GROUP TAB LOCATOR

LUBRICATION AND MAINTENANCE

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LUBRICANTS

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SERVICE PROCEDURES

PARTS AND LUBRICANT RECOMMENDATIONS

RECOMMENDATIONS

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.

INTERNATIONAL SYMBOLS

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

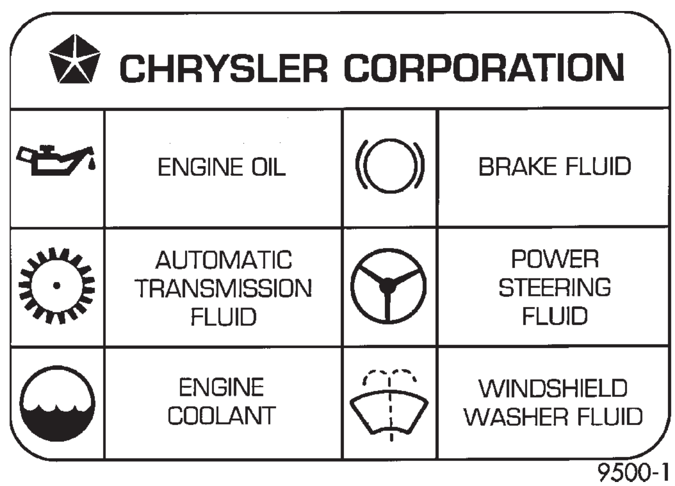


Fig. 1 International Symbols

CLASSIFICATION OF LUBRICANTS

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

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

ENGINE OIL

SAE VISCOSITY RATING INDICATES ENGINE OIL VISCOSITY

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

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

DaimlerChrysler Corporation only recommends multiple grade engine oils.

SERVICE PROCEDURES (Continued)

API QUALITY CLASSIFICATION

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

Refer to Group 9, Engine for gasoline engine oil specification.

9400-9

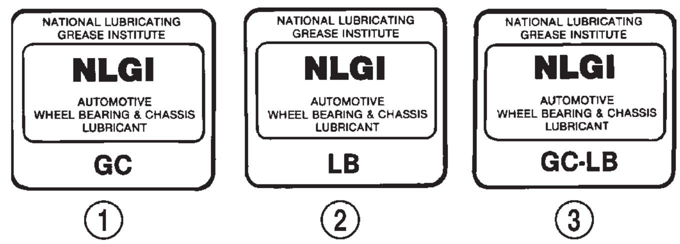
Fig. 2 API Symbol

GEAR LUBRICANTS

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

LUBRICANTS AND GREASES

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



9200-7

Fig. 3 NLGI Symbol

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

SPECIFICATIONS

FLUID CAPACITIES

FUEL TANK

All	76.4 L (20.2 gal.)

ENGINE OIL W/FILTER CHANGE

2.5L	3.8 L (4.0 qts.)
4.0L	5.7 L (6.0 qts.)

COOLING SYSTEM

2.5L	9.5 L (10 qts.)*
4.0L	11.4 L (12 qts.)**

*Includes 2.2 L (2.3 qts) for coolant recovery reservoir.

**Includes 0.9 L (1.0 qt) for coolant recovery reservoir.

AUTOMATIC TRANSMISSION

Dry fill capacity*

AW4	7.8 L (16.5 pts.)
30RH	4.67 L (9.86pts.)

*Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. Refer to Group 21, Transmission for proper fluid fill procedure.

MANUAL TRANSMISSION

AX5 (4X2)	3.5 L (3.7 qts.)
AX5 (4X4)	3.3 L (3.5 qts.)
AX15 (4X2)	3.15 L (3.3 qts.)
AX15 (4X4)	3.15 L (3.3 qts.)

TRANSFER CASE

SELEC-TRAC 242	1.3 L (2.85 pts.)
COMMAND-TRAC 231	1.0 L (2.2 pts.)

FRONT AXLE

181–FBI	1.48 L (3.13 pts.)
186–FBI	1.18L (2.5pts.)

REAR AXLE

194–RBI	1.66 L (3.5 pts.*)
8-1/4	2.08 L (4.4 pts.**)

* When equipped with TRAC-LOK, include 3.5 ounces of Friction Modifier Additive.

** When equipped with TRAC-LOK, include 4 ounces of Friction Modifier Additive.

POWER STEERING

Power steering fluid capacities are dependent on engine/chassis options as well as steering gear/cooler options. Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these capacities may vary. Refer to Section 19 of the service manual for proper fill and bleed procedures.

MAINTENANCE SCHEDULES

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SERVICE PROCEDURES

DESCRIPTION

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

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

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

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

Use the schedule that best describes the driving conditions.

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

UNSCHEDULED INSPECTION

At Each Stop For Fuel

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

Once A Month

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

At Each Oil Change

- Inspect exhaust system.
- Inspect brake hoses.
- Rotate the tires at each oil change interval shown on Schedule “A” (7,500 miles) or every other interval shown on Schedule “B” (6,000 miles).
- Check coolant level, hoses, and clamps.
- After completion of off-road operation, the underside of the vehicle should be thoroughly inspected. Examine threaded fasteners for looseness.

EMISSION CONTROL SYSTEM MAINTENANCE

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

FLUID FILL LOCATIONS AND LUBRICATION POINTS

The fluid fill/check locations and lubrication points are located in each applicable group.

SCHEDULE “A”

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

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

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

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

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

- Change engine oil.
- Replace engine oil filter.
- Inspect brake linings.
- Lubricate steering linkage (4x4 only).

SERVICE PROCEDURES (Continued)

30,000 Miles (48 000 km) or at 24 months
- Change engine oil.
- Replace engine oil filter.
- **Replace air cleaner element.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Lubricate steering and suspension ball joints.

37,500 Miles (60 000 km) or at 30 months
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.

45,000 Miles (72 000 km) or at 36 months
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Inspect brake linings.
- Flush and replace engine coolant at 36 months, regardless of mileage.
- Lubricate steering and suspension ball joints.

52,500 Miles (84 000 km) or at 42 months
- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant if not done at 36 months.
- Lubricate steering linkage (4x4 only).

60,000 Miles (96 000 km) or at 48 months
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Lubricate steering and suspension ball joints.

67,500 Miles (108 000 km) or at 54 months
- Change engine oil.
- Replace engine oil filter.
- Inspect brake linings.
- Lubricate steering linkage (4x4 only).

75,000 Miles (120 000 km) or at 60 months
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

82,500 Miles (133 000 km) or at 66 months
- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.
- Lubricate steering linkage (4x4 only).

90,000 Miles (144 000 km) or at 72 months
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

97,500 Miles (156 000 km) or at 78 months
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage (4x4 only).

105,000 Miles (168 000 km) or at 84 months
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.
- Lubricate steering and suspension ball joints.

112,500 Miles (180 000 km) or at 90 months
- Change engine oil.
- Replace engine oil filter.
- Inspect brake linings.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.
- Lubricate steering linkage (4x4 only).
- Drain and refill manual transmission fluid.

120,000 Miles (192 000 km) or at 96 months
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.

SERVICE PROCEDURES (Continued)

- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Lubricate steering and suspension ball joints.

Important: Inspection and service should also be performed any time a malfunction is observed or suspected.

SCHEDULE "B"

Follow Schedule "B" if the vehicle is usually operated under one or more of the following conditions.

- Frequent short trips driving less than 5 miles (8 km).
- Frequent driving in dusty conditions.
- Frequent trailer towing.
- Extensive idling.
- More than 50% of driving is at sustained high speeds during hot weather, above 90°F (32°C).
- Off-road driving.
- Desert operation.

3,000 Miles (5 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

6,000 Miles (10 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

9,000 Miles (14 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

12,000 Miles (19 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

15,000 Miles (24 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

18,000 Miles (29 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

21,000 Miles (34 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

24,000 Miles (38 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

27,000 Miles (43 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

30,000 Miles (48 000 km)

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill transfer case fluid.
- Lubricate steering and suspension ball joints.

33,000 Miles (53 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

36,000 Miles (58 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

39,000 Miles (62 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

42,000 Miles (67 000 km)

- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

SERVICE PROCEDURES (Continued)

45,000 Miles (72 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

48,000 Miles (77 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

51,000 Miles (82 000 km)
- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant.
- Lubricate steering linkage.

54,000 Miles (86 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

57,000 Miles (91 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

60,000 Miles (96 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

63,000 Miles (101 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

66,000 Miles (106 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

69,000 Miles (110 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

72,000 Miles (115 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

75,000 Miles (120 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

78,000 Miles (125 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

81,000 Miles (130 000 km)
- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) since last change.
- Lubricate steering linkage.

84,000 Miles (134 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

SERVICE PROCEDURES (Continued)

87,000 Miles (139 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

90,000 Miles (144 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill transfer case fluid.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

93,000 Miles (149 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

96,000 Miles (154 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

99,000 Miles (158 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

102,000 Miles (163 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

105,000 Miles (168 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Inspect engine air cleaner element, replace as necessary.**
- Lubricate steering linkage.

108,000 Miles (173 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.
- Drain and refill manual transmission fluid.

111,000 Miles (178 000 km)
- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) since last change.
- Lubricate steering linkage.

114,000 Miles (182 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.
- Lubricate steering and suspension ball joints.

117,000 Miles (187 000 km)
- Change engine oil.
- Replace engine oil filter.
- Lubricate steering linkage.

120,000 Miles (192 000 km)
- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace ignition cables.**
- **Replace spark plugs.**
- Inspect drive belt, adjust tension as necessary.
- Lubricate steering linkage.
- Drain and refill automatic transmission fluid.
- Drain and refill transfer case fluid.
- Drain and refill front and rear axles.‡
- Inspect brake linings.
- Lubricate steering and suspension ball joints.

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

Important: Inspection and service should also be performed any time a malfunction is observed or suspected.

JUMP STARTING, TOWING AND HOISTING

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SERVICE PROCEDURES

JUMP STARTING PROCEDURE

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

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

TO JUMP START A DISABLED VEHICLE:

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

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

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

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

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

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

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

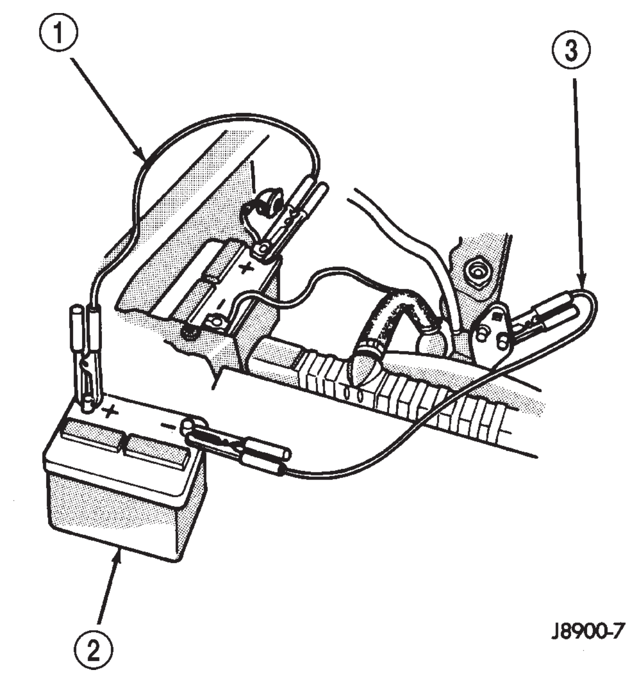

Fig. 1 Jumper Cable Connections—Typical

1 – POSITIVE CABLE CONNECTION
2 – BOOSTER BATTERY
3 – NEGATIVE OR GROUND CABLE CONNECTION

SERVICE PROCEDURES (Continued)

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

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

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.

TWO-WHEEL-DRIVE VEHICLE TOWING

TOWING-REAR END LIFTED (SLING-TYPE)

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

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

2WD XJ vehicles can be towed with the front wheels on the surface for extended distances at speeds not exceeding 48 km/h (30 mph). If the vehicle is equipped with a factory installed trailer tow package, use a SAE approved wheel lift device.

(1) Attach J-hooks around the axle shaft tube outboard of the shock absorber.

(2) Place the sling crossbar under and forward of the bumper.

(3) Attach safety chains around the frame rails.

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

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

(6) Verify that steering components are in good condition.

(7) Shift the transmission to NEUTRAL.

TOWING-REAR END LIFTED (WHEEL LIFT)

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

(2) Attach wheel lift to rear wheels.

(3) Place transmission in neutral.

(4) Raise vehicle to towing height.

(5) Place transmission in park (automatic transmission) or fist gear (manual transmission).

TOWING-FRONT END LIFTED

To prevent damage to front fascia components, use only a Wheel-Lift type towing device or Flat-Bed hauling equipment.

If using the wheel-lift towing method:

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

(2) Attach wheel lift to front wheels.

(3) Place transmission in neutral.

(4) Raise vehicle to towing height.

(5) Place transmission in park (automatic transmission) or fist gear (manual transmission).

FOUR-WHEEL-DRIVE VEHICLE TOWING

DaimlerChrysler Corporation recommends that a 4WD vehicle be transported on a flat bed device. A wheel lift or sling type device can be used provided all wheels are lifted off the ground using tow dollies.

If the vehicle is equipped with a factory installed trailer tow package, use a SAE approved wheel lift device.

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

TOWING-REAR END LIFTED (SLING TYPE)

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

(2) Attach J-hooks around rear axle shaft tube outboard of shock absorber.

(3) Place sling crossbar under and forward of bumper.

(4) Attach safety chains around frame rails.

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

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

(7) Shift transfer case to neutral.

SERVICE PROCEDURES (Continued)

TOWING-REAR END LIFTED (WHEEL LIFT)

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

(2) Attach wheel lift to rear wheels.

(3) Place transmission in neutral.

(4) Raise vehicle to towing height.

(5) Place transmission in park (automatic transmission) or first gear (manual transmission).

TOWING-FRONT END LIFTED

To prevent damage to front fascia components, use only a Wheel-Lift type towing device or Flat-Bed hauling equipment.

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

(2) Attach wheel lift to front wheels.

(3) Place transmission in neutral.

(4) Raise vehicle to towing height.

(5) Place transmission in park (automatic transmission) or first gear (manual transmission).

EMERGENCY TOW HOOKS

WARNING: REMAIN AT A SAFE DISTANCE FROM A VEHICLE THAT IS BEING TOWED VIA ITS TOW HOOKS. THE TOW STRAPS/CHAINS COULD BREAK AND CAUSE SERIOUS INJURY.

Some Jeep vehicles are equipped with front and rear emergency tow hooks. The tow hooks should be used for **EMERGENCY** purposes only.

CAUTION: DO NOT use emergency tow hooks for tow truck hook-up or highway towing.

HOISTING RECOMMENDATIONS

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

FLOOR JACK

When properly positioned, a floor jack can be used to lift a Jeep vehicle (Fig. 2) and (Fig. 3). Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.

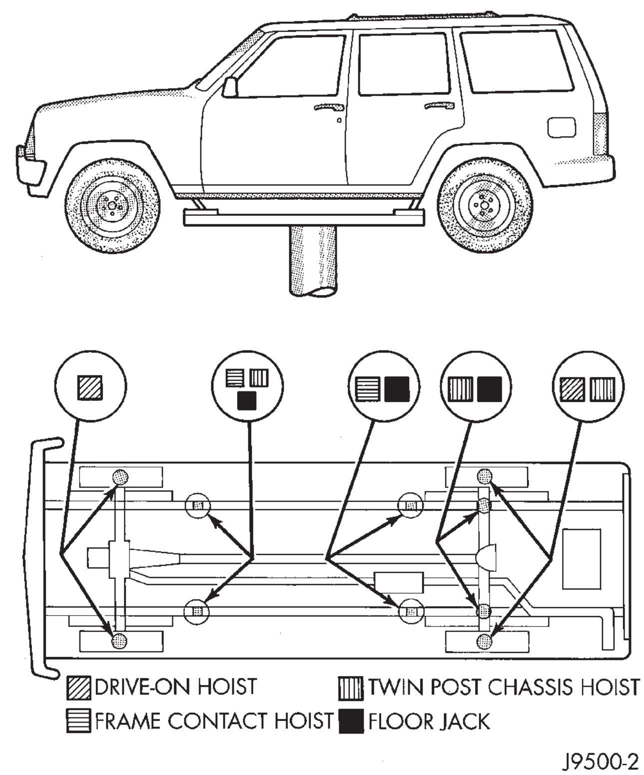

Fig. 2 Vehicle Lifting Locations

SERVICE PROCEDURES (Continued)

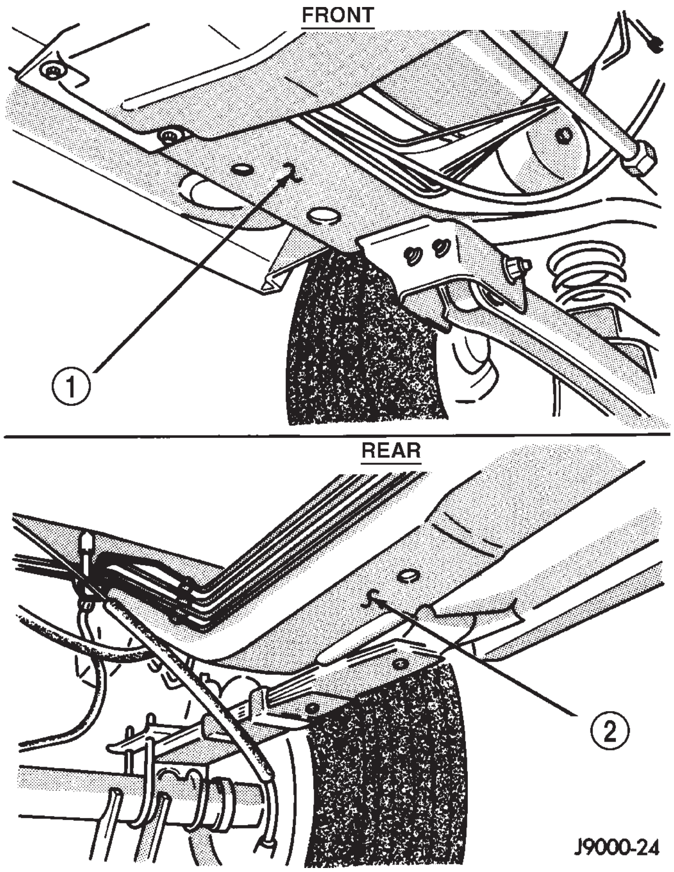

Fig. 3 Correct Vehicle Lifting Locations

1 – SUB-FRAME RAIL LOCATION
2 – SUB-FRAME RAIL LOCATION

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

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

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

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.

WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT 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.

SUSPENSION

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ALIGNMENT

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DESCRIPTION AND OPERATION

WHEEL ALIGNMENT

DESCRIPTION

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

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

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

NOTE: Periodic lubrication of the front suspension/steering system components may be required. Rubber bushings must never be lubricated. Refer to Group 0, Lubrication And Maintenance for the recommended maintenance schedule.

OPERATION

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns.
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire. The angle is not adjustable, damaged component(s) must be replaced to correct the camber angle.
- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires. Incorrect wheel toe position is the most common cause of unstable steering and uneven tire wear. The wheel toe position is the **final** front wheel alignment adjustment.
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted. The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, damaged component(s) must be replaced to correct the steering axis inclination angle.

DESCRIPTION AND OPERATION (Continued)

- **THRUST ANGLE** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle.

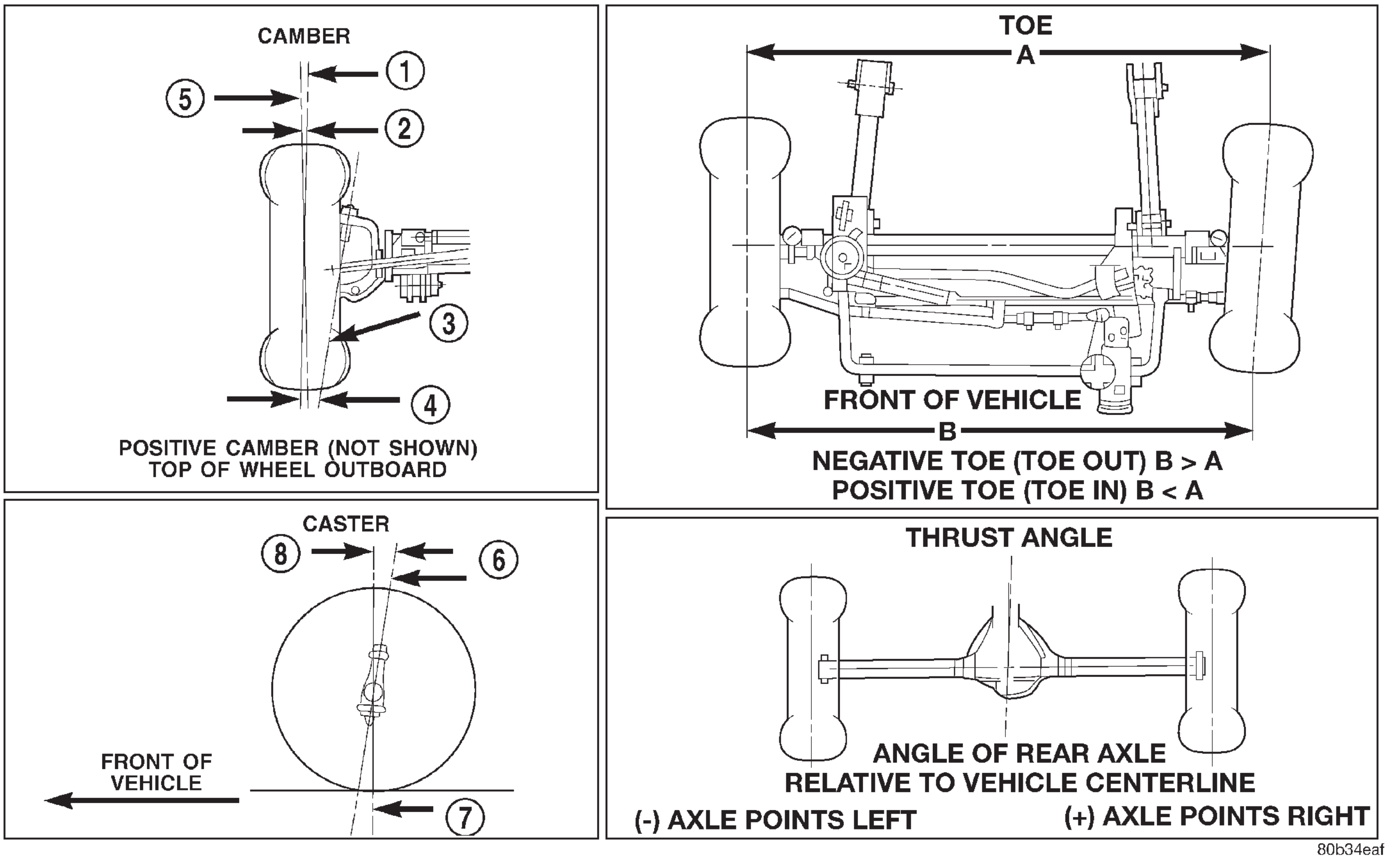

Fig. 1 Wheel Alignment Measurements

1 – WHEEL CENTERLINE
2 – NEGATIVE CAMBER ANGLE
3 – PIVOT CENTERLINE
4 – SCRUB RADIUS
5 – TRUE VERTICAL
6 – KING PIN
7 – VERTICAL
8 – POSITIVE CASTER

DIAGNOSIS AND TESTING

SUSPENSION AND STEERING SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components.	1. Adjust or replace wheel bearings. 2. Tighten or replace components as necessary.
EXCESSIVE PLAY IN STEERING	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Loose or worn steering gear.	1. Adjust or replace wheel bearings. 2. Tighten or replace components as necessary. 3. Adjust or replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Tires worn or out of balance. 4. Alignment. 5. Leaking steering dampener.	1. Adjust or replace wheel bearings. 2. Tighten or replace components as necessary. 3. Replace or balance tires. 4. Align vehicle to specifications. 5. Replace steering dampener.
VEHICLE INSTABILITY	1. Loose or worn wheel bearings. 2. Loose or worn steering or suspension components. 3. Tire pressure. 4. Alignment.	1. Adjust or replace wheel bearings. 2. Tighten or replace components as necessary. 3. Adjust tire pressure. 4. Align vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear. 2. Power steering fluid low. 3. Column coupler binding. 4. Tire pressure. 5. Alignment.	1. Adjust or replace steering gear. 2. Add fluid and repair leak. 3. Replace coupler. 4. Adjust tire pressure. 5. Align vehicle to specifications.
VEHICLE PULLS TO ONE SIDE DURING BRAKING	1. Uneven tire pressure. 2. Worn brake components. 3. Air in brake line.	1. Adjust tire pressure. 2. Repair brakes as necessary. 3. Repair as necessary.
VEHICLE LEADS OR DRIFTS FROM STRAIGHT AHEAD DIRECTION ON UNCROWNED ROAD	1. Radial tire lead. 2. Brakes dragging. 3. Weak or broken spring. 4. Uneven tire pressure. 5. Wheel Alignment. 6. Loose or worn steering or suspension components. 7. Cross caster out of spec.	1. Cross front tires. 2. Repair brake as necessary. 3. Replace spring. 4. Adjust tire pressure. 5. Align vehicle. 6. Repair as necessary. 7. Align vehicle.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
KNOCKING, RATTLING OR SQUEAKING	1. Worn shock bushings. 2. Loose, worn or bent steering/ suspension components. 3. Shock valve.	1. Replace shock. 2. Inspect, tighten or replace components as necessary. 3. Replace shock.
IMPROPER TRACKING	1. Loose, worn or bent track bar. 2. Loose, worn or bent steering/ suspension components.	1. Inspect, tighten or replace component as necessary. 2. Inspect, tighten or replace components as necessary.

SERVICE PROCEDURES

PRE-ALIGNMENT

Before starting wheel alignment, the following inspection and necessary corrections must be completed. Refer to Suspension and Steering System Diagnosis Chart for additional information.

(1) Inspect tires for size and tread wear.

(2) Set tire air pressure.

(3) Inspect front wheel bearings for wear.

(4) Inspect front wheels for excessive radial or lateral runout and balance.

(5) Inspect ball studs, linkage pivot points and steering gear for looseness, roughness or binding.

(6) Inspect suspension components for wear and noise.

WHEEL ALIGNMENT

Before each alignment reading, the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down several times. Always release the bumper in the down position. Set the front end alignment to specifications with the vehicle at its NORMAL RIDE HEIGHT.

CAMBER

The wheel camber angle is preset. This angle is not adjustable and cannot be altered.

CASTER

Before checking the caster of the front axle for correct angle, be sure the axle is not bent or twisted.

Road test the vehicle, make left and right turns. If the steering wheel returns to the center position unassisted, the caster angle is correct. If steering wheel does not return toward the center position unassisted, an incorrect caster angle is probable.

Caster can be adjusted by installing the appropriate size shims (Fig. 2).

NOTE: Changing caster angle will also change the front propeller shaft angle. The propeller shaft angle has priority over caster. Refer to Group 3 Differential & Driveline for additional information.

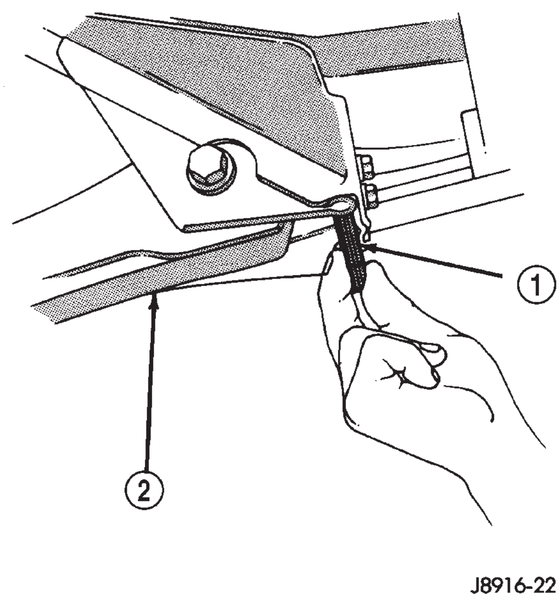

Fig. 2 Caster Adjustment

1 – SHIM
2 – SUSPENSION ARM

TOE POSITION (LHD)

NOTE: The wheel toe position adjustment is the final adjustment. The engine must remain running during the entire toe position adjustment.

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

(2) Loosen the adjustment sleeve clamp bolts (Fig. 3).

(3) Adjust the right wheel toe position with the drag link. Turn the sleeve until the right wheel is at correct TOE-IN specifications. Position the clamp

SERVICE PROCEDURES (Continued)

bolts as shown (Fig. 4) and tighten to 49 N·m (36 ft. lbs.).

NOTE: Make sure the toe setting does not change during clamp tightening.

(4) Adjust the left wheel toe position with the tie rod. Turn the sleeve until the left wheel is at specifications. Position the clamp bolts as shown (Fig. 4) and tighten to 27 N·m (20 ft. lbs.).

NOTE: Make sure the toe setting does not change during clamp tightening.

(5) Verify the right toe setting and turn off engine.
(6) Road test the vehicle on a flat level road to verify the steering wheel is centered.

NOTE: Once the toe setting is correct, the steering wheel can be re-centered by adjusting only the drag link.

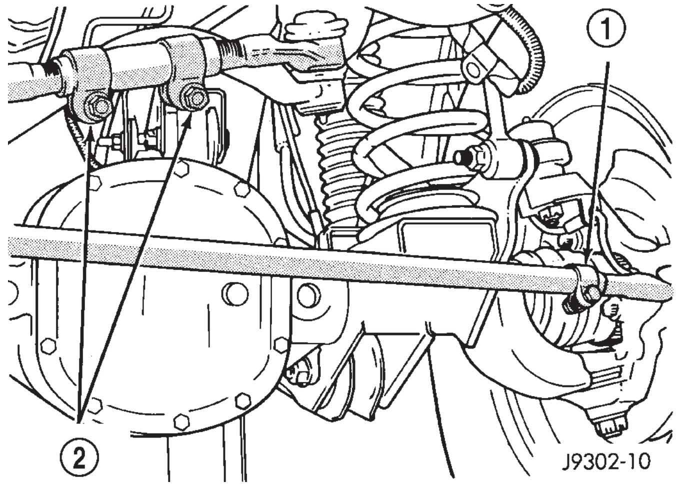

Fig. 4 Drag Link and Tie Rod Clamp (LHD)

1 – TIE ROD CLAMP
2 – DRAG LINK CLAMPS

TOE POSITION (RHD)

NOTE: The wheel toe position adjustment is the final adjustment. The engine must remain running during the entire toe position adjustment.

(1) Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.
(2) Loosen the adjustment sleeve clamp bolts (Fig. 5).
(3) Adjust the left wheel toe position with the drag link. Turn the sleeve until the left wheel is at the correct TOE-IN specifications. Position the clamp bolts to their original position and tighten to 49 N·m (36 ft. lbs.).

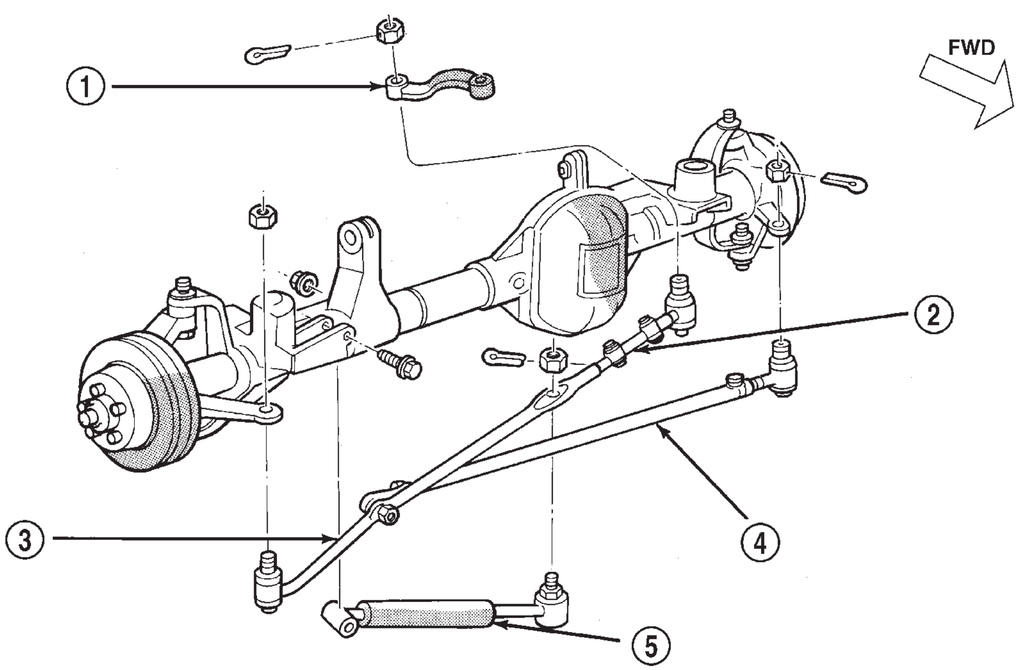

Fig. 3 Steering Linkage (LHD)

1 – PITMAN ARM
2 – ADJUSTMENT SLEEVE
3 – DRAG LINK
4 – TIE ROD
5 – STEERING DAMPENER

SERVICE PROCEDURES (Continued)

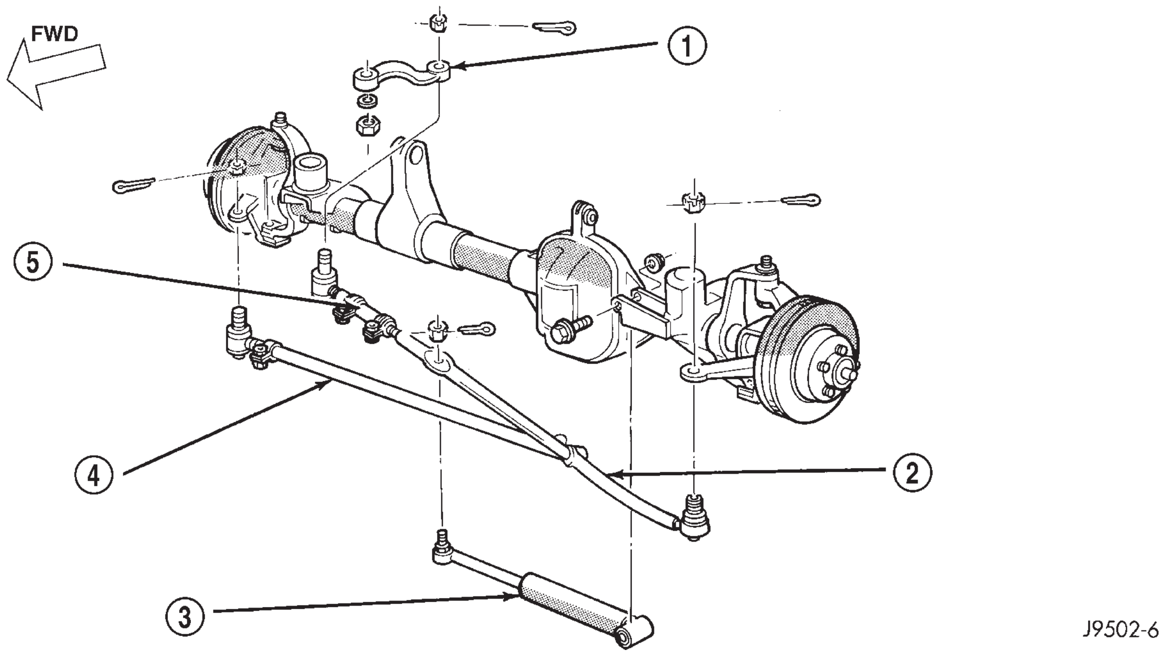

Fig. 5 Steering Linkage (RHD)

1 – PITMAN ARM
2 – DRAG LINK
3 – STEERING DAMPNER
4 – TIE ROD
5 – ADJUSTMENT SLEEVE

NOTE: Make sure the toe setting does not change during clamp tightening.

(4) Adjust the right wheel toe position with the tie rod. Turn the sleeve until the right wheel is at correct TOE-IN specifications. Position the clamp bolts to their original position and tighten to 27 N·m (20 ft. lbs.).

NOTE: Make sure the toe setting does not change during clamp tightening.

(5) Verify the right toe setting and turn off engine.

(6) Road test the vehicle on a flat level road to verify the steering wheel is centered.

NOTE: Once the toe setting is correct, the steering wheel can be re-centered by adjusting only the drag link.

SPECIFICATIONS

ALIGNMENT

NOTE: All alignment specifications are in degrees.

ANGLE	PREFERRED	RANGE	MAX RT/LT DIFFERENCE
CASTER	+ 7.0°	+ 5.25° to + 8.5°	1.25°
CAMBER (fixed angle)	− 0.25°	− 0.75° to + 0.5°	1.0°
TOTAL TOE-IN	+ 0.25°	0° to + 0.45°	.05°
THRUST ANGLE 0° ± 0.15°			

FRONT SUSPENSION

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DESCRIPTION AND OPERATION

SUSPENSION COMPONENTS

The front suspension is a link/coil design (Fig. 1). This suspension is use on Left Hand Drive (LHD) and Right Hand Drive (RHD) vehicles. The suspension is comprised of:

- Drive axle (4WD), tube axle (2WD)
- Dual-action shock absorbers
- Coil springs
- Upper and lower suspension arms
- Stabilizer bar
- Track bar
- Jounce bumpers

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

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

NOTE: Periodic lubrication of the front suspension/ steering system components may be required. Rubber bushings must never be lubricated. Refer to Group 0, Lubrication And Maintenance for the recommended maintenance schedule.

SHOCK ABSORBERS

DESCRIPTION

The top of the shock absorbers are bolted to a frame bracket. The bottom of the shocks are bolted to the axle brackets.

OPERATION

The shock absorbers dampen jounce and rebound motion of the vehicle over various road conditions and limit suspension rebound travel.

JOUNCE BUMPER

DESCRIPTION

The jounce bumpers are mounted under the frame rail inside of the coil spring.

OPERATION

The jounce bumpers are used to limit suspension travel in compression.

DESCRIPTION AND OPERATION (Continued)

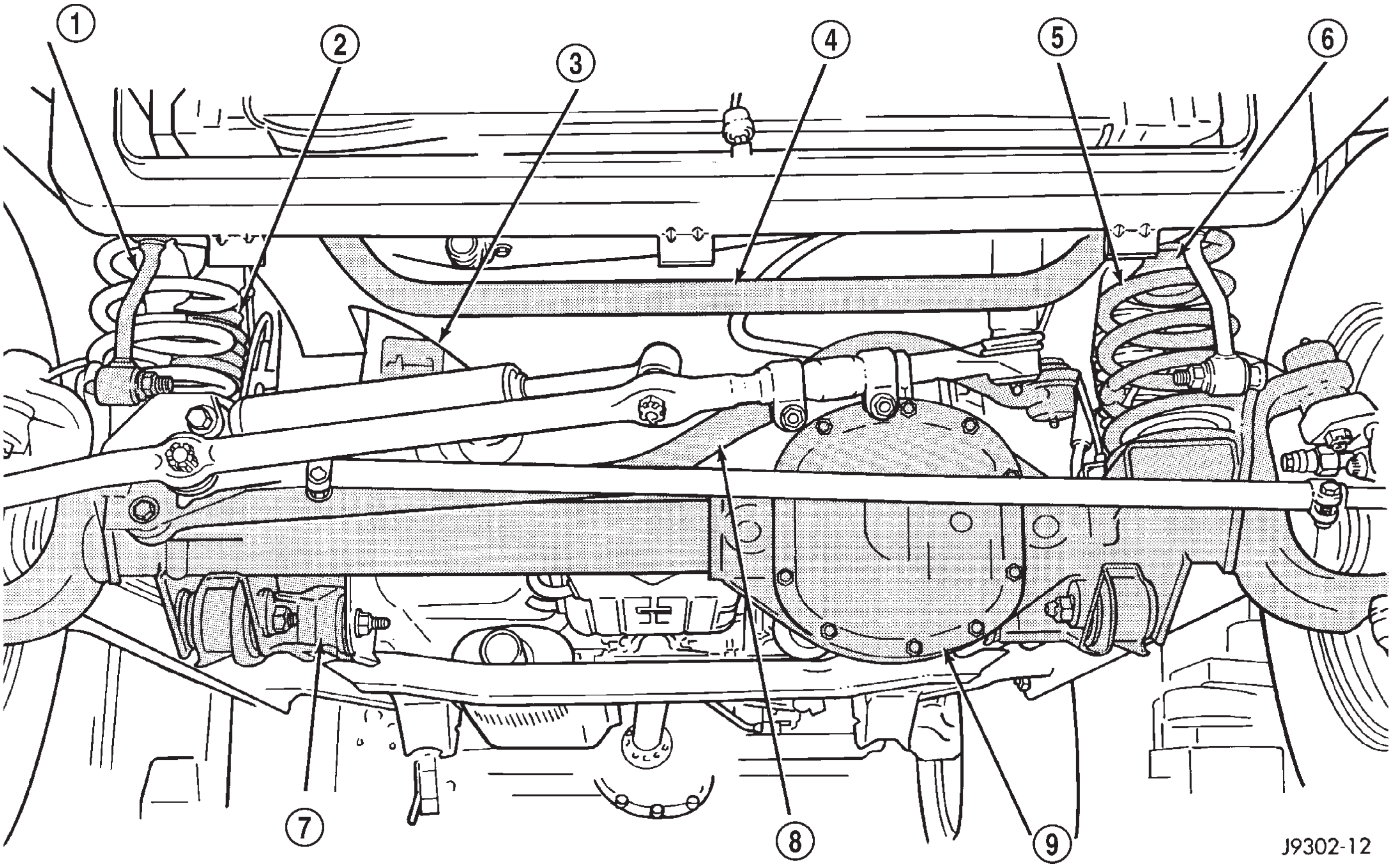


Fig. 1 Suspension Components (LHD)

1 – LINKS
2 – SHOCK ABSORBER
3 – UPPER SUSPENSION ARM
4 – STABILIZER BAR
5 – COIL SPRING
6 – JOUNCE BUMPER
7 – LOWER SUSPENSION ARM
8 – TRACK BAR
9 – AXLE

COIL SPRINGS AND ISOLATORS

DESCRIPTION

The coil springs mount up in the wheelhouse which is part of the unitized body bracket. A rubber doughnut isolator is located between the top of the spring and the bracket. The bottom of the spring seats on a axle pad and retained with a clip.

OPERATION

The coil springs control ride quality and maintain proper ride height. The isolators provide road noise isolation.

LOWER SUSPENSION ARMS AND BUSHINGS

DESCRIPTION

The lower suspension arms are steel and use bushings at one end of the arm. The arms mount to the frame rail bracket and the axle brackets.

OPERATION

The arm and bushings provide location and react to loads from the axle. The bushings provide isolation from the axle. The lower suspension arms can be used to adjust caster and pinion angle, through the use of shims at the frame rail bracket.

UPPER SUSPENSION ARMS AND BUSHINGS

DESCRIPTION

The upper suspension arms are steel and use rubber bushings at each end of the arm. The arms mount to the frame rail bracket and the axle brackets.

OPERATION

The arm and bushings provide location and react to loads from the axle. The bushings provide isolation from the axle.

DESCRIPTION AND OPERATION (Continued)

STABILIZER BAR

DESCRIPTION

The spring steel bar extends across the underside of the chassis frame rails. Links are connected from the bar to the axle brackets. The stabilizer bar and links are isolated by rubber bushings.

OPERATION

The stabilizer bar is used to control vehicle body roll during turns. The bar helps to control the vehicle body in relationship to the suspension.

TRACK BAR

DESCRIPTION

The bar is attached to a frame rail bracket with a ball stud and an axle bracket with a bushing. The bar is forged and has non replaceable isolator bushing and ball stud.

OPERATION

The track bar is used to control front axle lateral movement and provides cross car location of the axle assembly.

HUB/BEARING

DESCRIPTION

The bearing used on the front hub of this vehicle is the combined hub and bearing unit type assembly. This unit assembly combines the front wheel mounting hub (flange) and the front wheel bearing into a one piece unit. The wheel mounting studs are the only replaceable component of the hub/bearing assembly.

OPERATION

The hub/bearing assembly is mounted to the steering knuckle and is retained by three mounting bolts accessible from the back of the steering knuckle. The hub/bearing unit is not serviceable and must be replaced as an assembly if the bearing or the hub is determined to be defective.

DIAGNOSIS AND TESTING

SHOCK DIAGNOSIS

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

The shock absorber bushings do not require any type of lubrication. Do not attempt to stop bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing.

REMOVAL AND INSTALLATION

SHOCK ABSORBER

REMOVAL

(1) Remove the nut, retainer and grommet from the upper stud in the engine compartment (Fig. 2).

(2) Remove the lower nuts and bolts from the axle bracket.

(3) Remove the shock absorber.

INSTALLATION

(1) Position the lower retainer and grommet on the shock stud. Insert the shock absorber through the shock tower hole.

(2) Install the lower bolts and nuts. Tighten nuts to 23 N·m (17 ft. lbs.).

(3) Install the upper grommet and retainer on the stud. Install the nut and tighten to 22 N·m (16 ft. lbs.).

COIL SPRING/JOUNCE BUMPER

REMOVAL

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

(2) Remove the wheel and tire assemblies.

(3) Mark and disconnect the front propeller shaft from the axle.

(4) Remove lower suspension arms mounting nuts and bolts from the axle (Fig. 2).

(5) Remove the stabilizer bar link and shock absorber from the axle.

(6) Remove the track bar from the body rail bracket.

(7) Remove the drag link from the pitman arm.

REMOVAL AND INSTALLATION (Continued)

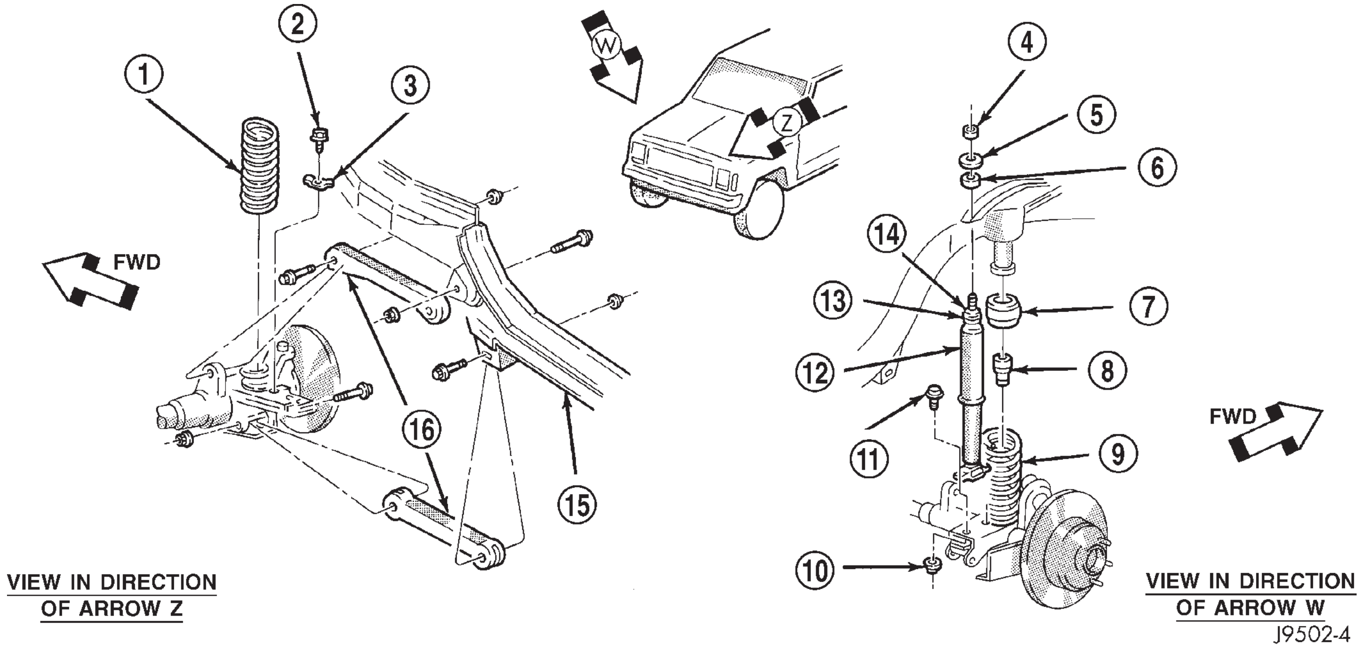


Fig. 2 Coil Spring & Shock Absorber

1 – SPRING
2 – SCREW
3 – SPRING RETAINER
4 – NUT
5 – RETAINER
6 – GROMMET
7 – ISOLATOR
8 – BUMPER
9 – SPRING
10 – NUT
11 – SCREW
12 – SHOCK ABSORBER
13 – RETAINER
14 – GROMMET
15 – FRAME
16 – CONTROL ARM

(8) Lower the axle until the spring is free from the upper mount. Remove the coil spring clip and remove the spring.

(9) Pull jounce bumper out of mount.

INSTALLATION

(1) Install jounce bumper into mount.

(2) Position the coil spring on the axle pad. Install the spring clip and bolt. Tighten bolt to 21 N·m (16 ft. lbs.).

(3) Raise the axle into position until the spring seats in the upper mount.

(4) Install the stabilizer bar links and shock absorbers to the axle bracket.

(5) Install the track bar to the body rail bracket.

(6) Install the lower suspension arms to the axle. Install mounting bolts and nuts finger tight.

(7) Install the front propeller shaft to the axle.

(8) Install the wheel and tire assemblies.

(9) Remove the supports and lower the vehicle.

(10) Tighten lower suspension arms nuts to 115 N·m (85 ft. lbs.).

STEERING KNUCKLE

For service procedures on the steering knuckle and ball joints refer to Group 3 Differentials And Driveline.

LOWER SUSPENSION ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the lower suspension arm nut and bolt from the axle bracket.

(3) Remove the nut and bolt from the rear bracket and remove the lower suspension arm (Fig. 3).

INSTALLATION

(1) Position the lower suspension arm at the axle bracket and rear bracket.

(2) Install the bolts and finger tighten the nuts.

(3) Remove support and lower the vehicle.

(4) Tighten the front and rear nuts to 115 N·m (85 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

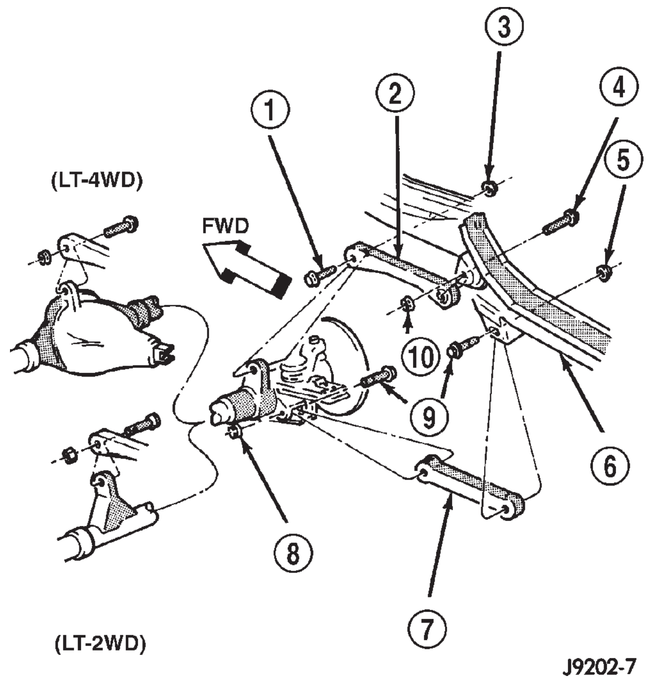


Fig. 3 Upper and Lower Suspension Arms

1 – BOLT
2 – UPPER ARM
3 – NUT
4 – BOLT
5 – NUT
6 – FRAME RAIL
7 – LOWER ARM
8 – NUT
9 – BOLT
10 – NUT

UPPER SUSPENSION ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the upper suspension arm nut and bolt at the axle bracket.

(3) Remove the nut and bolt at the frame rail and remove the upper suspension arm (Fig. 3).

INSTALLATION

(1) Position the upper suspension arm at the axle and frame rail.

(2) Install the bolts and finger tighten the nuts.

(3) Remove the supports and lower the vehicle.

(4) Tighten the nut at the axle to 75 N·m (55 ft. lbs.). Tighten the nut at the frame bracket to 90 N·m (66 ft. lbs.).

FRONT AXLE BUSHING

REMOVAL

(1) Remove the upper suspension arm from axle.

(2) Position Spacer 7932-3 over the axle bushing on a 4x2 vehicle and right side on a 4x4 vehicle.

(3) Place Receiver 7932-1 over flanged end of the bushing. (Fig. 4).

(4) Place small end of Remover/Install 7932-2 against other side of the bushing.

(5) Install bolt 7604 through remover, bushing and receiver.

(6) Install Long Nut 7603 and tighten nut too pull bushing out of the axle bracket.

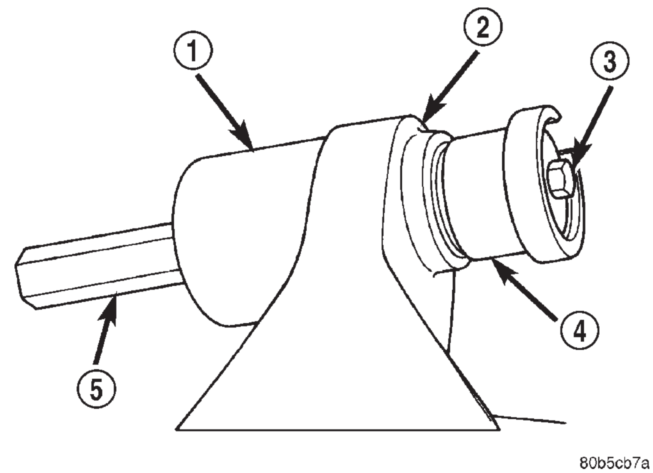


Fig. 4 Bushing Removal

1 – RECEIVER
2 – AXLE BRACKET
3 – BOLT
4 – REMOVER/INSTALLER
5 – LONG NUT

(7) Remove nut, bolt, receiver, remover and bushing.

NOTE: On 4x2 vehicle and right side of 4x4 vehicle, leave Spacer 7932-3 in position for bushing installation.

INSTALLATION

(1) Place Receiver 7932-1 on the other side of the axle bracket.

(2) Position new bushing up to the axle bracket., and large end of Remover/Install 7932-2 against the bushing (Fig. 5).

(3) Install bolt 7604 through receiver, bushing and installer.

(4) Install Long Nut 7603 and tighten nut to draw the bushing into the axle bracket.

(5) Remove tools and install the upper suspension arm.

REMOVAL AND INSTALLATION (Continued)

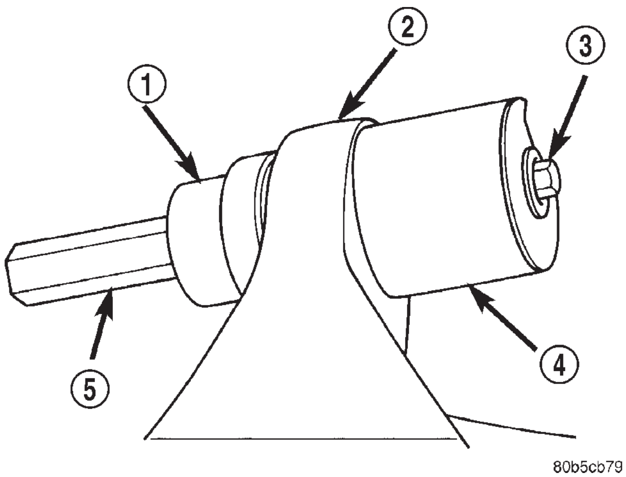


Fig. 5 Bushing Installation

1 – REMOVER/INSTALLER
2 – AXLE BRACKET
3 – BOLT
4 – RECEIVER
5 – LONG NUT

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove nuts, retainers and grommets from the links at the stabilizer bar (Fig. 6).

(3) Remove the links mounting nuts and bolts from the axle brackets.

(4) Remove the stabilizer bar clamps from the body rails. Remove the stabilizer bar.

INSTALLATION

(1) Inspect stabilizer bar bushings. Replace bushings if cracked, cut, distorted, or worn.

(2) Position the stabilizer bar on the body rail and install the bushings and clamps. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 75 N·m (40 ft. lbs.).

(3) Install the links and grommets onto the stabilizer bar and axle brackets.

(4) Tighten the link nuts at the axle bracket to 95 N·m (70 ft. lbs.).

(5) Tighten the link nuts at the stabilizer bar to 36 N·m (27 ft. lbs.).

(6) Remove the supports and lower the vehicle.

TRACK BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the cotter pin and nut from the ball stud end at the body rail bracket.

(3) Use a universal puller tool to separate the ball stud from the frame rail bracket.

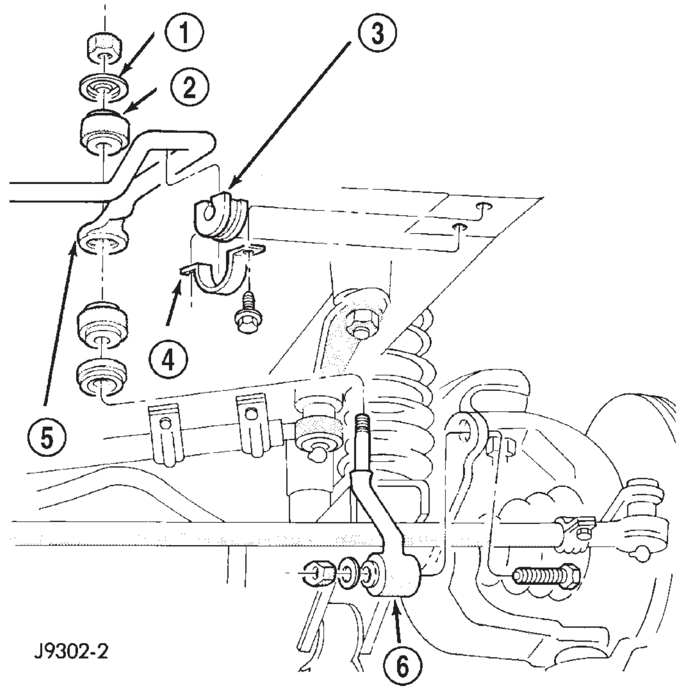


Fig. 6 Stabilizer Bar (LHD)

1 – RETAINER
2 – GROMMET
3 – BUSHING
4 – CLAMP
5 – STABILIZER BAR
6 – LINK

(4) Remove the bolt and flag nut from the axle shaft tube bracket (Fig. 7).

(5) Remove the track bar.

INSTALLATION

(1) Install the track bar at axle tube bracket. Loosely install the retaining bolt and flag nut.

(2) It may be necessary to pry the axle assembly over to install the track bar at the body rail. Install track bar at the body rail bracket. Install the retaining nut on the stud.

(3) Remove the supports and lower the vehicle.

(4) Tighten the retaining bolt at the axle shaft tube bracket to 54 N·m (40 ft. lbs.).

(5) Tighten the ball stud nut to 81 N·m (60 ft. lbs.). Install a new cotter pin.

HUB BEARING

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

(3) Remove the brake caliper, rotor and ABS wheel speed sensor, refer to Group 5 Brakes.

(4) Remove the cotter pin, nut retainer and axle hub nut (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

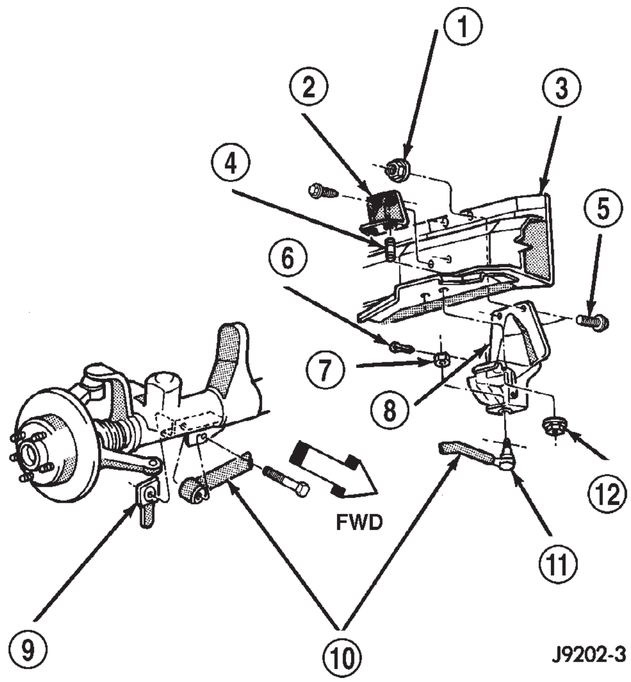


Fig. 7 Track Bar (LHD)

1 – NUT
2 – SUPPORT BRACKET
3 – LEFT FRAME RAIL
4 – STUD
5 – SCREW
6 – COTTER PIN
7 – NUT
8 – FRAME BRACKET
9 – NUT PLATE
10 – TRACK BAR
11 – BALL STUD END
12 – NUT

(5) Remove the hub bearing mounting bolts from the back of the steering knuckle. Remove hub bearing from the steering knuckle and off the axle shaft.

INSTALLATION

(1) Install the hub bearing and brake dust shield to the knuckle.

(2) Install the hub bearing to knuckle bolts and tighten to 102 N·m (75 ft. lbs.).

(3) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.). Install the nut retainer and a new cotter pin.

(4) Install the brake rotor, caliper and ABS wheel speed sensor, refer to Group 5 Brakes.

(5) Install the wheel and tire assembly.

(6) Remove support and lower the vehicle.

WHEEL MOUNTING STUDS

CAUTION: Do not use a hammer to remove wheel studs.

REMOVAL

(1) Raise and support vehicle.

(2) Remove wheel and tire assembly.

(3) Remove brake caliper, caliper adapter and rotor, refer to Group 5 Brakes for procedure.

(4) Remove stud from hub with Remover C-4150A (Fig. 9).

INSTALLATION

(1) Install new stud into hub flange.

(2) Install three washers onto stud, then install lug nut with the flat side of the nut against the washers.

(3) Tighten lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.

(4) Remove lug nut and washers.

(5) Install the brake rotor, caliper adapter, and caliper, refer to Group 5 Brakes for procedure.

(6) Install wheel and tire assembly, use new lug nut on stud or studs that were replaced.

(7) Remove support and lower vehicle.

REMOVAL AND INSTALLATION (Continued)

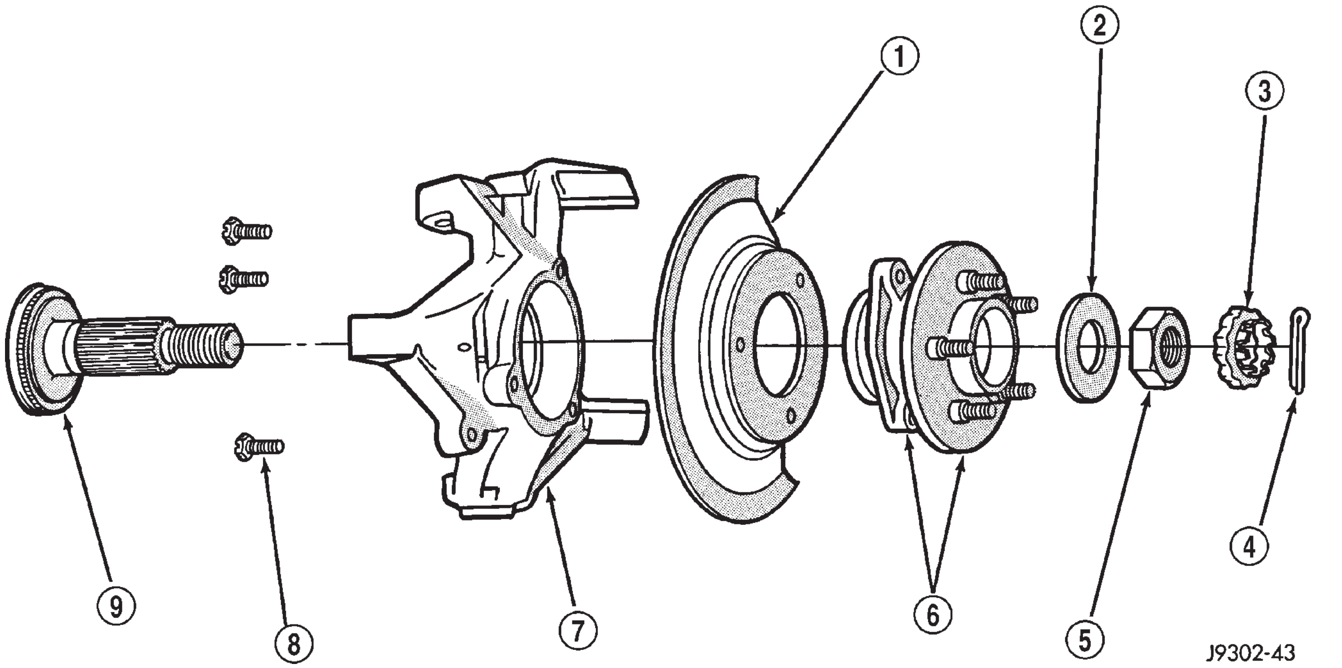


Fig. 8 Hub Bearing & Knuckle

1 – BRAKE SHIELD
2 – WASHER
3 – RETAINER
4 – COTTER PIN
5 – NUT
6 – HUB AND BEARING ASSEMBLY
7 – STEERING KNUCKLE
8 – BOLT
9 – TONE WHEEL (ABS)

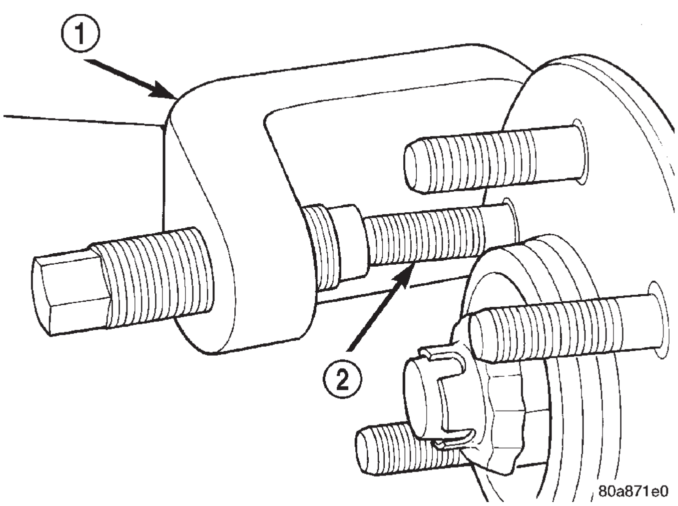


Fig. 9 Wheel Stud Removal

1 – REMOVER
2 – WHEEL STUD

SPECIFICATIONS

TORQUE CHART

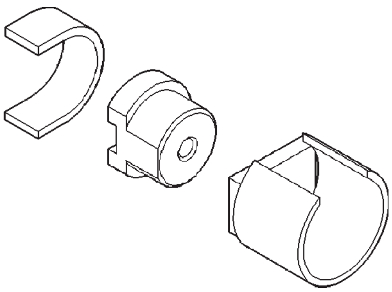
DESCRIPTION	TORQUE
Shock Absorber	
Upper Nut	22 N·m (16 ft. lbs.)
Lower Nut	23 N·m (17 ft. lbs.)
Suspension Arm Upper	
Front Nut	74 N·m (55 ft. lbs.)
Rear Nut	89 N·m (66 ft. lbs.)
Suspension Arm Lower	
Front Nut	115 N·m (85 ft. lbs.)
Rear Nut	115 N·m (85 ft. lbs.)
Stabilizer Bar	
Clamp Bolt	54 N·m (40 ft. lbs.)
Link Upper Nut	36 N·m (27 ft. lbs.)
Link Lower Nut	95 N·m (70 ft. lbs.)
Track Bar	
Ball Stud Nut	81 N·m (60 ft. lbs.)
Axle Bracket Bolt	54 N·m (40 ft. lbs.)

SPECIFICATIONS (Continued)

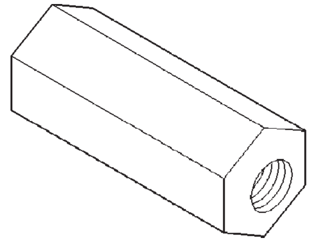
DESCRIPTION	TORQUE
Track Bar Bracket	
Bolts	125 N·m (92 ft. lbs.)
Nut	100 N·m (74 ft. lbs.)
Support Bolts	42 N·m (31 ft. lbs.)
Hub/Bearing	
Bolts	102 N·m (75 ft. lbs.)
Axle Nut	237 N·m (175 ft. lbs.)

SPECIAL TOOLS

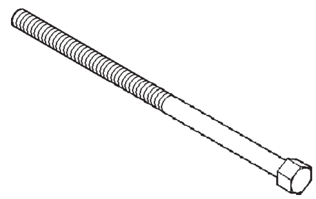
FRONT SUSPENSION



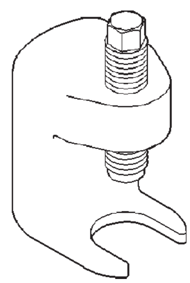
Remover/Installer Suspension Bushing 7932



Nut, Long 7603



Bolt, Special 7604



Remover C-4150A

REAR SUSPENSION

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DESCRIPTION AND OPERATION

SUSPENSION COMPONENT

The rear suspension is comprised of:

- Shock Absorbers
- Jounce Bumpers
- Stabilizer Bar (optional)
- Leaf Springs
- Drive Axle

CAUTION: A vehicle should always be loaded so the vehicle weight center-line is located immediately forward of the rear axle. Correct vehicle loading provides proper front tire-to-road contact. This results in maximum vehicle handling stability and safety. Incorrect vehicle weight distribution can cause excessive tire tread wear, spring fatigue or failure, and erratic steering.

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

SHOCK ABSORBERS

DESCRIPTION

The top of the shock absorbers are bolted to the body crossmember. The bottom of the shocks are bolted to the axle brackets.

OPERATION

The shock absorbers dampen jounce and rebound motion of the vehicle over various road conditions and limit suspension rebound travel.

JOUNCE BUMPERS

DESCRIPTION

The jounce bumpers are bolted to the bottom of the frame rail.

OPERATION

The jounce bumpers are used to limit suspension travel in compression.

STABILIZER BAR

DESCRIPTION

The spring steel bar extends across the axle and mounts to leaf spring brackets. Links are connected from the bar to the underside of the frame rail. The stabilizer bar and links are isolated by rubber bushings.

OPERATION

The stabilizer bar is used to control vehicle body roll during turns. The bar helps to control the vehicle body in relationship to the suspension.

COIL SPRINGS AND ISOLATORS

DESCRIPTION

The front of the multi-leaf springs mount to frame rail brackets. The rear of the spring mounts to shackles which mount the frame. The springs and shackles have bushing at the mounting points.

DESCRIPTION AND OPERATION (Continued)

OPERATION

The leaf springs control ride quality and maintain proper ride height. The shackles allow the springs to change their length as the vehicle moves over various road conditions. The bushings are used to isolate axle/road noise.

DIAGNOSIS AND TESTING

SPRING AND SHOCK

A knocking or rattling noise from a shock absorber may be caused by movement between mounting bushings and metal brackets or attaching components. These noises can usually be stopped by tightening the attaching nuts. If the noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

A squeaking noise from the shock absorber may be caused by the hydraulic valving and may be intermittent. This condition is not repairable and the shock absorber must be replaced.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston in and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

The spring eye and shock absorber bushings do not require any type of lubrication. Do not attempt to stop spring bushing noise by lubricating them. Grease and mineral oil-base lubricants will deteriorate the bushing rubber.

If the vehicle is used for severe, off-road operation, the springs should be examined periodically. Check for broken and shifted leafs, loose and missing clips, and broken center bolts. Refer to Spring and Shock Absorber Diagnosis chart for additional information.

SPRING AND SHOCK ABSORBER

CONDITION	POSSIBLE CAUSES	CORRECTION
SPRING SAGS	1. Broken leaf. 2. Spring fatigue.	1. Replace spring. 2. Replace spring.
SPRING NOISE	1. Loose spring clamp bolts. 2. Worn bushings. 3. Worn or missing spring tip inserts.	1. Tighten to specification. 2. Replace bushings. 3. Replace spring tip inserts.
SHOCK NOISE	1. Loose mounting fastener. 2. Worn bushings. 3. Leaking shock.	1. Tighten to specification. 2. Replace shock. 3. Replace shock.

REMOVAL AND INSTALLATION

SHOCK ABSORBER

REMOVAL

(1) Remove the shock absorber upper bolts from the body bracket (Fig. 1).

(2) Remove lower attaching nut and washer from the bracket stud. Remove the shock absorber.

INSTALLATION

(1) Install the shock absorber lower eye on the spring bracket stud. Install the shock absorber and upper bolts on the body bracket.

(2) Tighten the lower nut to 62 N·m (46 ft. lbs.).

(3) Tighten the upper bolts to 23 N·m (17 ft. lbs.).

STABILIZER BAR

REMOVAL

(1) Raise and support the vehicle.

(2) Disconnect stabilizer bar links from spring brackets (Fig. 2).

(3) Disconnect the stabilizer bar brackets from the body rails. Remove the stabilizer bar and links.

INSTALLATION

(1) Position the stabilizer bar links at the spring brackets. Install the attaching bolts and nuts and tighten to 74 N·m (55 ft. lbs.).

(2) Attach the stabilizer bar to the body rail brackets with the bolts. Tighten to 54 N·m (40 ft. lbs.).

(3) Remove the supports and lower the vehicle.

REMOVAL AND INSTALLATION (Continued)

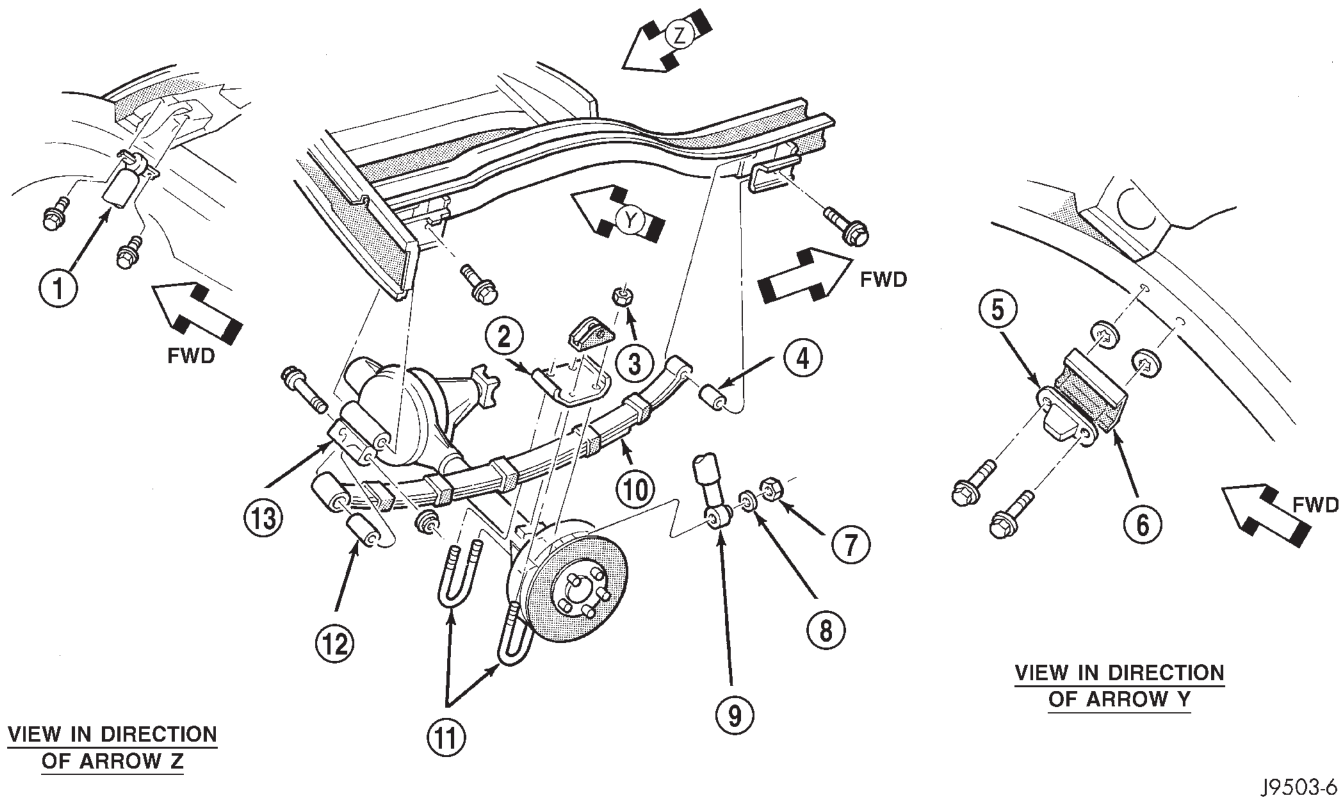

Fig. 1 Rear Suspension Components

1 – SHOCK ABSORBER
2 – SPRING BRACKET
3 – NUT
4 – BUSHING
5 – BUMPER
6 – BRACKET
7 – NUT
8 – RETAINER
9 – SHOCK ABSORBER
10 – SPRING
11 – U-BOLTS
12 – BUSHING
13 – SHACKLE

LEAF SPRING

REMOVAL

(1) Raise vehicle at body rails.
(2) Remove the wheel and tire assemblies.
(3) Support axle with hydraulic jack to relieve axle weight.
(4) Disconnect the stabilizer bar link from the spring bracket stud.
(5) Remove nuts, U-bolts and spring bracket from axle.
(6) Remove nut and bolt attaching spring front eye to shackle.
(7) Remove nut and bolt from spring rear eye.
(8) Remove spring from vehicle.

INSTALLATION

(1) Position the spring front eye in the bracket. Loosely install the attaching bolt and nut. Do not tighten at this time.
(2) Position the rear eye in the shackle bracket. Loosely install the attaching bolt and nut. Do not tighten at this time.
(3) Position the axle. Install the spring bracket, U-bolts and nuts. Tighten the nuts to 70 N·m (52 ft. lbs.).
(4) Connect the stabilizer bar link to the spring bracket.
(5) Remove the hydraulic jack.
(6) Lower the vehicle.
(7) Tighten the spring front eye attaching bolts to 156 N·m (115 ft. lbs.).
(8) Tighten the spring rear eye attaching bolts to 108 N·m (80 ft. lbs.).
(9) Tighten the stabilizer bar link to 74 N·m (55 ft. lbs.).

LEAF SPRING AND SHACKLE BUSHING

For front bushings bend tabs DOWN before removal. Use an appropriate driver tool and force the original bushing out of the spring eye.

REMOVAL AND INSTALLATION (Continued)

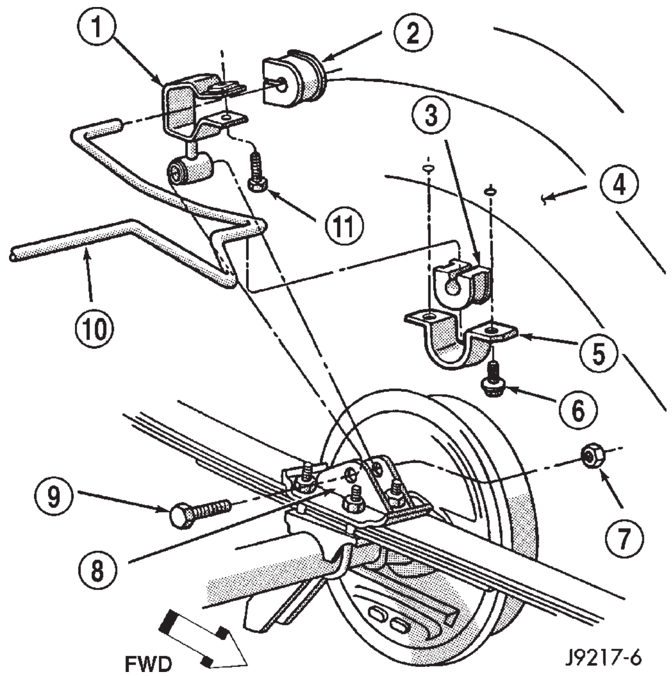

Fig. 2 Stabilizer Bar

1 – LINK
2 – BUSHING
3 – GROMMET
4 – FRAME RAIL
5 – CLAMP
6 – SCREW
7 – NUT
8 – SPRING BRACKET
9 – BOLT
10 – SWAY BAR
11 – SCREW

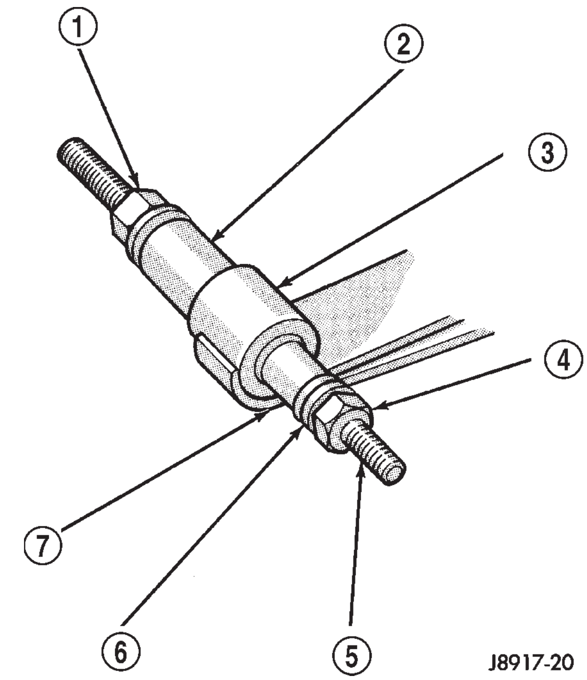

Fig. 3 Spring Eye Bushing Removal

1 – NUT
2 – PIPE (RECEIVER)
3 – SPRING EYE
4 – NUT
5 – THREADED ROD
6 – FLAT WASHER
7 – SOCKET WRENCH (DRIVER)

(1) Assemble tools shown (Fig. 3). Tighten nut at the socket wrench end of the threaded rod until the bushing is forced out.

(2) Assemble and align the bushing installation tools.

(3) Align the bushing with the spring eye or shackle eye and tighten the nut at the socket wrench end of the threaded rod. Tighten until the bushing is forced into the spring eye.

NOTE: The bushing must be centered in the spring eye. The ends of the bushing must be flush or slightly recessed within the end surfaces of the spring eye.

(4) For front bushings bend tabs up after installation.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Shock Absorber	
Upper Bolt	23 N·m (17 ft. lbs.)
Lower Nut	62 N·m (46 ft. lbs.)
Stabilizer Bar	
Clamp Bolt	54 N·m (40 ft. lbs.)
Link Upper Bolt	12 N·m (9 ft. lbs.)
Link Lower Nut	74 N·m (55 ft. lbs.)
Spring	
U-Bolt Nut	70 N·m (52 ft. lbs.)
Front Pivot Bolt	156 N·m (115 ft. lbs.)
Upper Shackle Bolt	156 N·m (115 ft. lbs.)
Lower Shackle Bolt	108 N·m (80 ft. lbs.)

DIFFERENTIAL AND DRIVELINE

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PROPELLER SHAFTS

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DESCRIPTION AND OPERATION

PROPELLER SHAFT

DESCRIPTION

A propeller shaft (Fig. 2) is the shaft which connects the transmission/transfer case to the axle differential. This is the link through which the engine power is transmitted to the axle.

The propeller shaft is designed and built with the yoke lugs in line with each other which is called zero phasing. This design produces the smoothest running condition, an out-of-phase shaft can cause a vibration.

Tubular propeller shafts are balanced by the manufacturer with weights spot welded to the tube.

PRECAUTIONS

Use the exact replacement parts when installing the propeller shafts. The use of the correct replacement parts helps to ensure safe operation. All fasteners must be torqued to the specified values for safe operation.

Also make alignment reference marks (Fig. 1) on the propeller shaft yoke and axle, or transmission, yoke prior to servicing. This helps to eliminate possible vibration.

CAUTION: Do not allow the propeller shaft to drop or hang from any propeller shaft joint during removal. Attach the propeller shaft to the vehicle underside with wire to prevent damage to the joints.

OPERATION

The propeller shaft must operate through constantly changing relative angles between the transmission and axle when going over various road surfaces. It must also be capable of changing length while transmitting torque. The axle rides suspended by springs in a floating motion.This is accomplished through universal joints, which permit the propeller

DESCRIPTION AND OPERATION (Continued)

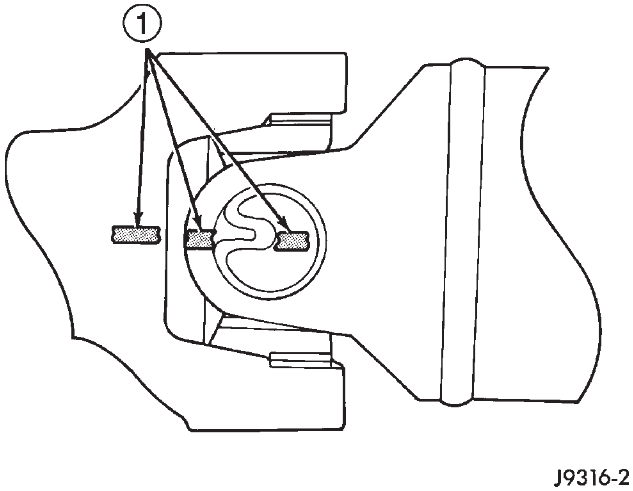


Fig. 1 Reference Marks on Yokes

1 – REFERENCE MARKS

shaft to operate at different angles. The slip joints (or yokes) permit contraction or expansion (Fig. 2).

Before undercoating a vehicle, the propeller shaft and the U-joints should be covered to prevent an out-of-balance condition and driveline vibration.

CAUTION: Use original equipment replacement parts for attaching the propeller shafts. The specified torque must always be applied when tightening the fasteners.

PROPELLER SHAFT JOINTS

DESCRIPTION

Two different types of propeller shaft joints are used:

- Single cardan universal joint (Fig. 3)
- Double cardan (CV) universal joint (Fig. 4)

None of the universal joints are serviceable. If one becomes worn or damaged, the complete universal joint assembly must be replaced.

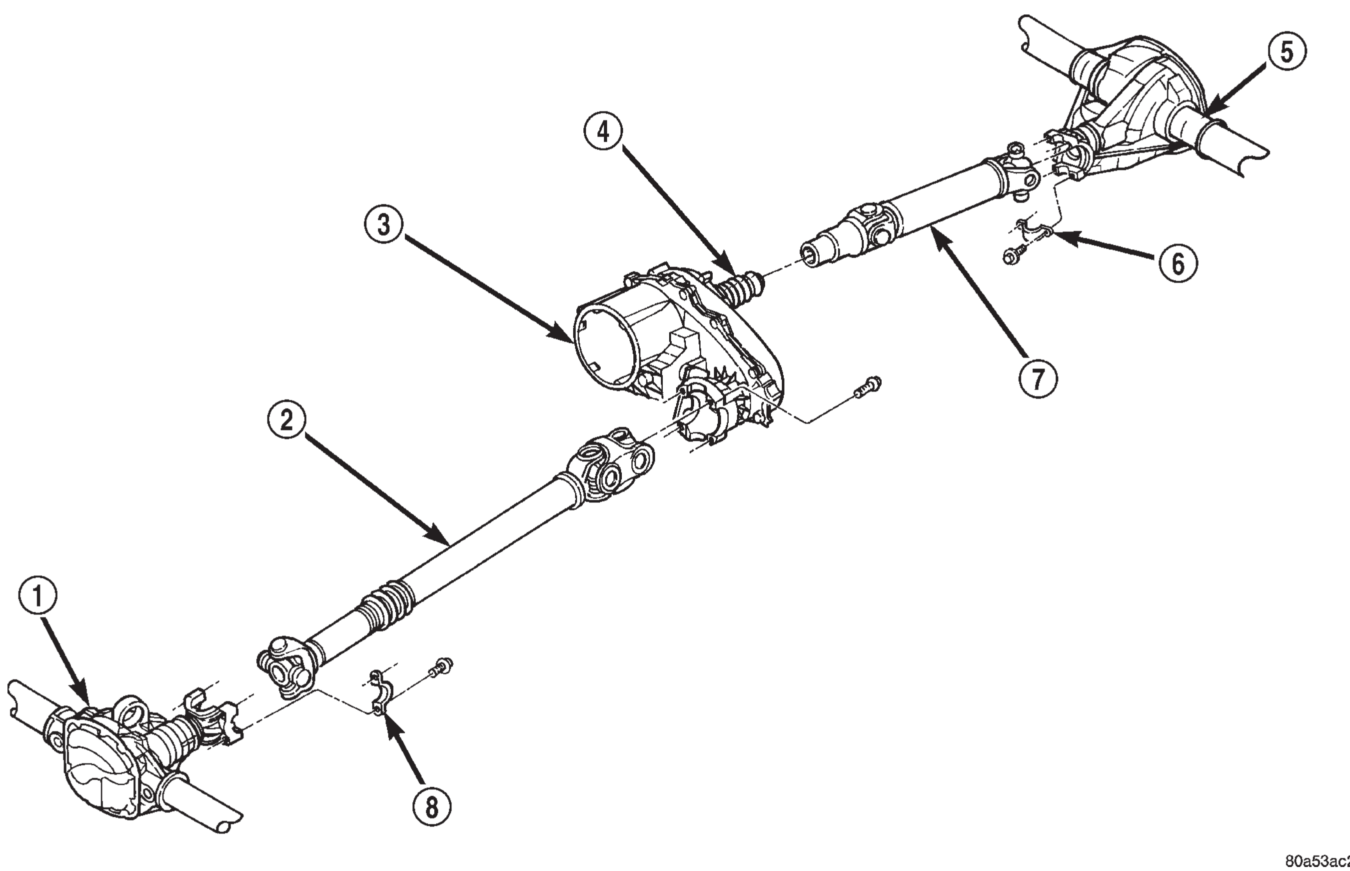


Fig. 2 Propeller Shafts

1 – FRONT AXLE
2 – FRONT PROPELLER SHAFT
3 – TRANSFER CASE
4 – BOOT
5 – REAR AXLE
6 – STRAP
7 – REAR PROPELLER SHAFT
8 – STRAP

DESCRIPTION AND OPERATION (Continued)

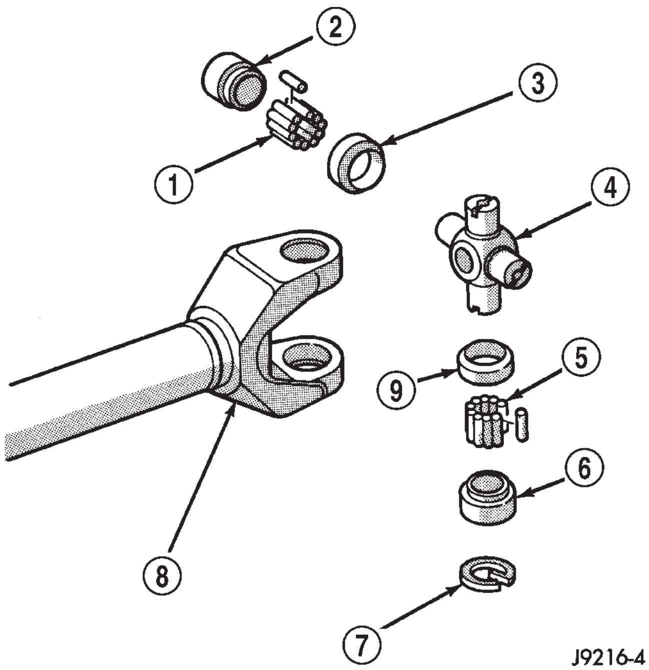


Fig. 3 Single Cardan Universal Joint

1 – NEEDLE BEARING	6 – BEARING CAP
2 – BEARING CAP	7 – RETAINING CLIP
3 – SEAL	8 – YOKE
4 – SPIDER	9 – SEAL
5 – NEEDLE BEARING	

PROPELLER SHAFT JOINT ANGLE

DESCRIPTION

When two shafts come together at a common joint, the bend that is formed is called the operating angle. The larger the angle, the larger the amount of angular acceleration and deceleration of the joint. This speeding up and slowing down of the joint must be cancelled to produce a smooth power flow.

OPERATION

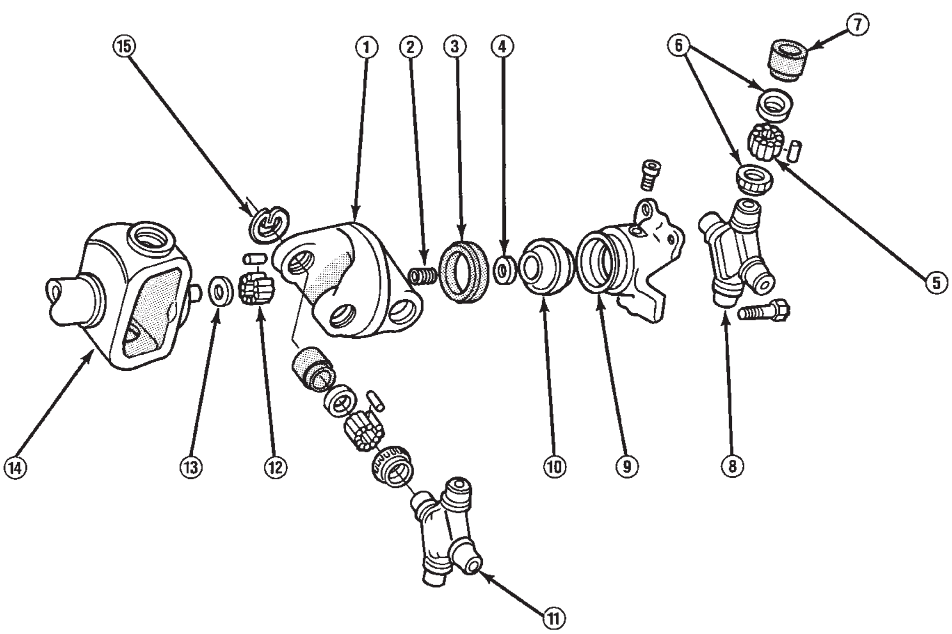
This cancellation is done through the phasing of a propeller shaft and ensuring that the proper propeller shaft joint working angles are maintained.

A propeller shaft is properly phased when the yoke ends are in the same plane, or in line. A twisted shaft will make the yokes out of phase and cause a noticeable vibration.

When taking propeller shaft joint angle measurements, or checking the phasing, of two piece shafts, consider each shaft separately.

Ideally the driveline system should have;

- Angles that are equal or opposite within 1 degree of each other.
- Have a 3 degree maximum operating angle.
- Have at least a 1/2 degree continuous operating (propeller shaft) angle.



1. LINK YOKE	6. SEAL	11. FRONT SPIDER
2. SOCKET SPRING	7. BEARING CAP	12. NEEDLE BEARINGS
3. SOCKET BALL RETAINER	8. REAR SPIDER	13. THRUST WASHER
4. THRUST WASHER	9. SOCKET YOKE	14. DRIVE SHAFT YOKE
5. NEEDLE BEARINGS	10. SOCKET BALL	15. RETAINING CLIP

J9216-21

Fig. 4 Double Cardan (CV) Universal Joint

DESCRIPTION AND OPERATION (Continued)

Propeller shaft speed (rpm) is the main factor in determining the maximum allowable operating angle. As a guide to the maximum normal operating angles refer to (Fig. 5).

PROPELLER SHAFT R.P.M.	MAX. NORMAL OPERATING ANGLES
5000	3°
4500	3°
4000	4°
3500	5°
3000	5°
2500	7°
2000	8°
1500	11°

Fig. 5 Maximum Angles And Propeller Shaft Speed

DIAGNOSIS AND TESTING

VIBRATION

Tires that are out-of-round, or wheels that are unbalanced, will cause a low frequency vibration. Refer to Group 22, Tires and Wheels, for additional information.

Brake drums that are unbalanced will cause a harsh, low frequency vibration. Refer to Group 5, Brakes, for additional information.

Driveline vibration can also result from loose or damaged engine mounts. Refer to Group 9, Engines, for additional information.

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

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1) Undercoating or other foreign material on shaft.	1) Clean exterior of shaft and wash with solvent.
	2) Loose U-joint clamp screws.	2) Install new clamps and screws and tighten to proper torque.
	3) Loose or bent U-joint yoke or excessive runout.	3) Install new yoke.
	4) Incorrect driveline angularity.	4) Measure and correct driveline angles.
	5) Rear spring center bolt not in seat.	5) Loosen spring u-bolts and seat center bolt.
	6) Worn U-joint bearings.	6) Install new U-joint.
	7) Propeller shaft damaged or out of balance.	7) Installl new propeller shaft.
	8) Broken rear spring.	8) Install new rear spring.
	9) Excessive runout or unbalanced condition.	9) Re-index propeller shaft, test, and evaluate.
	10) Excessive drive pinion gear shaft runout.	10) Re-index propeller shaft and evaluate.
	11) Excessive axle yoke deflection.	11) Inspect and replace yoke if necessary.
	12) Excessive transfer case runout.	12) Inspect and repair as necessary.
Universal Joint Noise	1) Loose U-joint clamp screws.	1) Install new clamps and screws and tighten to proper torque.
	2) Lack of lubrication.	2) Replace as U-joints as necessary.

DIAGNOSIS AND TESTING (Continued)

UNBALANCE

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

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

(1) Raise the vehicle.

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

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

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

(5) Check the universal joint clamp screws torque.

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

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

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

(9) Install a screw clamp at position 1 (Fig. 6).

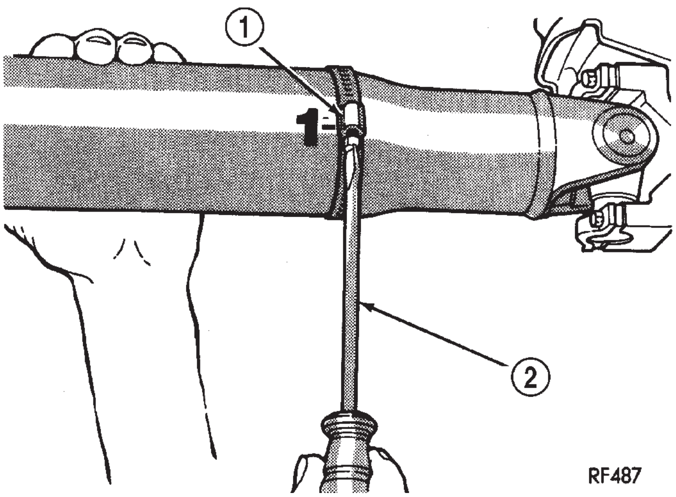


Fig. 6 Clamp Screw At Position 1

1 – CLAMP
2 – SCREWDRIVER

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

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

(12) If the vibration decreased, install a second clamp (Fig. 7) and repeat the test.

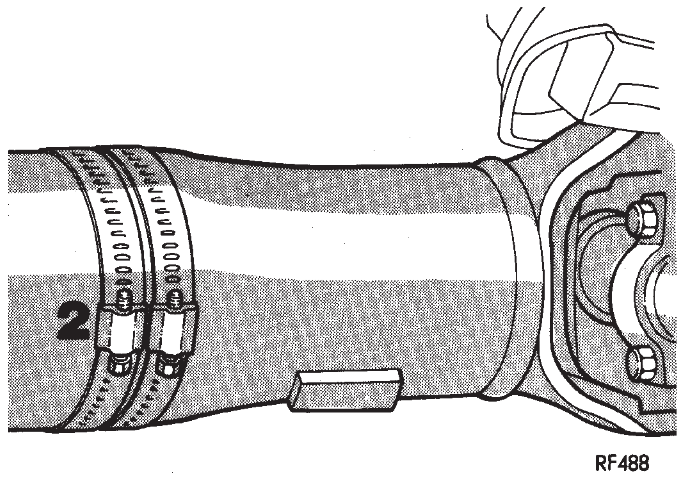


Fig. 7 Two Clamp Screws At The Same Position

(13) If the additional clamp causes an additional vibration, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 8).

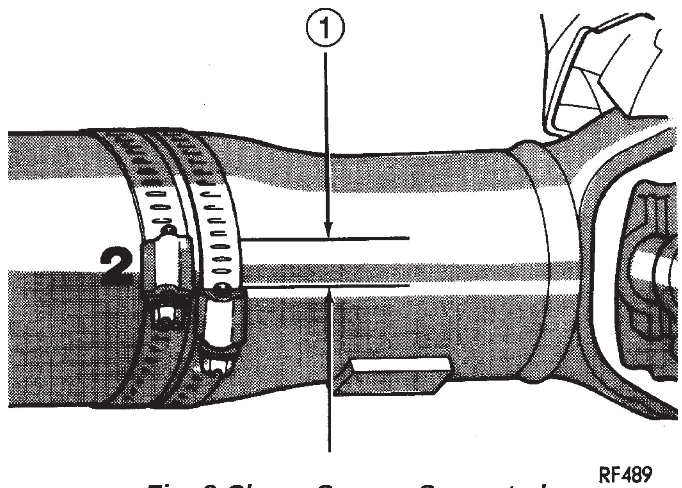


Fig. 8 Clamp Screws Separated

1 – ½ INCH

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

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

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

RUNOUT

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

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

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

DIAGNOSIS AND TESTING (Continued)

(4) Refer to Runout Specifications chart.

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

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

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

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

RUNOUT SPECIFICATIONS

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

SERVICE PROCEDURES

DRIVELINE ANGLE MEASUREMENT PREPARATION

Before measuring universal joint angles, the following must be done;

- Inflate all tires to correct pressure.
- Check the angles in the same loaded or unloaded condition as when the vibration occurred. Propeller shaft angles change according to the amount of load in the vehicle.
- Check the condition of all suspension components and verify all fasteners are torqued to specifications.
- Check the condition of the engine and transmission mounts and verify all fasteners are torqued to specifications.

PROPELLER SHAFT ANGLE MEASUREMENT

To accurately check driveline alignment, raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn.

(1) Remove any external bearing snap rings, if equipped, from universal joint so protractor base sits flat.

(2) Rotate the shaft until transmission/transfer case output yoke bearing is facing downward.

Always make measurements from front to rear. Also, be sure to take all measurements while working from the same side of the vehicle.

(3) Place Inclinometer on yoke bearing (A) parallel to the shaft (Fig. 9). Center bubble in sight glass and record measurement.

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

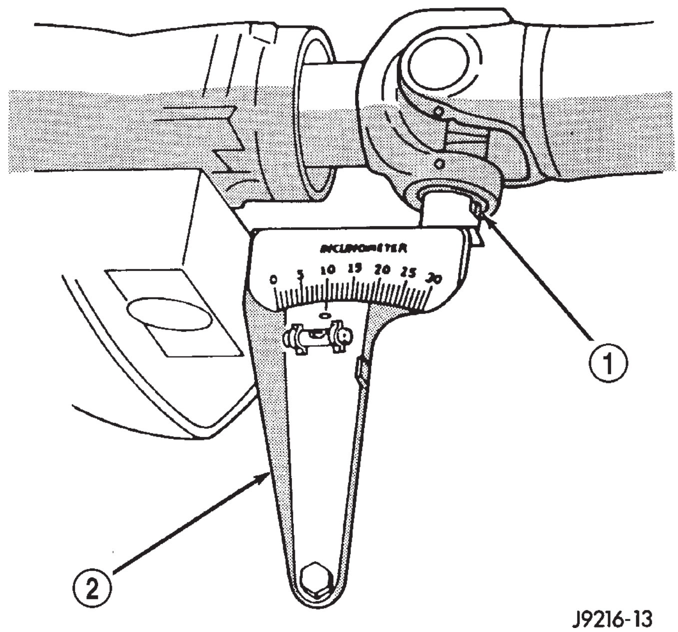


Fig. 9 Front (Output) Angle Measurement (A)

1 – SLIP YOKE BEARING CAP
2 – SPECIAL TOOL 7663 (J-23498A)

(4) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing parallel to the shaft (Fig. 10). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

This measurement will give you the Propeller Shaft Angle (C).

(5) Subtract smaller figure from larger (C minus A) to obtain Transmission Output Operating Angle.

(6) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing parallel to the shaft (Fig. 11). Center bubble in sight glass and record measurement.

SERVICE PROCEDURES (Continued)

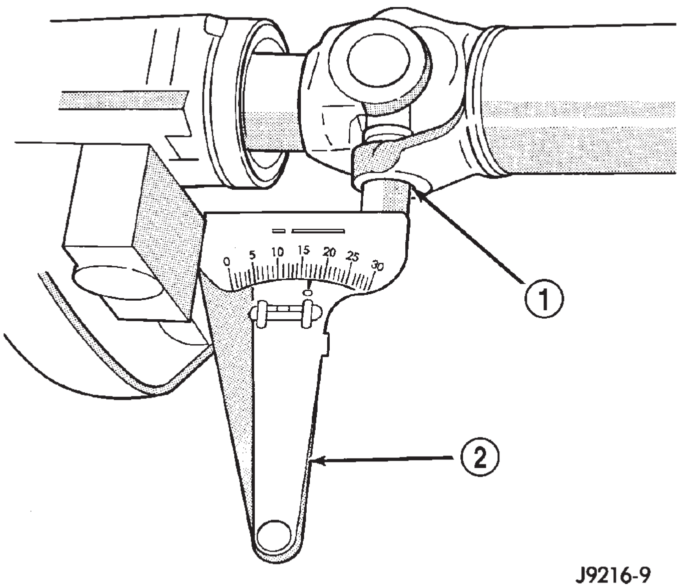


Fig. 10 Propeller Shaft Angle Measurement (C)

1 – SHAFT YOKE BEARING CAP
2 – SPECIAL TOOL 7663 (J23498–A)

This measurement will give you the pinion shaft or Input Yoke Angle (B).

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

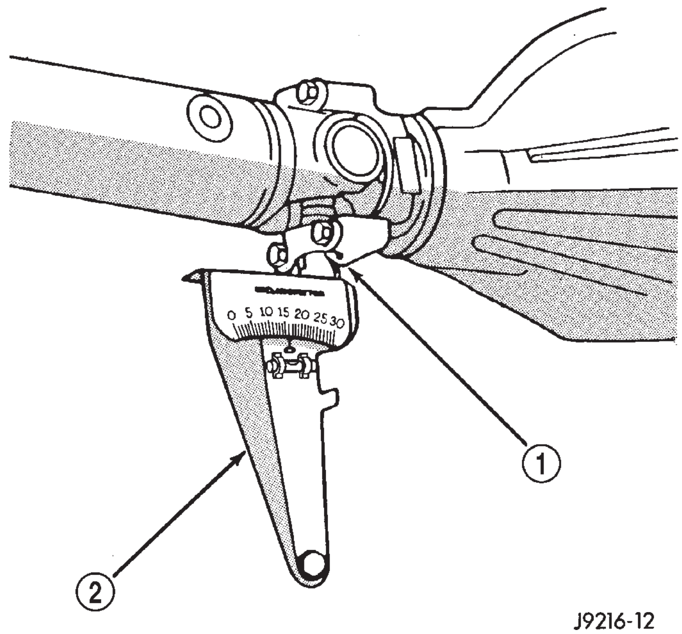


Fig. 11 Rear (Input) Angle Measurement (B)

1 – PINION YOKE BEARING CAP
2 – SPECIAL TOOL 7663 (J-23498A)

Refer to rules given below and the example in (Fig. 12) for additional information.

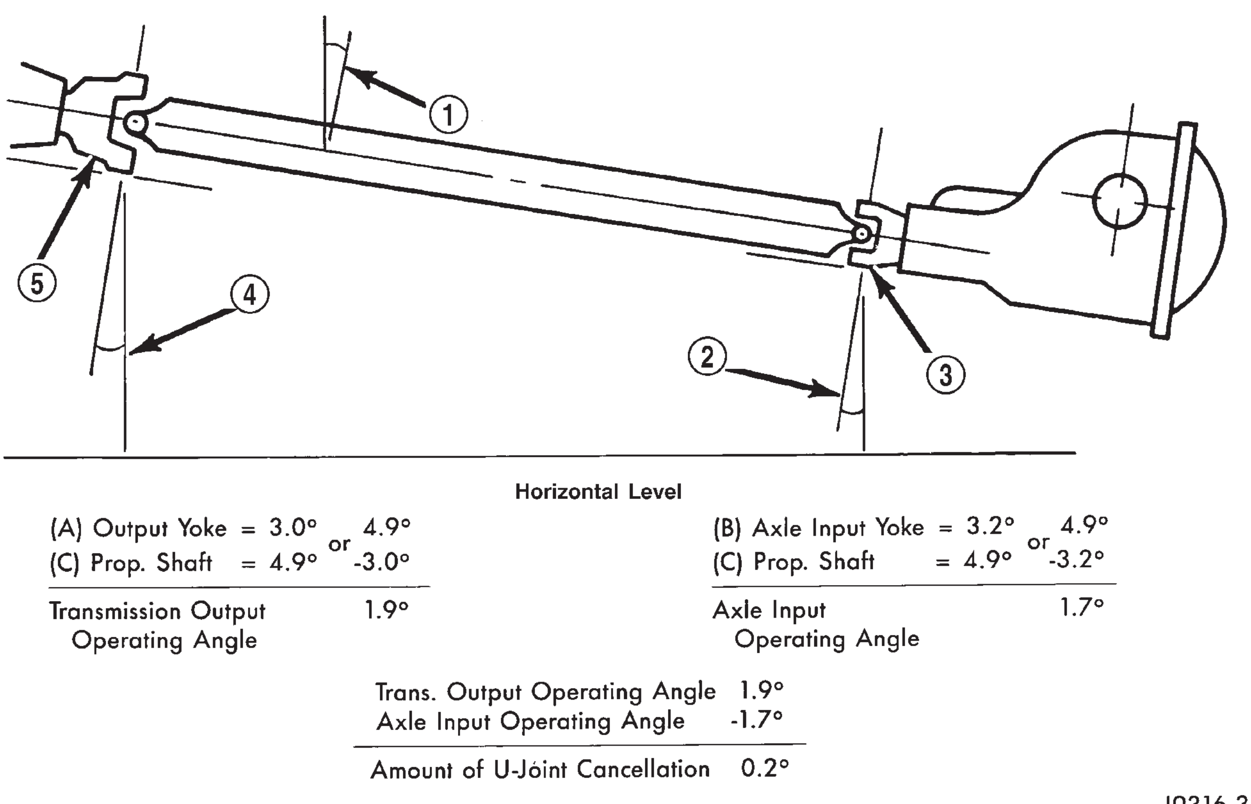


Fig. 12 Universal Joint Angle Example

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

SERVICE PROCEDURES (Continued)

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

REMOVAL AND INSTALLATION

FRONT PROPELLER SHAFT

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Remove the crossmember/skid plate as necessary to gain access to the propeller shaft.

(3) Shift the transmission and transfer case, if necessary, into the Neutral position.

(4) Using a suitable marker, mark a line across the yoke at the transfer case, the link yoke, and propeller shaft yoke at the rear of the front propeller shaft for installation reference (Fig. 13).

(5) Mark a line across the propeller shaft yoke and the pinion shaft yoke for installation reference.

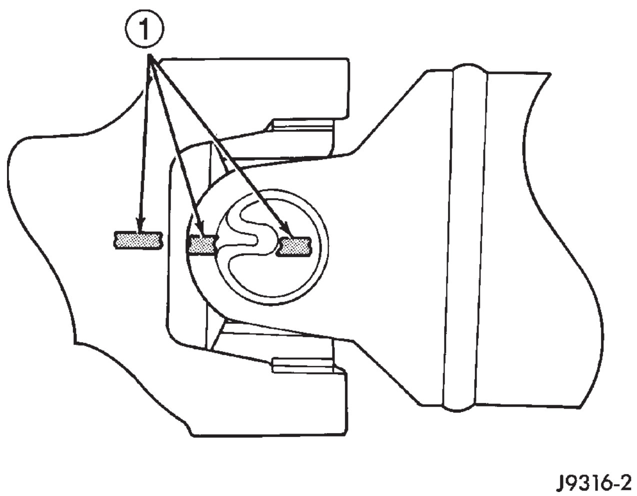


Fig. 13 Reference Marks on Yokes

1 – REFERENCE MARKS

(6) Remove the U-joint strap bolts at the pinion shaft yoke (Fig. 14).

(7) Remove bolts holding rear universal joint to the transfer case yoke.

(8) Separate the rear universal joint from the transfer case yoke.

(9) Push rear of propeller shaft upward to clear transfer case yoke.

(10) Separate front universal joint from front axle.

(11) Separate propeller shaft from vehicle.

INSTALLATION

(1) Position front propeller shaft under vehicle with rear universal joint over the transfer case yoke.

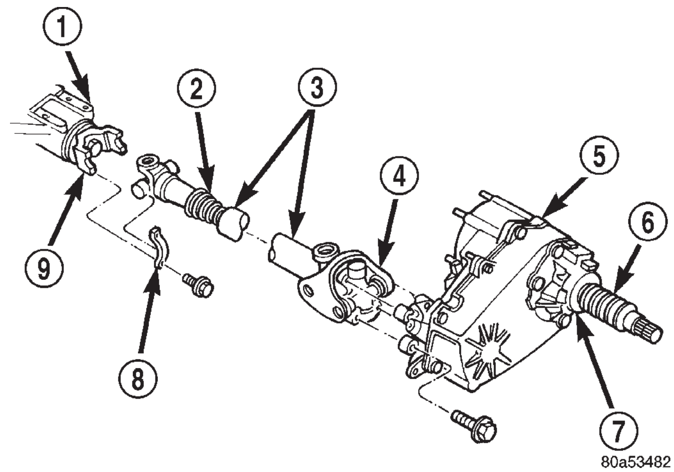


Fig. 14 Front Propeller Shaft

1 – FRONT AXLE
2 – BOOT
3 – PROPELLER SHAFT
4 – CV-JOINT
5 – TRANSFER CASE
6 – BOOT
7 – SLINGER
8 – CLAMP
9 – YOKE

(2) Place front universal joint into the axle pinion yoke.

(3) Align mark on the rear link yoke and universal joint to the mark on the transfer case yoke (Fig. 13).

(4) Loosely install bolts to hold universal joint to transfer case yoke.

(5) Align mark on front universal joint to the mark on the axle pinion yoke.

(6) Tighten the U-joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.

(7) Tighten the universal joint to transfer case bolts to 27 N·m (20 ft. lbs.) torque.

(8) Lower the vehicle.

REAR PROPELLER SHAFT

REMOVAL

(1) Shift the transmission and transfer case into Neutral.

(2) Hoist and support vehicle on safety stands.

(3) Scribe alignment marks at the pinion shaft and at each end of the propeller shaft. These marks will be used for installation reference.

(4) Remove the U-joint strap bolts at the pinion shaft yoke.

(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 15).

(6) Slide the slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 16).

REMOVAL AND INSTALLATION (Continued)

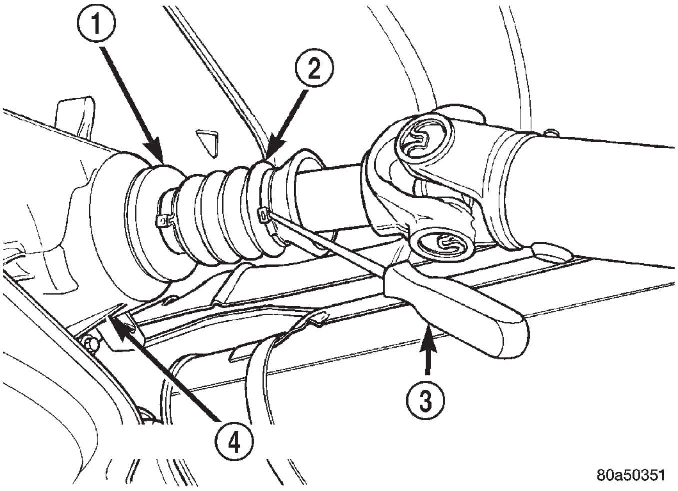


Fig. 15 Dust Boot Clamp

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

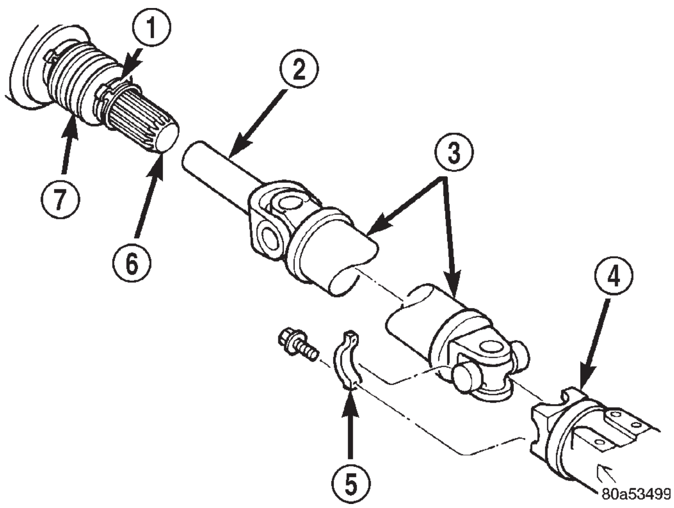


Fig. 16 Rear Propeller Shaft

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

INSTALLATION

(1) Slide the slip yoke on the transmission/transfer case output shaft. Align the installation reference marks at the axle yoke and install the propeller shaft (Fig. 16).

(2) Tighten the U-joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.

(3) Crimp clamp to hold dust boot to propeller shaft yoke (Fig. 17).

(4) Lower the vehicle.

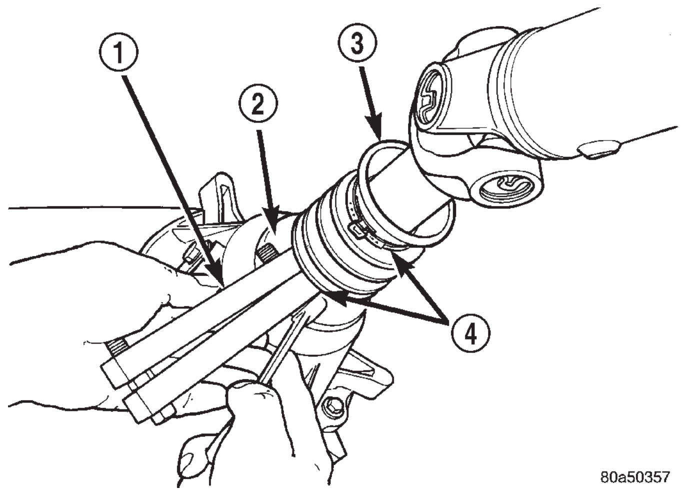


Fig. 17 Crimping Dust Boot Clamp

1 – SPECIAL TOOL C-4975–A
2 – SLINGER
3 – BOOT
4 – CLAMP

DISASSEMBLY AND ASSEMBLY

SINGLE CARDAN UNIVERSAL JOINT

DISASSEMBLY

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

(1) Remove the propeller shaft.

(2) Using a soft drift, tap the outside of the bearing cap assembly to loosen snap ring.

(3) Remove snap rings from both sides of yoke (Fig. 18).

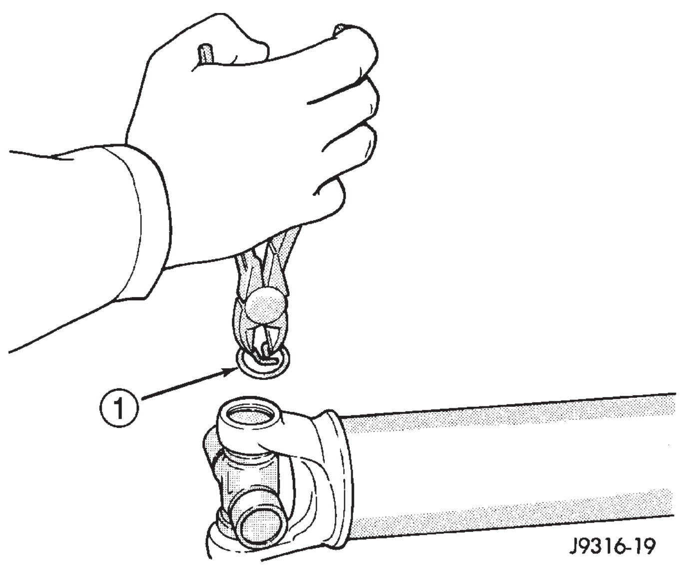


Fig. 18 Remove Snap Ring

1 – SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

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

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

(6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 19).

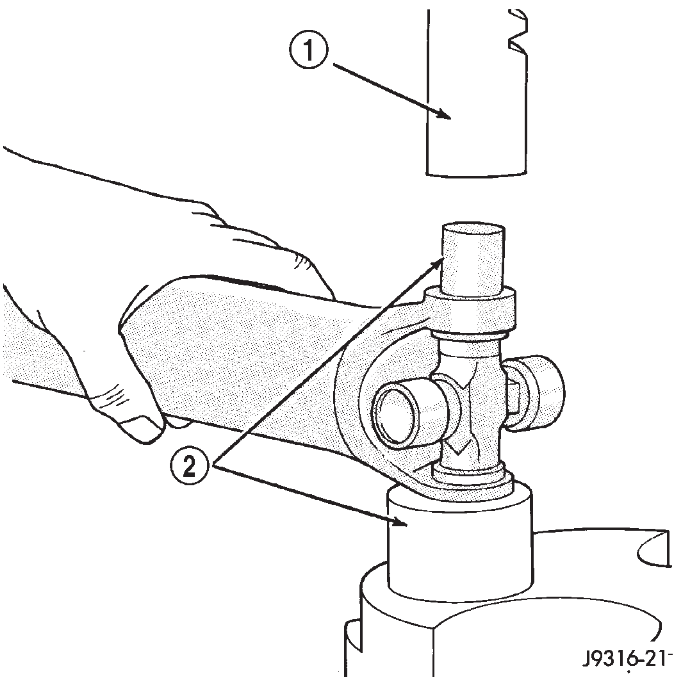


Fig. 19 Press Out Bearing

1 – PRESS
2 – SOCKET

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

(8) To remove the opposite bearing cap, turn the yoke over and straighten the cross in the open hole. Then, carefully press the end of the cross until the remaining bearing cap can be removed (Fig. 20).

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

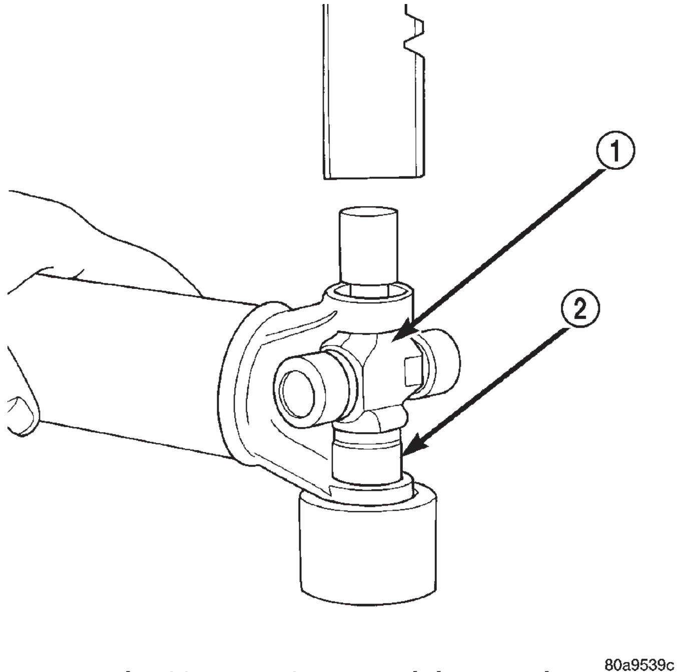


Fig. 20 Press Out Remaining Bearing

1 – CROSS
2 – BEARING CAP

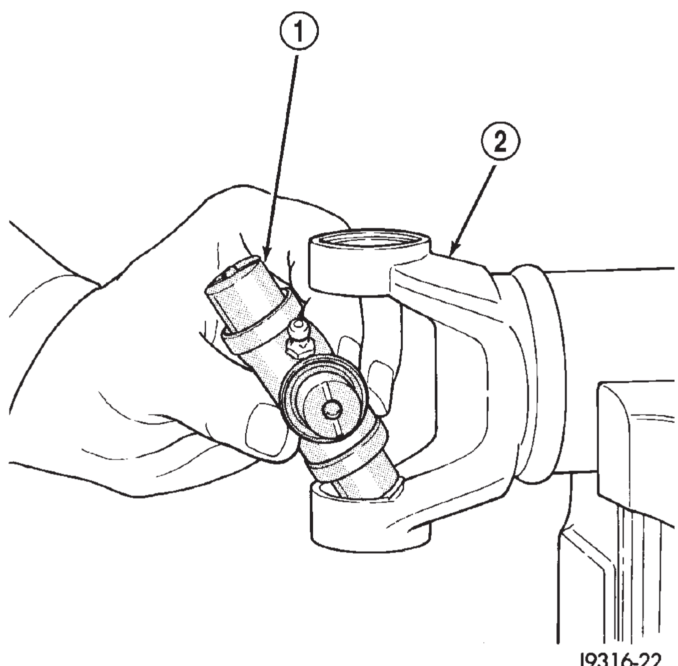


Fig. 21 Install Cross In Yoke

1 – CROSS
2 – YOKE

ASSEMBLY

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

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 21).

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 22). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

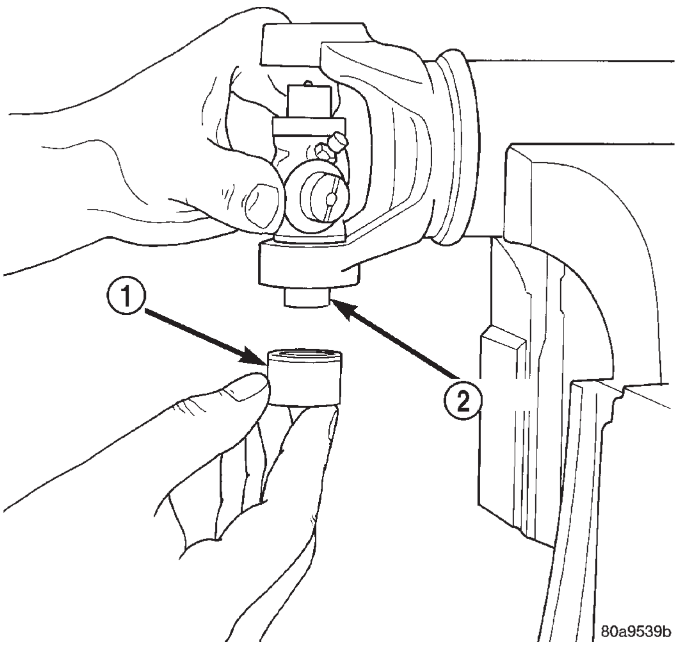


Fig. 22 Install Bearing On Trunnion

1 – BEARING CAP
2 – TRUNNION

(4) Press the bearing cap into the yoke bore enough to install a snap ring.

(5) Install a snap ring.

(6) Repeat Step 3 and Step 4to install the opposite bearing cap. If the joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

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

(8) Install the propeller shaft.

DOUBLE CARDAN JOINT

DISASSEMBLY

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

(1) Remove the propeller shaft.

(2) Using a soft drift, tap the outside of the bearing cap assembly to loosen snap ring.

(3) Remove all the bearing cap snap rings (Fig. 23).

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

(5) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and partially press one bearing cap from the outboard side of the link yoke enough to grasp the bearing cap with vise jaws (Fig. 24). Be sure to remove grease fittings that interfere with removal.

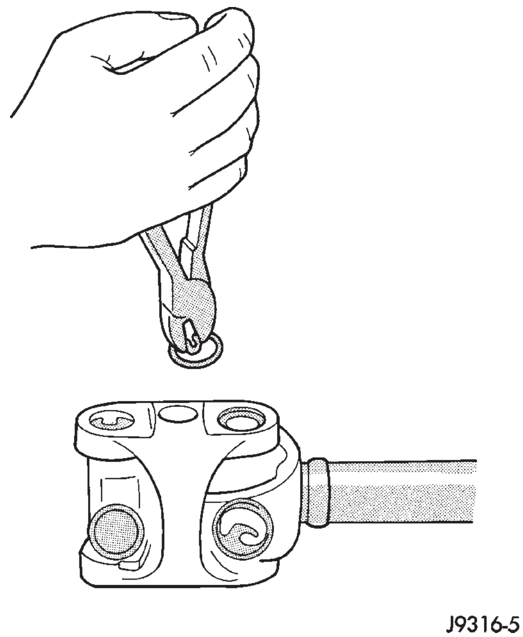


Fig. 23 Remove Snap Rings

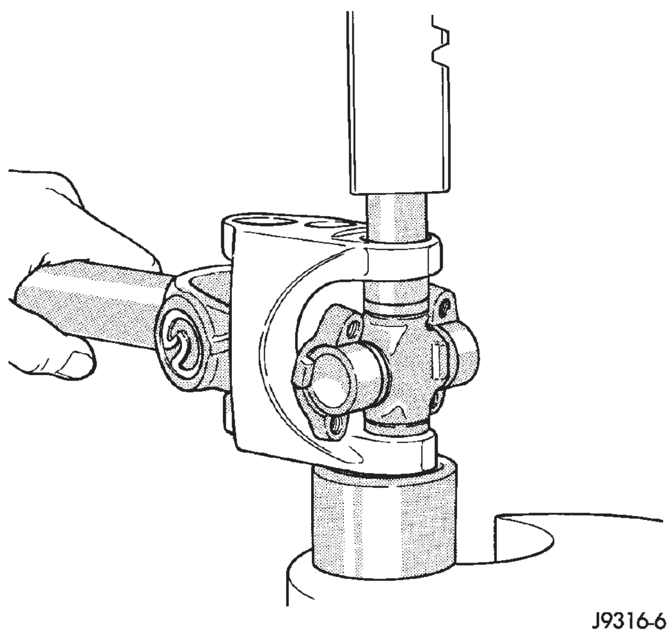


Fig. 24 Press Out Bearing

(6) Grasp the protruding bearing by vise jaws. Tap the link yoke with a mallet and drift to dislodge the bearing cap from the yoke (Fig. 25).

(7) Flip assembly and repeat Step 4, Step 5, and Step 6 to remove the opposite bearing cap. This will then allow removal of the cross centering kit assembly and spring (Fig. 26).

(8) Press the remaining bearing caps out the other end of the link yoke as described above to complete the disassembly.

DISASSEMBLY AND ASSEMBLY (Continued)

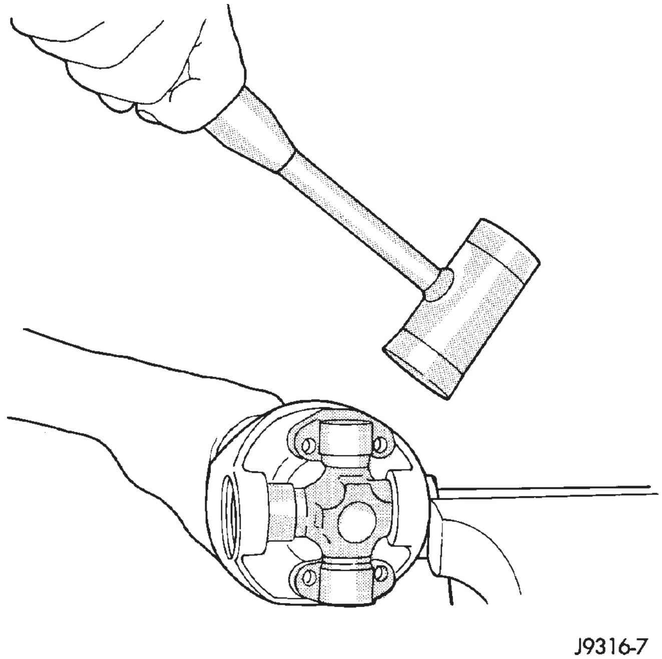


Fig. 25 Remove Bearing From Yoke

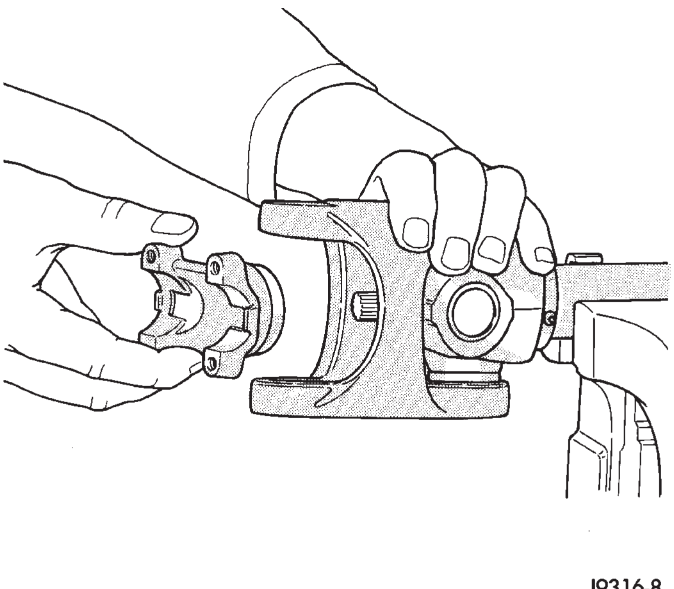


Fig. 26 Remove Centering Kit

ASSEMBLY

During assembly, ensure that the alignment marks on the link yoke and propeller shaft yoke are aligned.

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

(2) Fit a cross into the propeller shaft yoke (Fig. 27).

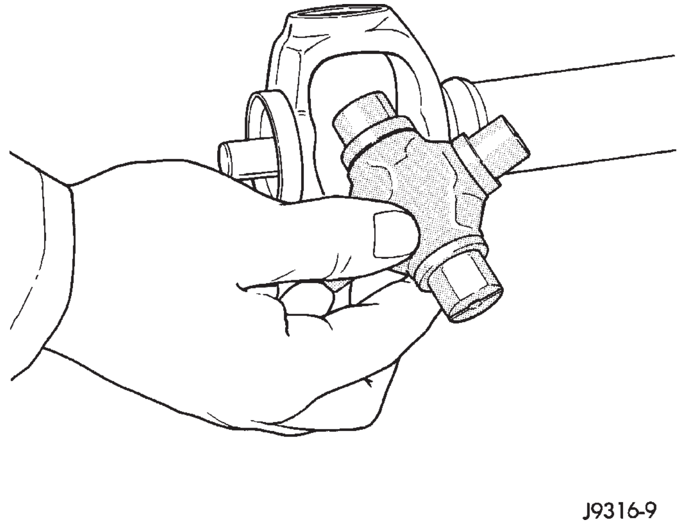


Fig. 27 Install Cross In Yoke

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 28). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

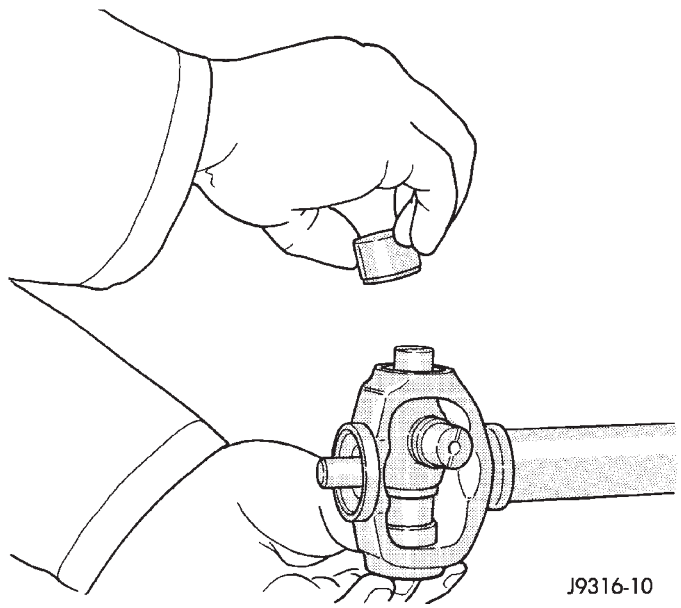
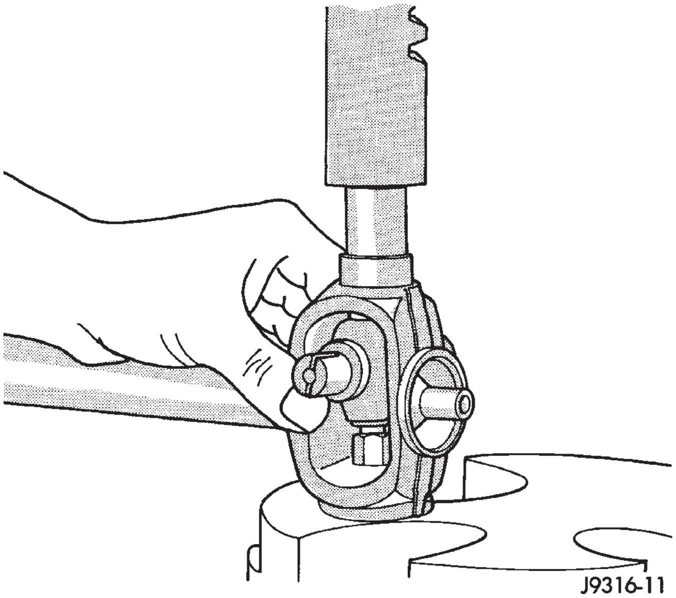


Fig. 28 Install Bearing Cap

(4) Press the bearing cap into the yoke bore enough to install a snap ring (Fig. 29).

(5) Install a snap ring.

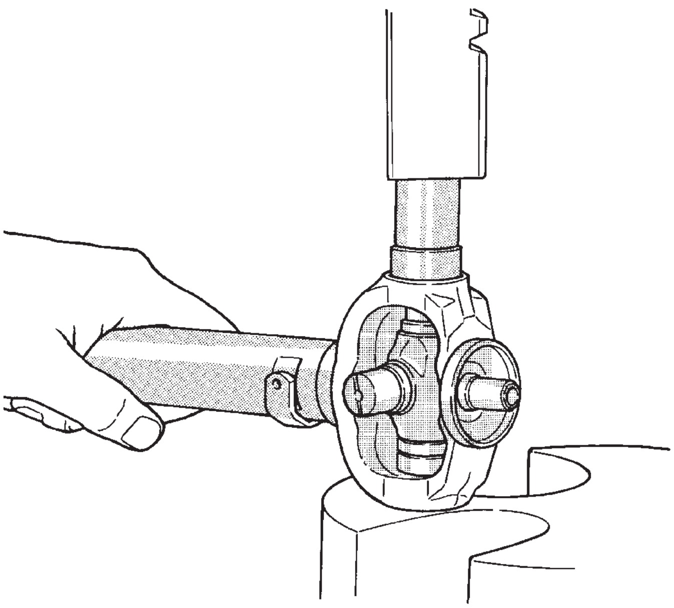
DISASSEMBLY AND ASSEMBLY (Continued)



J9316-11

Fig. 29 Press In Bearing Cap

(6) Flip the propeller shaft yoke and install the bearing cap onto the opposite trunnion. Install a snap ring (Fig. 30).

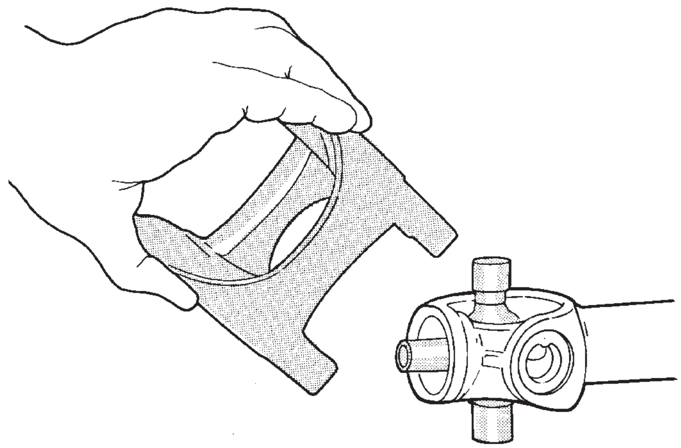


J9316-12

Fig. 30 Press In Bearing Cap

(7) Fit the link yoke on the remaining two trunnions and press both bearing caps into place (Fig. 31).

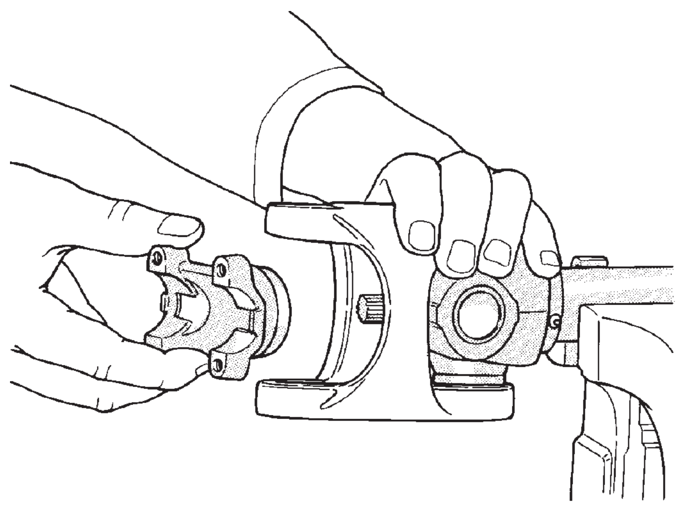
(8) Install snap rings.



J9316-13

Fig. 31 Install Link Yoke

(9) Install the centering kit assembly inside the link yoke making sure the spring is properly positioned (Fig. 32).



J9316-14

Fig. 32 Install Centering Kit

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Place two bearing caps on opposite trunnions of the remaining cross. Fit the open trunnions into the link yoke bores and the bearing caps into the centering kit (Fig. 33).

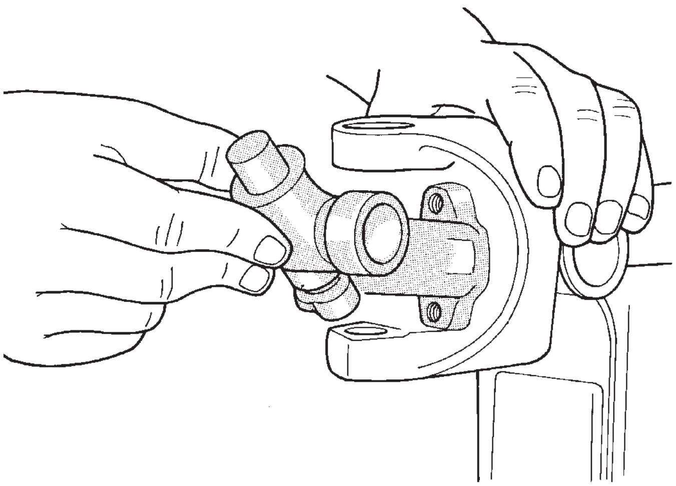


Fig. 33 Install Remaining Cross

(11) Press the remaining two bearing caps into place and install snap rings (Fig. 34).

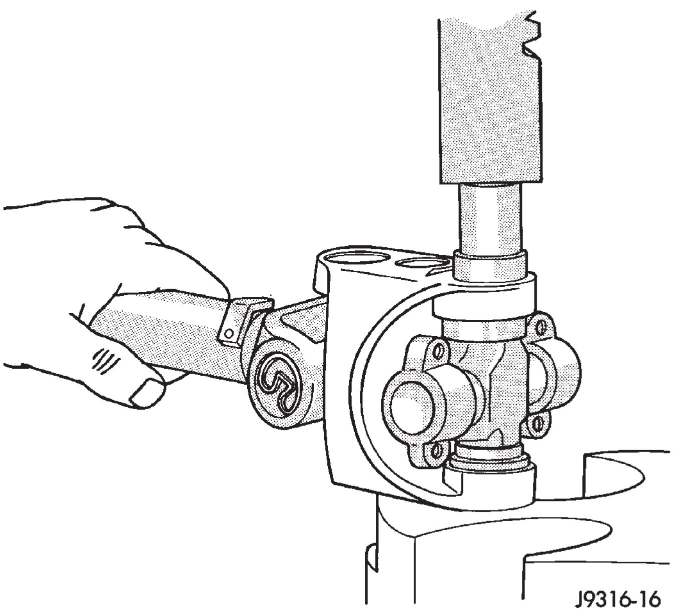


Fig. 34 Press In Bearing Cap

(12) Tap the snap rings to allow them to seat into the grooves (Fig. 35).

(13) Check for proper assembly. Flex the joint beyond center, it should snap over-center in both directions when correctly assembled (Fig. 36).

(14) Install the propeller shaft.

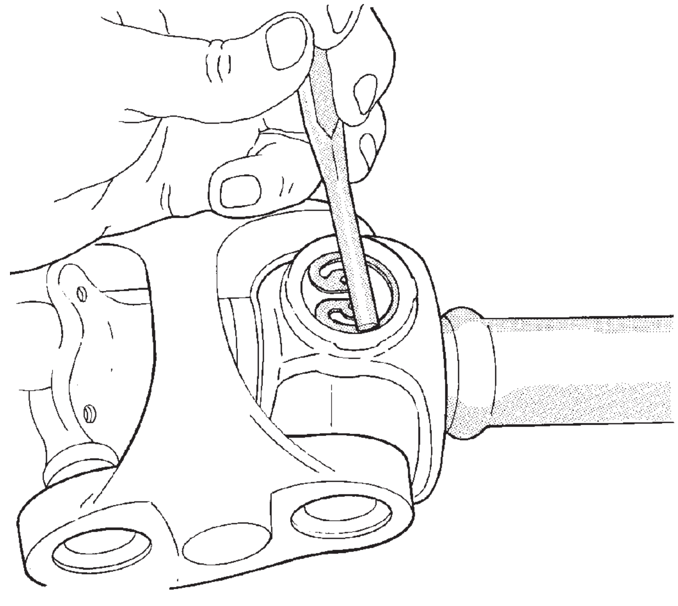


Fig. 35 Seat Snap Rings In Groove

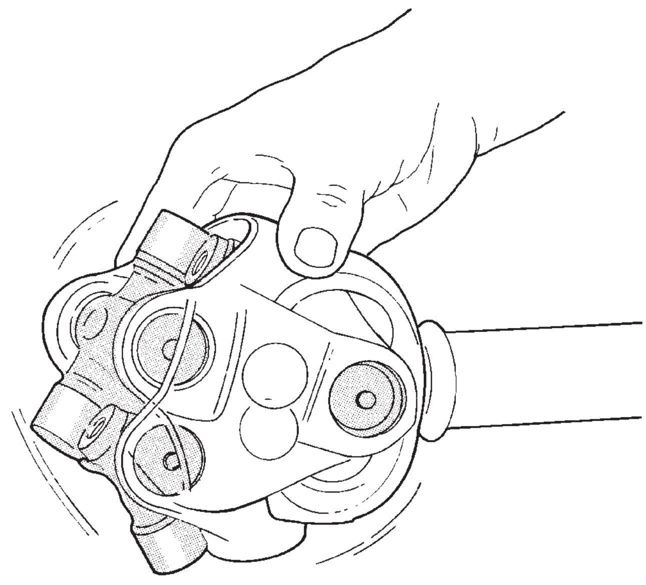


Fig. 36 Check Assembly

CLEANING AND INSPECTION

PROPELLER SHAFT

(1) Clean all universal joint bores with cleaning solvent and a wire brush.

(2) Inspect the yokes for distortion, cracks, and worn bearing cap bores.

ADJUSTMENTS

REAR AXLE PINION INPUT ANGLE

Adjust the rear axle pinion input angle on vehicles equipped with leaf springs with tapered shims (Fig. 37). Install tapered shims between the springs and axle pad to correct the angle. Refer to Group 2, Suspension, for additional information.

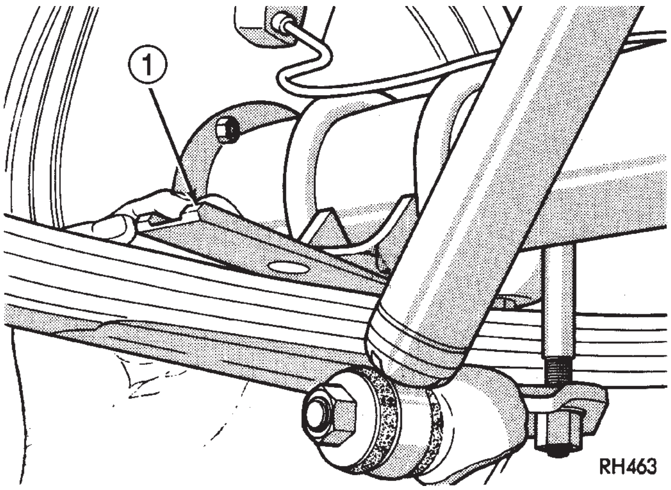


Fig. 37 Pinion Angle Adjustment at Leaf Springs
1 – WEDGE

FRONT AXLE PINION INPUT ANGLE

Adjust the front axle pinion input angle at the lower suspension arms with shims (Fig. 38). Adding shims will decrease the pinion shaft angle but will also increase the caster angle. The pinion shaft angle has priority over the caster angle. Refer to Group 2, Suspension, for additional information.

SPECIFICATIONS

PROPELLER SHAFTS AND U–JOINTS

DESCRIPTION	TORQUE
Bolts, Transfer Case Yoke	27 N·m (20 ft. lbs.)
Bolts, Axle Yoke	19 N·m (14 ft. lbs.)
Bolts, Axle Yoke	19 N·m (14 ft. lbs.)

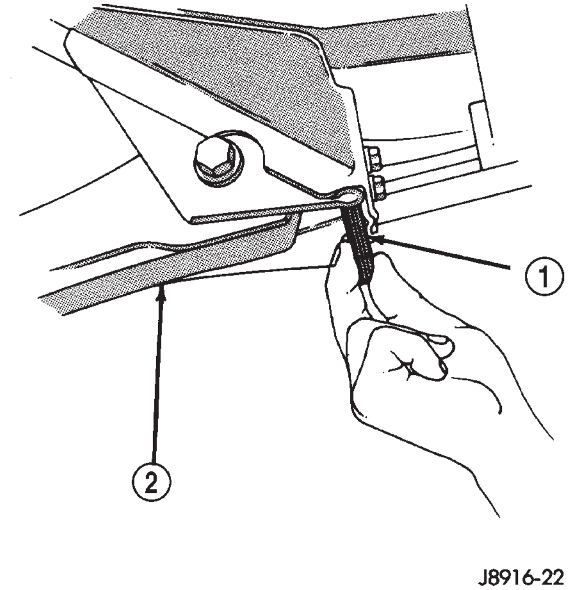
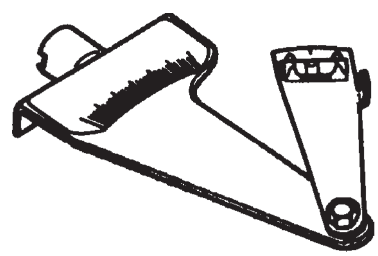


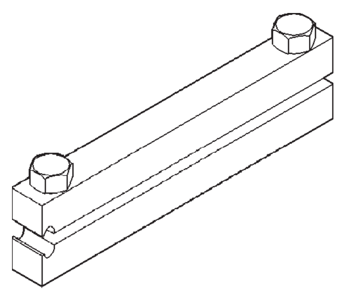
Fig. 38 Front Axle Angle Adjustment
1 – SHIM
2 – SUSPENSION ARM

SPECIAL TOOLS

PROPELLER SHAFT



Inclinometer—7663



Boot Clamp Installer—C-4975-A

TUBE, 181, AND 186 FBI AXLE

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

181 FBI AXLE

DESCRIPTION

The 181 Front Beam-design Iron (FBI) axle consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded.

The integral type housing, hypoid gear design has the centerline of the pinion set above the centerline of the ring gear.

The axle has a fitting for a vent hose used to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings. The hub bearings are bolted to the steering knuckle at the outboard end of the axle tube yoke. The hub bearings are serviced as an assembly.

For vehicles with ABS brakes, the ABS wheel speed sensors are attached to the knuckle assemblies. The tone rings for the ABS system are pressed onto the axle shaft. **Do not damage ABS tone wheel or the sensor when removing axle shafts.**

The stamped steel cover provides a means for inspection and servicing the differential.

The 181 FBI axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover by a cover bolt. Build date identification codes are stamped on the cover side of the axle shaft tube.

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

DESCRIPTION AND OPERATION (Continued)

OPERATION

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

186 FBI AXLE

DESCRIPTION

The 186 Front Beam-design Iron (FBI) axle consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded.

The integral type housing, hypoid gear design has the centerline of the pinion set below the centerline of the ring gear.

The axle has a fitting for a vent hose used to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings. The hub bearings are bolted to the steering knuckle at the outboard end of the axle tube yoke. The hub bearings are serviced as an assembly.

For vehicles with ABS brakes, the ABS wheel speed sensors are attached to the knuckle assemblies. The tone rings for the ABS system are pressed onto the axle shaft. **Do not damage ABS tone wheel or the sensor when removing axle shafts.**

The stamped steel cover provides a means for inspection and servicing the differential.

The 186 FBI axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover by a cover bolt. Build date identification codes are stamped on the cover side of the axle shaft tube.

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

OPERATION

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

LUBRICANT

DESCRIPTION

A multi–purpose, hypoid gear lubricant which conforms to the following specifications should be used. Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL–L–2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

The 181 FBI axle lubricant capacity is 1.2 L (2.5 pts.). The 186 FBI axle lubricant capacity is 1.18 L (2.5 pts.).

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

DESCRIPTION AND OPERATION (Continued)

STANDARD DIFFERENTIAL

DESCRIPTION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

OPERATION

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

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

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

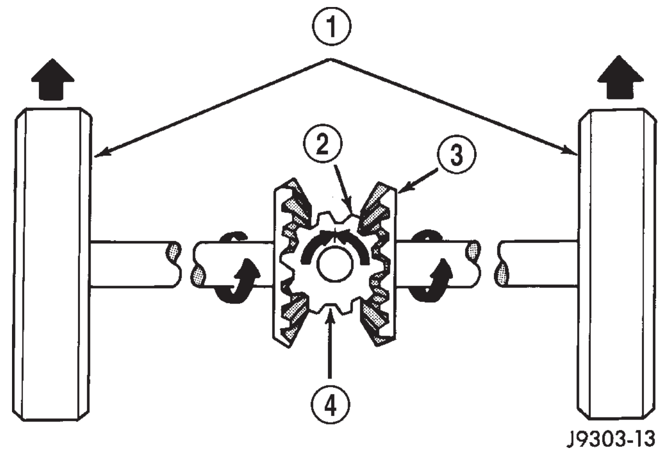


Fig. 1 Differential Operation—Straight Ahead Driving

1 – IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 – PINION GEAR
3 – SIDE GEAR
4 – PINION GEARS ROTATE WITH CASE

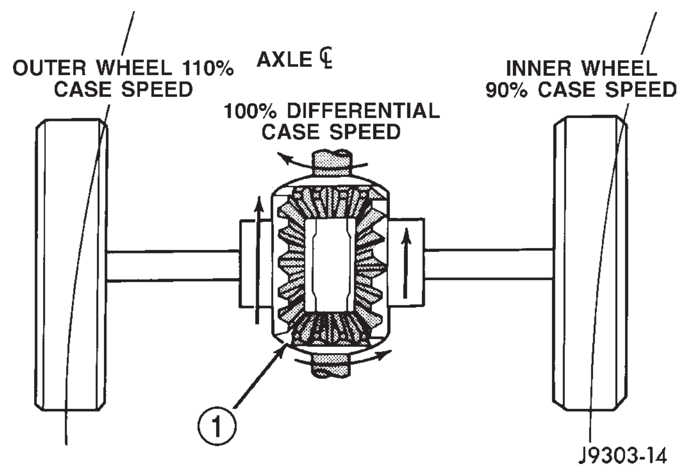


Fig. 2 Differential Operation—On Turns

1 – PINION GEARS ROTATE ON PINION SHAFT

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.
- Differential housing bores not square to each other.

DIAGNOSTIC CHART

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

DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

DIAGNOSIS AND TESTING (Continued)

GEAR NOISE

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

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

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

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

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

BEARING NOISE

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

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

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

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

LOW SPEED KNOCK

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

VIBRATION

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

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

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

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U–joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

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

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**

(5) Remove the sealant from the housing and cover surfaces. Use solvent to clean the mating surfaces.

SERVICE PROCEDURES (Continued)

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 3).

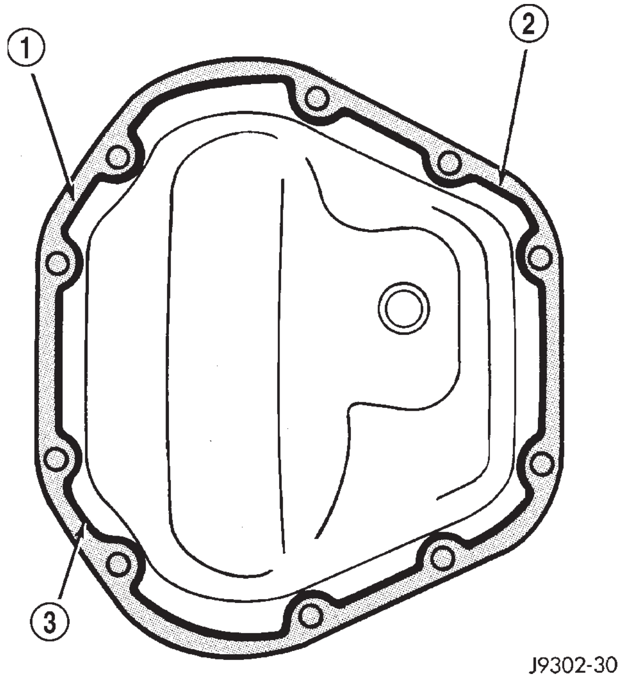


Fig. 3 Typical Housing Cover With Sealant

1 – SEALING SURFACE
2 – CONTOUR OF BEAD
3 – BEAD THICKNESS 6.35mm (1/4")

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts in a criss–cross pattern to 41 N·m (30 ft. lbs.) torque.

(8) Refill the differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications in this group for the quantity necessary.

(9) Install the fill hole plug and lower the vehicle. Tighten fill plug to 34 N·m (25 ft. lbs.).

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.
(7) Disconnect the vent hose from the axle shaft tube.
(8) Mark the propeller shaft and yoke for installation alignment reference.
(9) Remove propeller shaft.
(10) Disconnect stabilizer bar links at the axle.
(11) Disconnect shock absorbers from axle brackets.
(12) Disconnect track bar.
(13) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.
(14) Disconnect the steering damper from the axle bracket.
(15) Disconnect the upper and lower suspension arms from the axle brackets.
(16) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.
(17) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.
(2) Support the axle on a suitable lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Connect the vent hose to the axle shaft tube.
(6) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.
(7) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.
(8) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.
(9) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.
(10) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.
(11) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.
(12) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.

REMOVAL AND INSTALLATION (Continued)

(13) Align the previously made marks on the propeller shaft and the yoke.
(14) Install the straps and bolts to hold the propeller shaft to the yoke.
(15) Check and fill axle lubricant. Refer to the Lubricant Specifications in this group for the quantity necessary.
(16) Install the wheel and tire assemblies.
(17) Remove the lifting device from the axle and lower the vehicle.
(18) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.
(19) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.
(20) Check the front wheel alignment.

TUBE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.
(7) Disconnect stabilizer bar links at the axle.
(8) Disconnect shock absorbers from axle brackets.
(9) Disconnect track bar.
(10) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.
(11) Disconnect the steering damper from the axle bracket.
(12) Disconnect the upper and lower suspension arms from the axle brackets.
(13) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.
(14) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.
(2) Support the axle on a suitable lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.
(6) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.
(7) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.
(8) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.
(9) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.
(10) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.
(11) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.
(12) Install the wheel and tire assemblies.
(13) Remove the lifting device from the axle and lower the vehicle.
(14) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.
(15) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.
(16) Check the front wheel alignment.

AXLE SHAFT—CARDAN U-JOINT

Single cardan U–joint components are not serviceable. If defective, they must be replaced as a unit. If the bearings, seals, spider, or bearing caps are damaged or worn, replace the complete U–joint.

REMOVAL

CAUTION: Clamp only the narrow forged portion of the yoke in the vise. Also, to avoid distorting the yoke, do not over tighten the vise jaws.

(1) Remove axle shaft.
(2) Remove the bearing cap retaining snap rings (Fig. 4).
It can be helpful to saturate the bearing caps with penetrating oil prior to removal.
(3) Locate a socket where the inside diameter is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed.
(4) Locate a socket where the outside diameter is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap.
(5) Position the yoke with the sockets in a vise (Fig. 5).

REMOVAL AND INSTALLATION (Continued)

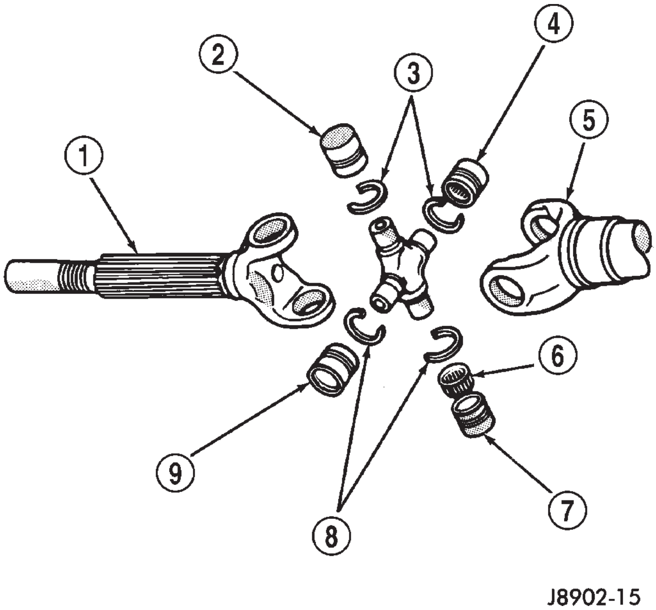


Fig. 4 Axle Shaft Outer U–Joint

1 – SHAFT YOKE
2 – BEARING CAP
3 – SNAP RINGS
4 – BEARING CAP
5 – SPINDLE YOKE
6 – BEARING
7 – BEARING CAP
8 – SNAP RINGS
9 – BEARING CAP

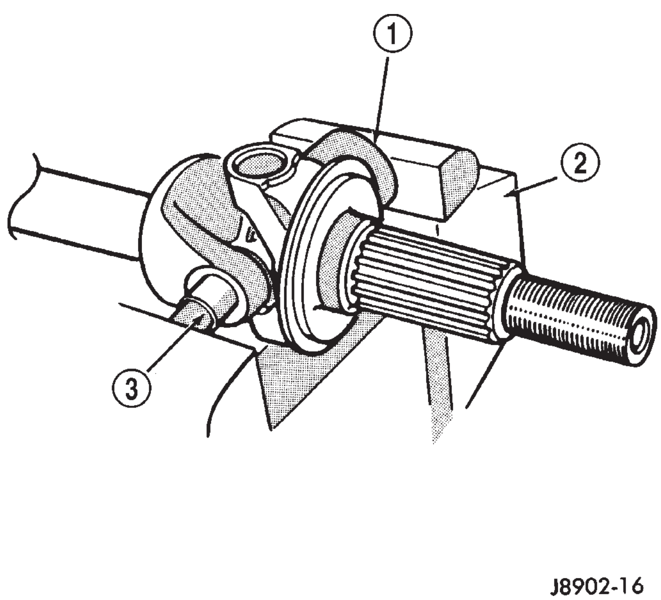


Fig. 5 Yoke Bearing Cap Removal

1 – LARGE-DIAMETER SOCKET WRENCH
2 – VISE
3 – SMALL-DIAMETER SOCKET WRENCH

(6) Compress the vise jaws to force the bearing cap into the larger socket (receiver).

(7) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.

(8) Repeat the above procedure for the remaining bearing cap.

(9) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

INSTALLATION

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium–base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket wrench in a vise.

(4) Compress the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.

(5) Install the bearing cap retaining clips.

(6) Install axle shaft.

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REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 6).

(10) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 7).

(2) Install yoke on the pinion gear with Installer W-162–D, Cup 8109, and Holder 6958 (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

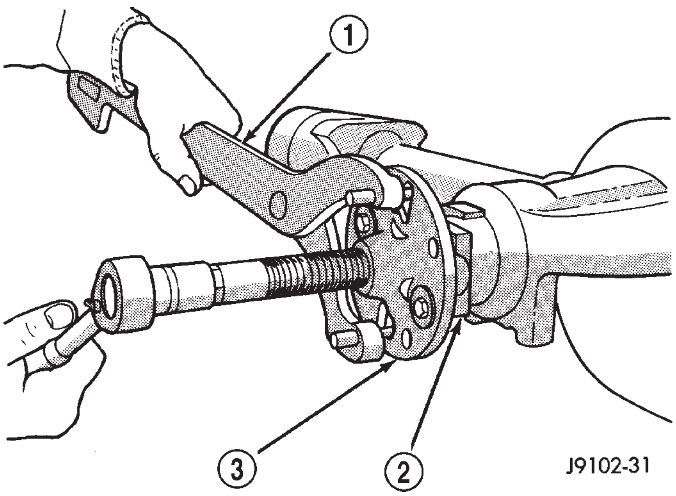

Fig. 6 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

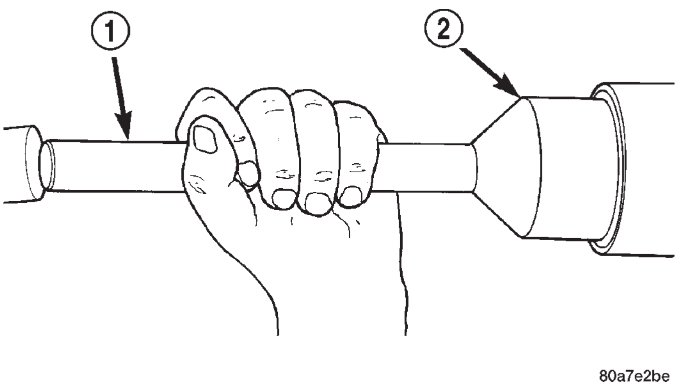

Fig. 7 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to the pinion bearings may result.

(3) Install the pinion washer and a new nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

(4) Tighten pinion nut to 217 N·m (160 ft. lbs.).

(5) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 9).

(6) If the rotating torque is low, use Holder 6958 to hold the pinion yoke, and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

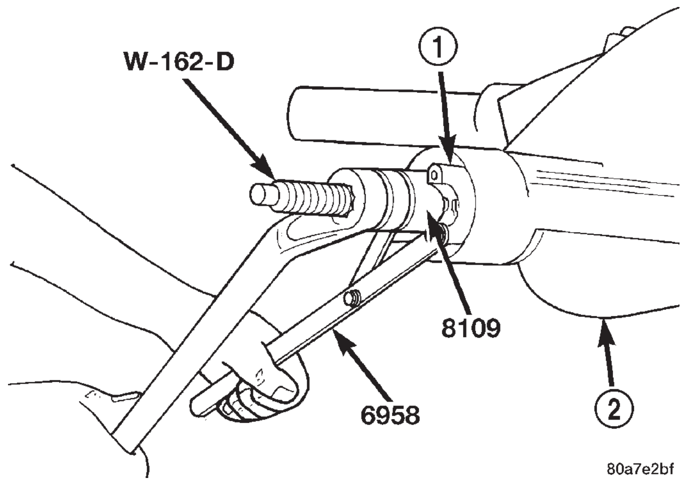

Fig. 8 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

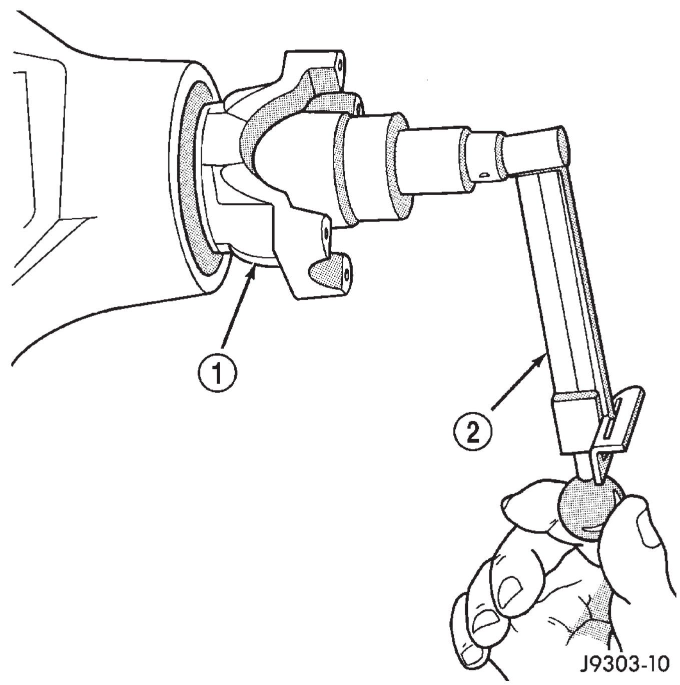

Fig. 9 Check Pinion Rotation Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(7) Align the installation reference marks on the propeller shaft and yoke, and install the propeller shaft.

(8) Check and fill the gear lubricant. Refer to the Lubricant Specifications for gear lubricant requirements.

(9) Install the brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

REMOVAL AND INSTALLATION (Continued)

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REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 10).

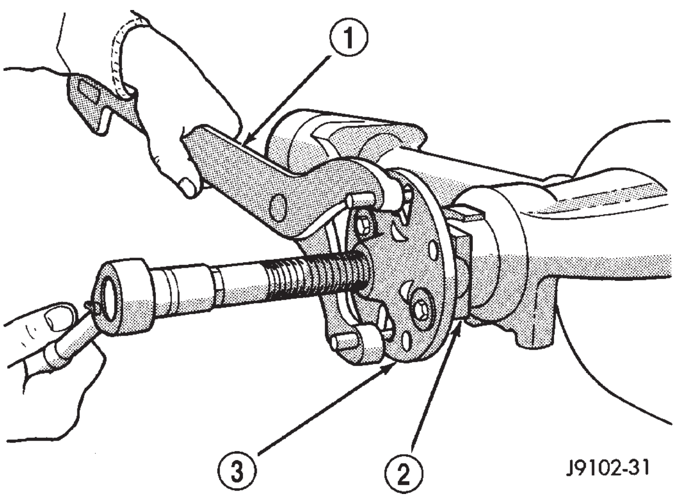

Fig. 10 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

(10) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 11).

(2) Install yoke on the pinion gear with Installer W-162–D, Cup 8109, and Holder 6958 (Fig. 12).

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to collapsible spacer or bearings may result.

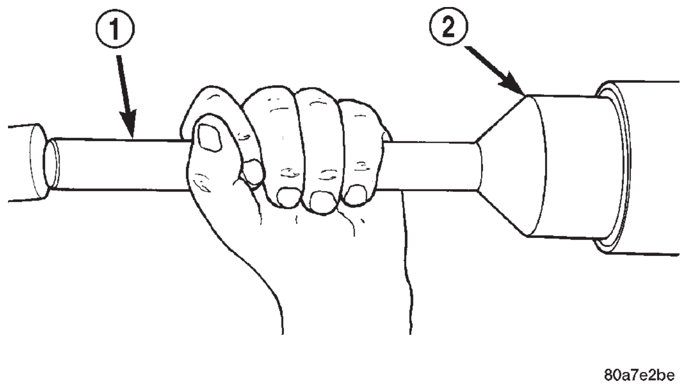

Fig. 11 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

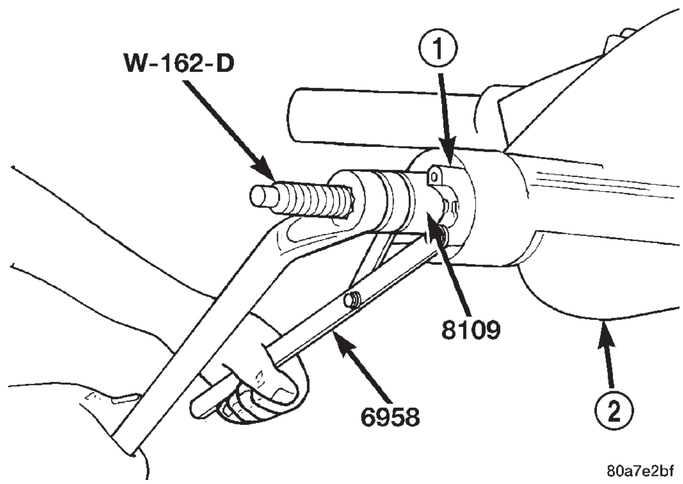

Fig. 12 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

(3) Install the pinion washer and a new nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

(4) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 13).

(5) If the rotating torque is low, use Holder 6958 to hold the pinion yoke (Fig. 14), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

CAUTION: If the maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(6) Align the installation reference marks on the propeller shaft and yoke and install the propeller shaft.

REMOVAL AND INSTALLATION (Continued)

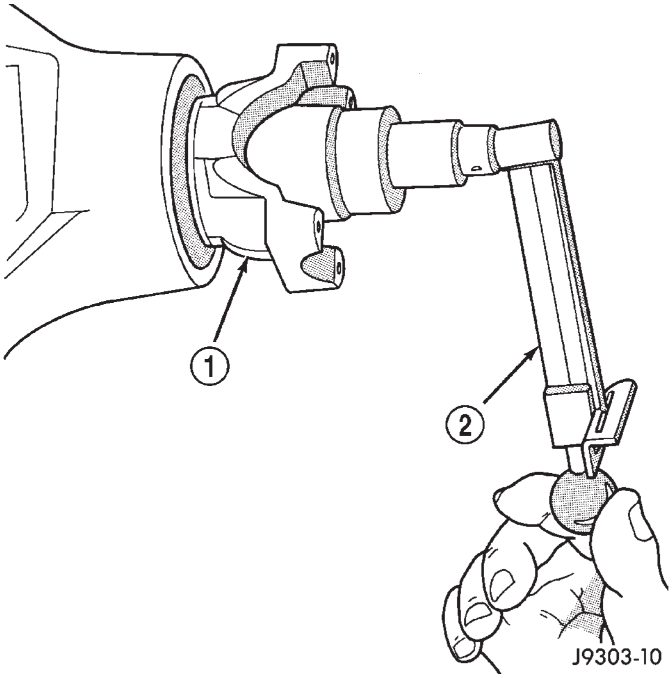

Fig. 13 Check Pinion Rotation Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

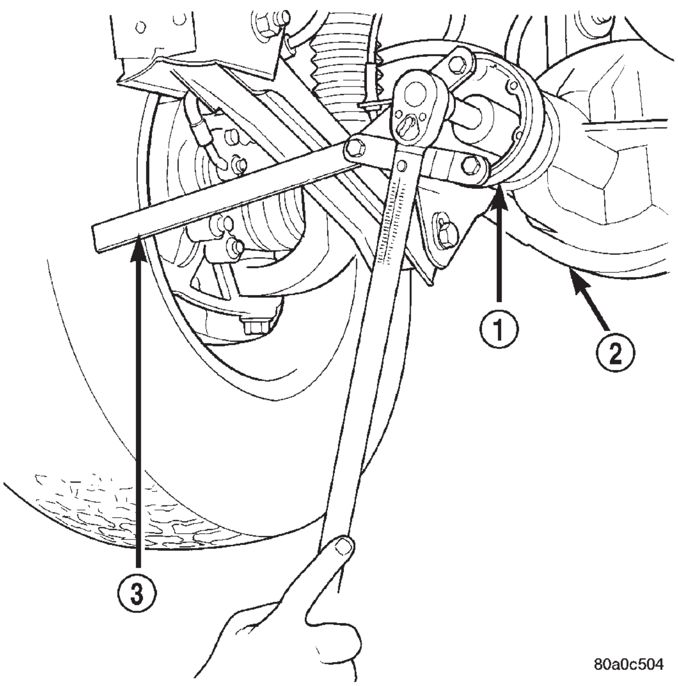

Fig. 14 Tightening Pinion Shaft Nut—Typical

1 – PINION FLANGE
2 – FRONT AXLE
3 – TOOL 6958

(7) Check and fill the gear lubricant. Refer to the Lubricant Specifications for gear lubricant requirements.

(8) Install the brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(9) Install wheel and tire assemblies.

(10) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL W/PINION INSTALLED

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 15).

(10) Use a suitable pry tool or a slide hammer mounted screw, remove the pinion seal.

(11) Remove the front pinion bearing using a pair of suitable pick tools to pull the bearing straight off the pinion gear shaft. It may be necessary to lightly tap the end of the pinion gear with a rawhide or rubber mallet if the bearing becomes bound on the pinion shaft.

(12) Remove the collapsible spacer.

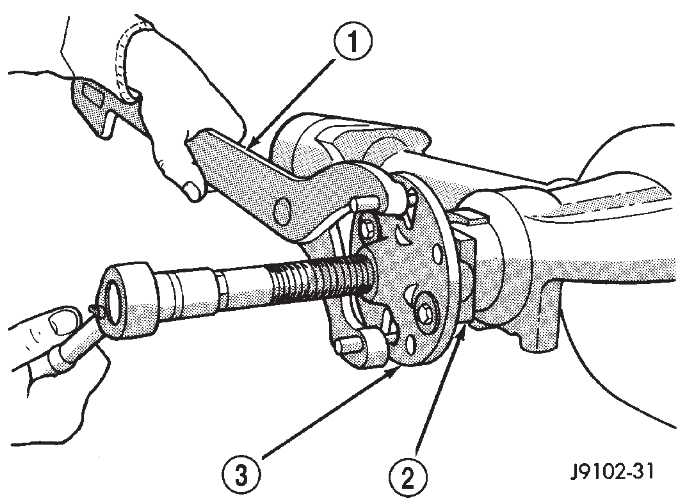

Fig. 15 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

REMOVAL AND INSTALLATION (Continued)

REMOVAL W/PINION REMOVED

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Remove differential assembly from axle housing.

(9) Using Holder 6958 to hold yoke, remove the pinion nut and washer.

(10) Using Remover C-452 and Wrench C-3281, remove the pinion yoke from pinion shaft (Fig. 15).

(11) Remove the pinion gear from housing (Fig. 16). Catch the pinion with your hand to prevent it from falling and being damaged.

(12) Remove collapsible spacer from pinion shaft.

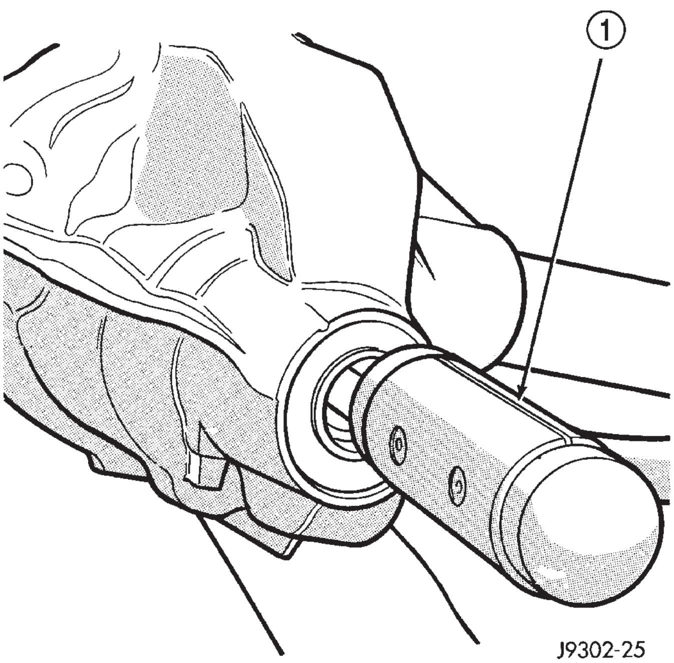

Fig. 16 Remove Pinion Gear

1 – RAWHIDE HAMMER

INSTALLATION

(1) Install a new collapsible preload spacer on pinion shaft (Fig. 17).

(2) If pinion gear was removed, install pinion gear in housing.

(3) Install pinion front bearing, if necessary.

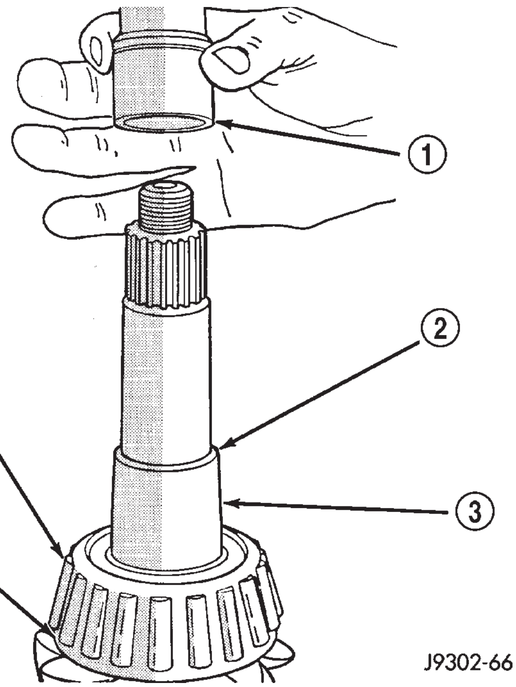

Fig. 17 Collapsible Preload Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION GEAR
4 – OIL SLINGER
5 – REAR BEARING

(4) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 18), if necessary.

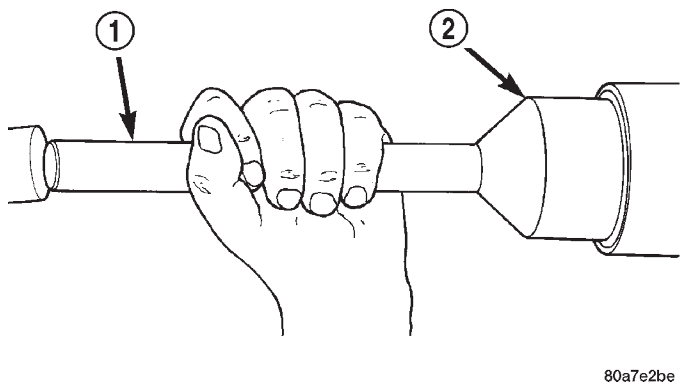

Fig. 18 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

(5) Install yoke with Installer W-162-D, Cup 8109, and holder 6958 (Fig. 19).

(6) If the original pinion bearings are being used, install differential assembly and axle shafts, if necessary.

REMOVAL AND INSTALLATION (Continued)

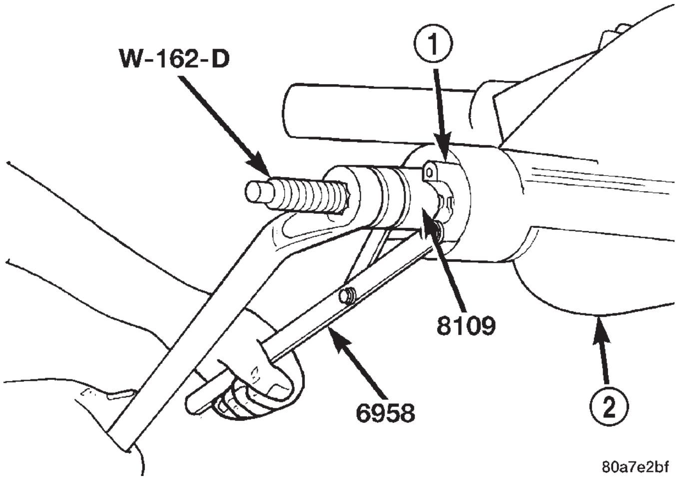

Fig. 19 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

NOTE: If new pinion bearings were installed, do not install the differential assembly and axle shafts until after the pinion bearing preload and rotating torque are set.

(7) Install the pinion washer and a new nut on the pinion gear. Tighten the nut to 217 N·m (160 ft. lbs.) minimum. **Do not over-tighten.** Maximum torque is 353 N·m (260 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque is exceeded, a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(8) Using yoke holder 6958 and a torque wrench set at 353 N·m (260 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 20). If more than 353 N·m (260 ft. lbs.) is needed to begin to collapse the spacer, the spacer is defective and must be replaced.

(9) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 21).

(10) Check rotating torque with an inch pound torque wrench (Fig. 21). The torque necessary to rotate the pinion gear should be:

- Original Bearings — The reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.).
- New Bearings — 1.5 to 4 N·m (15 to 35 in. lbs.).

(11) Install differential assembly and axle shafts, if necessary.

(12) Align marks made previously on yoke and propeller shaft and install propeller shaft.

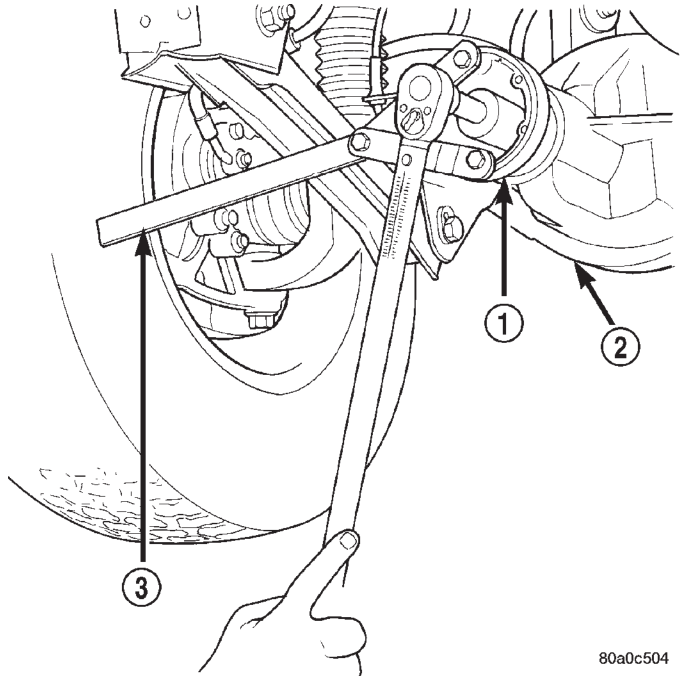

Fig. 20 Tightening Pinion Nut

1 – PINION FLANGE
2 – FRONT AXLE
3 – TOOL 6958

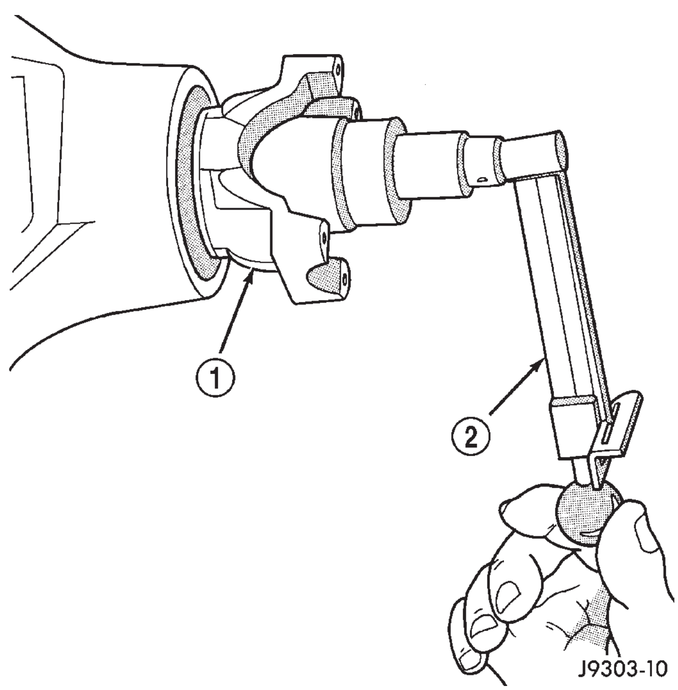

Fig. 21 Check Pinion Gear Rotation Torque—Typical

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(13) Install brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

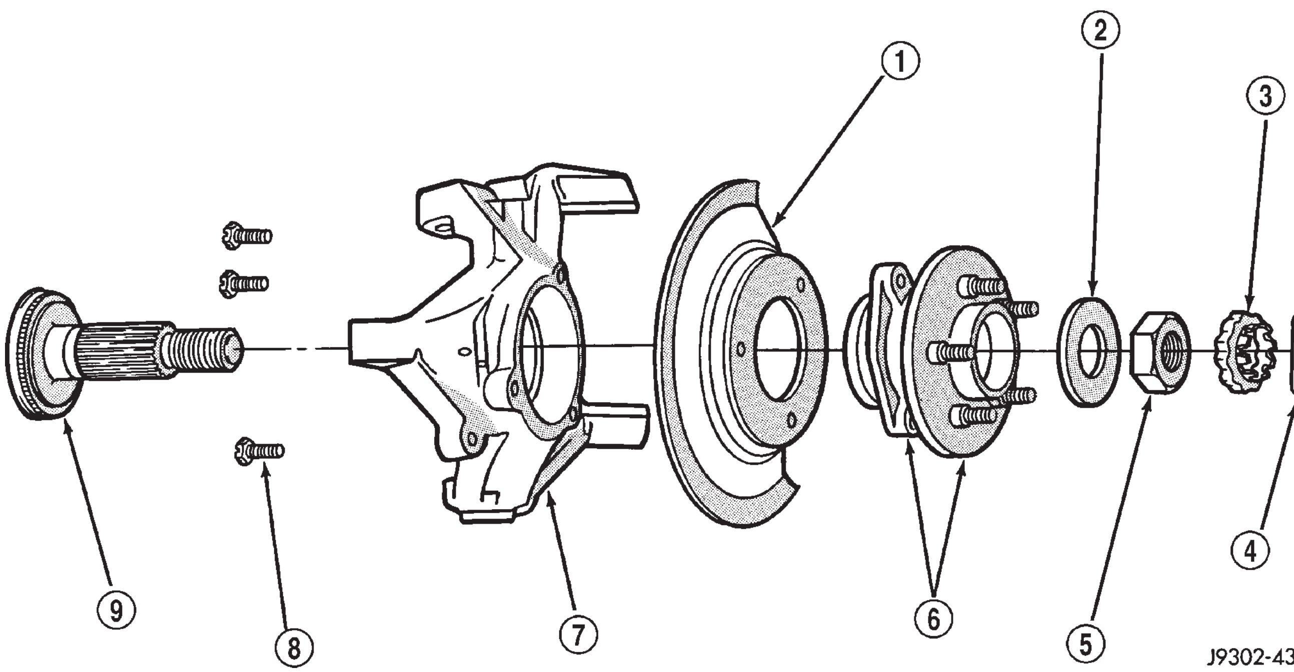

Fig. 22 Hub, Knuckle and Axle Shaft

1 – BRAKE SHIELD
2 – WASHER
3 – RETAINER
4 – COTTER PIN
5 – NUT
6 – HUB AND BEARING ASSEMBLY
7 – STEERING KNUCKLE
8 – BOLT
9 – TONE WHEEL (ABS)

(14) Add gear lubricant, if necessary. Refer to Lubricant Specifications of this section for lubricant requirements.

(15) Install wheel and tire assemblies.

(16) Lower vehicle.

HUB BEARING AND AXLE SHAFT

If the axle shaft and hub bearing are being removed in order to service another component, the axle shaft and hub bearing can be removed as an assembly.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

(3) Remove the brake caliper and rotor. Refer to Group 5, Brakes, for proper procedures.

(4) Remove ABS wheel speed sensor, if necessary. Refer to Group 5, Brakes, for proper procedures.

(5) Remove the cotter pin, nut retainer, and axle hub nut (Fig. 22), if necessary.

(6) Remove the hub to knuckle bolts (Fig. 23).

(7) Remove the hub from the steering knuckle and axle shaft, if necessary.

(8) Remove hub bearing and axle shaft assembly (Fig. 24), or axle shaft from axle. **Avoid damaging the axle shaft oil seals in the axle housing.**

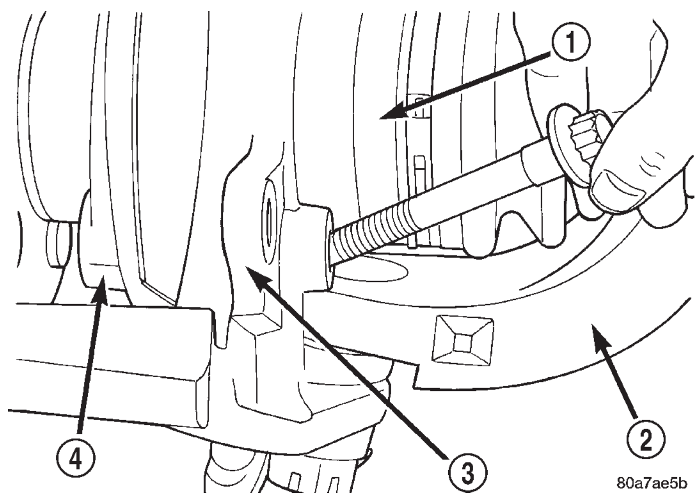

Fig. 23 Hub Bearing Bolts

1 – AXLE SHAFT
2 – AXLE
3 – KNUCKLE
4 – HUB BEARING

(9) Remove the brake rotor shield from the hub bearing or knuckle (Fig. 22).

REMOVAL AND INSTALLATION (Continued)

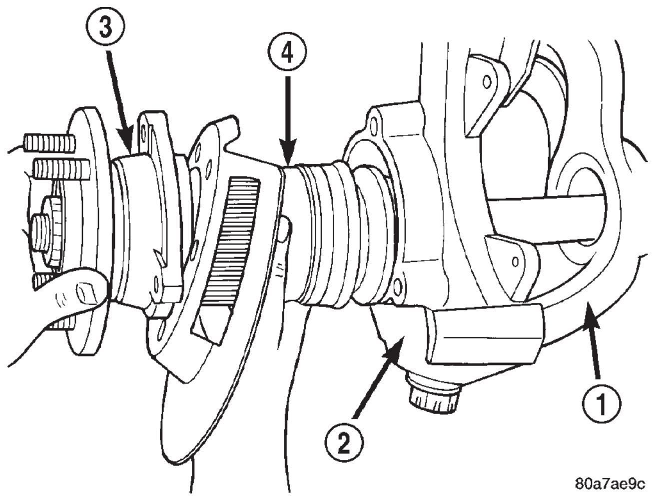

Fig. 24 Hub Bearing and Axle Assembly

1 – AXLE
2 – KNUCKLE
3 – HUB BEARING
4 – AXLE SHAFT

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 22) and apply a thin film of Mopar® Wheel Bearing Grease, or equivalent, to the shaft splines, seal contact surface, and hub bore.

(2) Install the brake rotor shield to the knuckle.

(3) Install the hub bearing and axle shaft assembly, or axle shaft, into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the axle housing.

(4) Install the hub bearing, if necessary.

(5) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.

(6) Install the hub washer and nut, if necessary. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 22).

(7) Install ABS wheel speed sensor, if necessary. Refer to Group 5, Brakes, for proper procedures.

(8) Install the brake rotor and caliper. Refer to Group 5, Brakes, for proper procedures.

(9) Install the wheel and tire assembly.

(10) Remove support and lower the vehicle.

STEERING KNUCKLE AND BALL STUDS

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

KNUCKLE REMOVAL

(1) Remove hub bearing and axle shaft.

(2) Disconnect the tie-rod or drag link from the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.

(3) Remove the cotter pins from the upper and lower ball studs.

(4) Remove the upper and lower ball stud nuts.

(5) Strike the steering knuckle with a brass hammer to loosen knuckle from the ball studs. Remove knuckle from ball studs (Fig. 25).

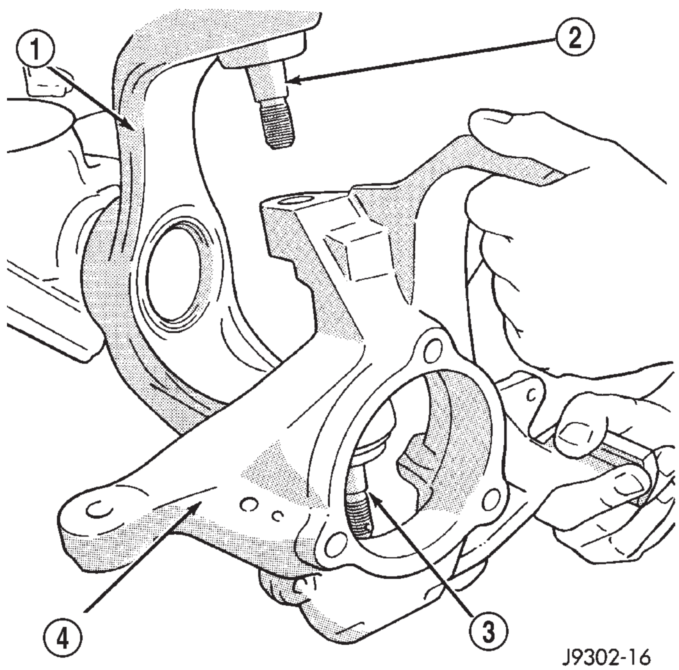

Fig. 25 Steering Knuckle Removal/Installation

1 – AXLE YOKE
2 – UPPER BALL STUD
3 – LOWER BALL STUD
4 – STEERING KNUCKLE

REMOVAL AND INSTALLATION (Continued)

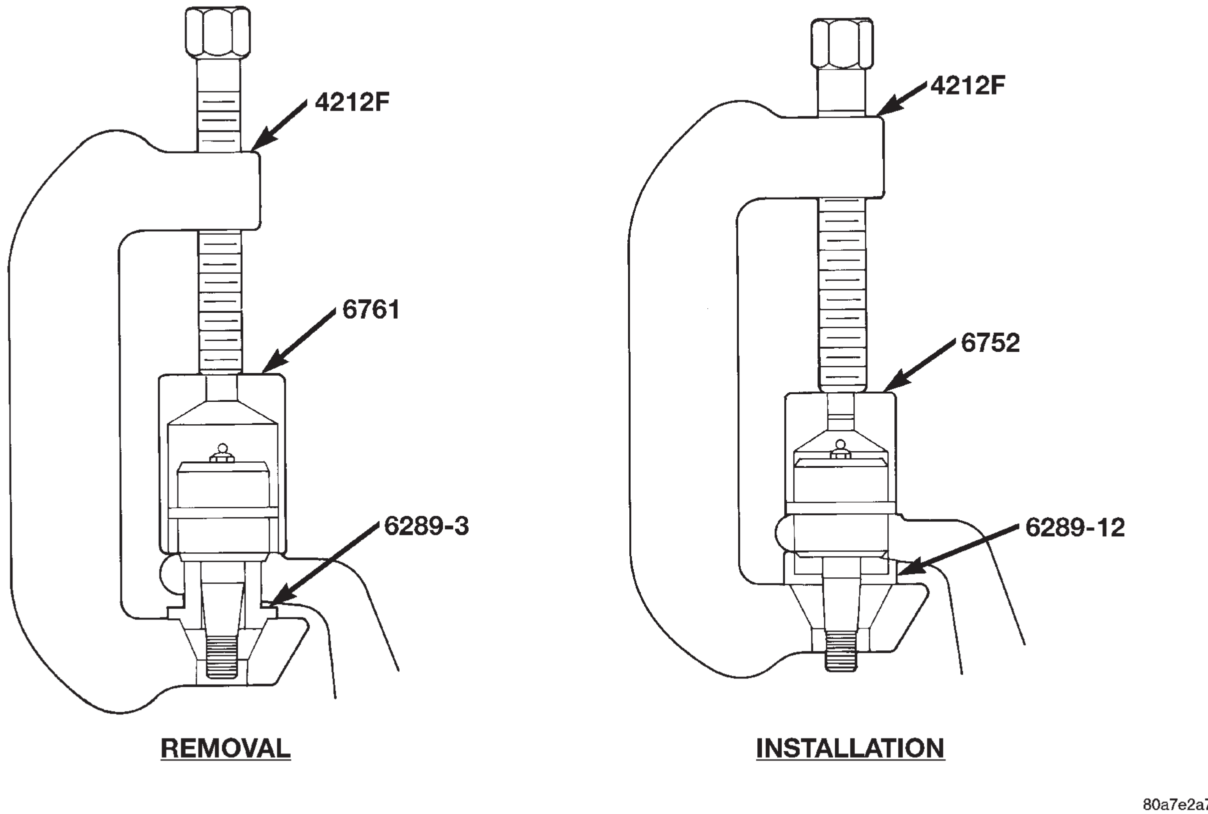

Fig. 26 Upper Ball Stud Remove/Install

UPPER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 26).

LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 27).

KNUCKLE INSTALLATION

(1) Position the steering knuckle on the ball studs.

(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.

(3) Install and tighten the top retaining nut to 101 N·m (75 ft. lbs.) torque. Install new cotter pin.

(4) Install the hub bearing and axle shaft.

(5) Connect the tie-rod or drag link end to the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

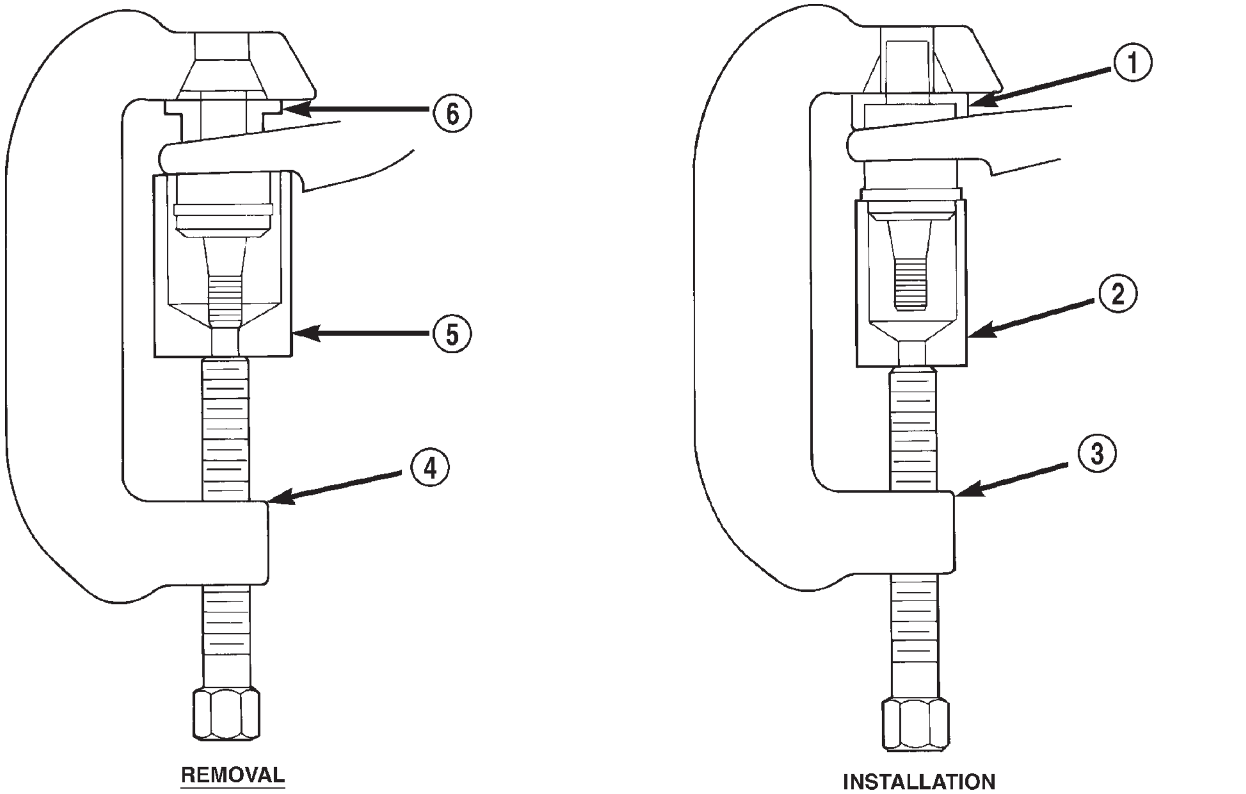

Fig. 27 Lower Ball Stud Remove/Install

1 – SPECIAL TOOL 6289–12
2 – SPECIAL TOOL 6289–4
3 – SPECIAL TOOL 4212F
4 – SPECIAL TOOL 4212F
5 – SPECIAL TOOL 6289–1
6 – SPECIAL TOOL 6289–3

AXLE BUSHING REPLACEMENT

Refer to Group 2, Suspension, for the proper axle bushing procedures.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and allow fluid to drain.

(4) Remove hub bearings and axle shafts.

(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 28).

(6) Loosen the differential bearing cap bolts.

(7) Position Spreader W–129–B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 29). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

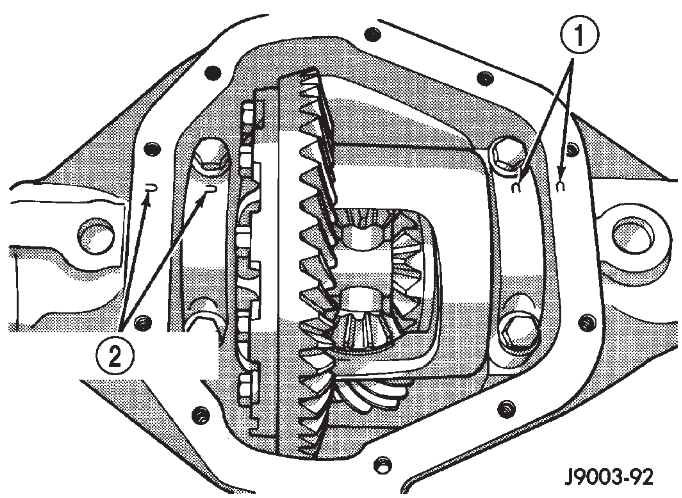

Fig. 28 Bearing Cap Identification

1 – INSTALLATION REFERENCE LETTERS
2 – INSTALLATION REFERENCE LETTERS

REMOVAL AND INSTALLATION (Continued)

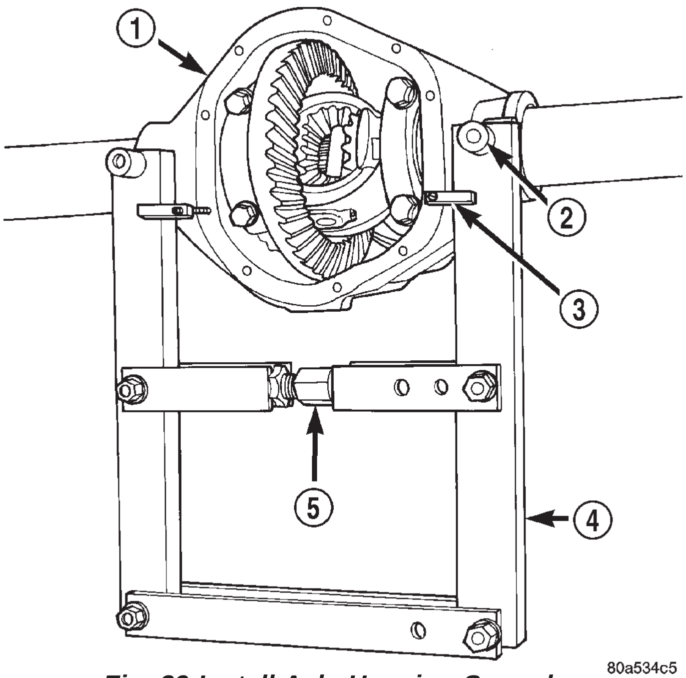

Fig. 29 Install Axle Housing Spreader

1 – AXLE HOUSING
2 – DOWEL
3 – SAFETY HOLD DOWN
4 – SPECIAL TOOL W-129–B
5 – TURNBUCKLE

(8) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 30) and zero the indicator.

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 31).

(10) Remove the dial indicator.

(11) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(12) Remove the differential, and the differential preload shims for the 181FBI axles, from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 32).

(13) Mark or tag the differential bearing cups, and the differential preload shims for the 181FBI axles, to indicate which side of the differential they were removed from.

(14) Remove spreader from housing.

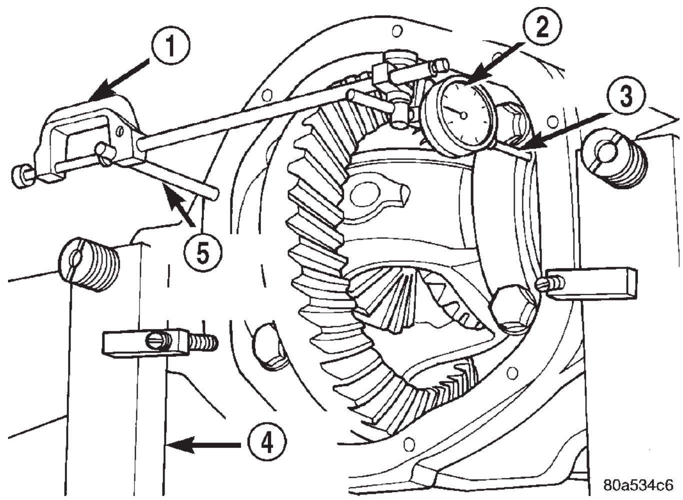

Fig. 30 Install Dial Indicator

1 – SPECIAL TOOL C-3339
2 – DIAL INDICATOR
3 – LEVER ADAPTER
4 – SPECIAL TOOL W-129–B
5 – SPECIAL TOOL C-3288–B

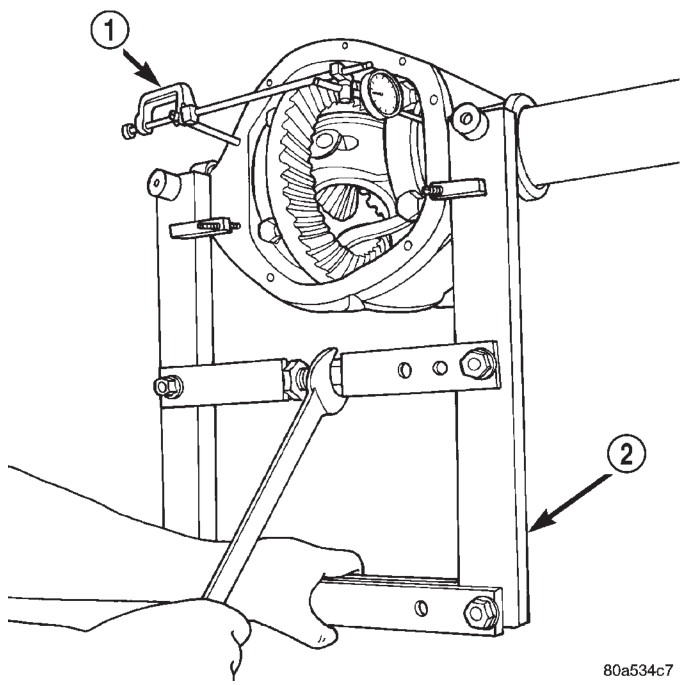

Fig. 31 Spread Axle Housing

1 – SPECIAL TOOL C-3339
2 – SPECIAL TOOL W-129–B

REMOVAL AND INSTALLATION (Continued)

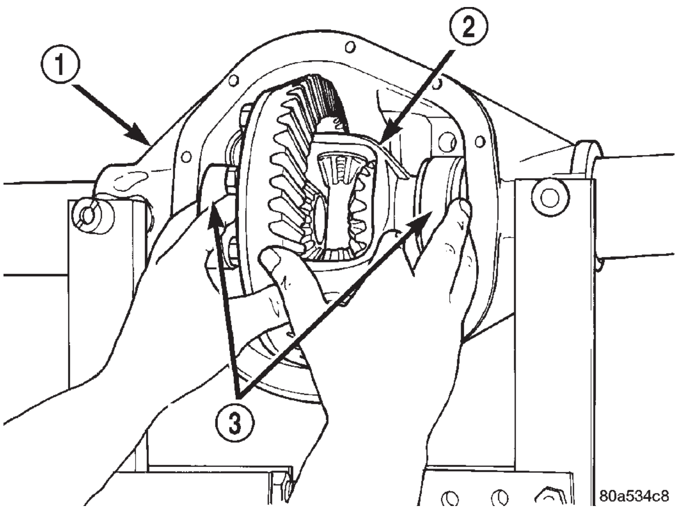

Fig. 32 Differential Case Removal

1 – AXLE HOUSING
2 – DIFFERENTIAL CASE
3 – BEARING CUPS

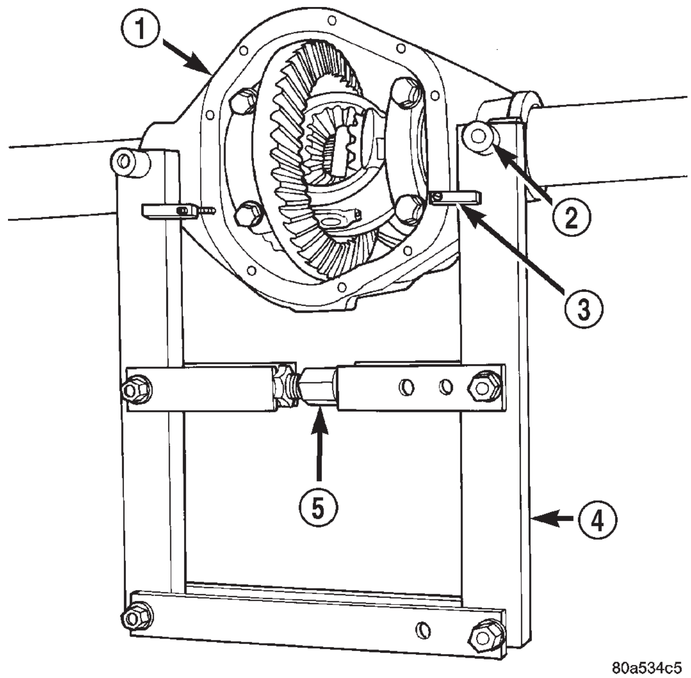

Fig. 33 Install Axle Housing Spreader

1 – AXLE HOUSING
2 – DOWEL
3 – SAFETY HOLD DOWN
4 – SPECIAL TOOL W-129–B
5 – TURNBUCKLE

INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Position Spreader W-129-B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 33). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 30) and zero the indicator.

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 31).

(4) Remove the dial indicator.

(5) Install differential case, and the differential preload shims for the 181FBI axles, in the housing. Ensure that the differential bearing cups remain in position on the differential bearings. Tap the differential case to ensure the bearings cups are fully seated in the housing.

(6) Install the bearing caps at their original locations (Fig. 34).

(7) Loosely install differential bearing cap bolts.

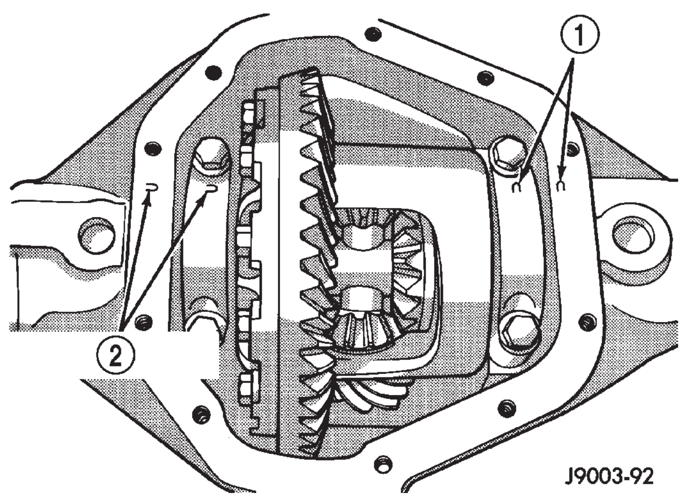

Fig. 34 Differential Bearing Cap Reference Letters

1 – INSTALLATION REFERENCE LETTERS
2 – INSTALLATION REFERENCE LETTERS

(8) Remove axle housing spreader.

(9) Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.

(10) Install the hub bearings and axle shafts.

REMOVAL AND INSTALLATION (Continued)

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-39 Adapter Blocks, and Plug SP-3289 (Fig. 35).

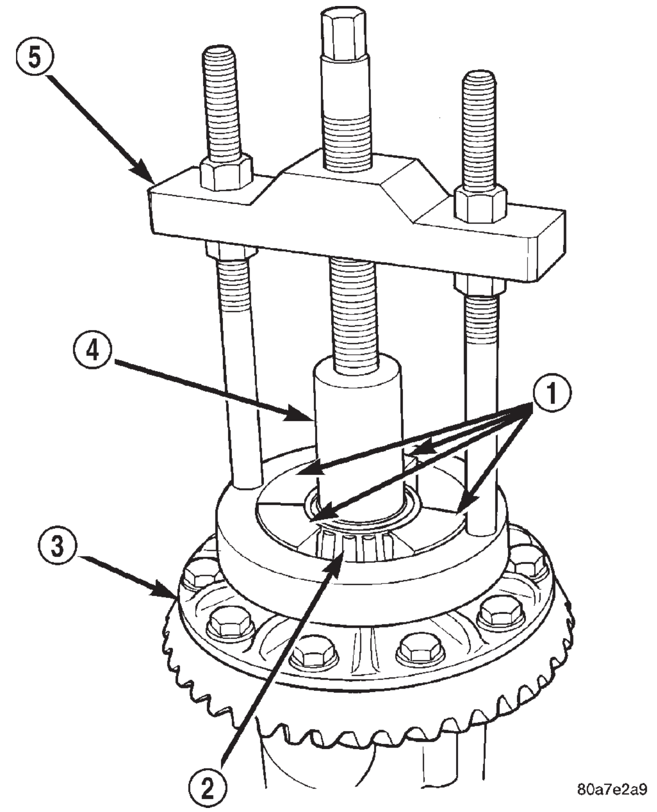

Fig. 35 Differential Bearing Removal

1 – SPECIAL TOOL C–293–39
2 – BEARING
3 – DIFFERENTIAL
4 – SPECIAL TOOL SP–3289
5 – SPECIAL TOOL C–293–PA

INSTALLATION

If replacement differential side bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Install differential side bearing shims onto differential case hubs, for 186FBI axles.

(2) Using Installer C-3716-A and Handle C-4171, install differential side bearings (Fig. 36).

(3) Install differential in axle housing.

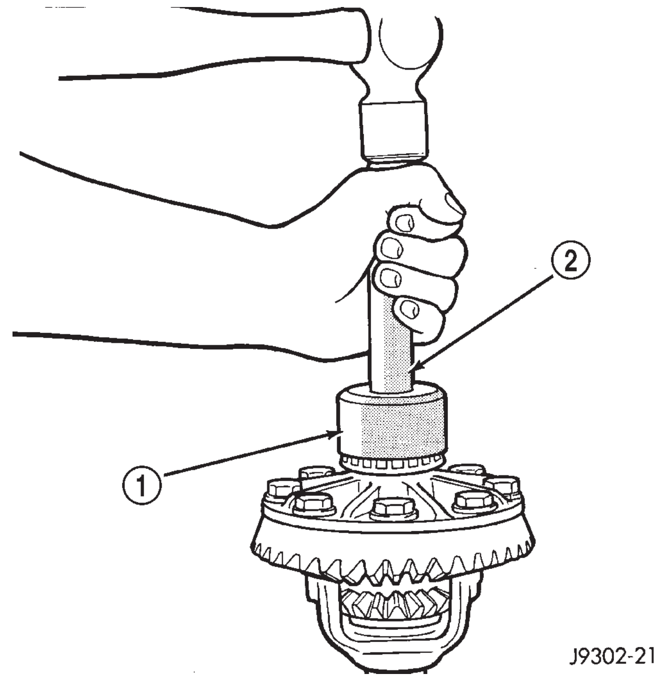

Fig. 36 Differential Side Bearing Installation

1 – SPECIAL TOOL C-3716–A
2 – SPECIAL TOOL C-4171

AXLE SHAFT OIL SEAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove differential assembly.

(3) Remove the inner axle shaft seals with a pry bay.

INSTALLATION

(1) Remove any sealer remaining from original seals.

(2) Remove sealer from axle tube to housing junction, if necessary.

(3) Install oil seals with Discs 8110 and Turnbuckle 6797 (Fig. 37). Tighten tool until disc bottoms in housing.

(4) Install differential assembly.

181 FBI PINION

The ring gear and pinion are serviced as a matched set. Do not replace the pinion without replacing the ring gear.

REMOVAL

(1) Remove differential assembly from axle housing.

(2) Mark pinion yoke and propeller shaft for installation alignment.

(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

REMOVAL AND INSTALLATION (Continued)

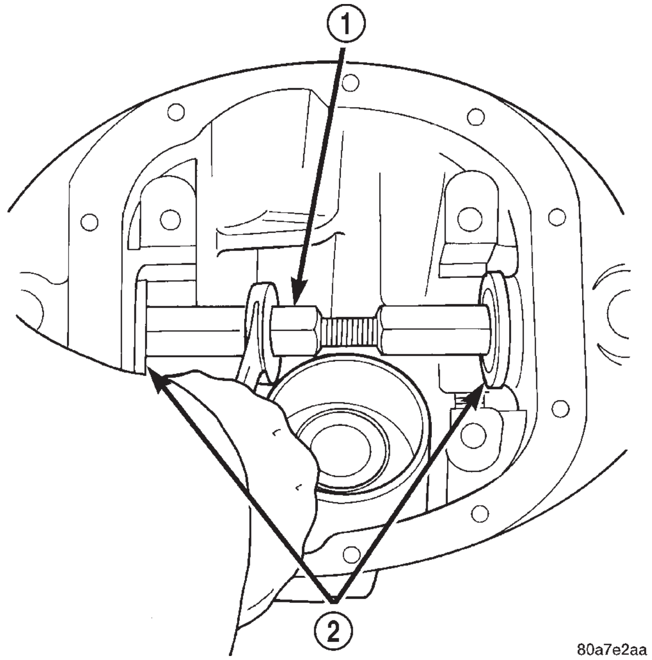

Fig. 37 Axle Seal Installation

1 – TURNBUCKLE 6797
2 – DISCS 8110

(4) Using Holder 6958 to hold yoke, remove the pinion nut and washer.

(5) Using Remover C-452 and Holder C-3281, remove the pinion yoke from pinion shaft (Fig. 38).

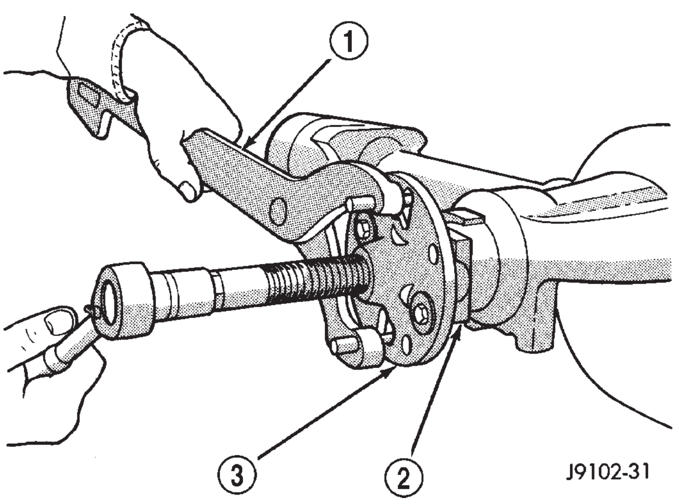

Fig. 38 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

(6) Remove the pinion gear and preload shims from housing (Fig. 39). Catch the pinion with your hand to prevent it from falling and being damaged.

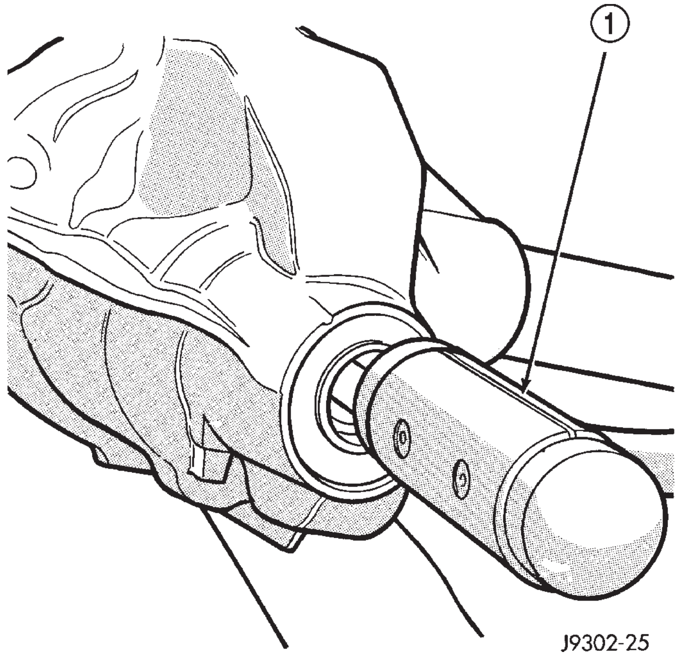

Fig. 39 Remove Pinion Gear

1 – RAWHIDE HAMMER

(7) Remove the front pinion bearing cup, bearing, oil slinger, if equipped, and pinion seal with Remover D-147 and Handle C–4171 (Fig. 40).

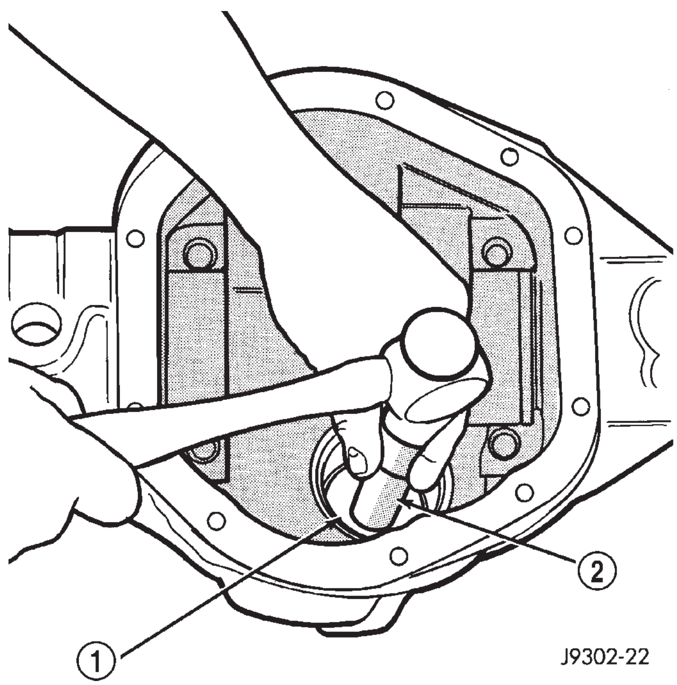

Fig. 40 Front Bearing Cup Removal

1 – REMOVER
2 – HANDLE

REMOVAL AND INSTALLATION (Continued)

(8) Remove the rear pinion bearing cup and oil slinger from the axle housing (Fig. 41). Use Remover D-149 and Handle C–4171. Record the thickness of the oil slinger for future reference.

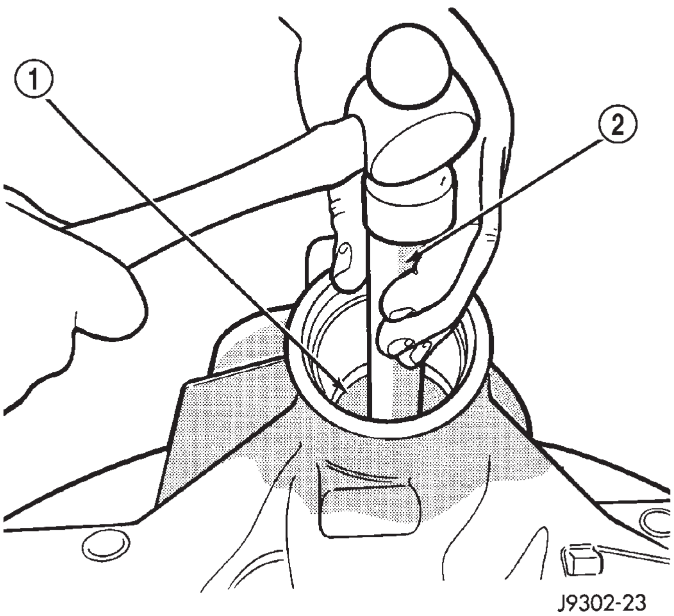

Fig. 41 Rear Bearing Cup Removal

1 – DRIVER
2 – HANDLE

(9) Remove the rear pinion bearing from the pinion with Puller/Press C–293-PA and Adapters C-293-39 (Fig. 42).

Place 4 adapter blocks so they do not damage the bearing cage.

(10) Remove the pinion depth shim/oil baffle from the pinion shaft. Record the thickness of the depth shim/oil baffle.

INSTALLATION

NOTE: A pinion depth shim/oil baffle is placed between the rear pinion bearing cone and pinion gear. If the factory installed ring and pinion gears are reused, the pinion depth shim/oil baffle should not require replacement. Refer to Pinion Gear Depth to select the proper thickness shim before installing pinion gear.

(1) Install a new oil slinger of the same thickness as the original into the rear pinion bearing bore of the axle housing.

(2) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of rear pinion bearing cup. Install the bearing cup with Installer D-146 and Handle C–4171 (Fig. 43). Verify cup is correctly seated.

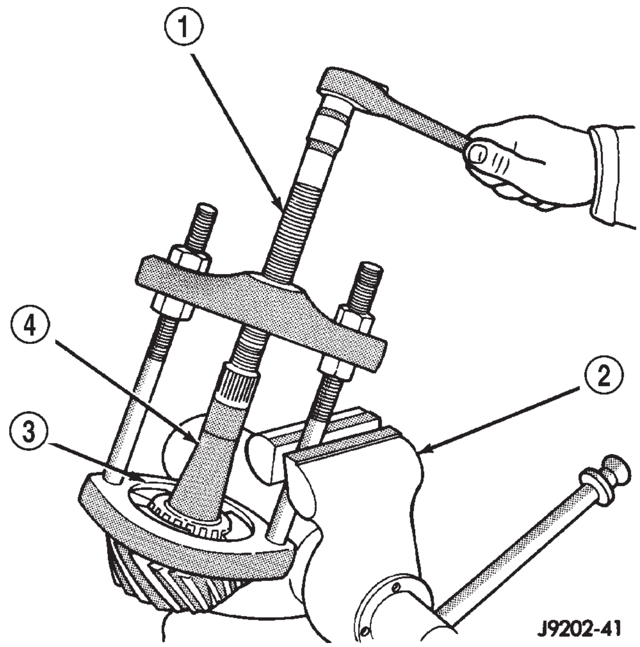

Fig. 42 Rear Bearing Removal

1 – SPECIAL TOOL C-293–PA
2 – VISE
3 – ADAPTERS
4 – DRIVE PINION GEAR SHAFT

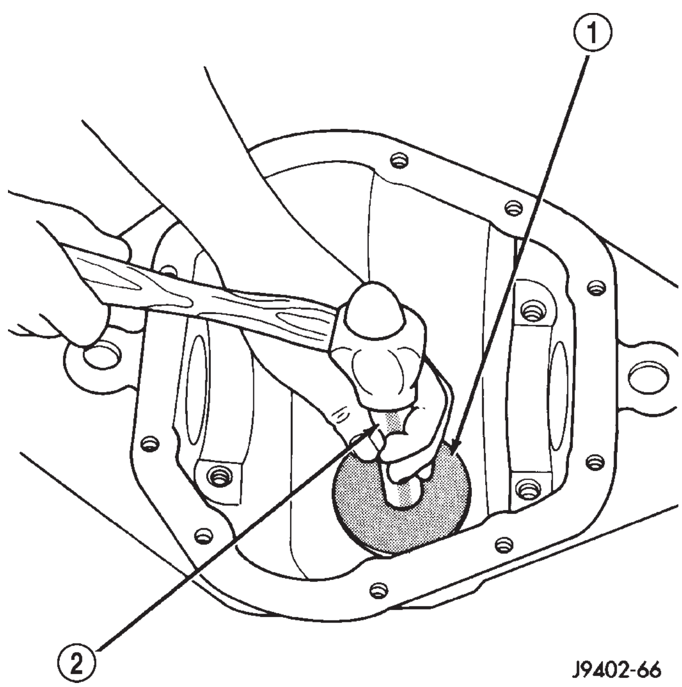

Fig. 43 Rear Pinion Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

REMOVAL AND INSTALLATION (Continued)

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of front pinion bearing cup. Install the bearing cup with Installer D-144 and Handle C–4171 (Fig. 44).

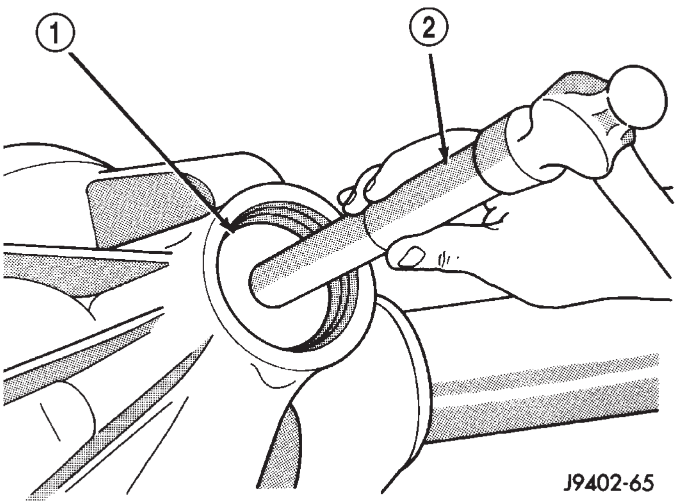

Fig. 44 Pinion Outer Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

(4) Install front pinion bearing, and oil slinger, if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 45).

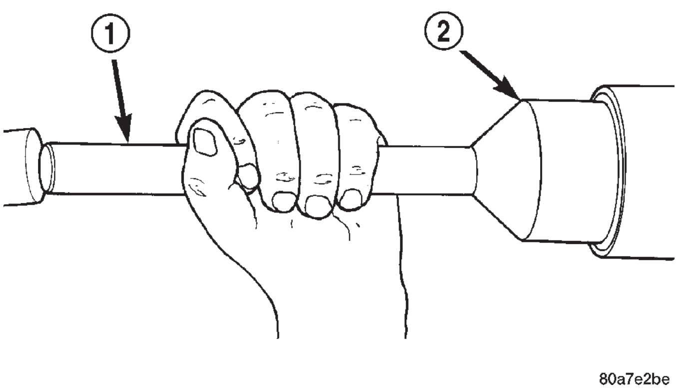

Fig. 45 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

(6) Install the rear pinion bearing and pinion depth shim/oil baffle onto the pinion gear with Installer W-262 and a shop press (Fig. 46).

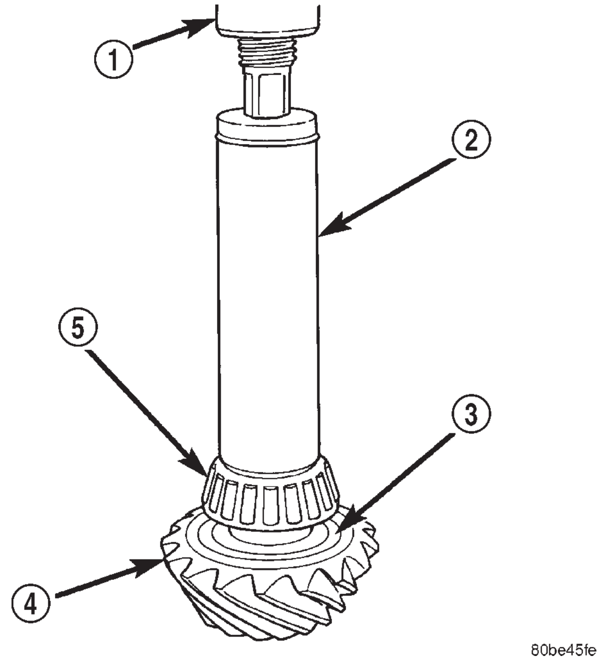

Fig. 46 Rear Pinion Bearing Installation

1 – PRESS
2 – INSTALLATION TOOL
3 – PINION DEPTH SHIM/OIL BAFFLE
4 – DRIVE PINION
5 – DRIVE PINION SHAFT REAR BEARING

(7) Install pinion bearing preload shims onto the pinion gear (Fig. 47).

(8) Install pinion gear in housing.

(9) Install yoke with Installer W-162-B, Cup 8109, and Holder 6958 (Fig. 48).

REMOVAL AND INSTALLATION (Continued)

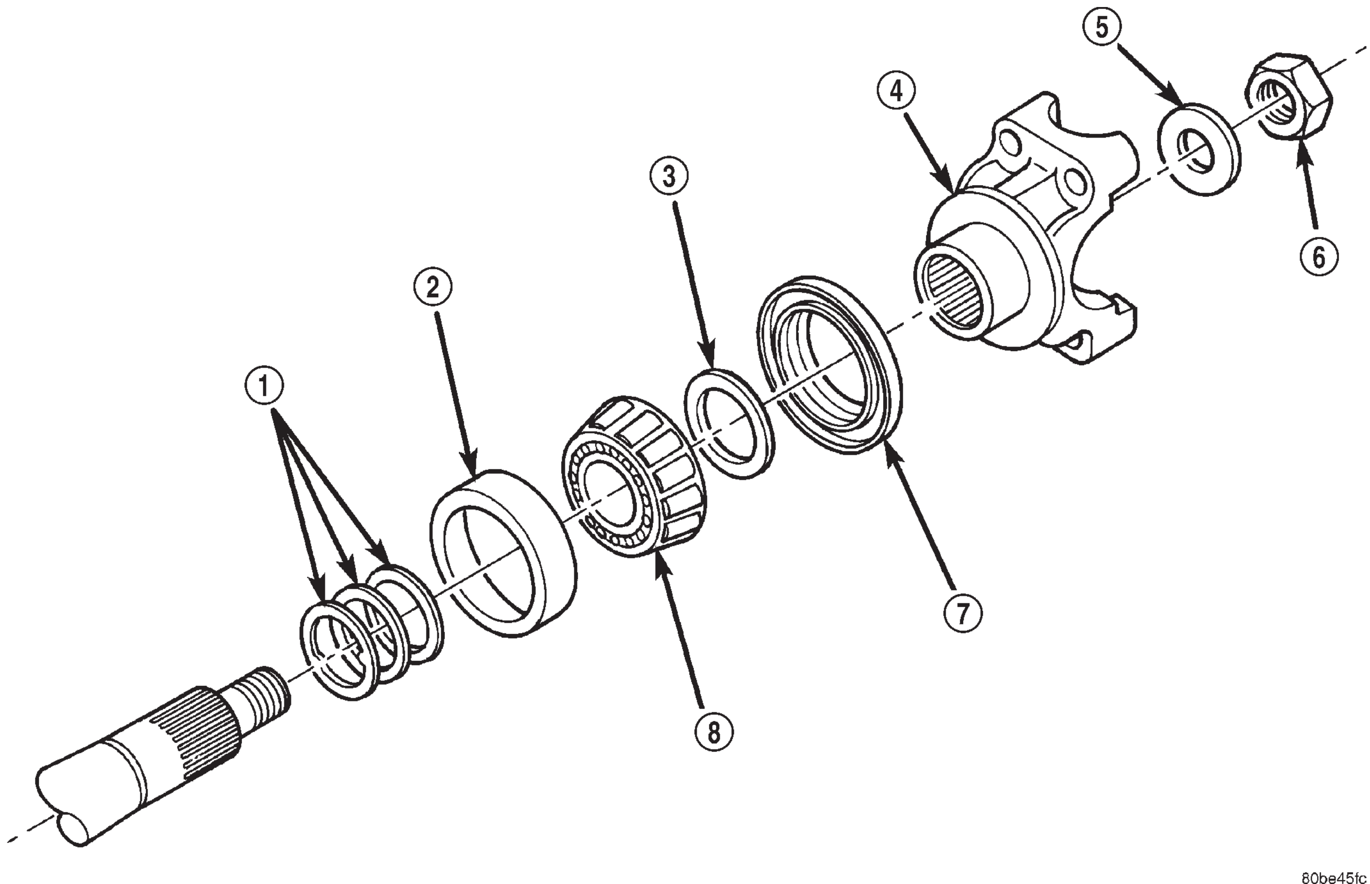

Fig. 47 Pinion Preload Shims–Typical

1 – PINION PRELOAD SHIMS
2 – FRONT BEARING CUP
3 – SLINGER
4 – PINION YOKE
5 – WASHER
6 – PINION NUT
7 – PINION OIL SEAL
8 – FRONT BEARING CONE

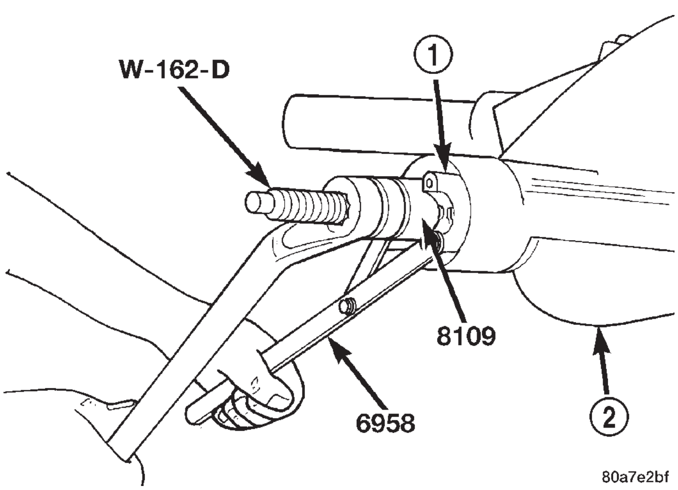

Fig. 48 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

(10) Install the pinion washer and a new nut on the pinion gear. Tighten the nut to 217 N·m (160 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload rotating torque.

(11) Check bearing preload torque with an inch pound torque wrench (Fig. 49). The torque necessary to rotate the pinion gear should be:

- Original Bearings—1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings—1.5 to 4 N·m (15 to 35 in. lbs.).

(12) If rotating torque is above the desired amount, remove the pinion yoke and increase the preload shim pack thickness. Increasing the shim pack thickness 0.025 mm (0.001 in.) will decrease the rotating torque approximately 0.9 N·m (8 in. lbs.).

(13) Tighten pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the maximum tightening or desired rotating torque is reached. Maximum tightening torque is 271 N·m (200 ft.lbs.).

REMOVAL AND INSTALLATION (Continued)

(14) If the maximum tightening torque is reached prior to achieving the desired rotating torque, remove the pinion yoke and decrease the thickness of the preload shim pack. Decreasing the shim pack thickness 0.025 mm (0.001 in.) will increase the rotating torque approximately 0.9 N·m (8 in. lbs.).

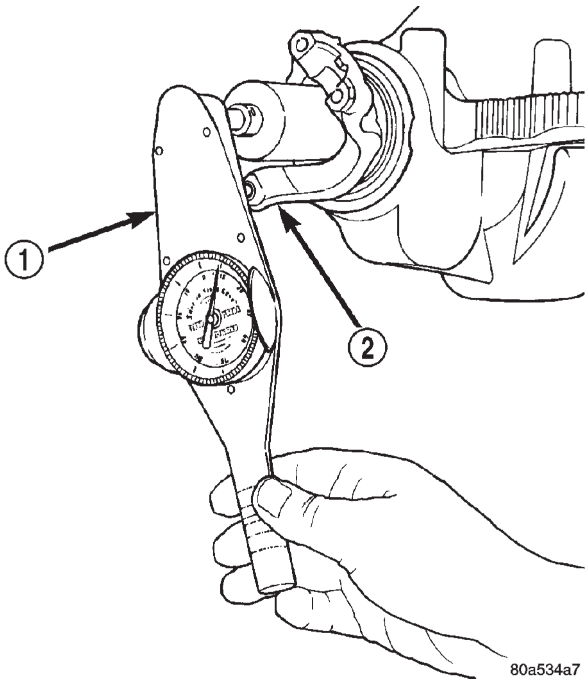

Fig. 49 Check Pinion Gear Rotating Torque

1 – in. lbs. TORQUE WRENCH
2 – PINION YOKE

(15) Install differential assembly.

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The ring gear and pinion are serviced as a matched set. Do not replace the pinion without replacing the ring gear.

REMOVAL

(1) Remove differential assembly from axle housing.

(2) Mark pinion yoke and propeller shaft for installation alignment.

(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

(4) Using Holder 6958 to the hold yoke, remove the pinion nut and washer (Fig. 50).

(5) Using Remover C–452 and Holder C-3281, remove the pinion yoke from pinion shaft (Fig. 51).

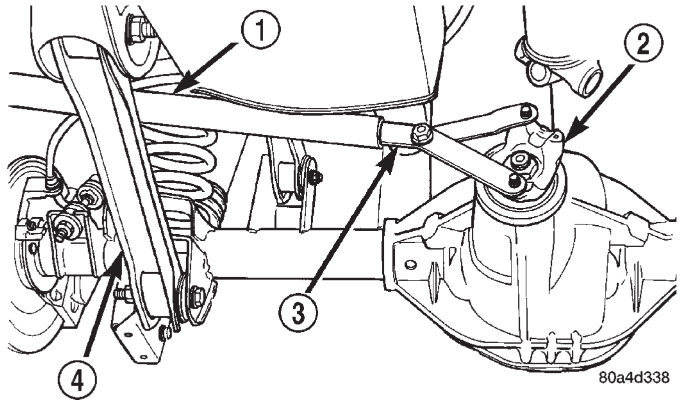


Fig. 50 Pinion Yoke Holder—Typical

1 – 1 in. PIPE
2 – PINION YOKE
3 – SPECIAL TOOL 6958
4 – LOWER CONTROL ARM

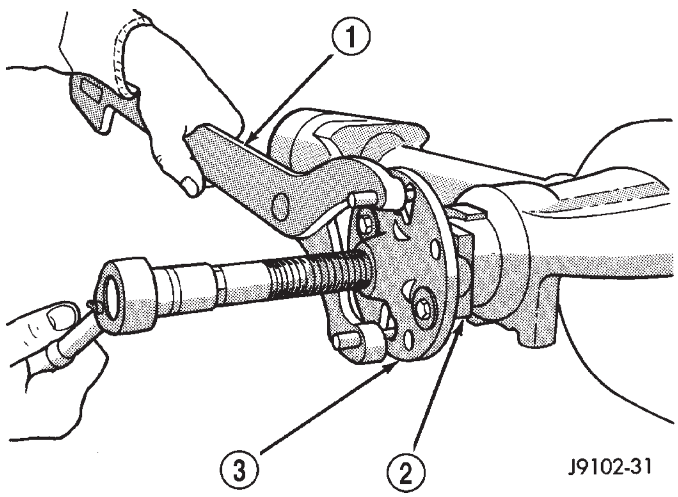


Fig. 51 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

REMOVAL AND INSTALLATION (Continued)

(6) Remove the pinion and collapsible spacer from housing (Fig. 52). Catch the pinion with your hand to prevent it from falling and being damaged.

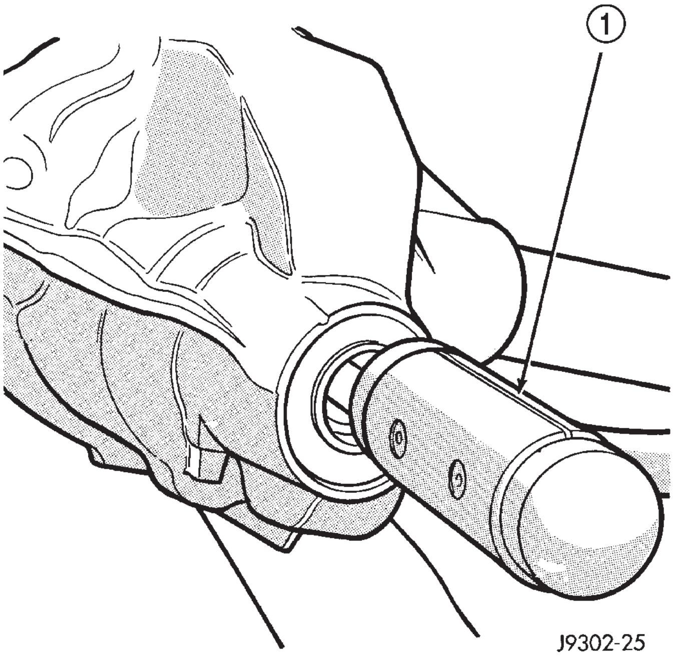


Fig. 52 Remove Pinion

1 – RAWHIDE HAMMER

(7) Remove the front pinion bearing cup, bearing, oil slinger, if equipped, and pinion seal with Remover C-4345 and Handle C–4171 (Fig. 53).

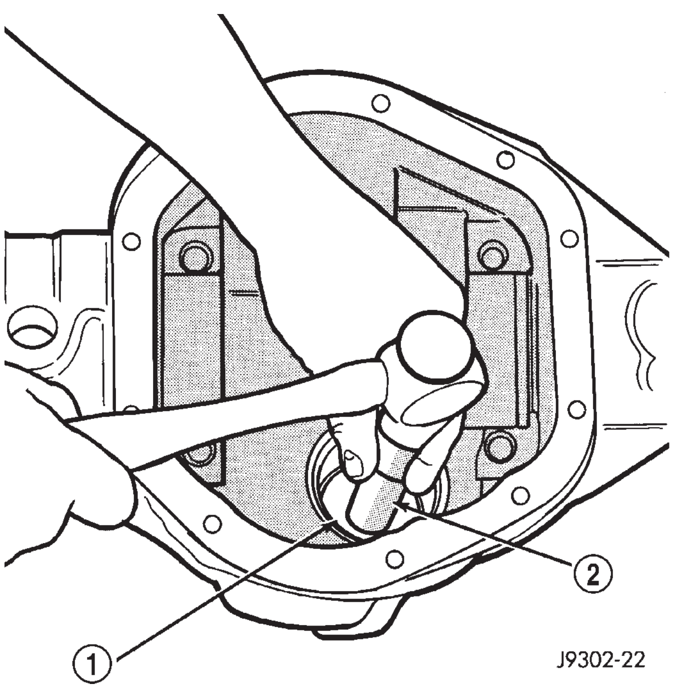


Fig. 53 Front Bearing Cup Removal

1 – REMOVER
2 – HANDLE

(8) Remove the rear pinion bearing cup from axle housing (Fig. 54). Use Remover D-149 and Handle C–4171.

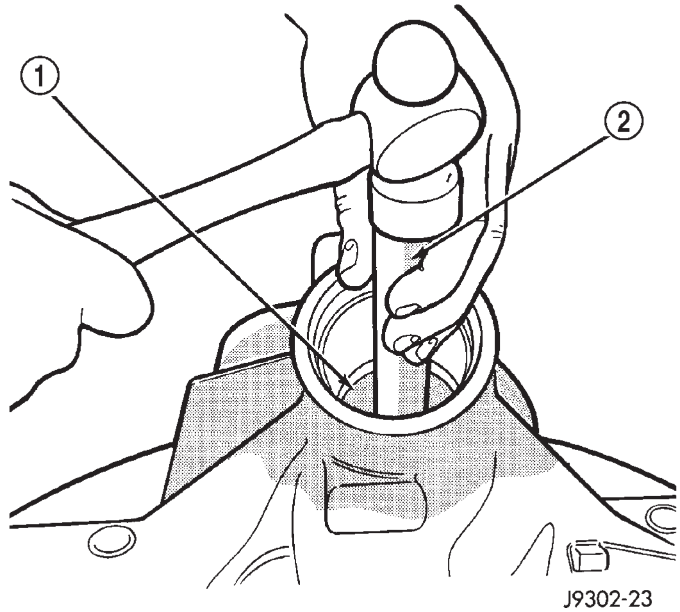


Fig. 54 Rear Bearing Cup Removal

1 – DRIVER
2 – HANDLE

(9) Remove the collapsible preload spacer from pinion gear (Fig. 55).

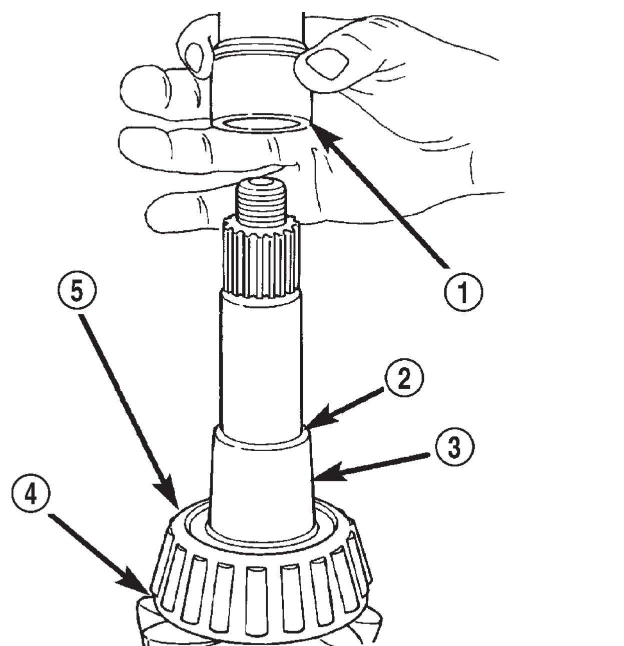


Fig. 55 Collapsible Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION
4 – PINION DEPTH SHIM
5 – REAR BEARING

REMOVAL AND INSTALLATION (Continued)

(10) Remove the rear pinion bearing from the pinion with Puller/Press C–293-PA and Adapters C–293–39 (Fig. 56).

Place 4 adapter blocks so they do not damage the bearing cage.

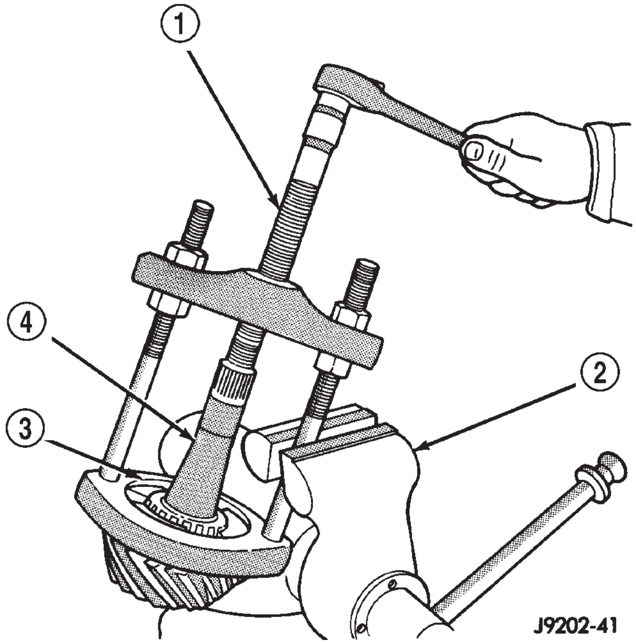


Fig. 56 Inner Bearing Removal

1 – SPECIAL TOOL C-293–PA
2 – VISE
3 – ADAPTERS
4 – DRIVE PINION GEAR SHAFT

(11) Remove the depth shim/oil slinger from the pinion shaft. Record the thickness of the depth shim/oil slinger.

INSTALLATION

NOTE: A pinion depth shim/oil slinger is placed between the rear pinion bearing cone and the pinion head to achieve proper ring gear and pinion mesh. If the factory installed ring gear and pinion are reused, the pinion depth shim/oil slinger should not require replacement. Refer to Pinion Gear Depth to select the proper thickness shim/oil slinger before installing pinion.

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of rear pinion bearing cup. Install the bearing cup with Installer D-146 and Driver Handle C–4171 (Fig. 57). Verify cup is correctly seated.

(2) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of front pinion bearing cup. Install the bearing cup with Installer D-130 and Handle C–4171 (Fig. 58).

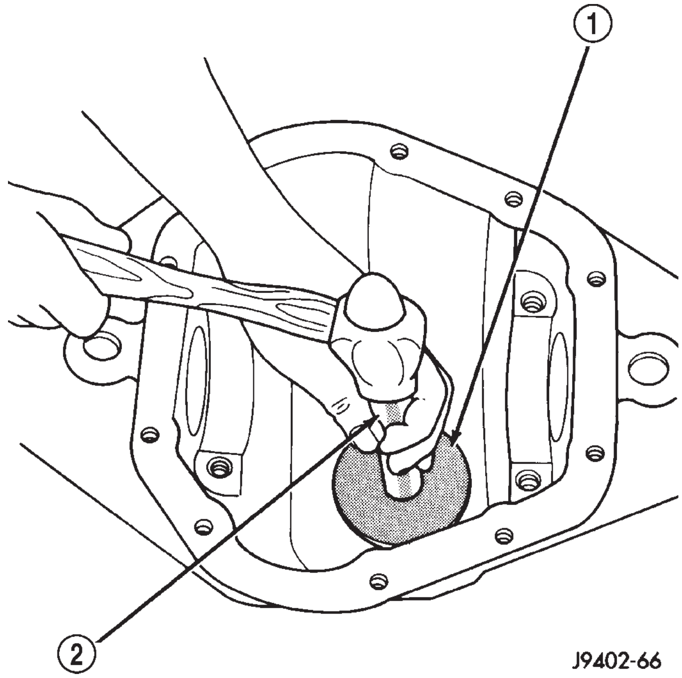


Fig. 57 Rear Pinion Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

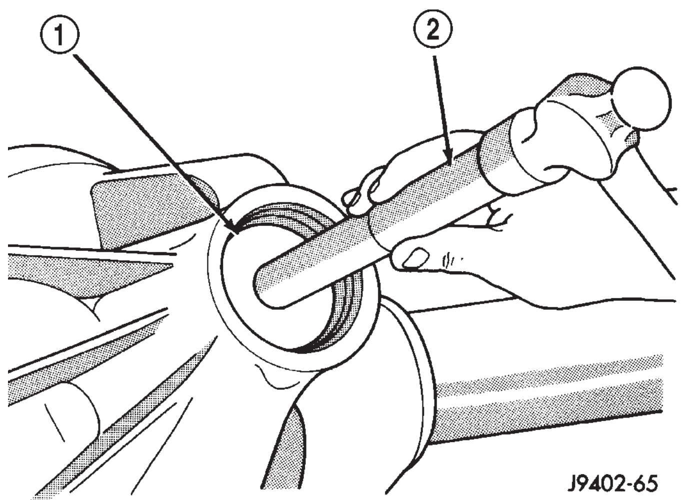


Fig. 58 Pinion Outer Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

(3) Install front pinion bearing, and oil slinger, if equipped.

(4) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 59).

(5) Install the rear pinion bearing and the pinion depth shim/oil slinger onto the pinion with Installer W-262 and a shop press (Fig. 60).

REMOVAL AND INSTALLATION (Continued)

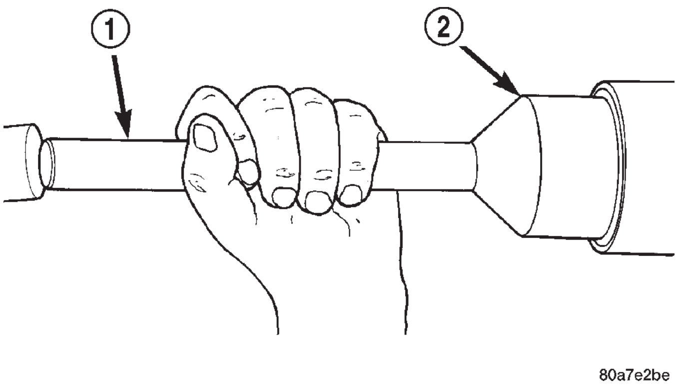


Fig. 59 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

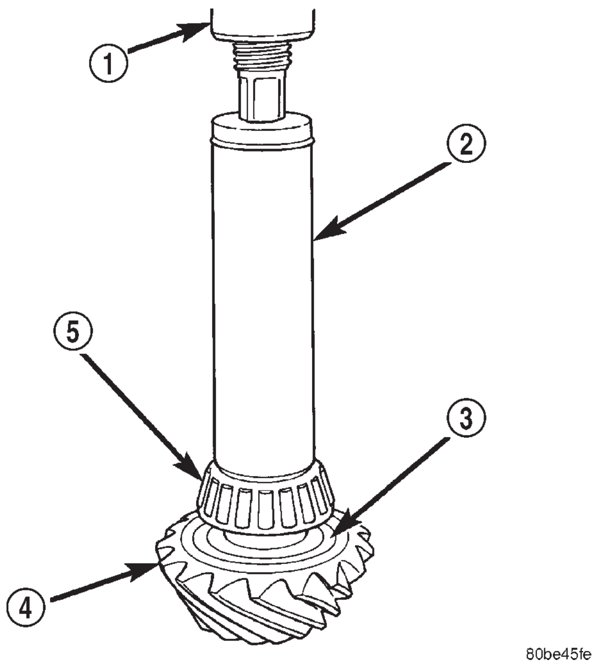


Fig. 60 Rear Pinion Bearing Installation

1 – PRESS
2 – INSTALLATION TOOL
3 – PINION DEPTH SHIM/OIL BAFFLE
4 – DRIVE PINION
5 – DRIVE PINION SHAFT REAR BEARING

(6) Install a new collapsible preload spacer on pinion shaft and install pinion in housing (Fig. 61).

(7) Install yoke with Installer W-162-B, Cup 8109, and Holder 6958 (Fig. 62).

(8) Install the pinion washer and a new nut onto the pinion. Tighten the nut to 216 N·m (160 ft. lbs.) minimum. **Do not over–tighten.** Maximum torque is 352 N·m (260 ft. lbs.).

CAUTION: Never loosen the pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

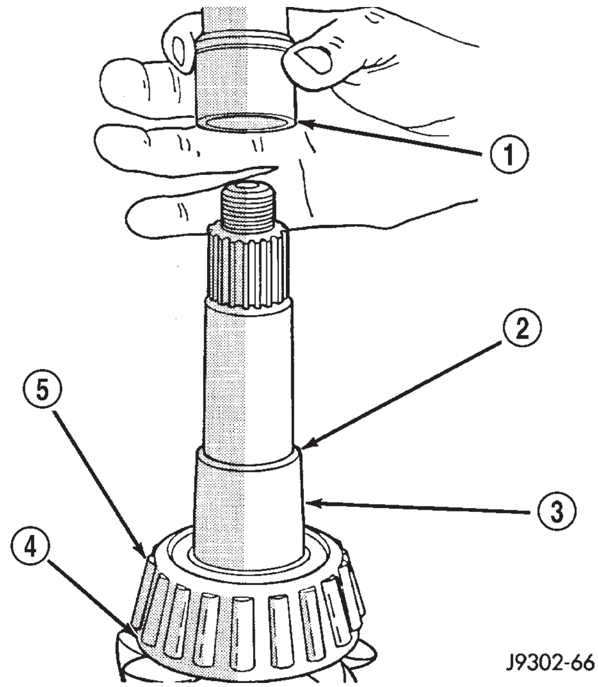


Fig. 61 Collapsible Preload Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION GEAR
4 – OIL SLINGER
5 – REAR BEARING

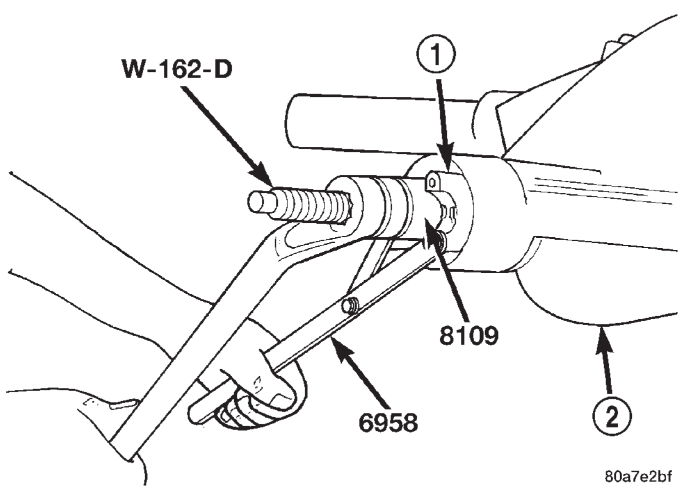


Fig. 62 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

(9) Using Holder 6958 and torque wrench (set at 352 N·m (260 ft. lbs.)), crush collapsible spacer until

REMOVAL AND INSTALLATION (Continued)

bearing end play is taken up (Fig. 63). If more than 353 N·m (260 ft. lbs.) is needed to begin to collapse the spacer, the spacer is defective and must be replaced.

(10) Slowly tighten the nut in 6.8 N·m (5 ft. lb.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 64).

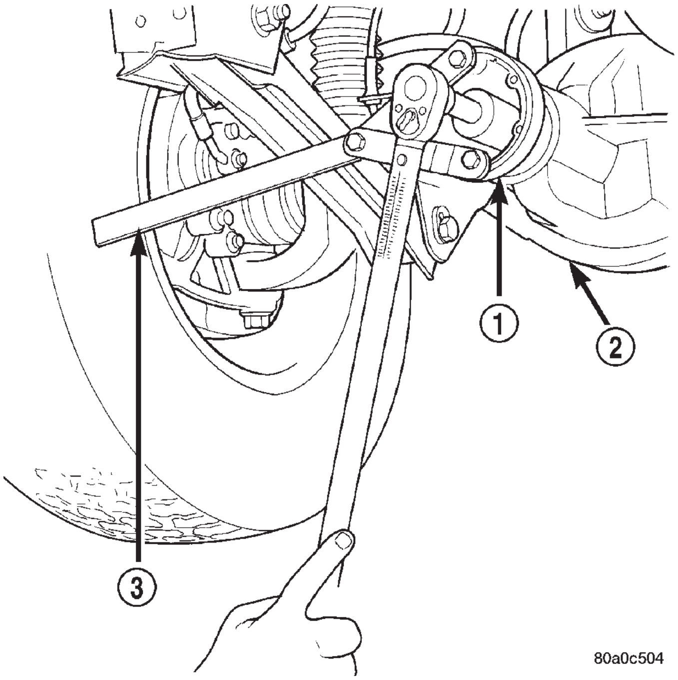


Fig. 63 Tightening Pinion Nut—Typical

1 – PINION FLANGE
2 – FRONT AXLE
3 – TOOL 6958

(11) Check bearing rotating torque with an inch pound torque wrench (Fig. 64). The torque necessary to rotate the pinion should be:

- Original Bearings — 1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings — 1.5 to 4 N·m (15 to 35 in. lbs.).

(12) Install differential assembly.

RING GEAR

NOTE: The ring gear and pinion are serviced as a matched set. Do not replace the ring gear without replacing the pinion.

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 65)

(3) Remove bolts holding ring gear to differential case.

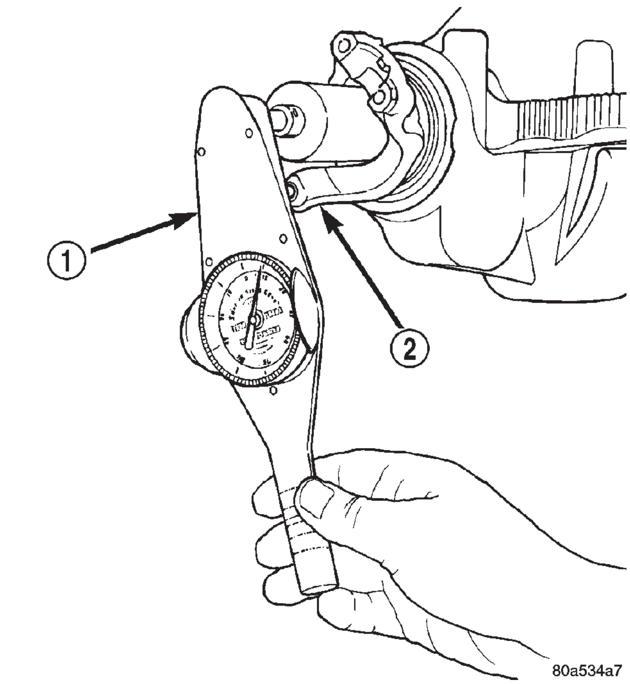


Fig. 64 Check Pinion Rotation Torque

1 – in. lbs. TORQUE WRENCH
2 – PINION YOKE

(4) Using a soft hammer, drive ring gear from differential case (Fig. 65).

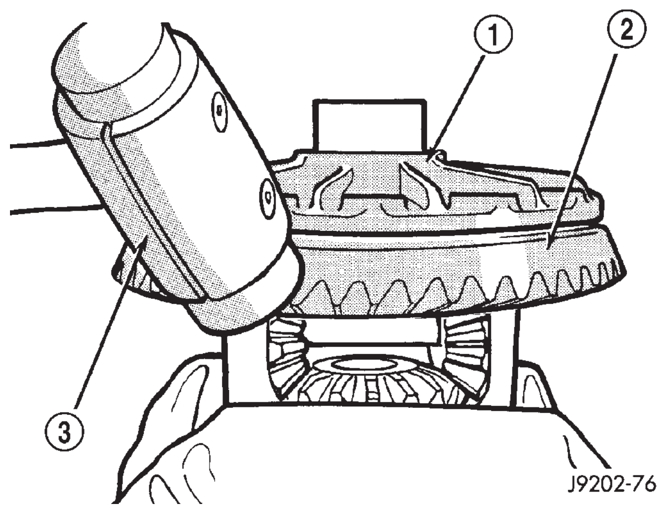


Fig. 65 Ring Gear Removal

1 – CASE
2 – RING GEAR
3 – RAWHIDE HAMMER

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

REMOVAL AND INSTALLATION (Continued)

(1) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(2) Invert the differential case in the vise.

(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 66).

(4) Install differential in axle housing and verify gear mesh and contact pattern.

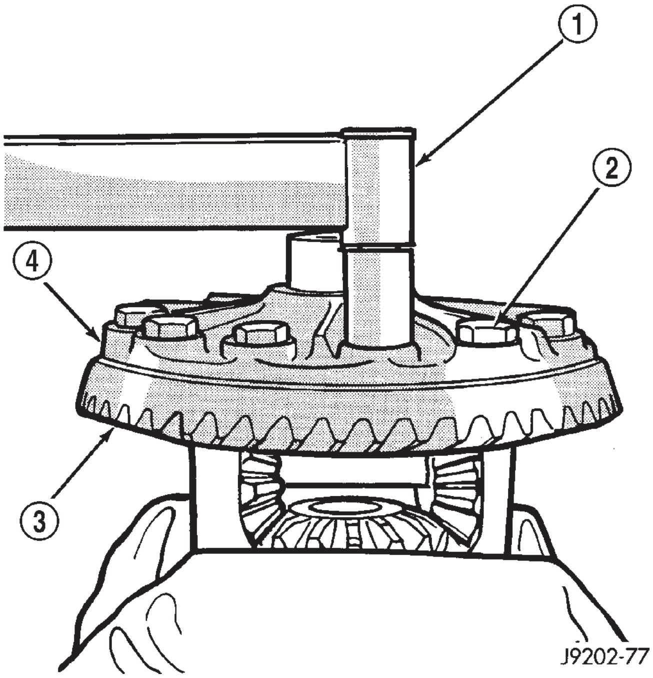


Fig. 66 Ring Gear Bolt Installation

1 – TORQUE WRENCH
2 – RING GEAR BOLT
3 – RING GEAR
4 – CASE

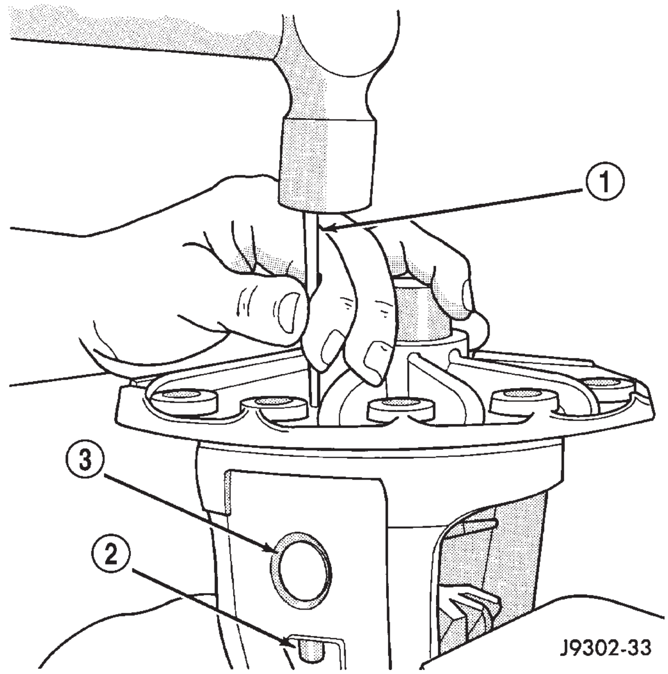


Fig. 67 Mate Shaft Roll Pin Removal

1 – DRIFT
2 – LOCKPIN
3 – MATE SHAFT

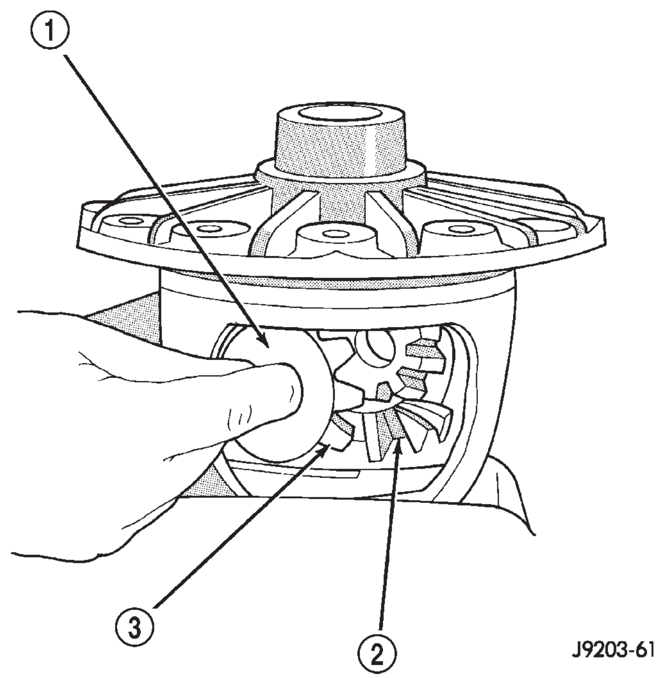


Fig. 68 Pinion Mate Gear Removal

1 – THRUST WASHER
2 – SIDE GEAR
3 – PINION MATE GEAR

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove the ring gear.

(2) Using a suitable roll pin punch, drive out the roll pin holding pinion gear mate shaft in the differential case (Fig. 67).

(3) Remove the pinion gear mate shaft from the differential case and the pinion mate gears.

(4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 68).

(5) Remove the differential side gears and thrust washers.

ASSEMBLY

(1) Install the differential side gears and thrust washers.

(2) Install the pinion mate gears and thrust washers.

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Install the pinion gear mate shaft. Align the roll pin holes in shaft and the differential case.

(4) Install the roll pin to hold the pinion mate shaft in the differential case (Fig. 69).

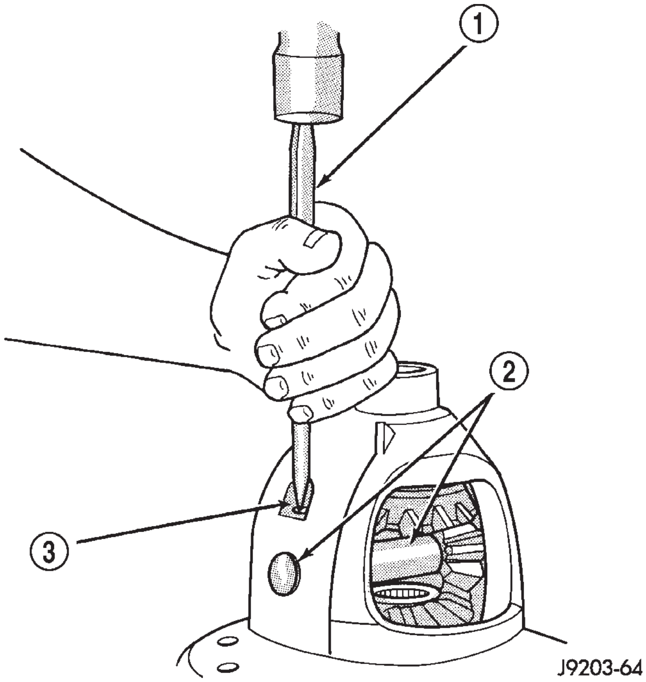


Fig. 69 Mate Shaft Roll Pin Installation

1 – PUNCH
2 – PINION MATE SHAFT
3 – MATE SHAFT LOCKPIN

(5) Install the ring gear.

(6) Lubricate all differential components with hypoid gear lubricant.

FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 70).

Install the housing cover within 5 minutes after applying the sealant.

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.

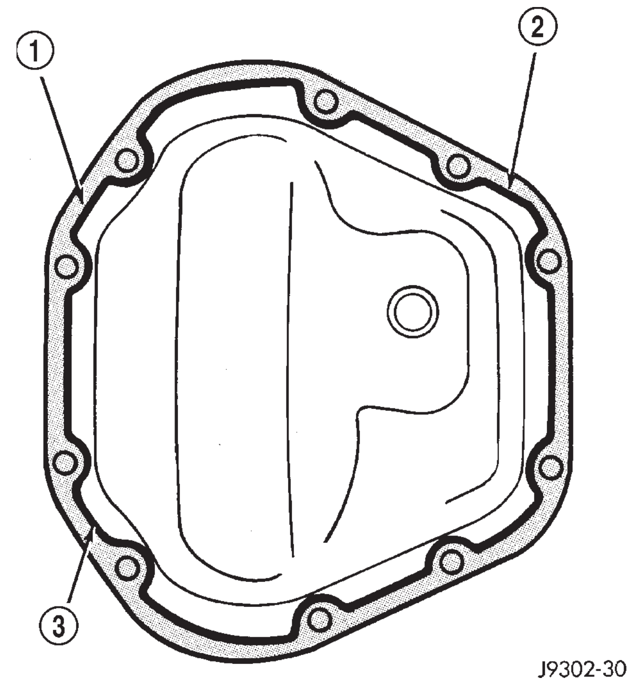


Fig. 70 Typical Housing Cover With Sealant

1 – SEALING SURFACE
2 – CONTOUR OF BEAD
3 – BEAD THICKNESS 6.35mm (1/4”)

CLEANING AND INSPECTION

CARDAN U-JOINT

Clean all the U–joint yoke bores with cleaning solvent and a wire brush. Ensure that all the rust and foreign matter are removed from the bores.

Inspect the yokes for distortion, cracks and worn bearing cap bores.

Replace the complete U–joint if any of the components are defective.

AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing. Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.

CLEANING AND INSPECTION (Continued)

• Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
• Ring and pinion gear for worn and chipped teeth.
• Ring gear for damaged bolt threads. Replaced as a matched set only.
• Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
• Preload shims for damage and distortion. Install new shims, if necessary.

ADJUSTMENTS

181 FBI PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 71). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.08 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

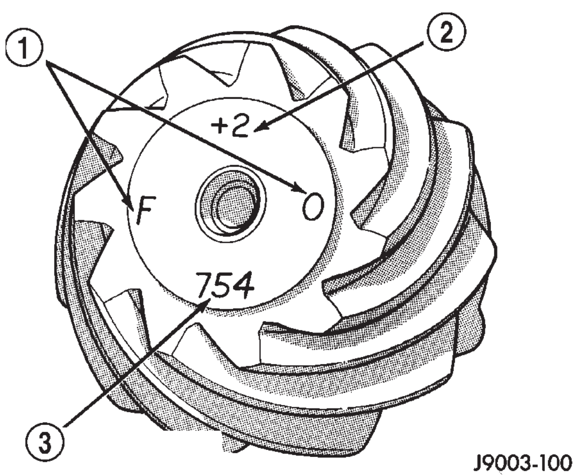


Fig. 71 Pinion Gear ID Numbers

1 – PRODUCTION NUMBERS
2 – DRIVE PINION GEAR DEPTH VARIANCE
3 – GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

Compensation for pinion depth variance is achieved with a select shim/oil baffle. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 72).

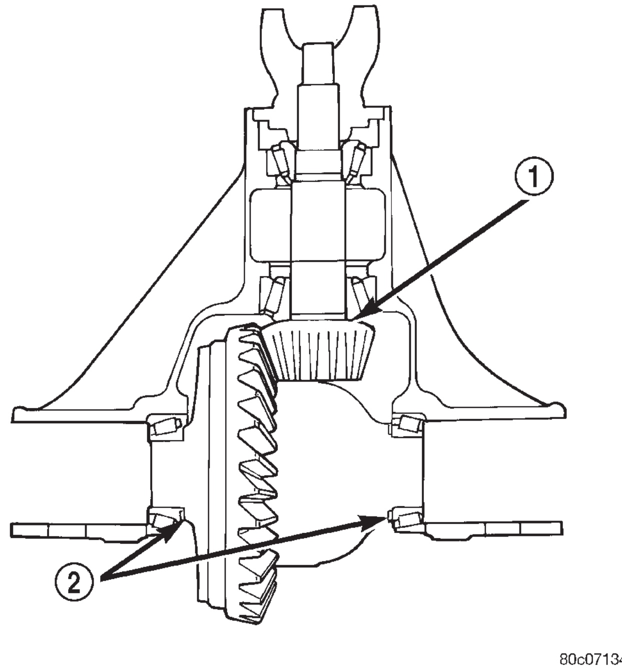


Fig. 72 Shim Locations

1 – PINION GEAR DEPTH SHIM/OIL BAFFLE
2 – DIFFERENTIAL BEARING SHIM

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

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

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

ADJUSTMENTS (Continued)

PINION GEAR DEPTH VARIANCE

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

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 73).

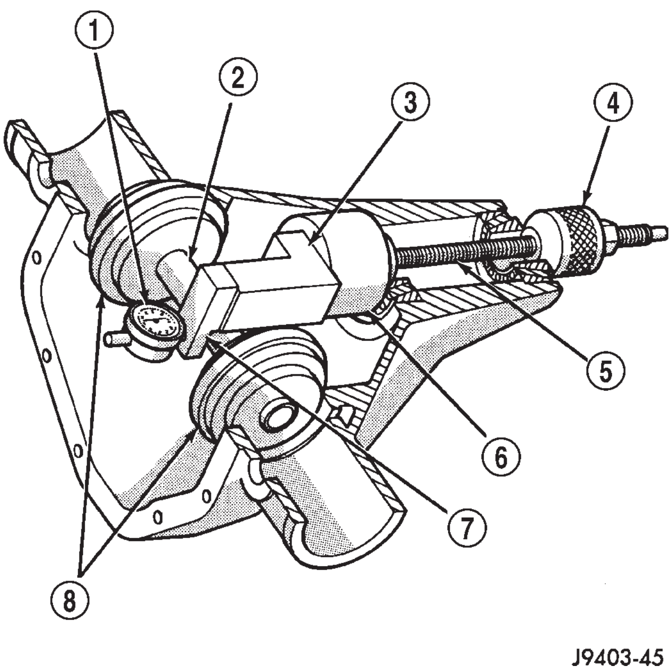


Fig. 73 Pinion Gear Depth Gauge Tools—Typical

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

(1) Assemble Pinion Height Block 6739, Pinion Block 6733, and rear pinion bearing onto Screw 6741 (Fig. 73).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 74).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 73).

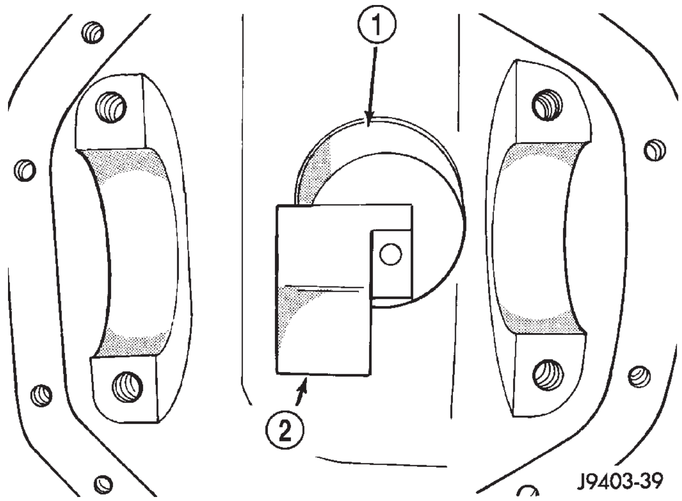


Fig. 74 Pinion Height Block—Typical

1 – PINION BLOCK
2 – PINION HEIGHT BLOCK

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 75). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

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

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

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion

ADJUSTMENTS (Continued)

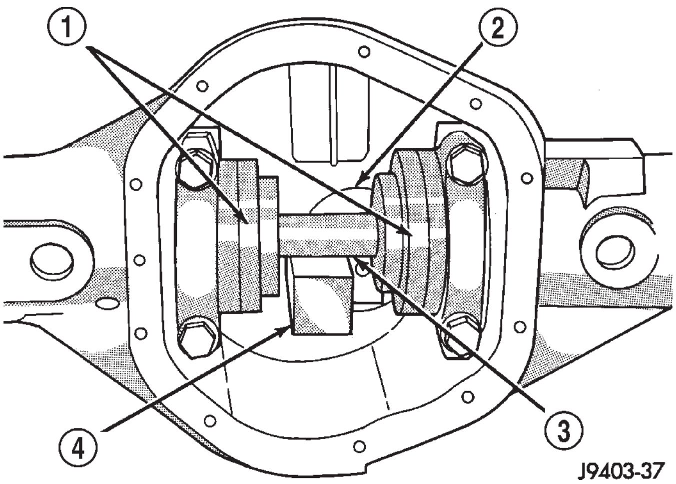


Fig. 75 Gauge Tools In Housing—Typical

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

height block (Fig. 73). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 76). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim/oil baffle equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 71). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

186 FBI PINION GEAR DEPTH

GENERAL INFORMATION

Ring gear and pinion are supplied as matched sets only. The identifying numbers for the ring gear and pinion are etched into the face of each gear (Fig. 77). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear head. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.08 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

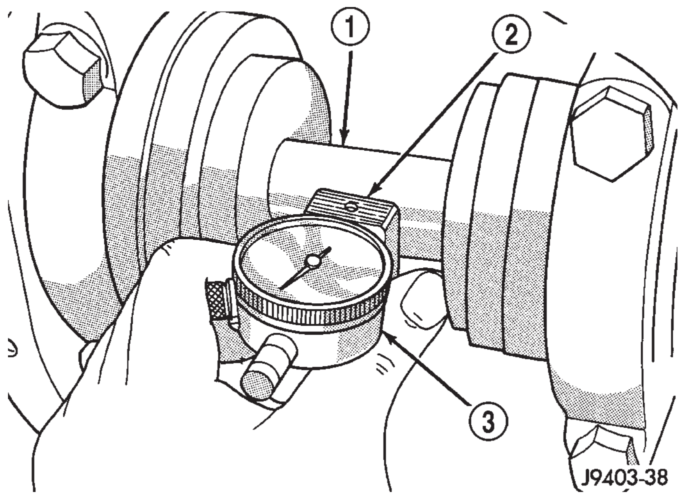


Fig. 76 Pinion Gear Depth Measurement—Typical

1 – ARBOR
2 – SCOOTER BLOCK
3 – DIAL INDICATOR

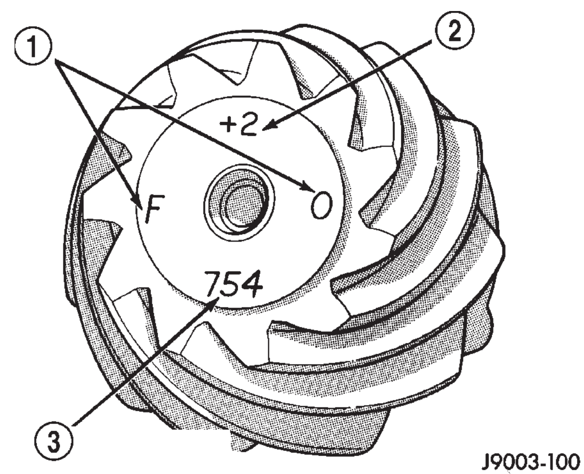


Fig. 77 Pinion Gear ID Numbers

1 – PRODUCTION NUMBERS
2 – DRIVE PINION GEAR DEPTH VARIANCE
3 – GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

Compensation for pinion depth variance is achieved with a select shim/oil slinger. The shim/oil slinger is placed between the rear pinion bearing and the pinion gear head (Fig. 78).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance chart.

ADJUSTMENTS (Continued)

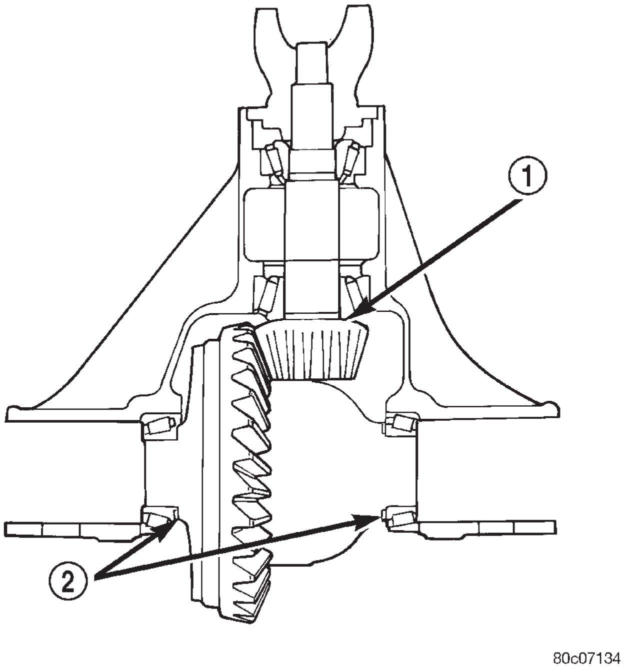


Fig. 78 Shim Locations

1 – PINION GEAR DEPTH SHIM/OIL BAFFLE
2 – DIFFERENTIAL BEARING SHIM

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

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

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing. Take measurements with Pinion Gauge Set 6774 and Dial Indicator C-3339 (Fig. 79).

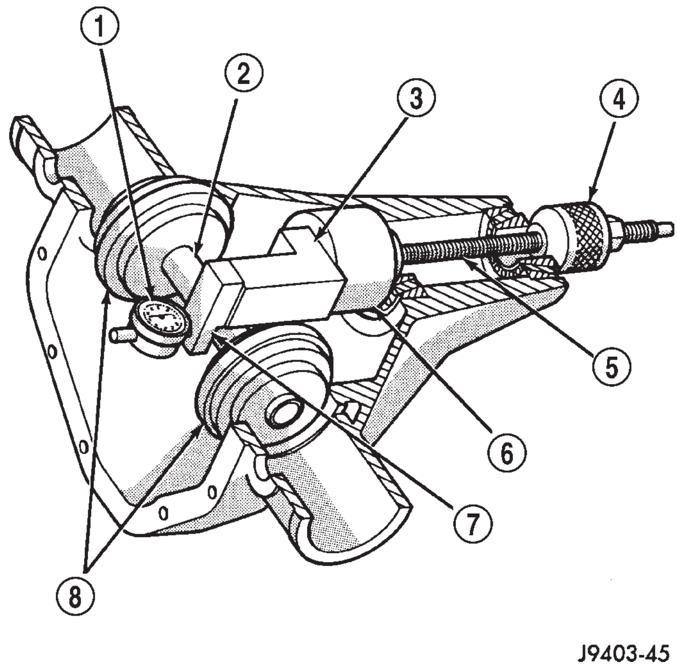


Fig. 79 Pinion Gear Depth Gauge Tools—Typical

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

PINION GEAR DEPTH VARIANCE

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

ADJUSTMENTS (Continued)

(1) Assemble Pinion Height Block 6739, Pinion Block 6733, and rear pinion bearing onto Screw 6741 (Fig. 79).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 80).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 79).

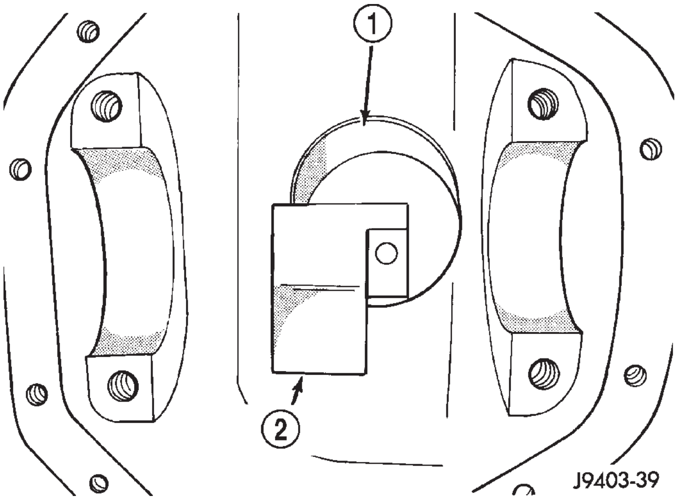


Fig. 80 Pinion Height Block—Typical

1 – PINION BLOCK
2 – PINION HEIGHT BLOCK

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 81). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

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

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

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 79). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 82). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading.

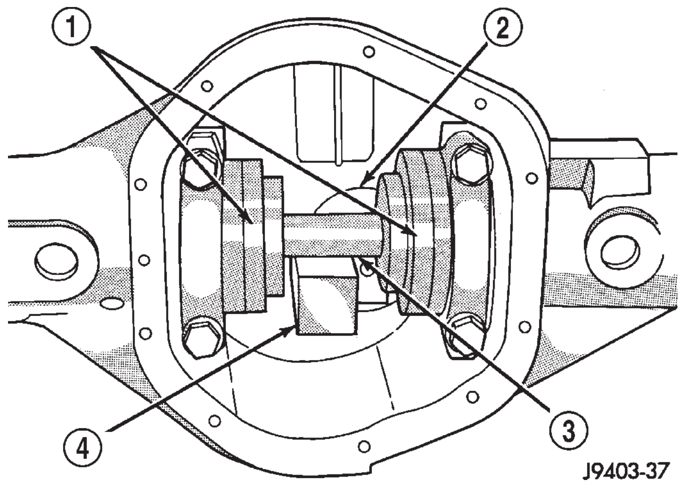


Fig. 81 Gauge Tools In Housing—Typical

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

If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim/oil slinger equal to the dial indicator reading plus the drive pinion depth variance number etched in the face of the pinion (Fig. 77). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

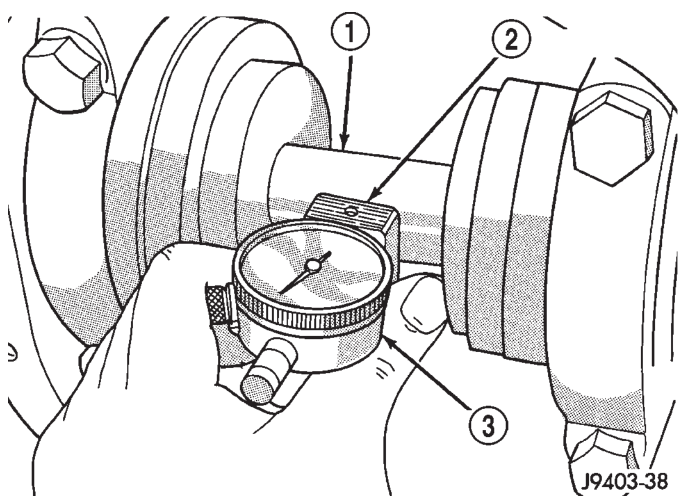


Fig. 82 Pinion Gear Depth Measurement—Typical

1 – ARBOR
2 – SCOOTER BLOCK
3 – DIAL INDICATOR

181 FBI DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the

ADJUSTMENTS (Continued)

differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 83). Differential shim measurements are performed with axle spreader W-129-B removed.

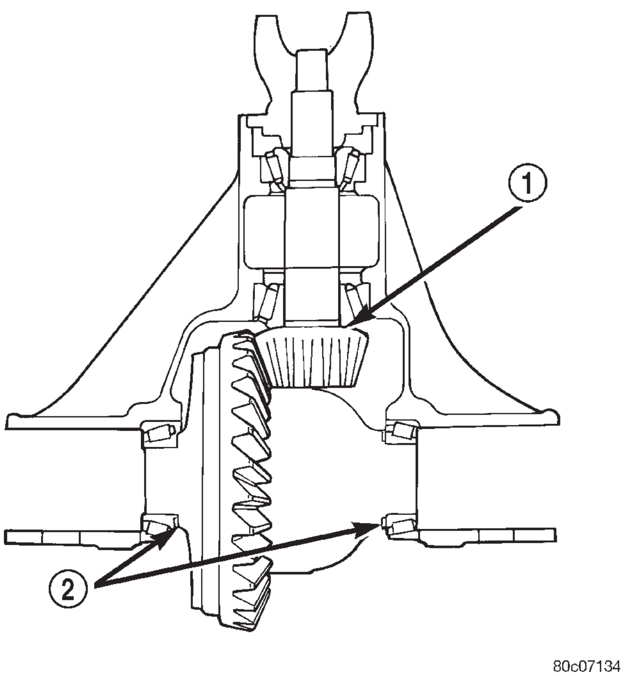


Fig. 83 Axle Adjustment Shim Locations

1 – PINION GEAR DEPTH SHIM/OIL BAFFLE
2 – DIFFERENTIAL BEARING SHIM

SHIM SELECTION

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

(1) Remove differential side bearings from differential case.

(2) Remove factory installed shims from differential case.

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

(4) Install dummy side bearings D-348 on differential case.

(5) Install differential case in axle housing.

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 84).

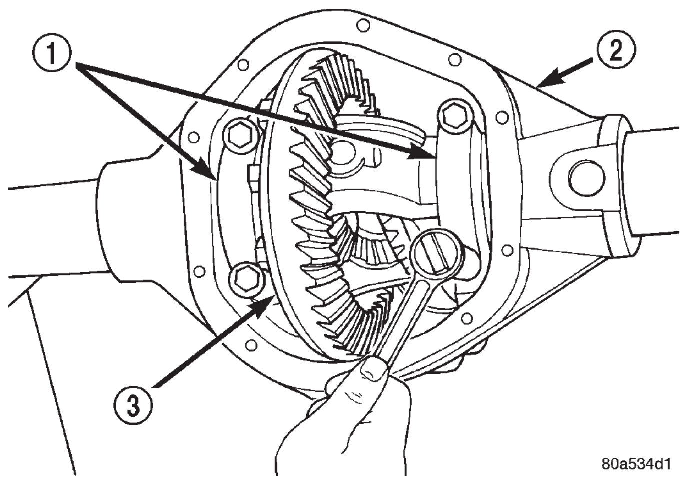


Fig. 84 Tighten Bolts Holding Bearing Caps

1 – BEARING CAP
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 85) and (Fig. 86).

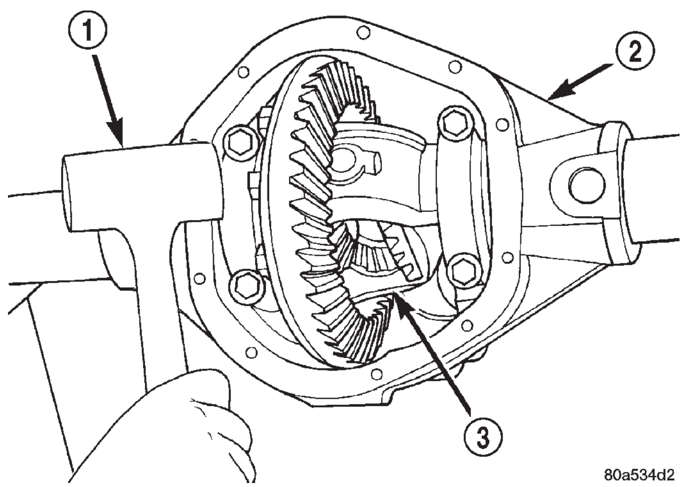


Fig. 85 Seat Pinion Gear Side Differential Dummy Side Bearing

1 – MALLET
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 87).

ADJUSTMENTS (Continued)

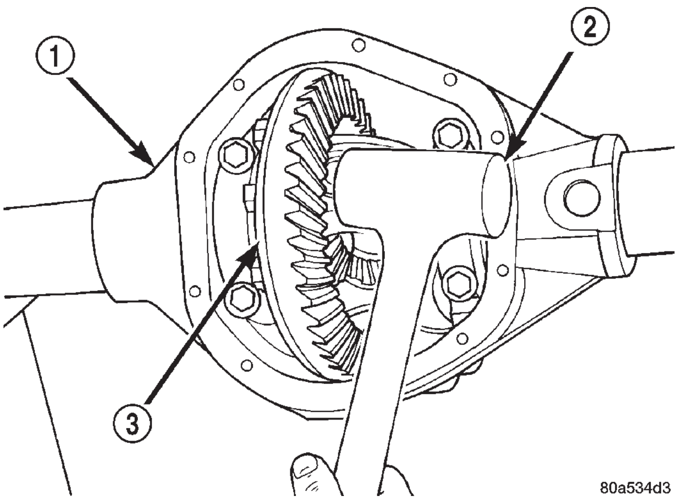


Fig. 86 Seat Ring Gear Side Differential Dummy Side Bearing

1 – AXLE HOUSING
2 – MALLET
3 – DIFFERENTIAL CASE

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 87).

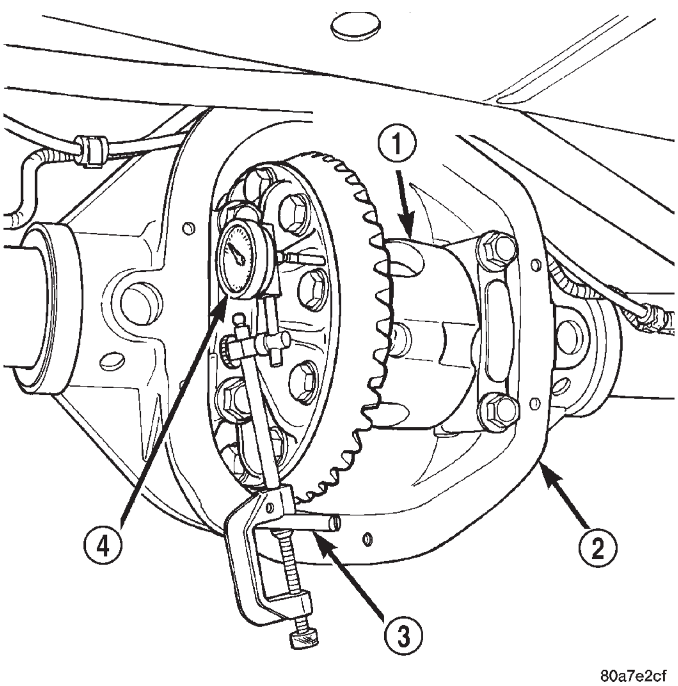


Fig. 87 Differential Side play Measurement

1 – DIFFERENTIAL CASE
2 – AXLE HOUSING
3 – SPECIAL TOOL C-3288–B
4 – SPECIAL TOOL C-3339

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 88).

(11) Zero dial indicator face to pointer (Fig. 88).

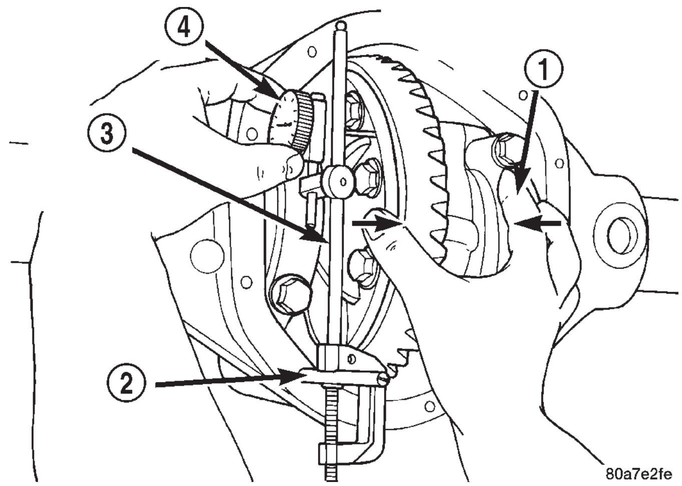


Fig. 88 Hold Differential Case and Zero Dial Indicator

1 – FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 – SPECIAL TOOL C-3288–B
3 – SPECIAL TOOL C-3339
4 – ZERO DIAL INDICATOR FACE

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 89).

(13) Record dial indicator reading (Fig. 89).

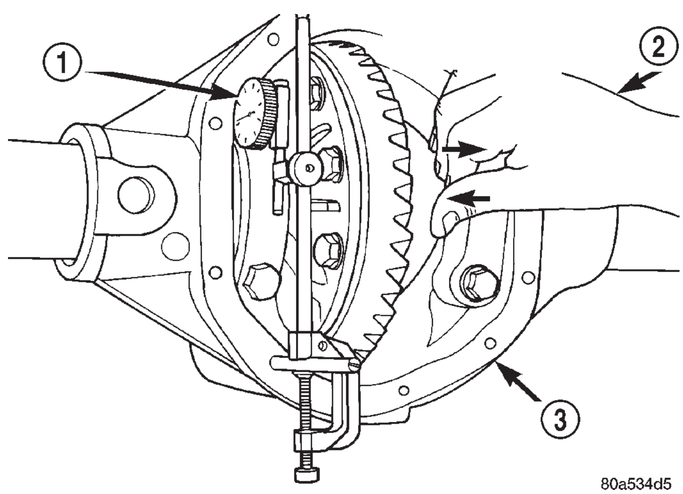


Fig. 89 Hold Differential Case and Read Dial Indicator

1 – READ DIAL INDICATOR
2 – FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 – AXLE HOUSING

(14) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(15) Rotate dial indicator out of the way on the guide stud.

(16) Remove differential case and dummy bearings from axle housing.

ADJUSTMENTS (Continued)

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

(18) Install differential case and dummy bearings D-348 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 86).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 87).

(21) Push and hold differential case toward pinion gear (Fig. 90).

(22) Zero dial indicator face to pointer (Fig. 90).

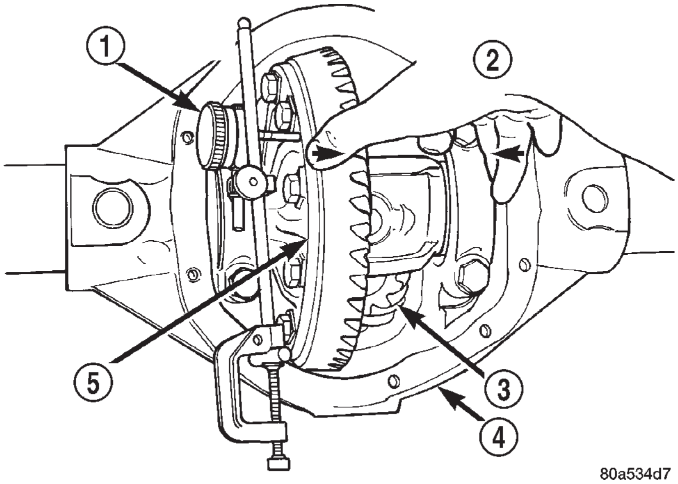


Fig. 90 Hold Differential Case and Zero Dial Indicator

1 – ZERO DIAL INDICATOR FACE
2 – FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
3 – PINION GEAR
4 – AXLE HOUSING
5 – DIFFERENTIAL CASE

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 91).

(24) Record dial indicator reading (Fig. 91).

(25) Subtract 0.002 in. (0.05 mm) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(26) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(27) Rotate dial indicator out of the way on guide stud.

(28) Remove differential case and dummy bearings from axle housing.

(29) Install the selected side bearing shims onto the differential case hubs.

(30) Install side bearings and cups on differential case.

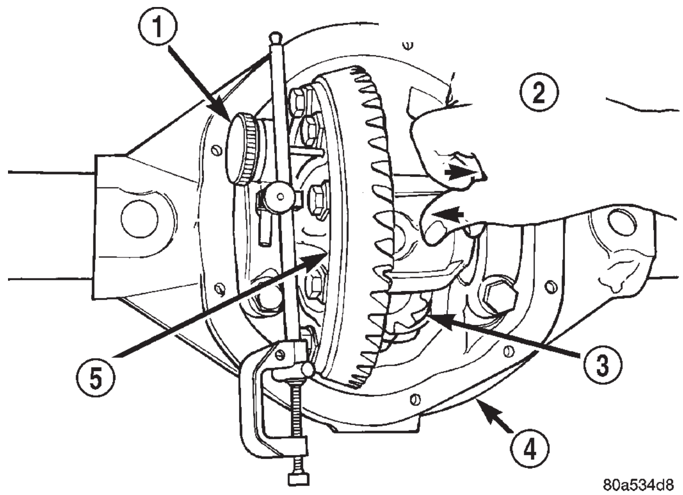


Fig. 91 Hold Differential Case and Read Dial Indicator

1 – READ DIAL INDICATOR
2 – FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 – PINION GEAR
4 – AXLE HOUSING
5 – DIFFERENTIAL CASE

(31) Install spreader W-129-B, utilizing some items from Adapter Set 6987, on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case into the axle housing.

(33) Remove spreader from axle housing.

(34) Rotate the differential case several times to seat the side bearings.

(35) Position the indicator plunger against a ring gear tooth (Fig. 92).

(36) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(37) Zero dial indicator face to pointer.

(38) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the axle housing to the other (Fig. 93).

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

ADJUSTMENTS (Continued)

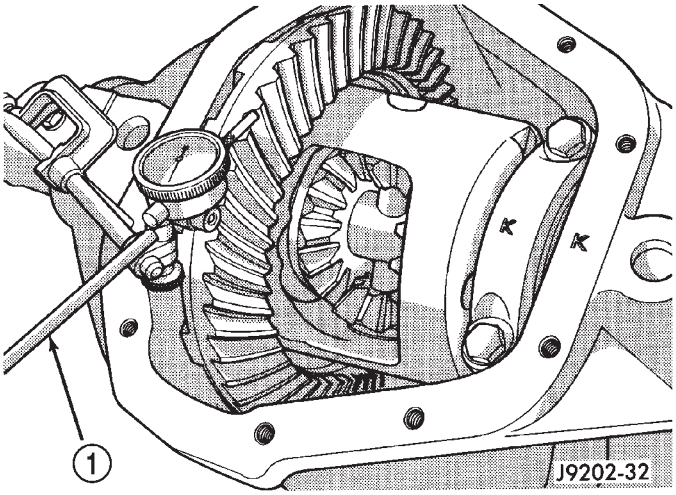


Fig. 92 Ring Gear Backlash Measurement

1 – DIAL INDICATOR

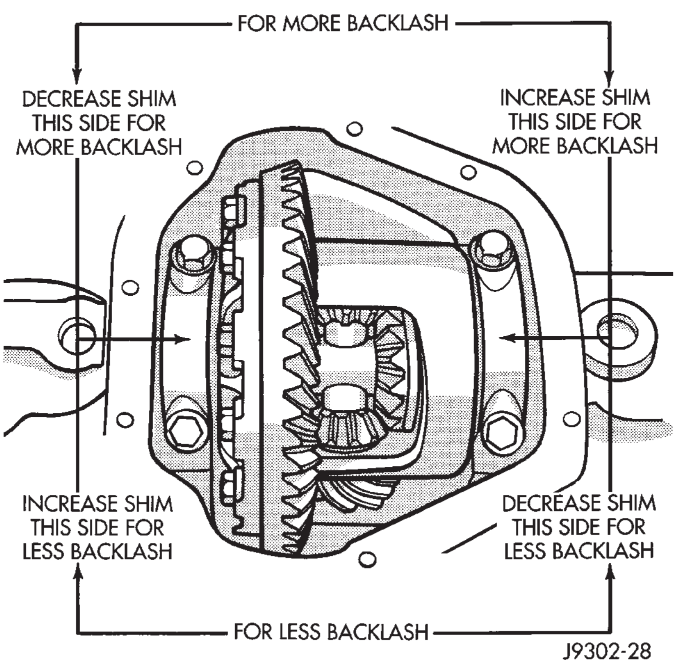


Fig. 93 Backlash Shim Adjustment

186 FBI DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 94). Differential shim measurements are performed with axle spreader W-129-B removed.

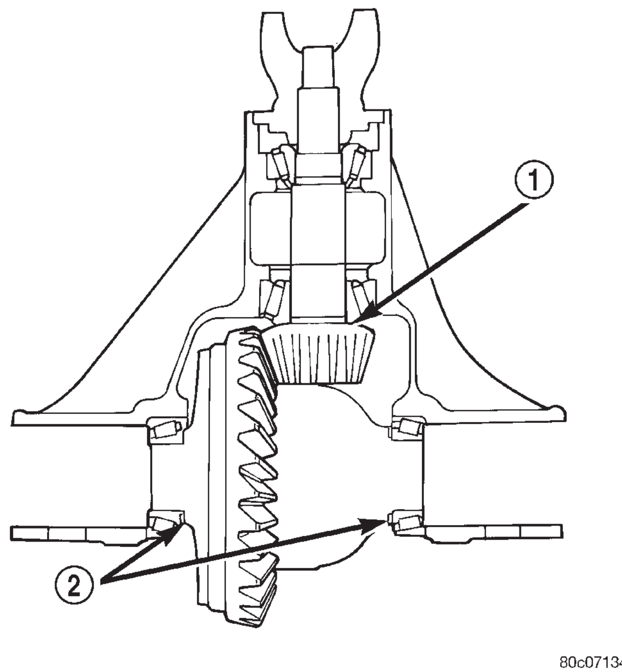


Fig. 94 Axle Adjustment Shim Locations

1 – PINION GEAR DEPTH SHIM/OIL BAFFLE
2 – DIFFERENTIAL BEARING SHIM

SHIM SELECTION

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

(1) Remove differential side bearings from differential case.

(2) Remove factory installed shims from differential case.

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

(4) Install dummy side bearings D-348 on differential case.

(5) Install differential case in axle housing.

ADJUSTMENTS (Continued)

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 95).

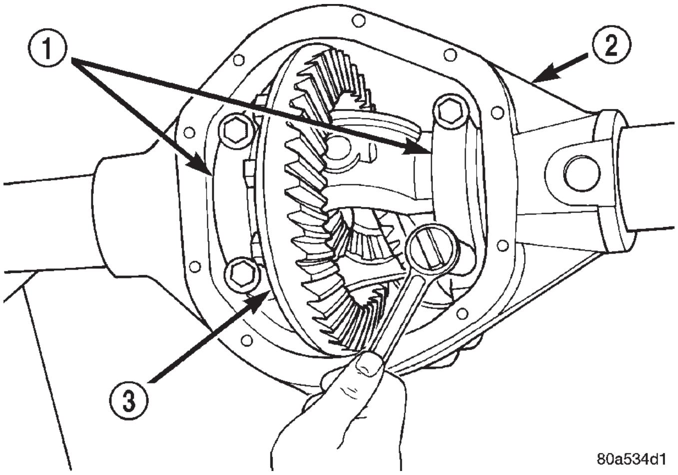


Fig. 95 Tighten Bolts Holding Bearing Caps

1 – BEARING CAP
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 96) and (Fig. 97).

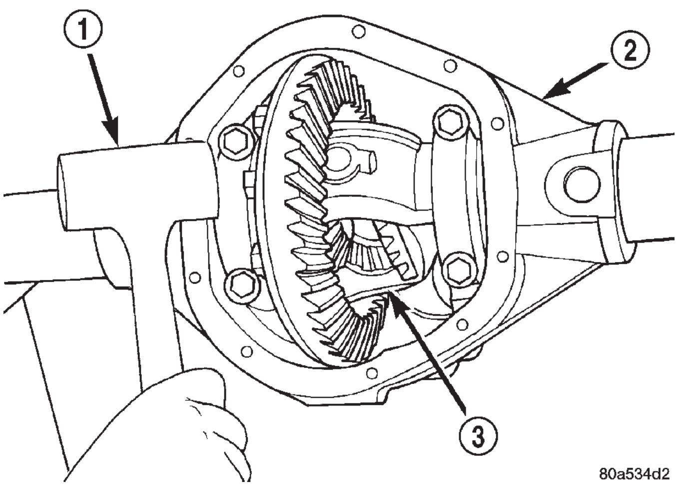


Fig. 96 Seat Pinion Gear Side Differential Dummy Side Bearing

1 – MALLET
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 98).

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 98).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 99).

(11) Zero dial indicator face to pointer (Fig. 99).

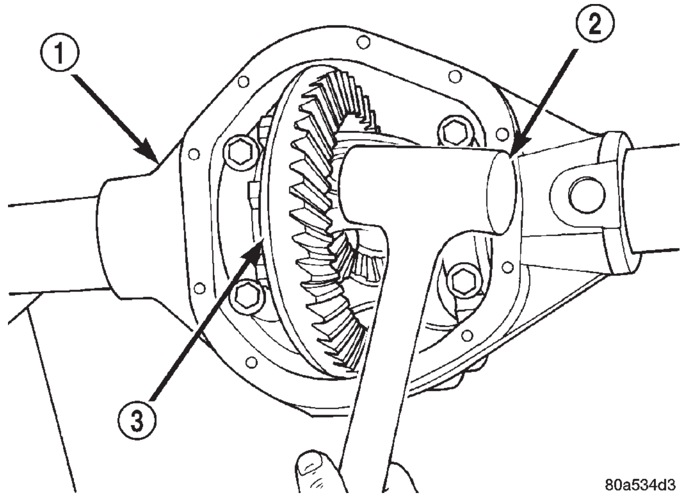


Fig. 97 Seat Ring Gear Side Differential Dummy Side Bearing

1 – AXLE HOUSING
2 – MALLET
3 – DIFFERENTIAL CASE

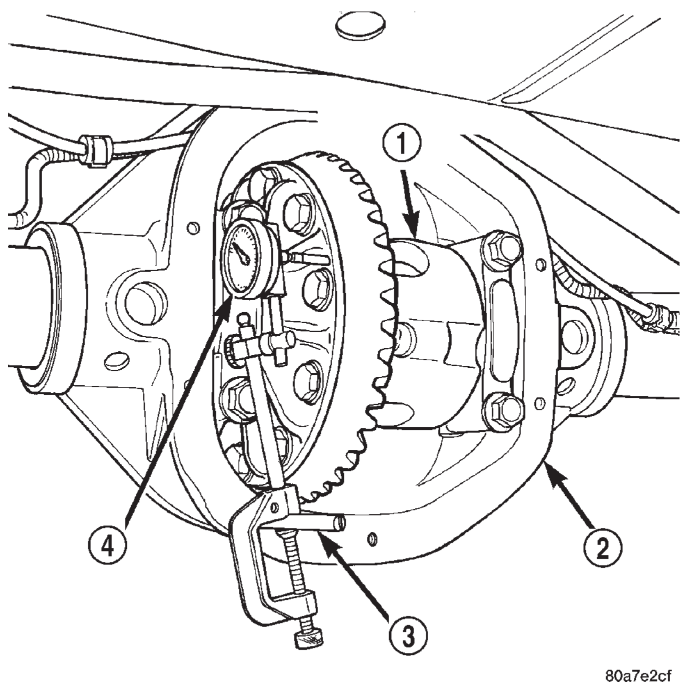


Fig. 98 Differential Side play Measurement

1 – DIFFERENTIAL CASE
2 – AXLE HOUSING
3 – SPECIAL TOOL C-3288–B
4 – SPECIAL TOOL C-3339

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 100).

(13) Record dial indicator reading (Fig. 100).

(14) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of

ADJUSTMENTS (Continued)

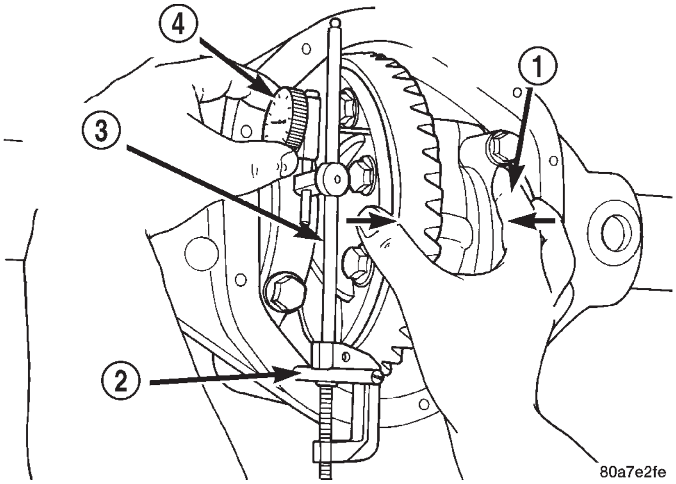


Fig. 99 Hold Differential Case and Zero Dial Indicator

1 – FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 – SPECIAL TOOL C-3288–B
3 – SPECIAL TOOL C-3339
4 – ZERO DIAL INDICATOR FACE

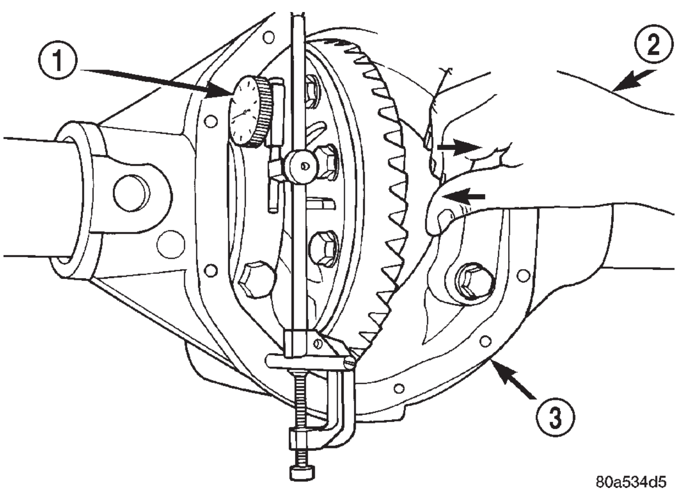


Fig. 100 Hold Differential Case and Read Dial Indicator

1 – READ DIAL INDICATOR
2 – FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 – AXLE HOUSING

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

(15) Rotate dial indicator out of the way on the guide stud.

(16) Remove differential case and dummy bearings from axle housing.

(17) Install the pinion in the axle housing. Install the pinion yoke and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-348 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 97).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 98).

(21) Push and hold differential case toward pinion gear (Fig. 101).

(22) Zero dial indicator face to pointer (Fig. 101).

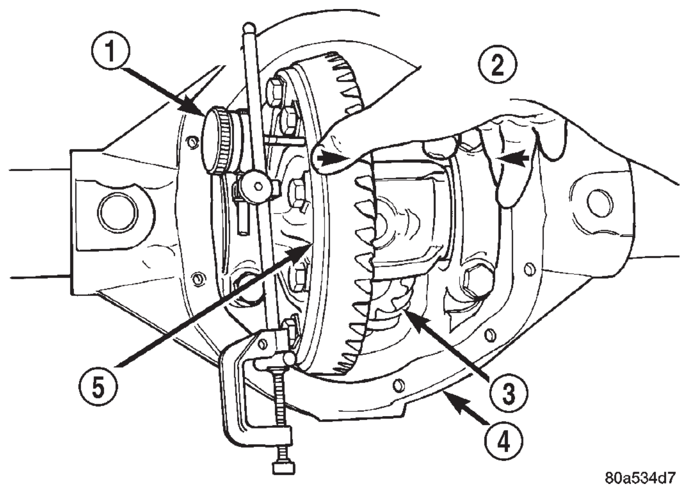


Fig. 101 Hold Differential Case and Zero Dial Indicator

1 – ZERO DIAL INDICATOR FACE
2 – FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
3 – PINION GEAR
4 – AXLE HOUSING
5 – DIFFERENTIAL CASE

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 102).

(24) Record dial indicator reading (Fig. 102).

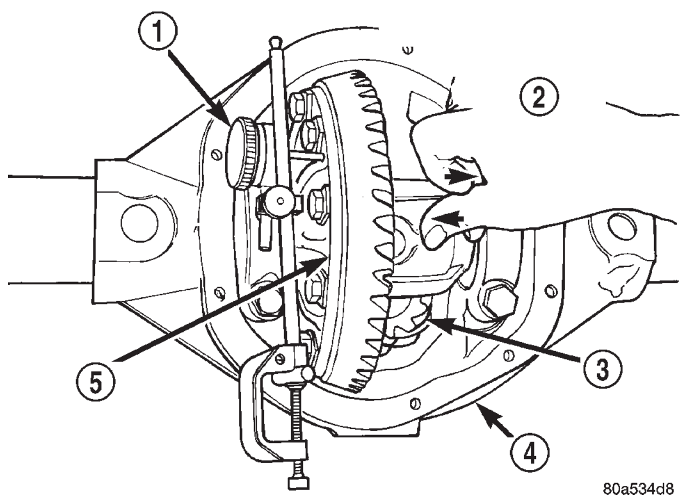


Fig. 102 Hold Differential Case and Read Dial Indicator

1 – READ DIAL INDICATOR
2 – FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 – PINION GEAR
4 – AXLE HOUSING
5 – DIFFERENTIAL CASE

ADJUSTMENTS (Continued)

(25) Subtract 0.002 in. (0.05 mm) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(26) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(27) Rotate dial indicator out of the way on guide stud.

(28) Remove differential case and dummy bearings from axle housing.

(29) Install side bearing shims on differential case hubs.

(30) Install side bearings and cups on differential case.

(31) Install spreader W-129-B, utilizing some items from Adapter Set 6987, on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case in axle housing.

(33) Remove spreader from axle housing.

(34) Rotate the differential case several times to seat the side bearings.

(35) Position the indicator plunger against a ring gear tooth (Fig. 103).

(36) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(37) Zero dial indicator face to pointer.

(38) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the axle housing to the other (Fig. 104).

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

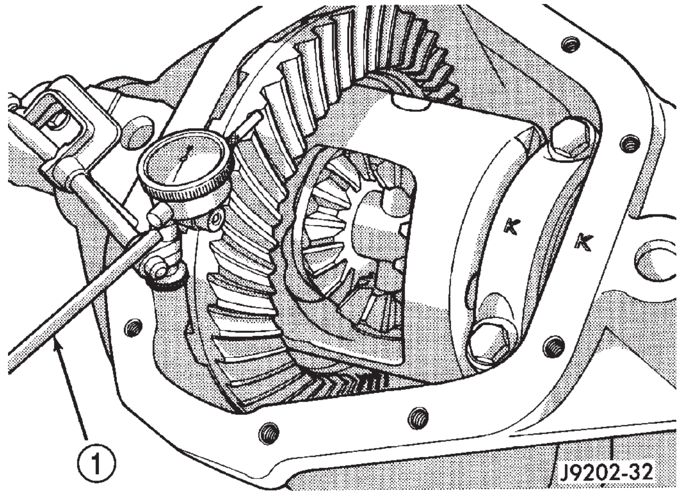


Fig. 103 Ring Gear Backlash Measurement

1 – DIAL INDICATOR

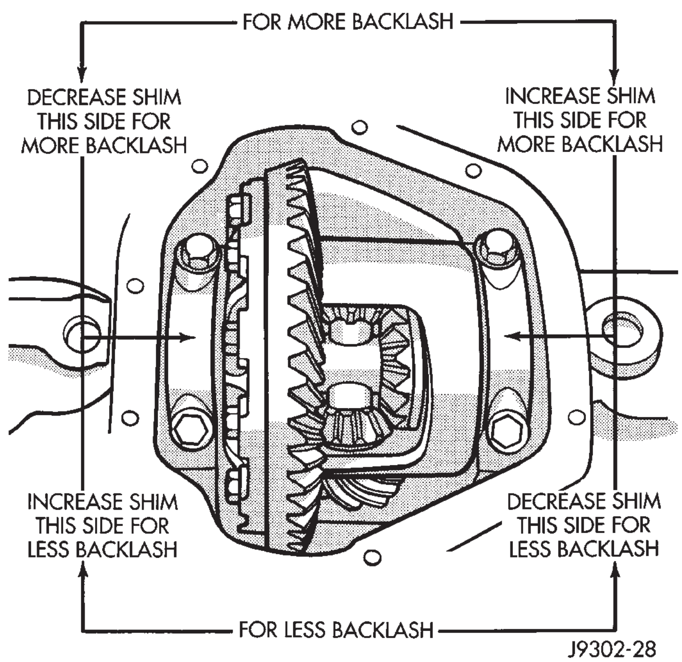


Fig. 104 Backlash Shim Adjustment

GEAR CONTACT PATTERN ANALYSIS

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

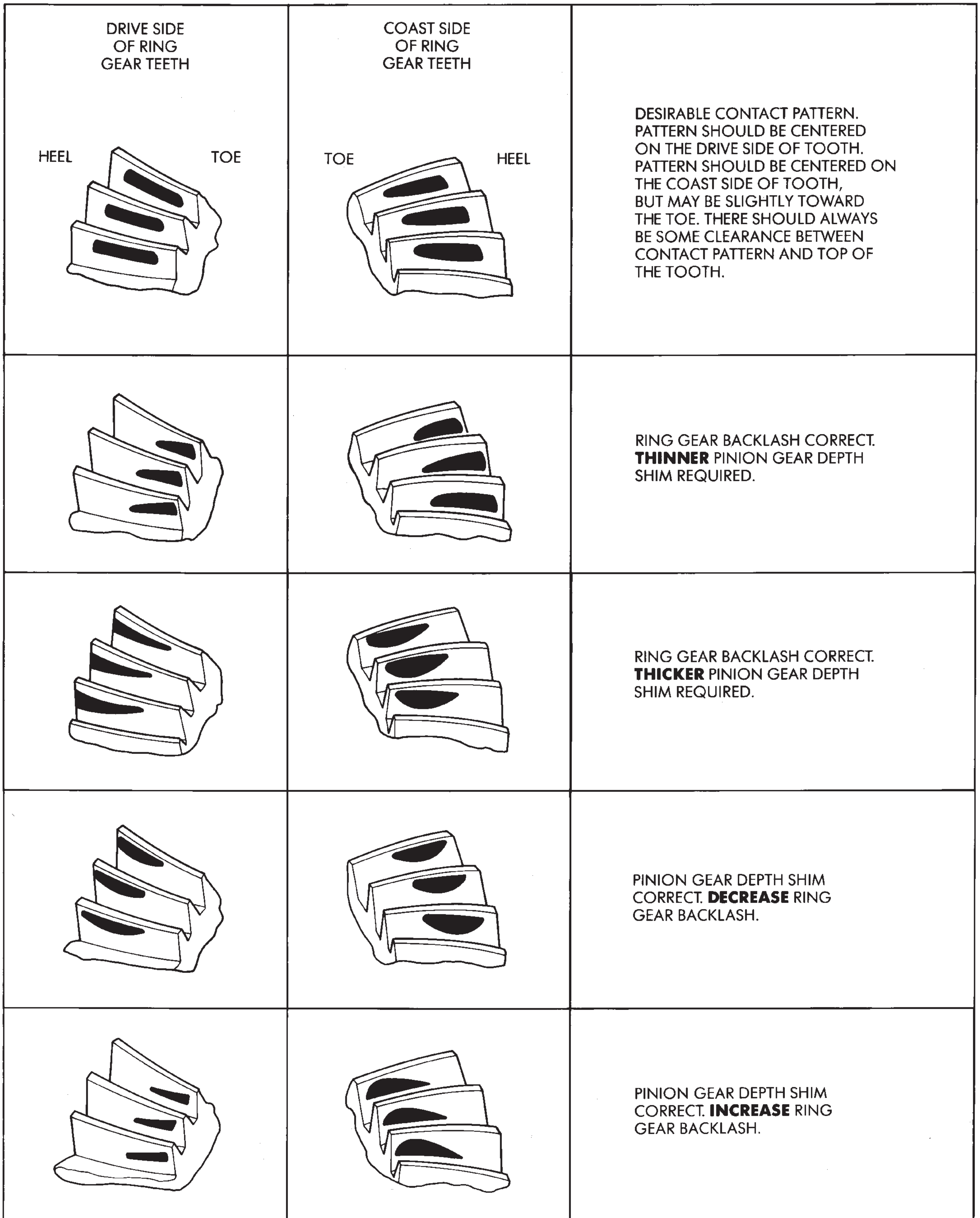
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 105) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)



J9003-24

Fig. 105 Gear Tooth Contact Patterns

SPECIFICATIONS

181 FBI AXLE

Axle Type	Hypoid
Lubricant–Std.	SAE Thermally Stable 80W–90
Lubricant–Heavy Duty	SAE 75W–140 Synthetic
Lube Capacity	1.48 L (3.13 pts.)
Axle Ratio	3.07, 3.55, 3.73, 4.10
Differential Side Gear Clearance	0.12–0.20 mm (0.005–0.008 in.)
Ring Gear Diameter	18.09 cm (7.125 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.1 mm (3.625 in.)
Pinion Bearing Rotating Torque	
Original Bearings	1–2 N·m (10–20 in. lbs.)
New Bearings	1.5–4 N·m (15–35 in. lbs.)

186 FBI AXLE

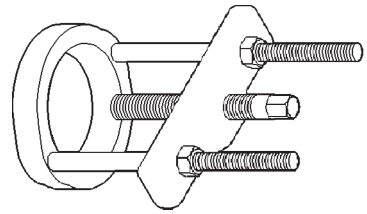
Axle Type	Hypoid
Lubricant–Std.	SAE Thermally Stable 80W–90
Lubricant–Heavy Duty	SAE 75W–140 Synthetic
Lube Capacity	1.18 L (2.5 pts.)
Axle Ratio	3.07, 3.55, 3.73, 4.10
Differential Side Gear Clearance	0.12–0.20 mm (0.005–0.008 in.)
Ring Gear Diameter	18.59 cm (7.33 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.1 mm (3.625 in.)
Pinion Bearing Rotating Torque	
Original Bearings	1–2 N·m (10–20 in. lbs.)
New Bearings	1.5–4 N·m (15–35 in. lbs.)

TORQUE

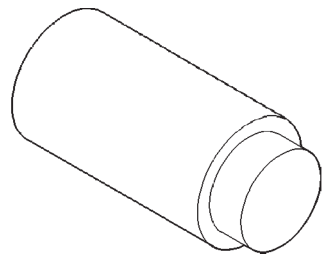
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	61 N·m (45 ft. lbs.)
Ring Gear Bolt	95–122 N·m (70–90 ft. lbs.)
Axle Nut	237 N·m (175 ft. lbs.)
Hub Brg. Bolt	102 N·m (75 ft. lbs.)
Lower Ball Stud	108 N·m (80 ft. lbs.)
Upper Ball Stud	101 N·m (75 ft. lbs.)

SPECIAL TOOLS

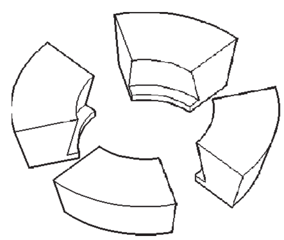
181 and 186 FBI AXLE



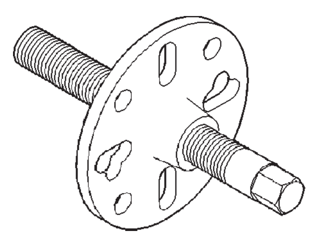
Puller—C-293-PA



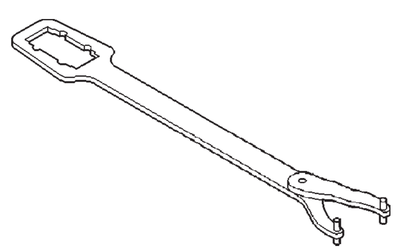
Plug—SP-3289



Adapter—C-293-39

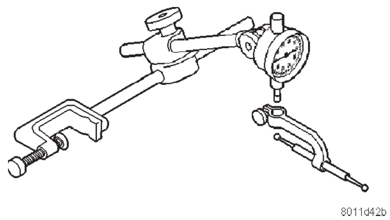


Puller—C-452

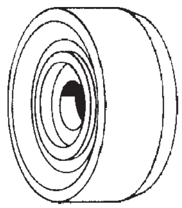


Wrench—C-3281

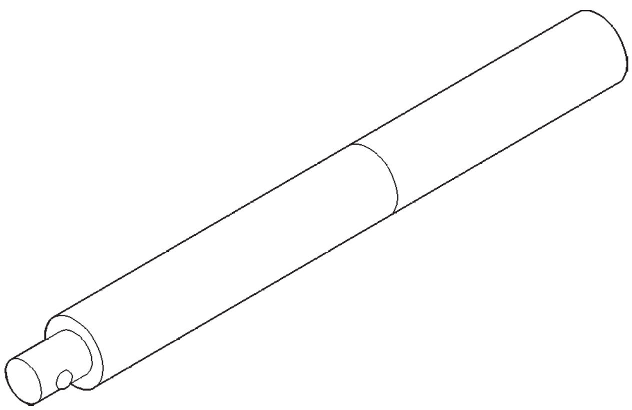
SPECIAL TOOLS (Continued)



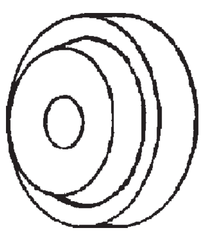
Dial Indicator—C-3339



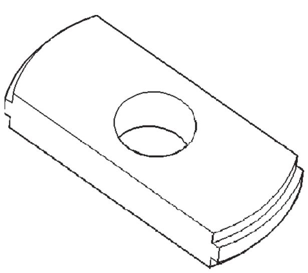
Driver—C-3716-A



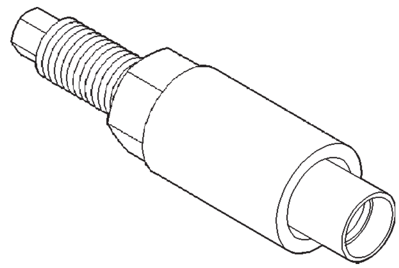
Handle—C-4171



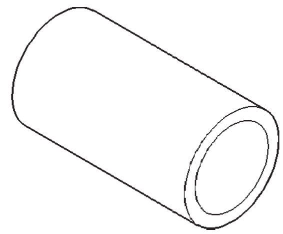
Installer—D-146



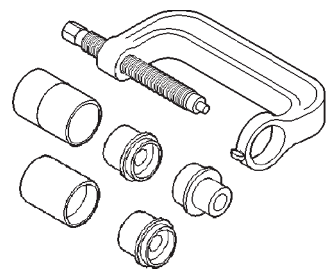
Remover—D-149



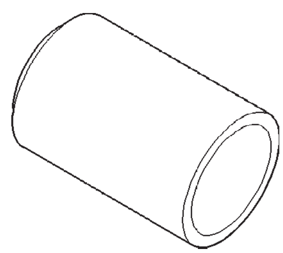
Installer—W-162-D



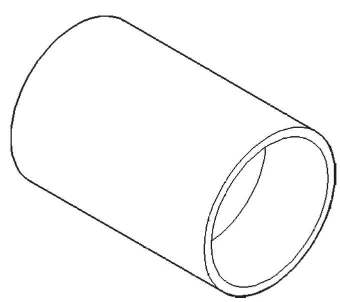
Cup—8109



Remover/Installer—6289

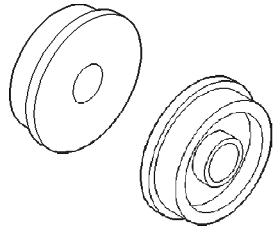


Installer—6761

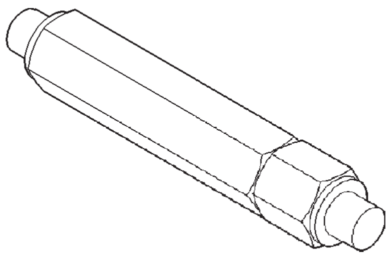


Installer—6752

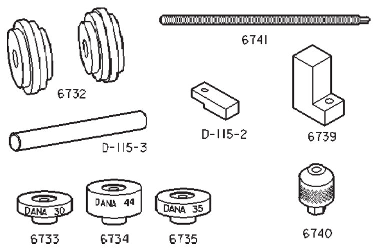
SPECIAL TOOLS (Continued)



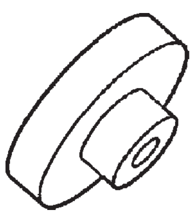
Installer Discs—8110



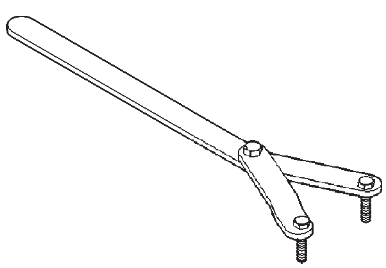
Turnbuckle—6797



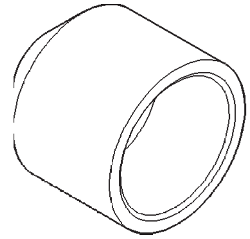
Tool Set, Pinion Depth—6774



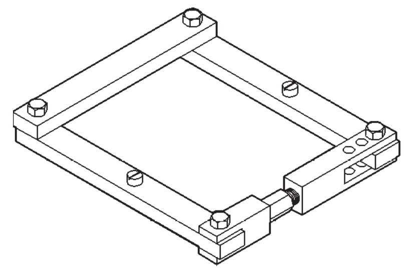
Gauge Block—6733



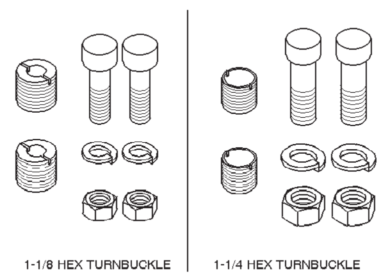
Spanner—6958



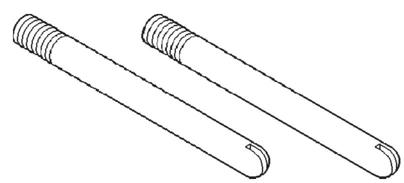
Installer—C-3972-A



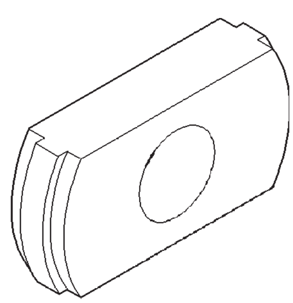
Spreader—W-129-B



Adapter Kit—6987

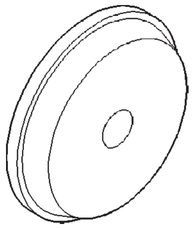


Pilot Stud—C-3288-B

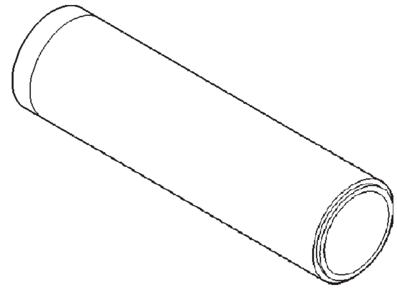


Remover—D-147

SPECIAL TOOLS (Continued)



Installer—D-144



Installer—W-262

194 RBI AXLE

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DESCRIPTION AND OPERATION

194 RBI AXLE

DESCRIPTION

The 194 Rear Beam-design Iron (RBI) axle housing has an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing.

The integral type, hypoid gear design, housing has the centerline of the pinion set below the centerline of the ring gear.

The axle has a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the axle shaft and bearings. The axle shafts are retained by C–clips in the differential side gears.

The cover provides a means for servicing the differential without removing the axle.

For vehicles equipped with ABS brakes, the axles have a tone ring pressed onto the axle shaft. Use care when removing axle shafts to ensure that the tone wheel or the wheel speed sensor are not damaged.

The 194 RBI axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the differential housing by a cover bolt. Build date identification codes are stamped on the cover side of an axle shaft tube.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash is adjusted by the use of selective spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer (Fig. 1).

Axles equipped with a Trac-Lok™ differential are optional. A Trac-Lok differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

OPERATION

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

DESCRIPTION AND OPERATION (Continued)

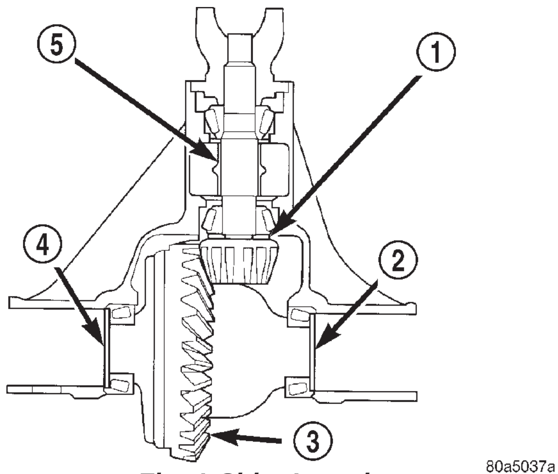


Fig. 1 Shim Locations

1 – PINION GEAR DEPTH SHIM
2 – DIFFERENTIAL BEARING SHIM-PINION GEAR SIDE
3 – RING GEAR
4 – DIFFERENTIAL BEARING SHIM-RING GEAR SIDE
5 – COLLAPSIBLE SPACER

LUBRICANT

DESCRIPTION

A multi-purpose, hypoid gear lubricant which conforms to the following specifications should be used. Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL–L–2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

Trac-lok differentials require the addition of 3.5 oz. of friction modifier to the axle lubricant. The 194 RBI axle lubricant capacity is 1.66L (3.50 pts.) total, including the friction modifier if necessary.

CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

STANDARD DIFFERENTIAL

DESCRIPTION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

OPERATION

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 2).

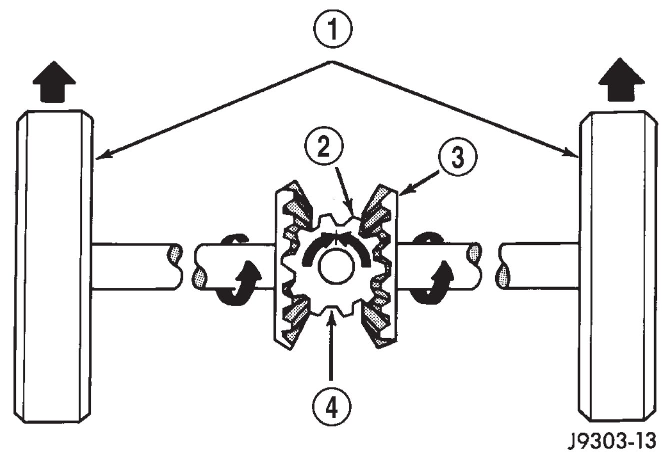


Fig. 2 Differential Operation—Straight Ahead Driving

1 – IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 – PINION GEAR
3 – SIDE GEAR
4 – PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 3). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

TRAC-LOK™ DIFFERENTIAL

DESCRIPTION

In a standard differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

DESCRIPTION AND OPERATION (Continued)

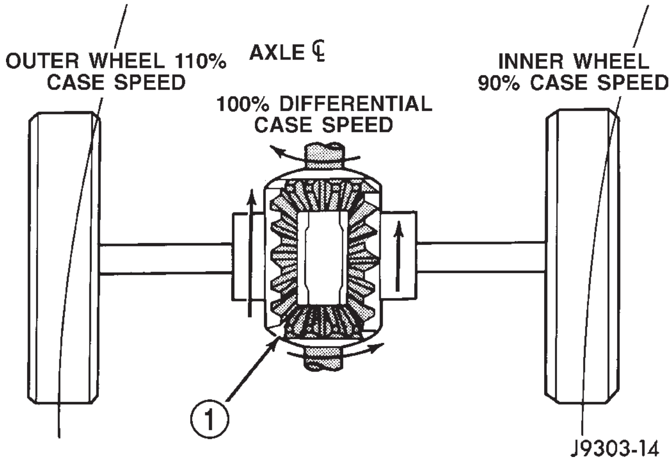


Fig. 3 Differential Operation—On Turns

1 – PINION GEARS ROTATE ON PINION SHAFT

In the Trac-lok™ differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. The clutches will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth in appearance.

OPERATION

In operation, the Trac-lok™ clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 4).

The Trac-lok™ design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok™ differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

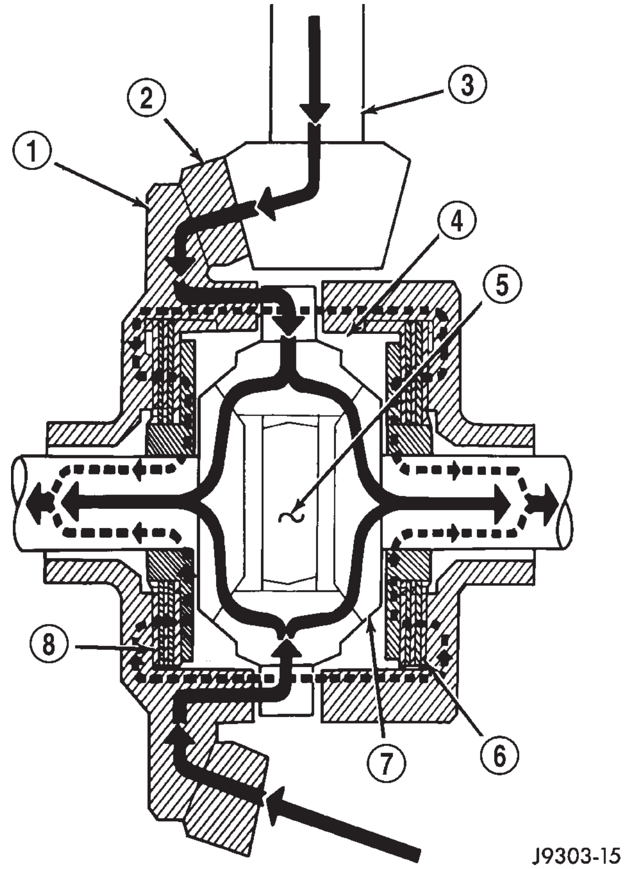


Fig. 4 Trac-lok™ Limited Slip Differential Operation

1 – CASE
2 – RING GEAR
3 – DRIVE PINION
4 – PINION GEAR
5 – MATE SHAFT
6 – CLUTCH PACK
7 – SIDE GEAR
8 – CLUTCH PACK

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.
- Differential housing bores not square to each other.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSTIC CHART

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

DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

DIAGNOSIS AND TESTING (Continued)

GEAR NOISE

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

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

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

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

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

BEARING NOISE

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

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

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

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

LOW SPEED KNOCK

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

VIBRATION

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

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

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

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U–joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

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

TRAC–LOK™ DIFFERENTIAL NOISE

The most common problem is a chatter noise when turning corners. Before removing a Trac-lok™ unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Mopar® Trac-lok™ Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIAGNOSIS AND TESTING (Continued)

TRAC–LOK™ TEST

WARNING: WHEN SERVICING VEHICLES WITH A TRAC–LOK™ DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A TRAC–LOK™ AXLE CAN EXERT ENOUGH FORCE IF ONE WHEEL IS IN CONTACT WITH A SURFACE TO CAUSE THE VEHICLE TO MOVE.

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 5).

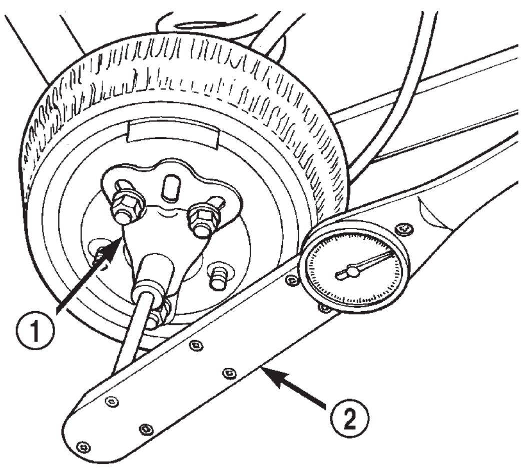


Fig. 5 Trac-lok™ Test —Typical

1 – SPECIAL TOOL 6790 WITH BOLT IN CENTER HOLE
2 – TORQUE WRENCH

(6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

(5) Remove the original sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 6).

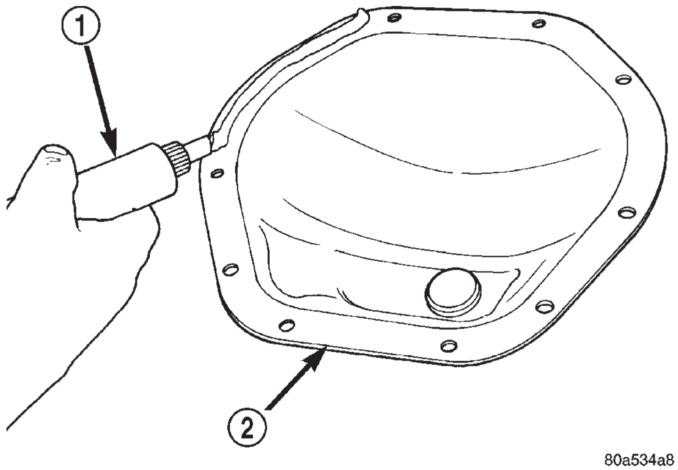


Fig. 6 Apply Sealant

1 – SEALANT
2 – AXLE HOUSING COVER

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) For Trac–lok™ differentials, a quantity of Mopar® Trac–lok™ lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

(9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(10) Install the fill hole plug and lower the vehicle.

(11) Trac–lok™ differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

(1) Raise and support the vehicle.

(2) Position a suitable lifting device under the axle.

(3) Secure axle to device.

(4) Remove the wheels and tires.

(5) Remove the brake drums from the axle. Refer to Group 5, Brakes, for proper procedures.

(6) Disconnect parking brake cables from brackets and lever.

(7) Remove wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.

(8) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.

(9) Disconnect the vent hose from the axle shaft tube.

(10) Mark the propeller shaft and yokes for installation alignment reference.

(11) Remove propeller shaft.

(12) Disconnect stabilizer bar links.

(13) Disconnect shock absorbers from axle.

(14) Remove the U-bolts which hold the axle to the spring brackets.

(15) Separate the axle from the vehicle.

INSTALLATION

NOTE: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, vehicle ride height and handling could be affected.

(1) Raise the axle with lifting device and align the spring centering bolts with the mating holes in the axle spring perch.

(2) Install the U-bolts which hold the axle to the spring brackets. Tighten nuts to 70 N·m (52 ft. lbs.).

(3) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.) torque.

(4) Install stabilizer bar links and tighten nuts to 74 N·m (55 ft. lbs.) torque.

(5) Install the wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.

(6) Connect parking brake cable to brackets and lever.

(7) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(8) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.

(9) Install axle vent hose.

(10) Align propeller shaft and pinion yoke reference marks. Install U-joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.

(11) Install the wheels and tires.

(12) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(13) Remove lifting device from axle and lower the vehicle.

PINION SHAFT SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove the brake drums. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation alignment reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 7).

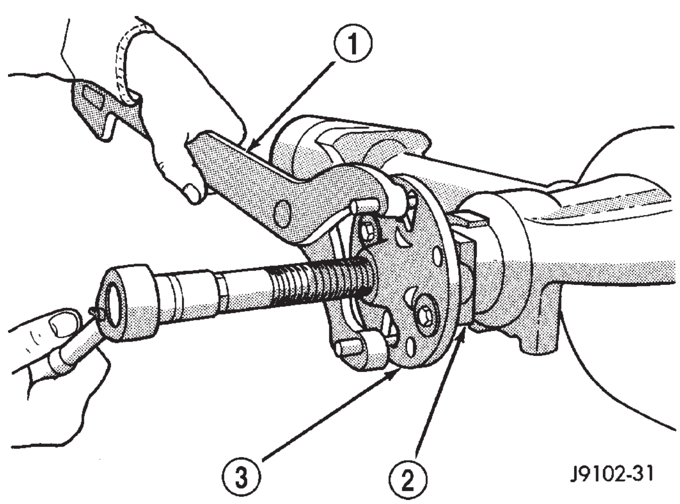


Fig. 7 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

REMOVAL AND INSTALLATION (Continued)

(10) Use a suitable pry tool or slide hammer mounted screw to remove the pinion gear seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 8).

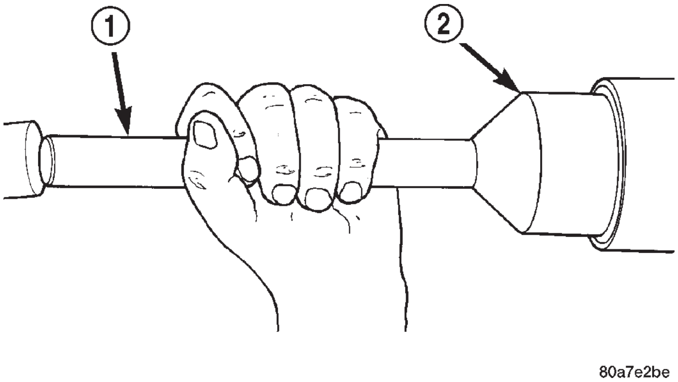


Fig. 8 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

(2) Install yoke on the pinion gear with Screw 8112, Cup 8109, and Holder 6958 (Fig. 9).

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke at this point. Damage to the collapsible spacer or bearings may result.

(3) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(4) Tighten the nut to 271 N·m (200 ft. lbs.).

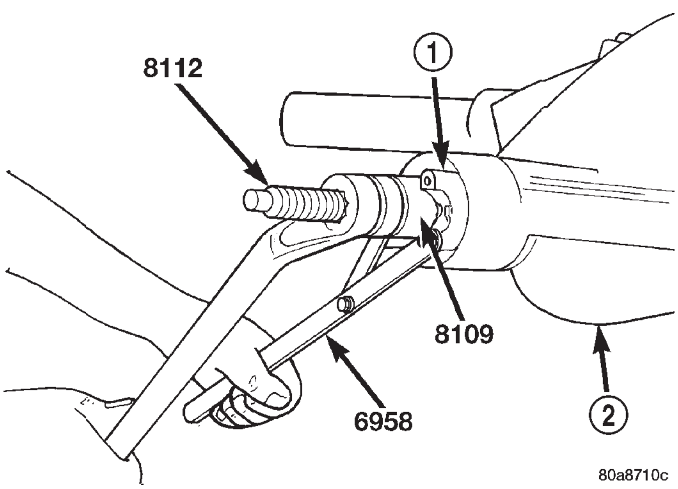


Fig. 9 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(5) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.) (Fig. 10).

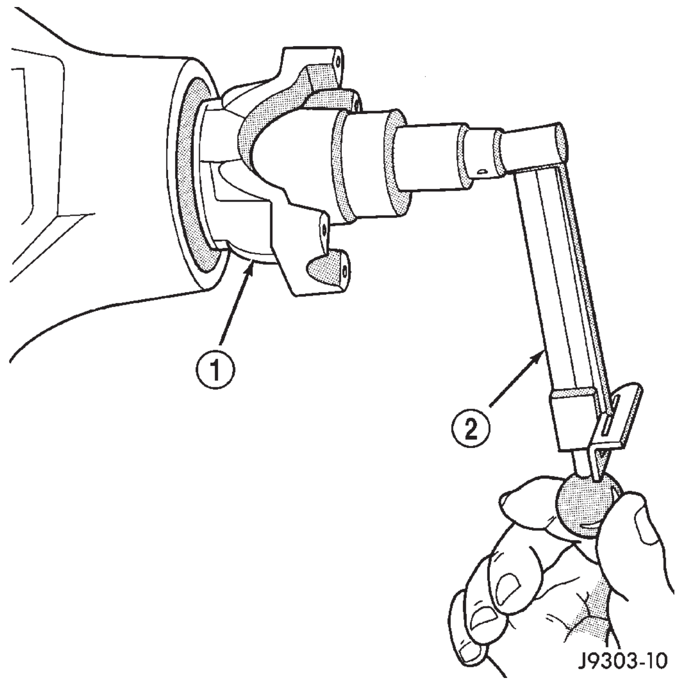


Fig. 10 Check Pinion Rotation Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(6) If the rotating torque is low, use Holder 6958 to hold the pinion yoke (Fig. 11), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the proper rotating torque is achieved.

CAUTION: If the maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(7) Align the installation reference marks on the propeller shaft and yoke and install the propeller shaft.

(8) Add gear lubricant to the differential housing, if necessary. Refer to the Lubricant Specifications for gear lubricant requirements.

(9) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(10) Install wheel and tire assemblies.

REMOVAL AND INSTALLATION (Continued)

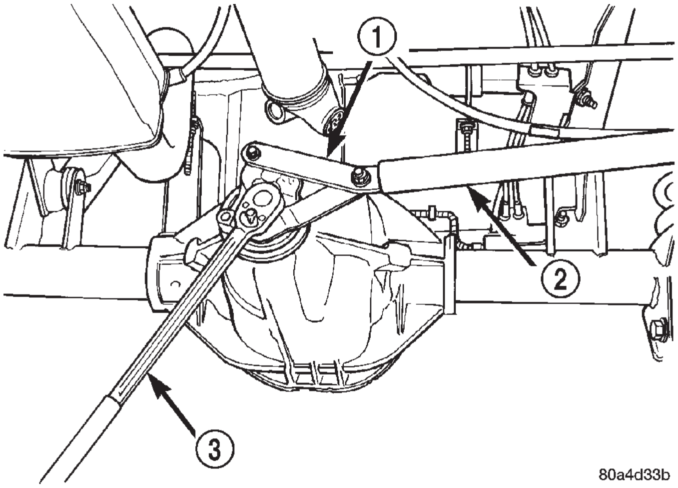


Fig. 11 Tightening Pinion Shaft Nut–Typical

1 – SPECIAL TOOL 6958
2 – 1 in. PIPE
3 – 3/4 DRIVE TORQUE WRENCH

(11) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL W/PINION INSTALLED

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.
(4) Mark the propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate the pinion gear three or four times.
(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
(8) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.
(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 12).
(10) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.
(11) Remove the front pinion bearing using a pair of suitable pick tools to pull the bearing straight off the pinion gear shaft. It may be necessary to lightly tap the end of the pinion gear with a rawhide or rubber mallet if the bearing becomes bound on the pinion shaft.
(12) Remove the collapsible spacer.

REMOVAL W/PINION REMOVED

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.

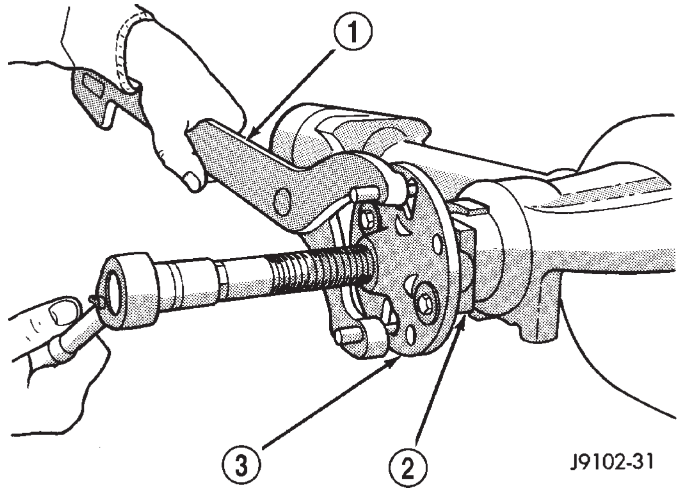


Fig. 12 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

(4) Mark the propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate the pinion gear three or four times.
(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
(8) Remove differential assembly from axle housing.
(9) Using Holder 6958 to hold yoke, remove the pinion yoke nut and washer.
(10) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 12).
(11) Remove the pinion gear from housing (Fig. 13). Catch the pinion with your hand to prevent it from falling and being damaged.
(12) Remove collapsible spacer from pinion shaft.

INSTALLATION

(1) Install a new collapsible preload spacer on pinion shaft (Fig. 14).
(2) If pinion gear was removed, install pinion gear in housing.
(3) Install pinion front bearing, if necessary.
(4) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 15).
(5) Install yoke with Screw 8112, Cup 8109, and Holder 6958 (Fig. 16).
(6) If the original pinion bearings are being used, install differential assembly and axle shafts, if necessary.

REMOVAL AND INSTALLATION (Continued)

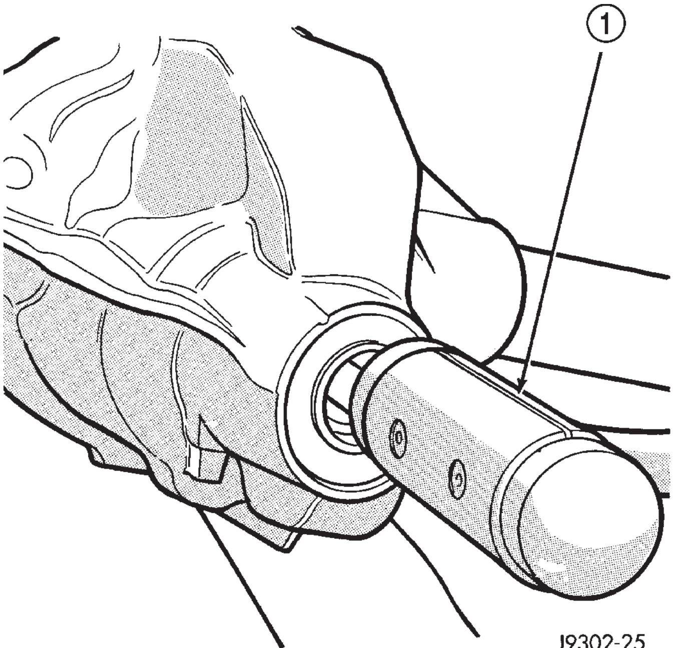


Fig. 13 Remove Pinion Gear

1 – RAWHIDE HAMMER

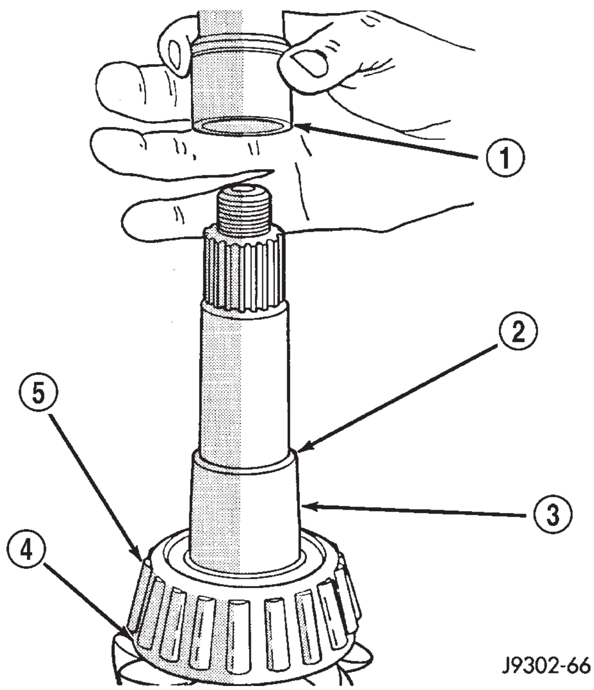


Fig. 14 Collapsible Preload Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION GEAR
4 – OIL SLINGER
5 – REAR BEARING

NOTE: If new pinion bearings were installed, do not install the differential assembly and axle shafts until after the pinion bearing preload and rotating torque are set.

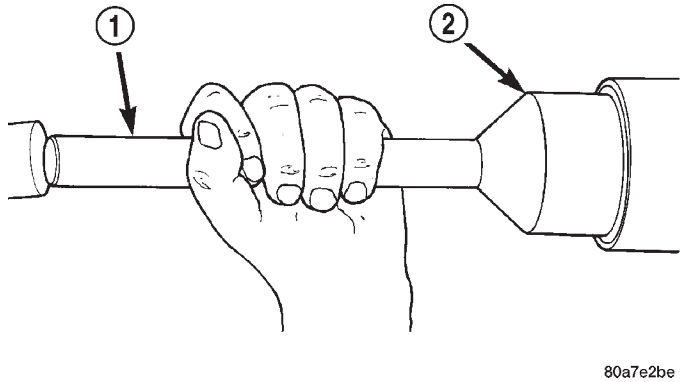


Fig. 15 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

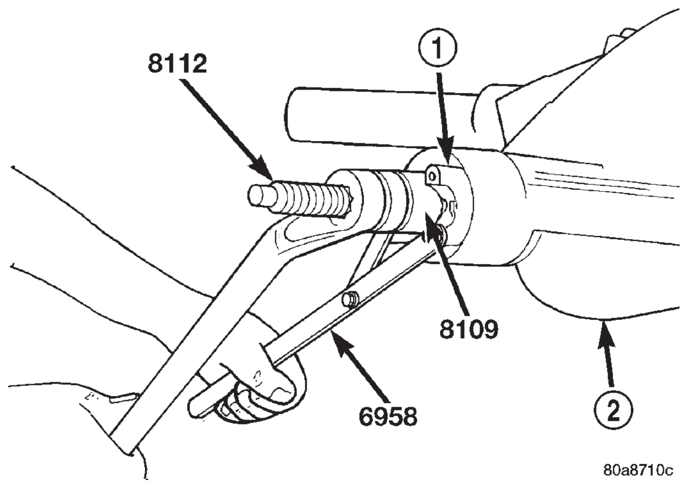


Fig. 16 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

(7) Install the yoke washer and a new nut on the pinion gear. Tighten the pinion nut until there is zero bearing end-play.

(8) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(9) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 17).

NOTE: If more than 474 N·m (350 ft. lbs.) of torque is necessary to remove the bearing end play, the collapsible spacer is defective and must be replaced.

REMOVAL AND INSTALLATION (Continued)

(10) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 18).

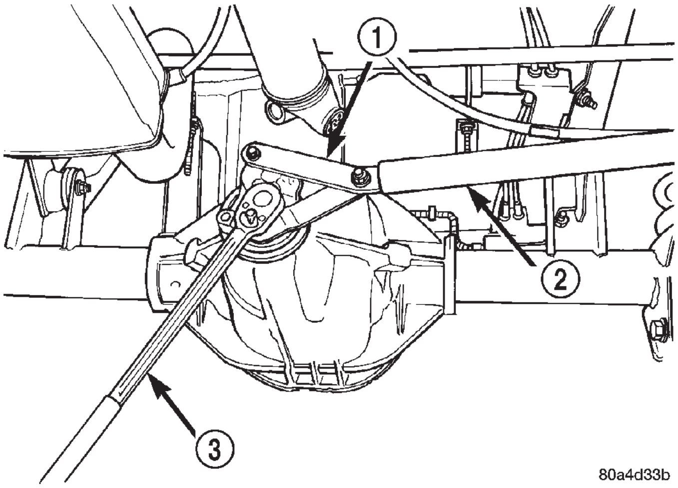


Fig. 17 Tightening Pinion Nut–Typical

1 – SPECIAL TOOL 6958
2 – 1 in. PIPE
3 – 3/4 DRIVE TORQUE WRENCH

(11) Check rotating torque with a (in. lbs.) torque wrench (Fig. 18). The torque necessary to rotate the pinion gear should be:

- Original Bearings — The reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.).
- New Bearings — 1.5 to 4 N·m (15 to 35 in. lbs.).

(12) Install differential assembly and axle shafts, if necessary.

(13) Align marks made previously on yoke and propeller shaft and install propeller shaft.

(14) Install rear brake drums. Refer to Group 5, Brakes, for proper procedures.

(15) Add gear lubricant, if necessary. Refer to Lubricant Specifications of this section for lubricant requirements.

(16) Install wheel and tire assemblies.

(17) Lower vehicle.

AXLE SHAFT

REMOVAL

(1) Raise and support vehicle. Ensure that the transmission is in neutral.

(2) Remove wheel and tire assembly.

(3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.

(4) Clean all foreign material from housing cover area.

(5) Loosen housing cover bolts. Drain lubricant from the housing and axle shaft tubes. Remove housing cover.

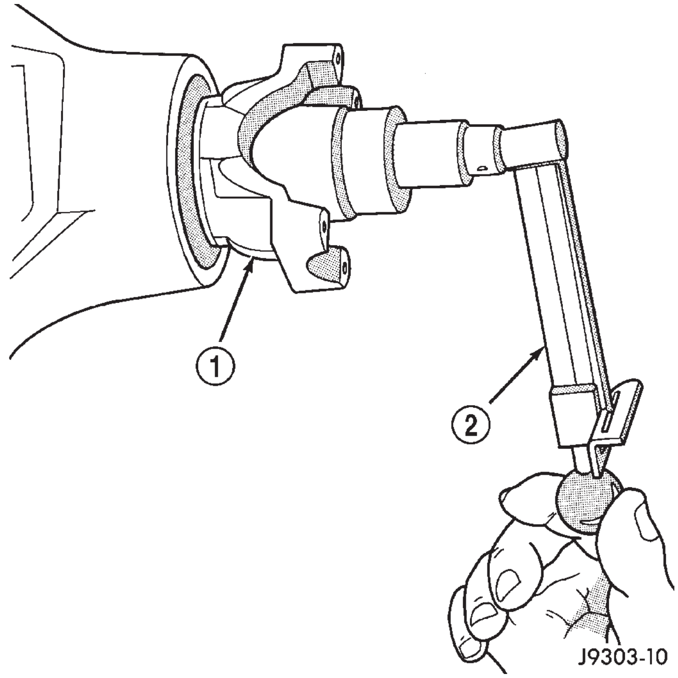


Fig. 18 Check Pinion Gear Rotation Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(6) Rotate differential case so that pinion mate gear shaft lock screw is accessible. Remove lock screw and pinion mate gear shaft from differential case (Fig. 19).

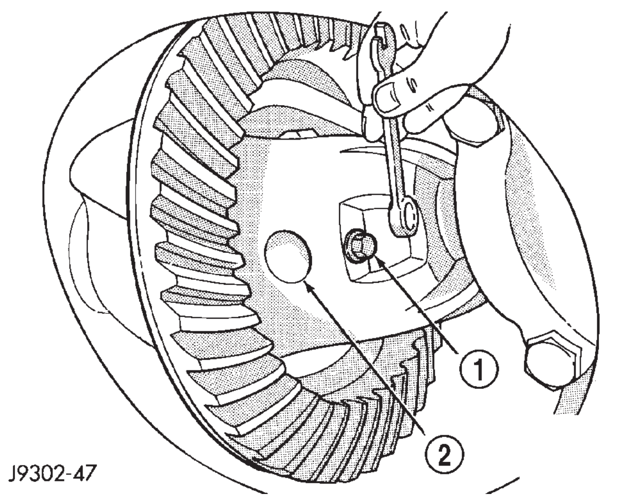


Fig. 19 Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION GEAR MATE SHAFT

(7) Push axle shaft inward and remove axle shaft C–clip lock from the axle shaft (Fig. 20).

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube. Also, exercise care not to damage the

REMOVAL AND INSTALLATION (Continued)

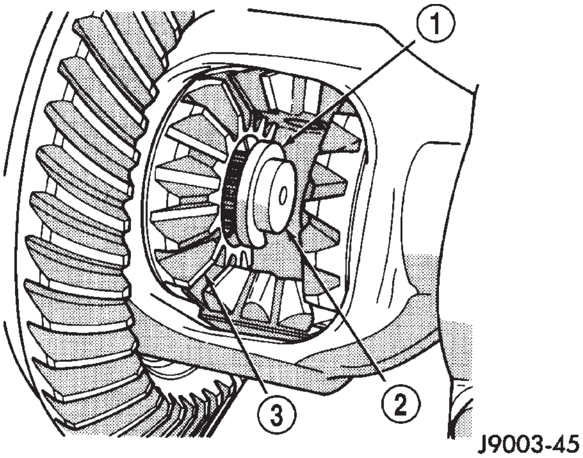


Fig. 20 Axle Shaft C–Clip Lock

1 – C-CLIP LOCK
2 – AXLE SHAFT
3 – SIDE GEAR

wheel speed sensor on vehicles equipped with ABS brakes.

(9) Inspect axle shaft seal for leakage or damage.

(10) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip. Also, exercise care not to damage the wheel speed sensor on vehicles equipped with ABS brakes

(2) Insert C–clip lock in end of axle shaft. Push axle shaft outward to seat C–clip lock in side gear.

(3) Insert pinion mate shaft into differential case and through thrust washers and pinion gears.

(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 19 N·m (14 ft. lbs.) torque.

(5) Install cover and add fluid. Refer to Lubricant Change procedure in this section for procedure and lubricant requirements.

(6) Install brake drum. Refer to Group 5, Brakes, for proper procedures.

(7) Install wheel and tire.

(8) Lower vehicle.

AXLE SHAFT SEAL AND BEARING

REMOVAL

(1) Remove the axle shaft.

(2) Remove the axle shaft seal from the end of the axle shaft tube with a small pry bar.

NOTE: The seal and bearing can be removed at the same time with the bearing removal tool.

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310 using Adapter Foot 6310-5 (Fig. 21).

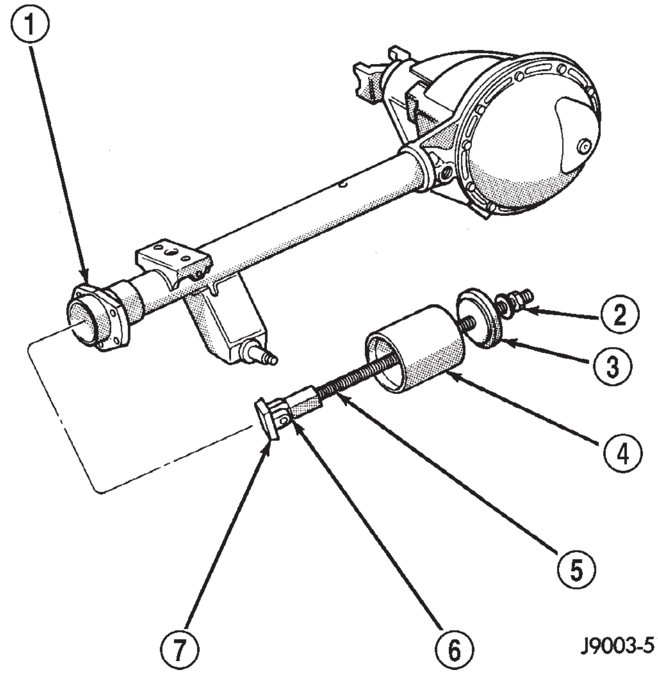


Fig. 21 Axle Shaft Bearing Removal

1 – AXLE SHAFT TUBE
2 – NUT
3 – GUIDE PLATE
4 – GUIDE
5 – THREADED ROD
6 – ADAPTER
7 – FOOT

(4) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

INSTALLATION

Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the axle shaft tube bore clean.

(2) Install axle shaft bearing with Installer 6436 and Handle C–4171. Ensure that the part number on the bearing is against the installer.

(3) Install the new axle shaft seal with Installer 6437 and Handle C–4171 (Fig. 22).

REMOVAL AND INSTALLATION (Continued)

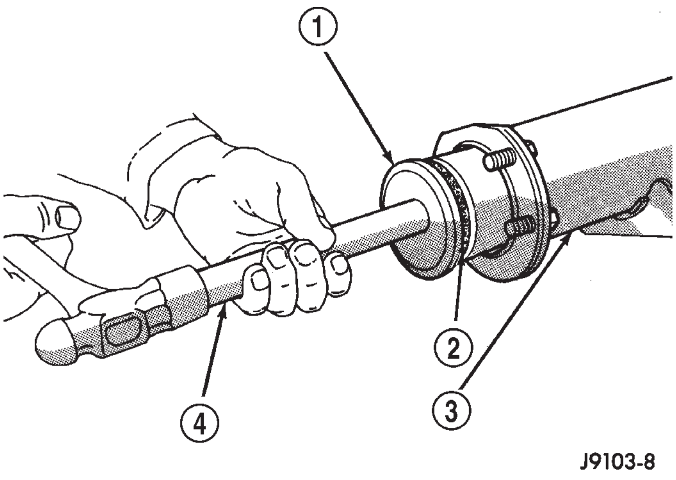


Fig. 22 Axle Shaft Seal Installation

1 – SPECIAL TOOL 6437
2 – SEAL
3 – AXLE SHAFT TUBE
4 – SPECIAL TOOL C-4171

(4) Install the axle shaft.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and allow fluid to drain.

(4) Remove axle shafts.

(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 23).

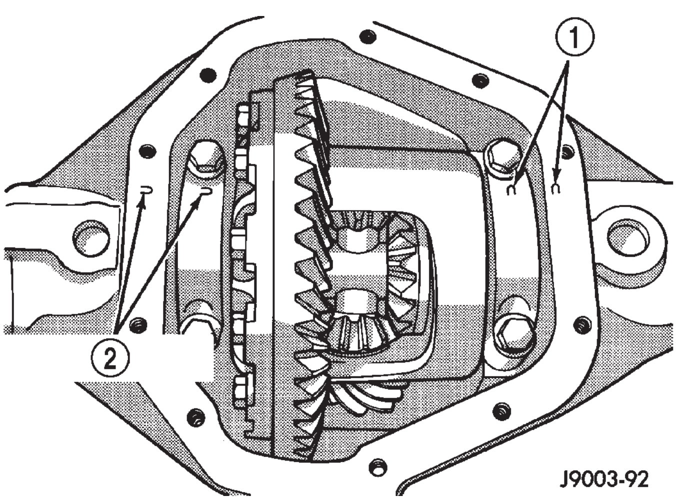


Fig. 23 Bearing Cap Identification

1 – INSTALLATION REFERENCE LETTERS
2 – INSTALLATION REFERENCE LETTERS

(6) Loosen the differential bearing cap bolts.

(7) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 24). Install the hold-down clamps and tighten the tool turnbuckle finger–tight.

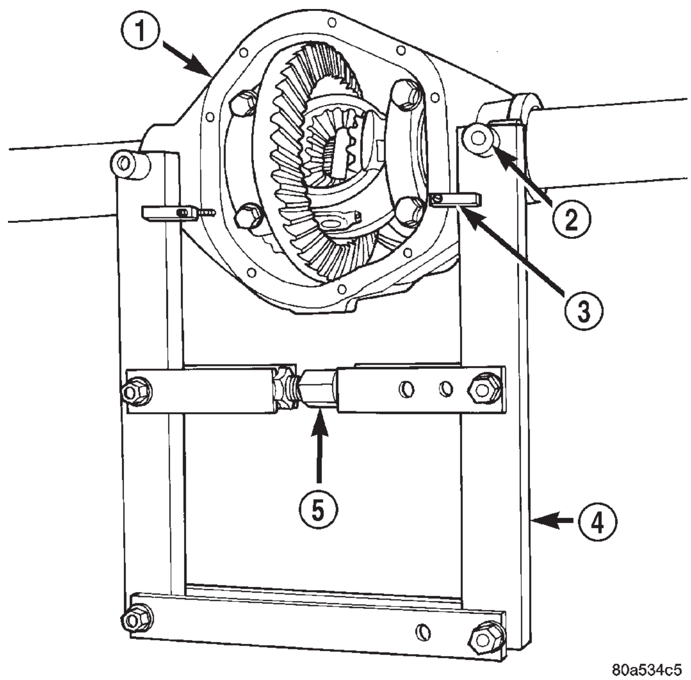


Fig. 24 Install Axle Housing Spreader

1 – AXLE HOUSING
2 – DOWEL
3 – SAFETY HOLD DOWN
4 – SPECIAL TOOL W-129–B
5 – TURNBUCKLE

(8) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–spread, it could be distorted or damaged.

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 26).

(10) Remove the dial indicator.

(11) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(12) Remove the differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 27).

(13) Mark or tag the differential bearing cups to indicate which side of the differential they were removed from.

REMOVAL AND INSTALLATION (Continued)

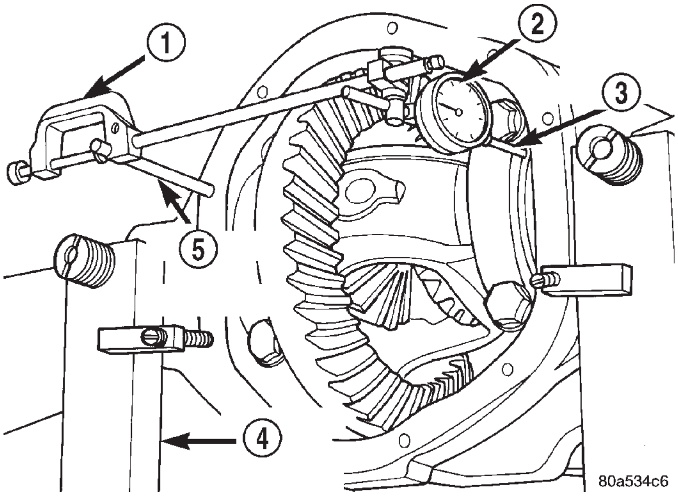


Fig. 25 Install Dial Indicator

1 – SPECIAL TOOLC-3339
2 – DIAL INDICATOR
3 – LEVER ADAPTER
4 – SPECIAL TOOL W-129–B
5 – SPECIAL TOOL C-3288–B

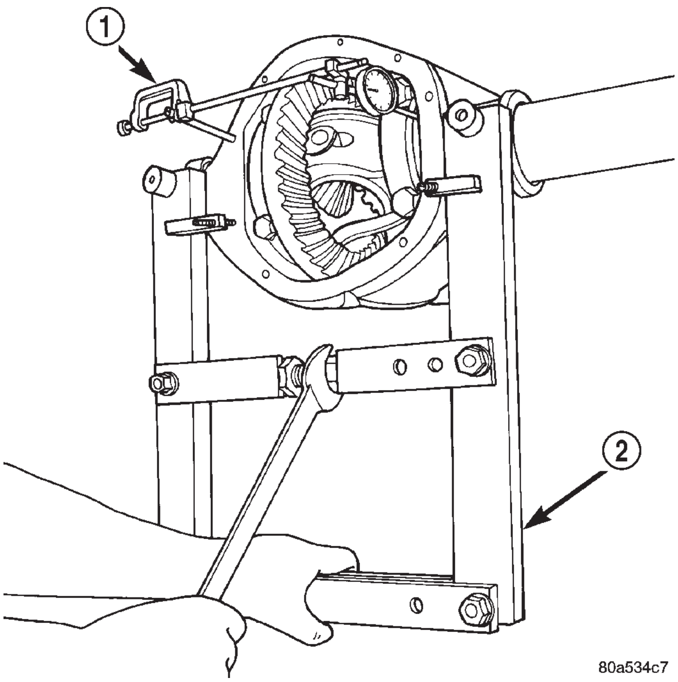


Fig. 26 Spread Axle Housing

1 – SPECIAL TOOL C-3339
2 – SPECIAL TOOL W-129–B

(14) Retrieve differential case preload shims from axle housing. Mark or tag the differential case preload shims to indicate which side of the differential they were removed from.

(15) Remove spreader from housing.

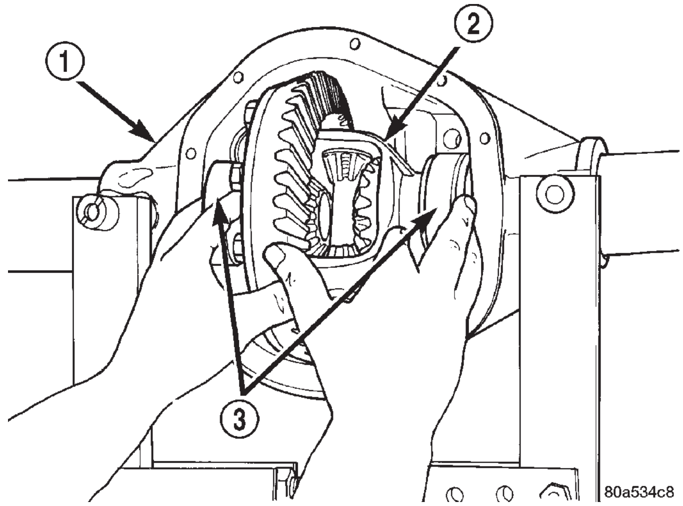


Fig. 27 Differential Case Removal

1 – AXLE HOUSING
2 – DIFFERENTIAL CASE
3 – BEARING CUPS

INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 28). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–spread, it could be distorted or damaged.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 26).

(4) Remove the dial indicator.

(5) Install differential case in the housing. Ensure that the differential bearing cups remain in position on the differential bearings and that the preload shims remain between the face of the bearing cup and the housing. Tap the differential case to ensure the bearings cups and shims are fully seated in the housing.

(6) Install the bearing caps at their original locations (Fig. 29).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

REMOVAL AND INSTALLATION (Continued)

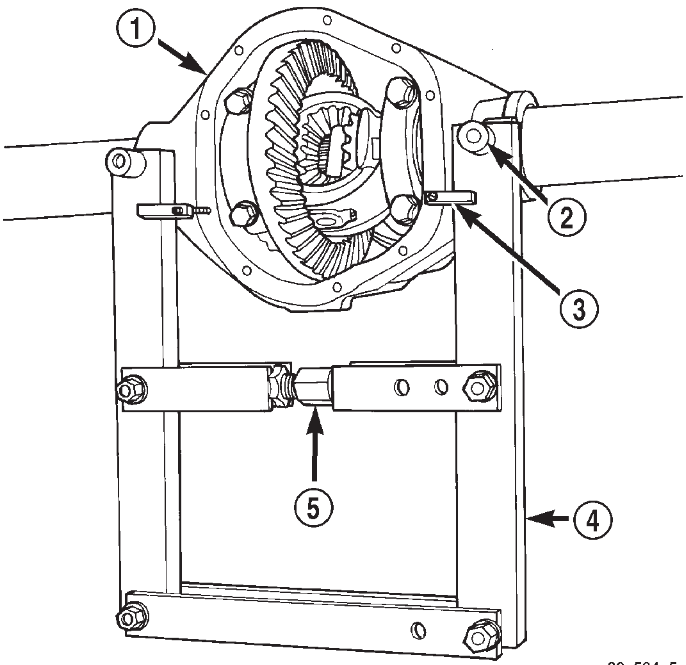


Fig. 28 Install Axle Housing Spreader

1 – AXLE HOUSING
2 – DOWEL
3 – SAFETY HOLD DOWN
4 – SPECIAL TOOL W-129–B
5 – TURNBUCKLE

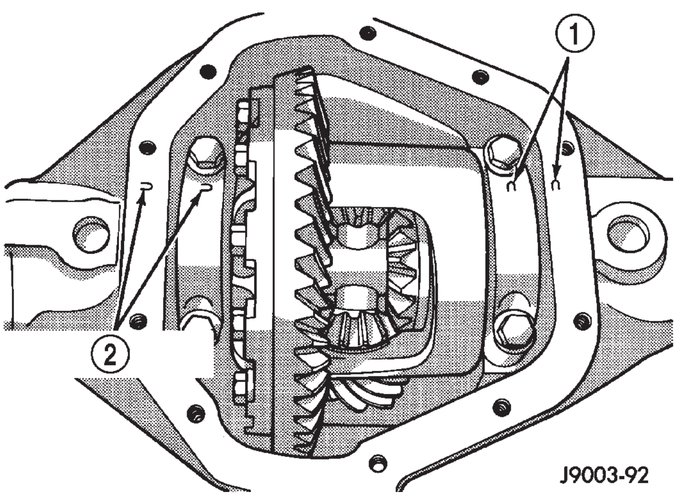


Fig. 29 Differential Bearing Cap Reference Letters

1 – INSTALLATION REFERENCE LETTERS
2 – INSTALLATION REFERENCE LETTERS

(9) Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

(10) Install the axle shafts.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-39 Blocks, and Plug SP-3289 (Fig. 30).

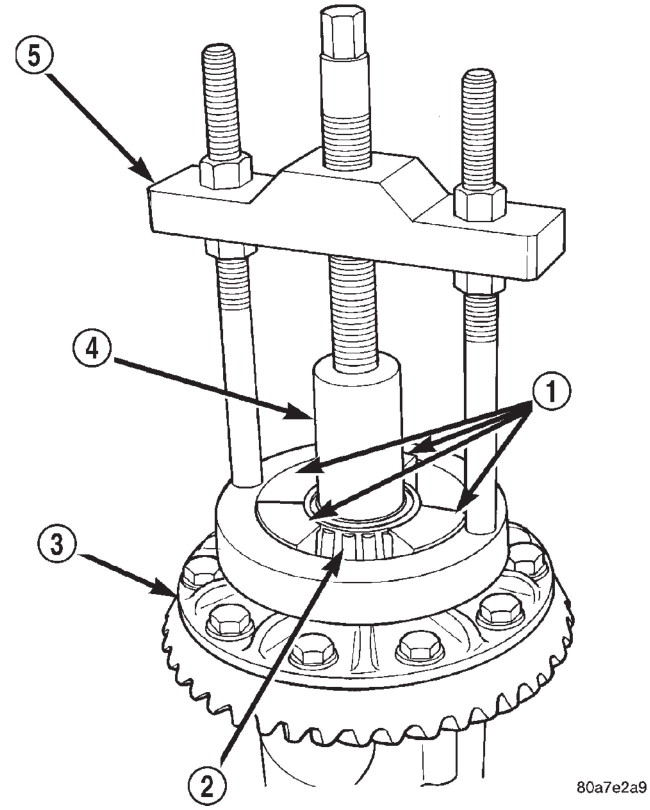


Fig. 30 Differential Bearing Removal

1 – SPECIAL TOOL C-293–39
2 – BEARING
3 – DIFFERENTIAL
4 – SPECIAL TOOL SP-3289
5 – SPECIAL TOOL C-293–PA

INSTALLATION

(1) Using tool C-3716-A with handle C-4171, install differential side bearings (Fig. 31).

(2) Install differential in axle housing.

RING GEAR

NOTE: The ring gear and pinion are serviced as a matched set. Do not replace the ring gear without replacing the pinion.

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 32)

(3) Remove bolts holding ring gear to differential case.

(4) Using a soft hammer, drive ring gear from differential case (Fig. 32).

REMOVAL AND INSTALLATION (Continued)

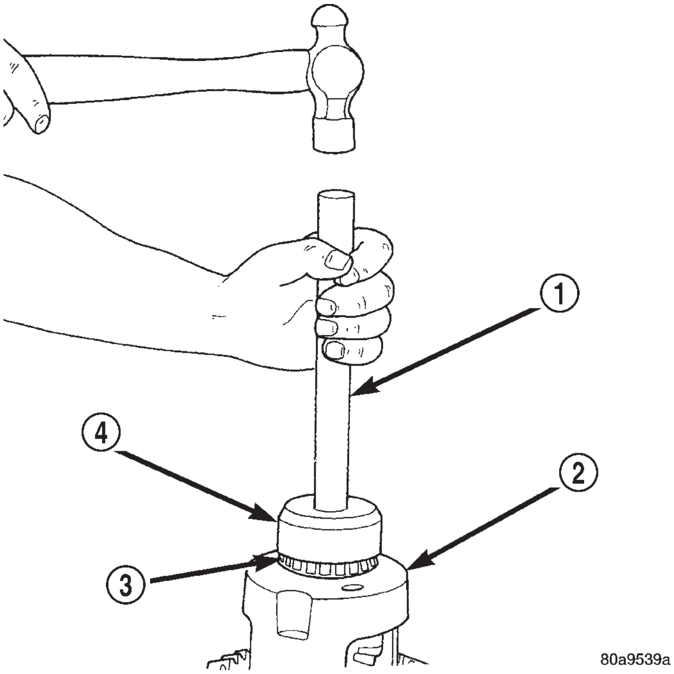


Fig. 31 Install Differential Side Bearings

1 – HANDLE C-4171
2 – DIFFERENTIAL
3 – BEARING
4 – TOOL C-3716–A

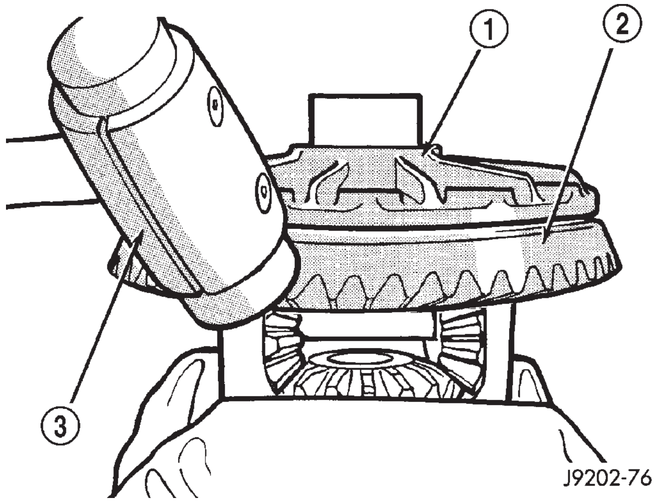


Fig. 32 Ring Gear Removal

1 – CASE
2 – RING GEAR
3 – RAWHIDE HAMMER

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(2) Invert the differential case in the vise.

(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 33).

(4) Install differential in axle housing and verify gear mesh and contact pattern.

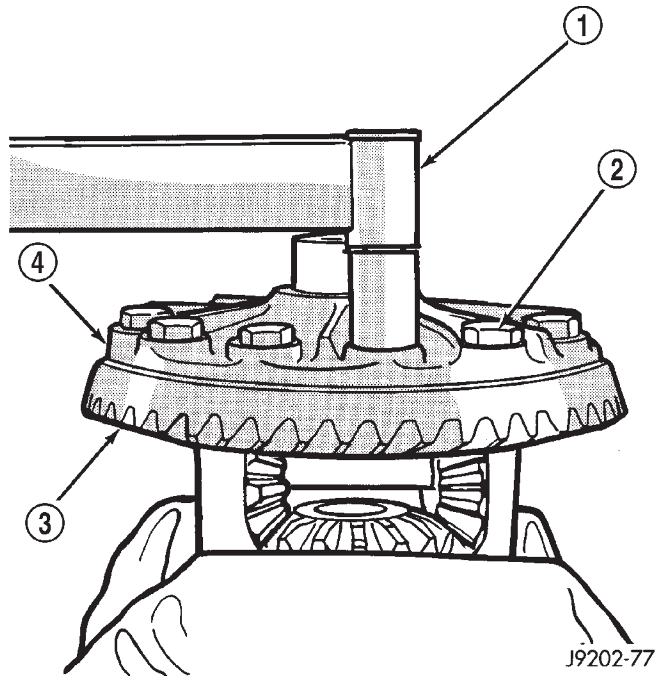


Fig. 33 Ring Gear Bolt Installation

1 – TORQUE WRENCH
2 – RING GEAR BOLT
3 – RING GEAR
4 – CASE

PINION GEAR

The ring and pinion gears are serviced in a matched set. Do not replace the pinion gear without replacing the ring gear.

REMOVAL

(1) Remove differential from the axle housing.

(2) Mark pinion yoke and propeller shaft for installation alignment.

(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

(4) Using Holder 6958 to hold yoke, remove the pinion yoke nut and washer.

(5) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 34).

(6) Remove the pinion gear from housing (Fig. 35). Catch the pinion with your hand to prevent it from falling and being damaged.

REMOVAL AND INSTALLATION (Continued)

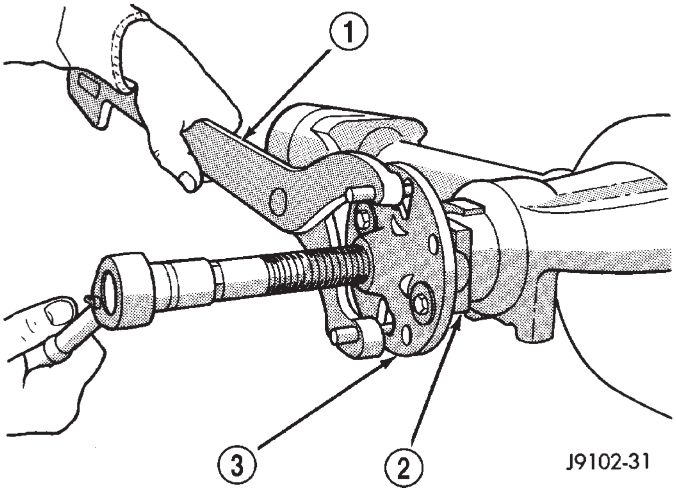


Fig. 34 Pinion Yoke Removal

1 – SPECIAL TOOL C-3281
2 – YOKE
3 – SPECIAL TOOL C-452

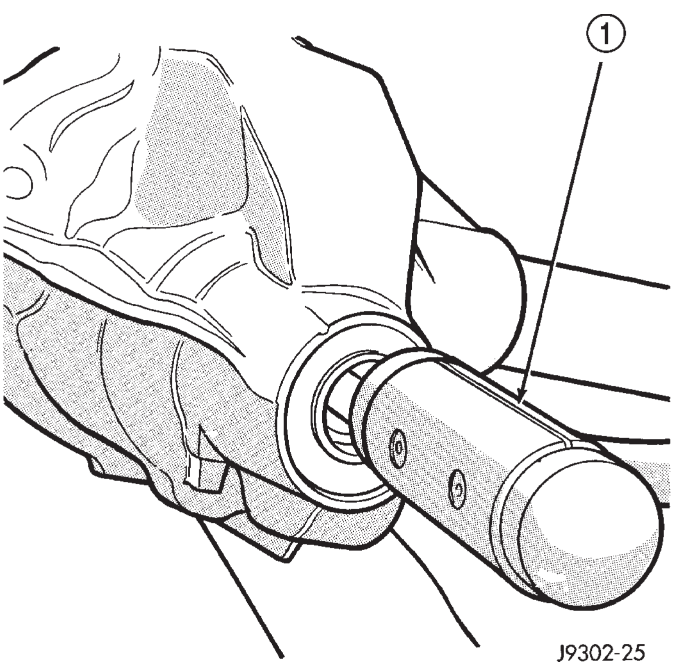


Fig. 35 Remove Pinion Gear

1 – RAWHIDE HAMMER

(7) Use a suitable pry tool or a slide hammer mounted screw to remove the pinion shaft seal.

(8) Remove oil slinger, if equipped, and front pinion bearing.

(9) Remove the front pinion bearing cup with Remover C-4345 and Handle C–4171 (Fig. 36).

(10) Remove the rear bearing cup from housing (Fig. 37). Use Remover D-149 and Handle C–4171.

(11) Remove the collapsible preload spacer (Fig. 38).

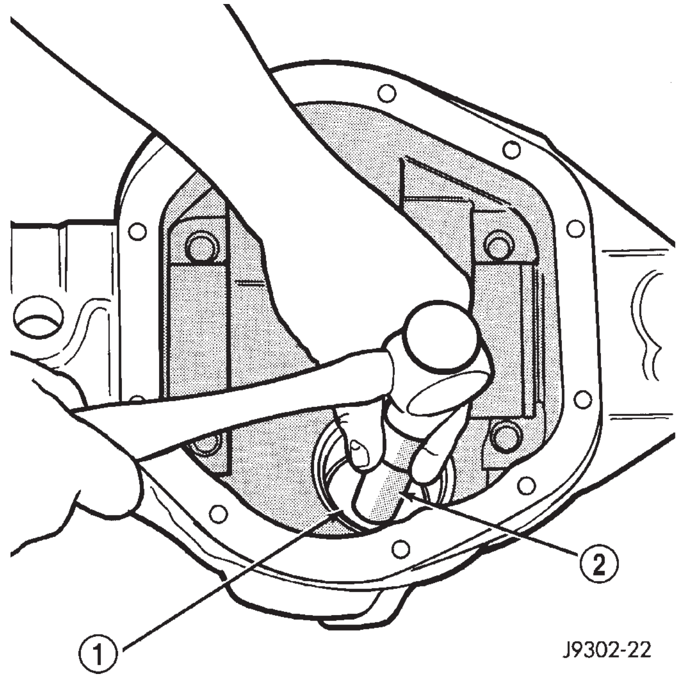


Fig. 36 Front Bearing Cup Removal

1 – REMOVER
2 – HANDLE

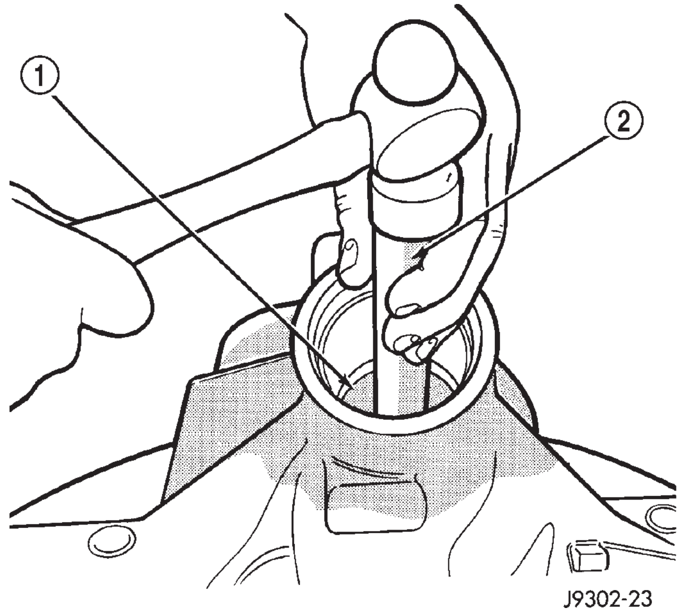


Fig. 37 Rear Bearing Cup Removal

1 – DRIVER
2 – HANDLE

(12) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-40 (Fig. 39).

Place 4 adapter blocks so they do not damage the bearing cage.

REMOVAL AND INSTALLATION (Continued)

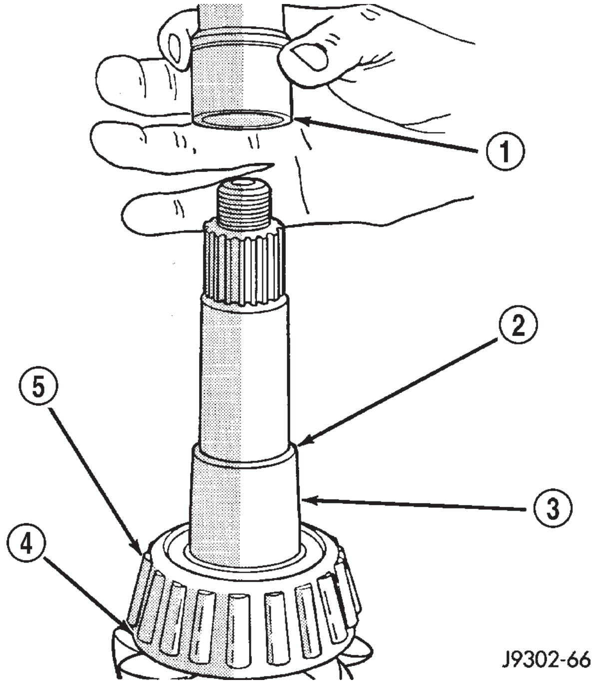


Fig. 38 Collapsible Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION GEAR
4 – OIL SLINGER
5 – REAR BEARING

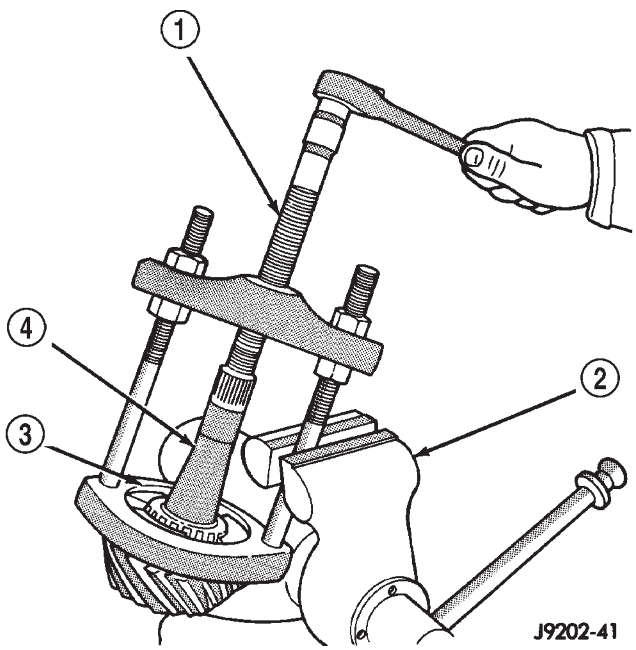


Fig. 39 Rear Bearing Removal

1 – SPECIAL TOOL C-293–PA
2 – VISE
3 – ADAPTERS
4 – DRIVE PINION GEAR SHAFT

(13) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

INSTALLATION

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(2) Install the pinion rear bearing cup with Installer D-146 and Driver Handle C–4171 (Fig. 40). Ensure cup is correctly seated.

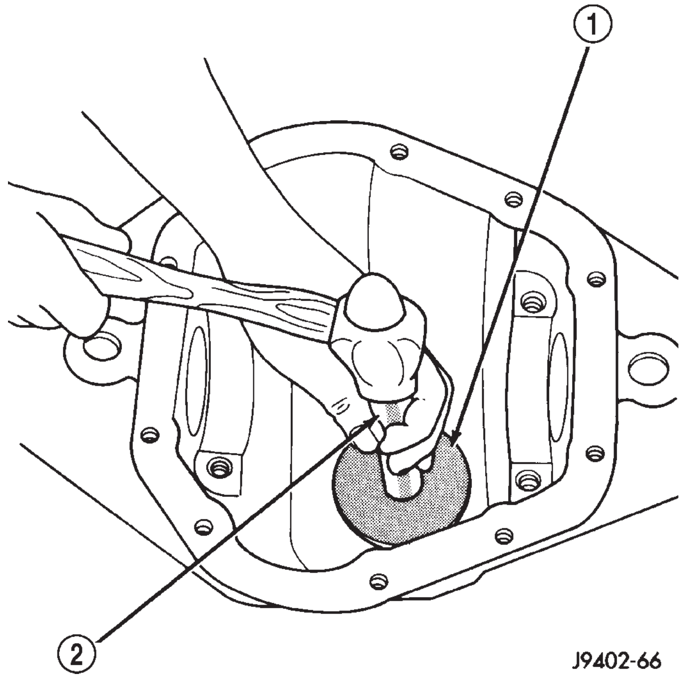


Fig. 40 Pinion Rear Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(4) Install the pinion front bearing cup with Installer D–130 and Handle C–4171 (Fig. 41).

(5) Install pinion front bearing, and oil slinger, if equipped.

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 42).

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion gear to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(7) Place the proper thickness depth shim on the pinion gear.

REMOVAL AND INSTALLATION (Continued)

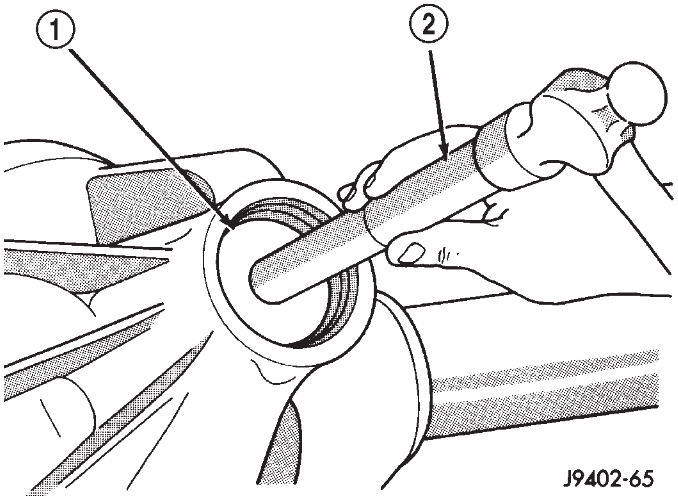


Fig. 41 Pinion Front Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

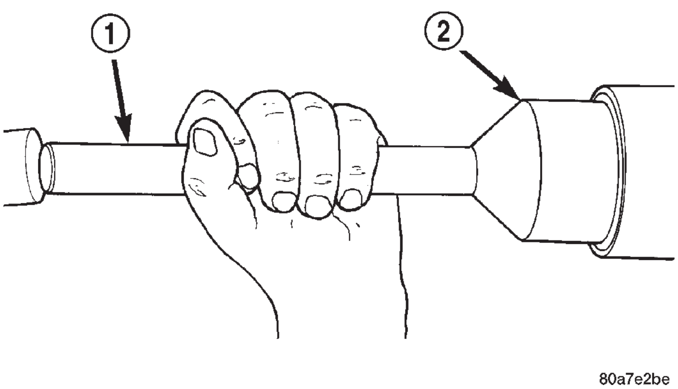


Fig. 42 Pinion Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

(8) Install the rear bearing and slinger, if equipped, on the pinion gear with Installer W-262 (Fig. 43).

(9) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 44).

(10) Install pinion gear in housing.

(11) Install yoke with Installer Screw 8112, Cup 8109, and holder 6958 (Fig. 45).

(12) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(13) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

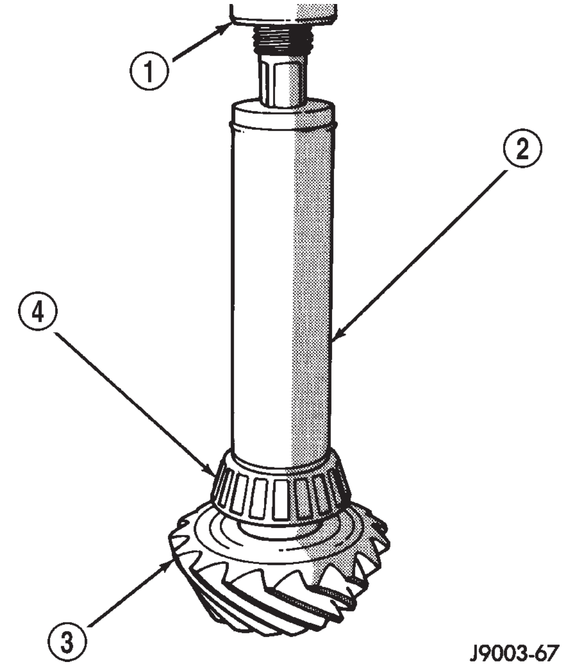


Fig. 43 Shaft Rear Bearing Installation

1 – PRESS
2 – INSTALLATION TOOL
3 – DRIVE PINION GEAR
4 – DRIVE PINION GEAR SHAFT REAR BEARING

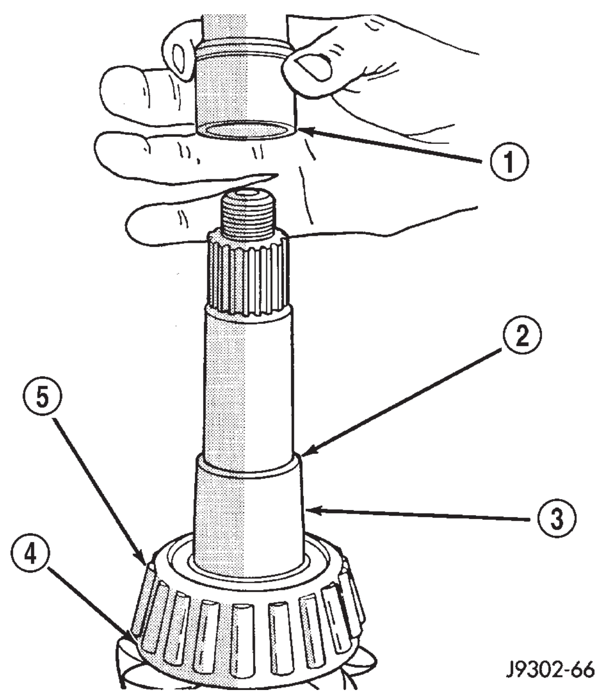


Fig. 44 Collapsible Preload Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION GEAR
4 – OIL SLINGER
5 – REAR BEARING

REMOVAL AND INSTALLATION (Continued)

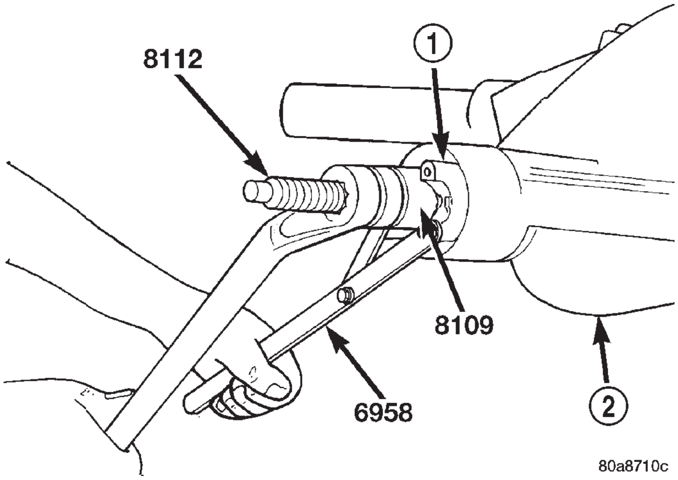


Fig. 45 Pinion Yoke Installation

1 – PINION YOKE
2 – AXLE HOUSING

(14) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 46).

NOTE: If the spacer requires more than 474 N·m (350 ft. lbs.) torque to crush, the collapsible spacer is defective and must be replaced.

(15) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 47).

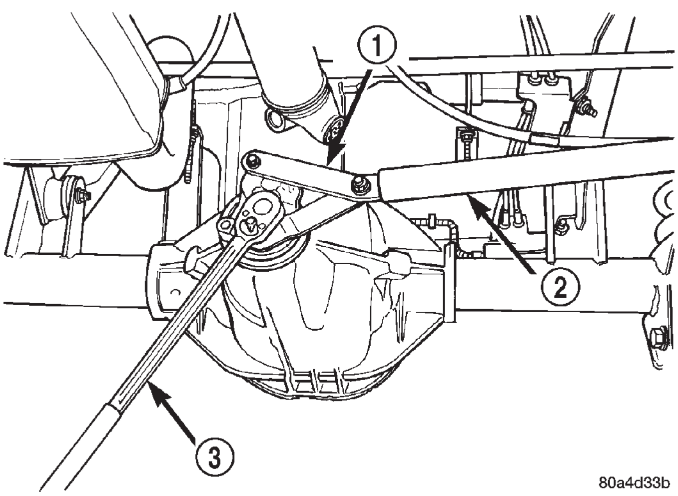


Fig. 46 Tightening Pinion Nut–Typical

1 – SPECIAL TOOL 6958
2 – 1 in. PIPE
3 – 3/4 DRIVE TORQUE WRENCH

(16) Check bearing rotating torque with a (in. lbs.) torque wrench (Fig. 47). The torque necessary to rotate the pinion gear should be:

- Original Bearings — 1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings — 1.5 to 4 N·m (15 to 35 in. lbs.).

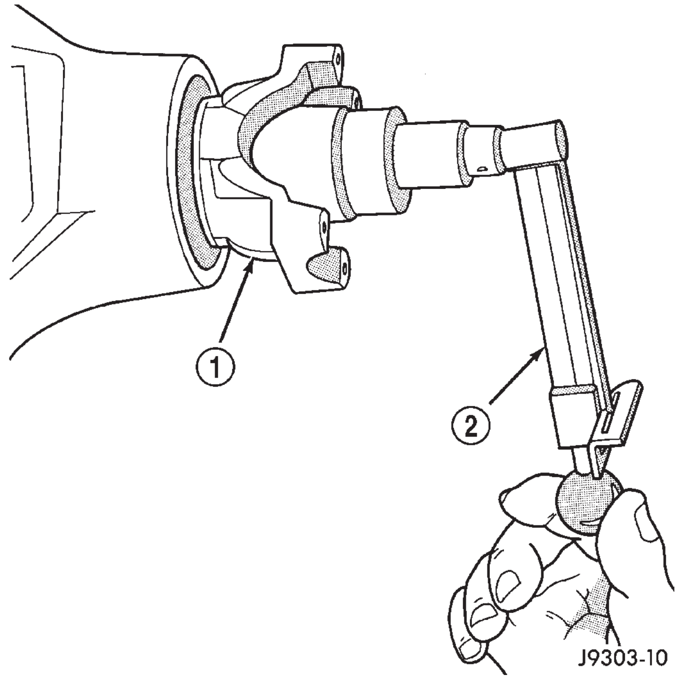


Fig. 47 Check Pinion Gear Rotating Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(17) Install differential in housing.

FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 48).

Install the housing cover within 5 minutes after applying the sealant.

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.

REMOVAL AND INSTALLATION (Continued)

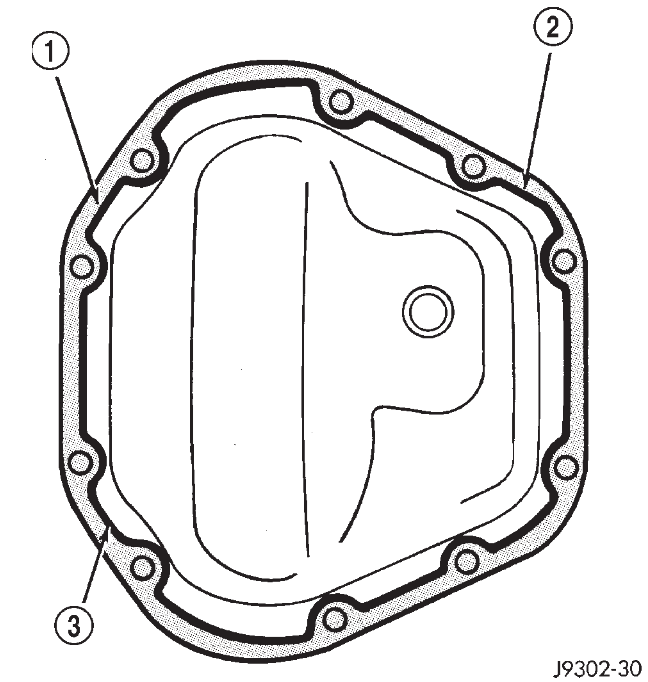


Fig. 48 Typical Housing Cover With Sealant

1 – SEALING SURFACE
2 – CONTOUR OF BEAD
3 – BEAD THICKNESS 6.35mm (1/4”)

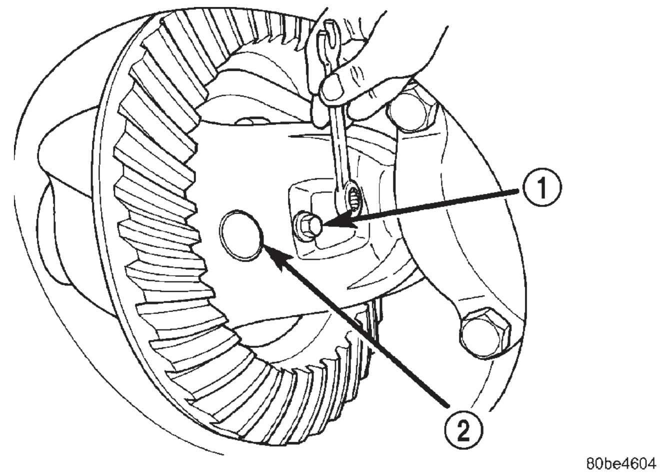


Fig. 49 Pinion Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION MATE SHAFT

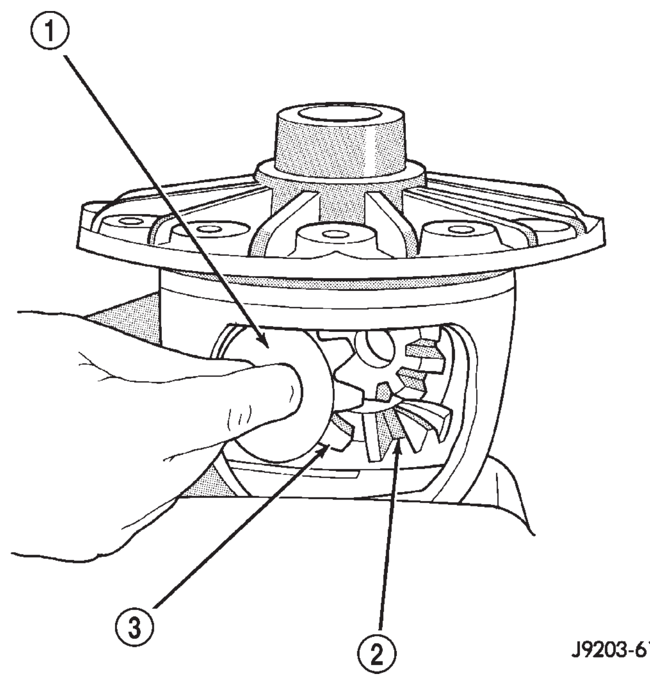


Fig. 50 Pinion Mate Gear Removal

1 – THRUST WASHER
2 – SIDE GEAR
3 – PINION MATE GEAR

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion mate shaft lock screw (Fig. 49).

(2) Remove pinion mate shaft.

(3) Rotate the differential side gears and remove the differential pinion gears and thrust washers (Fig. 50).

(4) Remove the differential side gears and thrust washers.

ASSEMBLY

(1) Install the differential side gears and thrust washers.

(2) Install the differential pinion gears and thrust washers.

(3) Install the pinion mate shaft.

(4) Align the hole in the pinion mate shaft with the hole in the differential case and install the pinion mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

DISASSEMBLY AND ASSEMBLY (Continued)

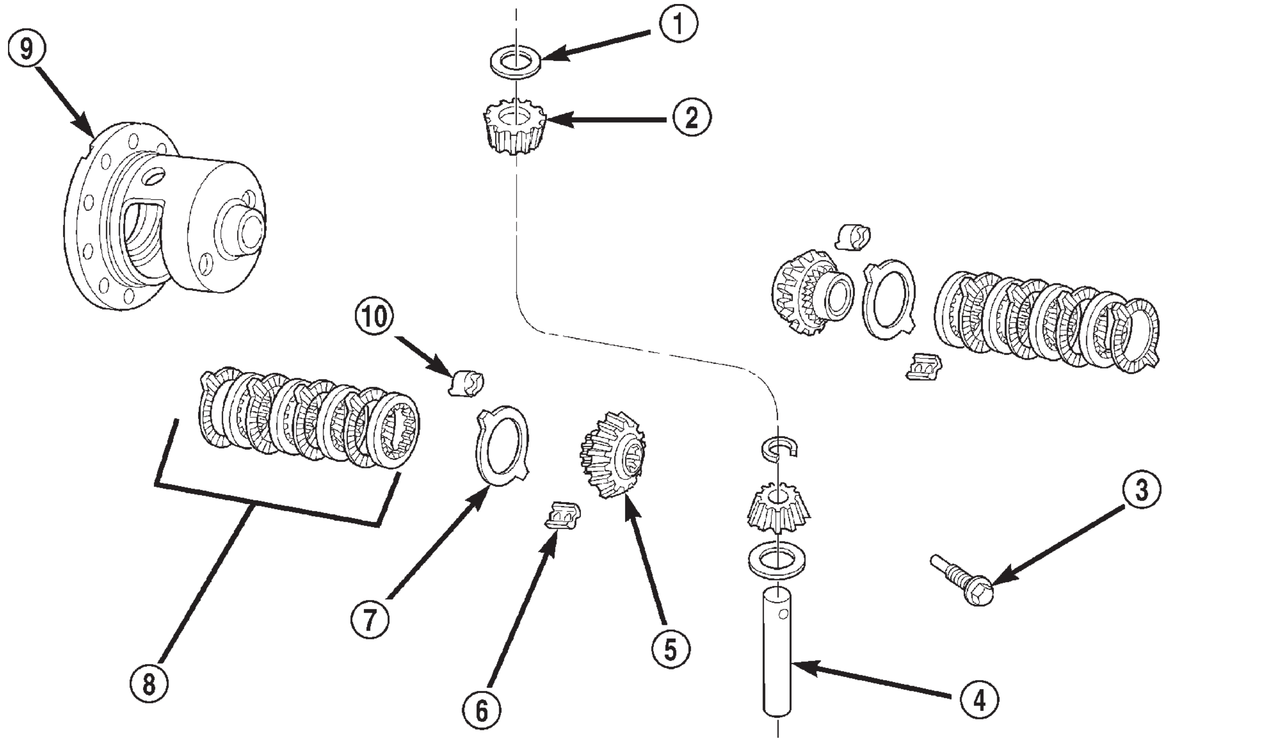


Fig. 51 Trac–lok™ Differential Components

1 – THRUST WASHER
2 – PINION
3 – SHAFT LOCK SCREW
4 – PINION MATE SHAFT
5 – SIDE GEAR
6 – RETAINER
7 – DISC
8 – CLUTCH PACK
9 – DIFFERENTIAL CASE
10 – RETAINER

TRAC-LOK™ DIFFERENTIAL

The Trac–lok™ differential components are illustrated in (Fig. 51). Refer to this illustration during repair service.

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 6965 in a vise.

(2) Position the differential case on Side Gear Holding Tool 6965 (Fig. 52).

(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-lok™ differential can be serviced with the ring gear installed.

(4) Remove the pinion gear mate shaft lock screw (Fig. 53).

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 54).

(6) Install and lubricate Step Plate C-6960-3 (Fig. 55).

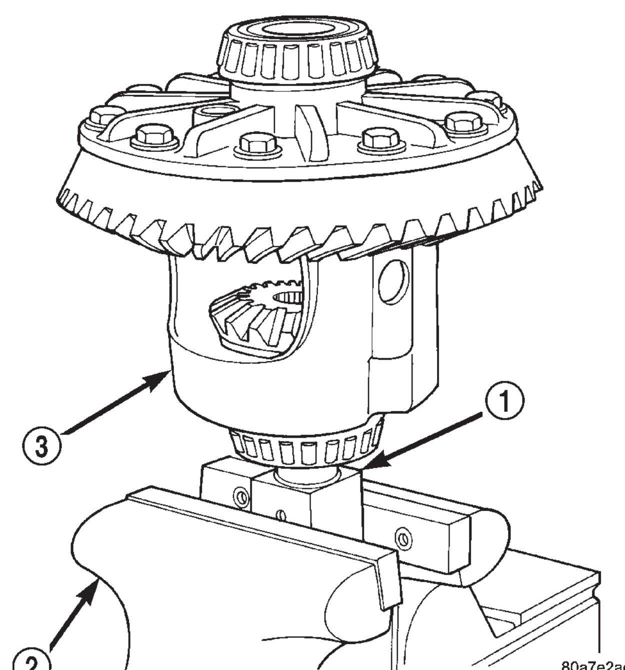


Fig. 52 Differential Case Holding Tool

1 – SPECIAL TOOL 6965
2 – VISE
3 – DIFFERENTIAL

DISASSEMBLY AND ASSEMBLY (Continued)

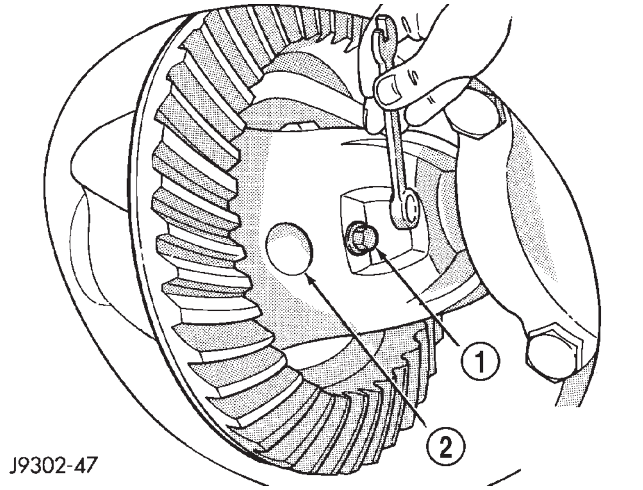


Fig. 53 Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION GEAR MATE SHAFT

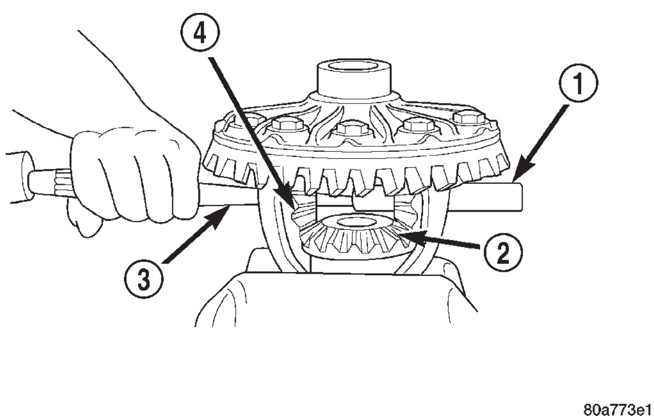


Fig. 54 Mate Shaft Removal

1 – PINION MATE SHAFT
2 – SIDE GEAR
3 – DRIFT
4 – PINION MATE GEAR

(7) Assemble Threaded Adapter C-6960-1 into top side gear. Thread Forcing Screw C-6960-4 into adapter until it becomes centered in adapter plate.

(8) Position a small screw driver in slot of Threaded Adapter C-6960-1 (Fig. 56) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 57).

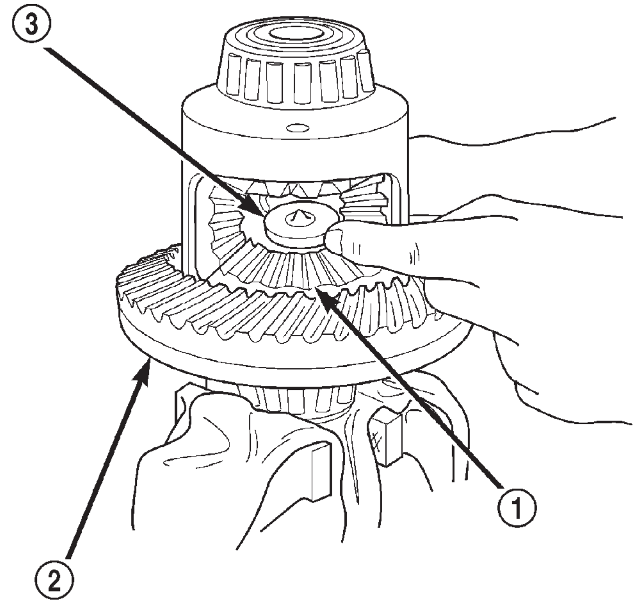


Fig. 55 Step Plate Tool Installation

1 – LOWER SIDE GEAR
2 – DIFFERENTIAL CASE
3 – SPECIAL TOOL C-6960–3

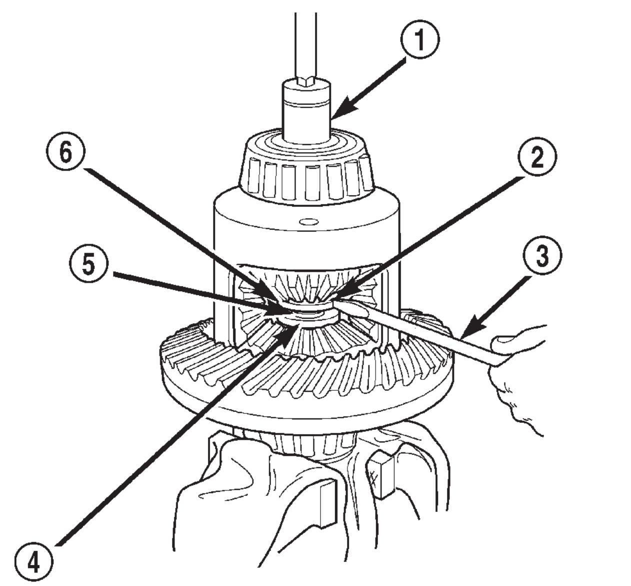


Fig. 56 Threaded Adapter Installation

1 – SOCKET
2 – SLOT IN ADAPTER
3 – SCREWDRIVER
4 – DISC C-6960–3
5 – THREADED ROD C-6960–4
6 – THREADED ADAPTER DISC C–6960–1

DISASSEMBLY AND ASSEMBLY (Continued)

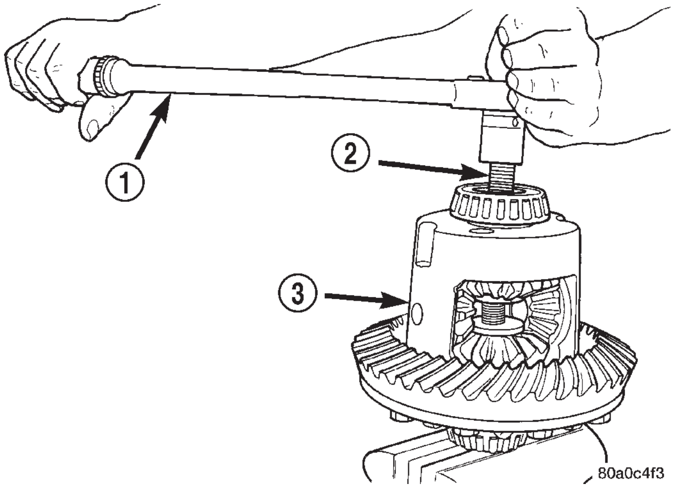


Fig. 57 Tighten Belleville Spring Compressor Tool

1 – TORQUE WRENCH
2 – TOOL ASSEMBLED
3 – DIFFERENTIAL CASE

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 58).

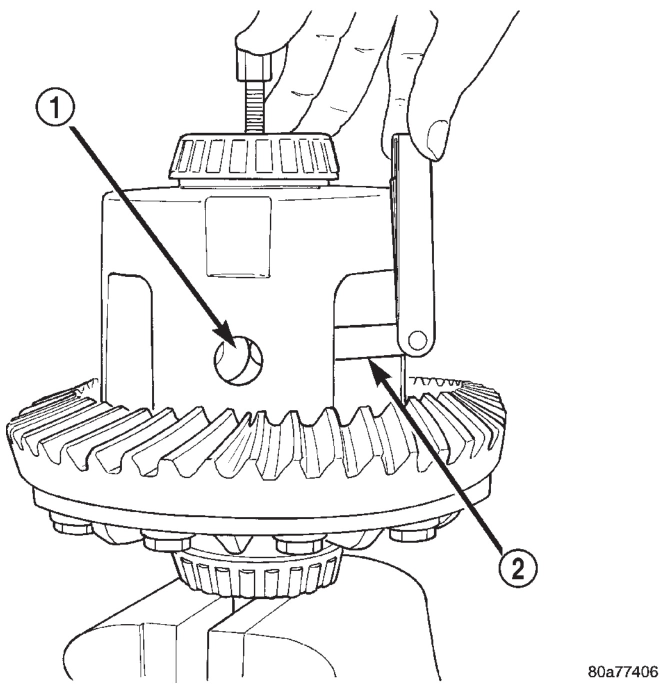


Fig. 58 Remove Pinion Gear Thrust Washer

1 – THRUST WASHER
2 – FEELER GAUGE

(11) Insert Turning Bar C-6960-2 in case (Fig. 59).

(12) Loosen the Forcing Screw C-6960-4 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar C-6960-2.

(13) Rotate differential case until the pinion gears can be removed.

(14) Remove pinion gears from differential case.

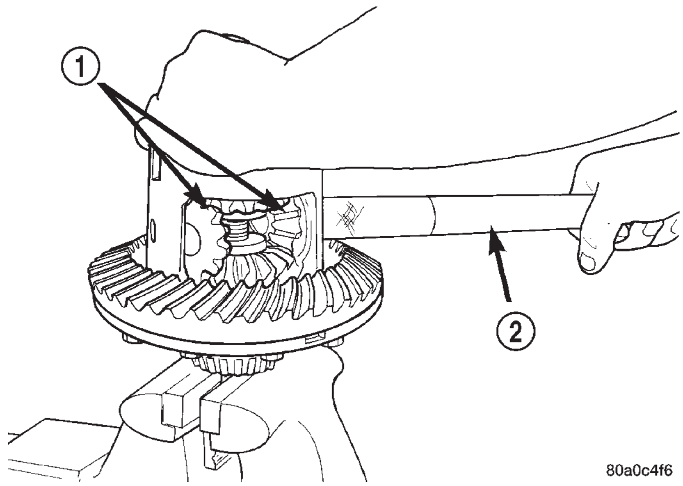


Fig. 59 Pinion Gear Removal

1 – PINION GEARS
2 – TOOL

(15) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 60).

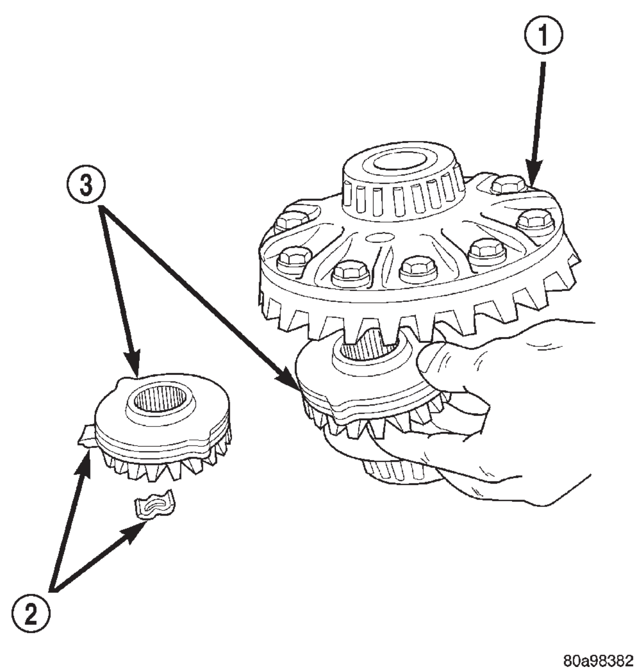


Fig. 60 Side Gear & Clutch Disc Removal

1 – DIFFERENTIAL CASE
2 – RETAINER
3 – SIDE GEAR AND CLUTCH DISC PACK

DISASSEMBLY AND ASSEMBLY (Continued)

(17) Remove differential case from Side Gear Holding Tool 6965. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

NOTE: The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 61).

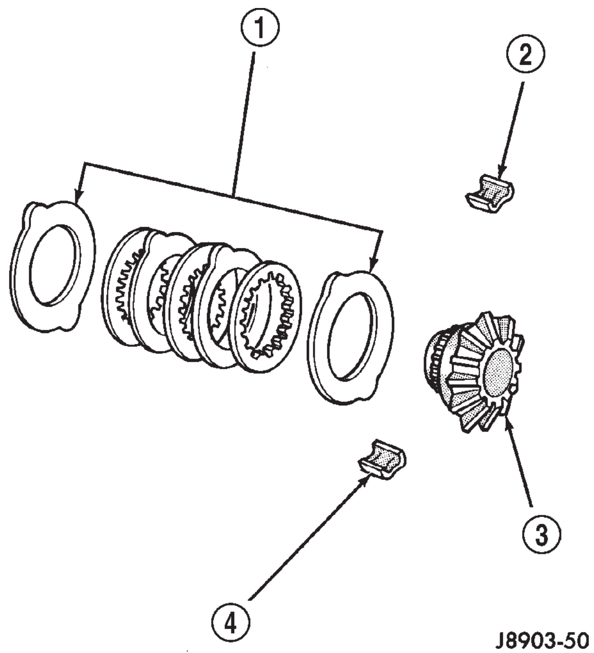


Fig. 61 Clutch Disc Pack

1 – CLUTCH PACK
2 – RETAINER
3 – SIDE GEAR
4 – RETAINER

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 62). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 6965.

(5) Install lubricated Step Plate C-6960-3 in lower side gear (Fig. 63).

(6) Install the upper side gear and clutch disc pack (Fig. 63).

(7) Hold assembly in position. Insert Threaded Adapter C-6960-1 into top side gear.

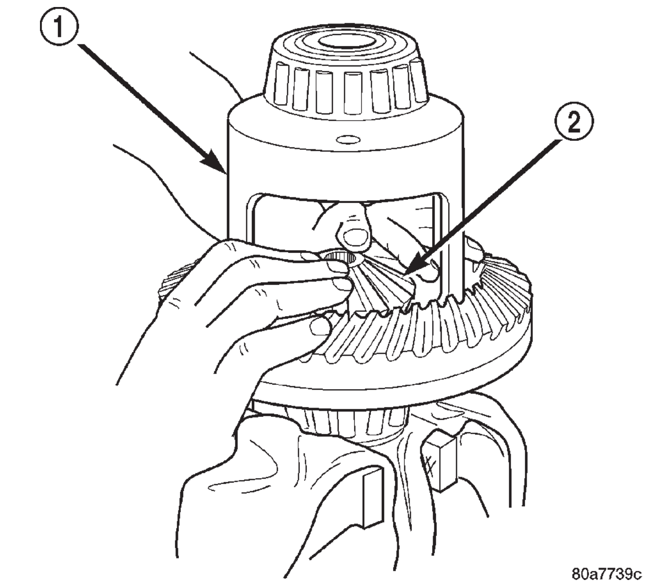


Fig. 62 Clutch Discs & Lower Side Gear Installation

1 – DIFFERENTIAL CASE
2 – LOWER SIDE GEAR AND CLUTCH DISC PACK

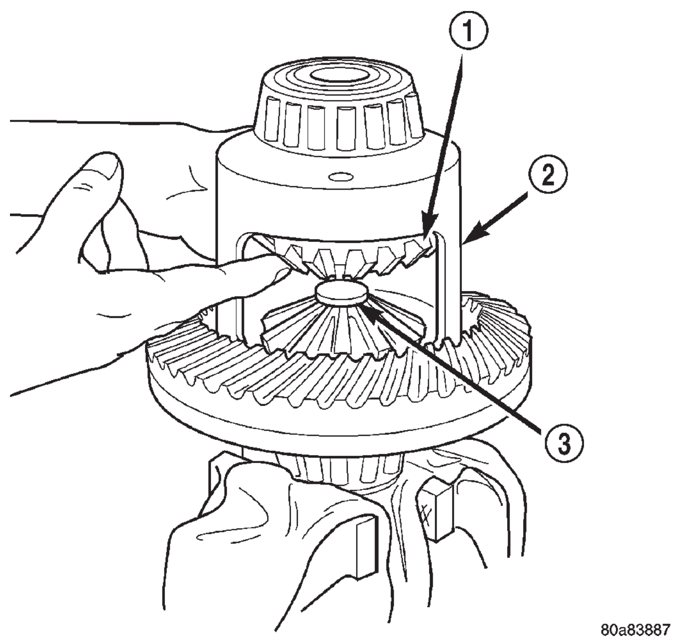


Fig. 63 Upper Side Gear & Clutch Disc Pack Installation

1 – UPPER SIDE GEAR AND CLUTCH DISC PACK
2 – DIFFERENTIAL CASE
3 – SPECIAL TOOL C-6960–3

(8) Insert Forcing Screw C-6960-4.

(9) Tighten forcing screw tool to slightly compress clutch discs.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

DISASSEMBLY AND ASSEMBLY (Continued)

(11) Rotate case with Turning Bar C-6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear backlash. Correct fit is due to close machining tolerances during manufacture.

(17) Lubricate all differential components with hypoid gear lubricant.

CLEANING AND INSPECTION

AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing. Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

TRAC-LOK™

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side gears and pinions. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

ADJUSTMENTS

PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 64). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.850 mm (3.813 in.). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.

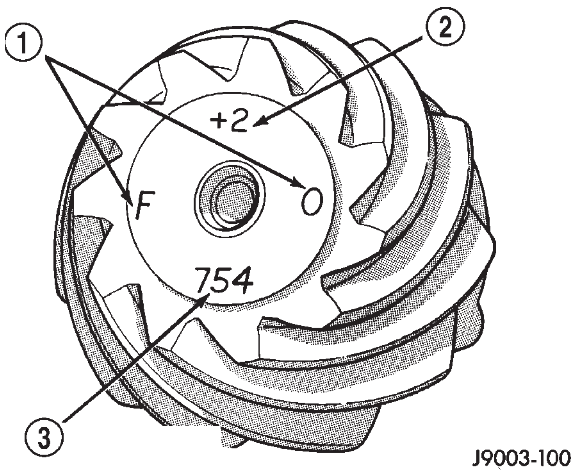


Fig. 64 Pinion Gear ID Numbers

1 – PRODUCTION NUMBERS
2 – DRIVE PINION GEAR DEPTH VARIANCE
3 – GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

ADJUSTMENTS (Continued)

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the inner pinion bearing cone (Fig. 65).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.

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

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

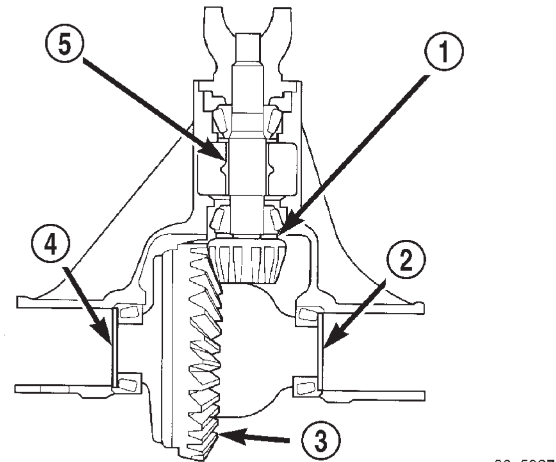


Fig. 65 Shim Locations

1 – PINION GEAR DEPTH SHIM
2 – DIFFERENTIAL BEARING SHIM-PINION GEAR SIDE
3 – RING GEAR
4 – DIFFERENTIAL BEARING SHIM-RING GEAR SIDE
5 – COLLAPSIBLE SPACER

PINION GEAR DEPTH VARIANCE

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

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set, Pinion Block 6735, Arbor Discs 6732, and Dial Indicator C-3339 (Fig. 66).

(1) Assemble Pinion Height Block 6739, Pinion Block 6735, and rear pinion bearing onto Screw 6741 (Fig. 66).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 67).

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 66).

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 68). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.

NOTE: Arbor Discs 6732 have different step diameters to fit other axle sizes. Pick correct size step for axle being serviced.

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

ADJUSTMENTS (Continued)

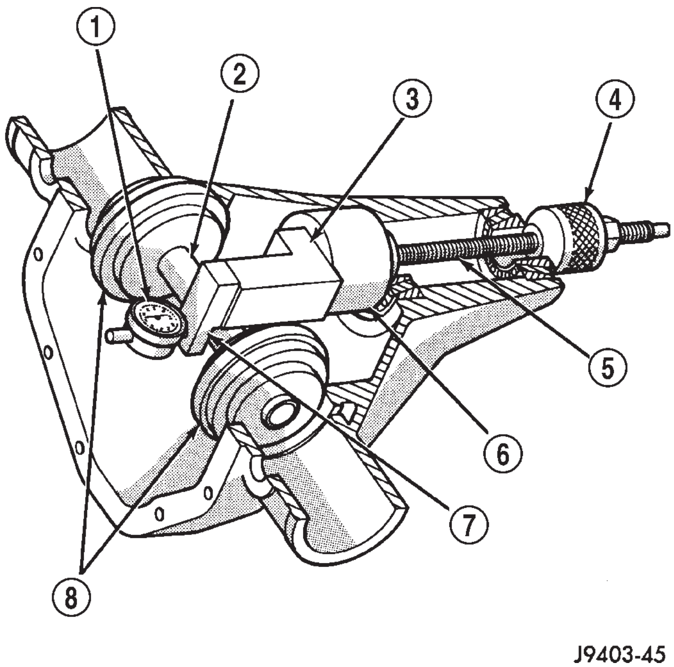


Fig. 66 Pinion Gear Depth Gauge Tools—Typical

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

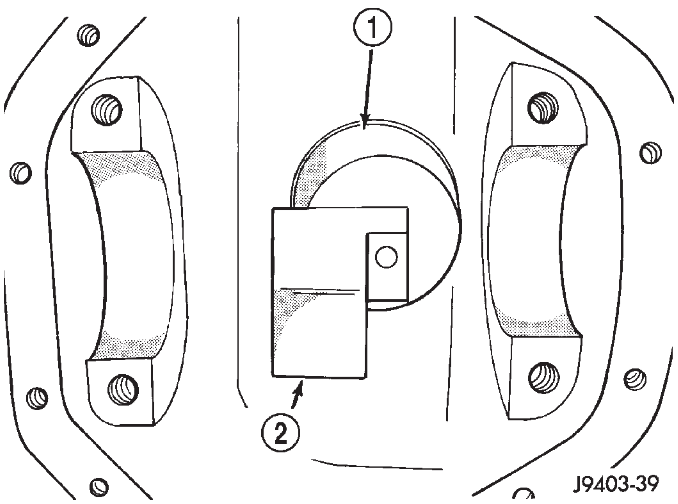


Fig. 67 Pinion Height Block—Typical

1 – PINION BLOCK
2 – PINION HEIGHT BLOCK

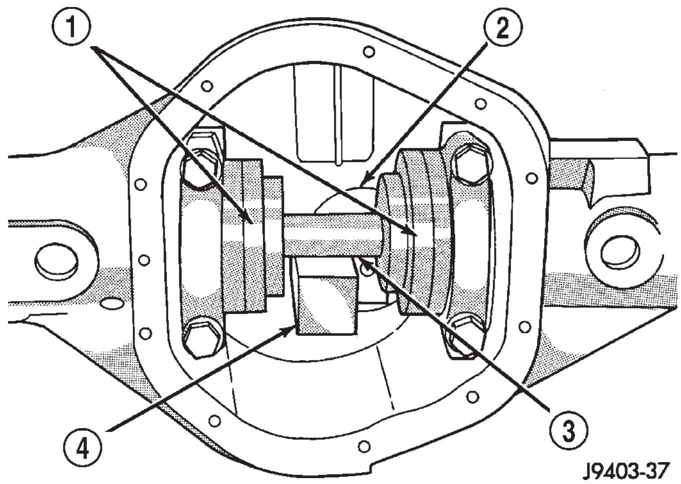


Fig. 68 Gauge Tools In Housing—Typical

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

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the surface of the pinion height block. Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block. Observe how many revolutions counterclockwise the dial pointer travels (approximately 0.125 in.) to the out-stop of the dial indicator.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 69). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 64) using the opposite sign on the variance number. For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

(10) Remove the pinion depth gauge components from the axle housing

ADJUSTMENTS (Continued)

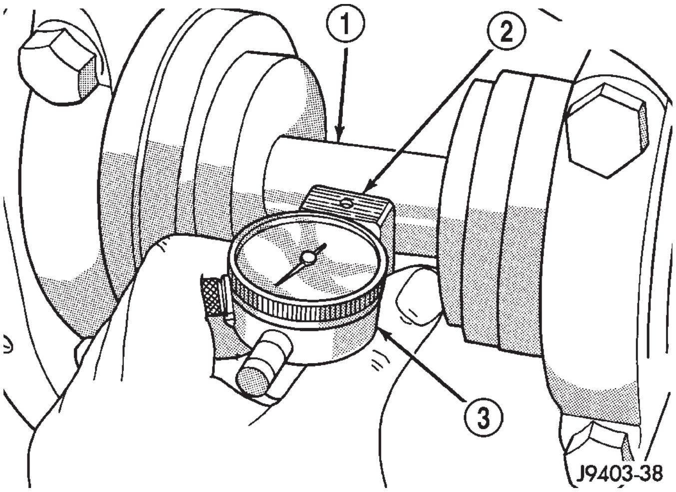


Fig. 69 Pinion Gear Depth Measurement—Typical

1 – ARBOR
2 – SCOOTER BLOCK
3 – DIAL INDICATOR

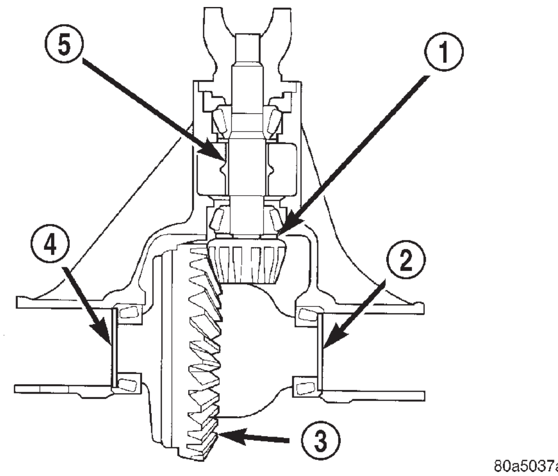


Fig. 70 Axle Adjustment Shim Locations

1 – PINION GEAR DEPTH SHIM
2 – DIFFERENTIAL BEARING SHIM-PINION GEAR SIDE
3 – RING GEAR
4 – DIFFERENTIAL BEARING SHIM-RING GEAR SIDE
5 – COLLAPSIBLE SPACER

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

Differential side bearing preload and gear backlash is achieved by selective shims inserted between the bearing cup and the axle housing. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion gear for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion gear is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading, starting point shim thickness, and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 70).

SHIM SELECTION

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

(1) Remove side bearings from differential case.

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

(3) Install dummy side bearings D-348 on differential case.

(4) Install differential case in axle housing.

(5) Insert Dummy Shims 8107 (0.118 in. (3.0 mm)) starting point shims between the dummy bearing and the axle housing (Fig. 71).

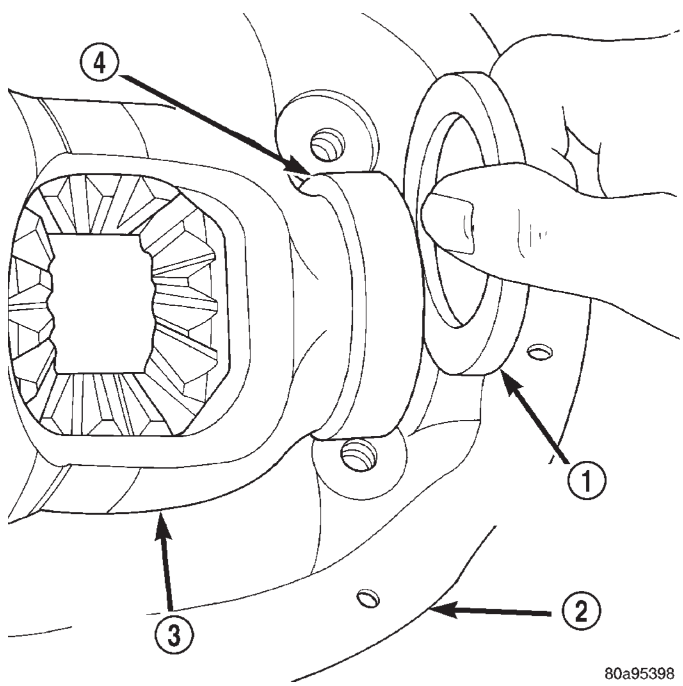


Fig. 71 Insert Starting Point Shims

1 – SPECIAL TOOL 8107
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE
4 – SPECIAL TOOL D-348

ADJUSTMENTS (Continued)

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

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 72) and (Fig. 73).

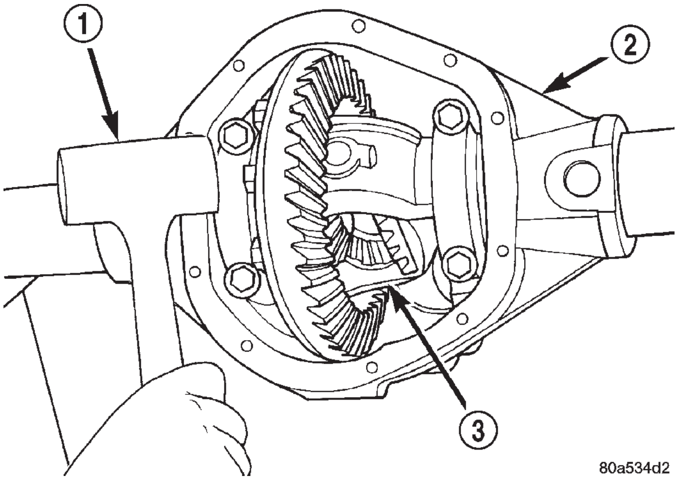


Fig. 72 Seat Pinion Gear Dummy Side Bearing

1 – MALLET
2 – AXLE HOUSING
3 – DIFFERENTIAL CASE

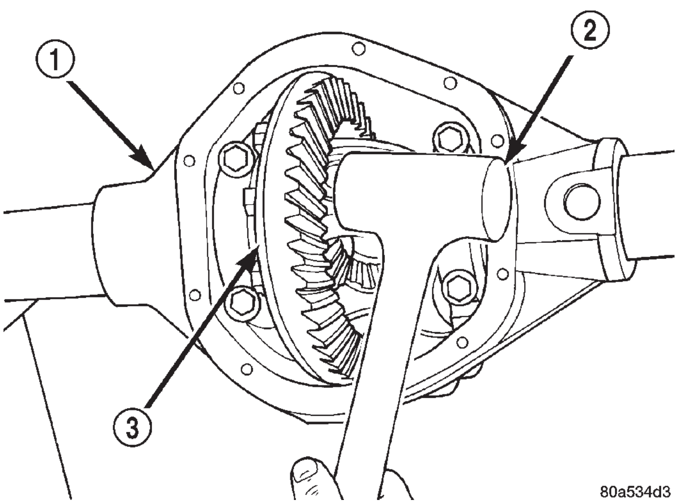


Fig. 73 Seat Ring Gear Side Dummy Bearing

1 – AXLE HOUSING
2 – MALLET
3 – DIFFERENTIAL CASE

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 74).

(9) Attach dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface on a ring gear bolt head (Fig. 74).

(10) Push firmly and hold differential case to pinion gear side of axle housing (Fig. 75).

(11) Zero dial indicator face to pointer.

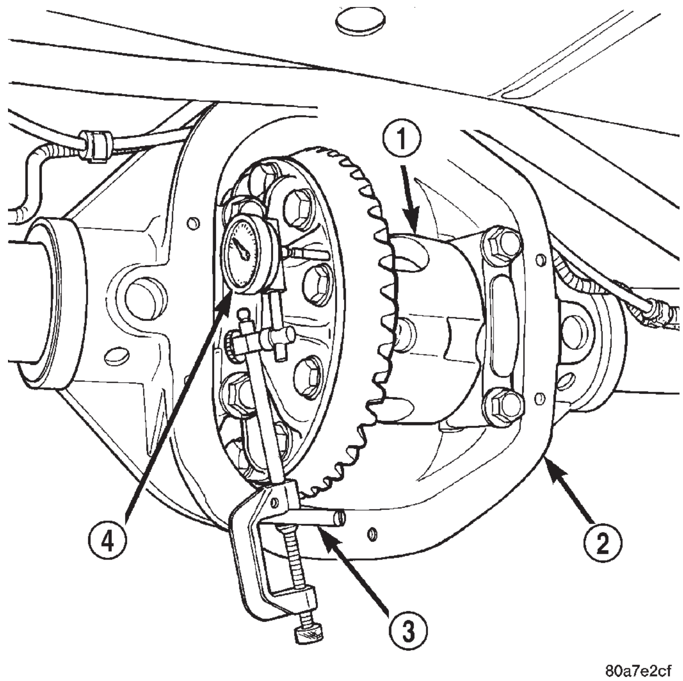


Fig. 74 Differential Side play Measurement

1 – DIFFERENTIAL CASE
2 – AXLE HOUSING
3 – SPECIAL TOOL C-3288–B
4 – SPECIAL TOOL C-3339

(12) Push firmly and hold differential case to ring gear side of the axle housing (Fig. 76).

(13) Record dial indicator reading.

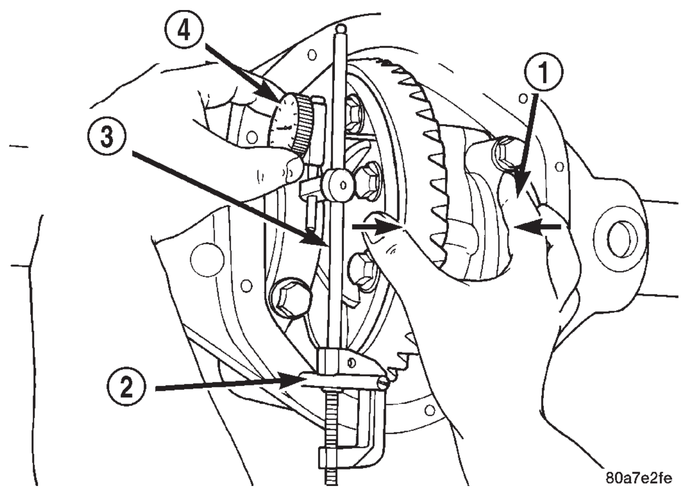


Fig. 75 Hold Differential Case and Zero Dial Indicator

1 – FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 – SPECIAL TOOL C-3288–B
3 – SPECIAL TOOL C-3339
4 – ZERO DIAL INDICATOR FACE

ADJUSTMENTS (Continued)

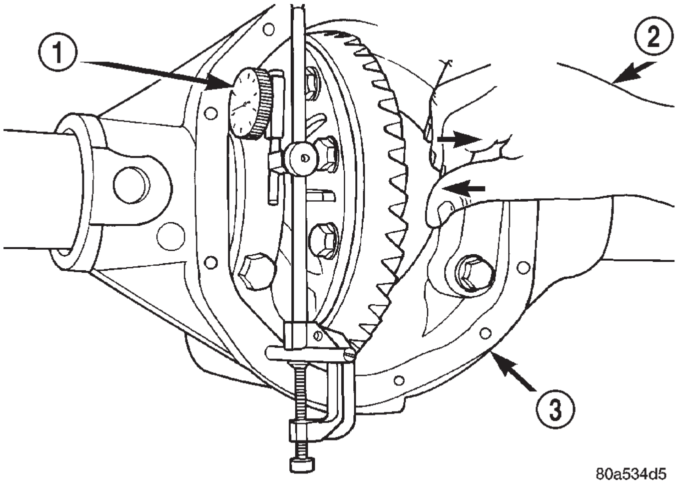


Fig. 76 Hold Differential Case and Read Dial Indicator

1 – READ DIAL INDICATOR
2 – FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 – AXLE HOUSING

(14) Add the dial indicator reading to the starting point shim thickness to determine total shim thickness to achieve zero differential end play.

(15) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(16) Rotate dial indicator out of the way on guide stud.

(17) Remove differential case, dummy bearings, and starting point shims from axle housing.

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

(19) Install differential case and dummy bearings in axle housing (without shims) and tighten retaining cap bolts.

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 74).

(21) Push and hold differential case toward pinion gear.

(22) Zero dial indicator face to pointer.

(23) Push and hold differential case to ring gear side of the axle housing.

(24) Record dial indicator reading.

(25) Subtract 0.002 in. (0.05 mm) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness of shim required to achieve proper backlash.

(26) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(27) Rotate dial indicator out of the way on guide stud.

(28) Remove differential case and dummy bearings from axle housing.

(29) Install new side bearing cones and cups on differential case.

(30) Install spreader W-129-B, utilizing some components of Adapter Set 6987, on axle housing and spread axle opening enough to receive differential case.

(31) Place side bearing shims in axle housing against axle tubes.

(32) Install differential case in axle housing.

(33) Rotate the differential case several times to seat the side bearings.

(34) Position the indicator plunger against a ring gear tooth (Fig. 77).

(35) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(36) Zero dial indicator face to pointer.

(37) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the differential housing to the other (Fig. 78).

ADJUSTMENTS (Continued)

(38) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform the Gear Contact Pattern Analysis procedure.

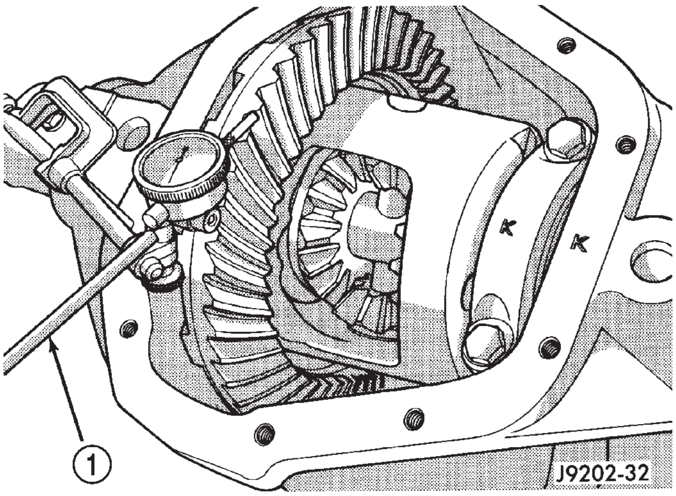


Fig. 77 Ring Gear Backlash Measurement

1 – DIAL INDICATOR

GEAR CONTACT PATTERN ANALYSIS

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

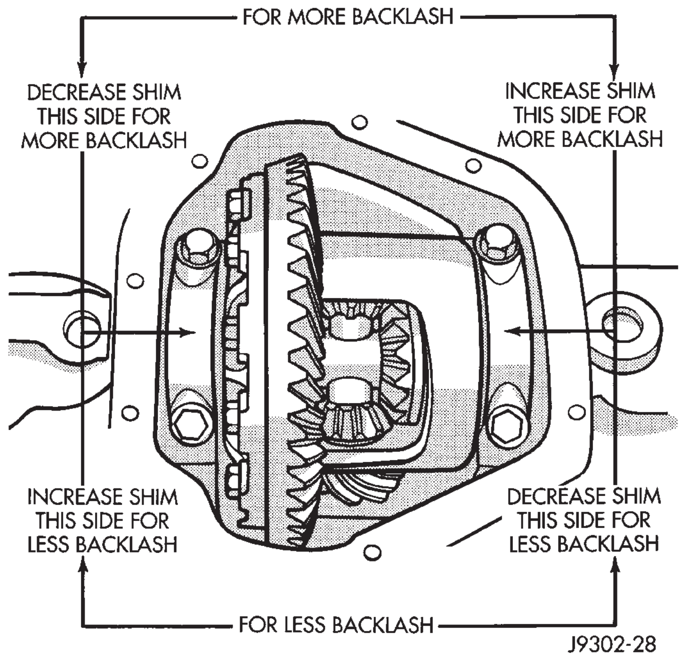


Fig. 78 Backlash Shim Adjustment

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 79) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

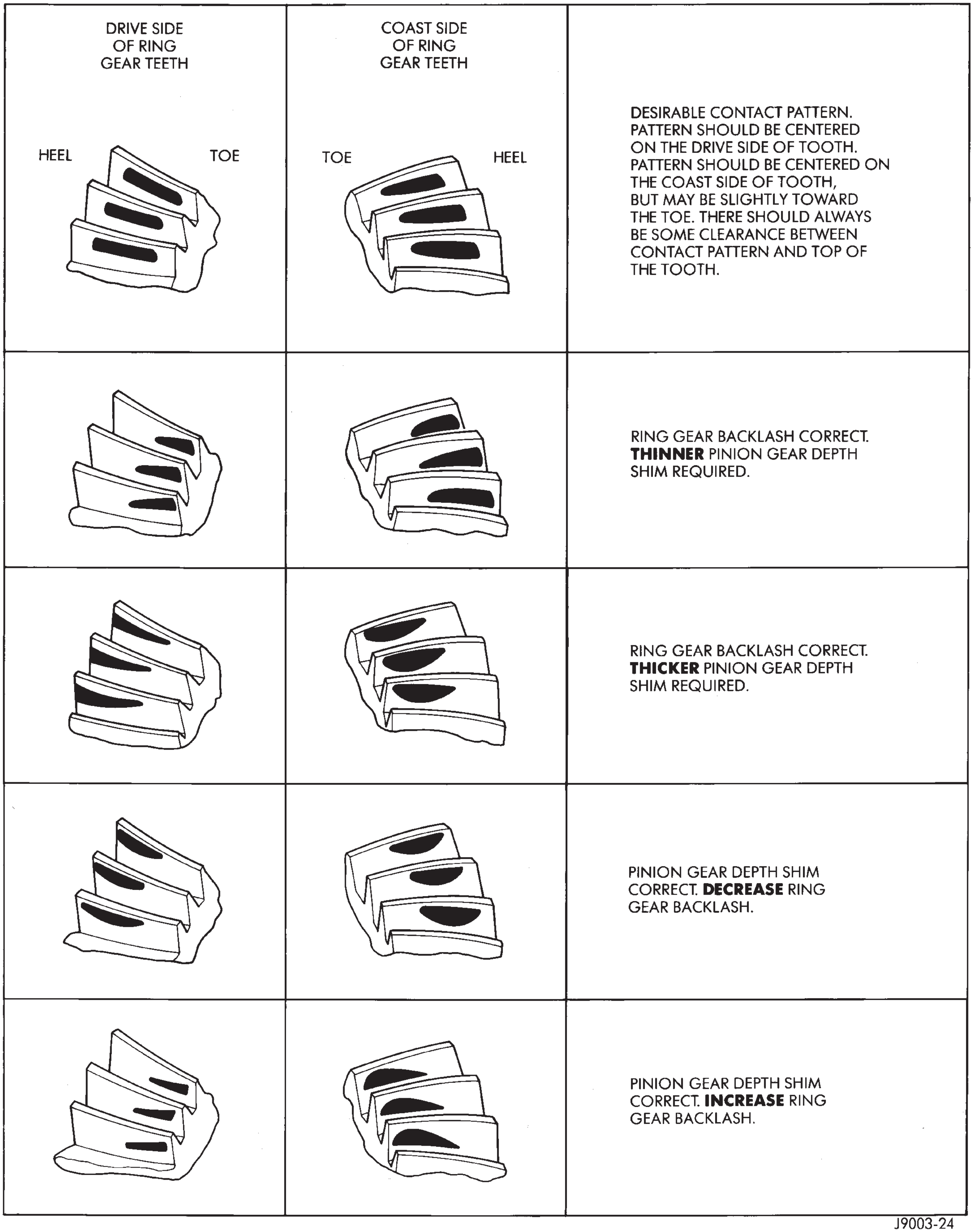


Fig. 79 Gear Tooth Contact Patterns

SPECIFICATIONS

194 RBI AXLE

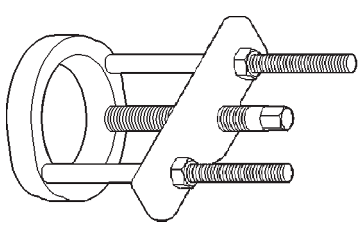
DESCRIPTION	SPECIFICATION
Axle Type	Semi–Floating Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lubricant Trailer Tow	Synthetic 75W–140
Lube Capacity	1.66 L (3.50 pts.)
Friction Modifier	0.12 L (3.50 ozs.)
Axle Ratios	3.07, 3.55, 3.73
Differential Bearing Preload	0.1 mm (0.008 in.)
Differential Side Gear Clearance	0–0.15 mm (0–0.006 in.)
Ring Gear Diameter	19.2 cm (7.562 in.)
Ring Gear Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	96.85 mm (3.813 in.)
Pinion Bearing Preload-Original Bearings	1–2 N·m (10–20 in. lbs.)
Pinion Bearing Preload-New Bearings	1.5–4 N·m (15–35 in. lbs.)

194 RBI AXLE

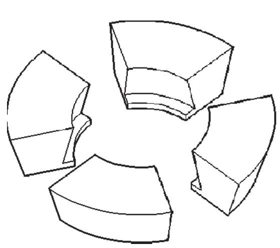
DESCRIPTION	TORQUE
Bolt, Diff. Cover	41 N·m (30 ft. lbs.)
Bolt, Bearing Cap	77 N·m (57 ft. lbs.)
Nut, Pinion	271–474 N·m (200–350 ft. lbs.)
Screw, Pinion Mate Shaft Lock	16.25 N·m (12 ft. lbs.)
Bolt, Ring Gear	95–122 N·m (70–90 ft. lbs.)
Bolt, RWAL/ABS Sensor	8 N·m (70 in. lbs.)

SPECIAL TOOLS

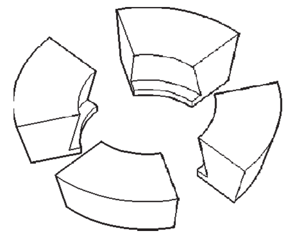
194 RBI AXLE



Puller—C-293-PA



Adapter—C-293-39



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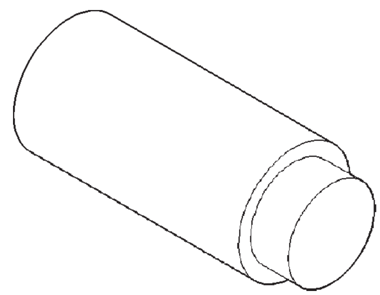
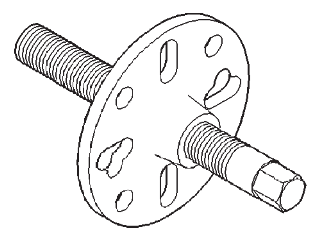
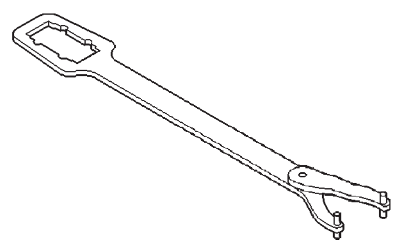


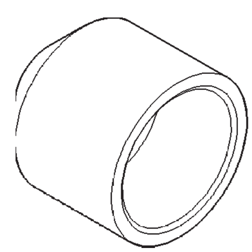
Plug—SP-3289



Puller—C-452

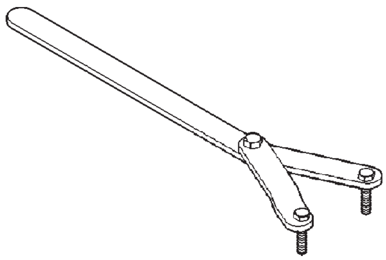


Wrench—C-3281

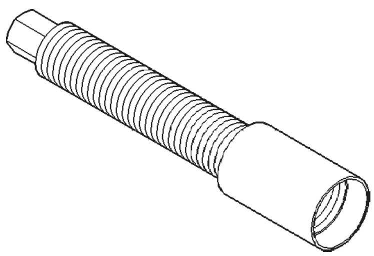


Installer—C-3972-A

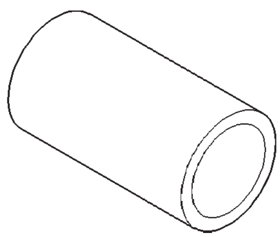
SPECIAL TOOLS (Continued)



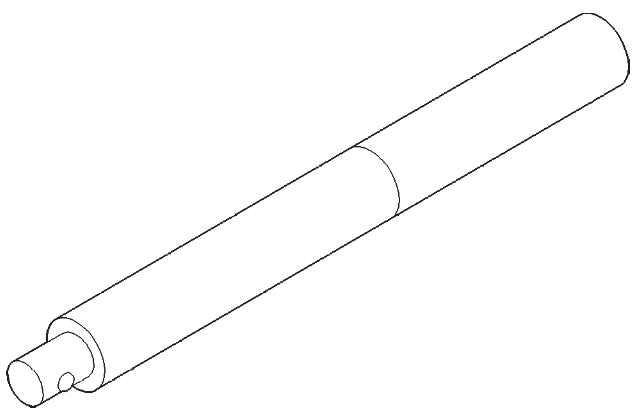
Spanner—6958



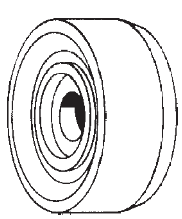
Installer Screw—8112



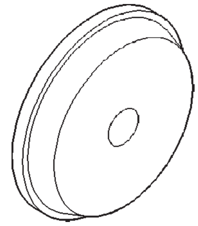
Cup—8109



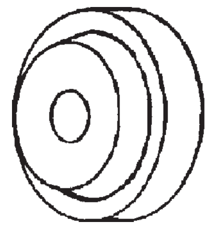
Handle—C-4171



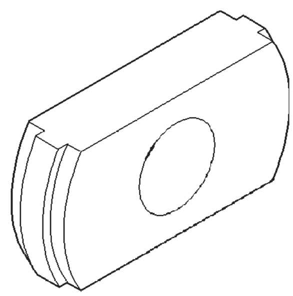
Driver—C-3716-A



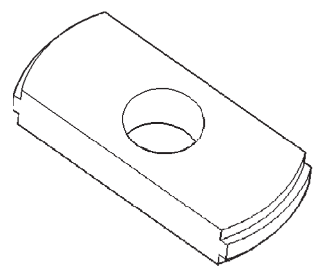
Installer—D-130



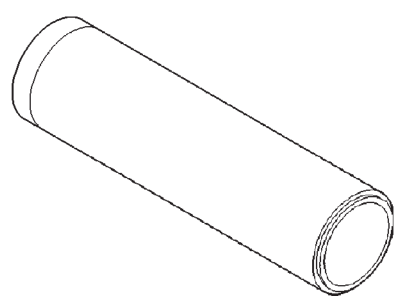
Installer—D-146



Remover—C-4345

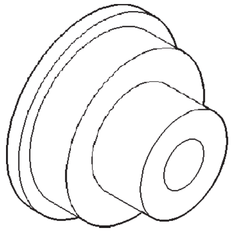


Remover—D-149

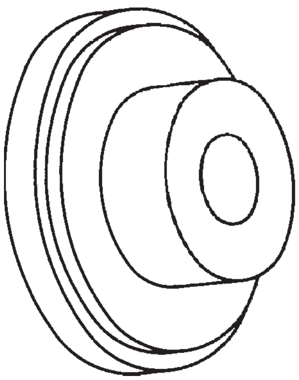


Installer—W-262

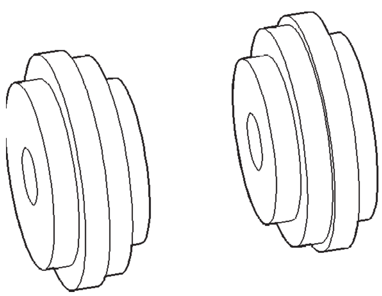
SPECIAL TOOLS (Continued)



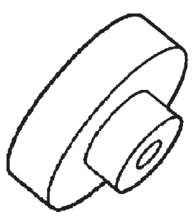
Installer—6436



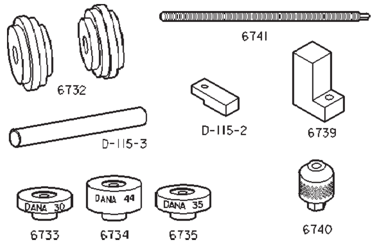
Installer—6437



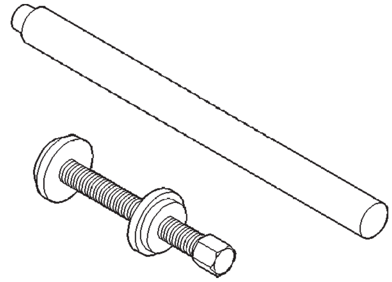
Disc, Axle Arbor—6732



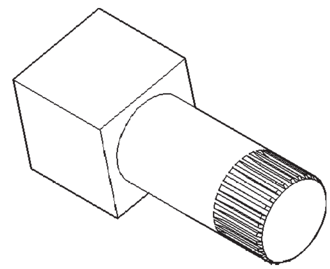
Gauge Block—6735



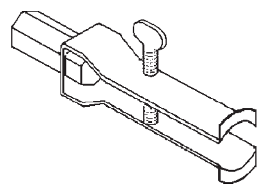
Tool Set, Pinion Depth—6774



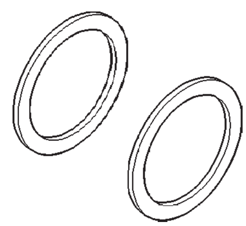
Trac-lok Tool Set—6960



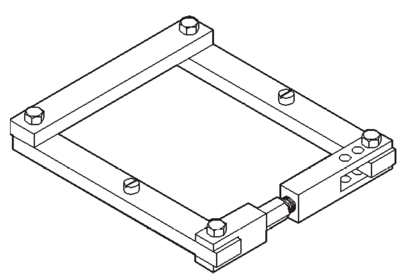
Holder—6965



Puller—7794-A

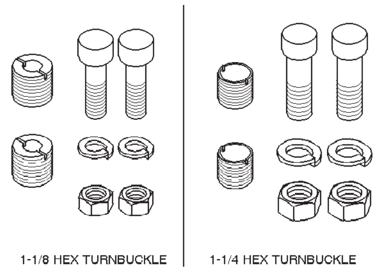


Starting Point Shim—8107

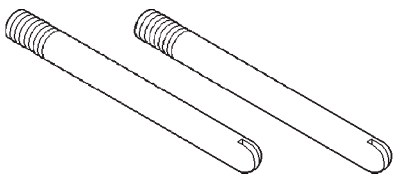


Spreader—W-129-B

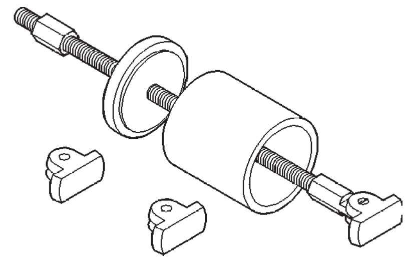
SPECIAL TOOLS (Continued)



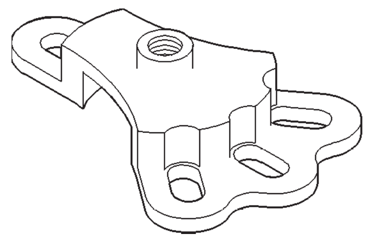
Adapter Kit—6987



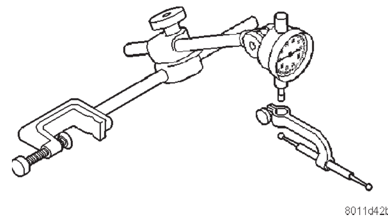
Guide Pin—C-3288-B



Bearing Remover Tool Set—6310



Hub Puller—6790



Dial Indicator—C-3339

8 1/4 REAR AXLE

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DESCRIPTION AND OPERATION

8 1/4 AXLE

DESCRIPTION

The 8 1/4 inch axle housings consist of a cast iron center section with axle tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing (Fig. 1).

The axles have a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

The axles are equipped with semi-floating axle shafts, meaning vehicle loads are supported by the axle shaft and bearings. The axle shafts are retained by C-locks in the differential side gears.

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle.

The 8 1/4 axle have a date tag and a gear ratio tag. The tags are attached to the differential housing by a cover bolt.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

Axles equipped with a Trac-Lok™ differential are optional. A Trac-Lok differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

AXLE IDENTIFICATION

The axle differential cover can be used for identification of the axle (Fig. 2). A tag is also attached to the cover.

OPERATION

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

DESCRIPTION AND OPERATION (Continued)

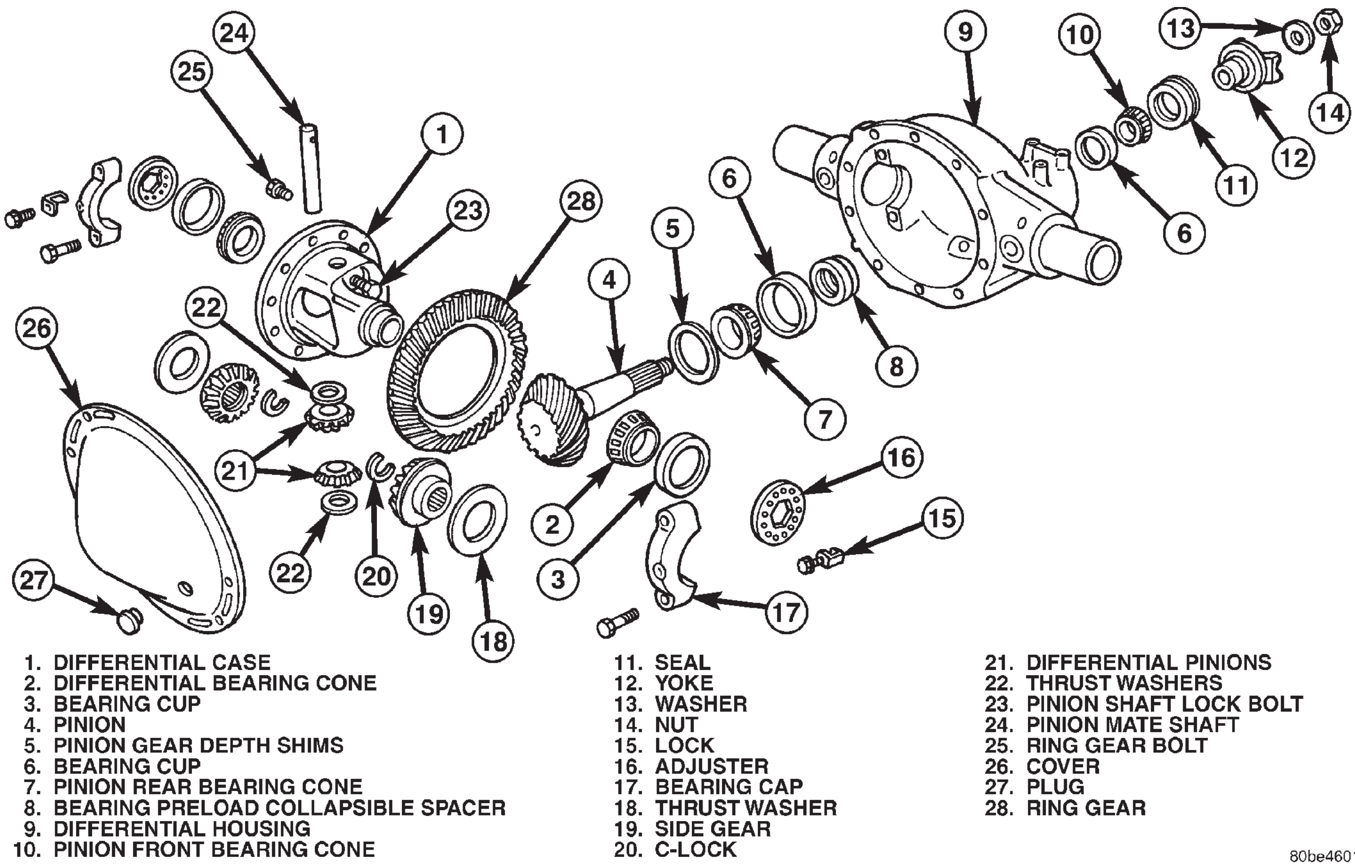


Fig. 1 8 1/4 Axle

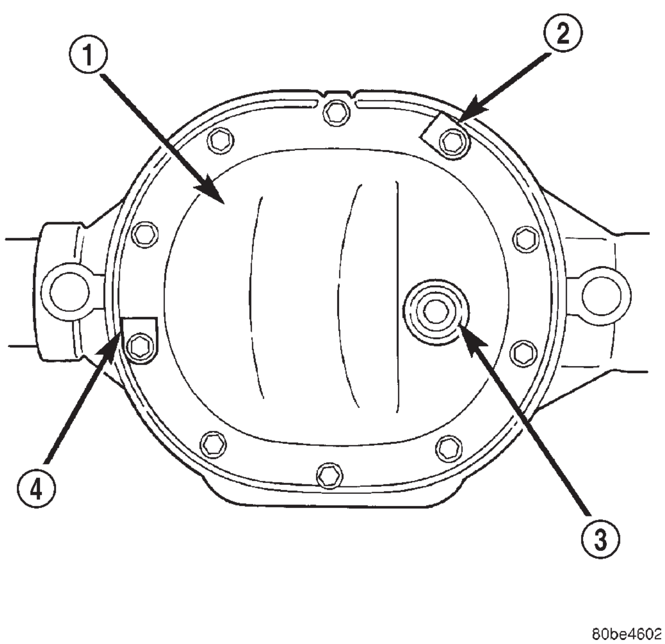


Fig. 2 Differential Cover 8 1/4 Inch Axle

1 – DIFFERENTIAL COVER
2 – IDENTIFICATION TAG
3 – PUSH-IN FILL PLUG
4 – DATE TAG

LUBRICANT

DESCRIPTION

Multi-purpose, hypoid gear lubricant should be used for rear axles with a standard differential. The lubricant should have a MIL-L-2105C and API GL 5 quality specifications.

Trac-Lok differentials require the addition of 4 oz. of friction modifier to the axle lubricant after service. The 8 1/4 axle lubricant capacity is 2.08 L (4.4 pts.) total, including the friction modifier, if necessary.

CAUTION: If the rear axle is submerged in water, the lubricant must be replaced immediately. Avoid the possibility of premature axle failure resulting from water contamination of the lubricant.

DESCRIPTION AND OPERATION (Continued)

STANDARD DIFFERENTIAL

DESCRIPTION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

OPERATION

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

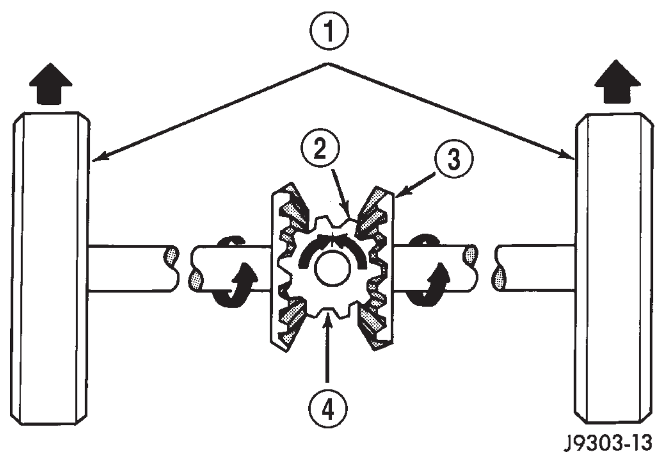


Fig. 3 Differential Operation—Straight Ahead Driving

1 – IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 – PINION GEAR
3 – SIDE GEAR
4 – PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 4). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

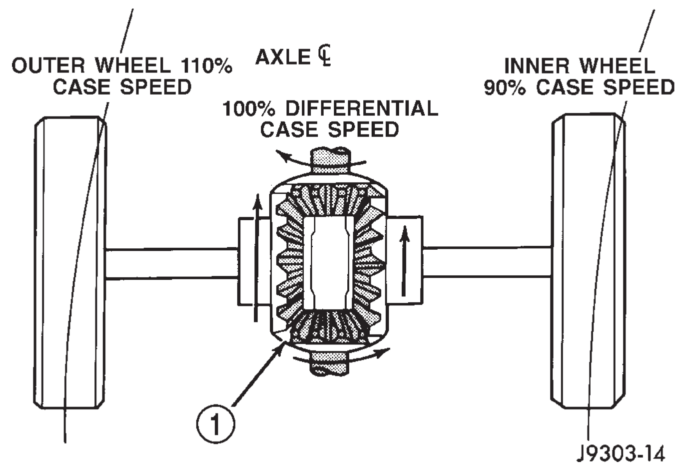


Fig. 4 Differential Operation—On Turns

1 – PINION GEARS ROTATE ON PINION SHAFT

TRAC-LOK™ DIFFERENTIAL

DESCRIPTION

In a standard differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

In the Trac-lok™ differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. The clutches will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth in appearance.

OPERATION

In operation, the Trac-lok™ clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 5).

DESCRIPTION AND OPERATION (Continued)

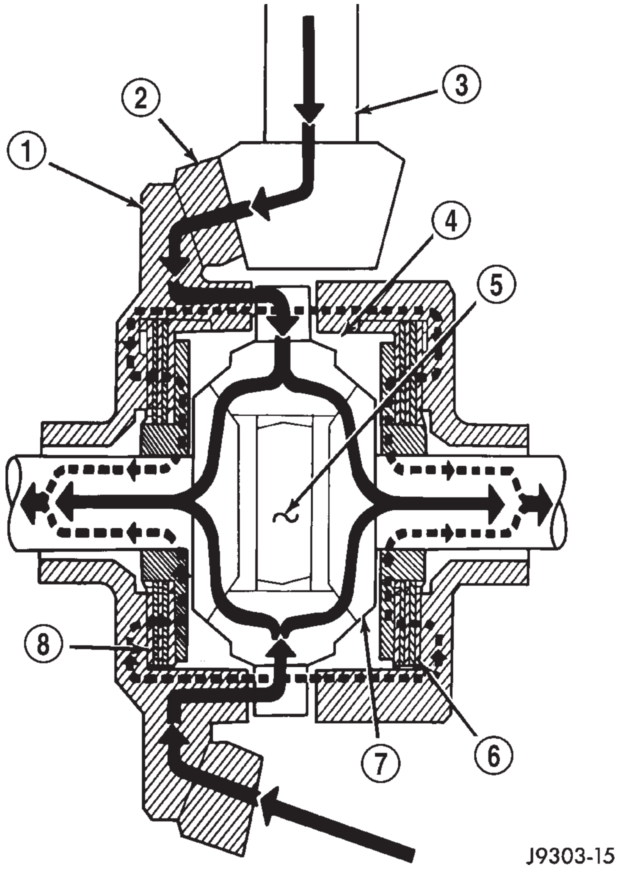


Fig. 5 Trac-lok™ Limited Slip Differential Operation

1 – CASE
2 – RING GEAR
3 – DRIVE PINION
4 – PINION GEAR
5 – MATE SHAFT
6 – CLUTCH PACK
7 – SIDE GEAR
8 – CLUTCH PACK

The Trac-lok™ design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok™ differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.
- Differential housing bores not square to each other.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSTIC CHART

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

DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

DIAGNOSIS AND TESTING (Continued)

GEAR NOISE

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

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

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

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

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

BEARING NOISE

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

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

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

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

LOW SPEED KNOCK

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

VIBRATION

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

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

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

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U–joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

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

TRAC–LOK™ DIFFERENTIAL NOISE

The most common problem is a chatter noise when turning corners. Before removing a Trac-lok™ unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Mopar® Trac-lok™ Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIAGNOSIS AND TESTING (Continued)

TRAC–LOK™ TEST

WARNING: WHEN SERVICING VEHICLES WITH A TRAC–LOK™ DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A TRAC–LOK™ AXLE CAN EXERT ENOUGH FORCE IF ONE WHEEL IS IN CONTACT WITH A SURFACE TO CAUSE THE VEHICLE TO MOVE.

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 6).

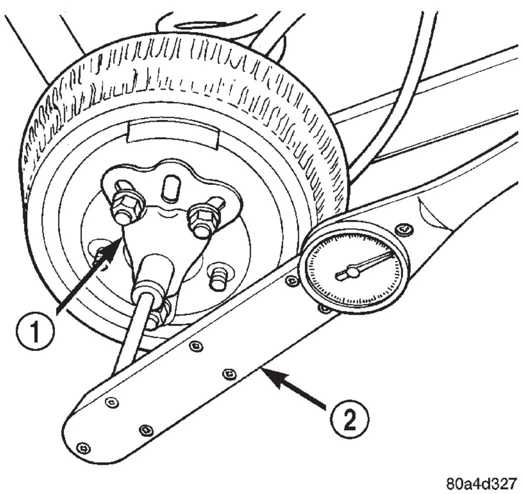


Fig. 6 Trac-lok™ Test —Typical

1 – SPECIAL TOOL 6790 WITH BOLT IN CENTER HOLE
2 – TORQUE WRENCH

(6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

SERVICE PROCEDURES

LUBRICANT CHANGE

(1) Raise and support the vehicle.

(2) Remove the lubricant fill hole plug from the differential housing cover.

(3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

(5) Remove the original sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 7).

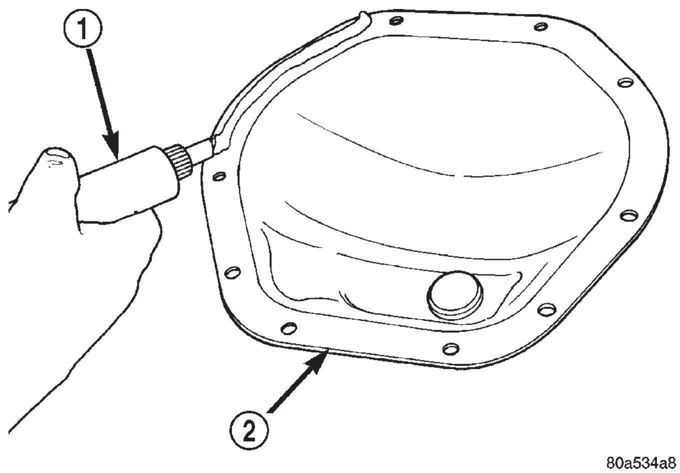


Fig. 7 Apply Sealant

1 – SEALANT
2 – AXLE HOUSING COVER

Install the housing cover within 5 minutes after applying the sealant.

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) For Trac–lok™ differentials, a quantity of Mopar® Trac–lok™ lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

(9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

(10) Install the fill hole plug and lower the vehicle.

(11) Trac–lok™ differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

(1) Raise and support the vehicle.

(2) Position a suitable lifting device under the axle.

(3) Secure axle to device.

(4) Remove the wheels and tires.

(5) Secure brake drums to the axle shaft.

(6) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.

(7) Disconnect the parking brake cables and cable brackets.

(8) Disconnect the vent hose from the axle tube.

(9) Mark the propeller shaft and yoke for installation alignment reference.

(10) Remove propeller shaft.

(11) Disconnect shock absorbers from axle.

(12) Remove the stabilizer links.

(13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.

(14) Separate the axle from the vehicle.

INSTALLATION

(1) Raise the axle with lifting device and align to the leaf spring centering bolts.

(2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.

(3) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.) torque.

(4) Install the stabilizer links. Tighten sway bar links to 74 N·m (55 ft. lbs.).

(5) Connect the parking brake cables and cable brackets.

(6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.

(8) Install axle vent hose.

(9) Align propeller shaft and pinion yoke reference marks. Install universal joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.

(10) Install the wheels and tires.

(11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(12) Remove lifting device from axle and lower the vehicle.

AXLE SHAFT

REMOVAL

(1) Raise and support vehicle. Ensure that the transmission is in neutral.

(2) Remove wheel and tire assembly.

(3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.

(4) Clean all foreign material from housing cover area.

(5) Loosen housing cover bolts. Drain lubricant from the housing and axle tubes. Remove housing cover.

(6) Rotate differential case so that pinion mate shaft lock screw is accessible. Remove lock screw and pinion mate shaft from differential case (Fig. 8).

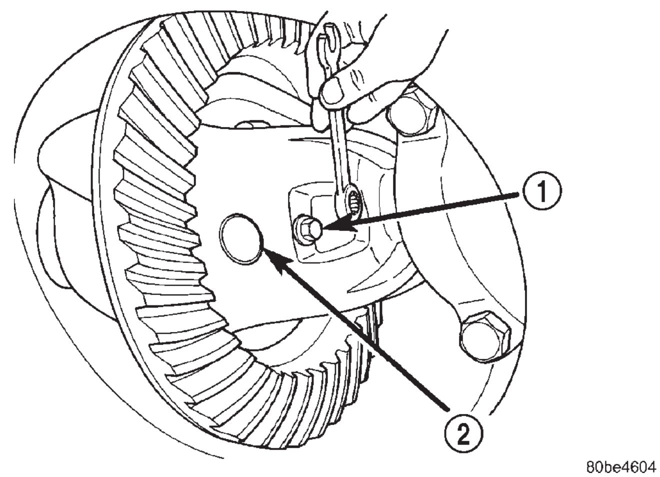


Fig. 8 Pinion Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION MATE SHAFT

(7) Push axle shaft inward and remove axle shaft C–lock from the axle shaft (Fig. 9).

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle tube.

(9) Inspect axle shaft seal for leakage or damage.

(10) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

REMOVAL AND INSTALLATION (Continued)

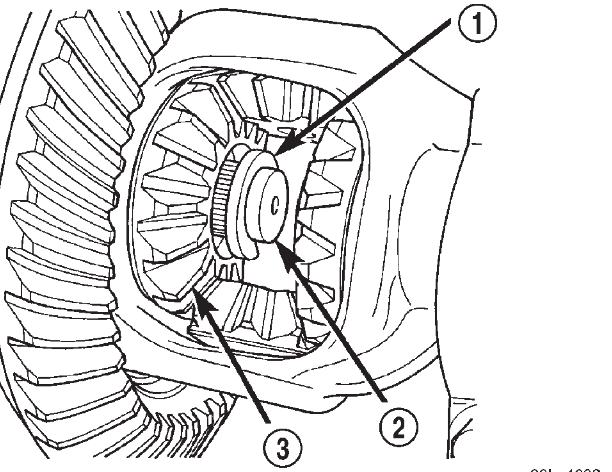


Fig. 9 Axle Shaft C–Lock

1 – C—LOCK
2 – AXLE SHAFT
3 – SIDE GEAR

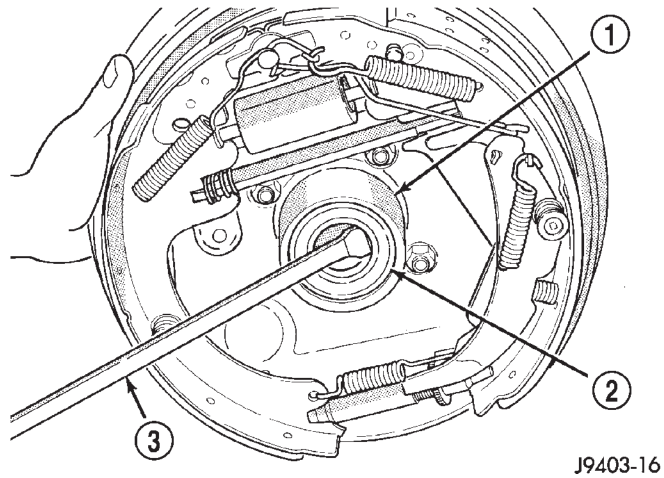


Fig. 10 Axle Seal Removal

1 – AXLE TUBE
2 – AXLE SEAL
3 – PRY BAR

(2) Insert C–lock in end of axle shaft. Push axle shaft outward to seat C–lock in side gear.

(3) Insert pinion shaft into differential case and through thrust washers and differential pinions.

(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 11 N·m (8 ft. lbs.) torque.

(5) Install cover and add fluid. Refer to Lubricant Change procedure in this section for procedure and lubricant requirements.

(6) Install brake drum. Refer to Group 5, Brakes, for proper procedures.

(7) Install wheel and tire.

(8) Lower vehicle.

AXLE SEAL AND BEARING

REMOVAL

(1) Remove axle shaft.

(2) Remove axle shaft seal from the end of the axle tube with a small pry bar (Fig. 10).

NOTE: The seal and bearing can be removed at the same time with the bearing removal tool.

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310, using Adapter Foot 6310-9 (Fig. 11).

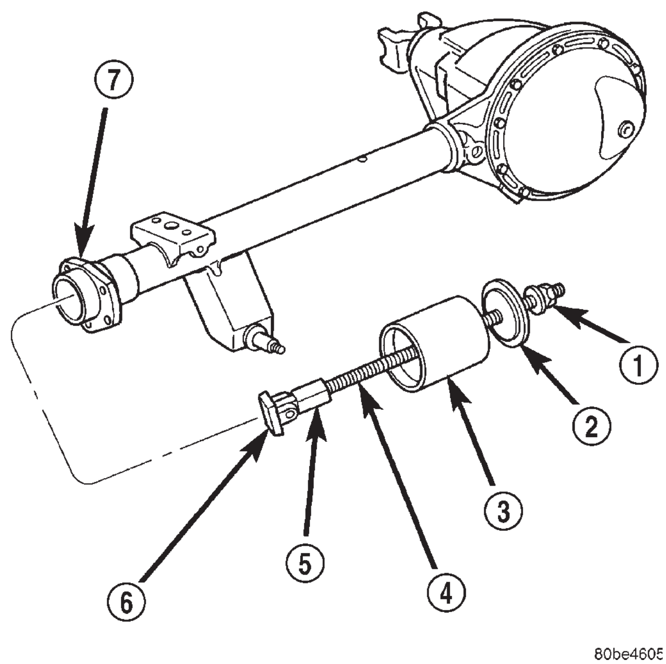


Fig. 11 Axle Shaft Bearing Removal Tool

1 – NUT
2 – GUIDE PLATE
3 – GUIDE
4 – THREADED ROD
5 – ADAPTER
6 – FOOT
7 – AXLE TUBE

INSTALLATION

NOTE: Do not install the original axle shaft seal. Always install a new seal.

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.

(2) Install the axle shaft bearing with Installer C-4198 and Handle C-4171 (Fig. 12). Ensure that the bearing part number is against the installer. Verify that the bearing in installed straight and the tool fully contacts the axle tube when seating the bearing.

REMOVAL AND INSTALLATION (Continued)

(3) Install a new axle seal with Installer C-4076-B and Handle C-4735-1. When the tool contacts the axle tube, the seal is installed to the correct depth.

(4) Coat the lip of the seal with axle lubricant for protection prior to installing the axle shaft.

(5) Install the axle shaft.

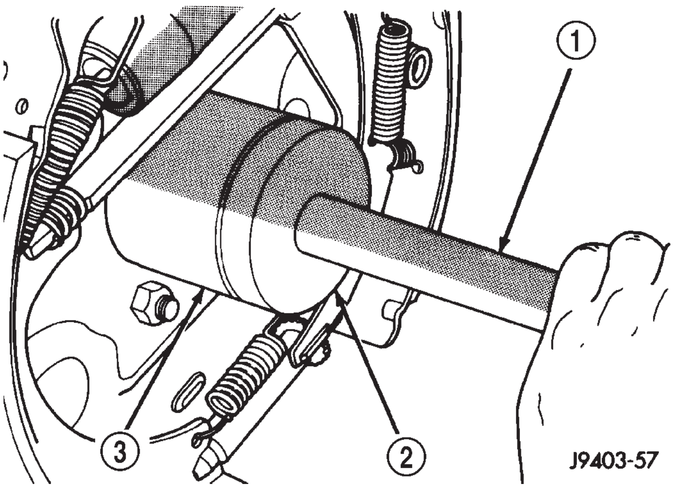


Fig. 12 Axle Shaft Seal and Bearing Installation

1 – HANDLE
2 – INSTALLER
3 – AXLE TUBE

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Scribe a mark on the universal joint, pinion yoke, and pinion shaft for reference.

(3) Disconnect the propeller shaft from the pinion yoke. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.

(4) Remove the wheel and tire assemblies.

(5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.

(6) Rotate the pinion yoke three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.

(8) Hold the yoke with Wrench 6719. Remove the pinion nut and washer.

(9) Remove the yoke with Remover C-452 (Fig. 13).

(10) Remove the pinion seal with suitable pry tool or slide-hammer mounted screw.

INSTALLATION

(1) Clean the seal contact surface in the housing bore.

(2) Examine the splines on the pinion shaft for burrs or wear. Remove any burrs and clean the shaft.

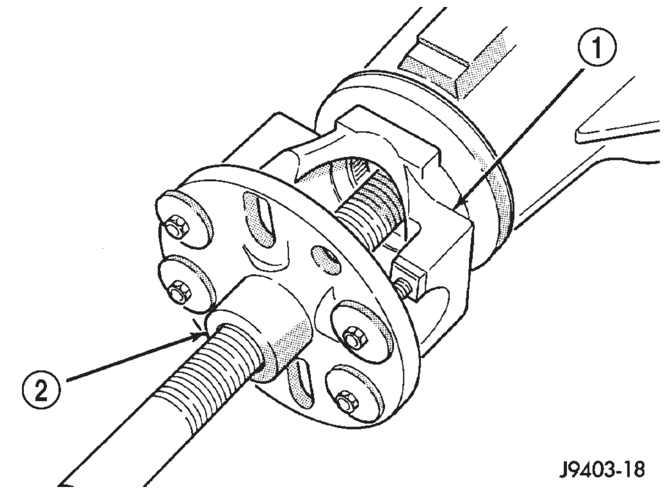


Fig. 13 Yoke Removal

1 – PINION YOKE
2 – TOOL C452

(3) Inspect pinion yoke for cracks, worn splines and worn seal contact surface. Replace yoke if necessary.

NOTE: The outer perimeter of the seal is pre-coated with a special sealant. An additional application of sealant is not required.

(4) Apply a light coating of gear lubricant on the lip of pinion seal.

(5) Install the new pinion seal with Installer C-4076-B and Handle C-4735-1 (Fig. 14).

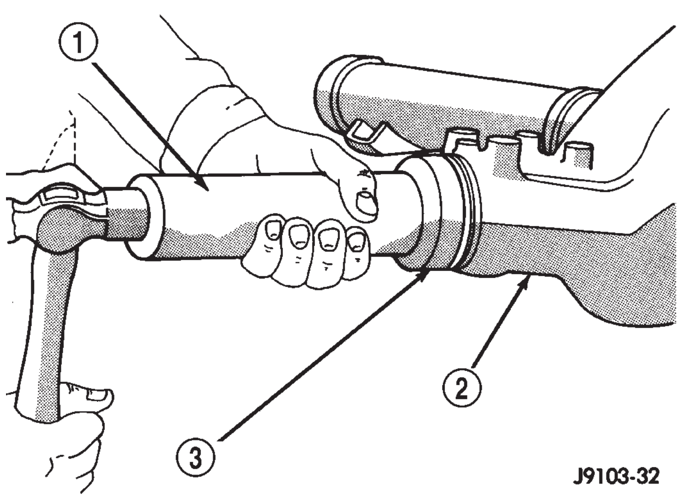


Fig. 14 8 1/4 Axle Pinion Seal Installation

1 – SPECIAL TOOL C-4735
2 – DIFFERENTIAL HOUSING
3 – SPECIAL TOOL C-4076-A

NOTE: The seal is correctly installed when the seal flange contacts the face of the differential housing flange.

REMOVAL AND INSTALLATION (Continued)

(6) Position the pinion yoke on the end of the shaft with the reference marks aligned.

(7) Seat yoke on pinion shaft with Installer C-3718 and Wrench 6719.

(8) Remove the tools and install the pinion yoke washer. The convex side of the washer must face outward.

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to collapsible spacer or bearings may result.

(9) Hold pinion yoke with Yoke Holder 6719 and tighten shaft nut to 285 N·m (210 ft. lbs.) (Fig. 15). Rotate the pinion several revolutions to ensure the bearing rollers are seated.

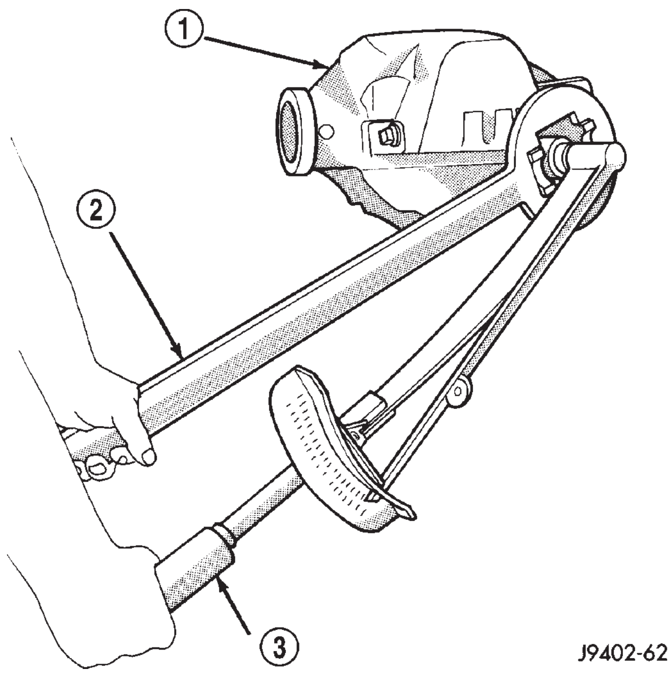


Fig. 15 Tightening Pinion Nut

1 – DIFFERENTIAL HOUSING
2 – YOKE HOLDER
3 – TORQUE WRENCH

(10) Rotate the pinion using an (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 16).

CAUTION: Never loosen pinion nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

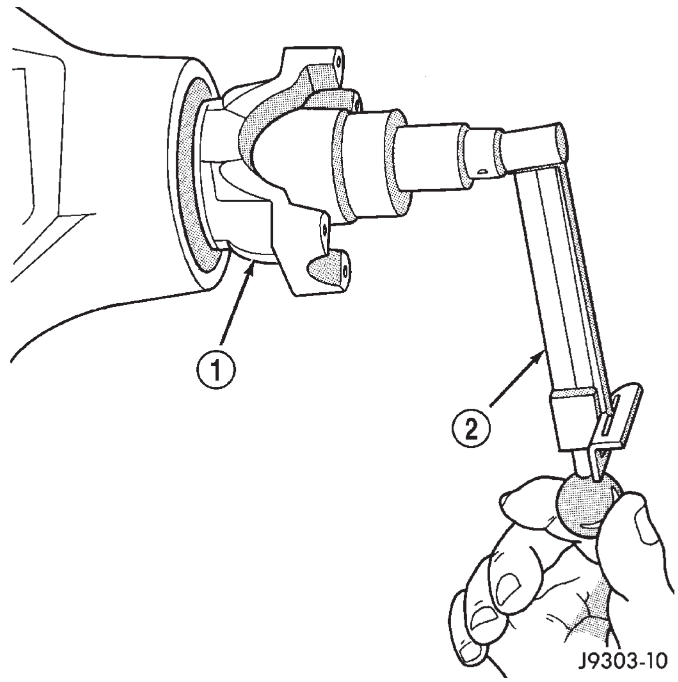


Fig. 16 Check Pinion Rotation Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

(11) If the rotating torque is low, use Yoke Holder 6719 to hold the pinion yoke (Fig. 15) and tighten the pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.

(12) The seal replacement is unacceptable if the final pinion nut torque is less than 285 N·m (210 ft. lbs.).

(13) Install the propeller shaft with the installation reference marks aligned.

(14) Tighten the universal joint yoke clamp screws to 19 N·m (14 ft. lbs.).

(15) Install the brake drums.

(16) Install wheel and tire assemblies and lower the vehicle.

(17) Check the differential housing lubricant level.

DIFFERENTIAL

REMOVAL

(1) Remove the axle shafts.

NOTE: Side play resulting from bearing races being loose on case hubs requires replacement of the differential case.

REMOVAL AND INSTALLATION (Continued)

(2) Mark the differential housing and the differential bearing caps for installation reference (Fig. 17).

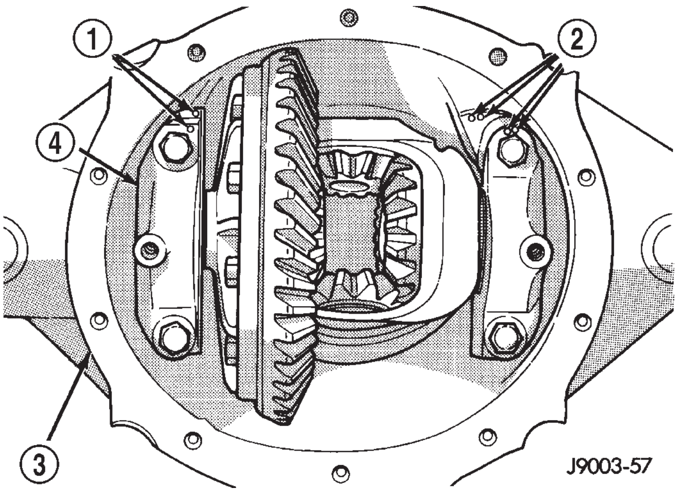


Fig. 17 Mark For Installation Reference

1 – INSTALLATION REFERENCE MARKS
2 – INSTALLATION REFERENCE MARKS
3 – DIFFERENTIAL HOUSING
4 – BEARING CAP

(3) Remove bearing threaded adjuster lock from each bearing cap. Loosen the bolts, but do not remove the bearing caps.

(4) Loosen the threaded adjusters with Wrench C-4164 (Fig. 18).

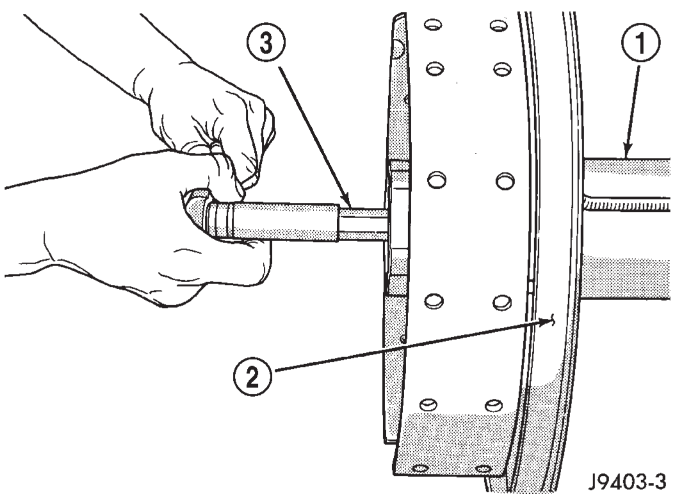


Fig. 18 Threaded Adjuster Tool

1 – AXLE TUBE
2 – BACKING PLATE
3 – TOOL C-4164

(5) Hold the differential case while removing bearing caps and adjusters.

(6) Remove the differential case.

NOTE: Each differential bearing cup and threaded adjuster must be kept with their respective bearing.

INSTALLATION

(1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups, and threaded adjusters. A dab of grease can be used to keep the adjusters in position. Carefully position the assembled differential case in the housing.

(2) Observe the reference marks and install the differential bearing caps at their original locations (Fig. 19).

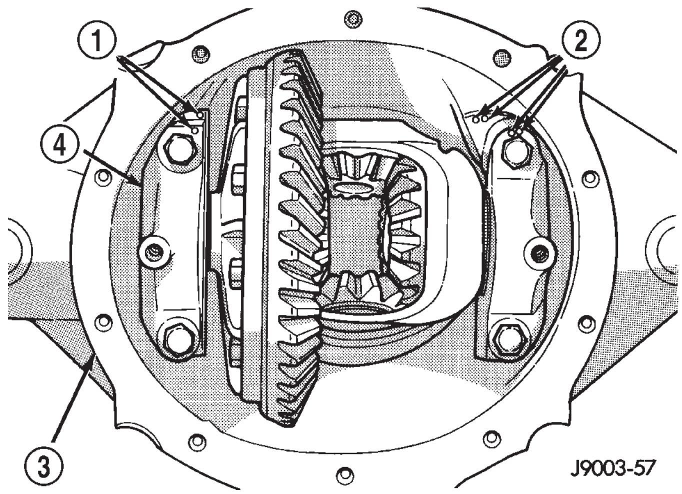


Fig. 19 Bearing Caps & Bolts

1 – INSTALLATION REFERENCE MARKS
2 – INSTALLATION REFERENCE MARKS
3 – DIFFERENTIAL HOUSING
4 – BEARING CAP

(3) Install bearing cap bolts and tighten the upper bolts to 14 N·m (10 ft. lbs.). Tighten the lower bolts finger-tight until the bolt head is seated.

(4) Perform the differential bearing preload and adjustment procedure.

NOTE: Be sure that all bearing cap bolts are tightened to the final torque of 95 N·m (70 ft.lbs) before proceeding.

(5) Install axle shafts and differential housing cover.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA and Adapters C-293-48 and Plug SP-3289 (Fig. 20).

INSTALLATION

(1) Install differential side bearings. Use Installer C-4340 with handle C-4171 (Fig. 21).

(2) Install differential case in axle housing.

REMOVAL AND INSTALLATION (Continued)

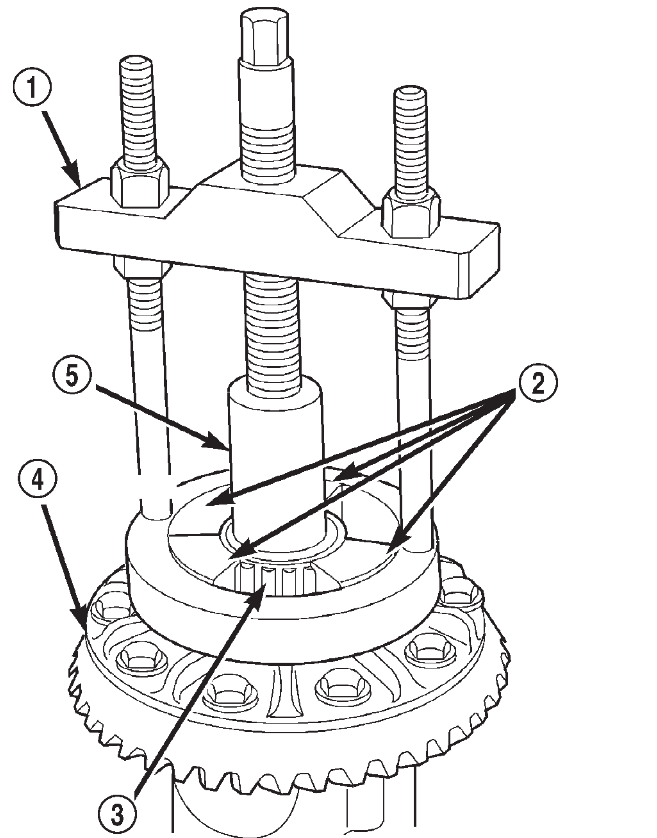


Fig. 20 Differential Bearing Removal

1 – SPECIAL TOOL C-293–PA
2 – SPECIAL TOOL C-293–48
3 – BEARING
4 – DIFFERENTIAL
5 – SPECIAL TOOL SP-3289

RING GEAR

The ring gear and pinion are serviced in a matched set. Do not replace the ring gear without replacing the pinion.

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 22).

(3) Remove bolts holding ring gear to differential case.

(4) Using a soft hammer, drive ring gear from differential case (Fig. 22).

INSTALLATION

CAUTION: Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case.

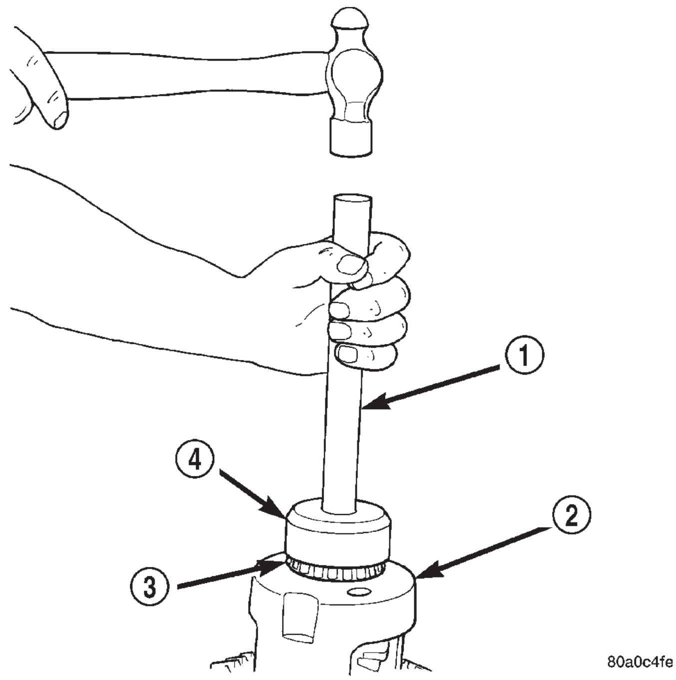


Fig. 21 Install Differential Side Bearings

1 – HANDLE C-4171
2 – DIFFERENTIAL
3 – BEARING
4 – TOOL C-4340

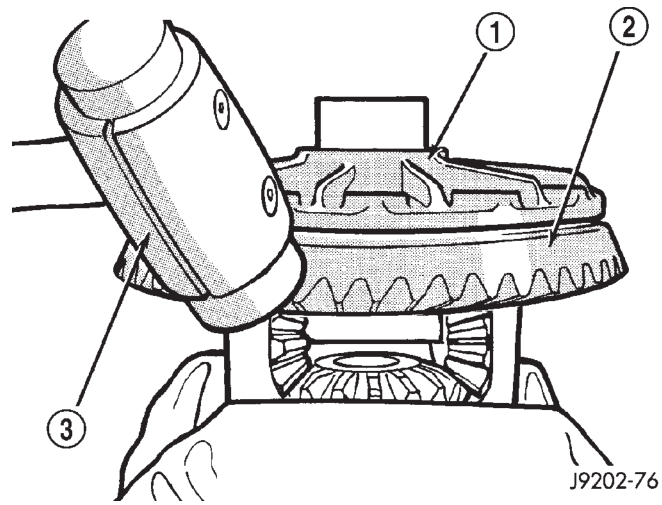


Fig. 22 Ring Gear Removal

1 – CASE
2 – RING GEAR
3 – RAWHIDE HAMMER

(2) Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(3) Invert the differential case in the vise.

(4) Install new ring gear bolts and alternately tighten to 102 N·m (75 ft. lbs.) torque (Fig. 23).

(5) Install differential in axle housing and verify gear mesh and contact pattern.

REMOVAL AND INSTALLATION (Continued)

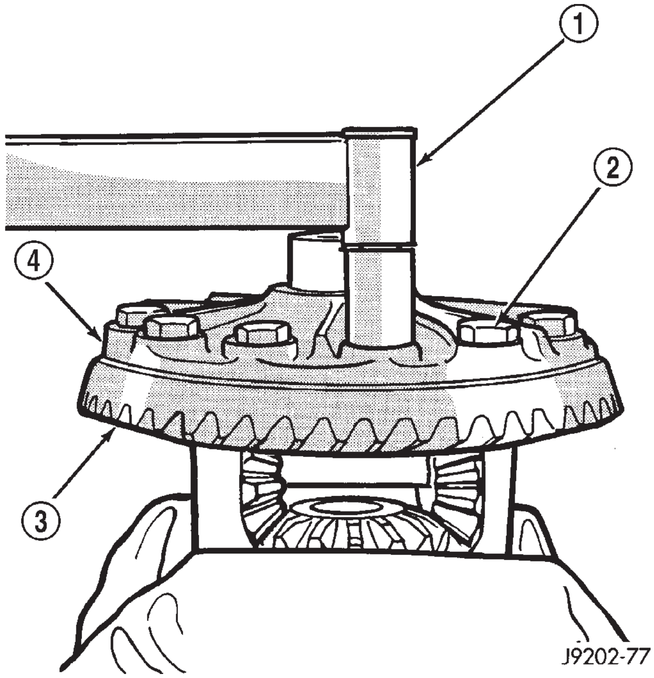


Fig. 23 Ring Gear Bolt Installation

1 – TORQUE WRENCH
2 – RING GEAR BOLT
3 – RING GEAR
4 – CASE

PINION GEAR

The ring gear and pinion are serviced in a matched set. Do not replace the pinion without replacing the ring gear.

REMOVAL

(1) Remove differential from the axle housing.

(2) Mark pinion yoke and propeller shaft for installation alignment.

(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

(4) Using Yoke Holder 6719 to hold yoke and remove the pinion yoke nut and washer.

(5) Using Remover C–452, remove the pinion yoke from pinion shaft (Fig. 24).

(6) Partially install pinion nut onto pinion to protect the threads.

(7) Remove the pinion from housing (Fig. 25). Catch the pinion with your hand to prevent it from falling and being damaged.

(8) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.

(9) Remove oil slinger, if equipped, and front pinion bearing.

(10) Remove the front pinion bearing cup with Remover C-4345 and Handle C–4171 (Fig. 26).

(11) Remove the rear bearing cup from housing (Fig. 27). Use Remover C-4307 and Handle C–4171.

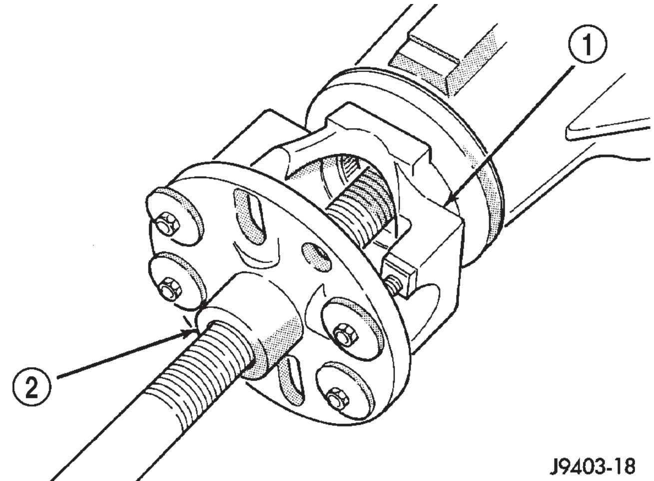


Fig. 24 Pinion Yoke Removal

1 – PINION YOKE
2 – TOOL C452

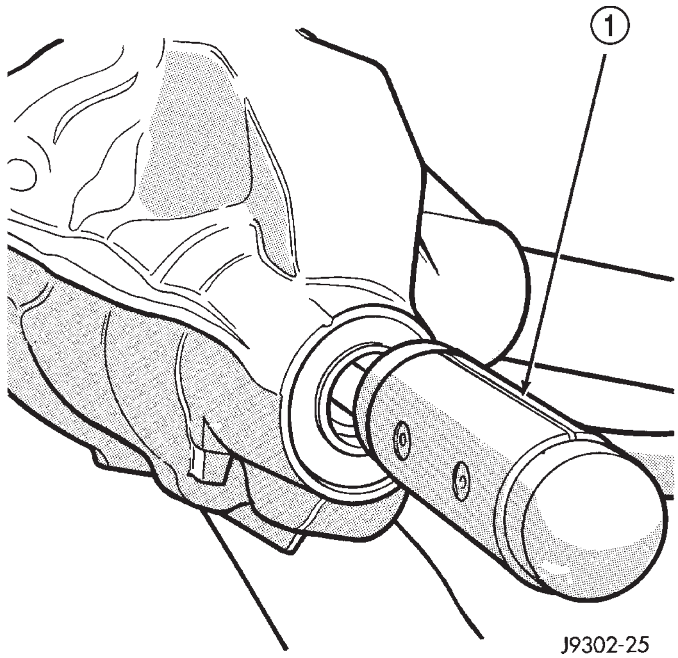


Fig. 25 Remove Pinion Gear

1 – RAWHIDE HAMMER

(12) Remove the collapsible preload spacer (Fig. 28).

(13) Remove the rear bearing from the pinion (Fig. 29) with Puller/Press C-293-PA and Adapters C-293-47. **Place 4 adapter blocks so they do not damage the bearing cage.**

(14) Remove the depth shims from the pinion shaft. Record the thickness of the depth shims.

INSTALLATION

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(2) Install the pinion rear bearing cup (Fig. 30) with Installer C-4308 and Driver Handle C–4171.

REMOVAL AND INSTALLATION (Continued)

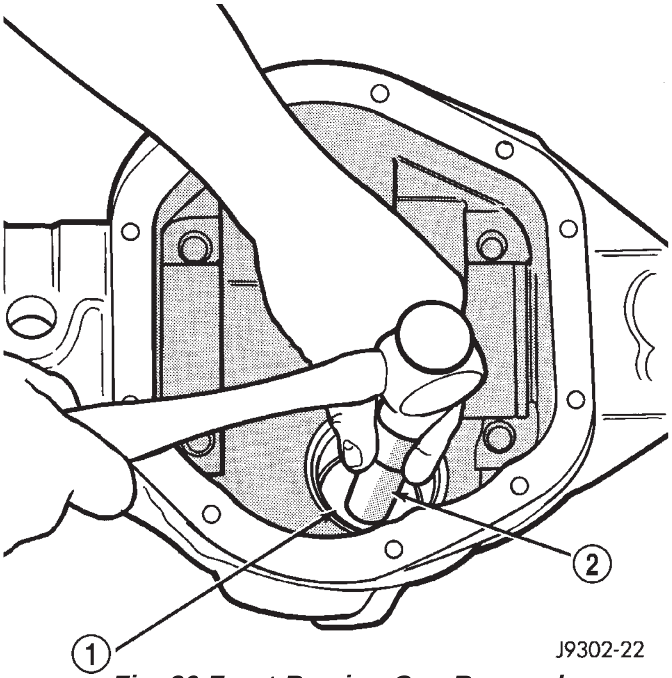


Fig. 26 Front Bearing Cup Removal

1 – REMOVER
2 – HANDLE

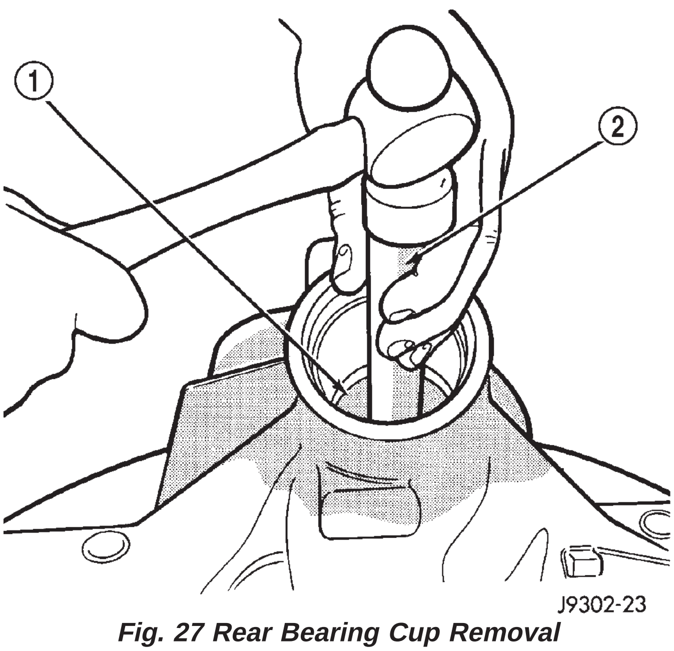


Fig. 27 Rear Bearing Cup Removal

1 – DRIVER
2 – HANDLE

(2) Ensure cup is correctly seated.

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(4) Install the pinion front bearing cup (Fig. 31) with Installer D–130 and Handle C–4171.

(5) Install pinion front bearing, and oil slinger, if equipped.

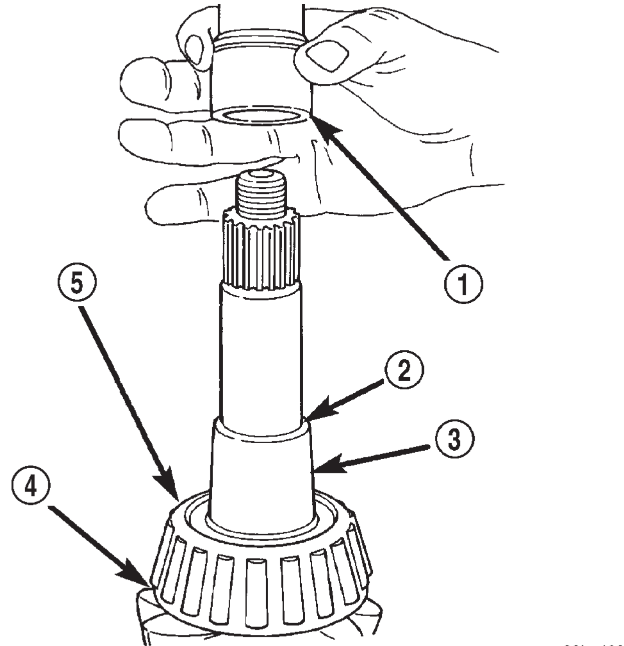


Fig. 28 Collapsible Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION
4 – PINION DEPTH SHIM
5 – REAR BEARING

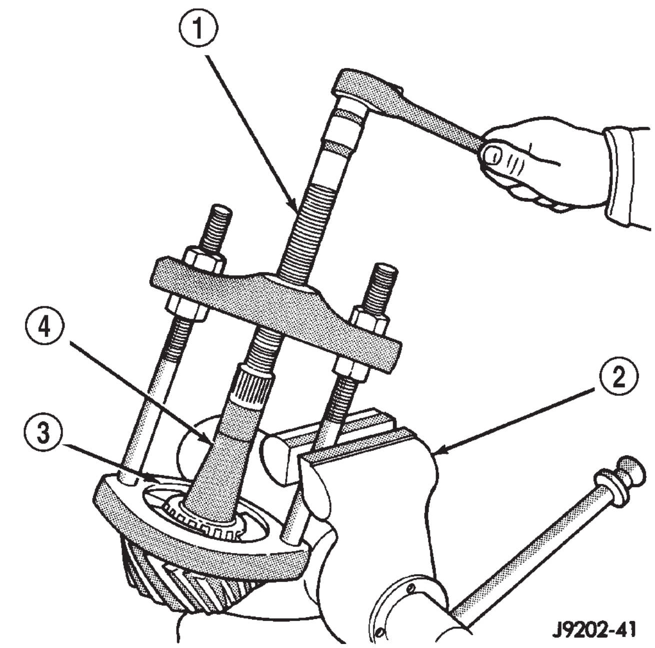


Fig. 29 Rear Bearing Removal

1 – SPECIAL TOOL C-293–PA
2 – VISE
3 – ADAPTERS
4 – DRIVE PINION GEAR SHAFT

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076–B and Handle C-4735-1 (Fig. 32).

REMOVAL AND INSTALLATION (Continued)

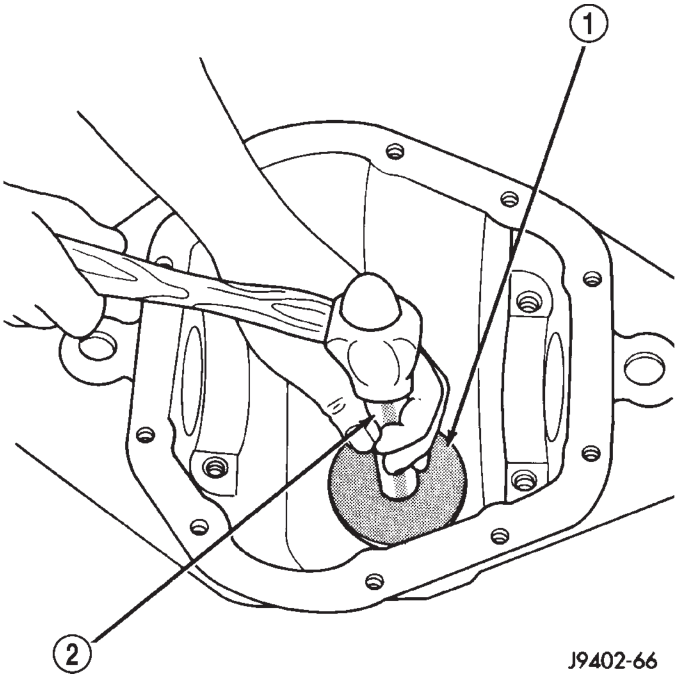


Fig. 30 Pinion Rear Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

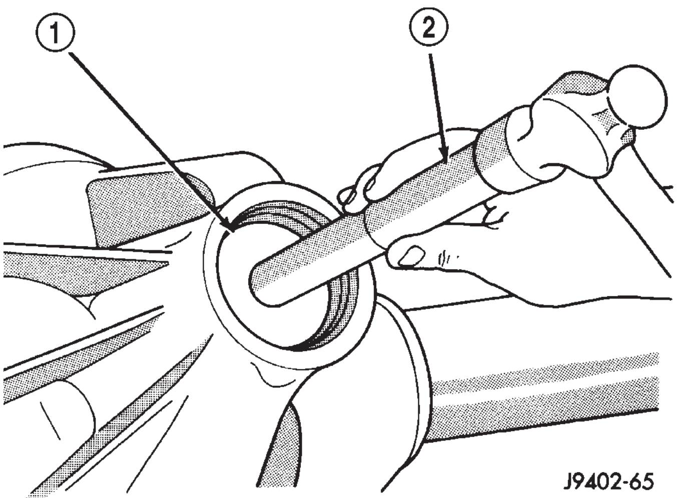


Fig. 31 Pinion Front Bearing Cup Installation

1 – INSTALLER
2 – HANDLE

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion head to achieve proper ring and pinion gear mesh. If the factory installed ring gear and pinion are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(7) Place the proper thickness depth shim on the pinion.

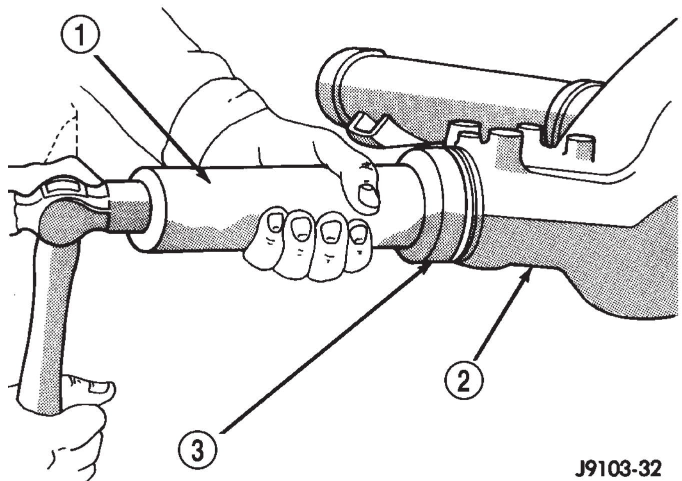


Fig. 32 Pinion Seal Installation

1 – SPECIAL TOOL C-4735
2 – DIFFERENTIAL HOUSING
3 – SPECIAL TOOL C-4076-A

(8) Install the rear bearing and slinger, if equipped, on the pinion (Fig. 33) with Installer 6448.

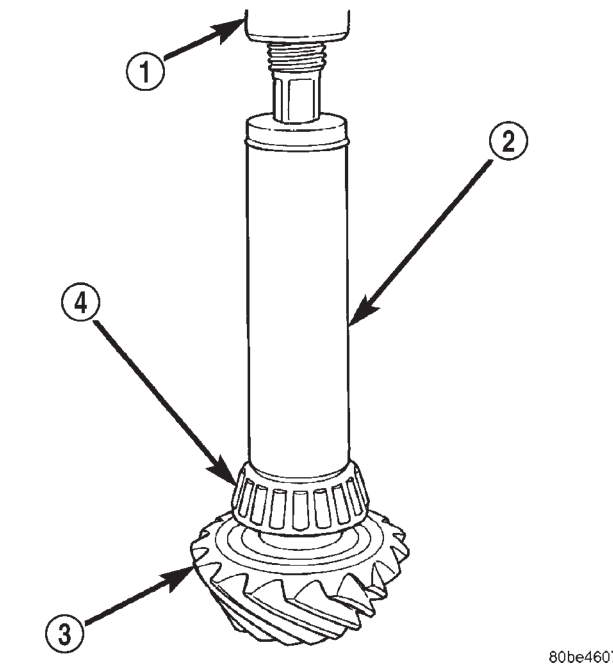


Fig. 33 Shaft Rear Bearing Installation

1 – PRESS
2 – INSTALLATION TOOL
3 – DRIVE PINION
4 – DRIVE PINION SHAFT REAR BEARING

(9) Install a new collapsible preload spacer on pinion shaft and install pinion in housing (Fig. 34).

(10) Install pinion in housing.

(11) Install yoke with Installer C-3718 and Yoke Holder 6719.

(12) Install the yoke washer and a new nut on the pinion and tighten the pinion nut until there is zero

REMOVAL AND INSTALLATION (Continued)

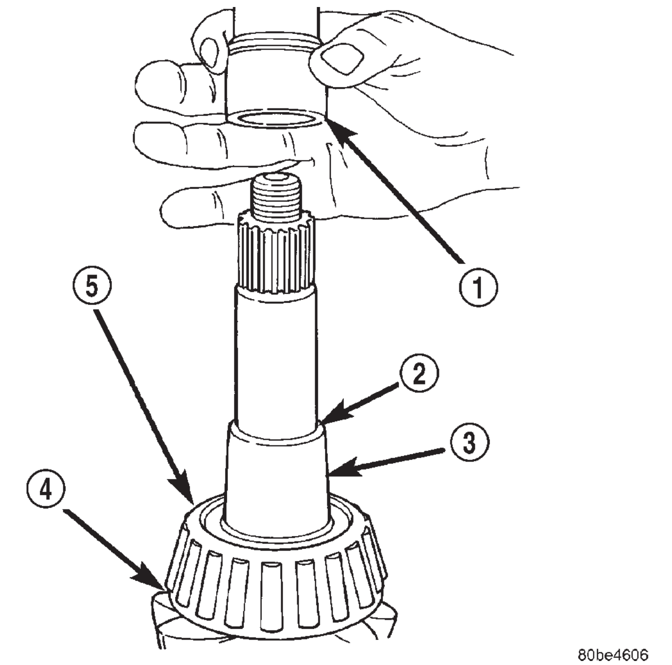


Fig. 34 Collapsible Preload Spacer

1 – COLLAPSIBLE SPACER
2 – SHOULDER
3 – PINION
4 – PINION DEPTH SHIM
5 – REAR BEARING

bearing end-play. It will not be possible at this point to achieve zero bearing end-play if a new collapsible spacer was installed.

(13) Tighten the nut to 285 N·m (210 ft. lbs.).

CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed. The torque sequence will then have to be repeated.

(14) Using Yoke Holder 6719, crush collapsible spacer until bearing end play is taken up.

(15) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 35).

(16) Check bearing rotating torque with an inch pound torque wrench (Fig. 35). The torque necessary to rotate the pinion gear should be:

- Original Bearings — 1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings — 1 to 5 N·m (10 to 30 in. lbs.).

(17) Install propeller shaft.

(18) Install differential in housing.

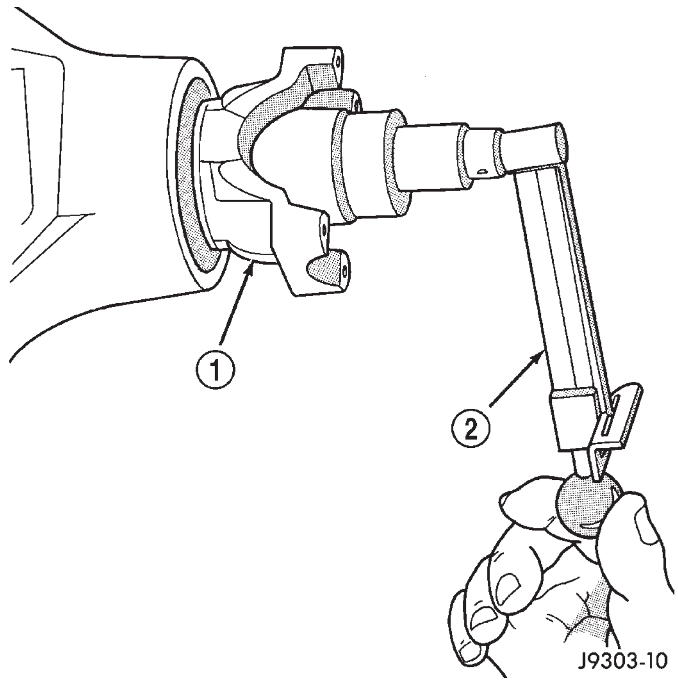


Fig. 35 Check Pinion Rotating Torque

1 – PINION YOKE
2 – INCH POUND TORQUE WRENCH

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion mate shaft lock screw (Fig. 36).

(2) Remove pinion mate shaft.

(3) Rotate the differential side gears and remove the differential pinion gears and thrust washers (Fig. 37).

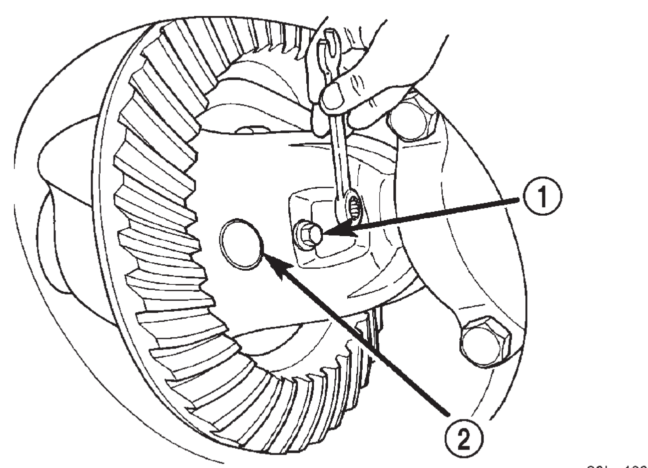


Fig. 36 Pinion Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION MATE SHAFT

(4) Remove the differential side gears and thrust washers.

DISASSEMBLY AND ASSEMBLY (Continued)

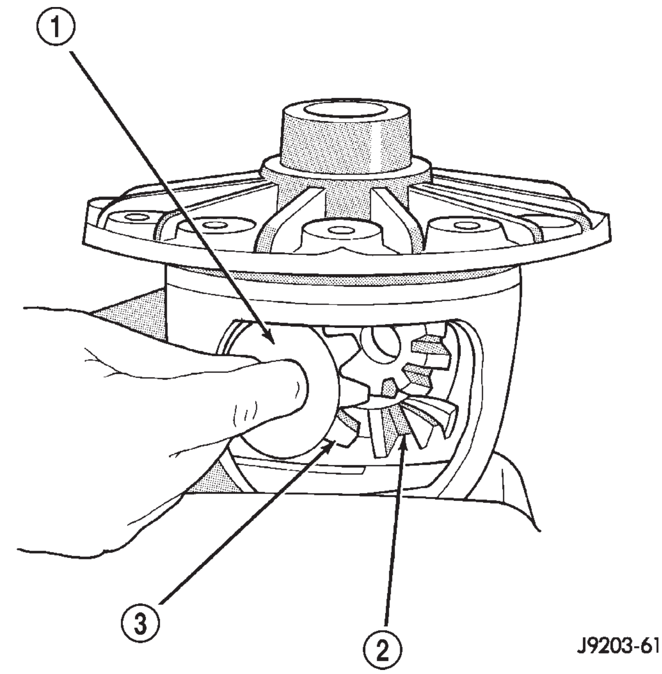


Fig. 37 Pinion Mate Gear Removal

1 – THRUST WASHER
2 – SIDE GEAR
3 – PINION MATE GEAR

ASSEMBLY

(1) Install the differential side gears and thrust washers.

(2) Install the differential pinion gears and thrust washers.

(3) Install the pinion mate shaft.

(4) Align the hole in the pinion mate shaft with the hole in the differential case and install the pinion mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

TRAC-LOK™ DIFFERENTIAL

The Trac–lok™ differential components are illustrated in (Fig. 38). Refer to this illustration during repair service.

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 8138 in a vise.

(2) Position the differential case on Side Gear Holding Tool 8138 (Fig. 39).

(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-lok™ differential can be serviced with the ring gear installed.

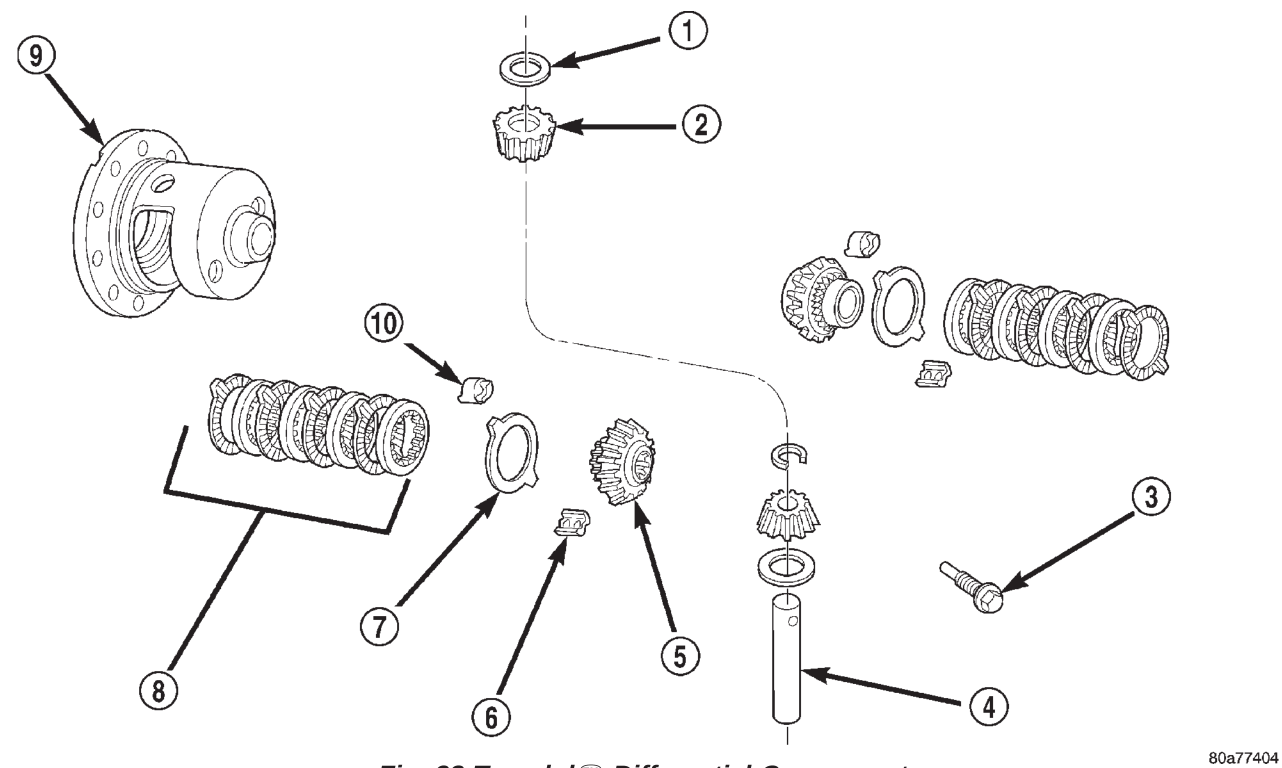


Fig. 38 Trac–lok™ Differential Components

1 – THRUST WASHER
2 – PINION
3 – SHAFT LOCK SCREW
4 – PINION MATE SHAFT
5 – SIDE GEAR
6 – RETAINER
7 – DISC
8 – CLUTCH PACK
9 – DIFFERENTIAL CASE
10 – RETAINER

DISASSEMBLY AND ASSEMBLY (Continued)

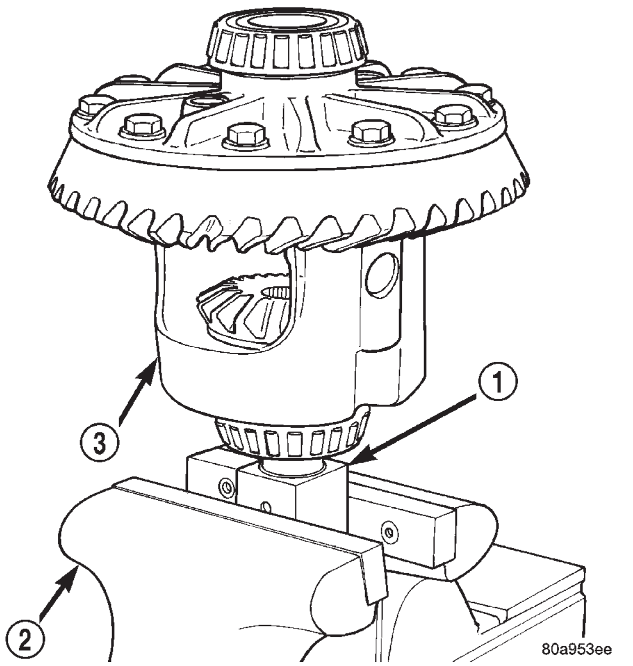


Fig. 39 Differential Case Holding Tool

1 – SIDE GEAR HOLDING TOOL
2 – VISE
3 – DIFFERENTIAL

(4) Remove the pinion mate shaft lock screw (Fig. 40).

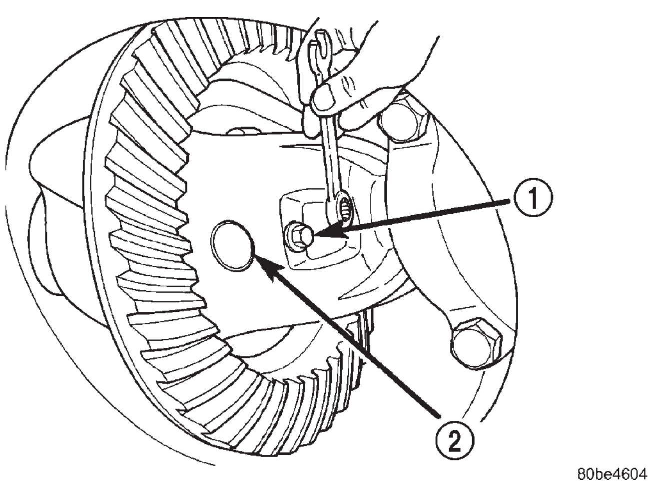


Fig. 40 Mate Shaft Lock Screw

1 – LOCK SCREW
2 – PINION MATE SHAFT

(5) Remove the pinion mate shaft. If necessary, use a drift and hammer (Fig. 41).

(6) Install and lubricate Step Plate 8140–2 (Fig. 42).

(7) Assemble Threaded Adapter 8140-1 into top side gear. Thread Forcing Screw 6960-4 into adapter until it becomes centered in adapter plate.

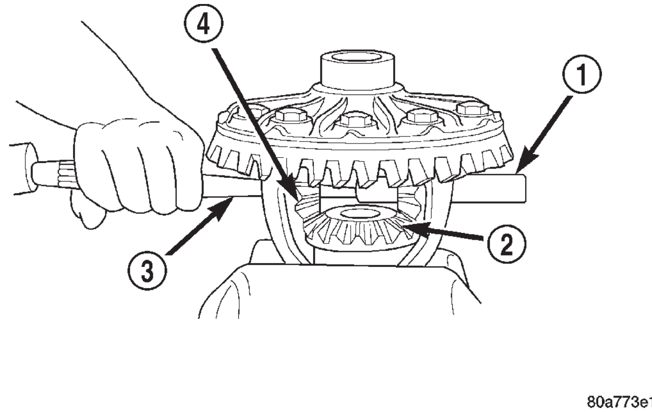


Fig. 41 Mate Shaft Removal

1 – PINION MATE SHAFT
2 – SIDE GEAR
3 – DRIFT
4 – PINION MATE GEAR

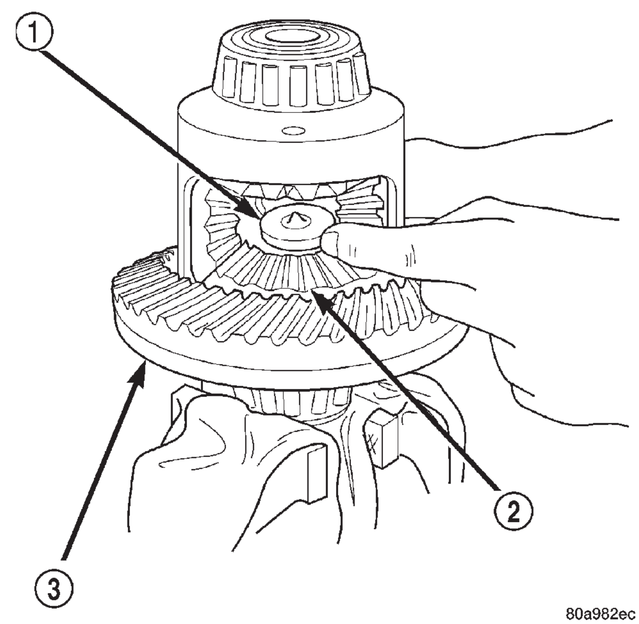


Fig. 42 Step Plate Tool Installation

1 – SPECIAL TOOL 8140–2
2 – LOWER SIDE GEAR
3 – DIFFERENTIAL CASE

(8) Position a small screw driver in slot of Threaded Adapter 8140-1 (Fig. 43) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 44).

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the differential pinions (Fig. 45).

(11) Insert Turning Bar 6960-2 in case (Fig. 46).

DISASSEMBLY AND ASSEMBLY (Continued)

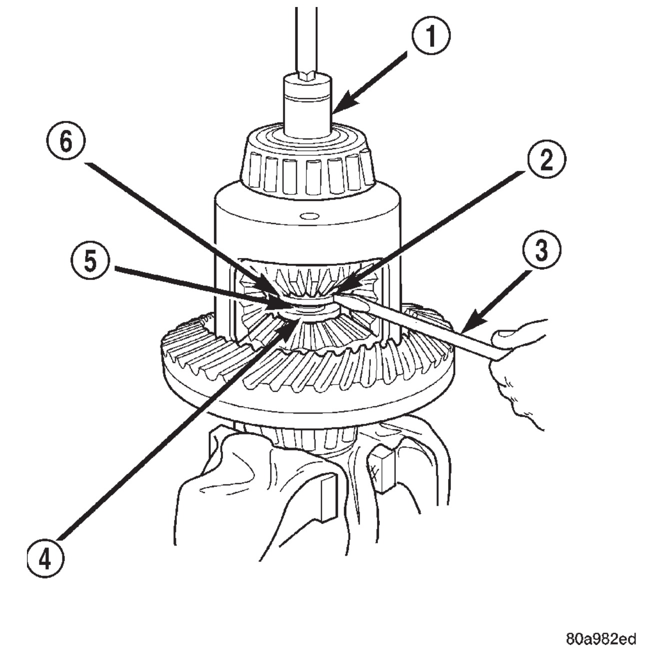


Fig. 43 Threaded Adapter Installation

1 – SOCKET
2 – SLOT IN ADAPTER
3 – SCREWDRIVER
4 – DISC 8140–2
5 – THREADED ROD C-6960–4
6 – THREADED ADAPTER DISC 8140–1

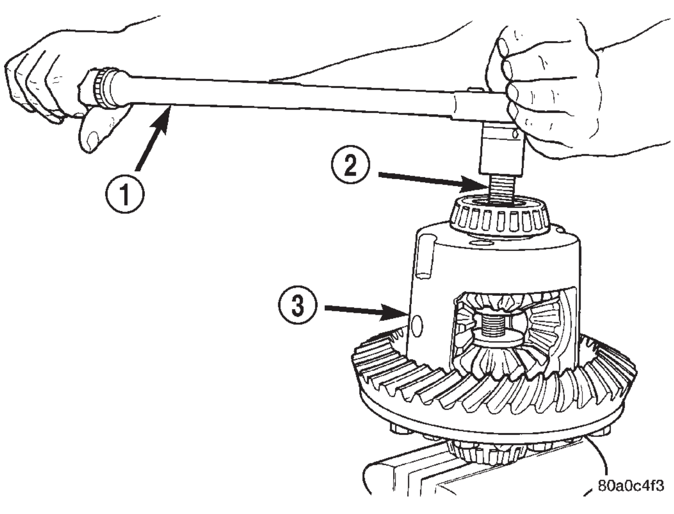


Fig. 44 Tighten Belleville Spring Compressor Tool

1 – TORQUE WRENCH
2 – TOOL ASSEMBLED
3 – DIFFERENTIAL CASE

(12) Loosen the Forcing Screw 6960-4 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar 6960-2.

(13) Rotate differential case until the differential pinions can be removed.

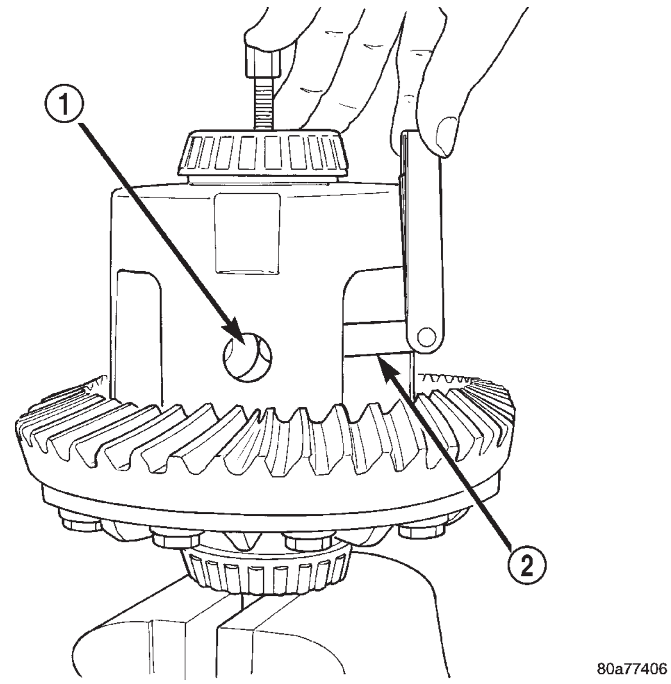


Fig. 45 Remove Pinion Thrust Washer

1 – THRUST WASHER
2 – FEELER GAUGE

(14) Remove pinions from differential case.

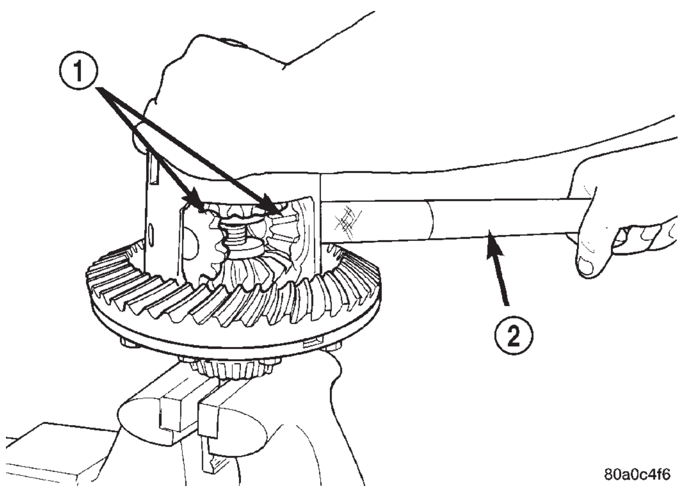


Fig. 46 Pinion Gear Removal

1 – PINION GEARS
2 – TOOL

(15) Remove Forcing Screw 6960-4, Step Plate 8140–2, and Threaded Adapter 8140–1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 47).

(17) Remove differential case from Side Gear Holding Tool 8138. Remove side gear, clutch pack retainer,

DISASSEMBLY AND ASSEMBLY (Continued)

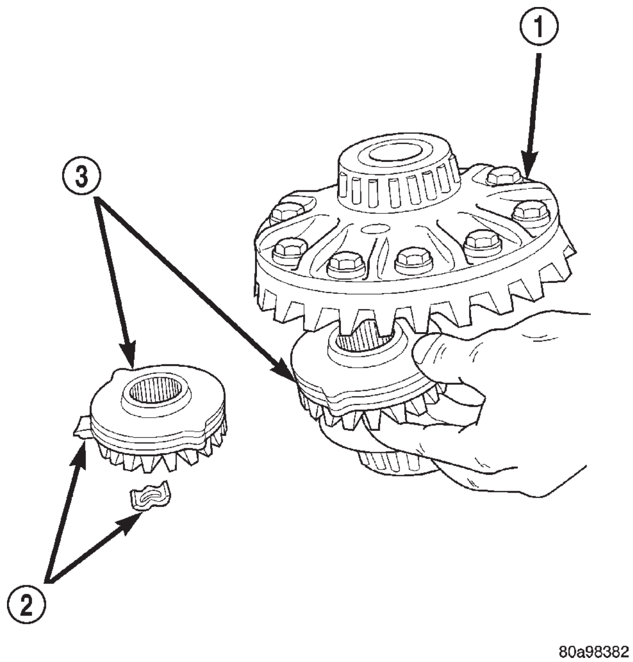


Fig. 47 Side Gear & Clutch Disc Removal

1 – DIFFERENTIAL CASE
2 – RETAINER
3 – SIDE GEAR AND CLUTCH DISC PACK

and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

NOTE: The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 48).

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 49). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 8138.

(5) Install lubricated Step Plate 8140–2 in lower side gear (Fig. 50).

(6) Install the upper side gear and clutch disc pack (Fig. 50).

(7) Hold assembly in position. Insert Threaded Adapter 8140-1 into top side gear.

(8) Insert Forcing Screw 6960-4.

(9) Tighten forcing screw tool to slightly compress clutch discs.

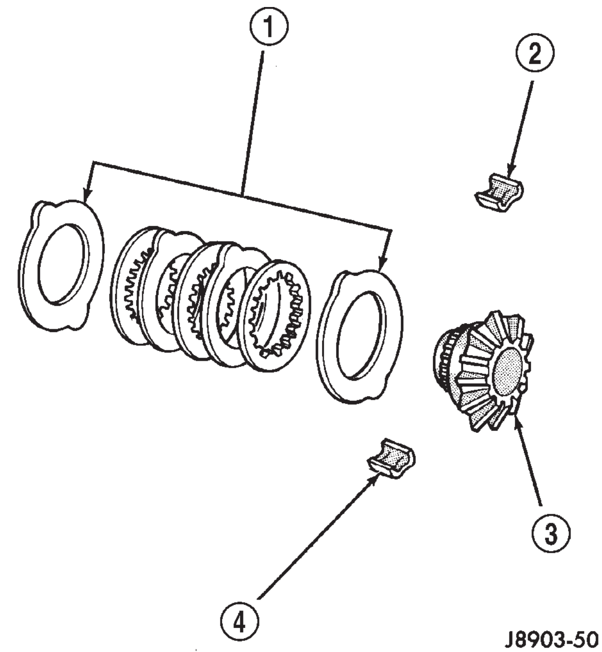


Fig. 48 Clutch Disc Pack

1 – CLUTCH PACK
2 – RETAINER
3 – SIDE GEAR
4 – RETAINER

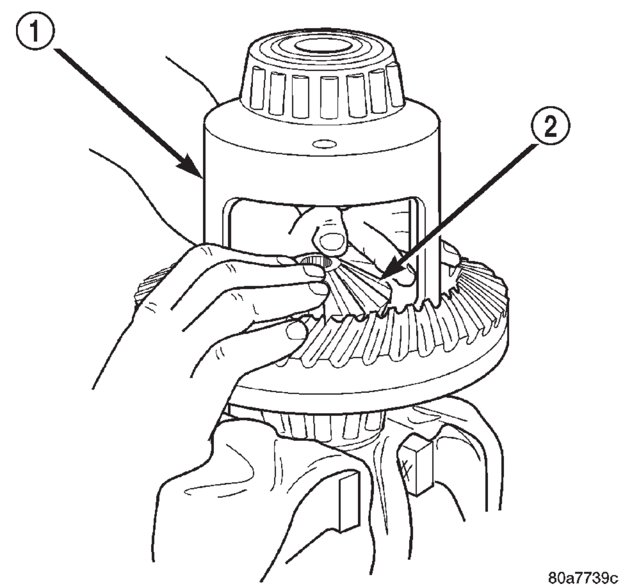


Fig. 49 Clutch Discs & Lower Side Gear Installation

1 – DIFFERENTIAL CASE
2 – LOWER SIDE GEAR AND CLUTCH DISC PACK

(10) Place differential pinions in position in side gears and verify that the pinion mate shaft holes are aligned.

(11) Rotate case with Turning Bar 6960-2 until the pinion mate shaft holes in the differential pinions align with holes in case. It may be necessary to

DISASSEMBLY AND ASSEMBLY (Continued)

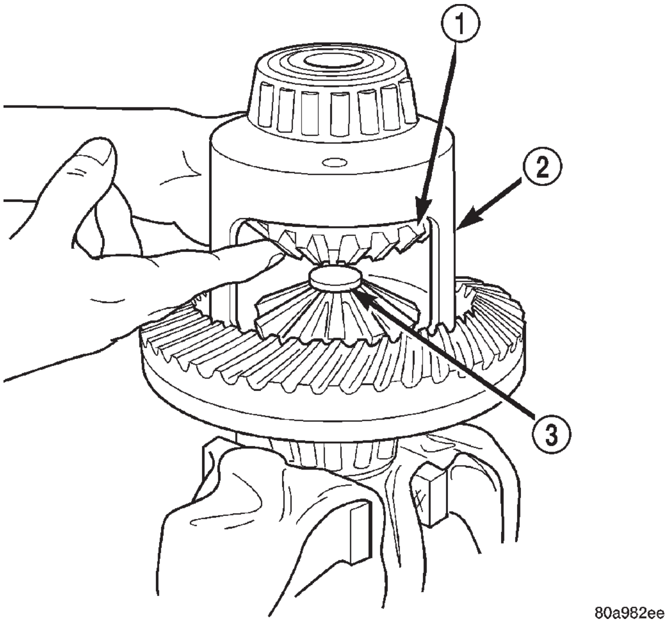


Fig. 50 Upper Side Gear & Clutch Disc Pack Installation

1 – UPPER SIDE GEAR AND CLUTCH DISC PACK
2 – DIFFERENTIAL CASE
3 – SPECIAL TOOL 8140–2

slightly tighten the forcing screw in order to install the pinions.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinions and align washers with a small screw driver. Insert mate shaft into each pinion to verify alignment.

(14) Remove Forcing Screw 6960-4, Step Plate 8140–2, and Threaded Adapter 8140-1.

(15) Install pinion mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

CLEANING AND INSPECTION

8 1/4 AXLE

Wash differential components with cleaning solvent and dry with dry compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. DO NOT spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Be sure that the axle tubes and oil channels are thoroughly cleaned in the housing.

Inspect for:

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion mate shaft, pinions, side gears and thrust washers. Replace as a matched set only.
- Ring gear and pinion for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Pinion depth shims for damage and distortion. Install new shims if necessary.
- The differential case. Replace the case if cracked or damaged.
- The axle shaft C-locks for cracks and excessive wear. Replace them if necessary.
- Each threaded adjuster to determine if it rotates freely. If an adjuster binds, repair the damaged threads or replace the adjuster.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in-line with the shaft).

TRAC-LOK™

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side gears and pinions. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

ADJUSTMENTS

8 1/4 AXLE PINION GEAR DEPTH

GENERAL INFORMATION

Ring gears and pinions are supplied as matched sets only. The identifying numbers for the ring gear and pinion are etched into the face of each gear (Fig. 51). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

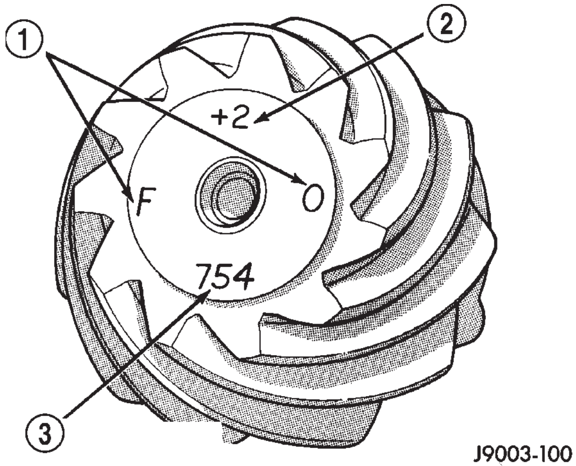


Fig. 51 Pinion Gear ID Numbers

1 – PRODUCTION NUMBERS
2 – DRIVE PINION GEAR DEPTH VARIANCE
3 – GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing (Fig. 52).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance chart.

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

Note the etched number on the face of the pinion gear head (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of

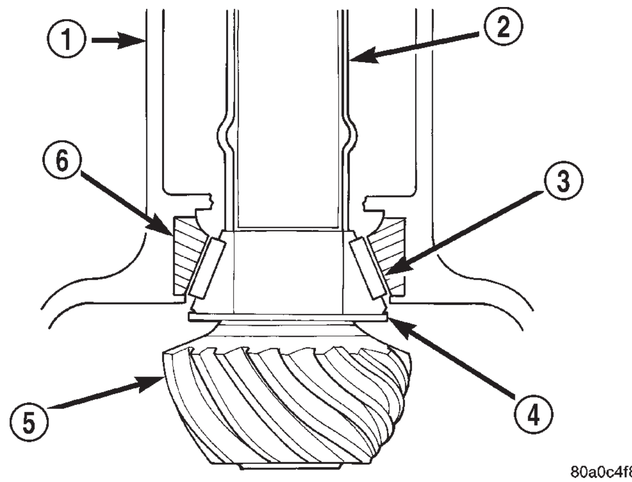


Fig. 52 Shim Locations

1 – AXLE HOUSING
2 – COLLAPSIBLE SPACER
3 – PINION BEARING
4 – PINION DEPTH SHIM
5 – PINION GEAR
6 – BEARING CUP

the depth shim. If the number is 0 no change is necessary.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 53).

(1) Assemble Pinion Height Block 6739, Pinion Block 8540, and rear pinion bearing onto Screw 6741 (Fig. 53).

(2) Insert assembled height gauge components, rear bearing, and screw into axle housing through pinion bearing cups (Fig. 54).

(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 53).

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 55). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 8541 has different step diameters to fit other axles. Choose proper step for axle being serviced.

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

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 53). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

ADJUSTMENTS (Continued)

PINION GEAR DEPTH VARIANCE

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

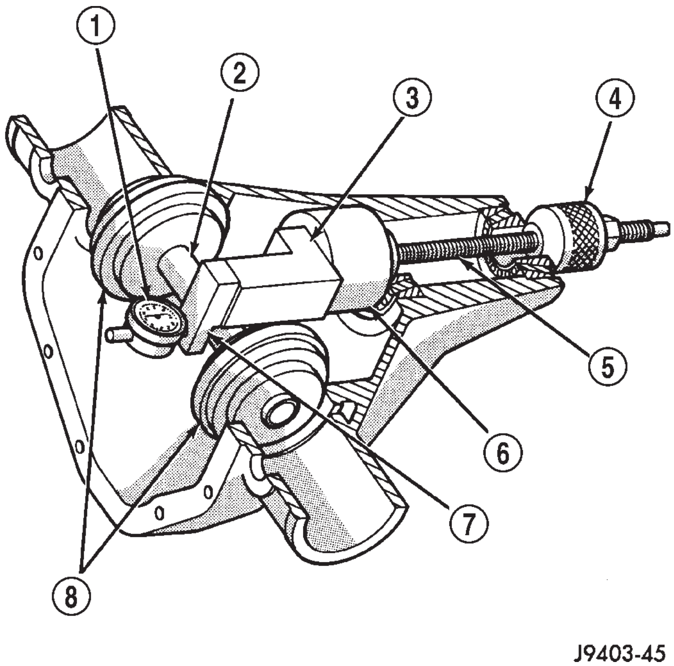


Fig. 53 Pinion Gear Depth Gauge Tools—Typical

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

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 56). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

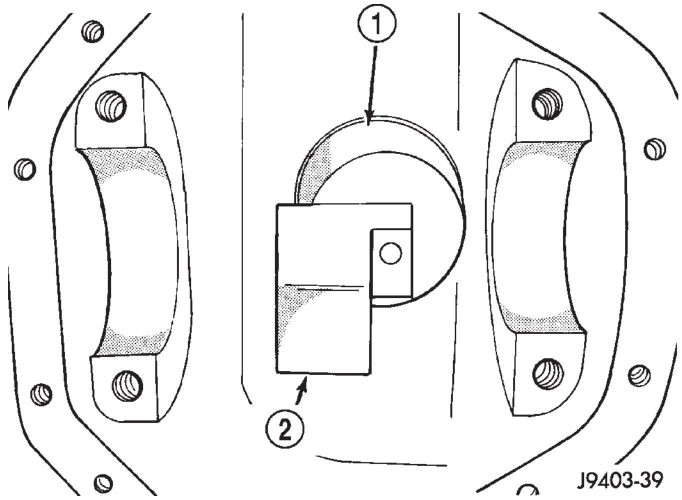


Fig. 54 Pinion Height Block—Typical

1 – PINION BLOCK
2 – PINION HEIGHT BLOCK

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion (Fig. 51). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

The following must be considered when adjusting bearing preload and gear backlash:

• The maximum ring gear backlash variation is 0.003 inch (0.076 mm).

ADJUSTMENTS (Continued)

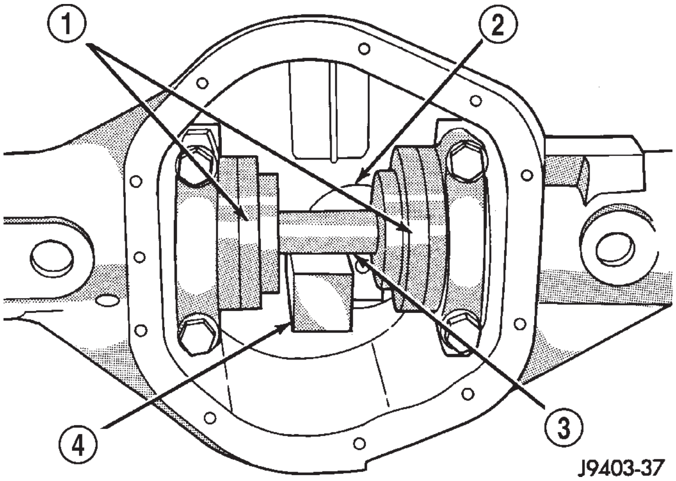


Fig. 55 Gauge Tools In Housing—Typical

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

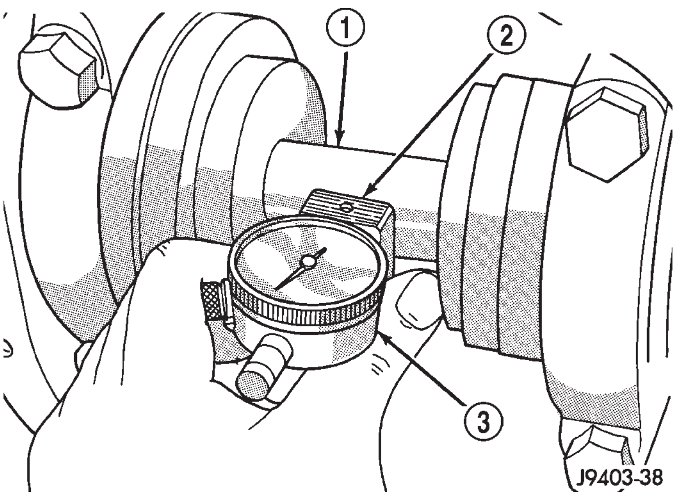


Fig. 56 Pinion Gear Depth Measurement—Typical

1 – ARBOR
2 – SCOOTER BLOCK
3 – DIAL INDICATOR

• Mark the gears so the same teeth are meshed during all backlash measurements.

• Maintain the torque while adjusting the bearing preload and ring gear backlash.

• Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.

• Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.

NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

• Maintain the gear teeth engaged (meshed) as marked.

• The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.

• Do this five to ten times each time the threaded adjusters are adjusted.

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated (Fig. 57). Allow some ring gear backlash (approximately 0.01 inch/0.25 mm) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

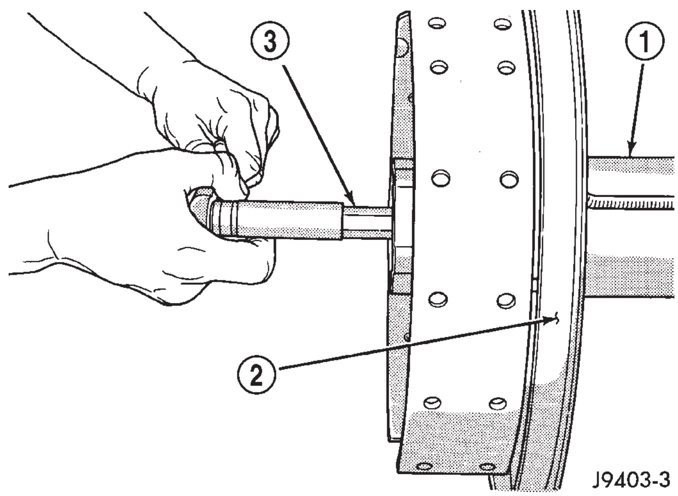


Fig. 57 Threaded Adjuster Tool

1 – AXLE TUBE
2 – BACKING PLATE
3 – TOOL C-4164

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 58). Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

(3) Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.003 to 0.004 inch (0.076 to 0.102 mm) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.

(5) Tighten the differential bearing cap bolts 95 N·m (70 ft. lbs.).

(6) Tighten the right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the pro-

ADJUSTMENTS (Continued)

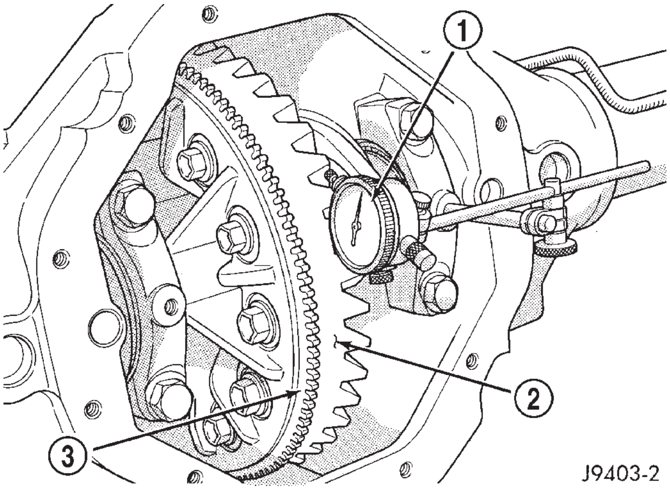


Fig. 58 Ring Gear Backlash Measurement

1 – DIAL INDICATOR
2 – RING GEAR
3 – EXCITER RING

cedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.)

(7) Measure the ring gear backlash. The range of backlash is 0.006 to 0.008 inch (0.15 to 0.203 mm).

(8) Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

(9) Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.

(10) Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

After the proper backlash is achieved, perform the Gear Contact Analysis procedure.

GEAR CONTACT PATTERN ANALYSIS

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 59) and adjust pinion depth and gear backlash as necessary.

SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

(1) Install the axle shafts and C-locks and pinion mate shaft.

(2) Measure each side gear clearance. Insert a matched pair of feeler gauge blades between the gear and differential housing on opposite sides of the hub (Fig. 60).

(3) If side gear clearances is no more than 0.005 inch. Determine if the axle shaft is contacting the pinion mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of the axle shaft is not contacting the pinion mate shaft, the side gear clearance is acceptable.

(4) If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer (Fig. 61).

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-lock is preventing the side gear from sliding on the axle shaft.

(5) If there is no side gear clearance, remove the C-lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the differential case without the C-lock installed and re-measure the side gear clearance.

(6) Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

ADJUSTMENTS (Continued)

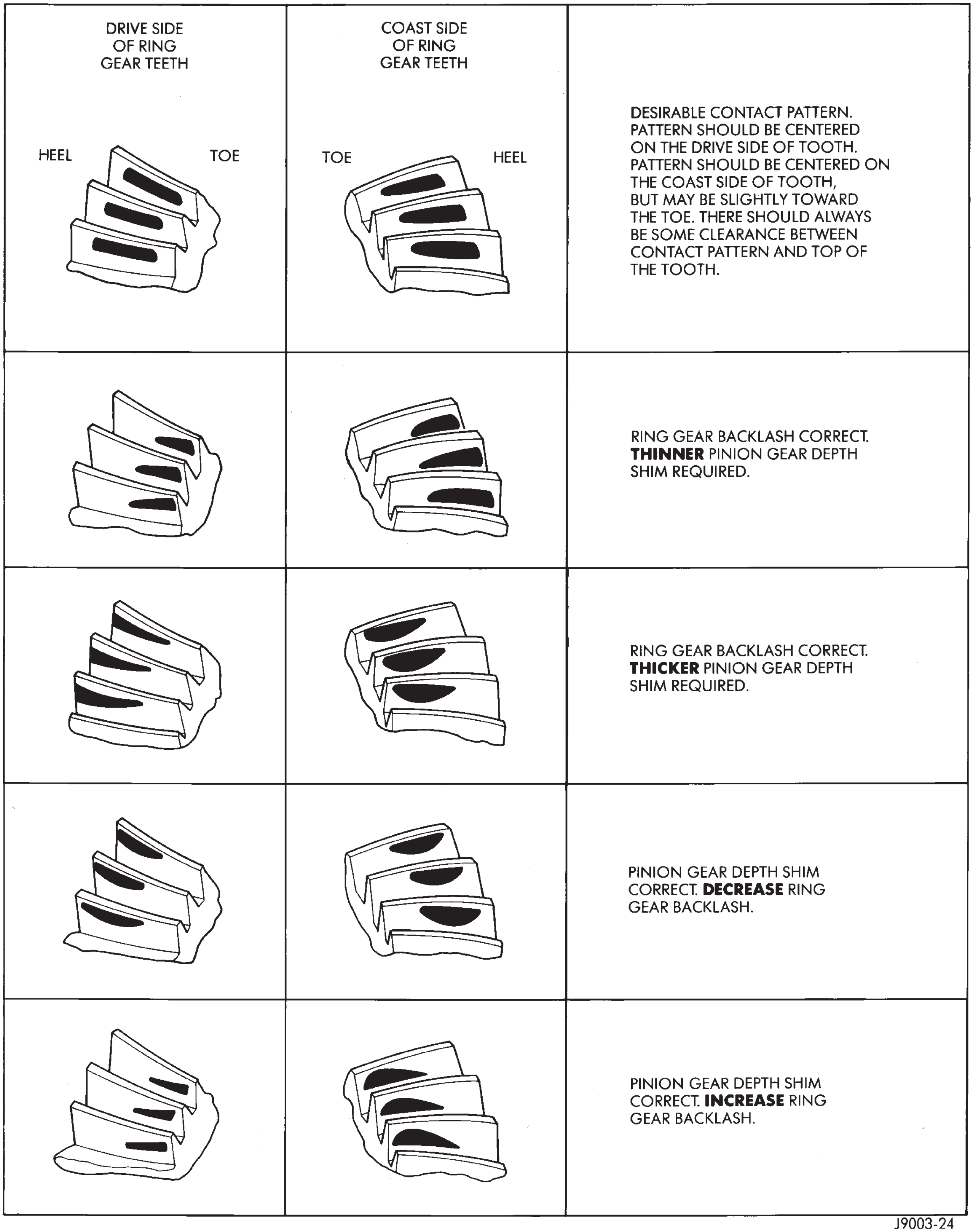


Fig. 59 Gear Tooth Contact Patterns

ADJUSTMENTS (Continued)

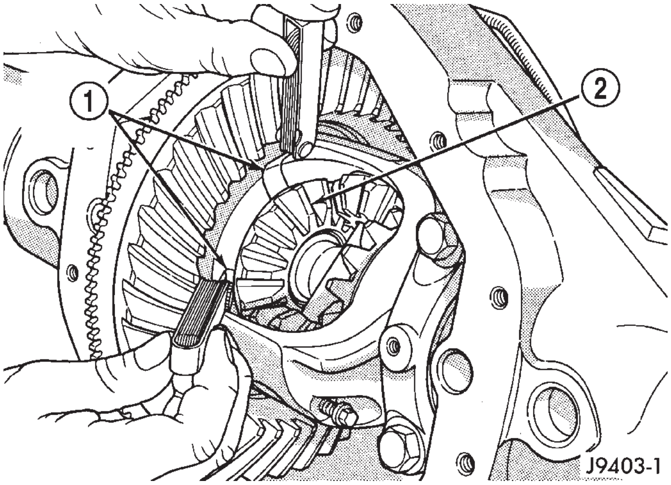


Fig. 60 Side Gear Clearance Measurement

1 – FEELER GAUGE BLADES
2 – SIDE GEAR

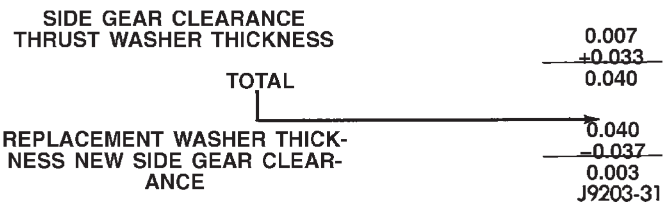


Fig. 61 Side Gear Calculations

(7) If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.

(8) If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS

8 1/4 INCH AXLE

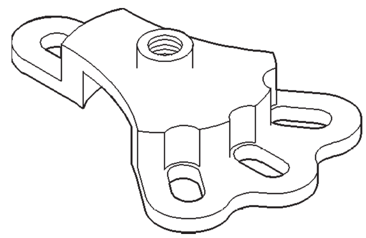
Axle Type	Semi-floating, hypoid
Lubricant	SAE 80W-90
Lube Capacity	2.08 L (4.4 pts.)
Trac-Lok Additive	118 ml (4 oz.)
Axle Ratio	3.07, 3.55,.4.10
Differential	
Case Clearance	0.12 mm (0.005 in.)
Case Flange Runout	0.076 mm (0.003 in.)
Ring Gear	
Diameter	20.95 cm (8.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)
Pinion Bearing	
Preload-Used Bearings	1-2 N·m (10-20 in.lbs.)
Preload-New Bearings	1-5 N·m (10-30 in.lbs.)

8 1/4 INCH AXLE

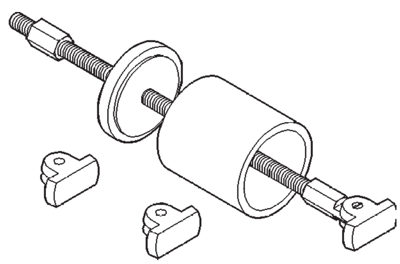
DESCRIPTION	TORQUE
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	136 N·m (100 ft. lbs.)
Pinion Nut–Minimum	285 N·m (210 ft. lbs.)
Ring Gear Bolt	95 N·m (70 ft. lbs.)
Backing Plate Bolt	614 N·m (45 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18. ft. lbs.)

SPECIAL TOOLS

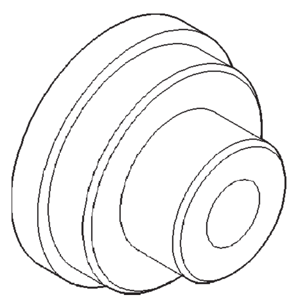
8 1/4 AXLES



Puller, Hub—6790

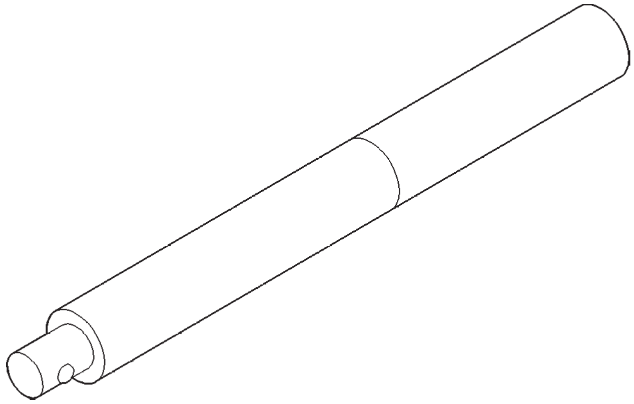


Remover, Bearing—6310

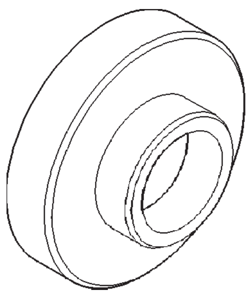


Installer—C-4198

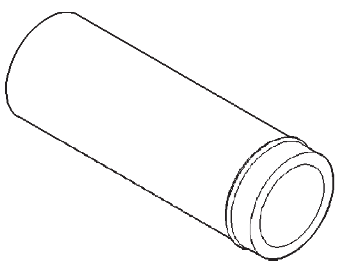
SPECIAL TOOLS (Continued)



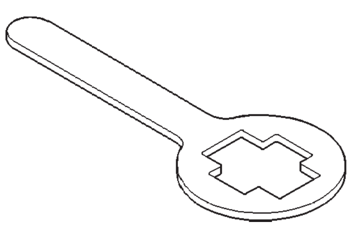
Handle—C-4171



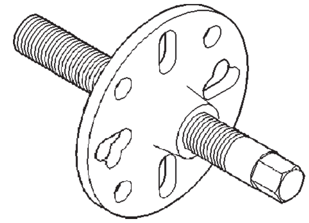
Installer—C-4076-B



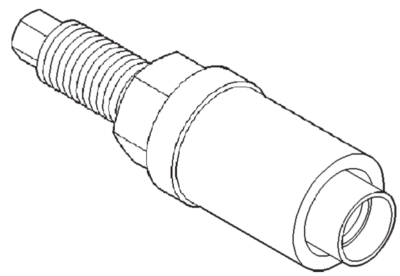
Handle—C-4735-1



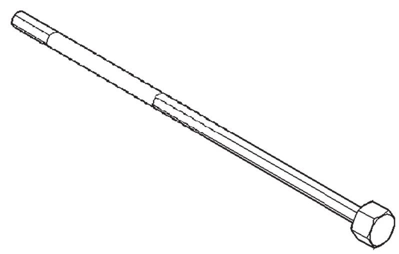
Holder—6719



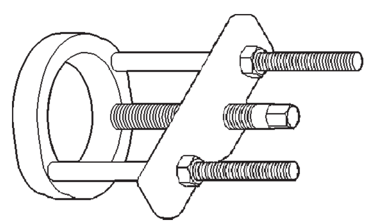
Puller—C-452



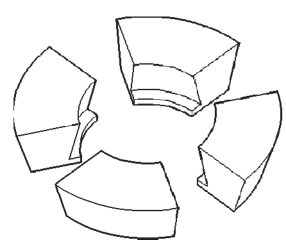
Installer—C-3718



Adjustment Rod—C-4164

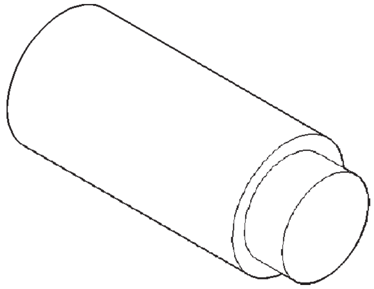


Puller/Press—C-293–PA

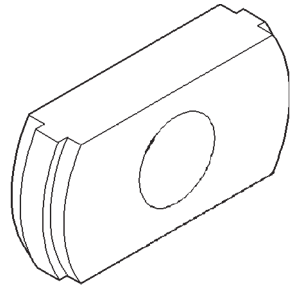


Adapters—C-293-48

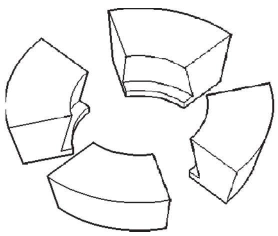
SPECIAL TOOLS (Continued)



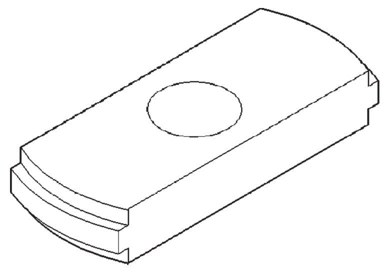
Plug—SP-3289



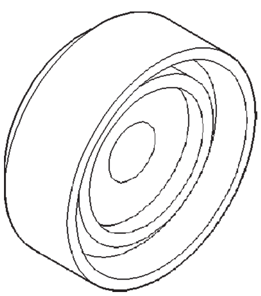
Installer—C-4345



Adapters—C-293-47



Remover—C-4307



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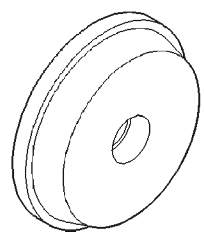
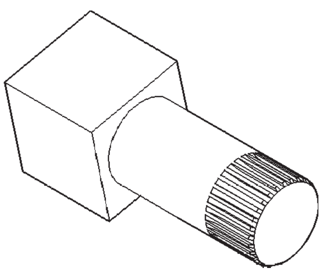
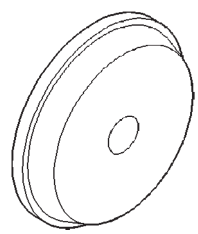


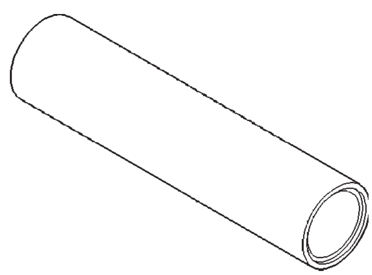
Installer—C-4308



Holder—8138

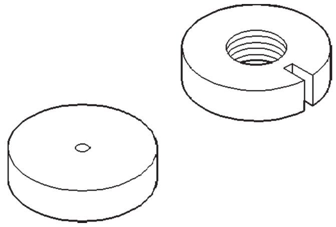


Installer—D-130

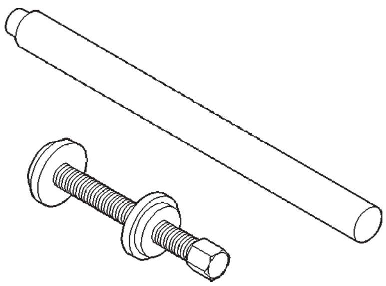


Installer—6448

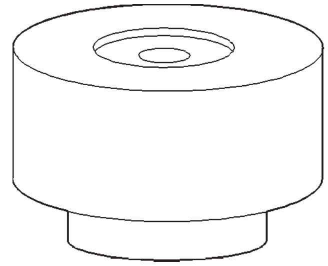
SPECIAL TOOLS (Continued)



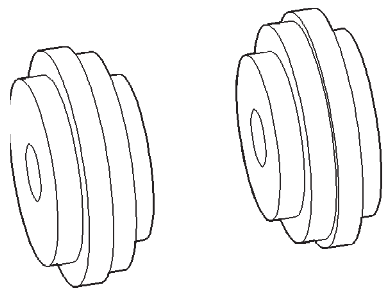
Trac-lok™ Tools—8140



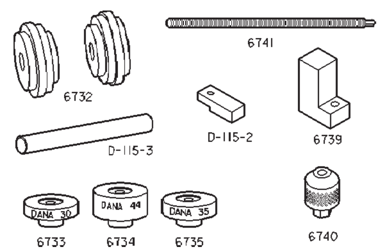
Trac-lok™ Tools—6960



Pinion Gauge Block—8540



Arbor Discs—8541



Pinion Gauge Set

BRAKES

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BASE BRAKE SYSTEM

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DESCRIPTION AND OPERATION

BRAKE SYSTEM

DESCRIPTION

Power assist front disc and rear drum brakes are standard equipment. Disc brake components consist of single piston calipers and ventilated rotors. Rear drum brakes are dual shoe units with cast brake drums.

The parking brake mechanism is lever and cable operated. The cables are attached to levers on the rear drum brake secondary shoes. The parking brakes are operated by a hand lever.

A dual diaphragm vacuum power brake booster is used for all applications. All models have an aluminum master cylinder with plastic reservoir.

All models are equipped with a combination valve. The valve contains a pressure differential valve and switch and a fixed rate rear proportioning valve.

Factory brake lining on all models consists of an organic base material combined with metallic particles. The original equipment linings do not contain asbestos.

SERVICE WARNINGS & CAUTIONS

DESCRIPTION

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF ASBESTOS FIBERS FROM BRAKE COMPONENTS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WITH A WATER DAMPENED CLOTH. DO NOT SAND, OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DISPOSE OF ALL RESIDUE CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE EXPOSURE TO YOURSELF AND OTHERS. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Also check the reservoir cap seal for distortion. Drain and flush the system with new brake fluid if contamination is suspected.

CAUTION: Use Mopar brake fluid, or an equivalent quality fluid meeting SAE/DOT standards J1703 and DOT 3. Brake fluid must be clean and free of contaminants. Use fresh fluid from sealed containers only to ensure proper antilock component operation.

CAUTION: Use Mopar multi-mileage or high temperature grease to lubricate caliper slide surfaces, drum brake pivot pins, and shoe contact points on the backing plates. Use multi-mileage grease or GE 661 or Dow 111 silicone grease on caliper slide pins to ensure proper operation.

BRAKE PEDAL

DESCRIPTION

A suspended-type brake pedal is used, the pedal pivots on a shaft mounted in the pedal support bracket. The bracket is attached to the dash panel and steering support bracket. The unit is serviced as an assembly, except for the pedal pad.

OPERATION

The brake pedal is attached to the booster push rod. When the pedal is depressed, the primary booster push rod is depressed which move the booster secondary rod. The booster secondary rod depress the master cylinder piston.

BRAKE LAMP SWITCH

DESCRIPTION

The plunger type brake lamp switch is mounted on a bracket attached to the brake pedal support. The switch can be adjusted when necessary.

OPERATION

The brake lamp switch is used to for the brake lamp, speed control and brake sensor circuits.

DESCRIPTION AND OPERATION (Continued)

RED BRAKE WARNING LAMP

DESCRIPTION

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument cluster.

OPERATION

The red warning light alerts the driver if a pressure differential exists between the front and rear hydraulic systems or the parking brakes are applied. The lamp is turned on momentarily when the ignition switch is turn to the on position. This is a self test to verify the lamp is operational.

POWER BRAKE BOOSTER

DESCRIPTION

The booster assembly consists of a housing divided into separate chambers by two internal diaphragms. The outer edge of each diaphragm is attached to the booster housing. The diaphragms are connected to the booster primary push rod.

Two push rods are used in the booster. The primary push rod connects the booster to the brake pedal. The secondary push rod connects the booster to the master cylinder to stroke the cylinder pistons.

OPERATION

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is through a hose attached to an intake manifold fitting at one end and to the booster check valve at the other. The vacuum check valve in the booster housing is a one-way device that prevents vacuum leak back.

Power assist is generated by utilizing the pressure differential between normal atmospheric pressure and a vacuum. The vacuum needed for booster operation is taken directly from the engine intake manifold. The entry point for atmospheric pressure is through a filter and inlet valve at the rear of the housing (Fig. 1).

The chamber areas forward of the booster diaphragms are exposed to vacuum from the intake manifold. The chamber areas to the rear of the diaphragms, are exposed to normal atmospheric pressure of 101.3 kilopascals (14.7 pounds/square in.).

Brake pedal application causes the primary push rod to open the atmospheric inlet valve. This exposes the area behind the diaphragms to atmospheric pressure. The resulting pressure differential provides the extra apply force for power assist.

The booster check valve, check valve grommet and booster seals are serviceable.

MASTER CYLINDER

DESCRIPTION

The master cylinder has a removable nylon reservoir. The cylinder body is made of aluminum and contains a primary and secondary piston assembly. The cylinder body including the piston assemblies are not serviceable. If diagnosis indicates an internal problem with the cylinder body, it must be replaced as an assembly. The reservoir and grommets are the only replaceable parts on the master cylinder.

OPERATION

The master cylinder bore contains a primary and secondary piston. The primary piston supplies hydraulic pressure to the front brakes. The secondary piston supplies hydraulic pressure to the rear brakes. The master cylinder reservoir stores reserve brake fluid for the hydraulic brake circuits.

COMBINATION VALVE

DESCRIPTION

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable and must be replaced as an assembly if diagnosis indicates this is necessary.

OPERATION

PRESSURE DIFFERENTIAL VALVE

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs to the brake system are made.

PROPORTIONING VALVE

The proportioning valve is used to balance front-rear brake action at high decelerations. The valve allows normal fluid flow during moderate braking. The valve only controls fluid flow during high decelerations brake stops.

DESCRIPTION AND OPERATION (Continued)

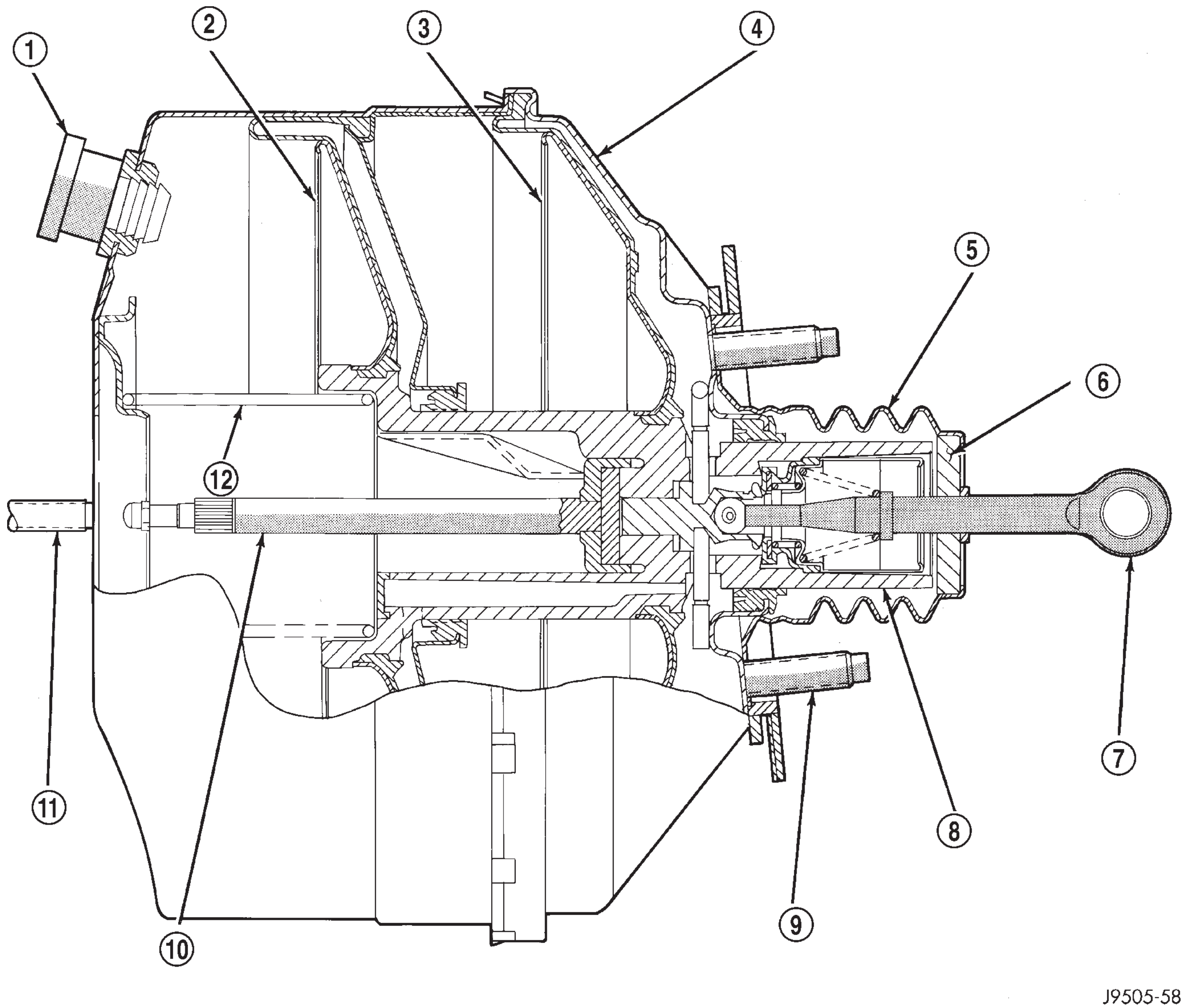


Fig. 1 Power Brake Booster–Typical

1 – VACUUM CHECK VALVE
2 – FRONT DIAPHRAGM
3 – REAR DIAPHRAGM
4 – HOUSING
5 – SEAL
6 – AIR FILTER
7 – PRIMARY PUSH ROD (TO BRAKE PEDAL)
8 – ATMOSPHERIC INLET VALVE ASSEMBLY
9 – BOOSTER MOUNTING STUDS (4)
10 – SECONDARY PUSH ROD (TO MASTER CYLINDER)
11 – MASTER CYLINDER MOUNTING STUD (2)
12 – SPRING

FRONT DISC BRAKES

DESCRIPTION

The calipers are a single piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

OPERATION

When the brakes are applied fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal (Fig. 2).

Fluid pressure applied to the piston is transmitted directly to the inboard brake shoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brake shoe lining into contact with the outer surface of the disc brake rotor.

DESCRIPTION AND OPERATION (Continued)

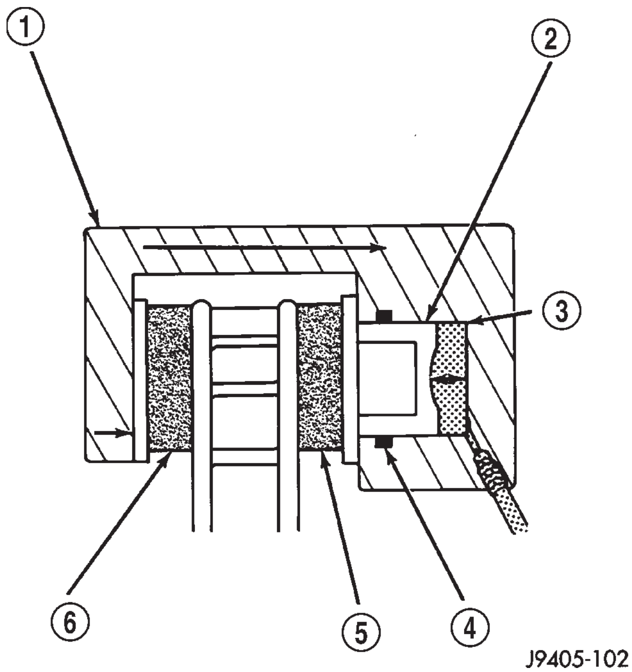


Fig. 2 Brake Caliper Operation

1 – CALIPER
2 – PISTON
3 – PISTON BORE
4 – SEAL
5 – INBOARD SHOE
6 – OUTBOARD SHOE

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will attempt to stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seal controls the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement (Fig. 3). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake shoe.

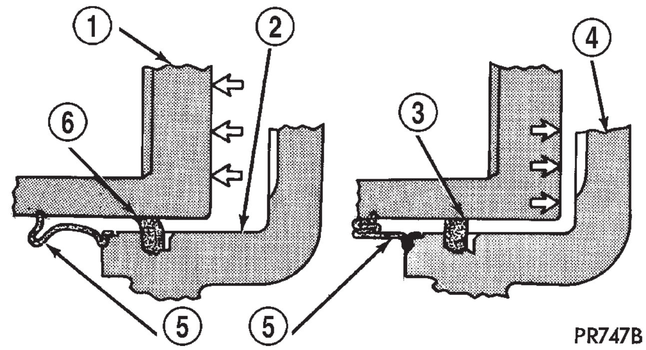


Fig. 3 Lining Wear Compensation By Piston Seal

1 – PISTON
2 – CYLINDER BORE
3 – PISTON SEAL BRAKE PRESSURE OFF
4 – CALIPER HOUSING
5 – DUST BOOT
6 – PISTON SEAL BRAKE PRESSURE ON

REAR DRUM BRAKE

DESCRIPTION

The rear brakes use a leading shoe (primary) and trailing shoe (secondary) design (Fig. 4).

OPERATION

When the brake pedal is depressed hydraulic pressure pushes the rear brake wheel cylinder pistons outward. The wheel cylinder push rods then push the brake shoes outward against the brake drum. When the brake pedal is released return springs attached to the brake shoes pull the shoes back to there original position.

PARKING BRAKE

DESCRIPTION

The parking bake is a hand lever and cable operated system used to apply the rear brakes.

OPERATION

A hand operated lever in the passenger compartment is the main application device. The front cable is connected between the hand lever and the tensioner. The tensioner rod is attached to the equalizer which is the connecting point for the rear cables (Fig. 5).

The rear cables are connected to the actuating lever on each secondary brake shoe. The levers are attached to the brake shoes by a pin either pressed into, or welded to the lever. A clip is used to secure the pin in the brake shoe. The pin allows each lever to pivot independently of the brake shoe.

To apply the parking brakes, the hand lever is pulled upward. This pulls the rear brake shoe actu-

DESCRIPTION AND OPERATION (Continued)

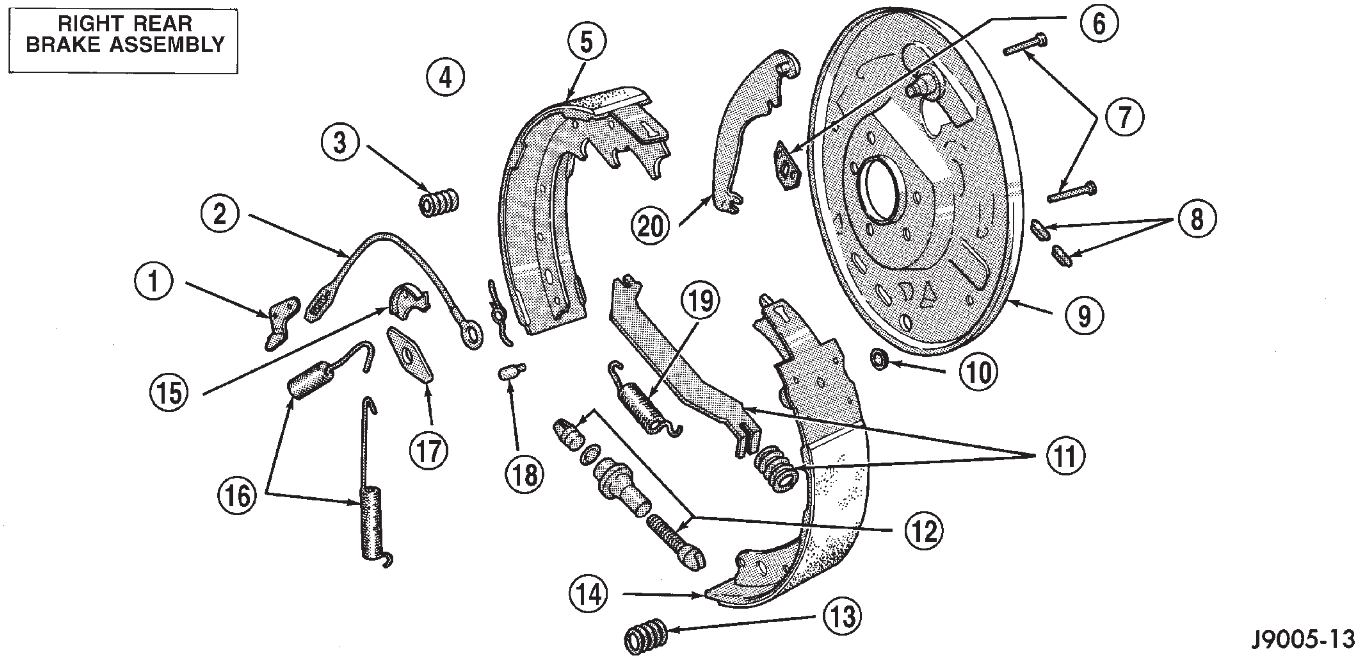


Fig. 4 Brake Components

1 – ADJUSTER LEVER
2 – ADJUSTER CABLE
3 – HOLDDOWN SPRING AND RETAINERS
4 – ADJUSTER LEVER SPRING
5 – TRAILING SHOE
6 – CYLINDER-TO-SUPPORT SEAL
7 – HOLDDOWN PINS
8 – ACCESS PLUGS
9 – SUPPORT PLATE
10 – CABLE HOLE PLUG
11 – PARK BRAKE STRUT AND SPRING
12 – ADJUSTER SCREW ASSEMBLY
13 – HOLDDOWN SPRING AND RETAINERS
14 – LEADING SHOE
15 – CABLE GUIDE
16 – SHOE RETURN SPRINGS
17 – SHOE GUIDE PLATE
18 – PIN
19 – SHOE SPRING
20 – PARK BRAKE LEVER

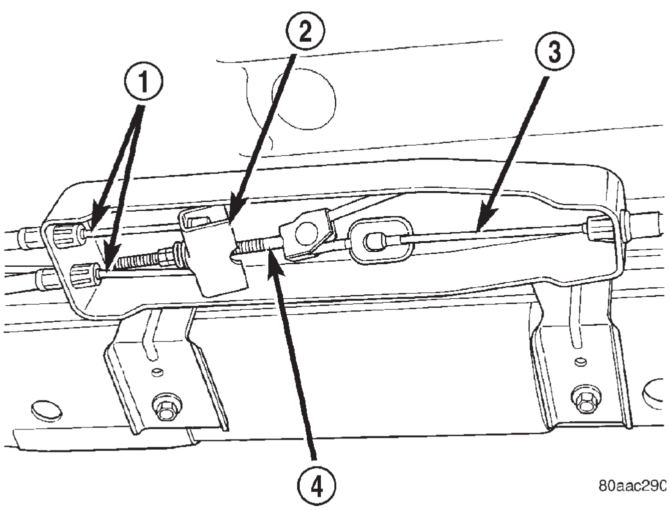


Fig. 5 Parking Brake Components

1 – REAR CABLES
2 – EQUALIZER
3 – FRONT CABLE
4 – TENSIONER ROD

ating levers forward, by means tensioner and cables. As the actuating lever is pulled forward, the parking brake strut (which is connected to both shoes), exerts a linear force against the primary brake shoe. This action presses the primary shoe into contact with the drum. Once the primary shoe contacts the drum, force is exerted through the strut. This force is transferred through the strut to the secondary brake shoe causing it to pivot into the drum as well.

A gear type ratcheting mechanism is used to hold the lever in an applied position. Parking brake release is accomplished by the hand lever release button.

A parking brake switch is mounted on the parking brake lever and is actuated by movement of the lever. The switch, which is in circuit with the red warning light in the dash, will illuminate the warning light whenever the parking brakes are applied.

Parking brake adjustment is controlled by a cable tensioner mechanism. The cable tensioner, once adjusted at the factory, should not need further adjustment under normal circumstances. Adjustment

DESCRIPTION AND OPERATION (Continued)

may be required if a new tensioner, or cables are installed, or disconnected.

BRAKE HOSES AND LINES

DESCRIPTION

Flexible rubber hose is used at both front brakes and at the rear axle junction block. Double walled steel tubing is used to connect the master cylinder to the major hydraulic braking components and then to the flexible rubber hoses. Double inverted style and ISO style flares are used on the brake lines.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM

Base brake components consist of the brake shoes, calipers, wheel cylinders, brake drums, rotors, brake lines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

(1) Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.

(2) If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.

(3) Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**

(a) If fluid level is abnormally low, look for evidence of leaks at calipers, wheel cylinders, brake lines, and master cylinder.

(b) If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups will also have to be replaced after flushing. Use clean brake fluid to flush the system.

(4) Check parking brake operation. Verify free movement and full release of cables and pedal. Also note if vehicle was being operated with parking brake partially applied.

(5) Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.

(6) Check booster vacuum check valve and hose.

(7) If components checked appear OK, road test the vehicle.

ROAD TESTING

(1) If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.

(2) Check brake pedal response with transmission in Neutral and engine running. Pedal should remain firm under constant foot pressure.

(3) During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.

(4) Attempt to stop the vehicle with the parking brake only and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brake line, fitting, hose, or caliper/wheel cylinder. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS or RWAL system may also be the problem with no physical evidence.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up worn linings, rotors, drums, or rear brakes out of adjustment are the most likely causes. The proper course of action is to inspect and replace all worn component and make the proper adjustments.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, thin brake drums or substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, and replace thin drums and substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster or check valve could also be faulty.

DIAGNOSIS AND TESTING (Continued)

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation, or out of round brake drums. Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake shoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors and drums to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper or wheel cylinder piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting.
- Drum brake shoes binding on worn/damaged support plates.
- Mis-assembled components.
- Long booster output rod.

If brake drag occurs at all wheels, the problem may be related to a blocked master cylinder return port, or faulty power booster (binds-does not release).

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake shoes
- Damaged rotor

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or proportioning valve could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and/or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers or wheel cylinders, worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

DIAGNOSIS AND TESTING (Continued)

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

BRAKE NOISES

Some brake noise is common with rear drum brakes and on some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake shoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors and drums can become so scored that replacement is necessary.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components. However, calipers that bind on the slide surfaces can generate a thump or clunk noise. In addition, worn out, improperly adjusted, or improperly assembled rear brake shoes can also produce a thump noise.

BRAKE LAMP SWITCH

The brake lamp switch operation can be tested with an ohmmeter. The ohmmeter is used to check continuity between the pin terminals (Fig. 6).

SWITCH CIRCUIT IDENTIFICATION

- Terminals 1 and 2: brake sensor circuit
- Terminals 3 and 4: speed control circuit if equipped
- Terminals 5 and 6: brake lamp circuit

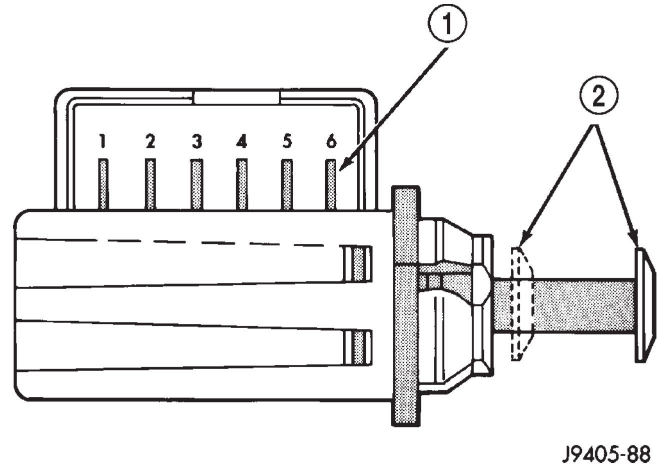


Fig. 6 Brake Lamp Switch Terminal Identification

1 – TERMINAL PINS
2 – PLUNGER TEST POSITIONS

SWITCH CONTINUITY TEST

NOTE: Disconnect switch harness before testing switch continuity.

With the switch plunger retracted, attach test leads to terminal pins 1 and 2. Replace switch if meter indicates no continuity.

With the switch plunger retracted, attach test leads to terminal pins 3 and 4. Replace switch if meter indicates no continuity.

With the switch plunger extended, attach test leads to terminal pins 5 and 6. Replace switch if meter indicates no continuity.

RED BRAKE WARNING LAMP

The red brake warning lamp will illuminate under the following conditions:

- Self test at start-up.
- Parking brakes are applied.
- Leak in front/rear brake hydraulic circuit.

If the red light remains on after start-up, first verify that the parking brakes are fully released. Then check pedal action and fluid level. If the lamp on and the brake pedal is low this indicates the pressure dif-

DIAGNOSIS AND TESTING (Continued)

ferential switch and valve have been actuated due to a leak in the hydraulic system.

On models with ABS brakes, the amber warning lamp only illuminates during the self test and when an ABS malfunction has occurred. The ABS lamp operates independently of the red warning lamp.

For additional information refer to Group 8W.

MASTER CYLINDER/POWER BOOSTER

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).

(5) Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately turn off ignition to stop engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 7).

(2) Start and run engine at curb idle speed for one minute.

(3) Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.

(4) Clamp hose shut between vacuum source and check valve.

(5) Stop engine and observe vacuum gauge.

(6) If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

(4) Apply 15-20 inches vacuum at large end of check valve (Fig. 8).

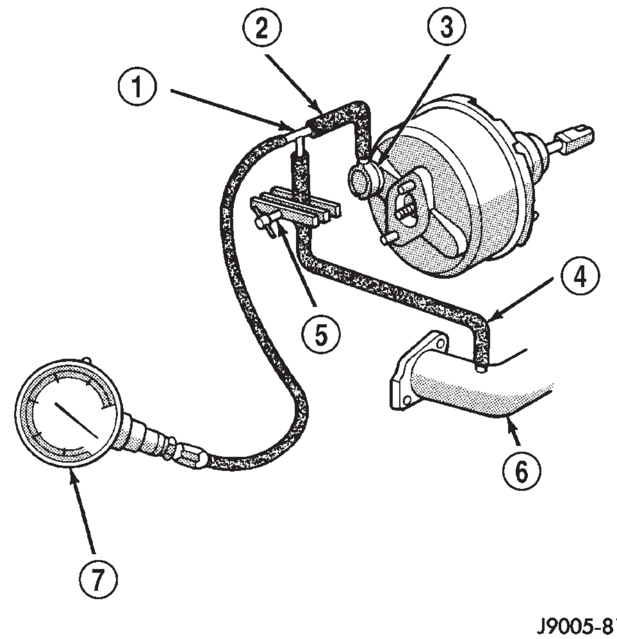


Fig. 7 Typical Booster Vacuum Test Connections

1 – TEE FITTING
2 – SHORT CONNECTING HOSE
3 – CHECK VALVE
4 – CHECK VALVE HOSE
5 – CLAMP TOOL
6 – INTAKE MANIFOLD
7 – VACUUM GAUGE

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

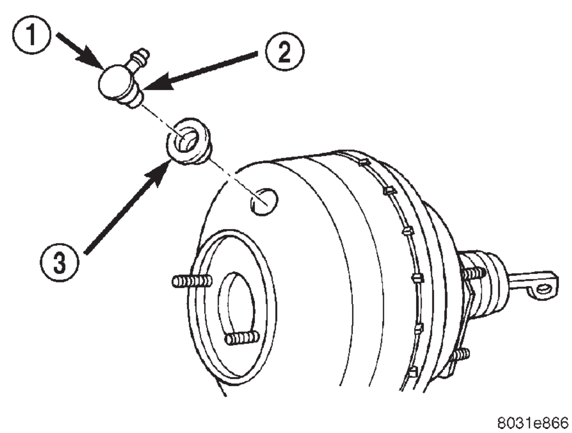


Fig. 8 Vacuum Check Valve And Seal

1 – BOOSTER CHECK VALVE
2 – APPLY TEST VACUUM HERE
3 – VALVE SEAL

DIAGNOSIS AND TESTING (Continued)

COMBINATION VALVE

PRESSURE DIFFERENTIAL SWITCH

(1) Have helper sit in drivers seat to apply brake pedal and observe red brake warning light.

(2) Raise vehicle on hoist.

(3) Connect bleed hose to a rear wheel cylinder and immerse hose end in container partially filled with brake fluid.

(4) Have helper press and hold brake pedal to floor and observe warning light.

(a) If warning light illuminates, switch is operating correctly.

(b) If light fails to illuminate, check circuit fuse, bulb, and wiring. The parking brake switch can be used to aid in identifying whether or not the brake light bulb and fuse is functional. Repair or replace parts as necessary and test differential pressure switch operation again.

(5) If warning light still does not illuminate, switch is faulty. Replace combination valve assembly, bleed brake system and verify proper switch and valve operation.

REAR PROPORTIONING VALVE

The valve controls fluid flow. If fluid enters the valve and does not exit the valve the combination valve must be replaced.

DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor surfaces can be restored by machining in a disc brake lathe if surface scoring and wear are light.

Replace the rotor under the following conditions:

- severely scored
- tapered
- hard spots
- cracked
- below minimum thickness

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if machining would reduce thickness below the allowable minimum.

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339 (Fig. 9). Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brake shoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge. Maximum allowable rotor runout is 0.102 mm (0.004 in.).

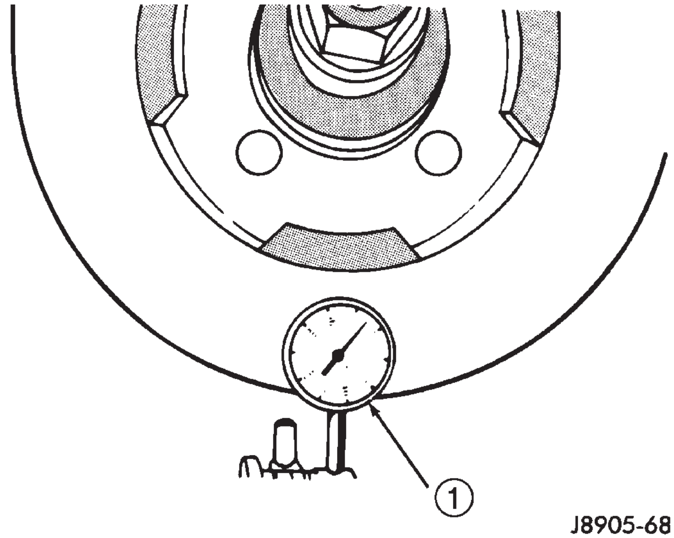


Fig. 9 Checking Rotor Runout And Thickness Variation

1 – DIAL INDICATOR

ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at 6 to 12 points around the rotor face (Fig. 10).

Position the micrometer approximately 25.4 mm (1 in.) from the rotor outer circumference for each measurement.

Thickness should not **vary** by more than 0.013 mm (0.0005 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.

BRAKE DRUM

The maximum allowable diameter of the drum braking surface is indicated on the drum outer edge. Generally, a drum can be machined to a maximum of 1.52 mm (0.060 in.) oversize. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum.

BRAKE DRUM RUNOUT

Measure drum diameter and runout with an accurate gauge. The most accurate method of measurement involves mounting the drum in a brake lathe and checking variation and runout with a dial indicator.

Variations in drum diameter should not exceed 0.076 mm (0.003 in.). Drum runout should not exceed 0.20 mm (0.008 in.) out of round. Machine the drum if runout or variation exceed these values. Replace

DIAGNOSIS AND TESTING (Continued)

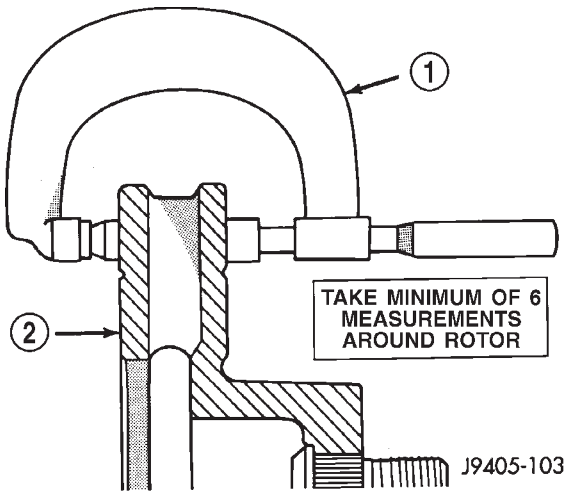


Fig. 10 Measuring Rotor Thickness

1 – MICROMETER
2 – ROTOR

the drum if machining causes the drum to exceed the maximum allowable diameter.

BRAKE LINE AND HOSES

Flexible rubber hose is used at both front brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, at every engine oil change, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. All of these conditions can lead to scuffing, cracking and eventual failure.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper seal washers at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

SERVICE PROCEDURES

BRAKE FLUID LEVEL

Always clean the master cylinder reservoir and cap before adding fluid. This will prevent dirt from falling in the reservoir and contaminating the brake fluid.

The reservoir has a ADD and a FULL mark on the side (Fig. 11) fill to the FULL mark.

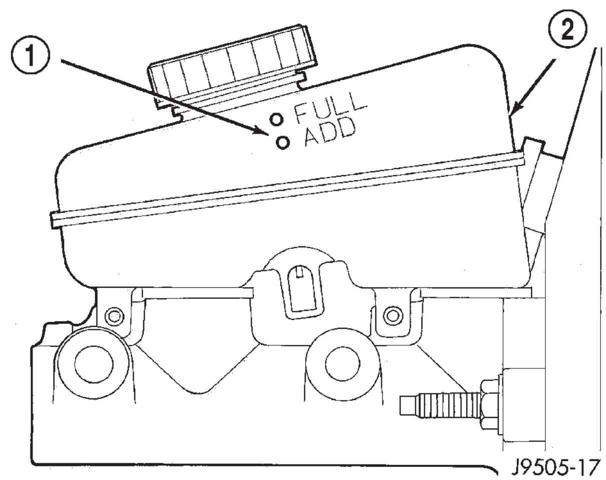


Fig. 11 Master Cylinder Fluid Level

1 – FLUID LEVEL MARKS
2 – RESERVOIR

MASTER CYLINDER BLEEDING

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

BLEEDING PROCEDURE

(1) Mount master cylinder in vise.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end into reservoir (Fig. 12).

SERVICE PROCEDURES (Continued)

(3) Fill reservoir with fresh brake fluid.

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

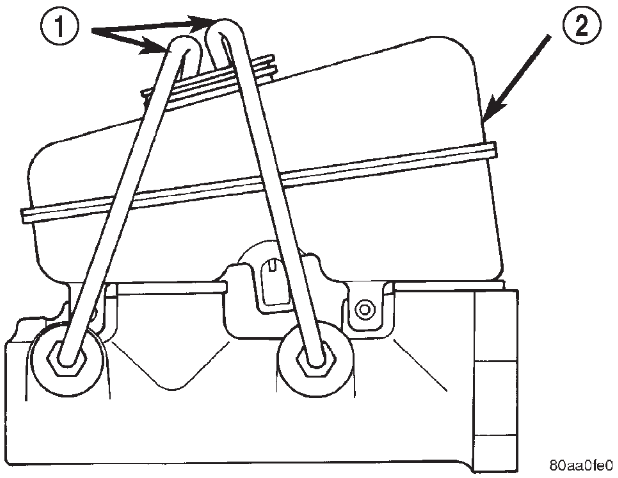


Fig. 12 Master Cylinder Bleeding–Typical

1 – BLEEDING TUBES
2 – RESERVOIR

BASE BRAKE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

Bleed only one brake component at a time in the following sequence:

- Master Cylinder
- Combination Valve
- Right Rear Wheel
- Left Rear Wheel
- Right Front Wheel
- Left Front Wheel

MANUAL BLEEDING

(1) Remove reservoir filler caps and fill reservoir.

(2) If calipers, or wheel cylinders were overhauled, open all caliper and wheel cylinder bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.

(3) Attach one end of bleed hose to bleed screw and insert opposite end in glass container partially filled with brake fluid (Fig. 13). Be sure end of bleed hose is immersed in fluid.

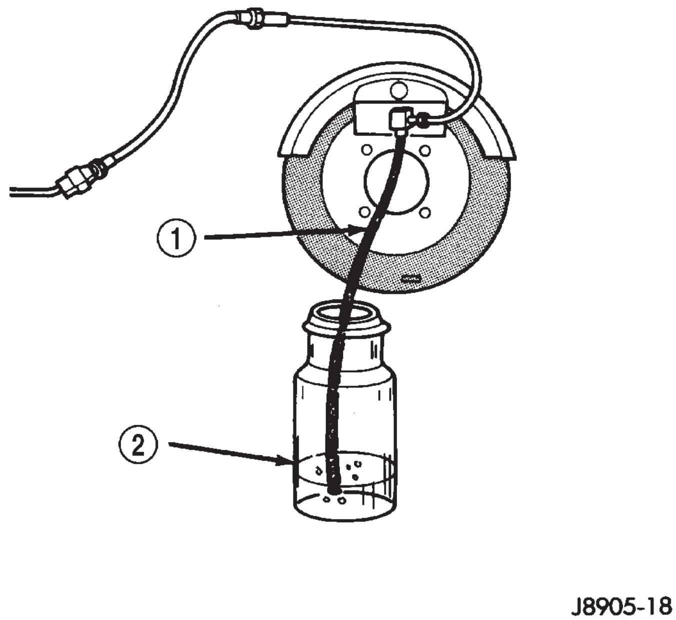


Fig. 13 Bleed Hose Setup

1 – BLEED HOSE
2 – FLUID CONTAINER PARTIALLY FILLED WITH FLUID

(4) Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.

PRESSURE BLEEDING

Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 15-20 psi is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system. Use adapter provided with the equipment or Adapter 6921.

DISC ROTOR MACHINING

The disc brake rotor can be machined if scored or worn. The lathe must machine both sides of the rotor simultaneously with dual cutter heads. The rotor mounting surface must be clean before placing on the lathe. Equipment capable of machining only one side at a time may produce a tapered rotor. A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

CAUTION: Brake rotors that do not meet minimum thickness specifications before or after machining must be replaced.

BRAKE DRUM MACHINING

The brake drums can be machined on a drum lathe when necessary. Initial machining cuts should be limited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.038 mm (0.001 to 0.0015 in.) are recommended and will generally provide the best surface finish.

Be sure the drum is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum outer edge.

CAUTION: Replace the drum if machining will cause the drum to exceed the maximum allowable diameter.

BRAKE TUBE FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

Special bending tools are needed to avoid kinking or twisting of metal brake tubes. Special flaring tools are needed to make a double inverted flare or ISO flare (Fig. 14).

DOUBLE INVERTED FLARING

(1) Cut off damaged tube with Tubing Cutter.

(2) Ream cut edges of tubing to ensure proper flare.

(3) Install replacement tube nut on the tube.

(4) Insert tube in flaring tool.

(5) Place gauge form over the end of the tube.

(6) Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.

(7) Tighten the tool bar on the tube

(8) Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc (Fig. 15).

(9) Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.

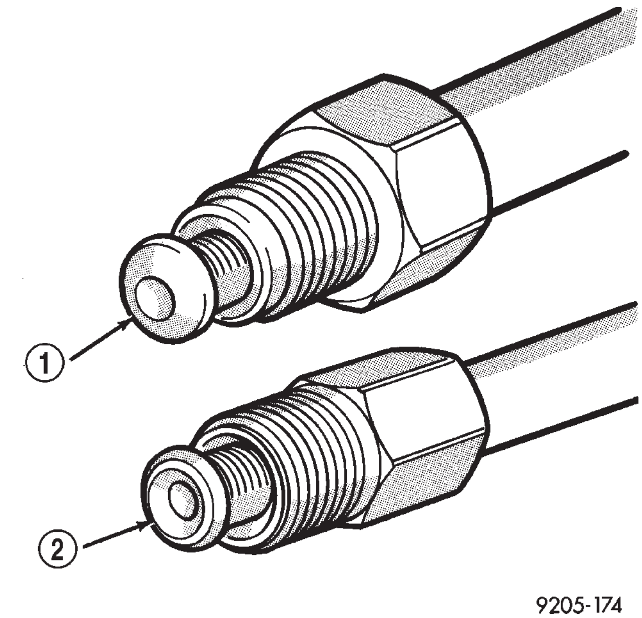


Fig. 14 Inverted Flare And ISO Flare

1 – ISO-STYLE FLARE

2 – DOUBLE INVERTED-STYLE FLARE

(10) Remove the plug gauge and complete the inverted flare.

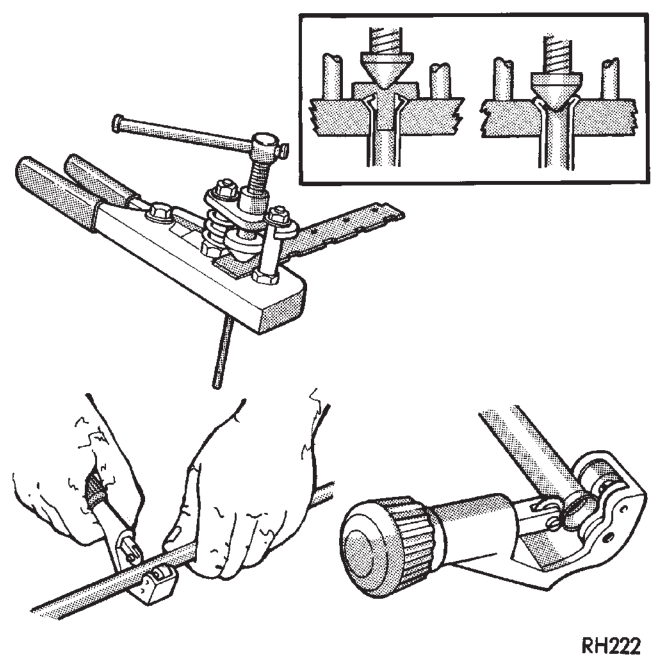


Fig. 15 Inverted Flare Tools

ISO FLARING

To make a ISO flare use Snap-On® Flaring Tool TFM-428 or equivalent.

(1) Cut off damaged tube with Tubing Cutter.

(2) Remove any burrs from the inside of the tube.

(3) Install tube nut on the tube.

SERVICE PROCEDURES (Continued)

(4) Position the tube in the flaring tool flush with the top of the tool bar (Fig. 16). Then tighten the tool bar on the tube.

(5) Install the correct size adaptor on the flaring tool yoke screw.

(6) Lubricate the adaptor.

(7) Align the adaptor and yoke screw over the tube (Fig. 16).

(8) Turn the yoke screw in until the adaptor is squarely seated on the tool bar.

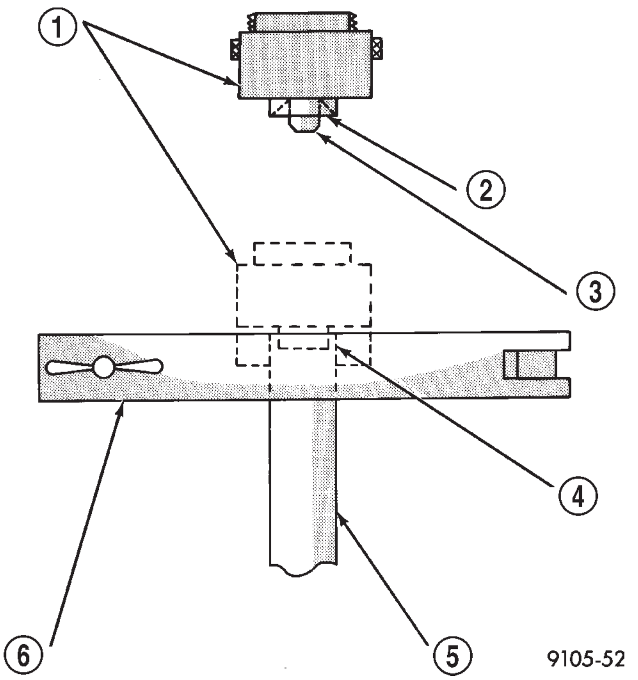


Fig. 16 ISO Flaring

1 – ADAPTER
2 – LUBRICATE HERE
3 – PILOT
4 – FLUSH WITH BAR
5 – TUBING
6 – BAR ASSEMBLY

REMOVAL AND INSTALLATION

BRAKE LAMP SWITCH

REMOVAL

(1) Remove steering column cover and lower trim panel for switch access (if necessary).

(2) Press brake pedal downward to fully applied position.

(3) Rotate switch approximately 30° in counter-clockwise direction to unlock switch retainer. Then pull switch rearward and out of bracket.

(4) Disconnect switch harness and remove switch from vehicle (Fig. 17).

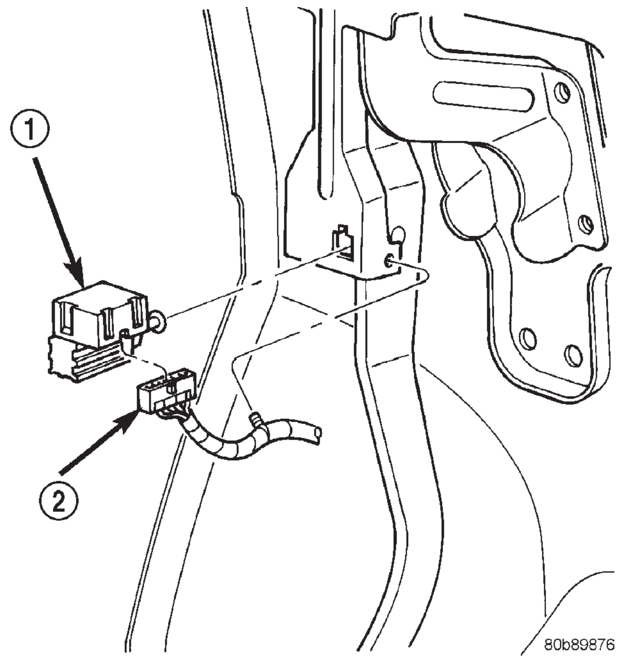


Fig. 17 Brake Lamp Switch

1 – SWITCH
2 – HARNESS CONNECTOR

INSTALLATION

(1) Pull switch plunger all the way out to fully extended position.

(2) Connect harness wires to switch.

(3) Press and hold brake pedal in applied position.

(4) Install switch as follows: Align tab on switch with notch in switch bracket. Then insert switch in bracket and turn it clockwise about 30° to lock it in place.

(5) Release brake pedal. Then pull pedal lightly rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs..

BRAKE PEDAL

REMOVAL

(1) Remove knee blocker under the steering column.

(2) Remove retainer clip securing booster push rod to pedal (Fig. 18).

(3) Remove brake lamp switch.

(4) Remove nuts securing the booster to the pedal support bracket and nuts to the column bracket.

(5) Remove pedal and support bracket as an assembly from the vehicle.

REMOVAL AND INSTALLATION (Continued)

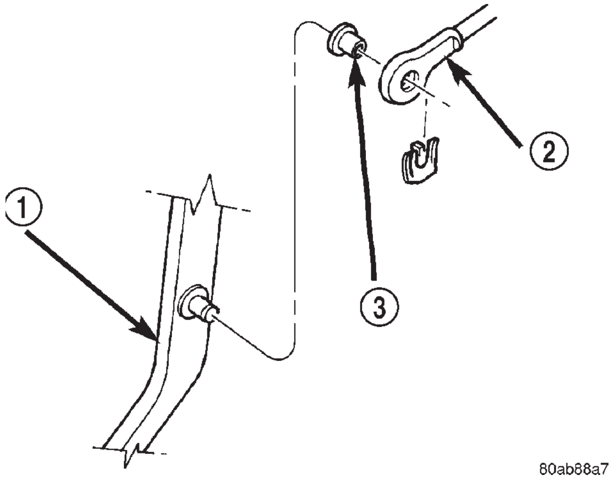


Fig. 18 Booster Push Rod

1 – BRAKE PEDAL
2 – BOOSTER ROD
3 – BUSHING

INSTALLATION

(1) Install pedal and support bracket as an assembly into the vehicle.

(2) Install nuts securing the booster to the pedal support bracket and nuts to the column bracket.

(3) Tighten nuts to 39 N·m (29 ft. lbs.).

(4) Lubricate the brake pedal pin and bushings with Mopar multi-mileage grease.

(5) Install booster push rod on pedal pin and install new retainer clip.

(6) Install knee blocker.

COMBINATION VALVE

NOTE: The combination valve is not repairable. The valve is serviced as an assembly only.

REMOVAL

(1) Remove air cleaner cover and hose for access to valve.

(2) Unsnap connector lock tabs and disconnect differential pressure switch wire at combination valve (Fig. 19). Do not pull switch wire to disconnect.

(3) Disconnect brake lines at combination valve (Fig. 20).

(4) Remove mounting nut and remove valve.

INSTALLATION

(1) Install valve and tighten mounting nut to 17 N·m (155 in. lbs.).

(2) Connect brake lines to replacement valve. Start line fittings by hand to avoid cross threading.

(3) Tighten brake line fittings to 14 N·m (124 in. lbs.).

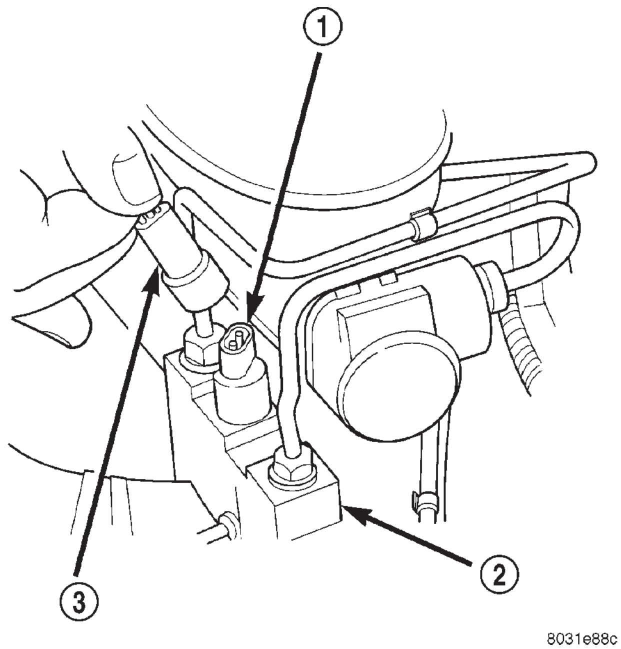


Fig. 19 Differential Pressure Switch

1 – SWITCH TERMINAL
2 – COMBINATION VALVE
3 – WIRE HARNESS CONNECTOR

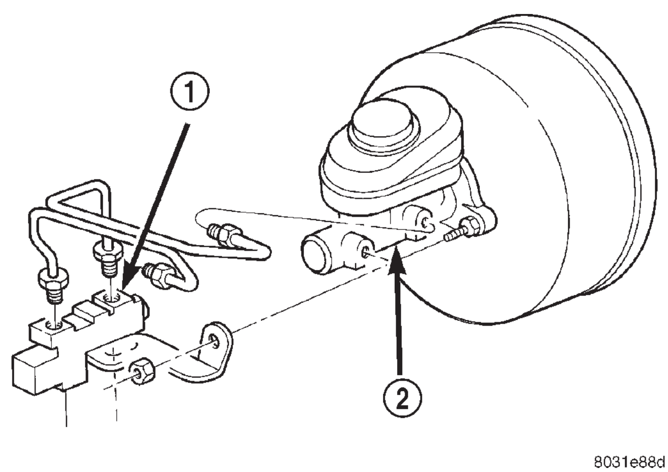


Fig. 20 Combination Valve

1 – COMBINATION VALVE
2 – MASTER CYLINDER

(4) Connect wire to pressure differential switch.

(5) Bleed base brakes.

MASTER CYLINDER

REMOVAL

(1) Remove brake lines at master cylinder and combination valve (Fig. 20).

(2) Disconnect differential pressure switch wire from the combination valve.

REMOVAL AND INSTALLATION (Continued)

(3) Remove mounting nuts from the combination valve bracket and remove the valve (Fig. 20).

(4) Remove mounting nuts from the master cylinder (Fig. 21).

(5) Remove master cylinder.

(6) Remove cylinder cover and drain fluid.

(7) If master cylinder reservoir requires service, refer to reservoir replacement procedure in this section.

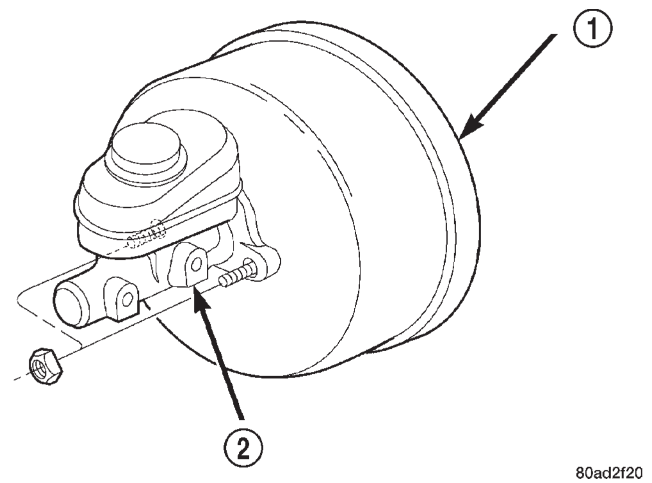


Fig. 21 Master Cylinder

1 – BOOSTER
2 – MASTER CYLINDER

INSTALLATION

NOTE: If master cylinder is replaced, bleed cylinder before installation.

(1) Remove protective sleeve from primary piston shank on new master cylinder.

(2) Clean cylinder mounting surface of brake booster.

(3) Install master cylinder onto brake booster studs.

(4) Install mounting nuts and tighten to 17 N·m (155 in. lbs.).

(5) Install combination valve and install mounting nuts.

(6) Connect brake lines to master cylinder and combination valve and tighten to 14 N·m (124 in. lbs.).

(7) Connect differential pressure switch wire to the combination valve.

(8) On RHD vehicles install the coolant reserve/overflow tank. Refer to Group 7 Cooling System.

(9) Fill and bleed base brake system.

POWER BRAKE BOOSTER

REMOVAL

(1) On RHD vehicles remove the coolant reserve/overflow tank. Refer to Group 7 Cooling System.

(2) Disconnect brake lines at master cylinder.

(3) Disconnect wire at combination valve differential pressure switch.

(4) Remove nut mounting combination valve bracket to booster studs and remove valve.

(5) Remove nuts mounting master cylinder to booster studs and remove cylinder.

(6) Disconnect vacuum hose from booster check valve.

(7) Remove knee blocker under the steering column.

(8) Remove retaining clip that secures booster push rod to brake pedal (Fig. 22).

(9) Remove nuts attaching booster to passenger compartment side of dash panel (Fig. 23).

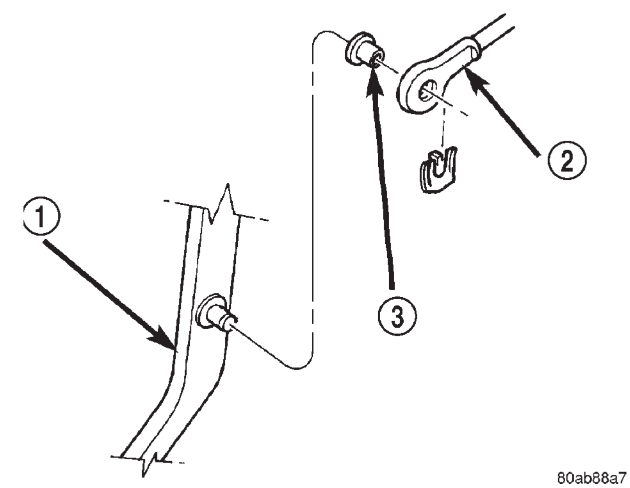


Fig. 22 Booster Push Rod

1 – BRAKE PEDAL
2 – BOOSTER ROD
3 – BUSHING

(10) In engine compartment, slide booster studs out of dash panel, tilt booster upward, and remove booster from engine compartment.

(11) Remove dash seal from booster.

INSTALLATION

(1) Install dash seal on booster.

(2) Align and position booster on dash panel.

(3) In passenger compartment, install booster mounting nuts. Tighten nuts just enough to hold booster in place.

(4) Slide booster push rod onto the brake pedal. Then secure push rod to pedal pin with retaining clip.

REMOVAL AND INSTALLATION (Continued)

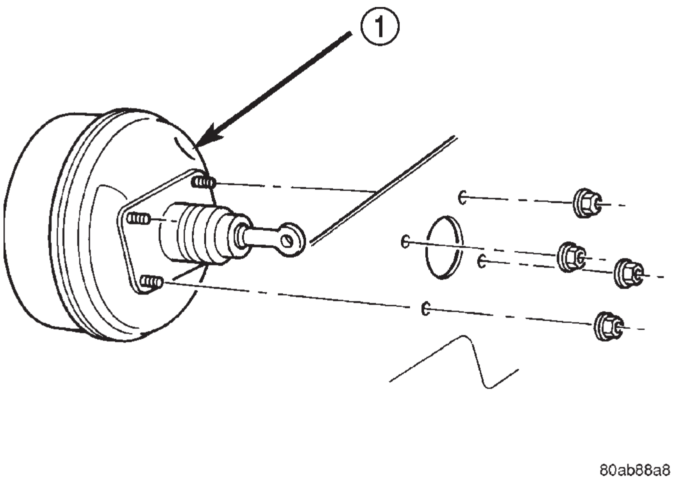


Fig. 23 Booster Mounting

1 – BOOSTER

NOTE: Lubricate the pedal pin and bushing with Mopar multi-mileage grease before installation.

(5) Tighten booster mounting nuts to 39 N·m (29 ft. lbs.).

(6) Install the knee blocker.

(7) If original master cylinder is being installed, check condition of seal at rear of master cylinder. Replace seal if cut, or torn.

(8) Clean cylinder mounting surface of brake booster. Use shop towel wetted with brake cleaner for this purpose. Dirt, grease, or similar materials will prevent proper cylinder seating and could result in vacuum leak.

(9) Align and install master cylinder on booster studs. Install mounting nuts and tighten to 17.5 N·m (155 in. lbs.).

(10) Connect vacuum hose to booster check valve.

(11) Connect and secure brake lines to combination valve and master cylinder. Start all brake line fittings by hand to avoid cross threading.

(12) Install combination valve on booster studs. Tighten bracket mounting nuts to 17.5 N·m (155 in. lbs.).

(13) Connect wire to combination valve switch.

(14) On RHD vehicles install the coolant reserve/overflow tank. Refer to Group 7 Cooling System.

(15) Fill and bleed base brake system.

(16) Verify proper brake operation before moving vehicle.

FRONT DISC BRAKE CALIPER

REMOVAL

(1) Raise and support vehicle.

(2) Remove front wheel and tire assembly.

(3) Drain small amount of fluid from master cylinder brake reservoir with suction gun.

(4) Bottom caliper piston in bore with C-clamp. Position clamp screw on outboard brake shoe and clamp frame on rear of caliper (Fig. 24). **Do not allow clamp screw to bear directly on outboard shoe retainer spring. Use wood or metal spacer between shoe and clamp screw.**

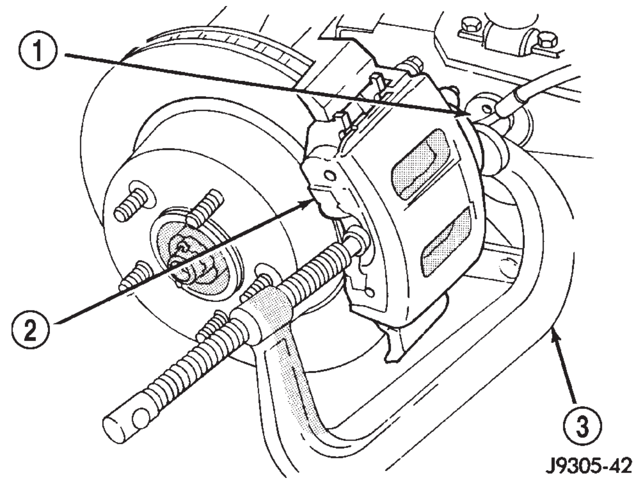


Fig. 24 Bottoming Caliper Piston With C-Clamp

1 – CALIPER BOSS
2 – OUTBOARD BRAKESHOE
3 – C-CLAMP

(5) Remove brake hose mounting bolt and discard washers (Fig. 25).

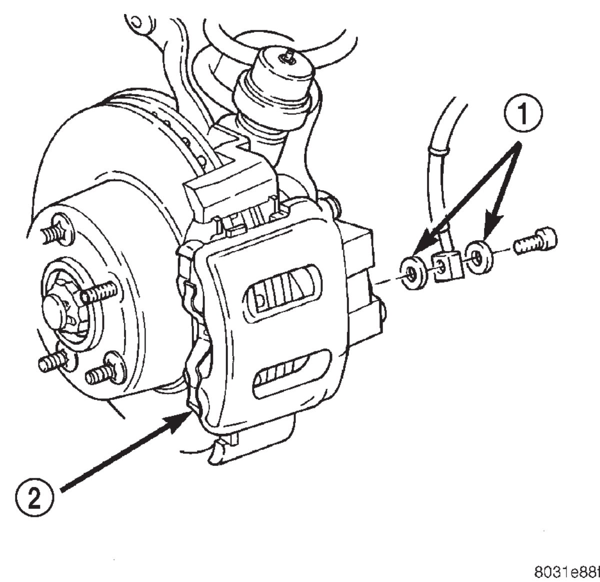


Fig. 25 Brake Hose And Bolt

1 – FITTING WASHERS
2 – CALIPERS

(6) Remove caliper mounting bolts (Fig. 26).

REMOVAL AND INSTALLATION (Continued)

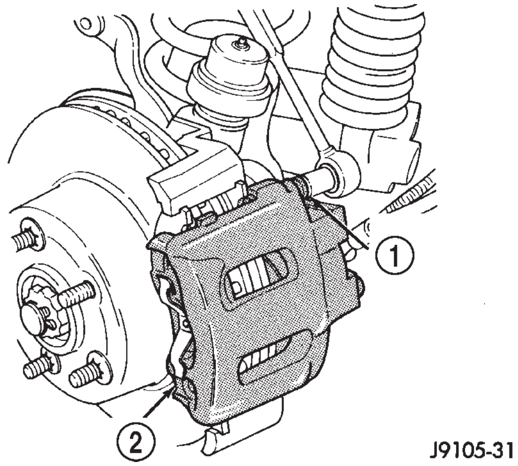


Fig. 26 Caliper Mounting Bolts

1 – CALIPER MOUNTING BOLT (2)
2 – CALIPER

(7) Tilt top of caliper outward with pry tool if necessary (Fig. 27) and remove caliper.

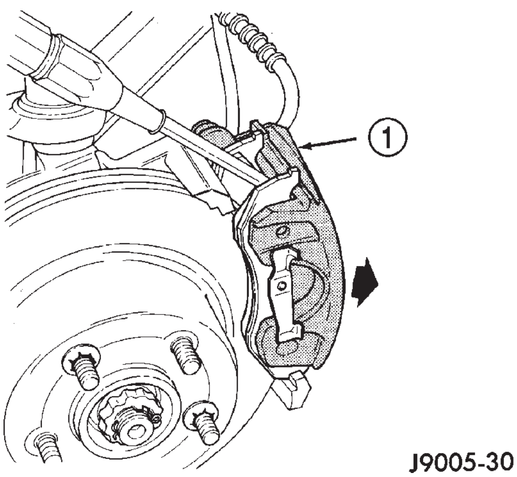


Fig. 27 Caliper Removal

1 – TILT CALIPER OUTBOARD TO REMOVE

(8) Remove caliper from vehicle.

INSTALLATION

(1) Clean brake shoe mounting ledges with wire brush and apply light coat of Mopar multi-mileage grease to surfaces (Fig. 28).

(2) Install caliper by position notches at lower end of brake shoes on bottom mounting ledge. Then rotate caliper over rotor and seat notches at upper end of shoes on top mounting ledge (Fig. 29).

(3) Coat caliper mounting bolts with silicone grease. Then install and tighten bolts to 15 N·m (11 ft. lbs.).

CAUTION: If new caliper bolts are being installed, or if the original reason for repair was a drag/pull condition, check caliper bolt length before proceeding. Bolts must not have a shank length greater than 67.6 mm (2.66 in.) (Fig. 30).

(4) Install brake hose to caliper with **new seal washers** and tighten fitting bolt to 31 N·m (23 ft. lbs.).

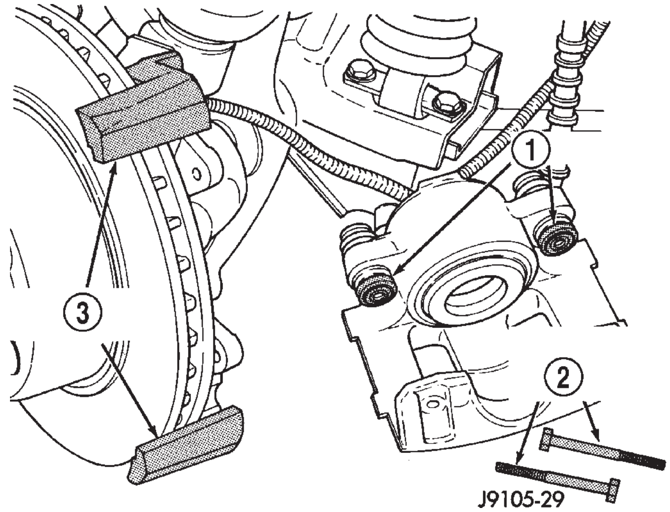


Fig. 28 Caliper Lubrication Points

1 – BUSHINGS
2 – CALIPER MOUNTING BOLTS
3 – MOUNTING LEDGES

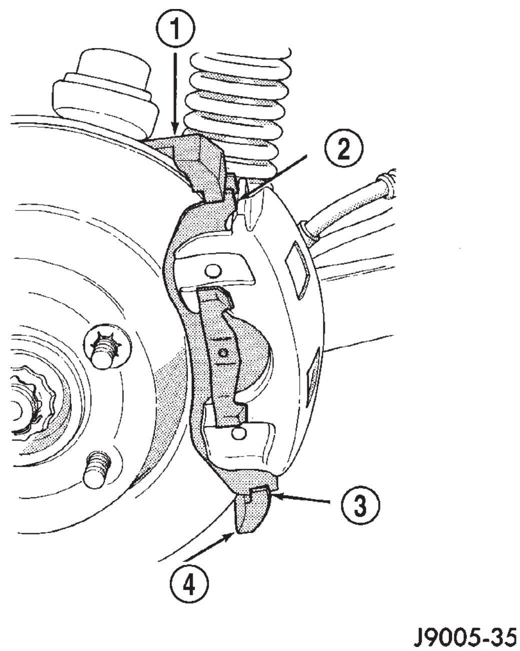


Fig. 29 Caliper Installation

1 – TOP LEDGE
2 – BRAKESHOE TAB ON LEDGE OUTER SURFACE
3 – LEDGE SEATED IN BRAKESHOE NOTCH
4 – BOTTOM LEDGE

REMOVAL AND INSTALLATION (Continued)

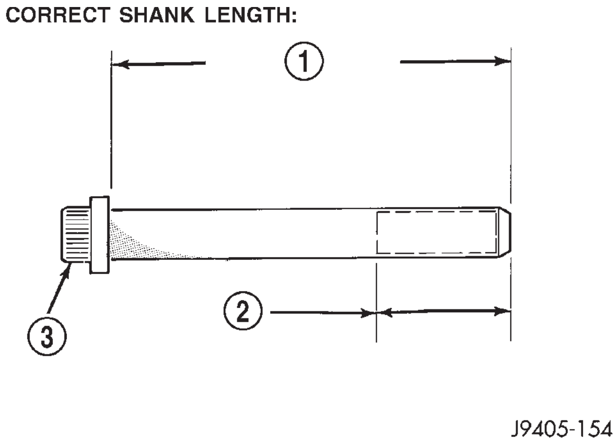


Fig. 30 Mounting Bolt Dimensions

1 – 67 mm (± 0.6 mm) 2.637 in. (± 0.0236 in.)
2 – 22 mm (0.866 in.) THREAD LENGTH
3 – CALIPER BOLT

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

(5) Bleed base brake system.
(6) Install wheel and tire assemblies.
(7) Remove supports and lower vehicle.
(8) Verify firm pedal before moving vehicle.

FRONT DISC BRAKE SHOES

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove caliper.
(4) Pressing one end of outboard shoe inward to disengage shoe lug. Then rotate shoe upward until retainer spring clears caliper. Press opposite end of shoe inward to disengage shoe lug and rotate shoe up and out of caliper (Fig. 31).
(5) Grasp ends of inboard shoe and tilt shoe outward to release springs from caliper piston (Fig. 32) and remove shoe from caliper.

NOTE: If original brake shoes will be used, keep them in sets left and right. They are not interchangeable.

(6) Secure caliper to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**
(7) Wipe caliper off with shop rags or towels.

CAUTION: Do not use compressed air, this can unseat dust boot and force dirt into piston bore.

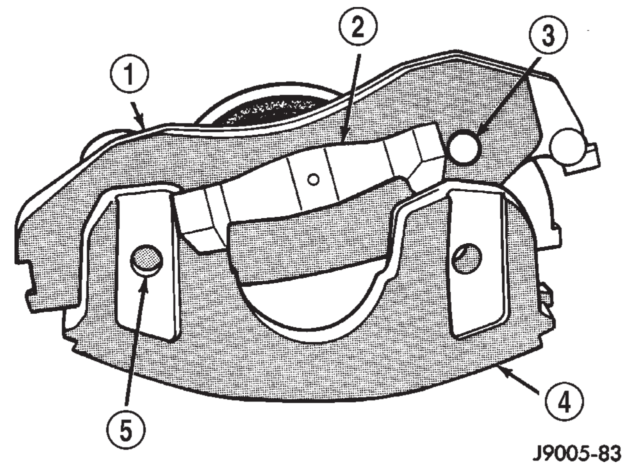


Fig. 31 Outboard Brake Shoe Removal

1 – OUTBOARD BRAKESHOE
2 – SHOE SPRING
3 – LOCATING LUG
4 – CALIPER
5 – LOCATING LUG

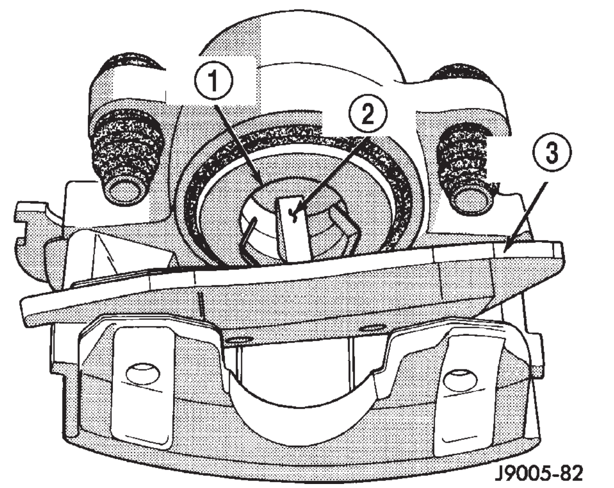


Fig. 32 Inboard Brake Shoe Removal

1 – CALIPER PISTON
2 – SHOE SPRINGS
3 – INBOARD BRAKESHOE

INSTALLATION

(1) Install inboard shoe in caliper and verify shoe retaining is fully seated into the piston.
(2) Starting one end of outboard shoe in caliper and rotating shoe downward into place. Verify shoe locating lugs and shoe spring are seated.
(3) Install caliper.
(4) Install wheel and tire assembly.
(5) Remove support and lower vehicle.
(6) Pump brake pedal until caliper pistons and brake shoes are seated.
(7) Top off brake fluid level if necessary.

REMOVAL AND INSTALLATION (Continued)

DISC BRAKE ROTOR

REMOVAL

(1) Remove wheel and tire assemble.

(2) Remove caliper.

(3) Remove retainers securing rotor to hub studs (Fig. 33).

(4) Remove rotor from hub.

(5) If rotor shield requires service, remove front hub and bearing assembly.

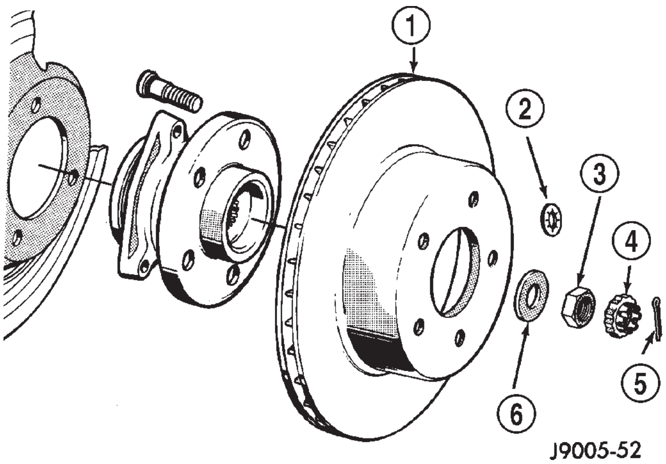


Fig. 33 Rotor & Hub

1 – ROTOR
2 – RETAINER
3 – BEARING NUT
4 – NUT LOCK
5 – COTTER PIN
6 – WASHER

INSTALLATION

(1) If new rotor is being installed, remove protective coating from rotor surfaces with carburetor cleaner.

(2) Install rotor on hub.

(3) Install caliper.

(4) Install wheel and tire assembly.

DRUM BRAKE SHOES

REMOVAL

(1) Raise vehicle and remove rear wheels.

(2) Remove and discard spring nuts securing drums to wheel studs.

(3) Remove brake drums. If drums prove difficult to remove, retract brake shoes. Remove access plug at the rear of backing plate and back off adjuster screw with brake tool and screwdriver.

(4) Remove U-clip and washer securing adjuster cable to parking brake lever (Fig. 34).

(5) Remove primary and secondary return springs from anchor pin with brake spring pliers.

(6) Remove hold-down springs, retainers and pins with standard retaining spring tool.

(7) Install spring clamps on wheel cylinders to hold pistons in place.

(8) Remove adjuster lever, adjuster screw and spring.

(9) Remove adjuster cable and cable guide.

(10) Remove brake shoes and parking brake strut.

(11) Disconnect cable from parking brake lever and remove lever.

INSTALLATION

(1) Clean support plate with brake cleaner.

(2) If new drums are being installed, remove protective coating with carburetor cleaner followed by final rinse with brake cleaner.

(3) Clean and lubricate anchor pin with light coat of Mopar multi-mileage grease.

(4) Apply Mopar multi-mileage grease to brake shoe contact surfaces of support plate (Fig. 35).

(5) Lubricate adjuster screw threads and pivot with spray lube.

(6) Attach parking brake lever to secondary brake shoe. Use new washer and U-clip to secure lever.

(7) Remove wheel cylinder clamps.

(8) Attach parking brake cable to lever.

(9) Install brake shoes on support plate. Secure shoes with new hold-down springs, pins and retainers.

(10) Install parking brake strut and spring.

(11) Install guide plate and adjuster cable on anchor pin.

(12) Install primary and secondary return springs.

(13) Install adjuster cable guide on secondary shoe.

(14) Lubricate and assemble adjuster screw.

(15) Install adjuster screw, spring and lever and connect to adjuster cable.

(16) Adjust shoes to drum.

(17) Install wheel/tire assemblies and lower vehicle.

(18) Verify firm brake pedal before moving vehicle.

WHEEL CYLINDER

REMOVAL

(1) Remove wheel and tire assembly.

(2) Remove brake drum.

(3) Disconnect wheel cylinder brake line.

(4) Remove brake shoe return springs and move shoes out of engagement with cylinder push rods.

(5) Remove cylinder attaching bolts and remove cylinder from support plate.

REMOVAL AND INSTALLATION (Continued)

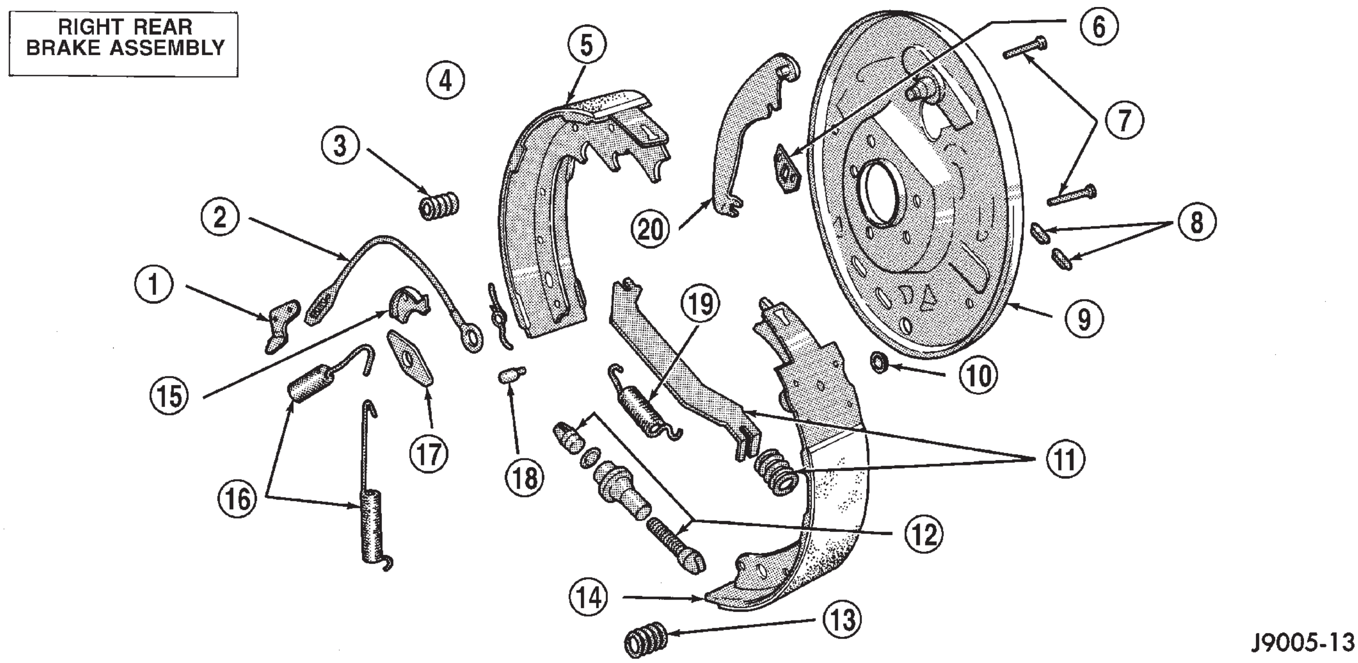


Fig. 34 Drum Brake Components—Typical

1 – ADJUSTER LEVER
2 – ADJUSTER CABLE
3 – HOLDDOWN SPRING AND RETAINERS
4 – ADJUSTER LEVER SPRING
5 – TRAILING SHOE
6 – CYLINDER-TO-SUPPORT SEAL
7 – HOLDDOWN PINS
8 – ACCESS PLUGS
9 – SUPPORT PLATE
10 – CABLE HOLE PLUG
11 – PARK BRAKE STRUT AND SPRING
12 – ADJUSTER SCREW ASSEMBLY
13 – HOLDDOWN SPRING AND RETAINERS
14 – LEADING SHOE
15 – CABLE GUIDE
16 – SHOE RETURN SPRINGS
17 – SHOE GUIDE PLATE
18 – PIN
19 – SHOE SPRING
20 – PARK BRAKE LEVER

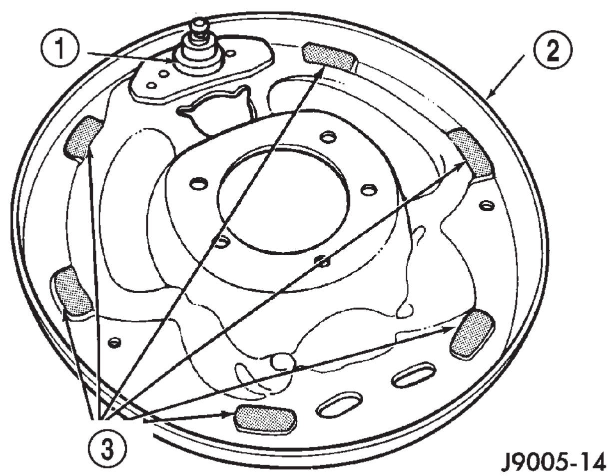


Fig. 35 Shoe Contact Surfaces

1 – ANCHOR PIN
2 – SUPPORT PLATE
3 – SHOE CONTACT SURFACES

INSTALLATION

(1) Apply bead of silicone sealer around cylinder mounting surface of support plate.

(2) Install cylinder mounting bolts and tighten to 20 N·m (15 ft. lbs.).

(3) Connect brake line to cylinder.

(4) Install brake shoe return spring.

(5) Install brake drum.

(6) Install wheel and tire assembly.

(7) Bleed base brake system.

BRAKE SUPPORT PLATE

REMOVAL

(1) Remove wheel and tire assembly and brake drum.

(2) Remove brake shoe assembly.

(3) Remove parking brake cable from parking brake lever.

(4) Compress parking brake cable retainer tabs. Then push retainer and cable through and out of support plate.

REMOVAL AND INSTALLATION (Continued)

(5) Disconnect brake line at wheel cylinder.
(6) Remove wheel cylinder from support plate.
(7) Remove axle shaft, refer to Group 3 for procedures.
(8) Remove bolts attaching support plate to axle and remove support plate.

INSTALLATION

(1) Apply bead of silicone sealer around axle mounting surface of support plate.
(2) Install support plate on axle flange. Tighten attaching bolts to 115 N·m (85 ft. lbs.).
(3) Apply bead of silicone sealer around wheel cylinder mounting surface and install wheel cylinder.
(4) Install brake line in wheel cylinder.
(5) Install parking brake cable in support plate.
(6) Install axle shaft, refer to Group 3 for procedure.
(7) Connect parking brake cable to lever on secondary shoe and install brake shoes on support plate.
(8) Adjust brake shoes to drum with brake gauge.
(9) Install brake drum and wheel and tire assembly.
(10) Bleed brake system.

REAR PARKING BRAKE CABLES

REMOVAL

(1) Raise vehicle and loosen equalizer nuts until rear cables are slack.
(2) Disengage cables from equalizer and compress cable retainers with a worm drive hose clamp.
(3) Remove cables from the cable bracket (Fig. 36).
(4) Remove rear wheel and brake drums.
(5) Remove secondary brake shoe and disconnect cable from lever on brake shoe.
(6) Compress cables retainer with worm drive hose clamp (Fig. 37) and remove cables from backing plates.

INSTALLATION

(1) Install new cables in backing plates. Be sure cable retainer is seated.
(2) Attach cable to lever on brake shoe and install brake shoe on backing plate.
(3) Adjust brake shoes to drum with brake gauge.
(4) Install brake drums and wheels.
(5) Install cables into the cable bracket and insure retainers are seated in the bracket.
(6) Engage the cable ends into the equalizer and install equalizer nut.
(7) Adjust parking brakes.

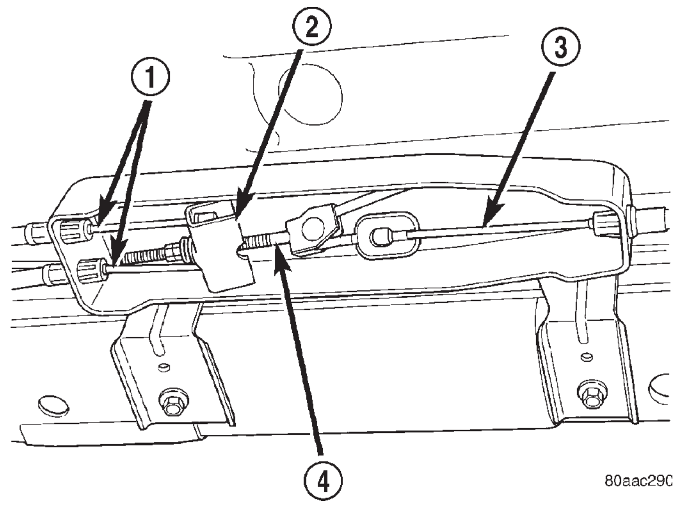


Fig. 36 Parking Brake Cables

1 – REAR CABLES
2 – EQUALIZER
3 – FRONT CABLE
4 – TENSIONER ROD

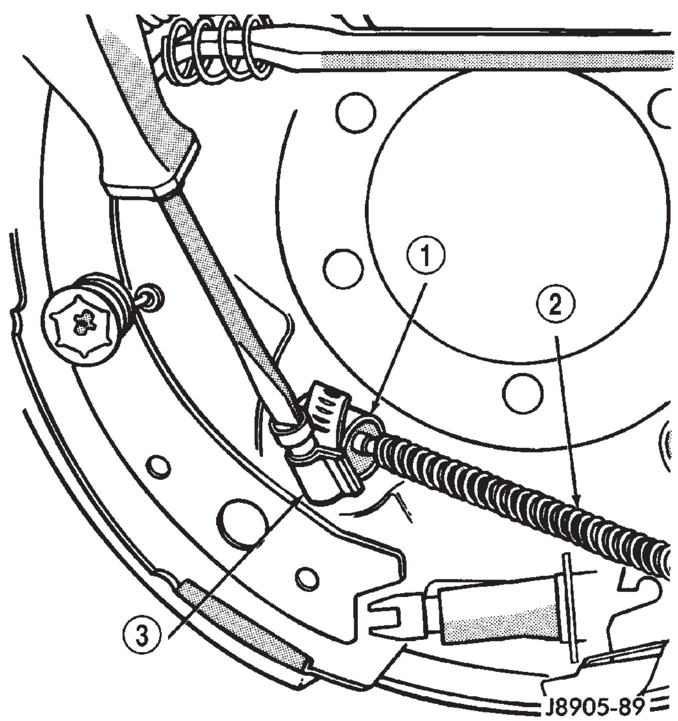


Fig. 37 Cable Retainer

1 – CABLE RETAINER
2 – REAR CABLE
3 – WORM DRIVE HOSE CLAMP

PARKING BRAKE LEVER

The center console must be removed to service the parking brake lever. Refer to Group 23 Interior Components for service procedures.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Release parking brakes.
(2) Raise vehicle.
(3) Remove adjusting nut from tensioner rod at the equalizer (Fig. 38).

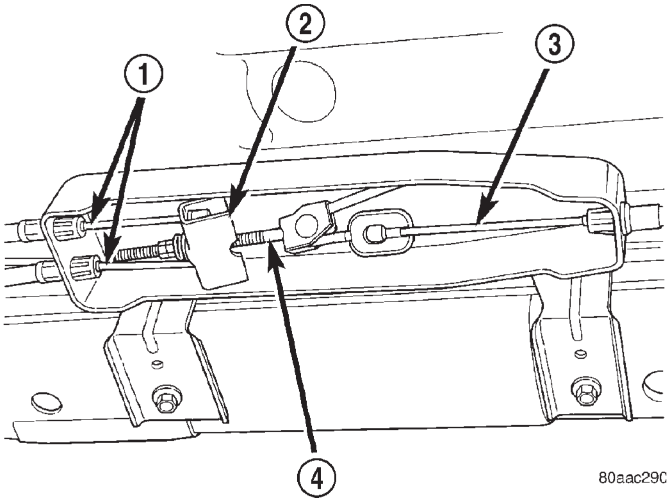


Fig. 38 Parking Brake Equalizer
1 – REAR CABLES
2 – EQUALIZER
3 – FRONT CABLE
4 – TENSIONER ROD

(4) Lower vehicle.
(5) Disengage front cable from the cable lever.
(6) Compress cable retainer with worm drive hose clamp and remove the cable from the parking brake lever base.
(7) Disconnect parking brake lamp switch wire (Fig. 39).
(8) Remove parking brake lever assembly mounting bolts (Fig. 39).
(9) Remove lever assembly.
(10) Remove parking brake lamp switch.

INSTALLATION

(1) Install parking brake lamp switch.
(2) Position lever assembly on floorpan and install lever mounting bolts.
(3) Tighten lever mounting bolts to 10 to 14 N·m (7 to 10 ft. lbs.).
(4) Insert front cable through the parking brake lever base. Insure the cable retainer is seated into the base.
(5) Attach the front cable to the cable lever (Fig. 39).
(6) Connect parking brake lamp switch wire.
(7) Raise vehicle.
(8) Install adjusting nut to the tensioner rod and adjust parking brakes.
(9) Lower vehicle.

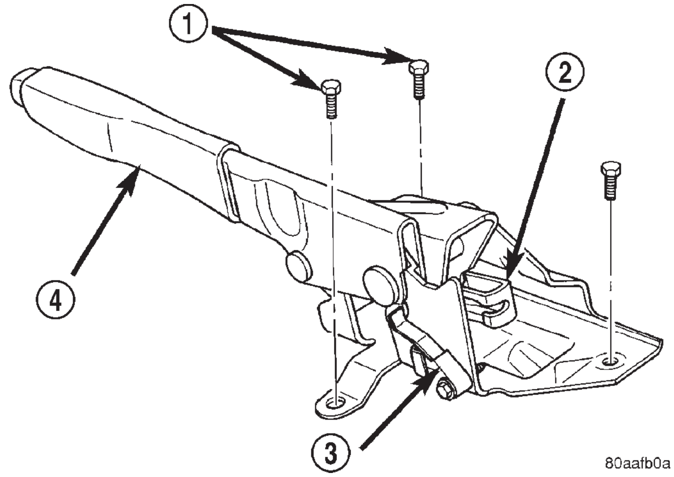


Fig. 39 Parking Brake Lever Assembly
1 – MOUNTING BOLTS
2 – FRONT CABLE LEVER
3 – PARKING BRAKE SWITCH
4 – PARKING BRAKE LEVER

(10) Verify correct parking brake operation.

DISASSEMBLY AND ASSEMBLY

MASTER CYLINDER RESERVOIR

REMOVAL

(1) Remove reservoir cap and empty fluid into drain container.
(2) Remove pins that retain reservoir to master cylinder. Use hammer and pin punch to remove pins (Fig. 40).

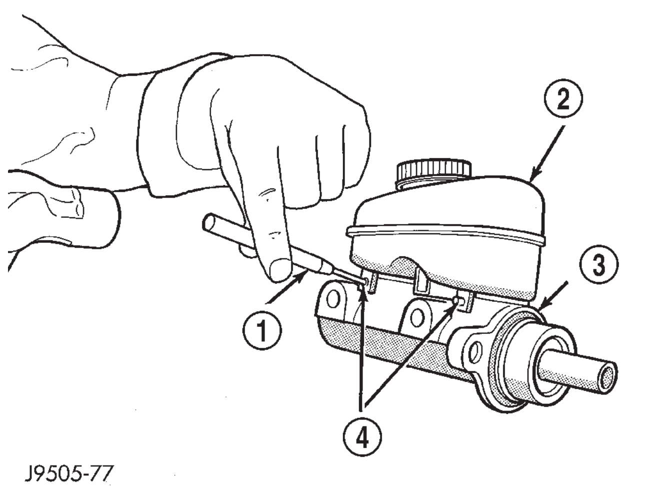


Fig. 40 Reservoir Retaining Pins
1 – PIN PUNCH
2 – RESERVOIR
3 – BODY
4 – ROLL PINS

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Clamp cylinder body in vise with brass protective jaws.

(4) Loosen reservoir from grommets with pry tool (Fig. 41).

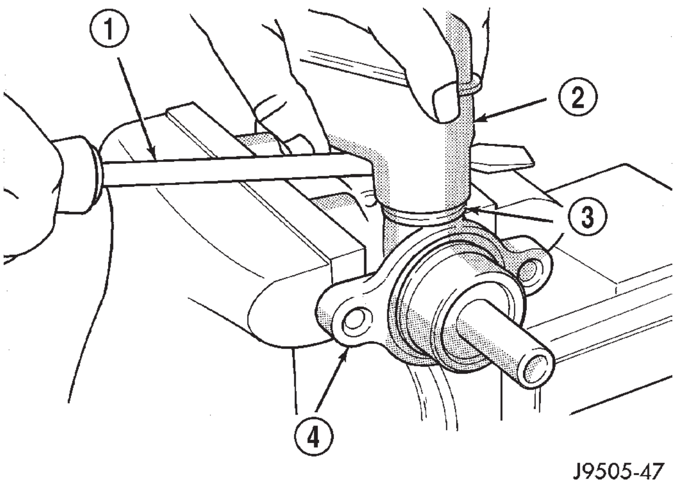


Fig. 41 Loosening Reservoir

1 – PRY TOOL
2 – RESERVOIR
3 – GROMMET
4 – MASTER CYLINDER BODY

(5) Remove reservoir by rocking it to one side and pulling free of grommets (Fig. 42).

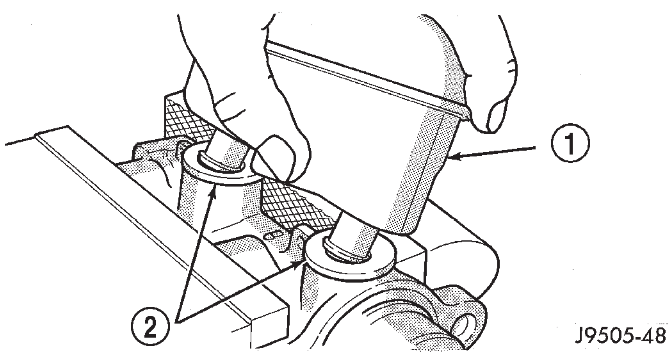


Fig. 42 Reservoir Removal

1 – RESERVOIR
2 – GROMMETS

(6) Remove old grommets from cylinder body (Fig. 43).

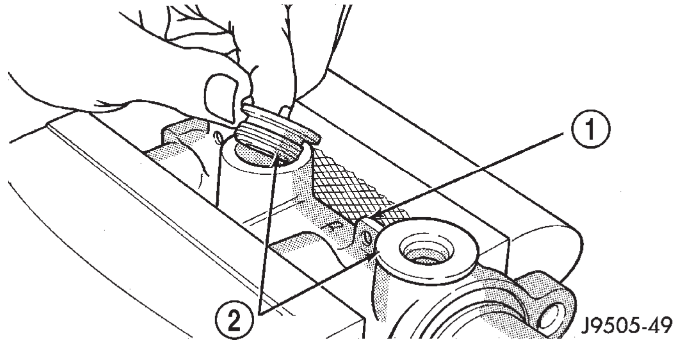


Fig. 43 Grommet Removal

1 – MASTER CYLINDER BODY
2 – GROMMETS

INSTALLATION

CAUTION: Do not use any type of tool to install the grommets. Tools may cut, or tear the grommets creating a leak problem after installation. Install the grommets using finger pressure only.

(1) Lubricate new grommets with clean brake fluid and Install new grommets in cylinder body (Fig. 44). Use finger pressure to install and seat grommets.

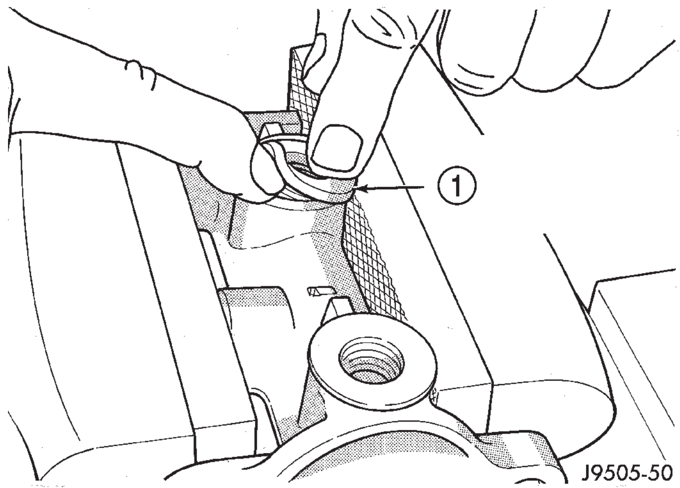


Fig. 44 Grommet Installation

1 – WORK NEW GROMMETS INTO PLACE USING FINGER PRESSURE ONLY

(2) Start reservoir in grommets. Then rock reservoir back and forth while pressing downward to seat it in grommets.

(3) Install pins that retain reservoir to cylinder body.

(4) Fill and bleed master cylinder on bench before installation in vehicle.

DISC BRAKE CALIPER

DISASSEMBLY

(1) Remove brake shoes from caliper.

(2) Drain brake fluid out of caliper.

(3) Take a piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the piston.

DISASSEMBLY AND ASSEMBLY (Continued)

This will cushion and protect caliper piston during removal (Fig. 45).

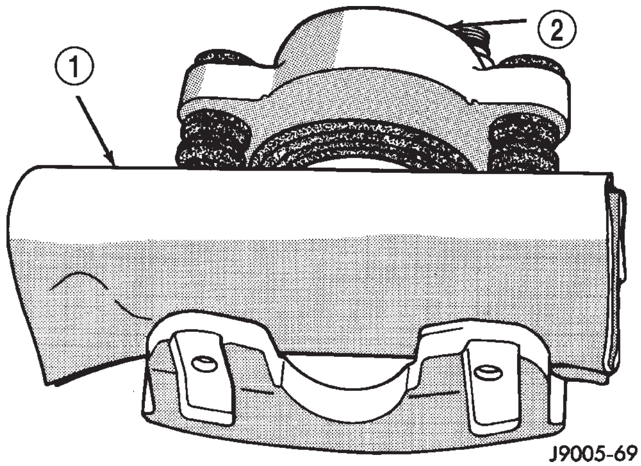


Fig. 45 Padding Caliper Interior

1 – SHOP TOWELS OR CLOTHS
2 – CALIPER

(4) Remove caliper piston with **short bursts** of low pressure compressed air. Direct air through fluid inlet port and ease piston out of bore (Fig. 46).

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston. Use only enough air pressure to ease the piston out.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS MAY RESULT IN PERSONAL INJURY.

(5) Remove caliper piston dust boot with suitable pry tool (Fig. 47).
(6) Remove caliper piston seal with wood or plastic tool (Fig. 48). Do not use metal tools as they will scratch piston bore.
(7) Remove caliper mounting bolt bushings and boots (Fig. 49).

ASSEMBLY

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

(1) Lubricate caliper piston bore, new piston seal and piston with clean brake fluid.
(2) Lubricate caliper bushings and interior of bushing boots with silicone grease.
(3) Install bushing boots in caliper, then insert bushing into boot and push bushing into place (Fig. 50).

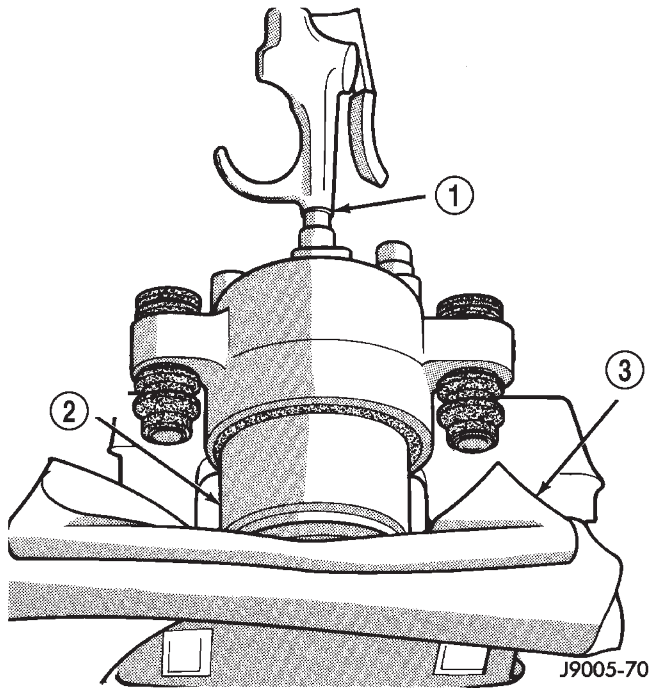


Fig. 46 Caliper Piston Removal

1 – AIR GUN
2 – CALIPER PISTON
3 – PADDING MATERIAL

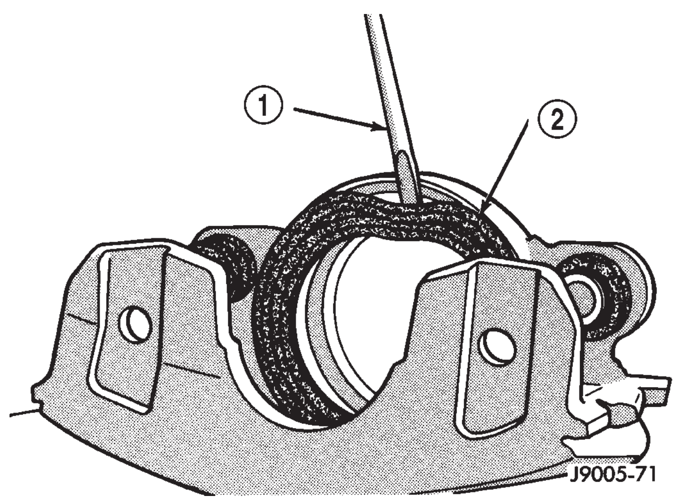


Fig. 47 Caliper Piston Dust Boot Removal

1 – COLLAPSE BOOT WITH PUNCH OR SCREWDRIVER
2 – PISTON DUST BOOT

(4) Install new piston seal into seal groove with finger (Fig. 51).
(5) Install new dust boot on caliper piston and seat boot in piston groove (Fig. 52).
(6) Press piston into caliper bore by hand, use a turn and push motion to work piston into seal (Fig. 53).
(7) Press caliper piston to bottom of bore.

DISASSEMBLY AND ASSEMBLY (Continued)

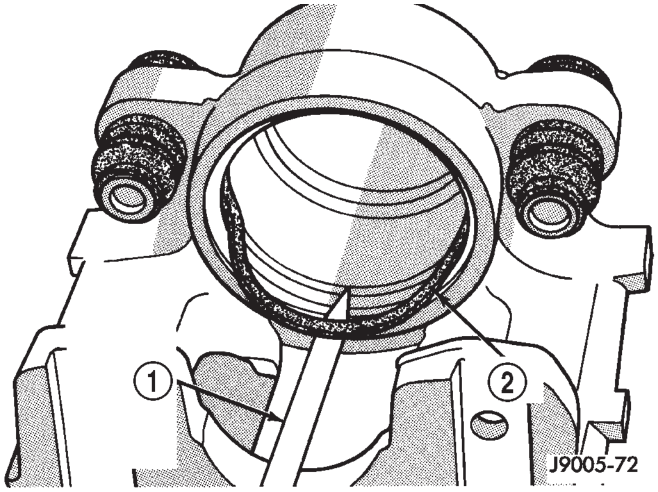


Fig. 48 Piston Seal Removal

1 – REMOVE SEAL WITH WOOD PENCIL OR SIMILAR TOOL
2 – PISTON SEAL

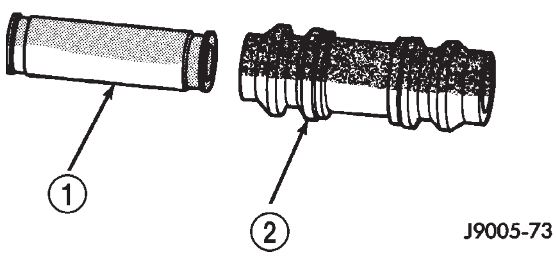


Fig. 49 Mounting Bolt Bushing And Boot

1 – CALIPER SLIDE BUSHING
2 – BOOT

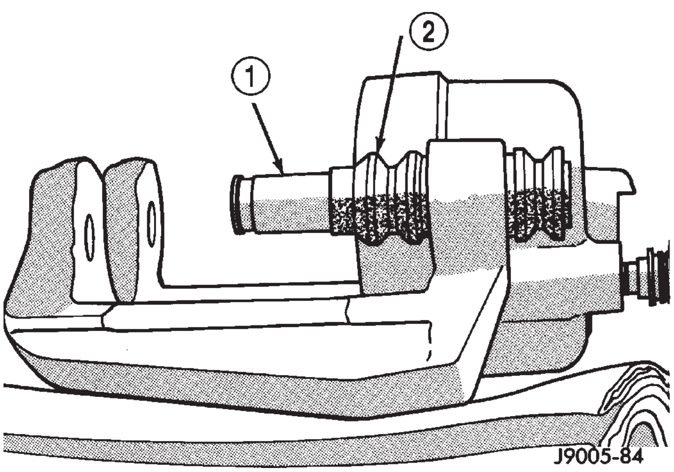


Fig. 50 Bushings And Boots Installation

1 – BUSHING
2 – BOOT

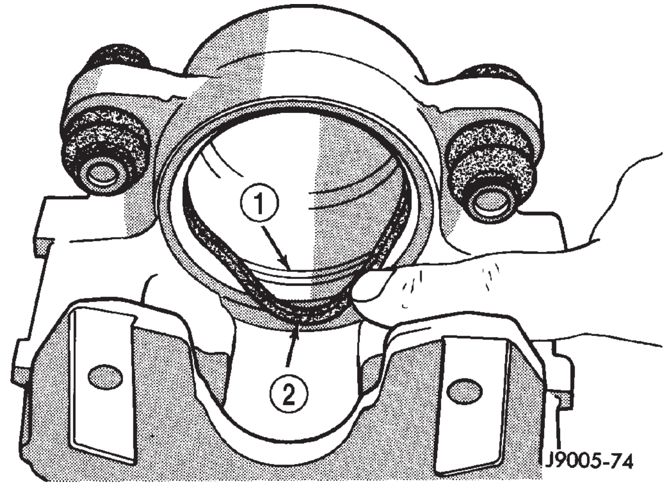


Fig. 51 Piston Seal Installation

1 – SEAL GROOVE
2 – PISTON SEAL

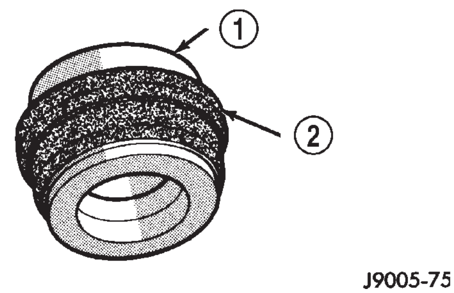


Fig. 52 Dust Boot On Piston

1 – PISTON
2 – DUST BOOT

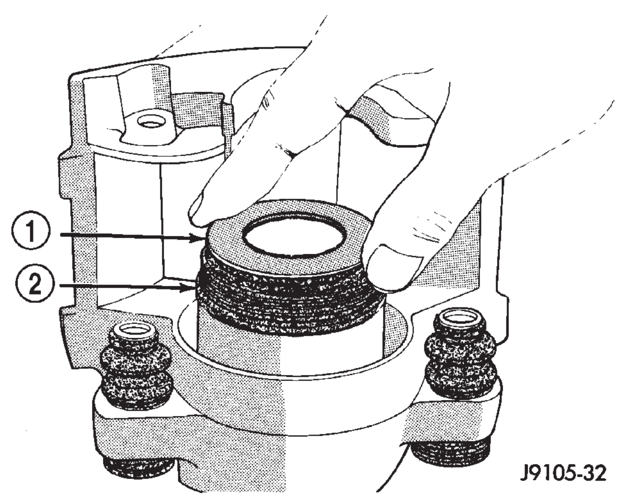


Fig. 53 Caliper Piston Installation

1 – PISTON
2 – BOOT

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Seat dust boot in caliper with Installer Tool C-4842 and Tool Handle C-4171 (Fig. 54).

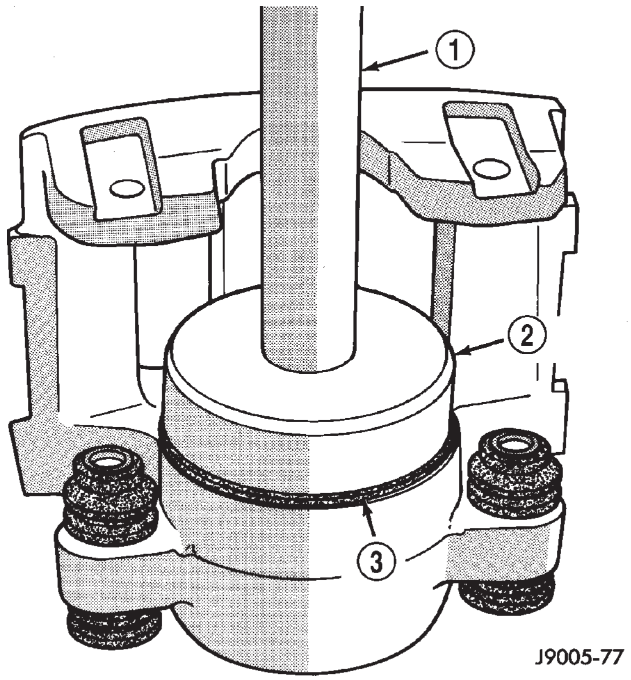


Fig. 54 Piston Dust Boot Installation

1 – HANDLE C-4171
2 – INSTALLER C-4842
3 – DUST BOOT

(9) Replace caliper bleed screw if removed.

WHEEL CYLINDER

DISASSEMBLY

(1) Remove push rods and boots (Fig. 55).
(2) Press pistons, cups and spring and expander out of cylinder bore.
(3) Remove bleed screw.

ASSEMBLY

(1) Lubricate wheel cylinder bore, pistons, piston cups and spring and expander with clean brake fluid.
(2) Install first piston in cylinder bore. Then install first cup in bore and against piston. **Be sure lip of piston cup is facing inward (toward spring and expander) and flat side is against piston.**
(3) Install spring and expander followed by remaining piston cup and piston.
(4) Install boots on each end of cylinder and insert push rods in boots.
(5) Install cylinder bleed screw.

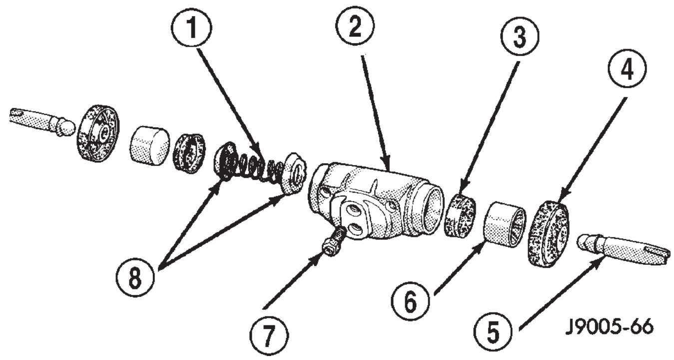


Fig. 55 Wheel Cylinder Components–Typical

1 – SPRING
2 – CYLINDER
3 – PISTON CLIP
4 – BOOT
5 – PUSH ROD
6 – PISTON
7 – BLEED SCREW
8 – CUP EXPANDERS

CLEANING AND INSPECTION

CALIPER

CLEANING

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

CAUTION: Do not use gasoline, kerosene, thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone to remove very minor surface imperfections (Fig. 56). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

CLEANING AND INSPECTION (Continued)

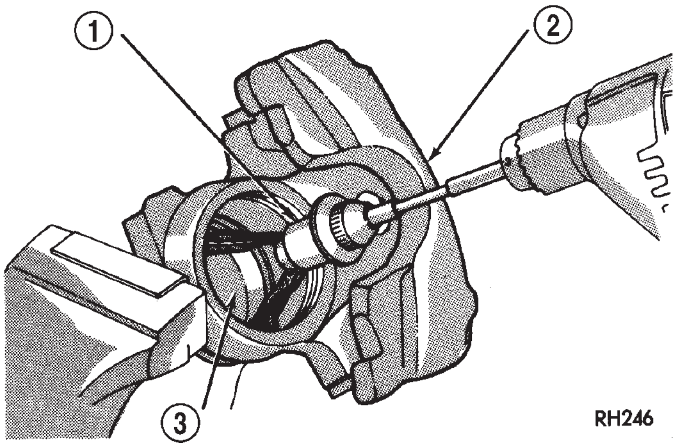


Fig. 56 Polishing Piston Bore

1 – SPECIAL HONE
2 – CALIPER
3 – PISTON BORE

REAR DRUM BRAKE

CLEANING

Clean the individual brake components, including the support plate and wheel cylinder exterior, with a water dampened cloth or with brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brake shoe contact pads on the support plate with fine sandpaper.

INSPECTION

As a general rule, riveted brake shoes should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes exhibiting contact only on one side should be replaced and the drum checked for runout or taper.

Inspect the adjuster screw assembly. Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded.

Discard the brake springs and retainer components if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brake shoe contact pads on the support plate, replace the support plate if any of the pads are worn or rusted through. Also replace the plate if it is bent or distorted (Fig. 57).

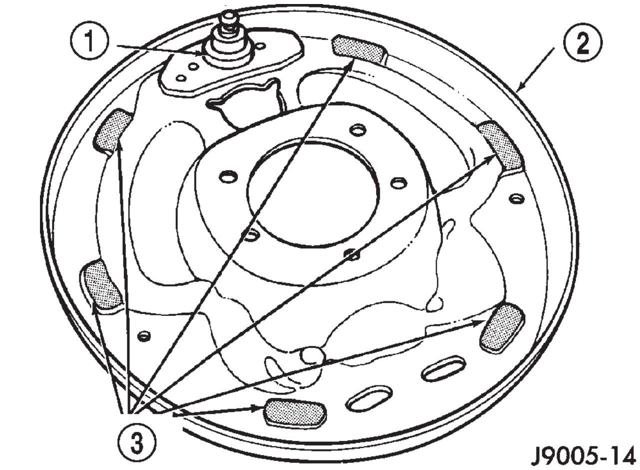


Fig. 57 Shoe Contact Surfaces

1 – ANCHOR PIN
2 – SUPPORT PLATE
3 – SHOE CONTACT SURFACES

WHEEL CYLINDER

CLEANING

Clean the cylinder and pistons with clean brake fluid or brake cleaner only. Do not use any other cleaning agents.

Dry the cylinder and pistons with compressed air. Do not use rags or shop towels to dry the cylinder components. Lint from cloth material will adhere to the cylinder bores and pistons.

INSPECTION

Inspect the cylinder bore. Light discoloration and dark stains in the bore are normal and will not impair cylinder operation.

The cylinder bore can be lightly polished but only with crocus cloth. Replace the cylinder if the bore is scored, pitted or heavily corroded. Honing the bore to restore the surface is not recommended.

Inspect the cylinder pistons. The piston surfaces should be smooth and free of scratches, scoring and corrosion. Replace the pistons if worn, scored, or corroded. Do attempt to restore the surface by sanding or polishing.

Discard the old piston cups and the spring and expander. These parts are not reusable. The original dust boots may be reused but only if they are in good condition.

ADJUSTMENTS

BRAKE LAMP SWITCH

(1) Press and hold brake pedal in applied position.

(2) Pull switch plunger all the way out to fully extended position.

(3) Release brake pedal. Then pull pedal lightly rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs..

REAR DRUM BRAKE

The rear drum brakes are equipped with a self-adjusting mechanism. Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both drums are replaced.

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

ADJUSTMENT WITH BRAKE GAUGE

(1) Be sure parking brakes are fully released.

(2) Raise rear of vehicle and remove wheels and brake drums.

(3) Verify that left and right automatic adjuster levers and cables are properly connected.

(4) Insert brake gauge in drum. Expand gauge until gauge inner legs contact drum braking surface. Then lock gauge in position (Fig. 58).

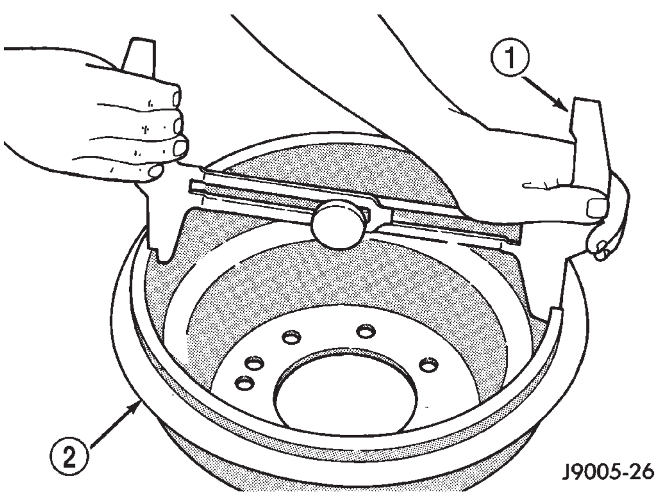


Fig. 58 Adjusting Gauge On Drum

1 – BRAKE GAUGE
2 – BRAKE DRUM

(5) Reverse gauge and install it on brake shoes. Position gauge legs at shoe centers as shown (Fig. 59). If gauge does not fit (too loose/too tight), adjust shoes.

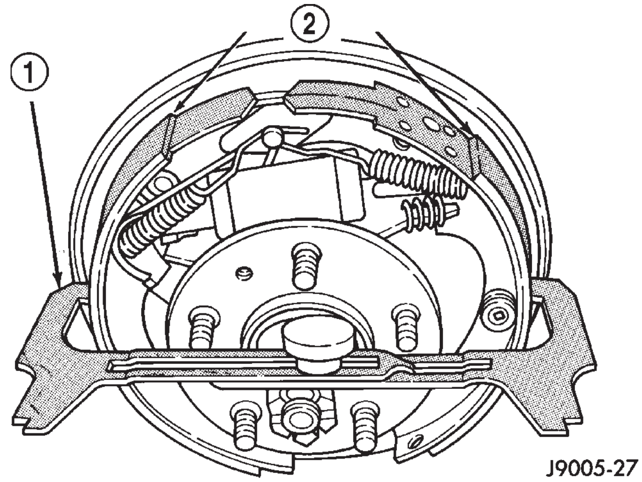


Fig. 59 Adjusting Gauge On Brake Shoes

1 – BRAKE GAUGE
2 – BRAKE SHOES

(6) Pull shoe adjuster lever away from adjuster screw star wheel.

(7) Turn adjuster screw star wheel (by hand) to expand or retract brake shoes. Continue adjustment until gauge outside legs are light drag-fit on shoes.

(8) Install brake drums and wheels and lower vehicle.

(9) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

ADJUSTMENT WITH ADJUSTING TOOL

(1) Be sure parking brake lever is fully released.

(2) Raise vehicle so rear wheels can be rotated freely.

(3) Remove plug from each access hole in brake support plates.

(4) Loosen parking brake cable adjustment nut until there is slack in front cable.

(5) Insert adjusting tool through support plate access hole and engage tool in teeth of adjusting screw star wheel (Fig. 60).

(6) Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.

ADJUSTMENTS (Continued)

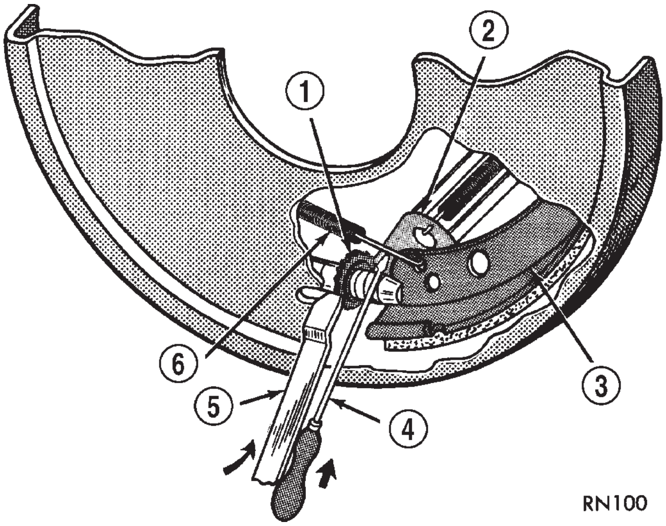


Fig. 60 Brake Adjustment

1 – STAR WHEEL
2 – LEVER
3 – BRAKE SHOE WEB
4 – SCREWDRIVER
5 – ADJUSTING TOOL
6 – ADJUSTER SPRING

(7) Push and hold adjuster lever away from star wheel with thin screwdriver.

(8) Back off adjuster screw star wheel until brake drag is eliminated.

(9) Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.

(10) Install support plate access hole plugs.

(11) Adjust parking brake cable and lower vehicle.

(12) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

PARKING BRAKE CABLE TENSIONER

NOTE: Parking brake adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected.

ADJUSTMENT

(1) Raise vehicle.

(2) Back off tensioner adjusting nut to create slack in cables.

(3) Remove rear wheel/tire assemblies and remove brake drums.

(4) Check rear brake shoe adjustment with standard brake gauge.

CAUTION: Excessive shoe-to-drum clearance, or worn brake components will result in faulty parking brake adjustment and operation.

(5) Verify that parking brake cables operate freely and are not binding, or seized. Replace faulty cables, before proceeding.

(6) Reinstall brake drums and wheel/tire assemblies after brake shoe adjustment is complete.

(7) Lower vehicle enough for access to parking brake lever. Then **fully** apply parking brakes. Leave brakes applied until adjustment is complete.

(8) Raise vehicle and mark tensioner rod 6.5 mm (1/4 in.) from tensioner bracket (Fig. 61).

(9) Tighten adjusting nut at equalizer until mark on tensioner rod moves into alignment with tensioner bracket.

(10) Lower vehicle until rear wheels are 15-20 cm (6-8 in.) off shop floor.

(11) Release parking brake lever and verify that rear wheels rotate freely without drag.

(12) Lower vehicle.

NOTE: Do not loosen/tighten equalizer adjusting nut for any reason after completing adjustment.

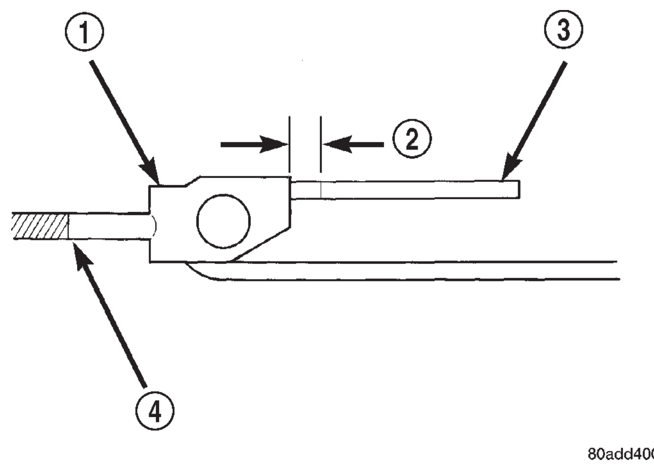


Fig. 61 Tensioner Rod Measurement

1 – TENSIONER BRACKET
2 – 6.5 mm (1/4 in.)
3 – TENSIONER ROD
4 – ROD TO EQUALIZER

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

SPECIFICATIONS (Continued)

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.

BRAKE COMPONENTS

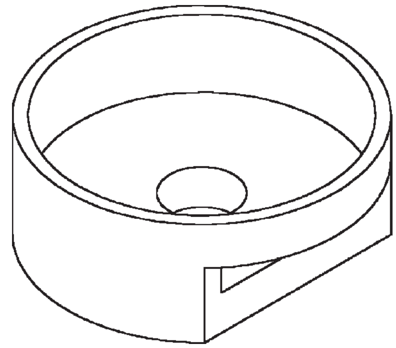
Disc Brake Caliper	
Type	Sliding
Disc Brake Rotor	
Type	Ventilated
Max. Runout	0.12 mm (0.005 in.)
Max. Thickness Variation	0.013 mm (0.0005 in.)
Min. Thickness	22.7 mm (0.8937 in.)
Brake Drum	
Size	9 in. or 10 in.
Brake Booster	
Type	Dual Diaphragm

TORQUE CHART

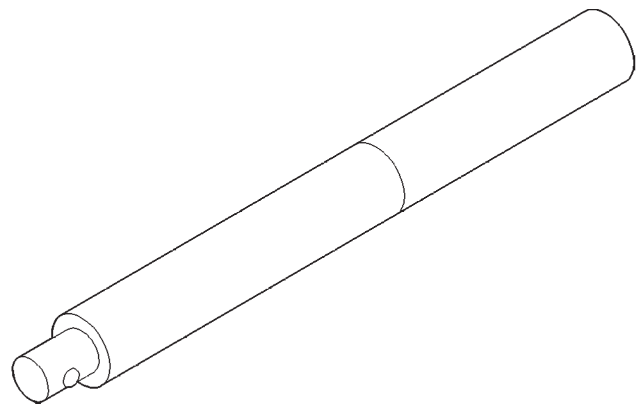
DESCRIPTION	TORQUE
Brake Pedal	
Pivot Bolt/Nut	35 N·m (26 ft. lbs.)
Brake Booster	
Mounting Nuts	39 N·m (29 ft. lbs.)
Master Cylinder	
Mounting Nuts	17.5 N·m (155 in. lbs.)
Brake Lines	14 N·m (124 in. lbs.)
Combination Valve	
Mounting Nuts	17.5 N·m (155 in. lbs.)
Brake Lines	14 N·m (124 in. lbs.)
Caliper	
Mounting Bolts	15 N·m (11 ft. lbs.)
Brake Hose Bolt	31 N·m (23 ft. lbs.)
Wheel Cylinder	
Mounting Bolts	10 N·m (7 ft. lbs.)
Brake Line	14 N·m (124 in. lbs.)
Parking Brake	
Lever Screws	10-14 N·m (7-10 ft. lbs.)
Lever Bracket Screws	10-14 N·m (7-10 ft. lbs.)
Cable Retainer Nut	1.5 N·m (14 in. lbs.)

SPECIAL TOOLS

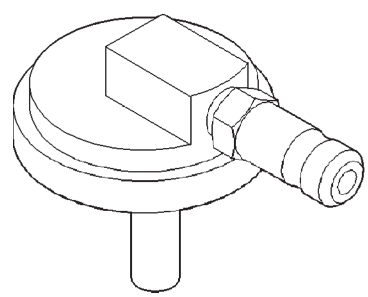
BASE BRAKES



Installer Caliper Dust Boot 8280



Handle C-4171



Adapter Pressure Bleeder 6921

ANTILOCK BRAKES

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

ANTILOCK BRAKE SYSTEM

DESCRIPTION

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock CAB activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching 20 to 30 percent of actual vehicle speed during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

Battery voltage is supplied to the CAB ignition terminal when the ignition switch is turned to Run position. The CAB performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 30 kph (18 mph). During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning light and registers a fault code in the microprocessor memory.

OPERATION

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

During antilock braking fluid pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a high slip condition activates the CAB antilock program. Two solenoid valves are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels. The solenoid valves are not static during antilock braking. They are cycled continuously to modulate pressure. Solenoid cycle time in antilock mode can be measured in milliseconds.

CONTROLLER ANTILOCK BRAKES

DESCRIPTION

The CAB is mounted to the HCU and operates the ABS system (Fig. 1) separate from other vehicle electrical circuits.

OPERATION

The CAB voltage source is through the ignition switch in the RUN position. The CAB contains dual

DESCRIPTION AND OPERATION (Continued)

microprocessors. A logic block in each microprocessor receives identical sensor signals. These signals are processed and compared simultaneously. The CAB contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in a diagnostic program memory and are accessible with the DRB scan tool. ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are **not** erased if the battery is disconnected.

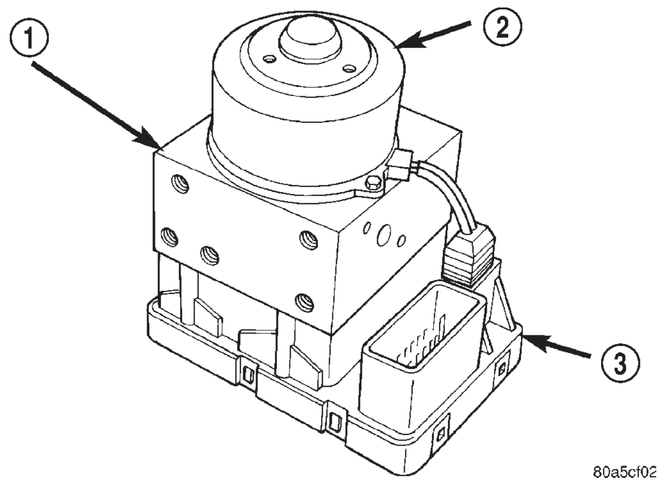


Fig. 1 Controller Antilock Brakes

1 – HCU
2 – MOTOR
3 – CAB

HYDRAULIC CONTROL UNIT

DESCRIPTION

The HCU consists of a valve body, pump motor, and wire harness (Fig. 1).

OPERATION

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the CAB.

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

PRESSURE HOLD

Both solenoid valves are closed in the pressure hold cycle. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

WHEEL SPEED SENSORS AND TONE WHEEL

DESCRIPTION

A speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors at the outboard end of the axle.

OPERATION

The sensors convert wheel speed into a small AC electrical signal. This signal is transmitted to the CAB. The CAB converts the AC signal into a digital signal for each wheel. This voltage is generated by magnetic induction when a tone wheel passes by the stationary magnet of the wheel speed sensor.

A gear type tone ring serves as the trigger mechanism for each sensor. The tone rings are mounted at the outboard ends of the front and rear axle shafts.

Different sensors are used at the front and rear wheels (Fig. 2). The front/rear sensors have the same electrical values but are not interchangeable. The

DESCRIPTION AND OPERATION (Continued)

sensors have a resistance between 900 and 1300 ohms.

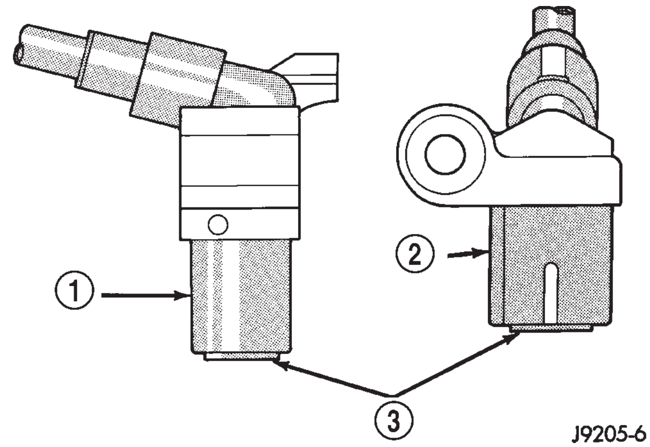


Fig. 2 Wheel Speed Sensors

1 – FRONT SENSOR
2 – REAR SENSOR
3 – PICKUP FACE

FRONT SENSOR AIR GAP

Front sensor air gap is fixed and not adjustable. Only rear sensor air gap is adjustable.

Although front air gap is not adjustable, it can be checked if diagnosis indicates this is necessary. Front air gap should be 0.36 to 1.5 mm (0.014 to 0.059 in.). If gap is incorrect, the sensor is either loose, or damaged.

REAR SENSOR AIR GAP

A rear sensor air gap adjustment is only needed when reinstalling an original sensor. Replacement sensors have an air gap spacer attached to the sensor pickup face. The spacer establishes correct air gap when pressed against the tone ring during installation. As the tone ring rotates, it peels the spacer off the sensor to create the required air gap. Rear sensor air gap is 0.92-1.275 mm (0.036-0.05 in.).

Sensor air gap measurement, or adjustment procedures are provided in this section. Refer to the front, or rear sensor removal and installation procedures as required.

COMBINATION VALVE

DESCRIPTION

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable and must be replaced as an assembly if diagnosis indicates this is necessary.

OPERATION

PRESSURE DIFFERENTIAL VALVE

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs to the brake system are made.

PROPORTIONING VALVE

The proportioning valve is used to balance front-rear brake action at high decelerations. The valve allows normal fluid flow during moderate braking. The valve only controls fluid flow during high decelerations brake stops.

G-SWITCH

DESCRIPTION

The G-switch is located under the rear seat. The switch has directional arrow and must be mounted with the arrow pointing towards the front of the vehicle.

OPERATION

The switch (Fig. 3), provides an additional vehicle deceleration reference during 4x4 operation. The switch is monitored by the CAB at all times. The switch reference signal is utilized by the CAB when all wheels are decelerating at the same speed.

ABS WARNING LAMP

DESCRIPTION

The amber ABS warning lamp is located in the instrument cluster. The lamp illuminates at start-up to perform a self check. The lamp goes out when the self check program determines the system is operating normal.

OPERATION

If an ABS component exhibits a fault the CAB will illuminate the lamp and register a trouble code in the microprocessor. The lamp is controlled by the CAB. The lamp is illuminated when the CAB sends a ground signal to the ABS relay. The ABS relay then grounds the lamp circuit and illuminates the lamp.

DESCRIPTION AND OPERATION (Continued)

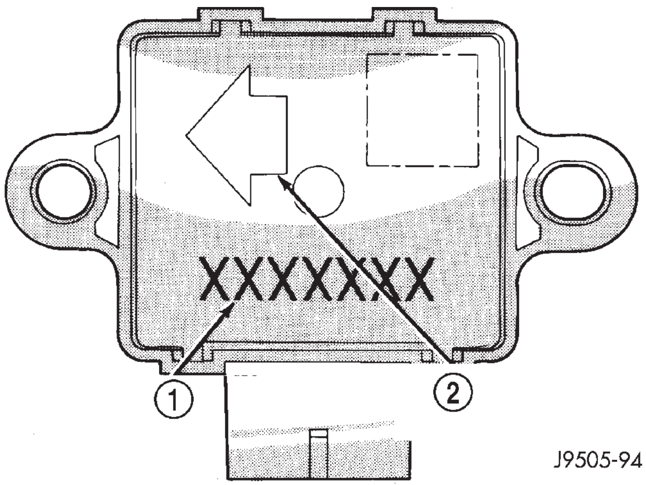


Fig. 3 G-Switch

1 – SWITCH PART NUMBER
2 – ARROW INDICATES FRONT OF SWITCH FOR PROPER MOUNTING

DIAGNOSIS AND TESTING

ANTILOCK BRAKES

The ABS brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the systems input and output circuits to verify the system is operating correctly. If the on board diagnostic system senses that a circuit is malfunctioning the system will set a trouble code in its memory.

NOTE: An audible noise may be heard during the self-test. This noise should be considered normal.

NOTE: The MDS or DRB III scan tool is used to diagnose the ABS system. For additional information refer to the Antilock Brake section in Group 8W. For test procedures refer to the Chassis Diagnostic Manual.

SERVICE PROCEDURES

BLEEDING ABS BRAKE SYSTEM

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

(1) Perform base brake bleeding. Refer to base brake section for procedure.

(2) Connect scan tool to the Data Link Connector.

(3) Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.

(4) Perform base brake bleeding a second time. Refer to base brake section for procedure.

(5) Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

REMOVAL AND INSTALLATION

HYDRAULIC CONTROL UNIT/CONTROLLER ANTILOCK BRAKES

REMOVAL

(1) Remove negative battery cable from the battery.

(2) Pull up on the CAB harness connector release (Fig. 4) and remove connector.

(3) Remove brake lines from the HCU.

(4) Remove HCU/CAB mounting nuts and bolt (Fig. 5) and remove HCU/CAB.

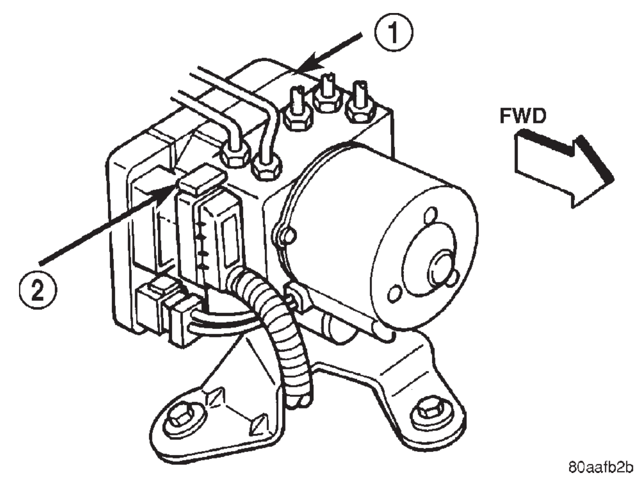


Fig. 4 CAB Harness Connector Release

1 – CAB
2 – CAB HARNESS RELEASE

INSTALLATION

(1) Install HCU/CAB on the mounting studs.

(2) Install mounting nuts and bolt. Tighten to 11.5 N·m (102 in. lbs.).

(3) Install brake lines to the HCU and tighten to 19 N·m (170 in. lbs.).

(4) Install wiring harness connector to the CAB and push down on the release to secure the connector.

(5) Install negative battery cable to the battery.

(6) Bleed ABS brake system.

REMOVAL AND INSTALLATION (Continued)

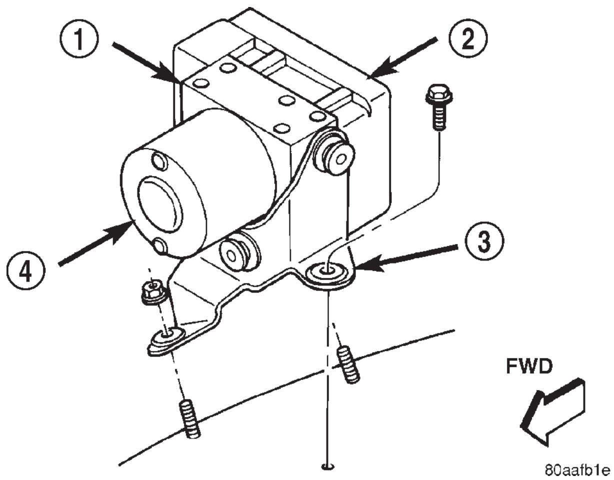


Fig. 5 HCU/CAB Mounting

1 – HCU
2 – CAB
3 – HCU/CAB BRACKET
4 – MOTOR

FRONT WHEEL SPEED SENSOR

REMOVAL

(1) Raise vehicle and turn wheel outward for easier access to sensor.

(2) Remove sensor wire from mounting brackets.

(3) Clean sensor and surrounding area with shop towel before removal.

(4) Remove bolt attaching sensor to steering knuckle and remove sensor (Fig. 6).

(5) Remove sensor wire from brackets on body and steering knuckle.

(6) Unseat sensor wire grommet in wheel house panel.

(7) In engine compartment, disconnect sensor wire connector at harness plug. Then remove sensor and wire.

INSTALLATION

(1) If **original** sensor will be installed, wipe all traces of old spacer material off sensor pickup face. Use a dry shop towel for this purpose.

(2) Apply Mopar Lock N' Seal or Loctite ® 242 to bolt that secures sensor in steering knuckle. Use new sensor bolt if original bolt is worn or damaged.

(3) Position sensor on steering knuckle. Seat sensor locating tab in hole in knuckle and install sensor attaching bolt finger tight.

(4) Tighten sensor attaching bolt to 4.7 N·m (42 in. lbs.).

(5) If original sensor has been installed, check sensor air gap. Air gap should be 0.36 to 1.5 mm (0.014 to 0.059 in.). If gap is incorrect, sensor is either loose, or damaged.

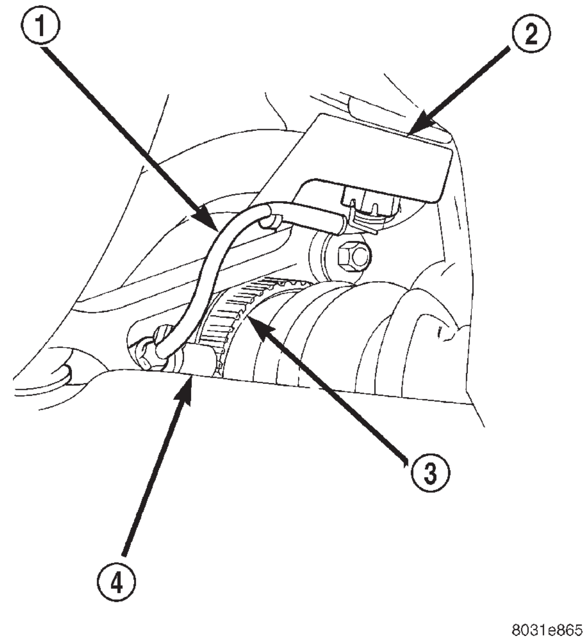


Fig. 6 Front Wheel Speed Sensor

1 – WHEEL SPEED SENSOR PIGTAIL
2 – STEERING KNUCKLE
3 – TONE WHEEL
4 – FRONT WHEEL SPEED SENSOR

(6) Secure sensor wire to steering knuckle and body brackets.

(7) Route sensor wire forward and behind shock absorber. Then attach sensor wire to spring seat bracket with grommets on sensor wire.

(8) Route sensor wire to outer sill bracket. Remove all twists or kinks from wire.

(9) Attach sensor wire to sill bracket with grommet. Be sure wire is free of twists and kinks.

(10) Verify sensor wire routing. Wire should loop forward and above sill bracket. Loose end of wire should be below sill bracket and towards brake hose.

(11) Seat sensor wire grommet in body panel and clip wire to brake line at grommet location.

(12) Connect sensor wire to harness in engine compartment.

REAR WHEEL SPEED SENSOR

REMOVAL

(1) Raise and fold rear seat forward for access to rear sensor connectors (Fig. 7).

(2) Disconnect sensors at rear harness connectors.

(3) Push sensor grommets and sensor wires through floorpan.

(4) Raise vehicle.

(5) Disconnect sensor wires at rear axle connectors.

(6) Remove wheel and tire assembly.

REMOVAL AND INSTALLATION (Continued)

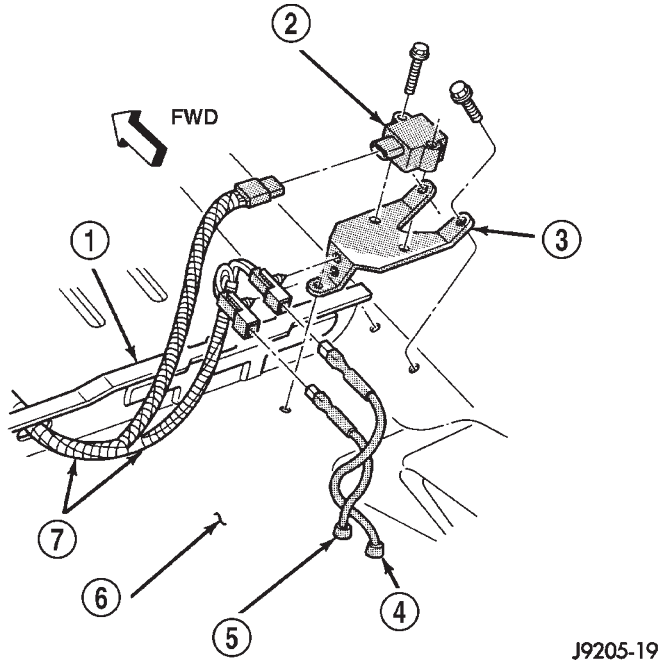


Fig. 7 Acceleration Switch And Rear Sensor Connections

1 – REAR SEAT CROSSMEMBER
2 – ACCELERATION SENSOR
3 – SENSOR MOUNTING BRACKET
4 – TO R. R. WHEEL SENSOR
5 – TO L. R. WHEEL SENSOR
6 – FLOORPAN
7 – SENSOR HARNESS

(7) Remove brake drum.

(8) Remove clips securing sensor wires to brake lines, rear axle and, brake hose.

(9) Unseat sensor wire support plate grommet.

(10) Remove bolt attaching sensor to bracket and remove sensor (Fig. 8).

INSTALLATION

(1) If **original sensor** is being installed, remove any remaining pieces of cardboard spacer from sensor pickup face. Use dry shop towel only to remove old spacer material.

(2) Insert sensor wire through support plate hole. Then seat sensor grommet in support plate.

(3) Apply Mopar Lock N' Seal or Loctite ® 242 to original sensor bolt. Use new bolt if original is worn or damaged.

(4) Install sensor bolt finger tight only at this time.

(5) If **original** rear sensor was installed, adjust sensor air gap to 0.92-1.275 mm (0.036-0.05 in.). Use feeler gauge to measure air gap (Fig. 9). Tighten sensor bolt to 13 N·m (115 in. lbs.).

(6) If **new** sensor was installed, push cardboard spacer on sensor face against tone ring (Fig. 10).

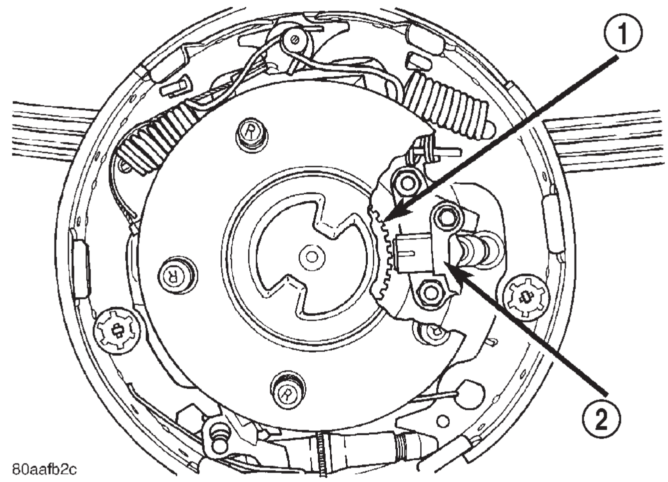


Fig. 8 Rear Wheel Speed Sensor

1 – TONE WHEEL
2 – WHEEL SPEED SENSOR

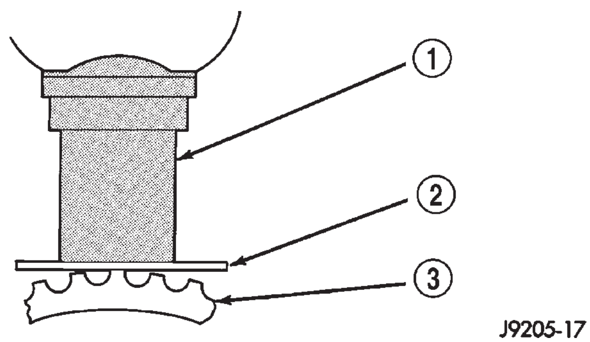


Fig. 9 Setting Air Gap On Original Rear Sensor

1 – WHEEL SPEED SENSOR
2 – BRASS FEELER GAUGE
3 – TONE RING

Then tighten sensor bolt to 13 N·m (115 in. lbs.). Correct air gap will be established as tone ring rotates and peels spacer off sensor face.

(7) Route sensor wires to rear seat area.

(8) Feed sensor wires through floorpan access hole and seat sensor grommets in floorpan.

(9) Verify that rear sensor wires are secured to rear brake hose and axle with clips. Verify that wire is clear of rotating components.

(10) Install brake drum and wheel and tire assembly.

(11) Lower vehicle.

(12) Connect sensor wire to harness connector. Then reposition carpet and fold rear seat down.

G-SWITCH

REMOVAL

(1) Raise and fold rear seat assembly forward for access to sensor.

REMOVAL AND INSTALLATION (Continued)

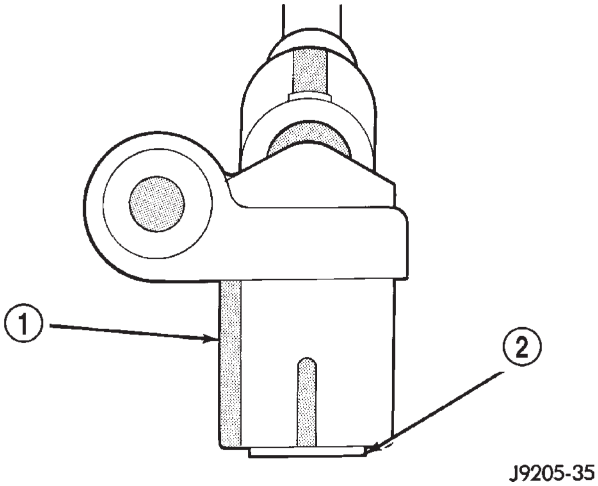


Fig. 10 New Rear Sensor

1 – REAR SENSOR
2 – AIR GAP SPACER ATTACHED TO SENSOR FACE

(2) Disconnect switch harness.
(3) Remove switch mounting screws (Fig. 11)
(4) Remove the acceleration switch.

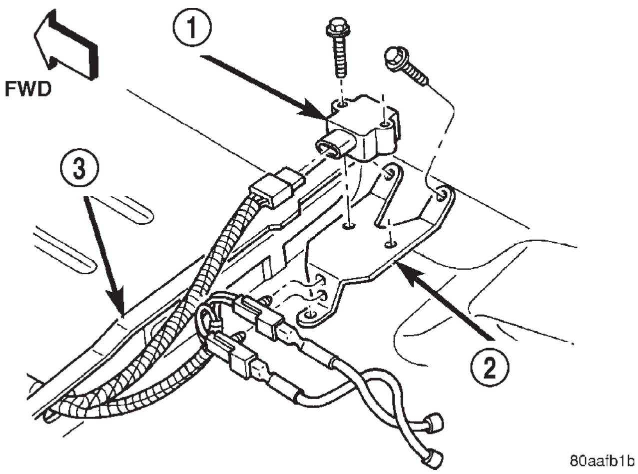


Fig. 11 G-Switch Mounting

1 – ACCELERATION SWITCH
2 – SWITCH BRACKET
3 – REAR SEAT CROSSMEMBER

INSTALLATION

CAUTION: The mercury switch (inside the G-switch), will not function properly if the switch is installed incorrectly. Verify that the switch locating arrow is pointing to the front of the vehicle (Fig. 12).

(1) Position switch in mounting bracket.
(2) Install switch mounting bolts and tighten to 3 N·m (27.5 in. lbs.).

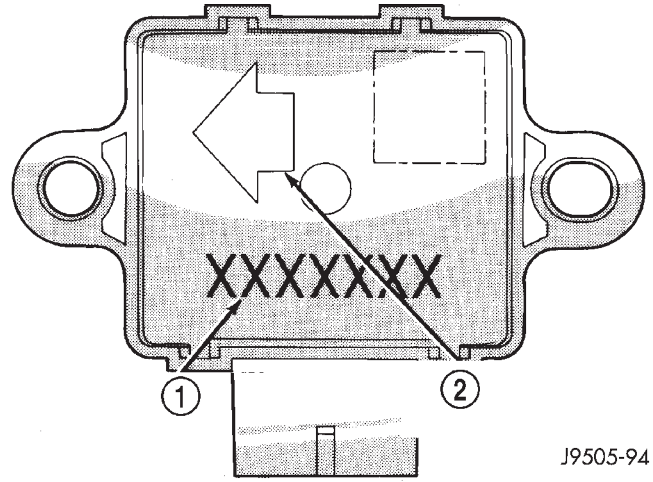


Fig. 12 G-Switch

1 – SWITCH PART NUMBER
2 – ARROW INDICATES FRONT OF SWITCH FOR PROPER MOUNTING

(3) Connect harness to switch. Be sure harness connector is firmly seated.
(4) Move seat back to normal position.

DISASSEMBLY AND ASSEMBLY

HYDRAULIC CONTROL UNIT/CONTROLLER ANTILOCK BRAKE

DISASSEMBLY

(1) Remove pump motor connector from the CAB.
(2) Remove CAB mounting screws from the HCU (Fig. 13).
(3) Remove CAB from the HCU.

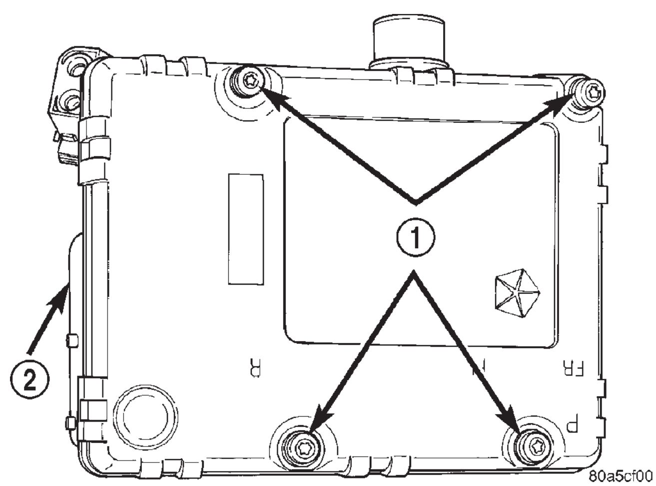


Fig. 13 CAB Mounting Screws

1 – MOUNTING SCREWS
2 – CAB

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

(1) Install the CAB onto the HCU.

(2) Install the CAB mounting screws and tighten to 1.8 N·m (16 in. lbs.).

(3) Install pump motor connector to the CAB.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
G-Sensor	
Sensor Bolt	3 N·m (27.5 in. lbs.)
Bracket Bolt	2.7 N·m (24 in. lbs.)
Hydraulic Control Unit/Controller Antilock Brakes	
Mounting Nuts	11.5 N·m (102 in. lbs.)
Brake Lines	19 N·m (170 in. lbs.)
Controller Antilock Brakes	
Mounting Screws	1.8 N·m (16 in. lbs.)
Wheel Speed Sensors	
Front Mounting Bolt	4.7 N·m (42 in. lbs.)
Rear Mounting Bolt	13 N·m (115 in. lbs.)

CLUTCH

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

CLUTCH

DESCRIPTION

The clutch mechanism consists of a flywheel, a single, dry-type disc, and a diaphragm style clutch cover (Fig. 1). A hydraulic linkage is used to operate the clutch release bearing and fork. The flywheel is bolted to the rear flange of the crankshaft. The clutch pressure plate is bolted to the flywheel with the clutch disc located between these two components. The clutch system provides the mechanical, but still easily detachable, link between the engine and the transmission. The system is designed to ensure that the full torque output of the engine is transfered to the transmission while isolating the transmission from the engine firing pulses to minimize concerns such as gear rattle.

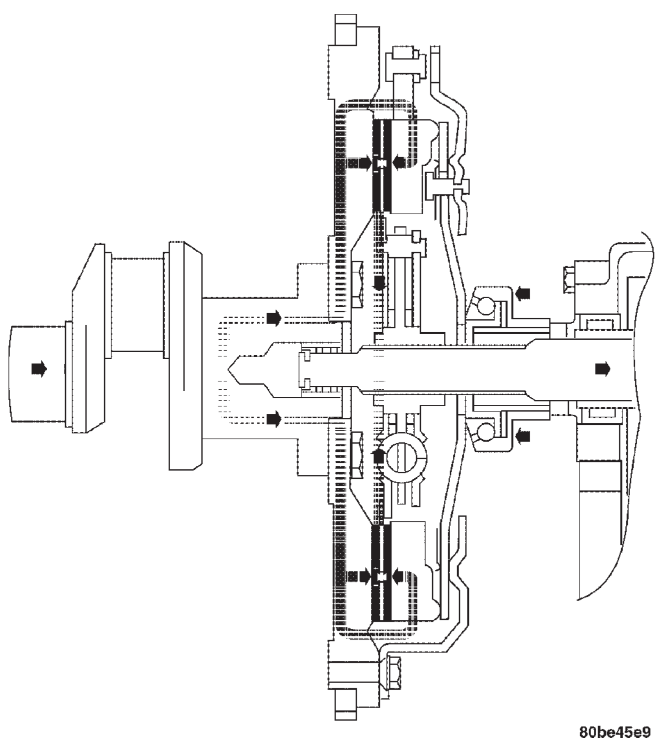


Fig. 1 Engine Powerflow

OPERATION

Leverage, clamping force, and friction are what make the clutch work. The disc serves as the friction element and a diaphragm spring and pressure plate provide the clamping force. The clutch pedal, hydraulic linkage, release lever and bearing provide the leverage.

DESCRIPTION AND OPERATION (Continued)

The clutch master cylinder push rod is connected to the clutch pedal. When the clutch pedal is depressed, the slave cylinder is operated by the clutch master cylinder mounted on the dash panel. The release fork is actuated by the hydraulic slave cylinder mounted on the transmission housing. The release bearing is operated by a release fork pivoting on a ball stud mounted in the transmission housing. The release bearing then depresses the pressure plate spring fingers, thereby releasing pressure on the clutch disc and allowing the engine crankshaft to spin independently of the transmission input shaft (Fig. 2).

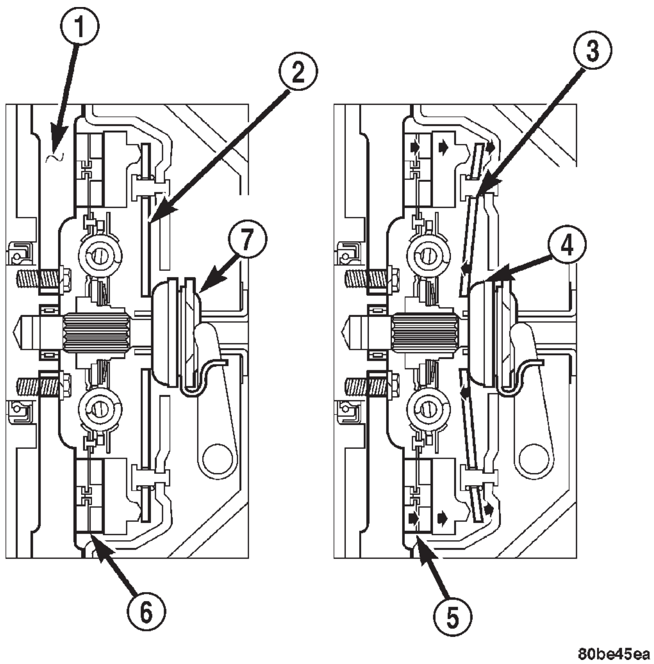


Fig. 2 Clutch Operation

1 – FLYWHEEL
2 – PRESSURE PLATE FINGERS
3 – PIVOT POINT
4 – RELEASE BEARING PUSHED IN
5 – CLUTCH DISC ENGAGED
6 – CLUTCH DISC ENGAGED
7 – RELEASE BEARING

FLYWHEEL

DESCRIPTION

The flywheel (Fig. 3) is a heavy plate bolted to the rear of the crankshaft. The flywheel incorporates the ring gear around the outer circumference to mesh with the starter to permit engine cranking. The rear face of the flywheel serves as the driving member to the clutch disc.

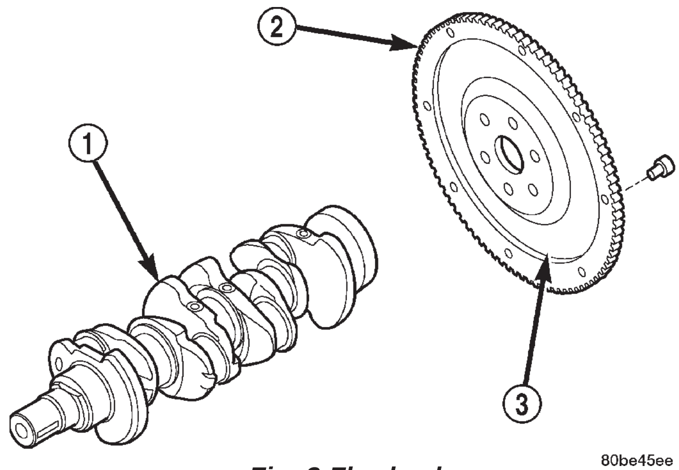


Fig. 3 Flywheel

1 – CRANKSHAFT
2 – RING GEAR
3 – FLYWHEEL

OPERATION

The flywheel serves to dampen the engine firing pulses. The heavy weight of the flywheel relative to the rotating mass of the engine components serves to stabilize the flow of power to the remainder of the drivetrain. The crankshaft has the tendency to attempt to speed up and slow down in response to the cylinder firing pulses. The flywheel dampens these impulses by absorbing energy when the crankshaft speeds and releasing the energy back into the system when the crankshaft slows down.

CLUTCH DISC

DESCRIPTION

The clutch disc friction material is riveted to the disc hub (Fig. 4). The hub bore is splined for installation on the transmission input shaft. The clutch disc has cushion springs in the disc hub to dampen disc vibrations during application and release of the clutch.

OPERATION

The clutch disc is held onto the surface of the flywheel by the force exerted by the pressure plate’s diaphragm spring. The friction material of the clutch disc then transfers the engine torque from the flywheel and pressure plate to the input shaft of the transmission.

CLUTCH PRESSURE PLATE

DESCRIPTION

The clutch pressure plate assembly is a diaphragm type with a one-piece spring and multiple release fingers (Fig. 5). The pressure plate release fingers are preset during manufacture and are not adjustable. The assembly also contains the cover, pressure plate, and fulcrum components.

DESCRIPTION AND OPERATION (Continued)

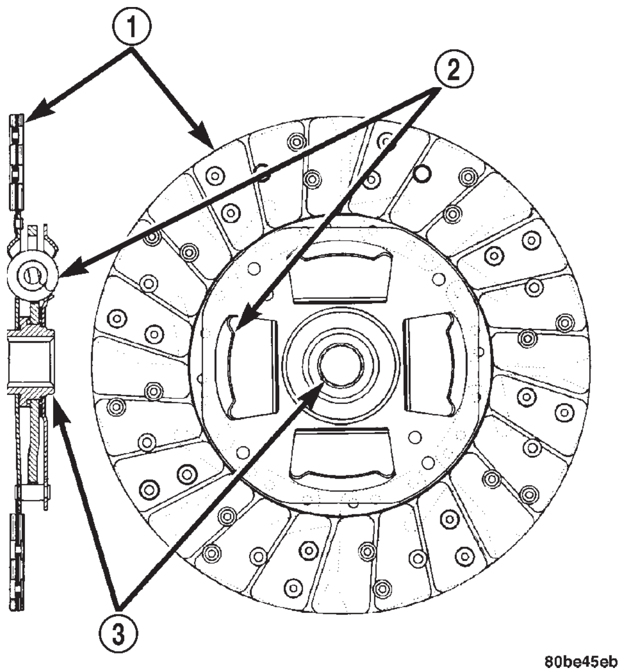


Fig. 4 Clutch Disc-Typical

1 – FACING MATERIAL
2 – DAMPER SPRINGS
3 – HUB

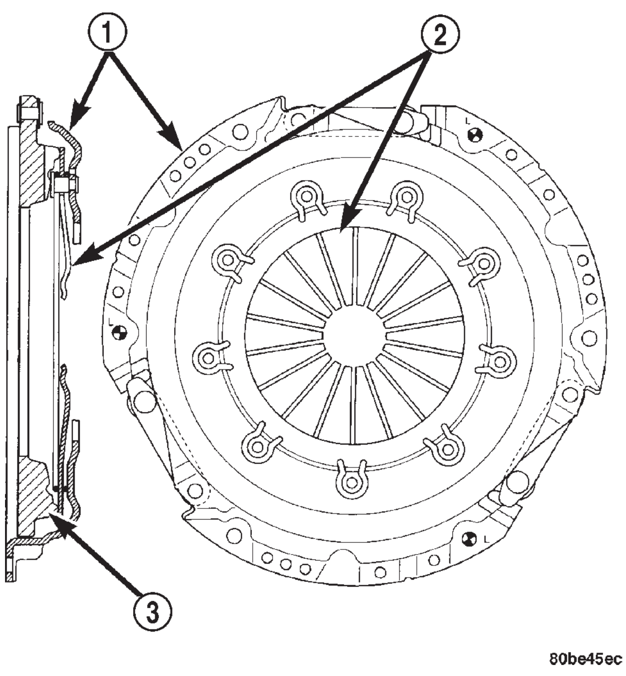


Fig. 5 Clutch Pressure Plate-Typical

1 – COVER
2 – RELEASE FINGERS
3 – PRESSURE PLATE

OPERATION

The clutch pressure plate assembly clamps the clutch disc against the flywheel. When the release bearing is depressed by the shift fork, the pressure exerted on the clutch disc by the pressure plate spring is decreased. 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. The clutch disc is disengaged and freewheeling at this point.

CLUTCH RELEASE BEARING

DESCRIPTION

A conventional release bearing (Fig. 6) is used to engage and disengage the clutch pressure plate assembly. The clutch release bearing is mounted on the transmission front bearing retainer. The bearing is attached to the release fork, which moves the bearing into contact with the clutch cover diaphragm spring.

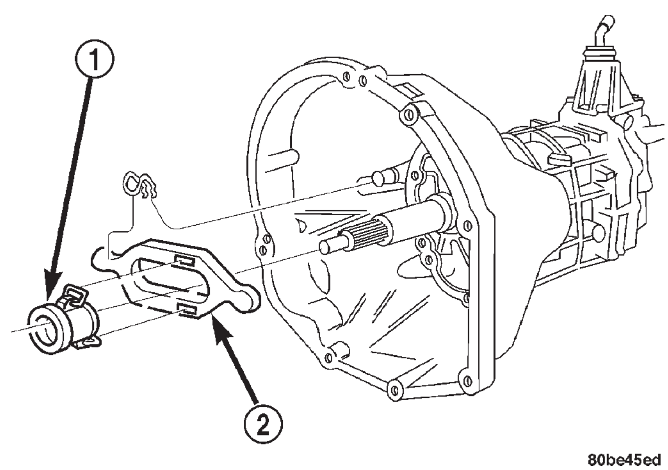


Fig. 6 Clutch Release Bearing

1 – RELEASE BEARING
2 – RELEASE FORK

OPERATION

The release bearing is operated by a release fork in the clutch housing. 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 clamp force on the 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.

DESCRIPTION AND OPERATION (Continued)

HYDRAULIC CLUTCH LINKAGE

DESCRIPTION

The hydraulic linkage consists of a clutch master cylinder with integral reservoir, a clutch slave cylinder and an interconnecting fluid line (Fig. 7).

The clutch master cylinder push rod is connected to the clutch pedal. The slave cylinder push rod is connected to the clutch release fork. The master cylinder is mounted on the driver side of the dash panel adjacent to the brake master cylinder and booster assembly.

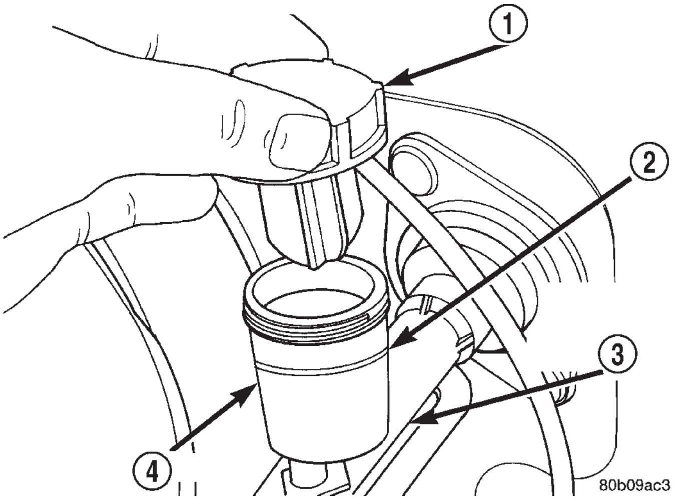


Fig. 7 Clutch Master Cylinder

1 – CAP
2 – FILL LINE
3 – CLUTCH MASTER CYLINDER
4 – RESERVOIR

OPERATION

The clutch linkage uses hydraulic pressure to operate 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.

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 clamp force on the disc.

DIAGNOSIS AND TESTING

SAFETY PRECAUTIONS

WARNING: EXERCISE CARE WHEN SERVICING CLUTCH COMPONENTS. FACTORY INSTALLED CLUTCH DISCS DO NOT CONTAIN ASBESTOS FIBERS. DUST AND DIRT ON CLUTCH PARTS MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET COMPONENTS. BREATHING EXCESSIVE CONCENTRATIONS OF THESE FIBERS CAN CAUSE SERIOUS BODILY HARM. WEAR A RESPIRATOR DURING SERVICE AND NEVER CLEAN CLUTCH COMPONENTS WITH COMPRESSED AIR OR WITH A DRY BRUSH. EITHER CLEAN THE COMPONENTS WITH A WATER DAMPENED RAGS OR USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR REMOVING ASBESTOS FIBERS AND DUST. DO NOT CREATE DUST BY SANDING A CLUTCH DISC. REPLACE THE DISC IF THE FRICTION MATERIAL IS DAMAGED OR CONTAMINATED. DISPOSE OF ALL DUST AND DIRT CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS. THIS WILL HELP MINIMIZE EXPOSURE TO YOURSELF AND TO OTHERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL SAFETY AGENCY (EPA), FOR THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

INSTALLATION METHODS AND PARTS USAGE

Distortion of clutch components during installation and the use of non-standard components are common causes of clutch malfunction.

Improper clutch cover bolt tightening can distort the cover. The usual result is clutch grab, chatter and rapid wear. Tighten the cover bolts as described in Removal and Installation section.

An improperly seated flywheel and/or clutch housing are additional causes of clutch failure. Improper seating will produce misalignment and additional clutch problems.

The use of non-standard or low quality parts will also lead to problems and wear. Use recommended factory quality parts to avoid comebacks.

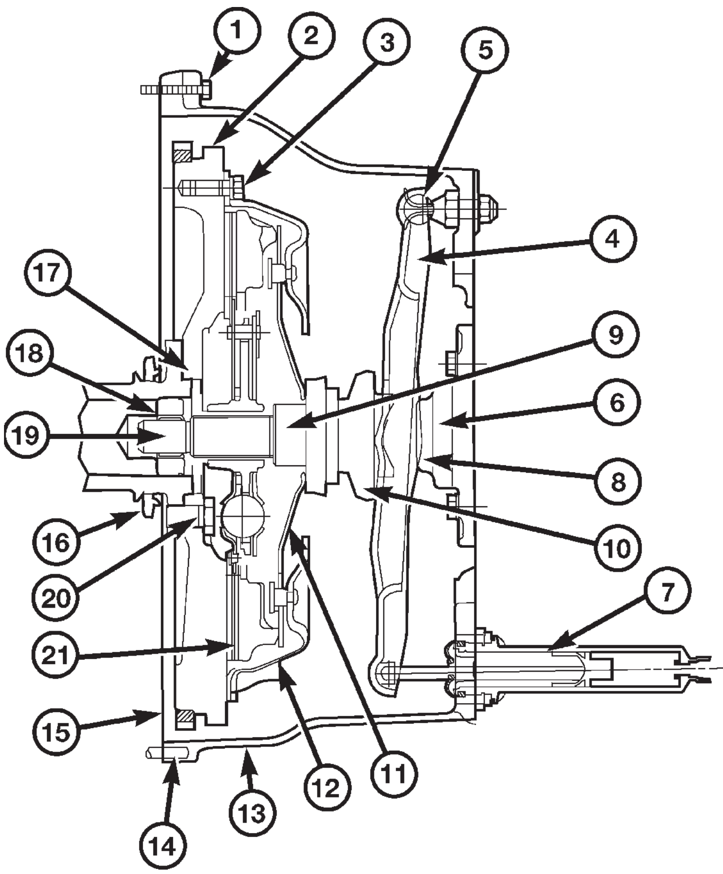
A cocked pilot bearing is another cause of clutch noise, drag, hard shifting, and rapid bearing wear. Always use an alignment tool to install a new bearing. This practice helps avoid cocking the bearing during installation.

CLUTCH DIAGNOSTIC INFORMATION

Unless the cause of a clutch problem is obvious, accurate problem diagnosis will usually require a road test to confirm a problem. Component inspection (Fig. 8) will then be required to determine the actual problem cause.

During a road test, drive the vehicle at normal speeds. Shift the transmission through all gear ranges and observe clutch action. If chatter, grab, slip, or improper release is experienced, remove and inspect the clutch components. However, if the problem is noise or hard shifting, further diagnosis may be needed as the transmission or another driveline component may be at fault. Careful observation during the test will help narrow the problem area.

DIAGNOSIS AND TESTING (Continued)



1 Check clutch housing bolts. Tighten if loose. Be sure housing is fully seated on engine block.

2 Check flywheel. Scuff sand face to remove glaze. Clean surface with wax and grease remover. Replace flywheel if severely scored, worn or cracked. Secure flywheel with new bolts (if removed). Do not reuse old bolts. Use Mopar Lock N'Seal on bolts.

3 Tighten clutch cover bolts 2–3 threads at a time, alternately and evenly (in a star pattern) to specified torque. Failure to do so could warp the cover.

4 Check release fork. Replace fork if bent or worn. Make sure pivot and bearing contact surfaces are lubricated.

5 Check release fork pivot (in housing). Be sure pivot is secure and ball end is lubricated.

6 Transmission input shaft bearing will cause noise, chatter, or improper release if damaged. Check condition before installing transmission.

7 Check slave cylinder. Replace it if leaking. Be sure cylinder is properly secured in housing and cylinder piston is seated in release fork.

8 Check input shaft seal if clutch cover and disc were oil covered. Replace seal if worn, or cut.

9 Inspect release bearing slide surface of trans. front bearing retainer. Surface should be smooth, free of nicks, scores. Replace retainer if necessary. Lubricate slide surface before installing release bearing.

10 Do not replace release bearing unless actually faulty. Replace bearing only if seized, noisy, or damaged.

11 Check clutch cover diaphragm spring and release fingers. Replace cover if spring or fingers are bent, warped, broken, cracked. Do not tamper with factory spring setting as clutch problems will result.

12 Check condition of clutch cover. Replace clutch cover if plate surface is deeply scored, warped, worn, or cracked. Be sure cover is correct size and properly aligned on disc and flywheel.

13 Inspect clutch housing. Be sure bolts are tight. Replace housing if damaged.

14 Verify that housing alignment dowels are in position before installing housing.

15 Clean engine block surface before installing clutch housing. Dirt, grime can produce misalignment.

16 Check rear main seal if clutch disc and cover were oil covered. Replace seal if necessary.

17 Check crankshaft flange (if flywheel is removed). Be sure flange is clean and flywheel bolt threads are in good condition.

18 Check pilot bearing. Replace bearing if damaged. Lube with Mopar high temp. bearing grease before installation.

19 Check transmission input shaft. Disc must slide freely on shaft splines. Lightly grease splines before installation. Replace shaft if splines or pilot bearing hub are damaged.

20 Check flywheel bolt torque. If bolts are loose, replace them. Use Mopar Lock N'Seal to secure new bolts.

21 Check clutch disc facing. Replace disc if facing is charred, scored, flaking off, or worn. Also check runout of new disc. Runout should not exceed 0.5 mm (0.02 in.).

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Fig. 8 Clutch Components And Inspection

DIAGNOSIS AND TESTING (Continued)

CLUTCH CONTAMINATION

Fluid contamination is a frequent cause of clutch malfunctions. Oil, water, or clutch fluid on the clutch disc and pressure plate surfaces will cause chatter, slip and grab.

During inspection, note if any components are contaminated with oil, hydraulic fluid, or water/road splash.

Oil contamination indicates a leak at either the rear main seal or transmission input shaft. Oil leakage produces a residue of oil on the housing interior and on the clutch cover and flywheel. Heat buildup caused by slippage between the cover, disc and flywheel, can sometimes bake the oil residue onto the components. The glaze-like residue ranges in color from amber to black.

Road splash contamination means dirt/water is entering the clutch housing due to loose bolts, housing cracks, or through hydraulic line openings. Driving through deep water puddles can force water/road splash into the housing through such openings.

Clutch fluid leaks are usually from damaged slave cylinder push rod seals. This type of leak can only be confirmed by visual inspection.

IMPROPER CLUTCH RELEASE OR ENGAGEMENT

Clutch release or engagement problems are caused by wear, or damage to one or more clutch components. A visual inspection of the release components will usually reveal the problem part.

Release problems can result in hard shifting and noise. Items to look for are: leaks at the clutch cylinders and interconnecting line; loose slave cylinder bolts; worn/loose release fork and pivot stud; damaged release bearing; and a worn clutch disc, or pressure plate.

Normal condensation in vehicles that are stored or out of service for long periods of time can generate enough corrosion to make the disc stick to the flywheel, or pressure plate. If this condition is experienced, correction only requires that the disc be loosened manually through the inspection plate opening.

Engagement problems usually result in slip, chatter/shudder, and noisy operation. The primary causes are clutch disc contamination; clutch disc wear; misalignment, or distortion; flywheel damage; or a combination of the foregoing. A visual inspection is required to determine the part actually causing the problem.

CLUTCH MISALIGNMENT

Clutch components must be in proper alignment with the crankshaft and transmission input shaft. Misalignment caused by excessive runout or warpage of any clutch component will cause grab, chatter and improper clutch release.

CLUTCH HOUSING MISALIGNMENT

Clutch housing alignment is important to proper clutch operation. The housing maintains alignment between the crankshaft and transmission input shaft. Misalignment can cause clutch noise, hard shifting, incomplete release and chatter. It can also result in premature wear of the pilot bearing, cover release fingers and clutch disc. In severe cases, misalignment can also cause premature wear of the transmission input shaft and front bearing.

Housing misalignment is generally caused by incorrect seating on the engine or transmission, loose housing bolts, missing alignment dowels, or housing damage. Infrequently, misalignment may also be caused by housing mounting surfaces that are not completely parallel. Misalignment can be corrected with shims.

CLUTCH FLYWHEEL RUNOUT

Check flywheel runout whenever misalignment is suspected. Flywheel runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the indicator on a stud installed in place of one of the flywheel bolts.

Common causes of runout are:

- heat warpage
- improper machining
- incorrect bolt tightening
- improper seating on crankshaft flange shoulder
- foreign material on crankshaft flange

Flywheel machining is not recommended. The flywheel clutch surface is machined to a unique contour and machining will negate this feature. However, minor flywheel scoring can be cleaned up by hand with 180 grit emery, or with surface grinding equipment. Remove only enough material to reduce scoring (approximately 0.001 - 0.003 in.). Heavy stock removal is **not recommended.** Replace the flywheel if scoring is severe and deeper than 0.076 mm (0.003 in.). Excessive stock removal can result in flywheel cracking or warpage after installation; it can also weaken the flywheel and interfere with proper clutch release.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout. Use new bolts when remounting a flywheel and secure the bolts with Mopar® Lock And Seal. Tighten flywheel bolts to specified torque only. Overtightening can distort the flywheel hub causing runout.

DIAGNOSIS AND TESTING (Continued)

CLUTCH COVER AND DISC RUNOUT

Check the clutch disc before installation. Axial (face) runout of a **new** disc should not exceed 0.50 mm (0.020 in.). Measure runout about 6 mm (1/4 in.) from the outer edge of the disc facing. Obtain another disc if runout is excessive.

Check condition of the clutch before installation. A warped cover or diaphragm spring will cause grab and incomplete release or engagement. Be careful when handling the cover and disc. Impact can distort the cover, diaphragm spring, release fingers and the hub of the clutch disc.

Use an alignment tool when positioning the disc on the flywheel. The tool prevents accidental misalignment which could result in cover distortion and disc damage.

A frequent cause of clutch cover distortion (and consequent misalignment) is improper bolt tightening.

CLUTCH DIAGNOSIS CHARTS

The clutch inspection chart (Fig. 8) outlines items to be checked before and during clutch installation. Use the chart as a check list to help avoid overlooking potential problem sources during service operations.

The diagnosis charts describe common clutch problems, causes and correction. Fault conditions are listed at the top of each chart. Conditions, causes and corrective action are outlined in the indicated columns.

The charts are provided as a convenient reference when diagnosing faulty clutch operation.

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
Disc facing worn out	1. Normal wear. 2. Driver frequently rides (slips) the clutch. Results in rapid overheating and wear. 3. Insufficient clutch cover diaphragm spring tension.	1. Replace cover and disc. 2. Replace cover and disc. 3. Replace cover and disc.
Clutch disc facing contaminated with oil, grease, or clutch fluid.	1. Leak at rear main engine seal or transmission input shaft seal. 2. Excessive amount of grease applied to the input shaft splines. 3. Road splash, water entering housing. 4. Slave cylinder leaking.	1. Replace appropriate seal. 2. Remove grease and apply the correct amount of grease. 3. Replace clutch disc. Clean clutch cover and reuse if in good condition. 4. Replace hydraulic clutch linkage.
Clutch is running partially disengaged.	1. Release bearing sticking or binding and does not return to the normal running position.	1. Verify failure. Replace the release bearing and transmission front bearing retainer as necessary.
Flywheel below minimum thickness specification.	1. Improper flywheel machining. Flywheel has excessive taper or excessive material removal.	1. Replace flywheel.
Clutch disc, cover and/or diaphragm spring warped or distorted.	1. Rough handling. Impact bent cover, spring, or disc. 2. Improper bolt tightening procedure.	1. Replace disc or cover as necessary. 2. Tighten clutch cover using proper procedure.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Facing on flywheel side of disc torn, gouged, or worn.	1. Flywheel surface scored or nicked.	2. Correct surface condition if possible. Replace flywheel and disc as necessary.
	2. Clutch disc sticking or binding on transmission input shaft.	2. Inspect components and correct/replace as necessary.
Clutch disc facing burnt. Flywheel and cover pressure plate surfaces heavily glazed.	1. Frequent operation under high loads or hard acceleration conditions.	1. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
	2. Driver frequently rides (slips) clutch. Results in rapid wear and overheating of disc and cover.	2. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
Clutch disc binds on input shaft splines.	1. Clutch disc hub splines damaged during installation.	1. Clean, smooth, and lubricate hub splines if possible. Replace disc if necessary.
	2. Input shaft splines rough, damaged, or corroded.	2. Clean, smooth, and lubricate shaft splines if possible. Replace input shaft if necessary.
Clutch disc rusted to flywheel and/or pressure plate.	1. Clutch not used for and extended period of time (e.g. long term vehicle storage).	1. Sand rusted surfaces with 180 grit sanding paper. Replace clutch cover and flywheel if necessary.
Pilot bearing seized, loose, or rollers are worn.	1. Bearing cocked during installation.	1. Install and lubricate a new bearing.
	2. Bearing defective.	2. Install and lubricate a new bearing.
	3. Bearing not lubricated.	3. Install and lubricate a new bearing.
	4. Clutch misalignment.	4. Inspect clutch and correct as necessary. Install and lubricate a new bearing.
Clutch will not disengage properly.	1. Low clutch fluid level.	1. Replace hydraulic linkage assembly.
	2. Clutch cover loose.	2. Follow proper bolt tightening procedure.
	3. Clutch disc bent or distorted.	3. Replace clutch disc.
	4. Clutch cover diaphragm spring bent or warped.	4. Replace clutch cover.
	5. Clutch disc installed backwards.	5. Remove and install clutch disc correctly.
	6. Release fork bent or fork pivot loose or damaged.	6. Replace fork or pivot as necessary.
	7. Clutch master or slave cylinder failure.	7. Replace hydraulic linkage assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Clutch pedal squeak.	1. Pivot pin loose. 2. Master cylinder bushing not lubricated. 3. Pedal bushings worn out or cracked.	1. Tighten pivot pin if possible. Replace clutch pedal if necessary. 2. Lubricate master cylinder bushing. 3. Replace and lubricate bushings.
Clutch master or slave cylinder plunger dragging andør binding	1. Master or slave cylinder components worn or corroded.	1. Replace clutch hydraulic linkage assembly.
Release bearing is noisy.	1. Release bearing defective or damaged.	1. Replace release bearing.
Contact surface of release bearing damaged.	1. Clutch cover incorrect or release fingers bent or distorted. 2. Release bearing defective or damaged. 3. Release bearing misaligned.	1. Replace clutch cover and release bearing. 2. Replace the release bearing. 3. Check and correct runout of clutch components. Check front bearing sleeve for damage/ alignment. Repair as necessary.
Partial engagement of clutch disc. One side of disc is worn and the other side is glazed and lightly worn.	1. Clutch pressure plate position incorrect. 2. Clutch cover, spring, or release fingers bent or distorted. 3. Clutch disc damaged or distorted. 4. Clutch misalignment.	1. Replace clutch disc and cover. 2. Replace clutch disc and cover. 2. Replace clutch disc. 4. Check alignment and runout of flywheel, disc, pressure plate, andør clutch housing. Correct as necessary.

SERVICE PROCEDURES

CLUTCH COMPONENT LUBRICATION

Proper clutch component lubrication is important to satisfactory operation. Using the correct lubricant and not over lubricating are equally important. Apply recommended lubricant sparingly to avoid disc and pressure plate contamination.

Clutch and transmission components requiring lubrication are:

- Pilot bearing.
- Release lever pivot ball stud.
- Release lever contact surfaces.
- Release bearing bore.
- Clutch disc hub splines.
- Clutch pedal pivot shaft bore.
- Clutch pedal bushings.
- Input shaft splines.
- Input shaft pilot hub.
- Transmission front bearing retainer slide surface.

NOTE: Never apply grease to any part of the clutch cover, or disc.

RECOMMENDED LUBRICANTS

Use Mopar® multi-purpose grease for the clutch pedal bushings and pivot shaft. Use Mopar® high temperature grease (or equivalent) for all other lubrication requirements. Apply recommended amounts and do not over lubricate.

CLUTCH LINKAGE FLUID

If inspection or diagnosis indicates additional fluid may be needed, use Mopar® brake fluid, or an equiv-

SERVICE PROCEDURES (Continued)

alent meeting standards SAE J1703 and DOT 3. Do not use any other type of fluid.

CLUTCH FLUID LEVEL

The clutch fluid reservoir, master cylinder, slave cylinder and fluid lines are pre-filled with fluid at the factory during assembly operations.

The hydraulic system should not require additional fluid under normal circumstances. In fact, **the reservoir fluid level will actually increase as normal clutch wear occurs. For this reason, it is important to avoid overfilling, or removing fluid from the reservoir.**

Clutch fluid level is checked at the master cylinder reservoir (Fig. 9). An indicator ring is provided on the outside rim of the reservoir.

Be sure to wipe the reservoir and cover clean before removing the cover. This will avoid having dirt or foreign material fall into the reservoir during a fluid level check.

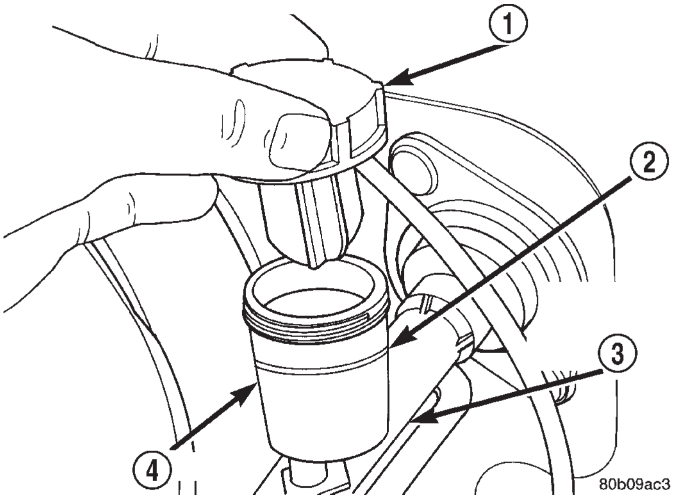


Fig. 9 Clutch Master Cylinder Reservoir And Cap

1 – CAP
2 – FILL LINE
3 – CLUTCH MASTER CYLINDER
4 – RESERVOIR

FLYWHEEL

Inspect the flywheel whenever the clutch disc, cover and housing are removed for service. Check condition of the flywheel face, hub, ring gear teeth, and flywheel bolts.

Minor scratches, burrs, or glazing on the flywheel face can be reduced with 180 grit emery cloth. However, the flywheel should be replaced if the disc contact surface is severely scored, heat checked, cracked, or obviously worn.

Flywheel machining is not recommended. The flywheel surface is manufactured with a unique contour that would be negated by machining. However, cleanup of minor flywheel scoring can be performed by hand with 180 grit emery, or with surface grinding equipment. Replace the flywheel if scoring is deeper than 0.0762 mm (0.003 in.).

Heavy stock removal by grinding is **not recommended.** Excessive stock removal can result in flywheel cracking or warpage after installation. It can also weaken the flywheel and interfere with proper clutch release.

Check flywheel runout if misalignment is suspected. Runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the dial indicator on a stud installed in place of one of the clutch housing attaching bolts.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout.

Check condition of the flywheel hub and attaching bolts. Replace the flywheel if the hub exhibits cracks in the area of the attaching bolt holes.

Install new attaching bolts whenever the flywheel is replaced and use Mopar® Lock N' Seal, or Loctite 242 on the replacement bolt threads.

Recommended flywheel bolt torques are:

- 142 N·m (105 ft. lbs.) for 6-cylinder flywheels
- 95 N·m (70 ft. lbs.) for 4-cylinder flywheels

Inspect the teeth on the starter ring gear. **If the teeth are worn or damaged, the flywheel should be replaced as an assembly. This is the recommended and preferred method of repair.**

In cases where a new flywheel is not readily available, a replacement ring gear can be installed. However, the following precautions must be observed to avoid damaging the flywheel and replacement gear.

(1) Mark position of the old gear for alignment reference on the flywheel. Use a scriber for this purpose.

(2) Wear protective goggles or approved safety glasses. Also wear heat resistent gloves when handling a heated ring gear.

(3) Remove the old gear by cutting most of the way through it (at one point) with an abrasive cut-off wheel. Then complete removal with a cold chisel or punch.

(4) The ring gear is a shrink fit on the flywheel. This means the gear must be expanded by heating in order to install it. **The method of heating and expanding the gear is extremely important.** Every surface of the gear must be heated at the same time to produce uniform expansion. An oven or similar enclosed heating device must be used. Temperature required for uniform expansion is approximately 375° F.

SERVICE PROCEDURES (Continued)

CAUTION: Do not use an oxy/acetylene torch to remove the old gear, or to heat and expand a new gear. The high temperature of the torch flame can cause localized heating that will damage the flywheel. In addition, using the torch to heat a replacement gear will cause uneven heating and expansion. The torch flame can also anneal the gear teeth resulting in rapid wear and damage after installation.

(5) The heated gear must be installed evenly to avoid misalignment or distortion. A shop press and suitable press plates should be used to install the gear if at all possible.

(6) Be sure to wear eye and hand protection. Heat resistent gloves and safety goggles are needed for personal safety. Also use metal tongs, vise grips, or similar tools to position the gear as necessary for installation.

(7) Allow the flywheel and ring gear to cool down before installation. Set the assembly on a workbench and let it cool in normal shop air.

CAUTION: Do not use water, or compressed air to cool the flywheel. The rapid cooling produced by water or compressed air can distort, or crack the gear and flywheel.

REMOVAL AND INSTALLATION

CLUTCH COVER AND DISC

REMOVAL

(1) Remove transmission. Refer to procedures in Group 21.

(2) If original clutch cover will be reinstalled, mark position of cover on flywheel for assembly reference. Use paint or a scriber for this purpose.

(3) If clutch cover is to be replaced, cover bolts can be removed in any sequence. However, if original cover will be reinstalled, loosen cover bolts evenly and in rotation to relieve spring tension equally. This is necessary to avoid warping cover.

(4) Remove cover bolts and remove cover and disc (Fig. 10).

INSTALLATION

(1) Lightly scuff sand flywheel face with 180 grit emery cloth. Then clean surface with a wax and grease remover.

(2) Lubricate pilot bearing with Mopar high temperature bearing grease.

(3) Check runout and free operation of new clutch disc as follows:

(a) Slide disc onto transmission input shaft splines. Disc should slide freely on splines.

(b) Leave disc on shaft and check face runout with dial indicator. Check runout at disc hub and about 6 mm (1/4 in.) from outer edge of facing.

(c) Face runout should not exceed 0.5 mm (0.020 in.). Obtain another clutch disc if runout exceeds this limit.

(4) Position clutch disc on flywheel. Be sure side of disc marked flywheel side is positioned against flywheel (Fig. 10). If disc is not marked, be sure flat side of disc hub is toward flywheel.

(5) Inspect condition of pressure plate surface of clutch cover (Fig. 10). Replace cover if this surface is worn, heat checked, cracked, or scored.

(6) Insert clutch alignment tool in clutch disc (Fig. 11).

(7) Insert alignment tool in pilot bearing and position disc on flywheel. Be sure disc hub is positioned correctly. Side of hub marked Flywheel Side should face flywheel (Fig. 10). If disc is not marked, place flat side of disc against flywheel.

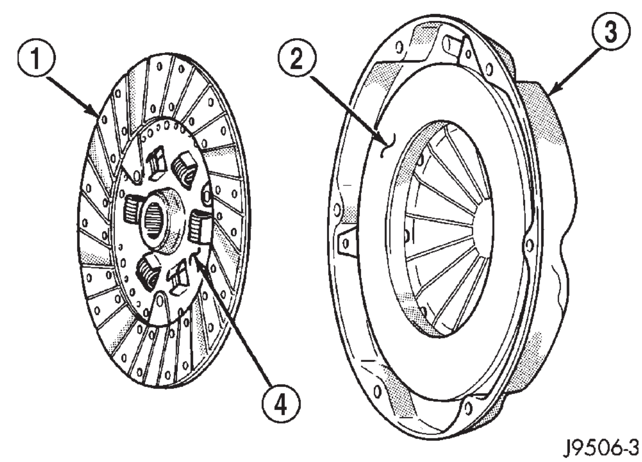


Fig. 10 Clutch Disc And Pressure Plate Inspection

1 – DISC
2 – INSPECT THIS SURFACE
3 – CLUTCH COVER
4 – “FLYWHEEL SIDE” STAMPED ON THIS SURFACE

(8) Position clutch cover over disc and on flywheel (Fig. 11).

(9) Install clutch cover bolts finger tight.

(10) Tighten cover bolts evenly and in rotation a few threads at a time. **Cover bolts must be tightened evenly and to specified torque to avoid distorting cover. Tightening torques are 31 N·m (23 ft. lbs.) on 2.5L engines and 50N·m (37ft. lbs.) on 4.0 L engines.**

(a) Start all 6 bolts by hand.

(b) Tighten 3 pilot hole bolts 3/4s of the way (any sequence).

REMOVAL AND INSTALLATION (Continued)

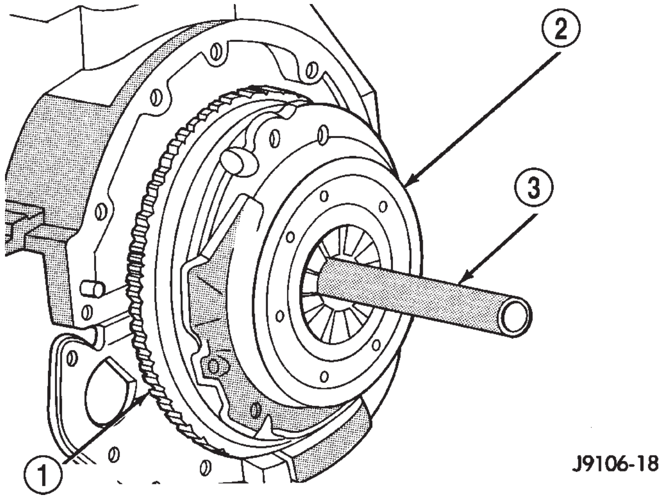


Fig. 11 Typical Method Of Aligning Clutch Disc

1 – FLYWHEEL
2 – CLUTCH COVER AND DISC
3 – CLUTCH DISC ALIGNMENT TOOL

(c) Starting 180 degrees from the last pilot bolt, tighten 3 large hole bolts 3/4s of the way (any sequence).

(d) Tighten 3 pilot hole bolts all the way (any sequence).

(e) Starting 180 degrees from last pilot bolt, tighten 3 large bolts all the way (any sequence).

(11) Apply light coat of Mopar® high temperature bearing grease to clutch disc hub and splines of transmission input shaft. **Do not over lubricate shaft splines. This will result in grease contamination of disc.**

(12) Install transmission.

RELEASE BEARING

REMOVAL

(1) Remove transmission.

(2) Disconnect release bearing from release lever and remove bearing (Fig. 12).

(3) Inspect bearing slide surface of transmission front bearing retainer. Replace retainer if slide surface is scored, worn, or cracked.

(4) Inspect release fork and fork pivot. Be sure pivot is secure and in good condition. Be sure fork is not distorted or worn. Replace release fork retainer spring if bent or damaged.

INSTALLATION

(1) Lubricate crankshaft pilot bearing with Mopar® high temperature bearing grease. Apply grease to end of long shank, small diameter flat blade screwdriver. Then insert tool through clutch disc hub to reach bearing.

(2) Lubricate input shaft splines, bearing retainer slide surface, fork pivot and release fork pivot surface with Mopar® high temperature grease.

(3) Install new release bearing. Be sure bearing is properly secured to release fork.

(4) Install transmission.

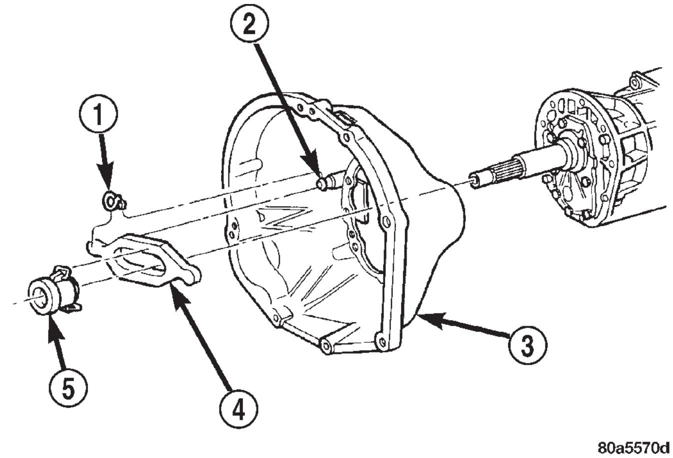


Fig. 12 Release Bearing Attachment

1 – RETURN SPRING
2 – PIVOT BALL STUD
3 – CLUTCH HOUSING
4 – RELEASE FORK
5 – RELEASE BEARING

PILOT BEARING

REMOVAL

(1) Remove transmission. Refer to Group 21, Transmission and Transfer Case, for proper procedures.

(2) Remove clutch cover and disc.

(3) Use a suitable blind hole puller to remove pilot bearing.

INSTALLATION

(1) Clean bearing bore with solvent and wipe dry with shop towel.

(2) Lubricate new pilot bearing with Mopar® high temperature grease.

(3) Position and start new bearing in bearing bore by hand. Note that pilot bearing has seal at one end. Install bearing so seal is facing outward toward transmission.

(4) Seat pilot bearing with clutch alignment tool (Fig. 13). Keep bearing straight during installation. Do not allow bearing to become cocked. Tap bearing into place until flush with edge of bearing bore. Do not recess bearing.

(5) Install transmission. Refer to Group 21, Transmission and Transfer Case, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

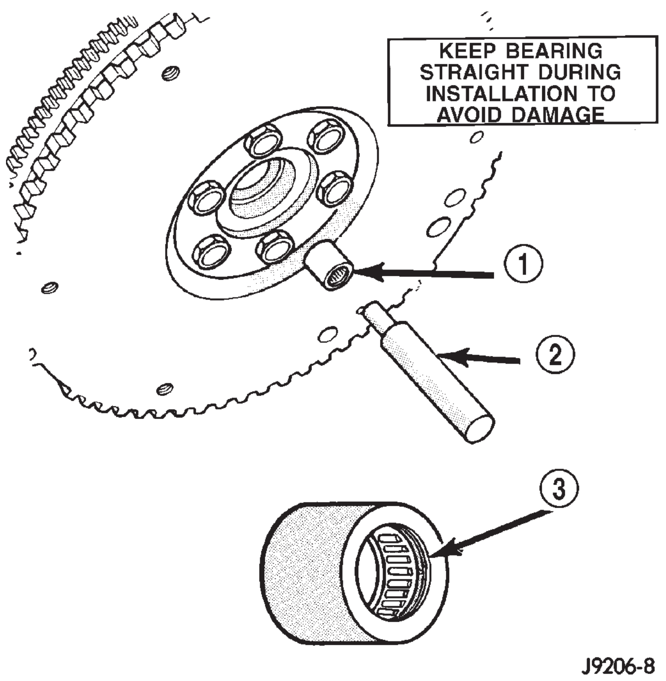


Fig. 13 Typical Method Of Installing Pilot Bearing

1 – PILOT BEARING
2 – ALIGNMENT TOOL
3 – BEARING SEAL MUST FACE TRANSMISSION

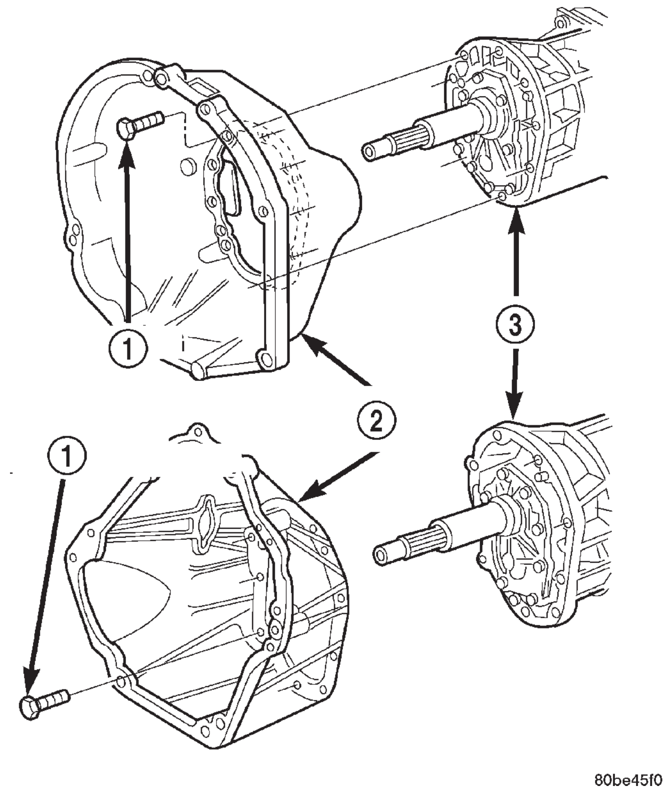


Fig. 14 Clutch Housing Attachment

1 – HOUSING-TO-TRANSMISSION BOLTS (46 N·m/34 ft. lbs.)
2 – CLUTCH HOUSING
3 – TRANSMISSION

CLUTCH HOUSING

The clutch housing is removable and can be replaced when the transmission is out of the vehicle.

The bolts attaching the housing to the transmission case are located inside the housing (Fig. 14). Recommended tightening torque for the clutch housing-to-transmission bolts is 46 N·m (34 ft. lbs.).

NOTE: Be sure the transmission and housing mating surfaces are clean before installing an original, or replacement clutch housing. Dirt/foreign material trapped between the housing and transmission will cause misalignment. If misalignment is severe enough, the result will be clutch drag, incomplete release and hard shifting.

CLUTCH HYDRAULIC LINKAGE

The clutch master cylinder, slave cylinder and connecting line are serviced as an assembly only. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting line are sealed units. Also note that removal/installation procedures for right and left hand drive models are basically the same. Only master cylinder location is different.

REMOVAL

(1) Raise vehicle.

(2) Remove fasteners attaching slave cylinder to clutch housing.

(3) Remove slave cylinder from clutch housing (Fig. 15).

(4) Disengage clutch fluid line from body clips, if applicable.

(5) Lower vehicle.

(6) Verify that cap on clutch master cylinder reservoir is tight. This is necessary to avoid spilling fluid during removal.

(7) Remove clutch master cylinder attaching nuts (Fig. 16) or (Fig. 17).

(8) Disengage captured bushing on clutch master cylinder actuator from pivot pin on pedal arm (Fig. 18).

(9) Slide actuator off pivot pin.

(10) Disconnect clutch interlock safety switch wires.

(11) Remove clutch hydraulic linkage through engine compartment.

REMOVAL AND INSTALLATION (Continued)

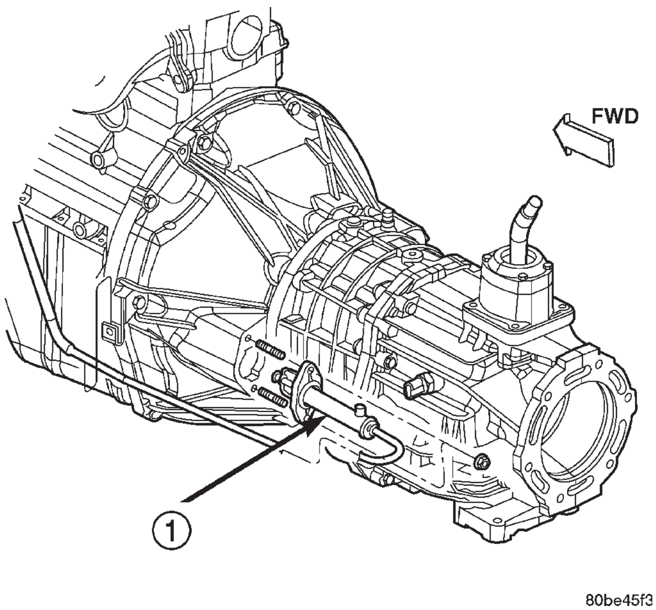


Fig. 15 Slave Cylinder

1 – CLUTCH SLAVE CYLINDER

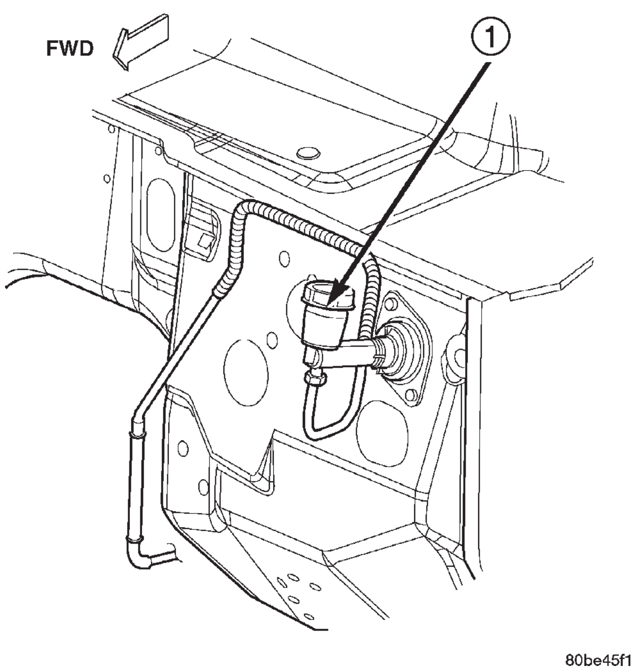


Fig. 16 Left Hand Drive Clutch Master Cylinder

1 – CLUTCH MASTER CYLINDER

INSTALLATION

(1) Be sure reservoir cover on clutch master cylinder is tight to avoid spills.

(2) Position clutch linkage components in vehicle. Work connecting line and slave cylinder downward past engine and adjacent to clutch housing (Fig. 16) or (Fig. 17).

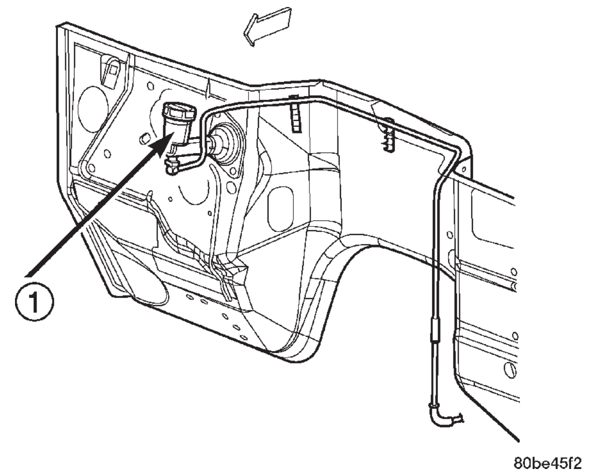


Fig. 17 Right Hand Drive Clutch Master Cylinder

1 – CLUTCH MASTER CYLINDER

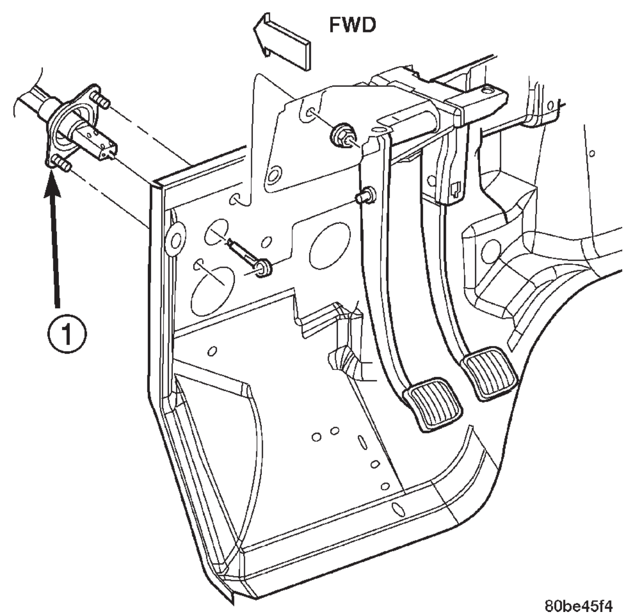


Fig. 18 Clutch Pedal Attachment

1 – CLUTCH MASTER CYLINDER

(3) Position clutch master cylinder on dash panel (Fig. 16) or (Fig. 17).

(4) Attach clutch master cylinder actuator to pivot pin on clutch pedal (Fig. 18).

(5) Install and tighten clutch master cylinder attaching nuts to 38 N·m (28 ft. lbs.) torque.

(6) Raise vehicle.

(7) Insert slave cylinder push rod through clutch housing opening and into release lever. Be sure cap on end of rod is securely engaged in lever. Check this before installing cylinder attaching nuts.

(8) Install and tighten slave cylinder attaching nuts to 23 N·m (17 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(9) Secure clutch fluid line in body and transmission clips.

(10) Lower vehicle.

(11) Connect clutch interlock safety switch wires.

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Bolts, clutch cover 2.5 L	31 N·m (23 ft. lbs)
Bolts, clutch cover 4.0 L	50 N·m (37 ft. lbs)
Bolt/Nut, clutch cyl. mount	23 N·m (200 in. lbs)
Bolt, clutch housing M12	75 N·m (55 ft. lbs)
Bolt, clutch housing 3/8	37 N·m (27 ft. lbs)
Bolt, clutch housing 7/16	58 N·m (43 ft. lbs)
Bolt, clutch housing/trans.	46 N·m (34 ft. lbs)
Bolt, dust shield M8	8 N·m (72 in. lbs)
Bolt, dust shield lower	50 N·m (37 ft. lbs)
Bolt, X-member/frame	41 N·m (30 ft. lbs)
Bolt, X-member/rear support	45 N·m (33 ft. lbs.)
Bolts, flywheel 4.0 L	142 N·m (105 ft. lbs)
Bolts, flywheel 2.5 L	95 N·m (70 ft. lbs)
Bolt, starter motor	45 N·m (33 ft. lbs)
Bolts, U-joints	19 N·m (170 in. lbs.)

CLUTCH

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

CLUTCH

DESCRIPTION

The clutch mechanism consists of a flywheel, a single, dry-type disc, and a diaphragm style clutch cover (Fig. 1). A hydraulic linkage is used to operate the clutch release bearing and fork. The flywheel is bolted to the rear flange of the crankshaft. The clutch pressure plate is bolted to the flywheel with the clutch disc located between these two components. The clutch system provides the mechanical, but still easily detachable, link between the engine and the transmission. The system is designed to ensure that the full torque output of the engine is transfered to the transmission while isolating the transmission from the engine firing pulses to minimize concerns such as gear rattle.

OPERATION

Leverage, clamping force, and friction are what make the clutch work. The disc serves as the friction element and a diaphragm spring and pressure plate provide the clamping force. The clutch pedal, hydraulic linkage, release lever and bearing provide the leverage.

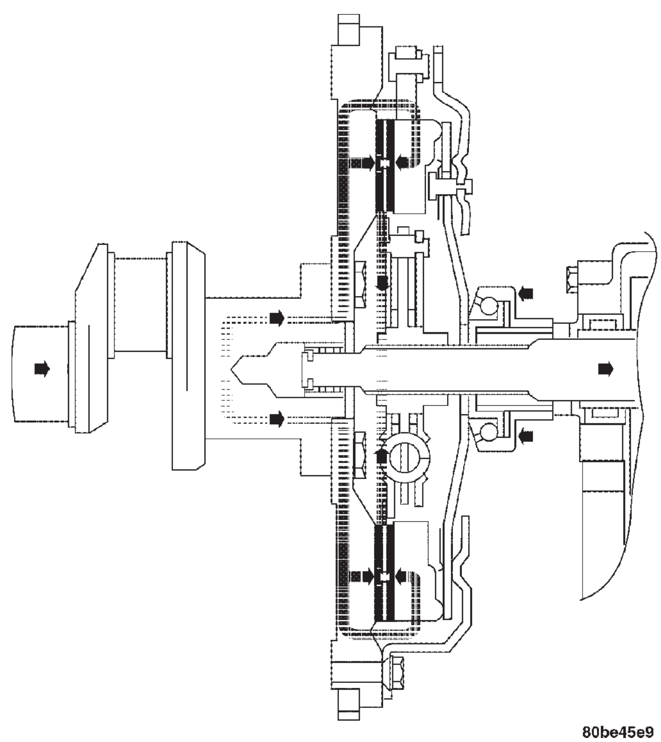


Fig. 1 Engine Powerflow

DESCRIPTION AND OPERATION (Continued)

The clutch master cylinder push rod is connected to the clutch pedal. When the clutch pedal is depressed, the slave cylinder is operated by the clutch master cylinder mounted on the dash panel. The release fork is actuated by the hydraulic slave cylinder mounted on the transmission housing. The release bearing is operated by a release fork pivoting on a ball stud mounted in the transmission housing. The release bearing then depresses the pressure plate spring fingers, thereby releasing pressure on the clutch disc and allowing the engine crankshaft to spin independently of the transmission input shaft (Fig. 2).

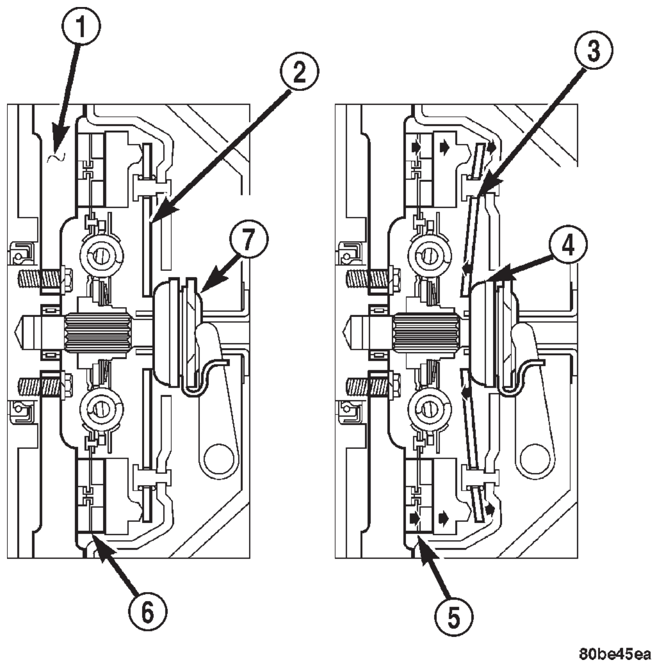


Fig. 2 Clutch Operation

1 – FLYWHEEL
2 – PRESSURE PLATE FINGERS
3 – PIVOT POINT
4 – RELEASE BEARING PUSHED IN
5 – CLUTCH DISC ENGAGED
6 – CLUTCH DISC ENGAGED
7 – RELEASE BEARING

FLYWHEEL

DESCRIPTION

The flywheel (Fig. 3) is a heavy plate bolted to the rear of the crankshaft. The flywheel incorporates the ring gear around the outer circumference to mesh with the starter to permit engine cranking. The rear face of the flywheel serves as the driving member to the clutch disc.

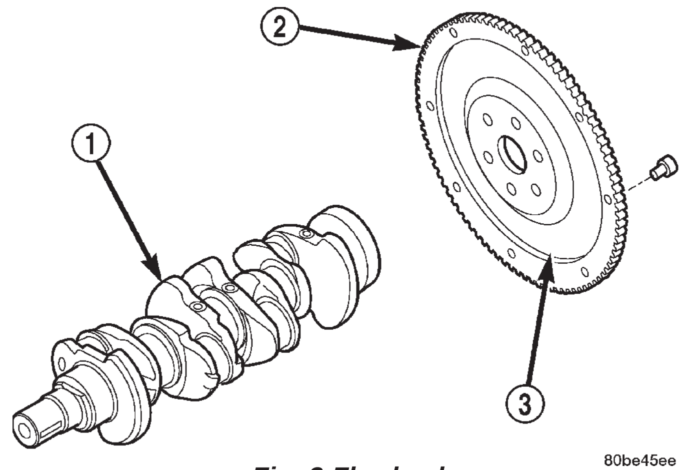


Fig. 3 Flywheel

1 – CRANKSHAFT
2 – RING GEAR
3 – FLYWHEEL

OPERATION

The flywheel serves to dampen the engine firing pulses. The heavy weight of the flywheel relative to the rotating mass of the engine components serves to stabilize the flow of power to the remainder of the drivetrain. The crankshaft has the tendency to attempt to speed up and slow down in response to the cylinder firing pulses. The flywheel dampens these impulses by absorbing energy when the crankshaft speeds and releasing the energy back into the system when the crankshaft slows down.

CLUTCH DISC

DESCRIPTION

The clutch disc friction material is riveted to the disc hub (Fig. 4). The hub bore is splined for installation on the transmission input shaft. The clutch disc has cushion springs in the disc hub to dampen disc vibrations during application and release of the clutch.

OPERATION

The clutch disc is held onto the surface of the flywheel by the force exerted by the pressure plate's diaphragm spring. The friction material of the clutch disc then transfers the engine torque from the flywheel and pressure plate to the input shaft of the transmission.

CLUTCH PRESSURE PLATE

DESCRIPTION

The clutch pressure plate assembly is a diaphragm type with a one-piece spring and multiple release fingers (Fig. 5). The pressure plate release fingers are preset during manufacture and are not adjustable. The assembly also contains the cover, pressure plate, and fulcrum components.

DESCRIPTION AND OPERATION (Continued)

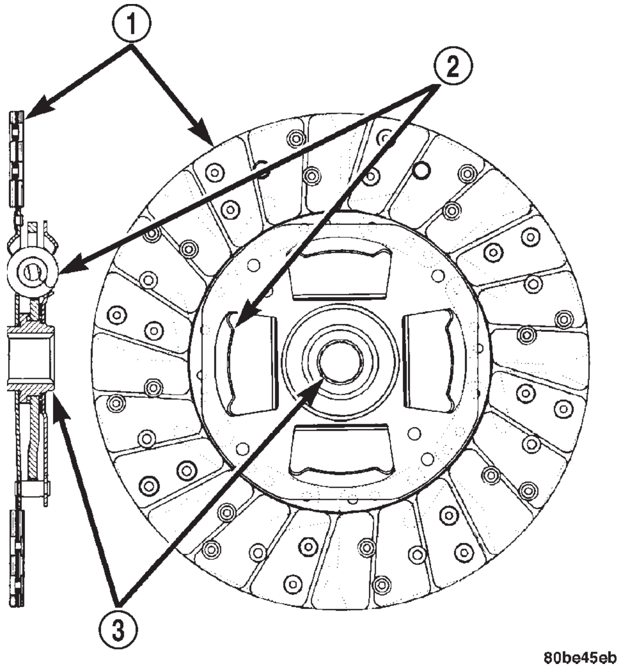


Fig. 4 Clutch Disc-Typical

1 – FACING MATERIAL
2 – DAMPER SPRINGS
3 – HUB

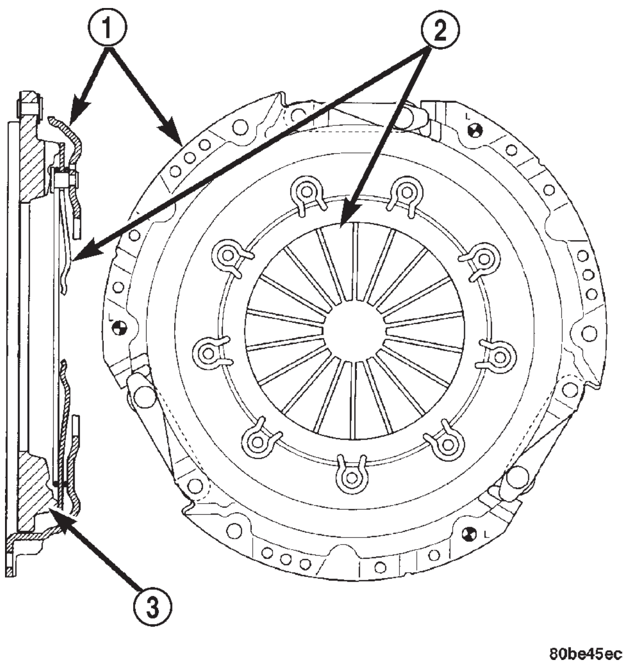


Fig. 5 Clutch Pressure Plate-Typical

1 – COVER
2 – RELEASE FINGERS
3 – PRESSURE PLATE

OPERATION

The clutch pressure plate assembly clamps the clutch disc against the flywheel. When the release bearing is depressed by the shift fork, the pressure exerted on the clutch disc by the pressure plate spring is decreased. 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. The clutch disc is disengaged and freewheeling at this point.

CLUTCH RELEASE BEARING

DESCRIPTION

A conventional release bearing (Fig. 6) is used to engage and disengage the clutch pressure plate assembly. The clutch release bearing is mounted on the transmission front bearing retainer. The bearing is attached to the release fork, which moves the bearing into contact with the clutch cover diaphragm spring.

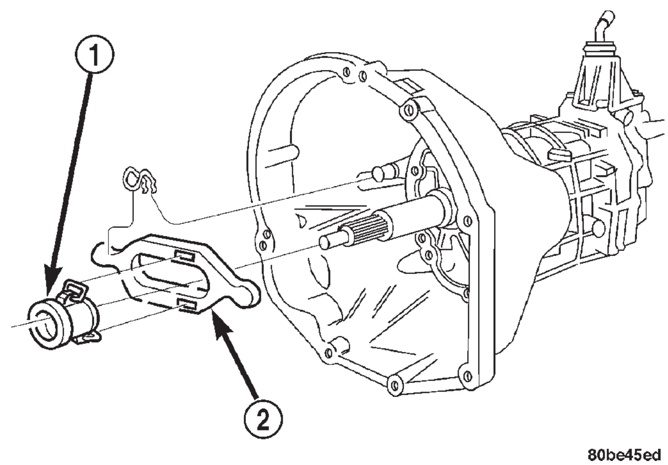


Fig. 6 Clutch Release Bearing

1 – RELEASE BEARING
2 – RELEASE FORK

OPERATION

The release bearing is operated by a release fork in the clutch housing. 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 clamp force on the 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.

DESCRIPTION AND OPERATION (Continued)

HYDRAULIC CLUTCH LINKAGE

DESCRIPTION

The hydraulic linkage consists of a clutch master cylinder with integral reservoir, a clutch slave cylinder and an interconnecting fluid line (Fig. 7).

The clutch master cylinder push rod is connected to the clutch pedal. The slave cylinder push rod is connected to the clutch release fork. The master cylinder is mounted on the driver side of the dash panel adjacent to the brake master cylinder and booster assembly.

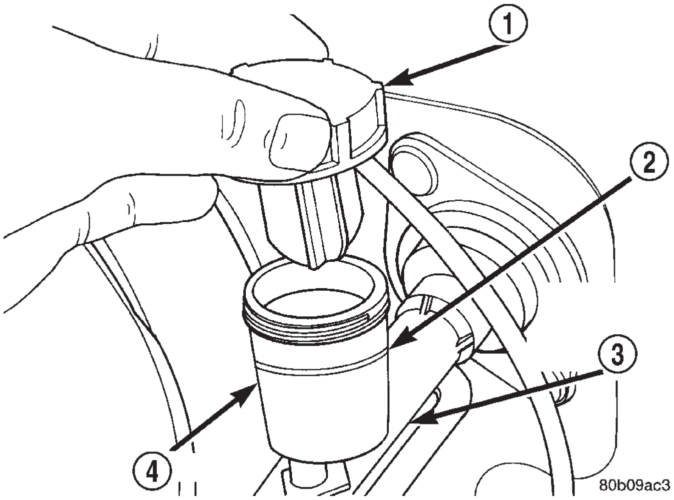


Fig. 7 Clutch Master Cylinder

1 – CAP
2 – FILL LINE
3 – CLUTCH MASTER CYLINDER
4 – RESERVOIR

OPERATION

The clutch linkage uses hydraulic pressure to operate 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.

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 clamp force on the disc.

DIAGNOSIS AND TESTING

SAFETY PRECAUTIONS

WARNING: EXERCISE CARE WHEN SERVICING CLUTCH COMPONENTS. FACTORY INSTALLED CLUTCH DISCS DO NOT CONTAIN ASBESTOS FIBERS. DUST AND DIRT ON CLUTCH PARTS MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET COMPONENTS. BREATHING EXCESSIVE CONCENTRATIONS OF THESE FIBERS CAN CAUSE SERIOUS BODILY HARM. WEAR A RESPIRATOR DURING SERVICE AND NEVER CLEAN CLUTCH COMPONENTS WITH COMPRESSED AIR OR WITH A DRY BRUSH. EITHER CLEAN THE COMPONENTS WITH A WATER DAMPENED RAGS OR USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR REMOVING ASBESTOS FIBERS AND DUST. DO NOT CREATE DUST BY SANDING A CLUTCH DISC. REPLACE THE DISC IF THE FRICTION MATERIAL IS DAMAGED OR CONTAMINATED. DISPOSE OF ALL DUST AND DIRT CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS. THIS WILL HELP MINIMIZE EXPOSURE TO YOURSELF AND TO OTHERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL SAFETY AGENCY (EPA), FOR THE HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

INSTALLATION METHODS AND PARTS USAGE

Distortion of clutch components during installation and the use of non-standard components are common causes of clutch malfunction.

Improper clutch cover bolt tightening can distort the cover. The usual result is clutch grab, chatter and rapid wear. Tighten the cover bolts as described in Removal and Installation section.

An improperly seated flywheel and/or clutch housing are additional causes of clutch failure. Improper seating will produce misalignment and additional clutch problems.

The use of non-standard or low quality parts will also lead to problems and wear. Use recommended factory quality parts to avoid comebacks.

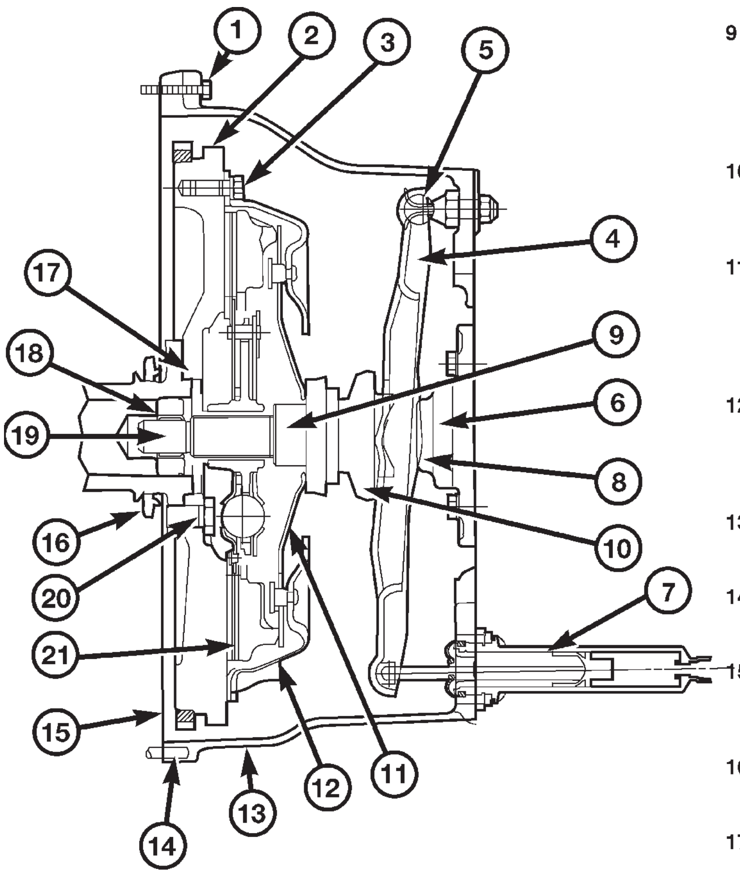
A cocked pilot bearing is another cause of clutch noise, drag, hard shifting, and rapid bearing wear. Always use an alignment tool to install a new bearing. This practice helps avoid cocking the bearing during installation.

CLUTCH DIAGNOSTIC INFORMATION

Unless the cause of a clutch problem is obvious, accurate problem diagnosis will usually require a road test to confirm a problem. Component inspection (Fig. 8) will then be required to determine the actual problem cause.

During a road test, drive the vehicle at normal speeds. Shift the transmission through all gear ranges and observe clutch action. If chatter, grab, slip, or improper release is experienced, remove and inspect the clutch components. However, if the problem is noise or hard shifting, further diagnosis may be needed as the transmission or another driveline component may be at fault. Careful observation during the test will help narrow the problem area.

DIAGNOSIS AND TESTING (Continued)



1 Check clutch housing bolts. Tighten if loose. Be sure housing is fully seated on engine block.

2 Check flywheel. Scuff sand face to remove glaze. Clean surface with wax and grease remover. Replace flywheel if severely scored, worn or cracked. Secure flywheel with new bolts (if removed). Do not reuse old bolts. Use Mopar Lock N'Seal on bolts.

3 Tighten clutch cover bolts 2–3 threads at a time, alternately and evenly (in a star pattern) to specified torque. Failure to do so could warp the cover.

4 Check release fork. Replace fork if bent or worn. Make sure pivot and bearing contact surfaces are lubricated.

5 Check release fork pivot (in housing). Be sure pivot is secure and ball end is lubricated.

6 Transmission input shaft bearing will cause noise, chatter, or improper release if damaged. Check condition before installing transmission.

7 Check slave cylinder. Replace it if leaking. Be sure cylinder is properly secured in housing and cylinder piston is seated in release fork.

8 Check input shaft seal if clutch cover and disc were oil covered. Replace seal if worn, or cut.

9 Inspect release bearing slide surface of trans. front bearing retainer. Surface should be smooth, free of nicks, scores. Replace retainer if necessary. Lubricate slide surface before installing release bearing.

10 Do not replace release bearing unless actually faulty. Replace bearing only if seized, noisy, or damaged.

11 Check clutch cover diaphragm spring and release fingers. Replace cover if spring or fingers are bent, warped, broken, cracked. Do not tamper with factory spring setting as clutch problems will result.

12 Check condition of clutch cover. Replace clutch cover if plate surface is deeply scored, warped, worn, or cracked. Be sure cover is correct size and properly aligned on disc and flywheel.

13 Inspect clutch housing. Be sure bolts are tight. Replace housing if damaged.

14 Verify that housing alignment dowels are in position before installing housing.

15 Clean engine block surface before installing clutch housing. Dirt, grime can produce misalignment.

16 Check rear main seal if clutch disc and cover were oil covered. Replace seal if necessary.

17 Check crankshaft flange (if flywheel is removed). Be sure flange is clean and flywheel bolt threads are in good condition.

18 Check pilot bearing. Replace bearing if damaged. Lube with Mopar high temp. bearing grease before installation.

19 Check transmission input shaft. Disc must slide freely on shaft splines. Lightly grease splines before installation. Replace shaft if splines or pilot bearing hub are damaged.

20 Check flywheel bolt torque. If bolts are loose, replace them. Use Mopar Lock N'Seal to secure new bolts.

21 Check clutch disc facing. Replace disc if facing is charred, scored, flaking off, or worn. Also check runout of new disc. Runout should not exceed 0.5 mm (0.02 in.).

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Fig. 8 Clutch Components And Inspection

DIAGNOSIS AND TESTING (Continued)

CLUTCH CONTAMINATION

Fluid contamination is a frequent cause of clutch malfunctions. Oil, water, or clutch fluid on the clutch disc and pressure plate surfaces will cause chatter, slip and grab.

During inspection, note if any components are contaminated with oil, hydraulic fluid, or water/road splash.

Oil contamination indicates a leak at either the rear main seal or transmission input shaft. Oil leakage produces a residue of oil on the housing interior and on the clutch cover and flywheel. Heat buildup caused by slippage between the cover, disc and flywheel, can sometimes bake the oil residue onto the components. The glaze-like residue ranges in color from amber to black.

Road splash contamination means dirt/water is entering the clutch housing due to loose bolts, housing cracks, or through hydraulic line openings. Driving through deep water puddles can force water/road splash into the housing through such openings.

Clutch fluid leaks are usually from damaged slave cylinder push rod seals. This type of leak can only be confirmed by visual inspection.

IMPROPER CLUTCH RELEASE OR ENGAGEMENT

Clutch release or engagement problems are caused by wear, or damage to one or more clutch components. A visual inspection of the release components will usually reveal the problem part.

Release problems can result in hard shifting and noise. Items to look for are: leaks at the clutch cylinders and interconnecting line; loose slave cylinder bolts; worn/loose release fork and pivot stud; damaged release bearing; and a worn clutch disc, or pressure plate.

Normal condensation in vehicles that are stored or out of service for long periods of time can generate enough corrosion to make the disc stick to the flywheel, or pressure plate. If this condition is experienced, correction only requires that the disc be loosened manually through the inspection plate opening.

Engagement problems usually result in slip, chatter/shudder, and noisy operation. The primary causes are clutch disc contamination; clutch disc wear; misalignment, or distortion; flywheel damage; or a combination of the foregoing. A visual inspection is required to determine the part actually causing the problem.

CLUTCH MISALIGNMENT

Clutch components must be in proper alignment with the crankshaft and transmission input shaft. Misalignment caused by excessive runout or warpage of any clutch component will cause grab, chatter and improper clutch release.

CLUTCH HOUSING MISALIGNMENT

Clutch housing alignment is important to proper clutch operation. The housing maintains alignment between the crankshaft and transmission input shaft. Misalignment can cause clutch noise, hard shifting, incomplete release and chatter. It can also result in premature wear of the pilot bearing, cover release fingers and clutch disc. In severe cases, misalignment can also cause premature wear of the transmission input shaft and front bearing.

Housing misalignment is generally caused by incorrect seating on the engine or transmission, loose housing bolts, missing alignment dowels, or housing damage. Infrequently, misalignment may also be caused by housing mounting surfaces that are not completely parallel. Misalignment can be corrected with shims.

CLUTCH FLYWHEEL RUNOUT

Check flywheel runout whenever misalignment is suspected. Flywheel runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the indicator on a stud installed in place of one of the flywheel bolts.

Common causes of runout are:

- heat warpage
- improper machining
- incorrect bolt tightening
- improper seating on crankshaft flange shoulder
- foreign material on crankshaft flange

Flywheel machining is not recommended. The flywheel clutch surface is machined to a unique contour and machining will negate this feature. However, minor flywheel scoring can be cleaned up by hand with 180 grit emery, or with surface grinding equipment. Remove only enough material to reduce scoring (approximately 0.001 - 0.003 in.). Heavy stock removal is **not recommended.** Replace the flywheel if scoring is severe and deeper than 0.076 mm (0.003 in.). Excessive stock removal can result in flywheel cracking or warpage after installation; it can also weaken the flywheel and interfere with proper clutch release.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout. Use new bolts when remounting a flywheel and secure the bolts with Mopar® Lock And Seal. Tighten flywheel bolts to specified torque only. Overtightening can distort the flywheel hub causing runout.

DIAGNOSIS AND TESTING (Continued)

CLUTCH COVER AND DISC RUNOUT

Check the clutch disc before installation. Axial (face) runout of a **new** disc should not exceed 0.50 mm (0.020 in.). Measure runout about 6 mm (1/4 in.) from the outer edge of the disc facing. Obtain another disc if runout is excessive.

Check condition of the clutch before installation. A warped cover or diaphragm spring will cause grab and incomplete release or engagement. Be careful when handling the cover and disc. Impact can distort the cover, diaphragm spring, release fingers and the hub of the clutch disc.

Use an alignment tool when positioning the disc on the flywheel. The tool prevents accidental misalignment which could result in cover distortion and disc damage.

A frequent cause of clutch cover distortion (and consequent misalignment) is improper bolt tightening.

CLUTCH DIAGNOSIS CHARTS

The clutch inspection chart (Fig. 8) outlines items to be checked before and during clutch installation. Use the chart as a check list to help avoid overlooking potential problem sources during service operations.

The diagnosis charts describe common clutch problems, causes and correction. Fault conditions are listed at the top of each chart. Conditions, causes and corrective action are outlined in the indicated columns.

The charts are provided as a convenient reference when diagnosing faulty clutch operation.

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
Disc facing worn out	1. Normal wear. 2. Driver frequently rides (slips) the clutch. Results in rapid overheating and wear. 3. Insufficient clutch cover diaphragm spring tension.	1. Replace cover and disc. 2. Replace cover and disc. 3. Replace cover and disc.
Clutch disc facing contaminated with oil, grease, or clutch fluid.	1. Leak at rear main engine seal or transmission input shaft seal. 2. Excessive amount of grease applied to the input shaft splines. 3. Road splash, water entering housing. 4. Slave cylinder leaking.	1. Replace appropriate seal. 2. Remove grease and apply the correct amount of grease. 3. Replace clutch disc. Clean clutch cover and reuse if in good condition. 4. Replace hydraulic clutch linkage.
Clutch is running partially disengaged.	1. Release bearing sticking or binding and does not return to the normal running position.	1. Verify failure. Replace the release bearing and transmission front bearing retainer as necessary.
Flywheel below minimum thickness specification.	1. Improper flywheel machining. Flywheel has excessive taper or excessive material removal.	1. Replace flywheel.
Clutch disc, cover and/or diaphragm spring warped or distorted.	1. Rough handling. Impact bent cover, spring, or disc. 2. Improper bolt tightening procedure.	1. Replace disc or cover as necessary. 2. Tighten clutch cover using proper procedure.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Facing on flywheel side of disc torn, gouged, or worn.	1. Flywheel surface scored or nicked.	2. Correct surface condition if possible. Replace flywheel and disc as necessary.
	2. Clutch disc sticking or binding on transmission input shaft.	2. Inspect components and correct/replace as necessary.
Clutch disc facing burnt. Flywheel and cover pressure plate surfaces heavily glazed.	1. Frequent operation under high loads or hard acceleration conditions.	1. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
	2. Driver frequently rides (slips) clutch. Results in rapid wear and overheating of disc and cover.	2. Correct condition of flywheel and pressure plate surface. Replace clutch cover and disc. Alert driver to problem cause.
Clutch disc binds on input shaft splines.	1. Clutch disc hub splines damaged during installation.	1. Clean, smooth, and lubricate hub splines if possible. Replace disc if necessary.
	2. Input shaft splines rough, damaged, or corroded.	2. Clean, smooth, and lubricate shaft splines if possible. Replace input shaft if necessary.
Clutch disc rusted to flywheel and/or pressure plate.	1. Clutch not used for and extended period of time (e.g. long term vehicle storage).	1. Sand rusted surfaces with 180 grit sanding paper. Replace clutch cover and flywheel if necessary.
Pilot bearing seized, loose, or rollers are worn.	1. Bearing cocked during installation.	1. Install and lubricate a new bearing.
	2. Bearing defective.	2. Install and lubricate a new bearing.
	3. Bearing not lubricated.	3. Install and lubricate a new bearing.
	4. Clutch misalignment.	4. Inspect clutch and correct as necessary. Install and lubricate a new bearing.
Clutch will not disengage properly.	1. Low clutch fluid level.	1. Replace hydraulic linkage assembly.
	2. Clutch cover loose.	2. Follow proper bolt tightening procedure.
	3. Clutch disc bent or distorted.	3. Replace clutch disc.
	4. Clutch cover diaphragm spring bent or warped.	4. Replace clutch cover.
	5. Clutch disc installed backwards.	5. Remove and install clutch disc correctly.
	6. Release fork bent or fork pivot loose or damaged.	6. Replace fork or pivot as necessary.
	7. Clutch master or slave cylinder failure.	7. Replace hydraulic linkage assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
Clutch pedal squeak.	1. Pivot pin loose. 2. Master cylinder bushing not lubricated. 3. Pedal bushings worn out or cracked.	1. Tighten pivot pin if possible. Replace clutch pedal if necessary. 2. Lubricate master cylinder bushing. 3. Replace and lubricate bushings.
Clutch master or slave cylinder plunger dragging andør binding	1. Master or slave cylinder components worn or corroded.	1. Replace clutch hydraulic linkage assembly.
Release bearing is noisy.	1. Release bearing defective or damaged.	1. Replace release bearing.
Contact surface of release bearing damaged.	1. Clutch cover incorrect or release fingers bent or distorted. 2. Release bearing defective or damaged. 3. Release bearing misaligned.	1. Replace clutch cover and release bearing. 2. Replace the release bearing. 3. Check and correct runout of clutch components. Check front bearing sleeve for damage/ alignment. Repair as necessary.
Partial engagement of clutch disc. One side of disc is worn and the other side is glazed and lightly worn.	1. Clutch pressure plate position incorrect. 2. Clutch cover, spring, or release fingers bent or distorted. 3. Clutch disc damaged or distorted. 4. Clutch misalignment.	1. Replace clutch disc and cover. 2. Replace clutch disc and cover. 2. Replace clutch disc. 4. Check alignment and runout of flywheel, disc, pressure plate, andør clutch housing. Correct as necessary.

SERVICE PROCEDURES

CLUTCH COMPONENT LUBRICATION

Proper clutch component lubrication is important to satisfactory operation. Using the correct lubricant and not over lubricating are equally important. Apply recommended lubricant sparingly to avoid disc and pressure plate contamination.

Clutch and transmission components requiring lubrication are:

- Pilot bearing.
- Release lever pivot ball stud.
- Release lever contact surfaces.
- Release bearing bore.
- Clutch disc hub splines.
- Clutch pedal pivot shaft bore.
- Clutch pedal bushings.
- Input shaft splines.
- Input shaft pilot hub.
- Transmission front bearing retainer slide surface.

NOTE: Never apply grease to any part of the clutch cover, or disc.

RECOMMENDED LUBRICANTS

Use Mopar® multi-purpose grease for the clutch pedal bushings and pivot shaft. Use Mopar® high temperature grease (or equivalent) for all other lubrication requirements. Apply recommended amounts and do not over lubricate.

CLUTCH LINKAGE FLUID

If inspection or diagnosis indicates additional fluid may be needed, use Mopar® brake fluid, or an equiv-

SERVICE PROCEDURES (Continued)

alent meeting standards SAE J1703 and DOT 3. Do not use any other type of fluid.

CLUTCH FLUID LEVEL

The clutch fluid reservoir, master cylinder, slave cylinder and fluid lines are pre-filled with fluid at the factory during assembly operations.

The hydraulic system should not require additional fluid under normal circumstances. In fact, **the reservoir fluid level will actually increase as normal clutch wear occurs. For this reason, it is important to avoid overfilling, or removing fluid from the reservoir.**

Clutch fluid level is checked at the master cylinder reservoir (Fig. 9). An indicator ring is provided on the outside rim of the reservoir.

Be sure to wipe the reservoir and cover clean before removing the cover. This will avoid having dirt or foreign material fall into the reservoir during a fluid level check.

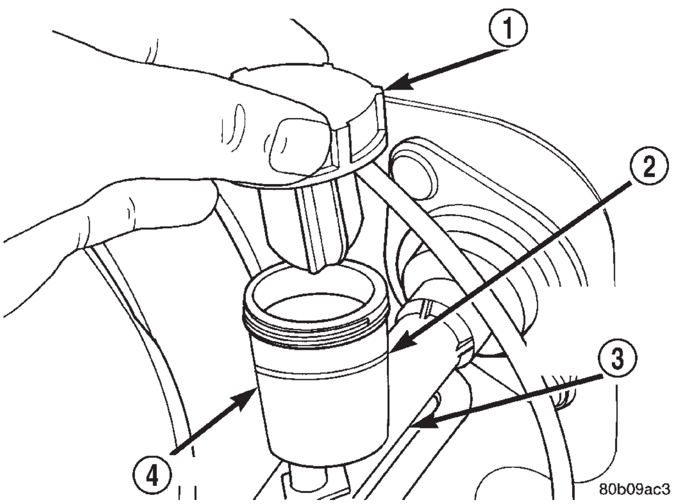


Fig. 9 Clutch Master Cylinder Reservoir And Cap

1 – CAP
2 – FILL LINE
3 – CLUTCH MASTER CYLINDER
4 – RESERVOIR

FLYWHEEL

Inspect the flywheel whenever the clutch disc, cover and housing are removed for service. Check condition of the flywheel face, hub, ring gear teeth, and flywheel bolts.

Minor scratches, burrs, or glazing on the flywheel face can be reduced with 180 grit emery cloth. However, the flywheel should be replaced if the disc contact surface is severely scored, heat checked, cracked, or obviously worn.

Flywheel machining is not recommended. The flywheel surface is manufactured with a unique contour that would be negated by machining. However, cleanup of minor flywheel scoring can be performed by hand with 180 grit emery, or with surface grinding equipment. Replace the flywheel if scoring is deeper than 0.0762 mm (0.003 in.).

Heavy stock removal by grinding is **not recommended.** Excessive stock removal can result in flywheel cracking or warpage after installation. It can also weaken the flywheel and interfere with proper clutch release.

Check flywheel runout if misalignment is suspected. Runout should not exceed 0.08 mm (0.003 in.). Measure runout at the outer edge of the flywheel face with a dial indicator. Mount the dial indicator on a stud installed in place of one of the clutch housing attaching bolts.

Clean the crankshaft flange before mounting the flywheel. Dirt and grease on the flange surface may cock the flywheel causing excessive runout.

Check condition of the flywheel hub and attaching bolts. Replace the flywheel if the hub exhibits cracks in the area of the attaching bolt holes.

Install new attaching bolts whenever the flywheel is replaced and use Mopar® Lock N' Seal, or Loctite 242 on the replacement bolt threads.

Recommended flywheel bolt torques are:

- 142 N·m (105 ft. lbs.) for 6-cylinder flywheels
- 95 N·m (70 ft. lbs.) for 4-cylinder flywheels

Inspect the teeth on the starter ring gear. **If the teeth are worn or damaged, the flywheel should be replaced as an assembly. This is the recommended and preferred method of repair.**

In cases where a new flywheel is not readily available, a replacement ring gear can be installed. However, the following precautions must be observed to avoid damaging the flywheel and replacement gear.

(1) Mark position of the old gear for alignment reference on the flywheel. Use a scriber for this purpose.

(2) Wear protective goggles or approved safety glasses. Also wear heat resistent gloves when handling a heated ring gear.

(3) Remove the old gear by cutting most of the way through it (at one point) with an abrasive cut-off wheel. Then complete removal with a cold chisel or punch.

(4) The ring gear is a shrink fit on the flywheel. This means the gear must be expanded by heating in order to install it. **The method of heating and expanding the gear is extremely important.** Every surface of the gear must be heated at the same time to produce uniform expansion. An oven or similar enclosed heating device must be used. Temperature required for uniform expansion is approximately 375° F.

SERVICE PROCEDURES (Continued)

CAUTION: Do not use an oxy/acetylene torch to remove the old gear, or to heat and expand a new gear. The high temperature of the torch flame can cause localized heating that will damage the flywheel. In addition, using the torch to heat a replacement gear will cause uneven heating and expansion. The torch flame can also anneal the gear teeth resulting in rapid wear and damage after installation.

(5) The heated gear must be installed evenly to avoid misalignment or distortion. A shop press and suitable press plates should be used to install the gear if at all possible.

(6) Be sure to wear eye and hand protection. Heat resistent gloves and safety goggles are needed for personal safety. Also use metal tongs, vise grips, or similar tools to position the gear as necessary for installation.

(7) Allow the flywheel and ring gear to cool down before installation. Set the assembly on a workbench and let it cool in normal shop air.

CAUTION: Do not use water, or compressed air to cool the flywheel. The rapid cooling produced by water or compressed air can distort, or crack the gear and flywheel.

REMOVAL AND INSTALLATION

CLUTCH COVER AND DISC

REMOVAL

(1) Remove transmission. Refer to procedures in Group 21.

(2) If original clutch cover will be reinstalled, mark position of cover on flywheel for assembly reference. Use paint or a scriber for this purpose.

(3) If clutch cover is to be replaced, cover bolts can be removed in any sequence. However, if original cover will be reinstalled, loosen cover bolts evenly and in rotation to relieve spring tension equally. This is necessary to avoid warping cover.

(4) Remove cover bolts and remove cover and disc (Fig. 10).

INSTALLATION

(1) Lightly scuff sand flywheel face with 180 grit emery cloth. Then clean surface with a wax and grease remover.

(2) Lubricate pilot bearing with Mopar high temperature bearing grease.

(3) Check runout and free operation of new clutch disc as follows:

(a) Slide disc onto transmission input shaft splines. Disc should slide freely on splines.

(b) Leave disc on shaft and check face runout with dial indicator. Check runout at disc hub and about 6 mm (1/4 in.) from outer edge of facing.

(c) Face runout should not exceed 0.5 mm (0.020 in.). Obtain another clutch disc if runout exceeds this limit.

(4) Position clutch disc on flywheel. Be sure side of disc marked flywheel side is positioned against flywheel (Fig. 10). If disc is not marked, be sure flat side of disc hub is toward flywheel.

(5) Inspect condition of pressure plate surface of clutch cover (Fig. 10). Replace cover if this surface is worn, heat checked, cracked, or scored.

(6) Insert clutch alignment tool in clutch disc (Fig. 11).

(7) Insert alignment tool in pilot bearing and position disc on flywheel. Be sure disc hub is positioned correctly. Side of hub marked Flywheel Side should face flywheel (Fig. 10). If disc is not marked, place flat side of disc against flywheel.

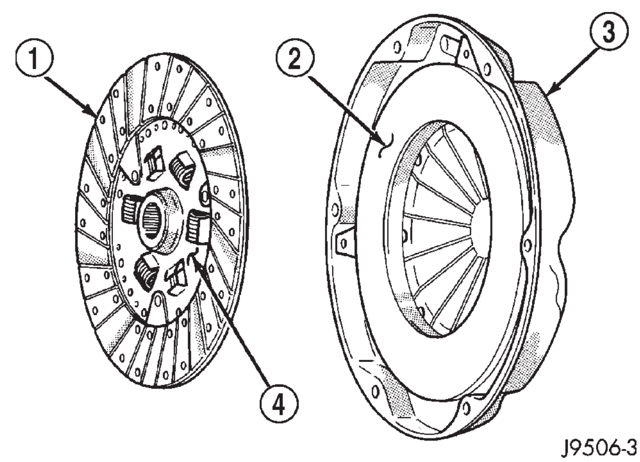


Fig. 10 Clutch Disc And Pressure Plate Inspection

1 – DISC
2 – INSPECT THIS SURFACE
3 – CLUTCH COVER
4 – “FLYWHEEL SIDE” STAMPED ON THIS SURFACE

(8) Position clutch cover over disc and on flywheel (Fig. 11).

(9) Install clutch cover bolts finger tight.

(10) Tighten cover bolts evenly and in rotation a few threads at a time. **Cover bolts must be tightened evenly and to specified torque to avoid distorting cover. Tightening torques are 31 N·m (23 ft. lbs.) on 2.5L engines and 50N·m (37ft. lbs.) on 4.0 L engines.**

(a) Start all 6 bolts by hand.

(b) Tighten 3 pilot hole bolts 3/4s of the way (any sequence).

REMOVAL AND INSTALLATION (Continued)

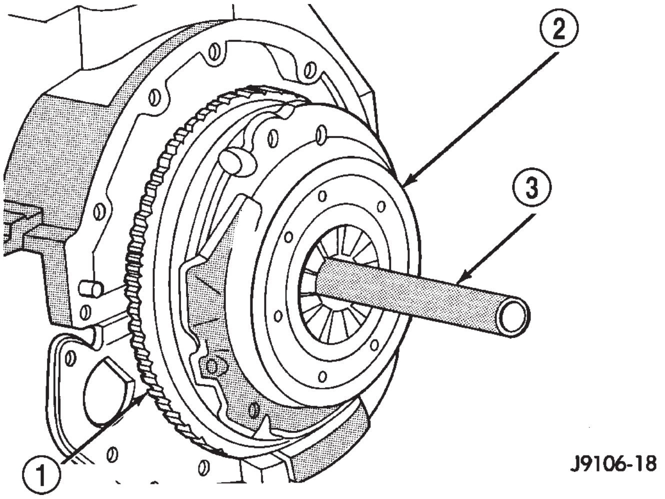


Fig. 11 Typical Method Of Aligning Clutch Disc

1 – FLYWHEEL
2 – CLUTCH COVER AND DISC
3 – CLUTCH DISC ALIGNMENT TOOL

(c) Starting 180 degrees from the last pilot bolt, tighten 3 large hole bolts 3/4s of the way (any sequence).

(d) Tighten 3 pilot hole bolts all the way (any sequence).

(e) Starting 180 degrees from last pilot bolt, tighten 3 large bolts all the way (any sequence).

(11) Apply light coat of Mopar® high temperature bearing grease to clutch disc hub and splines of transmission input shaft. **Do not over lubricate shaft splines. This will result in grease contamination of disc.**

(12) Install transmission.

RELEASE BEARING

REMOVAL

(1) Remove transmission.

(2) Disconnect release bearing from release lever and remove bearing (Fig. 12).

(3) Inspect bearing slide surface of transmission front bearing retainer. Replace retainer if slide surface is scored, worn, or cracked.

(4) Inspect release fork and fork pivot. Be sure pivot is secure and in good condition. Be sure fork is not distorted or worn. Replace release fork retainer spring if bent or damaged.

INSTALLATION

(1) Lubricate crankshaft pilot bearing with Mopar® high temperature bearing grease. Apply grease to end of long shank, small diameter flat blade screwdriver. Then insert tool through clutch disc hub to reach bearing.

(2) Lubricate input shaft splines, bearing retainer slide surface, fork pivot and release fork pivot surface with Mopar® high temperature grease.

(3) Install new release bearing. Be sure bearing is properly secured to release fork.

(4) Install transmission.

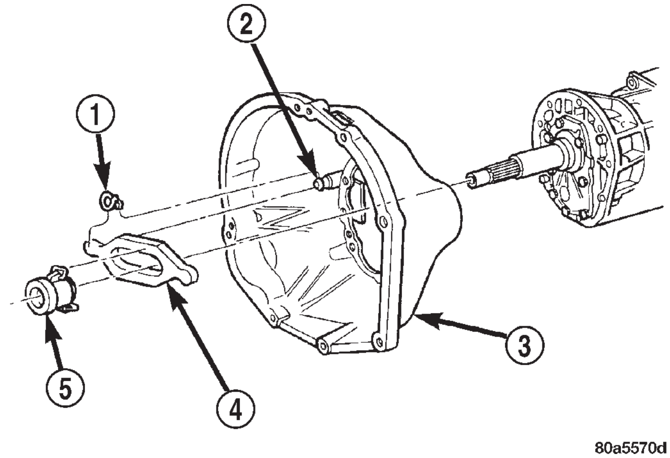


Fig. 12 Release Bearing Attachment

1 – RETURN SPRING
2 – PIVOT BALL STUD
3 – CLUTCH HOUSING
4 – RELEASE FORK
5 – RELEASE BEARING

PILOT BEARING

REMOVAL

(1) Remove transmission. Refer to Group 21, Transmission and Transfer Case, for proper procedures.

(2) Remove clutch cover and disc.

(3) Use a suitable blind hole puller to remove pilot bearing.

INSTALLATION

(1) Clean bearing bore with solvent and wipe dry with shop towel.

(2) Lubricate new pilot bearing with Mopar® high temperature grease.

(3) Position and start new bearing in bearing bore by hand. Note that pilot bearing has seal at one end. Install bearing so seal is facing outward toward transmission.

(4) Seat pilot bearing with clutch alignment tool (Fig. 13). Keep bearing straight during installation. Do not allow bearing to become cocked. Tap bearing into place until flush with edge of bearing bore. Do not recess bearing.

(5) Install transmission. Refer to Group 21, Transmission and Transfer Case, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

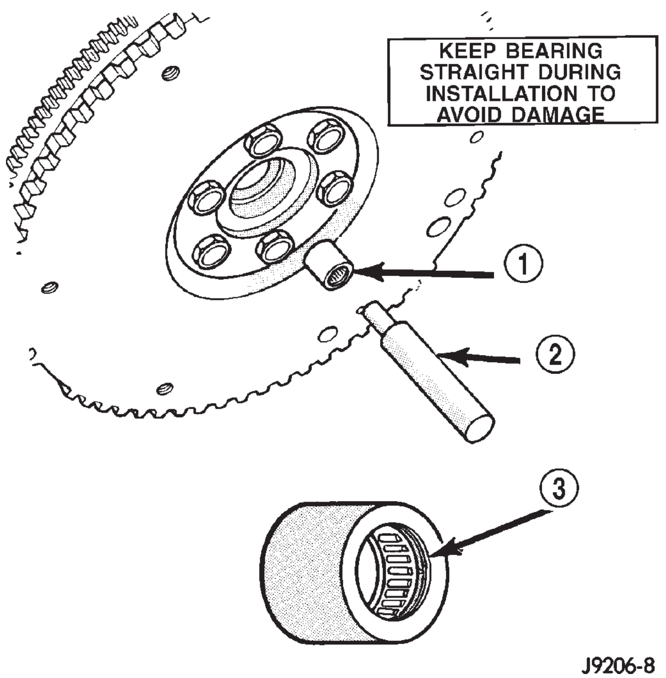


Fig. 13 Typical Method Of Installing Pilot Bearing

1 – PILOT BEARING
2 – ALIGNMENT TOOL
3 – BEARING SEAL MUST FACE TRANSMISSION

CLUTCH HOUSING

The clutch housing is removable and can be replaced when the transmission is out of the vehicle.

The bolts attaching the housing to the transmission case are located inside the housing (Fig. 14). Recommended tightening torque for the clutch housing-to-transmission bolts is 46 N·m (34 ft. lbs.).

NOTE: Be sure the transmission and housing mating surfaces are clean before installing an original, or replacement clutch housing. Dirt/foreign material trapped between the housing and transmission will cause misalignment. If misalignment is severe enough, the result will be clutch drag, incomplete release and hard shifting.

CLUTCH HYDRAULIC LINKAGE

The clutch master cylinder, slave cylinder and connecting line are serviced as an assembly only. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting line are sealed units. Also note that removal/installation procedures for right and left hand drive models are basically the same. Only master cylinder location is different.

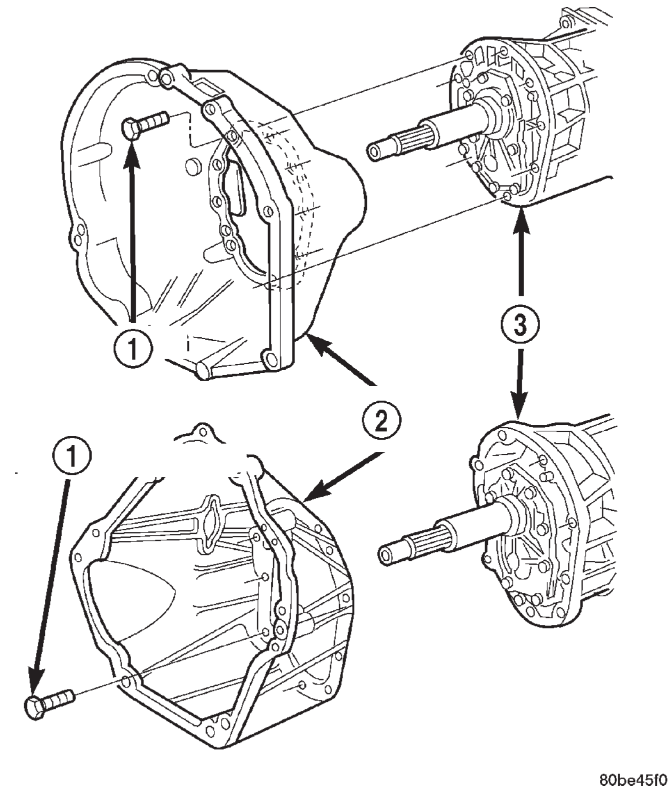


Fig. 14 Clutch Housing Attachment

1 – HOUSING-TO-TRANSMISSION BOLTS (46 N·m/34 ft. lbs.)
2 – CLUTCH HOUSING
3 – TRANSMISSION

REMOVAL

(1) Raise vehicle.

(2) Remove fasteners attaching slave cylinder to clutch housing.

(3) Remove slave cylinder from clutch housing (Fig. 15).

(4) Disengage clutch fluid line from body clips, if applicable.

(5) Lower vehicle.

(6) Verify that cap on clutch master cylinder reservoir is tight. This is necessary to avoid spilling fluid during removal.

(7) Remove clutch master cylinder attaching nuts (Fig. 16) or (Fig. 17).

(8) Disengage captured bushing on clutch master cylinder actuator from pivot pin on pedal arm (Fig. 18).

(9) Slide actuator off pivot pin.

(10) Disconnect clutch interlock safety switch wires.

(11) Remove clutch hydraulic linkage through engine compartment.

REMOVAL AND INSTALLATION (Continued)

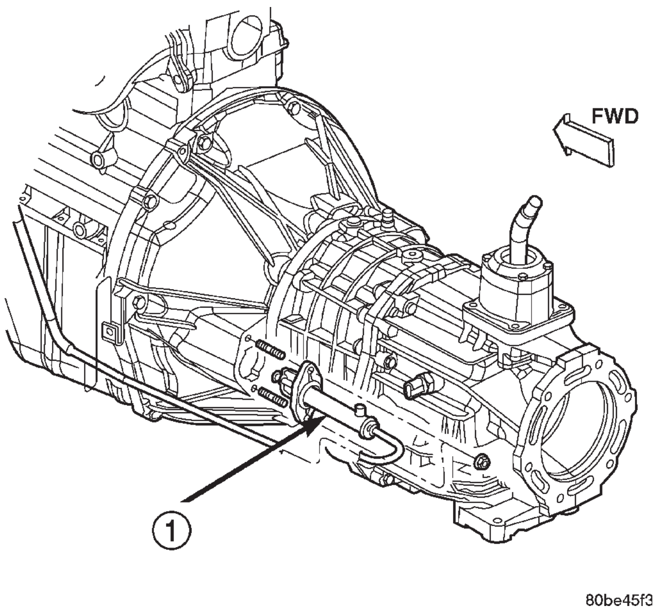


Fig. 15 Slave Cylinder

1 – CLUTCH SLAVE CYLINDER

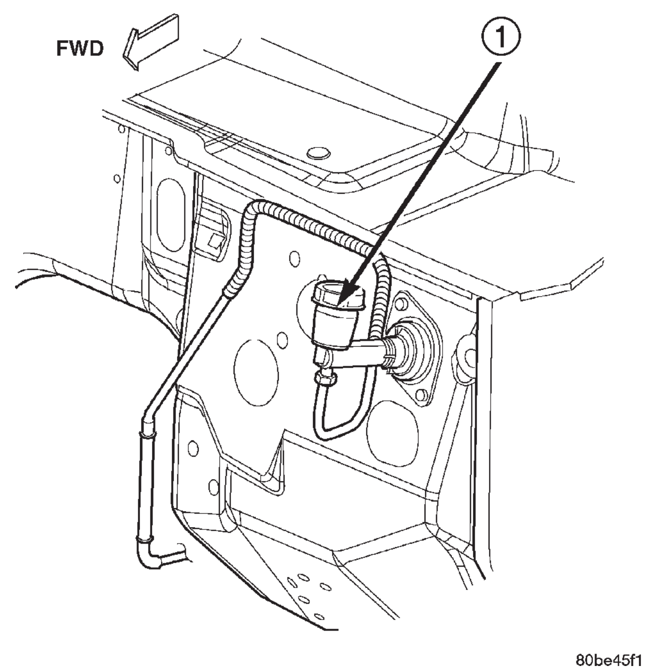


Fig. 16 Left Hand Drive Clutch Master Cylinder

1 – CLUTCH MASTER CYLINDER

INSTALLATION

(1) Be sure reservoir cover on clutch master cylinder is tight to avoid spills.

(2) Position clutch linkage components in vehicle. Work connecting line and slave cylinder downward past engine and adjacent to clutch housing (Fig. 16) or (Fig. 17).

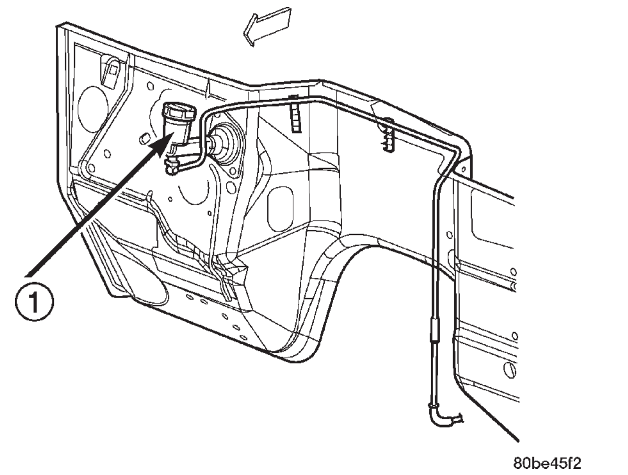


Fig. 17 Right Hand Drive Clutch Master Cylinder

1 – CLUTCH MASTER CYLINDER

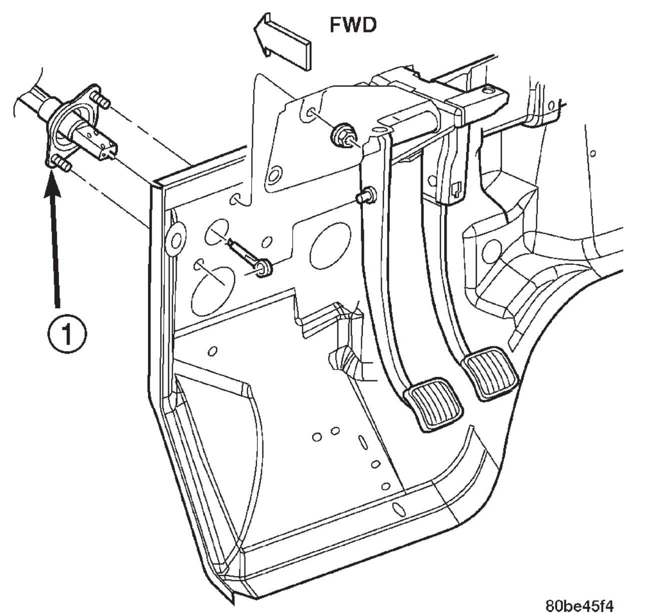


Fig. 18 Clutch Pedal Attachment

1 – CLUTCH MASTER CYLINDER

(3) Position clutch master cylinder on dash panel (Fig. 16) or (Fig. 17).

(4) Attach clutch master cylinder actuator to pivot pin on clutch pedal (Fig. 18).

(5) Install and tighten clutch master cylinder attaching nuts to 38 N·m (28 ft. lbs.) torque.

(6) Raise vehicle.

(7) Insert slave cylinder push rod through clutch housing opening and into release lever. Be sure cap on end of rod is securely engaged in lever. Check this before installing cylinder attaching nuts.

(8) Install and tighten slave cylinder attaching nuts to 23 N·m (17 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(9) Secure clutch fluid line in body and transmission clips.
(10) Lower vehicle.
(11) Connect clutch interlock safety switch wires.

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Bolts, clutch cover 2.5 L	31 N·m (23 ft. lbs)
Bolts, clutch cover 4.0 L	50 N·m (37 ft. lbs)
Bolt/Nut, clutch cyl. mount	23 N·m (200 in. lbs)
Bolt, clutch housing M12	75 N·m (55 ft. lbs)
Bolt, clutch housing 3/8	37 N·m (27 ft. lbs)
Bolt, clutch housing 7/16	58 N·m (43 ft. lbs)
Bolt, clutch housing/trans.	46 N·m (34 ft. lbs)
Bolt, dust shield M8	8 N·m (72 in. lbs)
Bolt, dust shield lower	50 N·m (37 ft. lbs)
Bolt, X-member/frame	41 N·m (30 ft. lbs)
Bolt, X-member/rear support	45 N·m (33 ft. lbs.)
Bolts, flywheel 4.0 L	142 N·m (105 ft. lbs)
Bolts, flywheel 2.5 L	95 N·m (70 ft. lbs)
Bolt, starter motor	45 N·m (33 ft. lbs)
Bolts, U-joints	19 N·m (170 in. lbs.)

COOLING SYSTEM

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

COOLING SYSTEM

DESCRIPTION

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible, maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

An optional factory installed heavy duty cooling package is available on most models. The package consists of a radiator that has an increased number of cooling fins. Vehicles equipped with a 2.5L/4.0L engine and heavy duty cooling and/or air conditioning also have an auxiliary electric cooling fan.

The cooling system consists of:

- A radiator
- Cooling fan (mechanical and/or electrical)
- Thermal viscous fan drive

DESCRIPTION AND OPERATION (Continued)

- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

Cooling system circulation for 2.5L/4.0L models is shown in (Fig. 1).

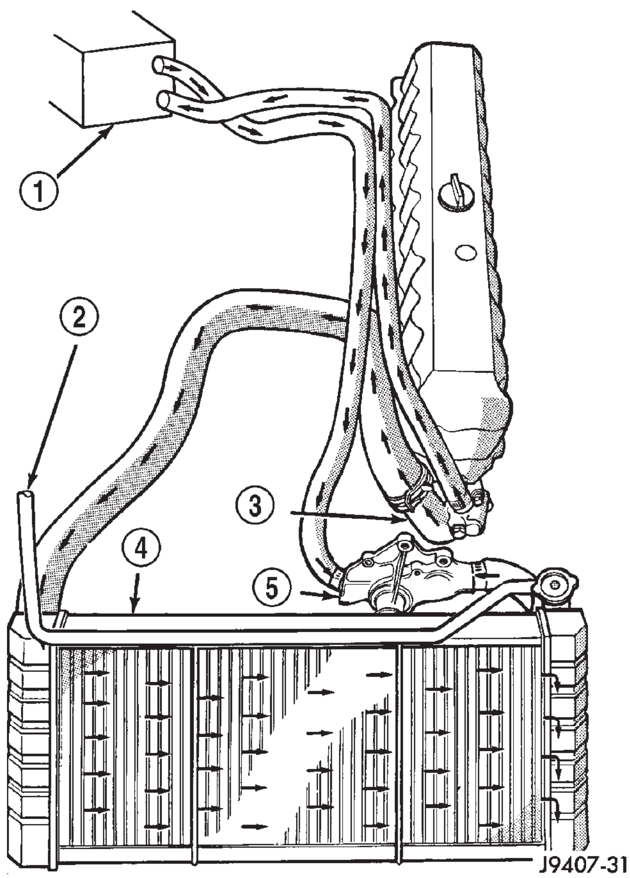


Fig. 1 Coolant Circulation—2.5L/4.0L Engines

1 – HEATER CORE
2 – TO COOLANT RESERVE/OVERFLOW TANK
3 – THERMOSTAT HOUSING
4 – RADIATOR
5 – WATER PUMP

AUTOMATIC TRANSMISSION OIL COOLER

DESCRIPTION

All models equipped with an automatic transmission are equipped with a transmission oil cooler mounted internally within the radiator tank. This internal cooler is supplied as standard equipment on all models equipped with an automatic transmission.

Transmission oil is cooled when it passes through this separate cooler. In case of a leak in the internal radiator mounted transmission oil cooler, engine coolant may become mixed with transmission fluid or transmission fluid may enter engine cooling system. Both cooling system and transmission should be drained and inspected if the internal radiator mounted transmission cooler is leaking.

An auxiliary air-to-oil transmission oil cooler is available with most engine packages.

The auxiliary air-to-oil transmission oil cooler is located in front of the radiator or A/C condenser (if equipped) and behind the grill. It is mounted to the front frame crossmember.

The auxiliary oil coolers on all models operate in conjunction with the internal radiator mounted main oil cooler. The transmission oil is routed through the main cooler first, then the auxiliary cooler, before returning to the transmission.

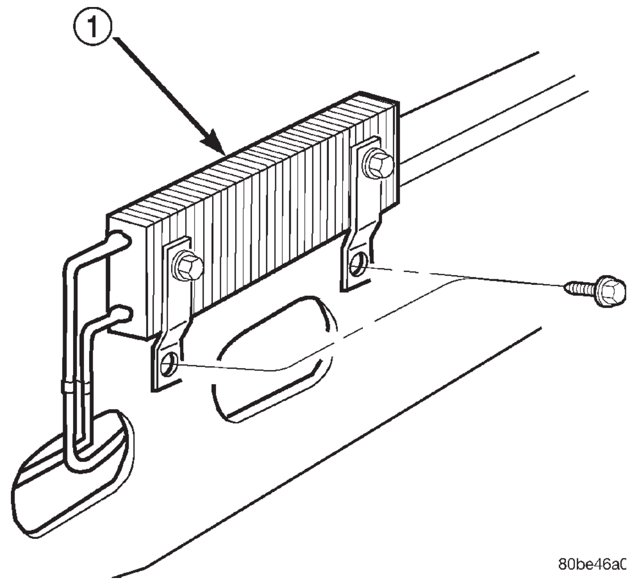


Fig. 2 Auxiliary Transmission Oil Cooler

1 – AUXILIARY TRANSMISSION OIL COOLER

COOLANT RESERVE/OVERFLOW SYSTEM

DESCRIPTION

The system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.
- A convenient and safe method for checking/adjusting coolant level at atmospheric pressure. This is done without removing the radiator pressure cap.
- Some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

DESCRIPTION AND OPERATION (Continued)

The coolant reserve/overflow system consists of a radiator mounted pressurized cap, a plastic reserve/overflow tank (Fig. 3) (Fig. 4), a tube (hose) connecting the radiator and tank, and an overflow tube on the side of the tank.

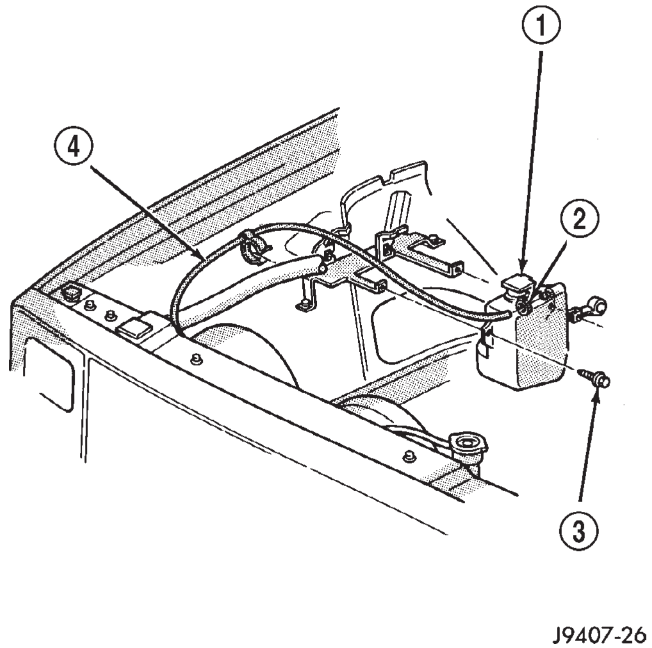


Fig. 3 Reserve/Overflow Tank—Except Right Hand Drive

1 – COOLANT RESERVE/OVERFLOW TANK
2 – CLAMP
3 – MOUNTING BOLTS
4 – TUBE TO RADIATOR

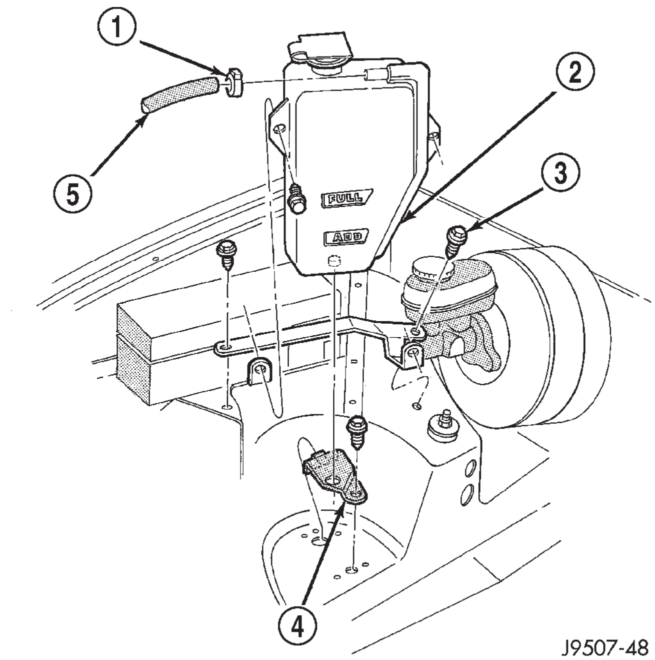


Fig. 4 Reserve/Overflow Tank—With Right Hand Drive

1 – CLAMP
2 – COOLANT RESERVE/OVERFLOW TANK
3 – MOUNTING BOLTS
4 – LOWER BRACKET
5 – TUBE TO RADIATOR

OPERATION

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

COOLING SYSTEM FANS

DESCRIPTION

All models are equipped with a viscous fan. This thermal viscous fan drive is a torque-and-temperature-sensitive clutch unit. It automatically increases or decreases fan speed to provide proper engine cooling. Vehicles with a 2.5L/4.0L engine with air conditioning, or 4.0L with “max” cooling also have an auxiliary electrical cooling fan.

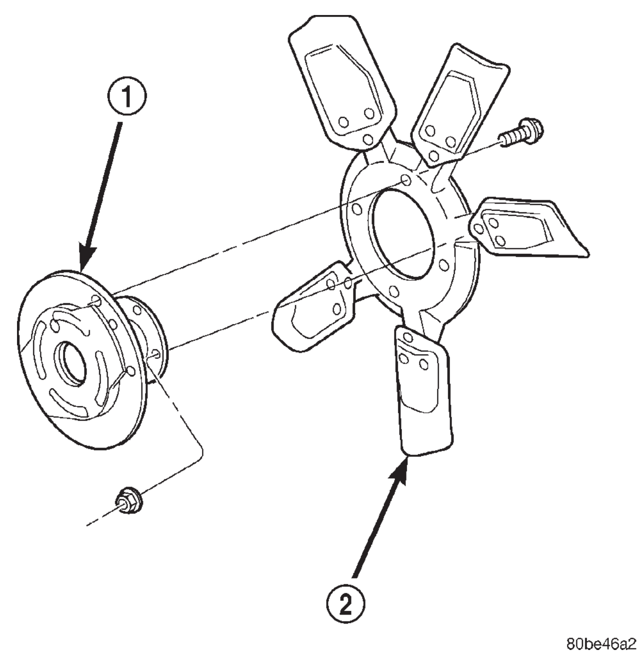


Fig. 5 Viscous Fan Drive and Fan Blade Assembly

1 – VISCOUS FAN DRIVE
2 – FAN BLADE ASSEMBLY

DESCRIPTION AND OPERATION (Continued)

BLOCK HEATER

DESCRIPTION

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE.

An optional engine block heater is available for all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block (in place of a freeze plug) with the heating element immersed in engine coolant.

BLOCK HEATER SPECIFICATIONS

- 2.5L 4-Cylinder Engine: 115 Volts 400 Watts
- 4.0L 6-Cylinder Engine: 120 Volts 600 Watts

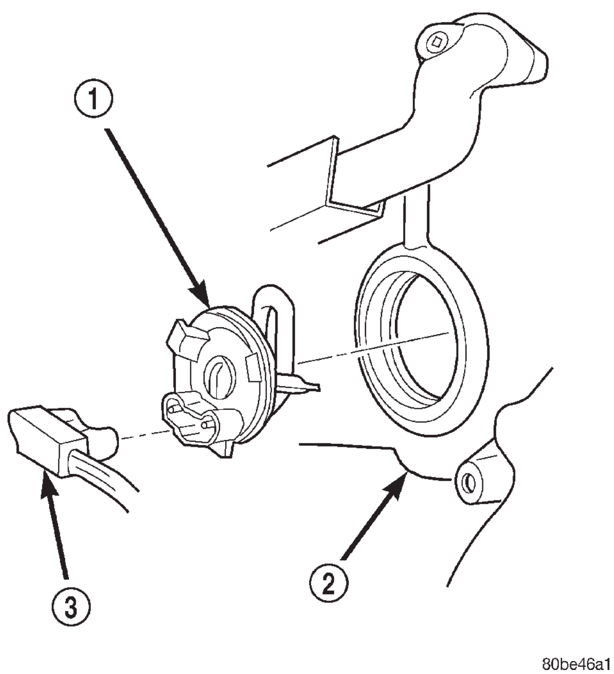


Fig. 6 Engine Block Heater

1 – BLOCK HEATER
2 – CYLINDER BLOCK
3 – BLOCK HEATER POWER CORD

OPERATION

Connecting the power cord to a grounded 110-120 volt AC electrical outlet with a grounded, three-wire extension cord activates the block heater.

THERMOSTAT

DESCRIPTION

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm-up and overall temperature control.

An arrow plus the word **UP** is stamped on the front flange next to the air bleed. The words **TO RAD** are stamped on one arm of the thermostat. They indicate the proper installed position.

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: A 'check engine' light and a DTC will eventually be set, longer engine warm-up time, unreliable warm-up performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

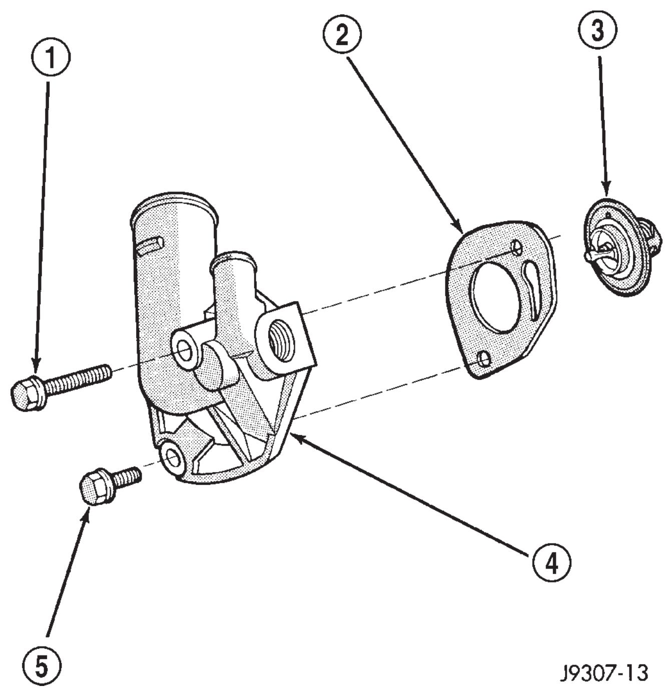


Fig. 7 Thermostat and Housing

1 – LONG BOLT
2 – GASKET
3 – THERMOSTAT
4 – THERMOSTAT HOUSING
5 – SHORT BOLT

DESCRIPTION AND OPERATION (Continued)

RADIATOR

DESCRIPTION

CAUTION: Plastic tanks, while stronger than brass, are subject to damage by impact, such as wrenches.

Radiators for both engines are the cross flow type. Plastic tanks are used on all radiators.

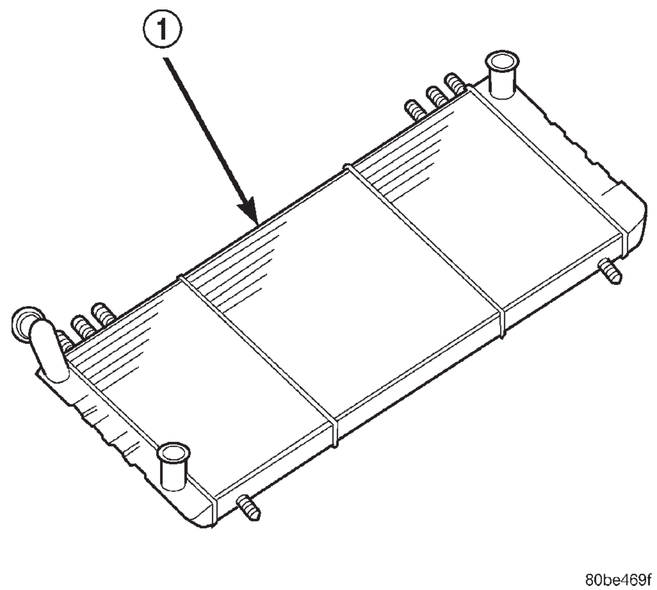


Fig. 8 Cross Flow Radiator

1 – RADIATOR

RADIATOR PRESSURE CAP

DESCRIPTION

All radiators are equipped with a pressure cap. This cap releases pressure at some point within a range of 83-110 kPa (12-16 psi). The pressure relief point (in pounds) is engraved on top of the cap (Fig. 9).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve that opens when system pressure reaches release range of 83-110 kPa (12-16 psi).

A rubber gasket seals radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.

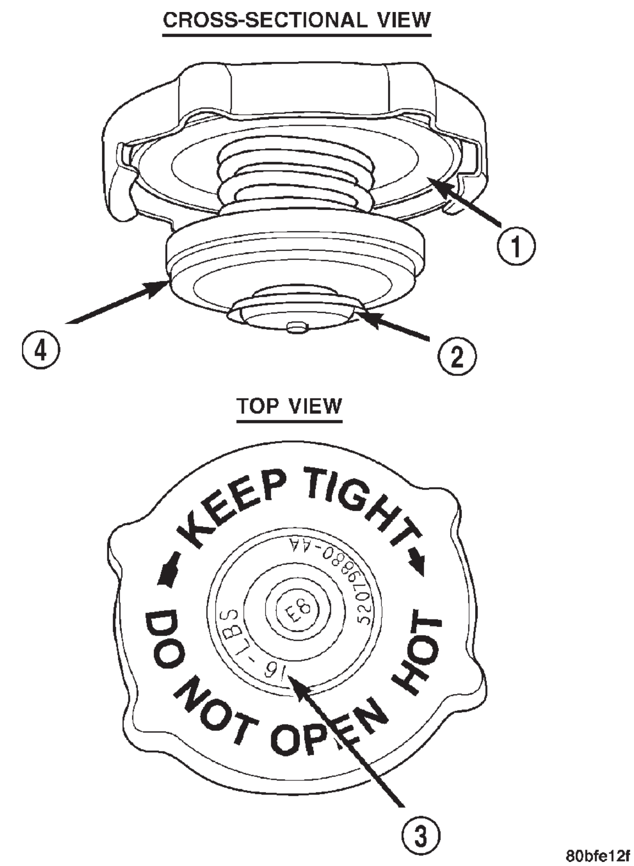


Fig. 9 Radiator Pressure Cap and Filler Neck—Typical

1 – FILLER NECK SEAL
2 – VACUUM VENT VALVE
3 – PRESSURE RATING
4 – PRESSURE VALVE

OPERATION

A vent valve in the center of cap allows a small coolant flow through cap when coolant is below boiling temperature. The valve is completely closed when boiling point is reached. As the coolant cools, it contracts and creates a vacuum in the cooling system. This causes the vacuum valve to open and coolant in the reserve/overflow tank to be drawn through its connecting hose into radiator. If the vacuum valve is stuck shut, the radiator hoses will collapse on cool-down.

DESCRIPTION AND OPERATION (Continued)

WATER PUMP

DESCRIPTION

CAUTION: All engines are equipped with a reverse (counter-clockwise) rotating water pump and viscous fan drive assembly. REVERSE is stamped or imprinted on the cover of the viscous fan drive and inner side of the fan. The letter R is stamped into the back of the water pump impeller (Fig. 10).

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a drive belt on all engines.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has a small hole to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

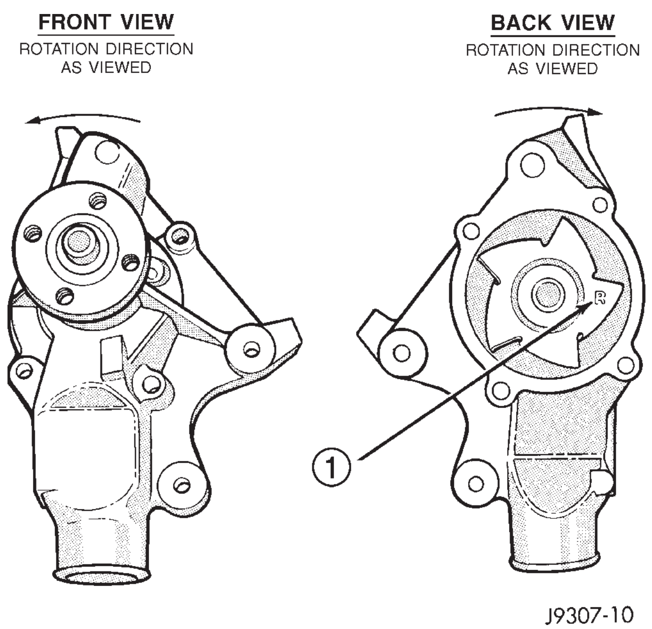


Fig. 10 Reverse Rotating Water Pump—Typical

1 – R STAMPED INTO IMPELLER

HOSE CLAMPS

DESCRIPTION

The cooling system utilizes both worm drive and spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

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. 11).

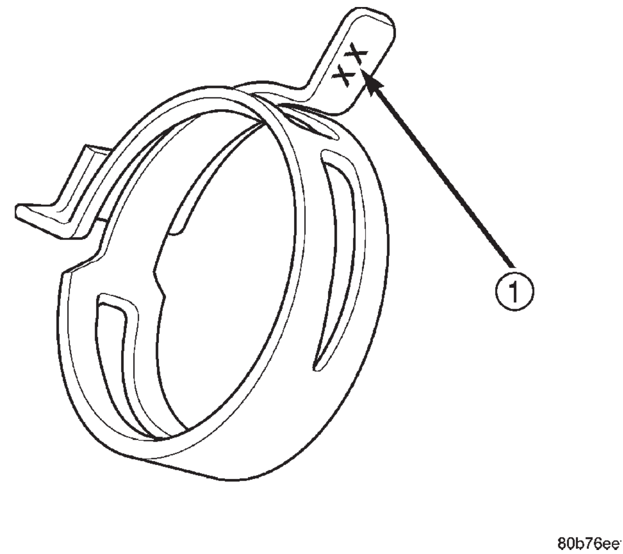


Fig. 11 Spring Clamp Size Location

1 – SPRING CLAMP SIZE LOCATION

OPERATION

The worm type hose clamp uses a specified torque value to maintain proper tension on a hose connection.

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, use Special Tool 6094 or equivalent, constant tension clamp pliers (Fig. 12) to compress the hose clamp.

DESCRIPTION AND OPERATION (Continued)

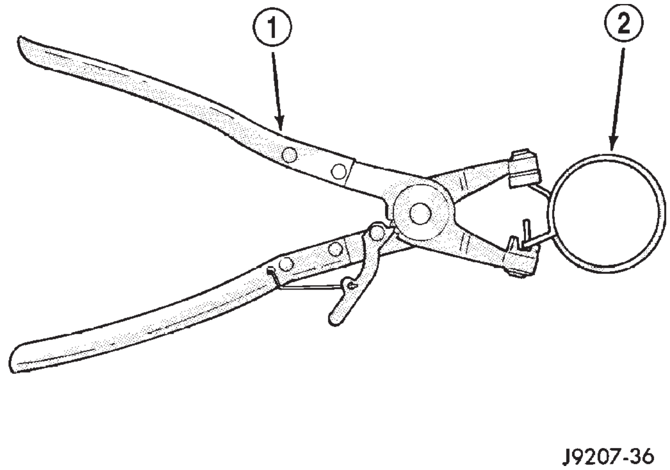


Fig. 12 Hose Clamp Tool

1 – HOSE CLAMP TOOL 6094
2 – HOSE CLAMP

VISCOUS FAN DRIVE

DESCRIPTION

CAUTION: Engines equipped with poly–V drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

The thermal viscous fan drive is a silicone-fluid-filled coupling used to connect the fan blades to either the engine or the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

2.5L vehicles with A/C are equipped with a viscous fan drive which is designed to “free wheel” during most of the ambient conditions encountered by the vehicle and will only engage during high heat loads as seen in trailer towing or high ambient temperatures.

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit. A typical viscous unit is shown in (Fig. 13). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.

Vehicles equipped with 2.5L engines have what is know as an hybrid cooling fan system. This means that not only do they have a viscous fan but they also have an electric fan as well. The hybrid viscous fan drive has a low speed characteristic. This causes the mechanical fan speeds to be very low 200–400 rpm range when not engaged allowing the engine to have additional performance and horsepower gaines.

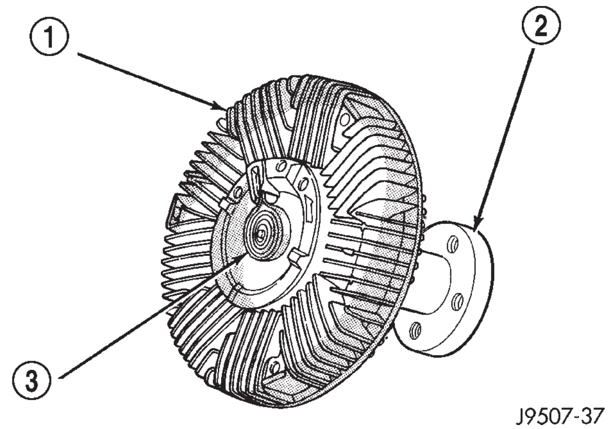


Fig. 13 Typical Viscous Fan Drive

1 – VISCOUS FAN DRIVE
2 – MOUNTING HUB
3 – THERMOSTATIC SPRING

OPERATION

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

DESCRIPTION AND OPERATION (Continued)

ELECTRIC COOLING FAN

DESCRIPTION

Vehicles equipped with a 2.5L/4.0L engine and air conditioning and 4.0L vehicles equipped with the “max” cooling package also have an electrical cooling fan. The fan is controlled by the cooling fan relay, which is located in the power distribution center (PDC) (Fig. 15). For the location of relay within the PDC, refer to the label on PDC cover.

The electric fan on the 2.5L engine equipped vehicles is considered the primary fan (low to moderate ambient conditions) and is energized when the JTEC receives input from the coolant temperature sensor or the a/c system and supplies ground to the cooling fan relay.

The cooling fan motor is protected by a 40 amp maxi-fuse located in the PDC. The fan relay is protected by a 15 amp fuse located in the junction block.

OPERATION

Electric cooling fan 2.5L: When air conditioning is not requested, the electric fan will not come on unless the coolant temperature is at least 103° C (218° F), at which time the fan will come on and remain on until the coolant temperature drops to 99° C (210° F) or below. When air conditioning is requested (including defroster operation), the fan will cycle on and off in conjunction with the A/C compressor unless the coolant temperature is at least 97° C (207° F), at which time the fan will come on and remain on until the coolant temperature drops to 93° C (199° F) or below. Then, the cycle fan operation will resume. When the fan is scheduled to be on, the powertrain control module (PCM) provides a ground path for the fan relay. This ground is provided to the cooling fan relay through pin C2 of PCM connector C3. Battery voltage is then applied to the fan through the relay. When the fan is scheduled to be off, the PCM opens the ground path to the relay. This will prevent the cooling fan from being energized.

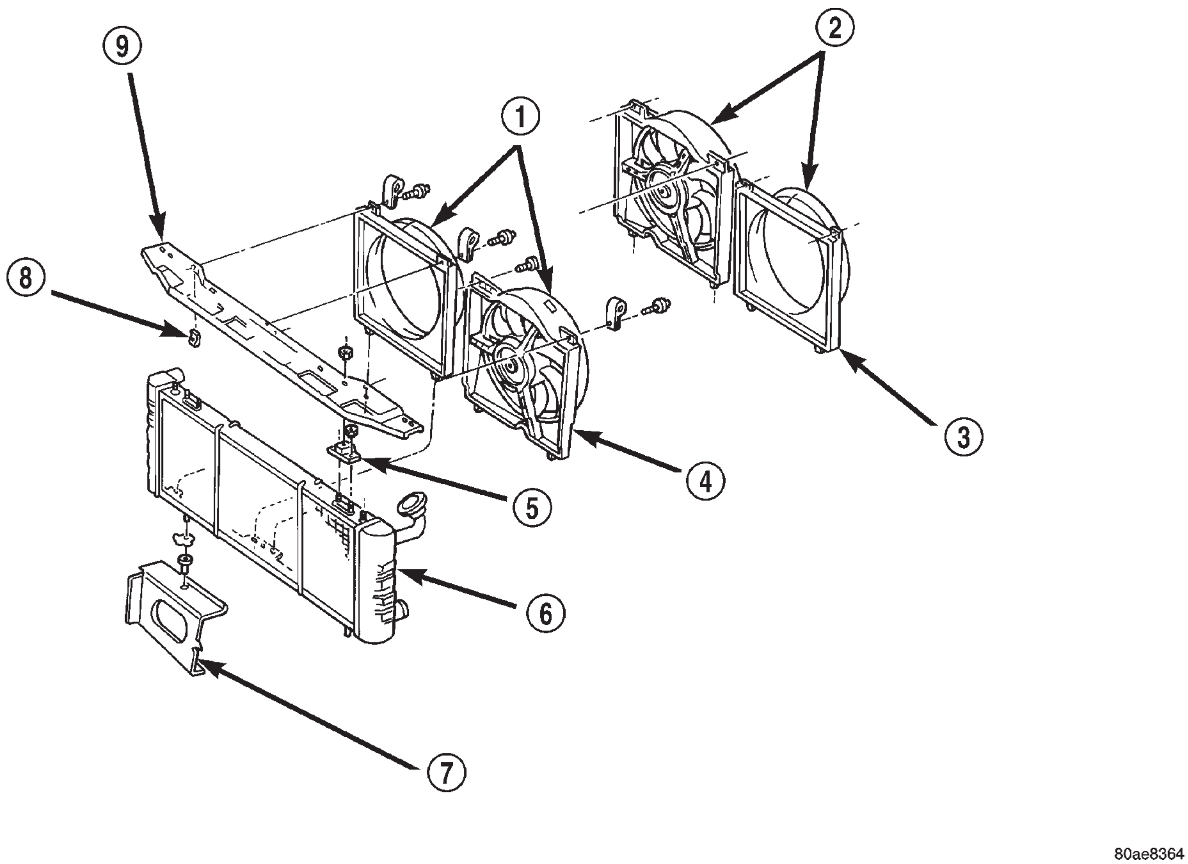


Fig. 14 Electric Cooling Fan

1 – (LHD)
2 – (RHD)
3 – VISCOUS FAN SHROUD
4 – ELECTRIC FAN MODULE
5 – ISOLATOR
6 – RADIATOR
7 – LOWER CROSSMEMBER
8 – U-NUT
9 – UPPER CROSSMEMBER

DESCRIPTION AND OPERATION (Continued)

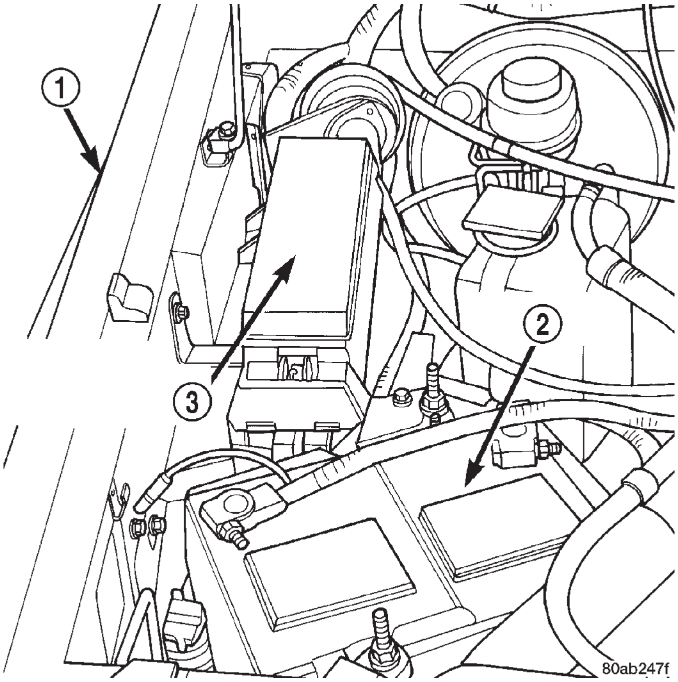


Fig. 15 Power Distribution Center (PDC)

1 – RIGHT FENDER
2 – BATTERY
3 – POWER DISTRIBUTION CENTER

Electric cooling fan 4.0L: With or without A/C request the electric fan will come on only when the coolant temperature is at least 106° C (223° F), and will remain on until the coolant temperature drops to 103° C (217° F) or below. Regardless of coolant temperature, When air conditioning system pressures reach 2068.5 ± 138 kPa (300 ± 20 psi) the electric fan will engage and continue to run until the A/C system pressure drops to 1620.3 kPa (235 psi) minimum, then the electric fan will shut off.

DIAGNOSIS AND TESTING

ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The Powertrain Control Module (PCM) has been programmed to monitor the certain following cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicate an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to Group 25, Emission Control Systems for proper procedures)

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, refer to Group 25, Emission Control Systems for proper procedures.

DRB SCAN TOOL

For operation of the DRB scan tool, refer to the appropriate Powertrain Diagnostic Procedures service manual.

ACCESSORY DRIVE BELT DIAGNOSIS

VISUAL DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib (Fig. 16), are considered normal. These are not a reason to replace the belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 16). Also replace the belt if it has excessive wear, frayed cords or severe glazing.

Refer to the Accessory Drive Belt Diagnosis charts for further belt diagnosis.

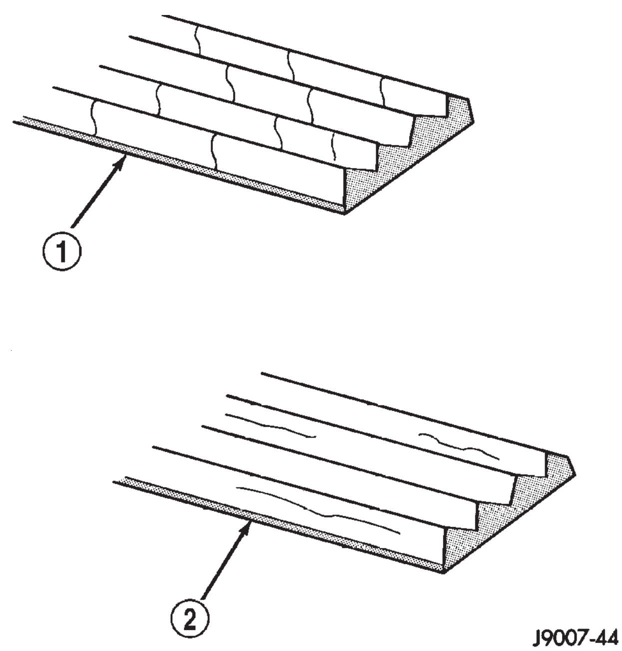


Fig. 16 Belt Wear Patterns

1 – NORMAL CRACKS BELT OK
2 – NOT NORMAL CRACKS REPLACE BELT

NOISE DIAGNOSIS

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for alignment, glazing, or excessive end play.

DIAGNOSIS AND TESTING (Continued)

ACCESSORY DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage	2. Replace belt
RIB OR BELT WEAR	1. Pulley misaligned	1. Align pulley(s)
	2. Abrasive environment	2. Clean pulley(s). Replace belt if necessary
	3. Rusted pulley(s)	3. Clean rust from pulley(s)
	4. Sharp or jagged pulley groove tips	4. Replace pulley. Inspect belt.
	5. Belt rubber deteriorated	5. Replace belt
BELT SLIPS	1. Belt slipping because of insufficient tension	1. Adjust tension (2.5L)
	2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol)	2. Replace belt and clean pulleys
	3. Driven component bearing failure (seizure)	3. Replace faulty component or bearing
	4. Belt glazed or hardened from heat and excessive slippage	4. Replace belt.
LONGITUDAL BELT CRACKING	1. Belt has mistracked from pulley groove	1. Replace belt
	2. Pulley groove tip has worn away rubber to tensile member	2. Replace belt
″GROOVE JUMPING” (Belt does not maintain correct position on pulley)	1. Belt tension either too low or too high	1. Adjust belt tension (2.5L)
	2. Pulley(s) not within design tolerance	2. Replace pulley(s)
	3. Foreign object(s) in grooves	3. Remove foreign objects from grooves
	4. Pulley misalignment	4. Align component
	5. Belt cordline is broken	5. Replace belt
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	1. Excessive tension	1. Replace belt and adjust tension to specification
	2. Tensile member damaged during belt installation	2. Replace belt
	3. Severe misalignment	3. Align pulley(s)
	4. Bracket, pulley, or bearing failure	4. Replace defective component and belt

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISE (Objectionable squeal, squeak, or rumble is heard or felt while drive belt is in operation)	1. Belt slippage 2. Bearing noise 3. Belt misalignment 4. Belt to pulley mismatch 5. Driven component induced vibration 6. System resonant frequency induced vibration	1. Adjust belt tension (2.5L) 2. Locate and repair 3. Align belt/pulley(s) 4. Install correct belt 5. Locate defective driven component and repair 6. Vary belt tension within specifications.
TENSION SHEETING FABRIC FAILURE (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object 2. Excessive heat causing woven fabric to age 3. Tension sheeting splice has fractured	1. Correct rubbing condition 2. Replace belt 3. Replace belt
CORD EDGE FAILURE (Tensile member exposed at edges of belt or separated from belt body)	1. Excessive tension 2. Belt contacting stationary object 3. Pulley(s) out of tolerance 4. Insufficient adhesion between tensile member and rubber matrix	1. Adjust belt tension (2.5L) 2. Replace belt 3. Replace pulley 4. Replace belt and adjust tension to specifications

PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

PROLONGED IDLE, VERY HIGH AMBIENT TEMPERATURE, SLIGHT TAIL WIND AT IDLE, SLOW TRAFFIC, TRAFFIC JAMS, HIGH SPEED OR STEEP GRADES.

Driving techniques that avoid overheating are:

- Idle with A/C off when temperature gauge is at end of normal range.
- Increasing engine speed for more air flow is recommended.

TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

AIR CONDITIONING; ADD-ON OR AFTER MARKET:

A maximum cooling package should have been ordered with vehicle if add-on or after market A/C is installed. If not, maximum cooling system components should be installed for model involved per manufacturer's specifications.

RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to following Cooling System Diagnosis charts.

These charts are to be used as a quick-reference only. Refer to the group text for information.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?	1. Refer to Group 25, Emission Systems for On-Board Diagnostics and DTC information. Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. Refer to Group 8E. Repair connector if necessary.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. Refer to Group 8E. Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant reserve/overflow tank and the radiator. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section of the manual text for WARNINGS and CAUTIONS associated with removing the radiator cap.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. Refer to Group 24, Heating and Air Conditioning for procedures.
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to 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 for overheating and repair. Refer to Possible Causes (2-20).
	2. Is the temperature gauge reading correctly?	2. Check gauge. Refer to Group 8E. Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. Check warning lamp operation. Refer to Group 8E. Repair as necessary.
	4. Coolant low in coolant reserve/ overflow tank and radiator?	4. Check for coolant leaks and repair as necessary. Refer to Testing Cooling System for Leaks in this Group.
	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 cap

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM (CONTINUED)	6. Poor seals at the radiator cap.	6. (a) Check condition of cap and cap seals. Refer to Radiator Cap. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.
	7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools	7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this Group. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator. (c) Check condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant reserve/overflow tank and tanks hoses for blockage. Repair as necessary.
	8. Incorrect coolant concentration	8. Check coolant. Refer to Coolant section in this Group for correct coolant/water mixture ratio.
	9. Coolant not flowing through system	9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine area of obstruction and repair as necessary.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Remove insects and debris. Refer to Radiator Cleaning in this Group.
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	12. Aftermarket A/C installed without proper radiator.	12. Install proper radiator.
	13. Fuel or ignition system problems.	13. Refer to Fuel and Ignition System Groups for diagnosis.
	14. Dragging brakes.	14. Check and correct as necessary. Refer to Group 5, Brakes for correct procedures.
	15. Bug screen or cardboard is being used, reducing airflow.	15. Remove bug screen or cardboard.
	16. Thermostat partially or completely shut.	16. Check thermostat operation and replace as necessary. Refer to Thermostats in this Group.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM (CONTINUED)	17. Viscous fan drive not operating properly.	17. Check fan drive operation and replace as necessary. Refer to Viscous Fan Drive in this Group.
	18. Electric cooling fan not operating properly (vehicles equipped with 2.5L/4.0L and air conditioning	18. Check electric fan operation and repair as necessary. Refer to Electric Cooling Fan in this Group.
	19. Cylinder head gasket leaking.	19. Check for cylinder head gasket leaks. Refer to Cooling System-Testing For Leaks in this Group. For repair, refer to Group 9, Engines.
	20. Heater core leaking.	20. Check heater core for leaks. Refer to Group 24, Heating and Air Conditioning. Repair as necessary.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. On vehicles equipped with an electric fan, the gauge may cycle up and down. This is due to the cycling of the electric radiator fan.	1. This is a normal condition. No correction is necessary unless the gauge cycles into the red (overheat) zone. Refer to Electric Cooling Fan Diagnosis and Testing in this group.
	2. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.	2. A normal condition. No correction is necessary.
	3. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	3. Check operation of gauge and repair if necessary. Refer to Group 8E, Instrument Panel and Gauges.
	4. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running)	4. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.
	5. Gauge reading high after re-starting 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 and correct coolant leaks. Refer to Cooling System-Testing for leaks in this group.
	7. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.	7. (a) Check for cylinder head gasket leaks. Refer to Cooling System-Testing for Leaks in this group. (b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC) (CONTINUED)	8. Water pump impeller loose on shaft. 9. Loose accessory drive belt. (water pump slipping) 10. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.	8. Check water pump and replace as necessary. Refer to water Pumps in this group. 9. Refer to Accessory Drive Belts in this group. Check and correct as necessary. 10. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	1. Pressure relief valve in radiator cap is defective.	1. Check condition of radiator cap and cap seals. Refer to Radiator Caps in this group. Replace cap as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE 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 Cooling System-Testing For Leaks in this group.
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. engine overheating. 2. Freeze point of coolant not correct. Mixture is too rich or too lean.	1. Check reason for overheating and repair as necessary. 2. Check coolant concentration. Refer to the Coolant section of this group and adjust ratio as required.
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. Refer to Radiator Cap in this group. Replace if necessary (b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.
ELECTRIC RADIATOR FAN RUNS ALL OF THE TIME (2.5L/4.0L MODELS EQUIPPED WITH A/C AND 4.0L MODELS EQUIPPED WITH MAX COOLING)	1. Fan relay, powertrain control module (PCM) or coolant temperature sensor defective.	1. Refer to Electric Cooling Fan Diagnosis and Testing. Also refer to Group 8W, Wiring Diagrams. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
ELECTRIC RADIATOR FAN WILL NOT RUN AT ALL. GAUGE READING HIGH OR HOT (2.5L/4.0L MODELS EQUIPPED WITH A/C AND 4.0L MODELS EQUIPPED WITH MAX COOLING)	1. Blown Fuse in Power Distribution Center (PDC)	1. Determine reason for blown fuse and repair as necessary.
	2. Fan relay, powertrain control module (PCM) or coolant temperature sensor defective.	2. Refer to Electric Cooling Fan Diagnosis and Testing. Also refer to Group 8W, Wiring Diagrams. Repair as necessary.
	3. Fan Motor Defective	3. Refer to Electric Cooling Fan Diagnosis and Testing. Also refer to Group 8W, Wiring Diagrams. Repair as necessary.
NOISY VISCOUS FAN/DRIVE	1. Fan blades loose.	1. Replace fan blade assembly. Refer to Cooling System Fans in this Group
	2. Fan blades striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or air conditioning condenser.	3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser.
	4. Thermal viscous fan drive has defective bearing.	4. Replace fan drive. Bearing is not serviceable. Refer to Viscous Fan Drive in this group.
	5. A certain amount of fan noise may be evident on models equipped with a thermal viscous fan drive. Some of this noise is normal.	5. Refer to Viscous Fan Drive in this group for an explanation of normal fan noise.
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	1. Has a Diagnostic trouble Code (DTC) been set?	1. Refer to Group 25, Emissions for correct procedures and replace thermostat if necessary
	2. Coolant level low	2. Refer to Cooling System-Testing For Leaks in this group.
	3. Obstructions in heater hose/ fittings	3. Remove heater hoses at both ends and check for obstructions
	4. Heater hose kinked	4. Locate kinked area and repair as necessary
	5. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.	5. Refer to Water Pump in this group. If a slipping belt is detected, refer to Accessory Drive Belts in this group. If heater core obstruction is detected, refer to Group 24, Heating and Air Conditioning.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. Refer to Coolant in this group for coolant concentration information. Adjust coolant mixture as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.

RADIATOR COOLANT FLOW CHECK

The following procedure will determine if coolant is flowing through the cooling system.

If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If hose is hot, the thermostat is open and water is circulating through cooling system.

COOLING SYSTEM—TESTING FOR LEAKS

ULTRAVIOLET LIGHT METHOD

All Jeep models have a leak detection additive added to the cooling system before they leave the factory. The additive is highly visible under ultraviolet light (black light). If the factory original coolant has been drained, pour one ounce of additive into the cooling system. The additive is available through the part's department. Place the heater control unit in HEAT position. Start and operate the engine until the radiator upper hose is warm to the touch. Aim the commercially available black light tool at the components to be checked. If leaks are present, the black light will cause the additive to glow a bright green color.

The black light can be used along with a pressure tester to determine if any external leaks exist (Fig. 17).

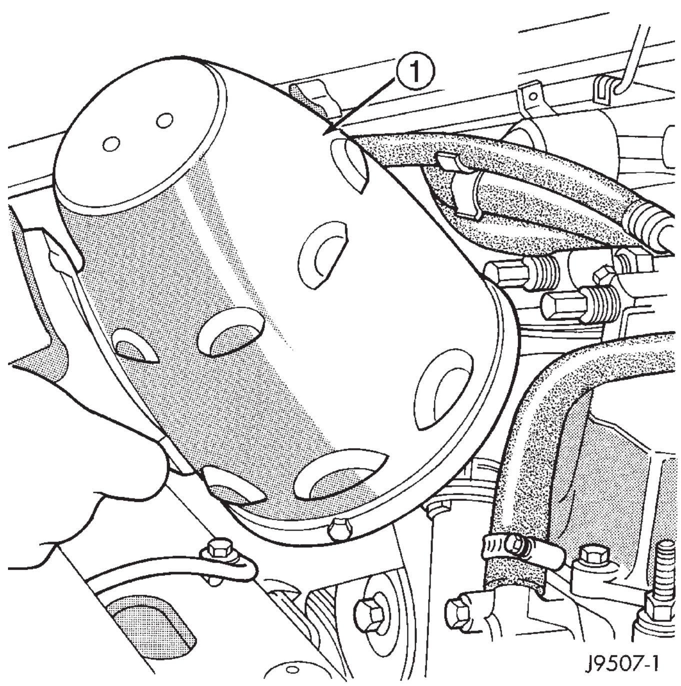


Fig. 17 Leak Detection Using Black Light—Typical

1 – TYPICAL BLACK LIGHT TOOL

DIAGNOSIS AND TESTING (Continued)

PRESSURE TESTER METHOD

The engine should be at the normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during warm engine examination.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

Carefully remove the radiator pressure cap from the filler neck and check the coolant level. Push down on the cap to disengage it from the stop tabs. Wipe the inner part of the filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the reserve/overflow tank tube for internal obstructions. Insert a wire through the tube to be sure it is not obstructed.

Inspect the cams on the outside part of the filler neck. If the cams are bent, seating of pressure cap valve and tester seal will be affected. Replace cap if cams are bent.

Attach pressure tester 7700 (or an equivalent) to the radiator filler neck (Fig. 18).

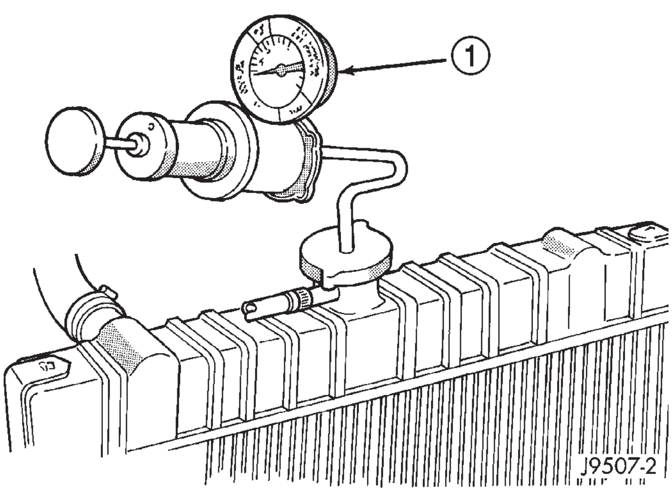


Fig. 18 Pressurizing System—Typical

1 – TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate the tester pump to apply 124 kPa (18 psi) pressure to the system. If the hoses enlarge excessively or bulge while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to the following criteria:

- Holds Steady: If the pointer remains steady for two minutes, there are no serious coolant leaks in the system. However, there could be an internal leak that does not appear with normal system test pressure. Inspect for interior leakage or do the Internal Leakage Test. Do this if it is certain that coolant is being lost and no leaks can be detected.
- Drops Slowly: Shows a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect the radiator, hoses, gasket edges and heater. Seal any small leak holes with a Sealer Lubricant or equivalent. Repair leak holes and reinspect the system with pressure applied.
- Drops Quickly: Shows that a serious leakage is occurring. Examine the system for serious external leakage. If no leaks are visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove the engine oil pan drain plug and drain a small amount of engine oil. Coolant, being heavier than engine oil, will drain first. Another way of testing is to operate the engine and check for water globules on the engine oil dipstick. Also inspect the automatic transmission oil dipstick for water globules. Inspect the automatic transmission fluid cooler for leakage. Operate the engine without the pressure cap on the radiator until thermostat opens.

Attach a pressure tester to the filler neck. If pressure builds up quickly, a leak exists as a result of a faulty cylinder head gasket or crack in the engine. Repair as necessary.

WARNING: DO NOT ALLOW PRESSURE TO EXCEED 124 KPA (18 PSI). TURN THE ENGINE OFF. TO RELEASE THE PRESSURE, ROCK THE TESTER FROM SIDE TO SIDE. WHEN REMOVING THE TESTER, DO NOT TURN THE TESTER MORE THAN 1/2 TURN IF THE SYSTEM IS UNDER PRESSURE.

If there is no immediate pressure increase, pump the pressure tester until the indicated pressure is within the system range. Vibration of the gauge pointer indicates compression or combustion leakage into the cooling system.

WARNING: DO NOT DISCONNECT THE SPARK PLUG WIRES WHILE THE ENGINE IS OPERATING.

CAUTION: Do not operate the engine with a spark plug shorted for more than a minute. The catalytic converter may be damaged.

Isolate the compression leak by shorting each spark plug to the cylinder block. The gauge pointer should stop or decrease vibration when spark plug for leaking cylinder is shorted. This happens because of the absence of combustion pressure.

DIAGNOSIS AND TESTING (Continued)

COMBUSTION LEAKAGE TEST (WITHOUT PRESSURE TESTER)

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow for thermostat removal. Refer to Thermostat Replacement. Disconnect the water pump drive belt.

Disconnect the upper radiator hose from the thermostat housing. Remove the housing and thermostat. Install the thermostat housing.

Add coolant to the radiator to bring the level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

CAUTION: Avoid overheating. Do not operate the engine for an excessive period of time. Open the draincock immediately after the test to eliminate boil over of coolant.

Start the engine and accelerate rapidly three times (to approximately 3000 rpm) while observing the coolant. If internal engine combustion gases are leaking into the cooling system, bubbles will appear in the coolant. If bubbles do not appear, there is no internal combustion gas leakage.

VISCOUS FAN DRIVE

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

TESTING

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18°-to-105°C (0°-to-220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

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 FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should have started to occur at between 74° to 82° C (165° to 180° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 88° C (190° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 57° to 79° C (135° to 175° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

ELECTRIC COOLING FAN

ELECTRIC COOLING FAN AND RELAY DIAGNOSIS

NOTE: Refer to Electrical Group 8W for electric cooling fan and relay circuit schematic.

The powertrain control module (PCM) will enter a diagnostic trouble code (DTC) in memory if it detects a problem in the auxiliary cooling fan relay or circuit. Refer to Group 25, Emission Control Systems for correct DTC retrieval procedures.

If the electric cooling fan is inoperative, check the 15A fuse in the junction block and the 40A fuse in the Power Distribution Center (PDC) with a 12 volt test lamp or DVOM. Refer to the inside of the PDC cover for the exact location of the fuse. If fuses are o.k., refer to Group 8W for electric cooling fan and relay circuit schematic.

DIAGNOSIS AND TESTING (Continued)

RADIATOR CAP-TO-FILLER NECK SEAL—PRESSURE RELIEF CHECK

With radiator cap installed on filler neck, remove coolant reserve/ overflow tank hose from nipple on filler neck. Connect a hand operated vacuum pump to nipple. Operate pump until a reading of 47-to-61 kPa (14- to-18 in. Hg) appears on gauge. If the reading stays steady, or drops slightly and then remains steady, the pressure valve seal is good. Replace radiator cap if reading does not hold.

WARNING: THE WARNING WORDS -DO NOT OPEN HOT- ON THE RADIATOR PRESSURE CAP (Fig. 19) ARE A SAFETY PRECAUTION. WHEN HOT, PRESSURE BUILDS UP IN COOLING SYSTEM. TO PREVENT SCALDING OR INJURY, THE RADIATOR CAP SHOULD NOT BE REMOVED WHILE THE SYSTEM IS HOT AND/OR UNDER PRESSURE.

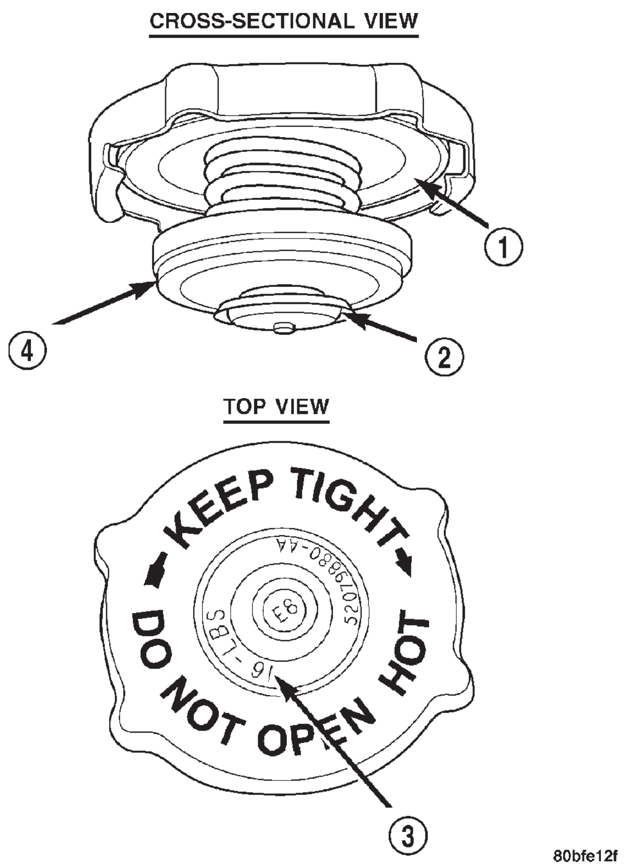


Fig. 19 Radiator Pressure Cap

1 – FILLER NECK SEAL
2 – VACUUM VENT VALVE
3 – PRESSURE RATING
4 – PRESSURE VALVE

There is no need to remove the radiator cap **except** for the following purposes:

(1) To check and adjust antifreeze freeze point.
(2) To refill system with new antifreeze.
(3) For conducting service procedures.
(4) When checking for vacuum leaks.

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT AT LEAST 15 MINUTES BEFORE REMOVING RADIATOR CAP. WITH A RAG, SQUEEZE RADIATOR UPPER HOSE TO CHECK IF SYSTEM IS UNDER PRESSURE. PLACE A RAG OVER THE CAP AND WITHOUT PUSHING DOWN, ROTATE CAP COUNTER-CLOCKWISE TO THE FIRST STOP. ALLOW FLUID TO ESCAPE THROUGH OVERFLOW HOSE INTO COOLANT RESERVE/OVERFLOW TANK. SQUEEZE RADIATOR UPPER HOSE TO DETERMINE WHEN PRESSURE HAS BEEN RELEASED. WHEN COOLANT AND STEAM STOP BEING PUSHED INTO TANK AND SYSTEM PRESSURE DROPS, REMOVE RADIATOR CAP COMPLETELY.

RADIATOR CAP—PRESSURE TESTING

Remove cap from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 20).

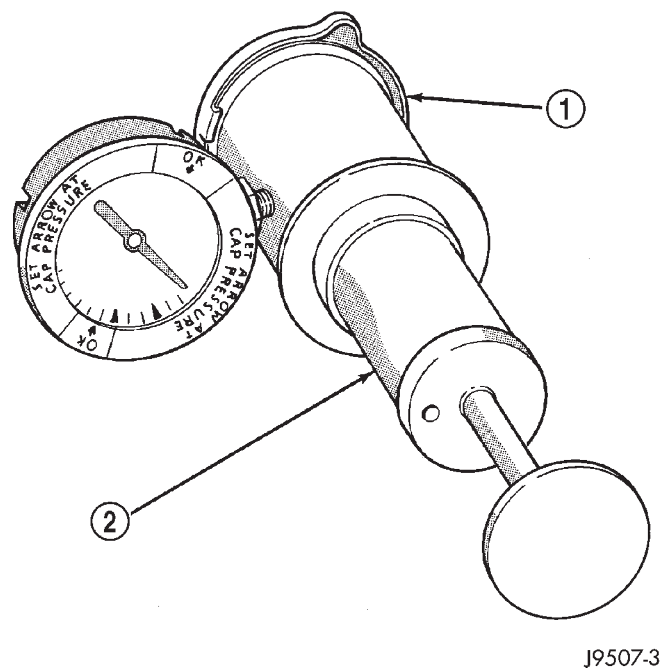


Fig. 20 Pressure Testing Radiator Pressure Cap—Typical

1 – PRESSURE CAP
2 – TYPICAL COOLING SYSTEM PRESSURE TESTER

DIAGNOSIS AND TESTING (Continued)

Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 83-to-110 kPa (12-to-16 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 83-to-110 kPa (12-to-16 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which 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 tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

CAP INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

COOLANT—LOW LEVEL AERATION

If the coolant level in radiator drops below top of radiator core tubes, air will enter cooling system.

Low coolant level can cause thermostat pellet to be suspended in air instead of coolant. This will cause thermostat to open later, which in turn causes higher coolant temperature. Air trapped in cooling system also reduces amount of coolant circulating in heater core resulting in low heat output.

DEAERATION

As the engine operates, any air trapped in cooling system gathers under the radiator cap. The next time the engine is operated, thermal expansion of coolant will push any trapped air past radiator cap into the coolant reserve/overflow tank. Here it escapes to the atmosphere into the tank. When the engine cools down the coolant, it will be drawn from the reserve/overflow tank into the radiator to replace any removed air.

SERVICE PROCEDURES

COOLANT—ROUTINE LEVEL CHECK

NOTE: Do not remove radiator cap for routine coolant level inspections. The coolant level can be checked at coolant reserve/overflow tank.

The coolant reserve/overflow system provides a quick visual method for determining coolant level without removing radiator pressure cap. With engine cold and not running, observe coolant level in reserve/overflow tank. The coolant level should be between ADD and FULL marks.

COOLANT—ADDING ADDITIONAL

Do not remove radiator cap to add coolant to system. When adding coolant to maintain correct level, do so at coolant reserve/overflow tank. Use a 50/50 mixture of ethylene-glycol antifreeze containing Alugard 340-2 ™ and low mineral content water. Remove radiator cap only for testing or when refilling system after service. Removing cap unnecessarily can cause loss of coolant and allow air to enter system, which produces corrosion.

COOLANT—LEVEL CHECK

The cooling system is closed and designed to maintain coolant level to top of radiator.

WARNING: DO NOT OPEN RADIATOR DRAINCOCK WITH ENGINE RUNNING OR WHILE ENGINE IS HOT AND COOLING SYSTEM IS UNDER PRESSURE.

When vehicle servicing requires a coolant level check in radiator, drain several ounces of coolant from radiator drain cock. Do this while observing coolant reserve/overflow system tank. The coolant level in reserve/overflow tank should drop slightly. If not, inspect for a leak between radiator and coolant reserve/overflow system connection. Remove radiator cap. The coolant level should be to top of radiator. If not and if coolant level in reserve/overflow tank is at ADD mark, check for:

- An air leak in coolant reserve/overflow tank or its hose
- An air leak in radiator filler neck
- Leak in pressure cap seal to radiator filler neck

COOLING SYSTEM—DRAINING AND FILLING

DRAINING

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Remove radiator pressure cap.

SERVICE PROCEDURES (Continued)

(2) For access to radiator draincock (Fig. 21), remove radiator grille mounting screws and remove grill. Refer to Group 23, Body for correct procedure.

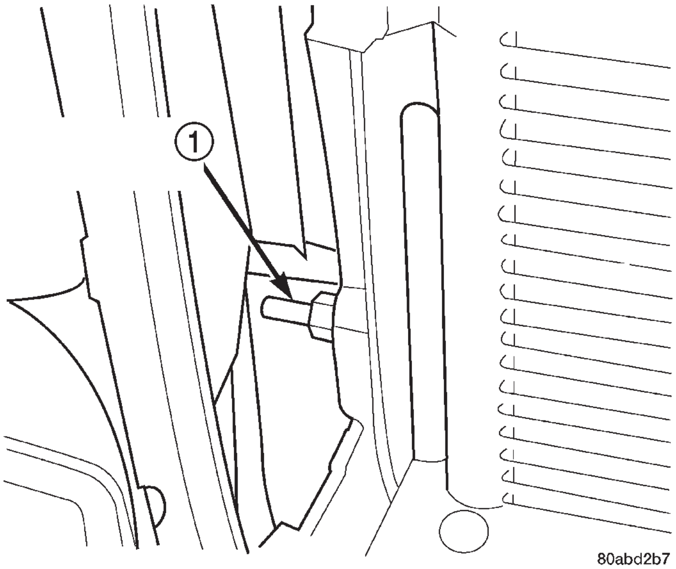


Fig. 21 Radiator Petcock—2.5L/4.0L (LHD/RHD)

1 – RADIATOR PETCOCK

(3) Attach one end of a 24 inch long X 1/4 inch ID hose to the radiator draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator.

(4) Drain coolant from engine by removing the drain plug and coolant temperature sensor on left side of block.

REFILLING

(1) Tighten the radiator petcock and the cylinder block drain plug(s).

(2) Install grille.

(3) Fill system using a 50/50 mixture of water and antifreeze as described in the Coolant section of this group. Fill radiator to top and install radiator cap. Add sufficient coolant to reserve/overflow tank to raise level to FULL mark.

(4) With heater control unit in the HEAT position, operate engine with radiator cap in place.

(5) After engine has reached normal operating temperature, shut engine off and allow it to cool.

(6) Add coolant to reserve/overflow tank as necessary. **Only add coolant when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

COOLING SYSTEM—REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97-to-124 kPa (14- to-18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

CHEMICAL CLEANING

If visual inspection indicates the formation of sludge or scaly deposits, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97-to-124 kPa (14- to-18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equipment. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain the cooling system. Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

SERVICE PROCEDURES (Continued)

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing and install thermostat. Install the thermostat housing with a replacement gasket. Refer to Thermostat Replacement. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture.

REMOVAL AND INSTALLATION

TRANSMISSION OIL COOLERS

WATER-TO-OIL COOLER

The internal transmission oil cooler located within the radiator is not serviceable. If it requires service, the radiator must be replaced.

Once the repaired or replacement radiator has been installed, fill the cooling system and inspect for leaks. Refer to the Refilling Cooling System and Testing Cooling System For Leaks sections in this group. If the transmission operates properly after repairing the leak, drain the transmission and remove the transmission oil pan. Inspect for sludge and/or rust. Inspect for a dirty or plugged inlet filter. If none of these conditions are found, the transmission and torque convertor may not require reconditioning. Refer to Group 21 for automatic transmission servicing.

AIR-TO-OIL COOLER

REMOVAL

(1) Remove the grill mounting screws and remove the grill. Refer to Group 23, Body for procedures.

(2) Place a drain pan below the transmission oil cooler.

(3) Remove the two constant tension clamps at oil cooler inlet and outlet tubes.

(4) Remove the two oil cooler mounting bolts (Fig. 22).

(5) Remove the oil cooler from vehicle.

INSTALLATION

(1) Position and secure oil cooler to vehicle. Tighten mounting bolts to 8 N·m (72 in. lbs.) torque.

(2) Secure inlet and outlet tubes with constant tension clamps.

Install the grill.

(3) Start engine and check transmission fluid level. Add fluid if necessary.

COOLANT RESERVE TANK

REMOVAL

(1) Remove the tube clamp at the tank and remove tube.

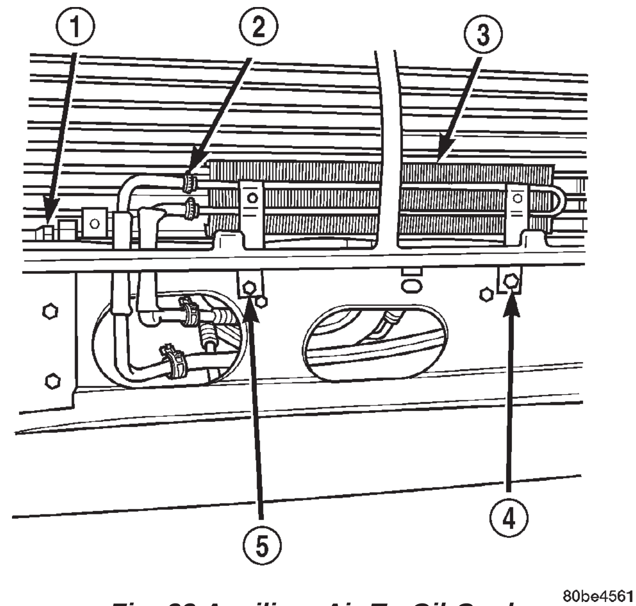


Fig. 22 Auxiliary Air-To-Oil Cooler

1 – AIR CONDITIONING CONDENSER
2 – HOSE CLAMPS (2)
3 – AUXILIARY AUTOMATIC TRANSMISSION OIL COOLER
4 – MOUNTING BOLT
5 – MOUNTING BOLT

(2) Remove the tank mounting bolts and remove tank (Fig. 23) (Fig. 24).

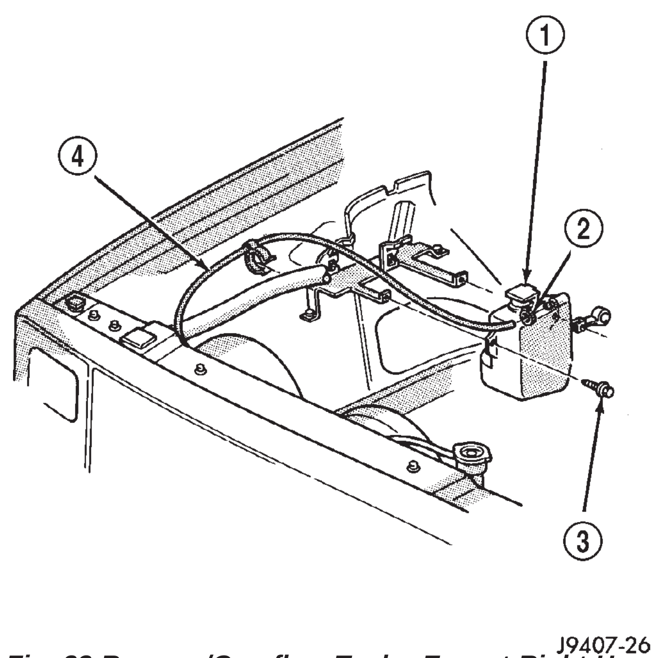


Fig. 23 Reserve/Overflow Tank—Except Right Hand Drive

1 – COOLANT RESERVE/OVERFLOW TANK
2 – CLAMP
3 – MOUNTING BOLTS
4 – TUBE TO RADIATOR

REMOVAL AND INSTALLATION (Continued)

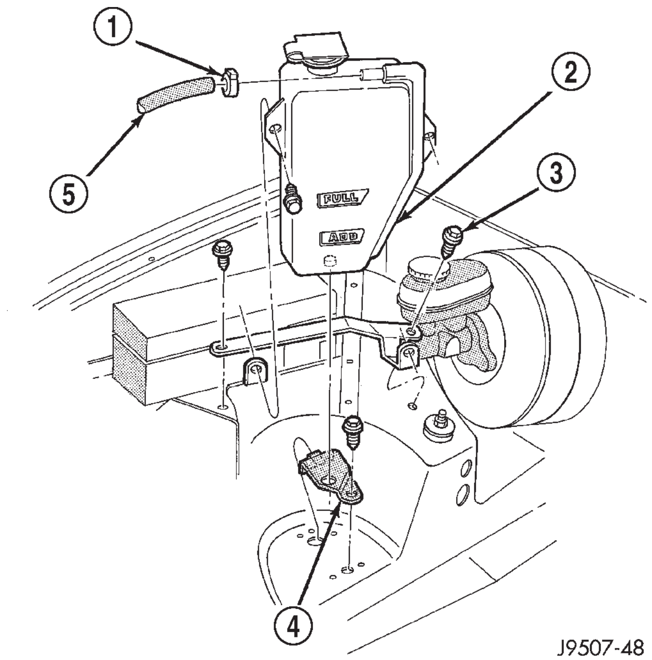


Fig. 24 Reserve/Overflow Tank—With Right Hand Drive

1 – CLAMP
2 – COOLANT RESERVE/OVERFLOW TANK
3 – MOUNTING BOLTS
4 – LOWER BRACKET
5 – TUBE TO RADIATOR

INSTALLATION

(1) Position tank and tighten to 2 N·m (17 in. lbs.) torque.

(2) Position tube and secure clamp.

WATER PUMP

CAUTION: If the water pump is replaced because of mechanical damage, the fan blades and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

The water pump can be removed without discharging the air conditioning system (if equipped).

CAUTION: All engines have a reverse (counter-clockwise) rotating water pump. The letter R is stamped into the back of the water pump impeller (Fig. 25) to identify. Engines from previous model years, depending upon application, may be equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump will cause engine over heating.

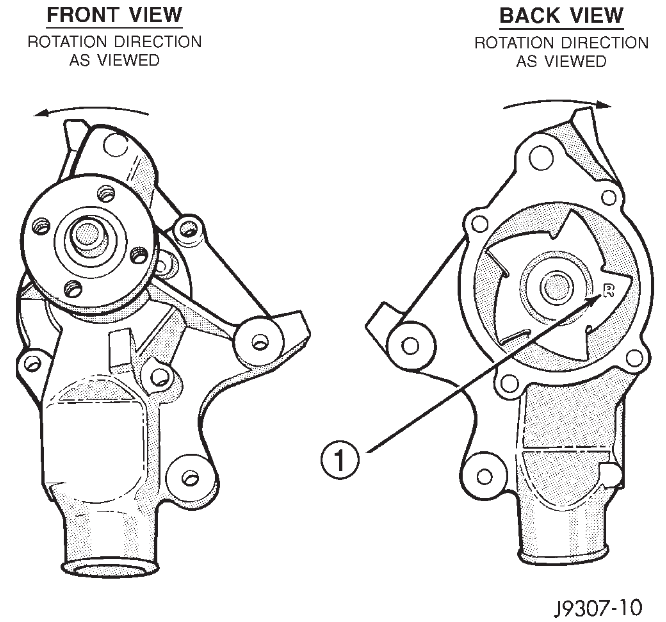


Fig. 25 Reverse Rotating Water Pump—Typical

1 – R STAMPED INTO IMPELLER

The water pump impeller is pressed on the rear of the pump shaft and bearing assembly. The water pump is serviced only as a complete assembly.

WARNING: DO NOT REMOVE THE BLOCK DRAIN PLUG(S) OR LOOSEN RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain coolant into a clean container for reuse.

REMOVAL-2.5L ENGINE (LHD/RHD)

(1) Disconnect battery negative cable.

(2) Drain cooling system. Refer to Cooling System-Draining and Filling in this group.

(3) Remove upper radiator hose.

(4) Loosen (but do not remove at this time) the four fan hub-to-water pump pulley mounting nuts (Fig. 26).

(5) Remove accessory drive belt. (Refer to Accessory Drive Belt, Removal and Installation in this group)

(6) Disconnect electric cooling fan connector (if equipped).

(7) Unbolt fan shroud.

(8) Remove the four fan hub-to-water pump pulley nuts and remove fan and shroud together.

REMOVAL AND INSTALLATION (Continued)

CAUTION: After removing fan blade/viscous fan drive assembly, do not place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(9) Remove power steering pump and bracket (Fig. 27), refer to Group 19 Steering for correct procedure.

(10) Remove lower radiator hose from water pump. Remove heater hose from water pump pipe.

(11) Remove the four pump mounting bolts (Fig. 28) and remove pump from vehicle. Discard old gasket. Note that one of the four bolts is longer than the other bolts.

(12) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

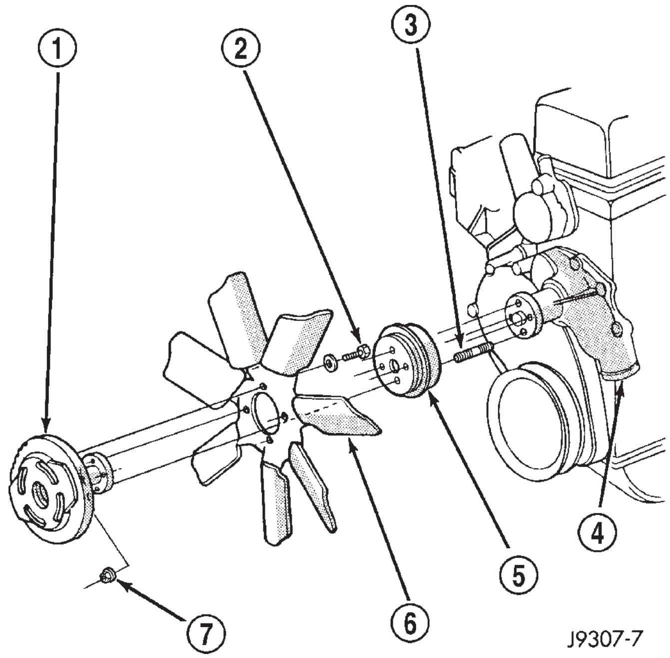


Fig. 26 Fan Mounting Nuts

1 – THERMAL VISCOUS FAN DRIVE
2 – (4) FAN BLADE-TO-VISCOUS DRIVE BOLTS
3 – (4) FAN HUB-TO-PUMP PULLEY STUDS
4 – WATER PUMP
5 – WATER PUMP PULLEY
6 – FAN BLADE
7 – (4) FAN HUB-TO-PUMP PULLEY NUTS

INSTALLATION-2.5L ENGINE (LHD/RHD)

(1) If pump is being replaced, install the heater hose pipe to the pump. Use a sealant on the fitting such as Mopar® Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other foreign material. Inspect the cylinder block and water

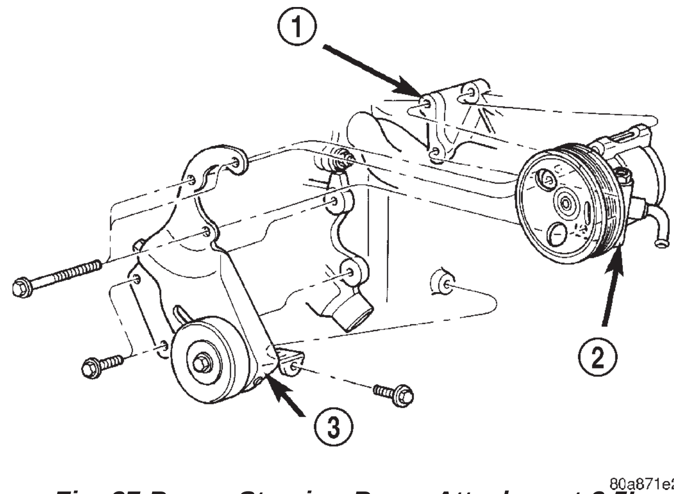


Fig. 27 Power Steering Pump Attachment-2.5L

1 – INTAKE MANIFOLD
2 – PUMP ASSEMBLY 2.5L
3 – PUMP BRACKET

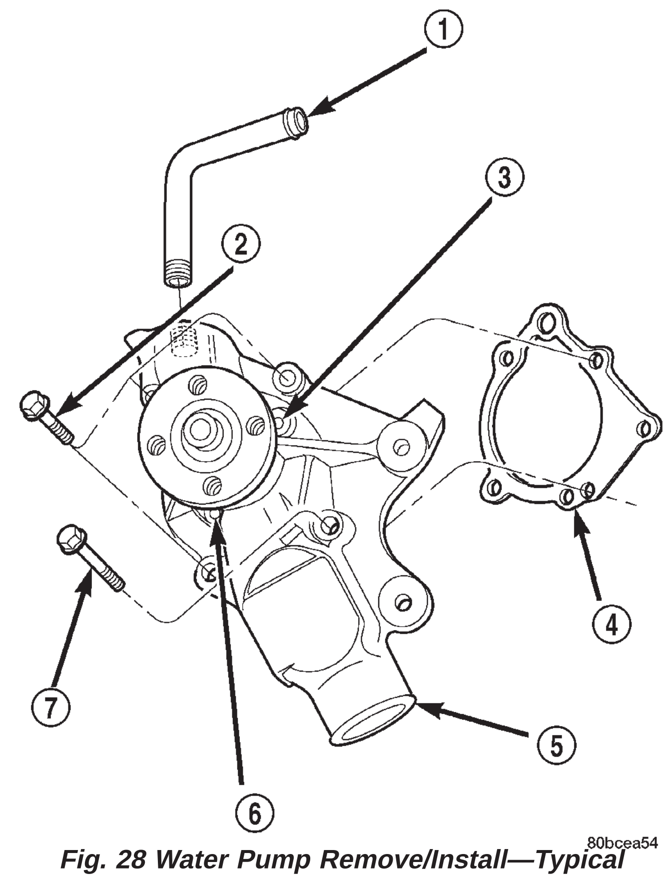


Fig. 28 Water Pump Remove/Install—Typical

1 – HEATER HOSE FITTING
2 – UPPER VENT HOLE
3 – PUMP GASKET
4 – WATER PUMP
5 – LOWER VENT HOLE
6 – LONG BOLT
7 – BOLTS (3) SHORT

REMOVAL AND INSTALLATION (Continued)

pump mating surfaces for erosion or damage from cavitation.

(3) Install the gasket and water pump. The silicone bead on the gasket should be facing the water pump. Also, the gasket is installed dry. Tighten mounting bolts to 23 N·m (17 ft. lbs.) torque. Rotate the shaft by hand to be sure it turns freely.

(4) Connect the radiator and heater hoses to the water pump.

(5) Install power steering pump and bracket. Refer to Group 19, Steering.

(6) Position water pump pulley to water pump hub.

(7) Install shroud and fan together and install four nuts to water pump hub studs. Tighten nuts to 27 N·m (20 ft. lbs.) torque.

(8) Install and tighten upper fan shroud nuts to 4 N·m (31 in. lbs.).

(9) Connect electric fan connector (if equipped).

CAUTION: When installing the accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to the Belt Removal and Installation in this group for appropriate belt routing. You may also refer to the Belt Routing Label in the vehicle engine compartment.

(10) Install and tension accessory drive belt, refer to Accessory Drive Belt removal and installation in this group.

(11) Install upper radiator hose.

(12) Fill cooling system with coolant and check for leaks. Refer to Refilling Cooling System in this group.

(13) Connect battery negative cable.

(14) Start and warm the engine. Check for leaks.

REMOVAL-4.0L ENGINE (LHD/RHD)

(1) Disconnect battery negative cable.

(2) Drain the cooling system. (Refer to Cooling System-Draining and Filling in this group.)

(3) Disconnect electric cooling fan connector.

(4) Remove electric cooling fan/shroud assembly (if equipped).

(5) Remove viscous fan shroud bolts (2).

(6) Loosen (but do not remove at this time) the four water pump pulley-to-water pump hub mounting bolts (Fig. 29) and the four viscous fan to idler pulley nuts.

NOTE: The accessory drive belt must be removed prior to removing the fan (if installed at pump) or fan pulley.

(7) Remove accessory drive belt (refer to Accessory Drive Belt, Removal and Installation in this group)

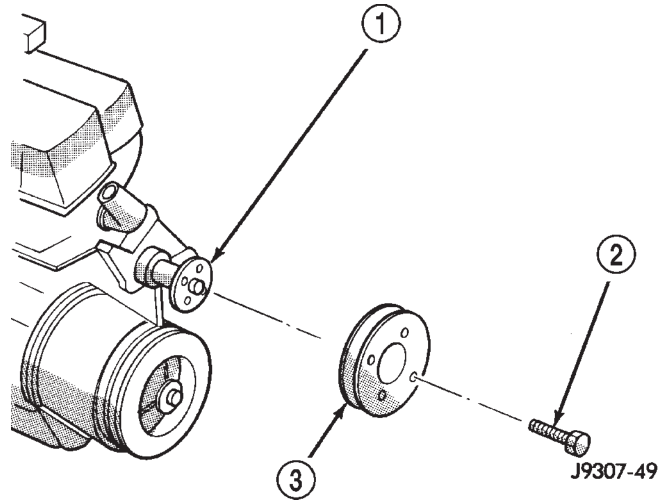


Fig. 29 Water Pump Pulley Bolts

1 – WATER PUMP HUB
2 – BOLTS (4)
3 – PUMP PULLEY

(8) Remove the four viscous fan to idler pulley nuts and remove the fan and shroud together.

CAUTION: After removing fan blade/viscous fan drive assembly, do not place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(9) Remove the four water pump pulley bolts and remove the pulley.

(10) Remove power steering pump and bracket (Fig. 30), refer to Group 19 Steering.

(11) Remove lower radiator hose from water pump. Remove heater hose from water pump fitting.

(12) Remove the four pump mounting bolts (Fig. 31) and remove pump from vehicle. Discard old gasket. Note that one of the four bolts is longer than the other bolts.

(13) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

INSTALLATION-4.0L ENGINE (LHD/RHD)

(1) If pump is being replaced, install the heater hose fitting to the pump. Use a sealant on the fitting such as Mopar® Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other foreign material. Inspect the cylinder block and water pump mating surfaces for erosion or damage from cavitation.

(3) Install the gasket and water pump. The silicone bead on the gasket should be facing the water

REMOVAL AND INSTALLATION (Continued)

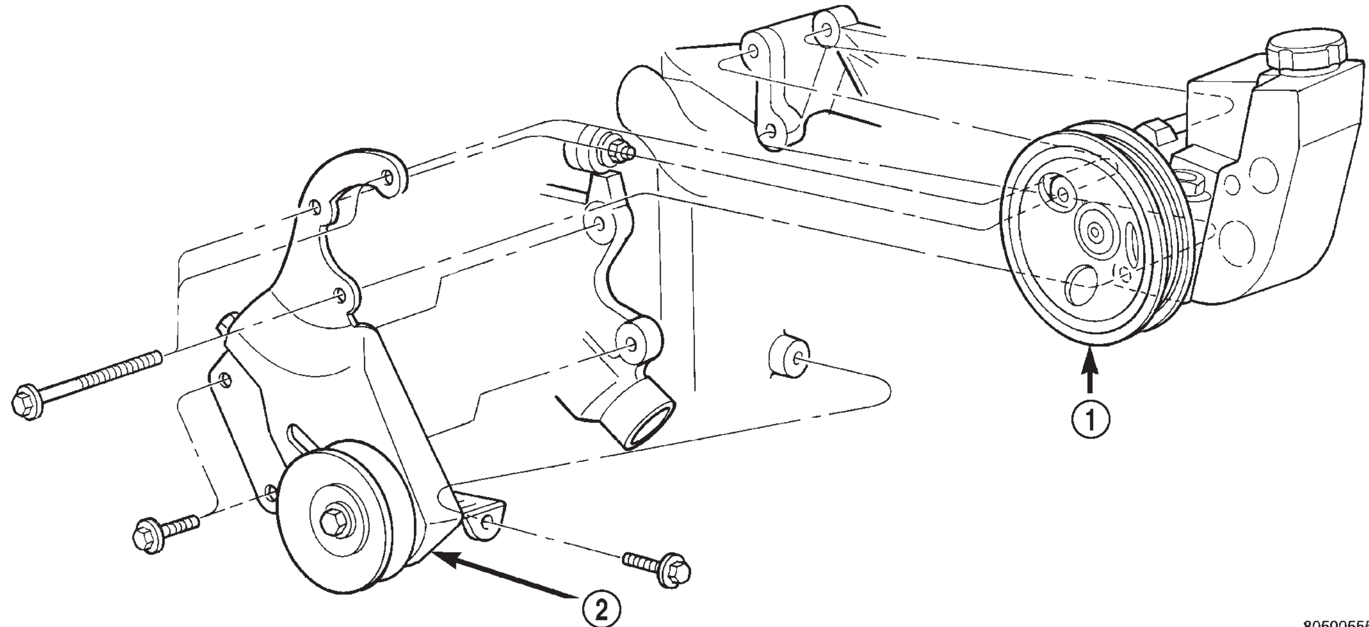


Fig. 30 Power Steering Pump Attachment-4.0L

1 – PUMP ASSEMBLY
2 – PUMP BRACKET

pump. Also, the gasket is installed dry. Tighten mounting bolts to 23 N·m (17 ft. lbs.) torque. Rotate the shaft by hand to be sure it turns freely.

(4) Connect the radiator and heater hoses to the water pump.

(5) Position water pump pulley to water pump hub.

(6) Install four pump pulley bolts. Tighten bolts (or nuts) to 27 N·m (20 ft. lbs.) torque.

(7) Install power steering pump. Refer to Group 19, Steering for proper procedure and torque values.

(8) Install the viscous fan and shroud together. Install the four fan to idler pulley nuts and tighten to 27 N·m (20 ft. lbs.).

CAUTION: When installing the accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to the Belt Removal and Installation in this group for appropriate belt routing. You may also refer to the Belt Routing Label in the vehicle engine compartment.

(9) Install and tighten viscous fan shroud bolts to 4 N·m (31 in. lbs.).

(10) Install and tension the accessory drive belt, refer to Accessory Drive Belt removal and installation in this group.

(11) Install the electric cooling fan/shroud assy.

(12) Install and tighten electric fan shroud bolts to 4 N·m (31 in. lbs.). Connect fan connector.

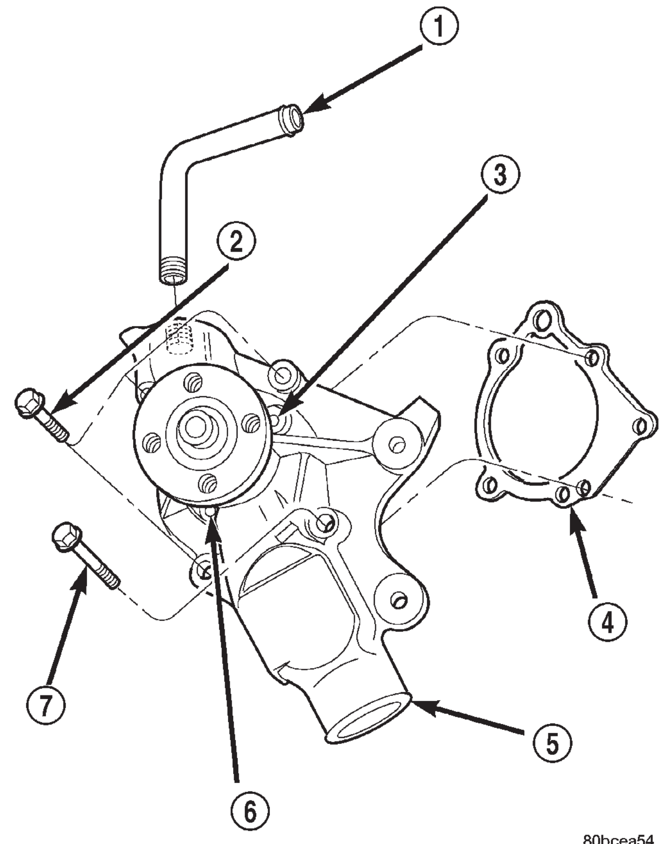


Fig. 31 Water Pump Remove/Install—Typical

1 – HEATER HOSE FITTING
2 – UPPER VENT HOLE
3 – PUMP GASKET
4 – WATER PUMP
5 – LOWER VENT HOLE
6 – LONG BOLT
7 – BOLTS (3) SHORT

REMOVAL AND INSTALLATION (Continued)

(13) Fill cooling system with coolant and check for leaks. Refer to Refilling Cooling System in this group.

(14) Connect battery negative cable.

(15) Start and warm the engine. Check for leaks.

THERMOSTAT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Drain the coolant from the radiator until the level is below the thermostat housing.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 12). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 11). If replacement is necessary, use only an original equipment clamp with matching number or letter.

(2) Remove radiator upper hose and heater hose at thermostat housing.

(3) Disconnect wiring connector at engine coolant temperature sensor.

(4) Remove thermostat housing mounting bolts, thermostat housing, gasket and thermostat (Fig. 32). Discard old gasket.

(5) Clean the gasket mating surfaces.

INSTALLATION

(1) Install the replacement thermostat so that the pellet, which is encircled by a coil spring, faces the engine. All thermostats are marked on the outer flange to indicate the proper installed position.

(a) Observe the recess groove in the engine cylinder head (Fig. 33).

(b) Position thermostat into this groove with arrow and air bleed hole on outer flange pointing up.

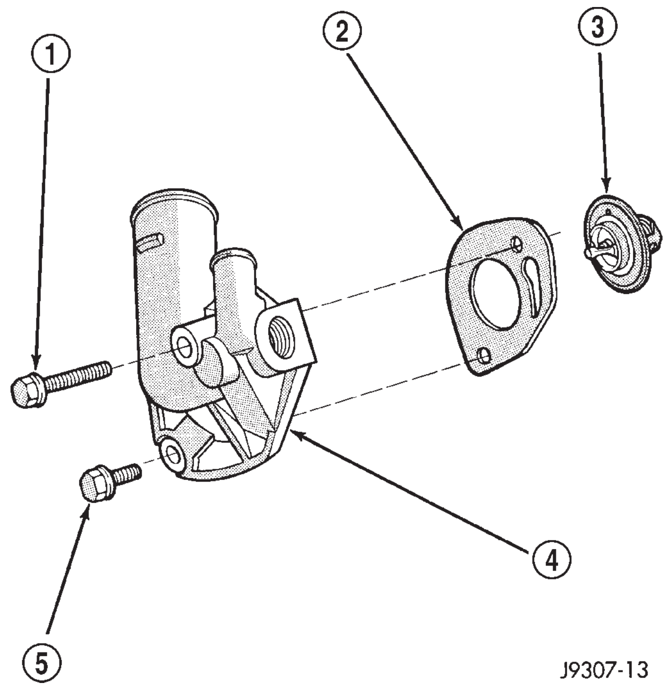


Fig. 32 Thermostat Removal/Installation

1 – LONG BOLT
2 – GASKET
3 – THERMOSTAT
4 – THERMOSTAT HOUSING
5 – SHORT BOLT

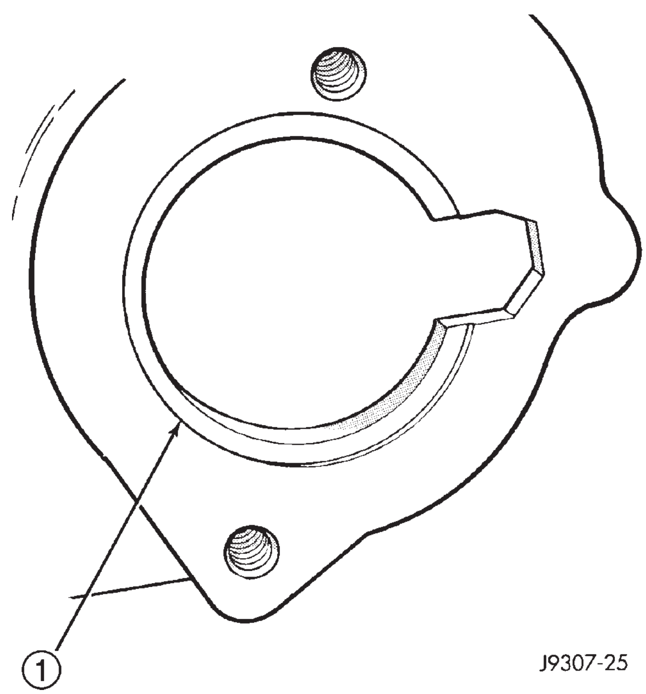


Fig. 33 Thermostat Recess

1 – GROOVE

(2) Install replacement gasket and thermostat housing.

REMOVAL AND INSTALLATION (Continued)

CAUTION: Tightening the thermostat housing unevenly or with the thermostat out of its recess may result in a cracked housing.

(3) Tighten the housing bolts to 20 N·m (15 ft. lbs.) torque.

(4) Install hoses to thermostat housing.

(5) Install electrical connector to coolant temperature sensor.

(6) Be sure that the radiator draincock is tightly closed. Fill the cooling system to the correct level with the required coolant mixture. Refer to Refilling Cooling System in this group.

(7) Start and warm the engine. Check for leaks.

RADIATOR—2.5L

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 12). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 11). If replacement is necessary, use only an original equipment clamp with matching number or letter.

REMOVAL

(1) Disconnect battery negative cable.

(2) Observe the previous **WARNINGS.**

(3) Remove radiator pressure cap.

(4) For access to radiator draincock, remove radiator grill mounting screws and remove grill. Refer to Group 23, Body for procedures.

(5) Attach one end of a 24 inch long X 1/4 inch ID hose to the radiator petcock (Fig. 34). Put the other end into a clean container. Open petcock and drain radiator.

(6) Detach power steering fluid reservoir from fan shroud and lay aside.

(7) Disconnect electric cooling fan electrical connector, if equipped.

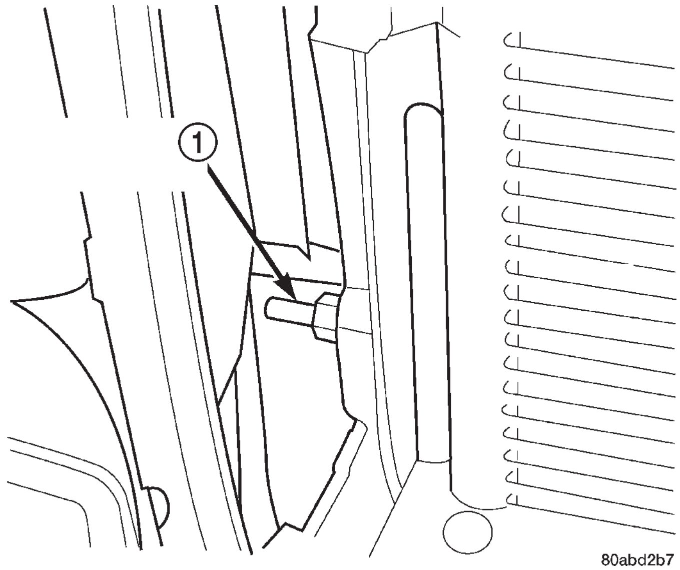


Fig. 34 Radiator Petcock—Typical

1 – RADIATOR PETCOCK

(8) Disconnect CRS hose from radiator filler neck and remove from shroud retaining loops.

(9) Remove the four (4) viscous fan/drive assembly nuts from the water pump pulley and remove fan/drive assy.

(10) Remove the four (4) fan shroud to core support mounting screws.

(11) Remove the electric fan (if equipped) and shroud assembly from the vehicle (Fig. 36).

(12) Remove radiator upper crossmember (Fig. 36).

(13) If equipped with air conditioning, separate radiator from condenser by removing condenser-to-radiator mounting brackets (Fig. 35).

(14) Disconnect upper and lower radiator hoses.

(15) If equipped, disconnect and plug automatic transmission fluid cooler lines. Quick Connect Fitting Release Tool 6935 may be needed. If equipped with remote transmission cooler, remove line to cooler from bracket at bottom of radiator.

(16) Lift radiator straight up and out of engine compartment taking care not to damage fins.

(17) If radiator is to be replaced, be sure to remove and transfer any components not included with replacement radiator.

INSTALLATION

The radiator is supplied with two alignment dowels (Fig. 41). They are located on the bottom tank and fit into rubber grommets in the radiator lower crossmember.

REMOVAL AND INSTALLATION (Continued)

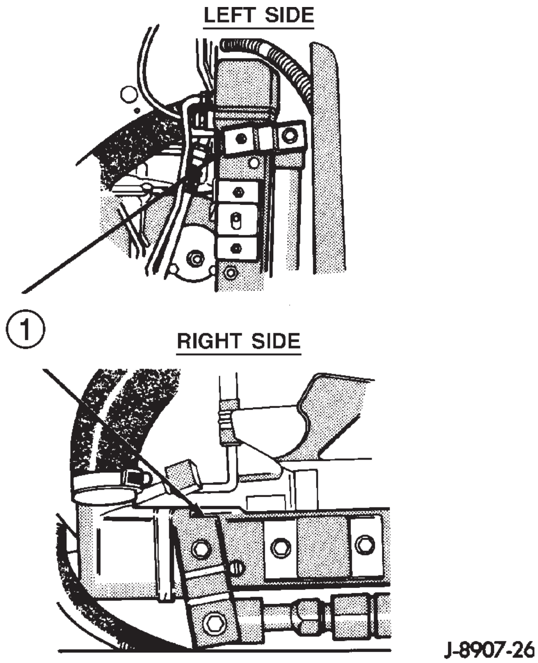


Fig. 35 Condenser-to-Radiator Mounting Brackets

1 – CONDENSER TO RADIATOR MOUNTING BRACKETS

(1) Lower radiator into engine compartment. Position alignment dowels into rubber grommets in radiator lower crossmember (Fig. 41).

(2) If equipped with air conditioning, attach condenser to radiator with mounting brackets (Fig. 35).

(3) Install radiator upper crossmember and four mounting bolts.

(4) Install radiator upper crossmember-to-isolator nuts. Tighten nuts to 10 N·m (86 in. lbs.) torque. If isolator-to-radiator nuts had been removed, tighten them to 5 N·m (47 in. lbs.) torque.

(5) Connect radiator upper and lower hoses.

(6) If equipped, connect automatic transmission fluid cooler lines. If equipped with remote cooler, attach cooler line to bracket at bottom of radiator.

(7) Install electric fan (if equipped) and shroud assembly.. Insert alignment tabs at bottom of fan shroud into slots in bracket at bottom of radiator. Tighten mounting bolts to 3 N·m (31 in. lbs.) torque.

(8) Connect electric cooling fan electrical connector.

(9) Install power steering reservoir to fan shroud.

(10) Install grill.

(11) Connect battery negative cable.

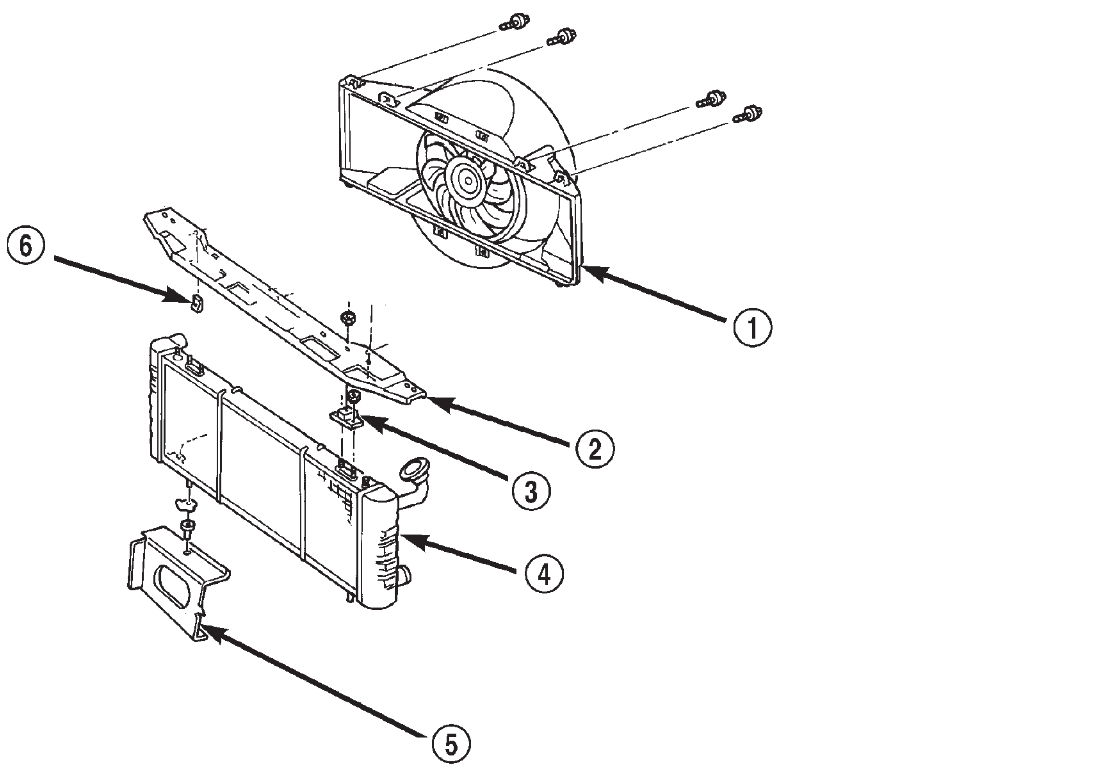


Fig. 36 Radiator Removal/Installation—2.5L Engines

1 – ELECTRIC FAN/SHROUD ASSEMBLY
2 – UPPER CROSSMEMBER
3 – ISOLATOR
4 – RADIATOR
5 – LOWER CROSSMEMBER
6 – U-NUT

REMOVAL AND INSTALLATION (Continued)

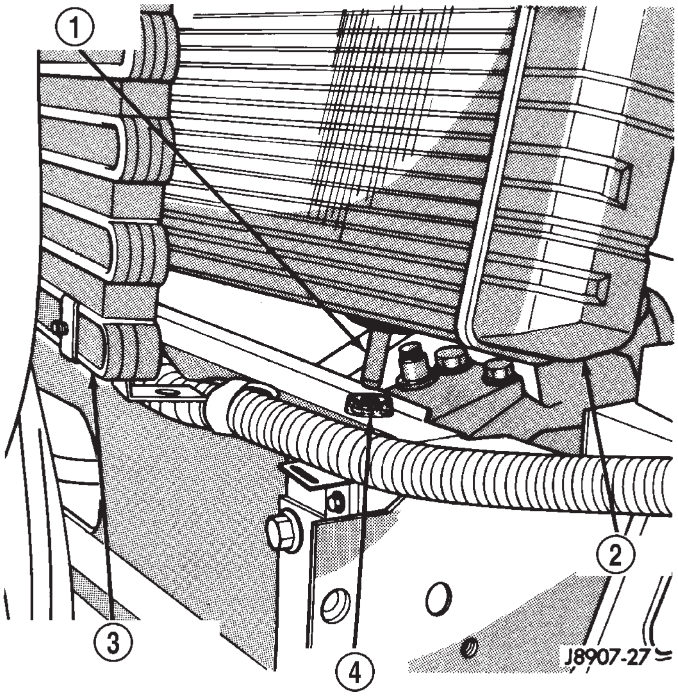


Fig. 37 Radiator Alignment Dowels—Typical

1 – ALIGNMENT DOWEL
2 – RADIATOR
3 – AIR CONDITIONING CONDENSER
4 – GROMMET

(12) Fill cooling system with correct coolant. Refer to the Coolant section of this group.

(13) Install pressure cap.

(14) Check and adjust automatic transmission fluid level (if equipped).

(15) Start engine and visually check for leaks.

RADIATOR—4.0L

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 12). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 11). If replacement is necessary, use only an original equipment clamp with matching number or letter.

REMOVAL

(1) Disconnect battery negative cable.

(2) Observe the previous **WARNINGS.**

(3) Remove radiator pressure cap.

(4) For access to radiator draincock, remove radiator grill mounting screws and remove grill. Refer to Group 23, Body for procedures.

(5) Attach one end of a 24 inch long X 1/4 inch ID hose to the radiator petcock (Fig. 38). Put the other end into a clean container. Open petcock and drain radiator.

(6) Disconnect electric cooling fan electrical connector, if equipped.

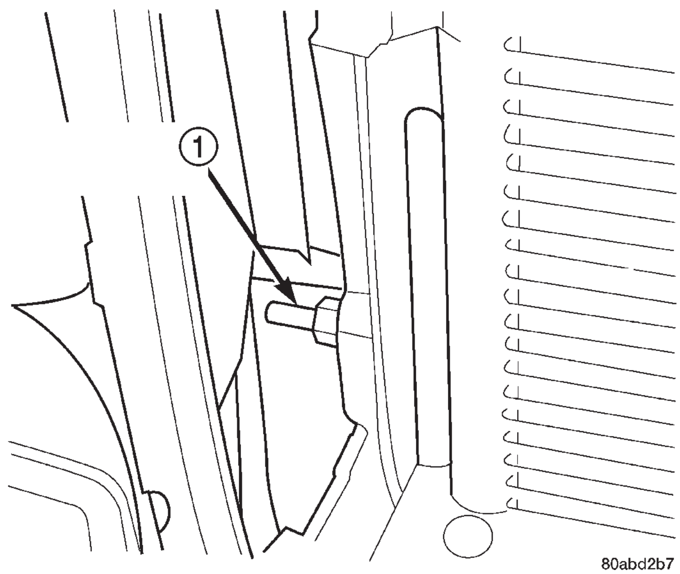


Fig. 38 Radiator Petcock—Typical

1 – RADIATOR PETCOCK

(7) If equipped, remove two electric cooling fan mounting bolts. Lift cooling fan straight up until alignment tabs at the bottom are clear of slots in bracket at bottom of radiator (Fig. 39).

(8) Remove the two mechanical (non-electrical) fan shroud mounting bolts. Lift shroud straight up until alignment tabs at the bottom are clear of slots in bracket at bottom of radiator (Fig. 39). Place shroud over mechanical fan.

(9) If equipped, disconnect and plug automatic transmission fluid cooler lines. Quick Connect Fitting Release Tool 6935 may be needed. If equipped with remote transmission cooler, remove line to cooler from bracket at bottom of radiator.

REMOVAL AND INSTALLATION (Continued)

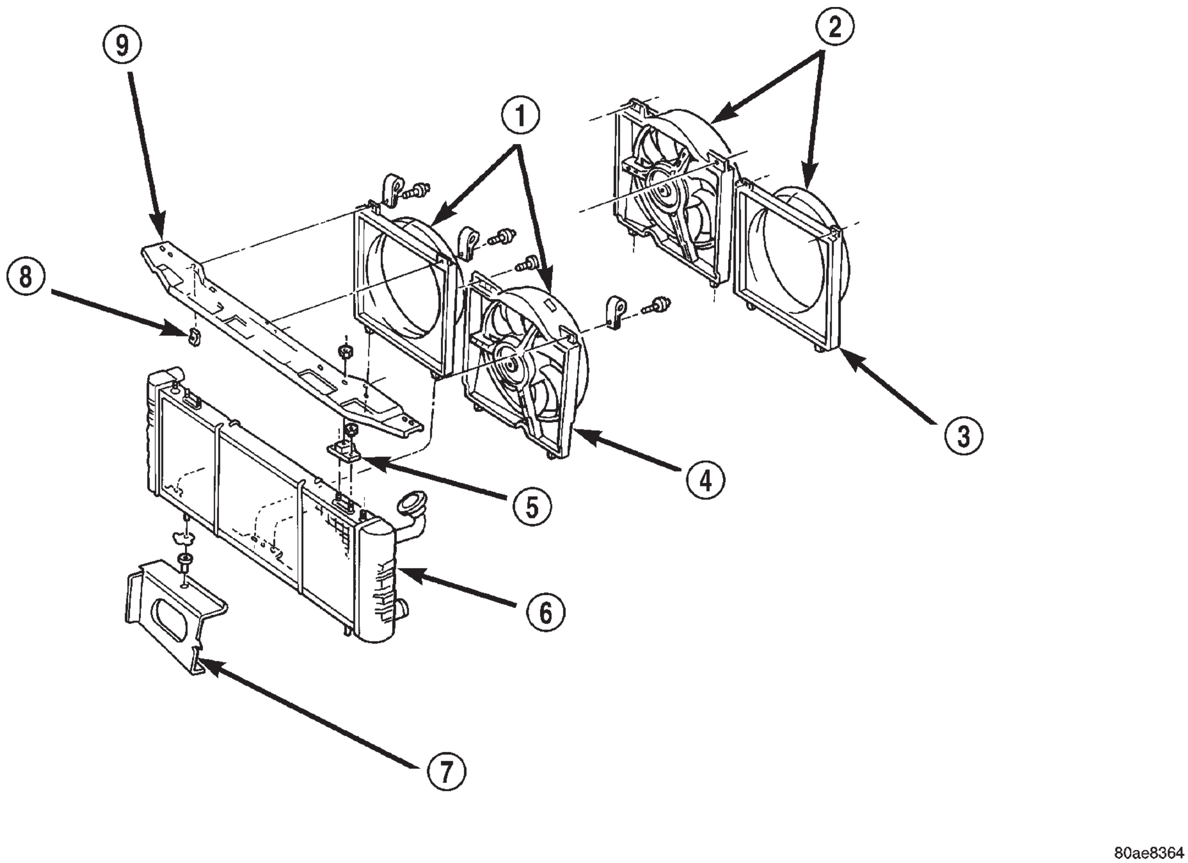


Fig. 39 Radiator Removal/Installation—4.0L Engines

1 – (LHD)
2 – (RHD)
3 – VISCOUS FAN SHROUD
4 – ELECTRIC FAN MODULE
5 – ISOLATOR
6 – RADIATOR
7 – LOWER CROSSMEMBER
8 – U-NUT
9 – UPPER CROSSMEMBER

(10) Disconnect radiator upper and lower hoses clamps. Disconnect radiator upper and lower hoses.

(11) Mark the position of the hood latch striker on the radiator crossmember and remove hood latch striker.

(12) Remove two radiator upper crossmember to isolator nuts (Fig. 39).

(13) Remove four radiator upper crossmember bolts and remove upper crossmember.

(14) If equipped with air conditioning, separate radiator from condenser by removing condenser-to-radiator mounting brackets (Fig. 40).

(15) Lift radiator straight up and out of engine compartment taking care not to damage fins.

INSTALLATION

The radiator is supplied with two alignment dowels (Fig. 41). They are located on the bottom tank and fit into rubber grommets in the radiator lower crossmember.

(1) Lower radiator into engine compartment. Position alignment dowels into rubber grommets in radiator lower crossmember (Fig. 41)

(2) If equipped with air conditioning, attach condenser to radiator with mounting brackets (Fig. 40).

(3) Install radiator upper crossmember and four mounting bolts.

(4) Install radiator upper crossmember-to-isolator nuts. Tighten nuts to 10 N·m (86 in. lbs.) torque. If isolator-to-radiator nuts had been removed, tighten them to 5 N·m (47 in. lbs.) torque.

(5) Install hood latch striker. Note previously marked position.

(6) Connect radiator upper and lower hoses.

(7) If equipped, connect automatic transmission fluid cooler lines. Refer to Group 21, Transmissions for procedures. If equipped with remote cooler, attach cooler line to bracket at bottom of radiator.

REMOVAL AND INSTALLATION (Continued)

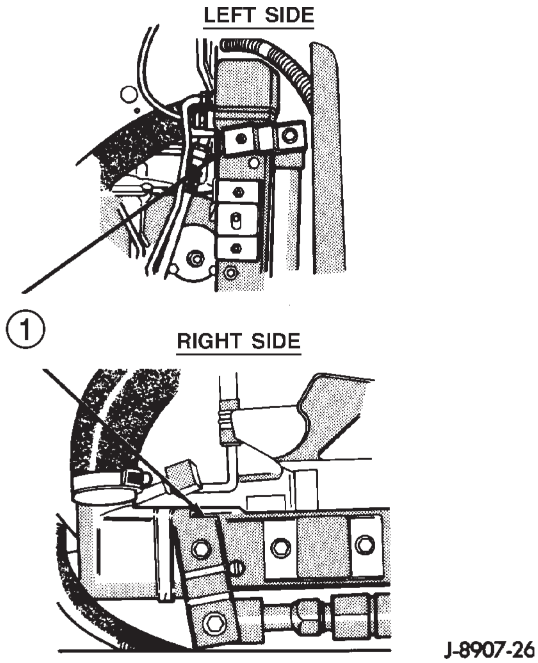


Fig. 40 Condenser to Radiator Mounting Brackets—4.0L Engine

1 – CONDENSER TO RADIATOR MOUNTING BRACKETS

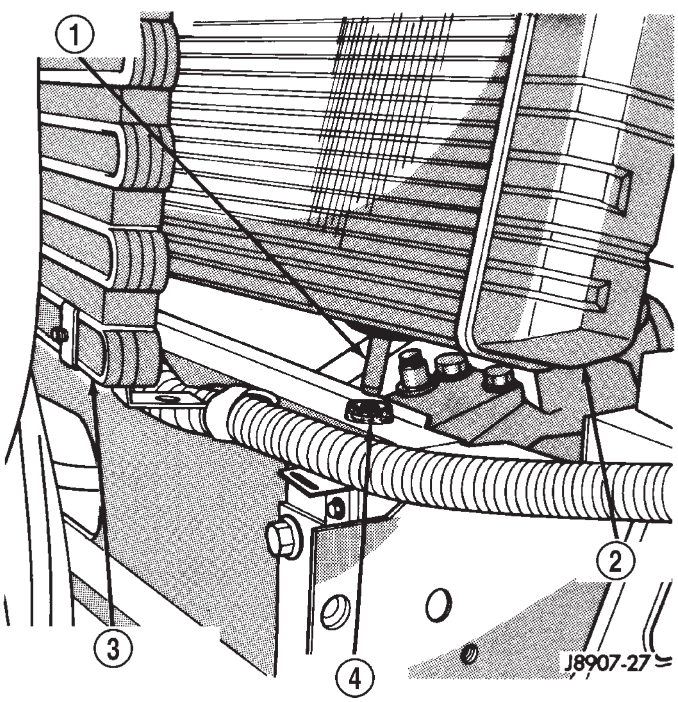


Fig. 41 Radiator Alignment Dowels—Typical

1 – ALIGNMENT DOWEL
2 – RADIATOR
3 – AIR CONDITIONING CONDENSER
4 – GROMMET

(8) Install electric cooling fan (if equipped). Insert alignment tabs at bottom of fan shroud into slots in bracket at bottom of radiator. Tighten mounting bolts to 3 N·m (31 in. lbs.) torque.

(9) Connect electric cooling fan electrical connector.

(10) Install mechanical cooling fan shroud. Insert alignment tabs at bottom of shroud into slots in bracket at bottom of radiator. Tighten mounting bolts to 3 N·m (31 in. lbs.) torque.

(11) Close radiator draincock.

(12) Install grill.

(13) Connect negative battery cable.

(14) Fill cooling system with correct coolant. Refer to the Coolant section of this group.

(15) Install pressure cap.

(16) Check and adjust automatic transmission fluid level (if equipped).

ELECTRIC COOLING FAN—2.5L

The electric fan module is only to be serviced as an assembly.

REMOVAL

(1) Disconnect battery negative cable.

(2) Disconnect CRS hose from radiator filler neck and pull through (remove) the shroud retaining loops.

(3) Detach power steering reservoir from fan shroud and lay aside.

(4) Remove the four viscous fan/drive assembly mounting nuts from the water pump studs and remove viscous fan assembly.

(5) Disconnect cooling fan electrical connector.

(6) Remove the four upper fan shroud to radiator crossmember mounting screws (Fig. 42).

(7) Lift fan and shroud assy. from vehicle

(8) Detach fan harness from shroud.

(9) Remove four fan module to shroud phillips head screws (Fig. 43) and remove module from shroud.

INSTALLATION

(1) Position fan module in shroud so that the harness exits the motor at the 12 o'clock postion (Fig. 43).

(2) Install and tighten fan module to shroud screws to 3 N·m (31 in. lbs.).

(3) Route fan harness through the shroud and attach to shroud at correct position.

(4) Lower fan and shroud assembly into place, making sure the shroud alignment tabs rest in their corresponding lower radiator slots.

(5) Install upper fan shroud screws and tighten to 3 N·m (31 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

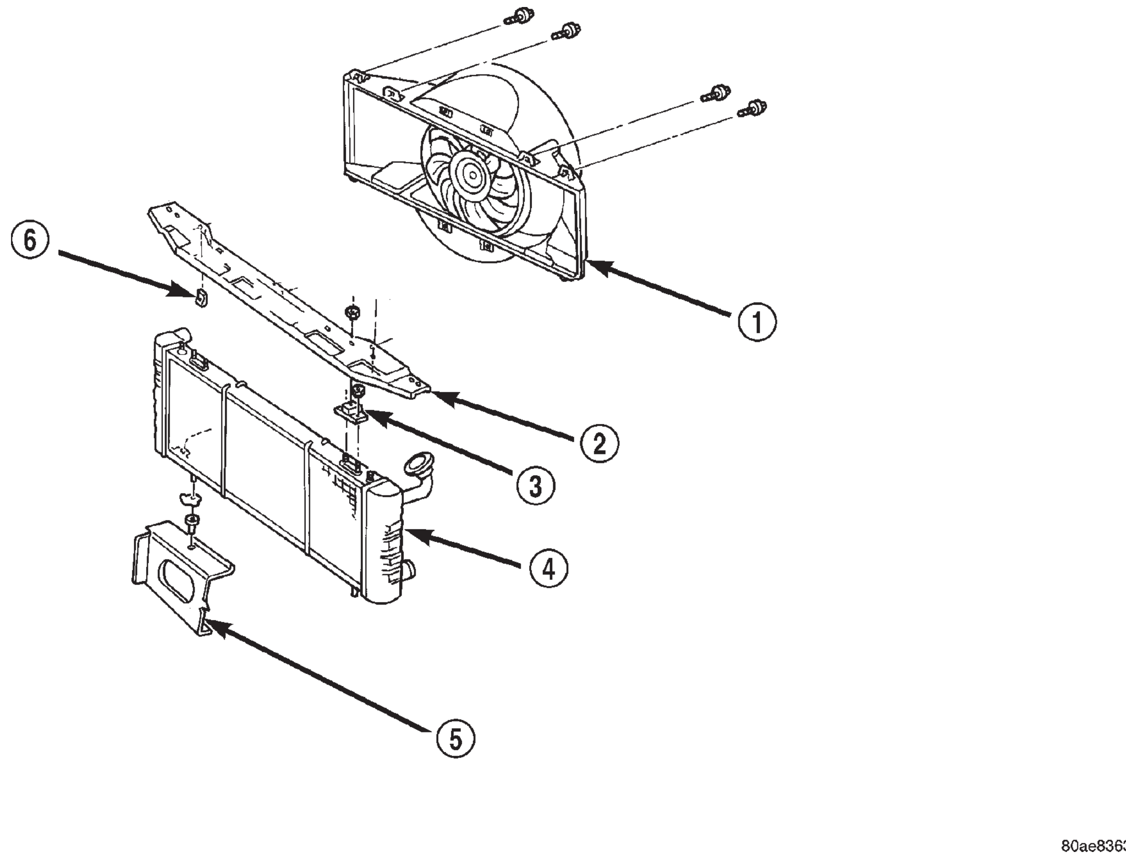


Fig. 42 Fan Shroud Removal/Installation

1 – ELECTRIC FAN/SHROUD ASSEMBLY
2 – UPPER CROSSMEMBER
3 – ISOLATOR
4 – RADIATOR
5 – LOWER CROSSMEMBER
6 – U-NUT

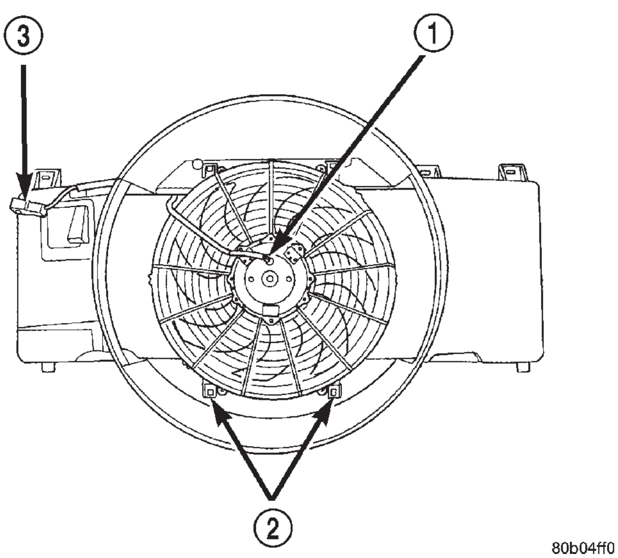


Fig. 43 Fan Module Orientation and Mounting

1 – FAN MOTOR HARNESS AT 12 O'CLOCK POSITION
2 – MOUNTING SCREWS (4)
3 – FAN CONNECTOR

(6) Connect fan electrical connector.

(7) Install power steering reservoir to shoud.

(8) Install viscous fan drive assy. to water pump hub and tighten nuts to 27 N·m (20 ft. lbs.)

(9) Connect battery negative cable.

ELECTRIC COOLING FAN—4.0L

REMOVAL

The auxiliary cooling fan is attached to the radiator upper crossmember behind the radiator.

(1) Remove the two fan mounting bolts from radiator upper crossmember (Fig. 44).

(2) Disconnect the electric fan connector.

(3) Lift fan straight up and out of vehicle.

INSTALLATION

(1) Align lower retaining tabs of fan shroud with slots in bracket at bottom of radiator. Push fan down into position.

(2) Tighten the mounting bolts to 4 N·m (31 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

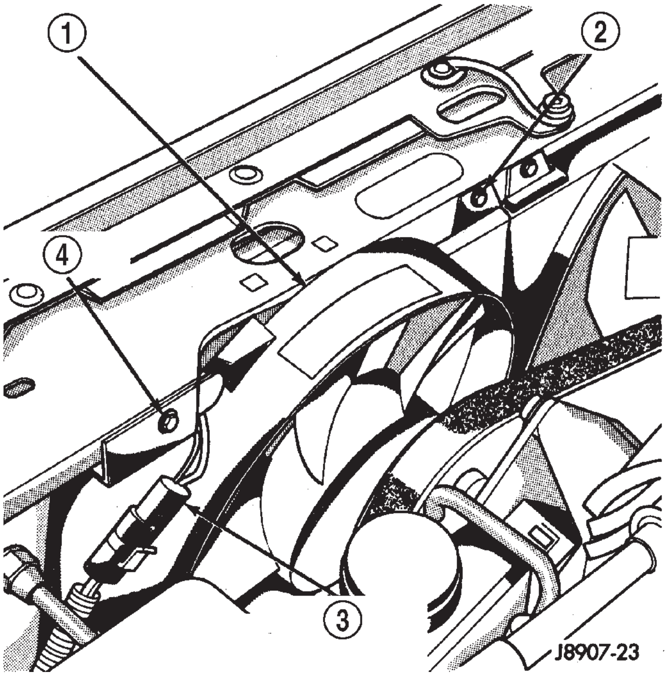


Fig. 44 Auxiliary Cooling Fan—Remove/Install—Typical

1 – ELECTRIC COOLING FAN
2 – MOUNTING BOLT
3 – ELECTRIC COOLING FAN CONNECTOR
4 – MOUNTING BOLT

(3) Connect auxiliary cooling fan electrical connector.

BLOCK HEATER

REMOVAL

Refer to correct illustration (Fig. 45) (Fig. 46) when servicing block heater.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

(1) Drain coolant from radiator and engine cylinder block.

(2) Unplug power cord from block heater.

(3) Loosen screw in center of block heater (Fig. 45) (Fig. 46).

(4) Remove block heater from cylinder block.

INSTALLATION

(1) Thoroughly clean the engine core hole and the block heater seat.

(2) Insert block heater assembly into core hole with element loop pointing **Up.**

(3) Seat block heater flush against block face. Tighten mounting screw to 3.6 N·m (32 in. lbs.) torque.

(4) Fill cooling system with coolant. Pressurize system and inspect for leaks.

(5) Plug power cord into block heater. Route cord away from moving parts, linkages and exhaust system components. Secure cord in place with tie-straps.

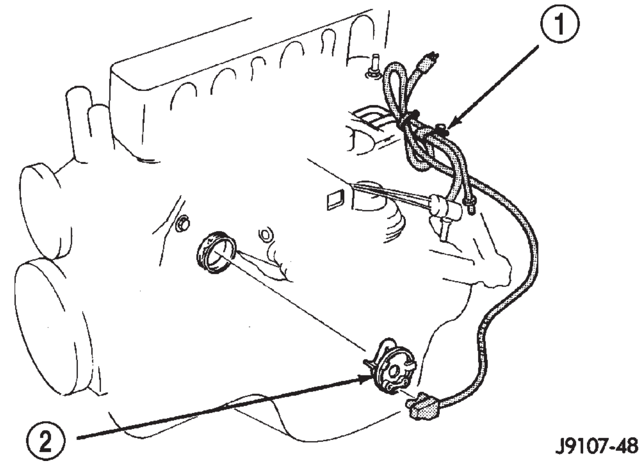


Fig. 45 Heater and Cord— 2.5L 4-Cylinder Engine

1 – POWER CORD LOCATION
2 – BLOCK HEATER

ENGINE ACCESSORY DRIVE BELTS

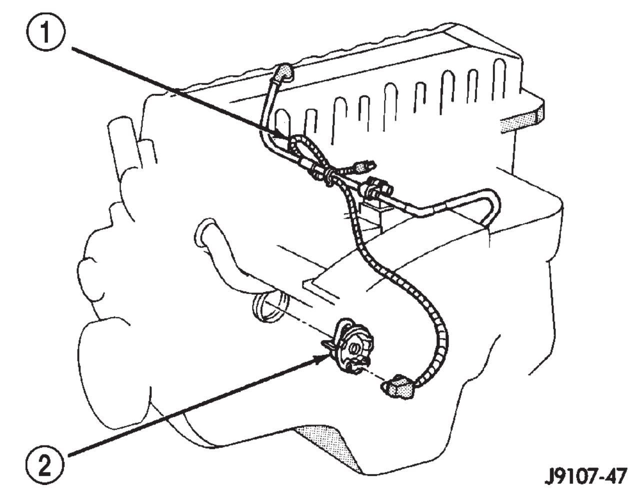


Fig. 46 Heater and Cord—4.0L 6-Cylinder Engine

1 – POWER CORD LOCATION
2 – BLOCK HEATER

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different types of adjustment gauges for checking either a serpentine or a V-type belt. Refer to the instructions supplied with the

REMOVAL AND INSTALLATION (Continued)

gauge. Use the correct gauge when checking belt tension. Place gauge in the middle of the section of belt being tested (between two pulleys) to check tension. Do not allow the gauge (or gauge adapter) to contact anything but the belt.

BELT SCHEMATICS

The belt routing schematics are published from the latest information available at the time of publication. **If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label.** This label is located in the engine compartment.

Refer to (Fig. 47) (Fig. 48) (Fig. 49) (Fig. 50) for proper belt routing on vehicles with conventional left hand drive. Refer to (Fig. 51) (Fig. 52) for proper belt routing on vehicles with right hand drive (RHD). Or, refer to the Belt Routing Label located in the vehicle engine compartment.

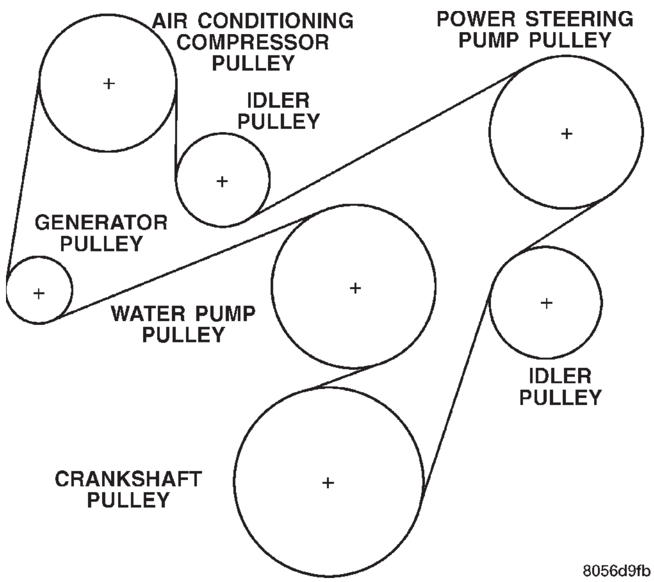


Fig. 47 Models with 2.5L Engine—With A/C

BELT REPLACEMENT OR ADJUSTMENT—LEFT HAND DRIVE

Belt tension is adjusted at the power steering pump bracket and idler pulley assembly.

(1) Disconnect negative battery cable from battery.

(2) Loosen idler pulley bolt at the power steering bracket (Fig. 53).

(3) Loosen adjusting bolt until belt can be removed from pulleys.

(4) Remove belt.

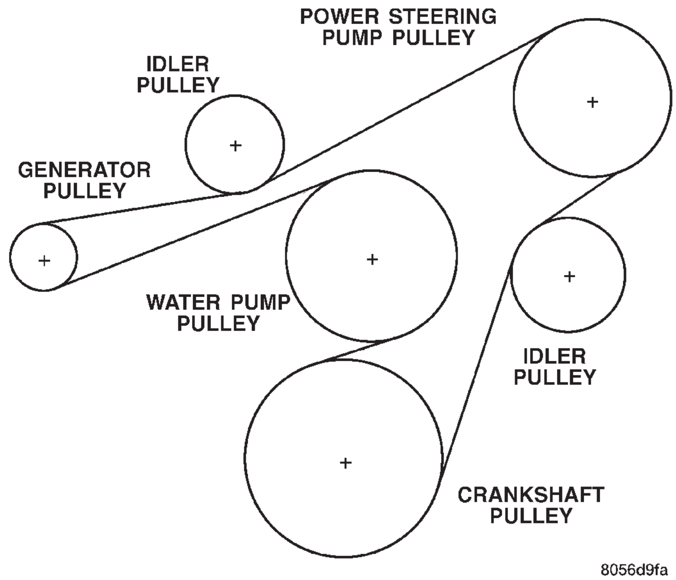


Fig. 48 Models with 2.5L Engine—Without A/C

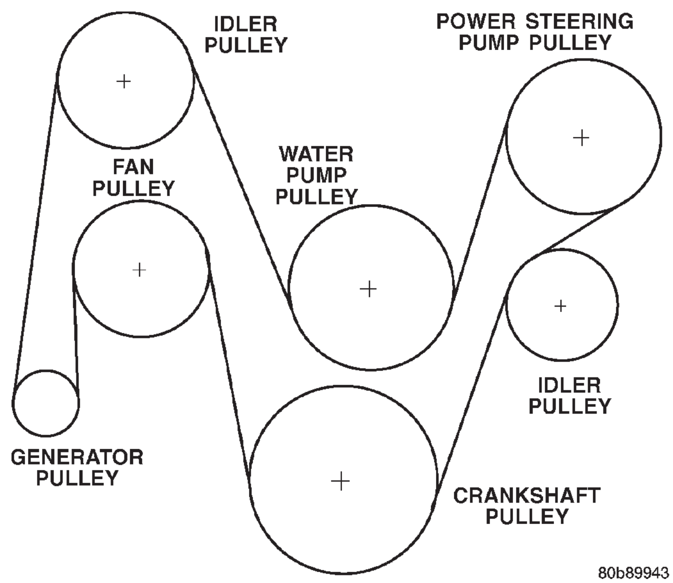


Fig. 49 Models with 4.0L Engine—Without A/C—Except RHD

INSTALLATION

(1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 47) (Fig. 48) (Fig. 49) (Fig. 50) for correct belt routing.

REMOVAL AND INSTALLATION (Continued)

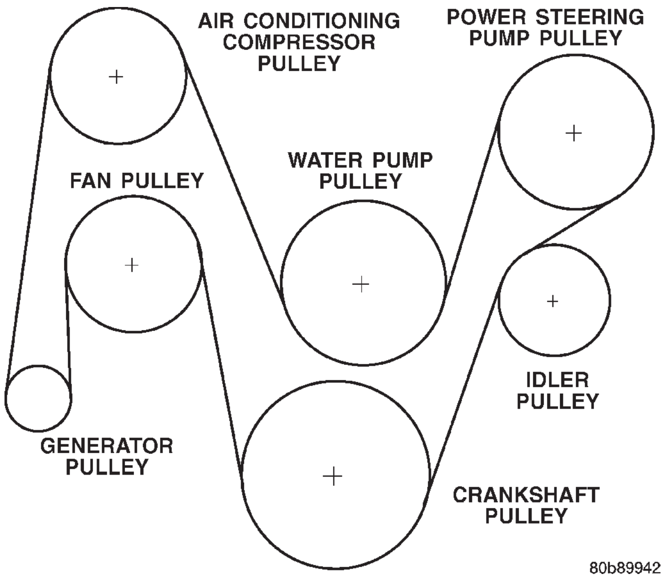


Fig. 50 Models With 4.0L Engine—With A/C—Except RHD

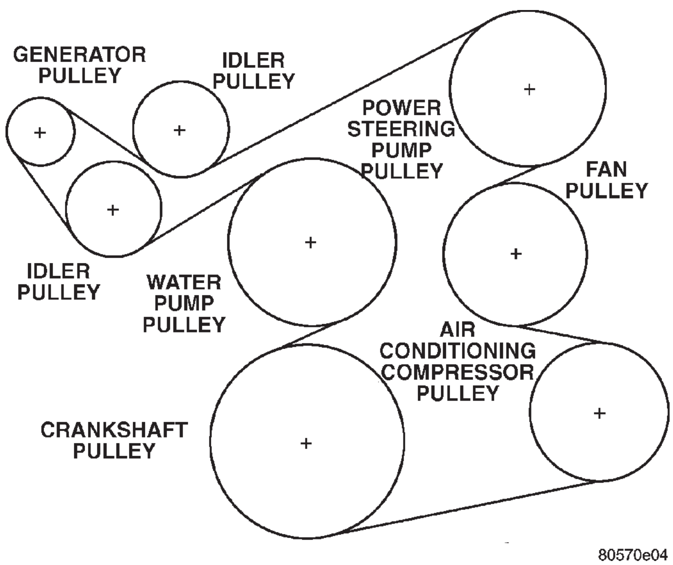


Fig. 51 Models With 4.0L Engine—With A/C—With RHD

(2) Install new belt.

(3) Using serpentine belt tension gauge, tighten adjusting bolt until belt reaches proper tension. Refer to Belt Tension at the rear of this section for proper belt tension.

(4) After belt is tensioned correctly, tighten idler pulley bolt to 47 N·m (35 ft. lbs.)

(5) After idler pulley has been tightened into position, recheck belt tension. Adjust if necessary.

BELT REPLACEMENT OR ADJUSTMENT—RIGHT HAND DRIVE (4.0L)

(1) Disconnect negative battery cable from battery.

(2) Loosen lower alternator mounting bolt and nut.

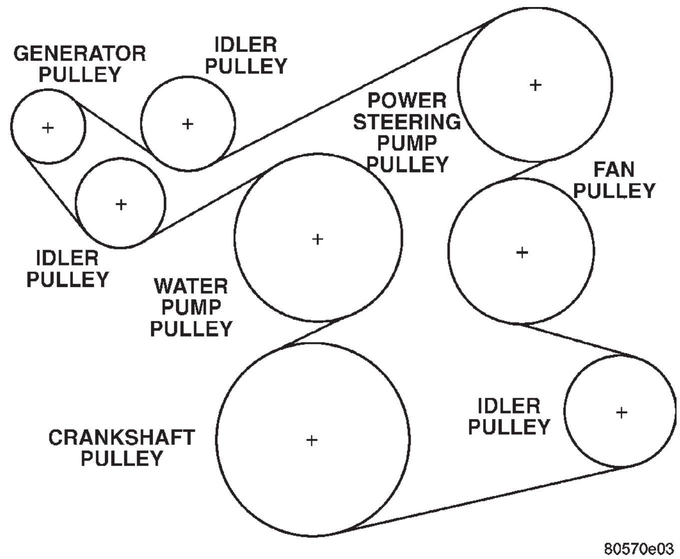


Fig. 52 Models With 4.0L Engine—Without A/C—With RHD

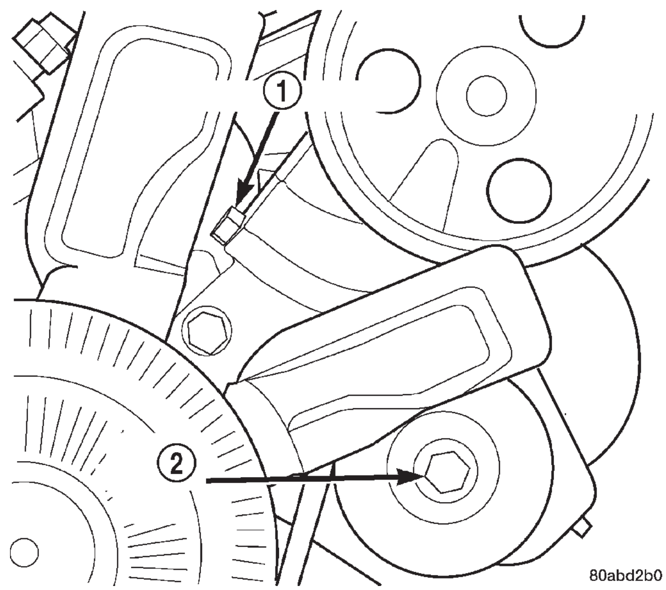


Fig. 53 Power Steering Pump Bracket and Idler Pulley

1 – ADJUSTING BOLT
2 – IDLER PULLEY BOLT

(3) Loosen upper alternator mounting nut.

(4) Loosen adjusting bolt at upper alternator bracket (Fig. 54) until belt can be removed from pulleys.

(5) Remove belt.

INSTALLATION

(1) Check condition of all pulleys.

REMOVAL AND INSTALLATION (Continued)

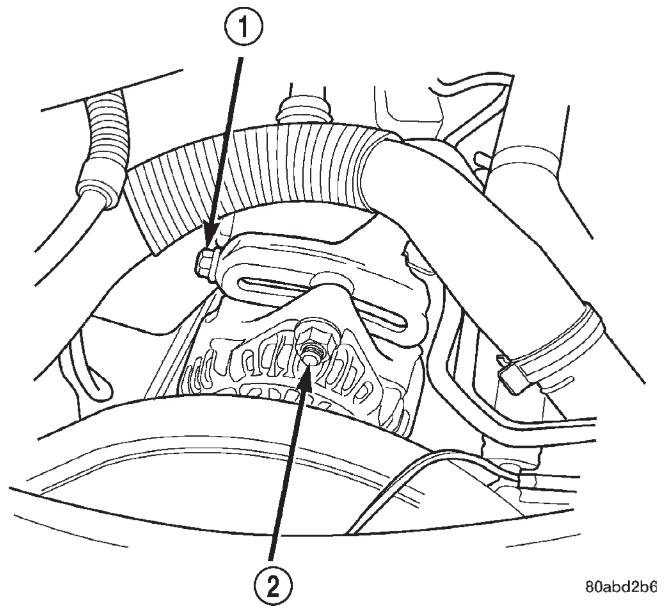


Fig. 54 Generator Belt Tension Adjust Bracket

1 – TENSION ADJUSTMENT BOLT
2 – UPPER ALTERNATOR NUT

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 51) (Fig. 52) for correct belt routing.

(2) Install new belt.

(3) Using serpentine belt tension gauge, tighten adjusting bolt until belt reaches proper tension. Refer to Belt Tension at the rear of this section for proper belt tension.

(4) Tighten alternator upper and lower mounting bolts.

(5) After generator and adjust bracket have been tightened into position, recheck belt tension. Adjust if necessary.

COOLING SYSTEM FANS

REMOVAL

Some engines have the mechanical fan/viscous fan drive assembly mounted directly to the water pump hub (Fig. 55). It may also be mounted to a hub/bearing attached to an aluminum bracket on the right front side of engine (Fig. 56).

(1) Loosen but do not remove at this time, the four fan hub mounting nuts (Fig. 55) (Fig. 56).

(2) Remove accessory serpentine drive belt. Refer to Belt Service in the Engine Accessory Drive Belt section of this group.

(3) Some models with certain engines may require the removal of the fan shroud to remove the viscous fan drive. The fan shroud and fan blade/viscous fan drive should be removed from the vehicle as one assembly.

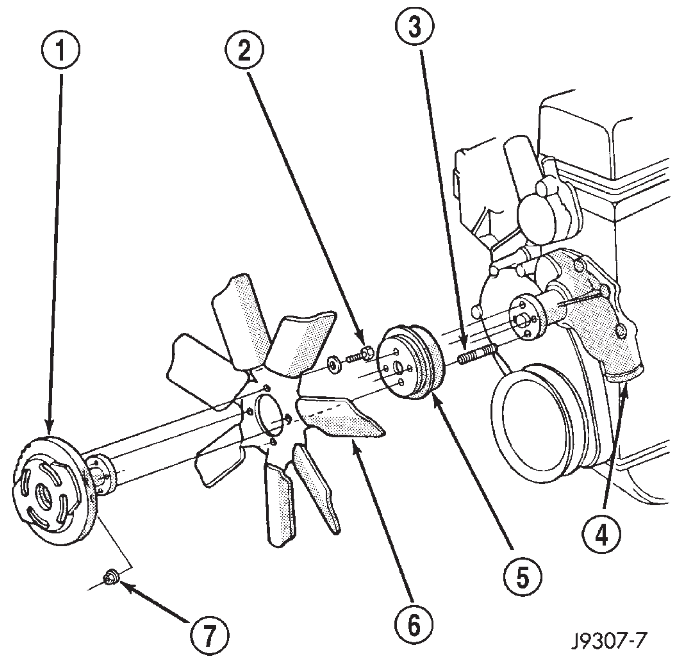


Fig. 55 Water Pump Mounted Cooling Fan

1 – THERMAL VISCOUS FAN DRIVE
2 – (4) FAN BLADE-TO-VISCOUS DRIVE BOLTS
3 – (4) FAN HUB-TO-PUMP PULLEY STUDS
4 – WATER PUMP
5 – WATER PUMP PULLEY
6 – FAN BLADE
7 – (4) FAN HUB-TO-PUMP PULLEY NUTS

(4) Remove four fan hub mounting nuts (Fig. 55) (Fig. 56) and remove fan/viscous fan drive assembly from vehicle.

(5) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

(2) Position mounting flange of fan blade/viscous fan drive assembly onto hub. Install four nuts and tighten to 24 N·m (18 ft. lbs.) torque. Tighten the first two nuts 180 degrees apart. Then tighten last two nuts.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to appropriate Engine Accessory Drive Belt Schematic in this group for correct belt routing.

REMOVAL AND INSTALLATION (Continued)

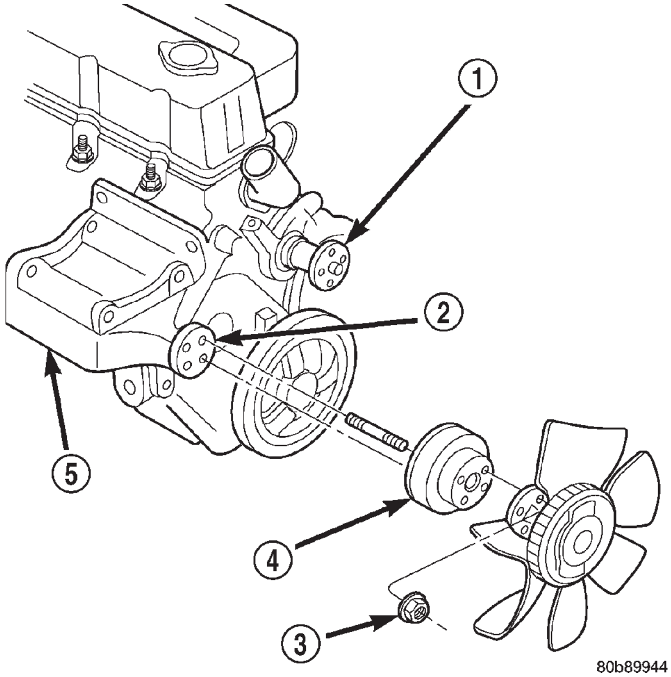


Fig. 56 Bracket Mounted Cooling Fan

1 – WATER PUMP (2.5L ENGINE)
2 – HUB/BEARING (4.0L ENGINE)
3 – PULLEY NUTS
4 – PULLEY
5 – BRACKET

(3) Install accessory drive belts. Tension belts to specifications. Refer to the Specifications section at the end of this group.

VISCOUS FAN DRIVE REMOVAL/INSTALLATION

Refer to Cooling System Fan for removal and installation procedures of the viscous drive unit.

Viscous Fan Drive Fluid Pump Out Requirement:

After installing a **new** viscous fan drive, bring the engine speed up to approximately 2000 rpm and hold for approximately two minutes. This will ensure proper fluid distribution within the drive.

CLEANING AND INSPECTION

RADIATOR PRESSURE CAP

CLEANING

Clean the radiator pressure cap using a mild soap and water only.

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

RADIATOR

CLEANING

Clean radiator fins 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

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

WATER PUMP

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

INSPECTION

Inspect the water pump assembly for cracks in the housing, Water leaks from shaft seal, Loose or rough turning bearing or Impeller rubbing either the pump body or timing chain case/cover.

FAN BLADE

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF FAN IS NOT WITHIN SPECIFICATIONS.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

(1) Remove fan blade assembly from viscous fan drive unit (four bolts).

(2) Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.

CLEANING AND INSPECTION (Continued)

(3) Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

COOLING SYSTEM HOSES

INSPECTION

Inspect the hoses at regular intervals. Replace hoses that are cracked, feel brittle when squeezed or swell excessively when the system is pressurized. The use of molded replacement hoses is recommended. When performing a hose inspection, inspect the radiator lower hose for proper position and condition of the spring.

SPECIFICATIONS

BELT TENSION

Belt tension must be adjusted. Refer to the following Belt Tension chart for specifications.

DESCRIPTION	N·f	Lbs. ft.
New Serpentine Belt*	800-900	180-200
Used Serpentine Belt	623-712	140-160
* Belt is considered new if it has been used 15 minetes or less.		

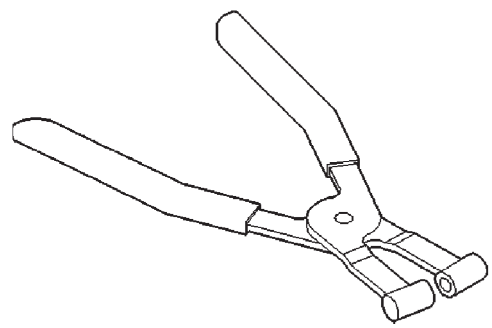
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Trans. Auxiliary Oil Cooler—Screws	2	—	18
Block Heater—Screw	4	—	20
Condenser-to-Radiator—Bolts	6	—	55
Electric Cooling Fan—Bolts	3	—	31
Fan Blade Assy to Viscous Fan Drive—Bolts	24	18	—
Fan Shroud—Bolts	3	—	31
Isolator-to-Crossmember—Nuts	10	—	86
Isolator-to-Radiator—Nuts	5	—	47
Radiator—Bolts			
4.0L Engine	8	—	70
2.5L Engine	6	—	55
Thermostat Housing—Bolts	20	15	—
Viscous Fan Drive Assy. to			

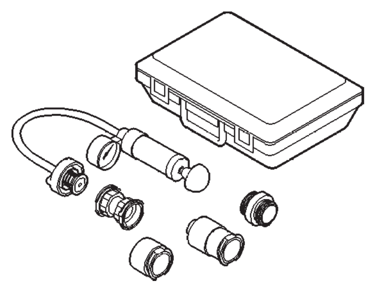
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Water Pump or Hub Bearing—Nuts	27	20	—
Water Pump—Bolts	23	17	—

SPECIAL TOOLS

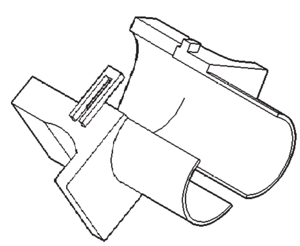
COOLING



Hose Clamp Tool—6094



Cooling System Pressure Tester—7700A



3/8” Quick Connect Release Tool—6935

WIRING DIAGRAMS

CONTENTS

8W-01 GENERAL INFORMATION

INDEX

DESCRIPTION AND OPERATION

INTRODUCTION

DaimlerChrysler wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use DaimlerChrysler wiring diagrams to diagnose and repair a DaimlerChrysler vehicle, it is important to understand all of their features and characteristics.

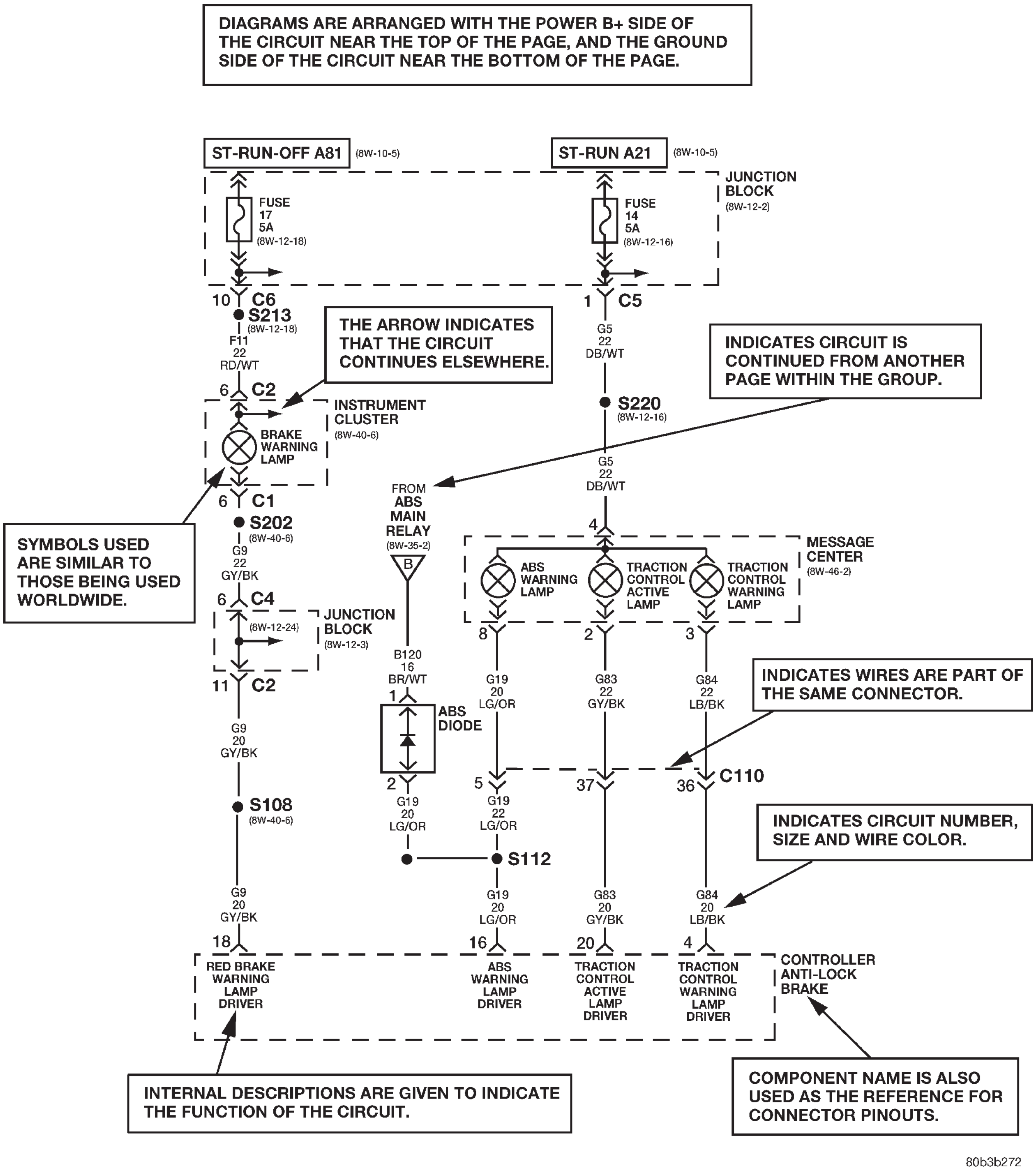
Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page.

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition.

Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around a component indicates that the component being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

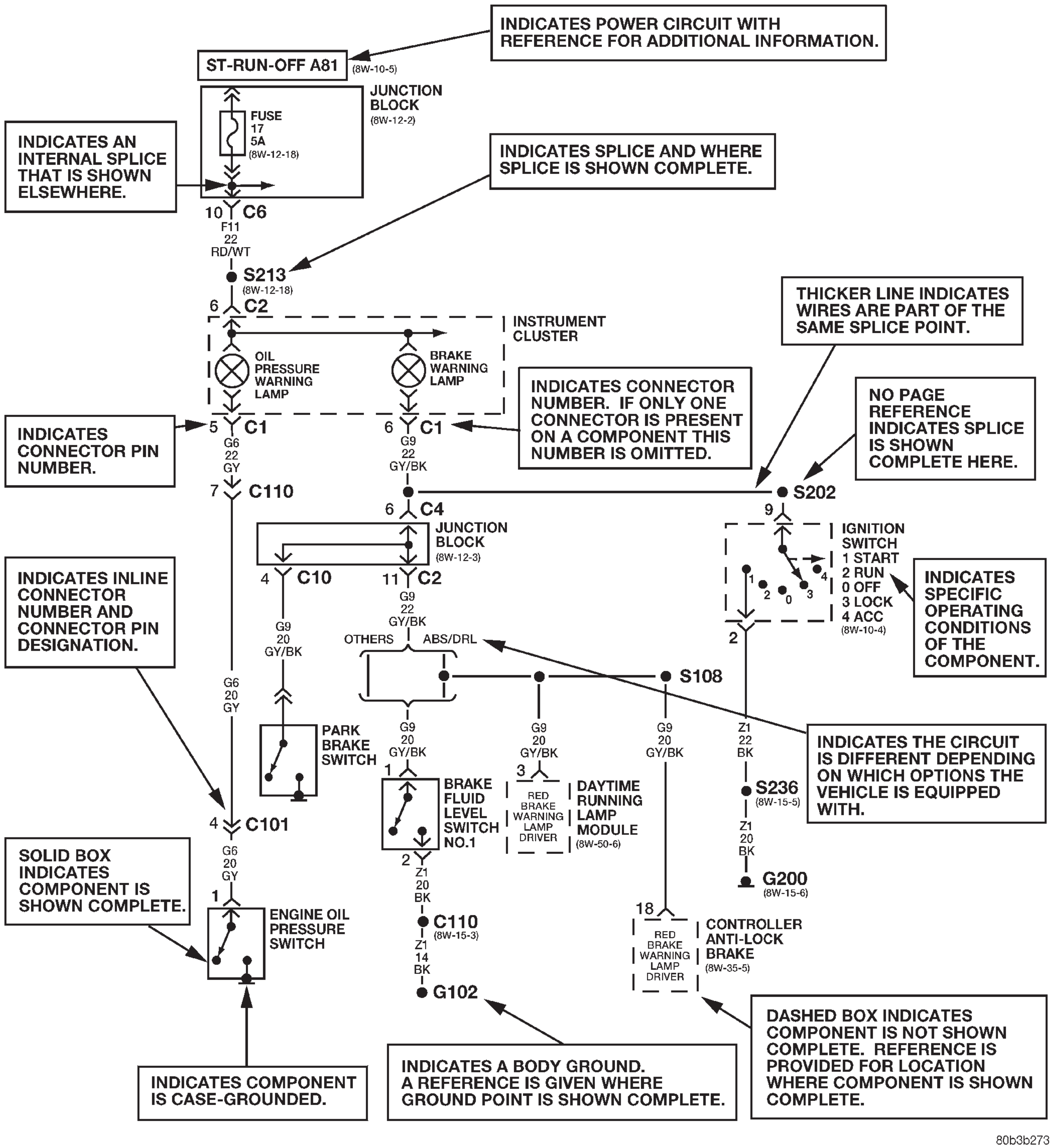
It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.

DESCRIPTION AND OPERATION (Continued)



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

DESCRIPTION AND OPERATION (Continued)



The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

DESCRIPTION AND OPERATION (Continued)

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. 1).

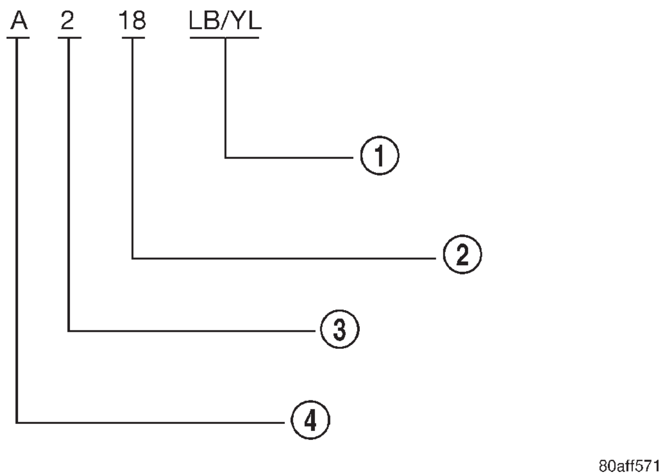


Fig. 1 Wire Code Identification

1 – COLOR OF WIRE (LIGHT BLUE WITH YELLOW TRACER)
2 – GAUGE OF WIRE (18 GAUGE)
3 – PART OF MAIN CIRCUIT (VARIES DEPENDING ON EQUIPMENT)
4 – MAIN CIRCUIT IDENTIFICATION

WIRE COLOR CODE CHART

COLOR CODE	COLOR	STANDARD TRACER COLOR
BL	BLUE	WT
BK	BLACK	WT
BR	BROWN	WT
DB	DARK BLUE	WT
DG	DARK GREEN	WT
GY	GRAY	BK
LB	LIGHT BLUE	BK
LG	LIGHT GREEN	BK
OR	ORANGE	BK
PK	PINK	BK or WT
RD	RED	WT
TN	TAN	WT
VT	VIOLET	WT
WT	WHITE	BK
YL	YELLOW	BK
*	WITH TRACER	

CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and its 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 AND OPERATION (Continued)

SECTION IDENTIFICATION

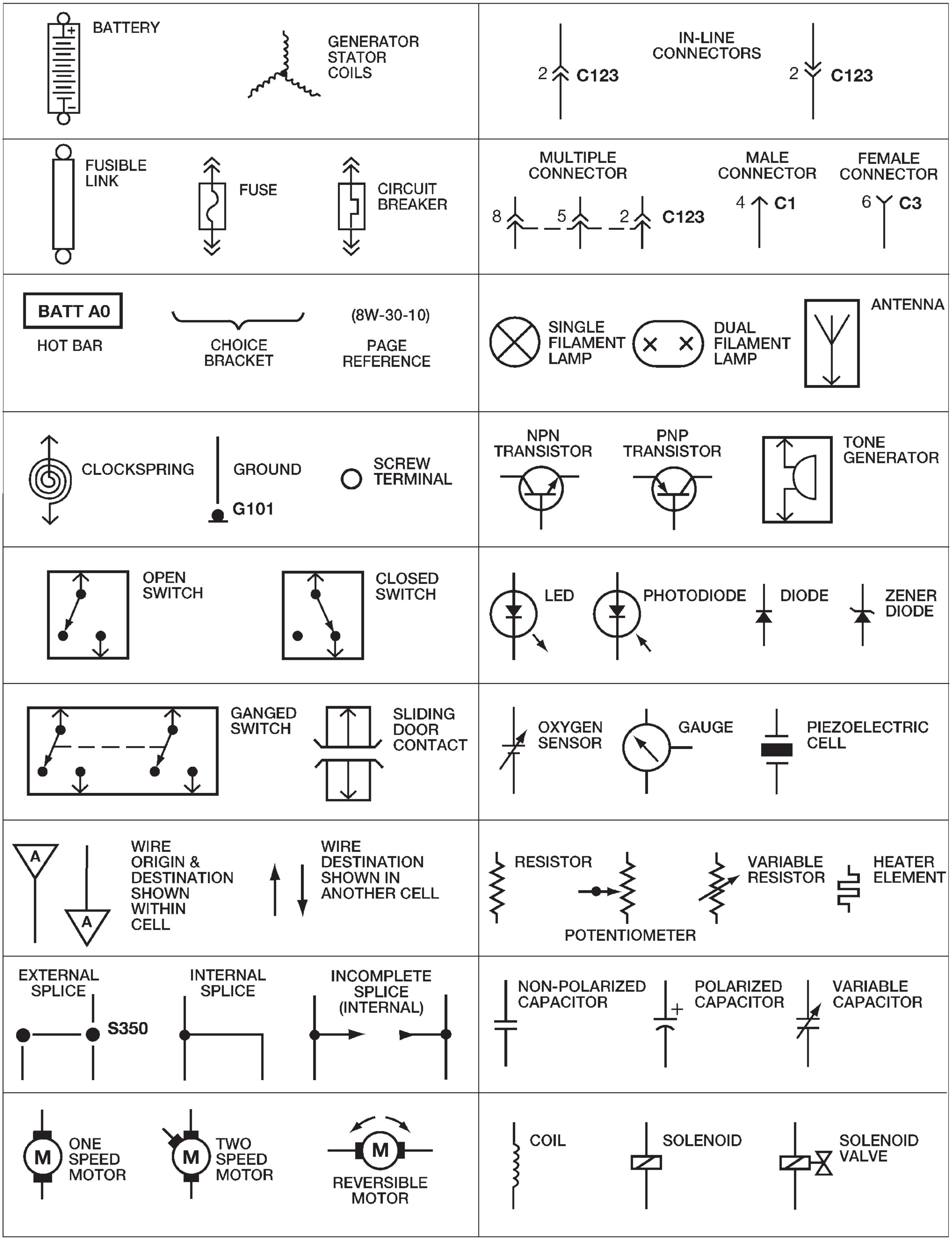
The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world

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-90	Connector Locations (including grounds)
8W-95	Splice Locations

DESCRIPTION AND OPERATION (Continued)



Wiring Diagram Symbols

DESCRIPTION AND OPERATION (Continued)

CONNECTOR 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 on the **engine compartment harness** are **C100** series numbers.
- Connectors located on the **instrument panel harness** are **C200** series numbers.
- Connectors located on the **body harness** 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 connector.

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-90 contains connector/ground location illustrations. The illustrations contain the connector name (or number)/ground number and component identification. Connector/ground location charts in Section 8W-90 reference the illustration number for components and connectors.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the Diagram pages.

SPLICE LOCATIONS

Splice Location charts in Section 8W-70 show the entire splice, and provide references to other sections the splice serves.

Section 8W-95 contains illustrations that show the general location of the splices in each harness. The illustrations show the splice by number, and provide a written location.

NOTES, CAUTIONS, and WARNINGS

Throughout this group additional important information is presented in three ways; Notes, Cautions, and Warnings.

NOTES are used to help describe how switches or components operate to complete a particular circuit. They are also used to indicate different conditions that may appear on the vehicle. For example, an up-to and after condition.

CAUTIONS are used to indicate information that could prevent making an error that may damage the vehicle.

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER, AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY, AND LOOSE CLOTHING.

TAKE OUTS

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component.

DESCRIPTION AND OPERATION (Continued)

ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are solid state and a symbol (Fig. 2) is used to indicate this. When handling any component with this symbol comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

(1) Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.

(2) Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.

(3) When using a voltmeter, be sure to connect the ground lead first.

(4) Do not remove the part from its protective packing until it is time to install the part.

(5) Before removing the part from its package, ground the package to a known good ground on the vehicle.

Fig. 2 Electrostatic Discharge Symbol

DIAGNOSIS AND TESTING

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

• Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: NEVER USE A JUMPER WIRE ACROSS A LOAD, SUCH AS A MOTOR, CONNECTED BETWEEN A BATTERY FEED AND GROUND.

• Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicle are solid state. When checking voltages in these circuits use a meter with a 10-megohm or greater impedance rating.

• Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: - Most of the electrical components used in today's vehicle are Solid State. When checking resistance in these circuits use a meter with a 10-megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle electrical system can cause damage to the equipment and provide false readings.

• Probing Tools - These tools are used for probing terminals in connectors (Fig. 3). 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.

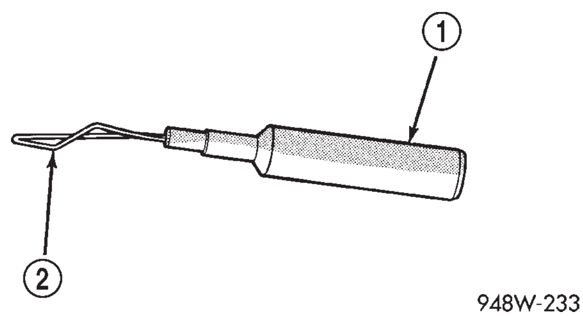


Fig. 3 Probing Tool

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 in position
• Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
• Damaged connector/component casing exposing the item to dirt and moisture
• Wire insulation that has rubbed through causing a short to ground
• Some or all of the wiring strands broken inside of the insulation covering.
• Wiring broken inside of the insulation

DIAGNOSIS AND TESTING (Continued)

TROUBLESHOOTING TESTS

Before beginning any tests on a vehicles electrical system use the Wiring Diagrams and study the circuit. Also refer to the Troubleshooting Wiring Problems in this section.

TESTING FOR VOLTAGE POTENTIAL

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 4).

(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.

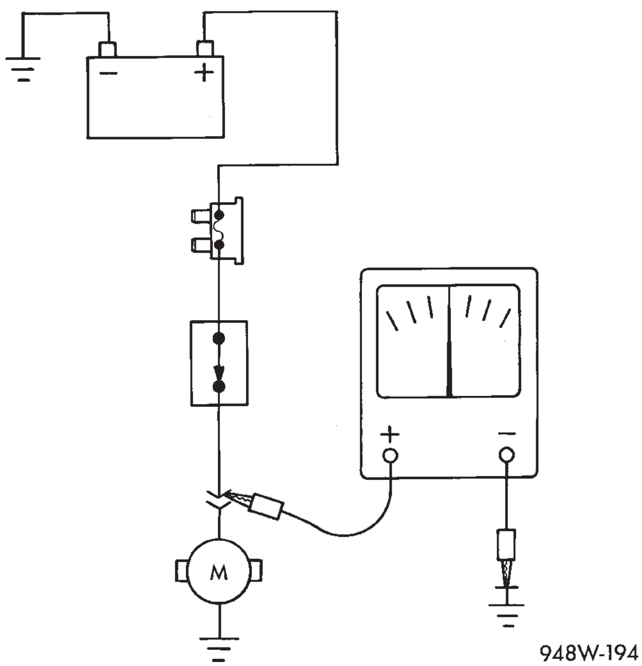


Fig. 4 Testing for Voltage Potential

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. 5).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

TESTING FOR A SHORT TO GROUND

(1) Remove the fuse and disconnect all items involved with the fuse.

(2) Connect a test light or a voltmeter across the terminals of the fuse.

(3) Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.

(4) If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

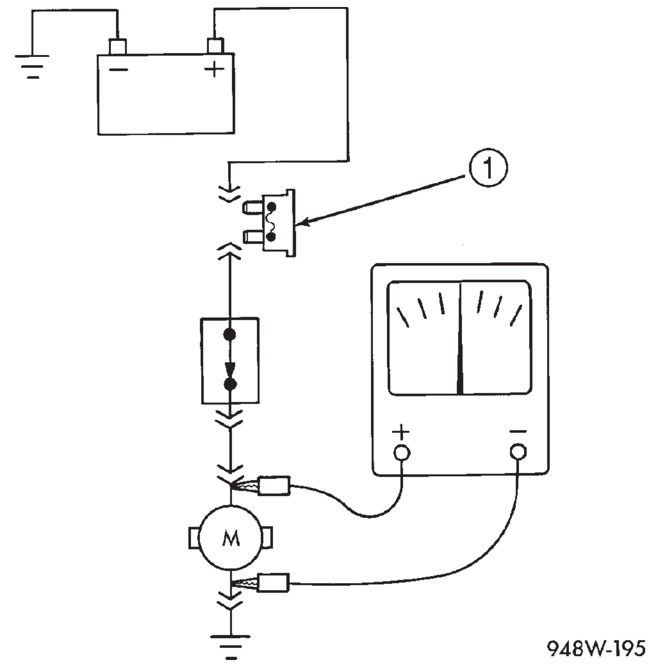


Fig. 5 Testing for Continuity

1 – FUSE REMOVED FROM CIRCUIT

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 the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 6).

(2) Connect the other lead of the voltmeter to the other side of the switch or component.

(3) Operate the item.

(4) The voltmeter will show the difference in voltage between the two points.

TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

(1) Verify the problem.

DIAGNOSIS AND TESTING (Continued)

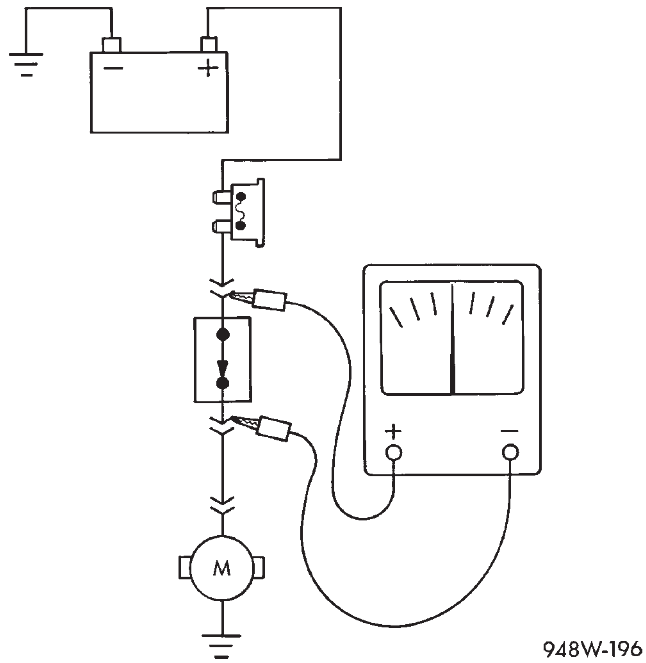


Fig. 6 Testing for Voltage Drop

(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.

(6) Verify proper operation. For this step check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

SERVICE PROCEDURES

WIRING REPAIR

When replacing or repairing a wire, it is important that the correct gage be used as shown in the wiring diagrams. The wires must also be held securely in place to prevent damage to the insulation.

(1) Disconnect battery negative cable

(2) Remove 1 inch of insulation from each end of the wire.

(3) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(4) Spread the strands of the wire apart on each part of the exposed wire (example 1). (Fig. 7)

(5) Push the two ends of wire together until the strands of wire are close to the insulation (example 2) (Fig. 7)

(6) Twist the wires together (example 3) (Fig. 7)

(7) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(8) Center the heat shrink tubing over the joint, and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

(9) Secure the wire to the existing ones to prevent chafing or damage to the insulation

(10) Connect battery and test all affected systems.

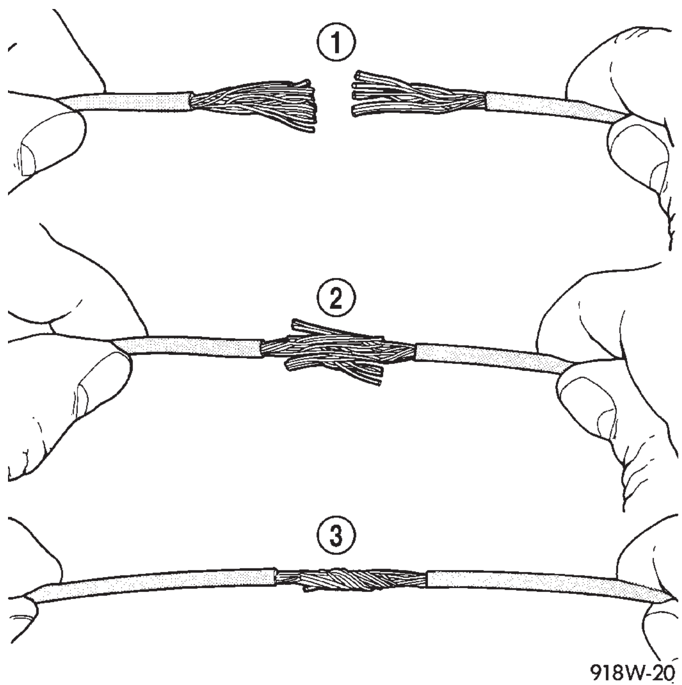


Fig. 7 Wire Repair

1 – EXAMPLE 1
2 – EXAMPLE 2
3 – EXAMPLE 3

TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/component.

(3) Insert the terminal releasing special tool 6742 into the terminal end of the connector (Fig. 8).

(4) Using special tool 6742 release the locking fingers on the terminal (Fig. 9).

(5) Pull on the wire to remove it from the connector.

(6) Repair or replace the connector or terminal, as necessary.

TERMINAL/CONNECTOR REPAIR—THOMAS AND BETTS CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/component.

SERVICE PROCEDURES (Continued)

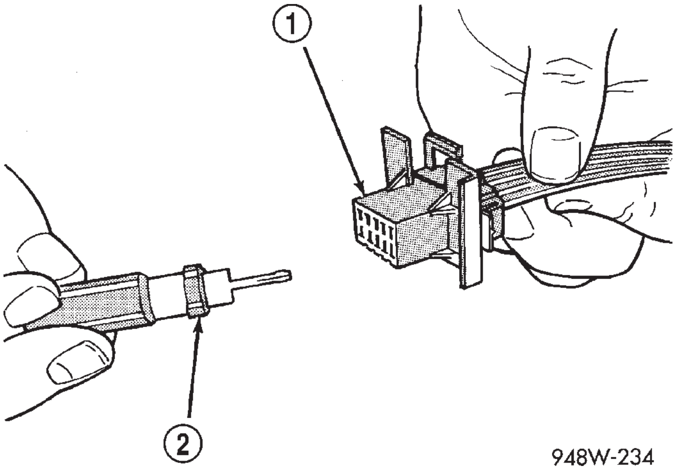


Fig. 8 Molex Connector Repair

1 – CONNECTOR
2 – SPECIAL TOOL 6742

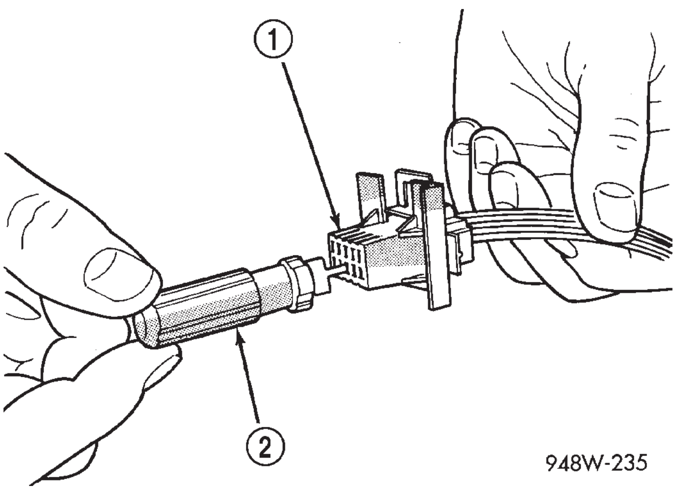


Fig. 9 Using Special Tool 6742

1 – CONNECTOR
2 – SPECIAL TOOL 6742

(3) Push in the two lock tabs on the side of the connector (Fig. 10).

(4) Insert the probe end of special tool 6934 into the back of the connector cavity (Fig. 11).

(5) Grasp the wire and tool 6934 and slowly remove the wire and terminal from the connector.

(6) Repair or replace the terminal.

(7) Install the wire and terminal in the connector. Fully seat the terminal in the connector.

(8) Push in the single lock tab on the side of the connector (Fig. 12).

TERMINAL/CONNECTOR REPAIR- AUGAT CONNECTORS

(1) Disconnect battery.

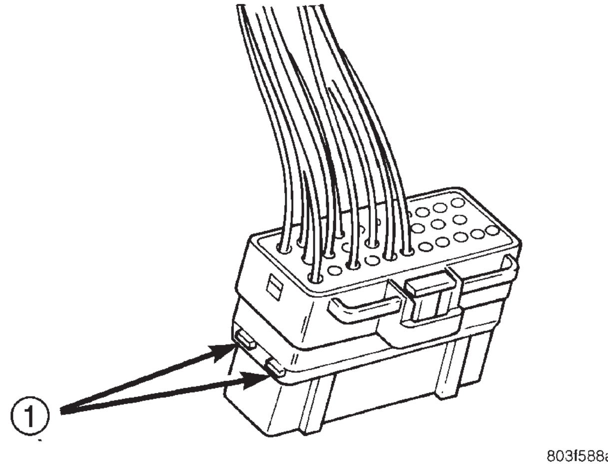


Fig. 10 Thomas and Betts Connector Lock Release Tabs

1 – LOCK TABS

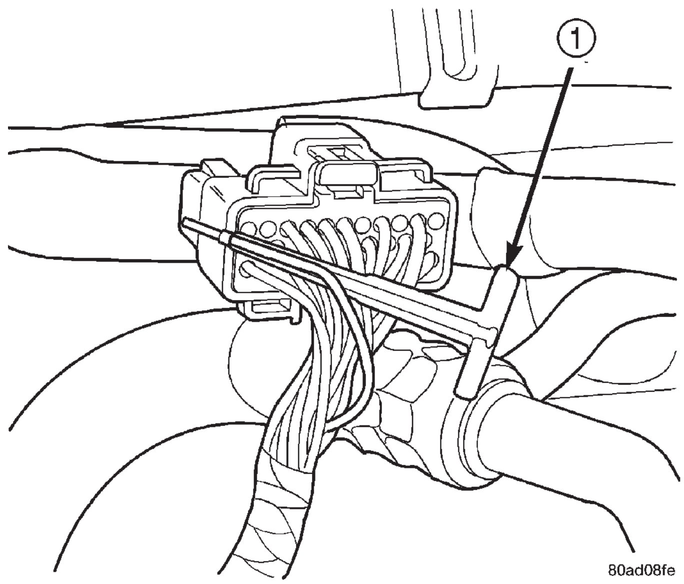


Fig. 11 Removing Wire Terminal

1 – SPECIAL TOOL 6934

(2) Disconnect the connector from its mating half/ component.

(3) Push down on the yellow connector locking tab to release the terminals (Fig. 13).

(4) Using special tool 6932, push the terminal to remove it from the connector (Fig. 14).

(5) Repair or replace the connector or terminal as necessary.

(6) When re-assembling the connector, the locking wedge must be placed in the locked position to prevent terminal push out.

SERVICE PROCEDURES (Continued)

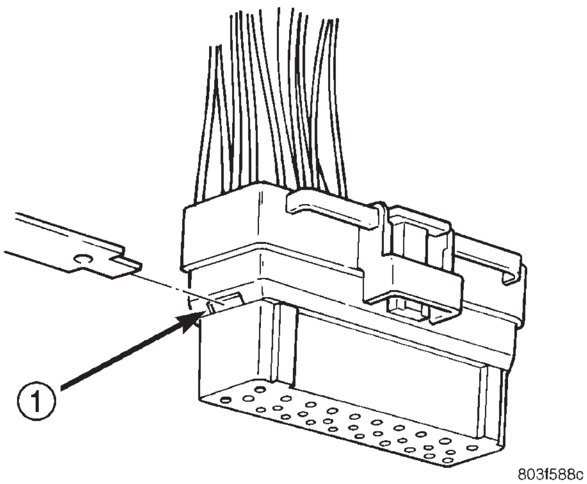


Fig. 12 Single Lock Tab

1 – SINGLE LOCK TAB

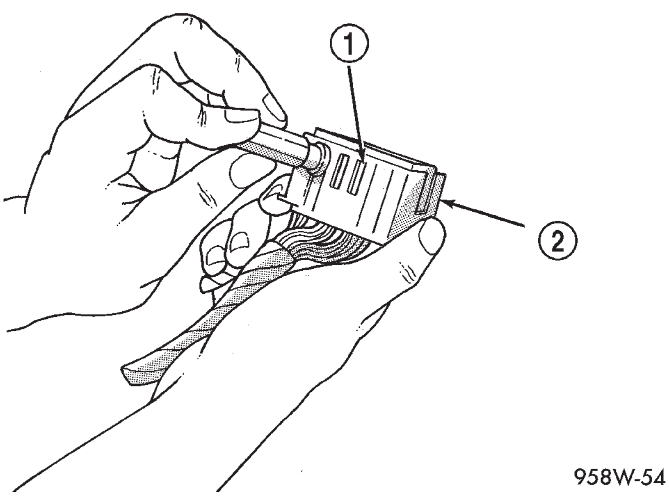


Fig. 13 Augat Connector Repair

1 – LOCKING TAB
2 – CONNECTOR

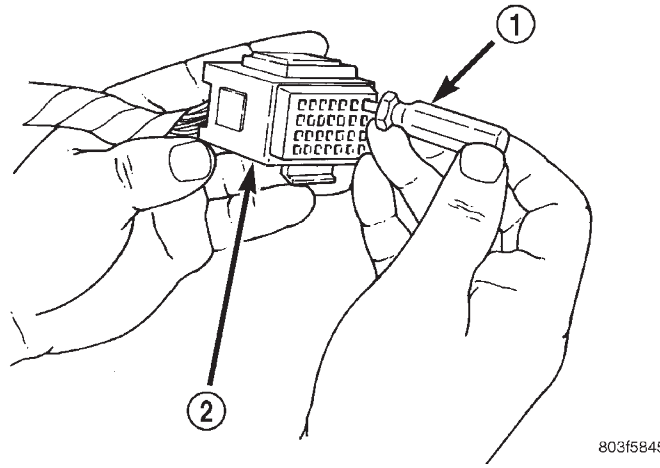


Fig. 14 Using Special Tool 6932

1 – SPECIAL TOOL 6932
2 – CONNECTOR

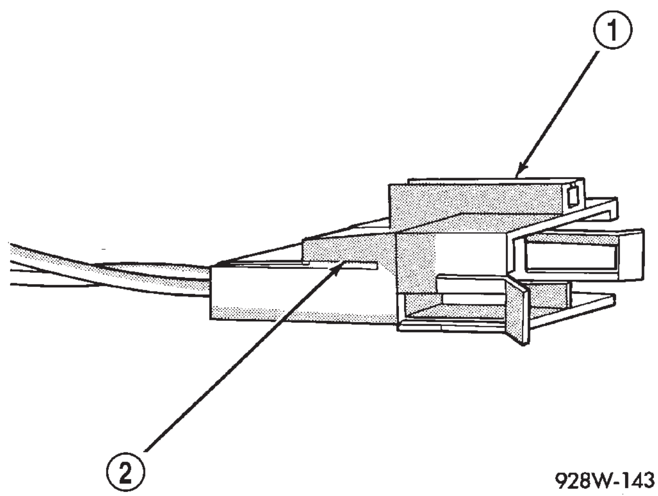


Fig. 15 Connector Locking Wedge

1 – CONNECTOR
2 – CONNECTOR LOCKING WEDGE TAB

CONNECTOR REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector that is to be repaired from its mating half/component

(3) Remove the connector locking wedge, if required (Fig. 15)

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 16) (Fig. 17).

(5) Reset the terminal locking tang, if it has one.

(6) Insert the removed wire in the same cavity on the repair connector.

(7) Repeat steps four through six for each wire in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.

(8) Insert the connector locking wedge into the repaired connector, if required.

(9) Connect connector to its mating half/component.

(10) Connect battery and test all affected systems.

CONNECTOR AND TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector (that is to be repaired) from its mating half/component.

(3) Cut off the existing wire connector directly behind the insulator. Remove six inches of tape from the harness.

SERVICE PROCEDURES (Continued)

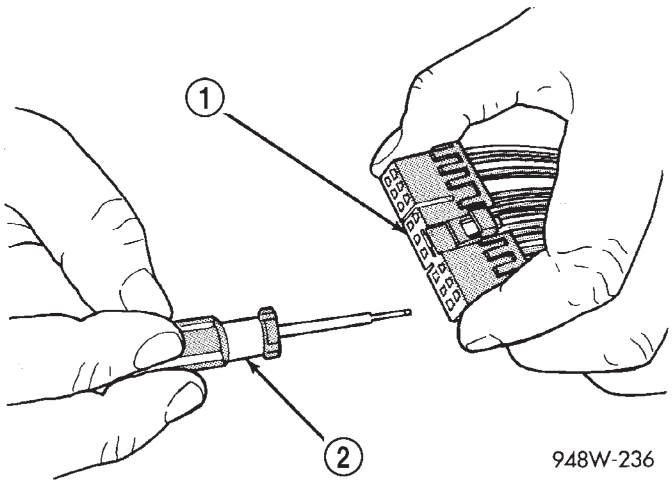


Fig. 16 Terminal Removal

1 – CONNECTOR
2 – FROM SPECIAL TOOL KIT 6680

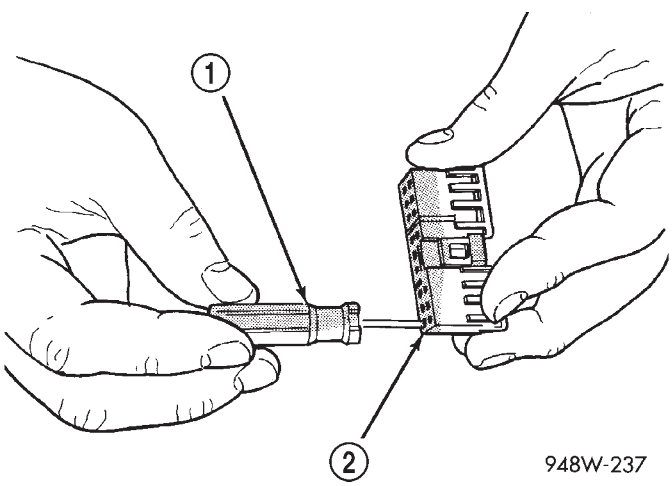


Fig. 17 Terminal Removal Using Special Tool

1 – FROM SPECIAL TOOL KIT 6680
2 – CONNECTOR

(4) Stagger cut all wires on the harness side at 1/2 inch intervals (Fig. 18).

(5) Remove 1 inch of insulation from each wire on the harness side.

(6) Stagger cut the matching wires on the repair connector assembly in the opposite order as was done on the harness side of the repair. Allow extra length for soldered connections. Check that the overall length is the same as the original (Fig. 18).

(7) Remove 1 inch of insulation from each wire.

(8) Place a piece of heat shrink tubing over one side of the wire. Be sure the tubing will be long enough to cover and seal the entire repair area.

(9) Spread the strands of the wire apart on each part of the exposed wires.

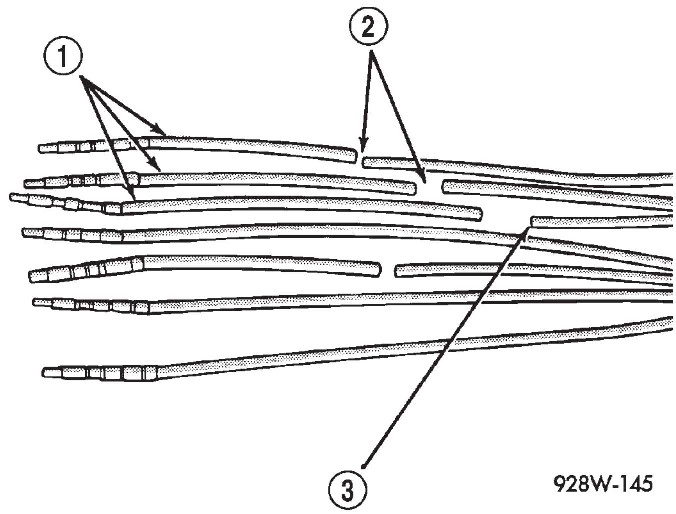


Fig. 18 Stagger Cutting Wires

1 – REPAIR SIDE WIRES
2 – STAGER CUTS
3 – HARNESS WIRES

(10) Push the two ends of wire together until the strands of wire are close to the insulation.

(11) Twist the wires together.

(12) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(13) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing

(14) Repeat steps 8 through 13 for each wire.

(15) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(16) Re-connect the repaired connector.

(17) Connect the battery, and test all affected systems.

TERMINAL REPLACEMENT

(1) Disconnect battery.

(2) Disconnect the connector being repaired from its mating half. Remove connector locking wedge, if required (Fig. 19).

(3) Remove connector locking wedge, if required (Fig. 19).

(4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Fig. 20) (Fig. 21).

(5) Cut the wire 6 inches from the back of the connector.

(6) Remove 1 inch of insulation from the wire on the harness side.

(7) Select a wire from the terminal repair assembly that best matches the color wire being repaired.

SERVICE PROCEDURES (Continued)

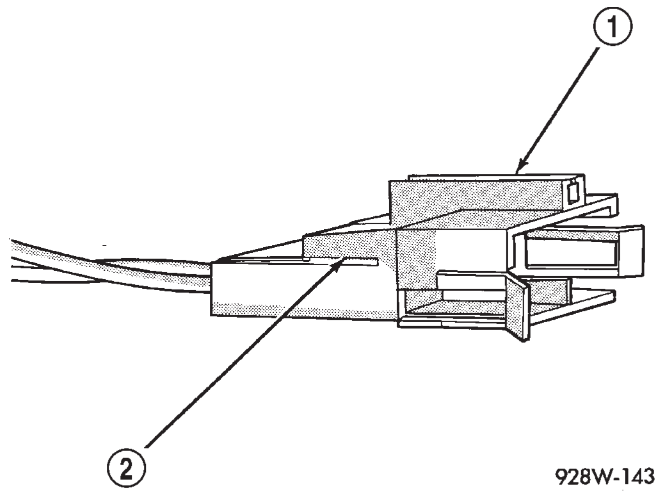


Fig. 19 Connector Locking Wedge Tab (Typical)

1 – CONNECTOR
2 – CONNECTOR LOCKING WEDGE TAB

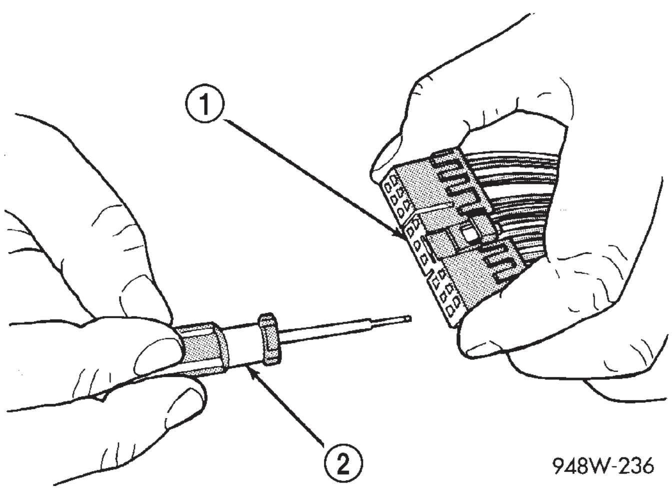


Fig. 20 Terminal Removal

1 – CONNECTOR
2 – FROM SPECIAL TOOL KIT 6680

(8) Cut the repair wire to the proper length and remove 1 inch of insulation.

(9) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(10) Spread the strands of the wire apart on each part of the exposed wires.

(11) Push the two ends of wire together until the strands of wire are close to the insulation.

(12) Twist the wires together.

(13) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(14) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

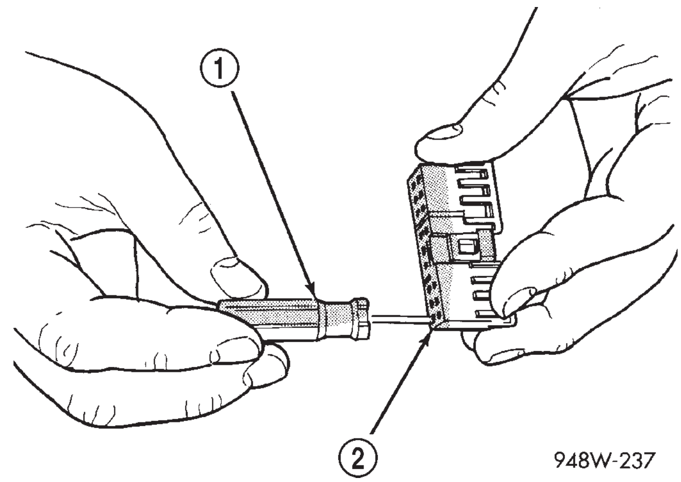


Fig. 21 Terminal Removal Using Special Tool

1 – FROM SPECIAL TOOL KIT 6680
2 – CONNECTOR

(15) Insert the repaired wire into the connector.

(16) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(17) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.

(18) Connect battery, and test all affected systems.

DIODE REPLACEMENT

(1) Disconnect the battery.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 22).

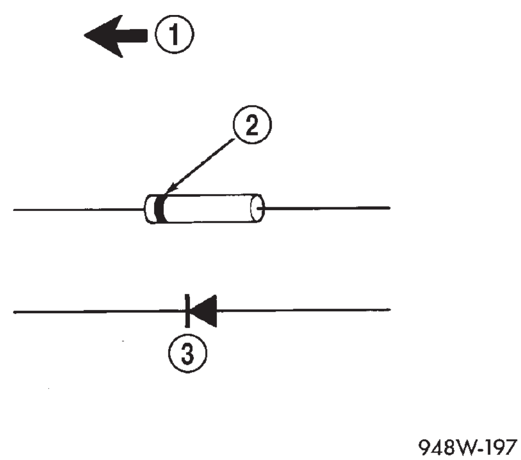


Fig. 22 Diode Identification

1 – CURRENT FLOW
2 – BAND AROUND DIODE INDICATES CURRENT FLOW
3 – DIODE AS SHOWN IN THE DIAGRAMS

SERVICE PROCEDURES (Continued)

(4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(5) Install the new diode in the harness, making sure current flow is correct. If necessary refer to the appropriate wiring diagram for current flow.

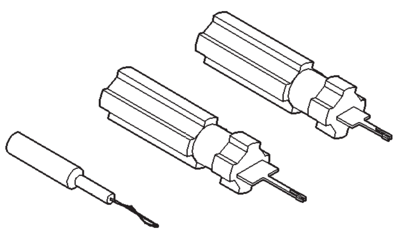
(6) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(7) Tape the diode to the harness using electrical tape making, sure the diode is completely sealed from the elements.

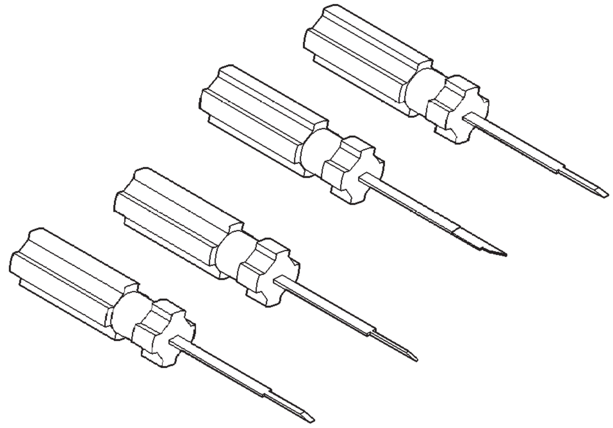
(8) Re-connect the battery, and test affected systems.

SPECIAL TOOLS

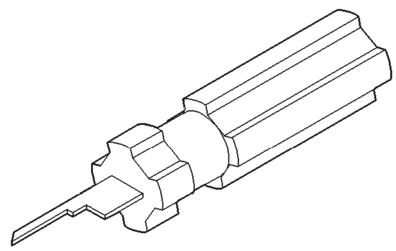
WIRING/TERMINAL



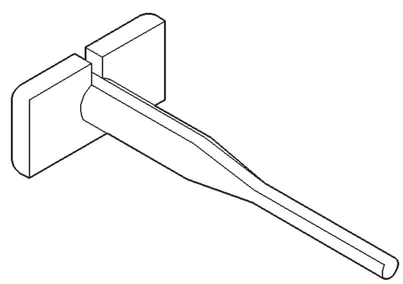
Probing Tool Package 6807



Terminal Pick 6680



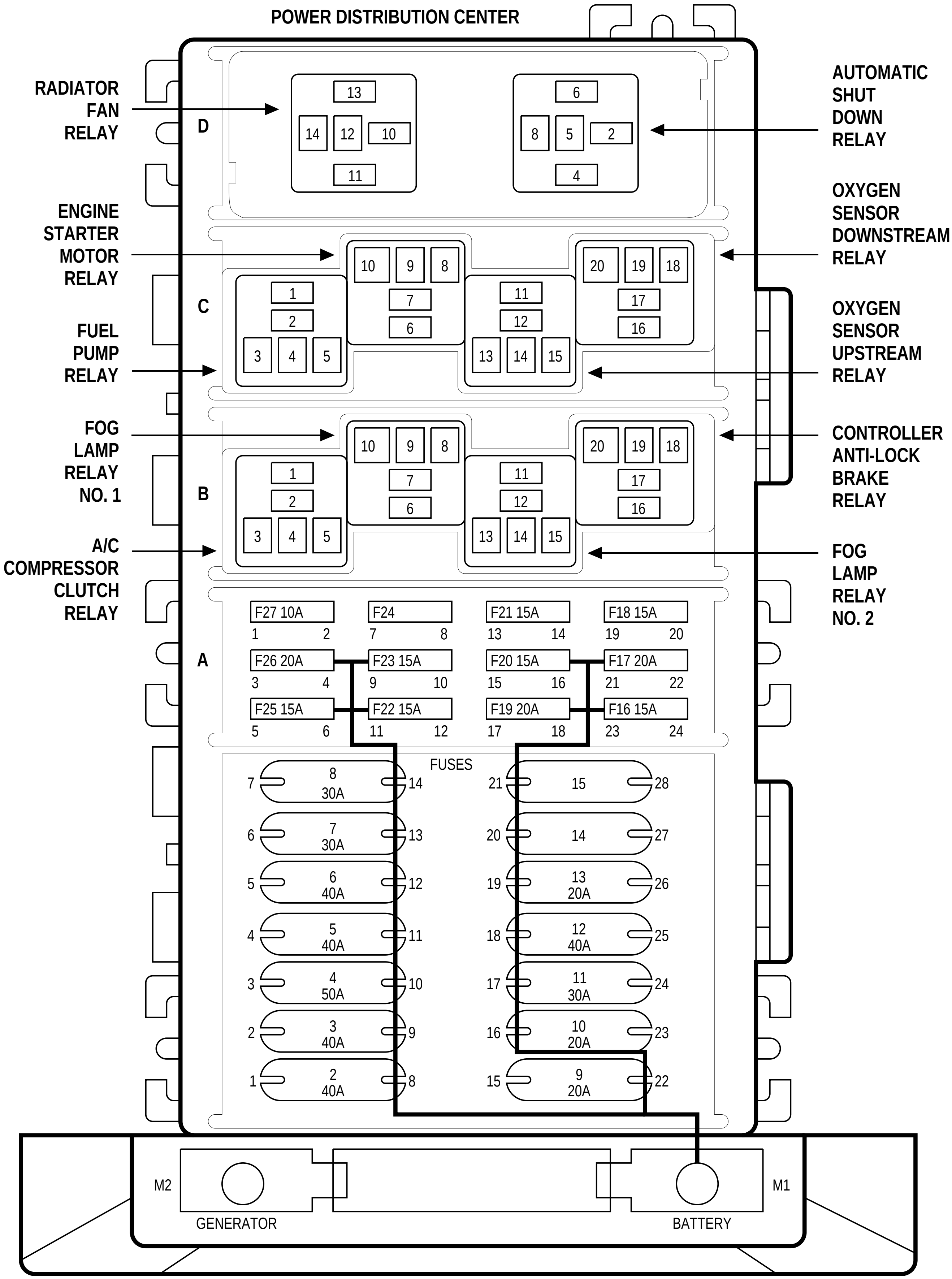
Terminal Removing Tool 6932



Terminal Removing Tool 6934

8W-02 COMPONENT INDEX

8W-10 POWER DISTRIBUTION


POWER DISTRIBUTION CENTER
RADIATOR FAN RELAY
AUTOMATIC SHUT DOWN RELAY
ENGINE STARTER MOTOR RELAY
OXYGEN SENSOR DOWNSTREAM RELAY
FUEL PUMP RELAY
OXYGEN SENSOR UPSTREAM RELAY
FOG LAMP RELAY NO. 1
CONTROLLER ANTI-LOCK BRAKE RELAY
A/C COMPRESSOR CLUTCH RELAY
FOG LAMP RELAY NO. 2
D
C
B
A
F27 10A
F24
F21 15A
F18 15A
F26 20A
F23 15A
F20 15A
F17 20A
F25 15A
F22 15A
F19 20A
F16 15A
FUSES
8 30A
7 30A
6 40A
5 40A
4 50A
3 40A
2 40A
15
14
13 20A
12 40A
11 30A
10 20A
9 20A
M2
M1
GENERATOR
BATTERY

FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FEED CIRCUIT
1	-	-	-
2	40A	A1 12RD	A0 6RD
3	40A	A2 12PK/BK	A0 6RD
4	50A	A7 10RD/BK	A0 6RD
5	40A	F141 12LG/RD	A0 6RD
6	40A	A111 12RD/LG	A0 6RD
7	30A	A3 14RD/WT A3 14RD/WT ▲	A0 6RD
8	30A	A16 14RD/LG	A0 6RD
9	20A	A17 16RD/BK A17 16RD/BK	A0 6RD
10	20A	A41 16YL	A0 6RD
11	30A	A4 12BK/PK	A0 6RD
12 ●	40A	A10 12RD/DG	A0 6RD
13 ●	20A	A20 12RD/DB	A0 6RD
14	-	-	A0 6RD
15	-	-	A0 6RD
16	15A	M1 20PK	A0 6RD
17 ■	20A	F99 18RD	A0 6RD
18	15A	A142 18DG/OR	A999 16RD
19	20A	F34 18TN/BK	A0 6RD
20	15A	L9 20BK/PK	A0 6RD
21	15A	F142 18DG/WT	A999 16RD
22	15A	A61 14DG/BK	A0 6RD
23	15A	F32 20PK/DB	A0 6RD
24	-	-	-
25	15A	F61 20WT/OR	A0 6RD
26	20A	F75 16VT	A0 6RD
27	10A	F1 20DB/GY	A17 16RD/BK

● ABS
▲ DRL
■ 4.0L

A/C COMPRESSOR CLUTCH RELAY

CAVITY	CIRCUIT	FUNCTION
B1	A17 16RD/BK	FUSED B(+)
B2	C3 16DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
B3	C13 18DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
B4	-	-
B5	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)

AUTOMATIC SHUT DOWN RELAY

CAVITY	CIRCUIT	FUNCTION
D2	A16 14RD/LG	FUSED B(+)
D4	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
D5	-	-
D6	K51 18DB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
D8	A999 16RD A999 16RD	AUTOMATIC SHUT DOWN RELAY OUTPUT

CONTROLLER ANTI-LOCK BRAKE RELAY

CAVITY	CIRCUIT	FUNCTION
B16	G19 20LG/OR	ABS WARNING INDICATOR DRIVER
B17	-	-
B18	G83 18GY/BK	ABS RELAY CONTROL
B19	Z1 20BK	GROUND
B19	Z1 20BK ■	GROUND
B20	F15 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)

ENGINE STARTER MOTOR RELAY

CAVITY	CIRCUIT	FUNCTION
C6	A41 16YL	FUSED B(+)
C7	T40 16BR	ENGINE STARTER MOTOR RELAY OUTPUT
C8	F45 20YL/RD ●	FUSED B(+) ENGINE STARTER MOTOR RELAY
C8	T141 20YL ▲	IGNITION SWITCH OUTPUT (START)
C9	-	-
C10	Z1 20BK ■■	GROUND
C10	Z1 20BK ▲▲	GROUND
C10	T41 20BK/WT ●●	PARK/NEUTRAL POSITION SWITCH SENSE
C10	T41 20BK/WT ■■■	PARK/NEUTRAL POSITION SWITCH SENSE

■ 4.0L ABS EXCEPT DRL
■■ 4.0L M/T
■■■ 4.0L A/T
▲ 2.5L, 4.0L M/T, RHD 4.0L A/T
▲▲ LHD 4.0L M/T EXCEPT ABS EXCEPT DRL
● LHD 4.0 A/T
●● EXCEPT 4.0L M/T

FOG LAMP RELAY NO. 1

CAVITY	CIRCUIT	FUNCTION
B6	L77 20BR/YL	FUSED HEADLAMP SWITCH OUTPUT
	L77 20BR/YL	FUSED HEADLAMP SWITCH OUTPUT
B7	-	-
B8	Z1 20BK	GROUND
	Z1 20BK	GROUND
B9	L139 20VT	FOG LAMP RELAY OUTPUT NO. 1
B10	L33 20RD/WT ▲	FUSED B(+)
B10	G34 16RD/GY ▲▲	HIGH BEAM INDICATOR DRIVER
	G34 16RD/GY ▲▲	HIGH BEAM INDICATOR DRIVER

FOG LAMP RELAY NO. 2

CAVITY	CIRCUIT	FUNCTION
B11	F61 20WT/OR	FUSED B(+)
B12	L39 20LB	FOG LAMP RELAY OUTPUT
B13	Z1 20BK	GROUND
B14	-	-
B15	L92 20PK	FOG LAMP SWITCH OUTPUT

FUEL PUMP RELAY

CAVITY	CIRCUIT	FUNCTION
C1	A61 14DG/BK	FUSED B(+)
	A61 16DG/BK	FUSED B(+)
C2	A141 14DG/WT	FUEL PUMP RELAY OUTPUT
C3	K31 18BR	FUEL PUMP RELAY CONTROL
C4	-	-
C5	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)

▲ EXCEPT DRL
▲▲ DRL

OXYGEN SENSOR DOWNSTREAM RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
C16	F99 18RD	FUSED B(+)
	F99 18RD	FUSED B(+)
C17	A242 18VT/OR	OXYGEN SENSOR 1/2 DOWNSTREAM
C18	F20 18WT ●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
	F20 18WT ●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
C18	F26 18PK/OR ●●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
	F26 18PK/OR ●●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
C19	-	-
C20	K74 18BR/VT	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL

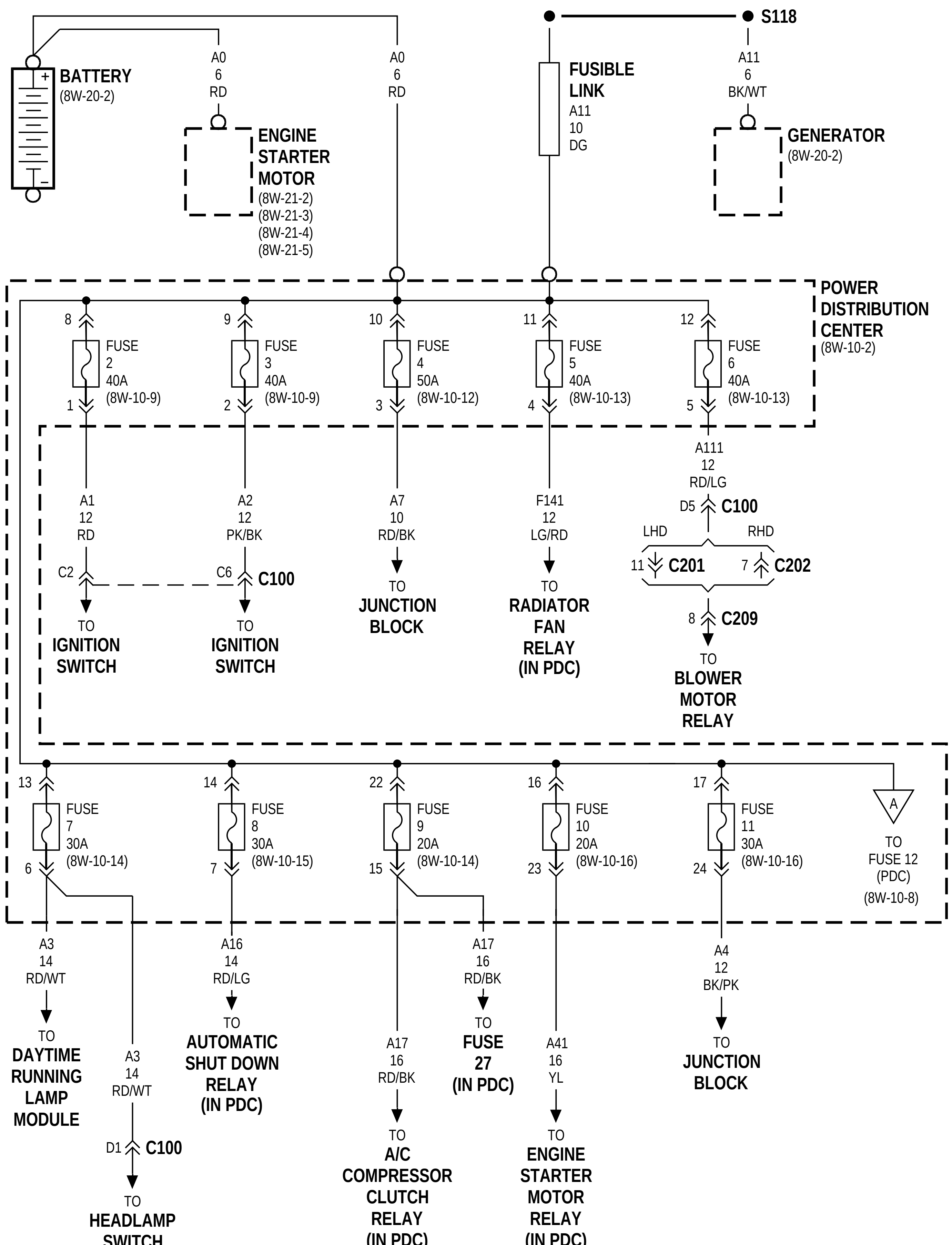
OXYGEN SENSOR UPSTREAM RELAY (GAS)

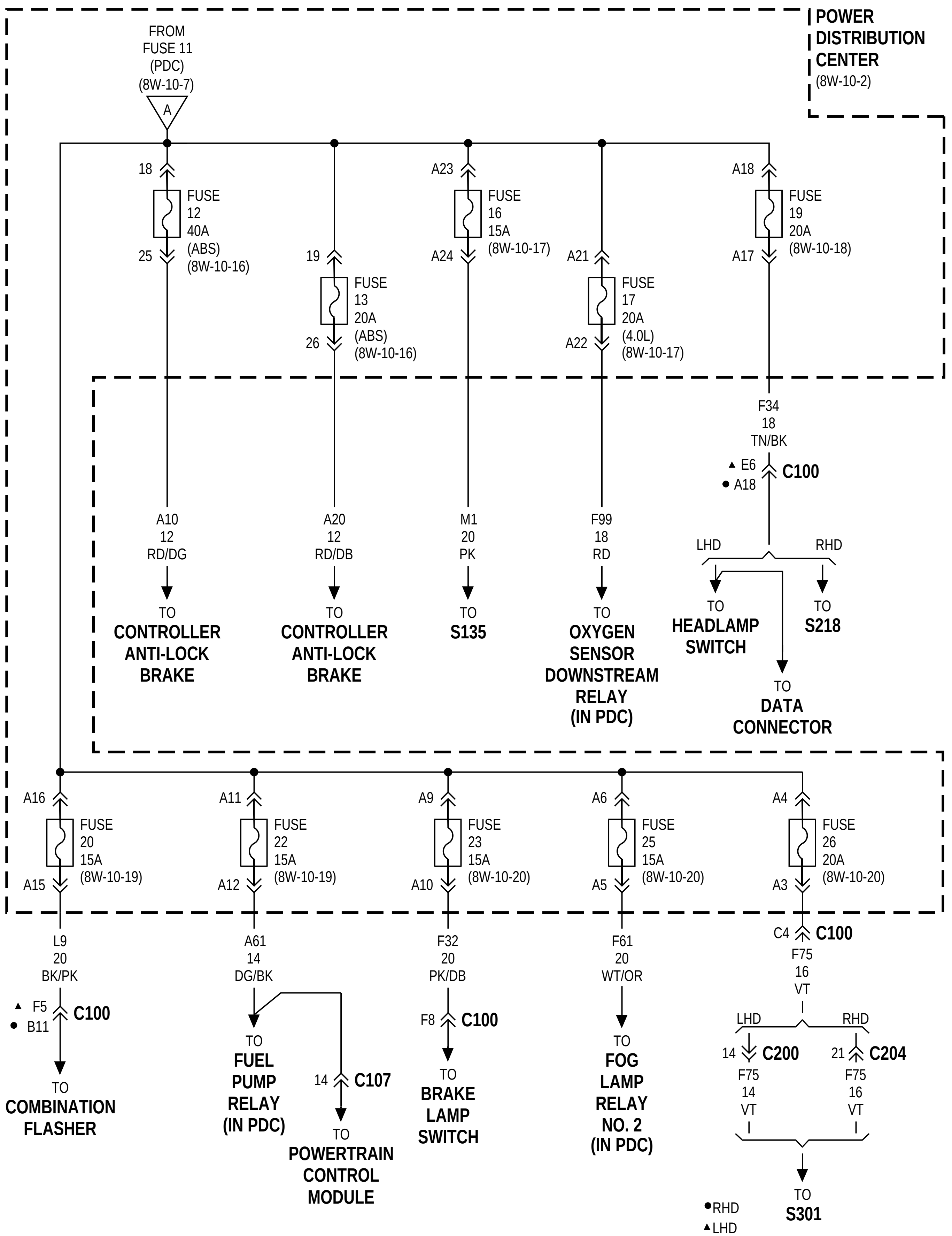
CAVITY	CIRCUIT	FUNCTION
C11	F99 18RD	FUSED B(+)
C12	A42 18DG	OXYGEN SENSOR 1/1 UPSTREAM
C13	F20 18WT ●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
	F20 18WT ●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
C13	F26 18PK/OR ●●	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
C14	-	-
C15	K73 18BR/OR	KNOCK SENSOR SIGNAL (-)

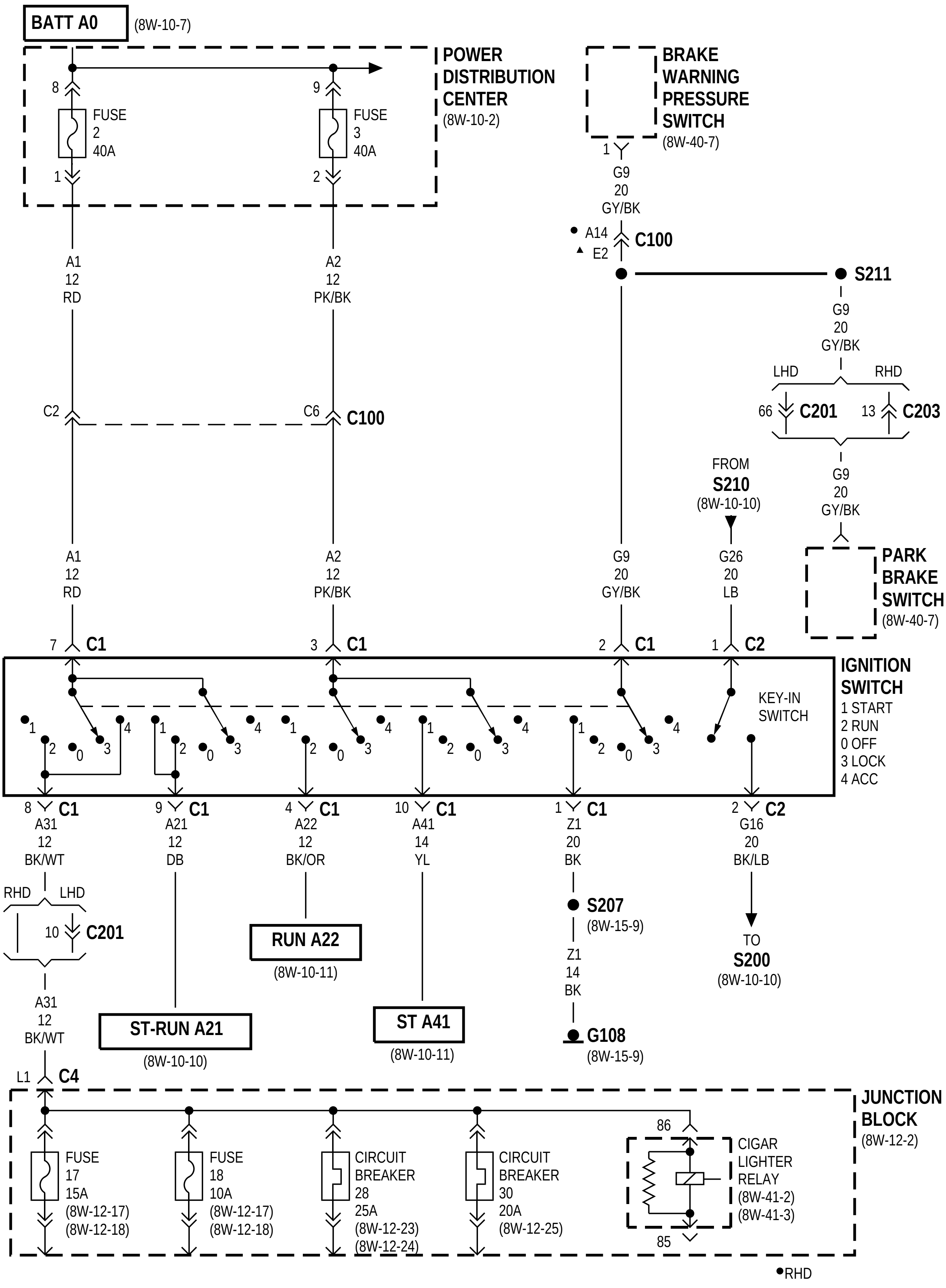
RADIATOR FAN RELAY

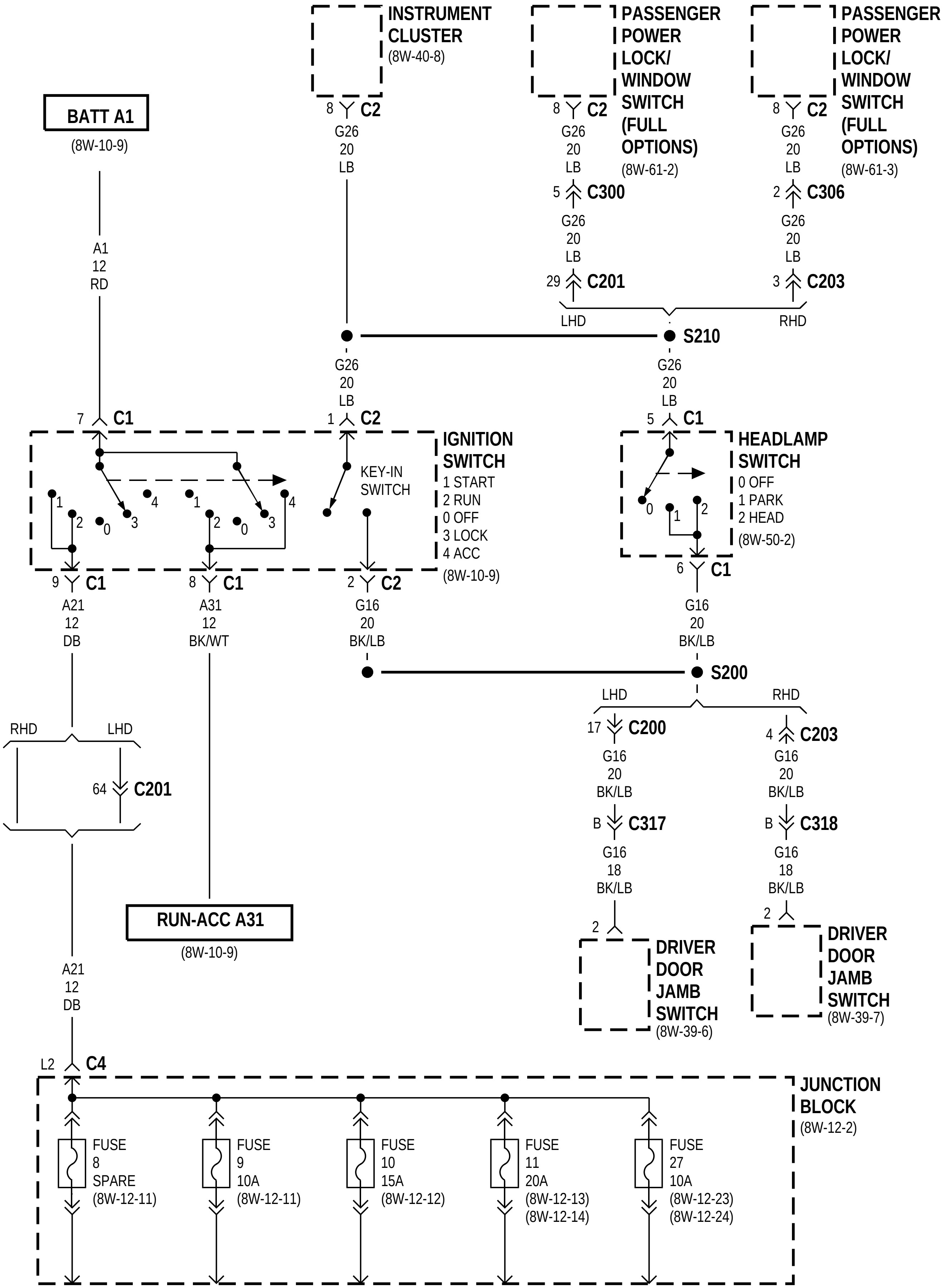
CAVITY	CIRCUIT	FUNCTION
D10	F141 12LG/RD	FUSED B(+)
D11	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
D12	-	-
D13	C27 18DB/PK	RADIATOR FAN RELAY CONTROL
D14	C25 12LB	RADIATOR FAN RELAY OUTPUT

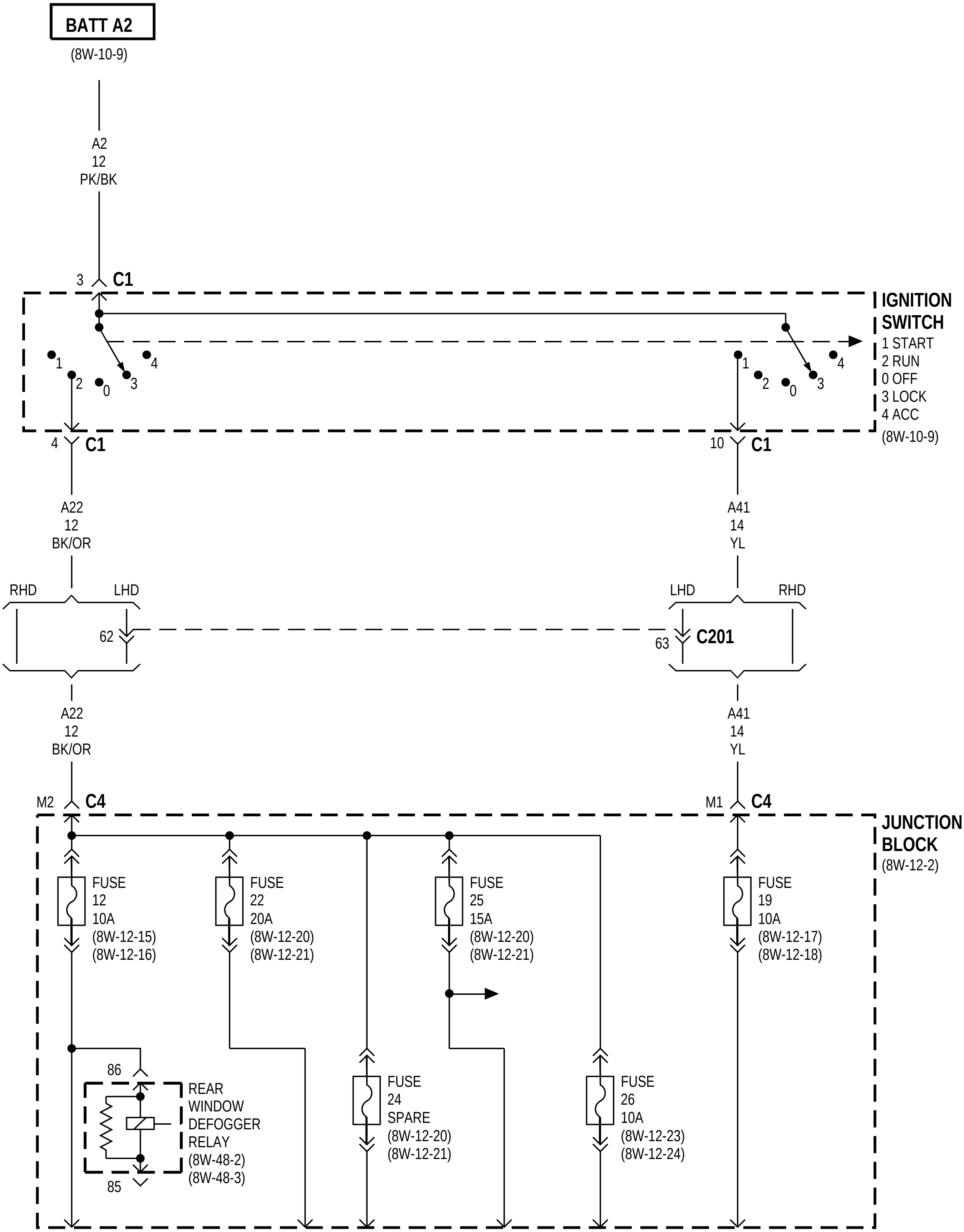
● 2.5L, 4.0L A/T FOG EXCEPT DRL
●● 4.0L (A/T DRL), (A/T EXCEPT FOG), (M/T)

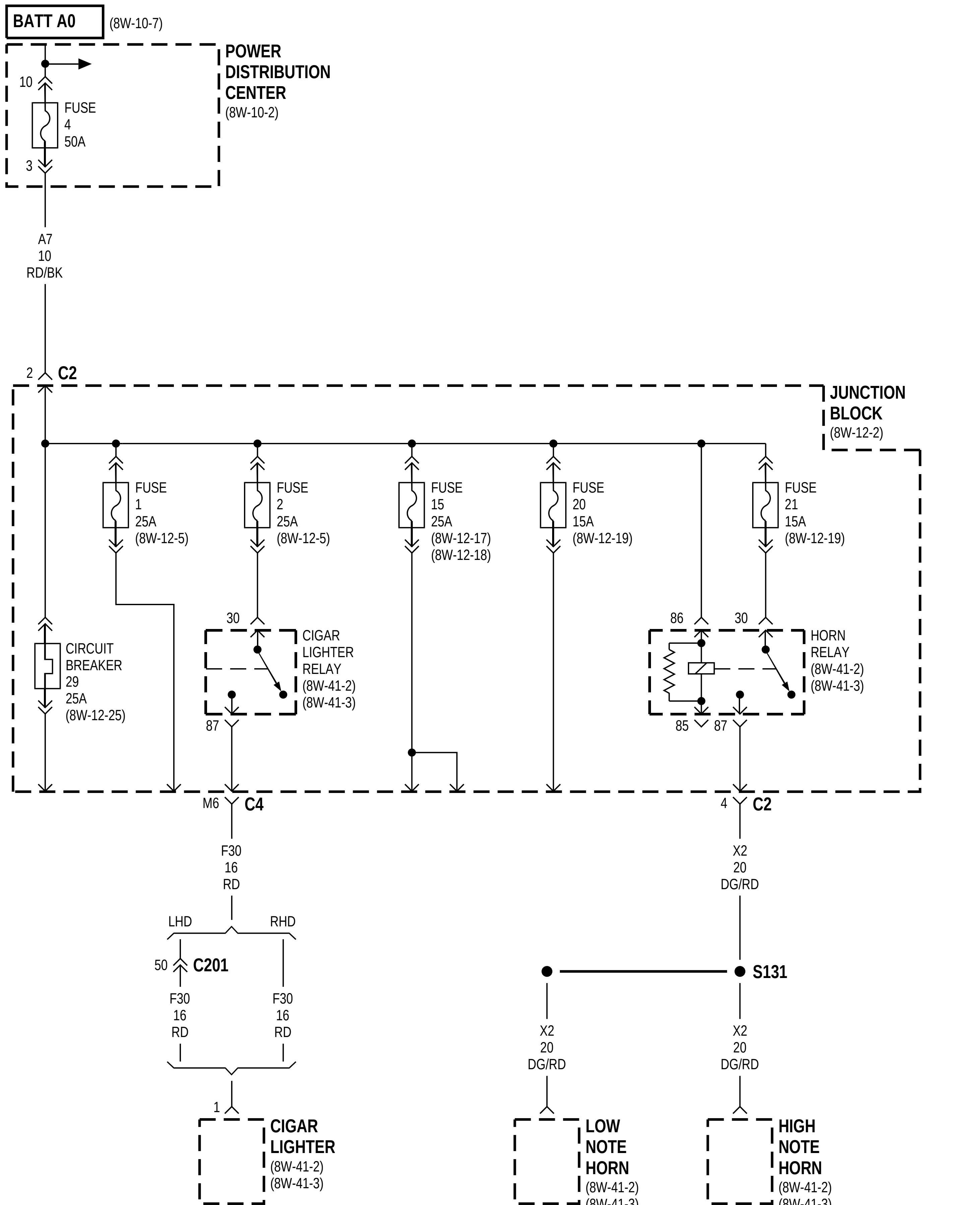

S118
BATTERY
(8W-20-2)
A0
6
RD
ENGINE STARTER MOTOR
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
A0
6
RD
FUSIBLE LINK
A11
10
DG
A11
6
BK/WT
GENERATOR
(8W-20-2)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 2 40A (8W-10-9)
FUSE 3 40A (8W-10-9)
FUSE 4 50A (8W-10-12)
FUSE 5 40A (8W-10-13)
FUSE 6 40A (8W-10-13)
A1 12 RD
C2
TO IGNITION SWITCH
A2 12 PK/BK
C6
C100
TO IGNITION SWITCH
A7 10 RD/BK
TO JUNCTION BLOCK
F141 12 LG/RD
TO RADIATOR FAN RELAY (IN PDC)
A111 12 RD/LG
D5
C100
LHD
RHD
11
C201
7
C202
8
C209
TO BLOWER MOTOR RELAY
FUSE 7 30A (8W-10-14)
FUSE 8 30A (8W-10-15)
FUSE 9 20A (8W-10-14)
FUSE 10 20A (8W-10-16)
FUSE 11 30A (8W-10-16)
A
TO FUSE 12 (PDC)
(8W-10-8)
A3 14 RD/WT
TO DAYTIME RUNNING LAMP MODULE
A3 14 RD/WT
D1
C100
TO HEADLAMP SWITCH
A16 14 RD/LG
TO AUTOMATIC SHUT DOWN RELAY (IN PDC)
A17 16 RD/BK
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
A17 16 RD/BK
TO FUSE 27 (IN PDC)
A41 16 YL
TO ENGINE STARTER MOTOR RELAY (IN PDC)
A4 12 BK/PK
TO JUNCTION BLOCK

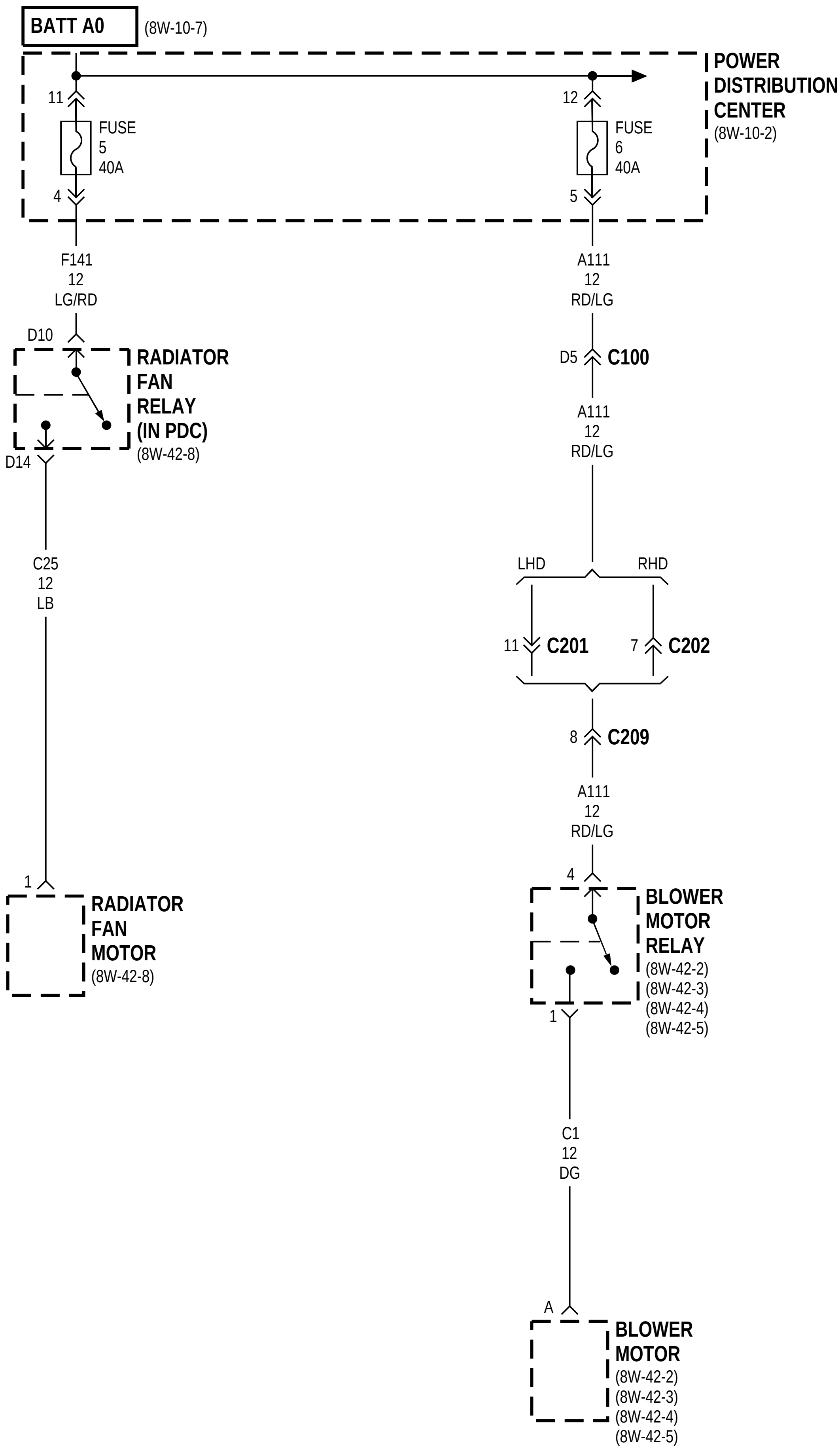

POWER
DISTRIBUTION
CENTER
(8W-10-2)
FROM
FUSE 11
(PDC)
(8W-10-7)
A
18
FUSE
12
40A
(ABS)
(8W-10-16)
25
19
FUSE
13
20A
(ABS)
(8W-10-16)
26
A23
FUSE
16
15A
(8W-10-17)
A24
A21
FUSE
17
20A
(4.0L)
(8W-10-17)
A22
A18
FUSE
19
20A
(8W-10-18)
A17
F34
18
TN/BK
E6
A18
C100
LHD
RHD
A10
12
RD/DG
TO
CONTROLLER
ANTI-LOCK
BRAKE
A20
12
RD/DB
TO
CONTROLLER
ANTI-LOCK
BRAKE
M1
20
PK
TO
S135
F99
18
RD
TO
OXYGEN
SENSOR
DOWNSTREAM
RELAY
(IN PDC)
TO
HEADLAMP
SWITCH
TO
S218
TO
DATA
CONNECTOR
A16
FUSE
20
15A
(8W-10-19)
A15
A11
FUSE
22
15A
(8W-10-19)
A12
A9
FUSE
23
15A
(8W-10-20)
A10
A6
FUSE
25
15A
(8W-10-20)
A5
A4
FUSE
26
20A
(8W-10-20)
A3
C4
C100
L9
20
BK/PK
F5
B11
C100
TO
COMBINATION
FLASHER
A61
14
DG/BK
TO
FUEL
PUMP
RELAY
(IN PDC)
14
C107
TO
POWERTRAIN
CONTROL
MODULE
F32
20
PK/DB
F8
C100
TO
BRAKE
LAMP
SWITCH
F61
20
WT/OR
TO
FOG
LAMP
RELAY
NO. 2
(IN PDC)
F75
16
VT
LHD
RHD
14
C200
21
C204
F75
14
VT
F75
16
VT
TO
S301
RHD
LHD

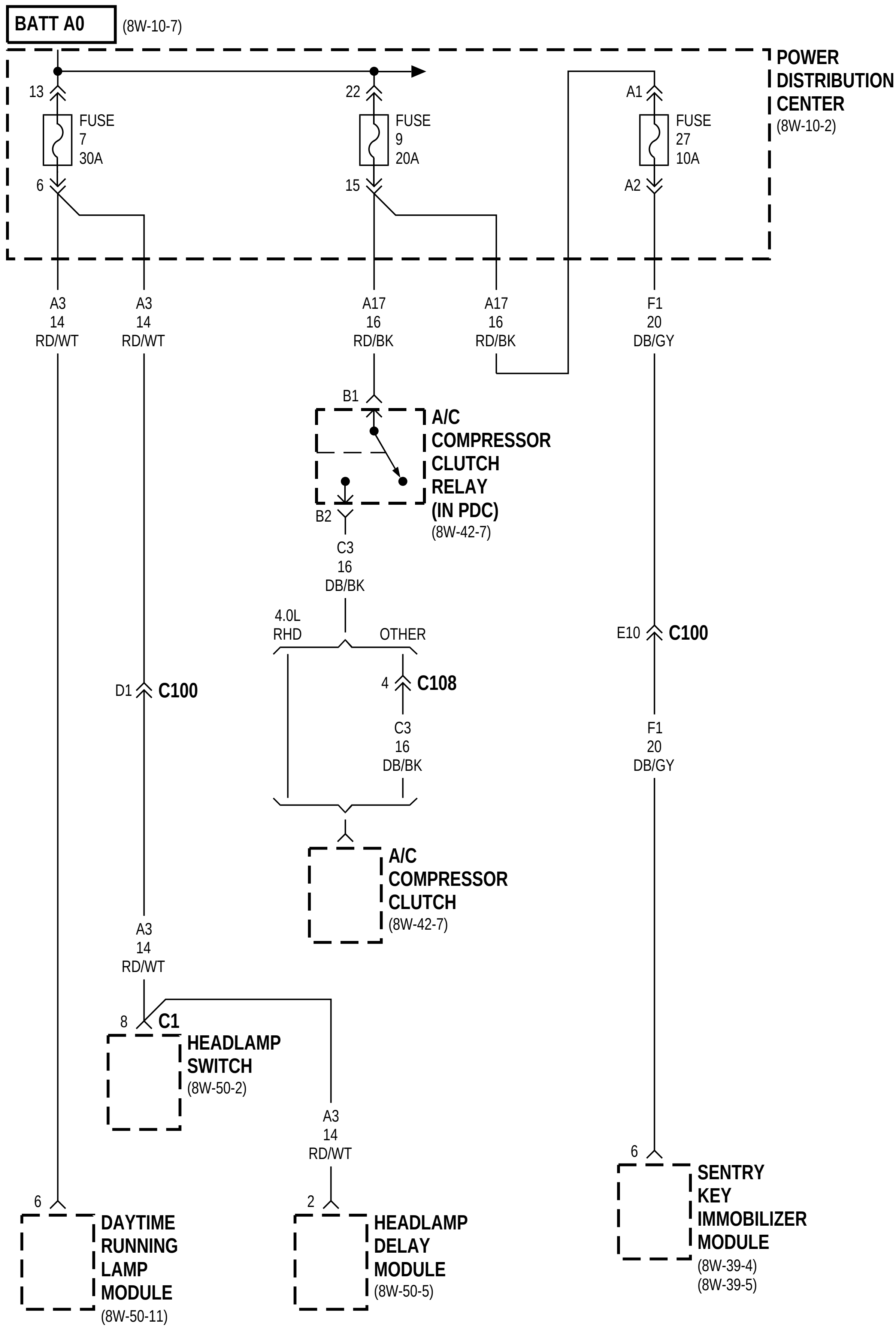

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 2 40A
FUSE 3 40A
BRAKE WARNING PRESSURE SWITCH
(8W-40-7)
G9 20 GY/BK
A14
E2
C100
S211
LHD
RHD
C201
C203
A1 12 RD
A2 12 PK/BK
C2
C6
C100
FROM
S210
(8W-10-10)
G26 20 LB
PARK BRAKE SWITCH
(8W-40-7)
C1
C2
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
KEY-IN SWITCH
A31 12 BK/WT
A21 12 DB
A22 12 BK/OR
A41 14 YL
Z1 20 BK
G16 20 BK/LB
S207
(8W-15-9)
Z1 14 BK
G108
(8W-15-9)
TO
S200
(8W-10-10)
RUN A22
(8W-10-11)
ST-RUN A21
(8W-10-10)
ST A41
(8W-10-11)
L1
C4
JUNCTION BLOCK
(8W-12-2)
FUSE 17 15A (8W-12-17) (8W-12-18)
FUSE 18 10A (8W-12-17) (8W-12-18)
CIRCUIT BREAKER 28 25A (8W-12-23) (8W-12-24)
CIRCUIT BREAKER 30 20A (8W-12-25)
86
85
CIGAR LIGHTER RELAY (8W-41-2) (8W-41-3)
●RHD
▲LHD

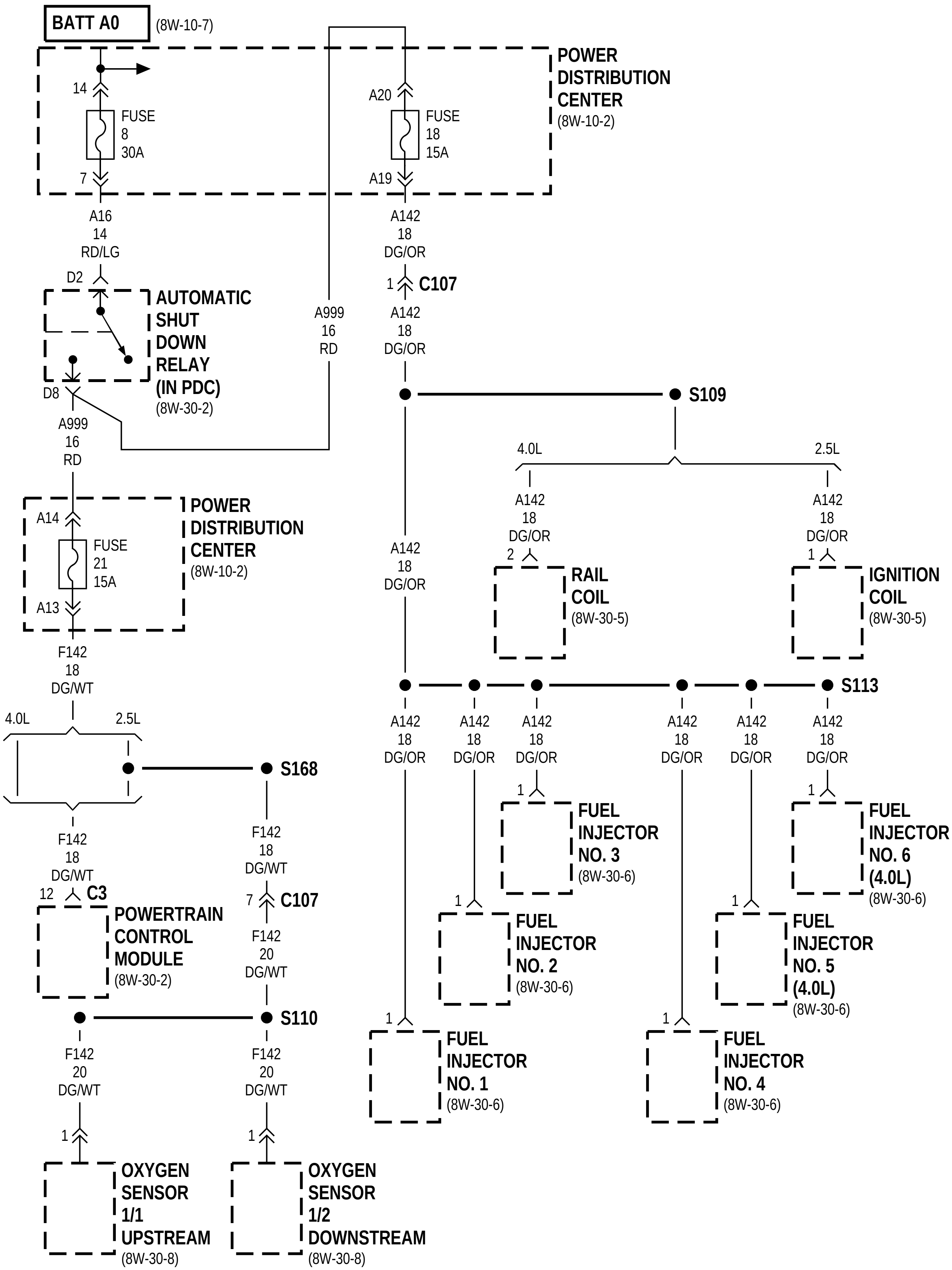

INSTRUMENT CLUSTER
(8W-40-8)
PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-2)
PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-3)
BATT A1
(8W-10-9)
8 C2
G26 20 LB
5 C300
2 C306
29 C201
3 C203
LHD
RHD
S210
A1 12 RD
7 C1
1 C2
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-9)
KEY-IN SWITCH
5 C1
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
(8W-50-2)
6 C1
9 C1
8 C1
2 C2
A21 12 DB
A31 12 BK/WT
G16 20 BK/LB
S200
17 C200
4 C203
B C317
B C318
G16 18 BK/LB
64 C201
RUN-ACC A31
(8W-10-9)
DRIVER DOOR JAMB SWITCH
(8W-39-6)
DRIVER DOOR JAMB SWITCH
(8W-39-7)
L2 C4
JUNCTION BLOCK
(8W-12-2)
FUSE 8 SPARE (8W-12-11)
FUSE 9 10A (8W-12-11)
FUSE 10 15A (8W-12-12)
FUSE 11 20A (8W-12-13) (8W-12-14)
FUSE 27 10A (8W-12-23) (8W-12-24)

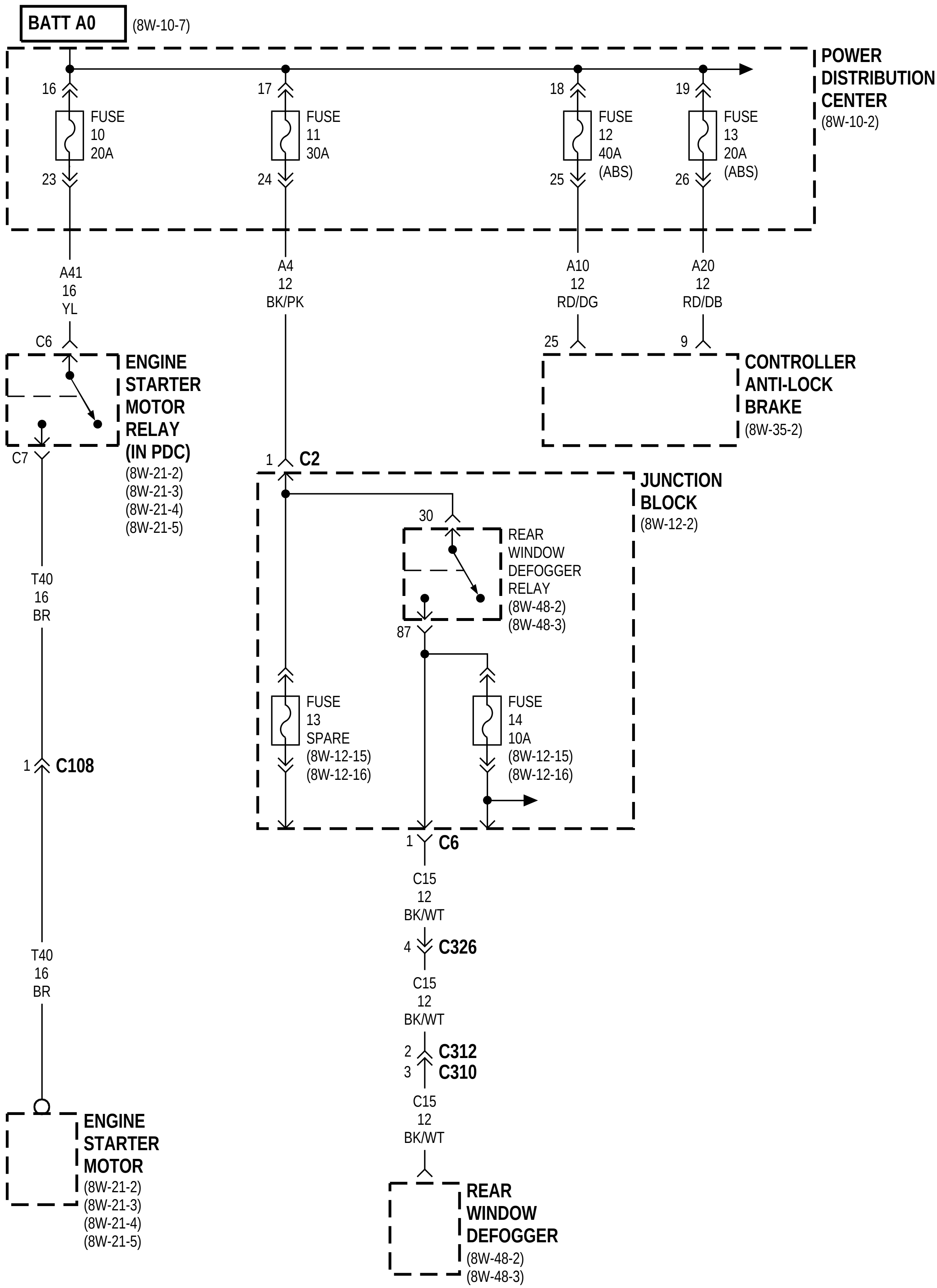

BATT A2
(8W-10-9)
A2
12
PK/BK
3
C1
IGNITION
SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-9)
4
C1
10
C1
A22
12
BK/OR
A41
14
YL
RHD
LHD
LHD
RHD
62
63
C201
A22
12
BK/OR
A41
14
YL
M2
C4
M1
C4
JUNCTION
BLOCK
(8W-12-2)
FUSE
12
10A
(8W-12-15)
(8W-12-16)
FUSE
22
20A
(8W-12-20)
(8W-12-21)
FUSE
25
15A
(8W-12-20)
(8W-12-21)
FUSE
19
10A
(8W-12-17)
(8W-12-18)
86
REAR
WINDOW
DEFOGGER
RELAY
(8W-48-2)
(8W-48-3)
85
FUSE
24
SPARE
(8W-12-20)
(8W-12-21)
FUSE
26
10A
(8W-12-23)
(8W-12-24)

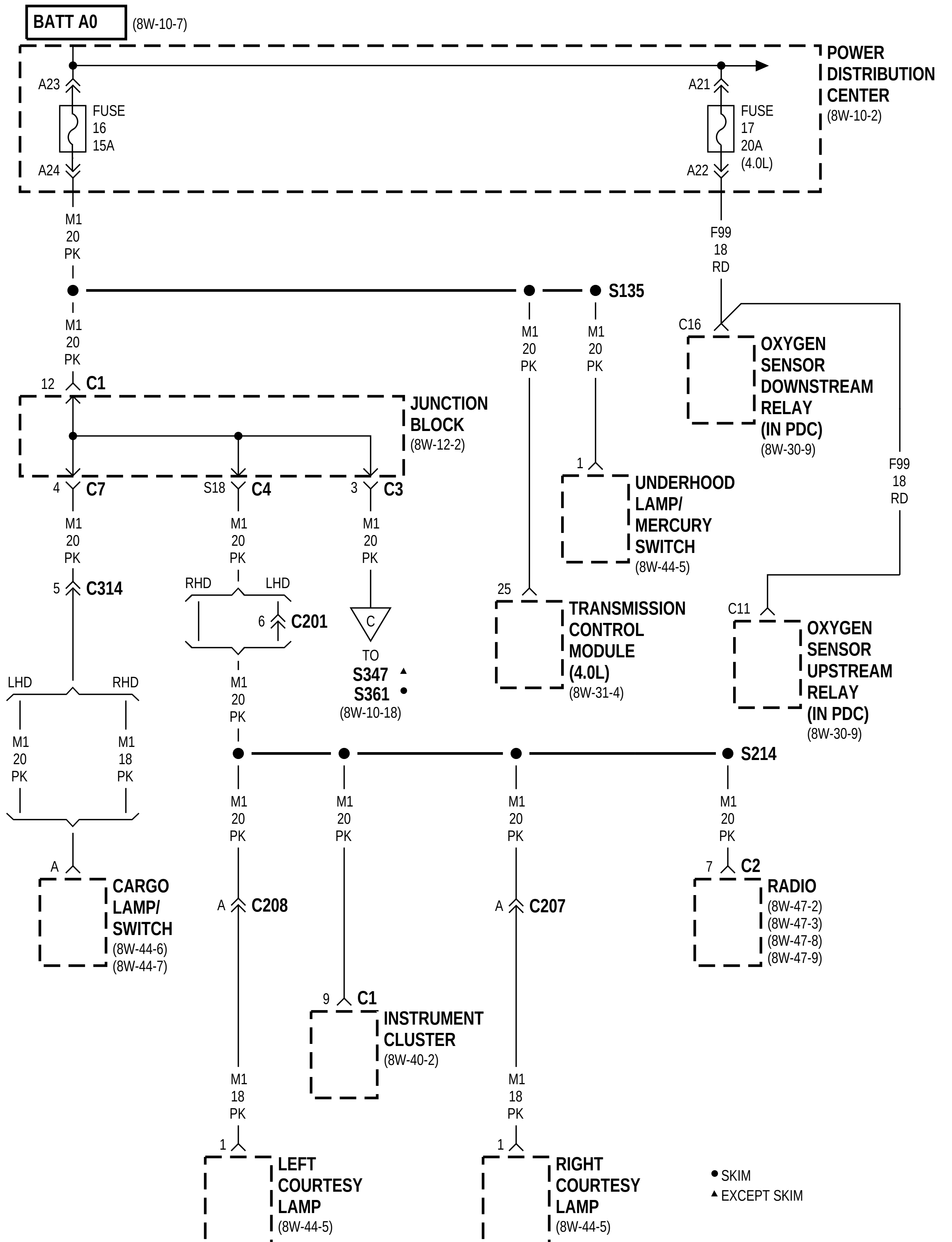

BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
10
FUSE
4
50A
3
A7
10
RD/BK
2
C2
JUNCTION
BLOCK
(8W-12-2)
FUSE
1
25A
(8W-12-5)
FUSE
2
25A
(8W-12-5)
FUSE
15
25A
(8W-12-17)
(8W-12-18)
FUSE
20
15A
(8W-12-19)
FUSE
21
15A
(8W-12-19)
CIRCUIT
BREAKER
29
25A
(8W-12-25)
30
CIGAR
LIGHTER
RELAY
(8W-41-2)
(8W-41-3)
87
86
30
HORN
RELAY
(8W-41-2)
(8W-41-3)
85
87
M6
C4
4
C2
F30
16
RD
X2
20
DG/RD
LHD
RHD
50
C201
F30
16
RD
F30
16
RD
S131
X2
20
DG/RD
X2
20
DG/RD
1
CIGAR
LIGHTER
(8W-41-2)
(8W-41-3)
LOW
NOTE
HORN
(8W-41-2)
(8W-41-3)
HIGH
NOTE
HORN
(8W-41-2)
(8W-41-3)

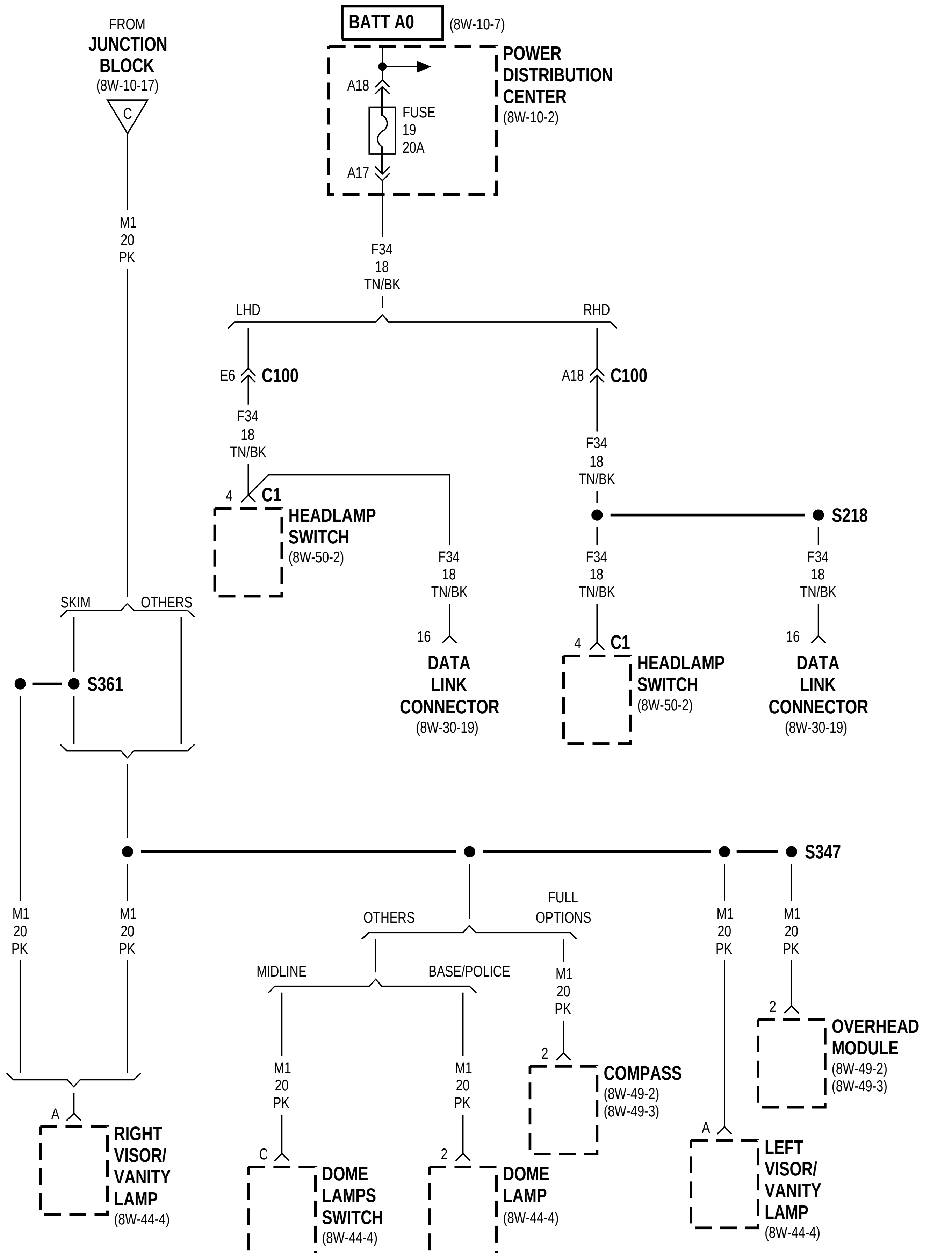

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
11
FUSE
5
40A
4
12
FUSE
6
40A
5
F141
12
LG/RD
A111
12
RD/LG
D10
RADIATOR FAN RELAY (IN PDC)
(8W-42-8)
D14
D5
C100
A111
12
RD/LG
C25
12
LB
LHD
RHD
11
C201
7
C202
8
C209
A111
12
RD/LG
1
RADIATOR FAN MOTOR
(8W-42-8)
4
BLOWER MOTOR RELAY
(8W-42-2)
(8W-42-3)
(8W-42-4)
(8W-42-5)
1
C1
12
DG
A
BLOWER MOTOR
(8W-42-2)
(8W-42-3)
(8W-42-4)
(8W-42-5)

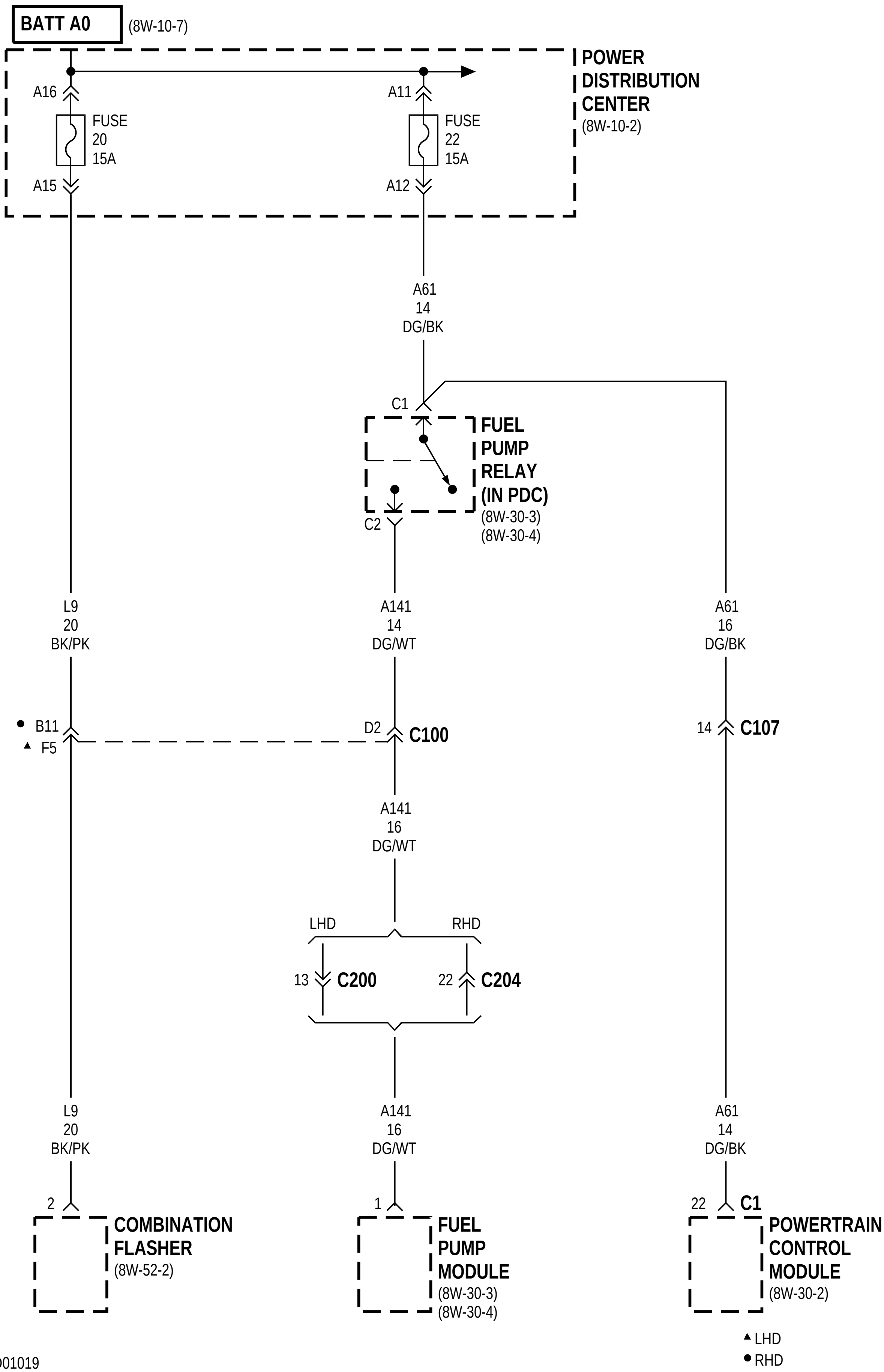

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
13
FUSE 7 30A
6
22
FUSE 9 20A
15
A1
FUSE 27 10A
A2
A3 14 RD/WT
A3 14 RD/WT
A17 16 RD/BK
A17 16 RD/BK
F1 20 DB/GY
B1
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-7)
B2
C3 16 DB/BK
4.0L RHD
OTHER
4
C108
C3 16 DB/BK
A/C COMPRESSOR CLUTCH
(8W-42-7)
D1
C100
E10
C100
F1 20 DB/GY
A3 14 RD/WT
8
C1
HEADLAMP SWITCH
(8W-50-2)
A3 14 RD/WT
6
SENTRY KEY IMMOBILIZER MODULE
(8W-39-4)
(8W-39-5)
6
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
2
HEADLAMP DELAY MODULE
(8W-50-5)

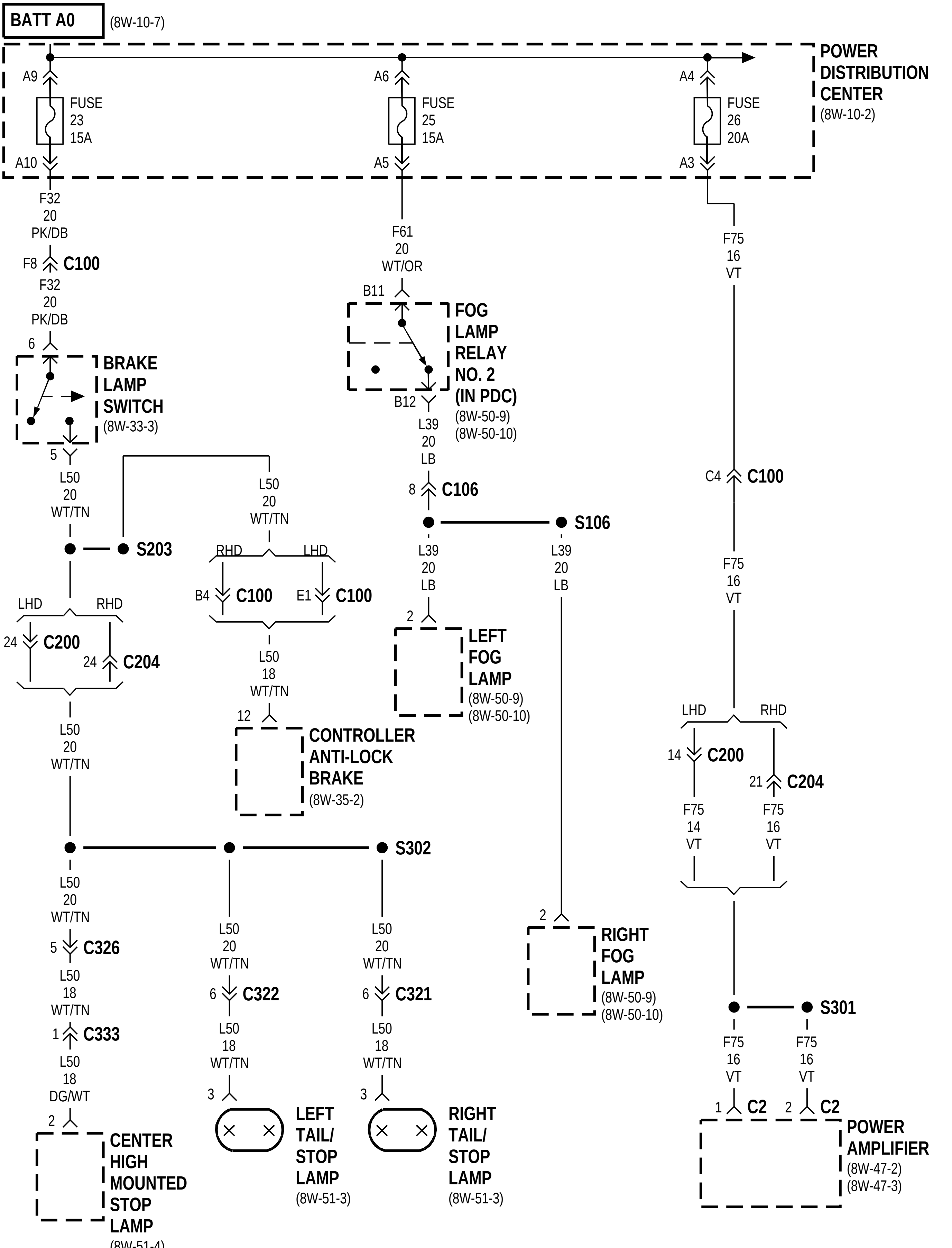

BATT A0
(8W-10-7)
14
FUSE
8
30A
7
A20
FUSE
18
15A
A19
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A16
14
RD/LG
A142
18
DG/OR
D2
1
C107
AUTOMATIC
SHUT
DOWN
RELAY
(IN PDC)
(8W-30-2)
A999
16
RD
D8
S109
4.0L
2.5L
A14
FUSE
21
15A
A13
POWER
DISTRIBUTION
CENTER
(8W-10-2)
2
RAIL
COIL
(8W-30-5)
IGNITION
COIL
(8W-30-5)
F142
18
DG/WT
S113
S168
FUEL
INJECTOR
NO. 3
(8W-30-6)
FUEL
INJECTOR
NO. 6
(4.0L)
(8W-30-6)
12
C3
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
7
C107
F142
20
DG/WT
FUEL
INJECTOR
NO. 2
(8W-30-6)
FUEL
INJECTOR
NO. 5
(4.0L)
(8W-30-6)
S110
FUEL
INJECTOR
NO. 1
(8W-30-6)
FUEL
INJECTOR
NO. 4
(8W-30-6)
OXYGEN
SENSOR
1/1
UPSTREAM
(8W-30-8)
OXYGEN
SENSOR
1/2
DOWNSTREAM
(8W-30-8)


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE 10 20A
23
17
FUSE 11 30A
24
18
FUSE 12 40A (ABS)
25
19
FUSE 13 20A (ABS)
26
A41 16 YL
A4 12 BK/PK
A10 12 RD/DG
A20 12 RD/DB
C6
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
C7
25
9
CONTROLLER ANTI-LOCK BRAKE
(8W-35-2)
1 C2
JUNCTION BLOCK
(8W-12-2)
30
REAR WINDOW DEFOGGER RELAY
(8W-48-2)
(8W-48-3)
87
FUSE 13 SPARE
(8W-12-15)
(8W-12-16)
FUSE 14 10A
(8W-12-15)
(8W-12-16)
T40 16 BR
1 C108
T40 16 BR
1 C6
C15 12 BK/WT
4 C326
C15 12 BK/WT
2 C312
3 C310
C15 12 BK/WT
ENGINE STARTER MOTOR
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
REAR WINDOW DEFOGGER
(8W-48-2)
(8W-48-3)

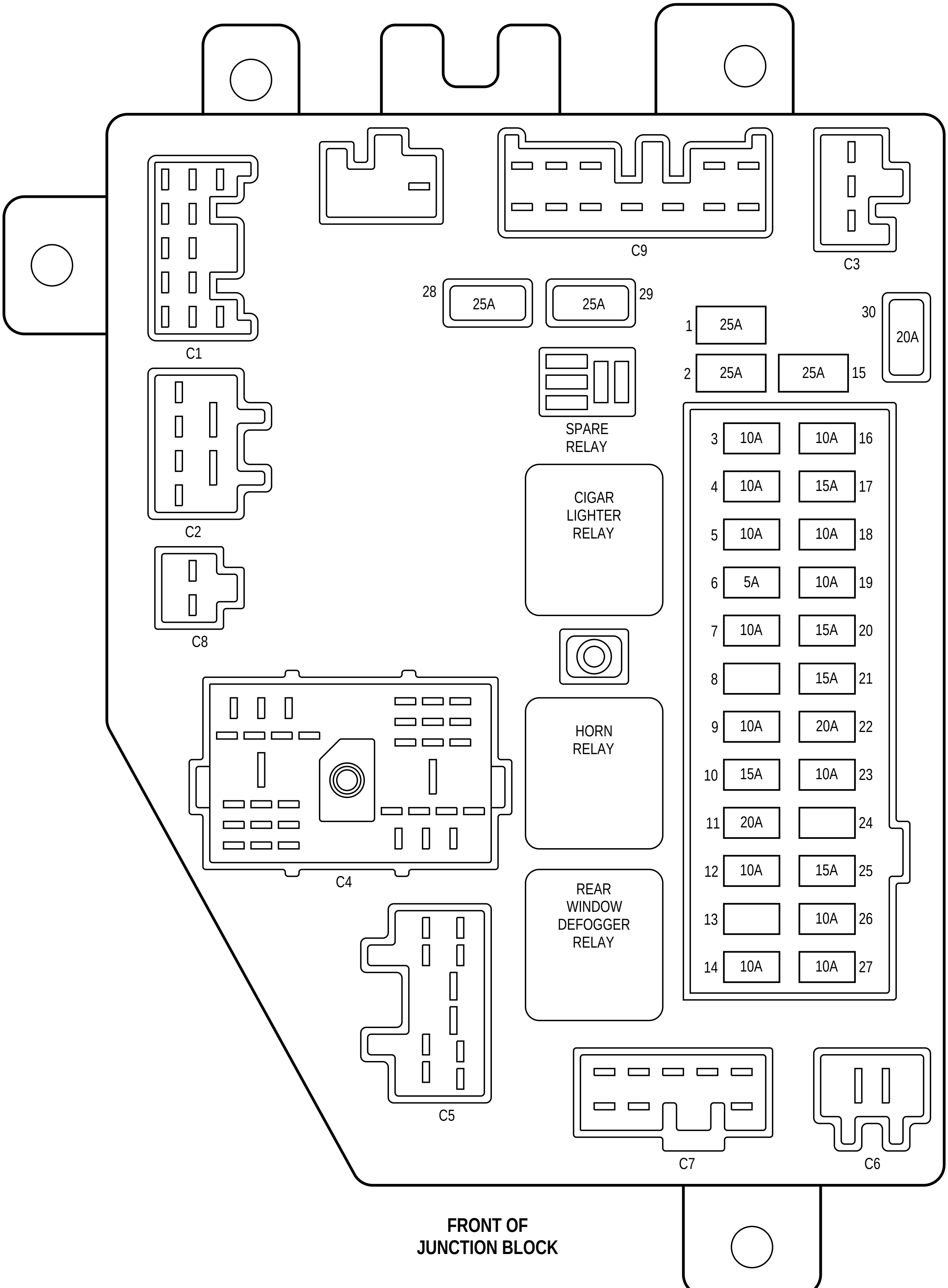

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
A24
A21
FUSE
17
20A
(4.0L)
A22
M1
20
PK
F99
18
RD
S135
C16
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-9)
12 C1
JUNCTION BLOCK
(8W-12-2)
4 C7
S18 C4
3 C3
1
UNDERHOOD LAMP/ MERCURY SWITCH
(8W-44-5)
5 C314
RHD
LHD
6 C201
C
TO
S347 ▲
S361 ●
(8W-10-18)
25
TRANSMISSION CONTROL MODULE (4.0L)
(8W-31-4)
C11
OXYGEN SENSOR UPSTREAM RELAY (IN PDC)
(8W-30-9)
M1
18
PK
S214
7 C2
RADIO
(8W-47-2)
(8W-47-3)
(8W-47-8)
(8W-47-9)
A
CARGO LAMP/ SWITCH
(8W-44-6)
(8W-44-7)
A C208
A C207
9 C1
INSTRUMENT CLUSTER
(8W-40-2)
1
LEFT COURTESY LAMP
(8W-44-5)
RIGHT COURTESY LAMP
(8W-44-5)
● SKIM
▲ EXCEPT SKIM


BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A18
FUSE
19
20A
A17
F34
18
TN/BK
FROM
JUNCTION
BLOCK
(8W-10-17)
C
M1
20
PK
LHD
RHD
E6
C100
A18
C100
F34
18
TN/BK
4
C1
HEADLAMP
SWITCH
(8W-50-2)
F34
18
TN/BK
16
DATA
LINK
CONNECTOR
(8W-30-19)
S218
4
C1
HEADLAMP
SWITCH
(8W-50-2)
16
DATA
LINK
CONNECTOR
(8W-30-19)
SKIM
OTHERS
S361
S347
M1
20
PK
OTHERS
FULL
OPTIONS
MIDLINE
BASE/POLICE
A
RIGHT
VISOR/
VANITY
LAMP
(8W-44-4)
C
DOME
LAMPS
SWITCH
(8W-44-4)
2
DOME
LAMP
(8W-44-4)
2
COMPASS
(8W-49-2)
(8W-49-3)
A
LEFT
VISOR/
VANITY
LAMP
(8W-44-4)
2
OVERHEAD
MODULE
(8W-49-2)
(8W-49-3)


BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A16
FUSE
20
15A
A15
A11
FUSE
22
15A
A12
A61
14
DG/BK
C1
FUEL
PUMP
RELAY
(IN PDC)
(8W-30-3)
(8W-30-4)
C2
L9
20
BK/PK
A141
14
DG/WT
A61
16
DG/BK
B11
F5
D2
C100
14
C107
A141
16
DG/WT
LHD
RHD
13
C200
22
C204
L9
20
BK/PK
A141
16
DG/WT
A61
14
DG/BK
2
COMBINATION
FLASHER
(8W-52-2)
1
FUEL
PUMP
MODULE
(8W-30-3)
(8W-30-4)
22
C1
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
LHD
RHD


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A9
FUSE 23 15A
A10
A6
FUSE 25 15A
A5
A4
FUSE 26 20A
A3
F32 20 PK/DB
F8 C100
F32 20 PK/DB
6
BRAKE LAMP SWITCH
(8W-33-3)
5
L50 20 WT/TN
S203
LHD
RHD
24 C200
24 C204
L50 20 WT/TN
L50 20 WT/TN
RHD
LHD
B4 C100
E1 C100
L50 18 WT/TN
12
CONTROLLER ANTI-LOCK BRAKE
(8W-35-2)
S302
L50 20 WT/TN
5 C326
L50 18 WT/TN
1 C333
L50 18 DG/WT
2
CENTER HIGH MOUNTED STOP LAMP
(8W-51-4)
L50 20 WT/TN
6 C322
L50 18 WT/TN
3
LEFT TAIL/ STOP LAMP
(8W-51-3)
L50 20 WT/TN
6 C321
L50 18 WT/TN
3
RIGHT TAIL/ STOP LAMP
(8W-51-3)
F61 20 WT/OR
B11
FOG LAMP RELAY NO. 2 (IN PDC)
(8W-50-9)
(8W-50-10)
B12
L39 20 LB
8 C106
S106
L39 20 LB
2
LEFT FOG LAMP
(8W-50-9)
(8W-50-10)
L39 20 LB
2
RIGHT FOG LAMP
(8W-50-9)
(8W-50-10)
F75 16 VT
C4 C100
F75 16 VT
LHD
RHD
14 C200
21 C204
F75 14 VT
F75 16 VT
S301
F75 16 VT
F75 16 VT
1 C2
2 C2
POWER AMPLIFIER
(8W-47-2)
(8W-47-3)

8W-12 JUNCTION BLOCK



FRONT OF JUNCTION BLOCK

J008W-7

XJD01202

FUSES

FUSE NO.	AMPS	FUSED CIRCUIT	FEED CIRCUIT
1	25A	F38 16RD/LB	A7 10RD/BK
2	25A	INTERNAL	A7 10RD/BK
3	10A	L33 20RD	L3 16RD/OR
4	10A	L43 20VT	L4 16VT/WT
5	10A	L44 20VT/RD	L4 16VT/WT
6	5A	E2 20OR	E1 20TN
7	10A	INTERNAL	L7 18BK/YL
8	-	-	A21 12DB
9	10A	F87 20WT/BK	A21 12DB
10	15A	F20 18WT	A21 12DB
11	20A	F12 18DB/WT	A21 12DB
12	10A	INTERNAL	A22 12BK/OR
13	-	-	A4 12BK/PK
14	10A	INTERNAL	INTERNAL
15	25A	F35 16RD	A7 10RD/BK
16	10A	L34 20RD/OR	L3 16RD/OR
17	15A	X12 16RD/WT	A31 12BK/WT
18	10A	F83 18YL/DG	A31 12BK/WT
19	10A	F45 20YL/RD	A41 14YL
20	15A	A6 20RD/OR	A7 10RD/BK
21	15A	INTERNAL	A7 10RD/BK
22	20A	V23 18BR/PK	A22 12BK/OR
23	10A	INTERNAL	L7 18BK/YL
24	-	-	A22 12BK/OR
25	15A	F15 20DB/WT	A22 12BK/OR
26	10A	F14 18LG/YL	A22 12BK/OR
27	10A	F23 18DB/YL	A21 12DB

CIRCUIT BREAKERS

CB NO.	AMPS	FUSED CIRCUIT	FEED CIRCUIT
28	25A	INTERNAL	A31 12BK/WT
29	25A	F37 14RD/LB	A7 10RD/BK
30	20A	V6 16DB	A31 12BK/WT

CIGAR LIGHTER RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	GROUND
86	A31 12BK/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87	F30 16RD	CIGAR LIGHTER RELAY OUTPUT
87A	-	-

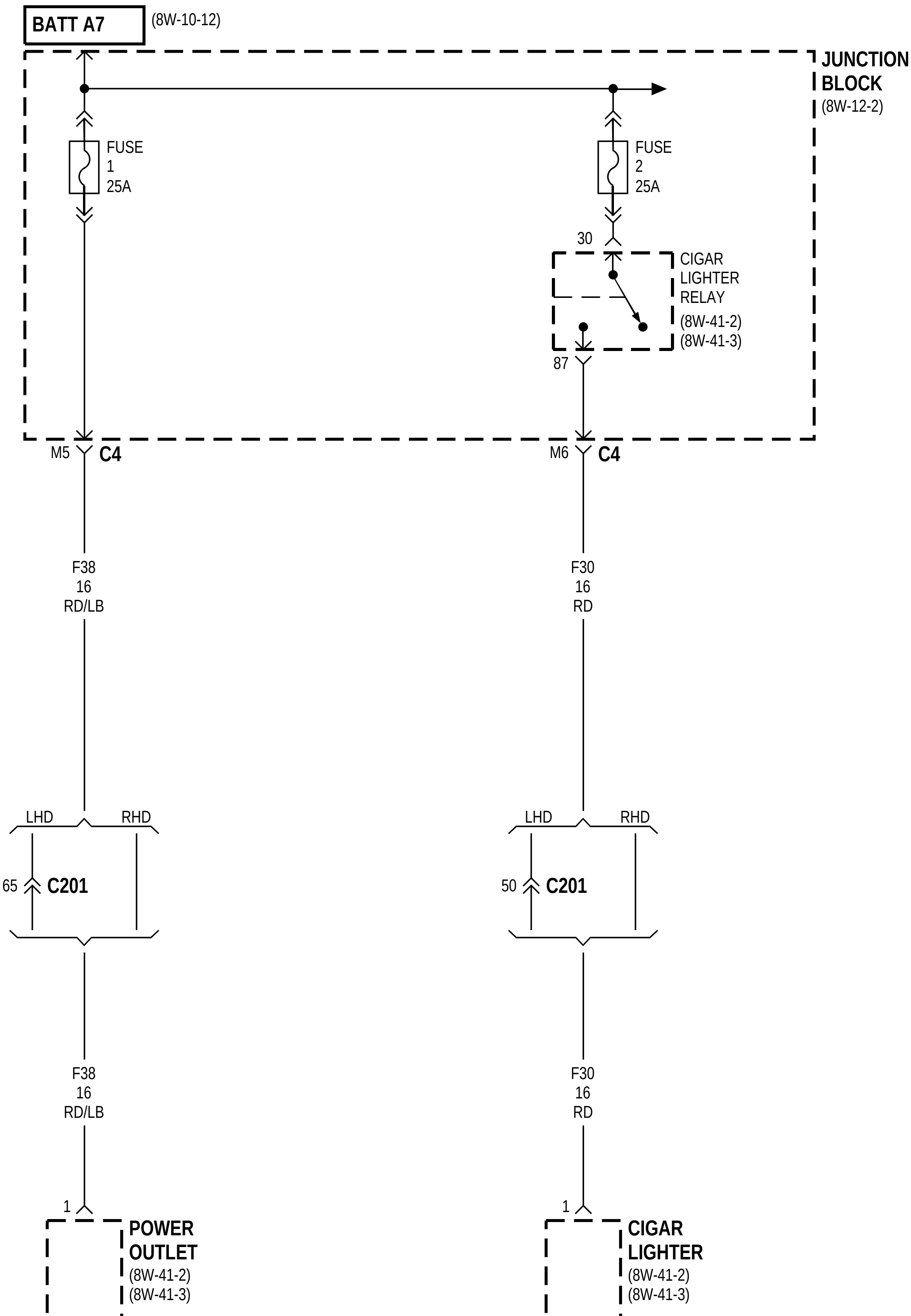
HORN RELAY

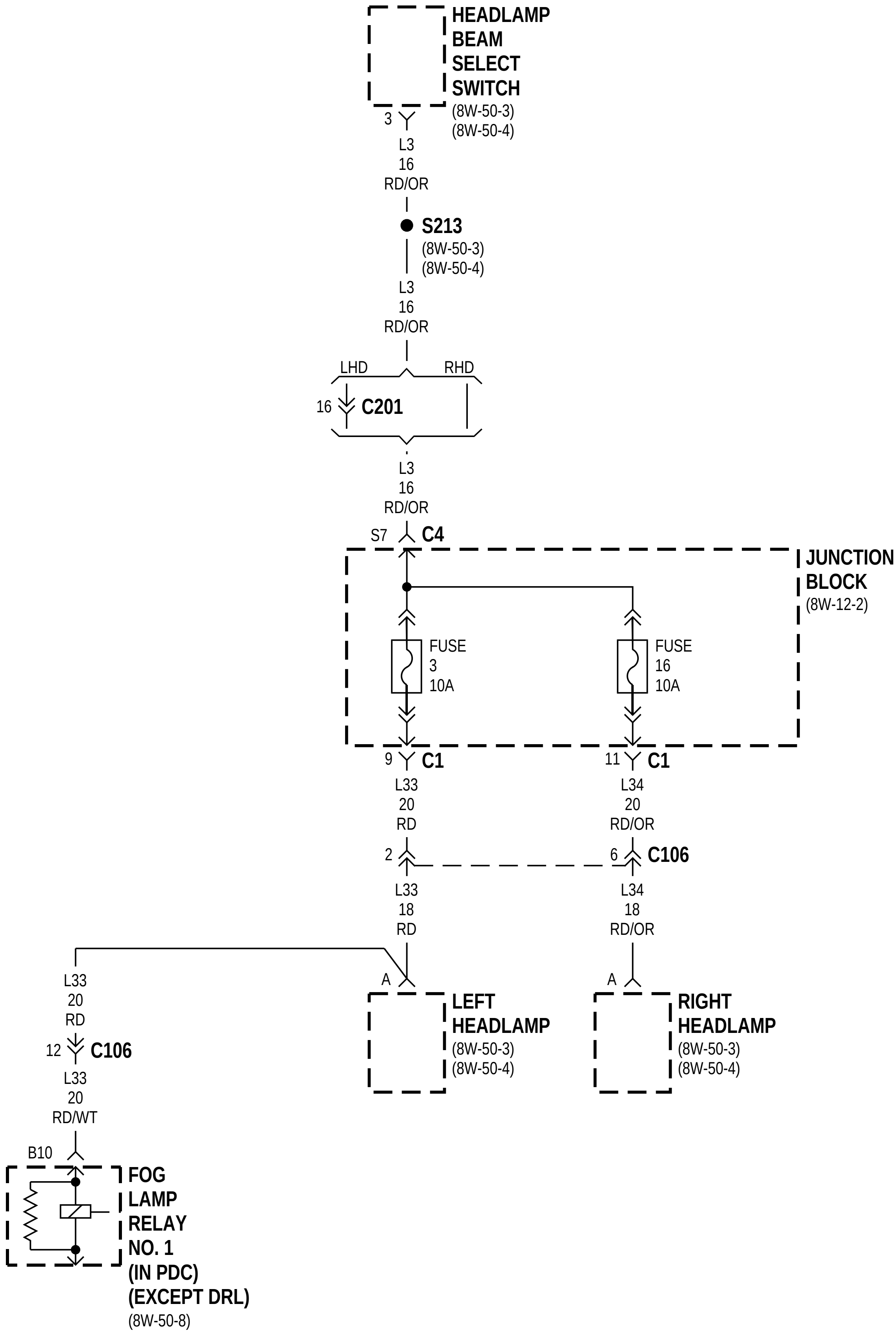
CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	X3 20BK/RD	HORN RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	X2 20DG/RD	HORN RELAY OUTPUT
87A	-	-

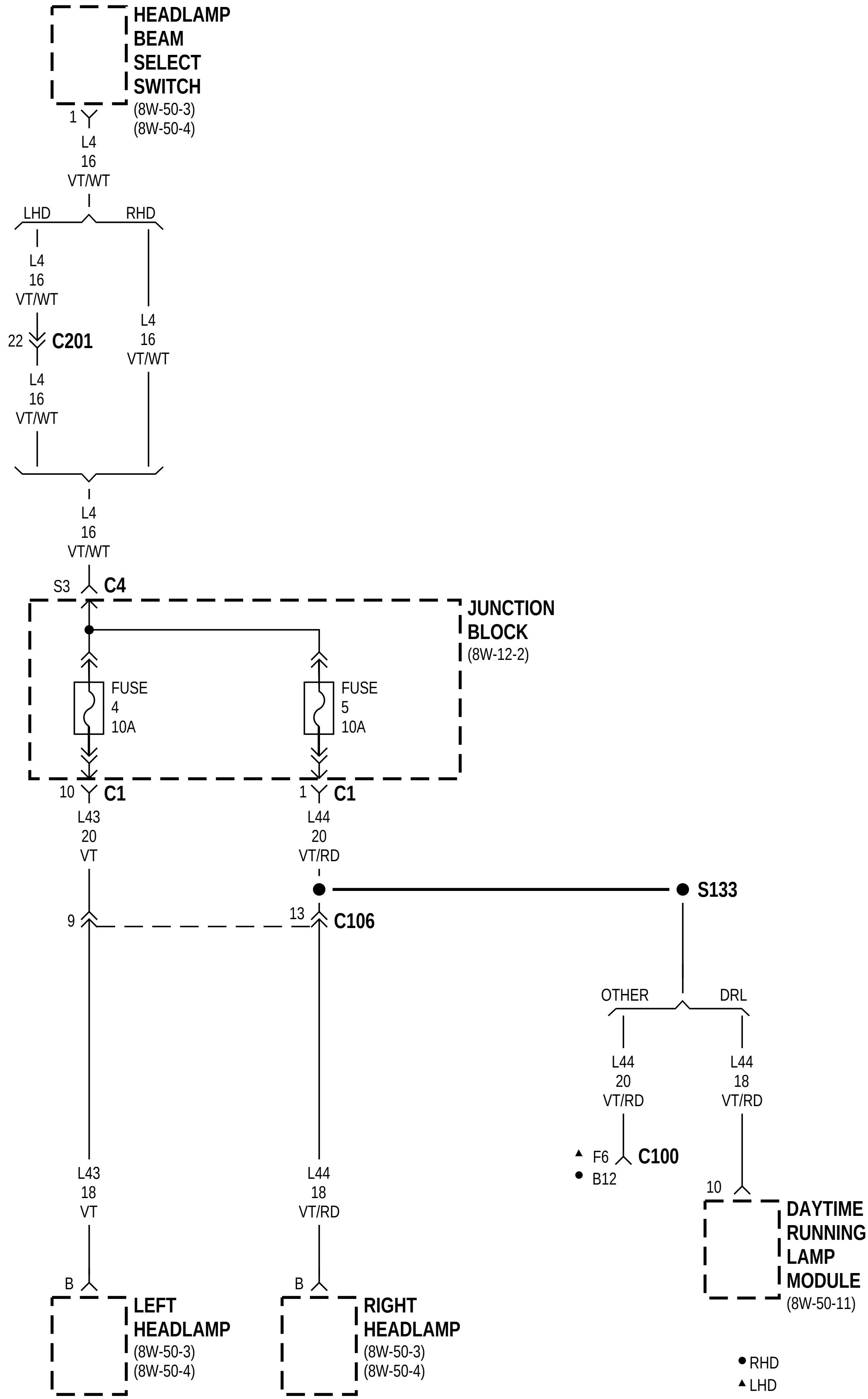
REAR WINDOW DEFOGGER RELAY

CAVITY	CIRCUIT	FUNCTION
30	A4 12BK/PK	FUSED B(+)
85	C81 20LB/WT	REAR WINDOW DEFOGGER RELAY CONTROL
86	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
87	INTERNAL	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

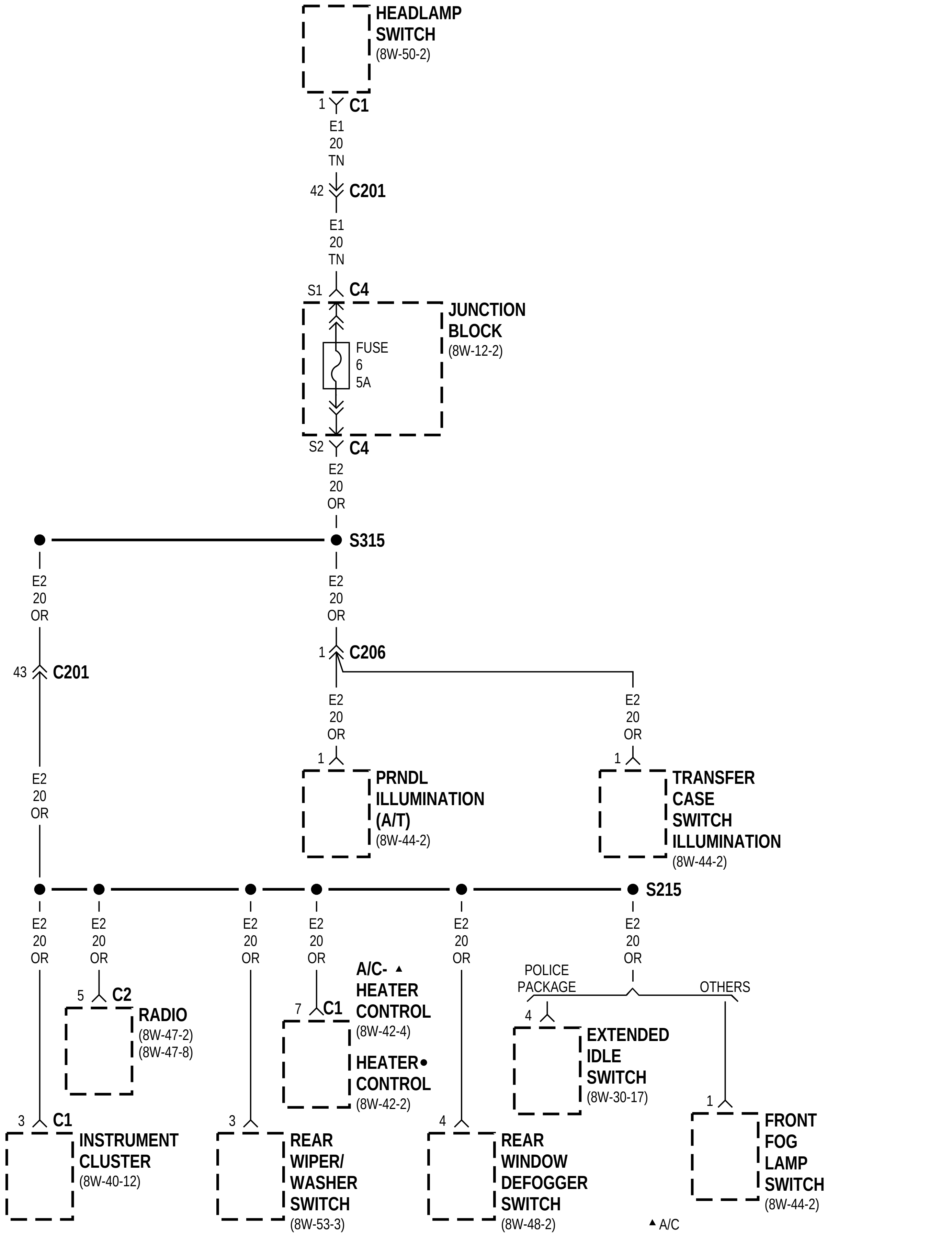
J008W-7 XJD01204


BATT A7
(8W-10-12)
JUNCTION
BLOCK
(8W-12-2)
FUSE
1
25A
FUSE
2
25A
30
CIGAR
LIGHTER
RELAY
(8W-41-2)
(8W-41-3)
87
M5
C4
M6
C4
F38
16
RD/LB
F30
16
RD
LHD
RHD
65
C201
LHD
RHD
50
C201
F38
16
RD/LB
F30
16
RD
1
POWER
OUTLET
(8W-41-2)
(8W-41-3)
1
CIGAR
LIGHTER
(8W-41-2)
(8W-41-3)

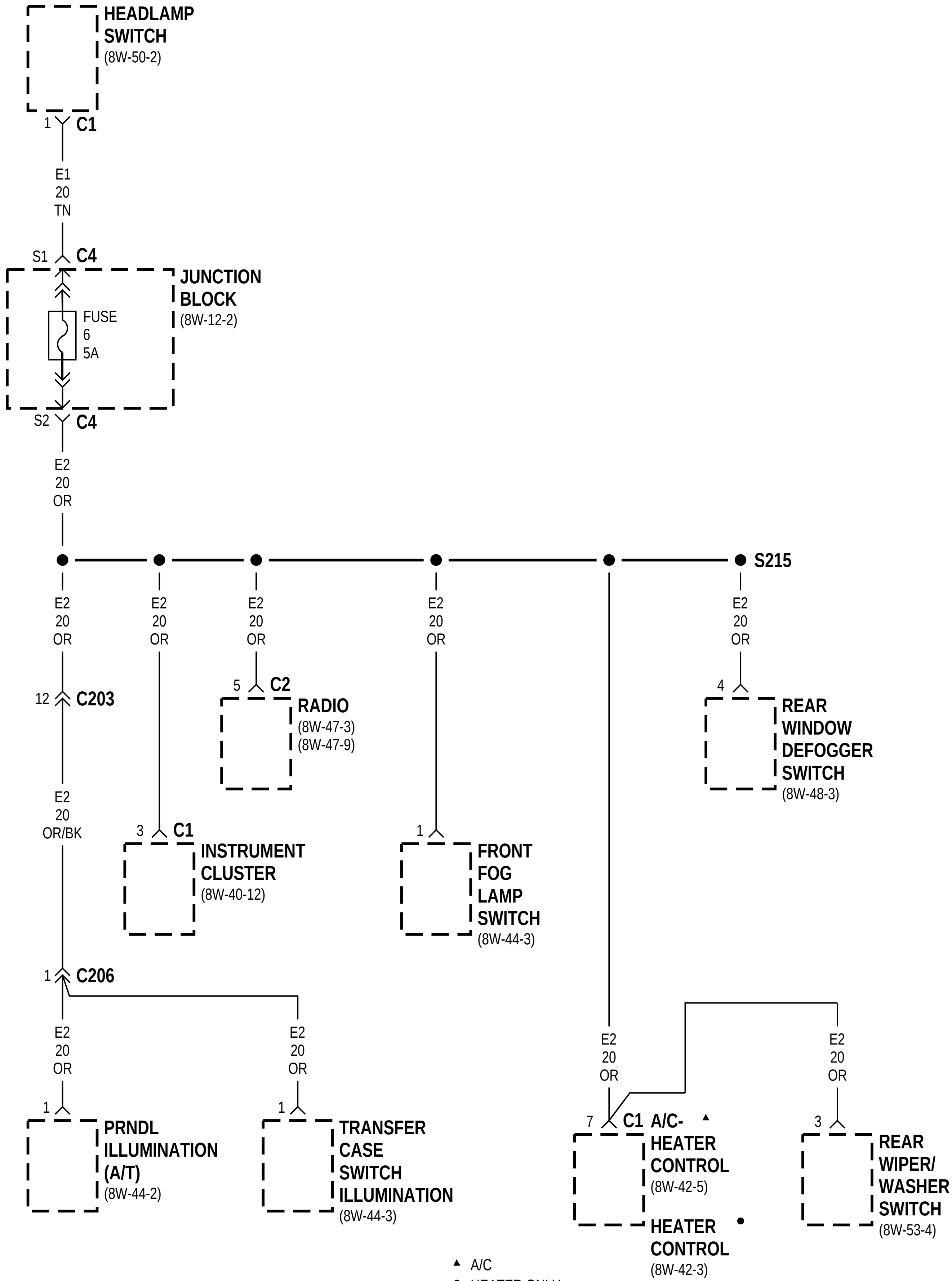

HEADLAMP BEAM SELECT SWITCH
(8W-50-3)
(8W-50-4)
3
L3
16
RD/OR
S213
(8W-50-3)
(8W-50-4)
L3
16
RD/OR
LHD
RHD
16
C201
L3
16
RD/OR
S7
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
3
10A
FUSE
16
10A
9
C1
11
C1
L33
20
RD
L34
20
RD/OR
2
6
C106
L33
18
RD
L34
18
RD/OR
A
A
LEFT HEADLAMP
(8W-50-3)
(8W-50-4)
RIGHT HEADLAMP
(8W-50-3)
(8W-50-4)
L33
20
RD
12
C106
L33
20
RD/WT
B10
FOG LAMP RELAY NO. 1 (IN PDC) (EXCEPT DRL)
(8W-50-8)

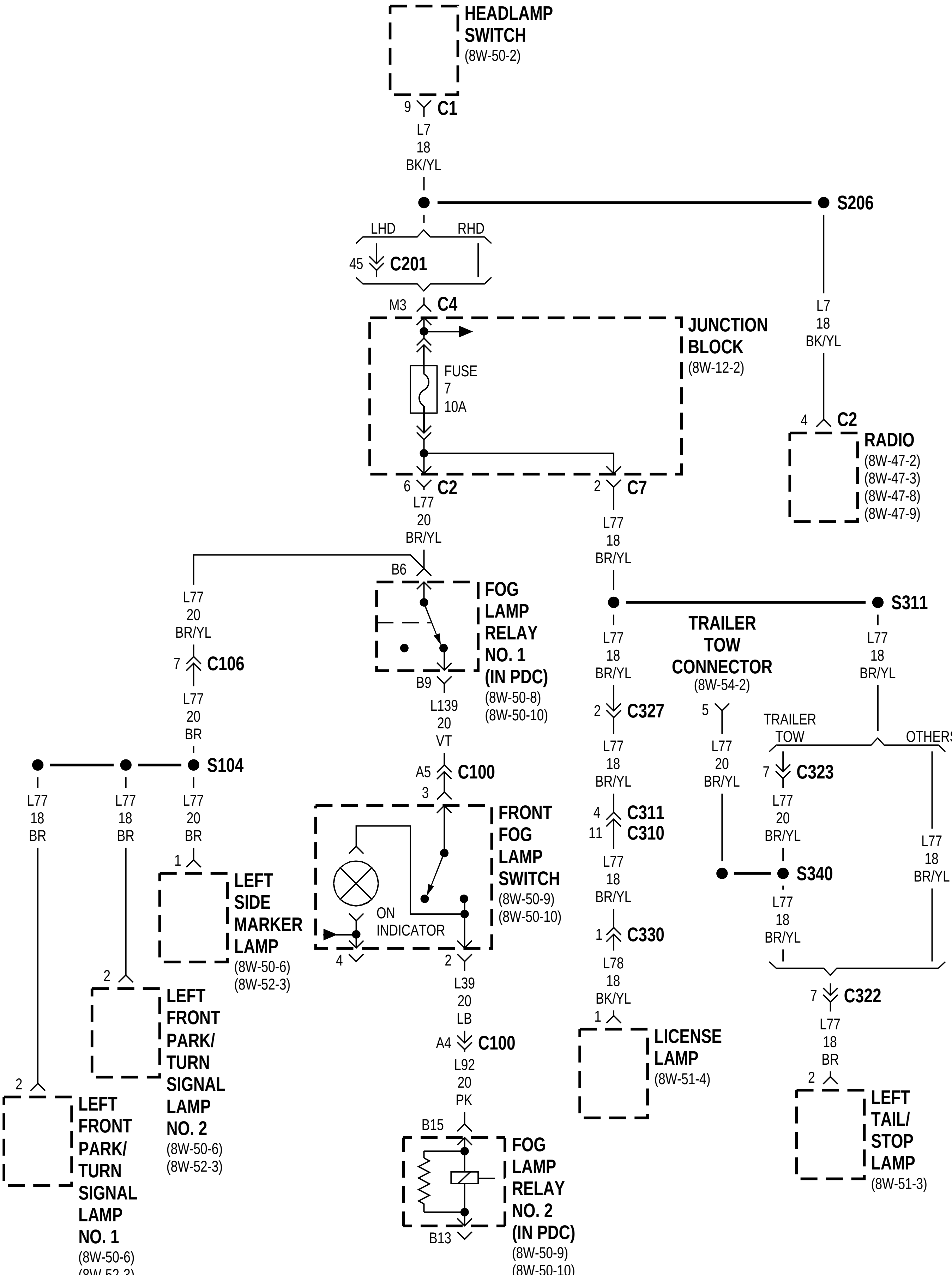

HEADLAMP
BEAM
SELECT
SWITCH
(8W-50-3)
(8W-50-4)
1
L4
16
VT/WT
LHD
RHD
L4
16
VT/WT
22
C201
L4
16
VT/WT
L4
16
VT/WT
L4
16
VT/WT
S3
C4
JUNCTION
BLOCK
(8W-12-2)
FUSE
4
10A
FUSE
5
10A
10
C1
1
C1
L43
20
VT
L44
20
VT/RD
S133
9
13
C106
OTHER
DRL
L44
20
VT/RD
L44
18
VT/RD
F6
B12
C100
10
DAYTIME
RUNNING
LAMP
MODULE
(8W-50-11)
L43
18
VT
L44
18
VT/RD
B
B
LEFT
HEADLAMP
(8W-50-3)
(8W-50-4)
RIGHT
HEADLAMP
(8W-50-3)
(8W-50-4)
RHD
LHD

LHD



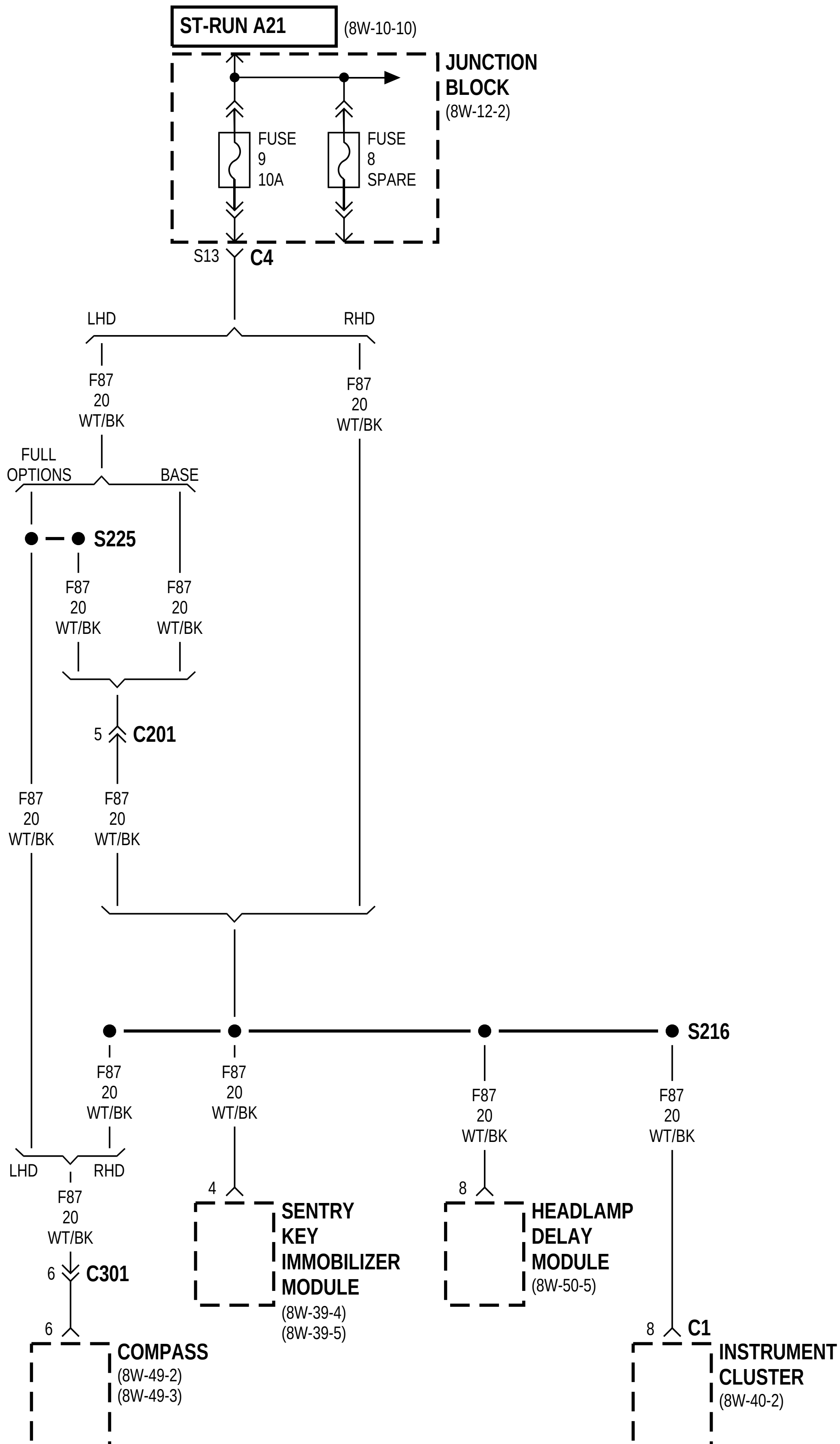
J008W-7 XJD01208


HEADLAMP SWITCH
(8W-50-2)
1 C1
E1
20
TN
S1 C4
JUNCTION BLOCK
(8W-12-2)
FUSE
6
5A
S2 C4
E2
20
OR
S215
E2
20
OR
12 C203
E2
20
OR/BK
5 C2
RADIO
(8W-47-3)
(8W-47-9)
3 C1
INSTRUMENT CLUSTER
(8W-40-12)
1
FRONT FOG LAMP SWITCH
(8W-44-3)
4
REAR WINDOW DEFOGGER SWITCH
(8W-48-3)
1 C206
1
PRNDL ILLUMINATION (A/T)
(8W-44-2)
1
TRANSFER CASE SWITCH ILLUMINATION
(8W-44-3)
7 C1
A/C-HEATER CONTROL ▲
(8W-42-5)
HEATER CONTROL ●
(8W-42-3)
3
REAR WIPER/ WASHER SWITCH
(8W-53-4)
▲ A/C
● HEATER ONLY

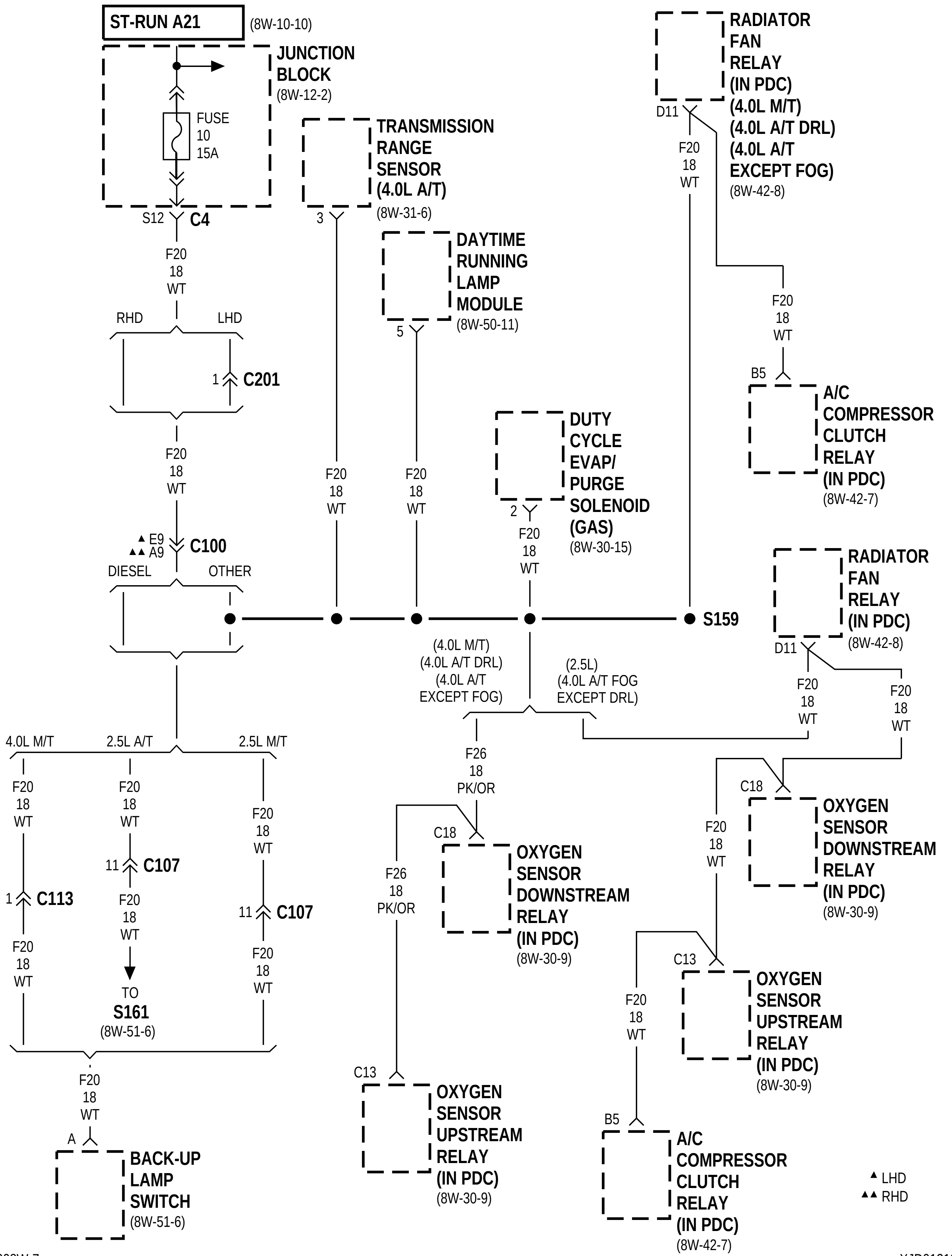


J008W-7

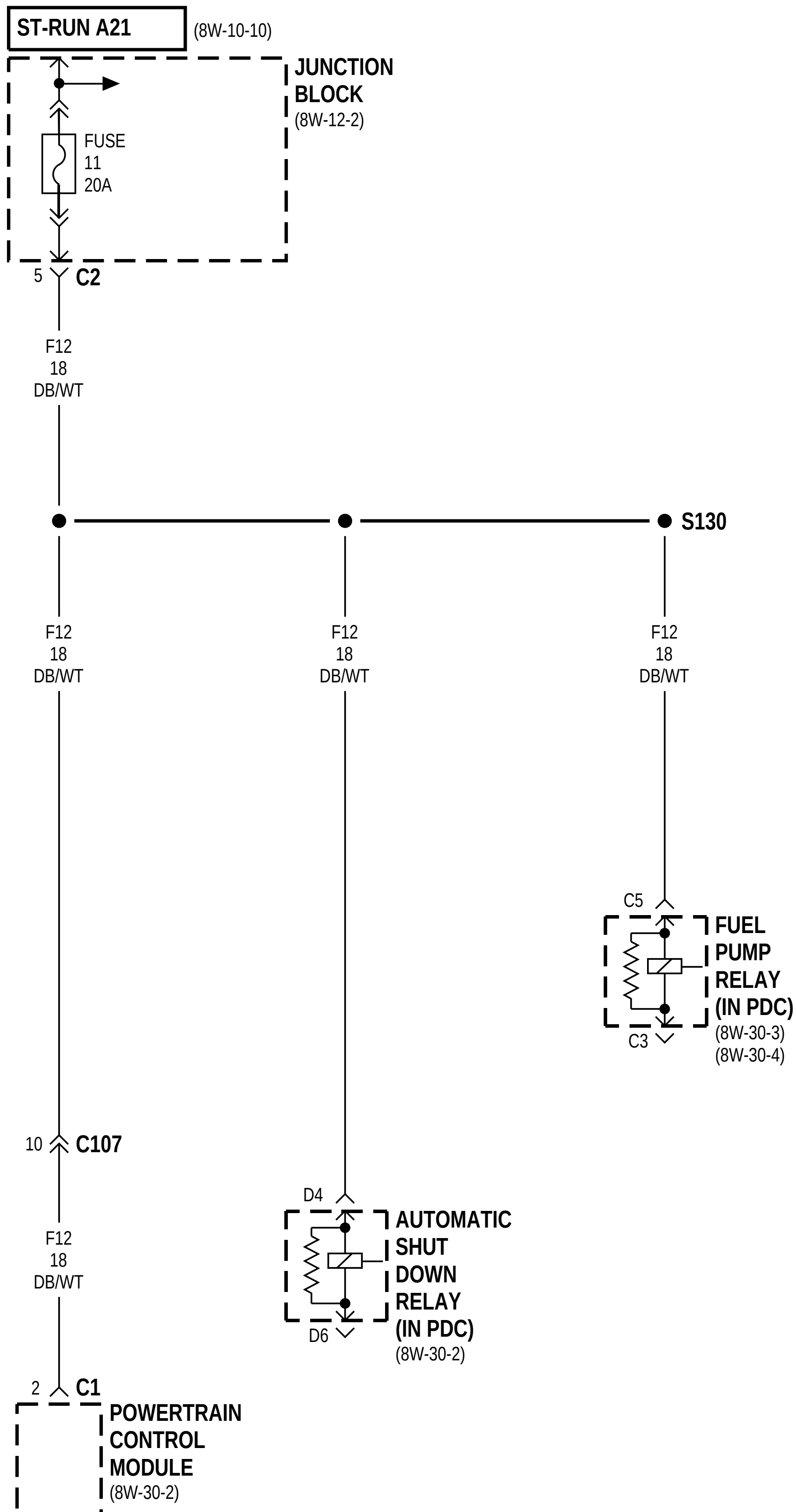
XJD01210



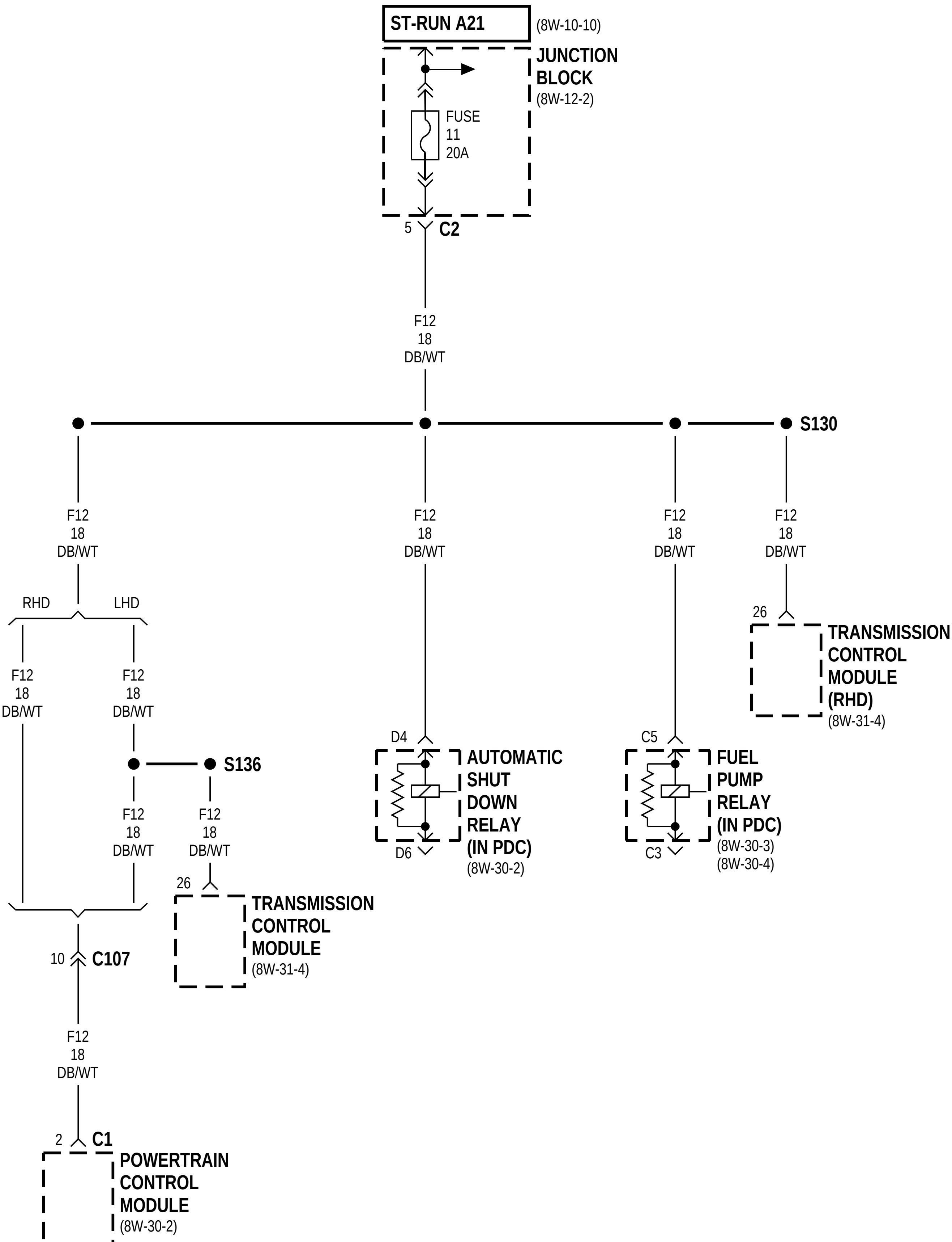
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 9 10A
FUSE 8 SPARE
S13
C4
LHD
RHD
F87 20 WT/BK
FULL OPTIONS
BASE
S225
5
C201
S216
4
SENTRY KEY IMMOBILIZER MODULE
(8W-39-4)
(8W-39-5)
8
HEADLAMP DELAY MODULE
(8W-50-5)
6
C301
COMPASS
(8W-49-2)
(8W-49-3)
8
C1
INSTRUMENT CLUSTER
(8W-40-2)



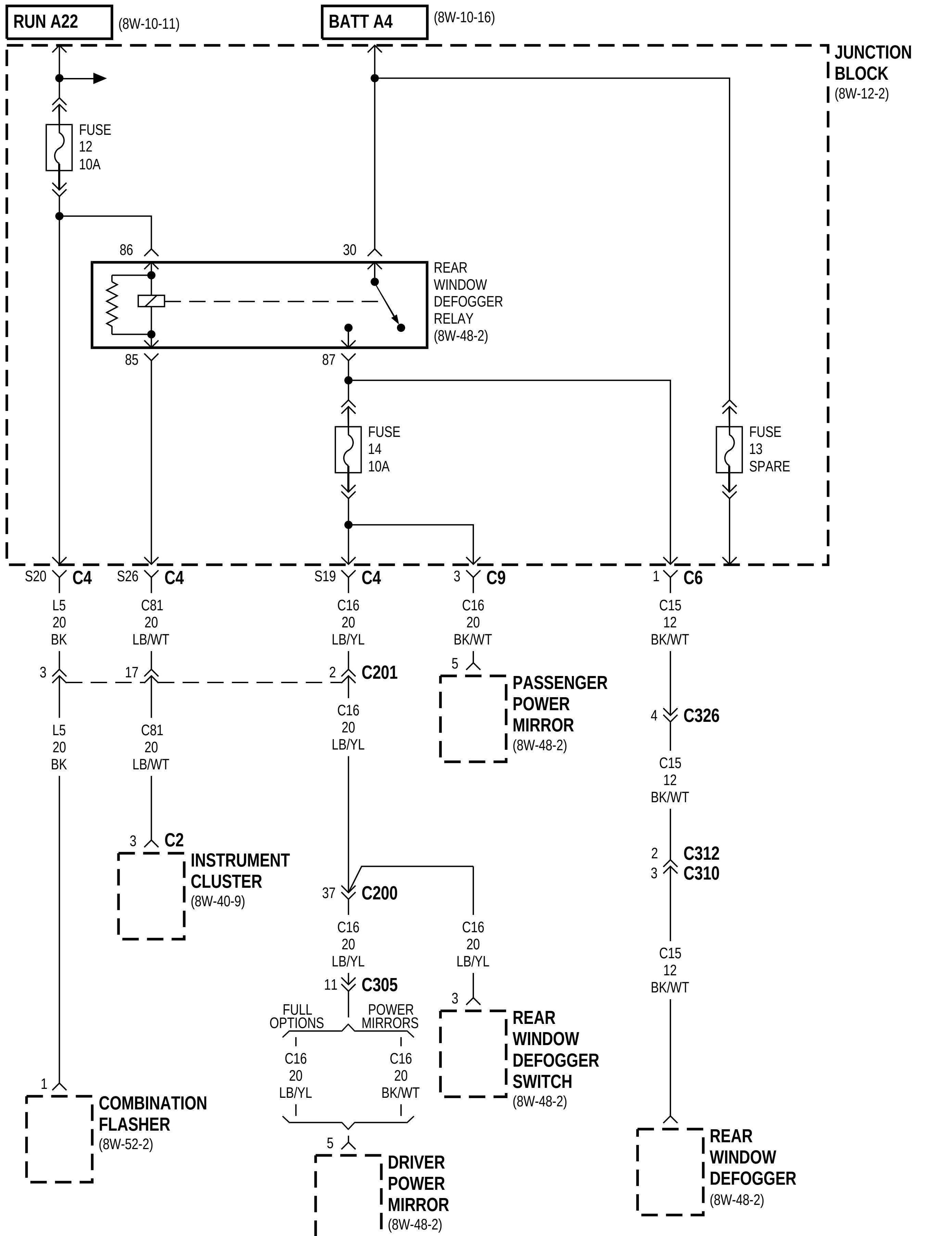
J008W-7 XJD01212


ST-RUN A21
(8W-10-10)
JUNCTION
BLOCK
(8W-12-2)
FUSE
11
20A
5
C2
F12
18
DB/WT
S130
F12
18
DB/WT
F12
18
DB/WT
F12
18
DB/WT
C5
FUEL
PUMP
RELAY
(IN PDC)
C3
(8W-30-3)
(8W-30-4)
10
C107
D4
AUTOMATIC
SHUT
DOWN
RELAY
(IN PDC)
D6
(8W-30-2)
F12
18
DB/WT
2
C1
POWERTRAIN
CONTROL
MODULE
(8W-30-2)

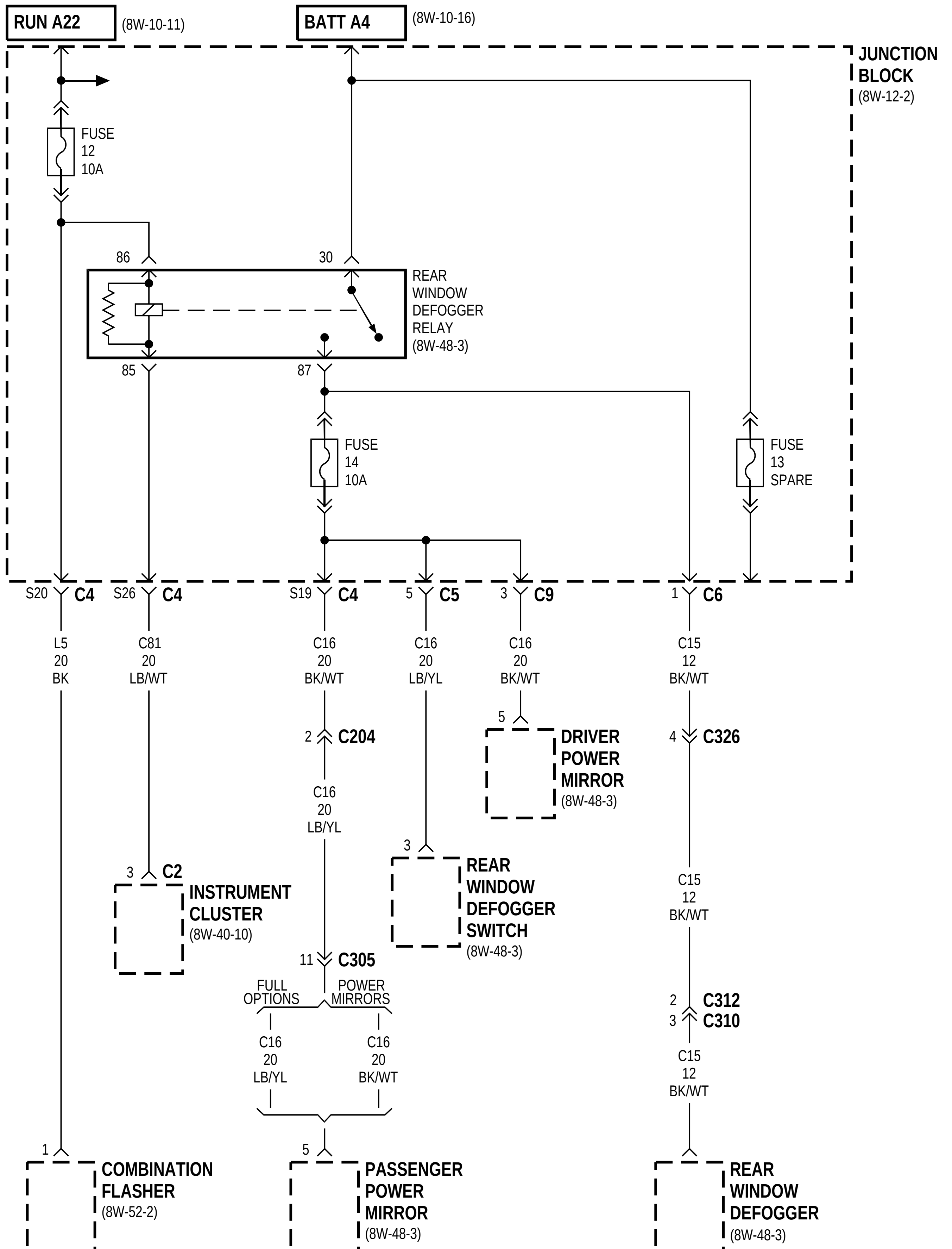
4.0L


ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
20A
5
C2
F12
18
DB/WT
S130
RHD
LHD
S136
D4
AUTOMATIC SHUT DOWN RELAY (IN PDC)
(8W-30-2)
D6
C5
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
(8W-30-4)
C3
26
TRANSMISSION CONTROL MODULE (RHD)
(8W-31-4)
TRANSMISSION CONTROL MODULE
(8W-31-4)
10
C107
2
C1
POWERTRAIN CONTROL MODULE
(8W-30-2)

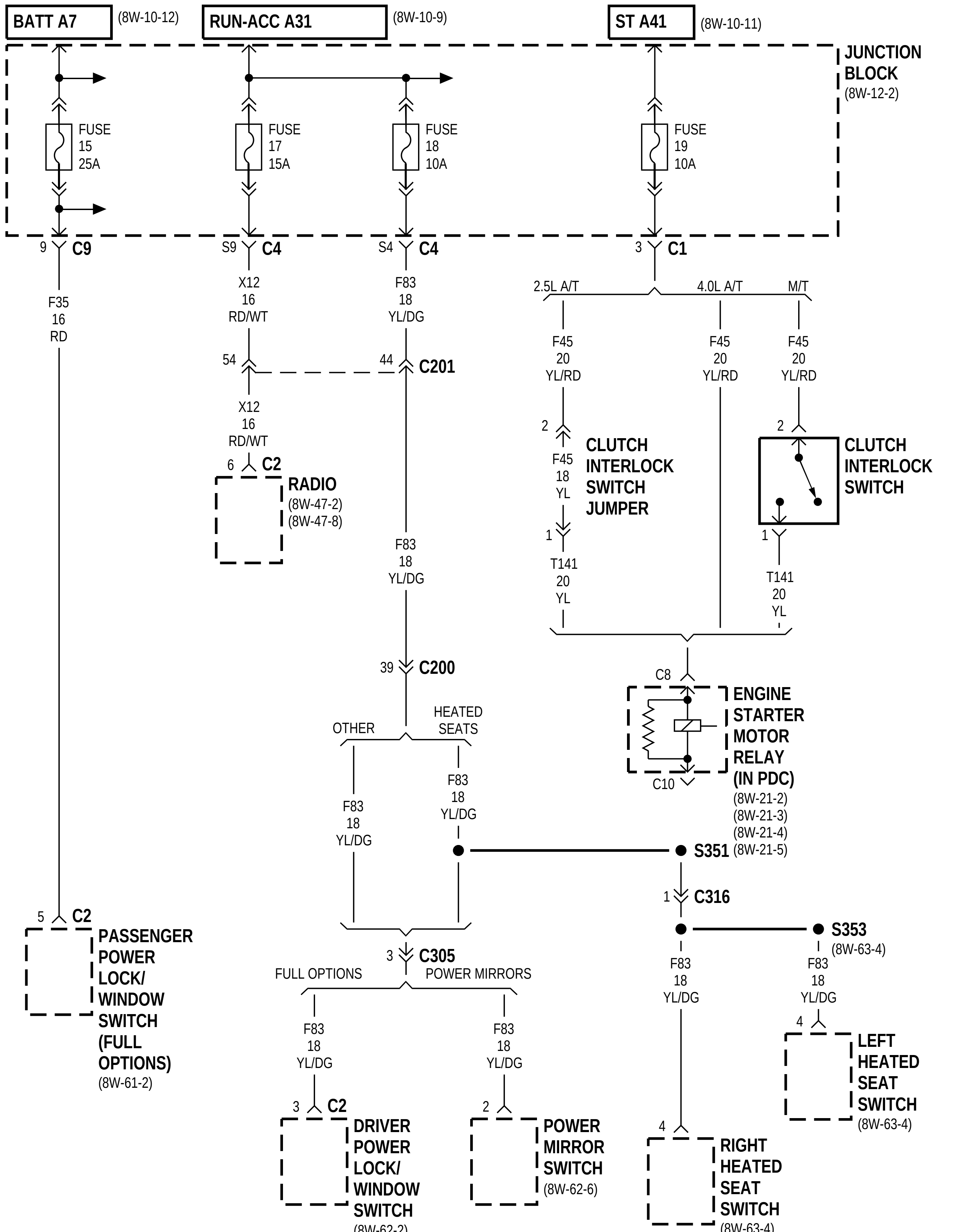
8W-12 JUNCTION BLOCK LHD



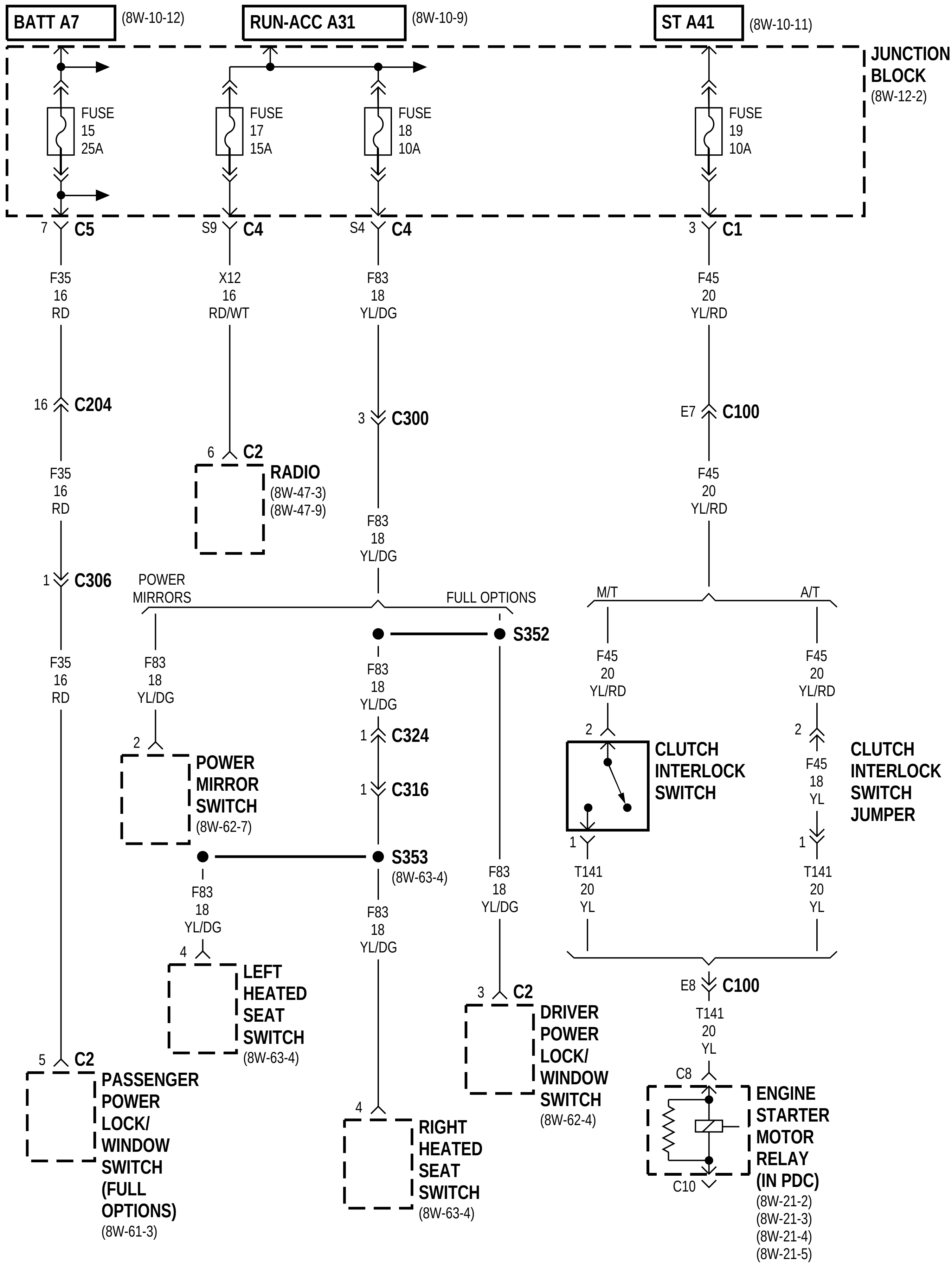
RHD

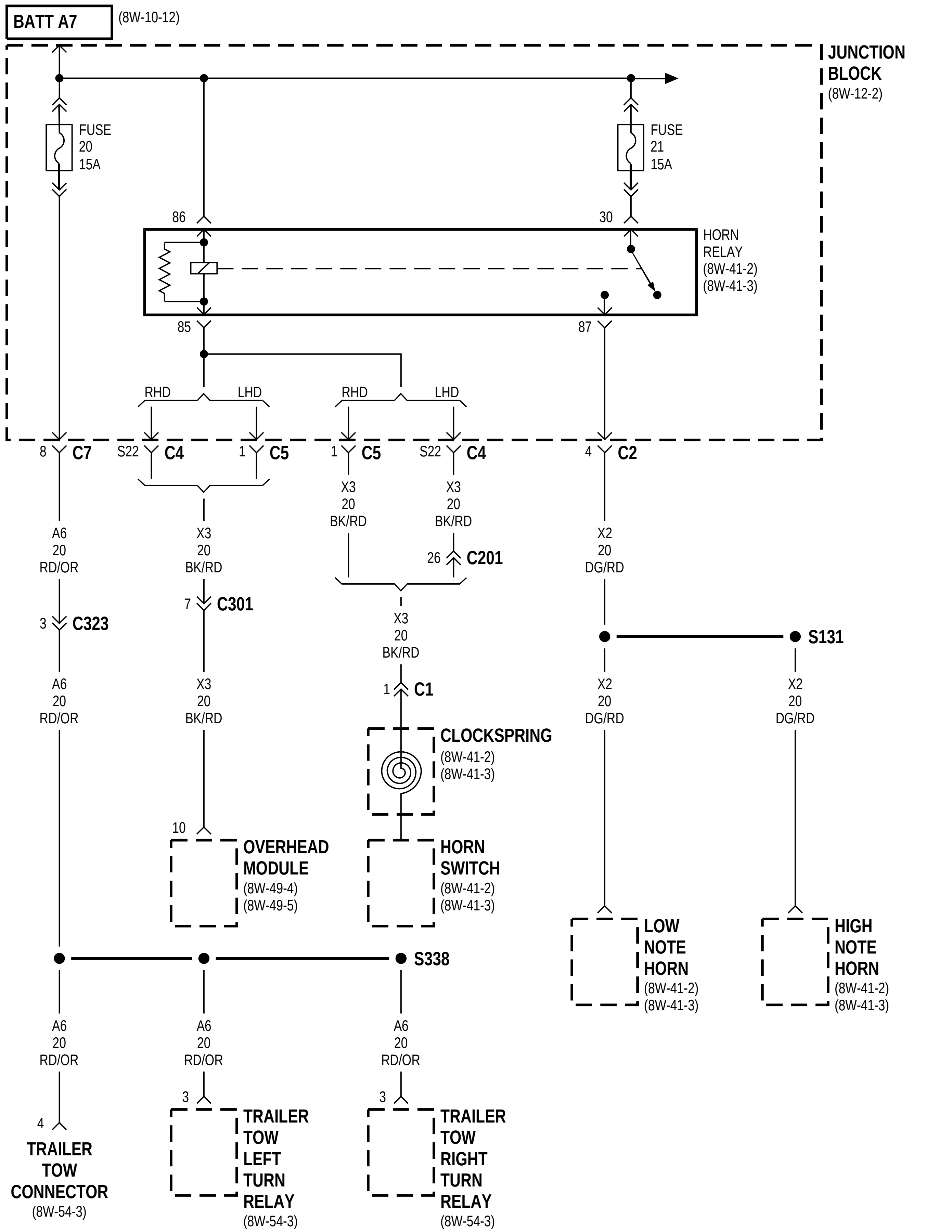


RUN A22
(8W-10-11)
BATT A4
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
FUSE 12 10A
86
30
REAR WINDOW DEFOGGER RELAY
(8W-48-3)
85
87
FUSE 14 10A
FUSE 13 SPARE
S20 C4
S26 C4
S19 C4
5 C5
3 C9
1 C6
L5 20 BK
C81 20 LB/WT
C16 20 BK/WT
C16 20 LB/YL
C16 20 BK/WT
C15 12 BK/WT
5
DRIVER POWER MIRROR
(8W-48-3)
2 C204
4 C326
C16 20 LB/YL
3
REAR WINDOW DEFOGGER SWITCH
(8W-48-3)
3 C2
INSTRUMENT CLUSTER
(8W-40-10)
C15 12 BK/WT
11 C305
FULL OPTIONS
POWER MIRRORS
C16 20 LB/YL
C16 20 BK/WT
2 C312
3 C310
C15 12 BK/WT
1
COMBINATION FLASHER
(8W-52-2)
5
PASSENGER POWER MIRROR
(8W-48-3)
REAR WINDOW DEFOGGER
(8W-48-3)


BATT A7
(8W-10-12)
RUN-ACC A31
(8W-10-9)
ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 15 25A
FUSE 17 15A
FUSE 18 10A
FUSE 19 10A
9 C9
S9 C4
S4 C4
3 C1
F35 16 RD
X12 16 RD/WT
F83 18 YL/DG
2.5L A/T
4.0L A/T
M/T
F45 20 YL/RD
54
44 C201
X12 16 RD/WT
6 C2
RADIO
(8W-47-2)
(8W-47-8)
2
CLUTCH INTERLOCK SWITCH JUMPER
F45 18 YL
1
T141 20 YL
CLUTCH INTERLOCK SWITCH
F83 18 YL/DG
39 C200
C8
ENGINE STARTER MOTOR RELAY (IN PDC)
C10
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
OTHER
HEATED SEATS
S351
1 C316
S353
(8W-63-4)
5 C2
PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-2)
3 C305
FULL OPTIONS
POWER MIRRORS
4
LEFT HEATED SEAT SWITCH
(8W-63-4)
3 C2
DRIVER POWER LOCK/ WINDOW SWITCH
(8W-62-2)
2
POWER MIRROR SWITCH
(8W-62-6)
RIGHT HEATED SEAT SWITCH
(8W-63-4)

RHD


BATT A7
(8W-10-12)
RUN-ACC A31
(8W-10-9)
ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 15 25A
FUSE 17 15A
FUSE 18 10A
FUSE 19 10A
7 C5
S9 C4
S4 C4
3 C1
F35 16 RD
X12 16 RD/WT
F83 18 YL/DG
F45 20 YL/RD
16 C204
3 C300
E7 C100
6 C2
RADIO
(8W-47-3)
(8W-47-9)
1 C306
POWER MIRRORS
FULL OPTIONS
M/T
A/T
S352
2
POWER MIRROR SWITCH
(8W-62-7)
1 C324
1 C316
CLUTCH INTERLOCK SWITCH
F45 18 YL
CLUTCH INTERLOCK SWITCH JUMPER
1
S353
(8W-63-4)
T141 20 YL
4
LEFT HEATED SEAT SWITCH
(8W-63-4)
E8 C100
3 C2
DRIVER POWER LOCK/ WINDOW SWITCH
(8W-62-4)
5 C2
PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-3)
C8
C10
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
RIGHT HEATED SEAT SWITCH
(8W-63-4)


BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
FUSE 20 15A
FUSE 21 15A
86
30
HORN RELAY
(8W-41-2)
(8W-41-3)
85
87
RHD
LHD
RHD
LHD
8 C7
S22 C4
1 C5
1 C5
S22 C4
4 C2
X3 20 BK/RD
X3 20 BK/RD
A6 20 RD/OR
X3 20 BK/RD
26 C201
X2 20 DG/RD
3 C323
7 C301
X3 20 BK/RD
S131
A6 20 RD/OR
X3 20 BK/RD
1 C1
X2 20 DG/RD
X2 20 DG/RD
CLOCKSPRING
(8W-41-2)
(8W-41-3)
10
OVERHEAD MODULE
(8W-49-4)
(8W-49-5)
HORN SWITCH
(8W-41-2)
(8W-41-3)
LOW NOTE HORN
(8W-41-2)
(8W-41-3)
HIGH NOTE HORN
(8W-41-2)
(8W-41-3)
S338
A6 20 RD/OR
A6 20 RD/OR
A6 20 RD/OR
4
3
3
TRAILER TOW CONNECTOR
(8W-54-3)
TRAILER TOW LEFT TURN RELAY
(8W-54-3)
TRAILER TOW RIGHT TURN RELAY
(8W-54-3)

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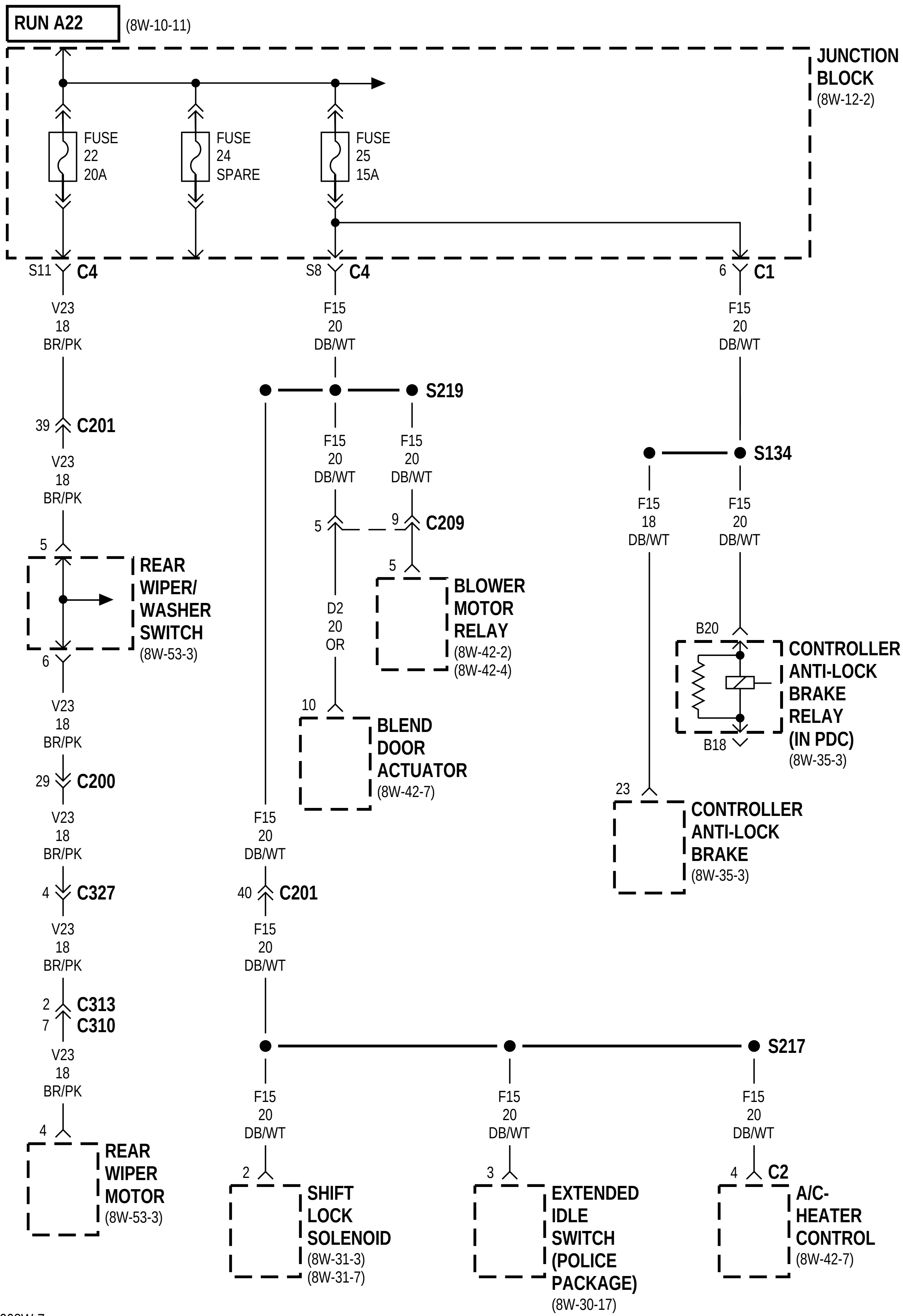
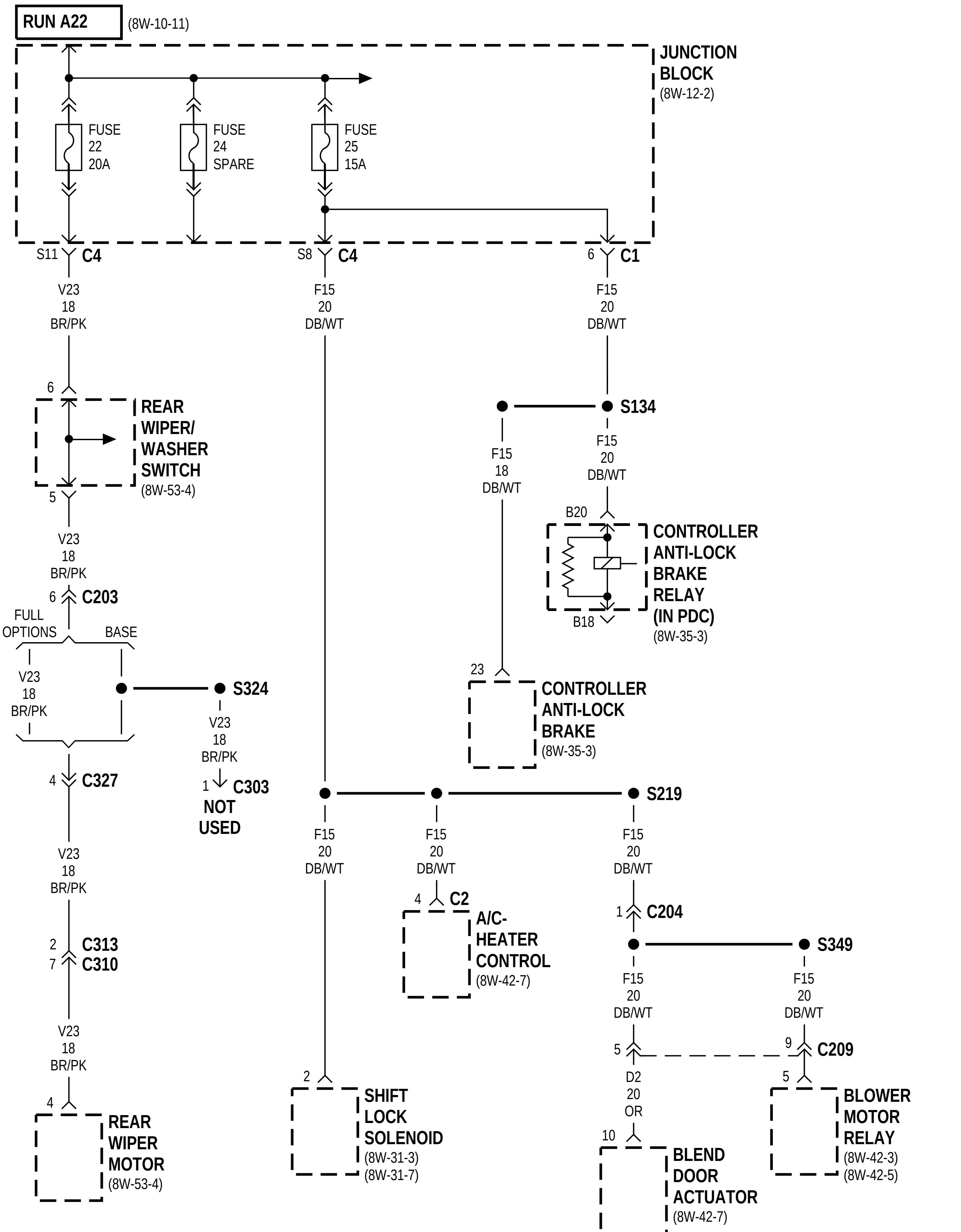
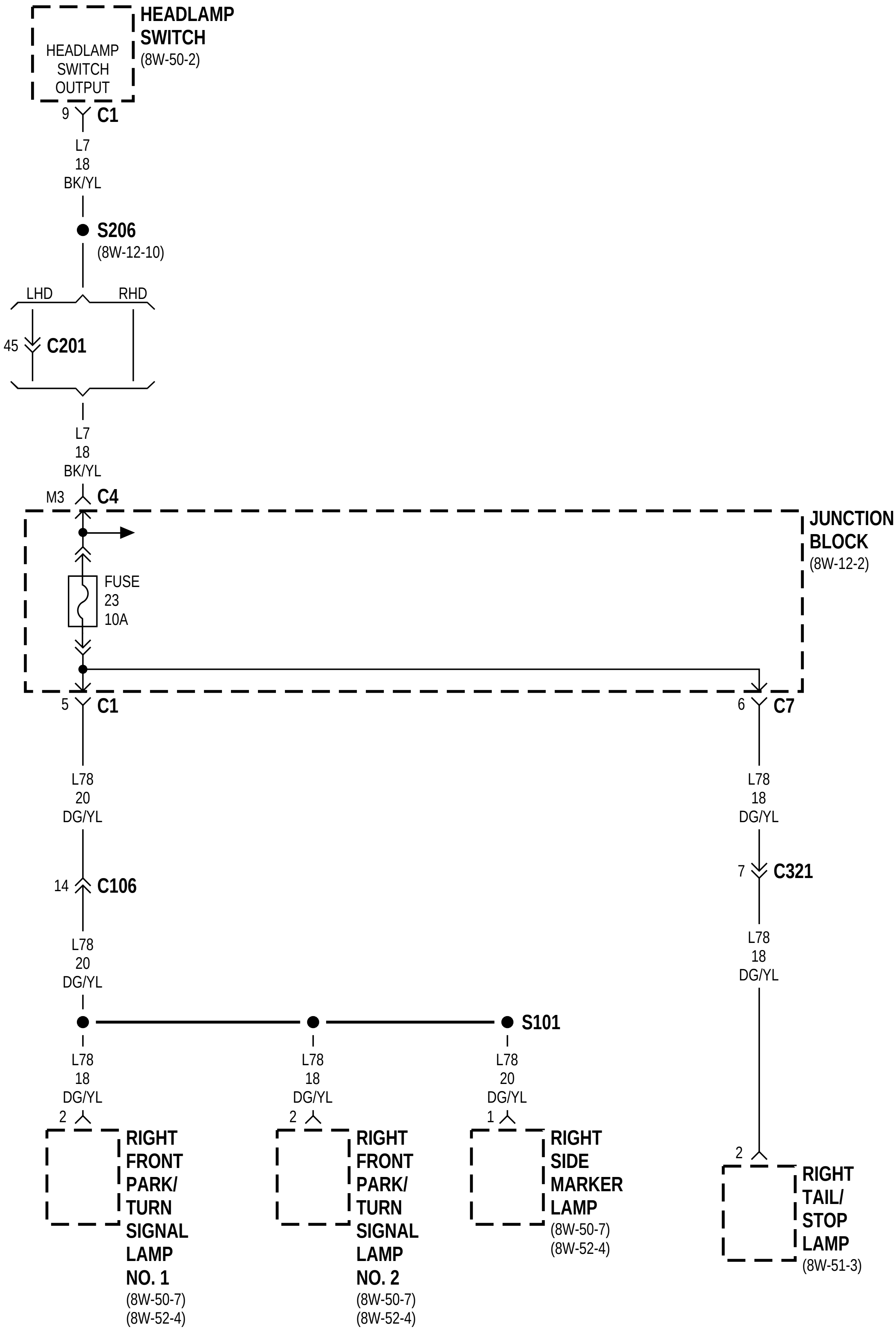
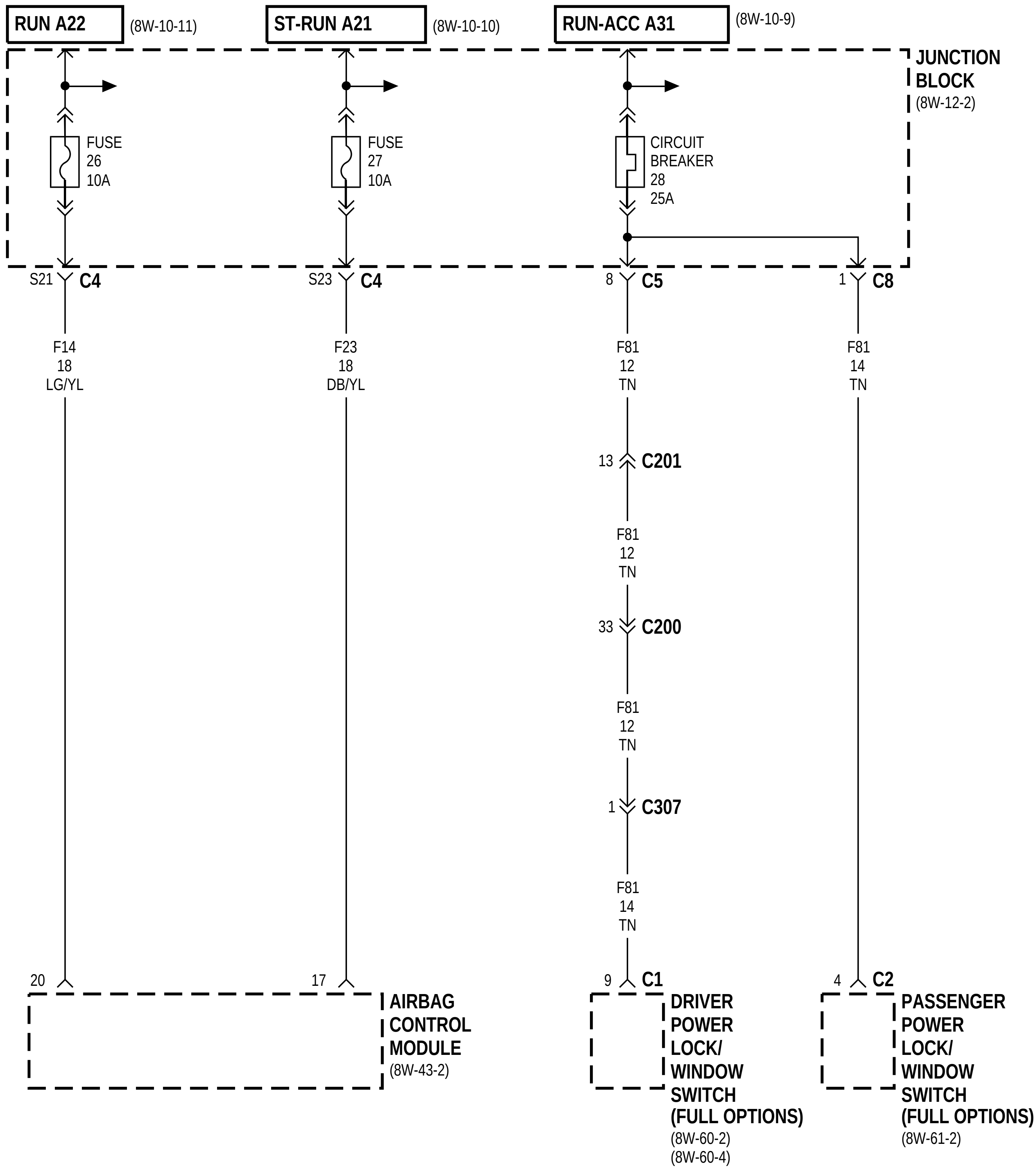

RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 22 20A
FUSE 24 SPARE
FUSE 25 15A
S11 C4
S8 C4
6 C1
V23 18 BR/PK
F15 20 DB/WT
S219
39 C201
S134
F15 18 DB/WT
5 9 C209
5
REAR WIPER/ WASHER SWITCH
(8W-53-3)
6
BLOWER MOTOR RELAY
(8W-42-2)
(8W-42-4)
D2 20 OR
B20
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC)
(8W-35-3)
B18
10
BLEND DOOR ACTUATOR
(8W-42-7)
29 C200
23
CONTROLLER ANTI-LOCK BRAKE
(8W-35-3)
4 C327
40 C201
2 C313
7 C310
S217
4
REAR WIPER MOTOR
(8W-53-3)
2
SHIFT LOCK SOLENOID
(8W-31-3)
(8W-31-7)
3
EXTENDED IDLE SWITCH (POLICE PACKAGE)
(8W-30-17)
4 C2
A/C-HEATER CONTROL
(8W-42-7)



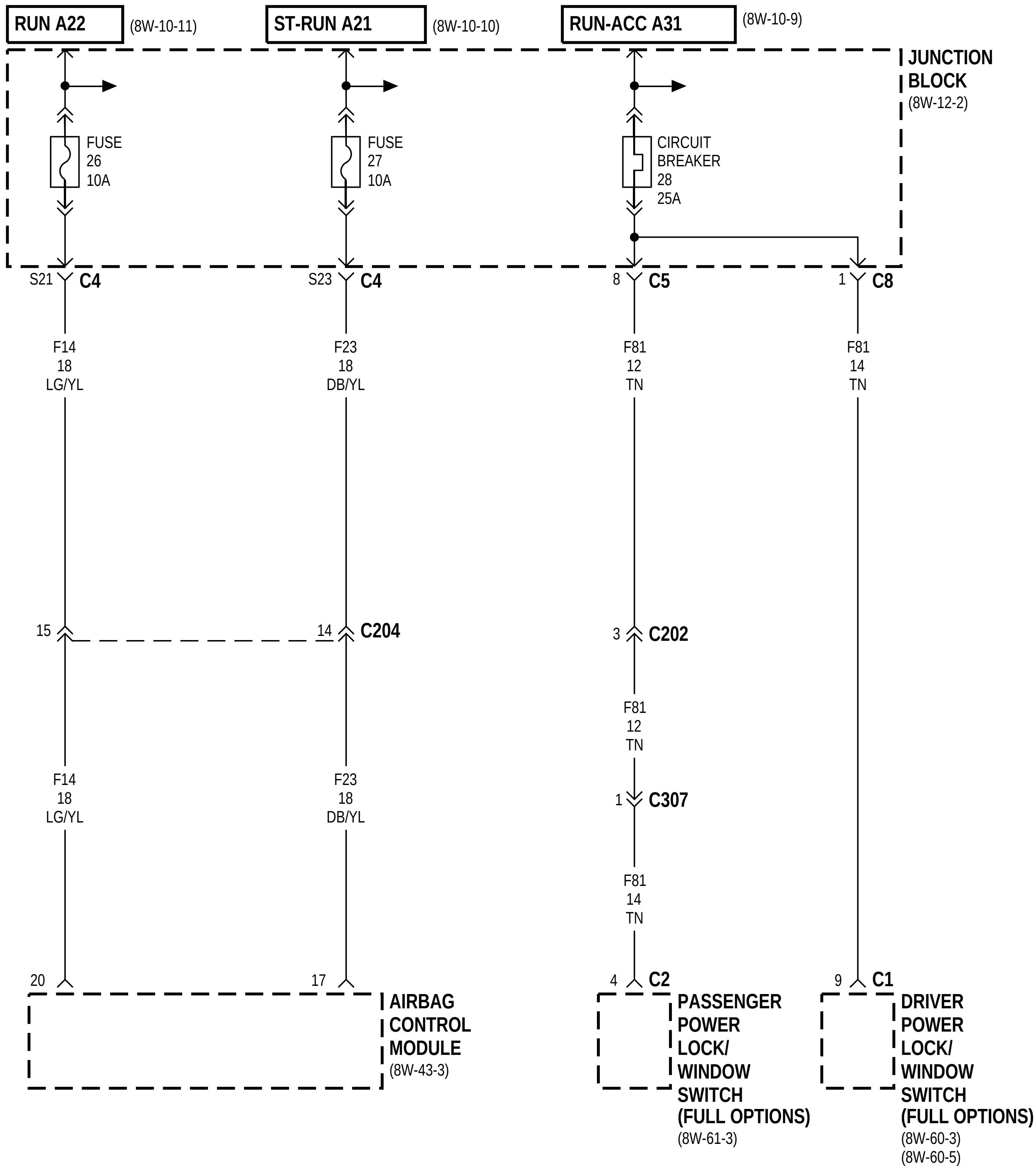
XJD01221 J008W-7

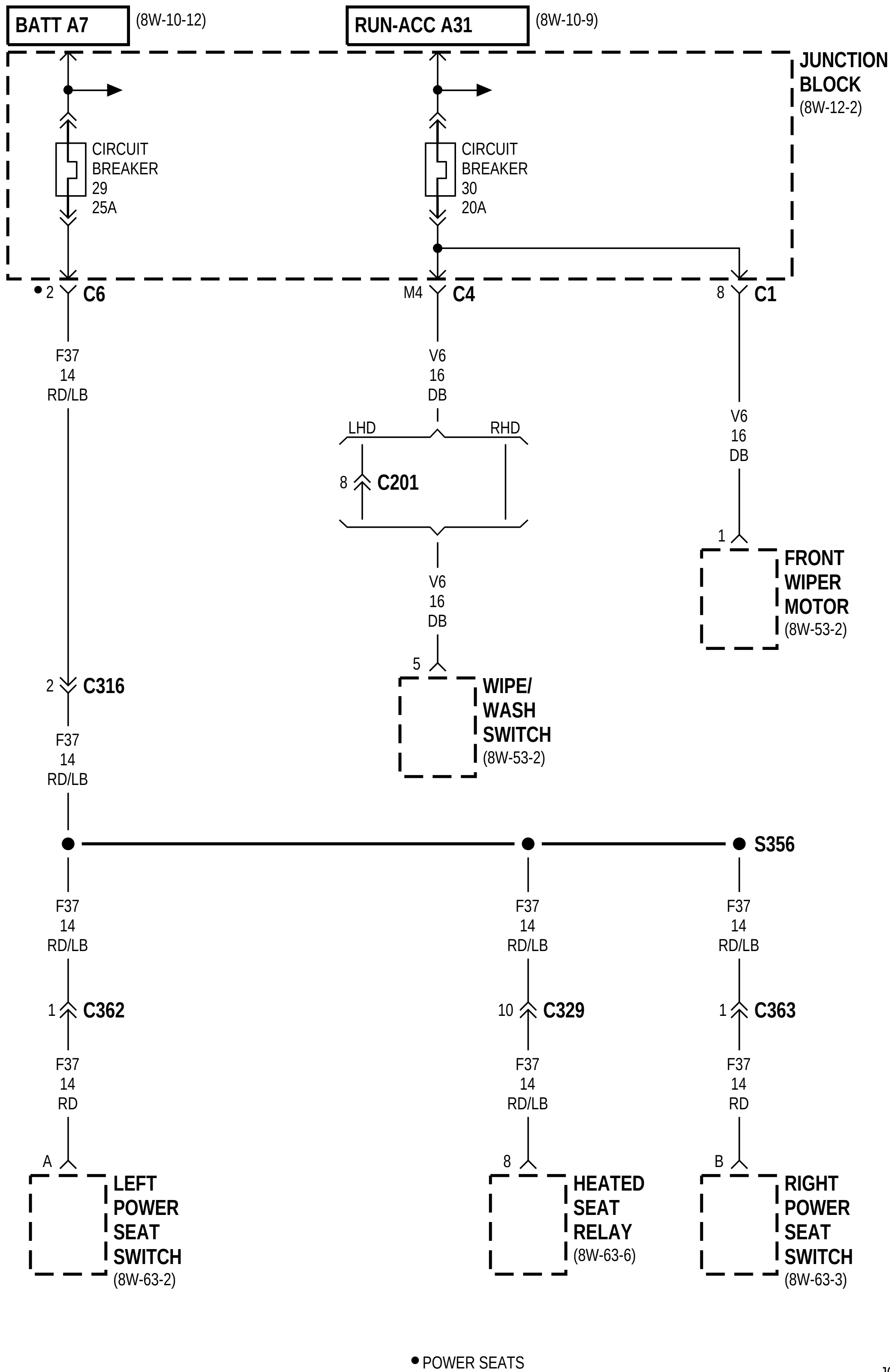

HEADLAMP SWITCH OUTPUT
HEADLAMP SWITCH
(8W-50-2)
9
C1
L7
18
BK/YL
S206
(8W-12-10)
LHD
RHD
45
C201
L7
18
BK/YL
M3
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
23
10A
5
C1
6
C7
L78
20
DG/YL
L78
18
DG/YL
14
C106
7
C321
L78
20
DG/YL
L78
18
DG/YL
S101
L78
18
DG/YL
L78
18
DG/YL
L78
20
DG/YL
2
2
1
2
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 1
(8W-50-7)
(8W-52-4)
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 2
(8W-50-7)
(8W-52-4)
RIGHT SIDE MARKER LAMP
(8W-50-7)
(8W-52-4)
RIGHT TAIL/ STOP LAMP
(8W-51-3)

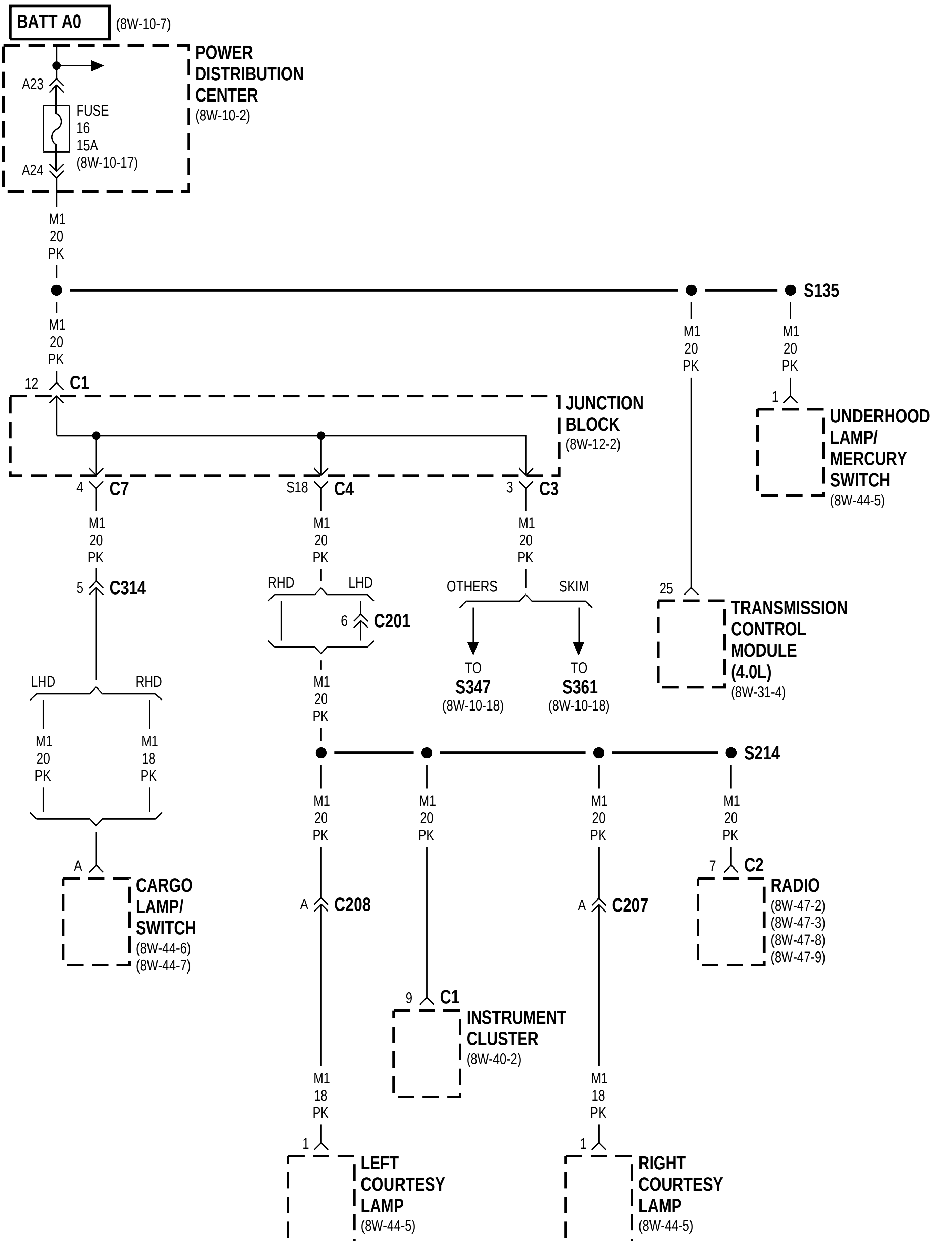
8W-12 JUNCTION BLOCK
LHD

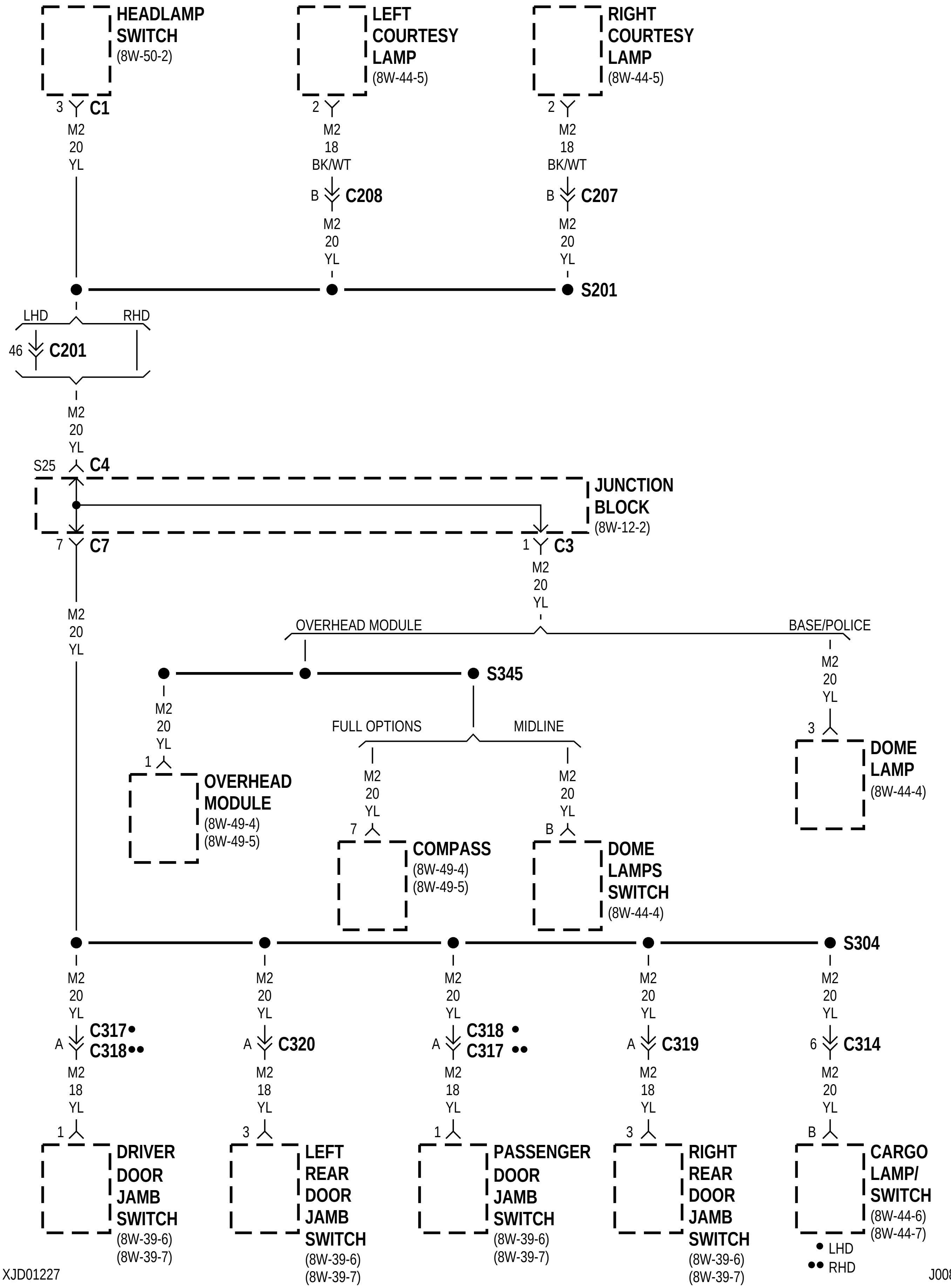


RHD


RUN A22
(8W-10-11)
ST-RUN A21
(8W-10-10)
RUN-ACC A31
(8W-10-9)
JUNCTION
BLOCK
(8W-12-2)
FUSE
26
10A
FUSE
27
10A
CIRCUIT
BREAKER
28
25A
S21
C4
S23
C4
8
C5
1
C8
F14
18
LG/YL
F23
18
DB/YL
F81
12
TN
F81
14
TN
15
14
C204
3
C202
F81
12
TN
1
C307
F14
18
LG/YL
F23
18
DB/YL
F81
14
TN
20
17
AIRBAG
CONTROL
MODULE
(8W-43-3)
4
C2
PASSENGER
POWER
LOCK/
WINDOW
SWITCH
(FULL OPTIONS)
(8W-61-3)
9
C1
DRIVER
POWER
LOCK/
WINDOW
SWITCH
(FULL OPTIONS)
(8W-60-3)
(8W-60-5)


BATT A7
(8W-10-12)
RUN-ACC A31
(8W-10-9)
JUNCTION
BLOCK
(8W-12-2)
CIRCUIT
BREAKER
29
25A
CIRCUIT
BREAKER
30
20A
2
C6
M4
C4
8
C1
F37
14
RD/LB
V6
16
DB
LHD
RHD
8
C201
V6
16
DB
1
FRONT
WIPER
MOTOR
(8W-53-2)
5
WIPE/
WASH
SWITCH
(8W-53-2)
2
C316
F37
14
RD/LB
S356
F37
14
RD/LB
1
C362
10
C329
1
C363
F37
14
RD
A
LEFT
POWER
SEAT
SWITCH
(8W-63-2)
8
HEATED
SEAT
RELAY
(8W-63-6)
B
RIGHT
POWER
SEAT
SWITCH
(8W-63-3)
● POWER SEATS


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE 16 15A
(8W-10-17)
A24
M1 20 PK
S135
12 C1
JUNCTION BLOCK
(8W-12-2)
UNDERHOOD LAMP/ MERCURY SWITCH
(8W-44-5)
4 C7
S18 C4
3 C3
5 C314
RHD LHD
6 C201
OTHERS SKIM
TO S347
(8W-10-18)
TO S361
(8W-10-18)
25
TRANSMISSION CONTROL MODULE (4.0L)
(8W-31-4)
LHD RHD
M1 18 PK
S214
A
CARGO LAMP/ SWITCH
(8W-44-6)
(8W-44-7)
A C208
A C207
7 C2
RADIO
(8W-47-2)
(8W-47-3)
(8W-47-8)
(8W-47-9)
9 C1
INSTRUMENT CLUSTER
(8W-40-2)
1
LEFT COURTESY LAMP
(8W-44-5)
RIGHT COURTESY LAMP
(8W-44-5)



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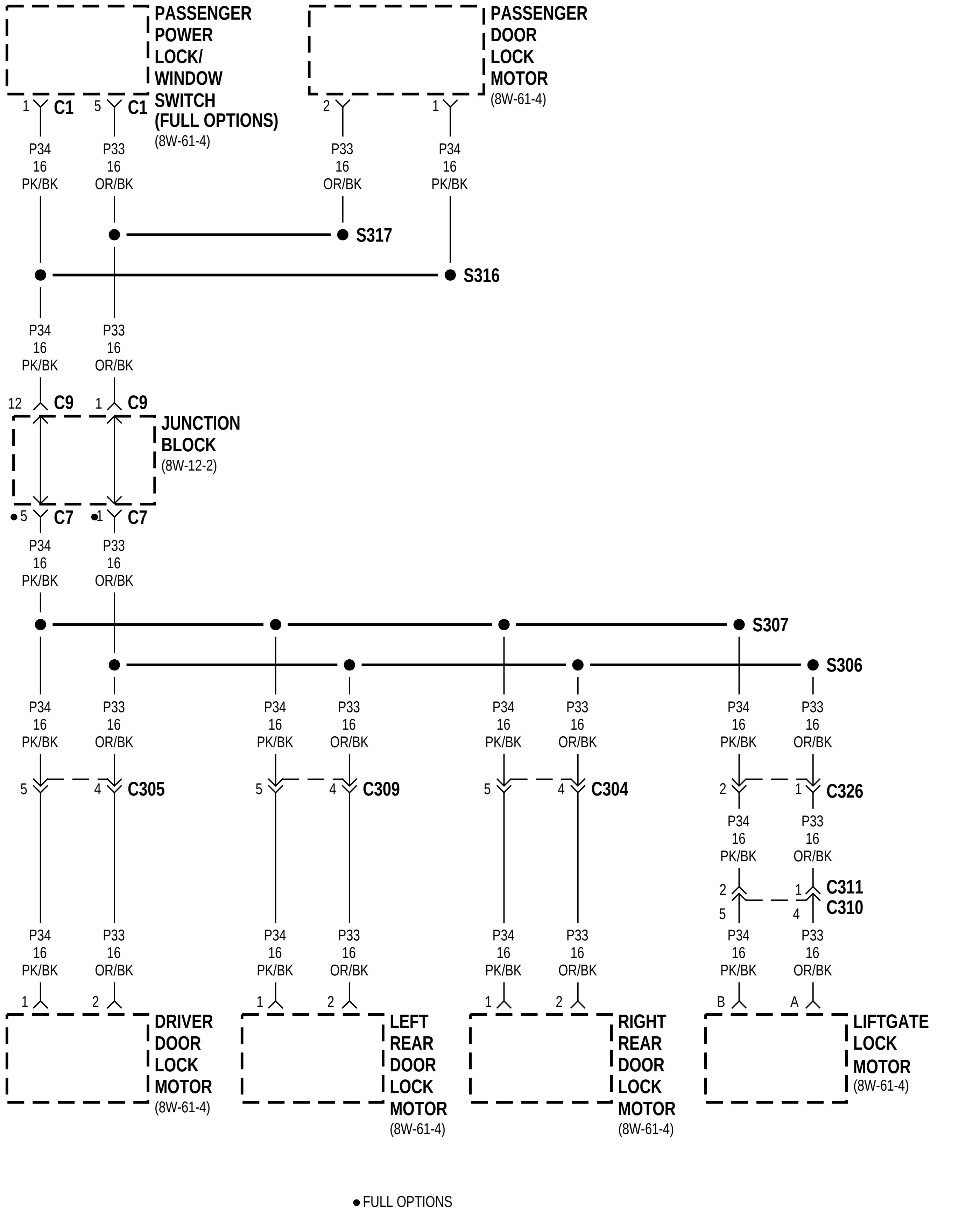
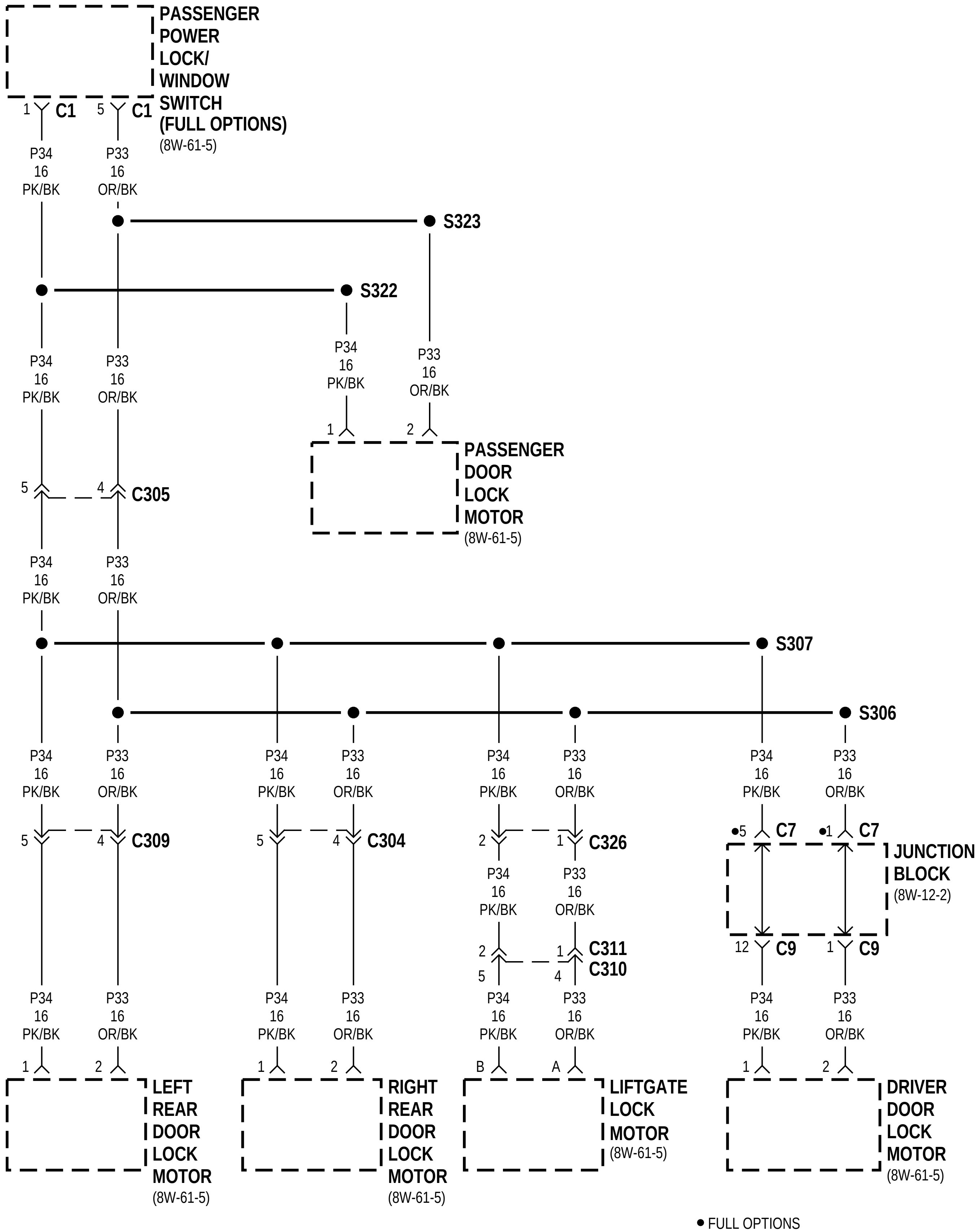
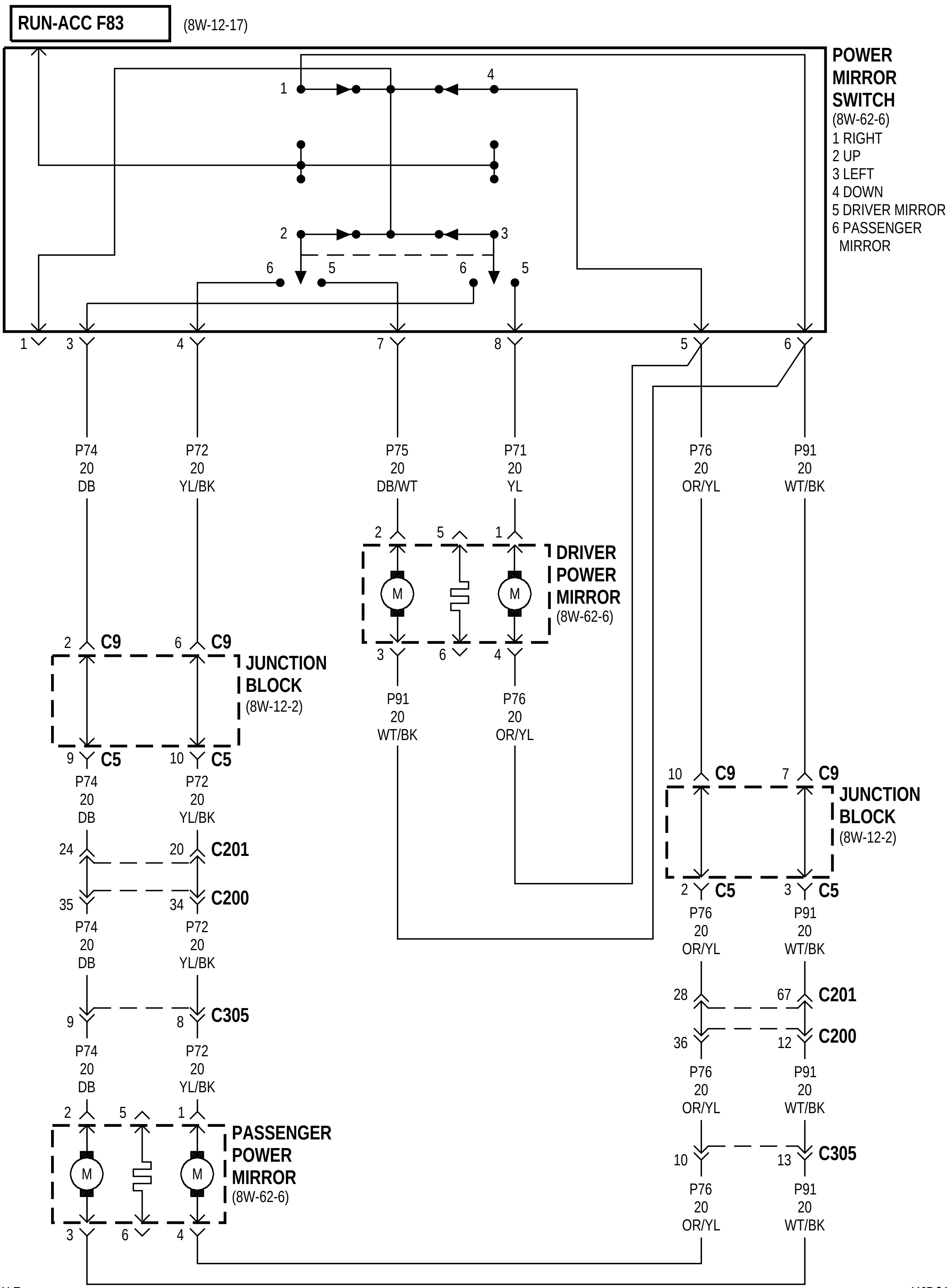
J008W-7

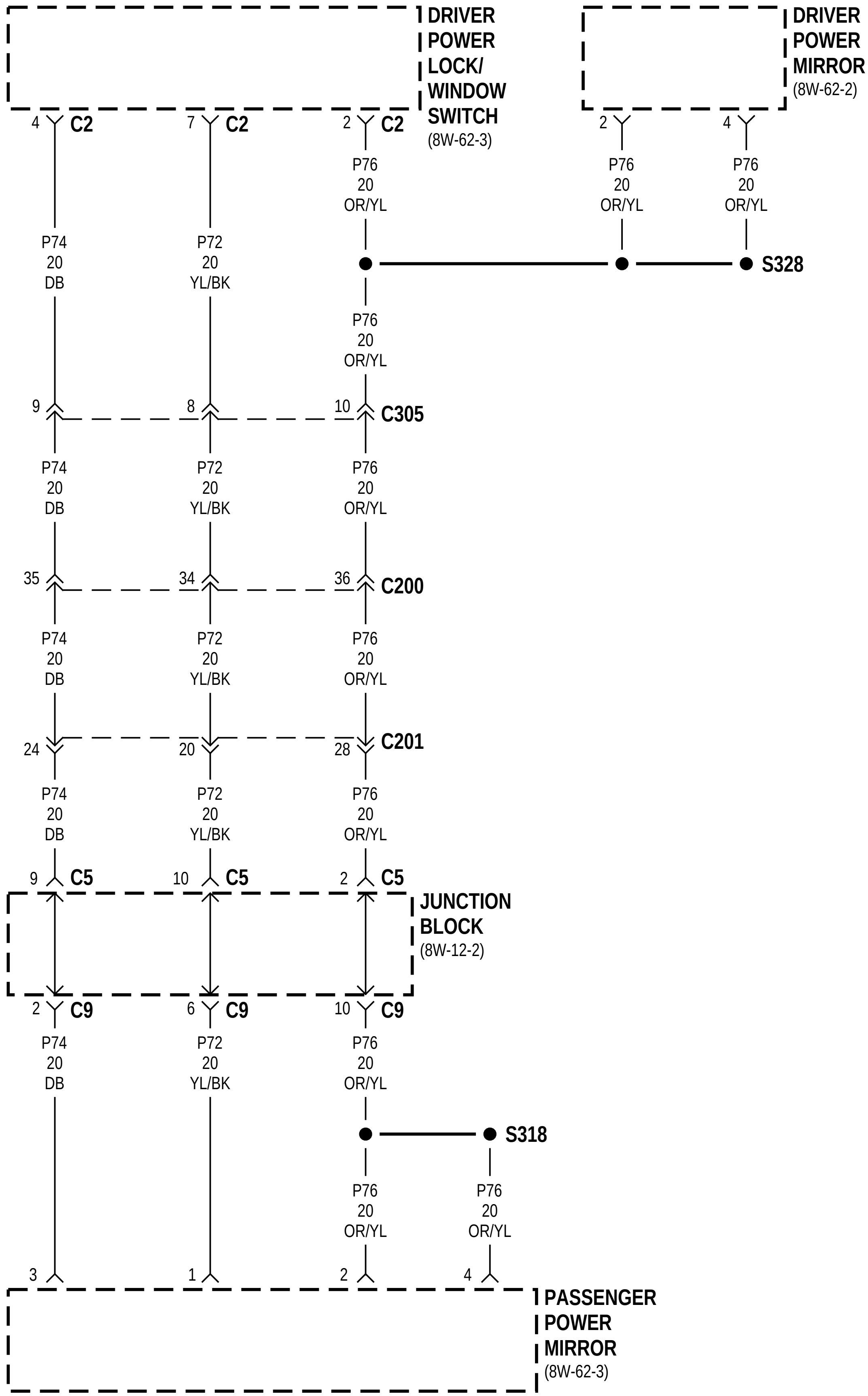

PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-4)
PASSENGER DOOR LOCK MOTOR
(8W-61-4)
1 C1
5 C1
2
1
P34 16 PK/BK
P33 16 OR/BK
S317
S316
12 C9
1 C9
JUNCTION BLOCK
(8W-12-2)
5 C7
1 C7
S307
S306
5 C305 4
5 C309 4
5 C304 4
2 C326 1
2 C311 1
5 C310 4
DRIVER DOOR LOCK MOTOR
(8W-61-4)
LEFT REAR DOOR LOCK MOTOR
(8W-61-4)
RIGHT REAR DOOR LOCK MOTOR
(8W-61-4)
LIFTGATE LOCK MOTOR
(8W-61-4)
B
A
● FULL OPTIONS

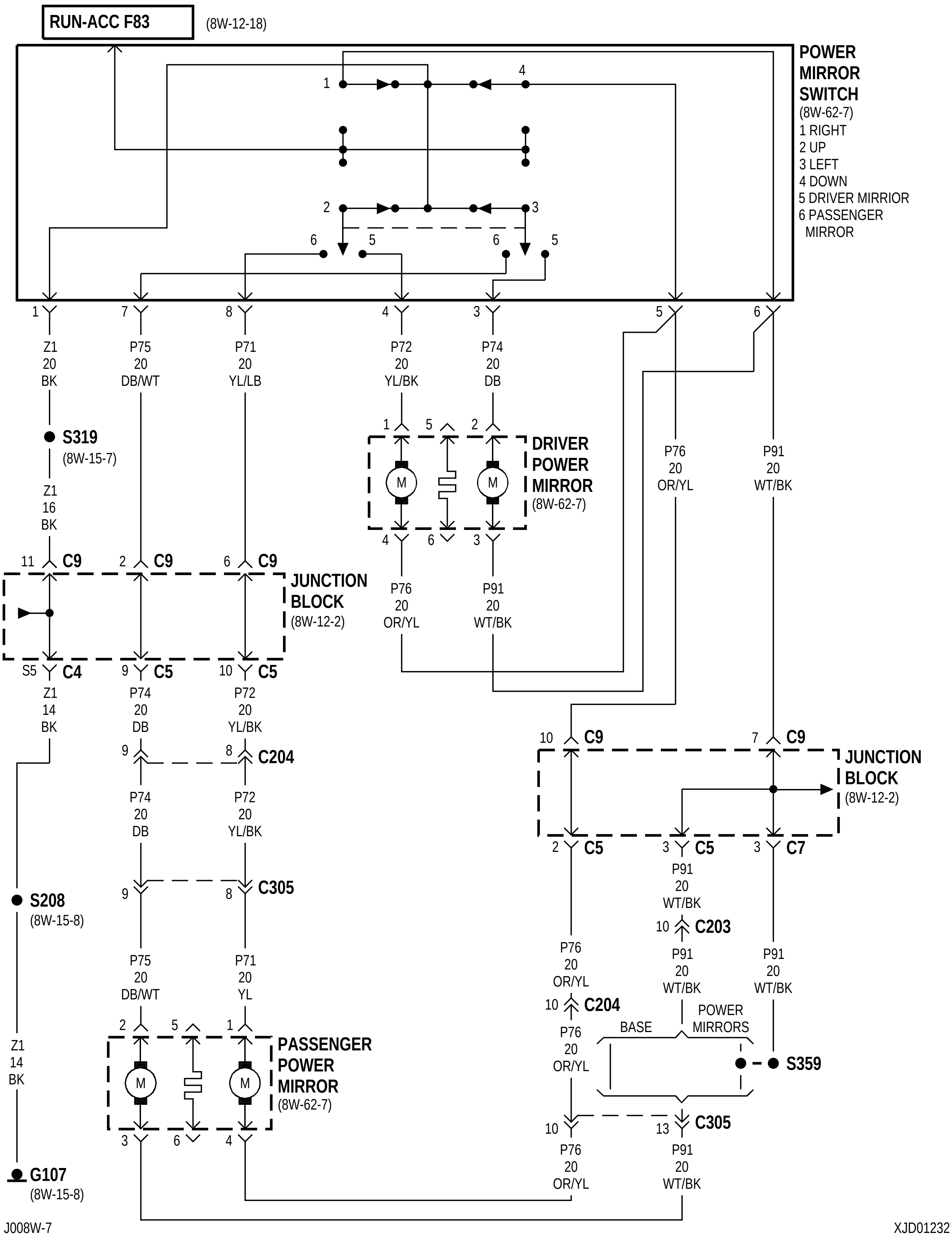

PASSENGER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS)
(8W-61-5)
1 C1
5 C1
P34 16 PK/BK
P33 16 OR/BK
S323
S322
5 4 C305
1 2
PASSENGER DOOR LOCK MOTOR
(8W-61-5)
S307
S306
5 4 C309
5 4 C304
2 1 C326
2 1 C311
5 4 C310
•5 C7
•1 C7
JUNCTION BLOCK
(8W-12-2)
12 C9
1 C9
1 2
LEFT REAR DOOR LOCK MOTOR
(8W-61-5)
1 2
RIGHT REAR DOOR LOCK MOTOR
(8W-61-5)
B A
LIFTGATE LOCK MOTOR
(8W-61-5)
1 2
DRIVER DOOR LOCK MOTOR
(8W-61-5)
• FULL OPTIONS

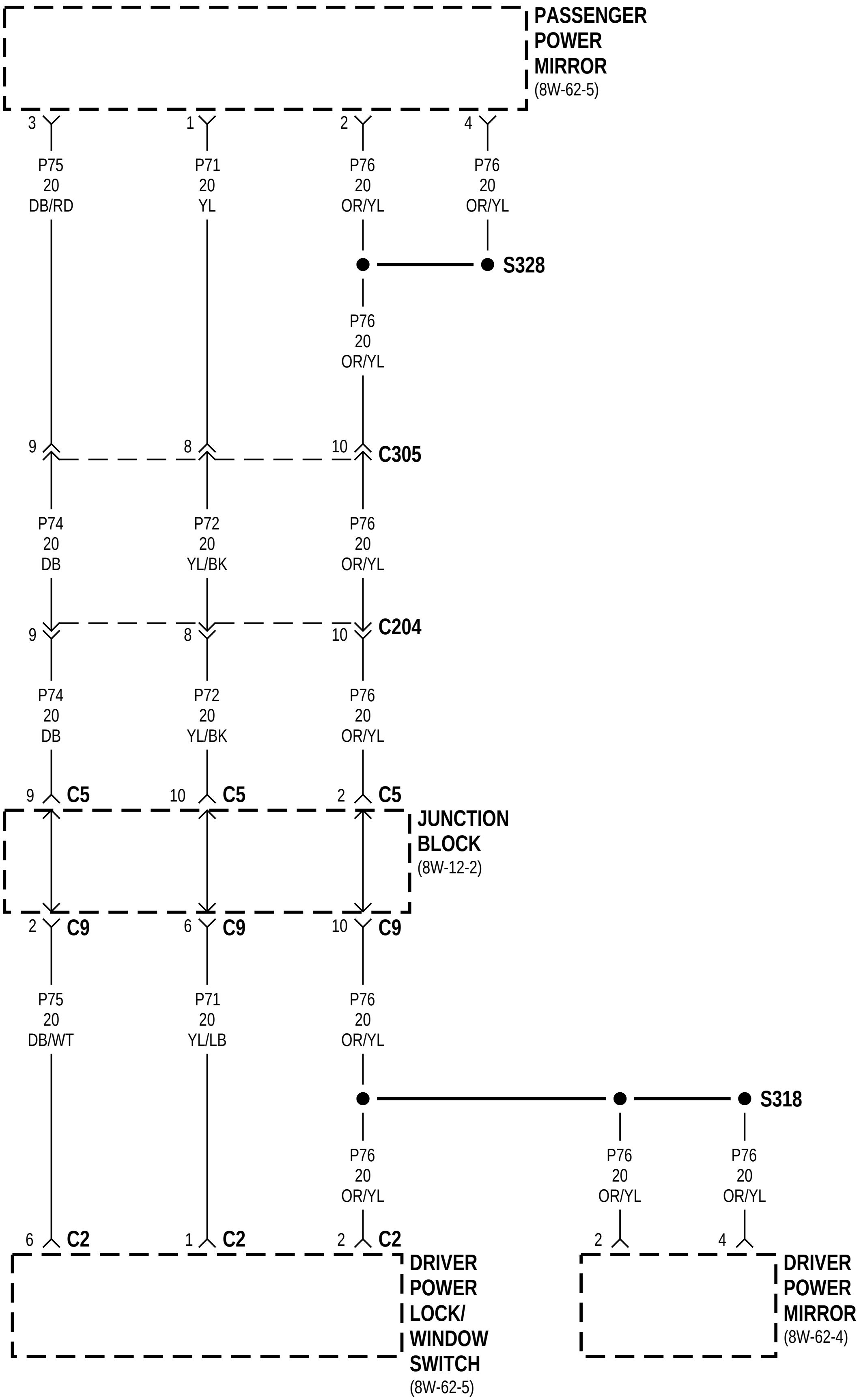
LHD EXCEPT FULL OPTIONS

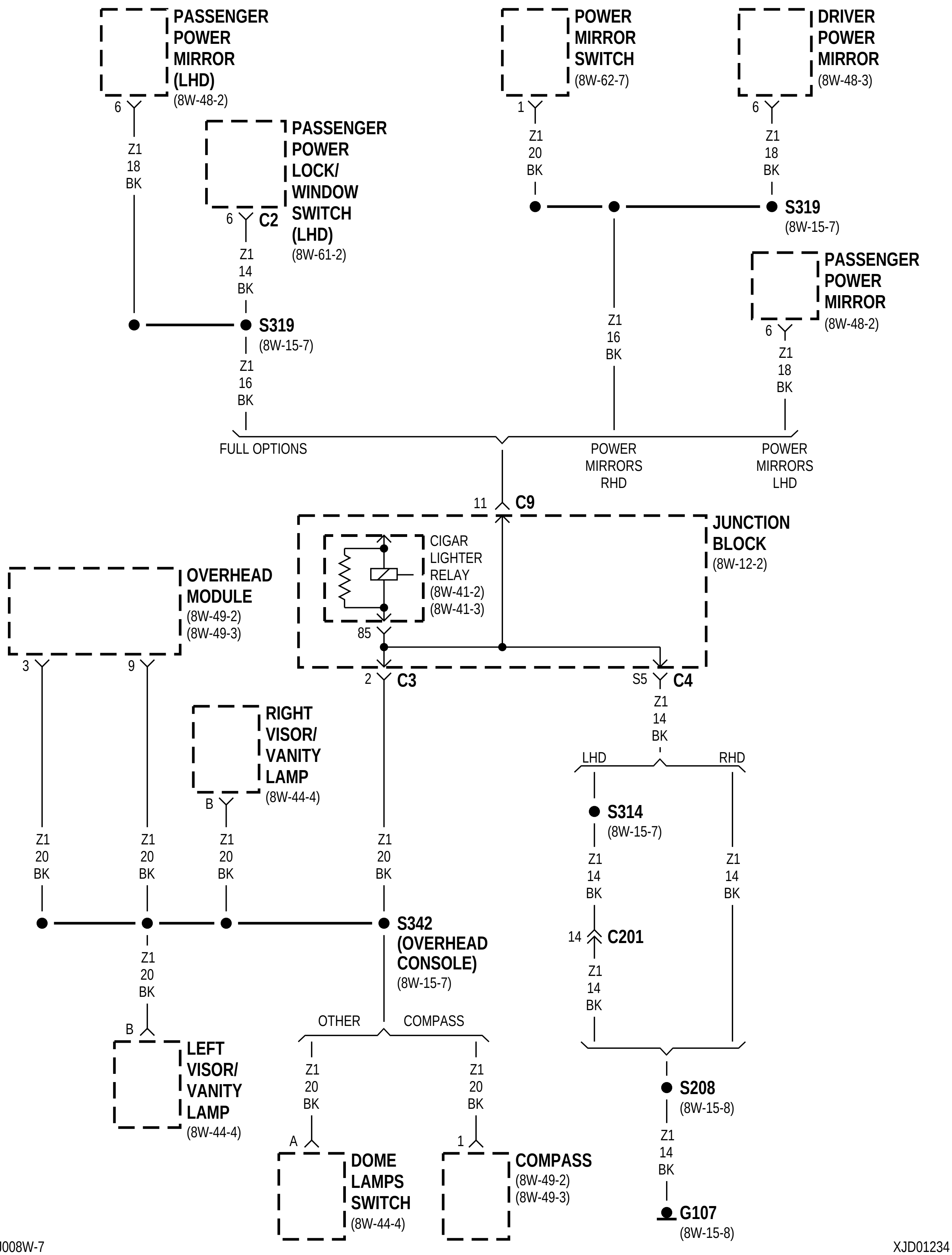


8W-12 JUNCTION BLOCK
LHD FULL OPTIONS

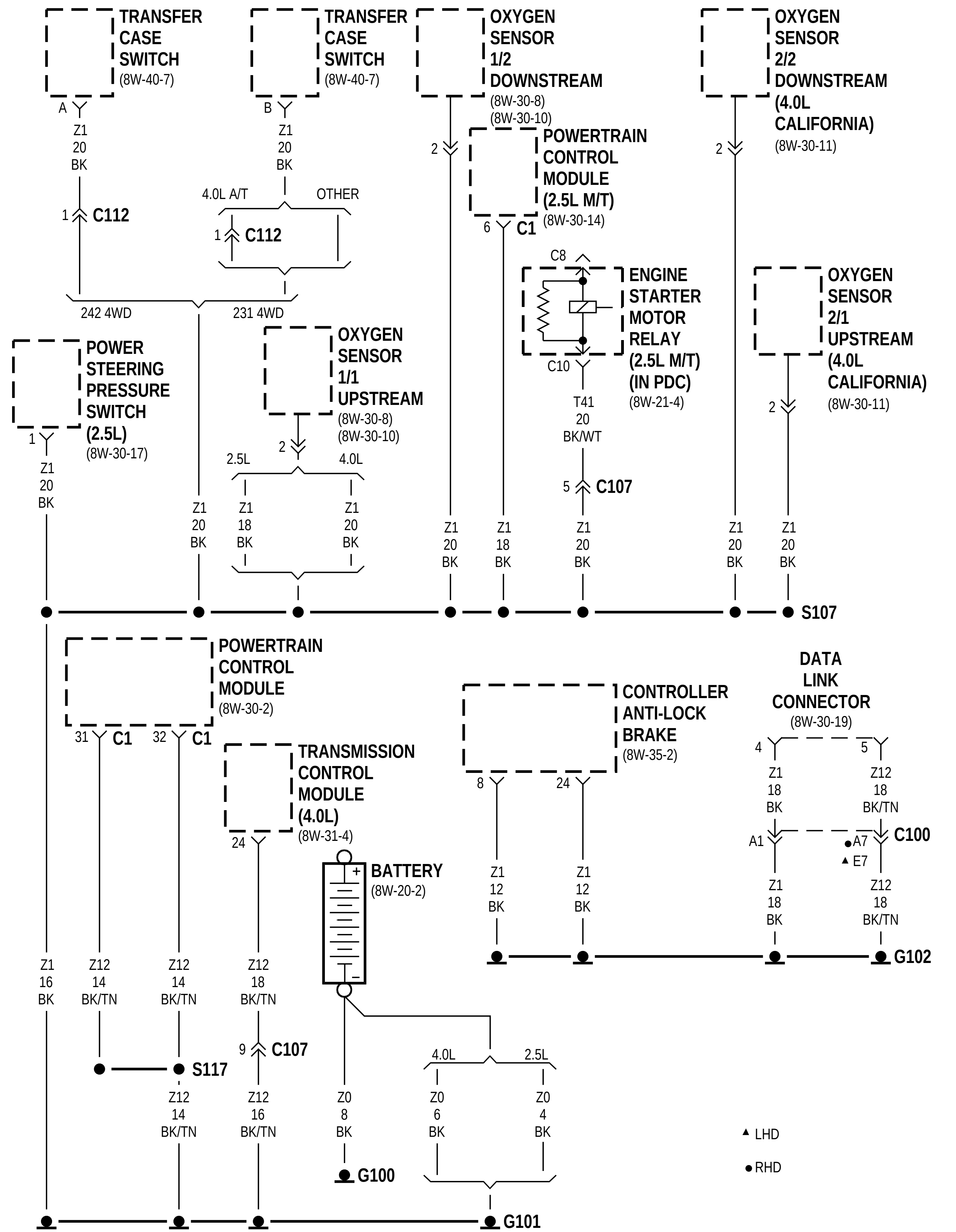



RUN-ACC F83
(8W-12-18)
POWER MIRROR SWITCH
(8W-62-7)
1 RIGHT
2 UP
3 LEFT
4 DOWN
5 DRIVER MIRRIOR
6 PASSENGER MIRROR
Z1 20 BK
P75 20 DB/WT
P71 20 YL/LB
P72 20 YL/BK
P74 20 DB
S319
(8W-15-7)
Z1 16 BK
DRIVER POWER MIRROR
(8W-62-7)
P76 20 OR/YL
P91 20 WT/BK
C9
JUNCTION BLOCK
(8W-12-2)
C4
C5
Z1 14 BK
P74 20 DB
P72 20 YL/BK
C204
C305
S208
(8W-15-8)
P75 20 DB/WT
P71 20 YL
PASSENGER POWER MIRROR
(8W-62-7)
G107
(8W-15-8)
C7
C203
BASE
POWER MIRRORS
S359
J008W-7
XJD01232


PASSENGER
POWER
MIRROR
(8W-62-5)
3
1
2
4
P75
20
DB/RD
P71
20
YL
P76
20
OR/YL
P76
20
OR/YL
S328
P76
20
OR/YL
9
8
10
C305
P74
20
DB
P72
20
YL/BK
P76
20
OR/YL
9
8
10
C204
P74
20
DB
P72
20
YL/BK
P76
20
OR/YL
9 C5
10 C5
2 C5
JUNCTION
BLOCK
(8W-12-2)
2 C9
6 C9
10 C9
P75
20
DB/WT
P71
20
YL/LB
P76
20
OR/YL
S318
P76
20
OR/YL
P76
20
OR/YL
P76
20
OR/YL
6 C2
1 C2
2 C2
2
4
DRIVER
POWER
LOCK/
WINDOW
SWITCH
(8W-62-5)
DRIVER
POWER
MIRROR
(8W-62-4)

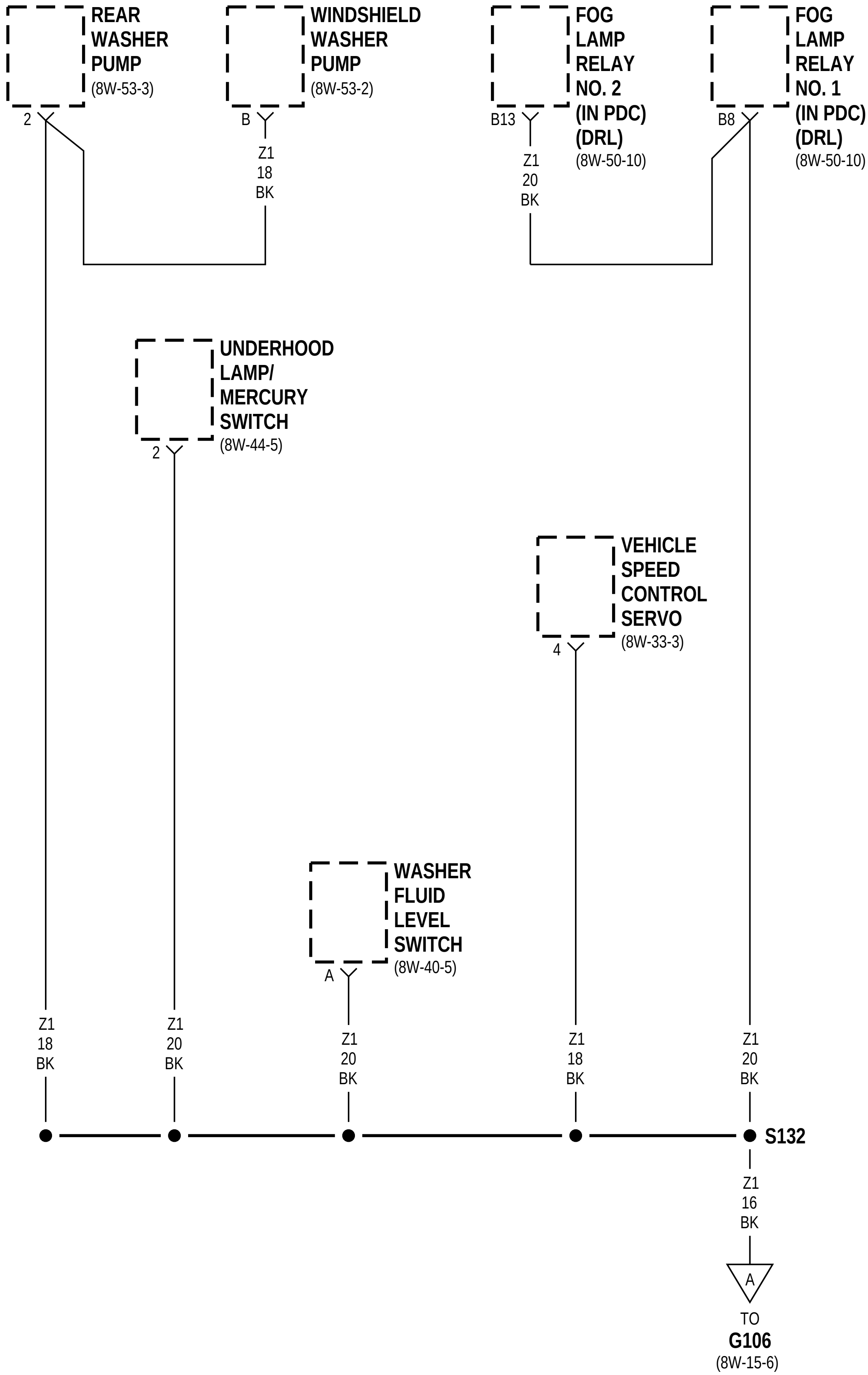

PASSENGER POWER MIRROR (LHD)
(8W-48-2)
PASSENGER POWER LOCK/ WINDOW SWITCH (LHD)
(8W-61-2)
C2
POWER MIRROR SWITCH
(8W-62-7)
DRIVER POWER MIRROR
(8W-48-3)
S319
(8W-15-7)
PASSENGER POWER MIRROR
(8W-48-2)
Z1 18 BK
Z1 14 BK
Z1 16 BK
Z1 20 BK
FULL OPTIONS
POWER MIRRORS RHD
POWER MIRRORS LHD
C9
JUNCTION BLOCK
(8W-12-2)
CIGAR LIGHTER RELAY
(8W-41-2)
(8W-41-3)
OVERHEAD MODULE
(8W-49-2)
(8W-49-3)
C3
C4
LHD
RHD
S314
(8W-15-7)
C201
RIGHT VISOR/ VANITY LAMP
(8W-44-4)
S342 (OVERHEAD CONSOLE)
(8W-15-7)
OTHER
COMPASS
LEFT VISOR/ VANITY LAMP
(8W-44-4)
DOME LAMPS SWITCH
(8W-44-4)
COMPASS
(8W-49-2)
(8W-49-3)
S208
(8W-15-8)
G107
(8W-15-8)
J008W-7
XJD01234

8W-15 GROUND DISTRIBUTION

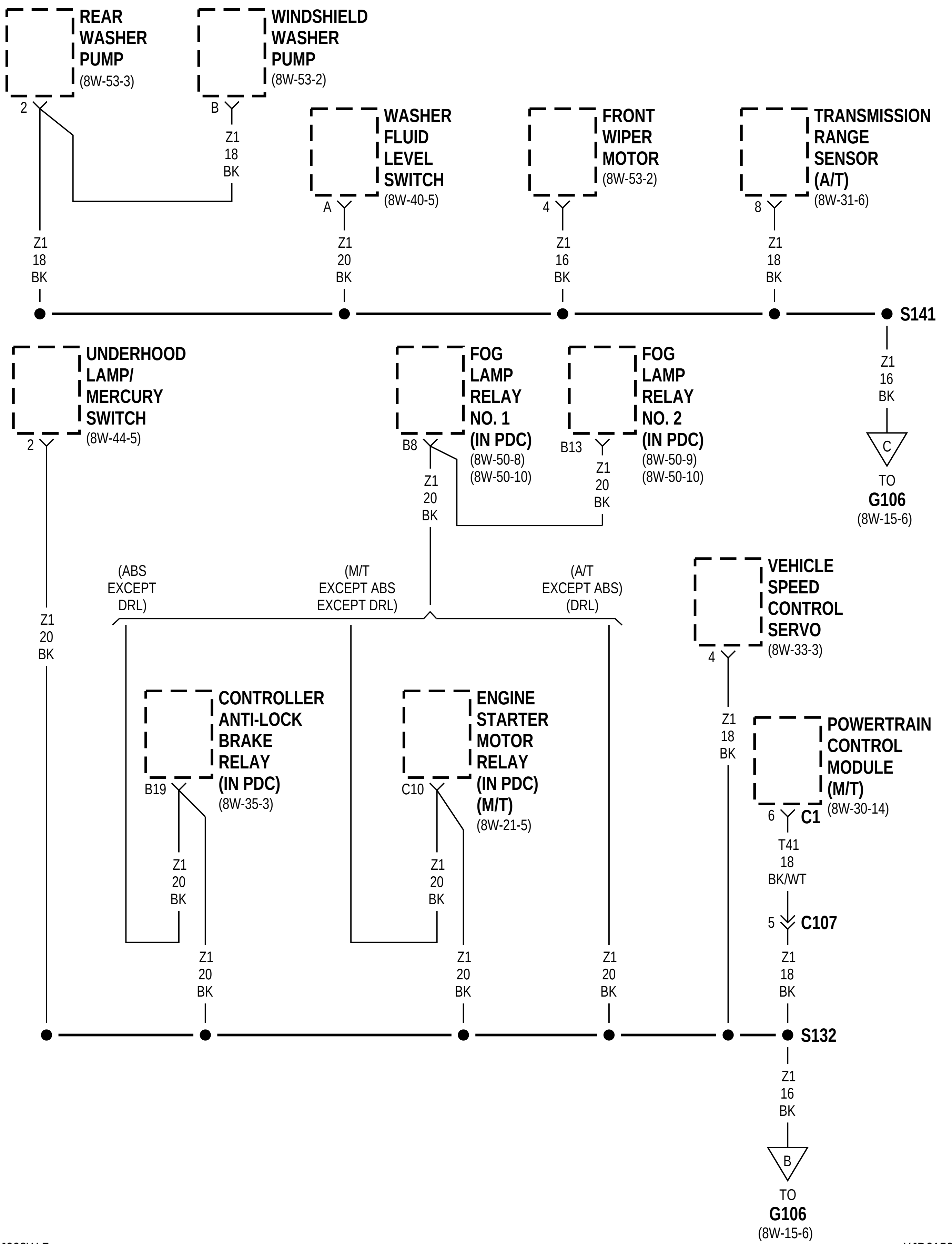


J008W-7 XJD01502

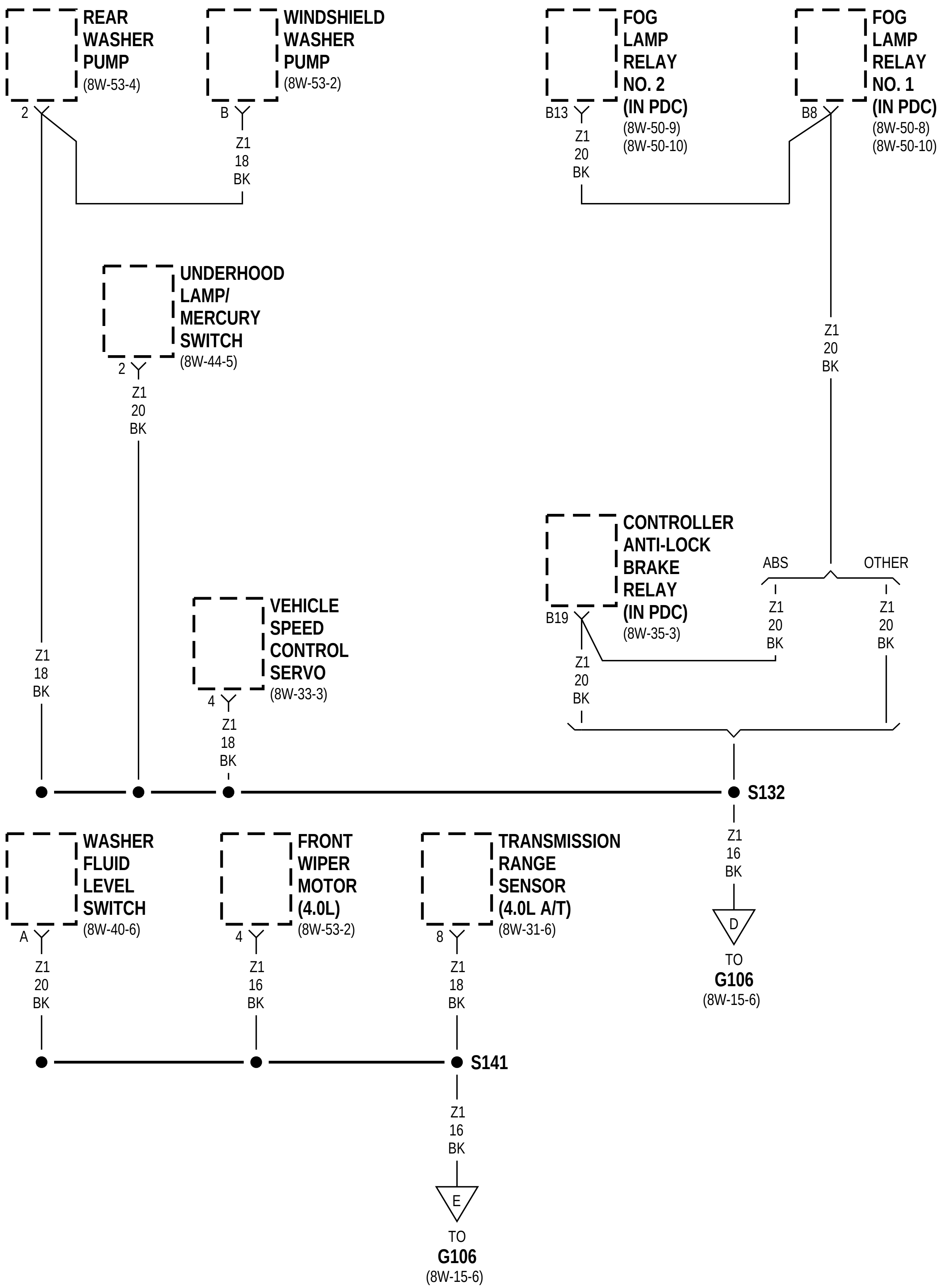
LHD 2.5L

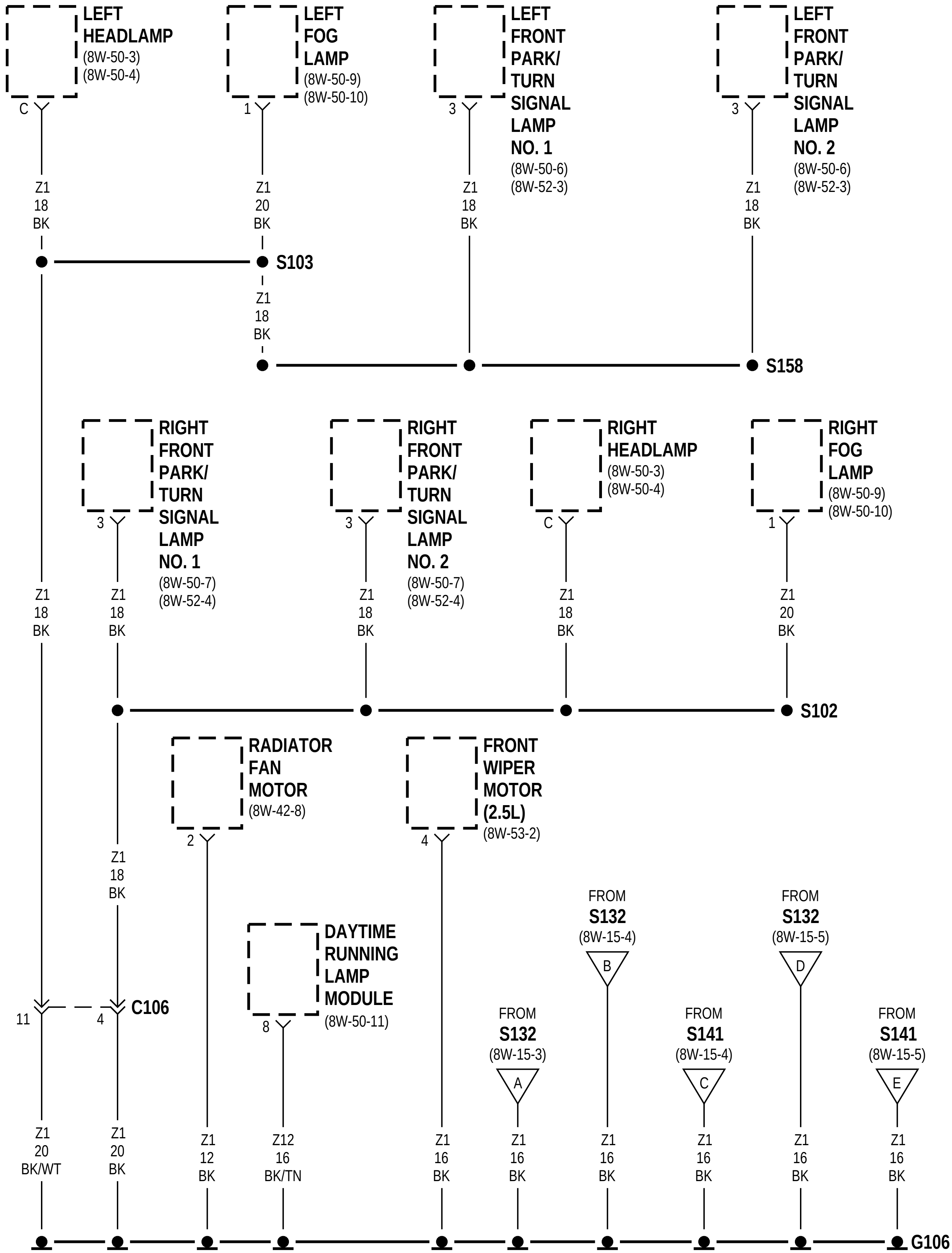

REAR WASHER PUMP
(8W-53-3)
2
WINDSHIELD WASHER PUMP
(8W-53-2)
B
Z1
18
BK
FOG LAMP RELAY NO. 2 (IN PDC) (DRL)
(8W-50-10)
B13
Z1
20
BK
FOG LAMP RELAY NO. 1 (IN PDC) (DRL)
(8W-50-10)
B8
UNDERHOOD LAMP/ MERCURY SWITCH
(8W-44-5)
2
VEHICLE SPEED CONTROL SERVO
(8W-33-3)
4
WASHER FLUID LEVEL SWITCH
(8W-40-5)
A
Z1
18
BK
Z1
20
BK
Z1
20
BK
Z1
18
BK
Z1
20
BK
S132
Z1
16
BK
A
TO
G106
(8W-15-6)

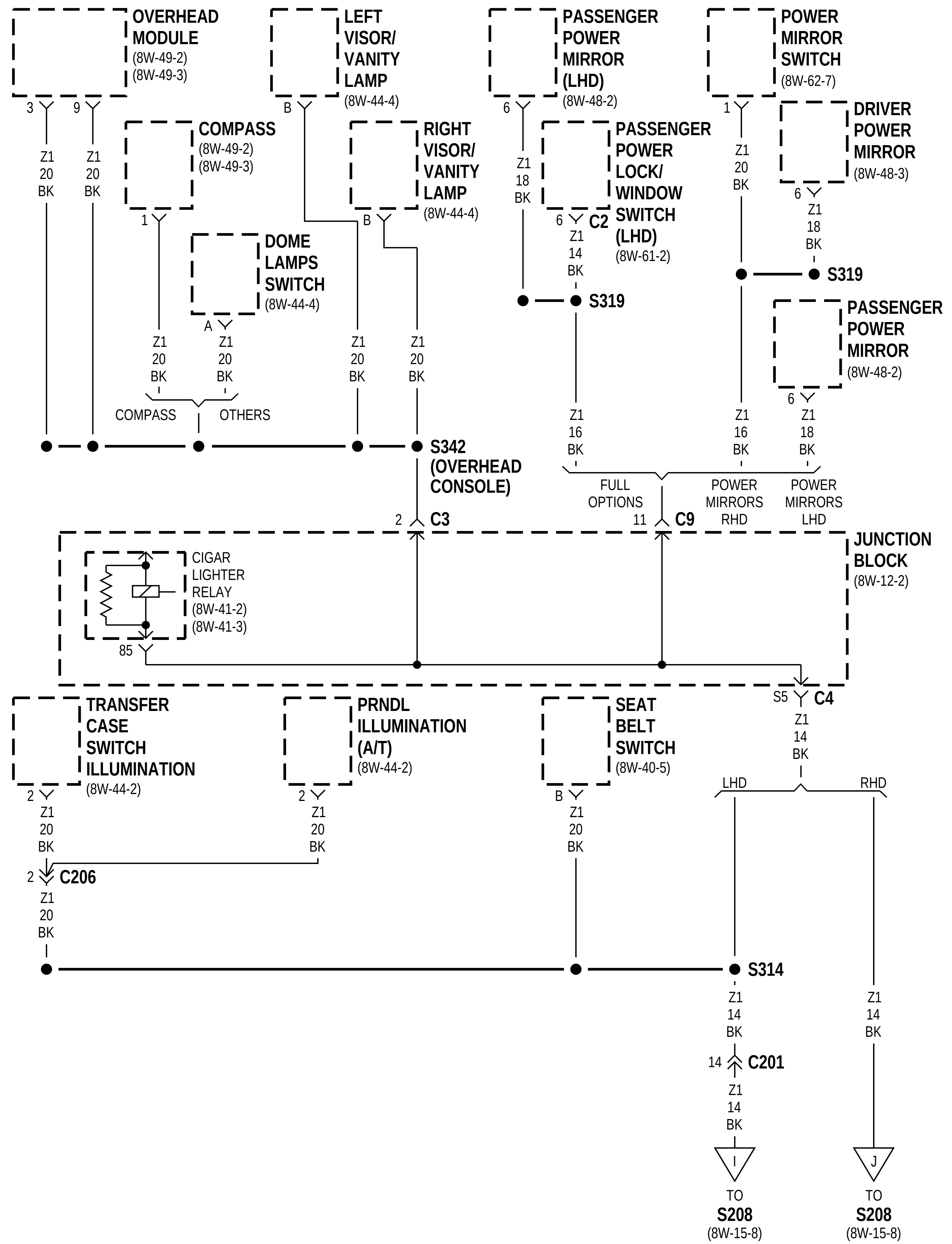
LHD 4.0L

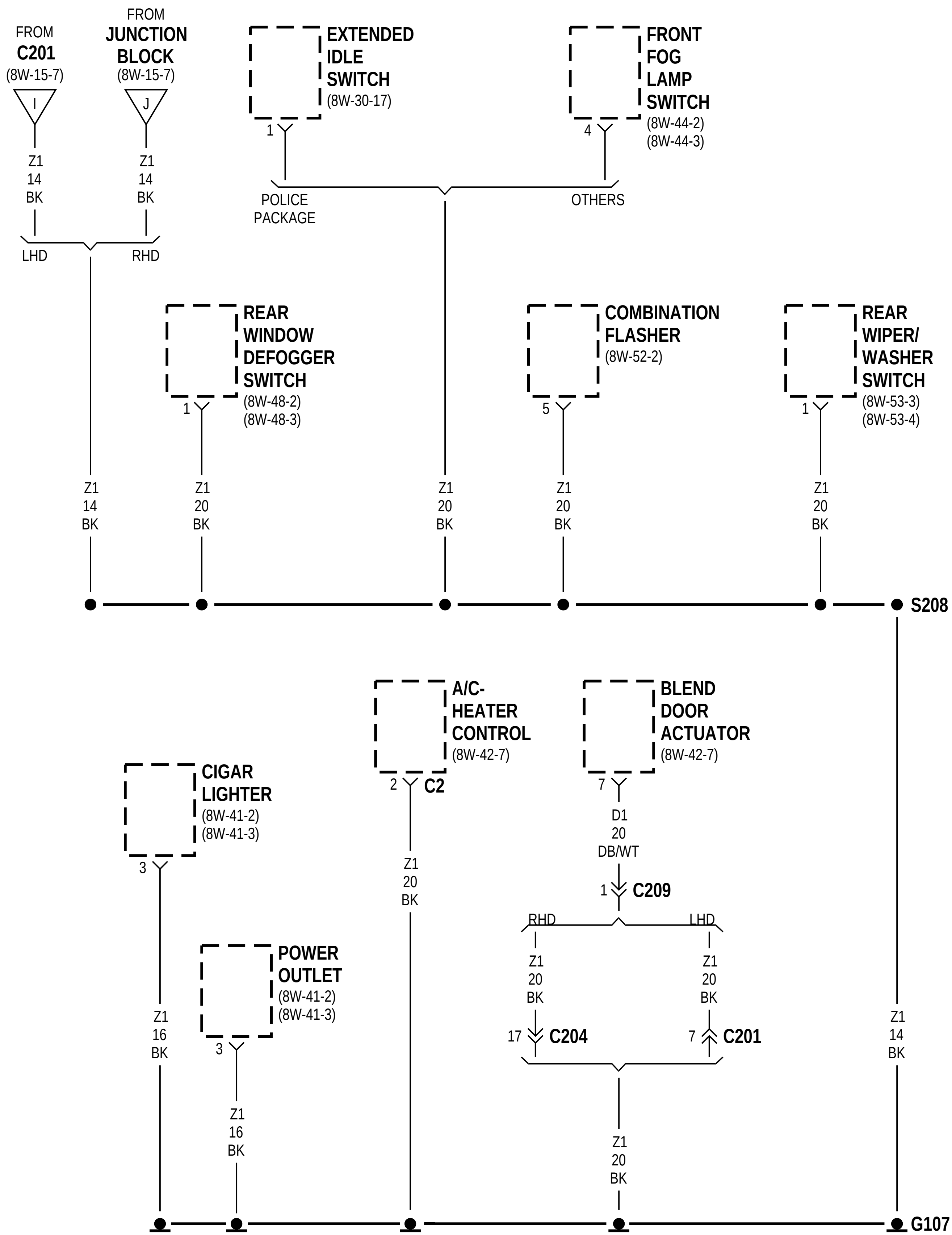

REAR WASHER PUMP
(8W-53-3)
2
WINDSHIELD WASHER PUMP
(8W-53-2)
B
Z1 18 BK
WASHER FLUID LEVEL SWITCH
(8W-40-5)
A
FRONT WIPER MOTOR
(8W-53-2)
4
TRANSMISSION RANGE SENSOR (A/T)
(8W-31-6)
8
Z1 18 BK
Z1 20 BK
Z1 16 BK
Z1 18 BK
S141
Z1 16 BK
C
TO G106
(8W-15-6)
UNDERHOOD LAMP/ MERCURY SWITCH
(8W-44-5)
2
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-8)
(8W-50-10)
B8
FOG LAMP RELAY NO. 2 (IN PDC)
(8W-50-9)
(8W-50-10)
B13
Z1 20 BK
Z1 20 BK
(ABS EXCEPT DRL)
(M/T EXCEPT ABS EXCEPT DRL)
(A/T EXCEPT ABS) (DRL)
Z1 20 BK
VEHICLE SPEED CONTROL SERVO
(8W-33-3)
4
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC)
(8W-35-3)
B19
ENGINE STARTER MOTOR RELAY (IN PDC) (M/T)
(8W-21-5)
C10
Z1 18 BK
POWERTRAIN CONTROL MODULE (M/T)
(8W-30-14)
6 C1
T41 18 BK/WT
5 C107
Z1 20 BK
Z1 20 BK
Z1 20 BK
Z1 20 BK
Z1 20 BK
Z1 18 BK
S132
Z1 16 BK
B
TO G106
(8W-15-6)

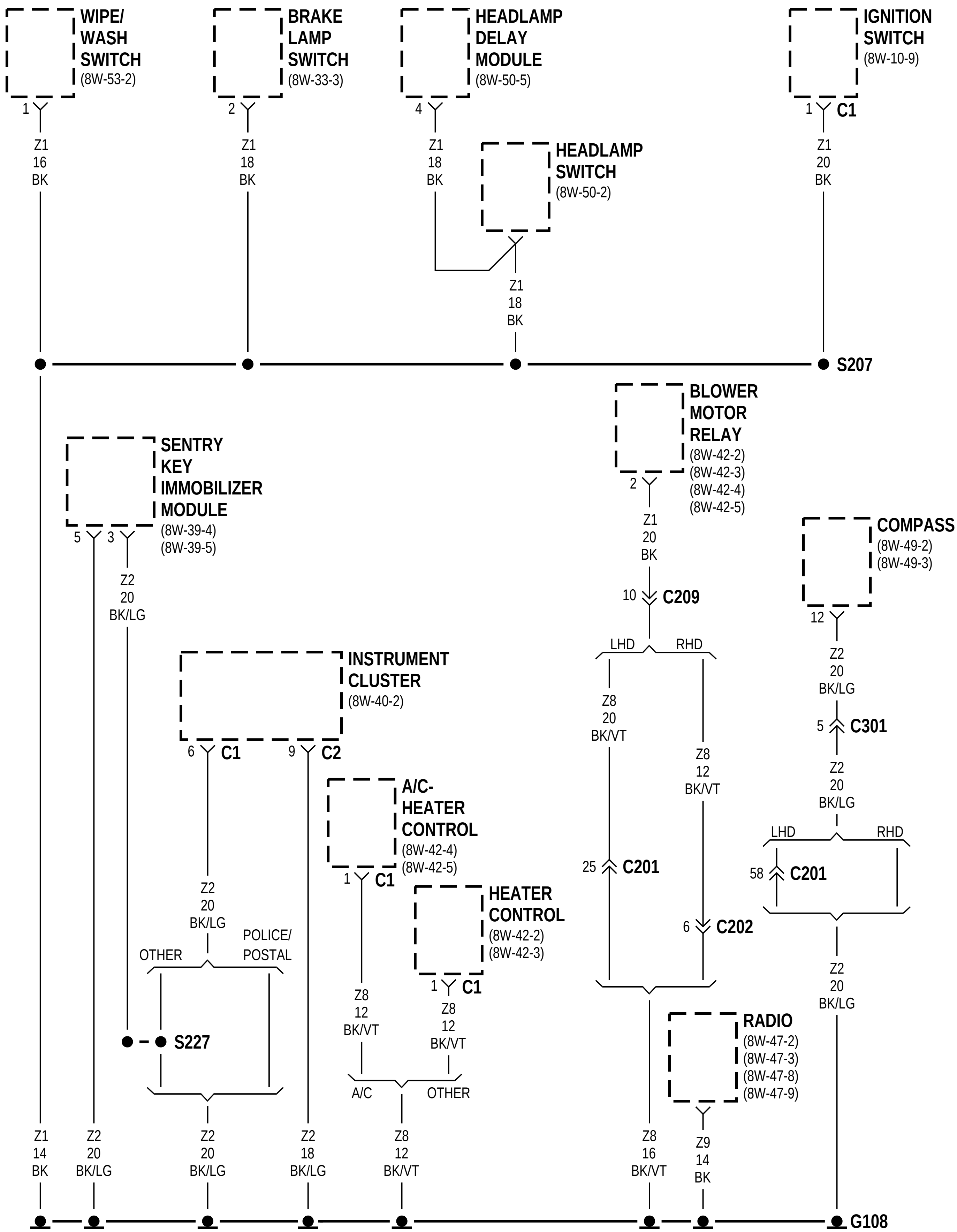
RHD


REAR WASHER PUMP (8W-53-4)
2
WINDSHIELD WASHER PUMP (8W-53-2)
B
Z1 18 BK
FOG LAMP RELAY NO. 2 (IN PDC) (8W-50-9) (8W-50-10)
B13
Z1 20 BK
FOG LAMP RELAY NO. 1 (IN PDC) (8W-50-8) (8W-50-10)
B8
UNDERHOOD LAMP/ MERCURY SWITCH (8W-44-5)
2
Z1 20 BK
Z1 20 BK
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC) (8W-35-3)
B19
ABS
OTHER
Z1 20 BK
Z1 20 BK
Z1 20 BK
VEHICLE SPEED CONTROL SERVO (8W-33-3)
4
Z1 18 BK
Z1 18 BK
S132
Z1 16 BK
D
TO G106 (8W-15-6)
WASHER FLUID LEVEL SWITCH (8W-40-6)
A
Z1 20 BK
FRONT WIPER MOTOR (4.0L) (8W-53-2)
4
Z1 16 BK
TRANSMISSION RANGE SENSOR (4.0L A/T) (8W-31-6)
8
Z1 18 BK
S141
Z1 16 BK
E
TO G106 (8W-15-6)


LEFT HEADLAMP (8W-50-3) (8W-50-4)
C
Z1 18 BK
LEFT FOG LAMP (8W-50-9) (8W-50-10)
1
Z1 20 BK
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 1 (8W-50-6) (8W-52-3)
3
Z1 18 BK
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 2 (8W-50-6) (8W-52-3)
3
Z1 18 BK
S103
Z1 18 BK
S158
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 1 (8W-50-7) (8W-52-4)
3
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 2 (8W-50-7) (8W-52-4)
3
RIGHT HEADLAMP (8W-50-3) (8W-50-4)
C
RIGHT FOG LAMP (8W-50-9) (8W-50-10)
1
Z1 18 BK
Z1 18 BK
Z1 18 BK
Z1 18 BK
Z1 20 BK
S102
RADIATOR FAN MOTOR (8W-42-8)
2
FRONT WIPER MOTOR (2.5L) (8W-53-2)
4
Z1 18 BK
DAYTIME RUNNING LAMP MODULE (8W-50-11)
8
FROM S132 (8W-15-4)
B
FROM S132 (8W-15-5)
D
FROM S132 (8W-15-3)
A
FROM S141 (8W-15-4)
C
FROM S141 (8W-15-5)
E
11
4
C106
Z1 20 BK/WT
Z1 20 BK
Z1 12 BK
Z12 16 BK/TN
Z1 16 BK
Z1 16 BK
Z1 16 BK
Z1 16 BK
Z1 16 BK
Z1 16 BK
G106

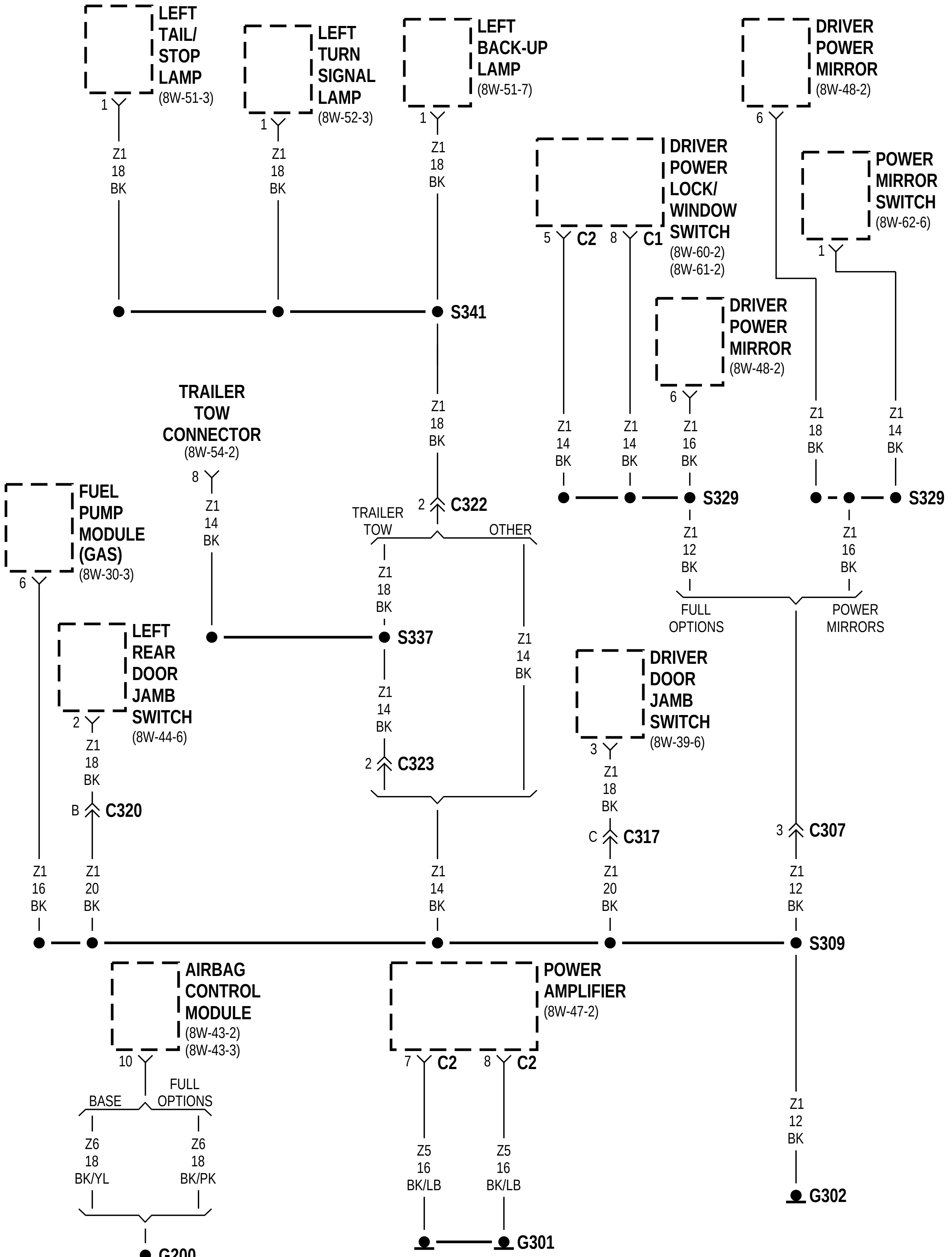

OVERHEAD MODULE (8W-49-2) (8W-49-3)
LEFT VISOR/ VANITY LAMP (8W-44-4)
PASSENGER POWER MIRROR (LHD) (8W-48-2)
POWER MIRROR SWITCH (8W-62-7)
COMPASS (8W-49-2) (8W-49-3)
RIGHT VISOR/ VANITY LAMP (8W-44-4)
PASSENGER POWER LOCK/ WINDOW SWITCH (LHD) (8W-61-2)
DRIVER POWER MIRROR (8W-48-3)
DOME LAMPS SWITCH (8W-44-4)
S319
S319
PASSENGER POWER MIRROR (8W-48-2)
C2
Z1 20 BK
Z1 18 BK
Z1 14 BK
Z1 16 BK
COMPASS
OTHERS
S342 (OVERHEAD CONSOLE)
FULL OPTIONS
POWER MIRRORS RHD
POWER MIRRORS LHD
C3
C9
JUNCTION BLOCK (8W-12-2)
CIGAR LIGHTER RELAY (8W-41-2) (8W-41-3)
85
S5
C4
TRANSFER CASE SWITCH ILLUMINATION (8W-44-2)
PRNDL ILLUMINATION (A/T) (8W-44-2)
SEAT BELT SWITCH (8W-40-5)
LHD
RHD
C206
S314
C201
TO S208 (8W-15-8)
TO S208 (8W-15-8)

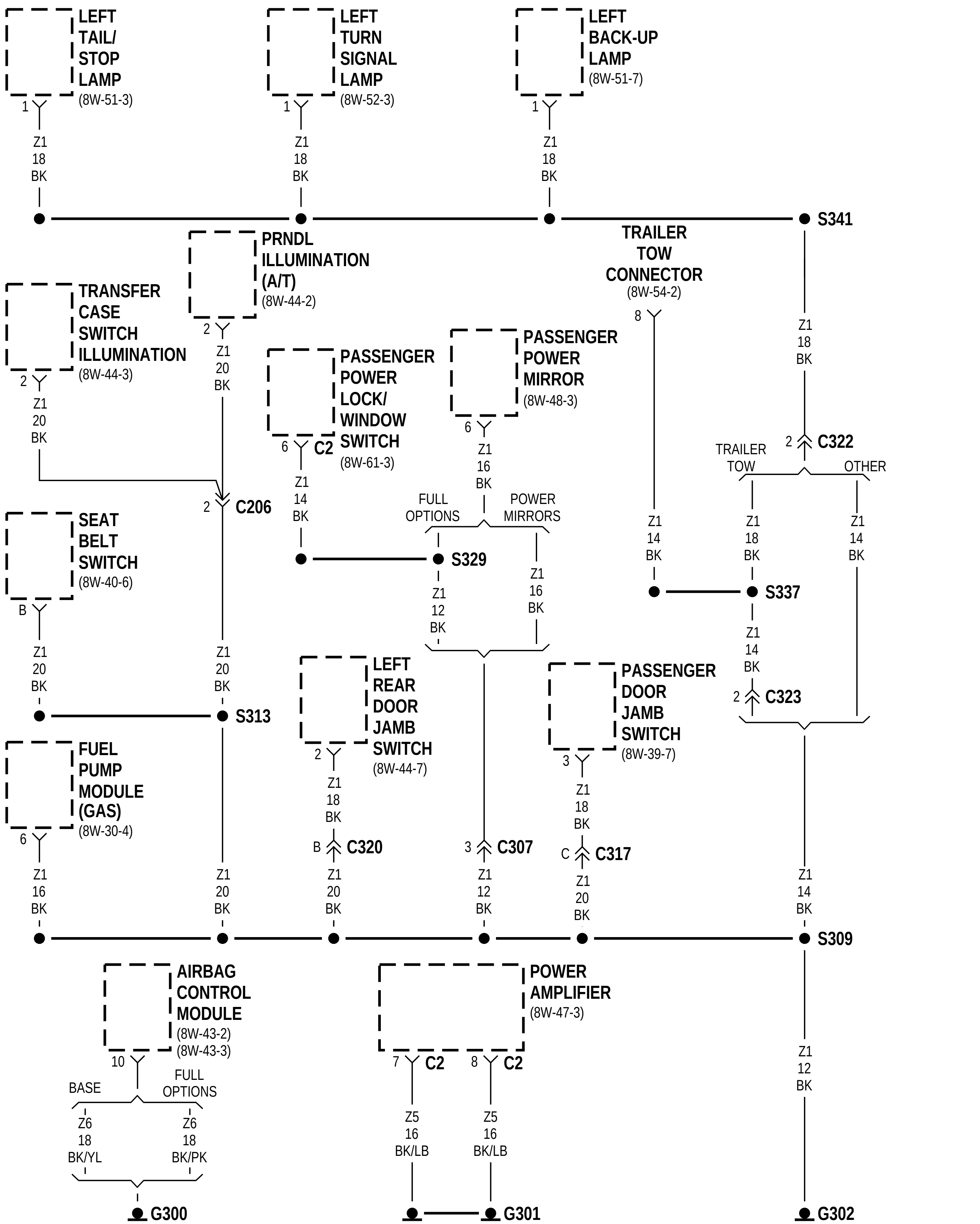

FROM
C201
(8W-15-7)
I
FROM
JUNCTION
BLOCK
(8W-15-7)
J
Z1
14
BK
LHD
RHD
EXTENDED
IDLE
SWITCH
(8W-30-17)
1
POLICE
PACKAGE
FRONT
FOG
LAMP
SWITCH
(8W-44-2)
(8W-44-3)
4
OTHERS
REAR
WINDOW
DEFOGGER
SWITCH
(8W-48-2)
(8W-48-3)
COMBINATION
FLASHER
(8W-52-2)
5
REAR
WIPER/
WASHER
SWITCH
(8W-53-3)
(8W-53-4)
Z1
20
BK
S208
A/C-
HEATER
CONTROL
(8W-42-7)
2
C2
BLEND
DOOR
ACTUATOR
(8W-42-7)
7
D1
20
DB/WT
1
C209
CIGAR
LIGHTER
(8W-41-2)
(8W-41-3)
3
POWER
OUTLET
(8W-41-2)
(8W-41-3)
Z1
16
BK
17
C204
C201
G107



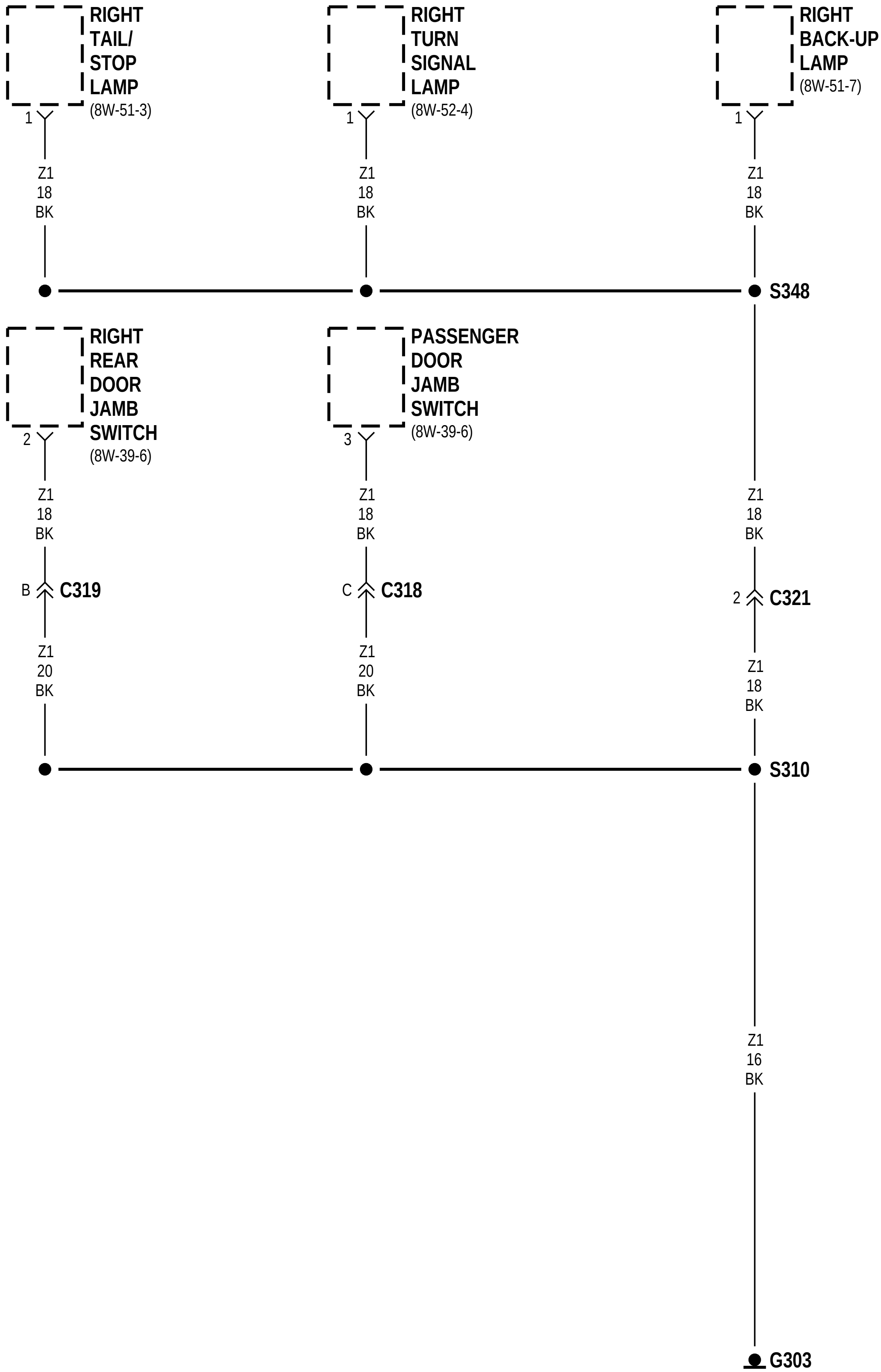
WIPE/ WASH SWITCH (8W-53-2)
1
Z1 16 BK
BRAKE LAMP SWITCH (8W-33-3)
2
Z1 18 BK
HEADLAMP DELAY MODULE (8W-50-5)
4
Z1 18 BK
HEADLAMP SWITCH (8W-50-2)
Z1 18 BK
IGNITION SWITCH (8W-10-9)
1 C1
Z1 20 BK
S207
BLOWER MOTOR RELAY (8W-42-2) (8W-42-3) (8W-42-4) (8W-42-5)
2
Z1 20 BK
10 C209
LHD RHD
Z8 20 BK/VT
Z8 12 BK/VT
25 C201
6 C202
COMPASS (8W-49-2) (8W-49-3)
12
Z2 20 BK/LG
5 C301
Z2 20 BK/LG
LHD RHD
58 C201
Z2 20 BK/LG
SENTRY KEY IMMOBILIZER MODULE (8W-39-4) (8W-39-5)
5 3
Z2 20 BK/LG
INSTRUMENT CLUSTER (8W-40-2)
6 C1
9 C2
Z2 20 BK/LG
OTHER
POLICE/ POSTAL
S227
A/C- HEATER CONTROL (8W-42-4) (8W-42-5)
1 C1
Z8 12 BK/VT
HEATER CONTROL (8W-42-2) (8W-42-3)
1 C1
Z8 12 BK/VT
A/C OTHER
RADIO (8W-47-2) (8W-47-3) (8W-47-8) (8W-47-9)
Z9 14 BK
Z1 14 BK
Z2 20 BK/LG
Z2 20 BK/LG
Z2 18 BK/LG
Z8 12 BK/VT
Z8 16 BK/VT
G108

LHD

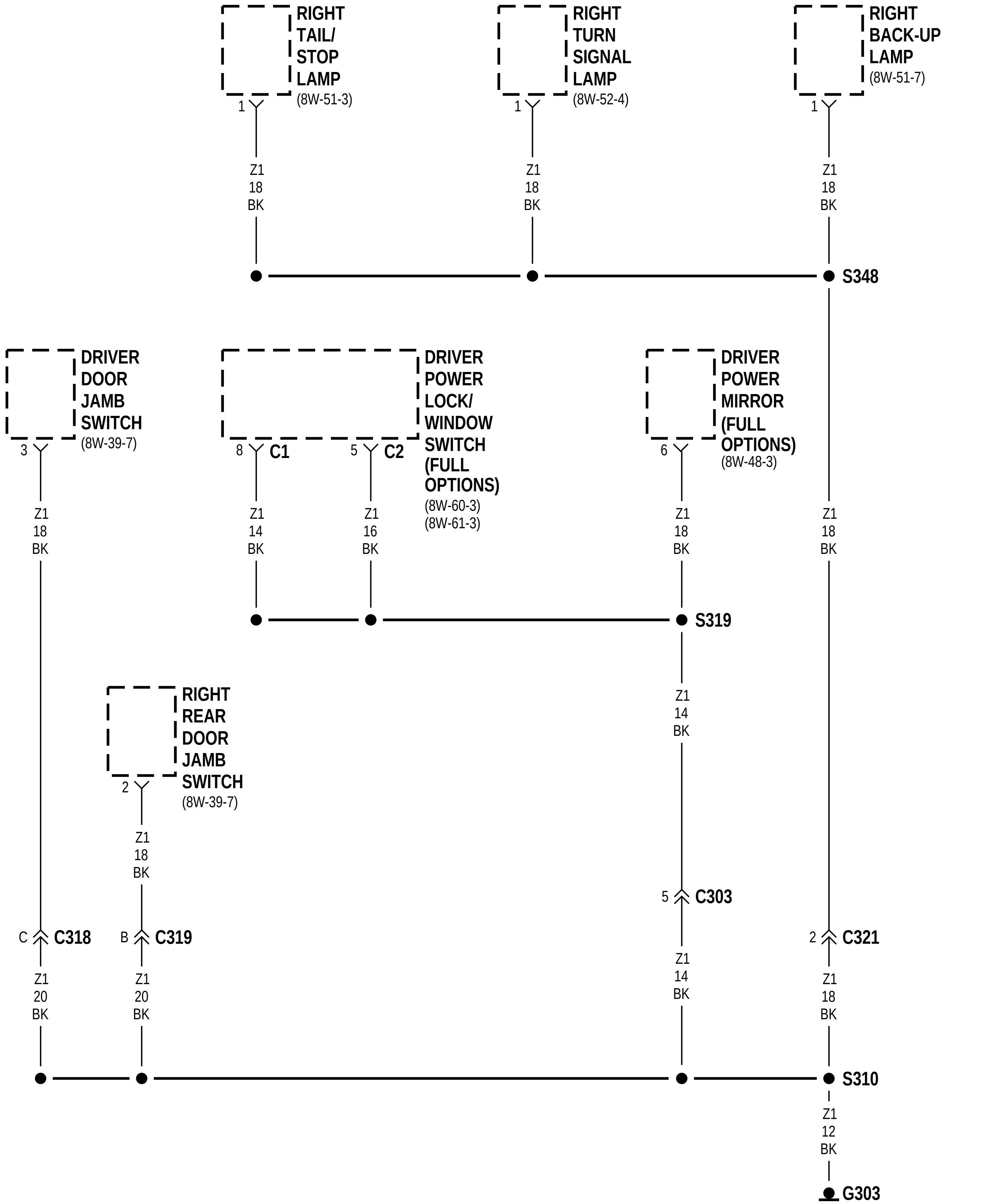

LEFT TAIL/ STOP LAMP (8W-51-3)
LEFT TURN SIGNAL LAMP (8W-52-3)
LEFT BACK-UP LAMP (8W-51-7)
DRIVER POWER MIRROR (8W-48-2)
DRIVER POWER LOCK/ WINDOW SWITCH (8W-60-2) (8W-61-2)
C2
C1
POWER MIRROR SWITCH (8W-62-6)
Z1 18 BK
Z1 14 BK
Z1 16 BK
Z1 12 BK
Z1 20 BK
S341
S329
S337
S309
TRAILER TOW CONNECTOR (8W-54-2)
FUEL PUMP MODULE (GAS) (8W-30-3)
C322
TRAILER TOW
OTHER
FULL OPTIONS
POWER MIRRORS
LEFT REAR DOOR JAMB SWITCH (8W-44-6)
DRIVER DOOR JAMB SWITCH (8W-39-6)
C323
C320
C317
C307
AIRBAG CONTROL MODULE (8W-43-2) (8W-43-3)
POWER AMPLIFIER (8W-47-2)
BASE
FULL OPTIONS
Z6 18 BK/YL
Z6 18 BK/PK
Z5 16 BK/LB
G200
G301
G302

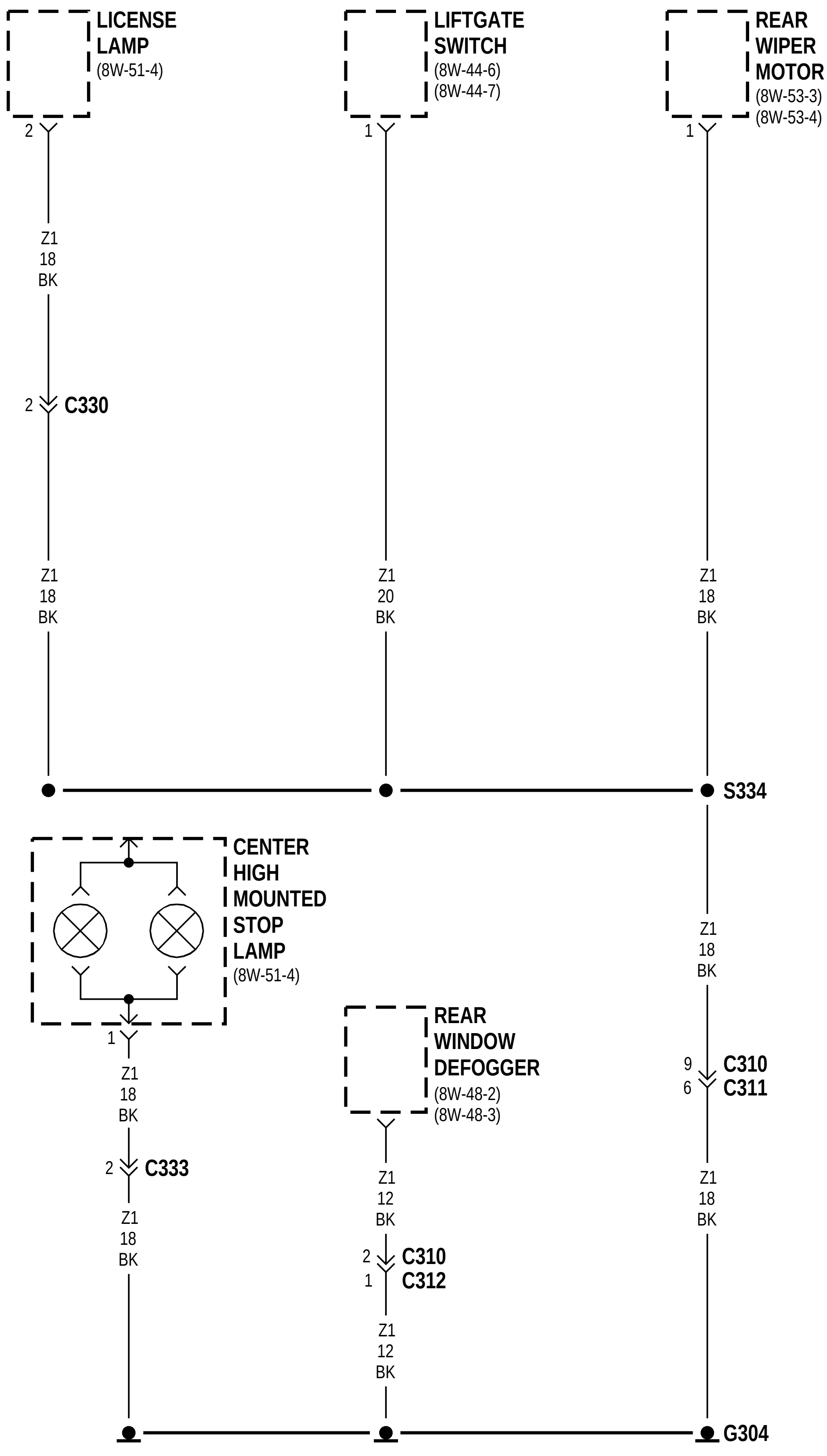

LEFT TAIL/ STOP LAMP
(8W-51-3)
LEFT TURN SIGNAL LAMP
(8W-52-3)
LEFT BACK-UP LAMP
(8W-51-7)
Z1 18 BK
S341
PRNDL ILLUMINATION (A/T)
(8W-44-2)
TRAILER TOW CONNECTOR
(8W-54-2)
TRANSFER CASE SWITCH ILLUMINATION
(8W-44-3)
Z1 20 BK
PASSENGER POWER LOCK/ WINDOW SWITCH
(8W-61-3)
C2
PASSENGER POWER MIRROR
(8W-48-3)
Z1 16 BK
C322
TRAILER TOW
OTHER
C206
Z1 14 BK
FULL OPTIONS
POWER MIRRORS
SEAT BELT SWITCH
(8W-40-6)
S329
Z1 12 BK
S337
C323
LEFT REAR DOOR JAMB SWITCH
(8W-44-7)
PASSENGER DOOR JAMB SWITCH
(8W-39-7)
S313
FUEL PUMP MODULE (GAS)
(8W-30-4)
C320
C307
C317
S309
AIRBAG CONTROL MODULE
(8W-43-2)
(8W-43-3)
POWER AMPLIFIER
(8W-47-3)
BASE
FULL OPTIONS
Z6 18 BK/YL
Z6 18 BK/PK
Z5 16 BK/LB
G300
G301
G302

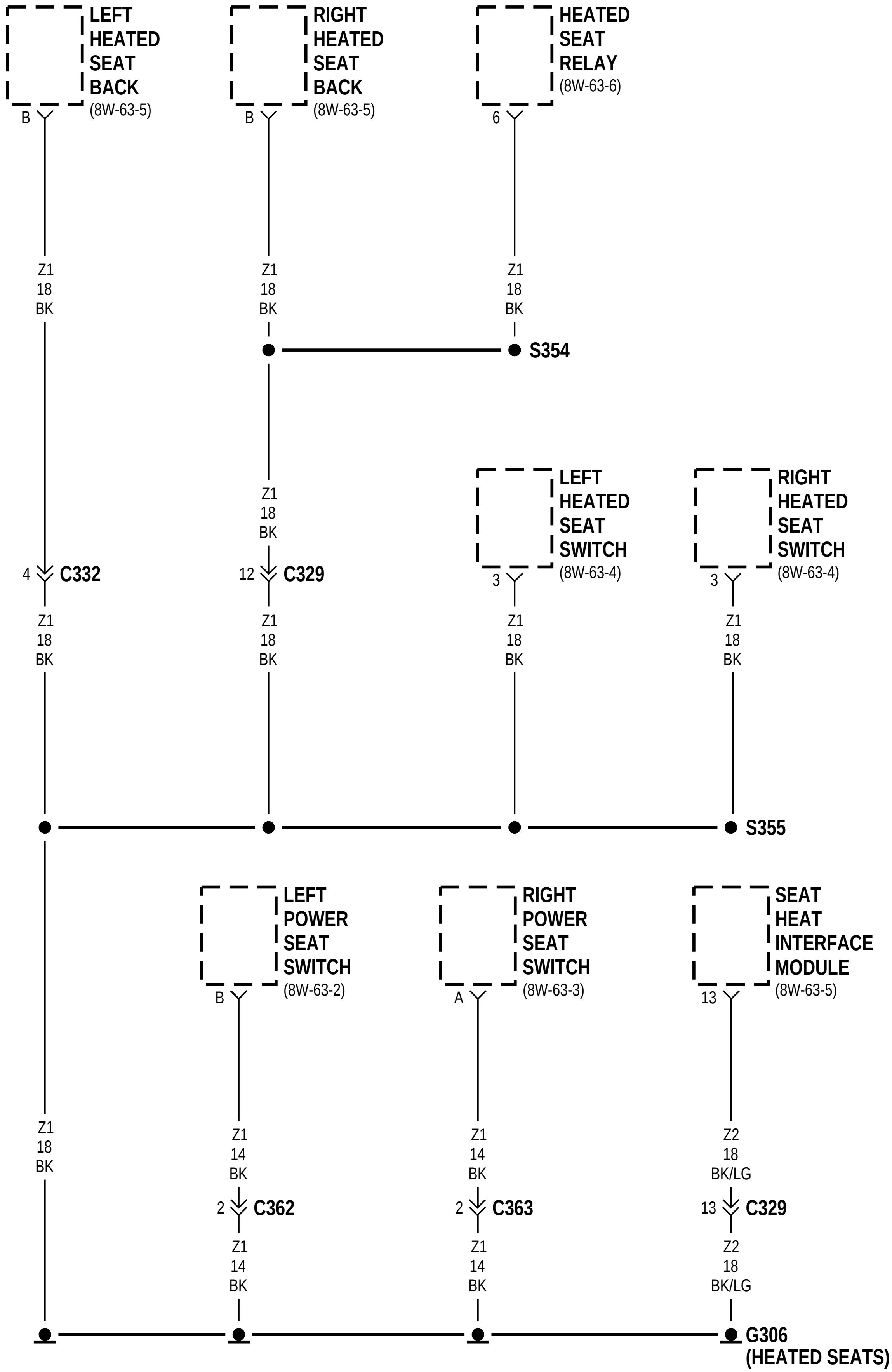
LHD


RIGHT
TAIL/
STOP
LAMP
(8W-51-3)
RIGHT
TURN
SIGNAL
LAMP
(8W-52-4)
RIGHT
BACK-UP
LAMP
(8W-51-7)
1
Z1
18
BK
S348
RIGHT
REAR
DOOR
JAMB
SWITCH
(8W-39-6)
2
PASSENGER
DOOR
JAMB
SWITCH
(8W-39-6)
3
B
C319
C
C318
2
C321
Z1
20
BK
S310
Z1
16
BK
G303

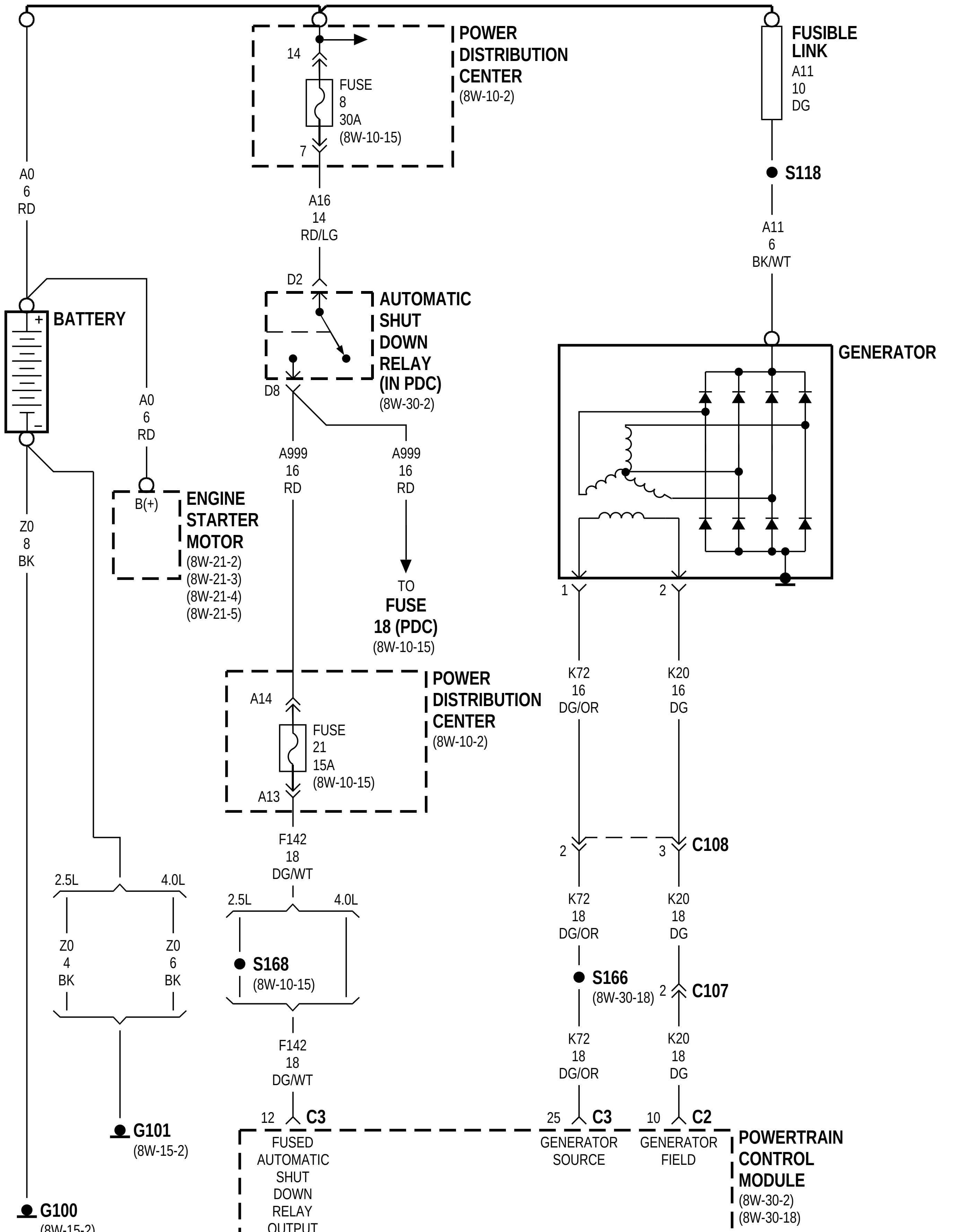
RHD

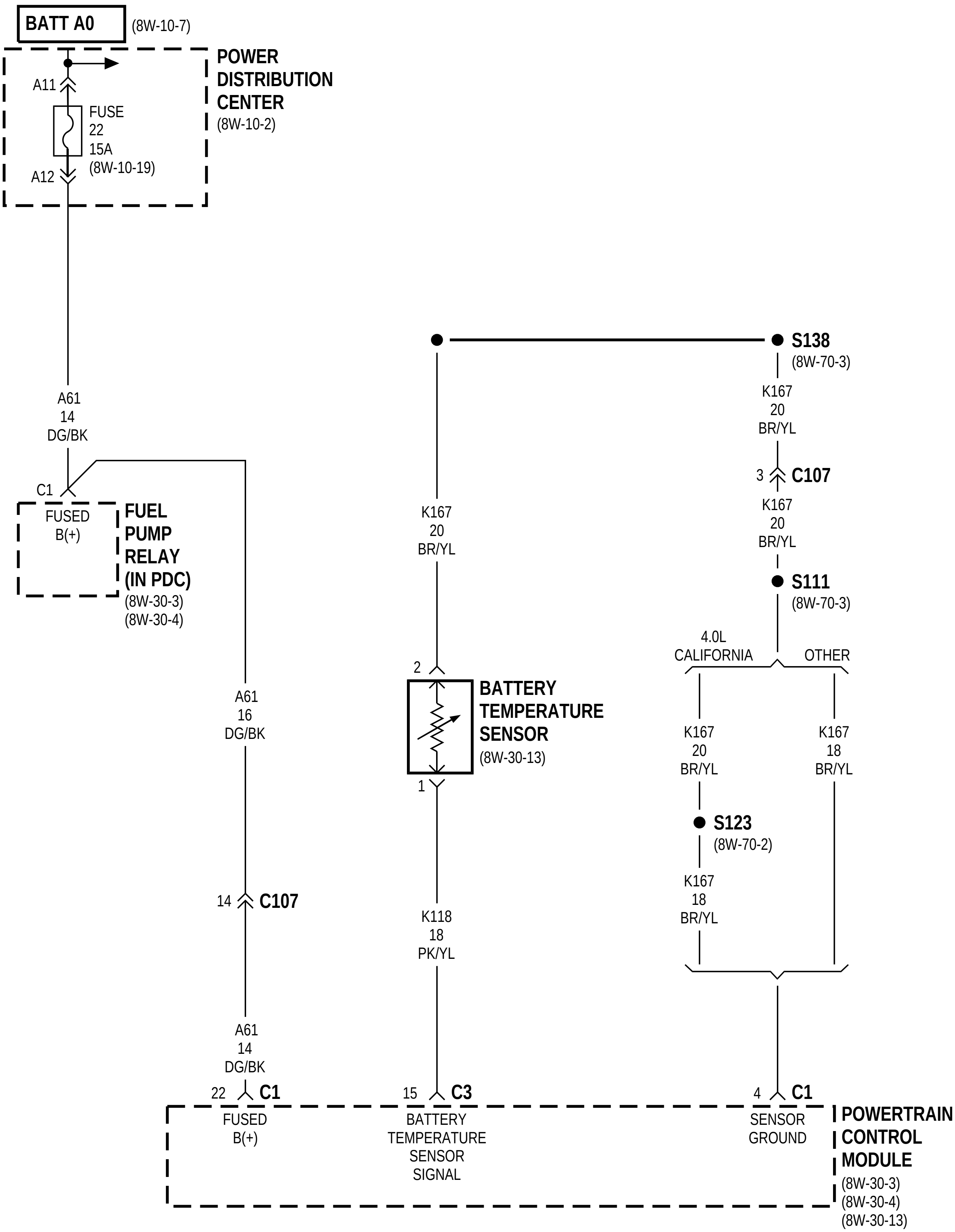

RIGHT TAIL/ STOP LAMP (8W-51-3)
1
Z1 18 BK
RIGHT TURN SIGNAL LAMP (8W-52-4)
1
Z1 18 BK
RIGHT BACK-UP LAMP (8W-51-7)
1
Z1 18 BK
S348
DRIVER DOOR JAMB SWITCH (8W-39-7)
3
Z1 18 BK
DRIVER POWER LOCK/ WINDOW SWITCH (FULL OPTIONS) (8W-60-3) (8W-61-3)
8 C1
Z1 14 BK
5 C2
Z1 16 BK
DRIVER POWER MIRROR (FULL OPTIONS) (8W-48-3)
6
Z1 18 BK
S319
Z1 14 BK
Z1 18 BK
RIGHT REAR DOOR JAMB SWITCH (8W-39-7)
2
Z1 18 BK
5 C303
Z1 14 BK
C C318
Z1 20 BK
B C319
Z1 20 BK
2 C321
Z1 18 BK
S310
Z1 12 BK
G303


LICENSE
LAMP
(8W-51-4)
2
Z1
18
BK
2 C330
Z1
18
BK
LIFTGATE
SWITCH
(8W-44-6)
(8W-44-7)
1
Z1
20
BK
REAR
WIPER
MOTOR
(8W-53-3)
(8W-53-4)
1
Z1
18
BK
S334
CENTER
HIGH
MOUNTED
STOP
LAMP
(8W-51-4)
1
Z1
18
BK
2 C333
Z1
18
BK
REAR
WINDOW
DEFOGGER
(8W-48-2)
(8W-48-3)
Z1
12
BK
2 C310
1 C312
Z1
12
BK
Z1
18
BK
9 C310
6 C311
Z1
18
BK
G304

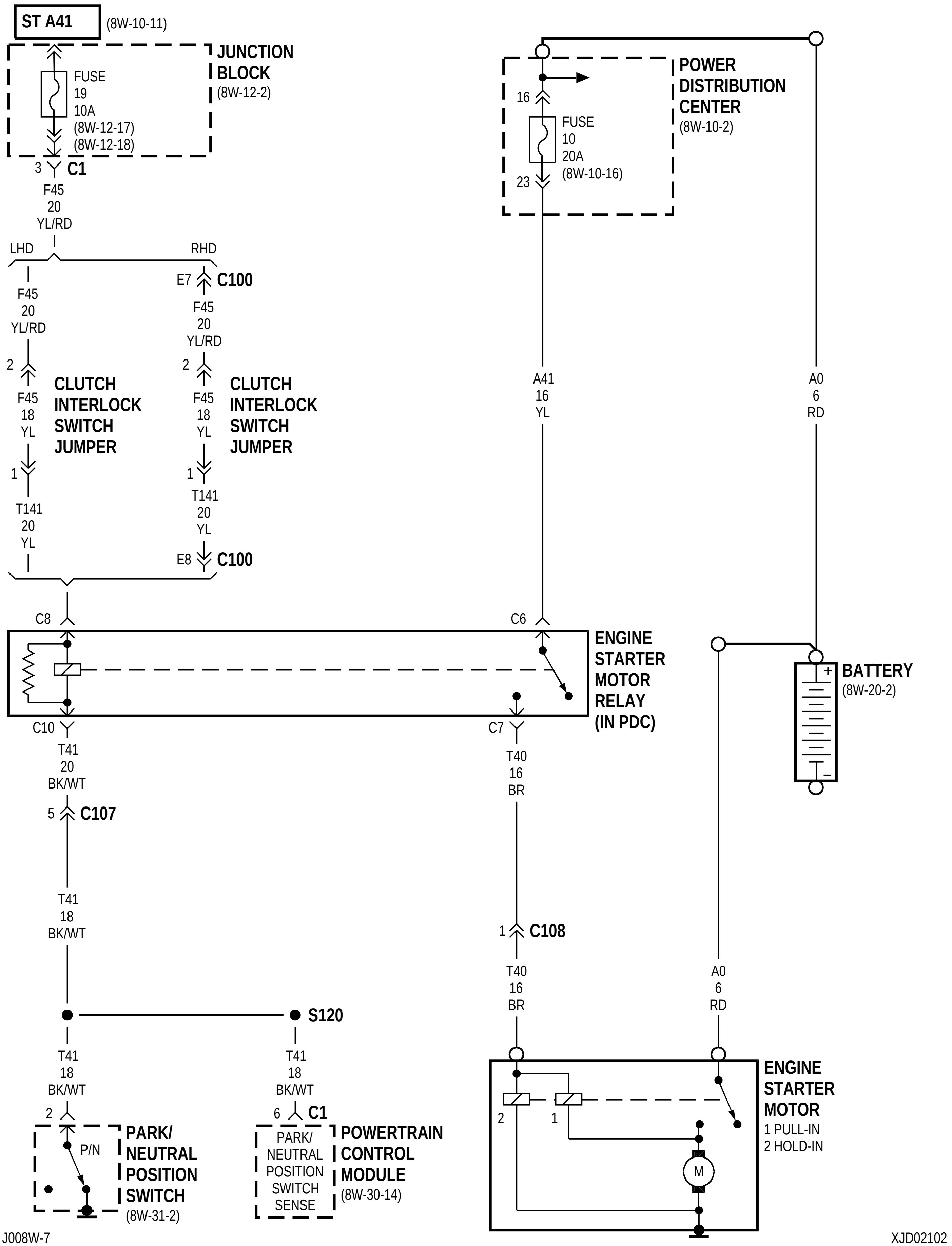

LEFT HEATED SEAT BACK
(8W-63-5)
B
RIGHT HEATED SEAT BACK
(8W-63-5)
B
HEATED SEAT RELAY
(8W-63-6)
6
Z1
18
BK
S354
LEFT HEATED SEAT SWITCH
(8W-63-4)
3
RIGHT HEATED SEAT SWITCH
(8W-63-4)
3
4
C332
12
C329
S355
LEFT POWER SEAT SWITCH
(8W-63-2)
B
RIGHT POWER SEAT SWITCH
(8W-63-3)
A
SEAT HEAT INTERFACE MODULE
(8W-63-5)
13
Z1
14
BK
Z2
18
BK/LG
2
C362
2
C363
13
C329
G306
(HEATED SEATS)

8W-20 CHARGING SYSTEM

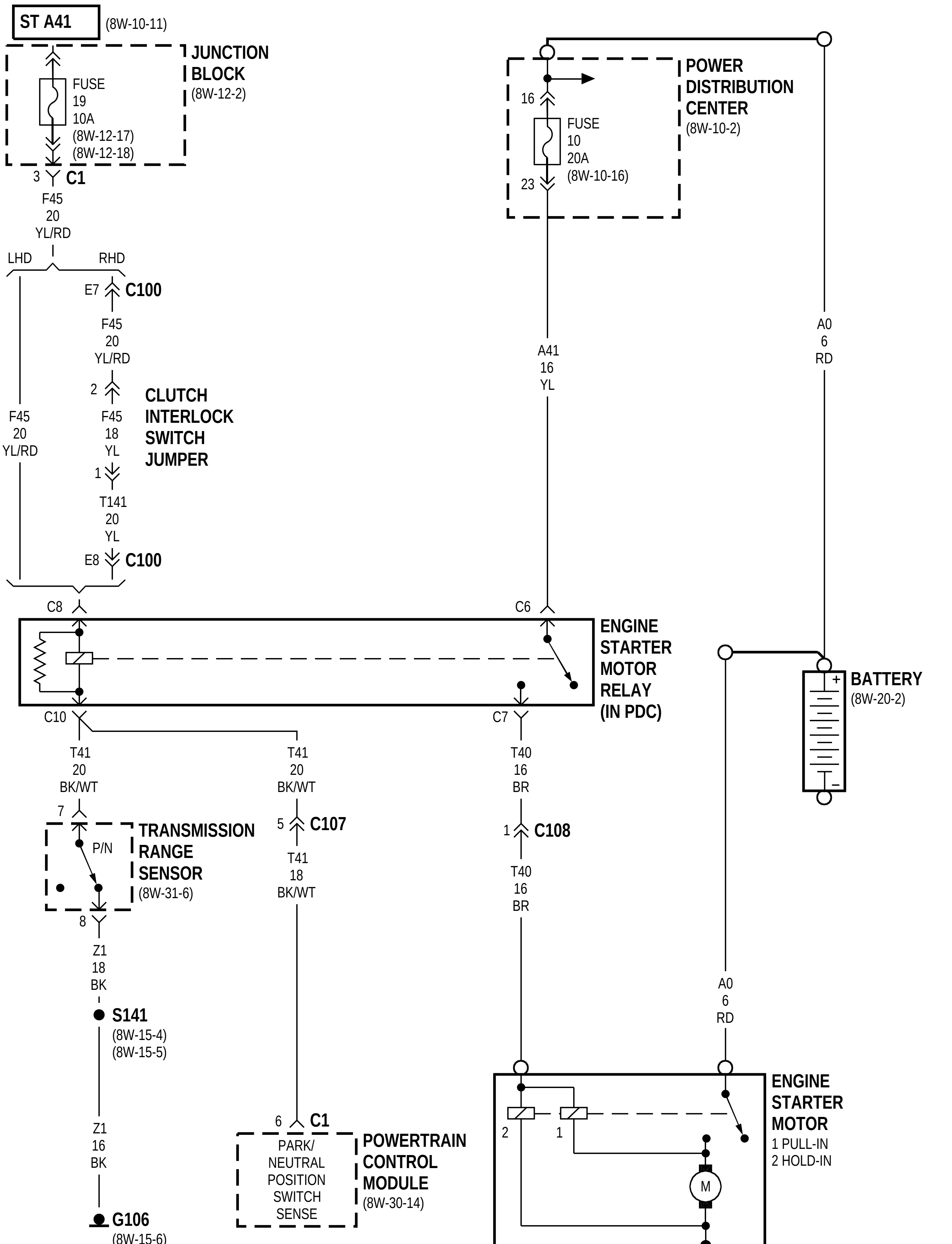

POWER
DISTRIBUTION
CENTER
(8W-10-2)
14
FUSE
8
30A
(8W-10-15)
7
FUSIBLE
LINK
A11
10
DG
S118
A11
6
BK/WT
A0
6
RD
A16
14
RD/LG
D2
AUTOMATIC
SHUT
DOWN
RELAY
(IN PDC)
(8W-30-2)
D8
BATTERY
A0
6
RD
GENERATOR
A999
16
RD
A999
16
RD
Z0
8
BK
B(+)
ENGINE
STARTER
MOTOR
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
TO
FUSE
18 (PDC)
(8W-10-15)
1
2
K72
16
DG/OR
K20
16
DG
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A14
FUSE
21
15A
(8W-10-15)
A13
F142
18
DG/WT
2
3
C108
2.5L
4.0L
2.5L
4.0L
K72
18
DG/OR
K20
18
DG
Z0
4
BK
Z0
6
BK
S168
(8W-10-15)
S166
(8W-30-18)
2
C107
F142
18
DG/WT
K72
18
DG/OR
K20
18
DG
G101
(8W-15-2)
12
C3
25
C3
10
C2
FUSED
AUTOMATIC
SHUT
DOWN
RELAY
OUTPUT
GENERATOR
SOURCE
GENERATOR
FIELD
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
(8W-30-18)
G100
(8W-15-2)

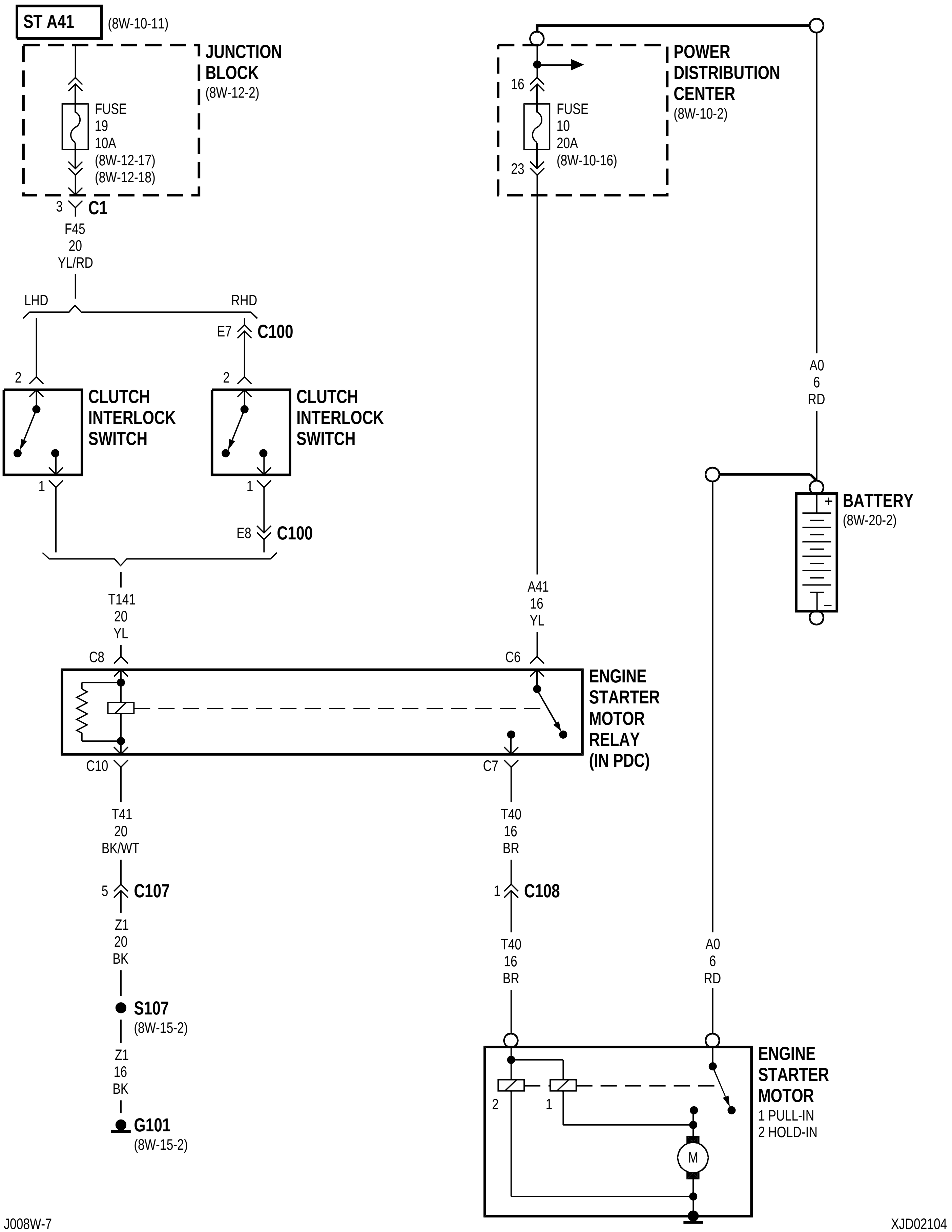

BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A11
FUSE
22
15A
(8W-10-19)
A12
A61
14
DG/BK
C1
FUSED
B(+)
FUEL
PUMP
RELAY
(IN PDC)
(8W-30-3)
(8W-30-4)
A61
16
DG/BK
14
C107
A61
14
DG/BK
S138
(8W-70-3)
K167
20
BR/YL
3
C107
K167
20
BR/YL
S111
(8W-70-3)
4.0L
CALIFORNIA
OTHER
K167
20
BR/YL
S123
(8W-70-2)
K167
18
BR/YL
K167
18
BR/YL
K167
20
BR/YL
2
BATTERY
TEMPERATURE
SENSOR
(8W-30-13)
1
K118
18
PK/YL
22
C1
FUSED
B(+)
15
C3
BATTERY
TEMPERATURE
SENSOR
SIGNAL
4
C1
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE
(8W-30-3)
(8W-30-4)
(8W-30-13)

8W-21 STARTING SYSTEM

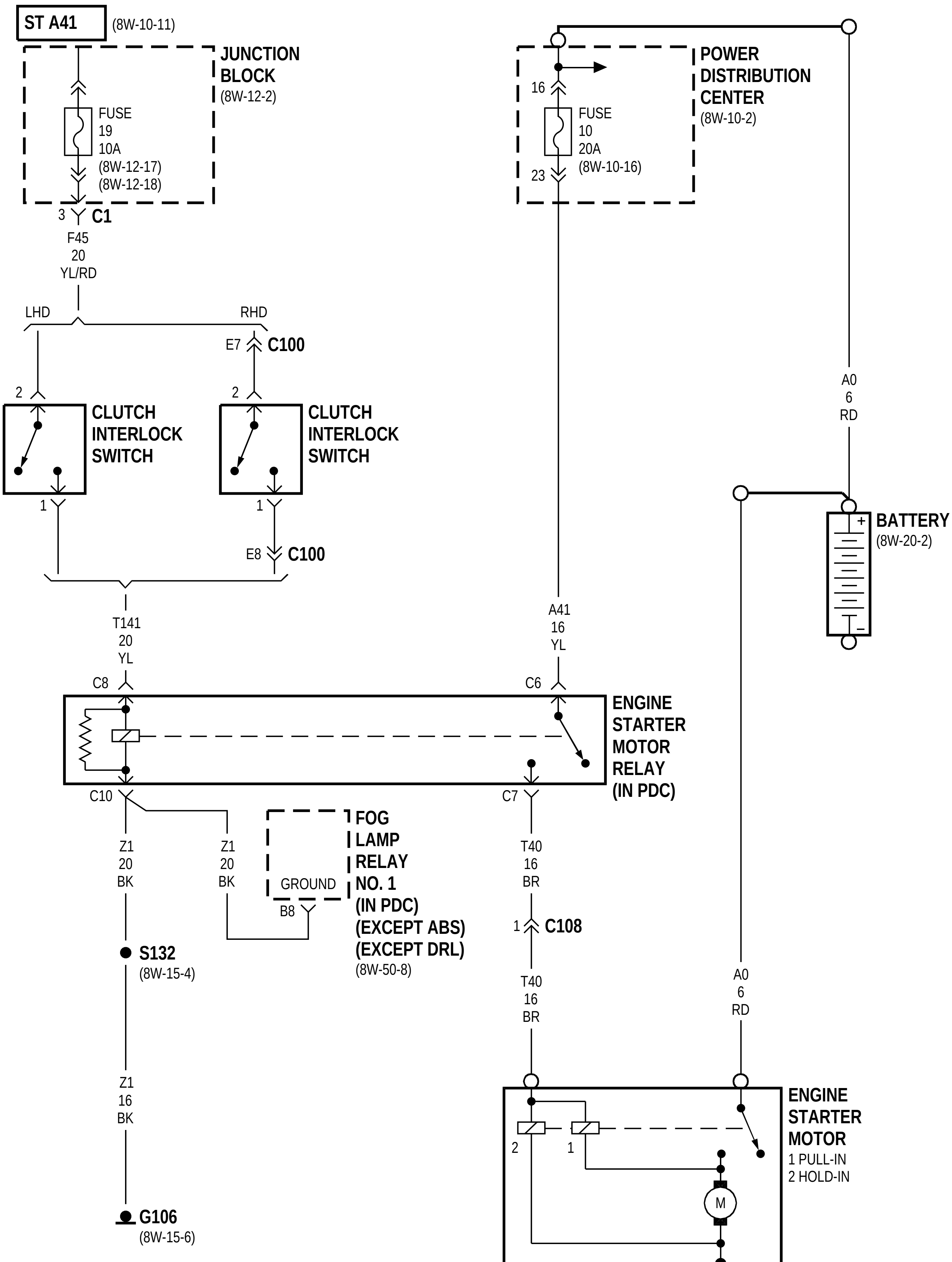

ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
19
10A
(8W-12-17)
(8W-12-18)
3
C1
F45
20
YL/RD
LHD
RHD
E7
C100
F45
20
YL/RD
F45
20
YL/RD
2
F45
18
YL
1
CLUTCH INTERLOCK SWITCH JUMPER
2
F45
18
YL
1
CLUTCH INTERLOCK SWITCH JUMPER
T141
20
YL
T141
20
YL
E8
C100
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE
10
20A
(8W-10-16)
23
A41
16
YL
A0
6
RD
C8
C6
ENGINE STARTER MOTOR RELAY (IN PDC)
C10
C7
BATTERY
(8W-20-2)
+
–
T41
20
BK/WT
5
C107
T40
16
BR
T41
18
BK/WT
1
C108
T40
16
BR
A0
6
RD
S120
T41
18
BK/WT
T41
18
BK/WT
2
6
C1
P/N
PARK/ NEUTRAL POSITION SWITCH
(8W-31-2)
PARK/ NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-14)
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN
J008W-7
XJD02102

4.0L A/T

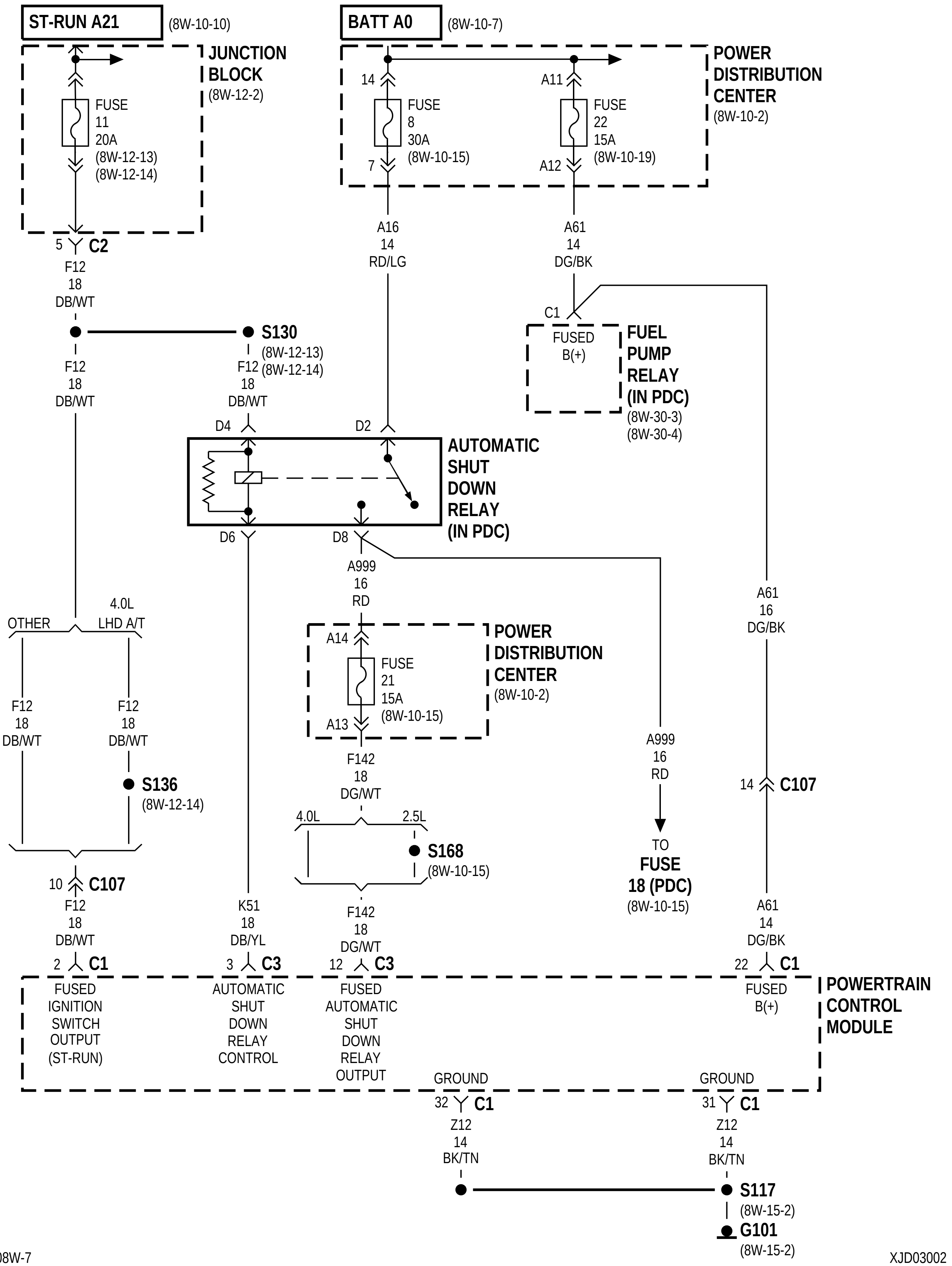

ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
19
10A
(8W-12-17)
(8W-12-18)
3
C1
F45
20
YL/RD
LHD
RHD
E7
C100
F45
20
YL/RD
2
CLUTCH INTERLOCK SWITCH JUMPER
F45
18
YL
1
F45
20
YL/RD
T141
20
YL
E8
C100
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE
10
20A
(8W-10-16)
23
A41
16
YL
A0
6
RD
C8
C6
ENGINE STARTER MOTOR RELAY (IN PDC)
C10
C7
BATTERY
(8W-20-2)
+
–
T41
20
BK/WT
T41
20
BK/WT
T40
16
BR
7
TRANSMISSION RANGE SENSOR
(8W-31-6)
P/N
8
5
C107
T41
18
BK/WT
1
C108
T40
16
BR
Z1
18
BK
S141
(8W-15-4)
(8W-15-5)
A0
6
RD
Z1
16
BK
G106
(8W-15-6)
6
C1
PARK/
NEUTRAL
POSITION
SWITCH
SENSE
POWERTRAIN CONTROL MODULE
(8W-30-14)
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN


ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
19
10A
(8W-12-17)
(8W-12-18)
3
C1
F45
20
YL/RD
LHD
RHD
E7
C100
2
CLUTCH INTERLOCK SWITCH
1
E8
C100
T141
20
YL
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE
10
20A
(8W-10-16)
23
A41
16
YL
A0
6
RD
BATTERY
(8W-20-2)
C8
C6
ENGINE STARTER MOTOR RELAY (IN PDC)
C10
C7
T41
20
BK/WT
5
C107
Z1
20
BK
S107
(8W-15-2)
Z1
16
BK
G101
(8W-15-2)
T40
16
BR
1
C108
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN
M

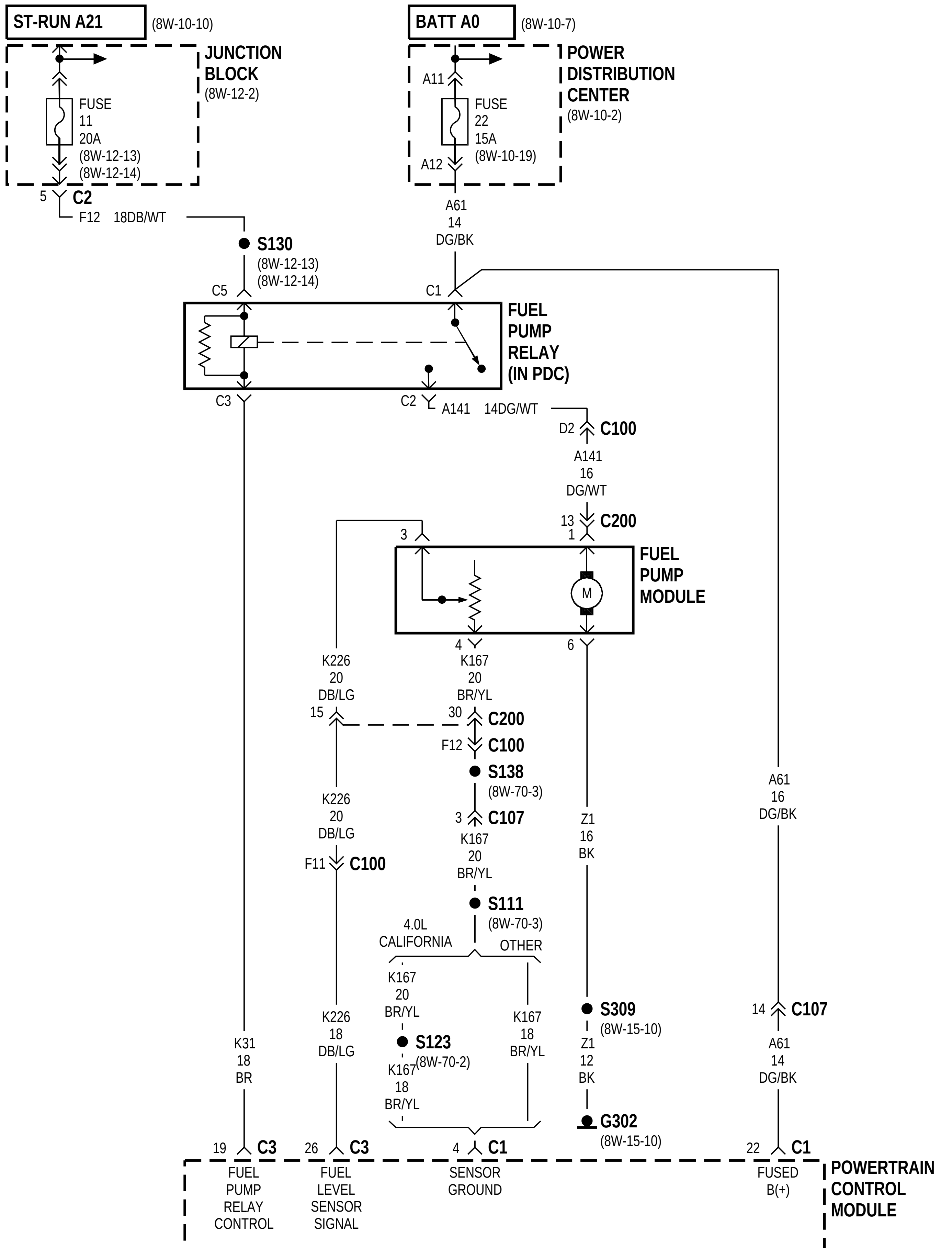
4.0L M/T


ST A41
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 19 10A
(8W-12-17)
(8W-12-18)
3 C1
F45 20 YL/RD
LHD
RHD
E7 C100
2
CLUTCH INTERLOCK SWITCH
2
CLUTCH INTERLOCK SWITCH
1
1
E8 C100
T141 20 YL
C8
C6
ENGINE STARTER MOTOR RELAY (IN PDC)
C10
C7
Z1 20 BK
Z1 20 BK
GROUND
B8
FOG LAMP RELAY NO. 1 (IN PDC) (EXCEPT ABS) (EXCEPT DRL)
(8W-50-8)
S132
(8W-15-4)
Z1 16 BK
G106
(8W-15-6)
POWER DISTRIBUTION CENTER
(8W-10-2)
16
FUSE 10 20A
(8W-10-16)
23
A41 16 YL
A0 6 RD
BATTERY
(8W-20-2)
T40 16 BR
1 C108
T40 16 BR
A0 6 RD
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN
2
1
M

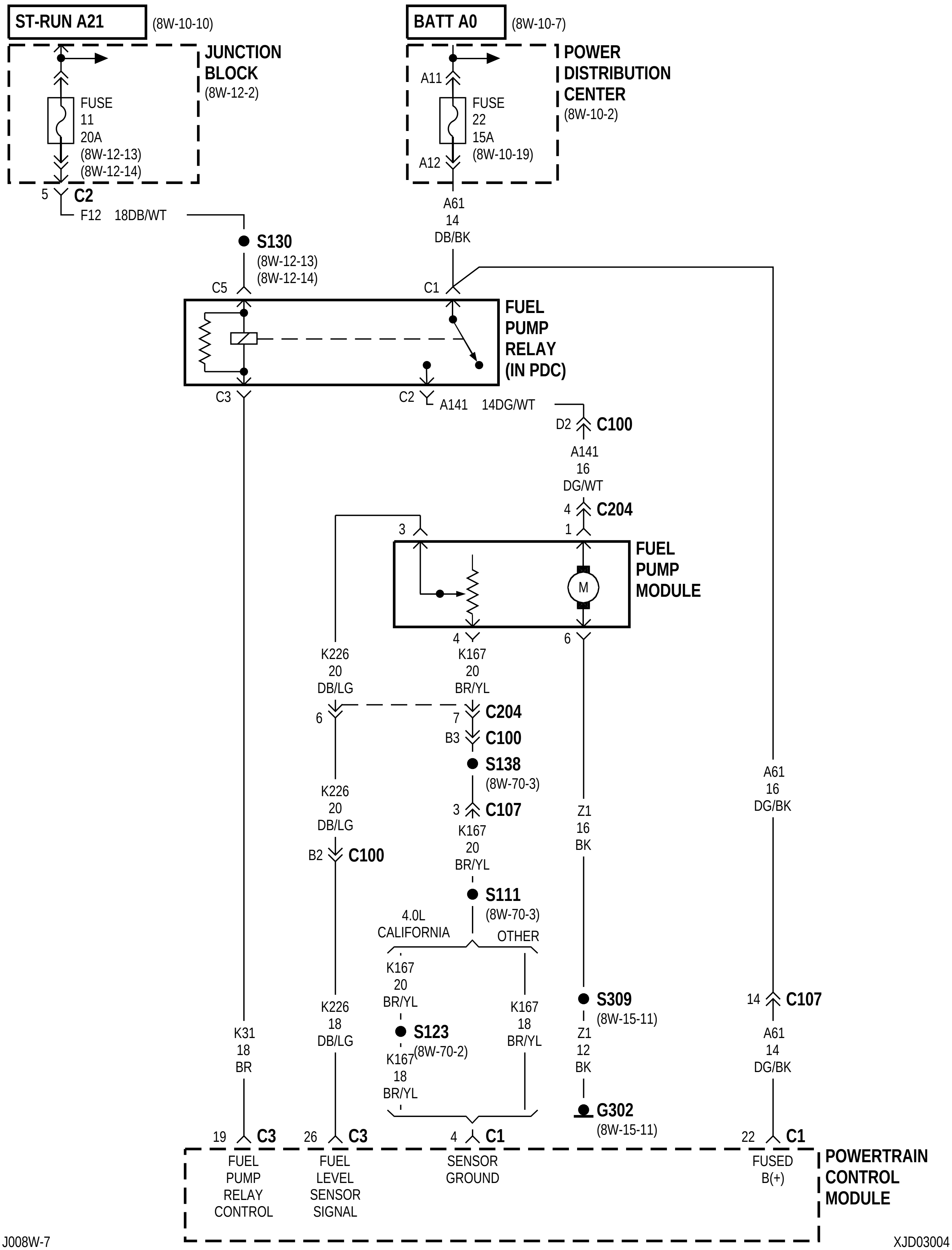
8W-30 FUEL/IGNITION SYSTEM

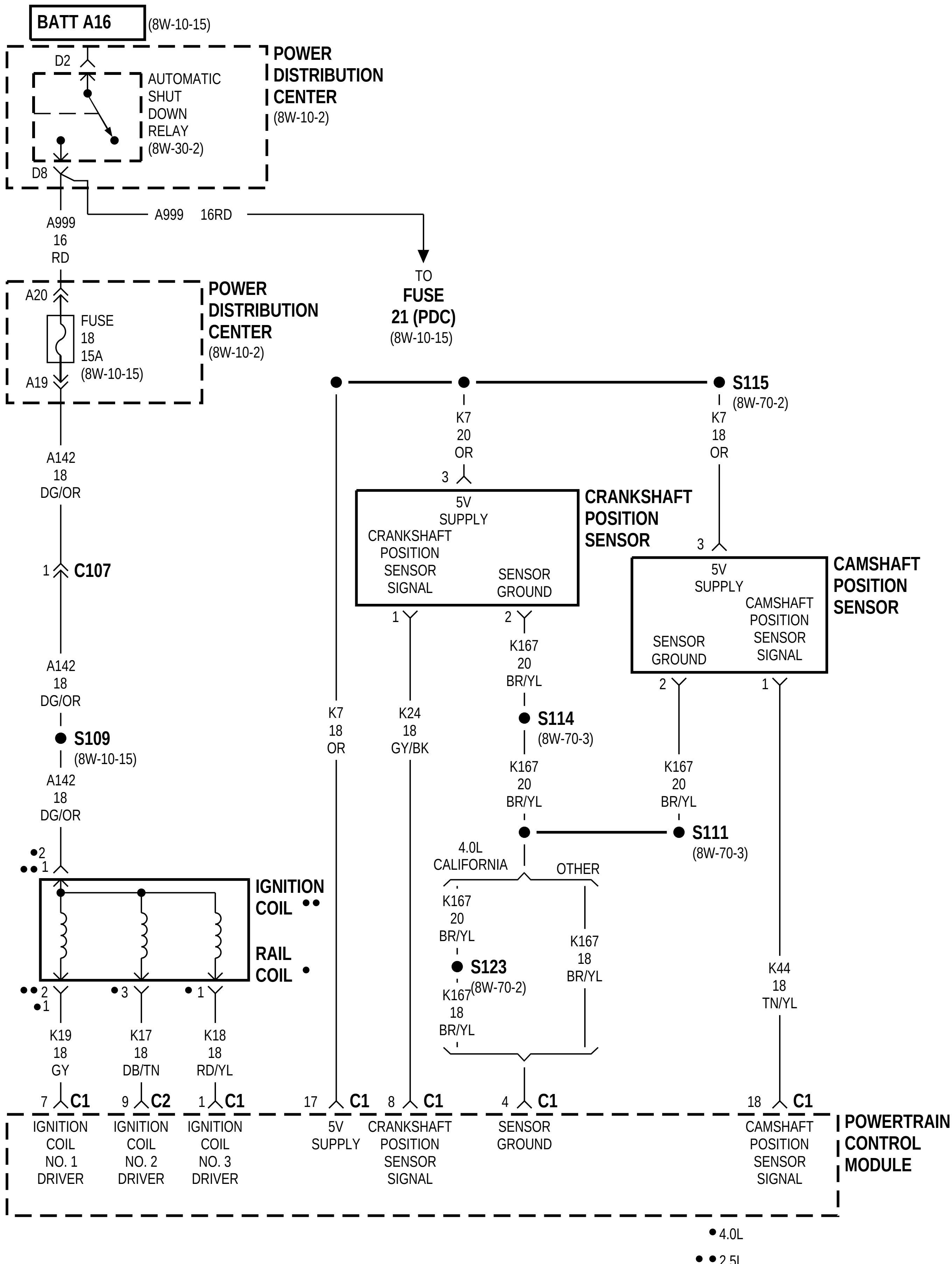

ST-RUN A21
(8W-10-10)
BATT A0
(8W-10-7)
JUNCTION BLOCK
(8W-12-2)
FUSE 11 20A
(8W-12-13)
(8W-12-14)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 8 30A
(8W-10-15)
FUSE 22 15A
(8W-10-19)
A16 14 RD/LG
A61 14 DG/BK
5 C2
F12 18 DB/WT
S130
(8W-12-13)
(8W-12-14)
FUSED B(+)
FUEL PUMP RELAY (IN PDC)
(8W-30-3)
(8W-30-4)
AUTOMATIC SHUT DOWN RELAY (IN PDC)
D4 D2 D6 D8
A999 16 RD
A61 16 DG/BK
OTHER
4.0L LHD A/T
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 21 15A
(8W-10-15)
A14 A13
F142 18 DG/WT
S136
(8W-12-14)
4.0L 2.5L
S168
(8W-10-15)
TO FUSE 18 (PDC)
(8W-10-15)
14 C107
10 C107
K51 18 DB/YL
A61 14 DG/BK
2 C1
3 C3
12 C3
22 C1
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
AUTOMATIC SHUT DOWN RELAY CONTROL
FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
FUSED B(+)
POWERTRAIN CONTROL MODULE
GROUND
32 C1
31 C1
Z12 14 BK/TN
S117
(8W-15-2)
G101
(8W-15-2)

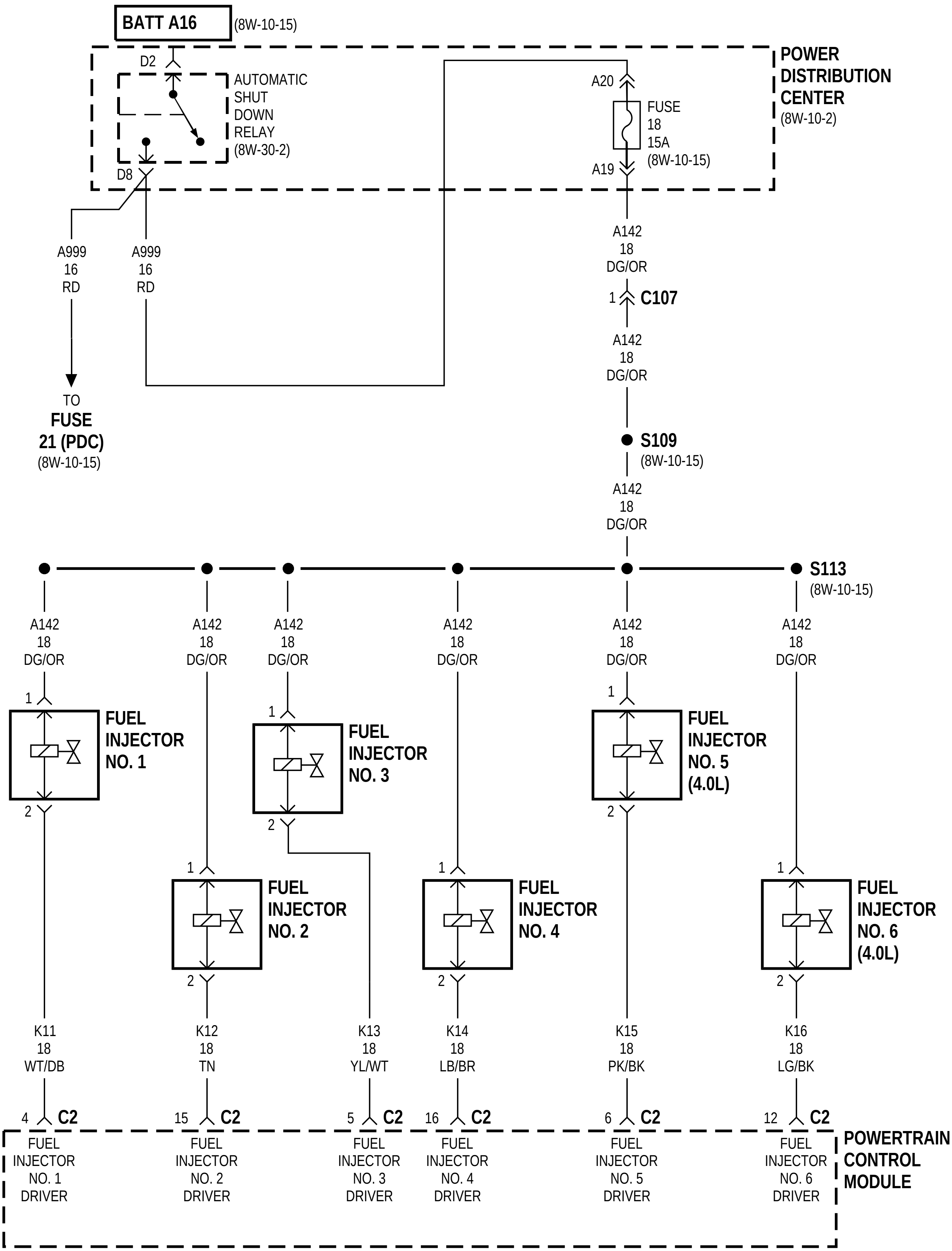
LHD

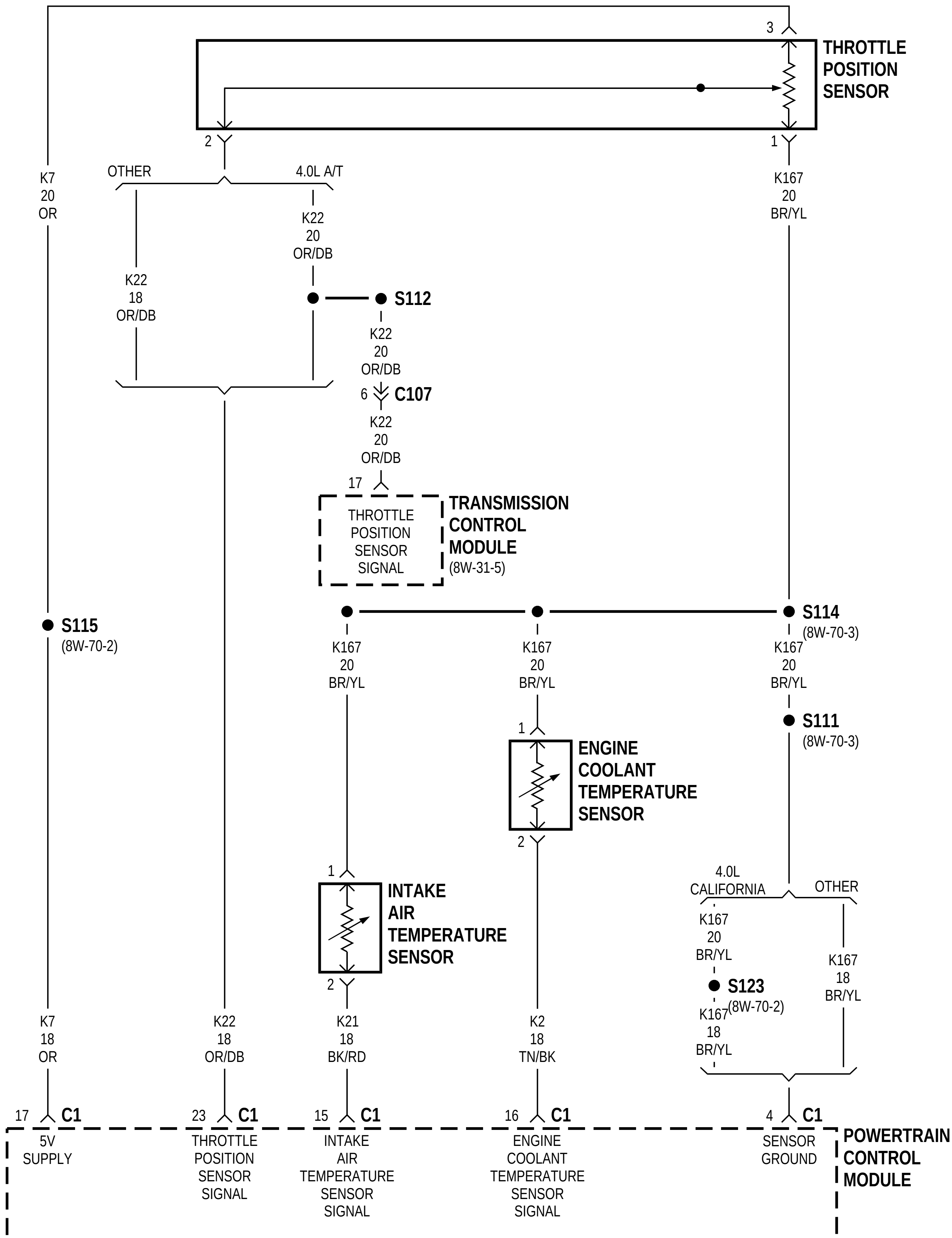

ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
20A
(8W-12-13)
(8W-12-14)
5
C2
F12 18DB/WT
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A11
FUSE
22
15A
(8W-10-19)
A12
A61
14
DG/BK
S130
(8W-12-13)
(8W-12-14)
C5
C1
FUEL PUMP RELAY (IN PDC)
C3
C2
A141 14DG/WT
D2
C100
A141
16
DG/WT
13
C200
1
3
FUEL PUMP MODULE
M
4
6
K226
20
DB/LG
K167
20
BR/YL
15
30
C200
F12
C100
S138
(8W-70-3)
K226
20
DB/LG
3
C107
K167
20
BR/YL
F11
C100
S111
(8W-70-3)
4.0L CALIFORNIA
OTHER
K167
20
BR/YL
S123
(8W-70-2)
K167
18
BR/YL
K167
18
BR/YL
Z1
16
BK
S309
(8W-15-10)
Z1
12
BK
G302
(8W-15-10)
A61
16
DG/BK
14
C107
A61
14
DG/BK
K31
18
BR
K226
18
DB/LG
19
C3
26
C3
4
C1
22
C1
FUEL PUMP RELAY CONTROL
FUEL LEVEL SENSOR SIGNAL
SENSOR GROUND
FUSED B(+)
POWERTRAIN CONTROL MODULE

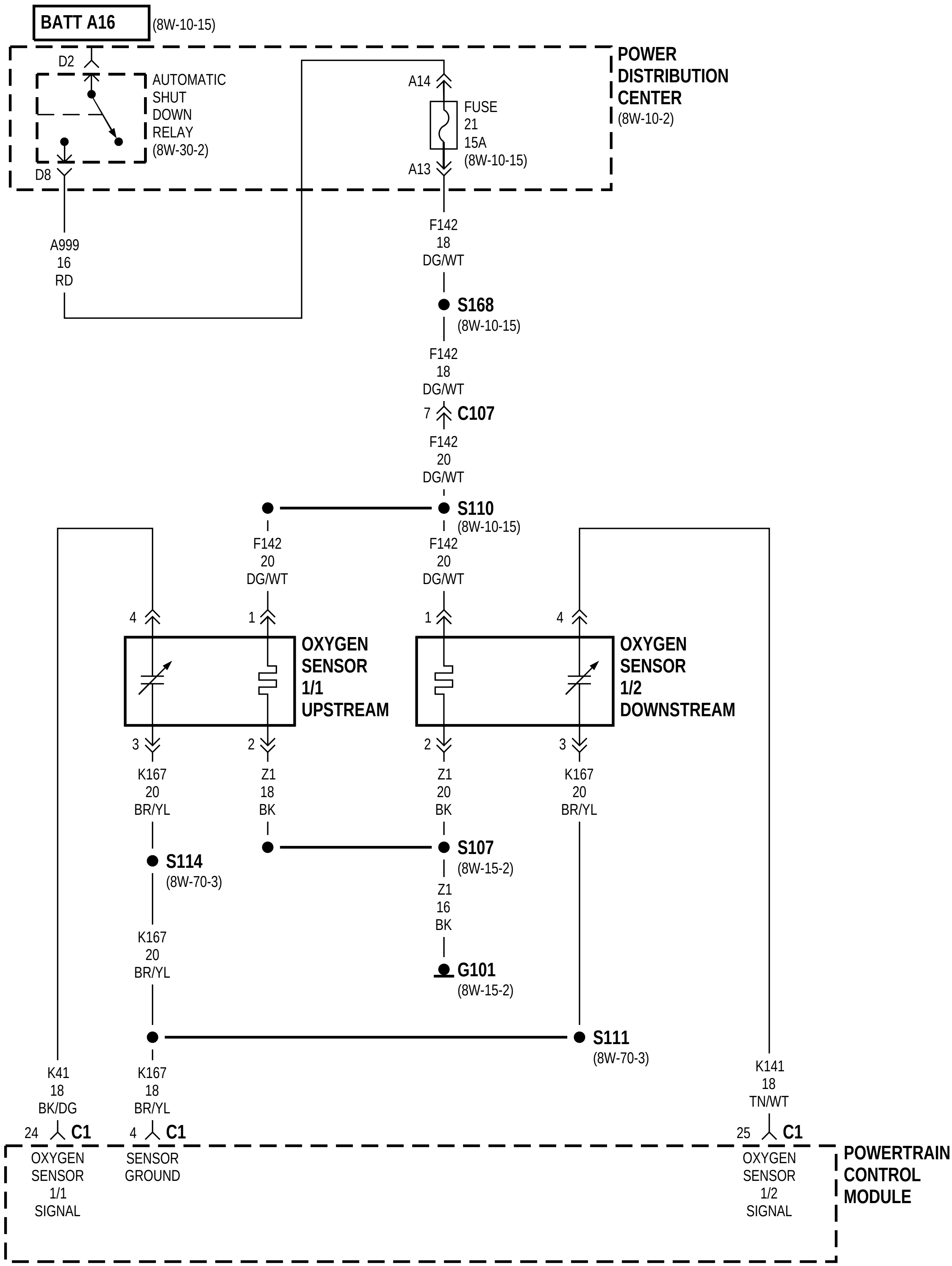
RHD

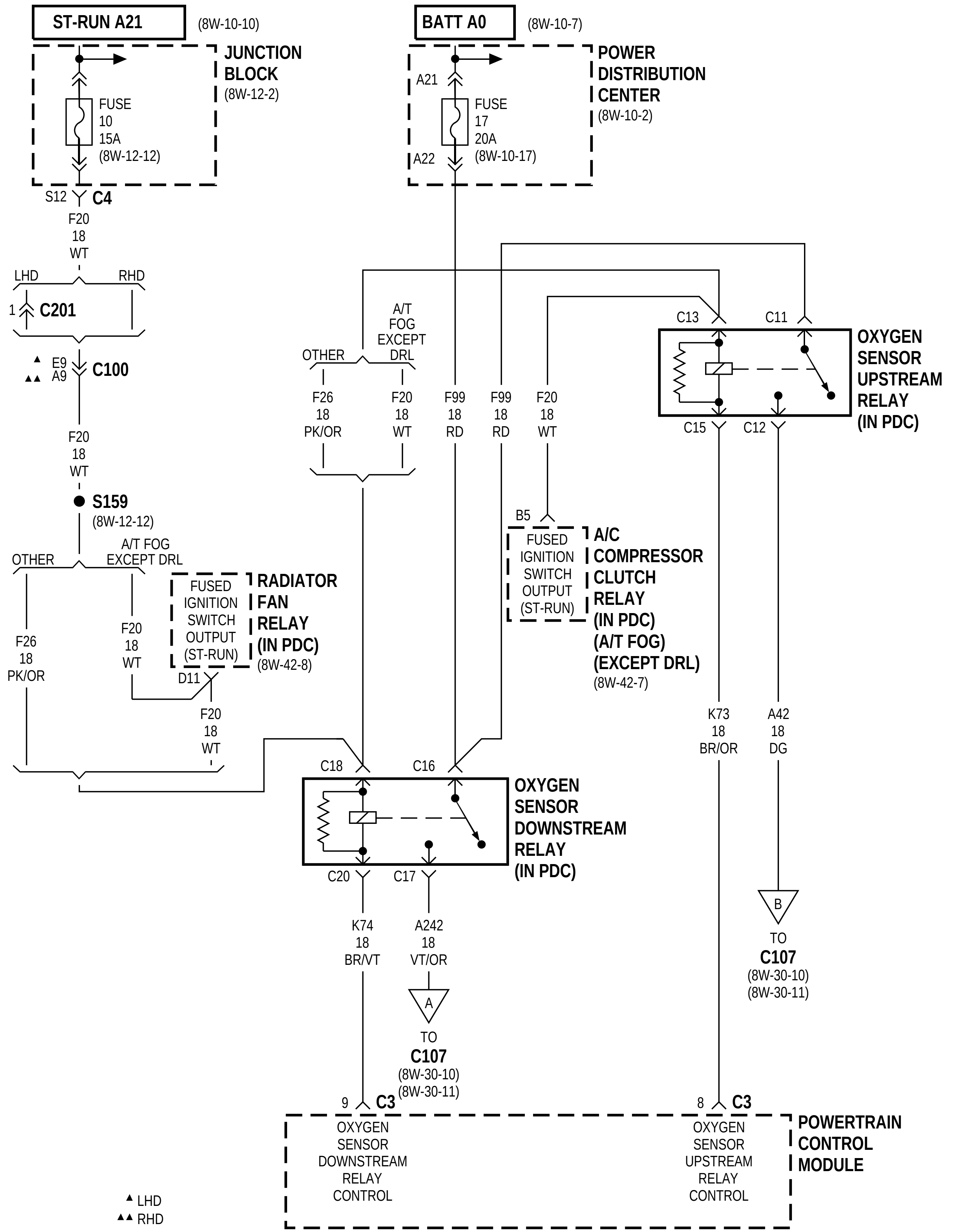

ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 11 20A
(8W-12-13)
(8W-12-14)
5 C2
F12 18DB/WT
S130
(8W-12-13)
(8W-12-14)
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A11
FUSE 22 15A
(8W-10-19)
A12
A61 14 DB/BK
C5
C1
FUEL PUMP RELAY (IN PDC)
C3
C2
A141 14DG/WT
D2 C100
A141 16 DG/WT
4 C204
1
3
FUEL PUMP MODULE
M
4
6
K226 20 DB/LG
K167 20 BR/YL
6
7 C204
B3 C100
S138
(8W-70-3)
3 C107
K226 20 DB/LG
B2 C100
K167 20 BR/YL
S111
(8W-70-3)
4.0L CALIFORNIA
OTHER
K167 20 BR/YL
S123
(8W-70-2)
K167 18 BR/YL
K167 18 BR/YL
K226 18 DB/LG
K31 18 BR
Z1 16 BK
S309
(8W-15-11)
Z1 12 BK
G302
(8W-15-11)
A61 16 DG/BK
14 C107
A61 14 DG/BK
19 C3
26 C3
4 C1
22 C1
FUEL PUMP RELAY CONTROL
FUEL LEVEL SENSOR SIGNAL
SENSOR GROUND
FUSED B(+)
POWERTRAIN CONTROL MODULE
J008W-7
XJD03004

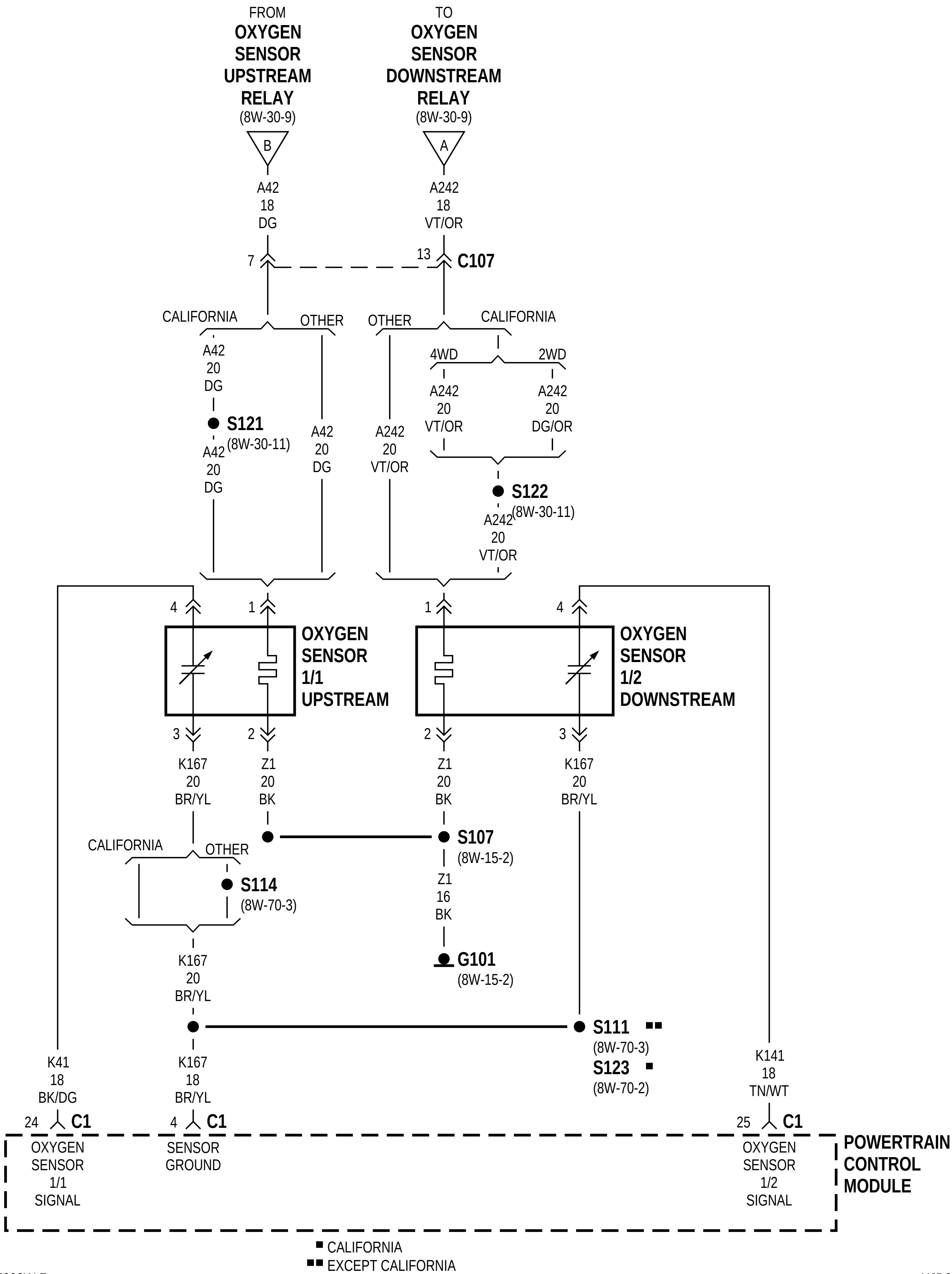

BATT A16
(8W-10-15)
D2
AUTOMATIC
SHUT
DOWN
RELAY
(8W-30-2)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
D8
A999
16
RD
A999 16RD
TO
FUSE
21 (PDC)
(8W-10-15)
A20
FUSE
18
15A
(8W-10-15)
A19
POWER
DISTRIBUTION
CENTER
(8W-10-2)
S115
(8W-70-2)
K7
20
OR
K7
18
OR
A142
18
DG/OR
3
5V
SUPPLY
CRANKSHAFT
POSITION
SENSOR
SIGNAL
SENSOR
GROUND
CRANKSHAFT
POSITION
SENSOR
3
5V
SUPPLY
CAMSHAFT
POSITION
SENSOR
SIGNAL
SENSOR
GROUND
CAMSHAFT
POSITION
SENSOR
1
C107
1
2
K167
20
BR/YL
2
1
A142
18
DG/OR
K7
18
OR
K24
18
GY/BK
S114
(8W-70-3)
S109
(8W-10-15)
A142
18
DG/OR
K167
20
BR/YL
K167
20
BR/YL
S111
(8W-70-3)
2
1
4.0L
CALIFORNIA
OTHER
IGNITION
COIL
RAIL
COIL
K167
20
BR/YL
K167
18
BR/YL
S123
(8W-70-2)
K167
18
BR/YL
K44
18
TN/YL
2
1
3
1
K19
18
GY
K17
18
DB/TN
K18
18
RD/YL
7 C1
9 C2
1 C1
17 C1
8 C1
4 C1
18 C1
IGNITION
COIL
NO. 1
DRIVER
IGNITION
COIL
NO. 2
DRIVER
IGNITION
COIL
NO. 3
DRIVER
5V
SUPPLY
CRANKSHAFT
POSITION
SENSOR
SIGNAL
SENSOR
GROUND
CAMSHAFT
POSITION
SENSOR
SIGNAL
POWERTRAIN
CONTROL
MODULE
• 4.0L
• • 2.5L

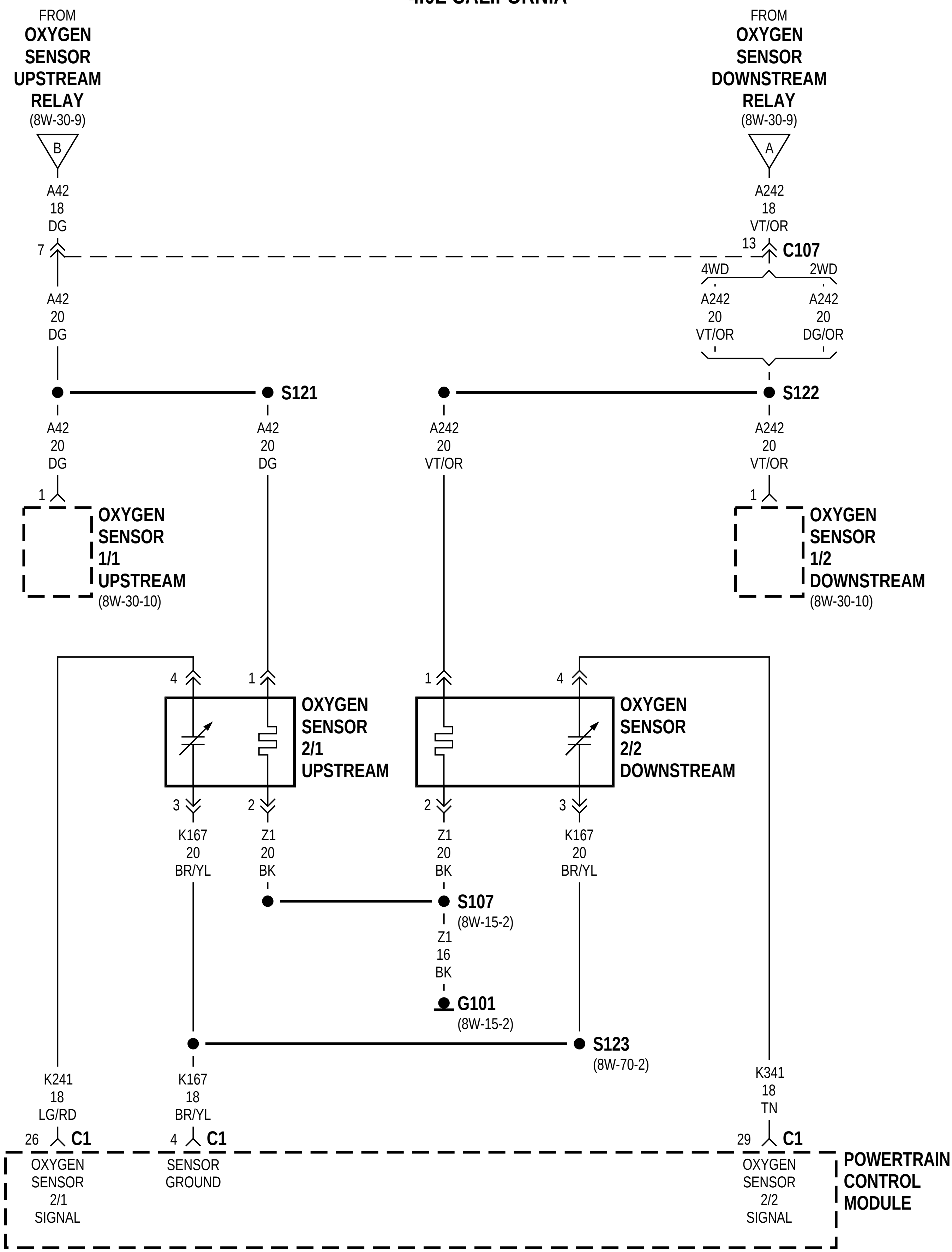

BATT A16
(8W-10-15)
POWER DISTRIBUTION CENTER
(8W-10-2)
D2
AUTOMATIC SHUT DOWN RELAY
(8W-30-2)
D8
A20
FUSE 18 15A
(8W-10-15)
A19
A999 16 RD
A999 16 RD
TO FUSE 21 (PDC)
(8W-10-15)
A142 18 DG/OR
1 C107
A142 18 DG/OR
S109
(8W-10-15)
A142 18 DG/OR
S113
(8W-10-15)
A142 18 DG/OR
A142 18 DG/OR
A142 18 DG/OR
A142 18 DG/OR
A142 18 DG/OR
A142 18 DG/OR
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
FUEL INJECTOR NO. 5 (4.0L)
FUEL INJECTOR NO. 6 (4.0L)
K11 18 WT/DB
K12 18 TN
K13 18 YL/WT
K14 18 LB/BR
K15 18 PK/BK
K16 18 LG/BK
4 C2
15 C2
5 C2
16 C2
6 C2
12 C2
FUEL INJECTOR NO. 1 DRIVER
FUEL INJECTOR NO. 2 DRIVER
FUEL INJECTOR NO. 3 DRIVER
FUEL INJECTOR NO. 4 DRIVER
FUEL INJECTOR NO. 5 DRIVER
FUEL INJECTOR NO. 6 DRIVER
POWERTRAIN CONTROL MODULE

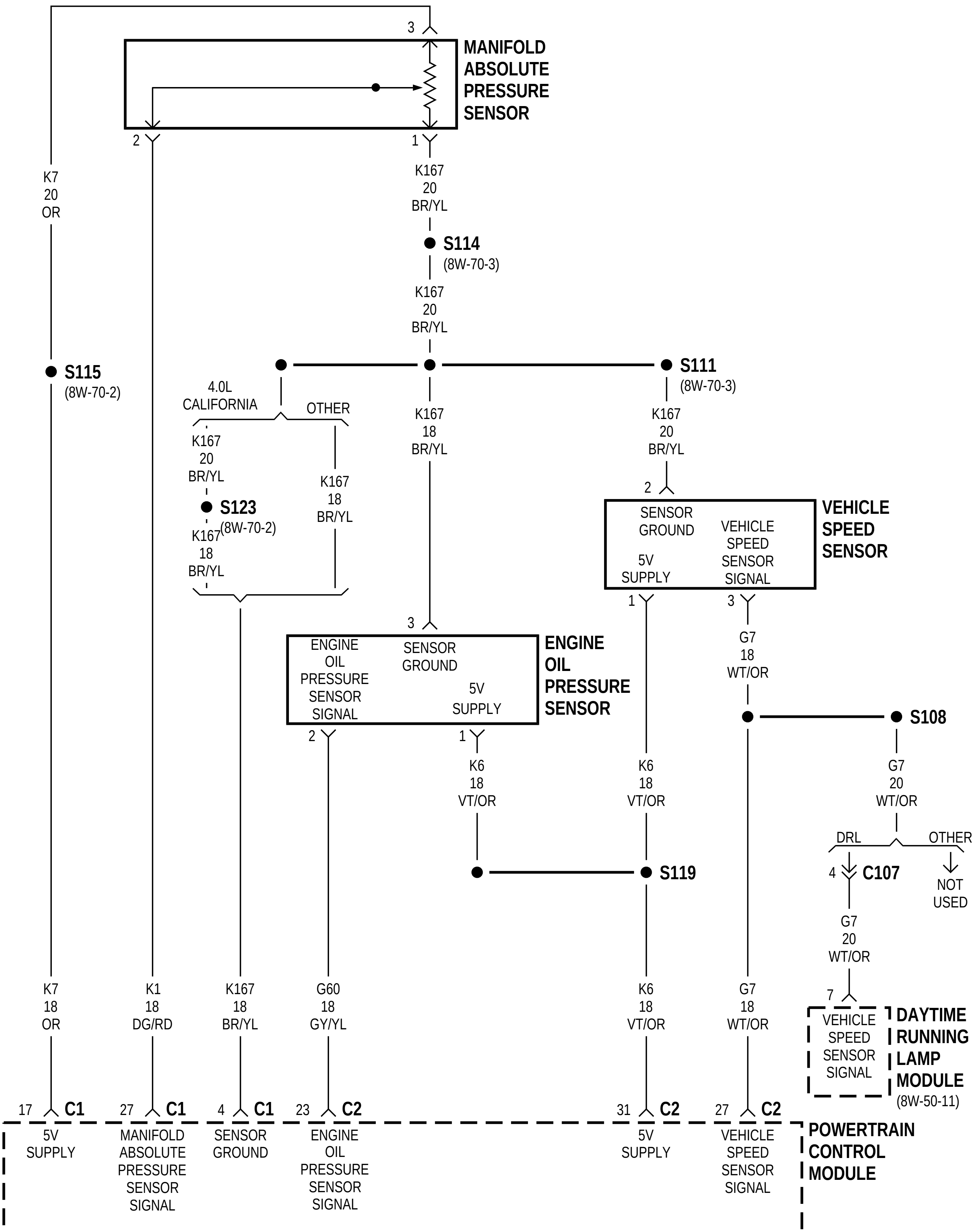

3
THROTTLE POSITION SENSOR
2
1
K7 20 OR
OTHER
4.0L A/T
K167 20 BR/YL
K22 20 OR/DB
K22 18 OR/DB
S112
K22 20 OR/DB
6 C107
K22 20 OR/DB
17
THROTTLE POSITION SENSOR SIGNAL
TRANSMISSION CONTROL MODULE
(8W-31-5)
S115
(8W-70-2)
S114
(8W-70-3)
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
S111
(8W-70-3)
1
ENGINE COOLANT TEMPERATURE SENSOR
2
1
INTAKE AIR TEMPERATURE SENSOR
2
4.0L CALIFORNIA
OTHER
K167 20 BR/YL
S123
(8W-70-2)
K167 18 BR/YL
K167 18 BR/YL
K7 18 OR
K22 18 OR/DB
K21 18 BK/RD
K2 18 TN/BK
17 C1
23 C1
15 C1
16 C1
4 C1
5V SUPPLY
THROTTLE POSITION SENSOR SIGNAL
INTAKE AIR TEMPERATURE SENSOR SIGNAL
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
POWERTRAIN CONTROL MODULE

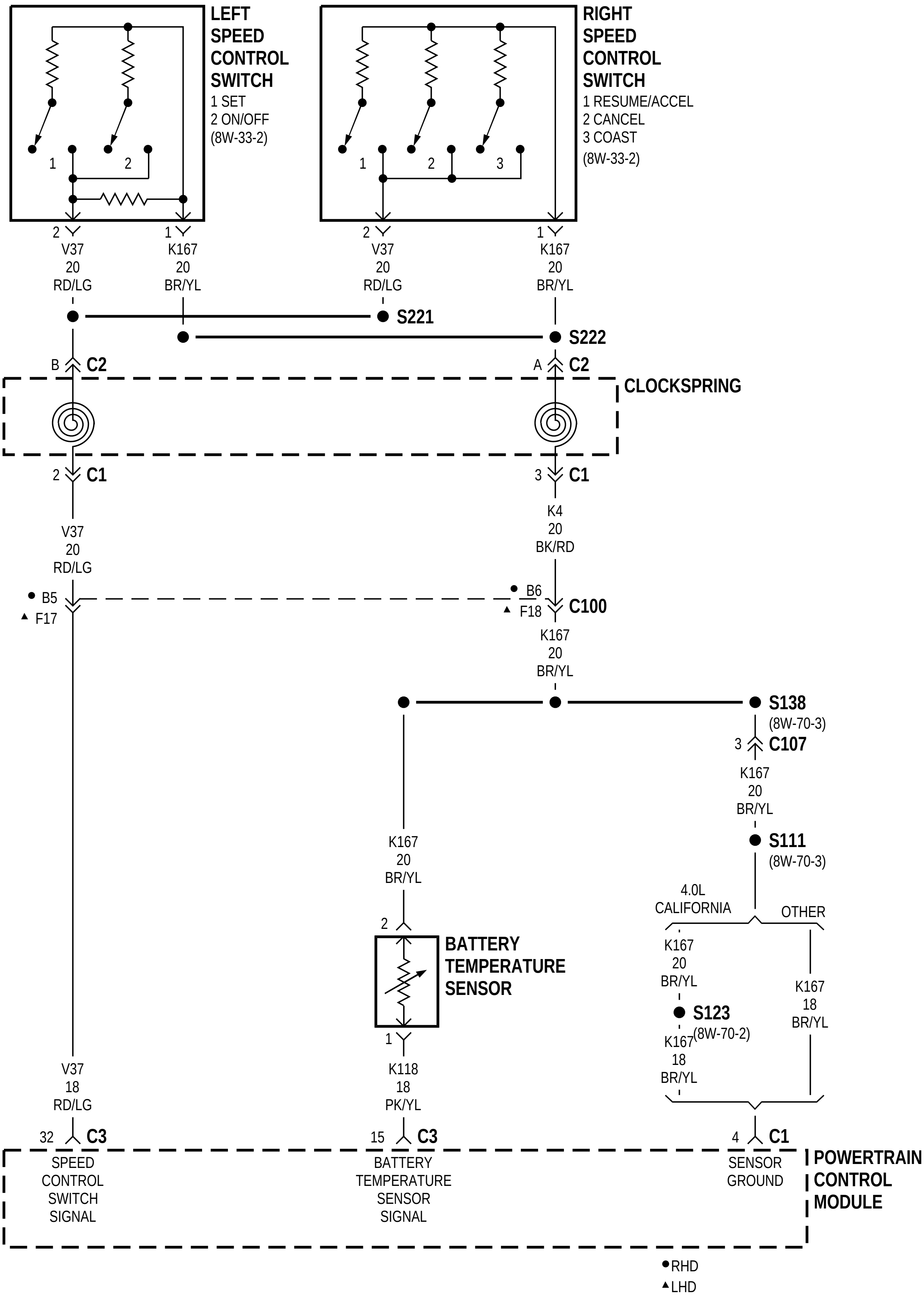

BATT A16
(8W-10-15)
D2
AUTOMATIC
SHUT
DOWN
RELAY
(8W-30-2)
D8
A14
FUSE
21
15A
(8W-10-15)
A13
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A999
16
RD
F142
18
DG/WT
S168
(8W-10-15)
F142
18
DG/WT
7
C107
F142
20
DG/WT
S110
(8W-10-15)
F142
20
DG/WT
F142
20
DG/WT
4
1
1
4
OXYGEN
SENSOR
1/1
UPSTREAM
OXYGEN
SENSOR
1/2
DOWNSTREAM
3
2
2
3
K167
20
BR/YL
Z1
18
BK
Z1
20
BK
K167
20
BR/YL
S114
(8W-70-3)
S107
(8W-15-2)
Z1
16
BK
K167
20
BR/YL
G101
(8W-15-2)
S111
(8W-70-3)
K41
18
BK/DG
K167
18
BR/YL
K141
18
TN/WT
24
C1
4
C1
25
C1
OXYGEN
SENSOR
1/1
SIGNAL
SENSOR
GROUND
OXYGEN
SENSOR
1/2
SIGNAL
POWERTRAIN
CONTROL
MODULE

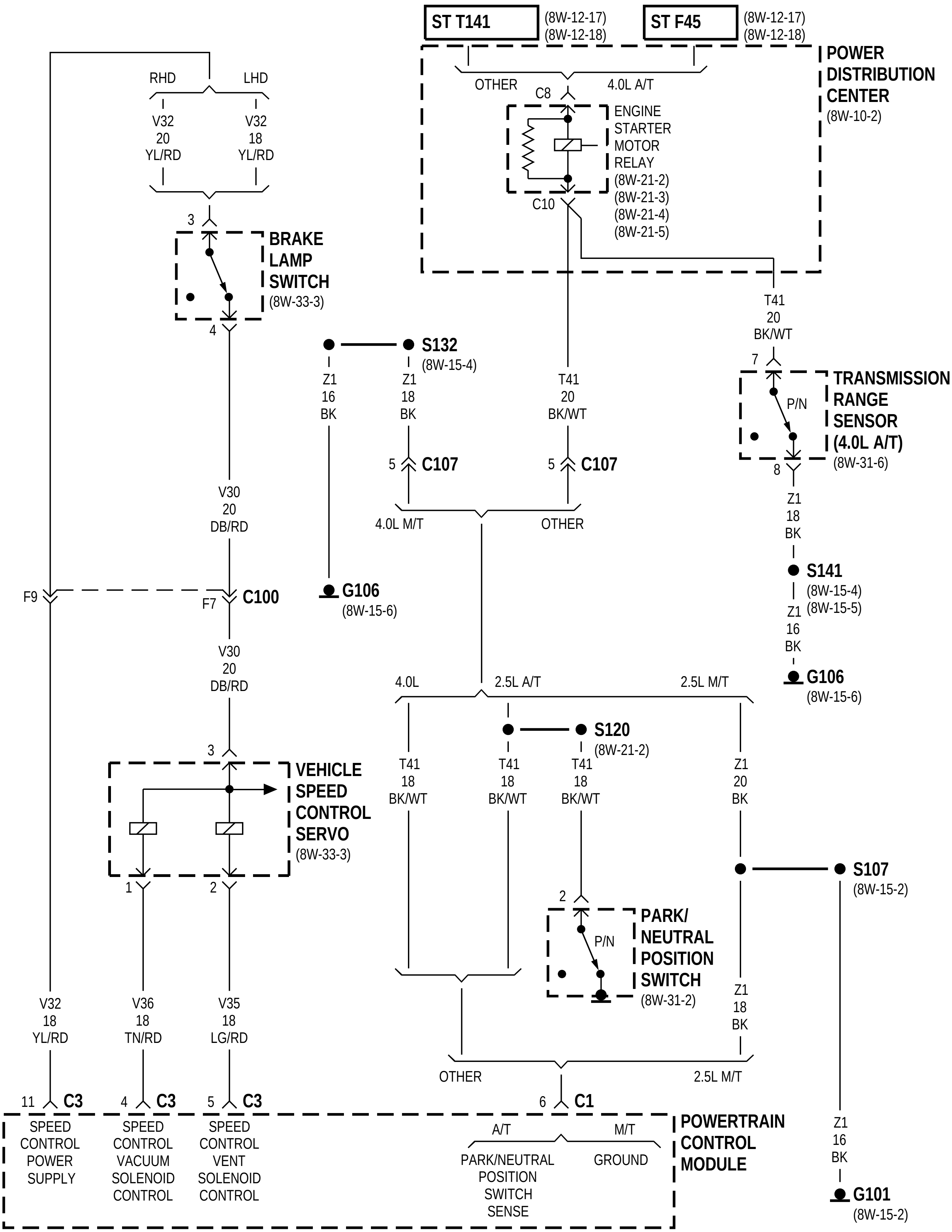

ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
10
15A
(8W-12-12)
S12
C4
F20
18
WT
LHD
RHD
1
C201
E9
A9
C100
F20
18
WT
S159
(8W-12-12)
OTHER
A/T FOG EXCEPT DRL
F26
18
PK/OR
F20
18
WT
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
RADIATOR FAN RELAY (IN PDC)
(8W-42-8)
D11
F20
18
WT
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A21
FUSE
17
20A
(8W-10-17)
A22
OTHER
A/T FOG EXCEPT DRL
F26
18
PK/OR
F20
18
WT
F99
18
RD
F99
18
RD
F20
18
WT
B5
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
A/C COMPRESSOR CLUTCH RELAY (IN PDC) (A/T FOG) (EXCEPT DRL)
(8W-42-7)
C13
C11
OXYGEN SENSOR UPSTREAM RELAY (IN PDC)
C15
C12
K73
18
BR/OR
A42
18
DG
B
TO C107
(8W-30-10)
(8W-30-11)
C18
C16
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
C20
C17
K74
18
BR/VT
A242
18
VT/OR
A
TO C107
(8W-30-10)
(8W-30-11)
9
C3
8
C3
OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
OXYGEN SENSOR UPSTREAM RELAY CONTROL
POWERTRAIN CONTROL MODULE
▲ LHD
▲▲ RHD

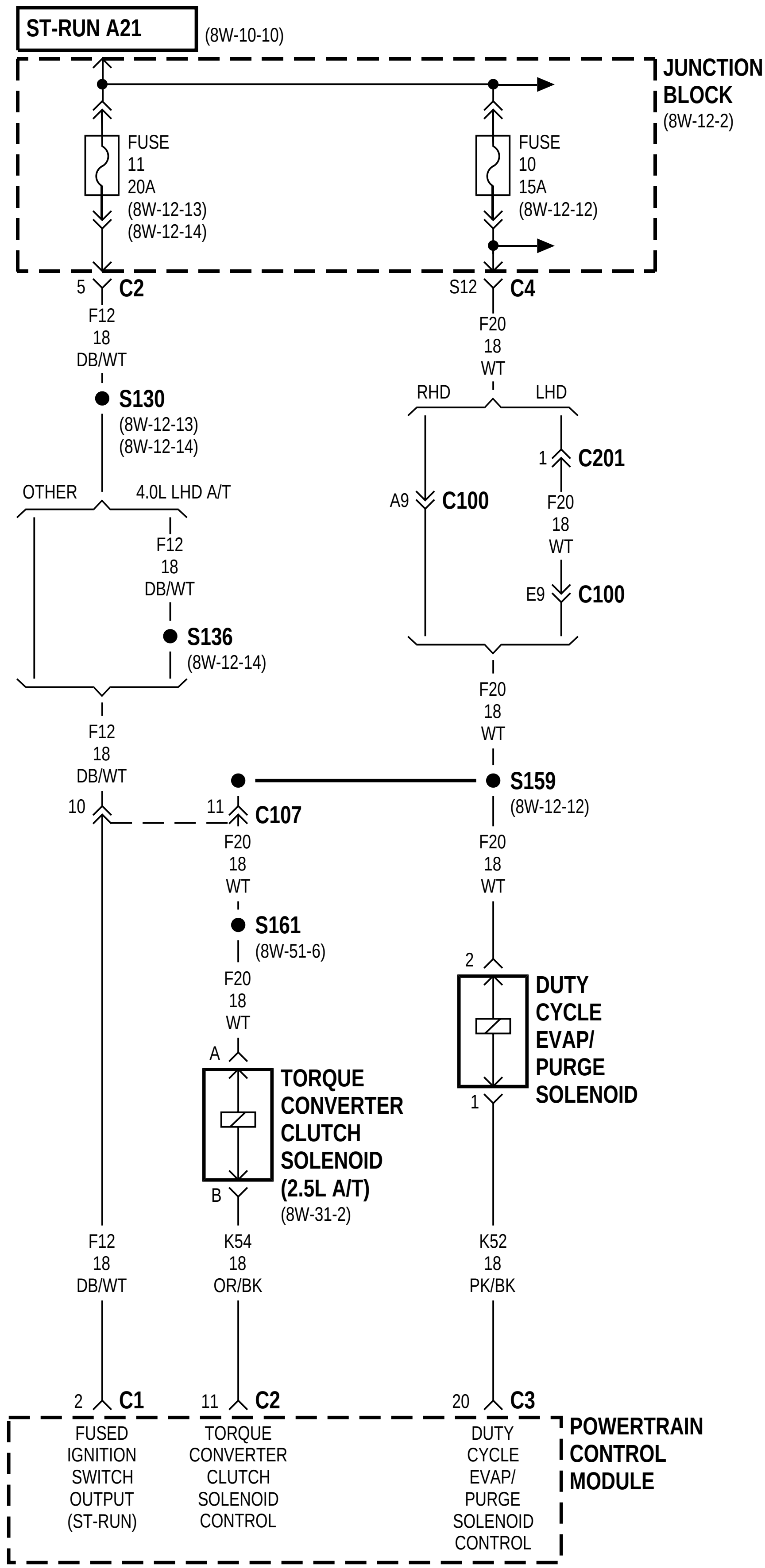

FROM
OXYGEN SENSOR UPSTREAM RELAY
(8W-30-9)
B
TO
OXYGEN SENSOR DOWNSTREAM RELAY
(8W-30-9)
A
A42 18 DG
A242 18 VT/OR
7
13
C107
CALIFORNIA
OTHER
OTHER
CALIFORNIA
4WD
2WD
A42 20 DG
S121
(8W-30-11)
A42 20 DG
A42 20 DG
A242 20 VT/OR
A242 20 VT/OR
A242 20 DG/OR
S122
(8W-30-11)
A242 20 VT/OR
4
1
1
4
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
3
2
2
3
K167 20 BR/YL
Z1 20 BK
Z1 20 BK
K167 20 BR/YL
S107
(8W-15-2)
CALIFORNIA
OTHER
S114
(8W-70-3)
Z1 16 BK
G101
(8W-15-2)
K167 20 BR/YL
S111 ■■
(8W-70-3)
S123 ■
(8W-70-2)
K41 18 BK/DG
K167 18 BR/YL
K141 18 TN/WT
24 C1
4 C1
25 C1
OXYGEN SENSOR 1/1 SIGNAL
SENSOR GROUND
OXYGEN SENSOR 1/2 SIGNAL
POWERTRAIN CONTROL MODULE
■ CALIFORNIA
■■ EXCEPT CALIFORNIA

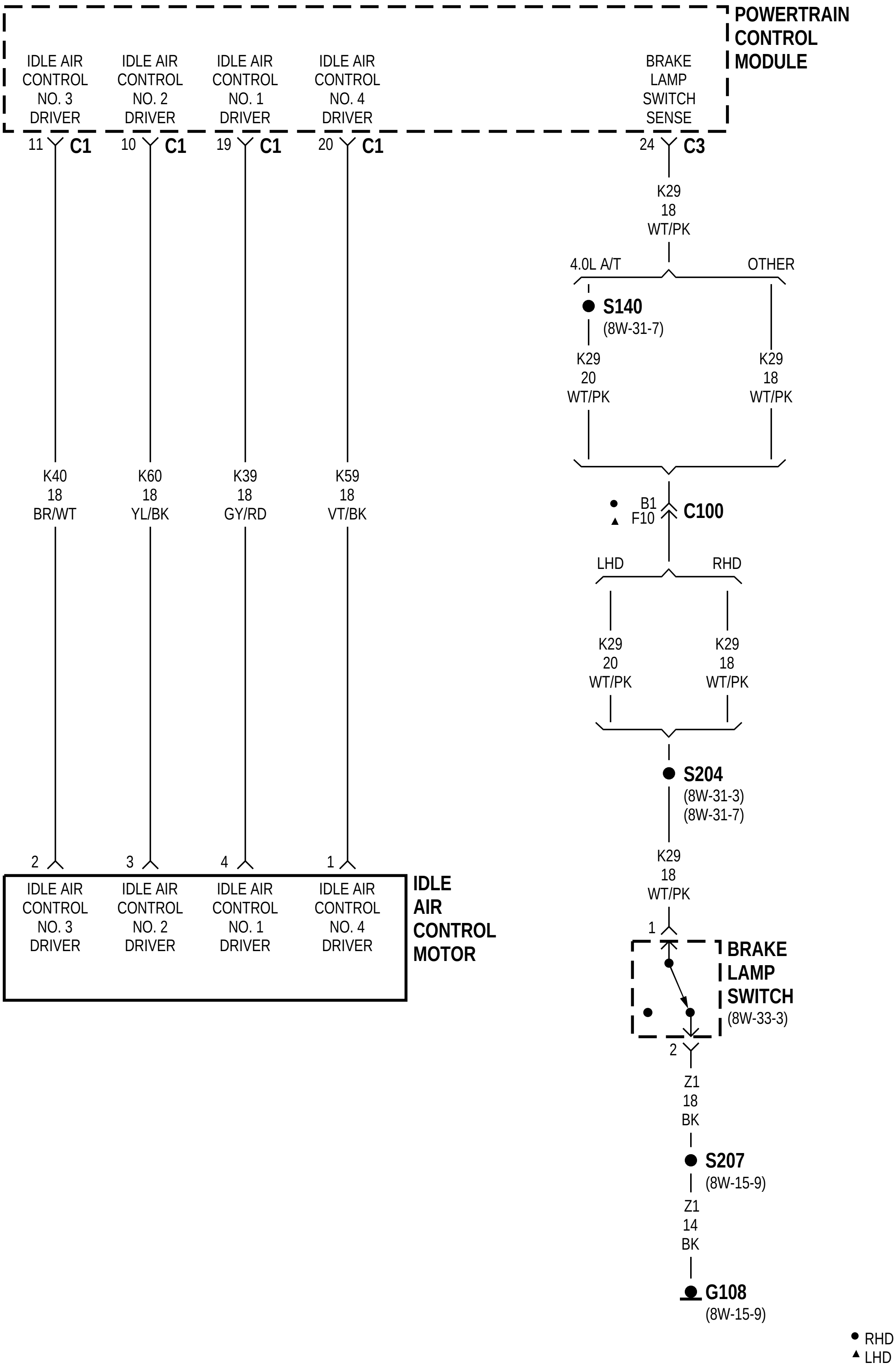

FROM
OXYGEN SENSOR UPSTREAM RELAY
(8W-30-9)
B
FROM
OXYGEN SENSOR DOWNSTREAM RELAY
(8W-30-9)
A
A42
18
DG
A242
18
VT/OR
7
13
C107
4WD
2WD
A42
20
DG
A242
20
VT/OR
A242
20
DG/OR
S121
S122
A42
20
DG
A42
20
DG
A242
20
VT/OR
A242
20
VT/OR
1
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-10)
1
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-10)
4
1
OXYGEN SENSOR 2/1 UPSTREAM
1
4
OXYGEN SENSOR 2/2 DOWNSTREAM
3
2
2
3
K167
20
BR/YL
Z1
20
BK
Z1
20
BK
K167
20
BR/YL
S107
(8W-15-2)
Z1
16
BK
G101
(8W-15-2)
S123
(8W-70-2)
K241
18
LG/RD
K167
18
BR/YL
K341
18
TN
26
C1
4
C1
29
C1
OXYGEN SENSOR 2/1 SIGNAL
SENSOR GROUND
OXYGEN SENSOR 2/2 SIGNAL
POWERTRAIN CONTROL MODULE

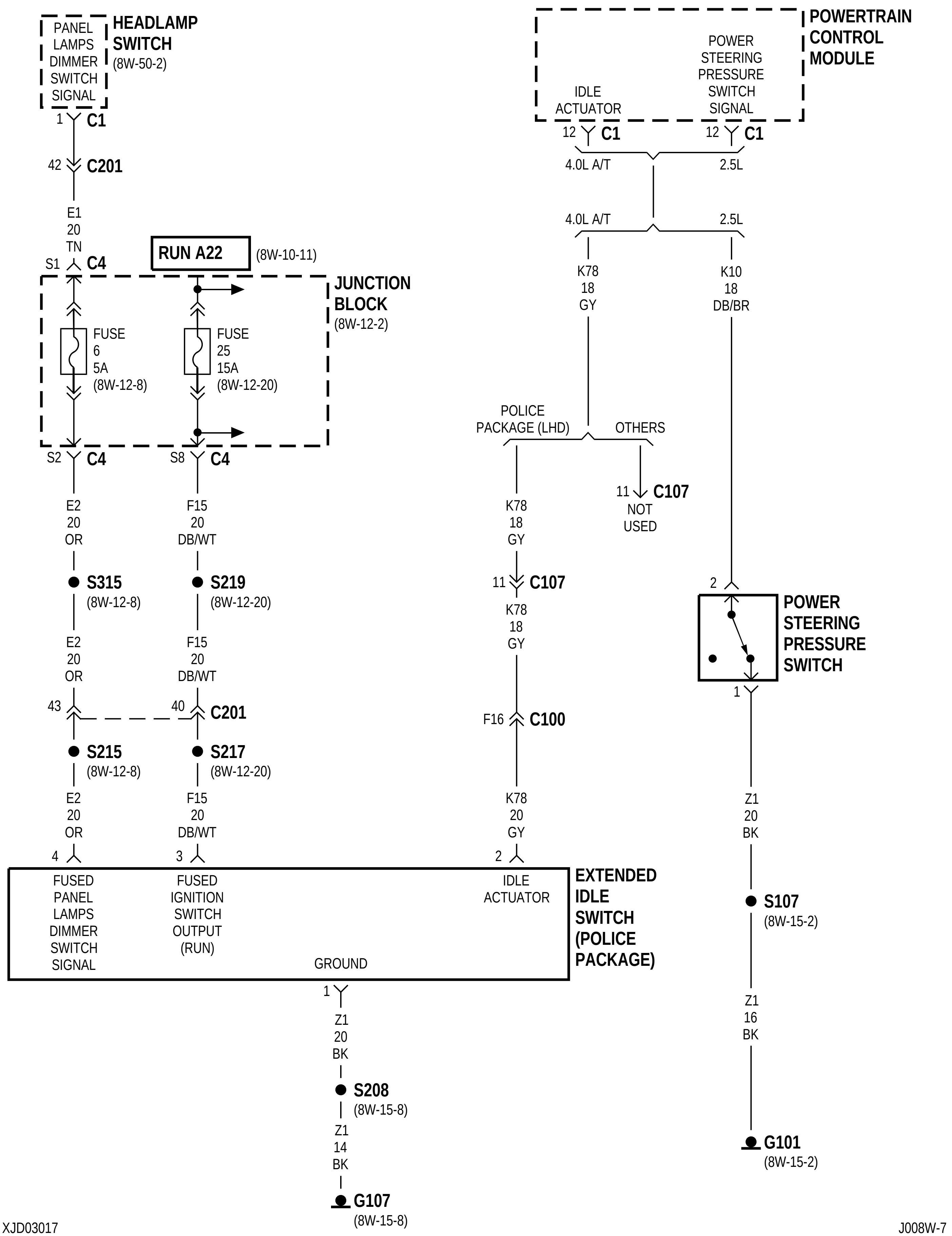

MANIFOLD ABSOLUTE PRESSURE SENSOR
K7 20 OR
K167 20 BR/YL
S114
(8W-70-3)
S115
(8W-70-2)
4.0L CALIFORNIA
OTHER
S111
(8W-70-3)
K167 18 BR/YL
S123
(8W-70-2)
VEHICLE SPEED SENSOR
SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL
5V SUPPLY
ENGINE OIL PRESSURE SENSOR
ENGINE OIL PRESSURE SENSOR SIGNAL
G7 18 WT/OR
S108
K6 18 VT/OR
G7 20 WT/OR
DRL
C107
NOT USED
S119
K7 18 OR
K1 18 DG/RD
G60 18 GY/YL
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
C1
C2
MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
POWERTRAIN CONTROL MODULE

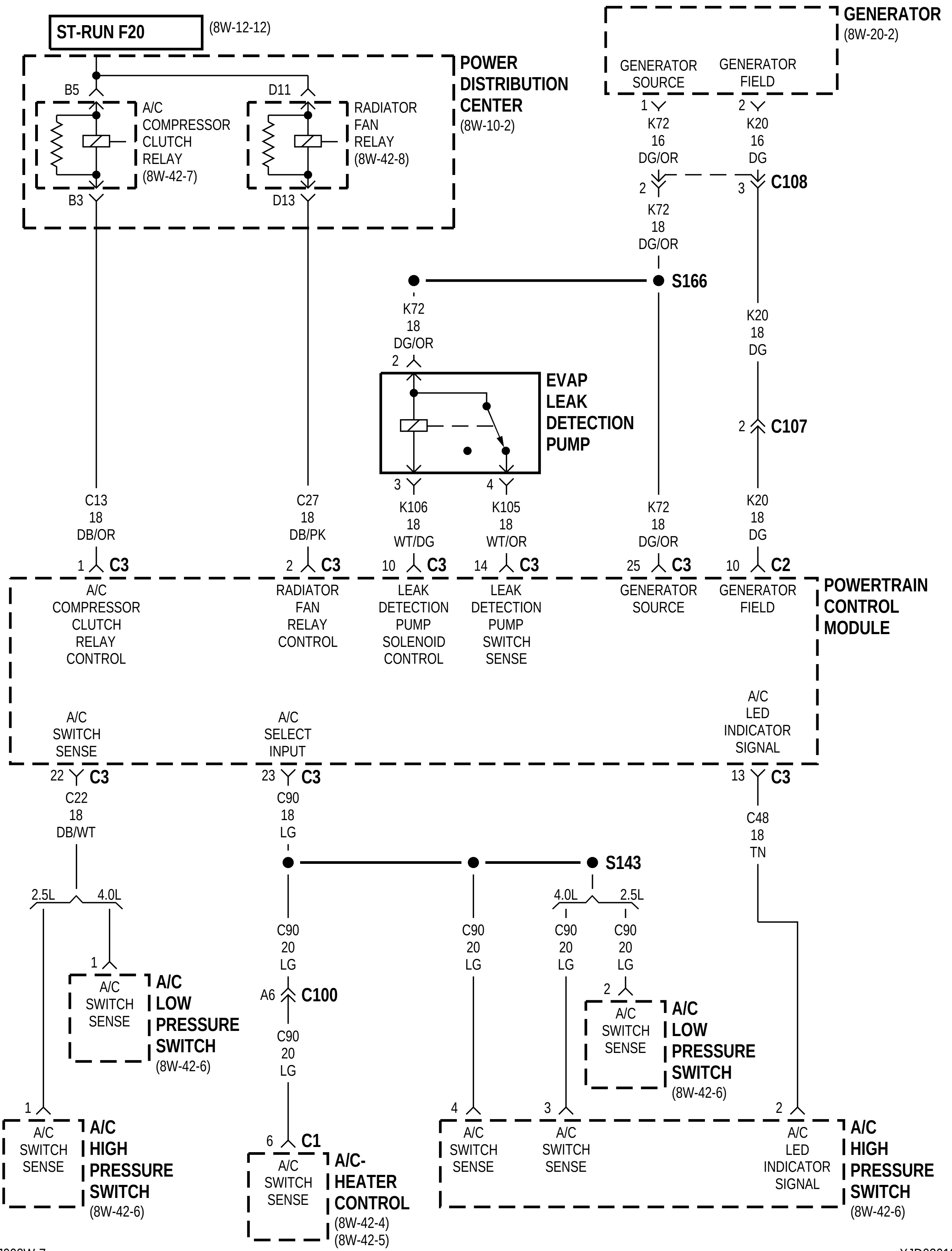

LEFT SPEED CONTROL SWITCH
1 SET
2 ON/OFF
(8W-33-2)
RIGHT SPEED CONTROL SWITCH
1 RESUME/ACCEL
2 CANCEL
3 COAST
(8W-33-2)
V37 20 RD/LG
K167 20 BR/YL
S221
S222
C2
CLOCKSPRING
C1
K4 20 BK/RD
B5
F17
B6
F18
C100
S138
(8W-70-3)
C107
S111
(8W-70-3)
4.0L CALIFORNIA
OTHER
K167 18 BR/YL
S123
(8W-70-2)
BATTERY TEMPERATURE SENSOR
V37 18 RD/LG
K118 18 PK/YL
C3
SPEED CONTROL SWITCH SIGNAL
BATTERY TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
POWERTRAIN CONTROL MODULE
RHD
LHD


ST T141
(8W-12-17)
(8W-12-18)
ST F45
(8W-12-17)
(8W-12-18)
POWER DISTRIBUTION CENTER
(8W-10-2)
OTHER
4.0L A/T
C8
ENGINE STARTER MOTOR RELAY
(8W-21-2)
(8W-21-3)
(8W-21-4)
(8W-21-5)
C10
RHD
LHD
V32 20 YL/RD
V32 18 YL/RD
3
BRAKE LAMP SWITCH
(8W-33-3)
4
S132
(8W-15-4)
Z1 16 BK
Z1 18 BK
T41 20 BK/WT
T41 20 BK/WT
7
TRANSMISSION RANGE SENSOR (4.0L A/T)
(8W-31-6)
P/N
8
5 C107
5 C107
4.0L M/T
OTHER
V30 20 DB/RD
Z1 18 BK
S141
(8W-15-4)
(8W-15-5)
Z1 16 BK
F9
F7 C100
G106
(8W-15-6)
G106
(8W-15-6)
V30 20 DB/RD
4.0L
2.5L A/T
2.5L M/T
S120
(8W-21-2)
3
VEHICLE SPEED CONTROL SERVO
(8W-33-3)
T41 18 BK/WT
T41 18 BK/WT
T41 18 BK/WT
Z1 20 BK
1
2
S107
(8W-15-2)
2
PARK/ NEUTRAL POSITION SWITCH
(8W-31-2)
P/N
V32 18 YL/RD
V36 18 TN/RD
V35 18 LG/RD
Z1 18 BK
OTHER
2.5L M/T
11 C3
4 C3
5 C3
6 C1
SPEED CONTROL POWER SUPPLY
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL VENT SOLENOID CONTROL
A/T
M/T
PARK/NEUTRAL POSITION SWITCH SENSE
GROUND
POWERTRAIN CONTROL MODULE
Z1 16 BK
G101
(8W-15-2)


ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
20A
(8W-12-13)
(8W-12-14)
FUSE
10
15A
(8W-12-12)
5
C2
S12
C4
F12
18
DB/WT
F20
18
WT
S130
(8W-12-13)
(8W-12-14)
RHD
LHD
1
C201
A9
C100
F20
18
WT
E9
C100
OTHER
4.0L LHD A/T
F12
18
DB/WT
S136
(8W-12-14)
F12
18
DB/WT
F20
18
WT
S159
(8W-12-12)
10
11
C107
F20
18
WT
F20
18
WT
S161
(8W-51-6)
F20
18
WT
2
DUTY CYCLE EVAP/ PURGE SOLENOID
1
A
TORQUE CONVERTER CLUTCH SOLENOID (2.5L A/T)
B
(8W-31-2)
F12
18
DB/WT
K54
18
OR/BK
K52
18
PK/BK
2
C1
11
C2
20
C3
POWERTRAIN CONTROL MODULE
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
TORQUE CONVERTER CLUTCH SOLENOID CONTROL
DUTY CYCLE EVAP/ PURGE SOLENOID CONTROL


POWERTRAIN CONTROL MODULE
IDLE AIR CONTROL NO. 3 DRIVER
IDLE AIR CONTROL NO. 2 DRIVER
IDLE AIR CONTROL NO. 1 DRIVER
IDLE AIR CONTROL NO. 4 DRIVER
BRAKE LAMP SWITCH SENSE
11 C1
10 C1
19 C1
20 C1
24 C3
K29 18 WT/PK
4.0L A/T
OTHER
S140 (8W-31-7)
K29 20 WT/PK
K29 18 WT/PK
K40 18 BR/WT
K60 18 YL/BK
K39 18 GY/RD
K59 18 VT/BK
B1
F10
C100
LHD
RHD
K29 20 WT/PK
K29 18 WT/PK
S204 (8W-31-3) (8W-31-7)
K29 18 WT/PK
2
3
4
1
IDLE AIR CONTROL NO. 3 DRIVER
IDLE AIR CONTROL NO. 2 DRIVER
IDLE AIR CONTROL NO. 1 DRIVER
IDLE AIR CONTROL NO. 4 DRIVER
IDLE AIR CONTROL MOTOR
1
BRAKE LAMP SWITCH (8W-33-3)
2
Z1 18 BK
S207 (8W-15-9)
Z1 14 BK
G108 (8W-15-9)
● RHD
▲ LHD


HEADLAMP SWITCH
(8W-50-2)
PANEL LAMPS DIMMER SWITCH SIGNAL
1 C1
42 C201
E1 20 TN
S1 C4
RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 6 5A (8W-12-8)
FUSE 25 15A (8W-12-20)
S2 C4
S8 C4
E2 20 OR
F15 20 DB/WT
S315
(8W-12-8)
S219
(8W-12-20)
E2 20 OR
F15 20 DB/WT
43
40 C201
S215
(8W-12-8)
S217
(8W-12-20)
E2 20 OR
F15 20 DB/WT
4
3
2
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
FUSED IGNITION SWITCH OUTPUT (RUN)
IDLE ACTUATOR
GROUND
EXTENDED IDLE SWITCH (POLICE PACKAGE)
1
Z1 20 BK
S208
(8W-15-8)
Z1 14 BK
G107
(8W-15-8)
POWERTRAIN CONTROL MODULE
IDLE ACTUATOR
POWER STEERING PRESSURE SWITCH SIGNAL
12 C1
12 C1
4.0L A/T
2.5L
4.0L A/T
2.5L
K78 18 GY
K10 18 DB/BR
POLICE PACKAGE (LHD)
OTHERS
11 C107
NOT USED
K78 18 GY
11 C107
K78 18 GY
F16 C100
K78 20 GY
2
POWER STEERING PRESSURE SWITCH
1
Z1 20 BK
S107
(8W-15-2)
Z1 16 BK
G101
(8W-15-2)



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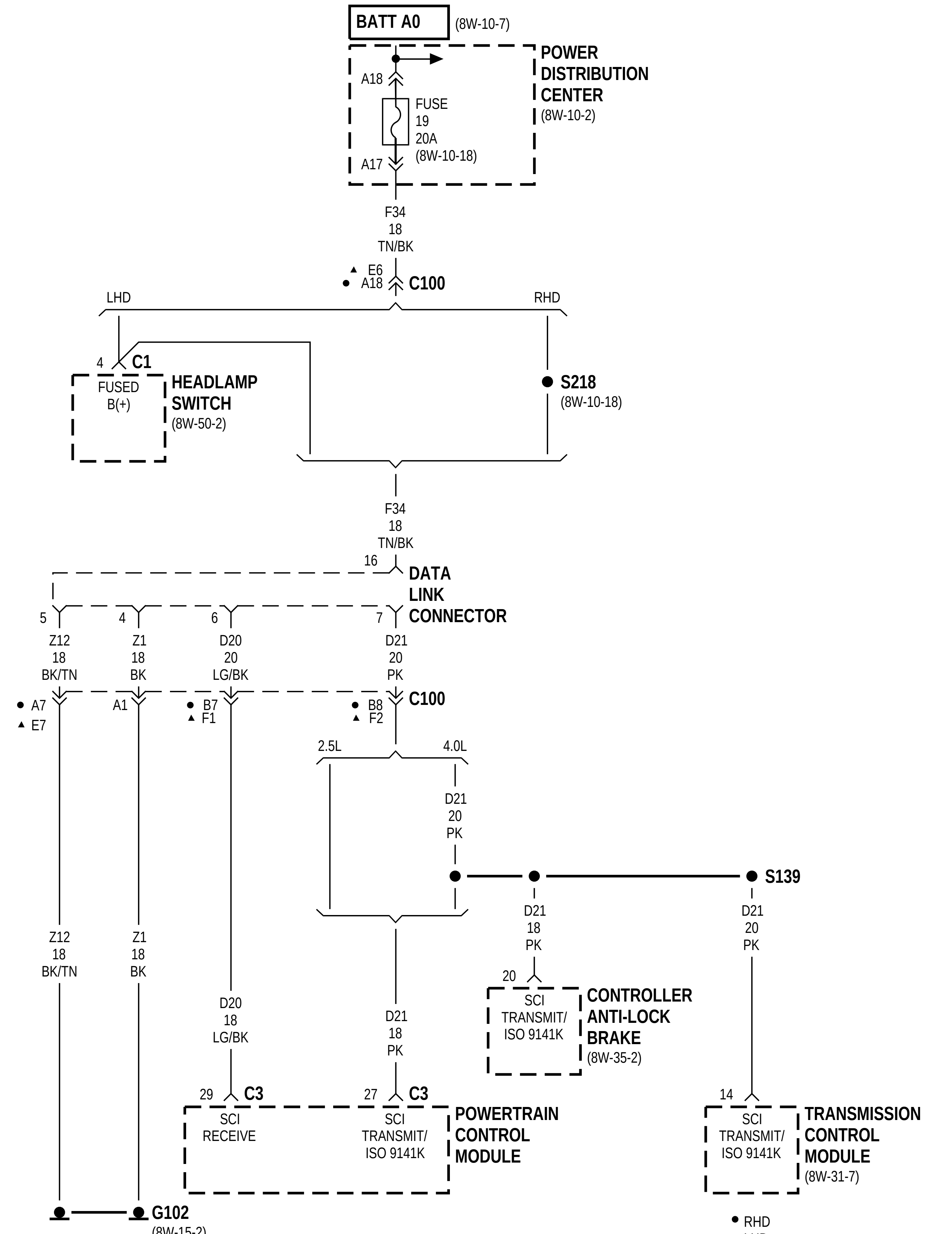
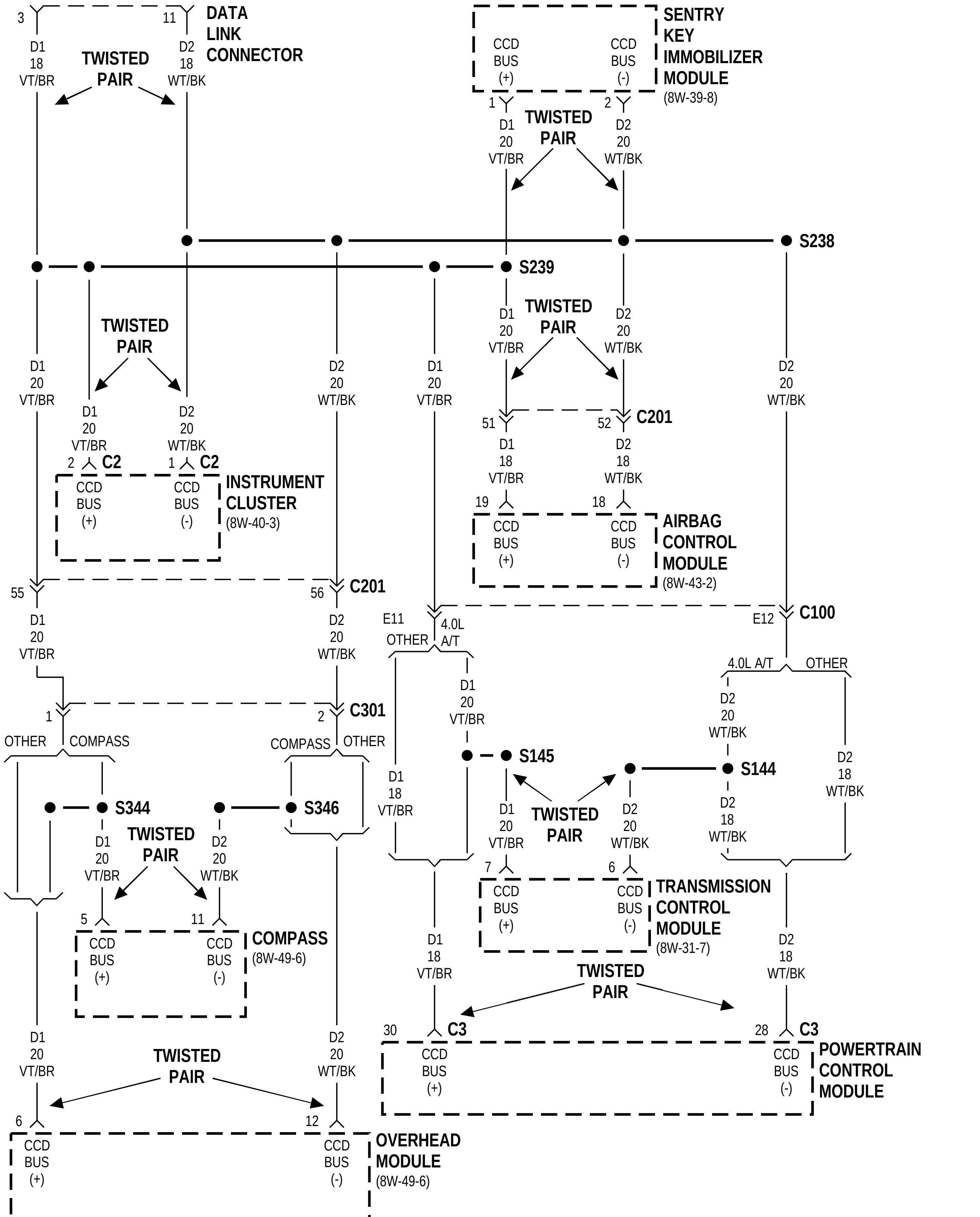
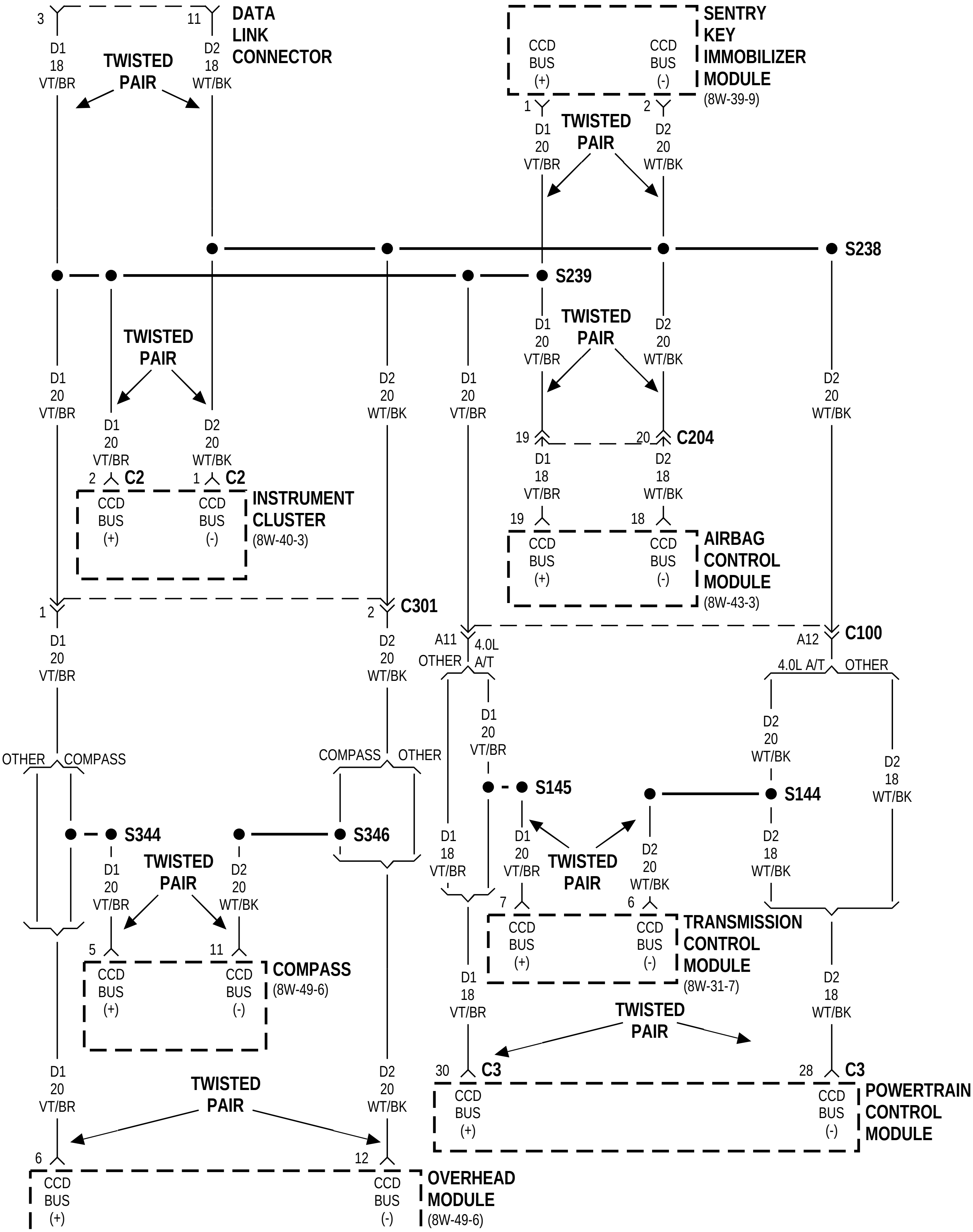

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A18
FUSE
19
20A
(8W-10-18)
A17
F34
18
TN/BK
E6
A18
C100
LHD
RHD
4
C1
FUSED
B(+)
HEADLAMP SWITCH
(8W-50-2)
S218
(8W-10-18)
F34
18
TN/BK
16
DATA LINK CONNECTOR
5
4
6
7
Z12
18
BK/TN
Z1
18
BK
D20
20
LG/BK
D21
20
PK
C100
A7
E7
A1
B7
F1
B8
F2
2.5L
4.0L
D21
20
PK
S139
D21
18
PK
D21
20
PK
Z12
18
BK/TN
Z1
18
BK
D20
18
LG/BK
D21
18
PK
20
SCI
TRANSMIT/
ISO 9141K
CONTROLLER ANTI-LOCK BRAKE
(8W-35-2)
29
C3
27
C3
SCI
RECEIVE
SCI
TRANSMIT/
ISO 9141K
POWERTRAIN CONTROL MODULE
14
SCI
TRANSMIT/
ISO 9141K
TRANSMISSION CONTROL MODULE
(8W-31-7)
G102
(8W-15-2)
RHD
LHD

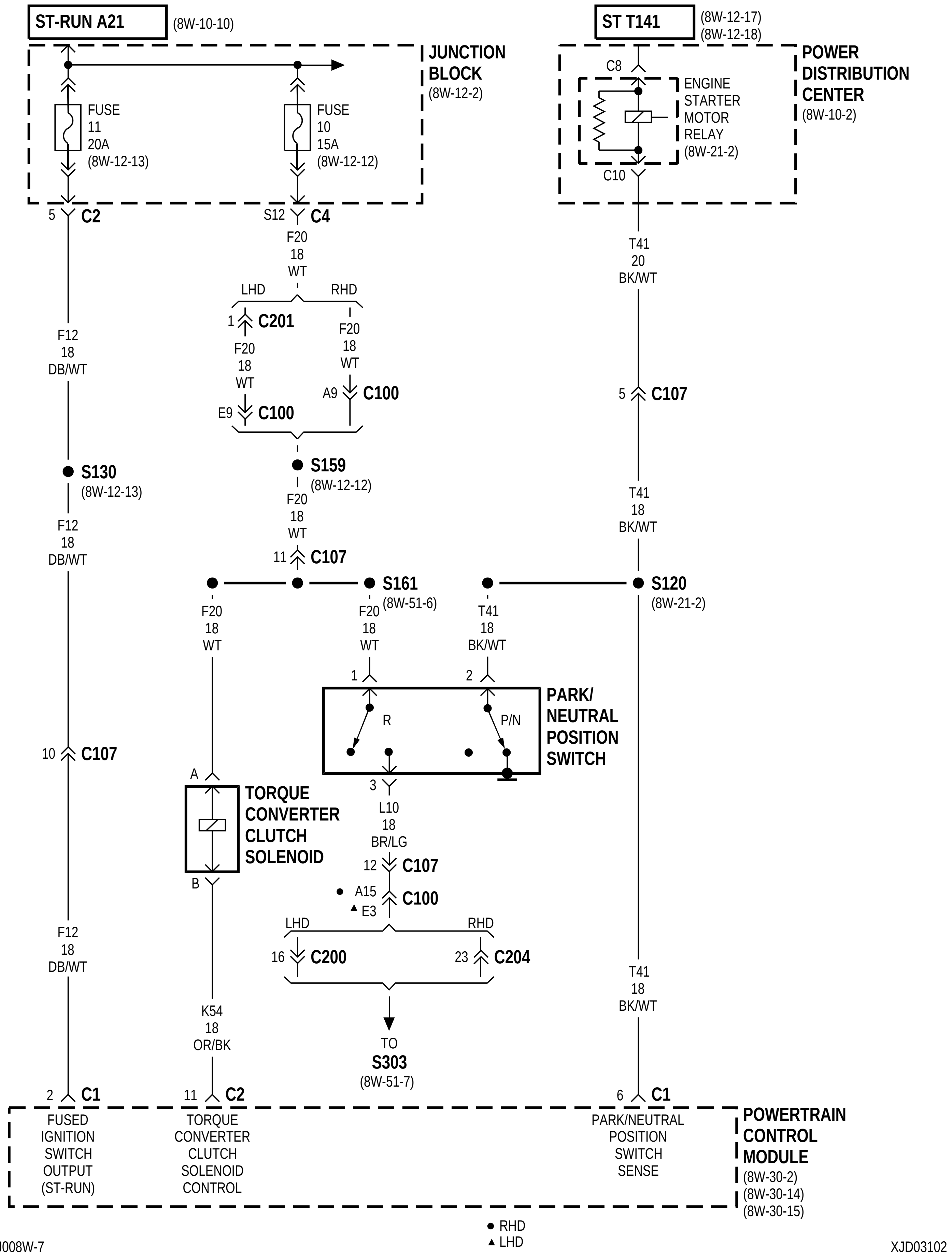
LHD


DATA LINK CONNECTOR
TWISTED PAIR
D1 18 VT/BR
D2 18 WT/BK
SENTRY KEY IMMOBILIZER MODULE
(8W-39-8)
CCD BUS (+)
CCD BUS (-)
D1 20 VT/BR
D2 20 WT/BK
S238
S239
INSTRUMENT CLUSTER
(8W-40-3)
C2
C201
AIRBAG CONTROL MODULE
(8W-43-2)
C100
4.0L A/T
OTHER
C301
COMPASS
S344
S346
S145
S144
TRANSMISSION CONTROL MODULE
(8W-31-7)
COMPASS
(8W-49-6)
C3
POWERTRAIN CONTROL MODULE
OVERHEAD MODULE
(8W-49-6)

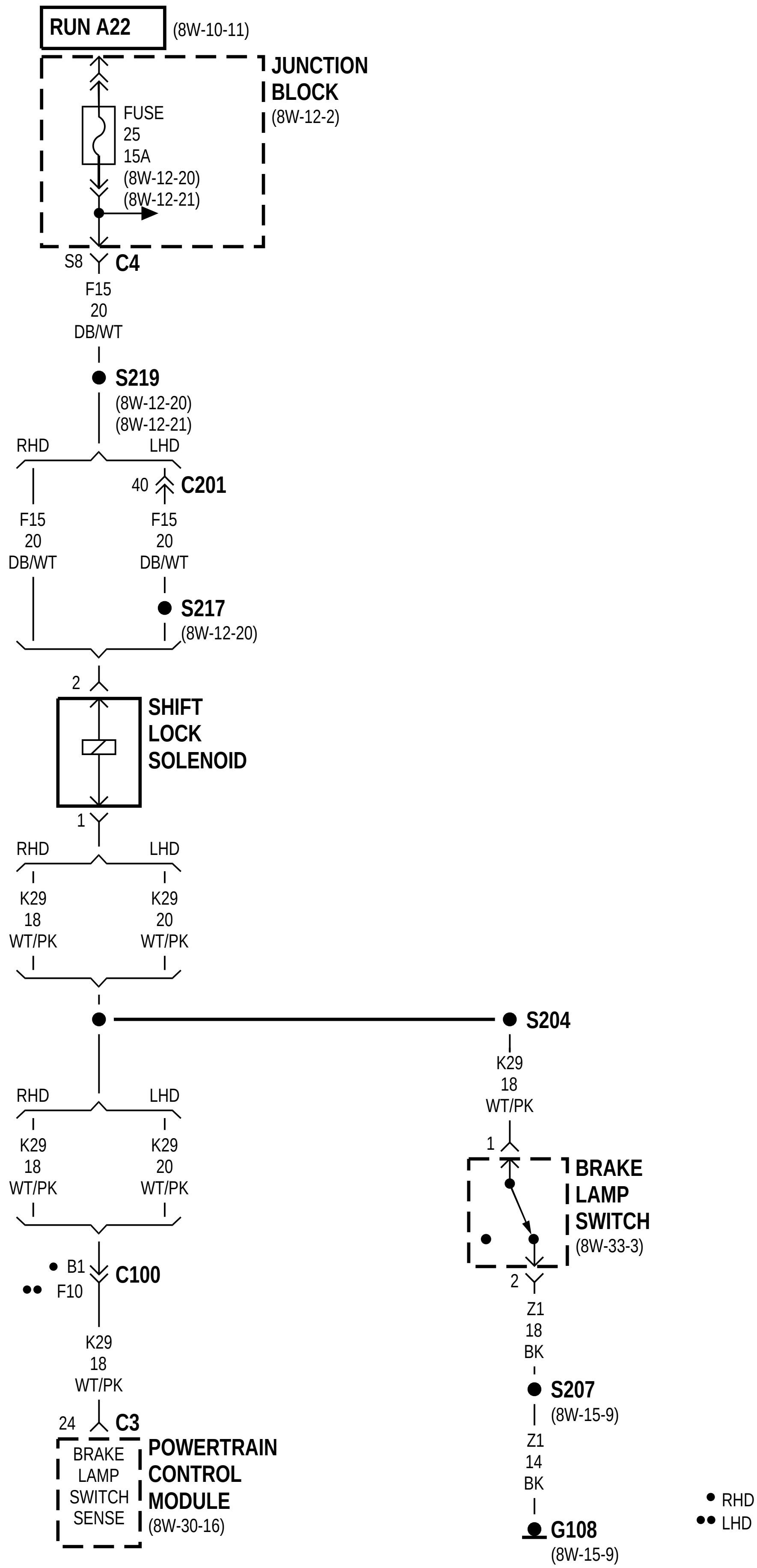

DATA LINK CONNECTOR
3
11
D1 18 VT/BR
D2 18 WT/BK
TWISTED PAIR
SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
CCD BUS (+)
CCD BUS (-)
1
2
D1 20 VT/BR
D2 20 WT/BK
S238
S239
D1 20 VT/BR
D2 20 WT/BK
D1 20 VT/BR
D2 20 WT/BK
C204
19
20
D1 18 VT/BR
D2 18 WT/BK
C2
INSTRUMENT CLUSTER
(8W-40-3)
AIRBAG CONTROL MODULE
(8W-43-3)
C301
C100
A11
A12
4.0L A/T
OTHER
COMPASS
S145
S144
S344
S346
TRANSMISSION CONTROL MODULE
(8W-31-7)
COMPASS
(8W-49-6)
POWERTRAIN CONTROL MODULE
C3
30
28
OVERHEAD MODULE
(8W-49-6)
6
12

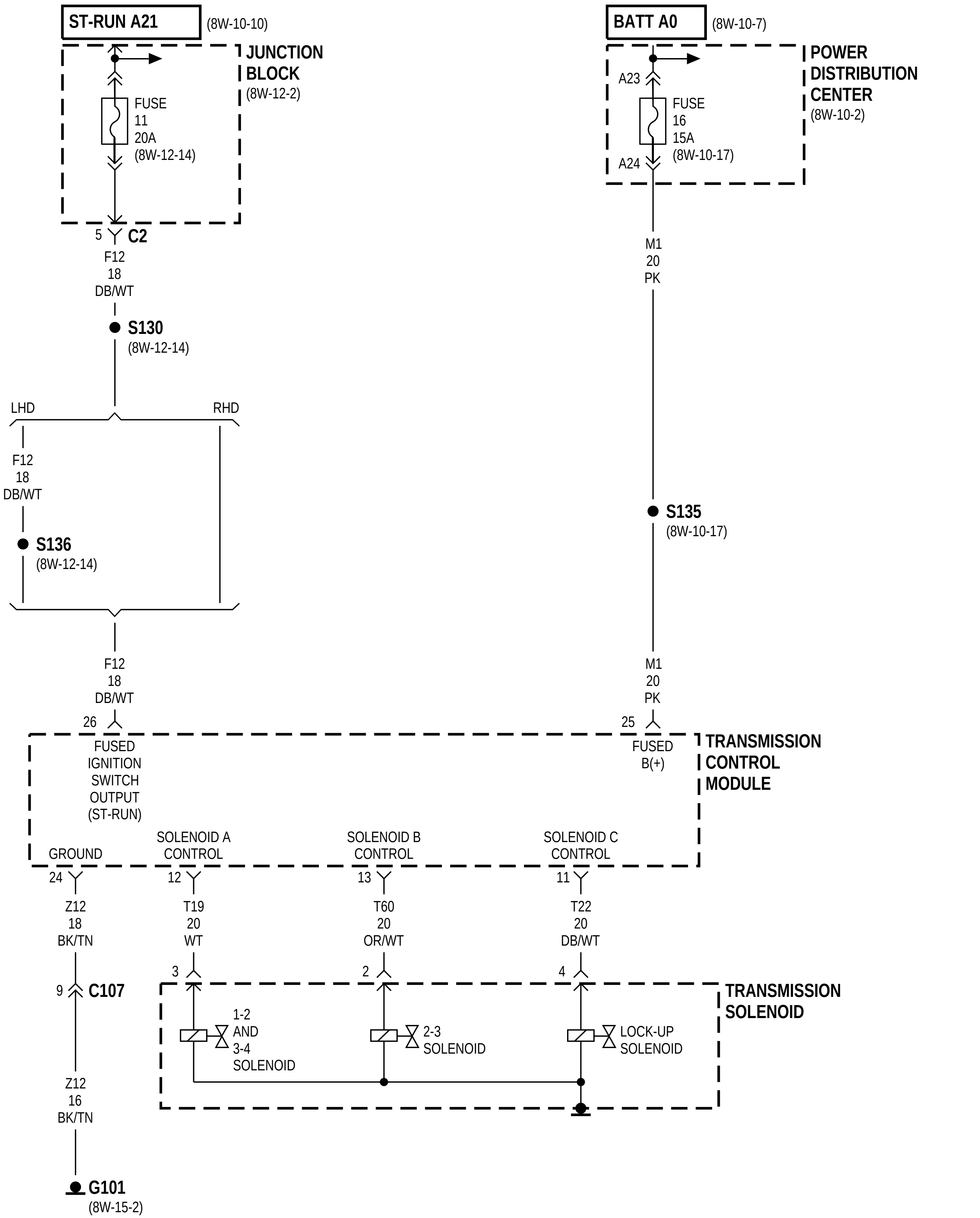
8W-31 TRANSMISSION CONTROL SYSTEM

2.5L

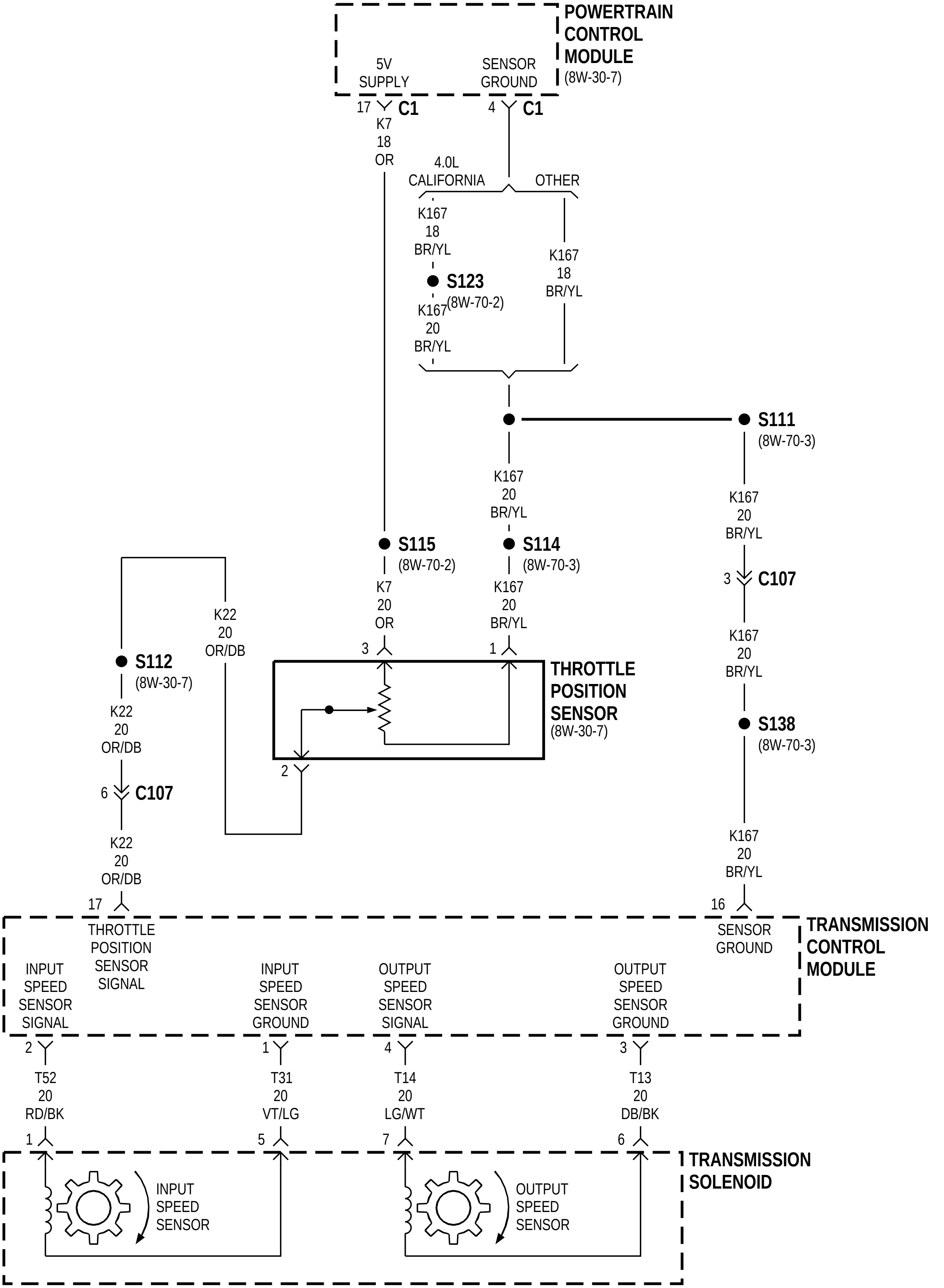

ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 11 20A (8W-12-13)
FUSE 10 15A (8W-12-12)
ST T141
(8W-12-17)
(8W-12-18)
POWER DISTRIBUTION CENTER
(8W-10-2)
C8
ENGINE STARTER MOTOR RELAY
(8W-21-2)
C10
5 C2
S12 C4
F20 18 WT
LHD
RHD
1 C201
A9 C100
E9 C100
S159
(8W-12-12)
F12 18 DB/WT
S130
(8W-12-13)
T41 20 BK/WT
5 C107
T41 18 BK/WT
11 C107
S161
(8W-51-6)
S120
(8W-21-2)
1
2
R
P/N
PARK/ NEUTRAL POSITION SWITCH
10 C107
A
B
TORQUE CONVERTER CLUTCH SOLENOID
3
L10 18 BR/LG
12 C107
A15
E3
C100
16 C200
23 C204
K54 18 OR/BK
TO S303
(8W-51-7)
2 C1
11 C2
6 C1
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
TORQUE CONVERTER CLUTCH SOLENOID CONTROL
PARK/NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-2)
(8W-30-14)
(8W-30-15)
● RHD
▲ LHD

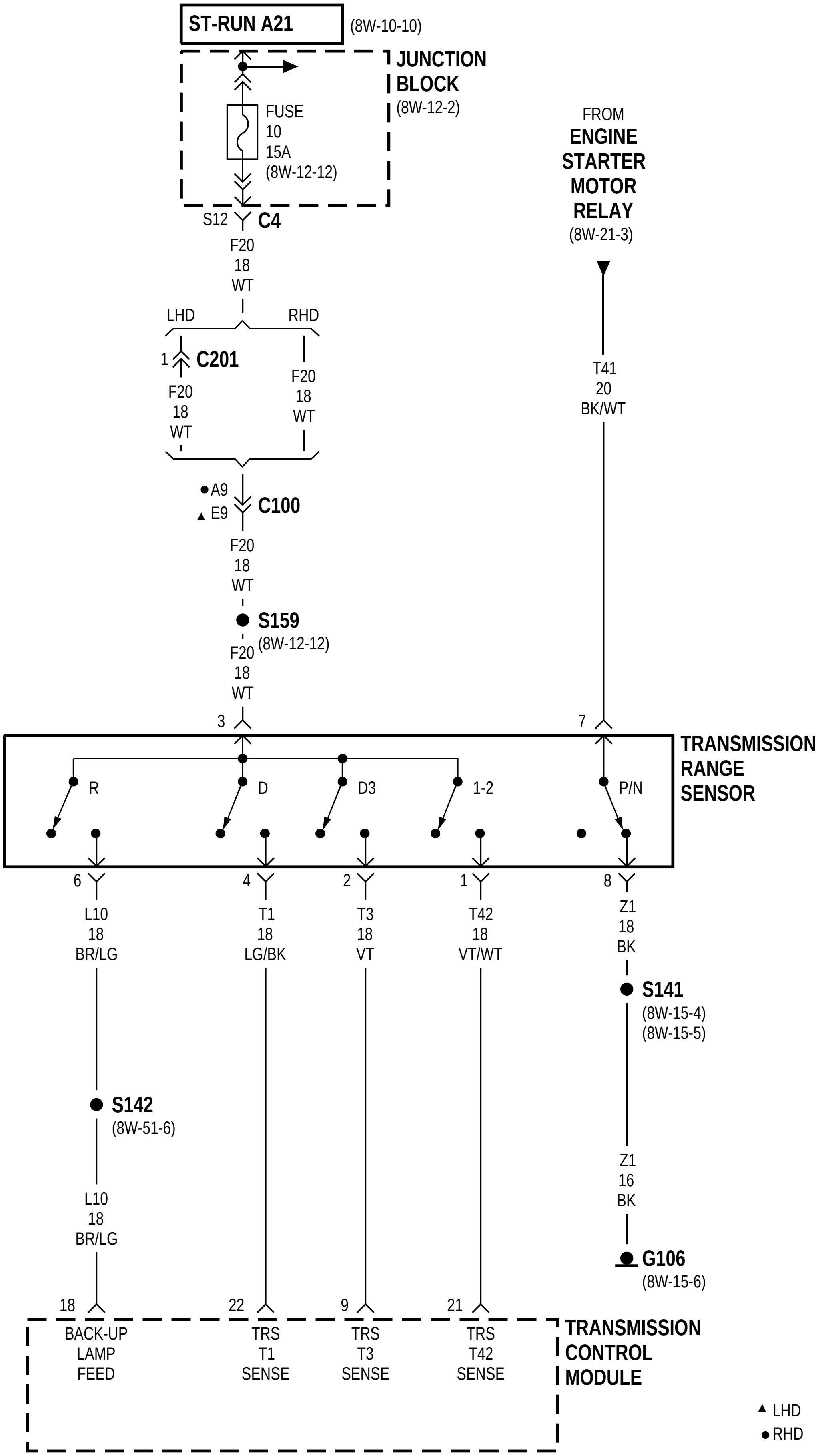
2.5L

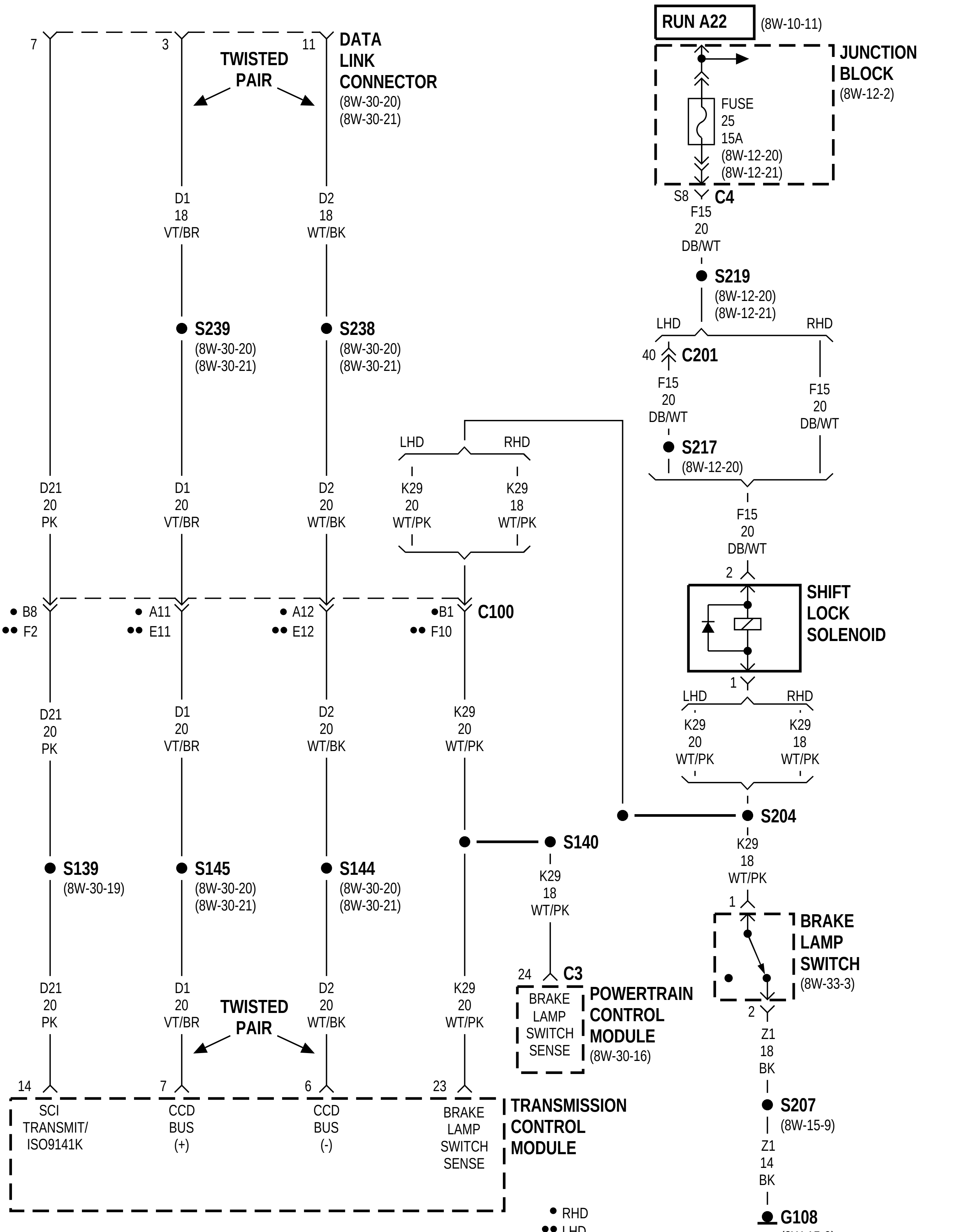

RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
25
15A
(8W-12-20)
(8W-12-21)
S8
C4
F15
20
DB/WT
S219
(8W-12-20)
(8W-12-21)
RHD
LHD
40
C201
F15
20
DB/WT
F15
20
DB/WT
S217
(8W-12-20)
2
SHIFT LOCK SOLENOID
1
RHD
LHD
K29
18
WT/PK
K29
20
WT/PK
S204
K29
18
WT/PK
RHD
LHD
K29
18
WT/PK
K29
20
WT/PK
1
BRAKE LAMP SWITCH
(8W-33-3)
2
• B1
•• F10
C100
Z1
18
BK
K29
18
WT/PK
S207
(8W-15-9)
24
C3
BRAKE LAMP SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-16)
Z1
14
BK
G108
(8W-15-9)
• RHD
•• LHD


ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
11
20A
(8W-12-14)
5
C2
F12
18
DB/WT
S130
(8W-12-14)
LHD
RHD
F12
18
DB/WT
S136
(8W-12-14)
F12
18
DB/WT
26
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
M1
20
PK
25
FUSED B(+)
TRANSMISSION CONTROL MODULE
GROUND
SOLENOID A CONTROL
SOLENOID B CONTROL
SOLENOID C CONTROL
24
12
13
11
Z12
18
BK/TN
T19
20
WT
T60
20
OR/WT
T22
20
DB/WT
9
C107
3
2
4
TRANSMISSION SOLENOID
1-2 AND 3-4 SOLENOID
2-3 SOLENOID
LOCK-UP SOLENOID
Z12
16
BK/TN
G101
(8W-15-2)

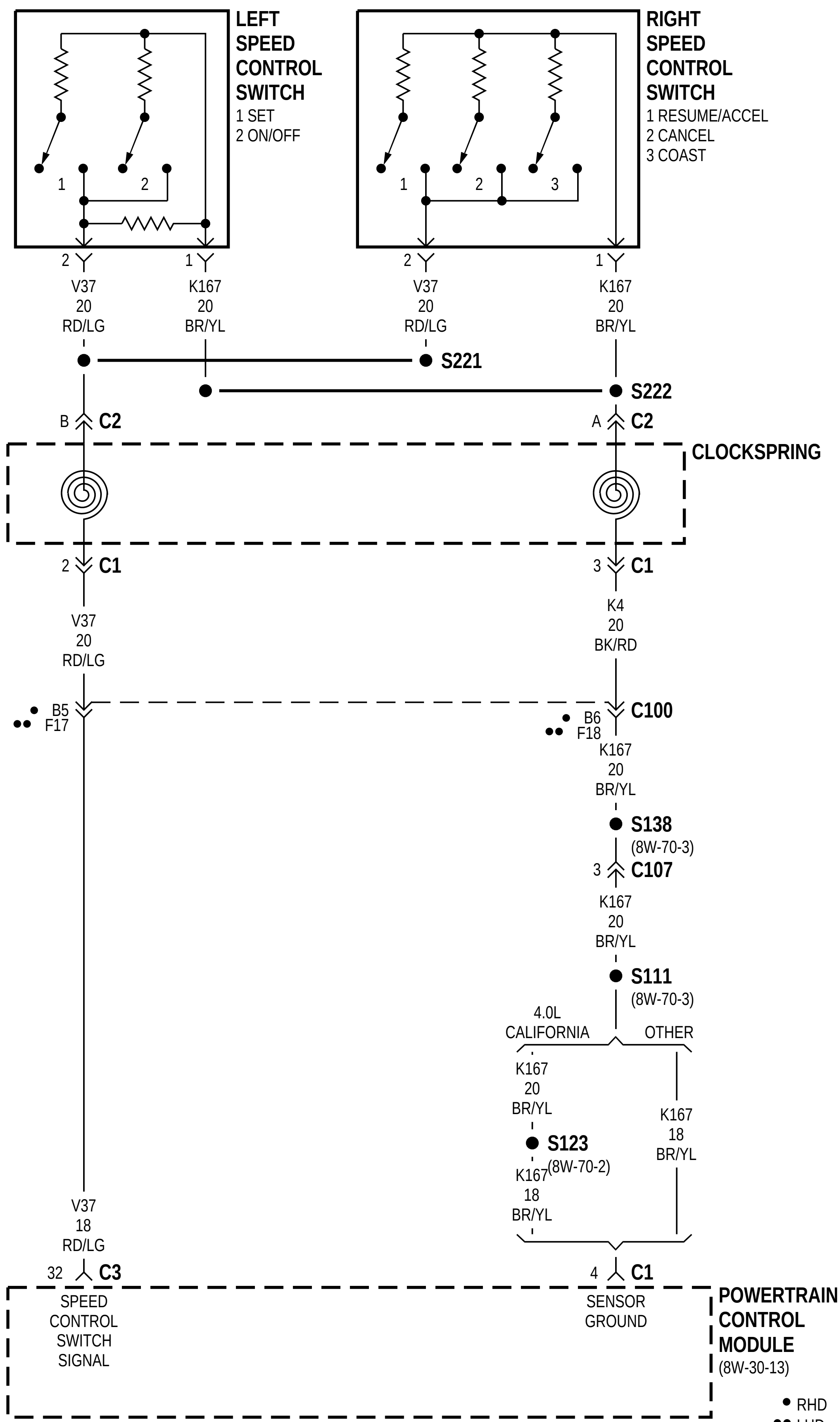
4.0L

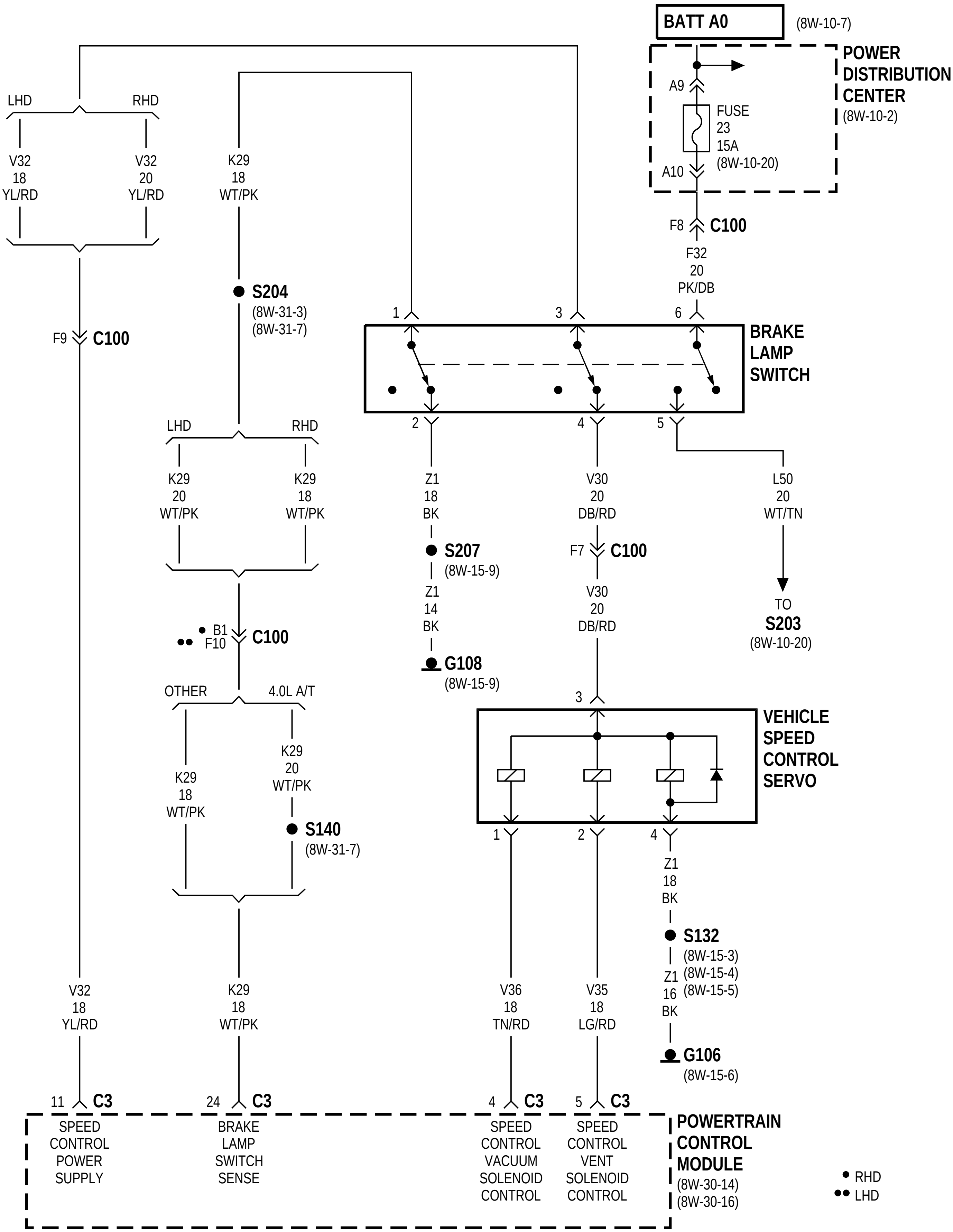

POWERTRAIN
CONTROL
MODULE
(8W-30-7)
5V
SUPPLY
SENSOR
GROUND
17 C1
4 C1
K7
18
OR
4.0L
CALIFORNIA
OTHER
K167
18
BR/YL
S123
(8W-70-2)
K167
20
BR/YL
S111
(8W-70-3)
S115
(8W-70-2)
S114
(8W-70-3)
K7
20
OR
K22
20
OR/DB
S112
(8W-30-7)
THROTTLE
POSITION
SENSOR
(8W-30-7)
3 C107
6 C107
S138
(8W-70-3)
TRANSMISSION
CONTROL
MODULE
THROTTLE
POSITION
SENSOR
SIGNAL
SENSOR
GROUND
INPUT
SPEED
SENSOR
SIGNAL
INPUT
SPEED
SENSOR
GROUND
OUTPUT
SPEED
SENSOR
SIGNAL
OUTPUT
SPEED
SENSOR
GROUND
T52
20
RD/BK
T31
20
VT/LG
T14
20
LG/WT
T13
20
DB/BK
TRANSMISSION
SOLENOID
INPUT
SPEED
SENSOR
OUTPUT
SPEED
SENSOR


ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 10 15A (8W-12-12)
S12 C4
F20 18 WT
LHD
RHD
1 C201
F20 18 WT
F20 18 WT
A9
E9 C100
F20 18 WT
S159
(8W-12-12)
F20 18 WT
FROM ENGINE STARTER MOTOR RELAY
(8W-21-3)
T41 20 BK/WT
3
7
TRANSMISSION RANGE SENSOR
R
D
D3
1-2
P/N
6
4
2
1
8
L10 18 BR/LG
T1 18 LG/BK
T3 18 VT
T42 18 VT/WT
Z1 18 BK
S141
(8W-15-4)
(8W-15-5)
S142
(8W-51-6)
L10 18 BR/LG
Z1 16 BK
G106
(8W-15-6)
18
22
9
21
BACK-UP LAMP FEED
TRS T1 SENSE
TRS T3 SENSE
TRS T42 SENSE
TRANSMISSION CONTROL MODULE
▲ LHD
● RHD

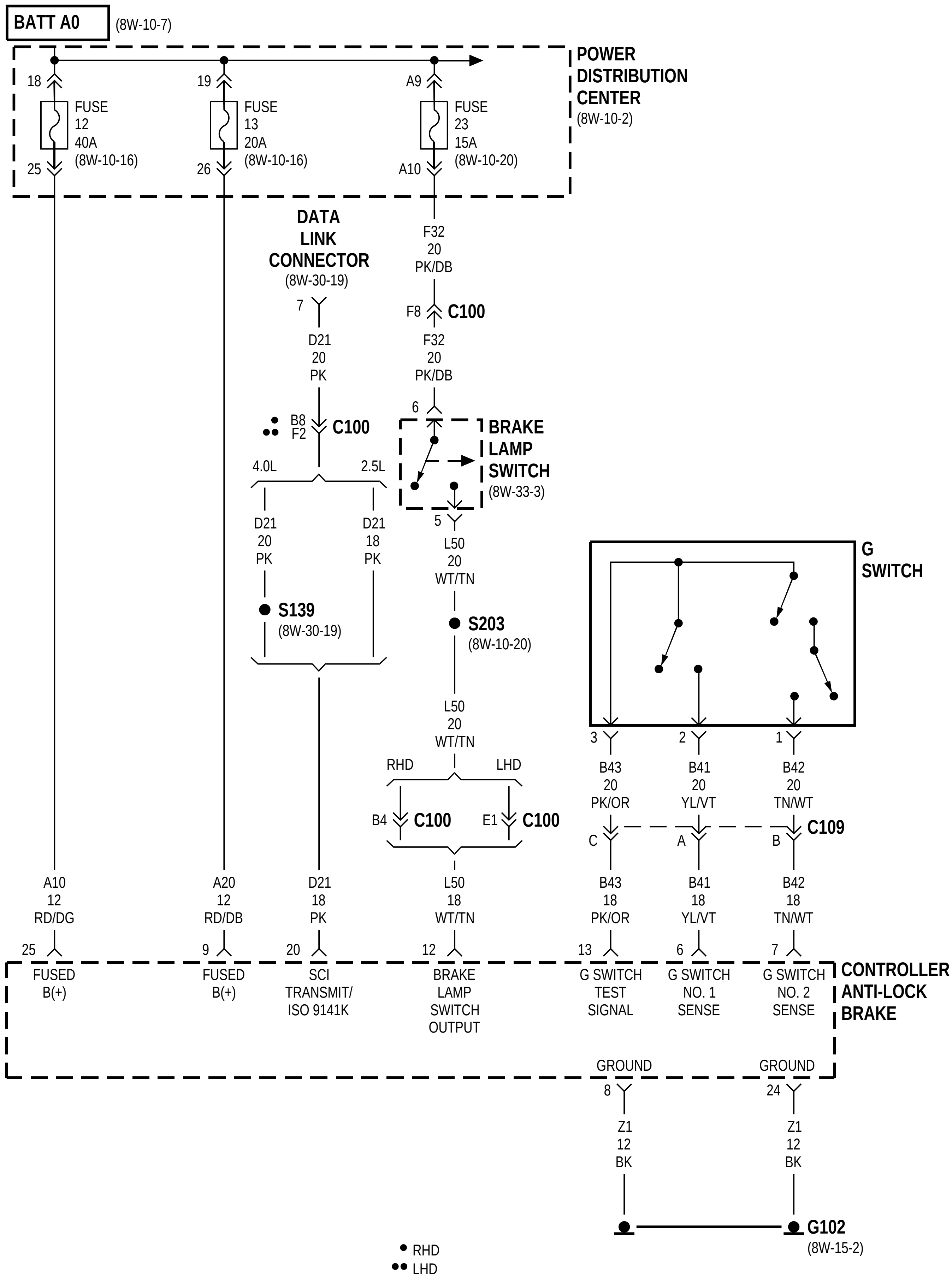

RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
25
15A
(8W-12-20)
(8W-12-21)
S8
C4
F15 20 DB/WT
S219
(8W-12-20)
(8W-12-21)
LHD
RHD
40
C201
F15 20 DB/WT
S217
(8W-12-20)
F15 20 DB/WT
2
SHIFT LOCK SOLENOID
1
K29 20 WT/PK
K29 18 WT/PK
S204
K29 18 WT/PK
1
BRAKE LAMP SWITCH
(8W-33-3)
2
Z1 18 BK
S207
(8W-15-9)
Z1 14 BK
G108
(8W-15-9)
7
3
11
DATA LINK CONNECTOR
(8W-30-20)
(8W-30-21)
TWISTED PAIR
D1 18 VT/BR
D2 18 WT/BK
S239
(8W-30-20)
(8W-30-21)
S238
(8W-30-20)
(8W-30-21)
D21 20 PK
D1 20 VT/BR
D2 20 WT/BK
K29 20 WT/PK
K29 18 WT/PK
B8
F2
A11
E11
A12
E12
B1
F10
C100
S140
S139
(8W-30-19)
S145
(8W-30-20)
(8W-30-21)
S144
(8W-30-20)
(8W-30-21)
24
C3
BRAKE LAMP SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-16)
14
7
6
23
SCI TRANSMIT/ ISO9141K
CCD BUS (+)
CCD BUS (-)
BRAKE LAMP SWITCH SENSE
TRANSMISSION CONTROL MODULE
• RHD
•• LHD

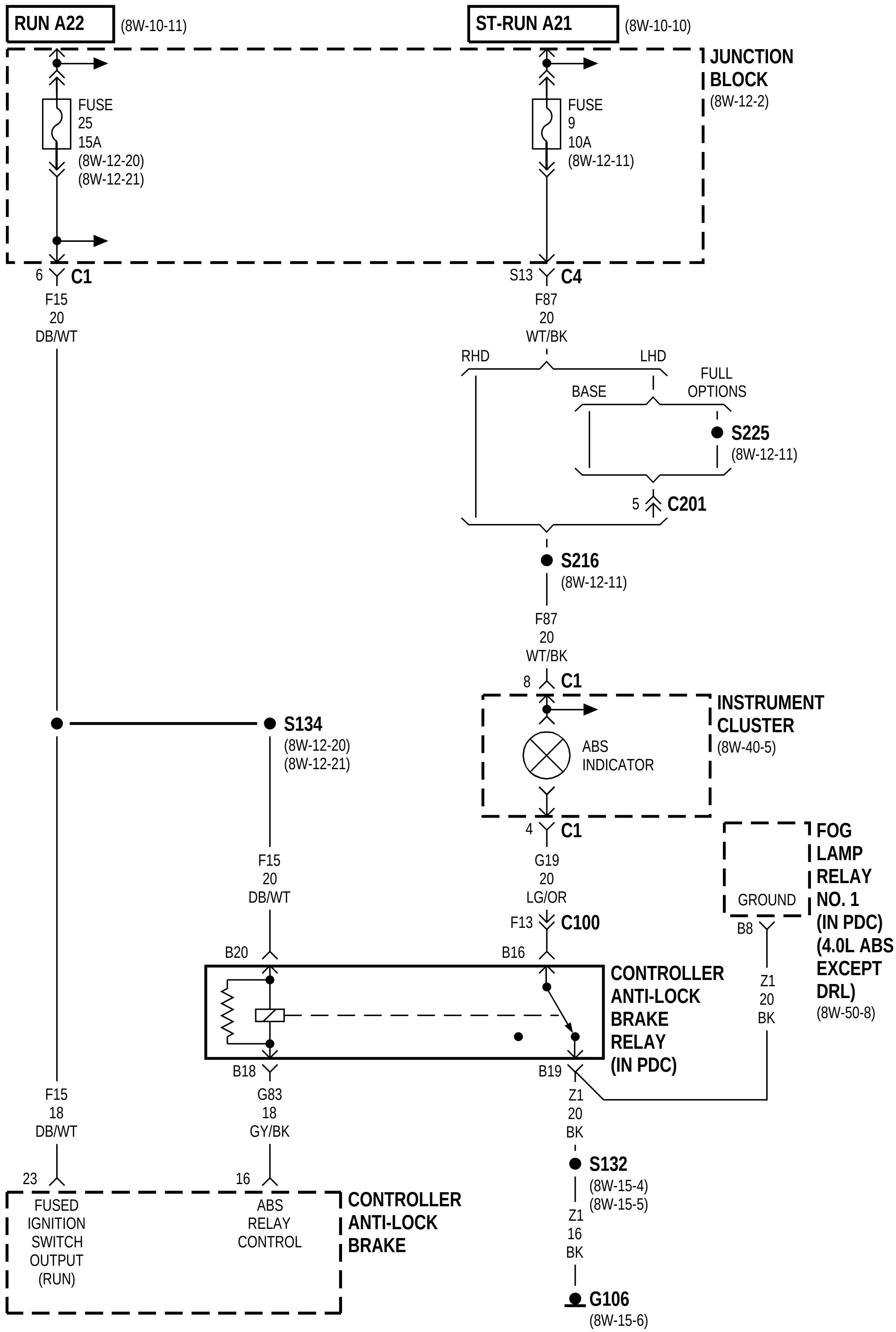
8W-33 VEHICLE SPEED CONTROL

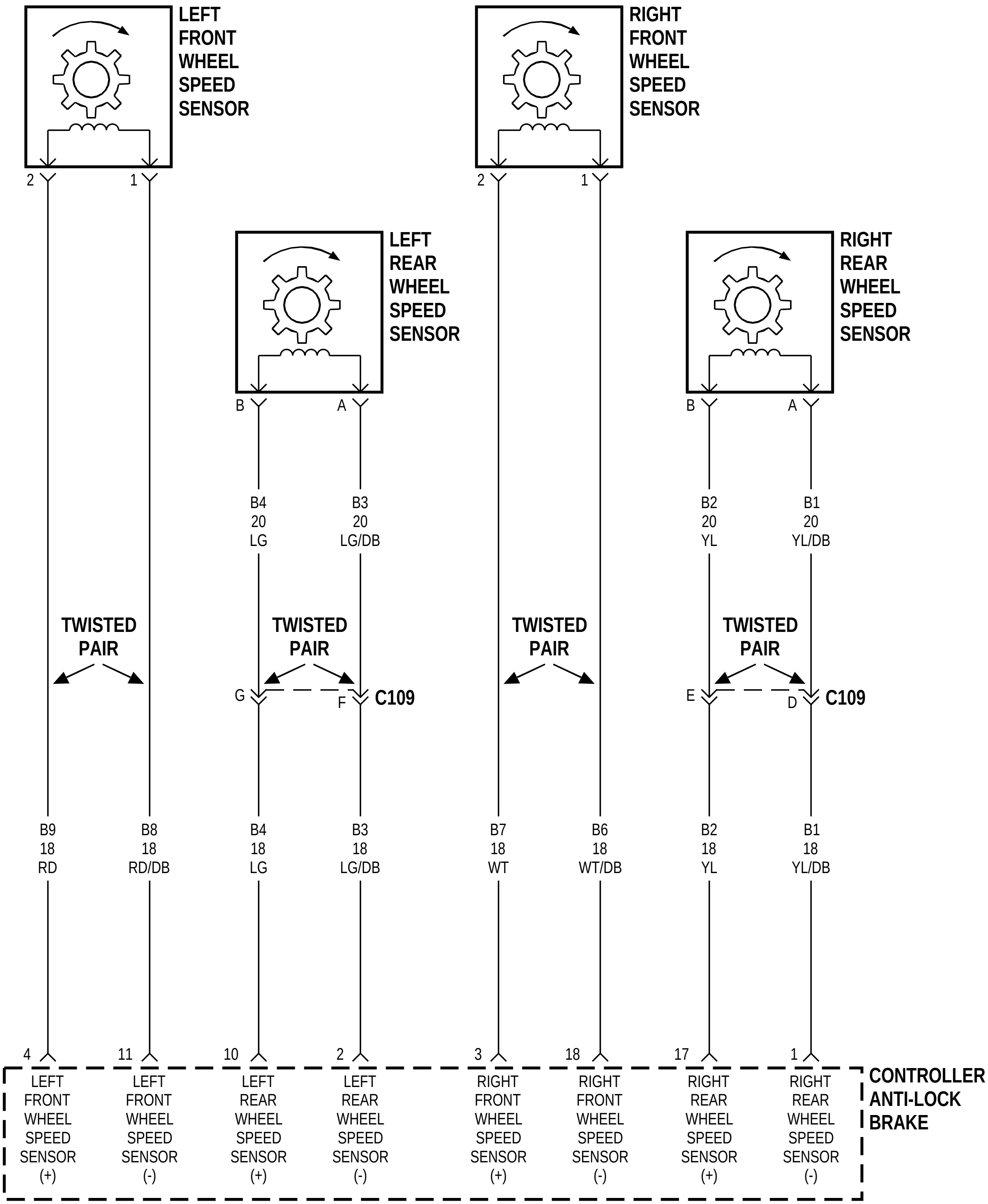

LEFT
SPEED
CONTROL
SWITCH
1 SET
2 ON/OFF
RIGHT
SPEED
CONTROL
SWITCH
1 RESUME/ACCEL
2 CANCEL
3 COAST
V37
20
RD/LG
K167
20
BR/YL
S221
S222
C2
CLOCKSPRING
C1
K4
20
BK/RD
B5
F17
B6
F18
C100
S138
(8W-70-3)
C107
S111
(8W-70-3)
4.0L
CALIFORNIA
OTHER
S123
(8W-70-2)
K167
18
BR/YL
V37
18
RD/LG
C3
SPEED
CONTROL
SWITCH
SIGNAL
SENSOR
GROUND
POWERTRAIN
CONTROL
MODULE
(8W-30-13)
RHD
LHD


BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A9
FUSE
23
15A
(8W-10-20)
A10
F8 C100
F32
20
PK/DB
LHD
RHD
V32
18
YL/RD
V32
20
YL/RD
K29
18
WT/PK
S204
(8W-31-3)
(8W-31-7)
F9 C100
1
3
6
BRAKE
LAMP
SWITCH
2
4
5
LHD
RHD
K29
20
WT/PK
K29
18
WT/PK
Z1
18
BK
V30
20
DB/RD
L50
20
WT/TN
S207
(8W-15-9)
F7 C100
Z1
14
BK
V30
20
DB/RD
TO
S203
(8W-10-20)
B1
F10
C100
G108
(8W-15-9)
OTHER
4.0L A/T
3
VEHICLE
SPEED
CONTROL
SERVO
K29
18
WT/PK
K29
20
WT/PK
S140
(8W-31-7)
1
2
4
Z1
18
BK
S132
(8W-15-3)
(8W-15-4)
(8W-15-5)
Z1
16
BK
G106
(8W-15-6)
V32
18
YL/RD
K29
18
WT/PK
V36
18
TN/RD
V35
18
LG/RD
11 C3
24 C3
4 C3
5 C3
SPEED
CONTROL
POWER
SUPPLY
BRAKE
LAMP
SWITCH
SENSE
SPEED
CONTROL
VACUUM
SOLENOID
CONTROL
SPEED
CONTROL
VENT
SOLENOID
CONTROL
POWERTRAIN
CONTROL
MODULE
(8W-30-14)
(8W-30-16)
• RHD
•• LHD

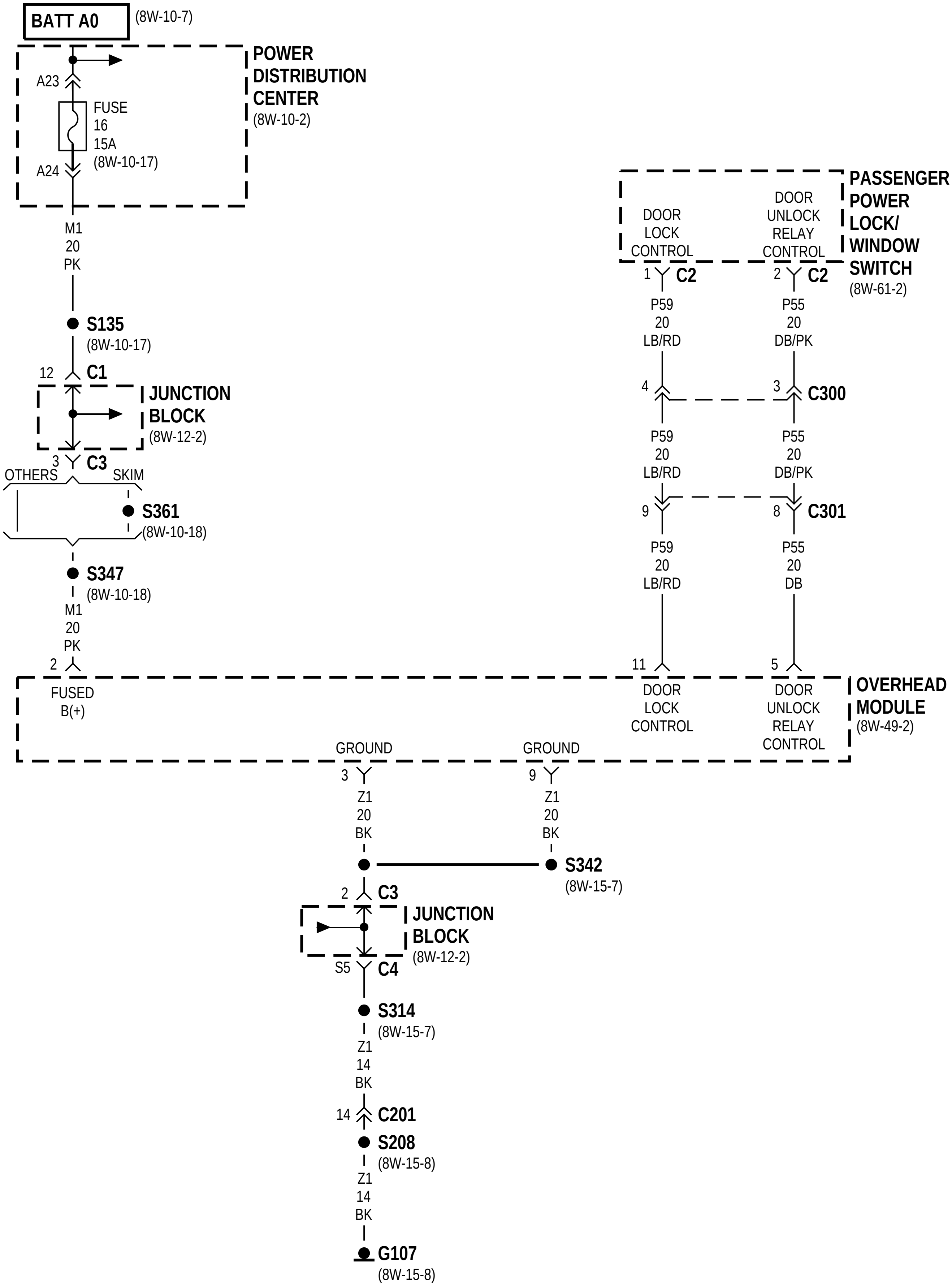
8W-35 ANTI-LOCK BRAKES

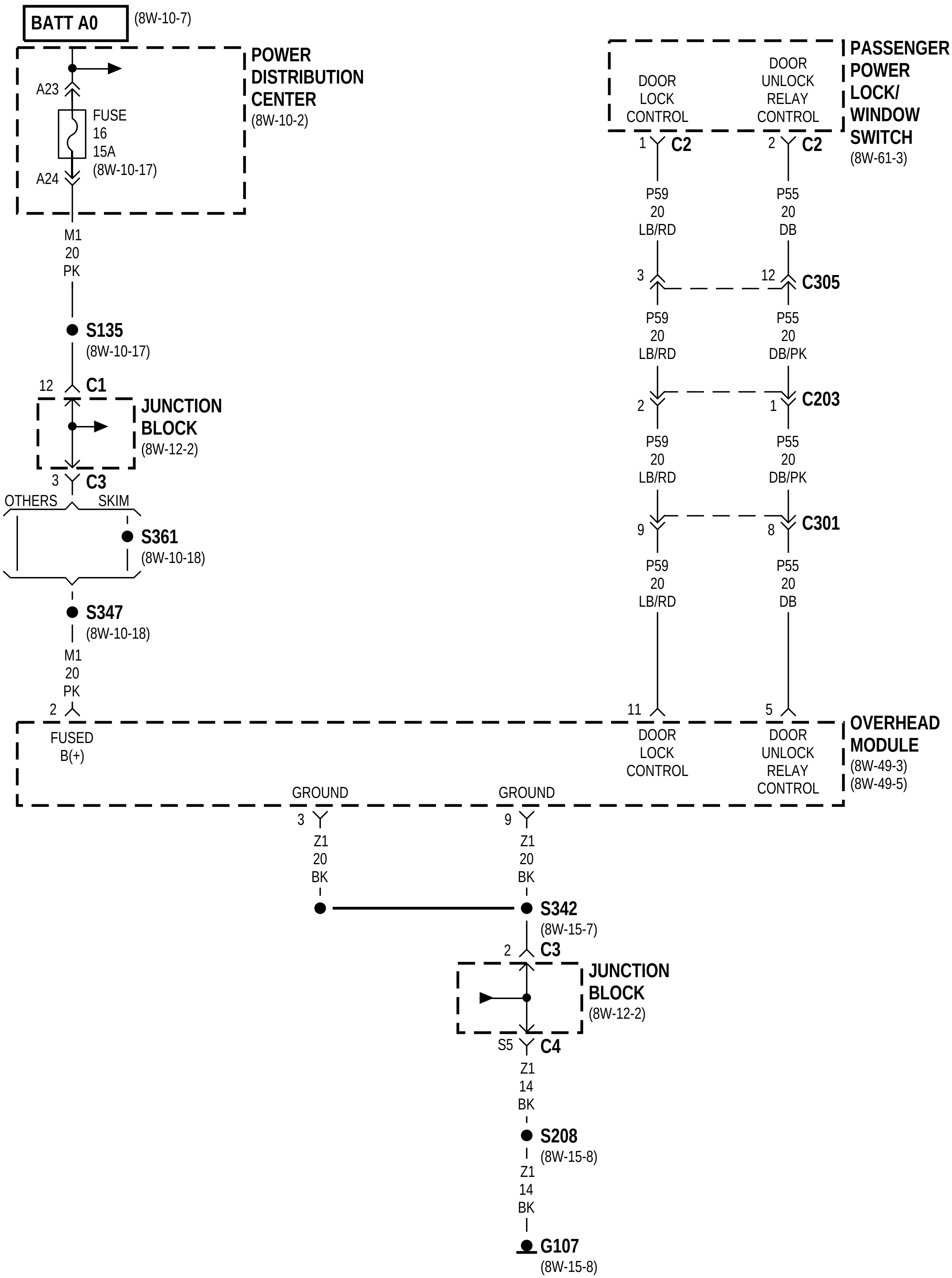

BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
18
FUSE
12
40A
(8W-10-16)
25
19
FUSE
13
20A
(8W-10-16)
26
A9
FUSE
23
15A
(8W-10-20)
A10
DATA
LINK
CONNECTOR
(8W-30-19)
7
D21
20
PK
B8
F2
C100
4.0L
2.5L
D21
20
PK
D21
18
PK
S139
(8W-30-19)
F32
20
PK/DB
F8
C100
F32
20
PK/DB
6
BRAKE
LAMP
SWITCH
(8W-33-3)
5
L50
20
WT/TN
S203
(8W-10-20)
L50
20
WT/TN
RHD
LHD
B4
C100
E1
C100
G
SWITCH
3
2
1
B43
20
PK/OR
B41
20
YL/VT
B42
20
TN/WT
C
A
B
C109
A10
12
RD/DG
A20
12
RD/DB
D21
18
PK
L50
18
WT/TN
B43
18
PK/OR
B41
18
YL/VT
B42
18
TN/WT
25
9
20
12
13
6
7
FUSED
B(+)
FUSED
B(+)
SCI
TRANSMIT/
ISO 9141K
BRAKE
LAMP
SWITCH
OUTPUT
G SWITCH
TEST
SIGNAL
G SWITCH
NO. 1
SENSE
G SWITCH
NO. 2
SENSE
CONTROLLER
ANTI-LOCK
BRAKE
GROUND
GROUND
8
24
Z1
12
BK
Z1
12
BK
G102
(8W-15-2)
● RHD
●● LHD

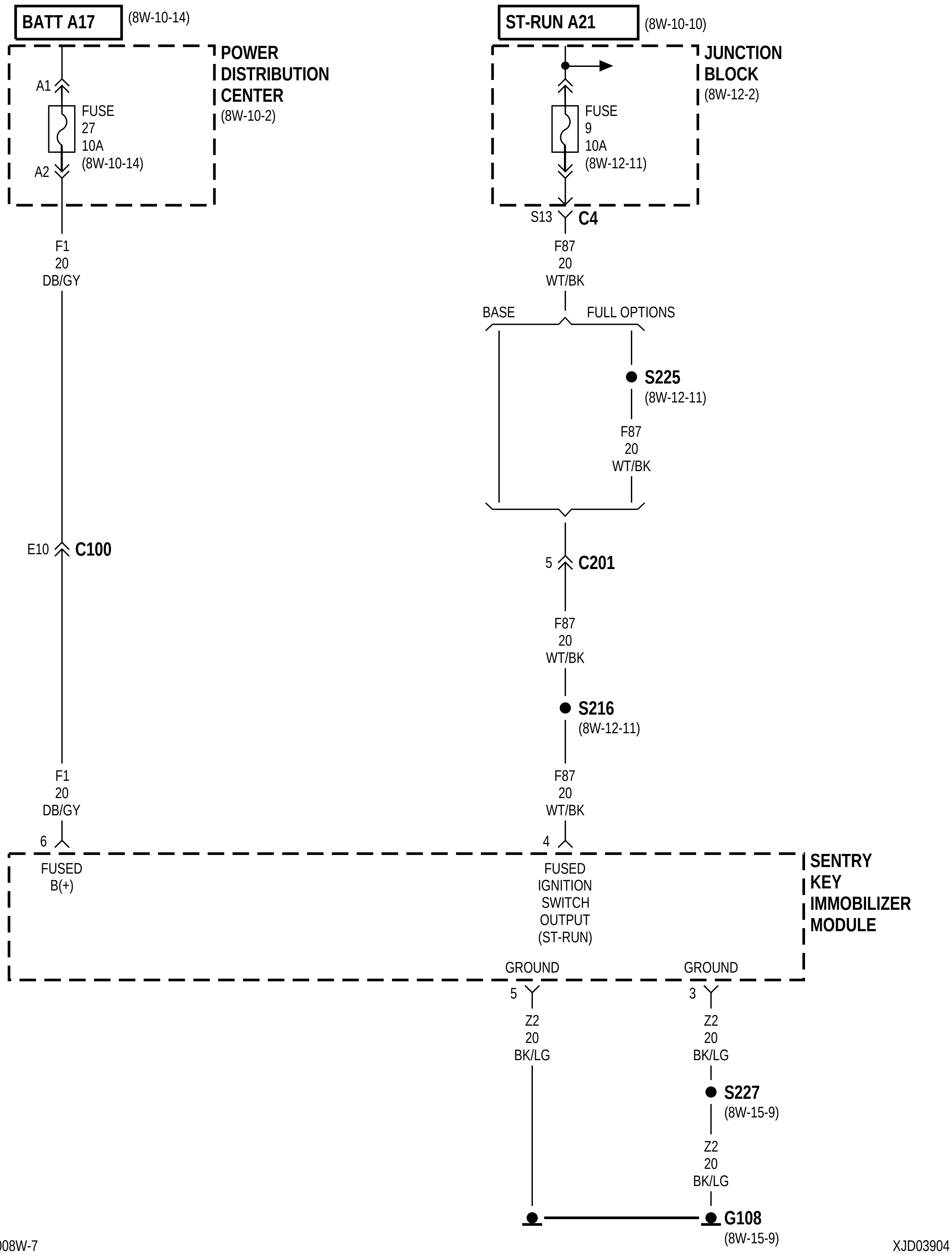

RUN A22
(8W-10-11)
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
25
15A
(8W-12-20)
(8W-12-21)
FUSE
9
10A
(8W-12-11)
6
C1
F15
20
DB/WT
S13
C4
F87
20
WT/BK
RHD
LHD
BASE
FULL OPTIONS
S225
(8W-12-11)
5
C201
S216
(8W-12-11)
F87
20
WT/BK
8
C1
INSTRUMENT CLUSTER
(8W-40-5)
ABS INDICATOR
4
C1
G19
20
LG/OR
F13
C100
S134
(8W-12-20)
(8W-12-21)
F15
20
DB/WT
FOG LAMP RELAY NO. 1 (IN PDC) (4.0L ABS EXCEPT DRL)
(8W-50-8)
GROUND
B8
Z1
20
BK
B20
B16
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC)
B18
B19
F15
18
DB/WT
G83
18
GY/BK
Z1
20
BK
S132
(8W-15-4)
(8W-15-5)
Z1
16
BK
G106
(8W-15-6)
23
16
FUSED IGNITION SWITCH OUTPUT (RUN)
ABS RELAY CONTROL
CONTROLLER ANTI-LOCK BRAKE

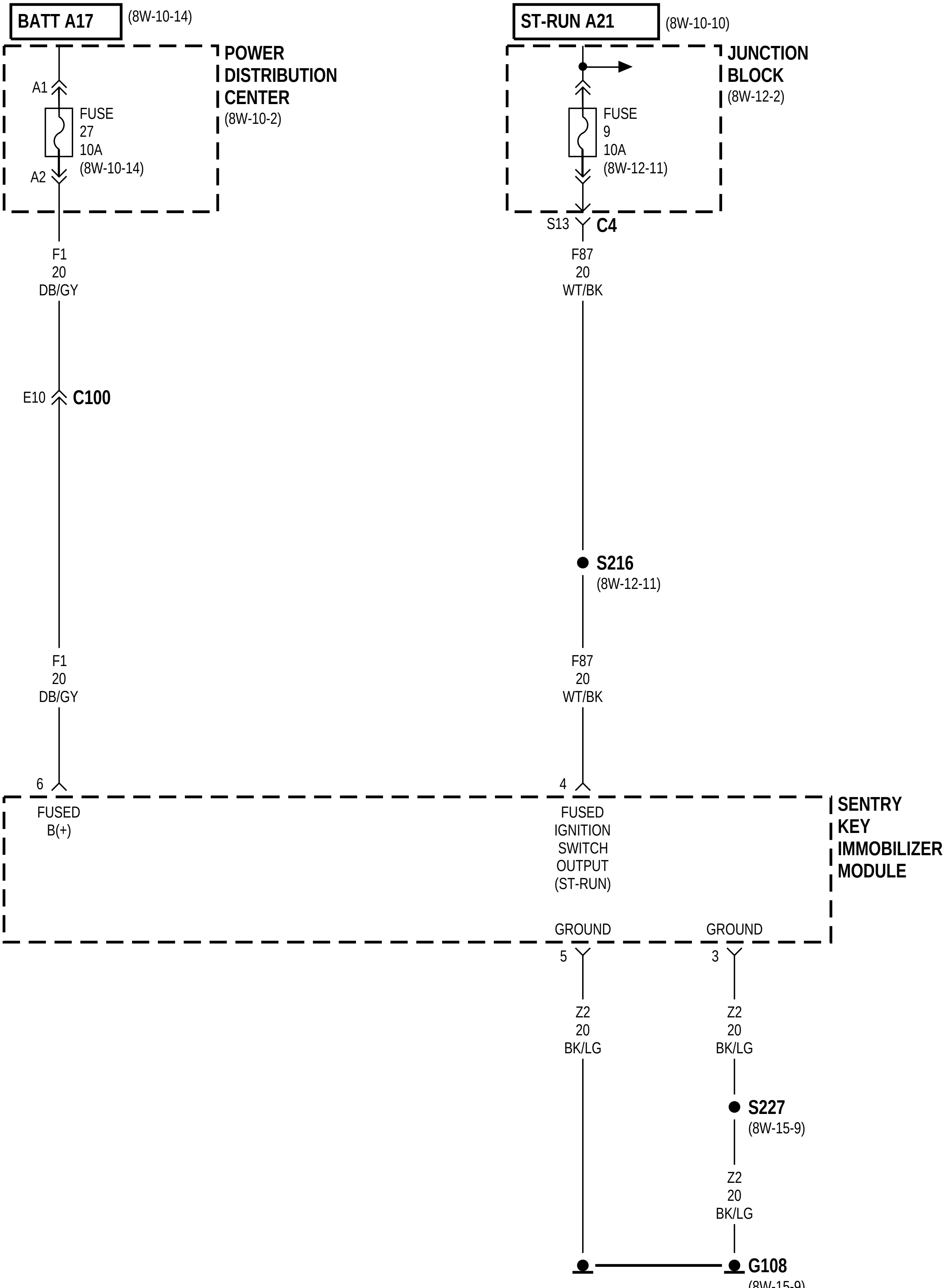

LEFT FRONT WHEEL SPEED SENSOR
RIGHT FRONT WHEEL SPEED SENSOR
2
1
2
1
LEFT REAR WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
B
A
B
A
B4 20 LG
B3 20 LG/DB
B2 20 YL
B1 20 YL/DB
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
TWISTED PAIR
G
F
C109
E
D
C109
B9 18 RD
B8 18 RD/DB
B4 18 LG
B3 18 LG/DB
B7 18 WT
B6 18 WT/DB
B2 18 YL
B1 18 YL/DB
4
11
10
2
3
18
17
1
LEFT FRONT WHEEL SPEED SENSOR (+)
LEFT FRONT WHEEL SPEED SENSOR (-)
LEFT REAR WHEEL SPEED SENSOR (+)
LEFT REAR WHEEL SPEED SENSOR (-)
RIGHT FRONT WHEEL SPEED SENSOR (+)
RIGHT FRONT WHEEL SPEED SENSOR (-)
RIGHT REAR WHEEL SPEED SENSOR (+)
RIGHT REAR WHEEL SPEED SENSOR (-)
CONTROLLER ANTI-LOCK BRAKE

8W-39 VEHICLE THEFT SECURITY SYSTEM

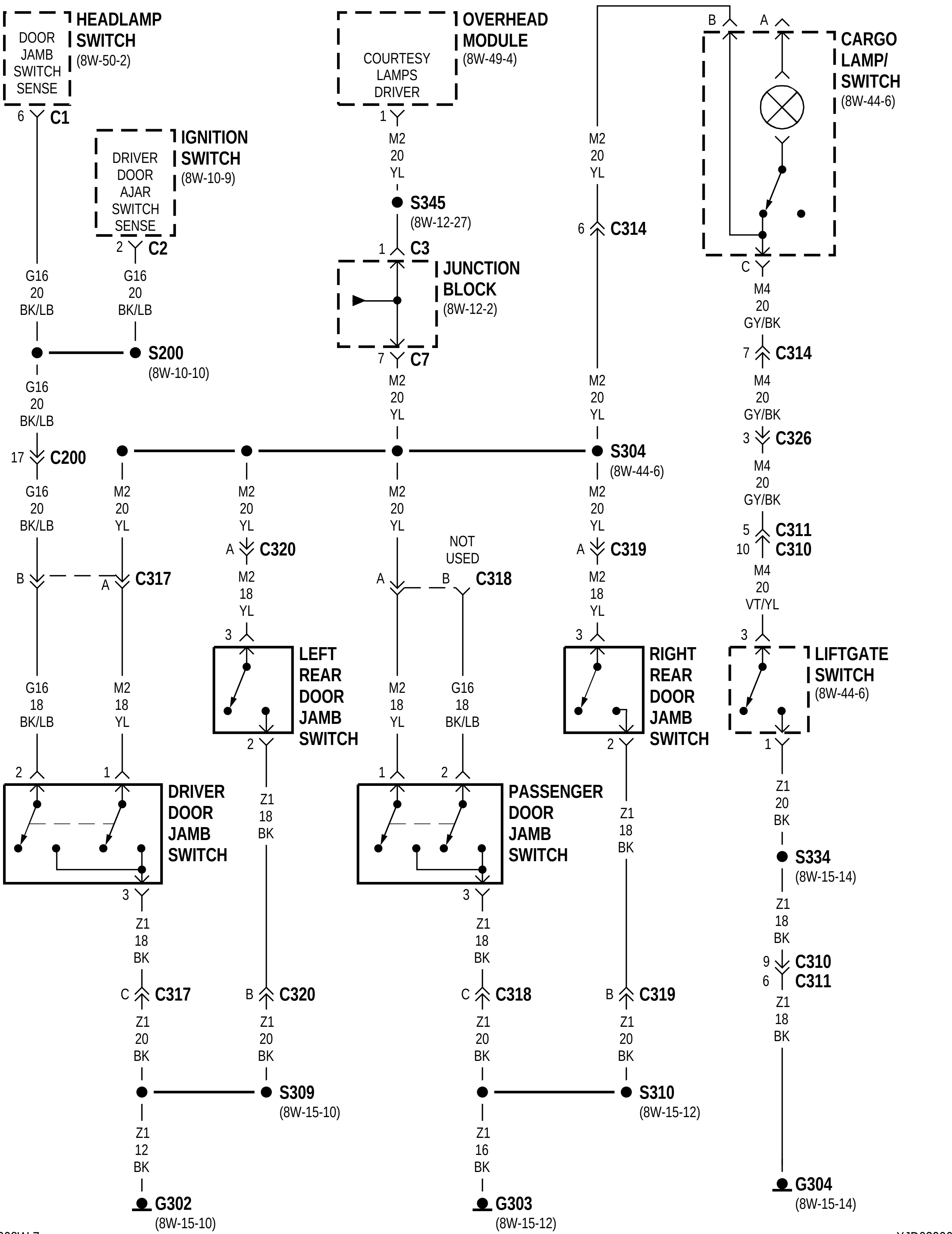

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
12
C1
JUNCTION BLOCK
(8W-12-2)
3
C3
OTHERS
SKIM
S361
(8W-10-18)
S347
(8W-10-18)
M1
20
PK
2
FUSED
B(+)
PASSENGER POWER LOCK/ WINDOW SWITCH
(8W-61-2)
DOOR
LOCK
CONTROL
DOOR
UNLOCK
RELAY
CONTROL
1
C2
2
C2
P59
20
LB/RD
P55
20
DB/PK
4
3
C300
P59
20
LB/RD
P55
20
DB/PK
9
8
C301
P59
20
LB/RD
P55
20
DB
11
5
DOOR
LOCK
CONTROL
DOOR
UNLOCK
RELAY
CONTROL
OVERHEAD MODULE
(8W-49-2)
GROUND
GROUND
3
9
Z1
20
BK
Z1
20
BK
S342
(8W-15-7)
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
S314
(8W-15-7)
Z1
14
BK
14
C201
S208
(8W-15-8)
Z1
14
BK
G107
(8W-15-8)


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE 16 15A
(8W-10-17)
A24
M1 20 PK
S135
(8W-10-17)
12
C1
JUNCTION BLOCK
(8W-12-2)
3
C3
OTHERS
SKIM
S361
(8W-10-18)
S347
(8W-10-18)
M1 20 PK
2
FUSED B(+)
PASSENGER POWER LOCK/ WINDOW SWITCH
(8W-61-3)
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
1
C2
2
C2
P59 20 LB/RD
P55 20 DB
3
12
C305
P59 20 LB/RD
P55 20 DB/PK
2
1
C203
P59 20 LB/RD
P55 20 DB/PK
9
8
C301
P59 20 LB/RD
P55 20 DB
11
5
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
OVERHEAD MODULE
(8W-49-3)
(8W-49-5)
GROUND
GROUND
3
9
Z1 20 BK
Z1 20 BK
S342
(8W-15-7)
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
Z1 14 BK
S208
(8W-15-8)
Z1 14 BK
G107
(8W-15-8)


BATT A17
(8W-10-14)
POWER DISTRIBUTION CENTER
(8W-10-2)
A1
FUSE 27 10A
(8W-10-14)
A2
F1 20 DB/GY
E10
C100
F1 20 DB/GY
6
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 9 10A
(8W-12-11)
S13
C4
F87 20 WT/BK
BASE
FULL OPTIONS
S225
(8W-12-11)
F87 20 WT/BK
5
C201
F87 20 WT/BK
S216
(8W-12-11)
F87 20 WT/BK
4
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
SENTRY KEY IMMOBILIZER MODULE
GROUND
GROUND
5
3
Z2 20 BK/LG
Z2 20 BK/LG
S227
(8W-15-9)
Z2 20 BK/LG
G108
(8W-15-9)

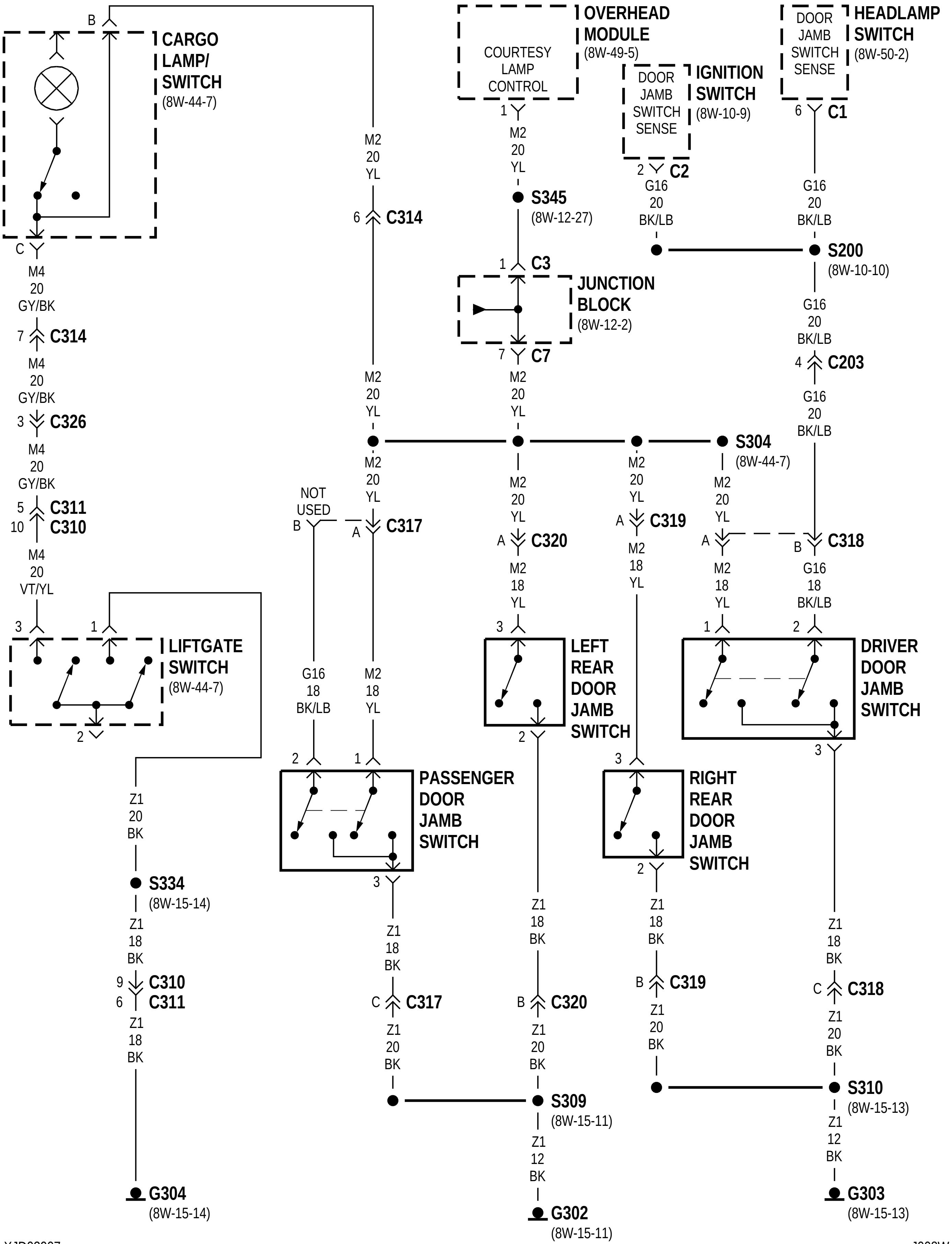

BATT A17
(8W-10-14)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A1
FUSE
27
10A
(8W-10-14)
A2
F1
20
DB/GY
E10
C100
F1
20
DB/GY
6
ST-RUN A21
(8W-10-10)
JUNCTION
BLOCK
(8W-12-2)
FUSE
9
10A
(8W-12-11)
S13
C4
F87
20
WT/BK
S216
(8W-12-11)
F87
20
WT/BK
4
FUSED
B(+)
FUSED
IGNITION
SWITCH
OUTPUT
(ST-RUN)
SENTRY
KEY
IMMOBILIZER
MODULE
GROUND
GROUND
5
3
Z2
20
BK/LG
Z2
20
BK/LG
S227
(8W-15-9)
Z2
20
BK/LG
G108
(8W-15-9)

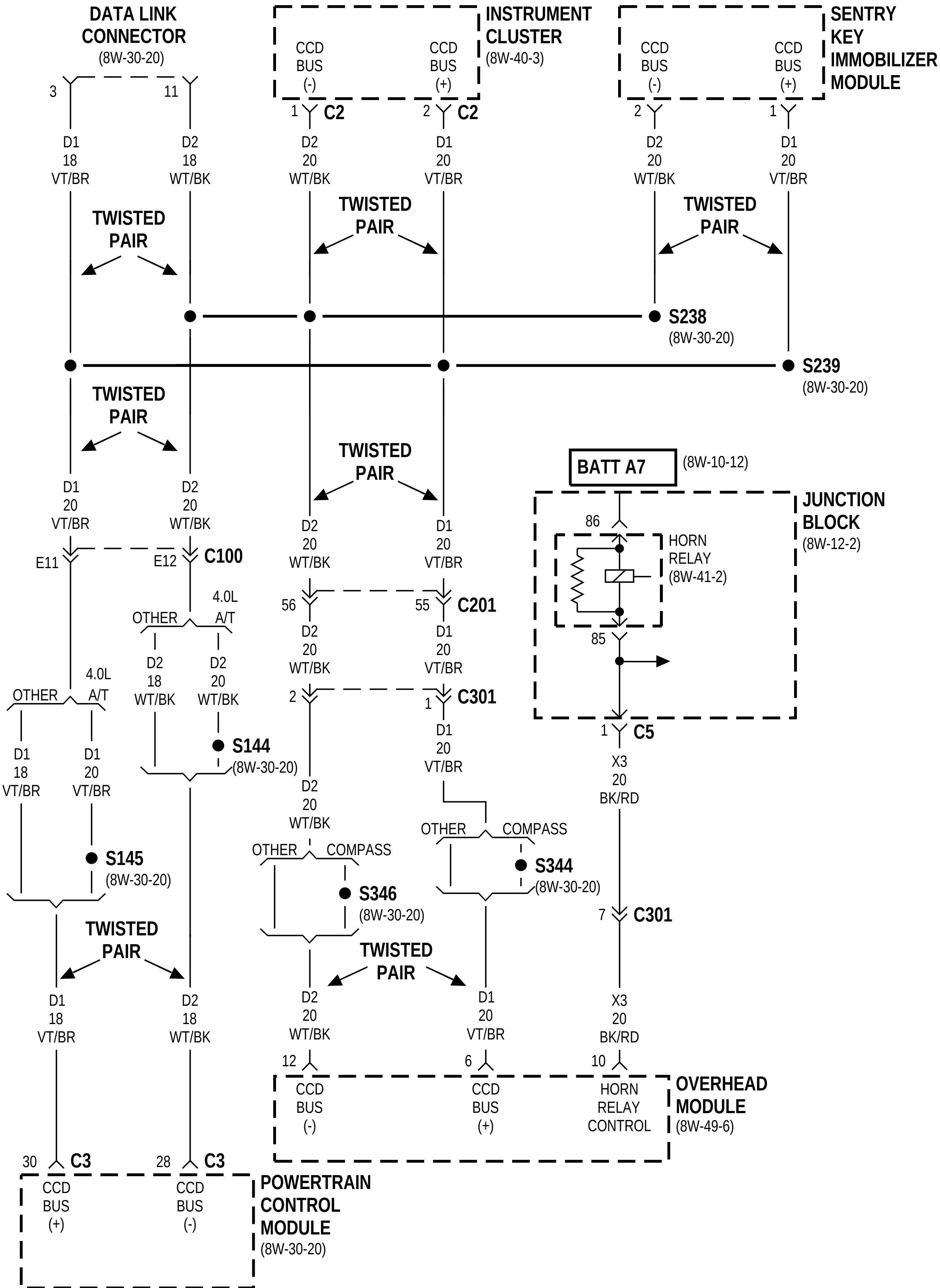
LHD



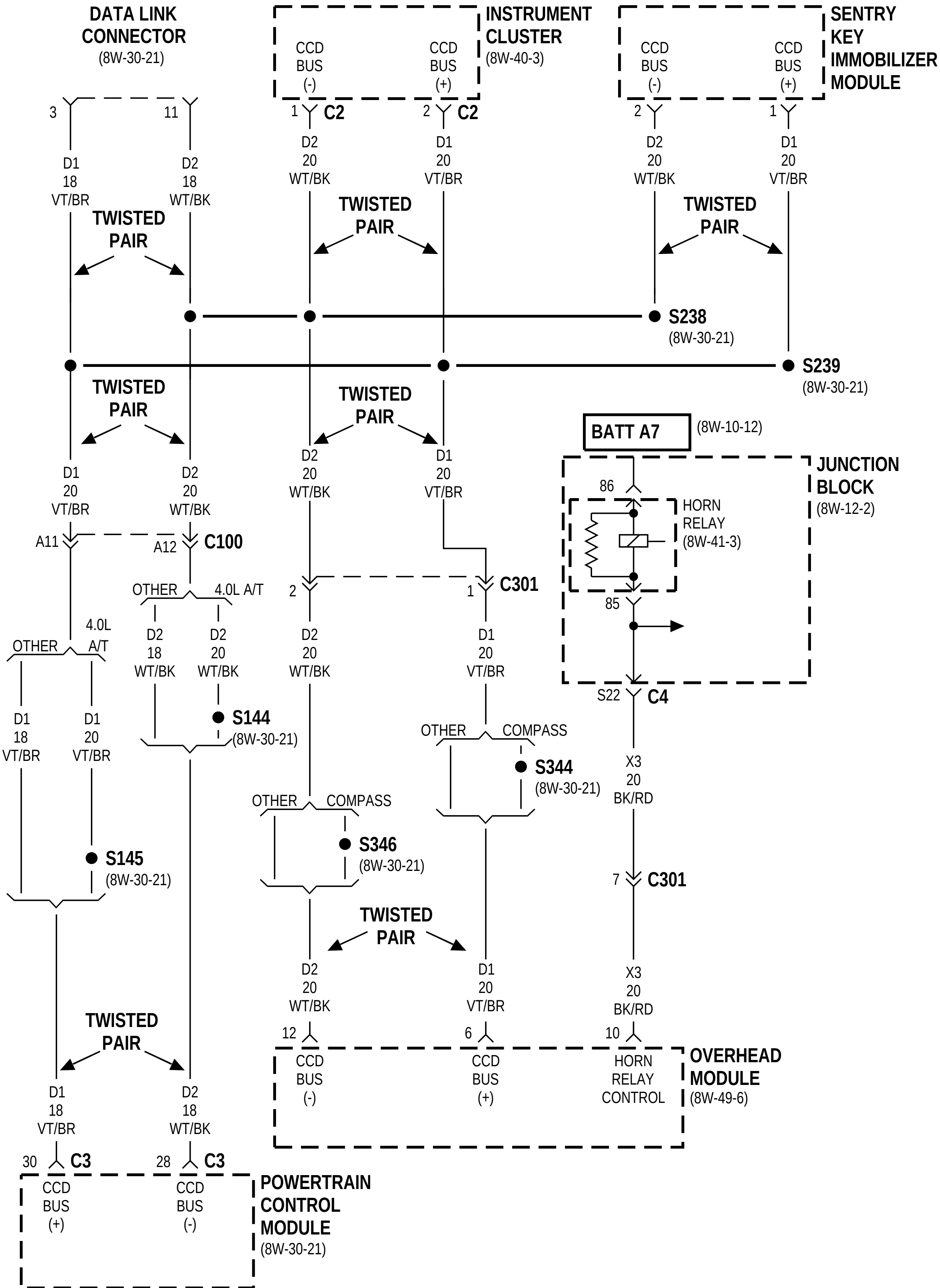
HEADLAMP SWITCH (8W-50-2)
DOOR JAMB SWITCH SENSE
6 C1
IGNITION SWITCH (8W-10-9)
DRIVER DOOR AJAR SWITCH SENSE
2 C2
G16 20 BK/LB
S200 (8W-10-10)
17 C200
G16 18 BK/LB
M2 20 YL
M2 18 YL
B A C317
DRIVER DOOR JAMB SWITCH
OVERHEAD MODULE (8W-49-4)
COURTESY LAMPS DRIVER
S345 (8W-12-27)
1 C3
JUNCTION BLOCK (8W-12-2)
7 C7
A C320
LEFT REAR DOOR JAMB SWITCH
NOT USED
A B C318
G16 18 BK/LB
PASSENGER DOOR JAMB SWITCH
6 C314
S304 (8W-44-6)
A C319
RIGHT REAR DOOR JAMB SWITCH
CARGO LAMP/ SWITCH (8W-44-6)
M4 20 GY/BK
7 C314
3 C326
5 C311
10 C310
M4 20 VT/YL
LIFTGATE SWITCH (8W-44-6)
Z1 20 BK
Z1 18 BK
S334 (8W-15-14)
9 C310
6 C311
G304 (8W-15-14)
C C317
B C320
Z1 12 BK
S309 (8W-15-10)
G302 (8W-15-10)
C C318
B C319
Z1 16 BK
S310 (8W-15-12)
G303 (8W-15-12)

RHD


CARGO LAMP/ SWITCH (8W-44-7)
OVERHEAD MODULE (8W-49-5)
COURTESY LAMP CONTROL
DOOR JAMB SWITCH SENSE
IGNITION SWITCH (8W-10-9)
DOOR JAMB SWITCH SENSE
HEADLAMP SWITCH (8W-50-2)
C1
C2
M2 20 YL
G16 20 BK/LB
S345 (8W-12-27)
S200 (8W-10-10)
C314
C3
JUNCTION BLOCK (8W-12-2)
C7
C203
M4 20 GY/BK
C326
C311
C310
M4 20 VT/YL
S304 (8W-44-7)
NOT USED
C317
C320
C319
C318
M2 18 YL
G16 18 BK/LB
LIFTGATE SWITCH (8W-44-7)
LEFT REAR DOOR JAMB SWITCH
DRIVER DOOR JAMB SWITCH
PASSENGER DOOR JAMB SWITCH
RIGHT REAR DOOR JAMB SWITCH
Z1 20 BK
S334 (8W-15-14)
Z1 18 BK
S309 (8W-15-11)
S310 (8W-15-13)
Z1 12 BK
G304 (8W-15-14)
G302 (8W-15-11)
G303 (8W-15-13)



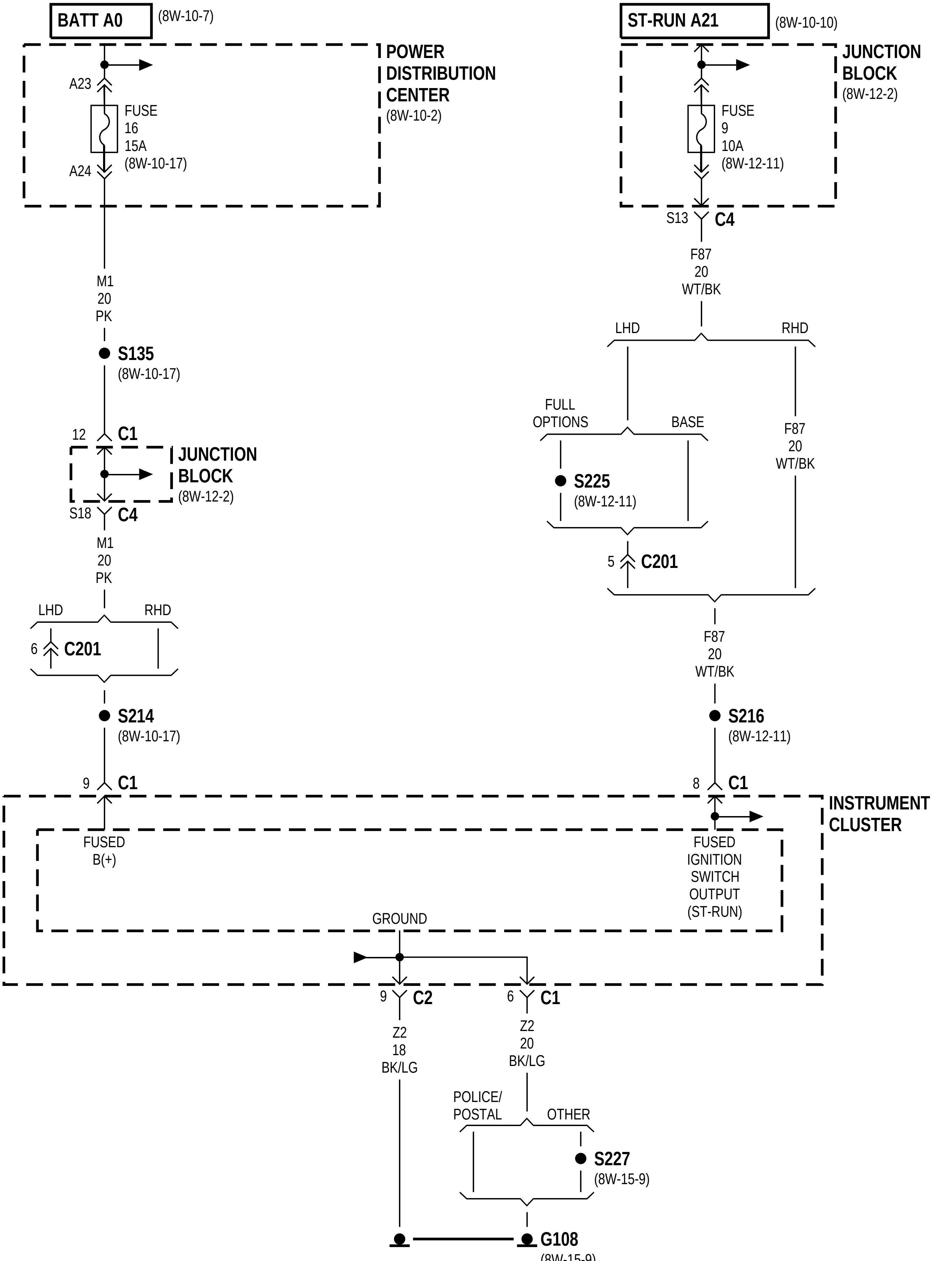
J008W-7 XJD03908

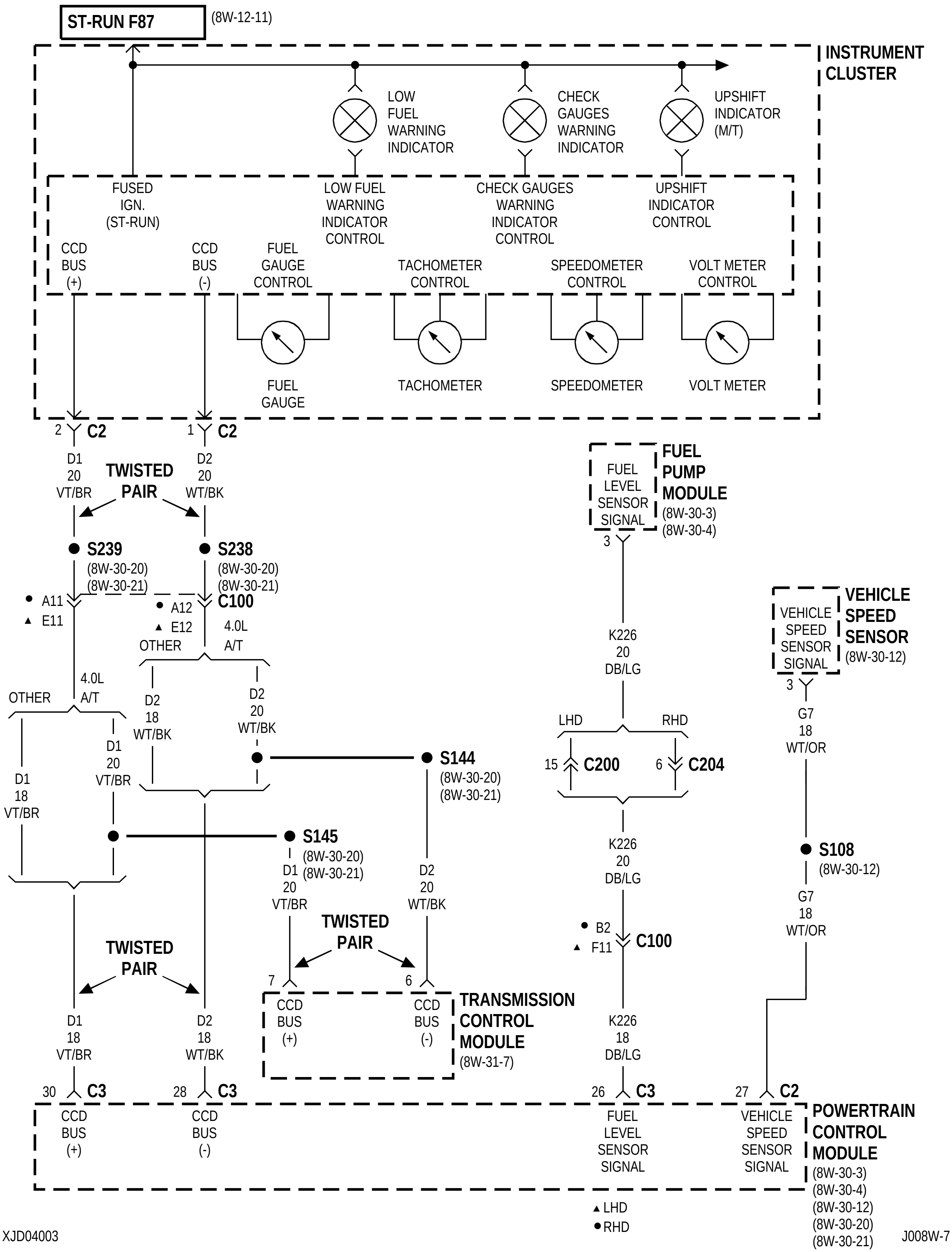

DATA LINK CONNECTOR
(8W-30-21)
3
11
D1
18
VT/BR
D2
18
WT/BK
TWISTED PAIR
INSTRUMENT CLUSTER
(8W-40-3)
CCD BUS (-)
CCD BUS (+)
1 C2
2 C2
D2
20
WT/BK
D1
20
VT/BR
SENTRY KEY IMMOBILIZER MODULE
CCD BUS (-)
CCD BUS (+)
S238
(8W-30-21)
S239
(8W-30-21)
BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
86
HORN RELAY
(8W-41-3)
85
S22 C4
A11
A12 C100
OTHER
4.0L A/T
4.0L
A/T
2
1 C301
S144
(8W-30-21)
S145
(8W-30-21)
COMPASS
S344
(8W-30-21)
S346
(8W-30-21)
X3
20
BK/RD
7 C301
12
6
10
OVERHEAD MODULE
(8W-49-6)
CCD BUS (-)
CCD BUS (+)
HORN RELAY CONTROL
30 C3
28 C3
POWERTRAIN CONTROL MODULE
(8W-30-21)
CCD BUS (+)
CCD BUS (-)

8W-40 INSTRUMENT CLUSTER

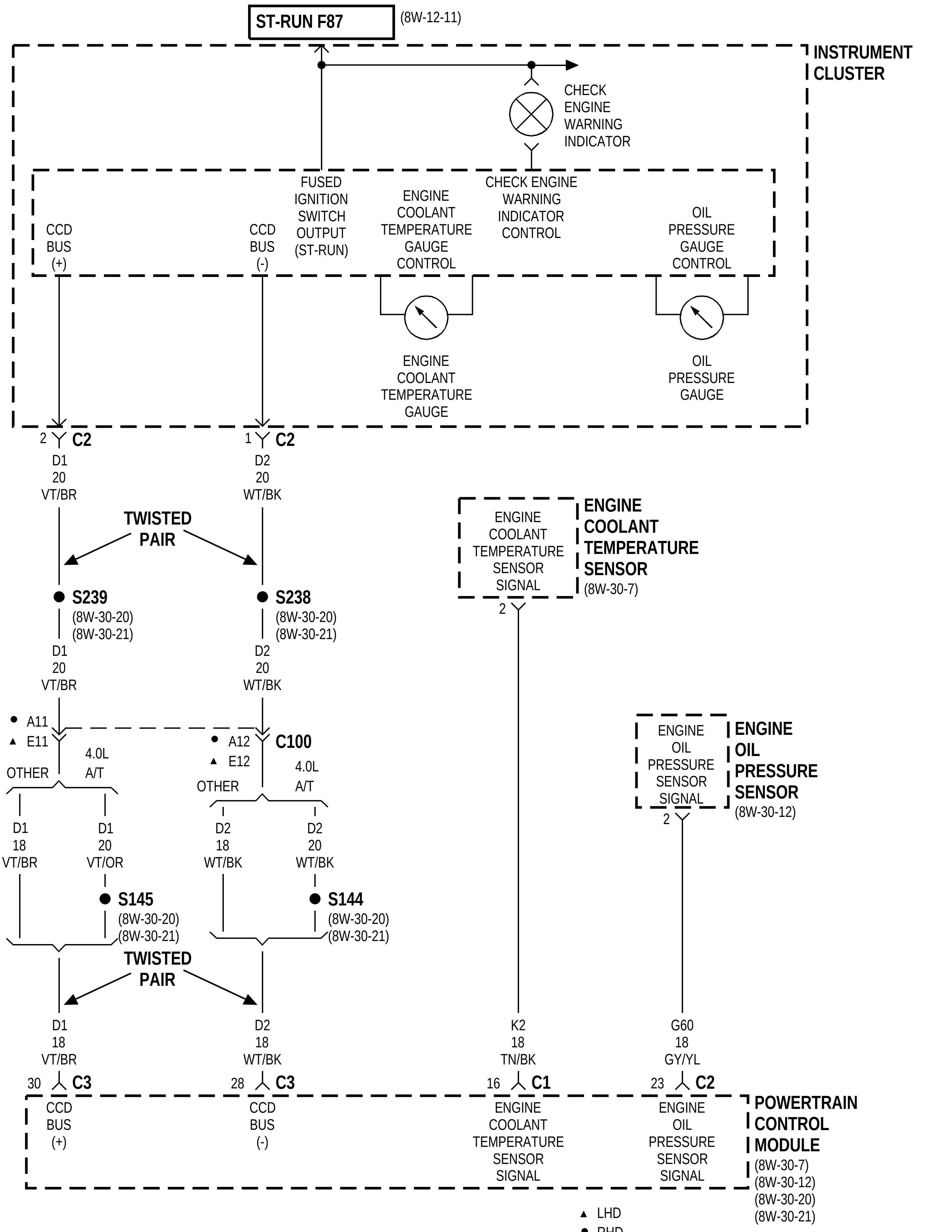
Component **Page**

Component **Page**


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
12
C1
JUNCTION BLOCK
(8W-12-2)
S18
C4
M1
20
PK
LHD
RHD
6
C201
S214
(8W-10-17)
9
C1
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
9
10A
(8W-12-11)
S13
C4
F87
20
WT/BK
LHD
RHD
FULL OPTIONS
BASE
S225
(8W-12-11)
F87
20
WT/BK
5
C201
F87
20
WT/BK
S216
(8W-12-11)
8
C1
INSTRUMENT CLUSTER
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
GROUND
9
C2
6
C1
Z2
18
BK/LG
Z2
20
BK/LG
POLICE/ POSTAL
OTHER
S227
(8W-15-9)
G108
(8W-15-9)

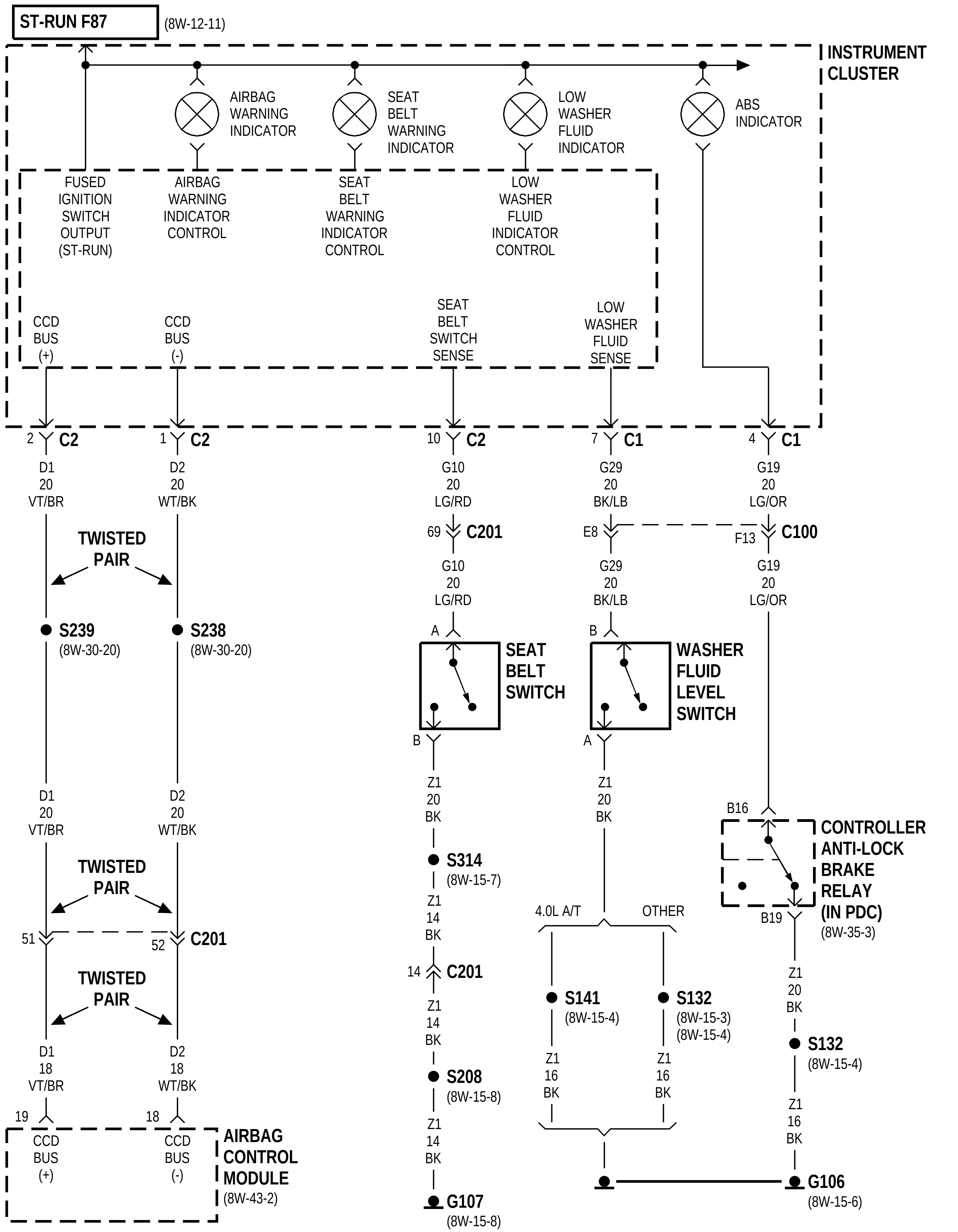


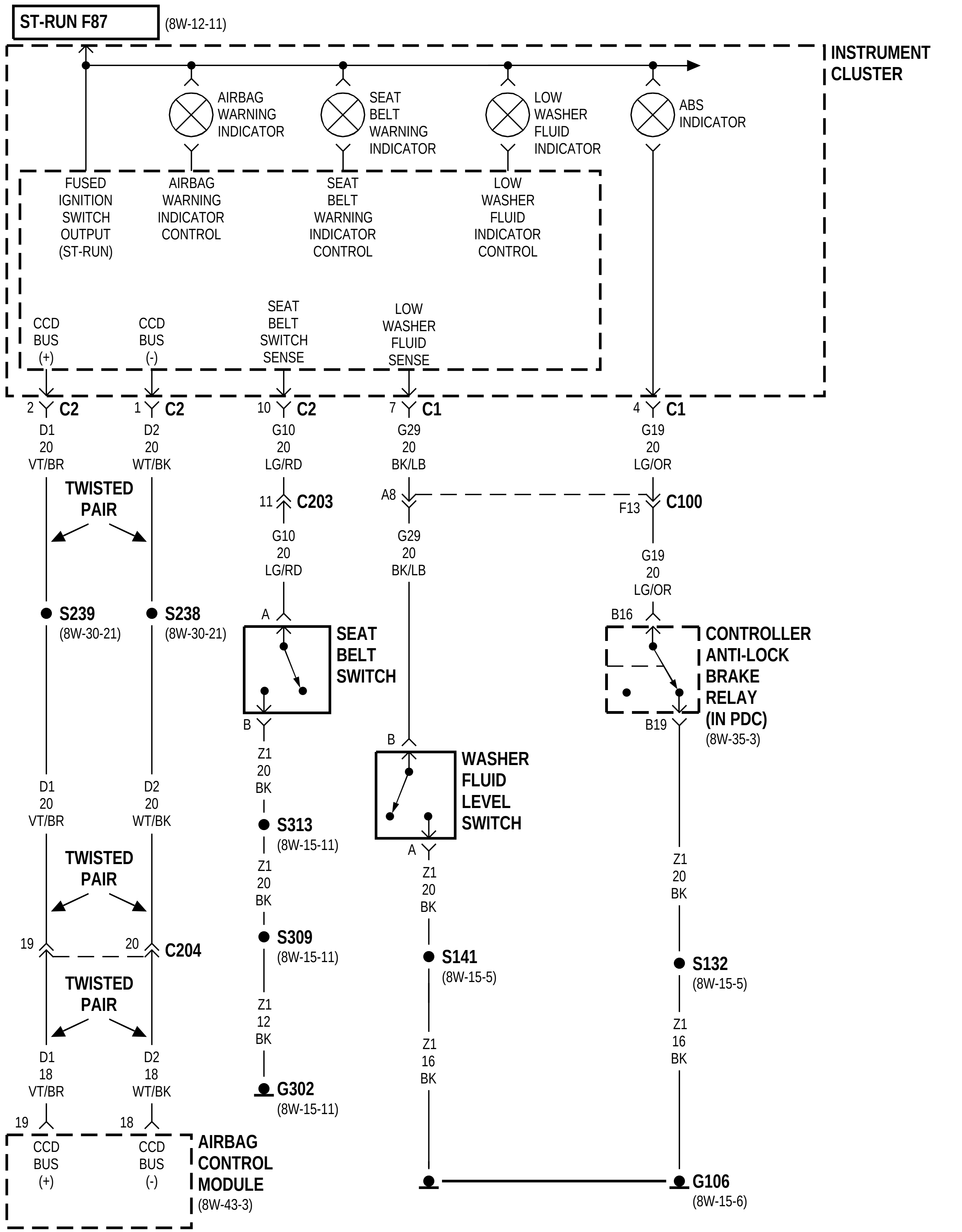
XJD04003 J008W-7

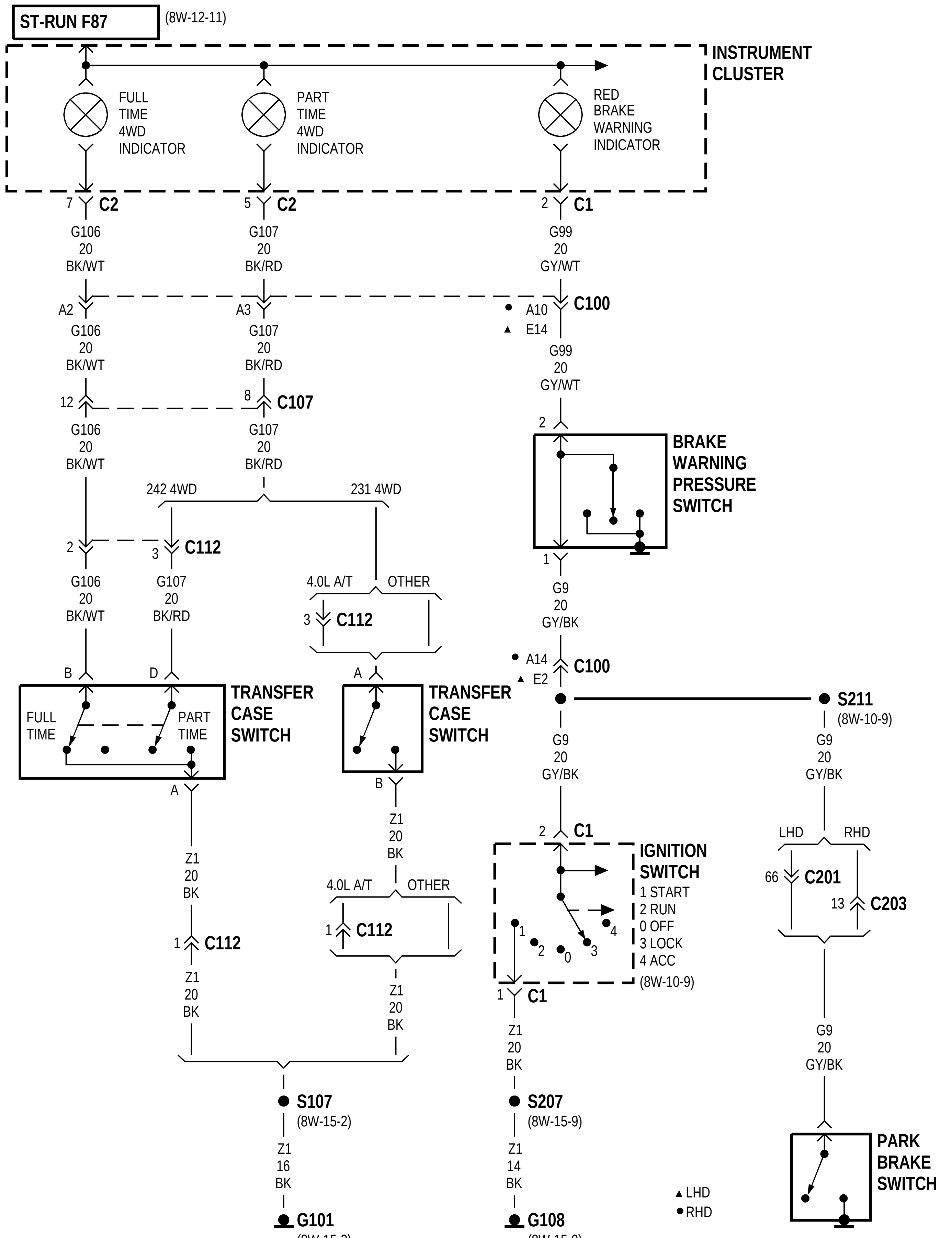


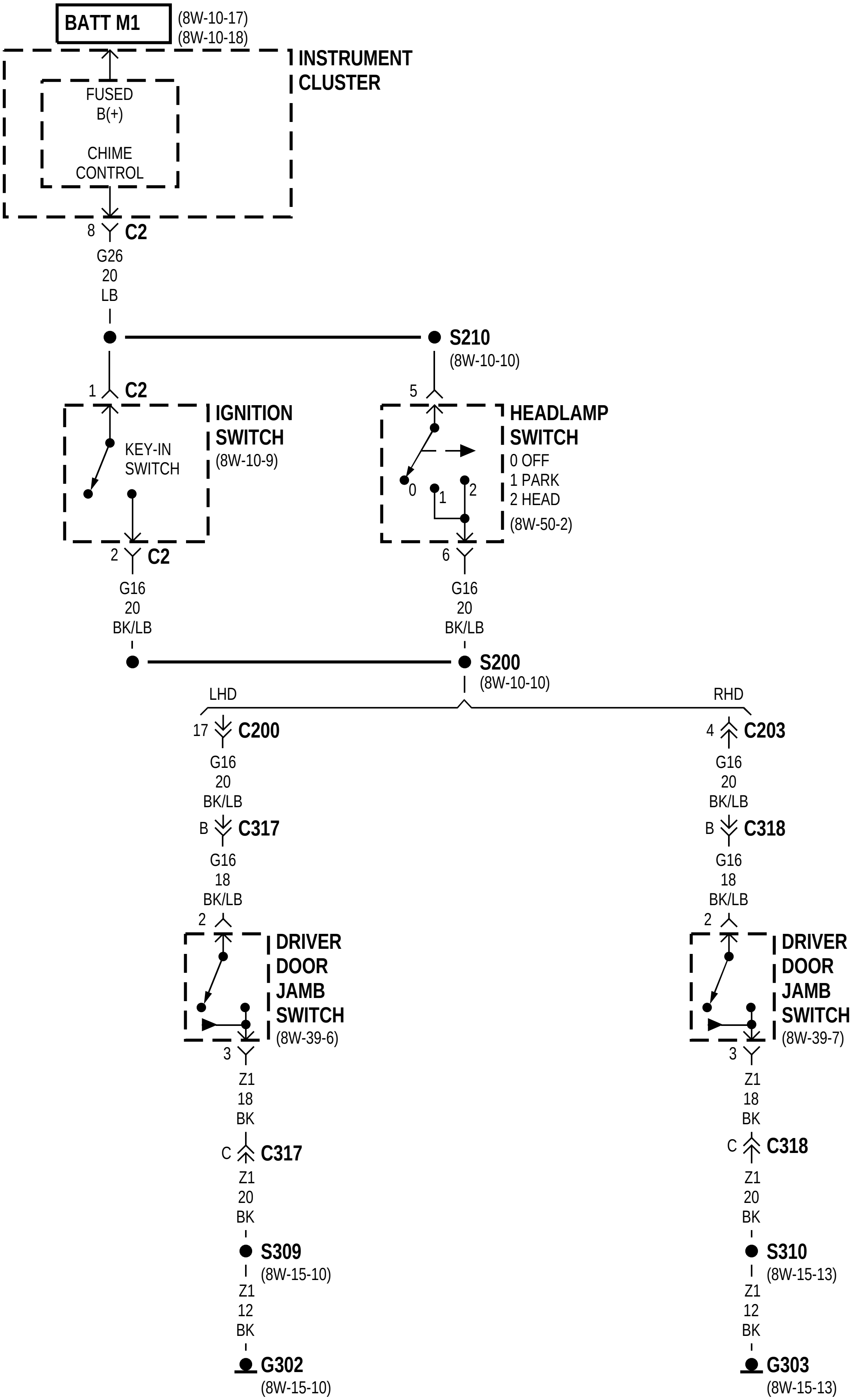
J008W-7

XJD04004

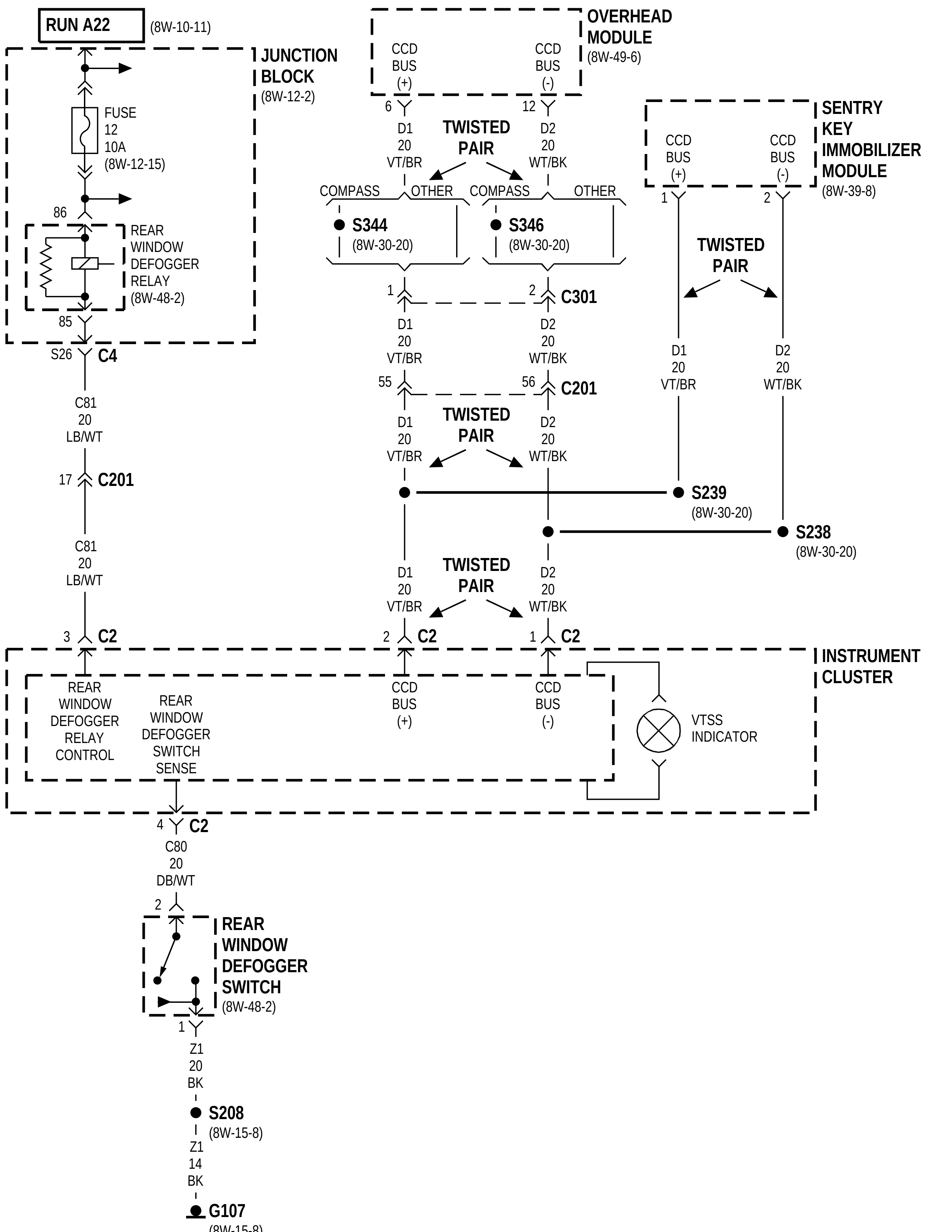

ST-RUN F87
(8W-12-11)
INSTRUMENT CLUSTER
AIRBAG WARNING INDICATOR
SEAT BELT WARNING INDICATOR
LOW WASHER FLUID INDICATOR
ABS INDICATOR
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
AIRBAG WARNING INDICATOR CONTROL
SEAT BELT WARNING INDICATOR CONTROL
LOW WASHER FLUID INDICATOR CONTROL
CCD BUS (+)
CCD BUS (-)
SEAT BELT SWITCH SENSE
LOW WASHER FLUID SENSE
2 C2
1 C2
10 C2
7 C1
4 C1
D1 20 VT/BR
D2 20 WT/BK
G10 20 LG/RD
G29 20 BK/LB
G19 20 LG/OR
TWISTED PAIR
69 C201
E8
F13 C100
G10 20 LG/RD
G29 20 BK/LB
G19 20 LG/OR
S239 (8W-30-20)
S238 (8W-30-20)
A
SEAT BELT SWITCH
B
B
WASHER FLUID LEVEL SWITCH
A
D1 20 VT/BR
D2 20 WT/BK
Z1 20 BK
Z1 20 BK
B16
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC)
(8W-35-3)
B19
TWISTED PAIR
S314 (8W-15-7)
Z1 14 BK
4.0L A/T
OTHER
51
52 C201
14 C201
TWISTED PAIR
Z1 14 BK
S141 (8W-15-4)
S132 (8W-15-3) (8W-15-4)
Z1 20 BK
S132 (8W-15-4)
D1 18 VT/BR
D2 18 WT/BK
S208 (8W-15-8)
Z1 16 BK
Z1 16 BK
Z1 14 BK
Z1 16 BK
19
18
CCD BUS (+)
CCD BUS (-)
AIRBAG CONTROL MODULE
(8W-43-2)
G106 (8W-15-6)
G107 (8W-15-8)


ST-RUN F87
(8W-12-11)
INSTRUMENT CLUSTER
AIRBAG WARNING INDICATOR
SEAT BELT WARNING INDICATOR
LOW WASHER FLUID INDICATOR
ABS INDICATOR
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
AIRBAG WARNING INDICATOR CONTROL
SEAT BELT WARNING INDICATOR CONTROL
LOW WASHER FLUID INDICATOR CONTROL
CCD BUS (+)
CCD BUS (-)
SEAT BELT SWITCH SENSE
LOW WASHER FLUID SENSE
2 C2
1 C2
10 C2
7 C1
4 C1
D1 20 VT/BR
D2 20 WT/BK
G10 20 LG/RD
G29 20 BK/LB
G19 20 LG/OR
TWISTED PAIR
11 C203
A8
F13 C100
S239 (8W-30-21)
S238 (8W-30-21)
A
B16
SEAT BELT SWITCH
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC) (8W-35-3)
B
B19
Z1 20 BK
WASHER FLUID LEVEL SWITCH
S313 (8W-15-11)
S309 (8W-15-11)
19
20
C204
Z1 12 BK
G302 (8W-15-11)
S141 (8W-15-5)
S132 (8W-15-5)
Z1 16 BK
D1 18 VT/BR
D2 18 WT/BK
18
AIRBAG CONTROL MODULE (8W-43-3)
G106 (8W-15-6)

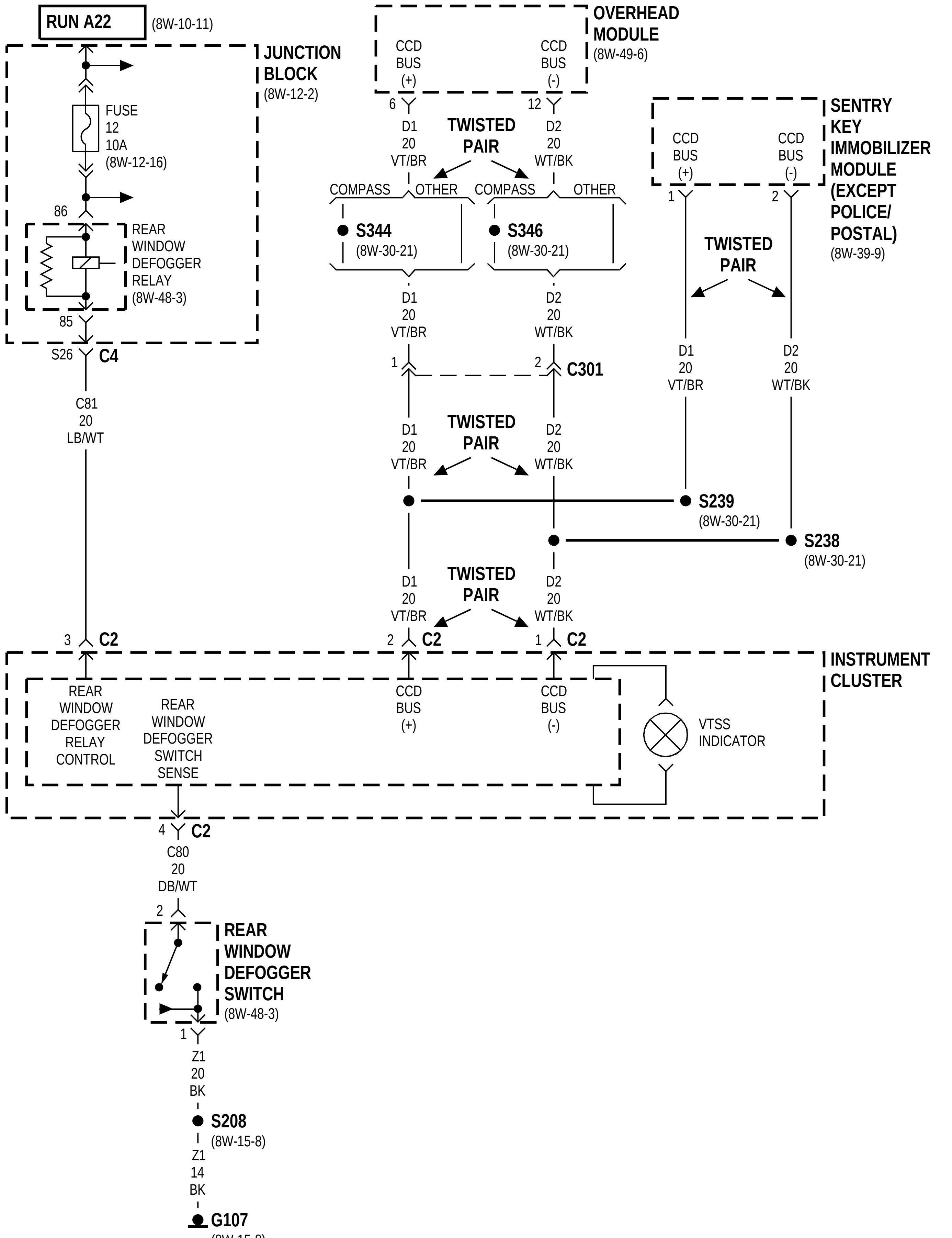

ST-RUN F87
(8W-12-11)
INSTRUMENT CLUSTER
FULL TIME 4WD INDICATOR
PART TIME 4WD INDICATOR
RED BRAKE WARNING INDICATOR
7 C2
5 C2
2 C1
G106 20 BK/WT
G107 20 BK/RD
G99 20 GY/WT
A2
A3
A10
E14
C100
12
8 C107
242 4WD
231 4WD
2
3 C112
4.0L A/T
OTHER
3 C112
BRAKE WARNING PRESSURE SWITCH
1
G9 20 GY/BK
A14
E2
C100
S211
(8W-10-9)
B
D
A
FULL TIME
PART TIME
TRANSFER CASE SWITCH
TRANSFER CASE SWITCH
B
Z1 20 BK
2 C1
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-9)
1 C1
LHD
RHD
66 C201
13 C203
1 C112
1 C112
S107
(8W-15-2)
Z1 16 BK
G101
(8W-15-2)
S207
(8W-15-9)
Z1 14 BK
G108
(8W-15-9)
Z1 20 BK
PARK BRAKE SWITCH
▲ LHD
● RHD


BATT M1
(8W-10-17)
(8W-10-18)
INSTRUMENT CLUSTER
FUSED B(+)
CHIME CONTROL
8 C2
G26
20
LB
S210
(8W-10-10)
1 C2
IGNITION SWITCH
(8W-10-9)
KEY-IN SWITCH
2 C2
G16
20
BK/LB
5
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
(8W-50-2)
0
1
2
6
G16
20
BK/LB
S200
(8W-10-10)
LHD
RHD
17 C200
G16
20
BK/LB
B C317
G16
18
BK/LB
2
DRIVER DOOR JAMB SWITCH
(8W-39-6)
3
Z1
18
BK
C C317
Z1
20
BK
S309
(8W-15-10)
Z1
12
BK
G302
(8W-15-10)
4 C203
G16
20
BK/LB
B C318
G16
18
BK/LB
2
DRIVER DOOR JAMB SWITCH
(8W-39-7)
3
Z1
18
BK
C C318
Z1
20
BK
S310
(8W-15-13)
Z1
12
BK
G303
(8W-15-13)

LHD


RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
12
10A
(8W-12-15)
86
REAR WINDOW DEFOGGER RELAY
(8W-48-2)
85
S26
C4
C81
20
LB/WT
17
C201
C81
20
LB/WT
3
C2
OVERHEAD MODULE
(8W-49-6)
CCD BUS (+)
CCD BUS (-)
6
12
D1
20
VT/BR
TWISTED PAIR
D2
20
WT/BK
COMPASS
OTHER
COMPASS
OTHER
S344
(8W-30-20)
S346
(8W-30-20)
1
2
C301
D1
20
VT/BR
D2
20
WT/BK
55
56
C201
D1
20
VT/BR
TWISTED PAIR
D2
20
WT/BK
SENTRY KEY IMMOBILIZER MODULE
(8W-39-8)
CCD BUS (+)
CCD BUS (-)
1
2
TWISTED PAIR
D1
20
VT/BR
D2
20
WT/BK
S239
(8W-30-20)
S238
(8W-30-20)
D1
20
VT/BR
TWISTED PAIR
D2
20
WT/BK
2
C2
1
C2
INSTRUMENT CLUSTER
REAR WINDOW DEFOGGER RELAY CONTROL
REAR WINDOW DEFOGGER SWITCH SENSE
CCD BUS (+)
CCD BUS (-)
VTSS INDICATOR
4
C2
C80
20
DB/WT
2
REAR WINDOW DEFOGGER SWITCH
(8W-48-2)
1
Z1
20
BK
S208
(8W-15-8)
Z1
14
BK
G107
(8W-15-8)

RHD



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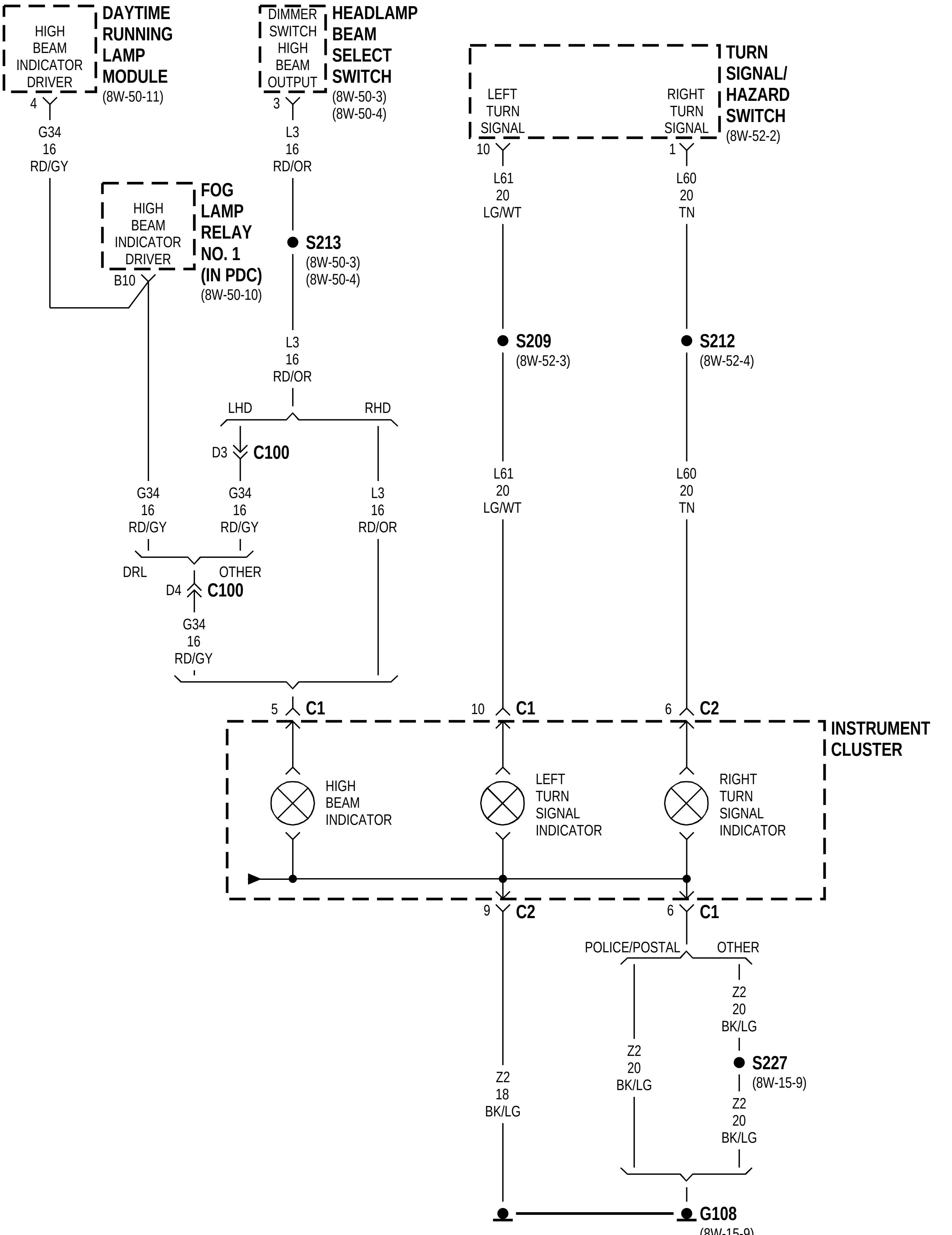
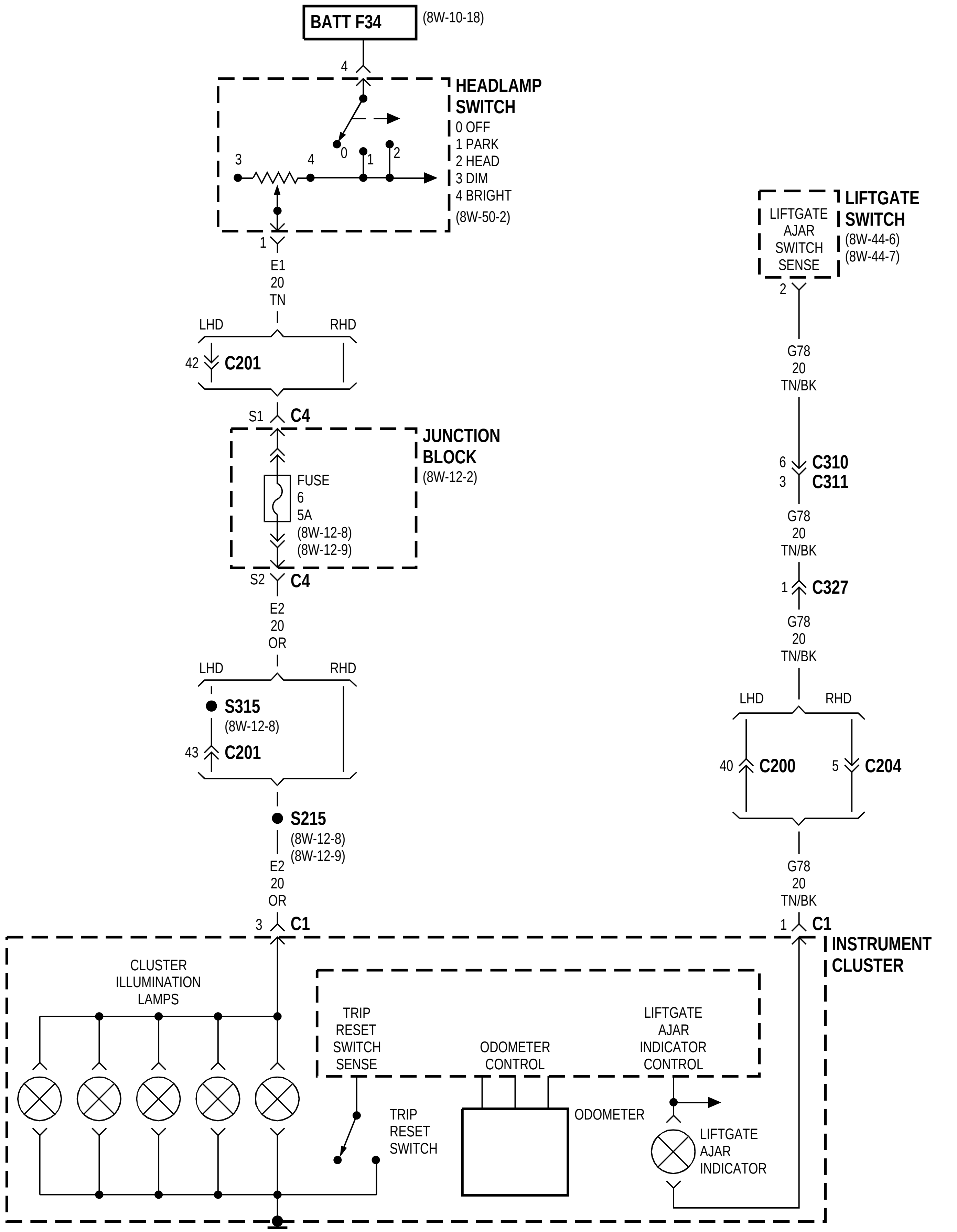
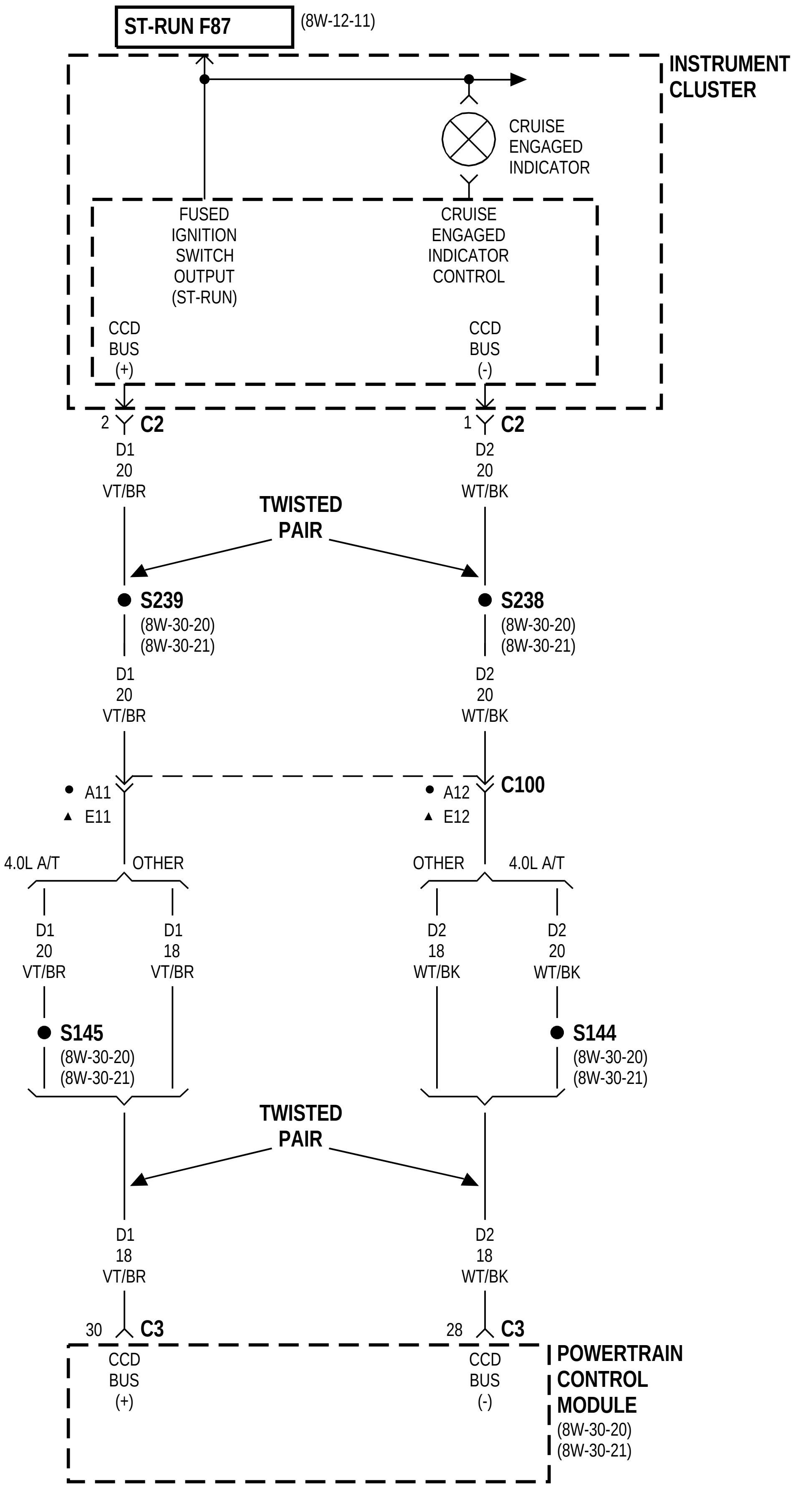
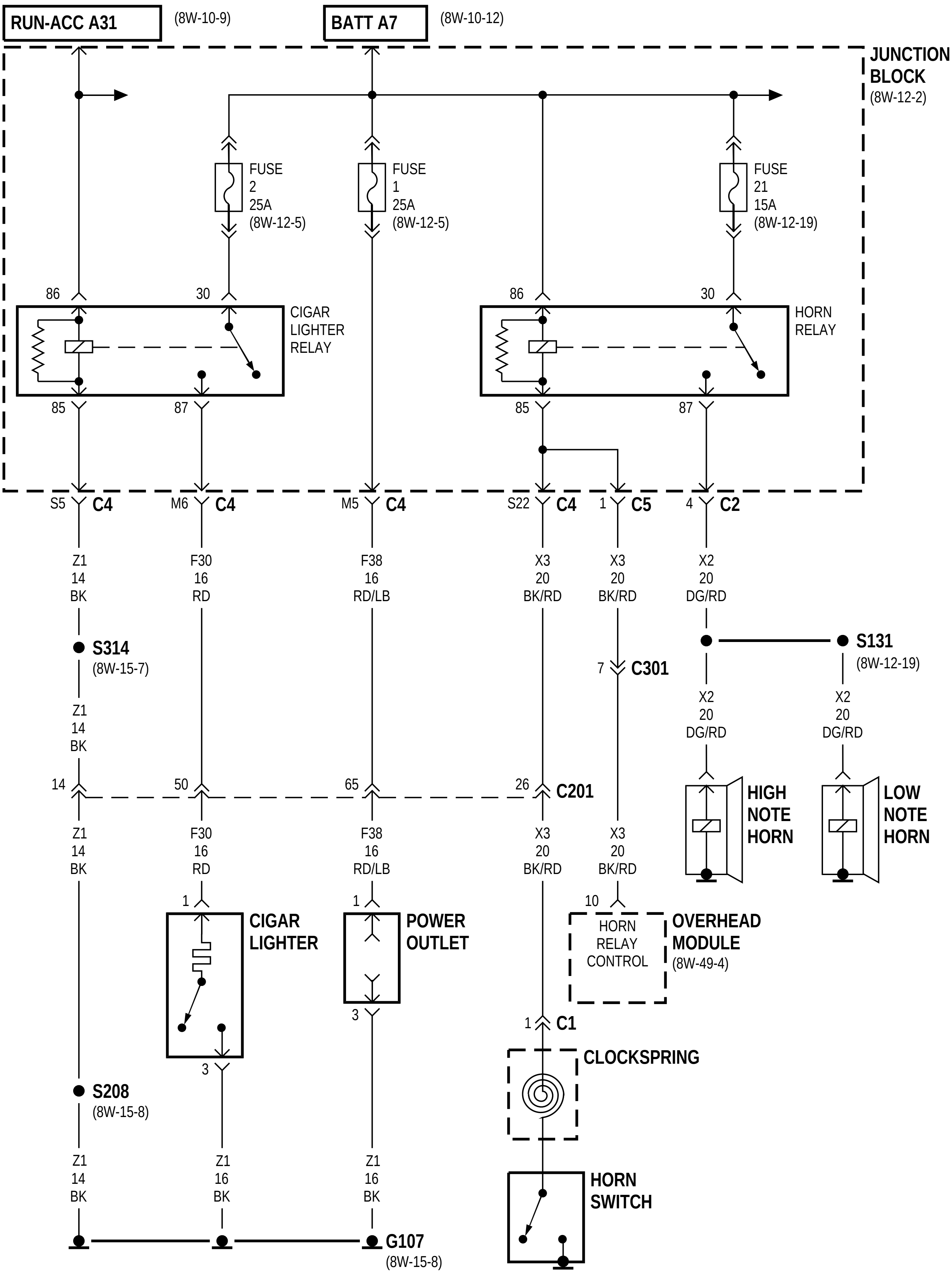


HIGH BEAM INDICATOR DRIVER
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
4
G34 16 RD/GY
DIMMER SWITCH HIGH BEAM OUTPUT
HEADLAMP BEAM SELECT SWITCH
(8W-50-3)
(8W-50-4)
3
L3 16 RD/OR
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
10
1
L61 20 LG/WT
L60 20 TN
HIGH BEAM INDICATOR DRIVER
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-10)
B10
S213
(8W-50-3)
(8W-50-4)
S209
(8W-52-3)
S212
(8W-52-4)
L3 16 RD/OR
LHD
RHD
D3
C100
G34 16 RD/GY
G34 16 RD/GY
L3 16 RD/OR
L61 20 LG/WT
L60 20 TN
DRL
OTHER
D4
C100
G34 16 RD/GY
5
C1
10
C1
6
C2
INSTRUMENT CLUSTER
HIGH BEAM INDICATOR
LEFT TURN SIGNAL INDICATOR
RIGHT TURN SIGNAL INDICATOR
9
C2
6
C1
POLICE/POSTAL
OTHER
Z2 20 BK/LG
S227
(8W-15-9)
Z2 20 BK/LG
Z2 20 BK/LG
Z2 18 BK/LG
G108
(8W-15-9)

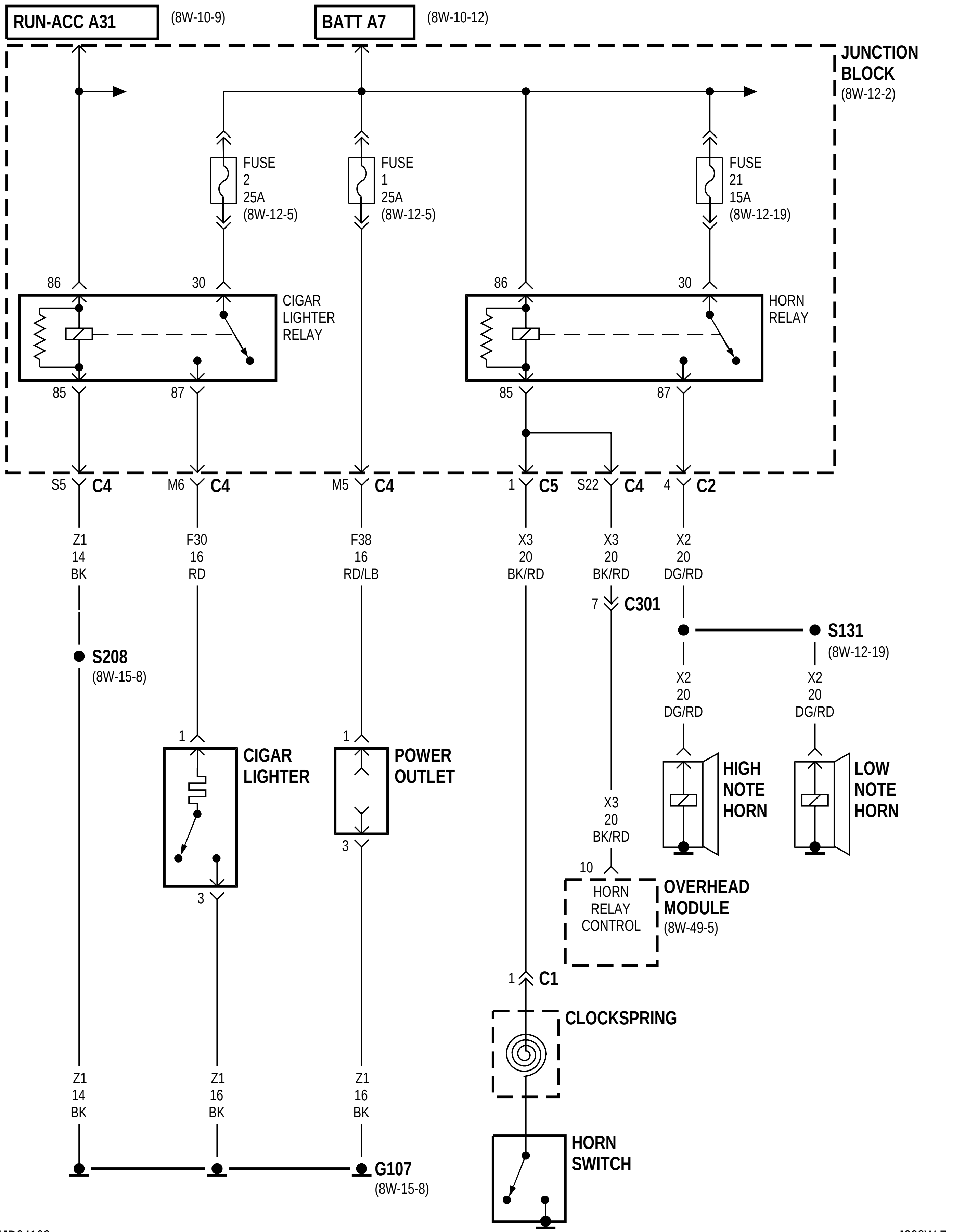

BATT F34
(8W-10-18)
4
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 DIM
4 BRIGHT
(8W-50-2)
3
4
0
1
2
1
E1
20
TN
LHD
RHD
42
C201
S1
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
6
5A
(8W-12-8)
(8W-12-9)
S2
C4
E2
20
OR
LHD
RHD
S315
(8W-12-8)
43
C201
S215
(8W-12-8)
(8W-12-9)
E2
20
OR
3
C1
LIFTGATE AJAR SWITCH SENSE
LIFTGATE SWITCH
(8W-44-6)
(8W-44-7)
2
G78
20
TN/BK
6
C310
3
C311
G78
20
TN/BK
1
C327
G78
20
TN/BK
LHD
RHD
40
C200
5
C204
G78
20
TN/BK
1
C1
INSTRUMENT CLUSTER
CLUSTER ILLUMINATION LAMPS
TRIP RESET SWITCH SENSE
ODOMETER CONTROL
LIFTGATE AJAR INDICATOR CONTROL
TRIP RESET SWITCH
ODOMETER
LIFTGATE AJAR INDICATOR


ST-RUN F87
(8W-12-11)
INSTRUMENT CLUSTER
CRUISE ENGAGED INDICATOR
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
CRUISE ENGAGED INDICATOR CONTROL
CCD BUS (+)
CCD BUS (-)
2 C2
1 C2
D1 20 VT/BR
D2 20 WT/BK
TWISTED PAIR
S239 (8W-30-20) (8W-30-21)
S238 (8W-30-20) (8W-30-21)
D1 20 VT/BR
D2 20 WT/BK
C100
● A11
▲ E11
● A12
▲ E12
4.0L A/T
OTHER
OTHER
4.0L A/T
D1 20 VT/BR
D1 18 VT/BR
D2 18 WT/BK
D2 20 WT/BK
S145 (8W-30-20) (8W-30-21)
S144 (8W-30-20) (8W-30-21)
TWISTED PAIR
D1 18 VT/BR
D2 18 WT/BK
30 C3
28 C3
CCD BUS (+)
CCD BUS (-)
POWERTRAIN CONTROL MODULE
(8W-30-20)
(8W-30-21)
● RHD
▲ LHD

8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

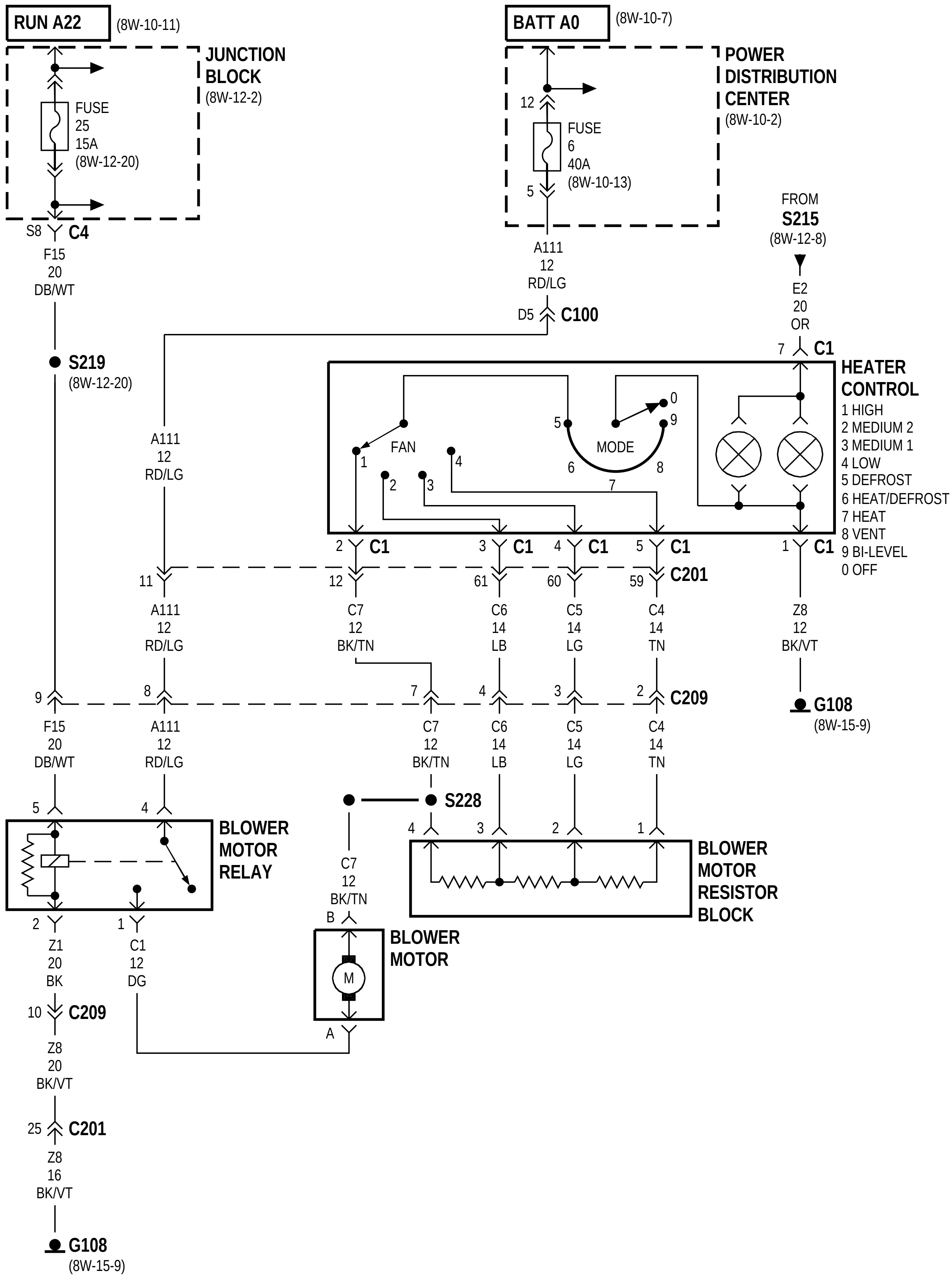

RUN-ACC A31
(8W-10-9)
BATT A7
(8W-10-12)
JUNCTION
BLOCK
(8W-12-2)
FUSE
2
25A
(8W-12-5)
FUSE
1
25A
(8W-12-5)
FUSE
21
15A
(8W-12-19)
86
30
CIGAR
LIGHTER
RELAY
85
87
86
30
HORN
RELAY
85
87
S5 C4
M6 C4
M5 C4
S22 C4
1 C5
4 C2
Z1
14
BK
F30
16
RD
F38
16
RD/LB
X3
20
BK/RD
X3
20
BK/RD
X2
20
DG/RD
S314
(8W-15-7)
7 C301
S131
(8W-12-19)
X2
20
DG/RD
X2
20
DG/RD
14
50
65
26 C201
HIGH
NOTE
HORN
LOW
NOTE
HORN
1
CIGAR
LIGHTER
1
POWER
OUTLET
10
HORN
RELAY
CONTROL
OVERHEAD
MODULE
(8W-49-4)
3
3
1 C1
CLOCKSPRING
S208
(8W-15-8)
Z1
16
BK
HORN
SWITCH
G107
(8W-15-8)

RHD

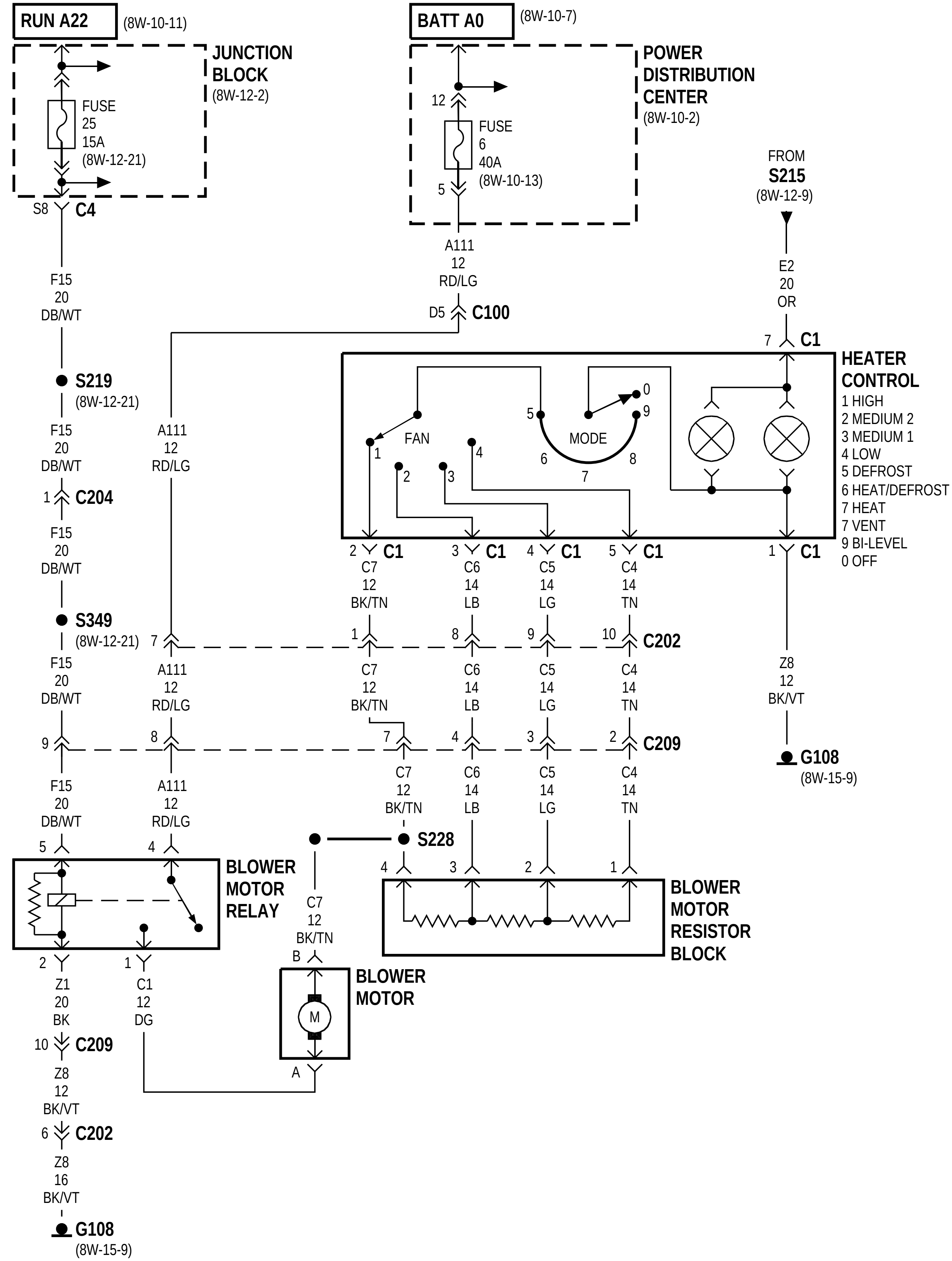

RUN-ACC A31
(8W-10-9)
BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
FUSE 2 25A
(8W-12-5)
FUSE 1 25A
(8W-12-5)
FUSE 21 15A
(8W-12-19)
86
30
CIGAR LIGHTER RELAY
85
87
86
30
HORN RELAY
85
87
S5 C4
M6 C4
M5 C4
1 C5
S22 C4
4 C2
Z1 14 BK
F30 16 RD
F38 16 RD/LB
X3 20 BK/RD
X3 20 BK/RD
X2 20 DG/RD
7 C301
S131
(8W-12-19)
S208
(8W-15-8)
X2 20 DG/RD
X2 20 DG/RD
1
CIGAR LIGHTER
3
1
POWER OUTLET
3
HIGH NOTE HORN
LOW NOTE HORN
X3 20 BK/RD
10
HORN RELAY CONTROL
OVERHEAD MODULE
(8W-49-5)
1 C1
CLOCKSPRING
Z1 14 BK
Z1 16 BK
Z1 16 BK
HORN SWITCH
G107
(8W-15-8)

8W-42 AIR CONDITIONING-HEATER

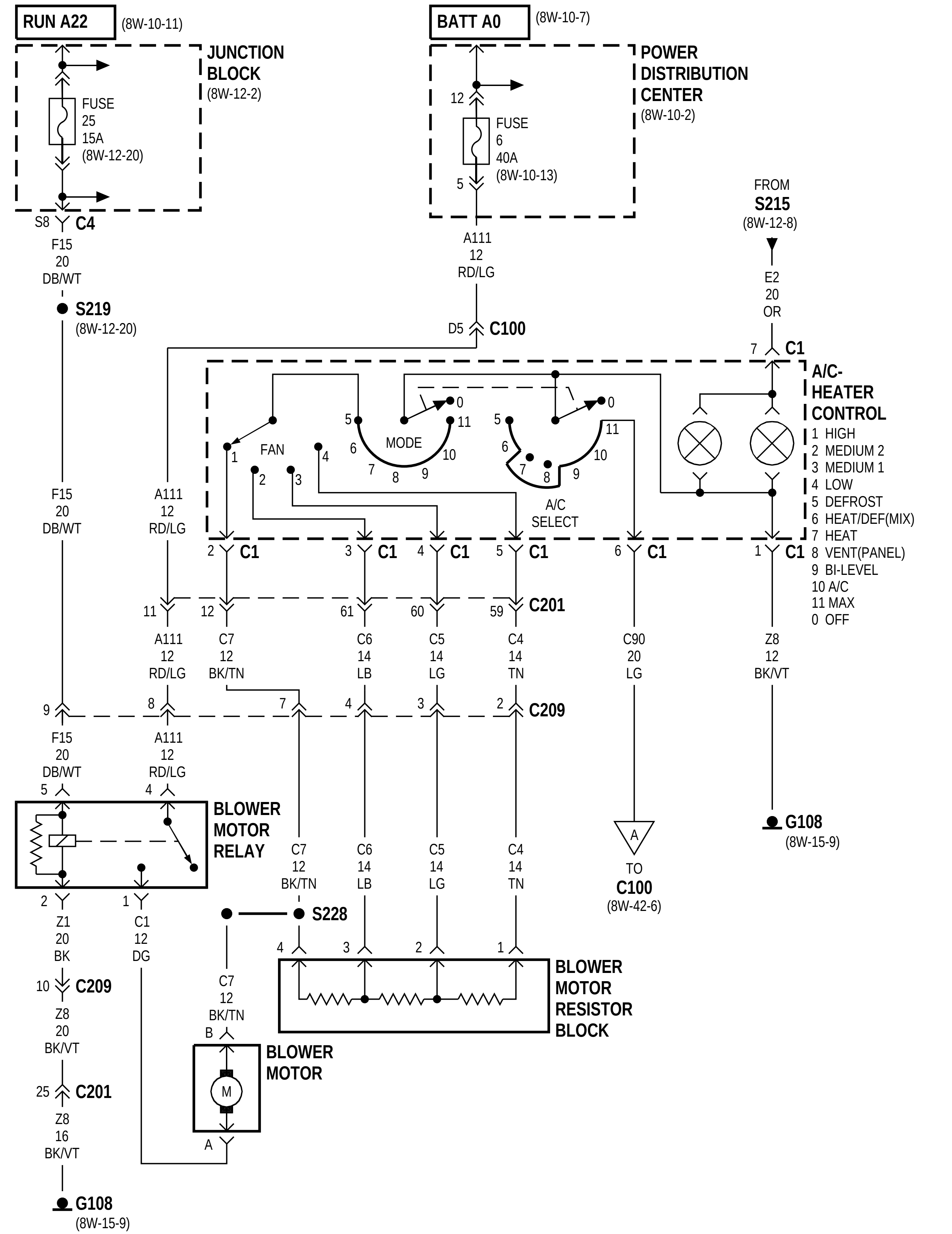
LHD HEATER ONLY



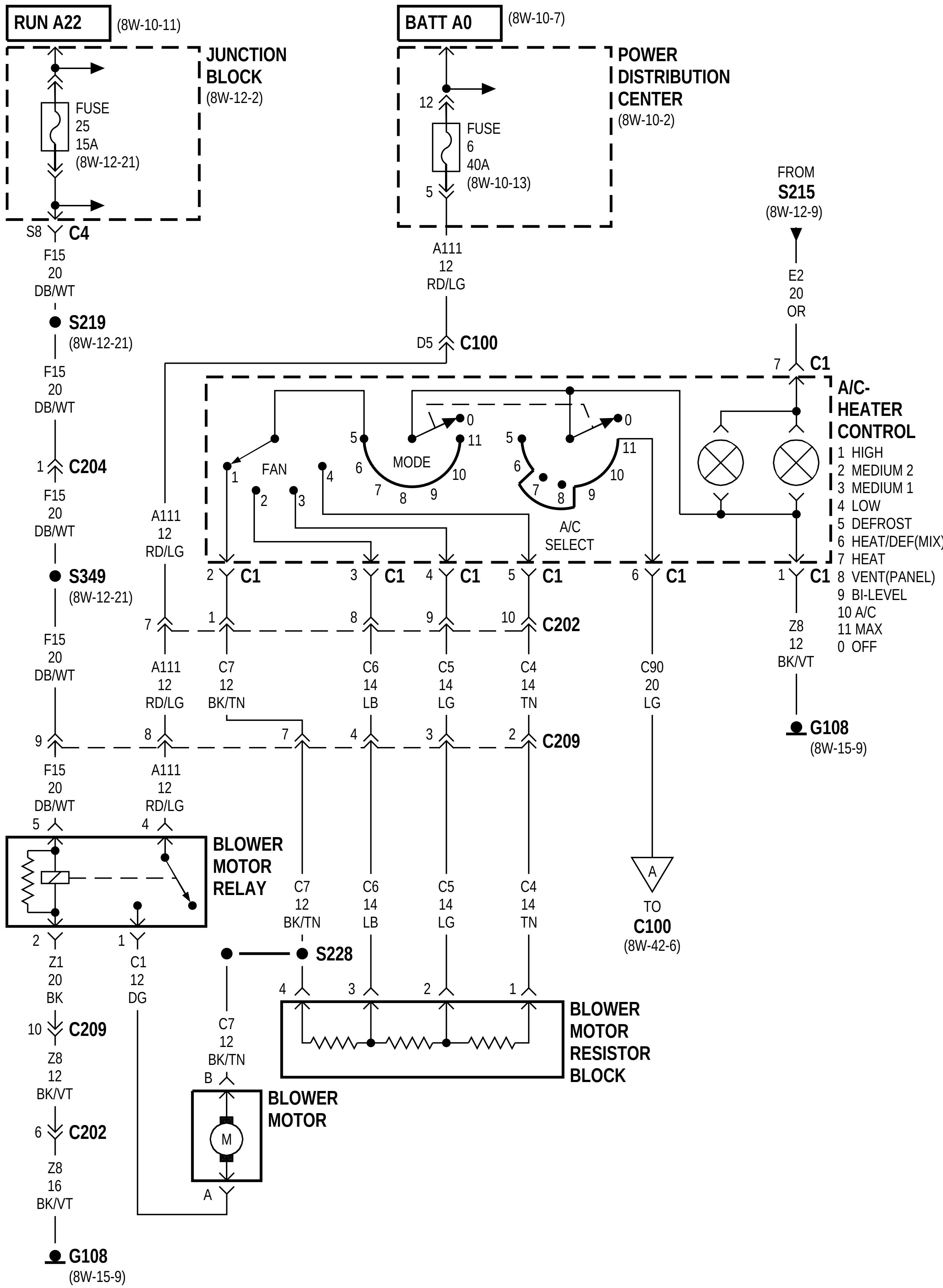
RHD HEATER ONLY

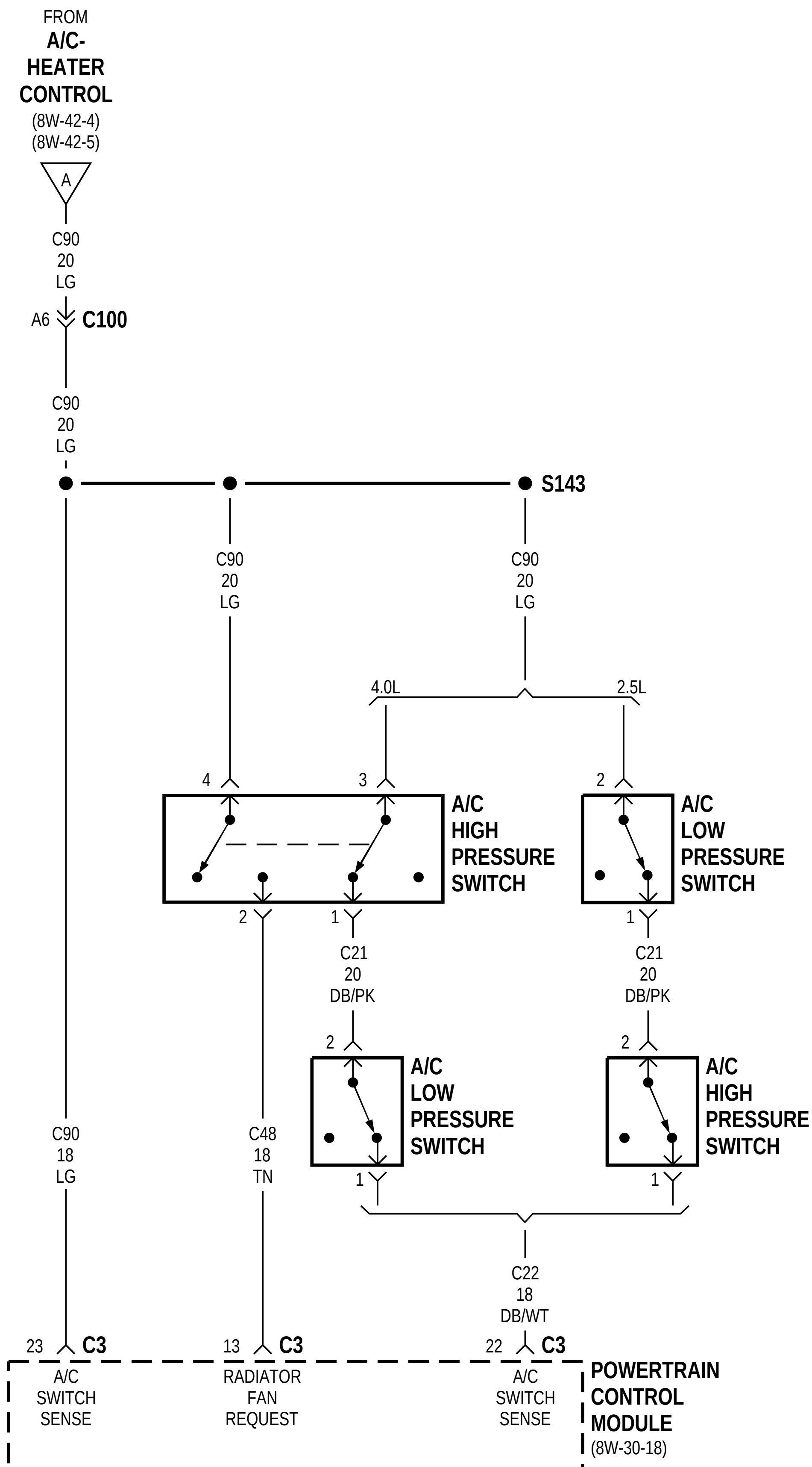


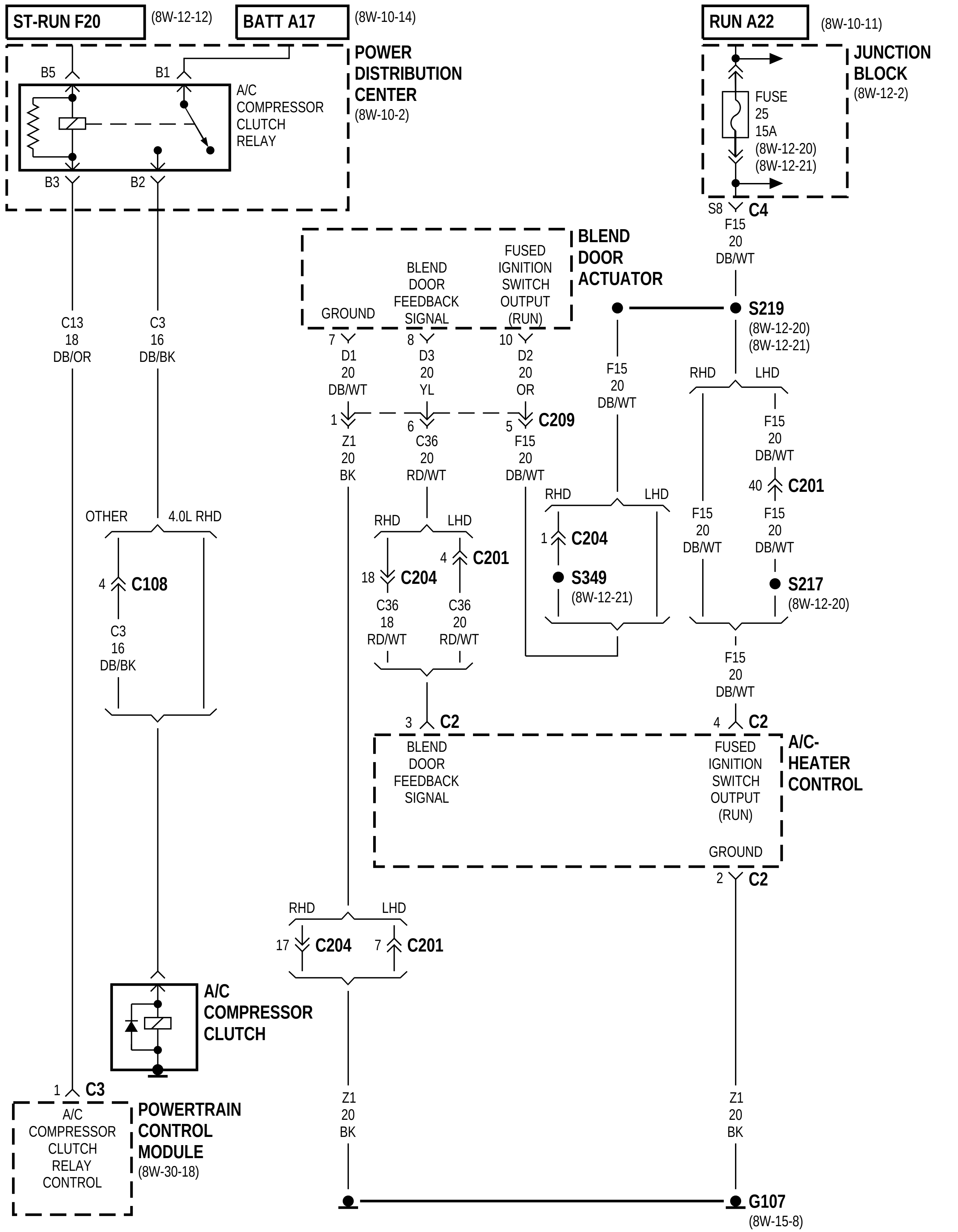
LHD

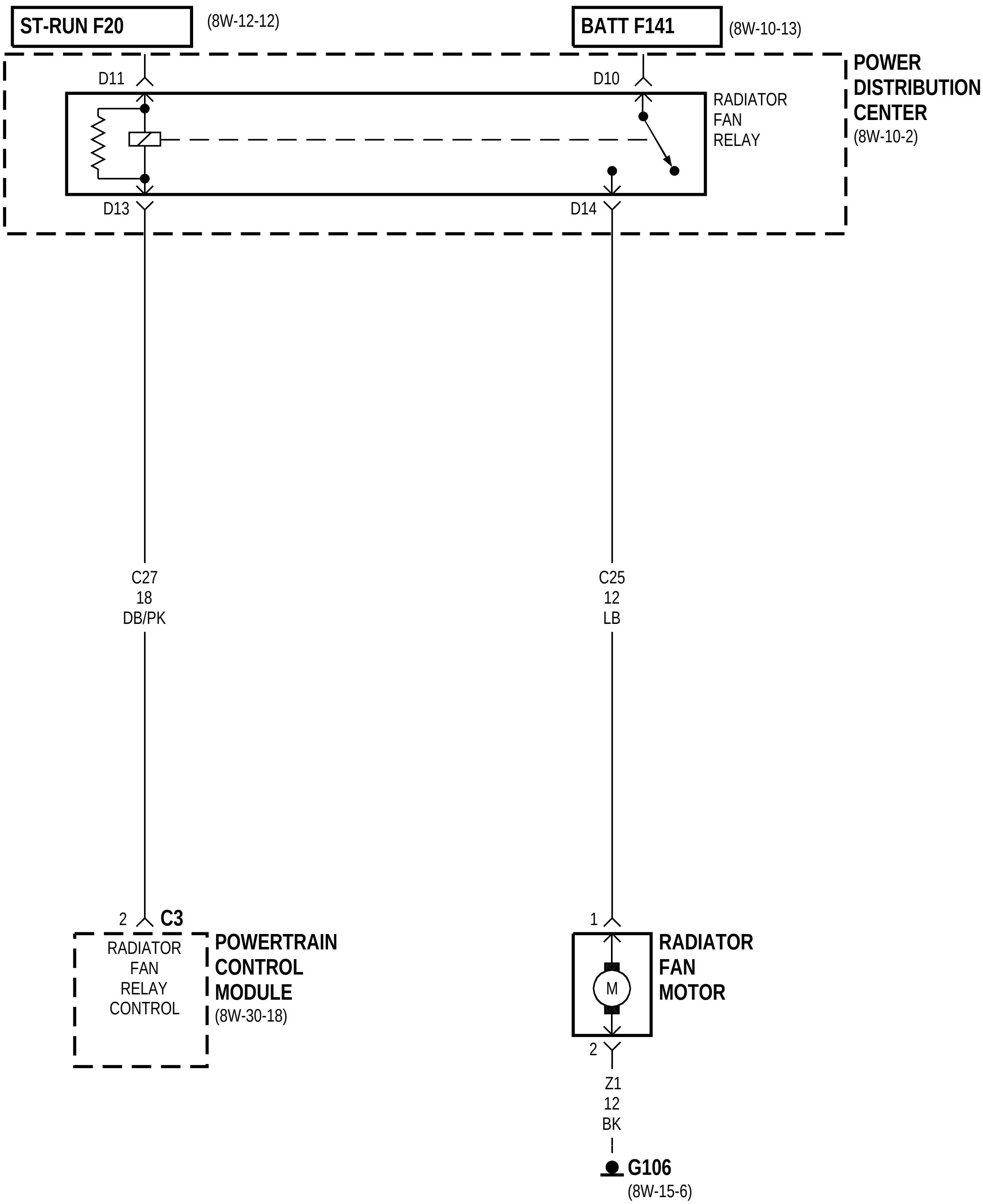


RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 25 15A (8W-12-20)
S8 C4
F15 20 DB/WT
S219
(8W-12-20)
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
12
FUSE 6 40A (8W-10-13)
5
A111 12 RD/LG
D5 C100
FROM S215 (8W-12-8)
E2 20 OR
7 C1
A/C-HEATER CONTROL
1 HIGH
2 MEDIUM 2
3 MEDIUM 1
4 LOW
5 DEFROST
6 HEAT/DEF(MIX)
7 HEAT
8 VENT(PANEL)
9 BI-LEVEL
10 A/C
11 MAX
0 OFF
FAN
MODE
A/C SELECT
2 C1
3 C1
4 C1
5 C1
6 C1
1 C1
11 12 61 60 59 C201
A111 12 RD/LG
C7 12 BK/TN
C6 14 LB
C5 14 LG
C4 14 TN
C90 20 LG
Z8 12 BK/VT
9 8 7 4 3 2 C209
F15 20 DB/WT
A111 12 RD/LG
BLOWER MOTOR RELAY
C7 12 BK/TN
C6 14 LB
C5 14 LG
C4 14 TN
TO C100 (8W-42-6)
G108 (8W-15-9)
Z1 20 BK
C1 12 DG
S228
10 C209
Z8 20 BK/VT
C7 12 BK/TN
BLOWER MOTOR RESISTOR BLOCK
BLOWER MOTOR
25 C201
Z8 16 BK/VT
G108 (8W-15-9)


RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
25
15A
(8W-12-21)
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
12
FUSE
6
40A
(8W-10-13)
5
FROM
S215
(8W-12-9)
S8
C4
F15
20
DB/WT
S219
(8W-12-21)
A111
12
RD/LG
E2
20
OR
D5
C100
7
C1
A/C-HEATER CONTROL
1 HIGH
2 MEDIUM 2
3 MEDIUM 1
4 LOW
5 DEFROST
6 HEAT/DEF(MIX)
7 HEAT
8 VENT(PANEL)
9 BI-LEVEL
10 A/C
11 MAX
0 OFF
FAN
MODE
A/C SELECT
C204
S349
(8W-12-21)
C202
C209
C7
12
BK/TN
C6
14
LB
C5
14
LG
C4
14
TN
C90
20
LG
Z8
12
BK/VT
G108
(8W-15-9)
BLOWER MOTOR RELAY
Z1
20
BK
C1
12
DG
S228
A
TO
C100
(8W-42-6)
BLOWER MOTOR RESISTOR BLOCK
BLOWER MOTOR
M
B
A
Z8
16
BK/VT
G108
(8W-15-9)

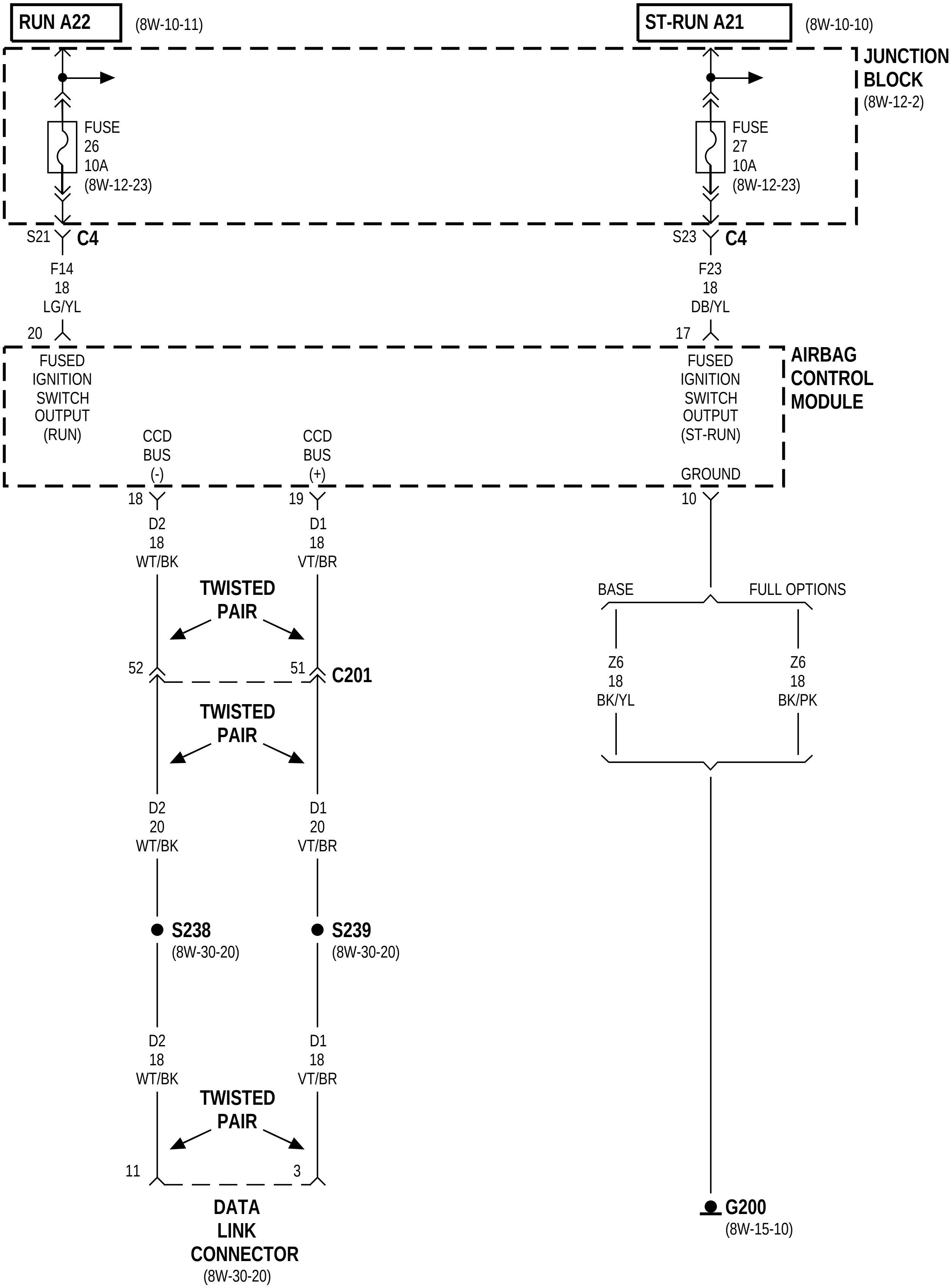

FROM
A/C-HEATER CONTROL
(8W-42-4)
(8W-42-5)
A
C90
20
LG
A6
C100
C90
20
LG
S143
C90
20
LG
C90
20
LG
4.0L
2.5L
4
3
2
A/C HIGH PRESSURE SWITCH
A/C LOW PRESSURE SWITCH
2
1
1
C21
20
DB/PK
C21
20
DB/PK
2
2
A/C LOW PRESSURE SWITCH
A/C HIGH PRESSURE SWITCH
C90
18
LG
C48
18
TN
1
1
C22
18
DB/WT
23
C3
13
C3
22
C3
A/C SWITCH SENSE
RADIATOR FAN REQUEST
A/C SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-18)


ST-RUN F20
(8W-12-12)
BATT A17
(8W-10-14)
RUN A22
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
B5
B1
A/C COMPRESSOR CLUTCH RELAY
B3
B2
JUNCTION BLOCK
(8W-12-2)
FUSE 25 15A
(8W-12-20)
(8W-12-21)
S8
C4
F15 20 DB/WT
BLEND DOOR ACTUATOR
GROUND
BLEND DOOR FEEDBACK SIGNAL
FUSED IGNITION SWITCH OUTPUT (RUN)
S219
(8W-12-20)
(8W-12-21)
C13 18 DB/OR
C3 16 DB/BK
7 D1 20 DB/WT
8 D3 20 YL
10 D2 20 OR
C209
1 Z1 20 BK
6 C36 20 RD/WT
5 F15 20 DB/WT
F15 20 DB/WT
RHD
LHD
40 C201
F15 20 DB/WT
OTHER
4.0L RHD
4 C108
C3 16 DB/BK
18 C204
4 C201
C36 18 RD/WT
C36 20 RD/WT
1 C204
S349
(8W-12-21)
S217
(8W-12-20)
3 C2
4 C2
A/C-HEATER CONTROL
GROUND
2 C2
17 C204
7 C201
A/C COMPRESSOR CLUTCH
1 C3
POWERTRAIN CONTROL MODULE
(8W-30-18)
A/C COMPRESSOR CLUTCH RELAY CONTROL
Z1 20 BK
G107
(8W-15-8)

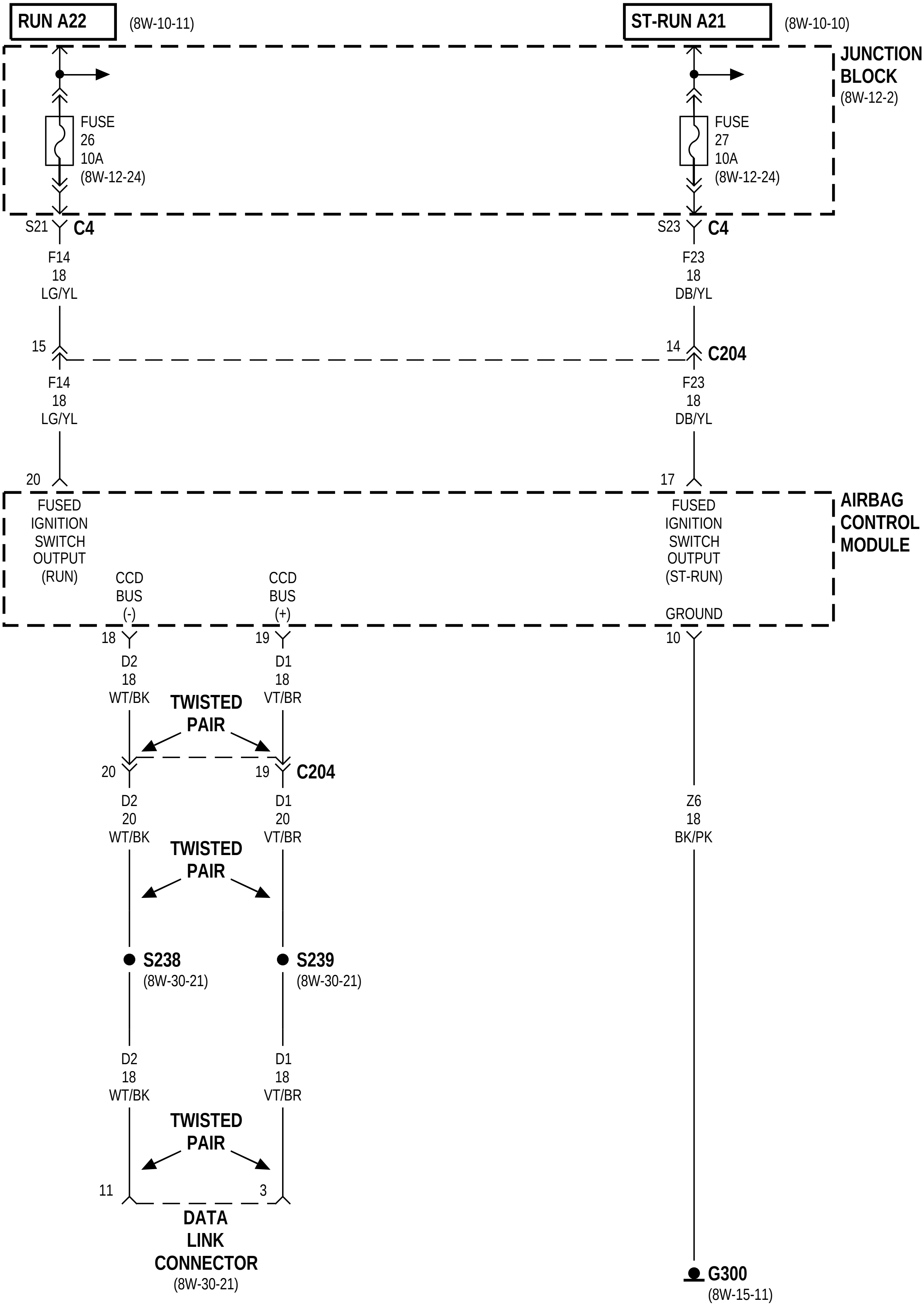

ST-RUN F20
(8W-12-12)
BATT F141
(8W-10-13)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
D11
D10
RADIATOR
FAN
RELAY
D13
D14
C27
18
DB/PK
C25
12
LB
2
C3
RADIATOR
FAN
RELAY
CONTROL
POWERTRAIN
CONTROL
MODULE
(8W-30-18)
1
M
RADIATOR
FAN
MOTOR
2
Z1
12
BK
G106
(8W-15-6)

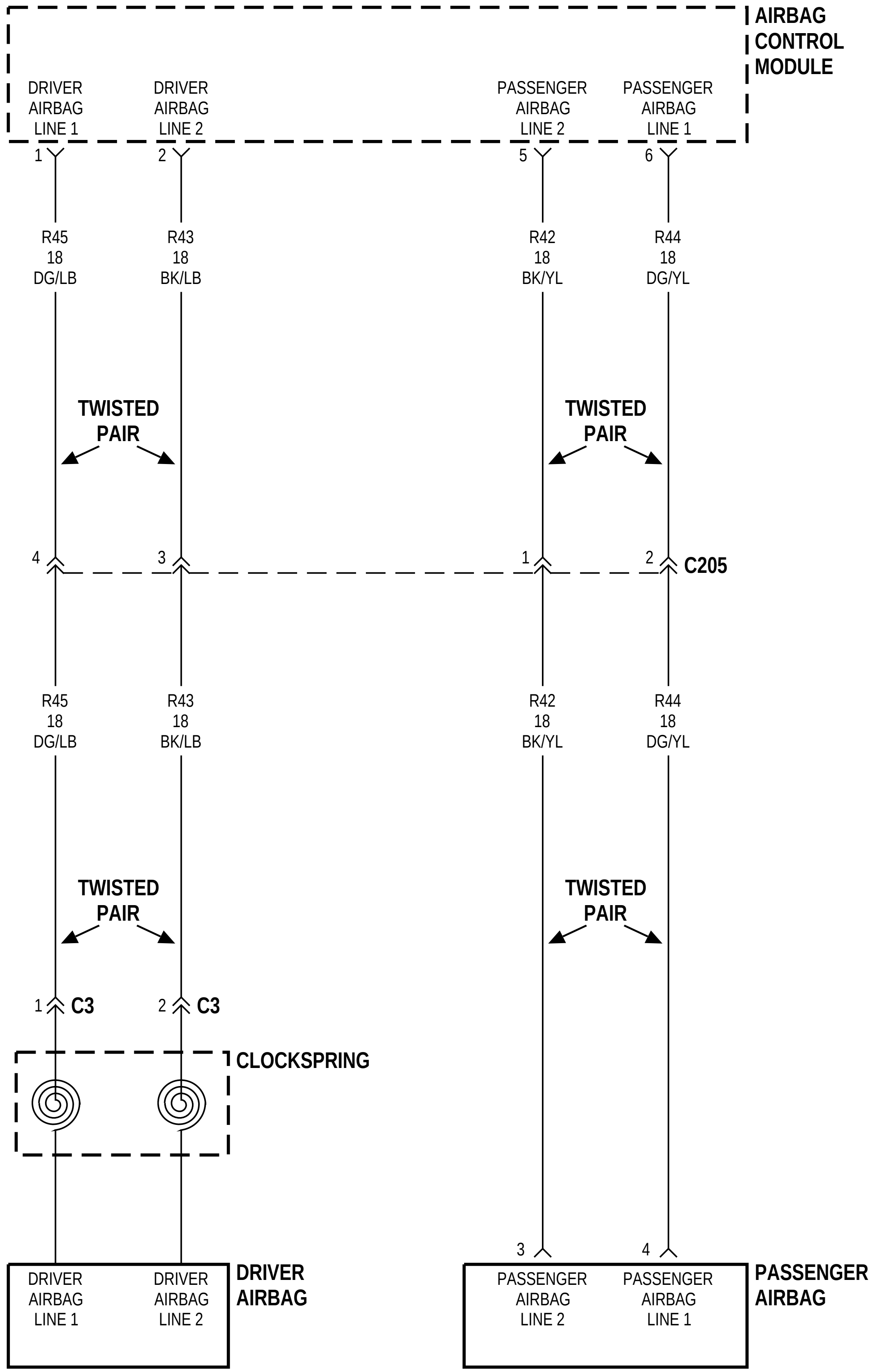
8W-43 AIRBAG SYSTEM

LHD

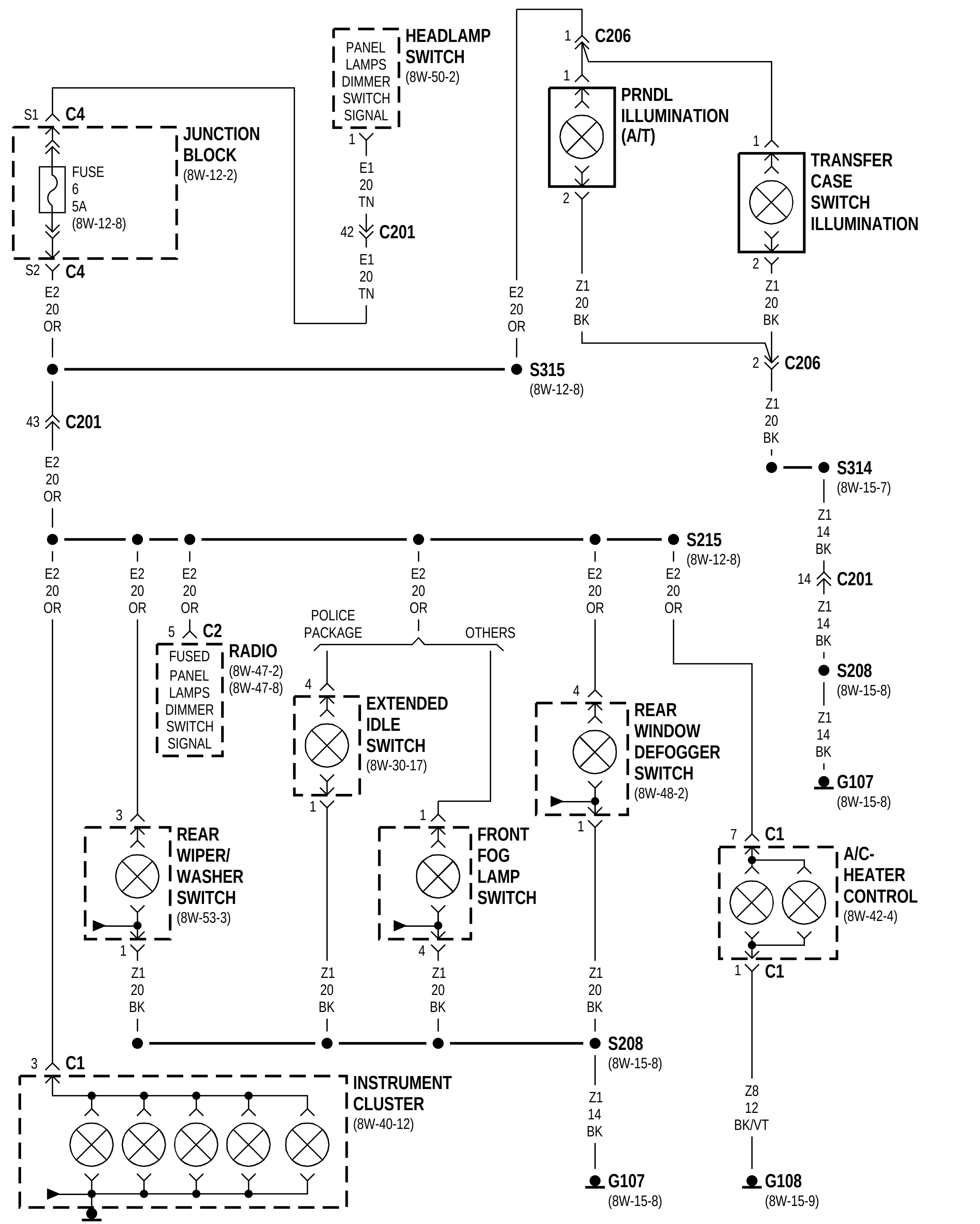

RUN A22
(8W-10-11)
ST-RUN A21
(8W-10-10)
JUNCTION
BLOCK
(8W-12-2)
FUSE
26
10A
(8W-12-23)
FUSE
27
10A
(8W-12-23)
S21
C4
S23
C4
F14
18
LG/YL
F23
18
DB/YL
20
17
FUSED
IGNITION
SWITCH
OUTPUT
(RUN)
FUSED
IGNITION
SWITCH
OUTPUT
(ST-RUN)
AIRBAG
CONTROL
MODULE
CCD
BUS
(-)
CCD
BUS
(+)
GROUND
18
19
10
D2
18
WT/BK
D1
18
VT/BR
TWISTED
PAIR
BASE
FULL OPTIONS
52
51
C201
Z6
18
BK/YL
Z6
18
BK/PK
TWISTED
PAIR
D2
20
WT/BK
D1
20
VT/BR
S238
(8W-30-20)
S239
(8W-30-20)
D2
18
WT/BK
D1
18
VT/BR
TWISTED
PAIR
11
3
DATA
LINK
CONNECTOR
(8W-30-20)
G200
(8W-15-10)

8W-43 AIRBAG SYSTEM
RHD

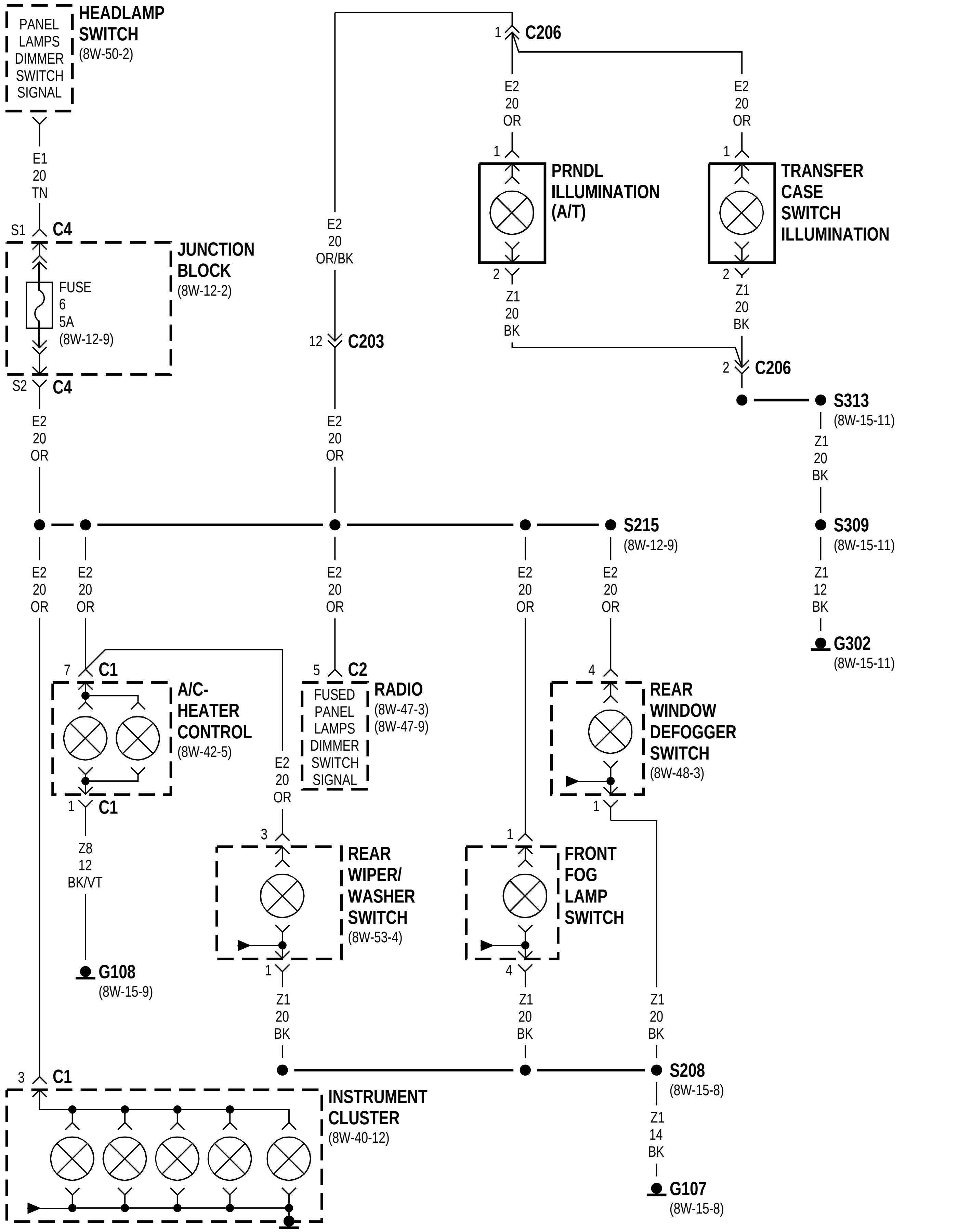


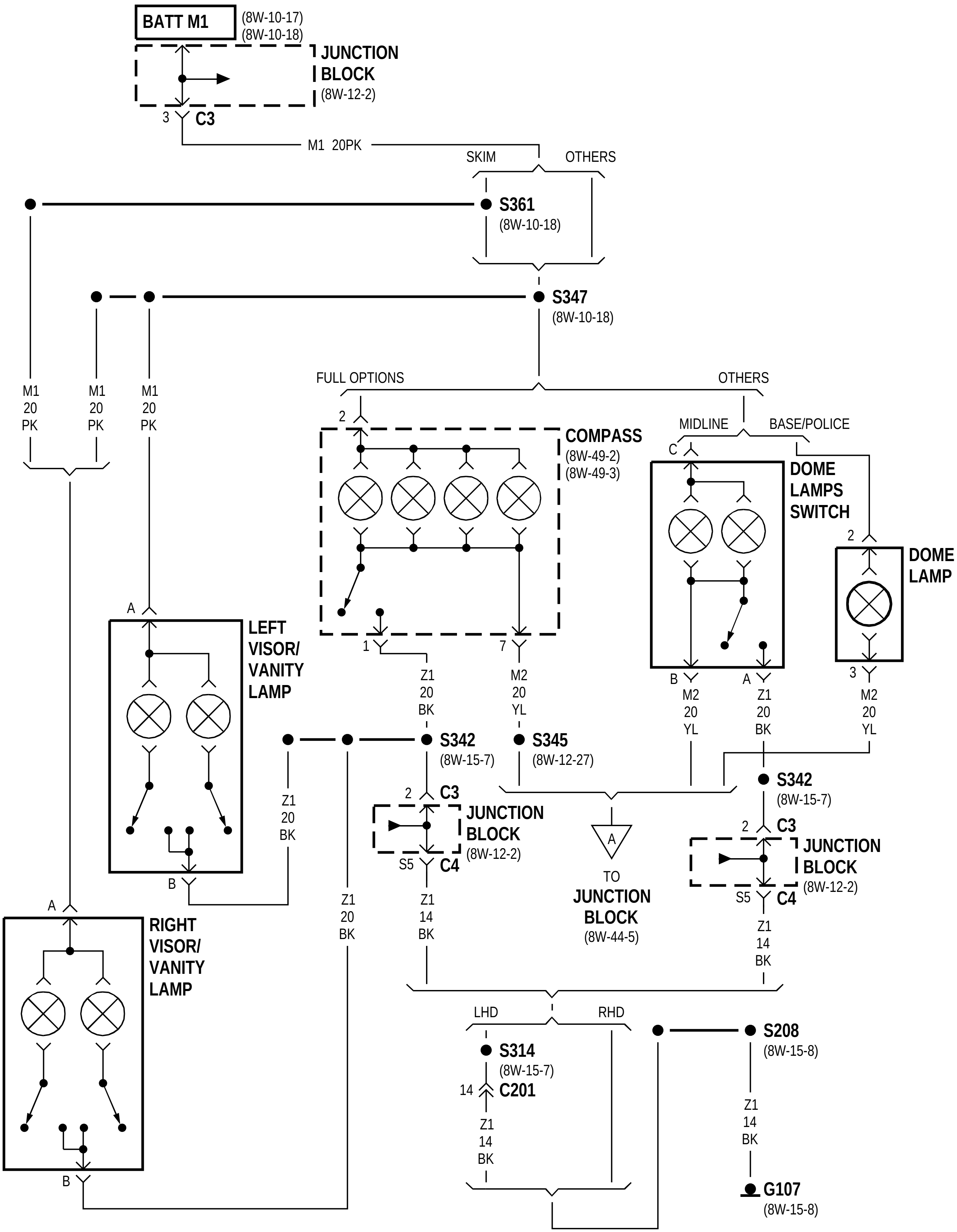

AIRBAG CONTROL MODULE
DRIVER AIRBAG LINE 1
DRIVER AIRBAG LINE 2
PASSENGER AIRBAG LINE 2
PASSENGER AIRBAG LINE 1
1
2
5
6
R45 18 DG/LB
R43 18 BK/LB
R42 18 BK/YL
R44 18 DG/YL
TWISTED PAIR
TWISTED PAIR
4
3
1
2
C205
R45 18 DG/LB
R43 18 BK/LB
R42 18 BK/YL
R44 18 DG/YL
TWISTED PAIR
TWISTED PAIR
1 C3
2 C3
CLOCKSPRING
3
4
DRIVER AIRBAG LINE 1
DRIVER AIRBAG LINE 2
DRIVER AIRBAG
PASSENGER AIRBAG LINE 2
PASSENGER AIRBAG LINE 1
PASSENGER AIRBAG

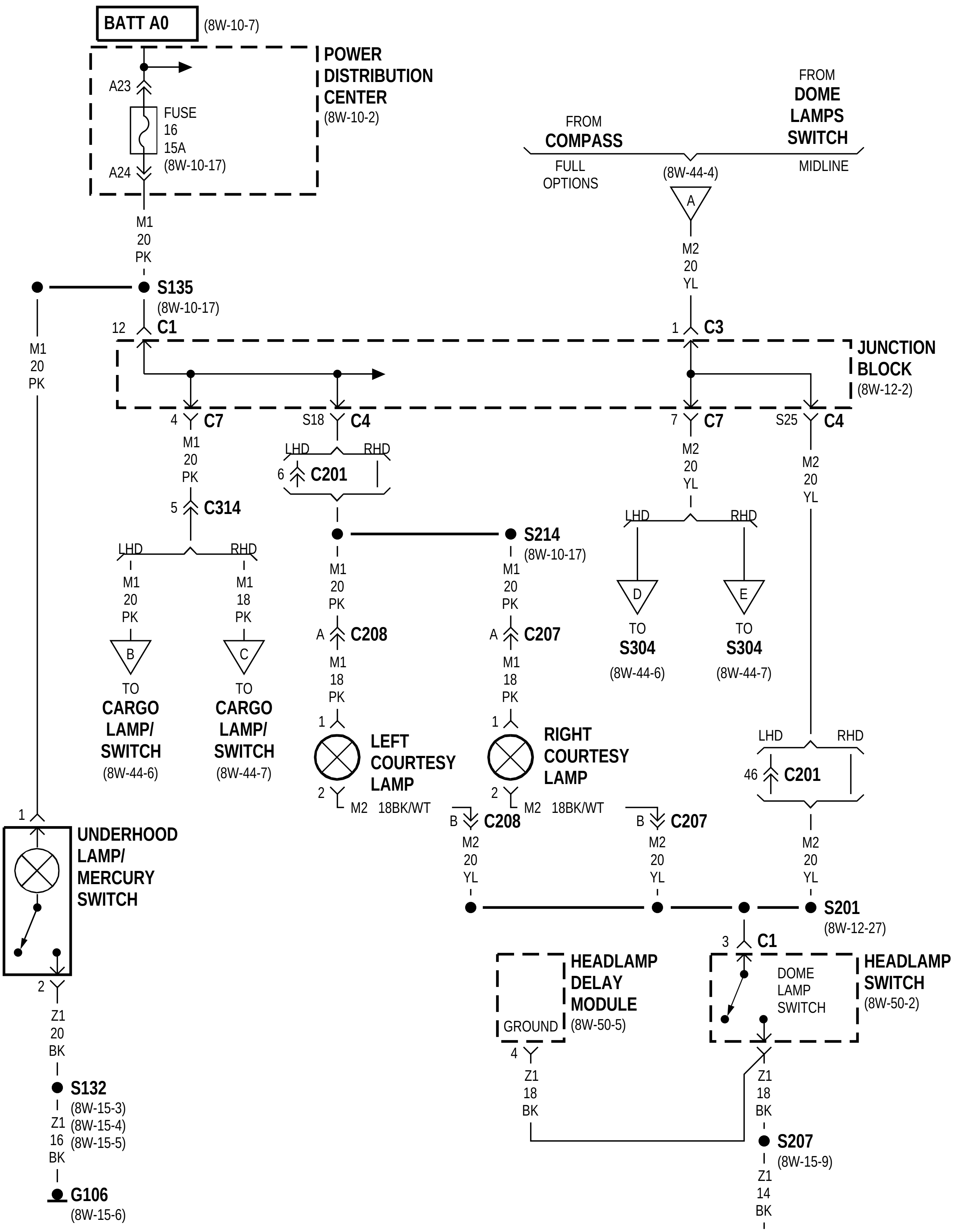
8W-44 INTERIOR LIGHTING

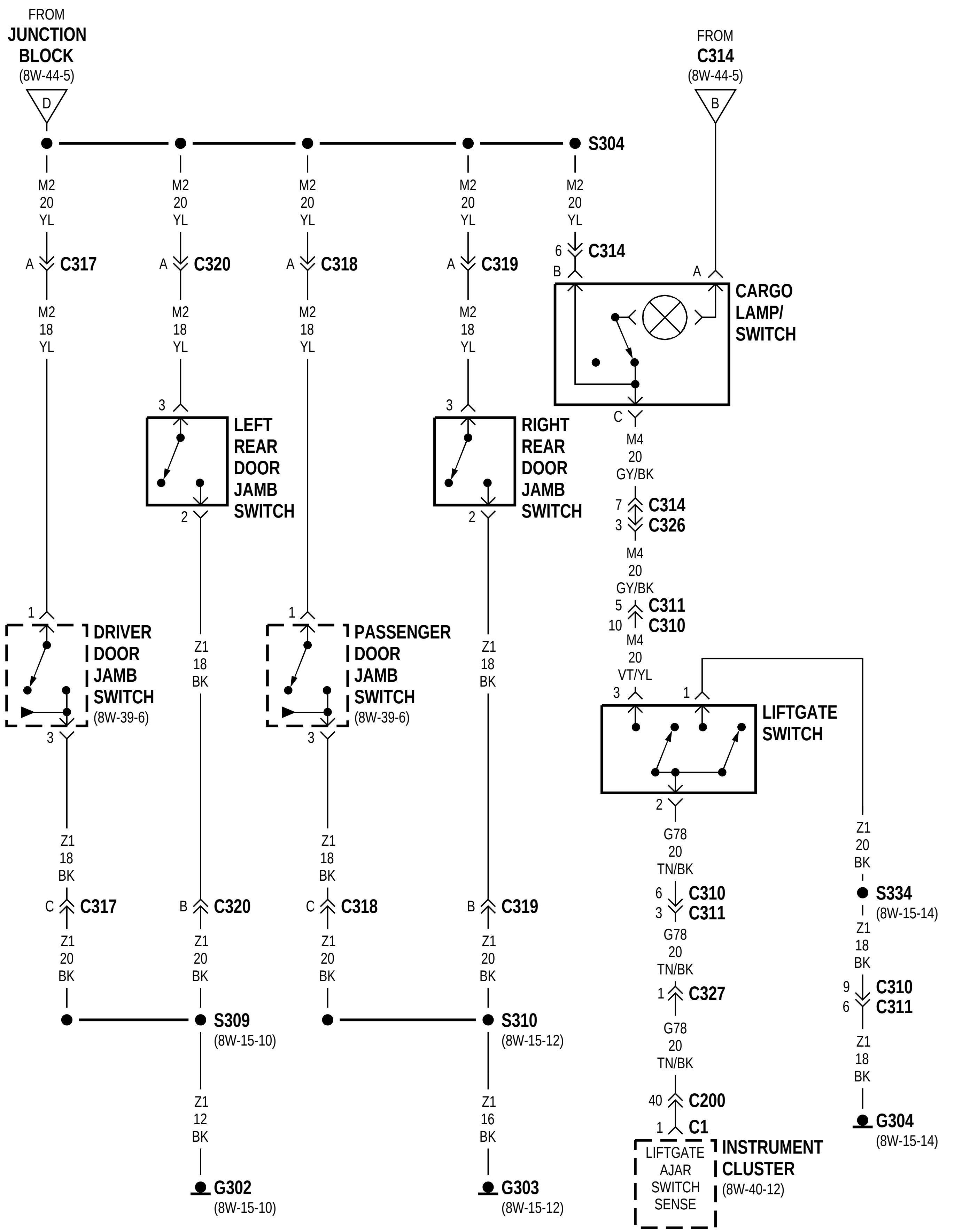


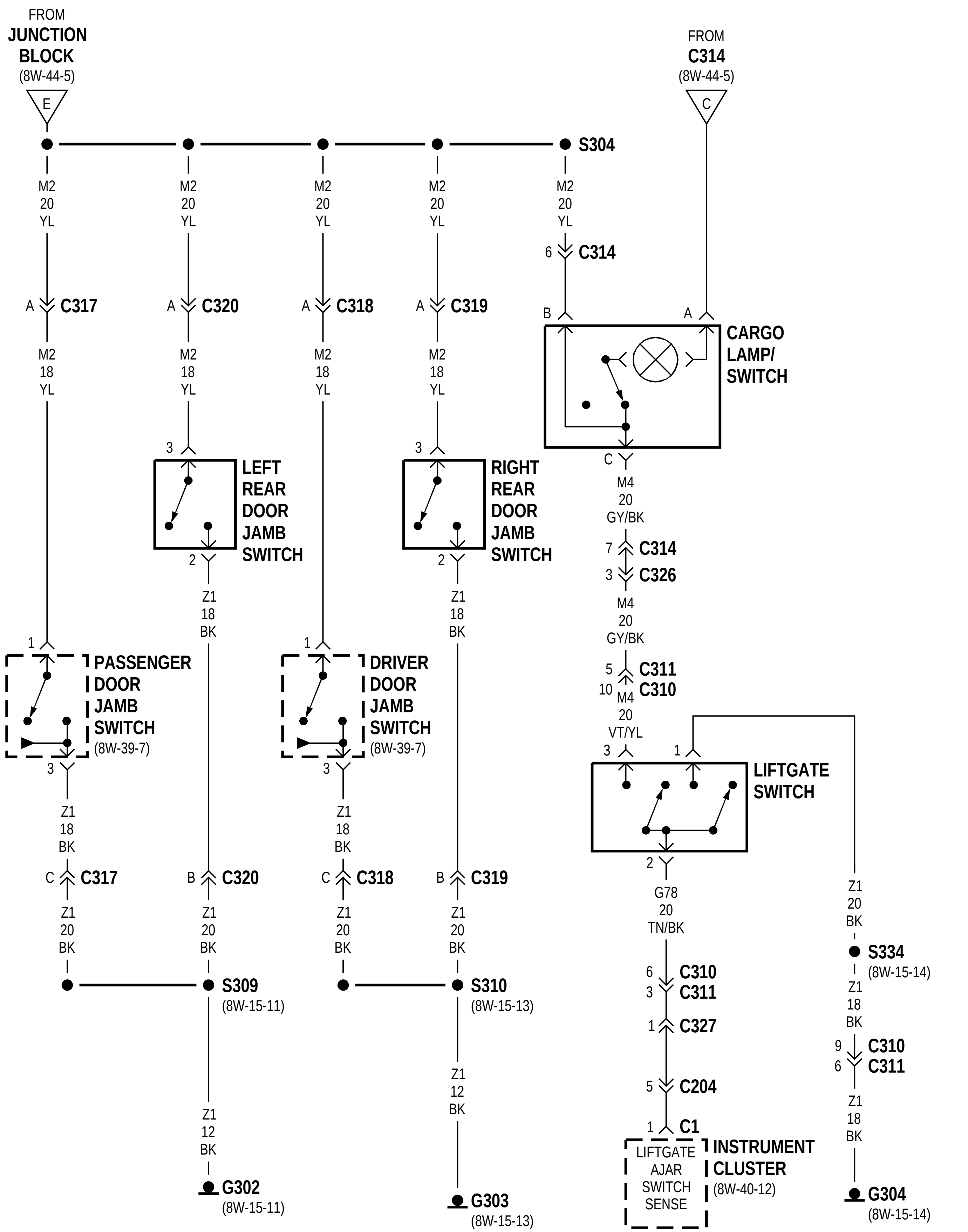
C206
PRNDL ILLUMINATION (A/T)
TRANSFER CASE SWITCH ILLUMINATION
HEADLAMP SWITCH
(8W-50-2)
PANEL LAMPS DIMMER SWITCH SIGNAL
E1 20 TN
C201
C4
JUNCTION BLOCK
(8W-12-2)
FUSE 6 5A (8W-12-8)
E2 20 OR
Z1 20 BK
S315
(8W-12-8)
S314
(8W-15-7)
Z1 14 BK
S215
(8W-12-8)
S208
(8W-15-8)
G107
(8W-15-8)
C2
RADIO
(8W-47-2)
(8W-47-8)
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
POLICE PACKAGE
OTHERS
EXTENDED IDLE SWITCH
(8W-30-17)
REAR WINDOW DEFOGGER SWITCH
(8W-48-2)
REAR WIPER/ WASHER SWITCH
(8W-53-3)
FRONT FOG LAMP SWITCH
C1
A/C-HEATER CONTROL
(8W-42-4)
INSTRUMENT CLUSTER
(8W-40-12)
Z8 12 BK/VT
G108
(8W-15-9)


PANEL LAMPS DIMMER SWITCH SIGNAL
HEADLAMP SWITCH
(8W-50-2)
E1 20 TN
S1 C4
JUNCTION BLOCK
(8W-12-2)
FUSE 6 5A (8W-12-9)
S2 C4
E2 20 OR
E2 20 OR/BK
12 C203
1 C206
E2 20 OR
1
PRNDL ILLUMINATION (A/T)
2
Z1 20 BK
TRANSFER CASE SWITCH ILLUMINATION
2 C206
S313
(8W-15-11)
Z1 20 BK
S309
(8W-15-11)
Z1 12 BK
G302
(8W-15-11)
S215
(8W-12-9)
7 C1
A/C-HEATER CONTROL
(8W-42-5)
1 C1
Z8 12 BK/VT
G108
(8W-15-9)
5 C2
RADIO
(8W-47-3)
(8W-47-9)
FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
4
REAR WINDOW DEFOGGER SWITCH
(8W-48-3)
3
REAR WIPER/ WASHER SWITCH
(8W-53-4)
FRONT FOG LAMP SWITCH
4
Z1 20 BK
S208
(8W-15-8)
Z1 14 BK
G107
(8W-15-8)
3 C1
INSTRUMENT CLUSTER
(8W-40-12)


BATT M1
(8W-10-17)
(8W-10-18)
JUNCTION BLOCK
(8W-12-2)
3
C3
M1 20PK
SKIM
OTHERS
S361
(8W-10-18)
S347
(8W-10-18)
FULL OPTIONS
OTHERS
M1 20 PK
M1 20 PK
M1 20 PK
2
COMPASS
(8W-49-2)
(8W-49-3)
MIDLINE
BASE/POLICE
C
DOME LAMPS SWITCH
2
DOME LAMP
A
LEFT VISOR/ VANITY LAMP
1
7
Z1 20 BK
M2 20 YL
B
A
M2 20 YL
Z1 20 BK
3
M2 20 YL
S342
(8W-15-7)
S345
(8W-12-27)
S342
(8W-15-7)
Z1 20 BK
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
A
TO JUNCTION BLOCK
(8W-44-5)
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
B
A
RIGHT VISOR/ VANITY LAMP
Z1 20 BK
Z1 14 BK
Z1 14 BK
LHD
RHD
S314
(8W-15-7)
14
C201
Z1 14 BK
S208
(8W-15-8)
Z1 14 BK
G107
(8W-15-8)
B

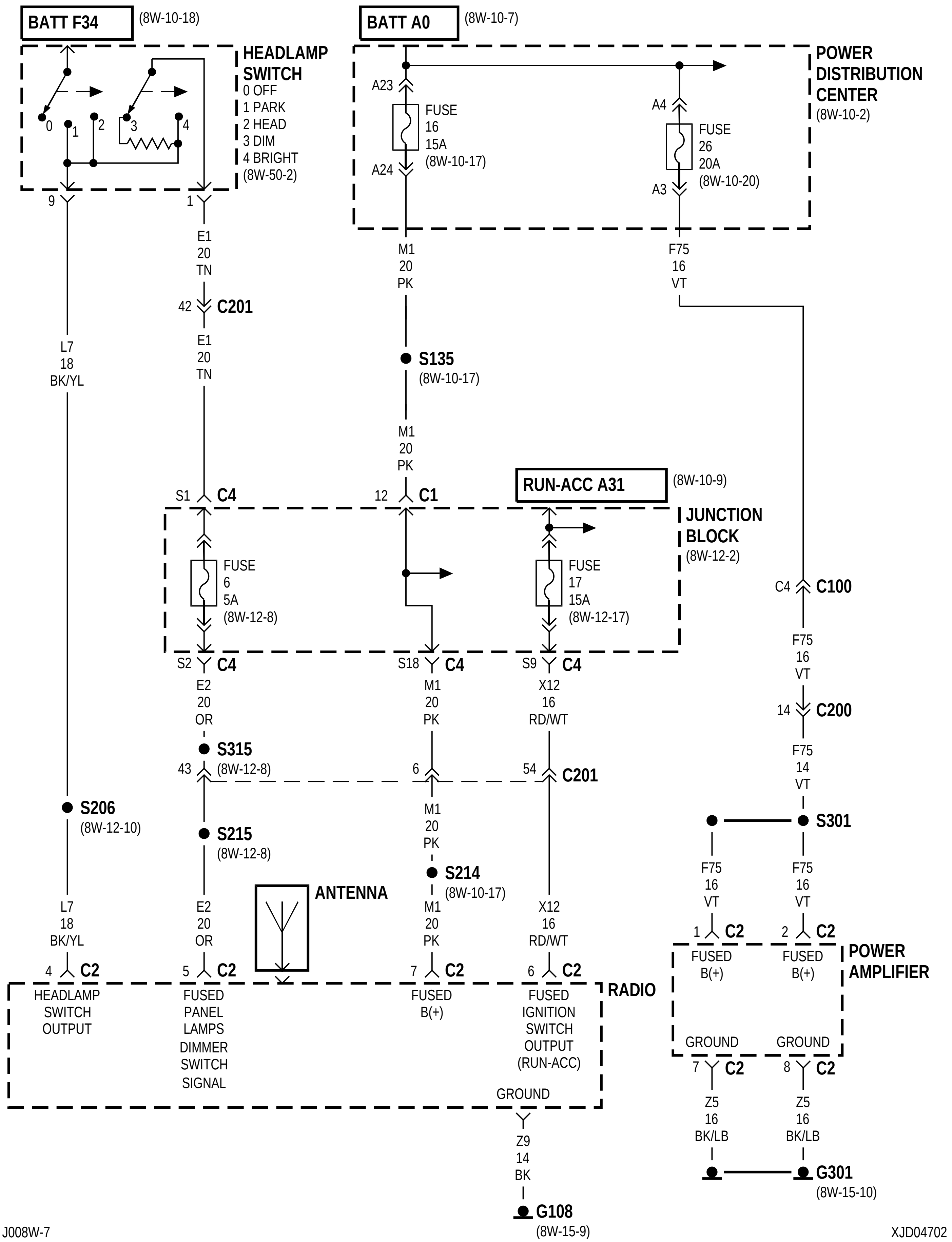

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
12
C1
M1
20
PK
FROM
COMPASS
FULL OPTIONS
FROM
DOME LAMPS SWITCH
MIDLINE
(8W-44-4)
A
M2
20
YL
1
C3
JUNCTION BLOCK
(8W-12-2)
4
C7
S18
C4
7
C7
S25
C4
LHD
RHD
6
C201
5
C314
S214
(8W-10-17)
B
TO
CARGO LAMP/ SWITCH
(8W-44-6)
C
TO
CARGO LAMP/ SWITCH
(8W-44-7)
M1
18
PK
A
C208
A
C207
LEFT COURTESY LAMP
RIGHT COURTESY LAMP
M2 18BK/WT
D
TO
S304
(8W-44-6)
E
TO
S304
(8W-44-7)
46
C201
B
C208
B
C207
S201
(8W-12-27)
UNDERHOOD LAMP/ MERCURY SWITCH
3
C1
HEADLAMP DELAY MODULE
GROUND
(8W-50-5)
DOME LAMP SWITCH
HEADLAMP SWITCH
(8W-50-2)
Z1
20
BK
S132
(8W-15-3)
(8W-15-4)
(8W-15-5)
Z1
16
BK
G106
(8W-15-6)
Z1
18
BK
S207
(8W-15-9)
Z1
14
BK
G108
(8W-15-9)


FROM
JUNCTION BLOCK
(8W-44-5)
D
FROM
C314
(8W-44-5)
B
S304
M2
20
YL
A C317
A C320
A C318
A C319
6 C314
B
A
M2
18
YL
CARGO LAMP/ SWITCH
C
M4
20
GY/BK
7 C314
3 C326
5 C311
10 C310
M4
20
VT/YL
3
1
LIFTGATE SWITCH
2
G78
20
TN/BK
6 C310
3 C311
1 C327
40 C200
1 C1
LIFTGATE AJAR SWITCH SENSE
INSTRUMENT CLUSTER
(8W-40-12)
Z1
20
BK
S334
(8W-15-14)
Z1
18
BK
9 C310
6 C311
G304
(8W-15-14)
LEFT REAR DOOR JAMB SWITCH
RIGHT REAR DOOR JAMB SWITCH
DRIVER DOOR JAMB SWITCH
(8W-39-6)
PASSENGER DOOR JAMB SWITCH
(8W-39-6)
Z1
18
BK
C C317
B C320
C C318
B C319
S309
(8W-15-10)
S310
(8W-15-12)
Z1
12
BK
Z1
16
BK
G302
(8W-15-10)
G303
(8W-15-12)

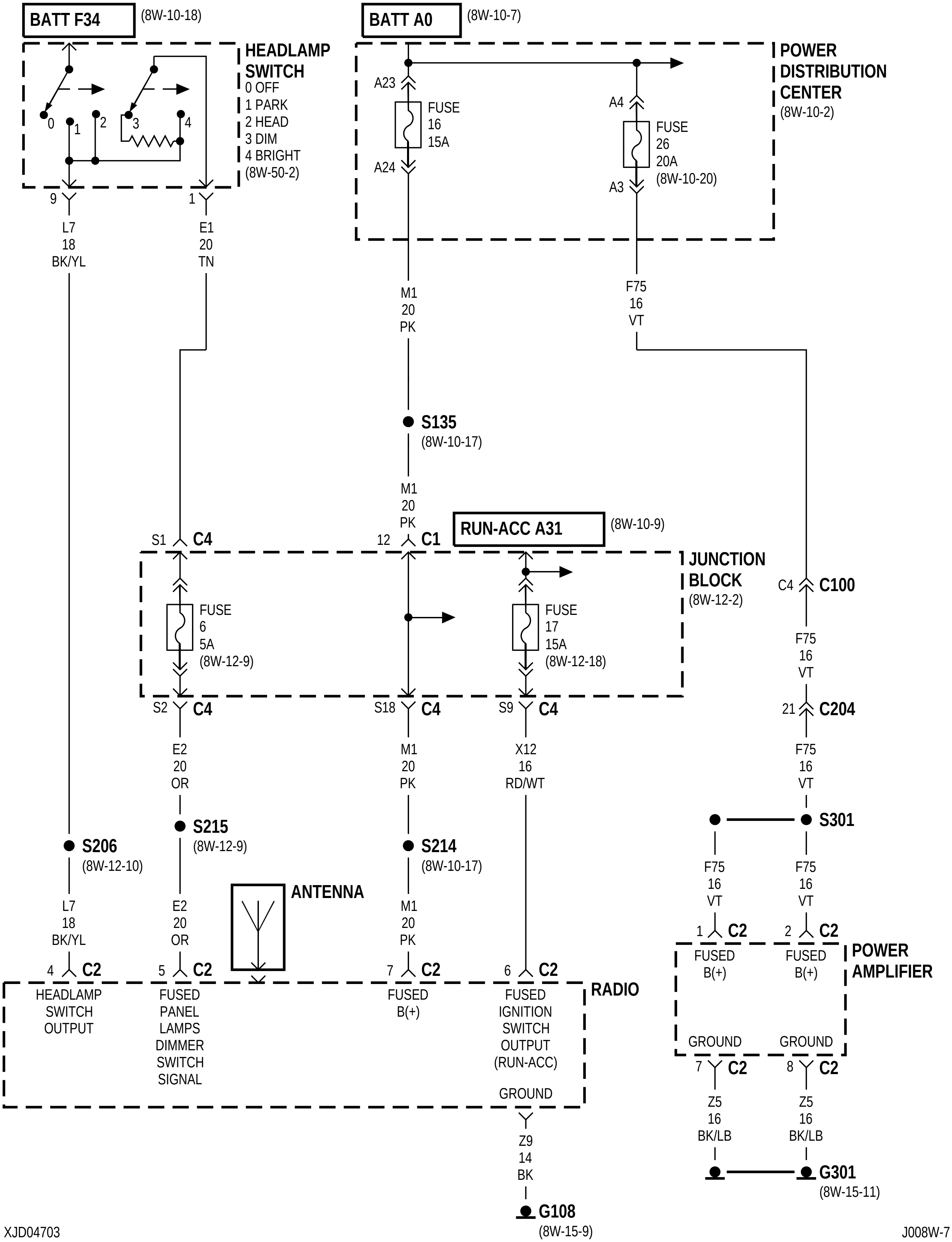

FROM
JUNCTION BLOCK
(8W-44-5)
E
FROM
C314
(8W-44-5)
C
S304
M2 20 YL
6 C314
A C317
A C320
A C318
A C319
B
A
CARGO LAMP/ SWITCH
M2 18 YL
C
M4 20 GY/BK
3
LEFT REAR DOOR JAMB SWITCH
2
RIGHT REAR DOOR JAMB SWITCH
7 C314
3 C326
M4 20 GY/BK
Z1 18 BK
1
PASSENGER DOOR JAMB SWITCH
(8W-39-7)
DRIVER DOOR JAMB SWITCH
(8W-39-7)
5 C311
10 C310
M4 20 VT/YL
LIFTGATE SWITCH
Z1 18 BK
C C317
B C320
C C318
B C319
G78 20 TN/BK
Z1 20 BK
S334
(8W-15-14)
S309
(8W-15-11)
S310
(8W-15-13)
6 C310
3 C311
1 C327
Z1 18 BK
9 C310
6 C311
5 C204
Z1 12 BK
1 C1
LIFTGATE AJAR SWITCH SENSE
INSTRUMENT CLUSTER
(8W-40-12)
G302
(8W-15-11)
G303
(8W-15-13)
G304
(8W-15-14)

8W-47 AUDIO SYSTEM

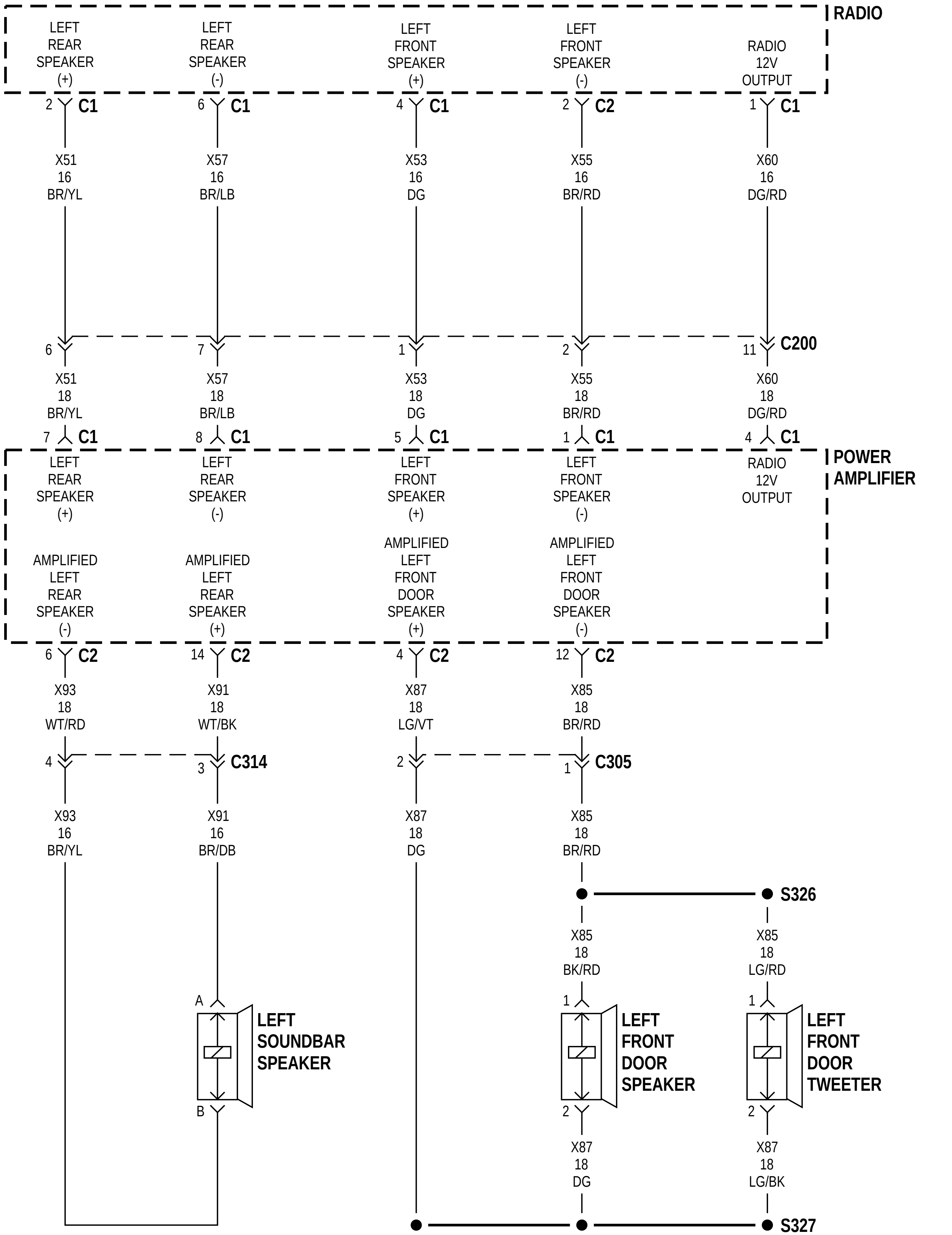
LHD 6 SPEAKER SYSTEM



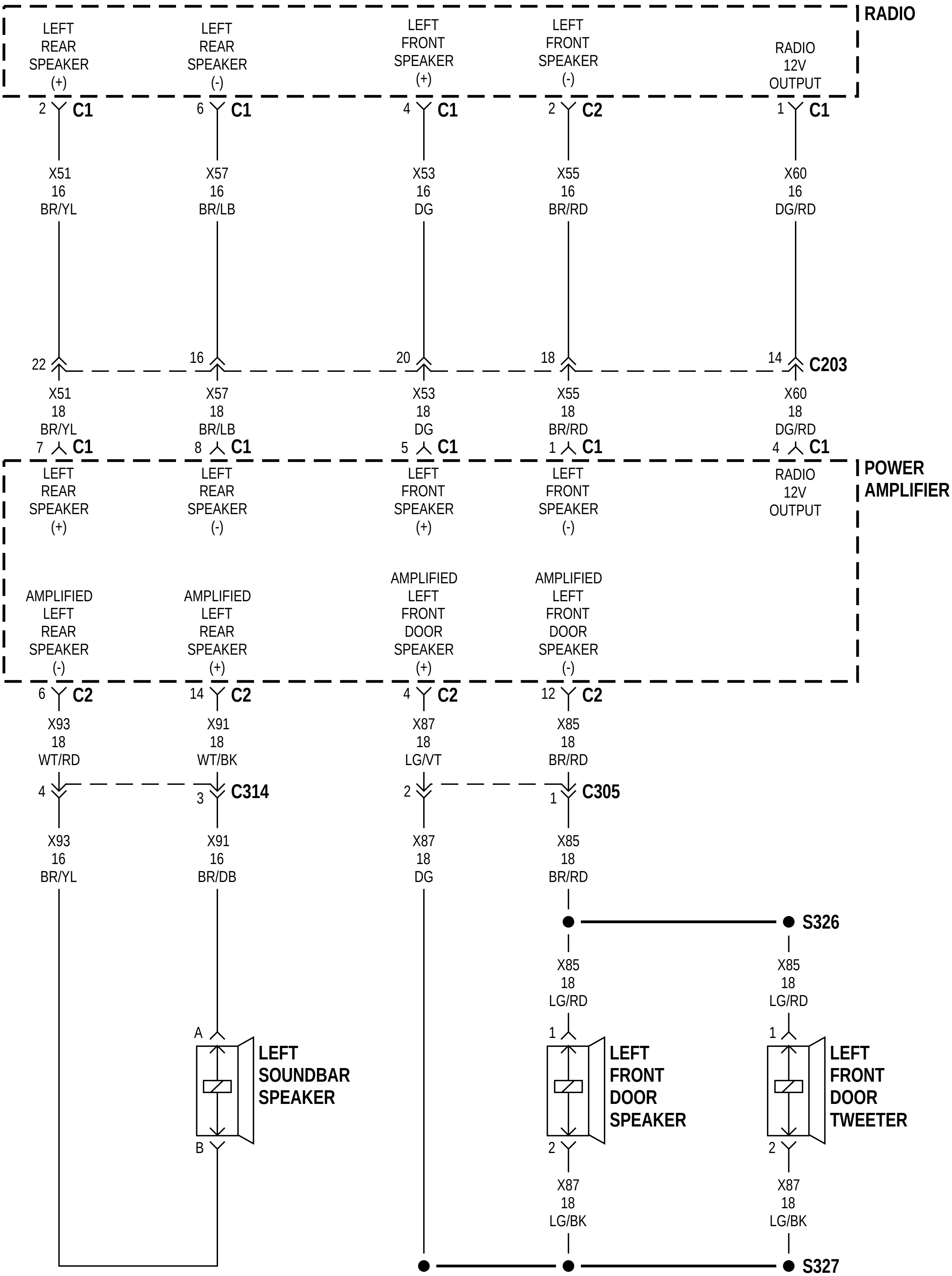
RHD 6 SPEAKER SYSTEM



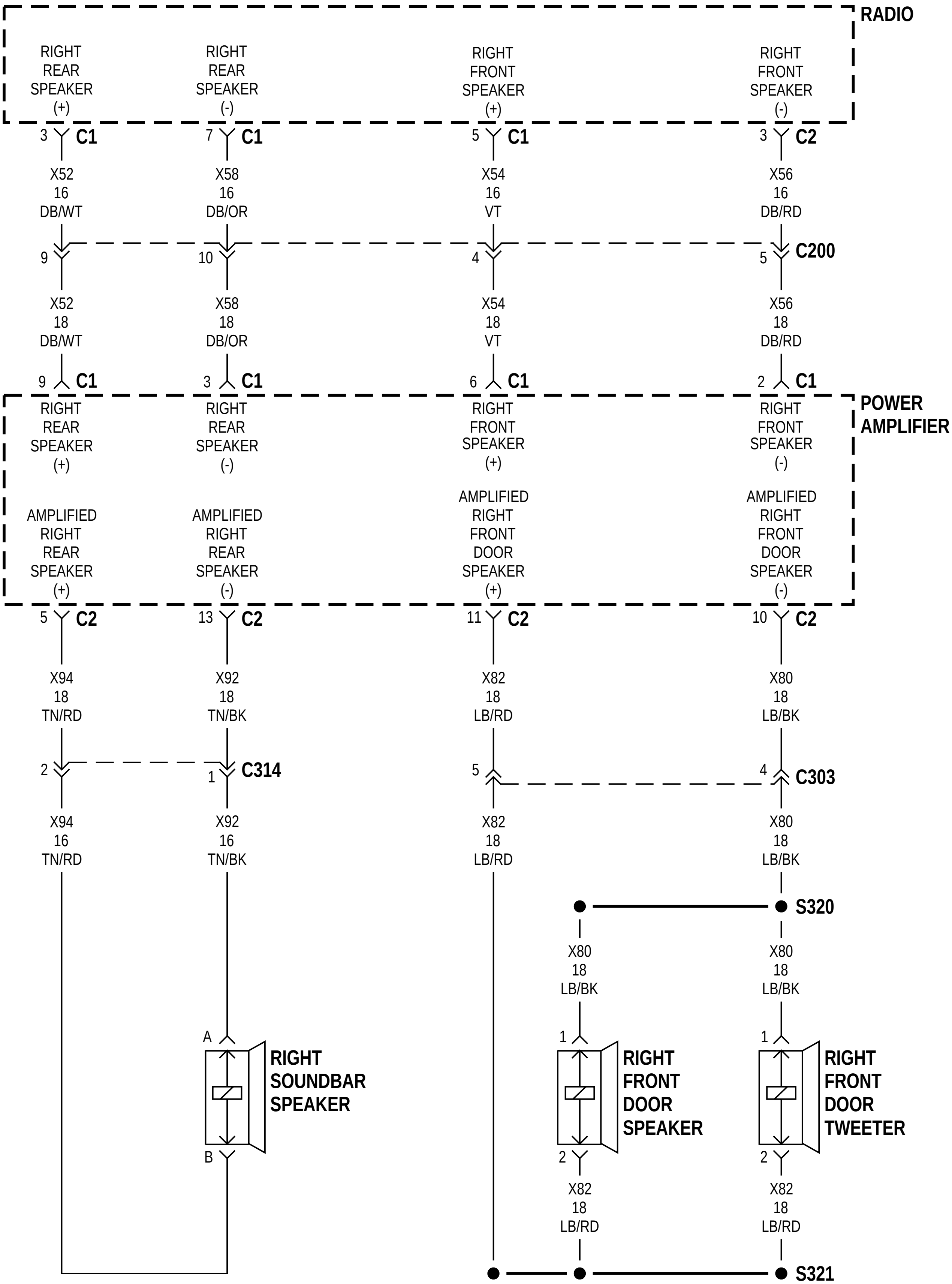
LHD 6 SPEAKER SYSTEM



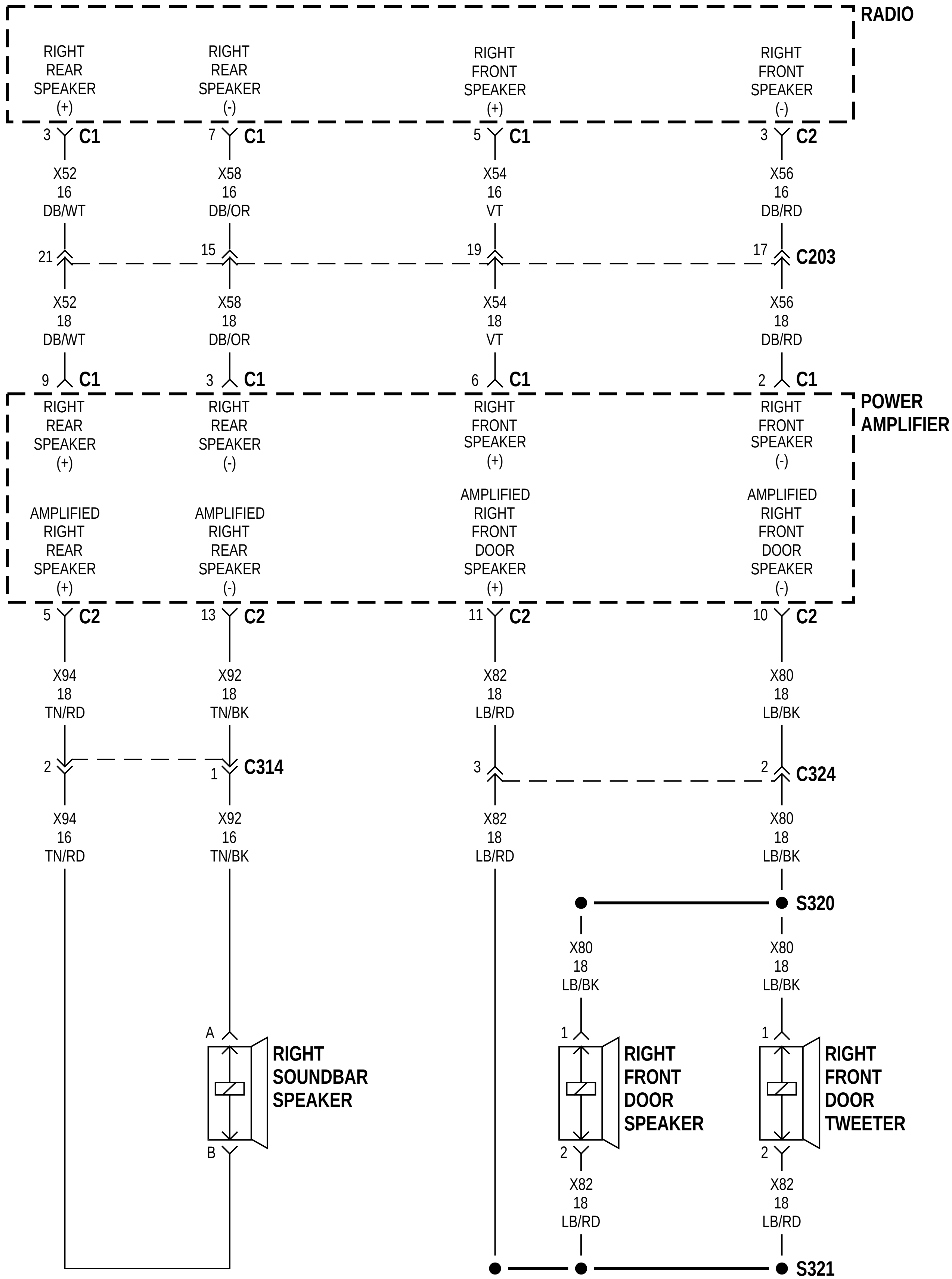
RHD 6 SPEAKER SYSTEM



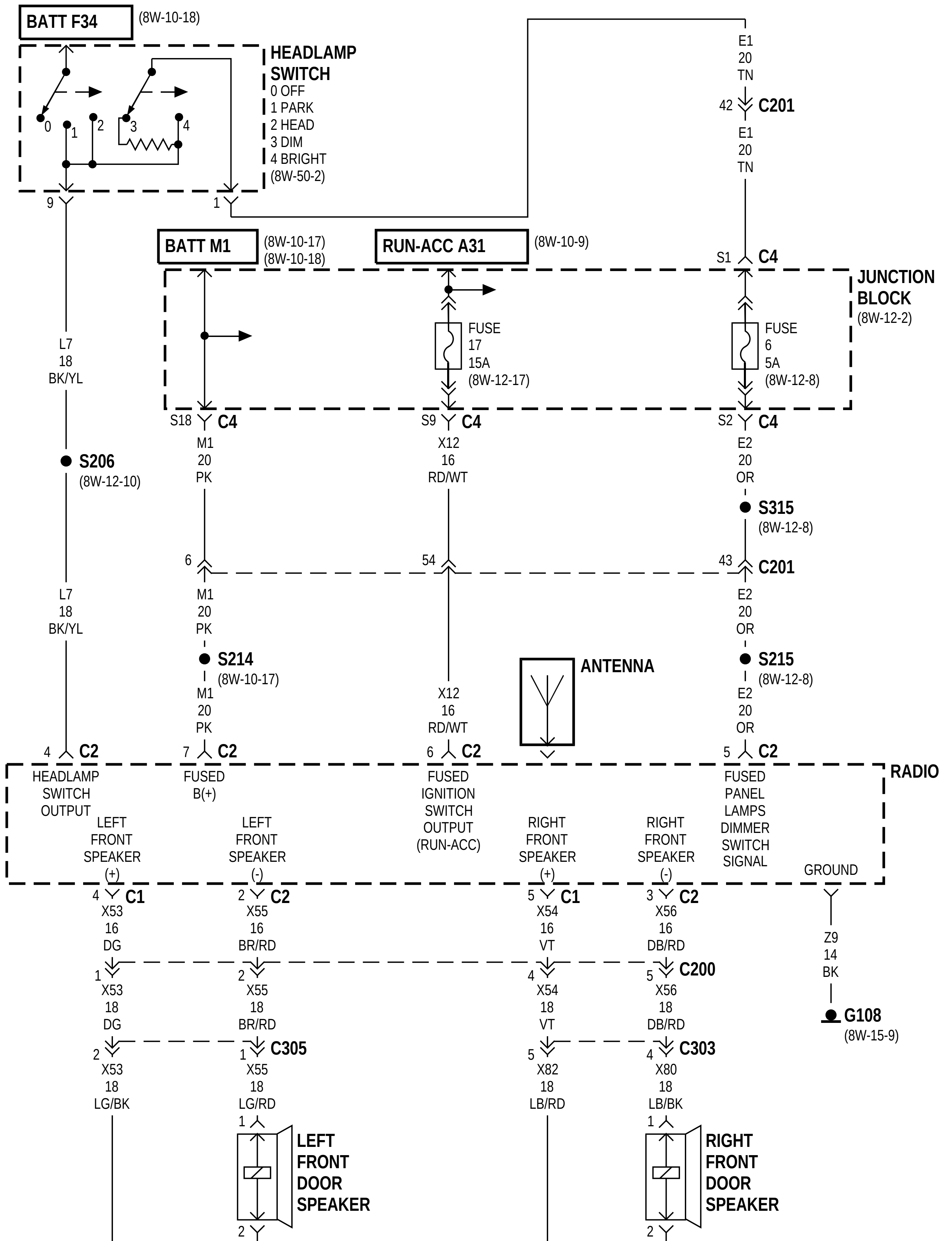
LHD 6 SPEAKER SYSTEM



RHD 6 SPEAKER SYSTEM

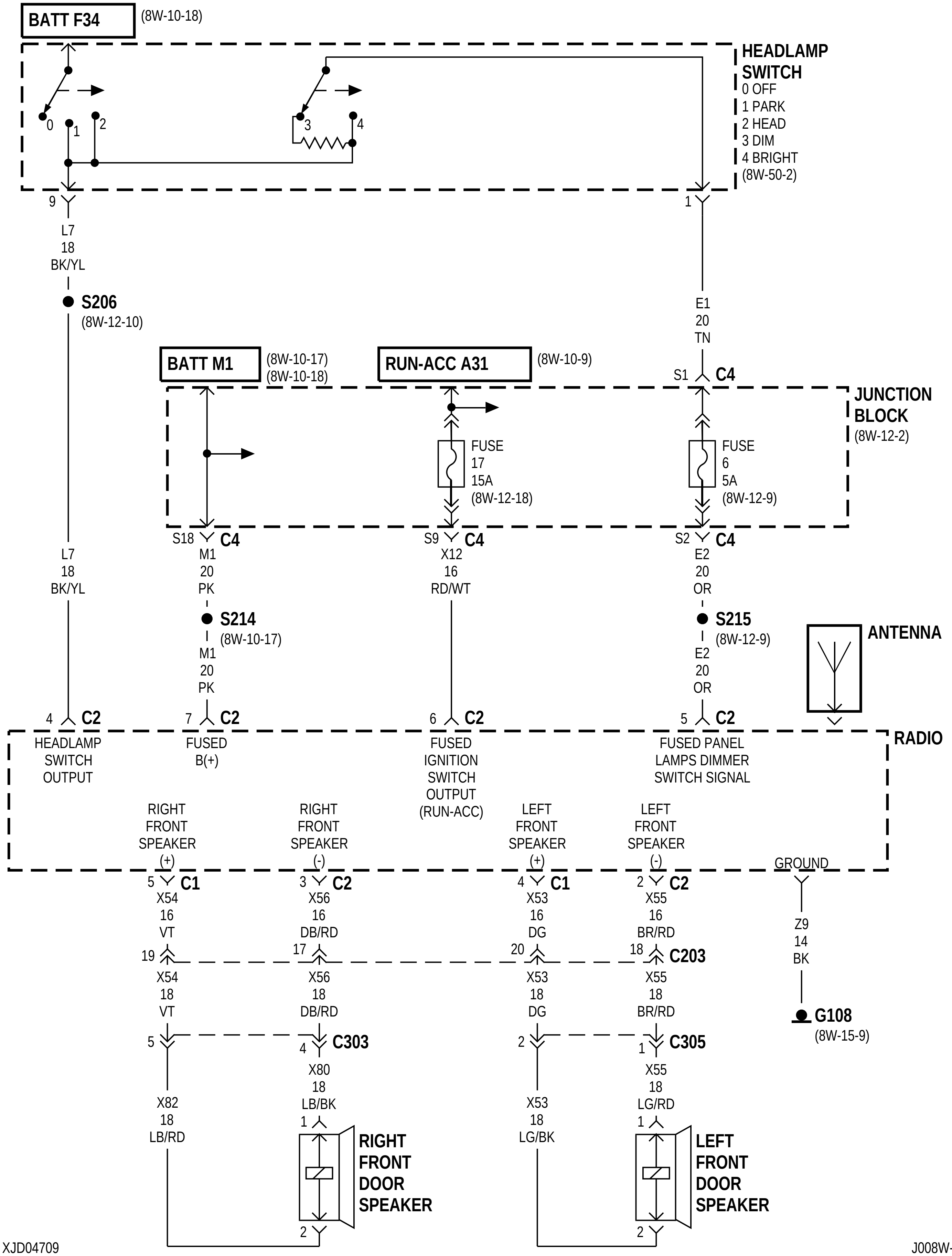


LHD 4 SPEAKER SYSTEM



J008W-7 XJD04708

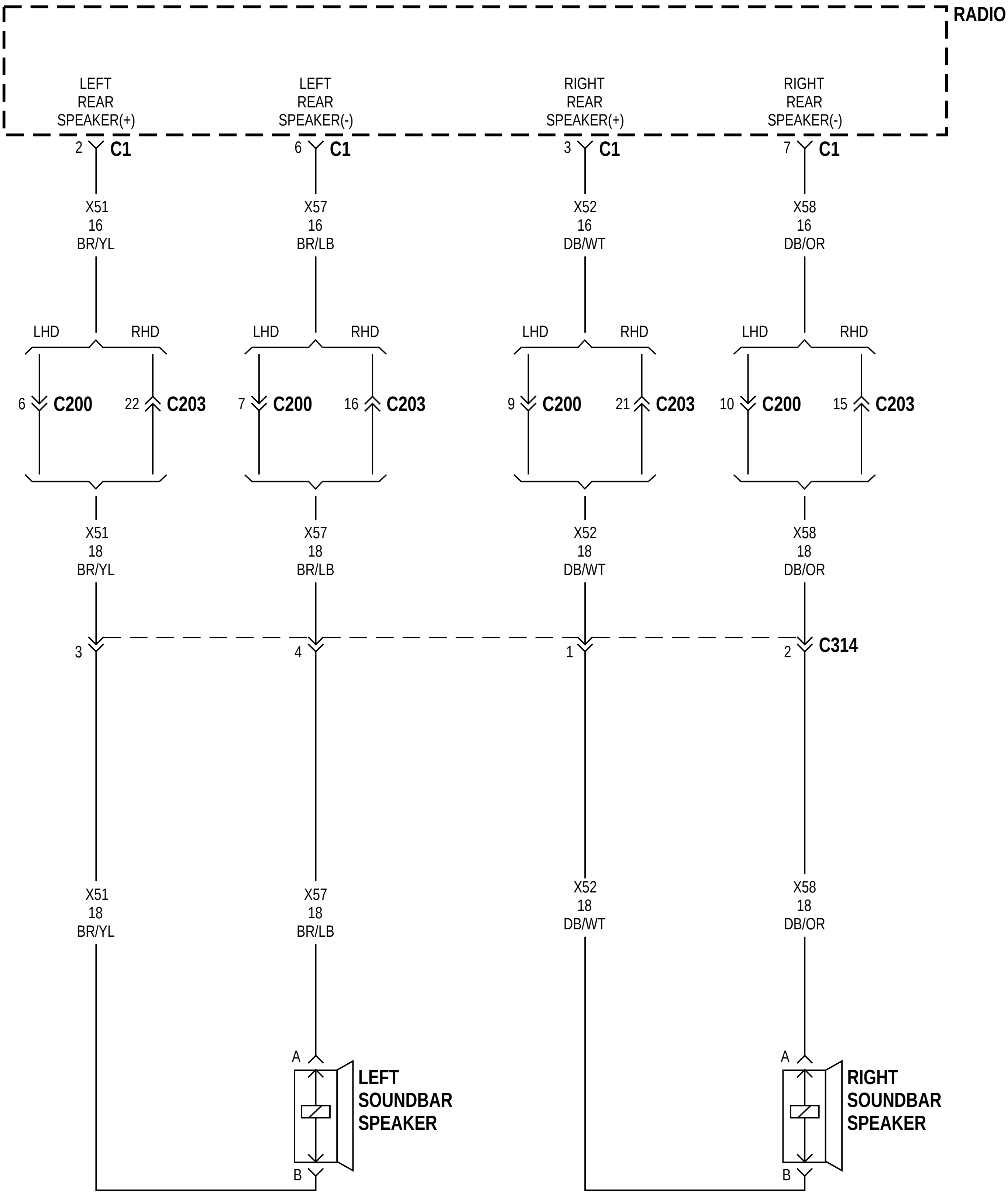
RHD 4 SPEAKER SYSTEM



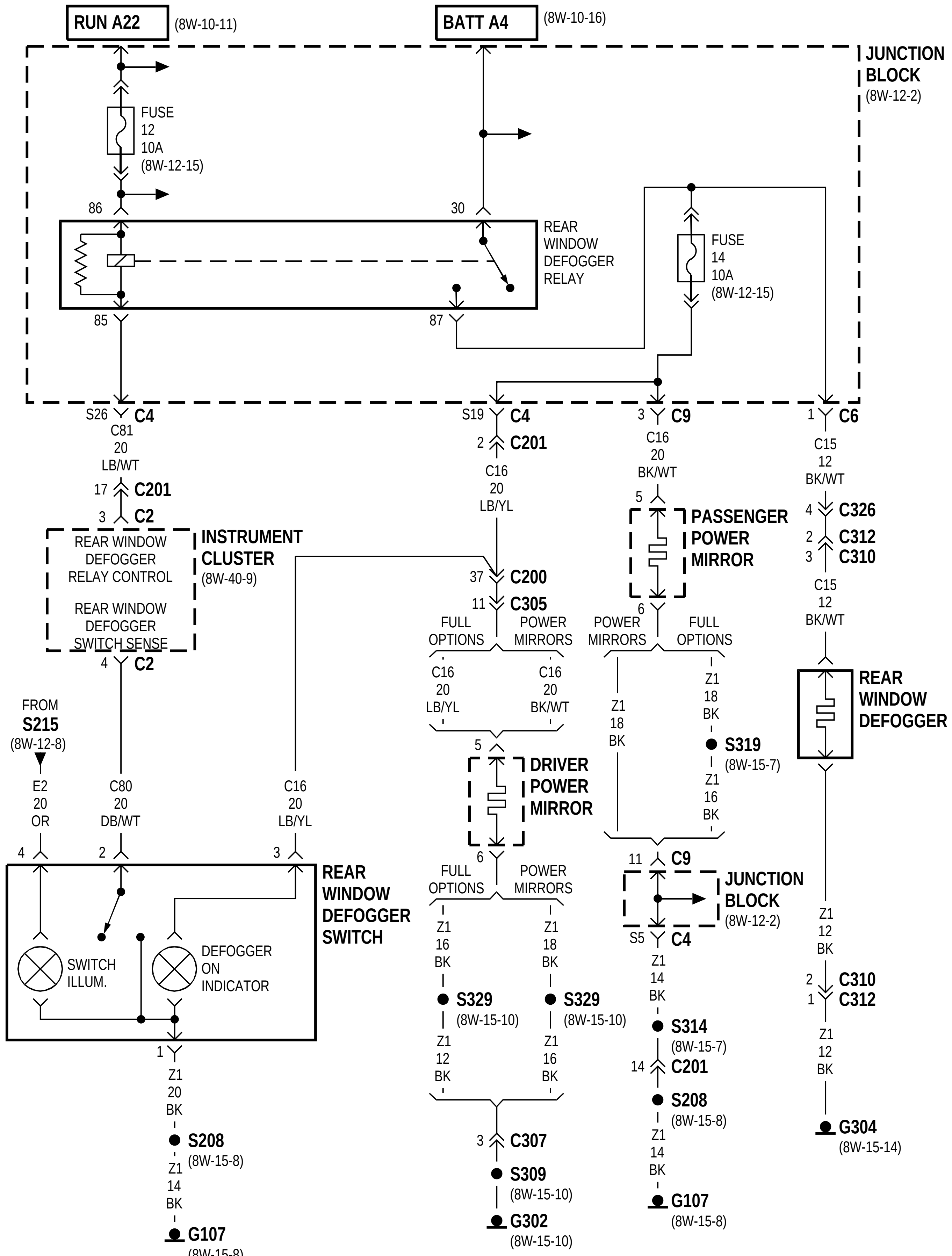
XJD04709

J008W-7

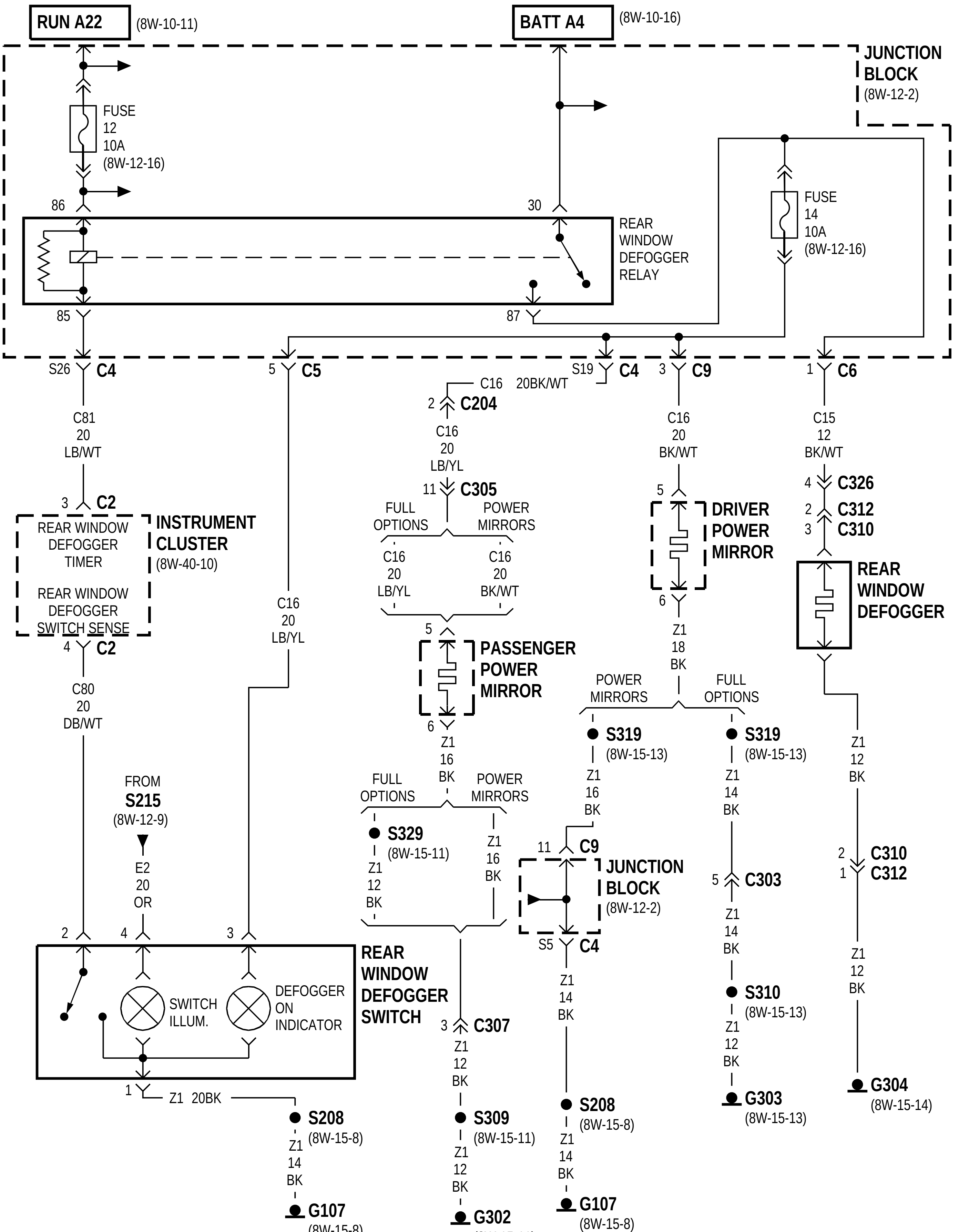
4 SPEAKER SYSTEM



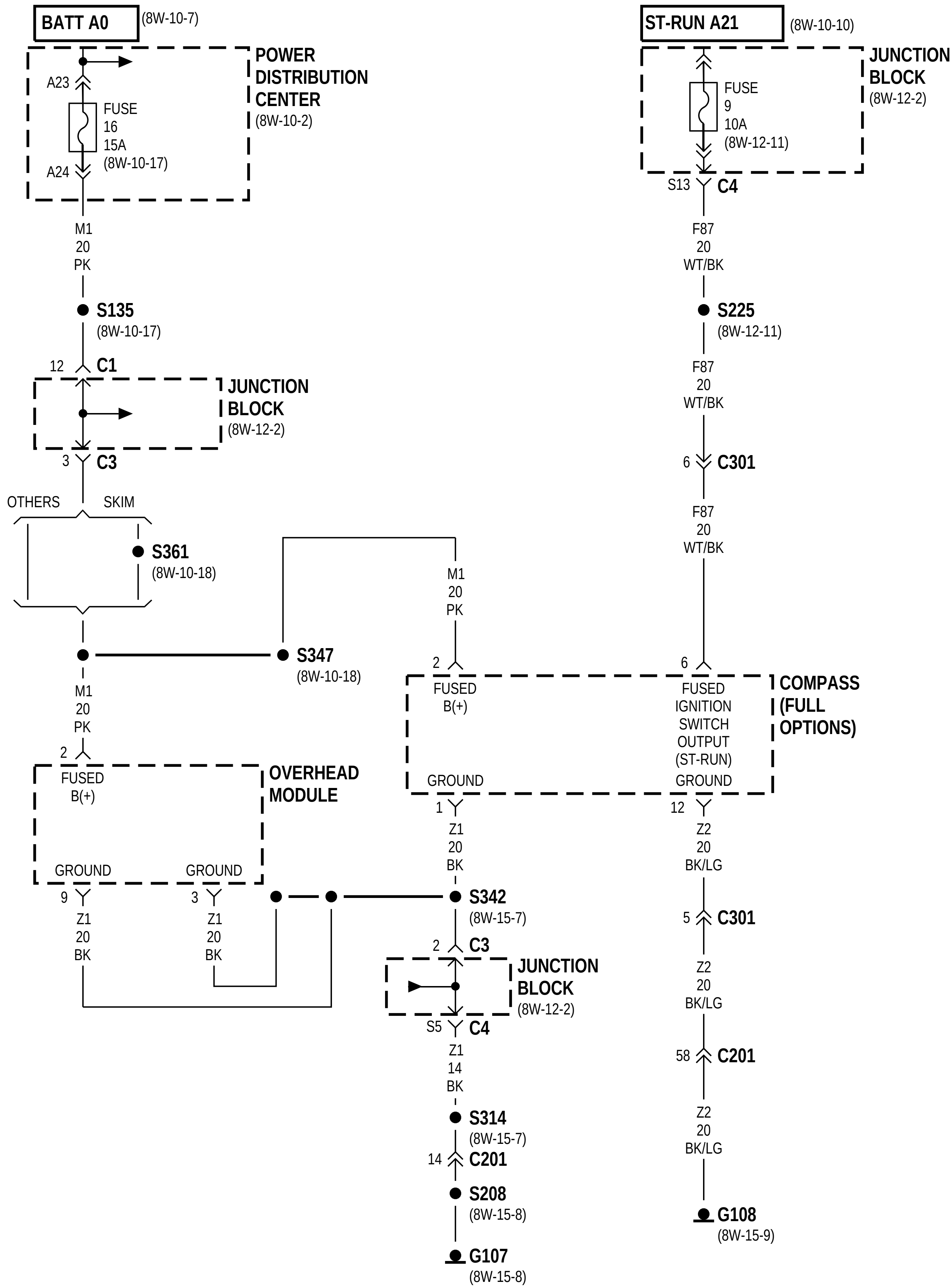
8W-48 REAR WINDOW DEFOGGER

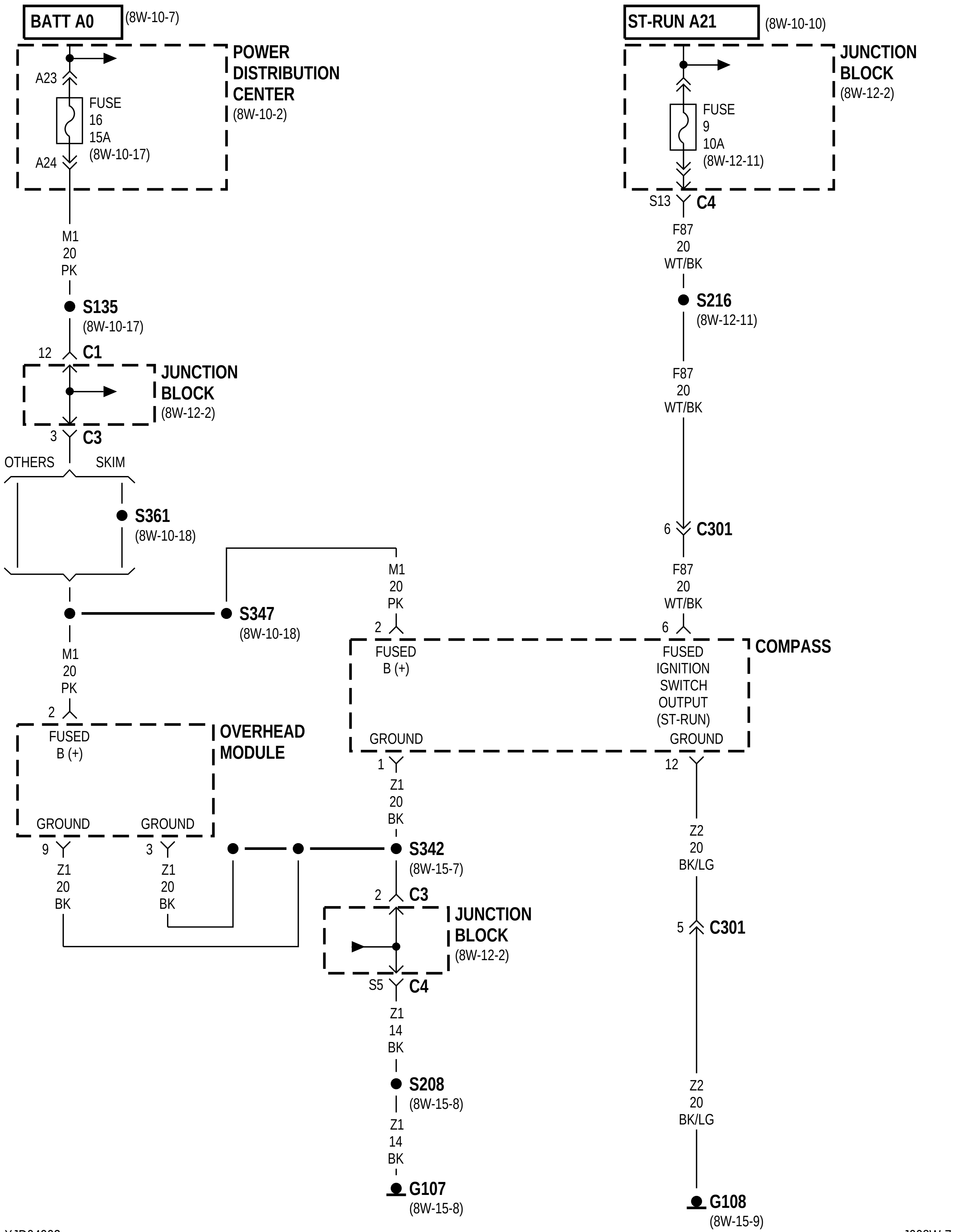

RUN A22
(8W-10-11)
BATT A4
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
FUSE 12 10A
(8W-12-15)
86
30
REAR WINDOW DEFOGGER RELAY
FUSE 14 10A
(8W-12-15)
85
87
S26 C4
S19 C4
3 C9
1 C6
C81 20 LB/WT
2 C201
C16 20 LB/YL
C16 20 BK/WT
C15 12 BK/WT
17 C201
5
PASSENGER POWER MIRROR
4 C326
3 C2
2 C312
3 C310
INSTRUMENT CLUSTER
(8W-40-9)
REAR WINDOW DEFOGGER RELAY CONTROL
REAR WINDOW DEFOGGER SWITCH SENSE
37 C200
11 C305
6
C15 12 BK/WT
FULL OPTIONS
POWER MIRRORS
POWER MIRRORS
FULL OPTIONS
4 C2
C16 20 LB/YL
C16 20 BK/WT
Z1 18 BK
Z1 18 BK
REAR WINDOW DEFOGGER
FROM S215
(8W-12-8)
5
DRIVER POWER MIRROR
S319
(8W-15-7)
Z1 16 BK
E2 20 OR
C80 20 DB/WT
C16 20 LB/YL
4
2
3
REAR WINDOW DEFOGGER SWITCH
6
11 C9
FULL OPTIONS
POWER MIRRORS
JUNCTION BLOCK
(8W-12-2)
SWITCH ILLUM.
DEFOGGER ON INDICATOR
S5 C4
Z1 16 BK
Z1 18 BK
Z1 14 BK
Z1 12 BK
S329
(8W-15-10)
S329
(8W-15-10)
2 C310
1 C312
Z1 12 BK
Z1 16 BK
S314
(8W-15-7)
Z1 12 BK
1
14 C201
Z1 20 BK
S208
(8W-15-8)
G304
(8W-15-14)
3 C307
S208
(8W-15-8)
Z1 14 BK
Z1 14 BK
S309
(8W-15-10)
G107
(8W-15-8)
G302
(8W-15-10)
G107
(8W-15-8)

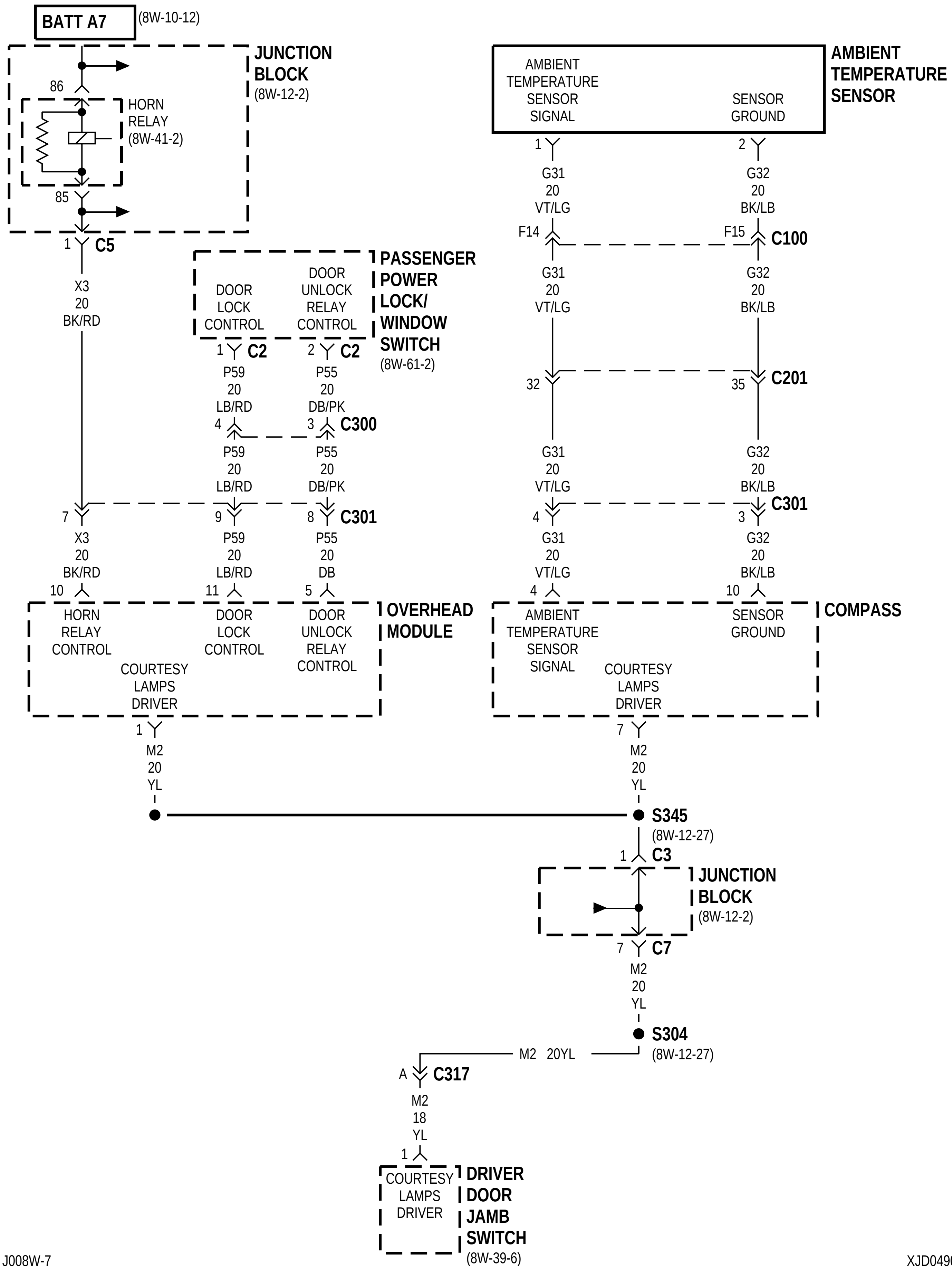
RHD

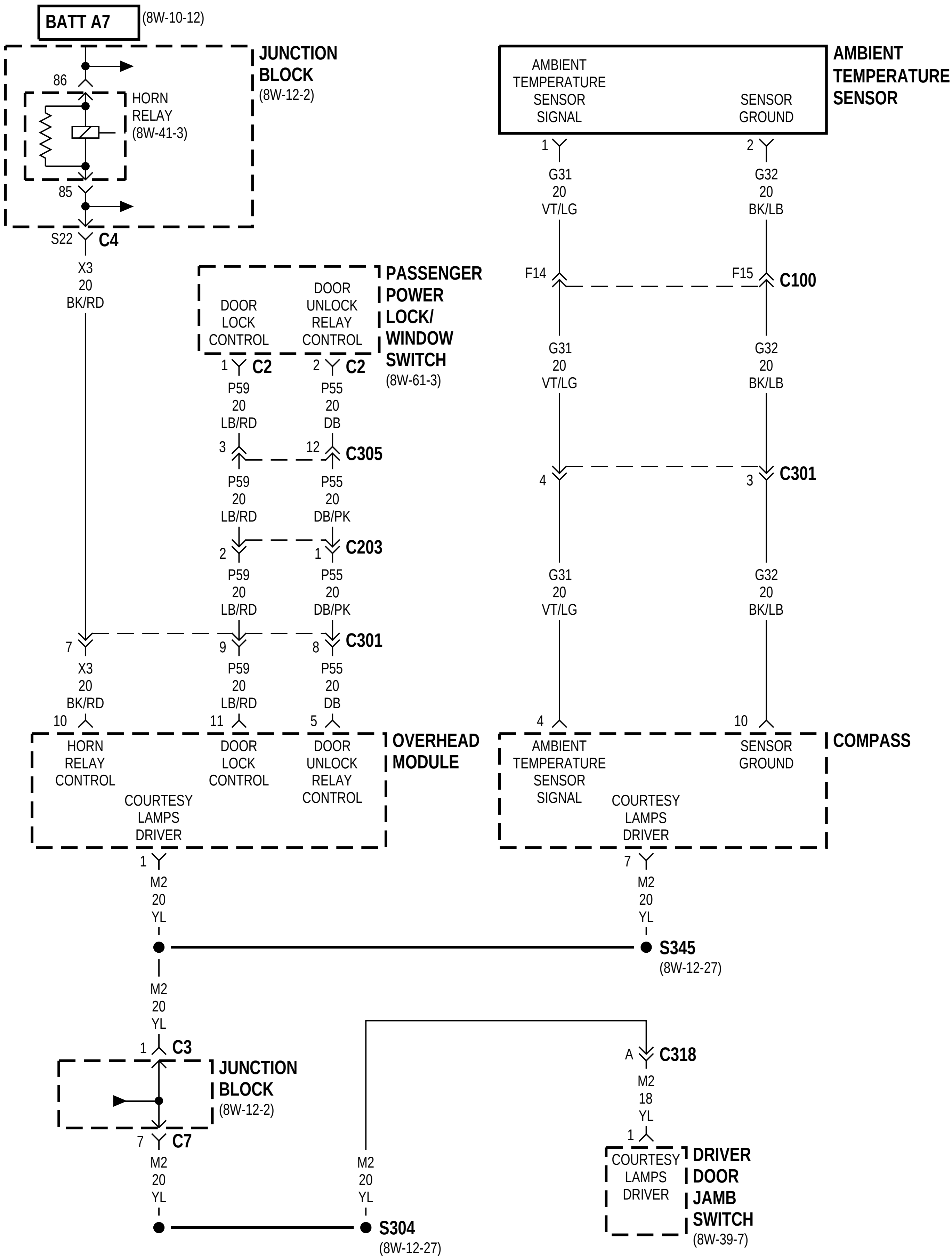

RUN A22
(8W-10-11)
BATT A4
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
FUSE 12 10A (8W-12-16)
FUSE 14 10A (8W-12-16)
86
30
85
87
REAR WINDOW DEFOGGER RELAY
S26 C4
5 C5
C16 20BK/WT
S19 C4
3 C9
1 C6
C81 20 LB/WT
2 C204
C16 20 LB/YL
11 C305
FULL OPTIONS
POWER MIRRORS
C16 20 LB/YL
C16 20 BK/WT
C16 20 BK/WT
C15 12 BK/WT
4 C326
2 C312
3 C310
5
DRIVER POWER MIRROR
6
REAR WINDOW DEFOGGER
3 C2
INSTRUMENT CLUSTER
(8W-40-10)
REAR WINDOW DEFOGGER TIMER
REAR WINDOW DEFOGGER SWITCH SENSE
4 C2
C16 20 LB/YL
C80 20 DB/WT
5
PASSENGER POWER MIRROR
6
Z1 16 BK
Z1 18 BK
POWER MIRRORS
FULL OPTIONS
S319
(8W-15-13)
S319
(8W-15-13)
Z1 12 BK
FROM S215
(8W-12-9)
E2 20 OR
FULL OPTIONS
POWER MIRRORS
S329
(8W-15-11)
Z1 12 BK
Z1 16 BK
Z1 16 BK
Z1 14 BK
11 C9
JUNCTION BLOCK
(8W-12-2)
S5 C4
2 C310
1 C312
5 C303
Z1 14 BK
Z1 12 BK
2
4
3
REAR WINDOW DEFOGGER SWITCH
SWITCH ILLUM.
DEFOGGER ON INDICATOR
3 C307
Z1 12 BK
Z1 14 BK
S310
(8W-15-13)
Z1 12 BK
1
Z1 20BK
S208
(8W-15-8)
Z1 14 BK
S309
(8W-15-11)
Z1 12 BK
S208
(8W-15-8)
Z1 14 BK
G303
(8W-15-13)
G304
(8W-15-14)
G107
(8W-15-8)
G302
(8W-15-11)
G107
(8W-15-8)

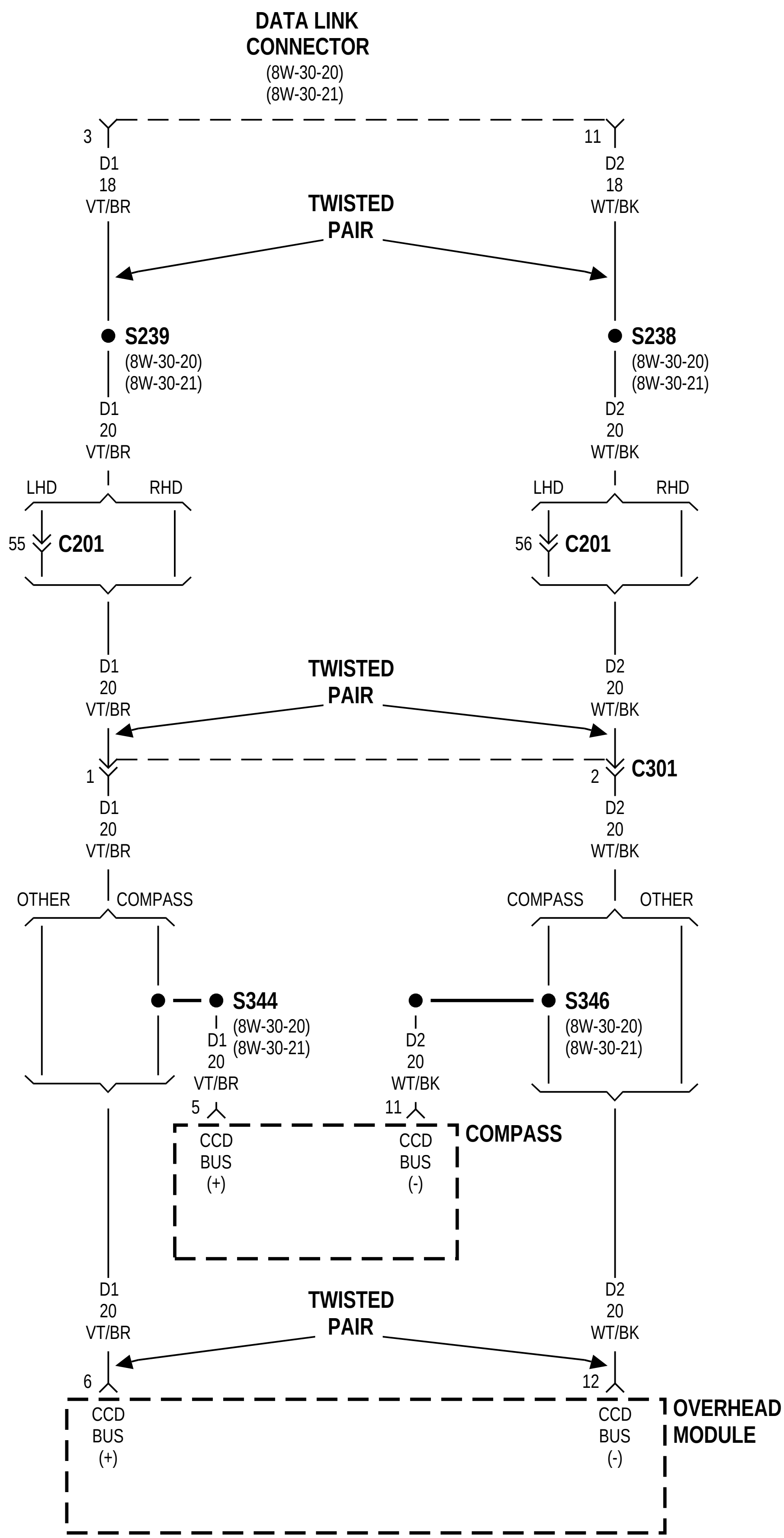
8W-49 OVERHEAD CONSOLE


BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
12
C1
JUNCTION BLOCK
(8W-12-2)
3
C3
OTHERS
SKIM
S361
(8W-10-18)
S347
(8W-10-18)
M1
20
PK
2
OVERHEAD MODULE
FUSED B(+)
GROUND
GROUND
9
3
Z1
20
BK
Z1
20
BK
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
9
10A
(8W-12-11)
S13
C4
F87
20
WT/BK
S225
(8W-12-11)
F87
20
WT/BK
6
C301
F87
20
WT/BK
M1
20
PK
2
6
COMPASS (FULL OPTIONS)
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
GROUND
GROUND
1
12
Z1
20
BK
S342
(8W-15-7)
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
Z1
14
BK
S314
(8W-15-7)
14
C201
S208
(8W-15-8)
G107
(8W-15-8)
Z2
20
BK/LG
5
C301
Z2
20
BK/LG
58
C201
Z2
20
BK/LG
G108
(8W-15-9)

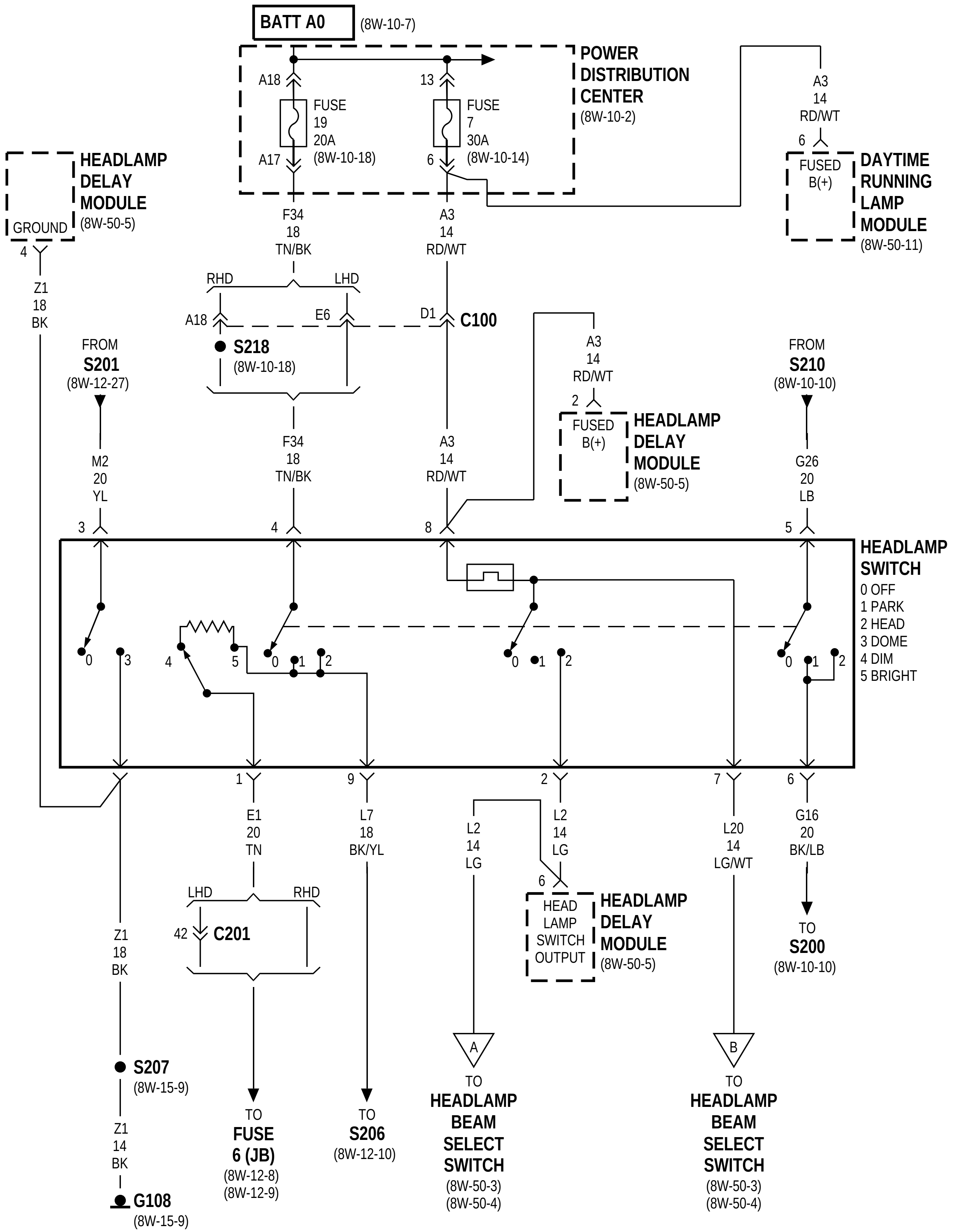

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A23
FUSE
16
15A
(8W-10-17)
A24
M1
20
PK
S135
(8W-10-17)
12
C1
JUNCTION BLOCK
(8W-12-2)
3
C3
OTHERS
SKIM
S361
(8W-10-18)
S347
(8W-10-18)
M1
20
PK
2
FUSED B (+)
OVERHEAD MODULE
GROUND
GROUND
9
3
Z1
20
BK
Z1
20
BK
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE
9
10A
(8W-12-11)
S13
C4
F87
20
WT/BK
S216
(8W-12-11)
F87
20
WT/BK
6
C301
F87
20
WT/BK
M1
20
PK
2
6
COMPASS
FUSED B (+)
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
GROUND
GROUND
1
12
Z1
20
BK
S342
(8W-15-7)
2
C3
JUNCTION BLOCK
(8W-12-2)
S5
C4
Z1
14
BK
S208
(8W-15-8)
Z1
14
BK
G107
(8W-15-8)
Z2
20
BK/LG
5
C301
Z2
20
BK/LG
G108
(8W-15-9)


BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
86
HORN RELAY
(8W-41-2)
85
1 C5
X3 20 BK/RD
PASSENGER POWER LOCK/ WINDOW SWITCH
(8W-61-2)
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
1 C2
2 C2
P59 20 LB/RD
P55 20 DB/PK
4
3 C300
P59 20 LB/RD
P55 20 DB/PK
7
9
8 C301
X3 20 BK/RD
P59 20 LB/RD
P55 20 DB
10
11
5
OVERHEAD MODULE
HORN RELAY CONTROL
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
COURTESY LAMPS DRIVER
1
M2 20 YL
AMBIENT TEMPERATURE SENSOR
AMBIENT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
1
2
G31 20 VT/LG
G32 20 BK/LB
F14
F15 C100
G31 20 VT/LG
G32 20 BK/LB
32
35 C201
G31 20 VT/LG
G32 20 BK/LB
4
3 C301
G31 20 VT/LG
G32 20 BK/LB
4
10
COMPASS
AMBIENT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
COURTESY LAMPS DRIVER
7
M2 20 YL
S345
(8W-12-27)
1 C3
JUNCTION BLOCK
(8W-12-2)
7 C7
M2 20 YL
S304
(8W-12-27)
M2 20YL
A C317
M2 18 YL
1
DRIVER DOOR JAMB SWITCH
(8W-39-6)
COURTESY LAMPS DRIVER

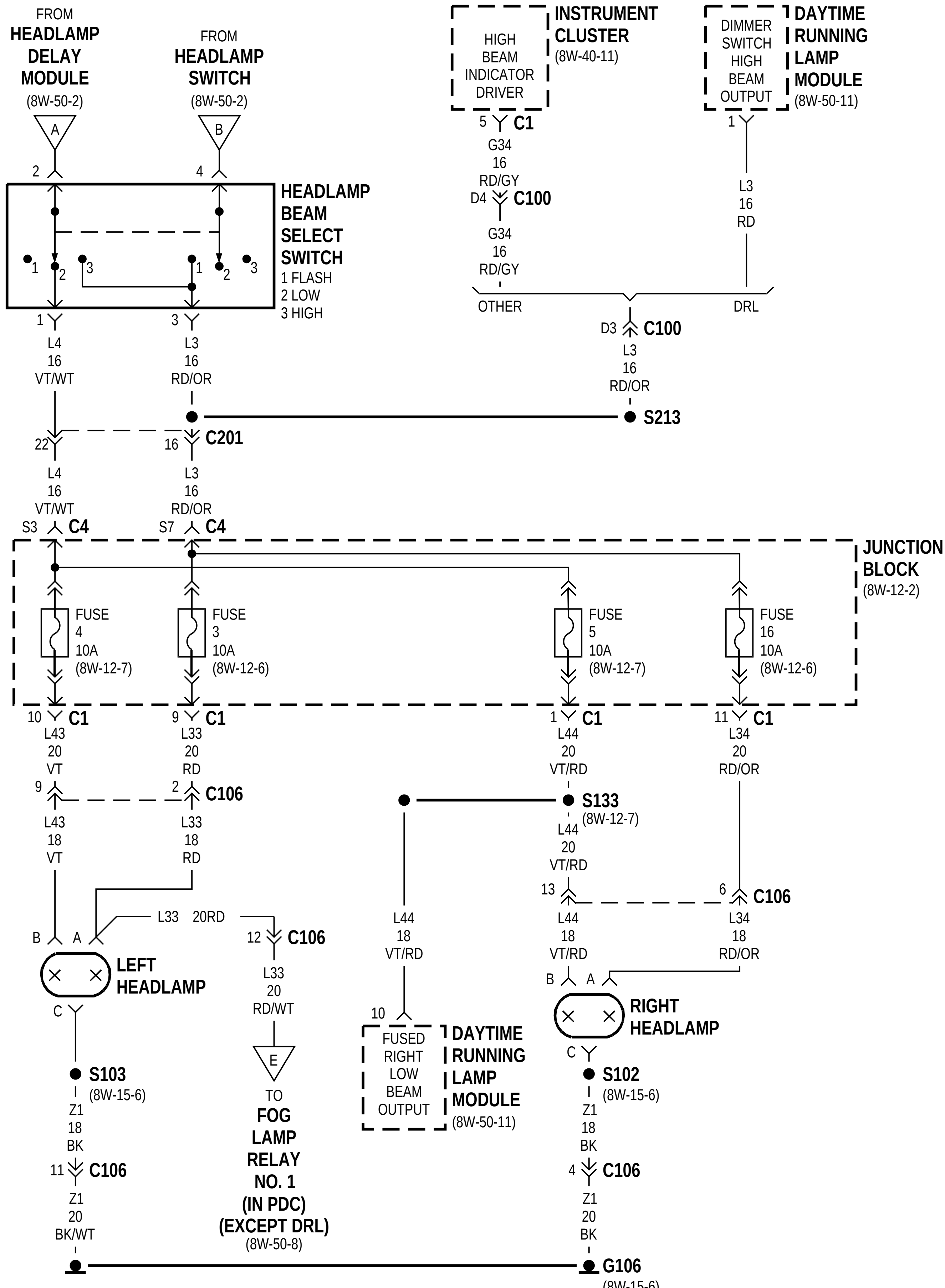

BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
86
HORN RELAY
(8W-41-3)
85
S22
C4
X3
20
BK/RD
PASSENGER POWER LOCK/ WINDOW SWITCH
(8W-61-3)
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
1
C2
2
C2
P59
20
LB/RD
P55
20
DB
3
12
C305
P59
20
LB/RD
P55
20
DB/PK
2
1
C203
P59
20
LB/RD
P55
20
DB/PK
7
9
8
C301
X3
20
BK/RD
P59
20
LB/RD
P55
20
DB
10
11
5
OVERHEAD MODULE
HORN RELAY CONTROL
DOOR LOCK CONTROL
DOOR UNLOCK RELAY CONTROL
COURTESY LAMPS DRIVER
1
M2
20
YL
AMBIENT TEMPERATURE SENSOR
AMBIENT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
1
2
G31
20
VT/LG
G32
20
BK/LB
F14
F15
C100
G31
20
VT/LG
G32
20
BK/LB
4
3
C301
G31
20
VT/LG
G32
20
BK/LB
4
10
COMPASS
AMBIENT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
COURTESY LAMPS DRIVER
7
M2
20
YL
S345
(8W-12-27)
M2
20
YL
1
C3
JUNCTION BLOCK
(8W-12-2)
7
C7
M2
20
YL
M2
20
YL
S304
(8W-12-27)
A
C318
M2
18
YL
1
DRIVER DOOR JAMB SWITCH
(8W-39-7)
COURTESY LAMPS DRIVER

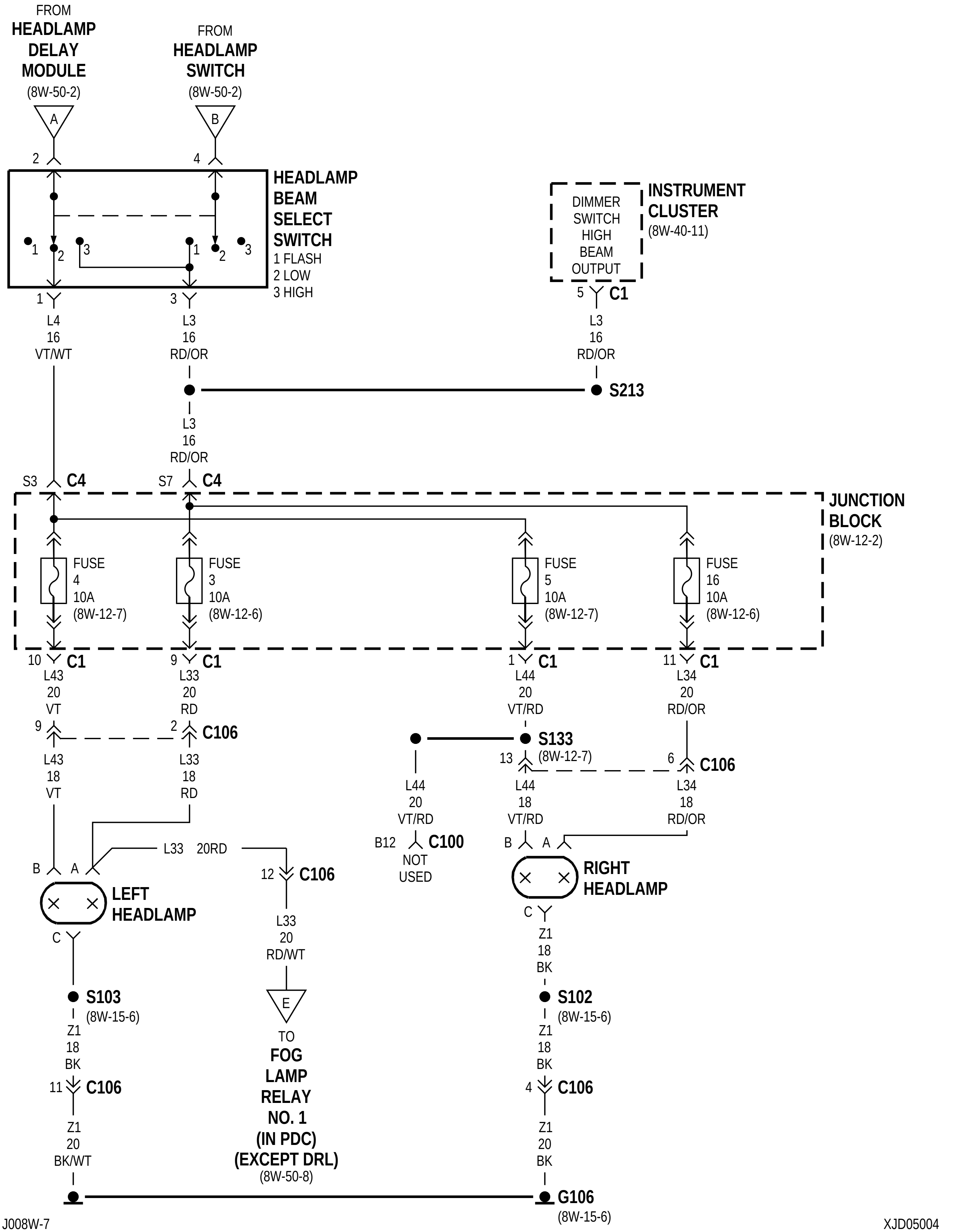

DATA LINK CONNECTOR
(8W-30-20)
(8W-30-21)
3
11
D1
18
VT/BR
D2
18
WT/BK
TWISTED PAIR
S239
(8W-30-20)
(8W-30-21)
S238
(8W-30-20)
(8W-30-21)
D1
20
VT/BR
D2
20
WT/BK
LHD
RHD
55
C201
LHD
RHD
56
C201
D1
20
VT/BR
TWISTED PAIR
D2
20
WT/BK
1
2
C301
D1
20
VT/BR
D2
20
WT/BK
OTHER
COMPASS
COMPASS
OTHER
S344
(8W-30-20)
(8W-30-21)
D1
20
VT/BR
D2
20
WT/BK
S346
(8W-30-20)
(8W-30-21)
5
11
COMPASS
CCD BUS (+)
CCD BUS (-)
D1
20
VT/BR
TWISTED PAIR
D2
20
WT/BK
6
12
OVERHEAD MODULE
CCD BUS (+)
CCD BUS (-)

8W-50 FRONT LIGHTING

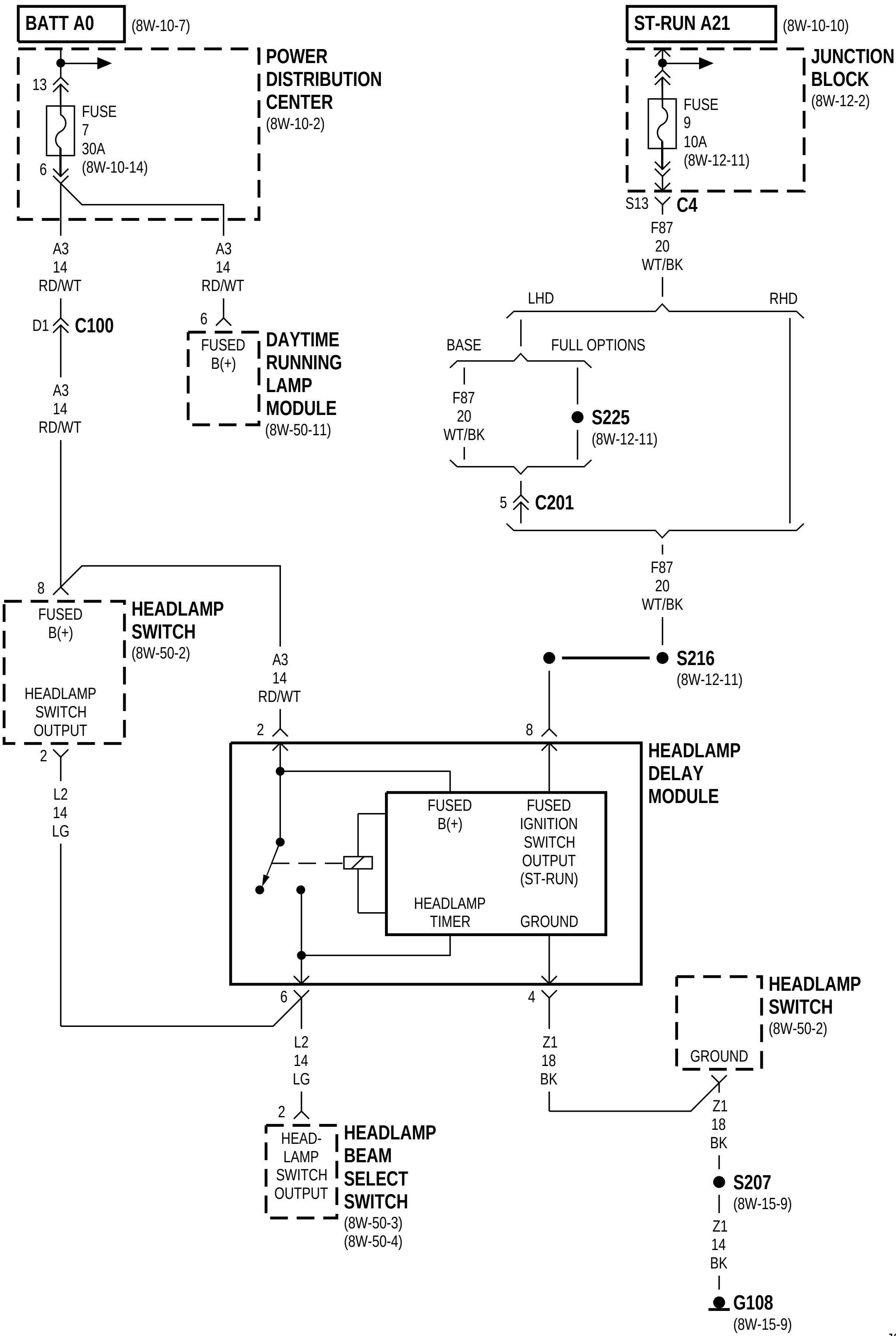

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A18
13
FUSE 19 20A (8W-10-18)
FUSE 7 30A (8W-10-14)
A17
6
A3 14 RD/WT
6
FUSED B(+)
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
HEADLAMP DELAY MODULE
GROUND
(8W-50-5)
4
Z1 18 BK
F34 18 TN/BK
A3 14 RD/WT
RHD
LHD
A18
E6
D1
C100
S218
(8W-10-18)
A3 14 RD/WT
2
FUSED B(+)
HEADLAMP DELAY MODULE
(8W-50-5)
FROM S201
(8W-12-27)
FROM S210
(8W-10-10)
M2 20 YL
F34 18 TN/BK
A3 14 RD/WT
G26 20 LB
3
4
8
5
HEADLAMP SWITCH
0 OFF
1 PARK
2 HEAD
3 DOME
4 DIM
5 BRIGHT
1
9
2
7
6
E1 20 TN
L7 18 BK/YL
L2 14 LG
L2 14 LG
L20 14 LG/WT
G16 20 BK/LB
LHD
RHD
42
C201
6
HEAD LAMP SWITCH OUTPUT
HEADLAMP DELAY MODULE
(8W-50-5)
TO S200
(8W-10-10)
Z1 18 BK
S207
(8W-15-9)
Z1 14 BK
G108
(8W-15-9)
TO FUSE 6 (JB)
(8W-12-8)
(8W-12-9)
TO S206
(8W-12-10)
A
TO HEADLAMP BEAM SELECT SWITCH
(8W-50-3)
(8W-50-4)
B
TO HEADLAMP BEAM SELECT SWITCH
(8W-50-3)
(8W-50-4)

LHD


FROM
HEADLAMP DELAY MODULE
(8W-50-2)
A
FROM
HEADLAMP SWITCH
(8W-50-2)
B
HIGH BEAM INDICATOR DRIVER
INSTRUMENT CLUSTER
(8W-40-11)
DIMMER SWITCH HIGH BEAM OUTPUT
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
5 C1
G34 16 RD/GY
D4 C100
G34 16 RD/GY
1
L3 16 RD
OTHER
DRL
D3 C100
L3 16 RD/OR
S213
HEADLAMP BEAM SELECT SWITCH
1 FLASH
2 LOW
3 HIGH
L4 16 VT/WT
L3 16 RD/OR
22
16 C201
S3 C4
S7 C4
JUNCTION BLOCK
(8W-12-2)
FUSE 4 10A (8W-12-7)
FUSE 3 10A (8W-12-6)
FUSE 5 10A (8W-12-7)
FUSE 16 10A (8W-12-6)
10 C1
9 C1
1 C1
11 C1
L43 20 VT
L33 20 RD
L44 20 VT/RD
L34 20 RD/OR
9
2 C106
S133
(8W-12-7)
L43 18 VT
L33 18 RD
L44 20 VT/RD
13
6 C106
L33 20RD
12 C106
L44 18 VT/RD
L44 18 VT/RD
L34 18 RD/OR
LEFT HEADLAMP
RIGHT HEADLAMP
L33 20 RD/WT
E
TO
FOG LAMP RELAY NO. 1 (IN PDC) (EXCEPT DRL)
(8W-50-8)
10
FUSED RIGHT LOW BEAM OUTPUT
DAYTIME RUNNING LAMP MODULE
(8W-50-11)
S103
(8W-15-6)
Z1 18 BK
11 C106
Z1 20 BK/WT
S102
(8W-15-6)
Z1 18 BK
4 C106
Z1 20 BK
G106
(8W-15-6)



FROM
HEADLAMP
DELAY
MODULE
(8W-50-2)
A
FROM
HEADLAMP
SWITCH
(8W-50-2)
B
2
4
HEADLAMP
BEAM
SELECT
SWITCH
1 FLASH
2 LOW
3 HIGH
1
2
3
1
2
3
INSTRUMENT
CLUSTER
(8W-40-11)
DIMMER
SWITCH
HIGH
BEAM
OUTPUT
5 C1
1
3
L4
16
VT/WT
L3
16
RD/OR
L3
16
RD/OR
S213
L3
16
RD/OR
S3 C4
S7 C4
JUNCTION
BLOCK
(8W-12-2)
FUSE
4
10A
(8W-12-7)
FUSE
3
10A
(8W-12-6)
FUSE
5
10A
(8W-12-7)
FUSE
16
10A
(8W-12-6)
10 C1
9 C1
1 C1
11 C1
L43
20
VT
L33
20
RD
L44
20
VT/RD
L34
20
RD/OR
9
2 C106
S133
(8W-12-7)
13
6 C106
L43
18
VT
L33
18
RD
L44
20
VT/RD
L44
18
VT/RD
L34
18
RD/OR
B12 C100
NOT
USED
B
A
RIGHT
HEADLAMP
L33 20RD
12 C106
B
A
LEFT
HEADLAMP
C
C
Z1
18
BK
S103
(8W-15-6)
L33
20
RD/WT
E
TO
FOG
LAMP
RELAY
NO. 1
(IN PDC)
(EXCEPT DRL)
(8W-50-8)
S102
(8W-15-6)
Z1
18
BK
Z1
18
BK
11 C106
4 C106
Z1
20
BK/WT
Z1
20
BK
G106
(8W-15-6)



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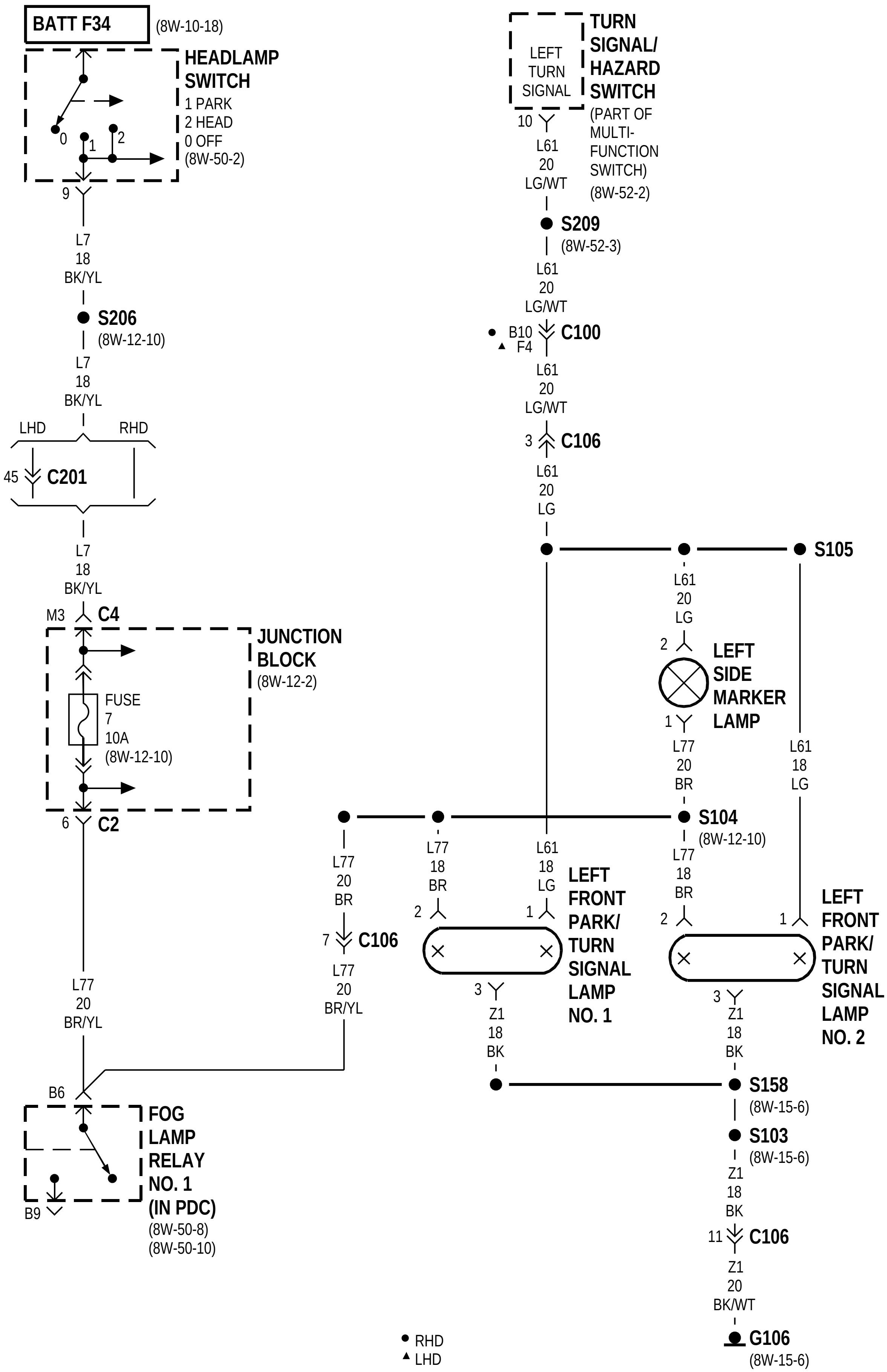
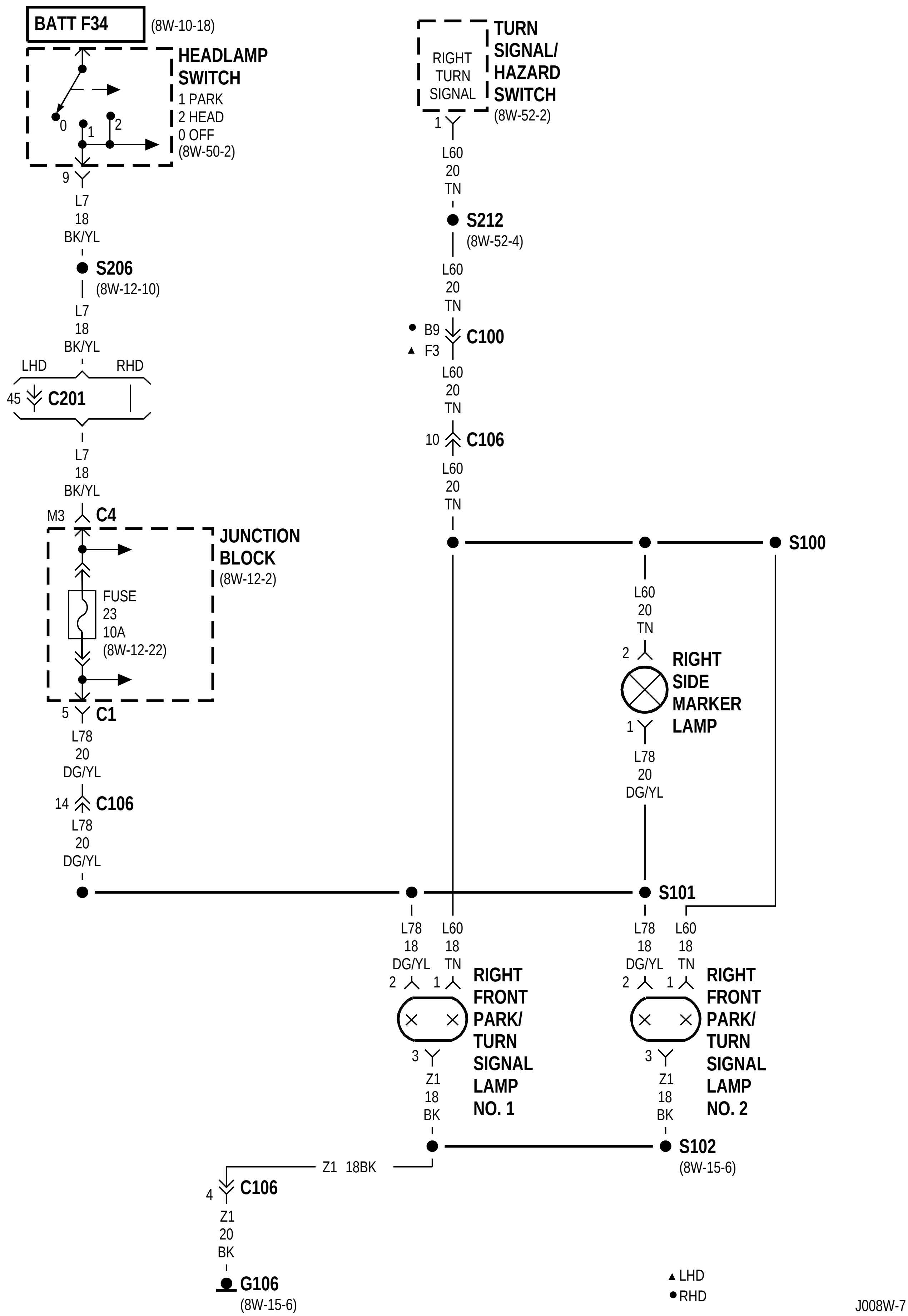
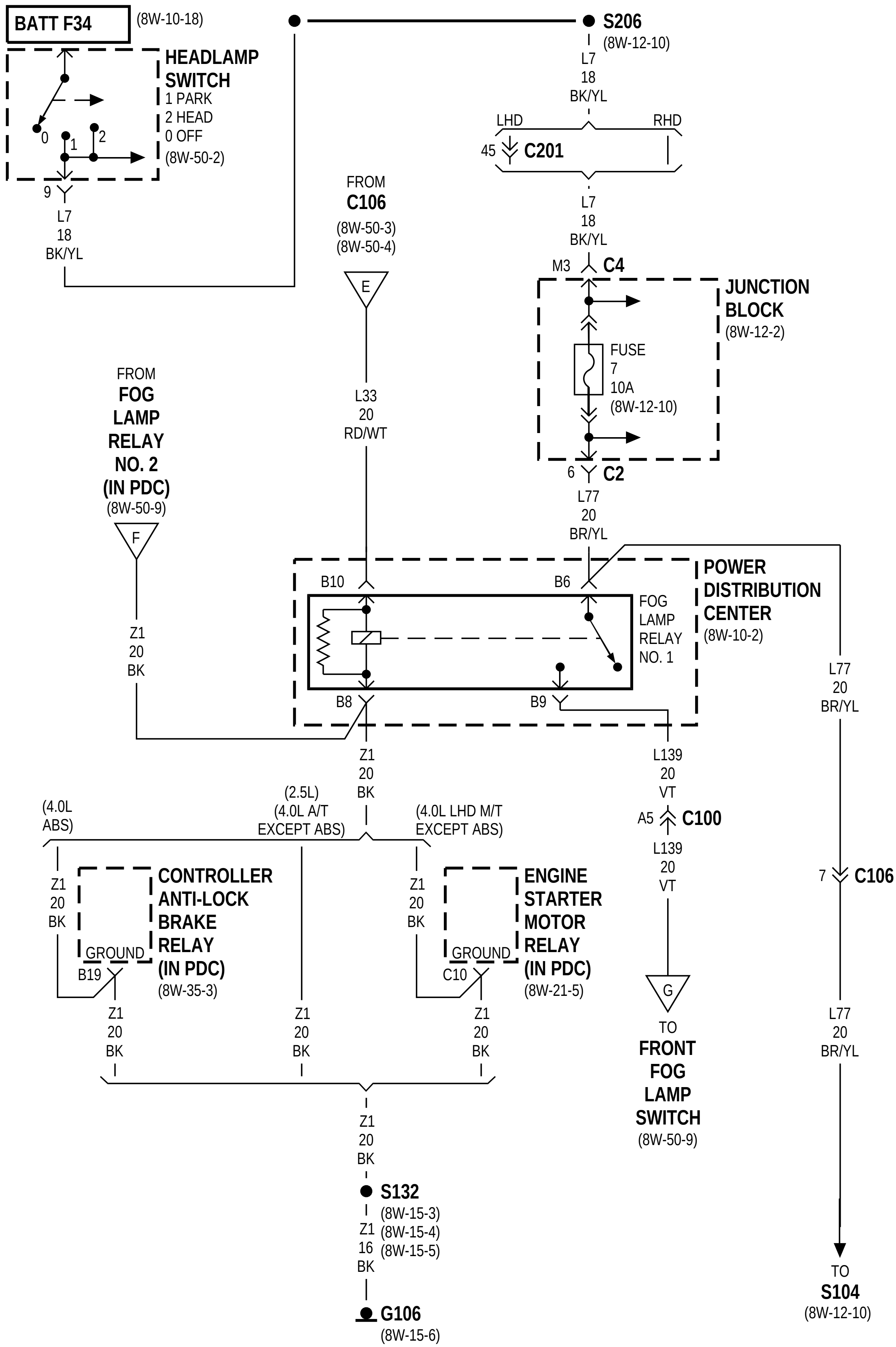
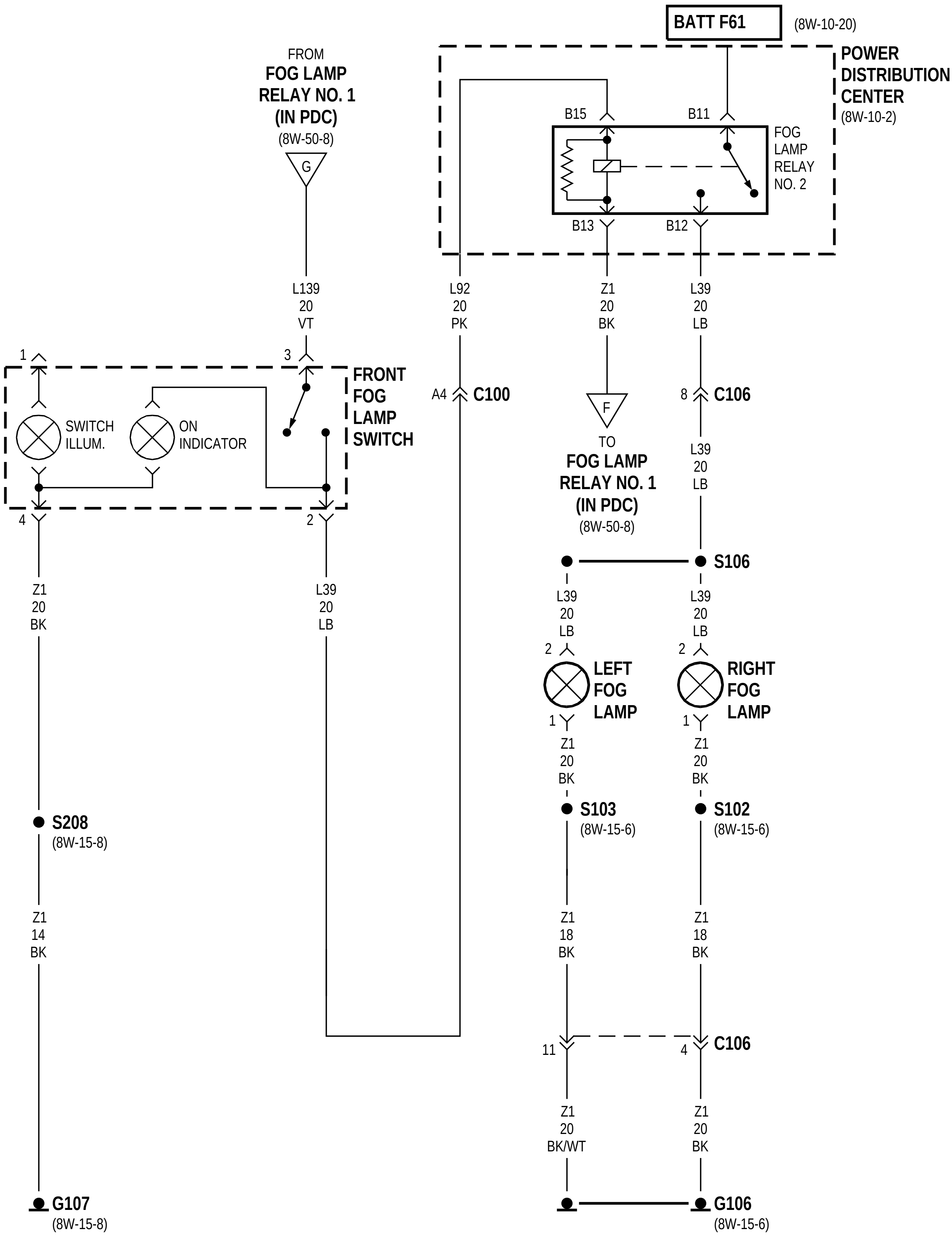
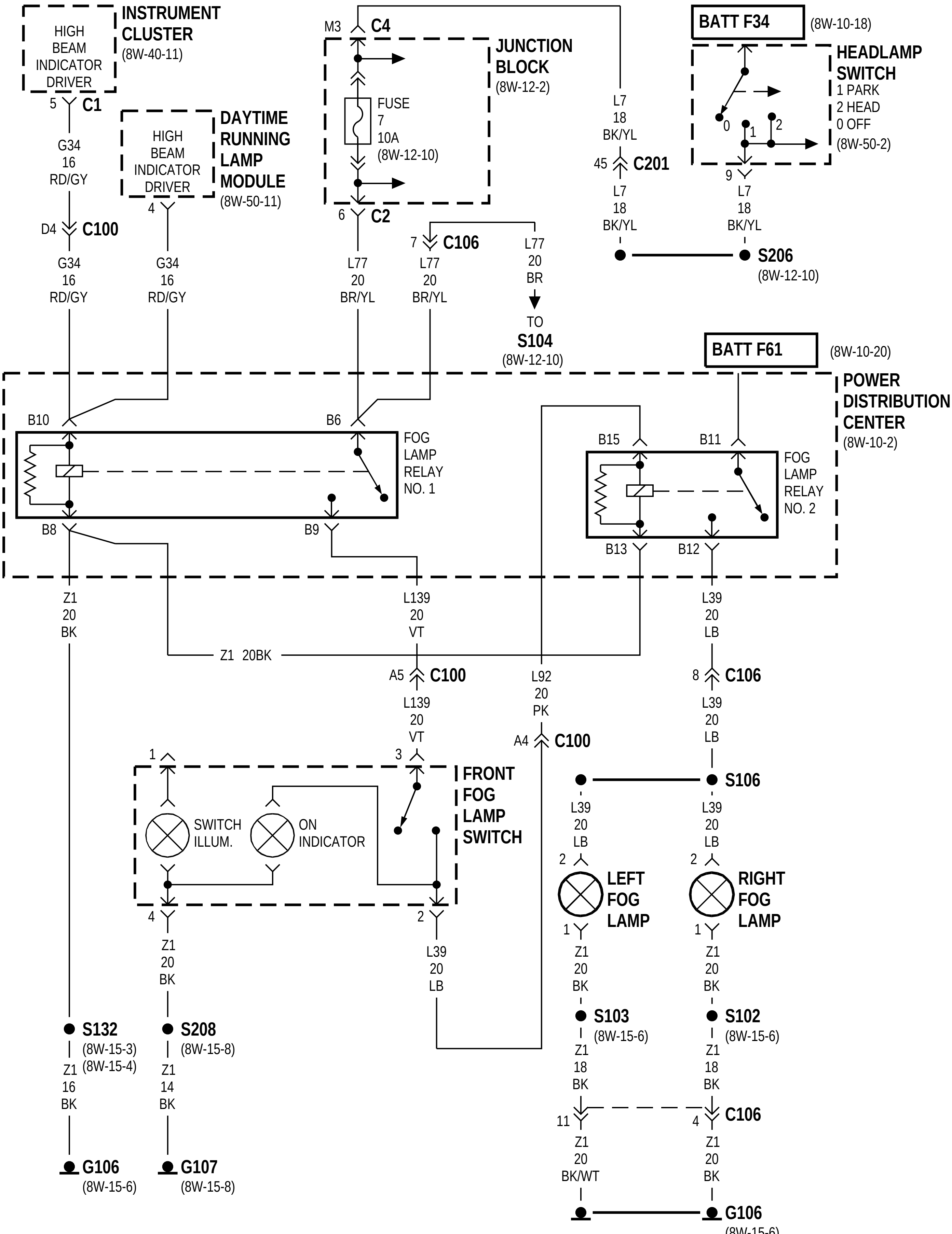

BATT F34
(8W-10-18)
HEADLAMP SWITCH
1 PARK
2 HEAD
0 OFF
(8W-50-2)
0
1
2
9
L7
18
BK/YL
S206
(8W-12-10)
L7
18
BK/YL
LHD
RHD
45
C201
L7
18
BK/YL
M3
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
7
10A
(8W-12-10)
6
C2
L77
20
BR/YL
B6
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-8)
(8W-50-10)
B9
TURN SIGNAL/ HAZARD SWITCH
(PART OF MULTI-FUNCTION SWITCH)
(8W-52-2)
LEFT TURN SIGNAL
10
L61
20
LG/WT
S209
(8W-52-3)
L61
20
LG/WT
B10
F4
C100
L61
20
LG/WT
3
C106
L61
20
LG
S105
L61
20
LG
2
LEFT SIDE MARKER LAMP
1
L77
20
BR
L61
18
LG
S104
(8W-12-10)
L77
20
BR
7
C106
L77
20
BR/YL
L77
18
BR
2
L61
18
LG
1
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 1
3
Z1
18
BK
L77
18
BR
2
1
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 2
3
Z1
18
BK
S158
(8W-15-6)
S103
(8W-15-6)
Z1
18
BK
11
C106
Z1
20
BK/WT
G106
(8W-15-6)
● RHD
▲ LHD


BATT F34
(8W-10-18)
HEADLAMP SWITCH
1 PARK
2 HEAD
0 OFF
(8W-50-2)
0
1
2
9
L7
18
BK/YL
S206
(8W-12-10)
L7
18
BK/YL
LHD
RHD
45
C201
L7
18
BK/YL
M3
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
23
10A
(8W-12-22)
5
C1
L78
20
DG/YL
14
C106
L78
20
DG/YL
RIGHT TURN SIGNAL
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
1
L60
20
TN
S212
(8W-52-4)
L60
20
TN
B9
F3
C100
L60
20
TN
10
C106
L60
20
TN
S100
L60
20
TN
2
RIGHT SIDE MARKER LAMP
1
L78
20
DG/YL
S101
L78
18
DG/YL
L60
18
TN
2
1
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 1
3
Z1
18
BK
L78
18
DG/YL
L60
18
TN
2
1
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 2
3
Z1
18
BK
S102
(8W-15-6)
Z1 18BK
4
C106
Z1
20
BK
G106
(8W-15-6)
▲ LHD
● RHD


BATT F34
(8W-10-18)
HEADLAMP SWITCH
1 PARK
2 HEAD
0 OFF
(8W-50-2)
0
1
2
9
L7
18
BK/YL
S206
(8W-12-10)
L7
18
BK/YL
LHD
RHD
45
C201
L7
18
BK/YL
FROM
C106
(8W-50-3)
(8W-50-4)
E
L33
20
RD/WT
M3
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
7
10A
(8W-12-10)
6
C2
L77
20
BR/YL
FROM
FOG LAMP RELAY NO. 2 (IN PDC)
(8W-50-9)
F
Z1
20
BK
B10
B6
FOG LAMP RELAY NO. 1
POWER DISTRIBUTION CENTER
(8W-10-2)
B8
B9
L77
20
BR/YL
Z1
20
BK
L139
20
VT
A5
C100
L139
20
VT
(4.0L ABS)
(2.5L)
(4.0L A/T EXCEPT ABS)
(4.0L LHD M/T EXCEPT ABS)
Z1
20
BK
CONTROLLER ANTI-LOCK BRAKE RELAY (IN PDC)
(8W-35-3)
GROUND
B19
Z1
20
BK
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-5)
GROUND
C10
7
C106
G
TO
FRONT FOG LAMP SWITCH
(8W-50-9)
Z1
20
BK
Z1
20
BK
Z1
20
BK
L77
20
BR/YL
Z1
20
BK
S132
(8W-15-3)
(8W-15-4)
(8W-15-5)
Z1
16
BK
G106
(8W-15-6)
TO
S104
(8W-12-10)


BATT F61
(8W-10-20)
POWER DISTRIBUTION CENTER
(8W-10-2)
FROM
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-8)
G
B15
B11
FOG LAMP RELAY NO. 2
B13
B12
L139 20 VT
L92 20 PK
Z1 20 BK
L39 20 LB
1
3
FRONT FOG LAMP SWITCH
SWITCH ILLUM.
ON INDICATOR
4
2
A4
C100
F
TO
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-8)
8
C106
L39 20 LB
S106
Z1 20 BK
L39 20 LB
LEFT FOG LAMP
RIGHT FOG LAMP
Z1 20 BK
S103
(8W-15-6)
S102
(8W-15-6)
S208
(8W-15-8)
Z1 14 BK
Z1 18 BK
11
4
C106
Z1 20 BK/WT
Z1 20 BK
G107
(8W-15-8)
G106
(8W-15-6)

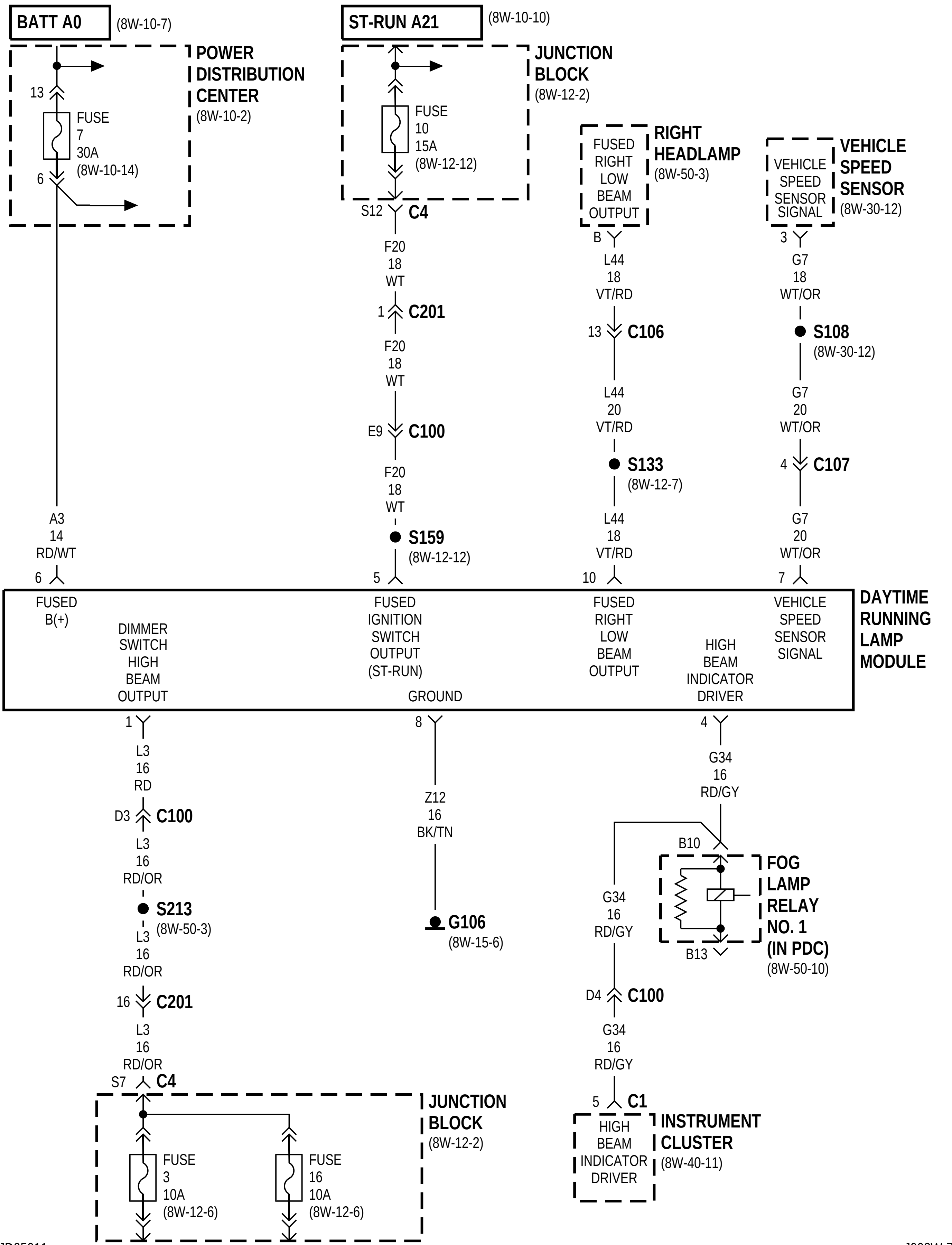
DRL



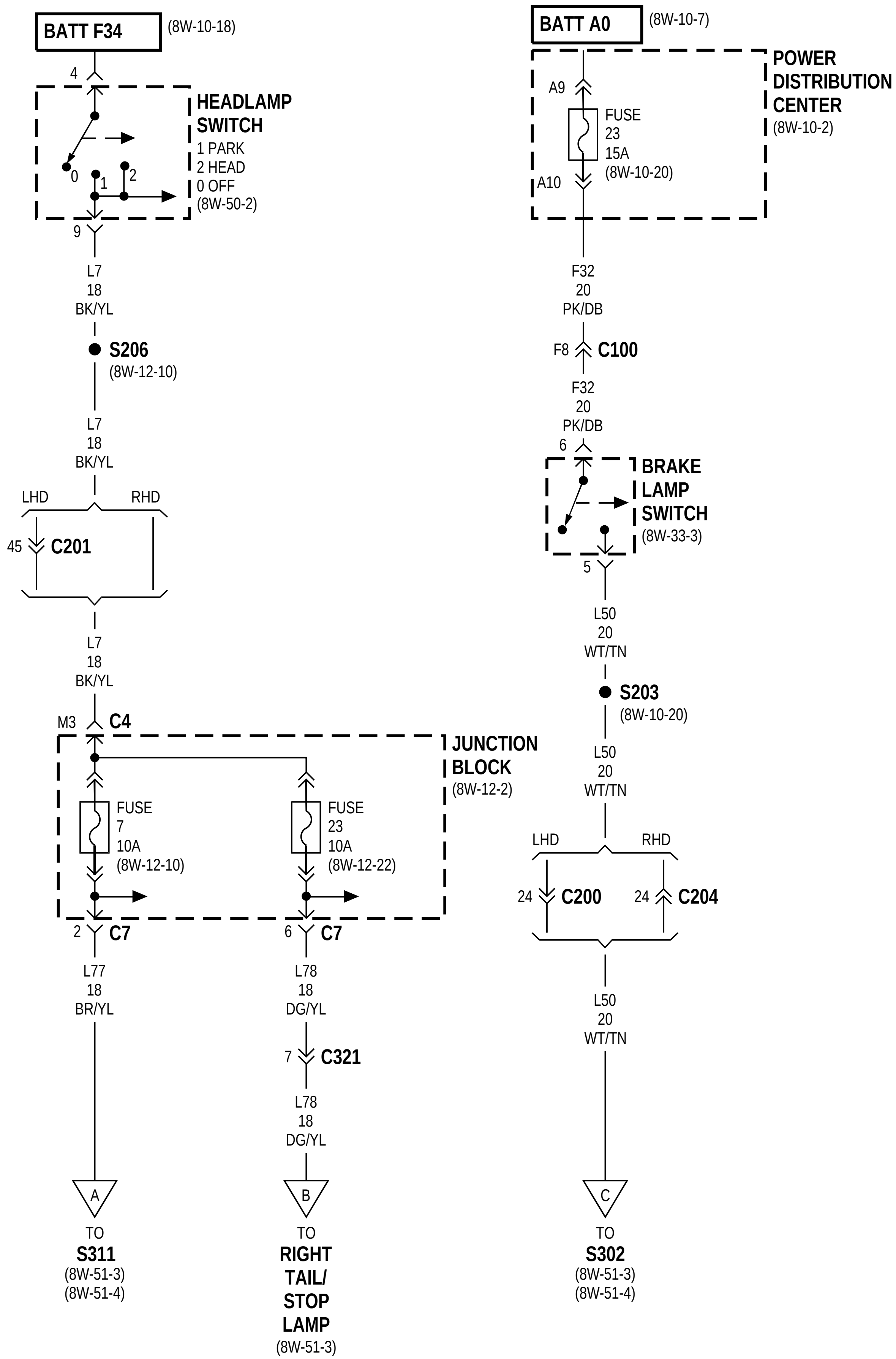
J008W-7

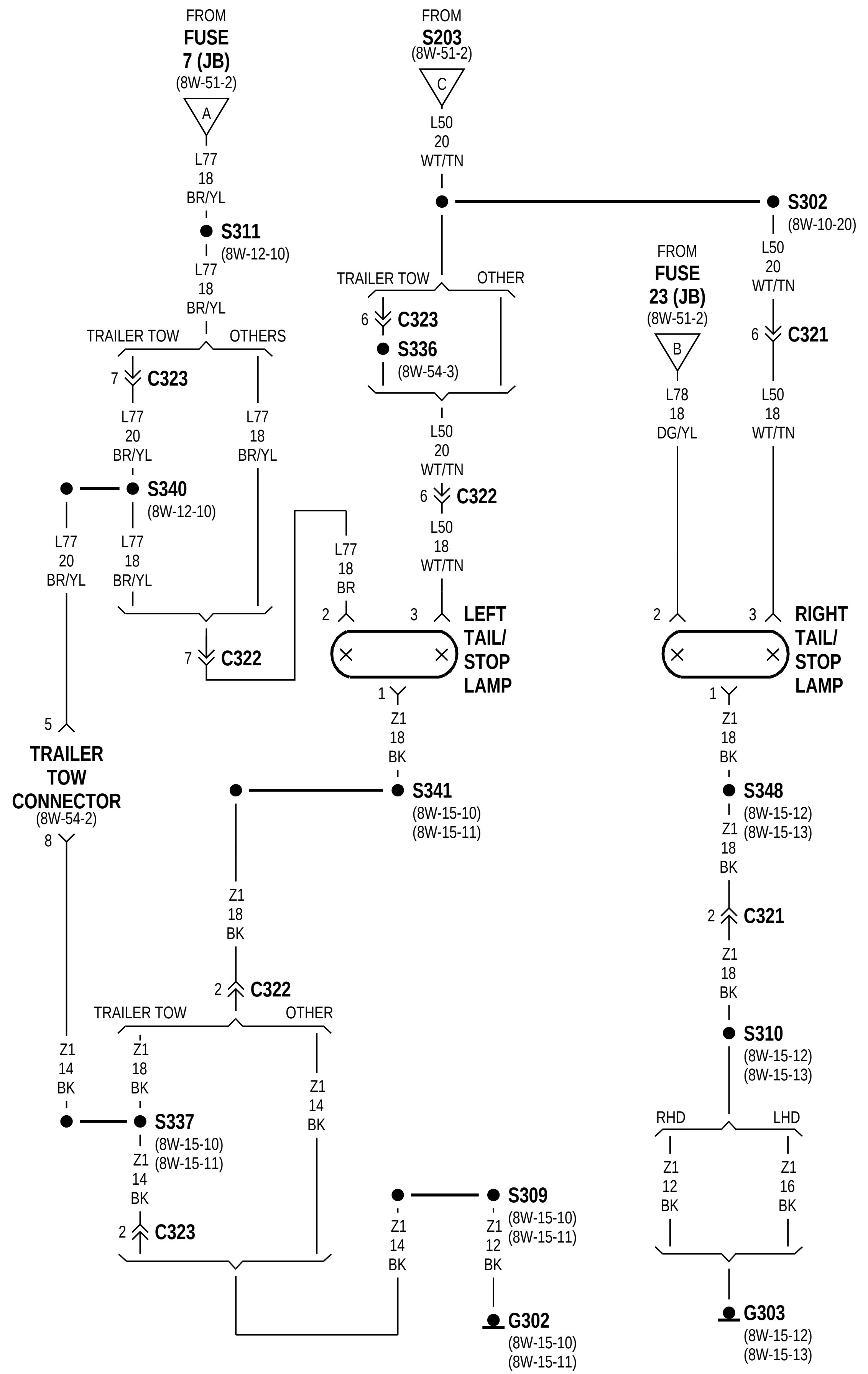
XJD05010

DRL

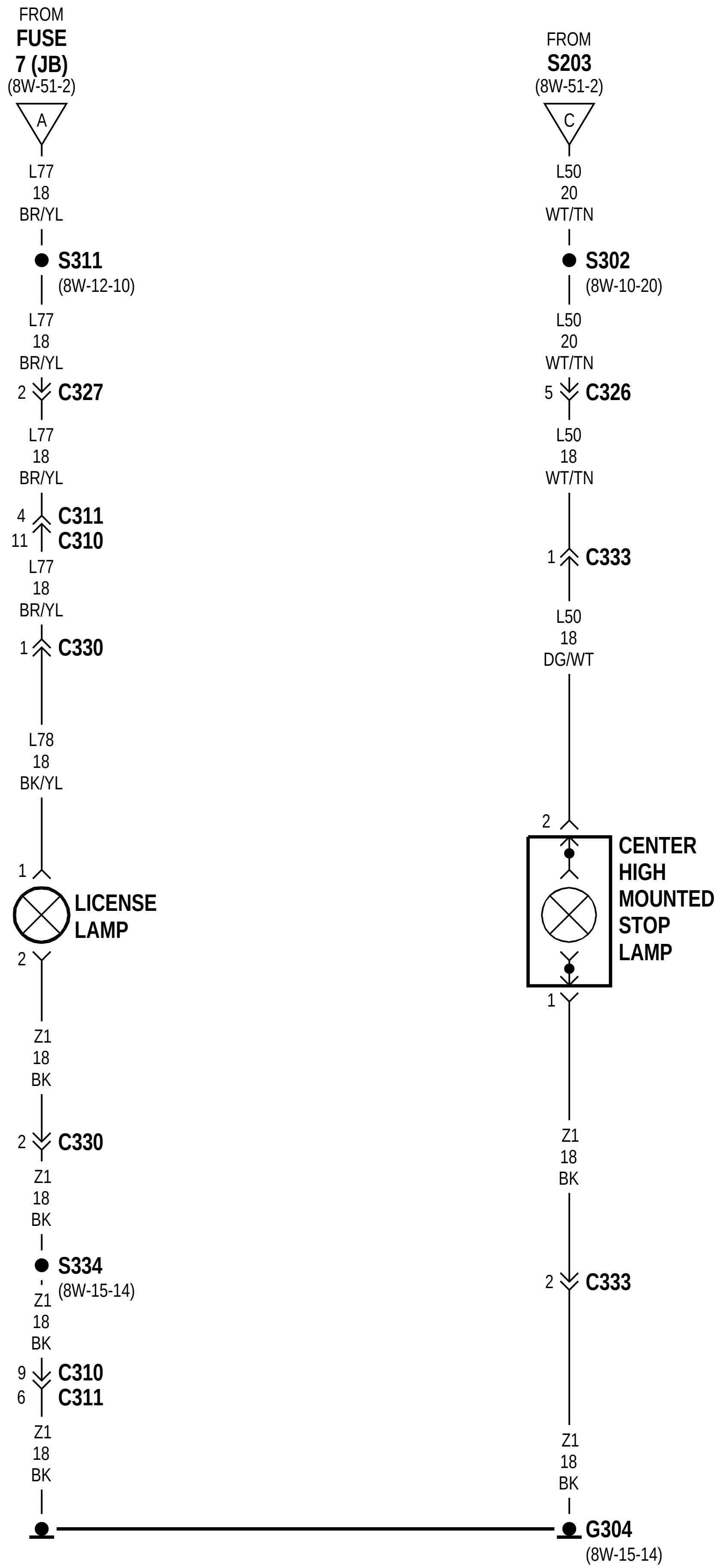

BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
13
FUSE 7 30A (8W-10-14)
6
ST-RUN A21
(8W-10-10)
JUNCTION BLOCK
(8W-12-2)
FUSE 10 15A (8W-12-12)
S12
C4
F20 18 WT
1
C201
F20 18 WT
E9
C100
F20 18 WT
S159
(8W-12-12)
5
FUSED RIGHT LOW BEAM OUTPUT
RIGHT HEADLAMP
(8W-50-3)
B
L44 18 VT/RD
13
C106
L44 20 VT/RD
S133
(8W-12-7)
L44 18 VT/RD
10
VEHICLE SPEED SENSOR SIGNAL
VEHICLE SPEED SENSOR
(8W-30-12)
3
G7 18 WT/OR
S108
(8W-30-12)
G7 20 WT/OR
4
C107
G7 20 WT/OR
7
A3 14 RD/WT
6
FUSED B(+)
DIMMER SWITCH HIGH BEAM OUTPUT
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
GROUND
FUSED RIGHT LOW BEAM OUTPUT
HIGH BEAM INDICATOR DRIVER
VEHICLE SPEED SENSOR SIGNAL
DAYTIME RUNNING LAMP MODULE
1
L3 16 RD
D3
C100
L3 16 RD/OR
S213
(8W-50-3)
L3 16 RD/OR
16
C201
L3 16 RD/OR
S7
C4
JUNCTION BLOCK
(8W-12-2)
FUSE 3 10A (8W-12-6)
FUSE 16 10A (8W-12-6)
8
Z12 16 BK/TN
G106
(8W-15-6)
4
G34 16 RD/GY
B10
FOG LAMP RELAY NO. 1 (IN PDC)
(8W-50-10)
B13
G34 16 RD/GY
D4
C100
G34 16 RD/GY
5
C1
HIGH BEAM INDICATOR DRIVER
INSTRUMENT CLUSTER
(8W-40-11)

8W-51 REAR LIGHTING

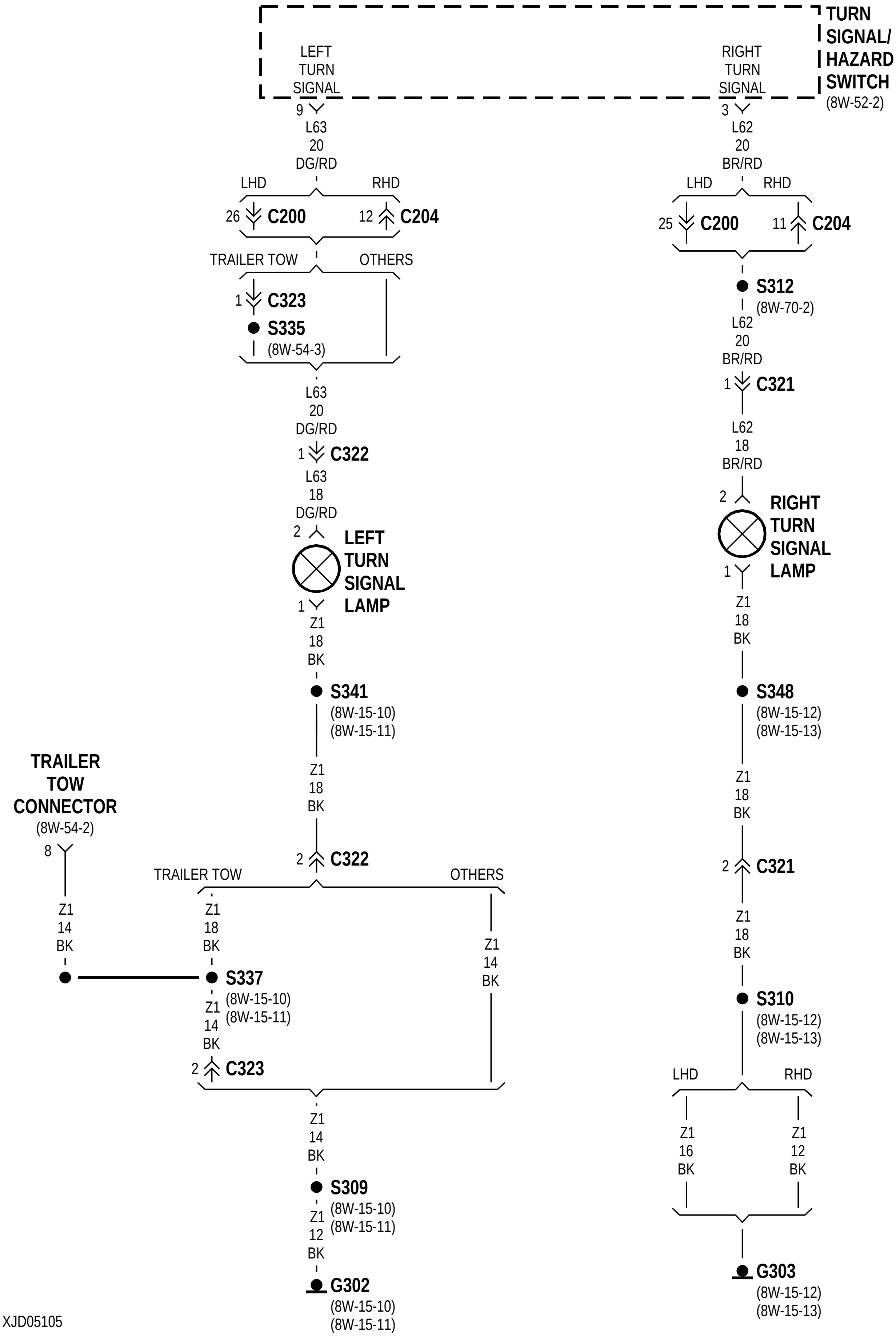

BATT F34
(8W-10-18)
4
HEADLAMP
SWITCH
1 PARK
2 HEAD
0 OFF
(8W-50-2)
0
1
2
9
L7
18
BK/YL
S206
(8W-12-10)
L7
18
BK/YL
LHD
RHD
45
C201
L7
18
BK/YL
M3
C4
JUNCTION
BLOCK
(8W-12-2)
FUSE
7
10A
(8W-12-10)
FUSE
23
10A
(8W-12-22)
2
C7
6
C7
L77
18
BR/YL
L78
18
DG/YL
7
C321
L78
18
DG/YL
A
TO
S311
(8W-51-3)
(8W-51-4)
B
TO
RIGHT
TAIL/
STOP
LAMP
(8W-51-3)
BATT A0
(8W-10-7)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
A9
FUSE
23
15A
(8W-10-20)
A10
F32
20
PK/DB
F8
C100
F32
20
PK/DB
6
BRAKE
LAMP
SWITCH
(8W-33-3)
5
L50
20
WT/TN
S203
(8W-10-20)
L50
20
WT/TN
LHD
RHD
24
C200
24
C204
L50
20
WT/TN
C
TO
S302
(8W-51-3)
(8W-51-4)

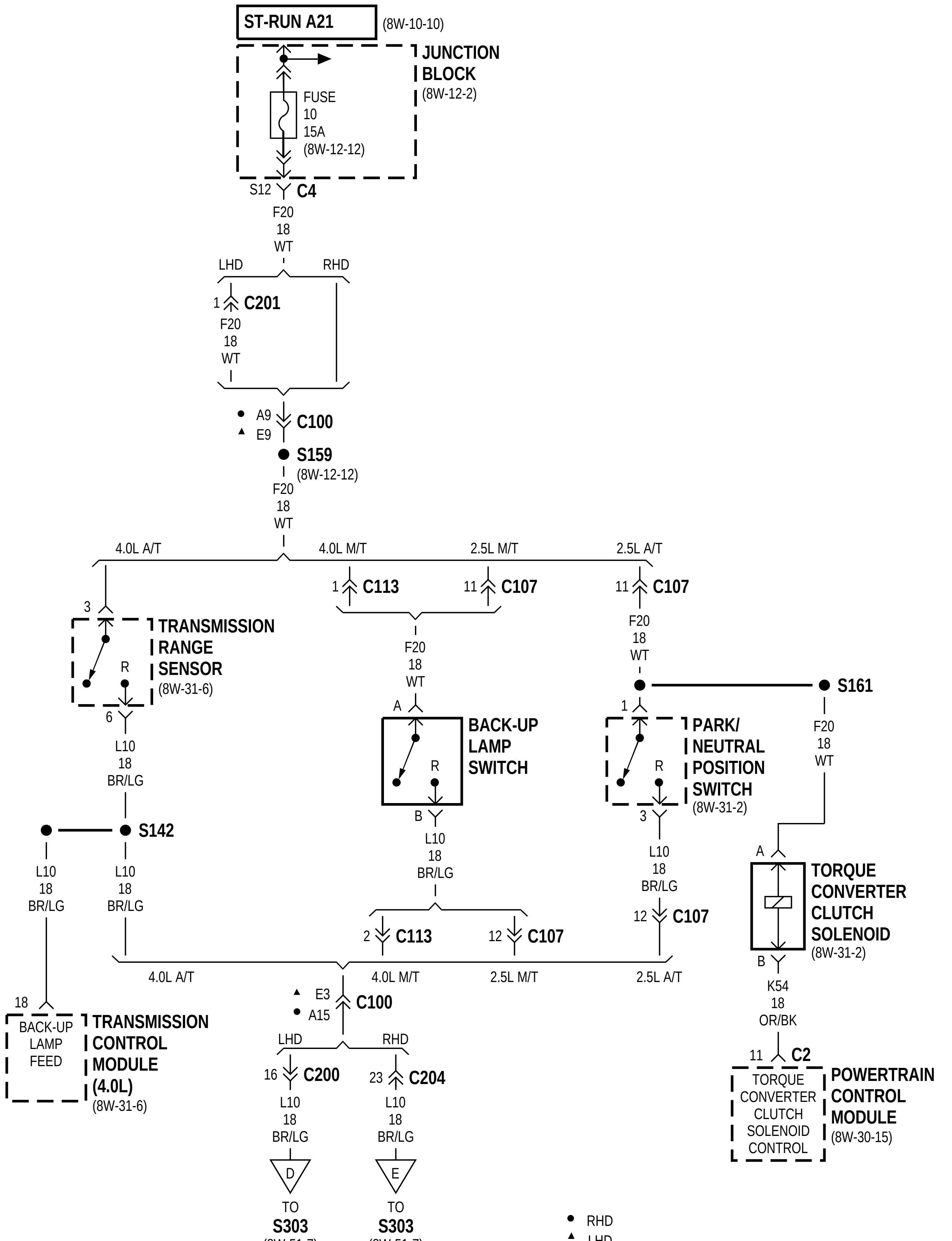

FROM
FUSE
7 (JB)
(8W-51-2)
A
L77
18
BR/YL
S311
(8W-12-10)
L77
18
BR/YL
TRAILER TOW
OTHERS
7
C323
L77
20
BR/YL
L77
18
BR/YL
S340
(8W-12-10)
L77
20
BR/YL
L77
18
BR/YL
7
C322
L77
18
BR
5
TRAILER
TOW
CONNECTOR
(8W-54-2)
8
FROM
S203
(8W-51-2)
C
L50
20
WT/TN
S302
(8W-10-20)
L50
20
WT/TN
TRAILER TOW
OTHER
6
C323
S336
(8W-54-3)
L50
20
WT/TN
6
C322
L50
18
WT/TN
2
3
LEFT
TAIL/
STOP
LAMP
1
Z1
18
BK
S341
(8W-15-10)
(8W-15-11)
Z1
18
BK
2
C322
TRAILER TOW
OTHER
Z1
14
BK
Z1
18
BK
Z1
14
BK
S337
(8W-15-10)
(8W-15-11)
Z1
14
BK
2
C323
S309
(8W-15-10)
(8W-15-11)
Z1
14
BK
Z1
12
BK
G302
(8W-15-10)
(8W-15-11)
FROM
FUSE
23 (JB)
(8W-51-2)
B
L78
18
DG/YL
6
C321
L50
18
WT/TN
2
3
RIGHT
TAIL/
STOP
LAMP
1
Z1
18
BK
S348
(8W-15-12)
(8W-15-13)
Z1
18
BK
2
C321
Z1
18
BK
S310
(8W-15-12)
(8W-15-13)
RHD
LHD
Z1
12
BK
Z1
16
BK
G303
(8W-15-12)
(8W-15-13)

XJD05103

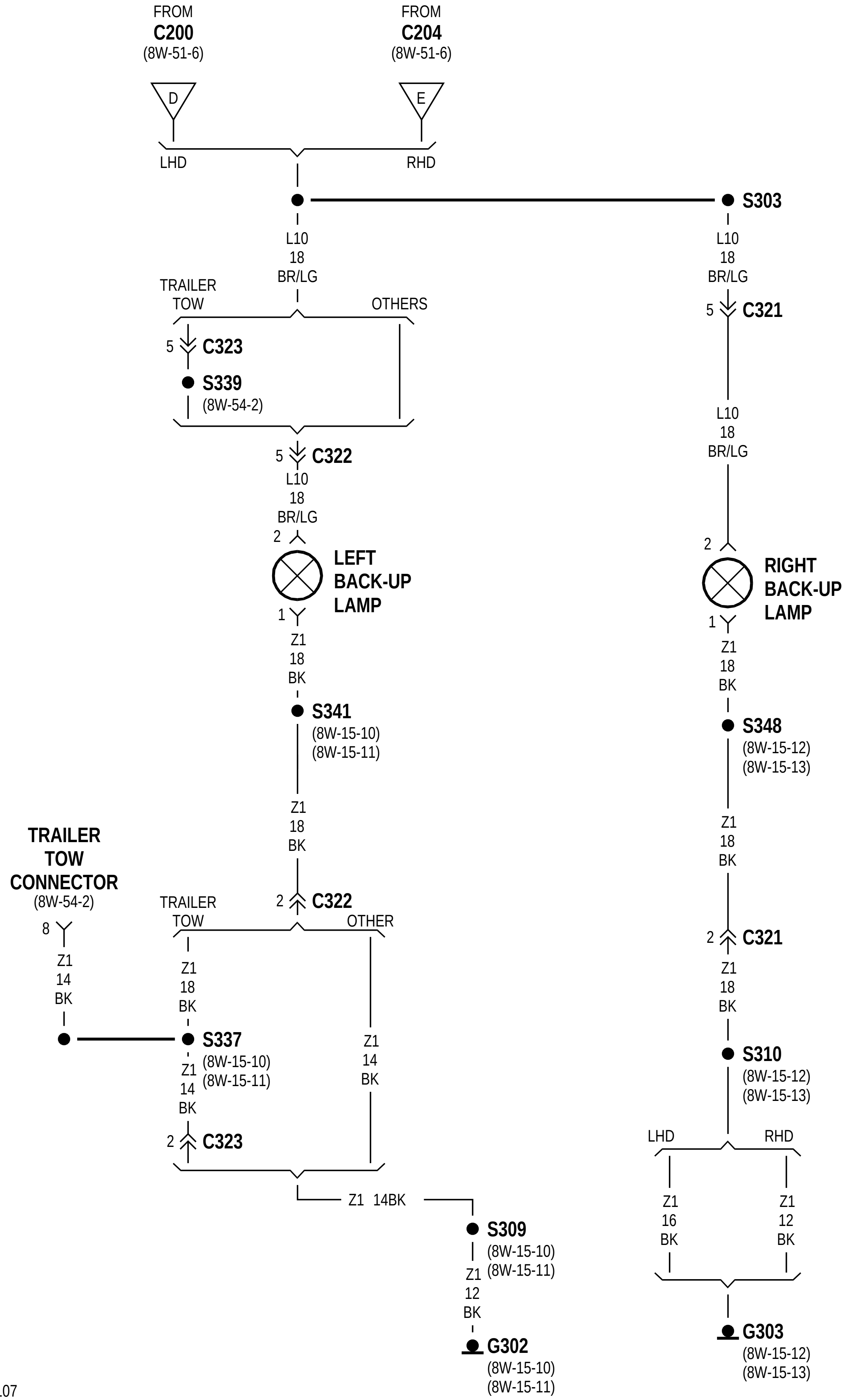


J008W-7 XJD05104


TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
9
L63
20
DG/RD
3
L62
20
BR/RD
LHD
RHD
26 C200
12 C204
25 C200
11 C204
TRAILER TOW
OTHERS
1 C323
S335
(8W-54-3)
S312
(8W-70-2)
L62
20
BR/RD
1 C321
L63
20
DG/RD
1 C322
L63
18
DG/RD
L62
18
BR/RD
2
LEFT TURN SIGNAL LAMP
1
RIGHT TURN SIGNAL LAMP
Z1
18
BK
S341
(8W-15-10)
(8W-15-11)
S348
(8W-15-12)
(8W-15-13)
TRAILER TOW CONNECTOR
(8W-54-2)
8
2 C322
2 C321
Z1
14
BK
S337
(8W-15-10)
(8W-15-11)
2 C323
S310
(8W-15-12)
(8W-15-13)
Z1
16
BK
Z1
12
BK
S309
(8W-15-10)
(8W-15-11)
G302
(8W-15-10)
(8W-15-11)
G303
(8W-15-12)
(8W-15-13)

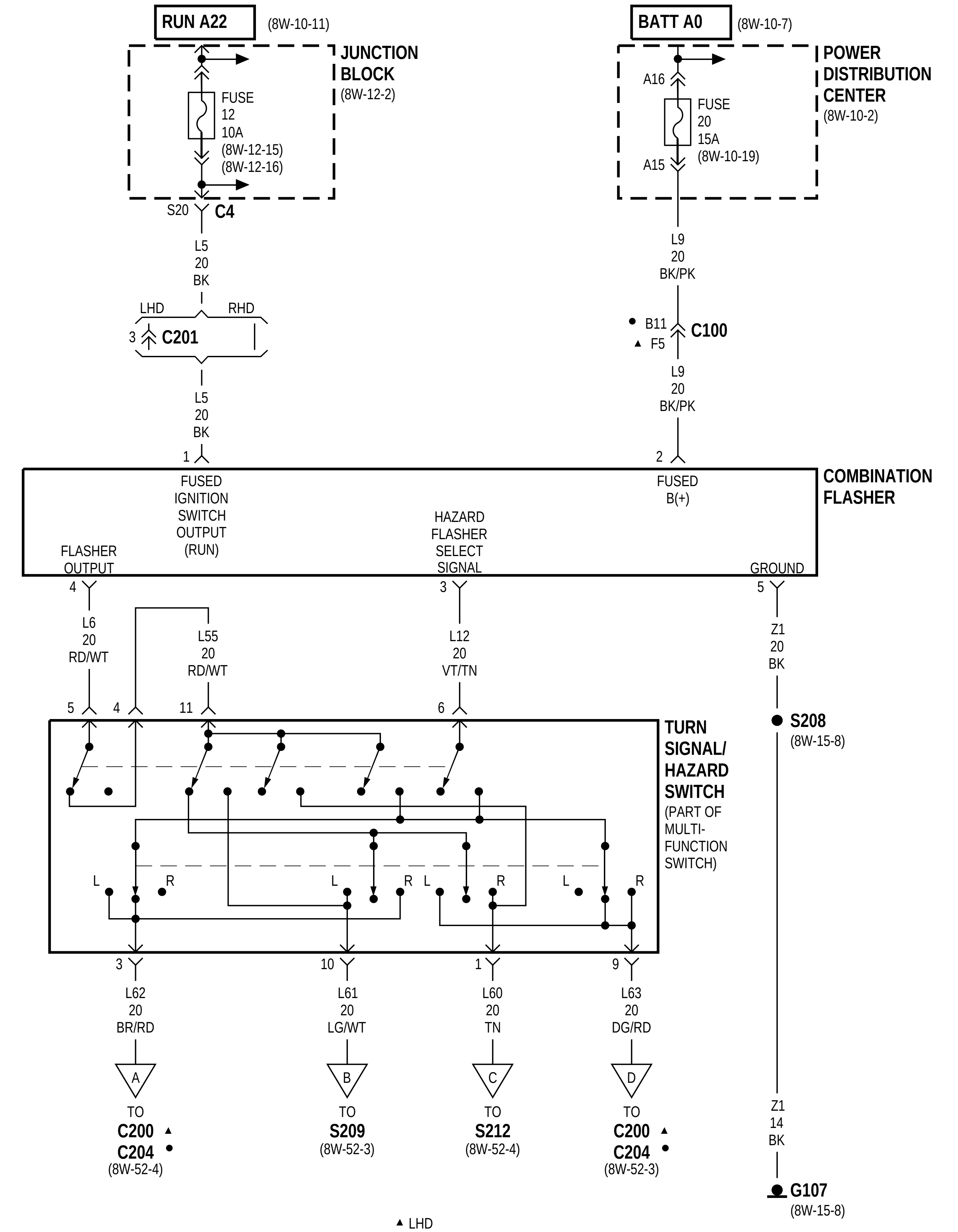


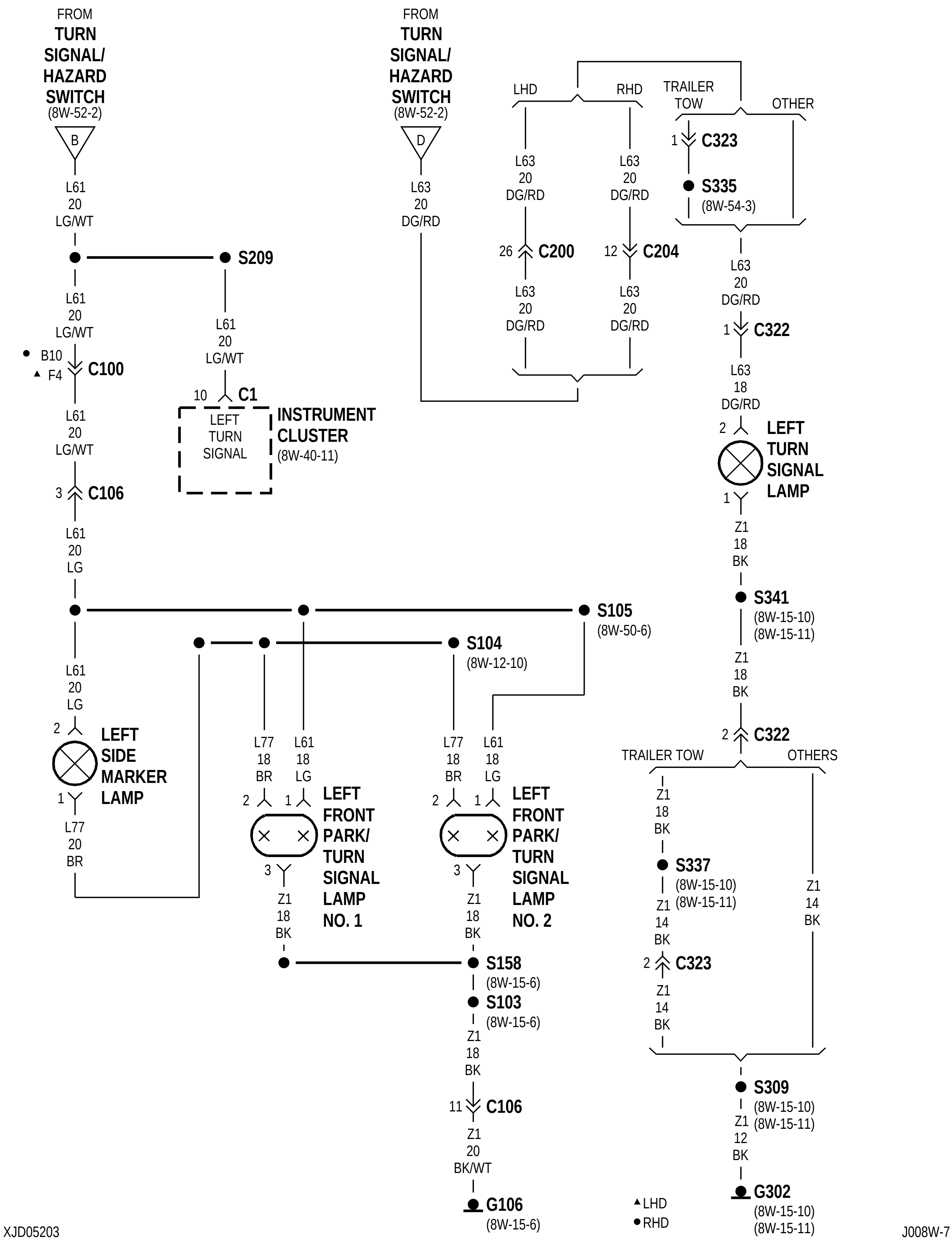
J008W-7 XJD05106

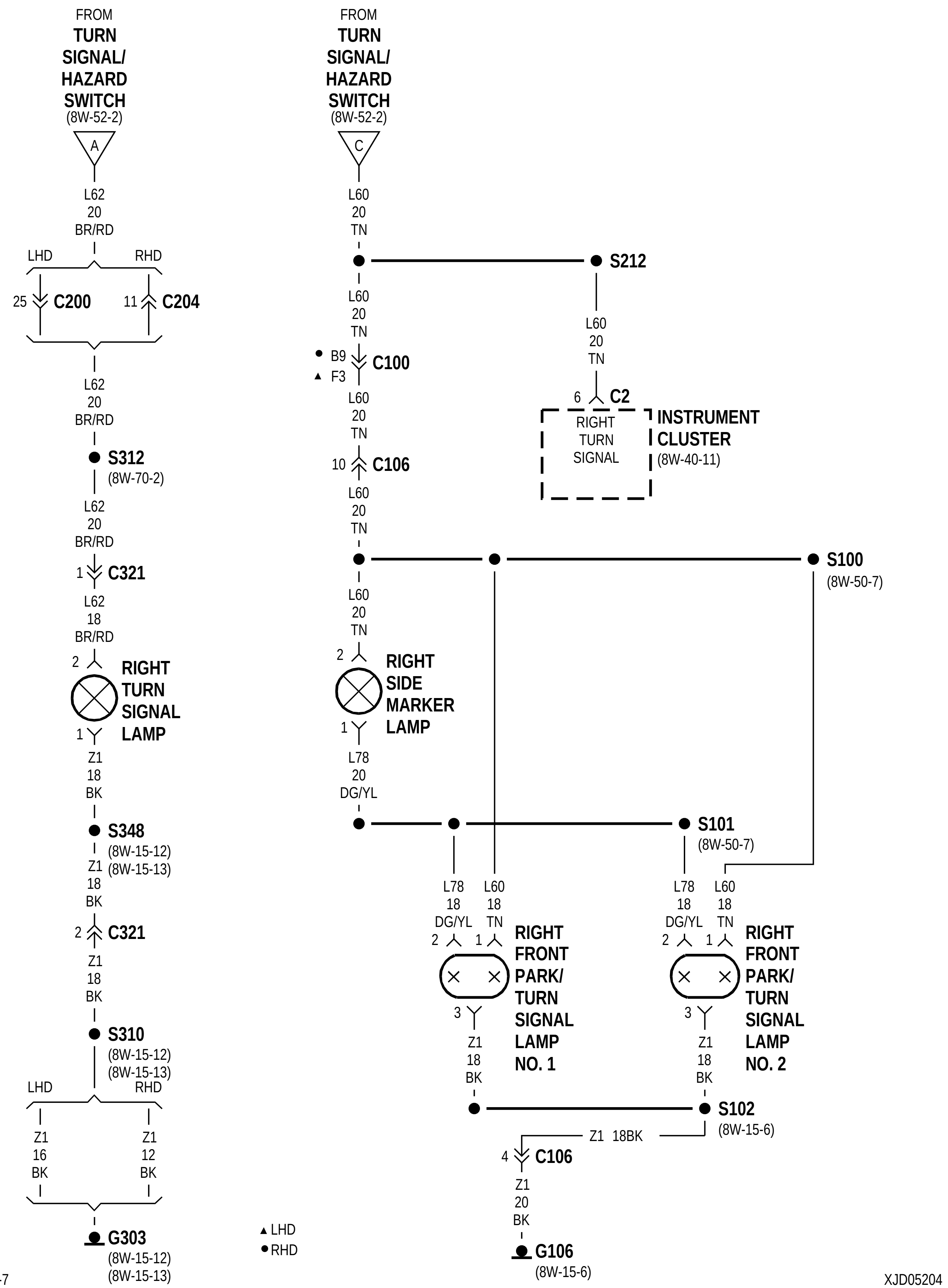

FROM
C200
(8W-51-6)
D
FROM
C204
(8W-51-6)
E
LHD
RHD
S303
L10
18
BR/LG
TRAILER TOW
OTHERS
5 C323
S339
(8W-54-2)
5 C321
5 C322
2
LEFT BACK-UP LAMP
1
Z1
18
BK
S341
(8W-15-10)
(8W-15-11)
RIGHT BACK-UP LAMP
S348
(8W-15-12)
(8W-15-13)
TRAILER TOW CONNECTOR
(8W-54-2)
8
2 C322
OTHER
Z1
14
BK
S337
(8W-15-10)
(8W-15-11)
2 C323
2 C321
S310
(8W-15-12)
(8W-15-13)
Z1 14BK
S309
(8W-15-10)
(8W-15-11)
Z1
12
BK
G302
(8W-15-10)
(8W-15-11)
Z1
16
BK
G303
(8W-15-12)
(8W-15-13)

XJD05107

8W-52 TURN SIGNALS

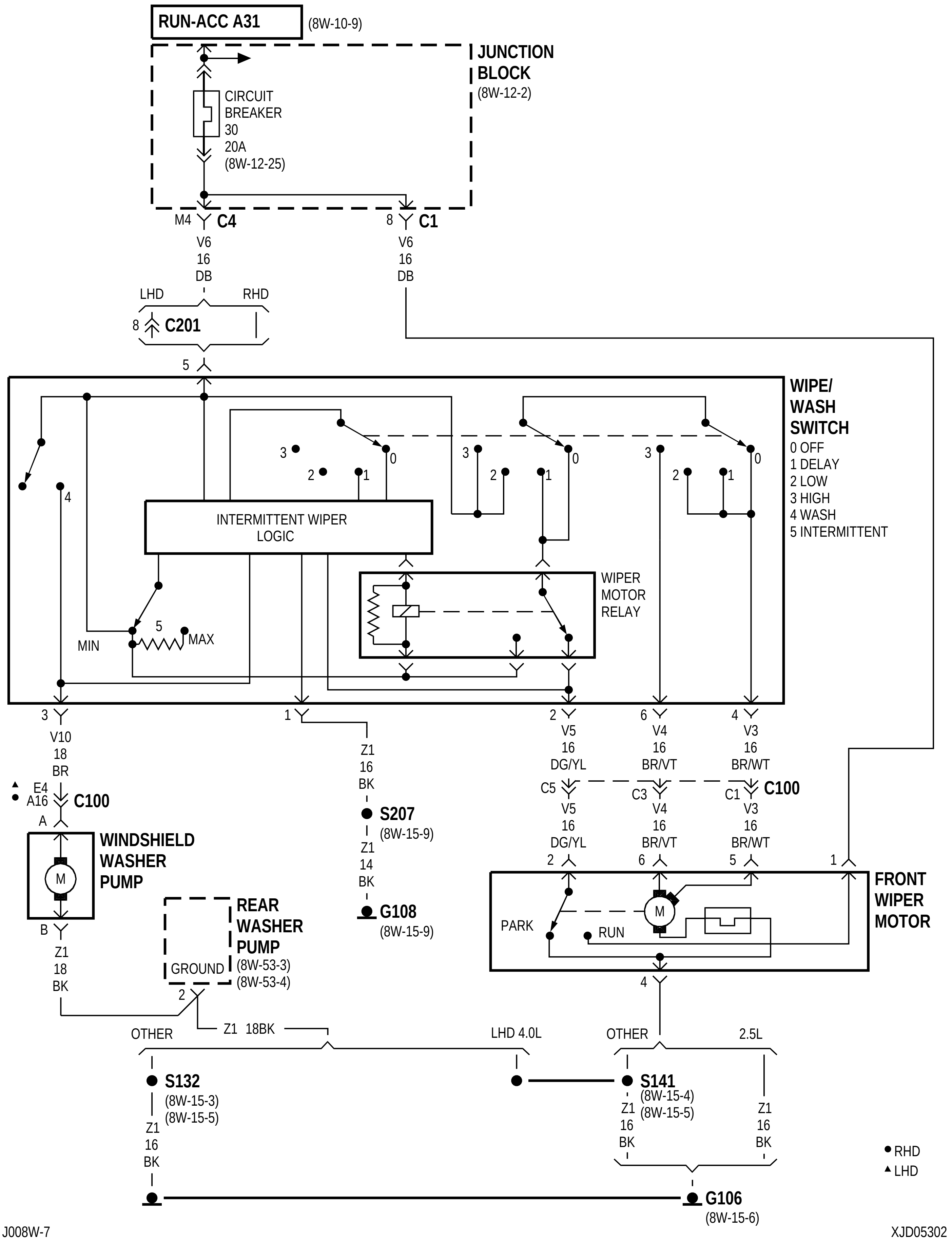

RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE
12
10A
(8W-12-15)
(8W-12-16)
S20
C4
L5
20
BK
LHD
RHD
3
C201
L5
20
BK
BATT A0
(8W-10-7)
POWER DISTRIBUTION CENTER
(8W-10-2)
A16
FUSE
20
15A
(8W-10-19)
A15
L9
20
BK/PK
B11
F5
C100
L9
20
BK/PK
1
2
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED B(+)
COMBINATION FLASHER
FLASHER OUTPUT
HAZARD FLASHER SELECT SIGNAL
GROUND
4
3
5
L6
20
RD/WT
L55
20
RD/WT
L12
20
VT/TN
Z1
20
BK
5
4
11
6
S208
(8W-15-8)
TURN SIGNAL/ HAZARD SWITCH
(PART OF MULTI-FUNCTION SWITCH)
L
R
L
R
L
R
L
R
3
10
1
9
L62
20
BR/RD
L61
20
LG/WT
L60
20
TN
L63
20
DG/RD
A
B
C
D
TO
C200
C204
(8W-52-4)
TO
S209
(8W-52-3)
TO
S212
(8W-52-4)
TO
C200
C204
(8W-52-3)
Z1
14
BK
G107
(8W-15-8)
▲ LHD
● RHD


FROM
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
B
L61
20
LG/WT
S209
L61
20
LG/WT
B10
F4
C100
10
C1
LEFT TURN SIGNAL
INSTRUMENT CLUSTER
(8W-40-11)
3
C106
L61
20
LG
2
LEFT SIDE MARKER LAMP
1
L77
20
BR
FROM
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
D
L63
20
DG/RD
LHD
RHD
L63
20
DG/RD
26
C200
12
C204
TRAILER TOW
OTHER
1
C323
S335
(8W-54-3)
C322
L63
18
DG/RD
LEFT TURN SIGNAL LAMP
Z1
18
BK
S341
(8W-15-10)
(8W-15-11)
S105
(8W-50-6)
S104
(8W-12-10)
L77
18
BR
L61
18
LG
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 1
LEFT FRONT PARK/ TURN SIGNAL LAMP NO. 2
S158
(8W-15-6)
S103
(8W-15-6)
11
C106
Z1
20
BK/WT
G106
(8W-15-6)
TRAILER TOW
OTHERS
S337
(8W-15-10)
(8W-15-11)
Z1
14
BK
2
C323
S309
(8W-15-10)
(8W-15-11)
Z1
12
BK
G302
(8W-15-10)
(8W-15-11)
▲LHD
●RHD
XJD05203
J008W-7

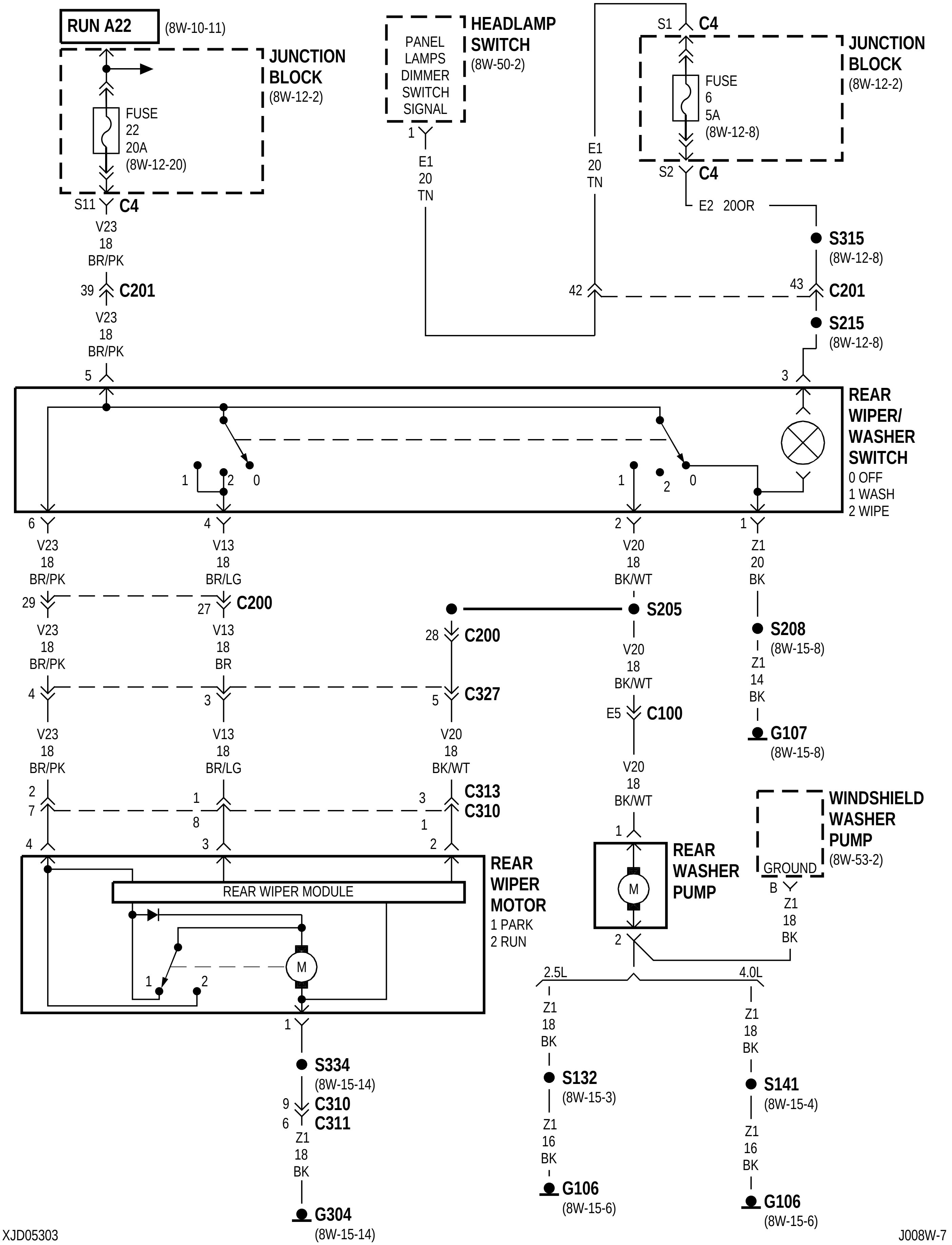


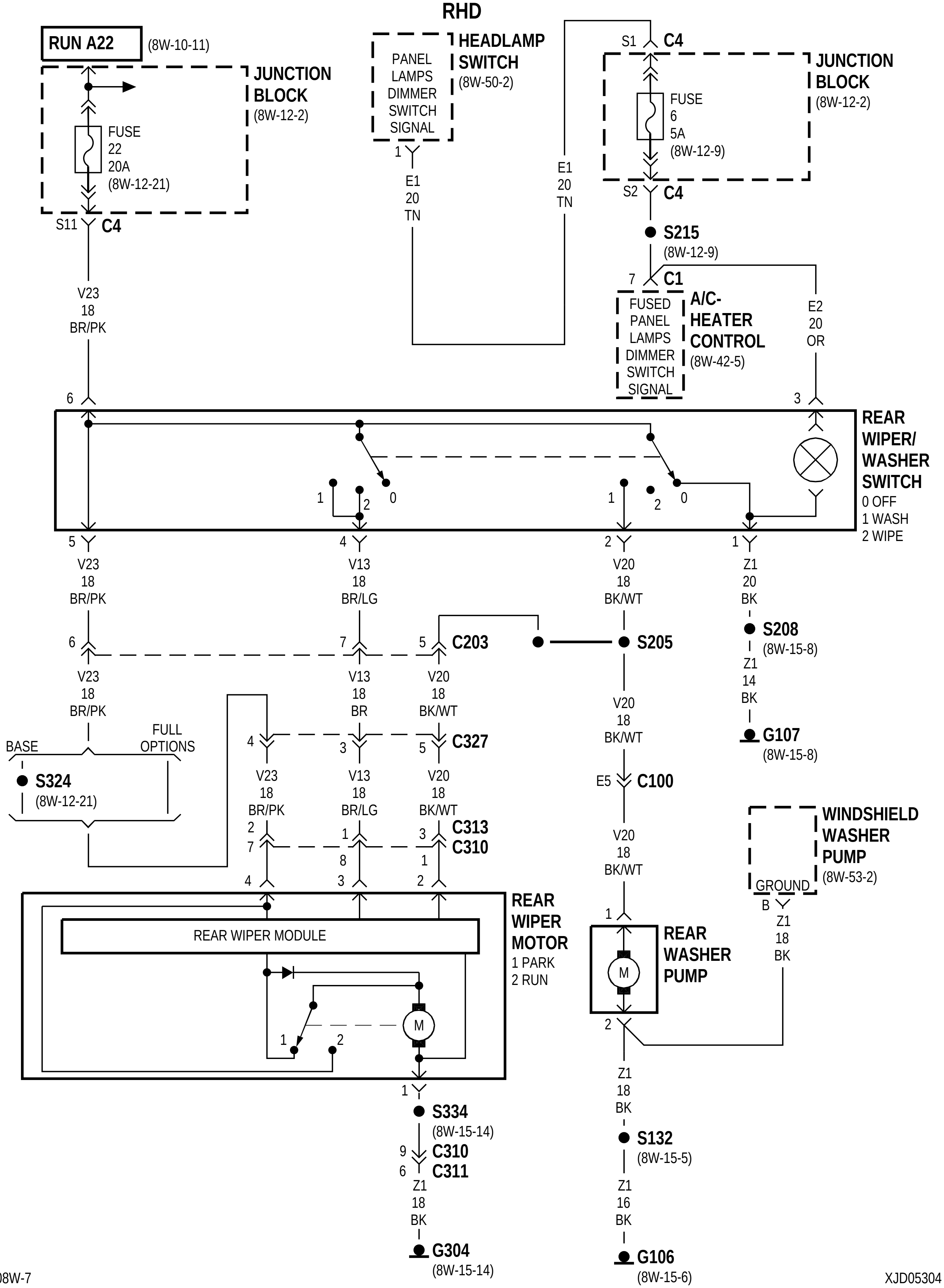
FROM
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
A
L62 20 BR/RD
LHD
RHD
25 C200
11 C204
L62 20 BR/RD
S312
(8W-70-2)
L62 20 BR/RD
1 C321
L62 18 BR/RD
2
RIGHT TURN SIGNAL LAMP
1
Z1 18 BK
S348
(8W-15-12)
(8W-15-13)
Z1 18 BK
2 C321
Z1 18 BK
S310
(8W-15-12)
(8W-15-13)
LHD
RHD
Z1 16 BK
Z1 12 BK
G303
(8W-15-12)
(8W-15-13)
FROM
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
C
L60 20 TN
S212
L60 20 TN
B9
F3
C100
L60 20 TN
10 C106
L60 20 TN
L60 20 TN
6 C2
RIGHT TURN SIGNAL
INSTRUMENT CLUSTER
(8W-40-11)
S100
(8W-50-7)
L60 20 TN
2
RIGHT SIDE MARKER LAMP
1
L78 20 DG/YL
S101
(8W-50-7)
L78 18 DG/YL
L60 18 TN
2
1
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 1
3
Z1 18 BK
L78 18 DG/YL
L60 18 TN
2
1
RIGHT FRONT PARK/ TURN SIGNAL LAMP NO. 2
3
Z1 18 BK
S102
(8W-15-6)
Z1 18BK
4 C106
Z1 20 BK
G106
(8W-15-6)
▲ LHD
● RHD

8W-53 WIPERS


RUN-ACC A31
(8W-10-9)
JUNCTION
BLOCK
(8W-12-2)
CIRCUIT
BREAKER
30
20A
(8W-12-25)
M4
C4
8
C1
V6
16
DB
V6
16
DB
LHD
RHD
8
C201
5
WIPE/
WASH
SWITCH
0 OFF
1 DELAY
2 LOW
3 HIGH
4 WASH
5 INTERMITTENT
INTERMITTENT WIPER
LOGIC
WIPER
MOTOR
RELAY
MIN
5
MAX
3
V10
18
BR
E4
A16
C100
A
WINDSHIELD
WASHER
PUMP
M
B
Z1
18
BK
REAR
WASHER
PUMP
GROUND
(8W-53-3)
(8W-53-4)
2
Z1 18BK
1
Z1
16
BK
S207
(8W-15-9)
Z1
14
BK
G108
(8W-15-9)
2
V5
16
DG/YL
6
V4
16
BR/VT
4
V3
16
BR/WT
C5
C3
C1
C100
V5
16
DG/YL
V4
16
BR/VT
V3
16
BR/WT
2
6
5
1
FRONT
WIPER
MOTOR
PARK
RUN
M
4
OTHER
LHD 4.0L
OTHER
2.5L
S132
(8W-15-3)
(8W-15-5)
Z1
16
BK
S141
(8W-15-4)
(8W-15-5)
Z1
16
BK
Z1
16
BK
G106
(8W-15-6)
RHD
LHD
J008W-7
XJD05302

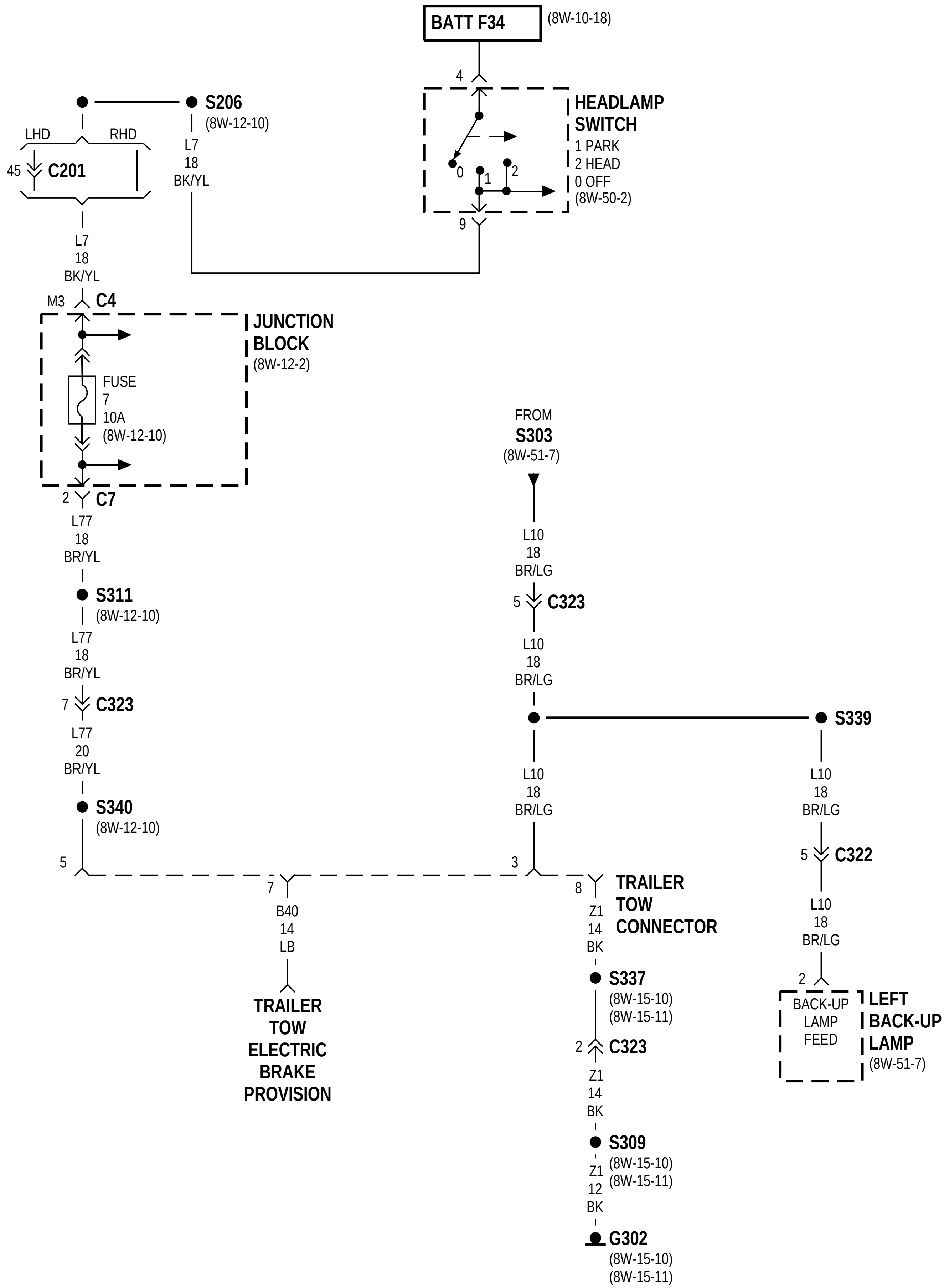
LHD

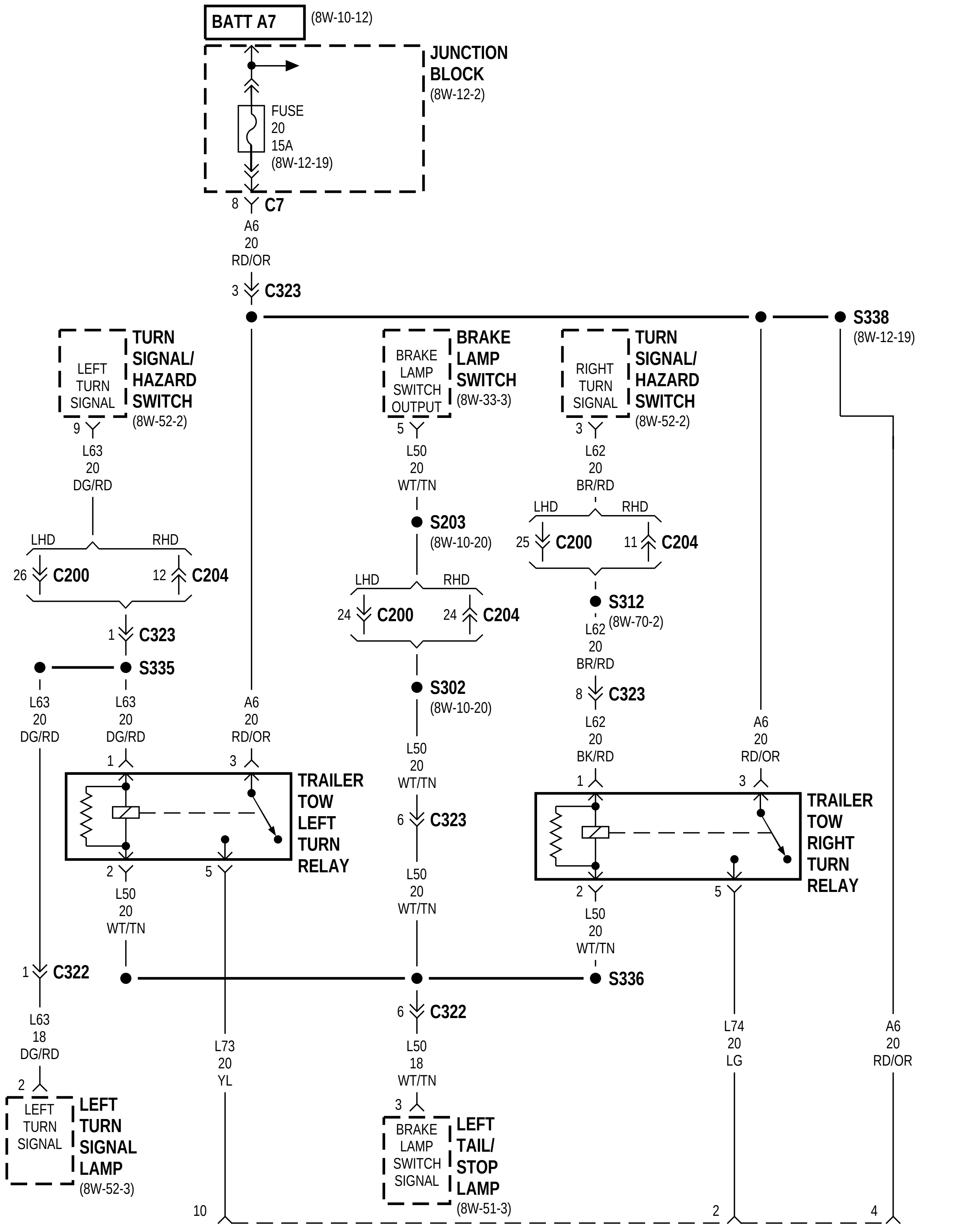

RUN A22
(8W-10-11)
JUNCTION BLOCK
(8W-12-2)
FUSE 22 20A (8W-12-20)
S11 C4
V23 18 BR/PK
39 C201
PANEL LAMPS DIMMER SWITCH SIGNAL
HEADLAMP SWITCH
(8W-50-2)
E1 20 TN
S1 C4
JUNCTION BLOCK
(8W-12-2)
FUSE 6 5A (8W-12-8)
S2 C4
E2 20OR
S315
(8W-12-8)
42
43 C201
S215
(8W-12-8)
REAR WIPER/ WASHER SWITCH
0 OFF
1 WASH
2 WIPE
V23 18 BR/PK
V13 18 BR/LG
V20 18 BK/WT
Z1 20 BK
29
27 C200
S205
28 C200
V13 18 BR
S208
(8W-15-8)
Z1 14 BK
G107
(8W-15-8)
4
3
5 C327
E5 C100
V20 18 BK/WT
C313
C310
WINDSHIELD WASHER PUMP
(8W-53-2)
GROUND
REAR WASHER PUMP
REAR WIPER MODULE
REAR WIPER MOTOR
1 PARK
2 RUN
Z1 18 BK
2.5L
4.0L
S334
(8W-15-14)
9 C310
6 C311
G304
(8W-15-14)
S132
(8W-15-3)
Z1 16 BK
G106
(8W-15-6)
S141
(8W-15-4)
G106
(8W-15-6)



J008W-7 XJD05304

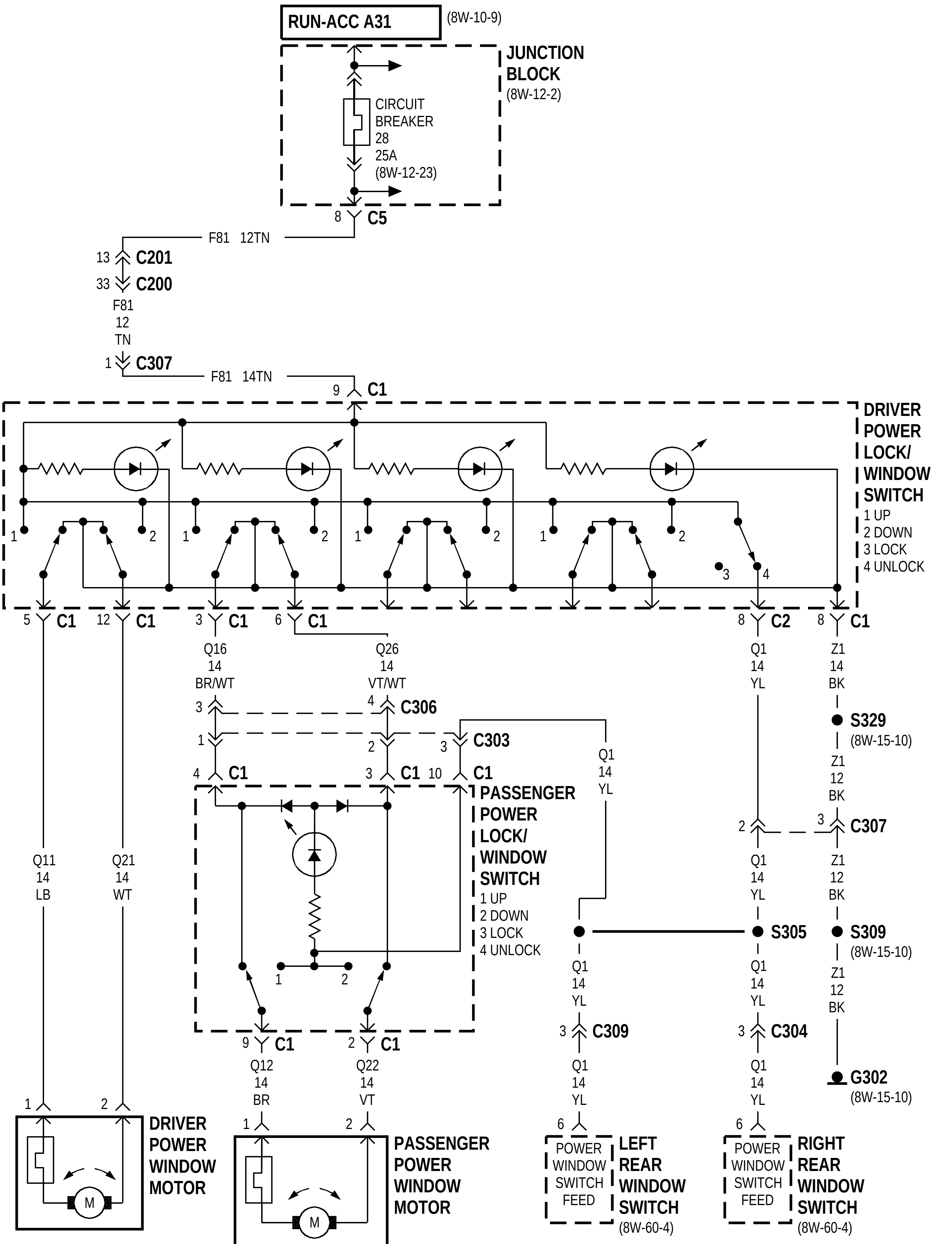
8W-54 TRAILER TOW


BATT F34
(8W-10-18)
4
HEADLAMP SWITCH
1 PARK
2 HEAD
0 OFF
(8W-50-2)
0
1
2
9
S206
(8W-12-10)
L7
18
BK/YL
LHD
RHD
45
C201
L7
18
BK/YL
M3
C4
JUNCTION BLOCK
(8W-12-2)
FUSE
7
10A
(8W-12-10)
2
C7
L77
18
BR/YL
S311
(8W-12-10)
L77
18
BR/YL
7
C323
L77
20
BR/YL
S340
(8W-12-10)
5
FROM
S303
(8W-51-7)
L10
18
BR/LG
5
C323
L10
18
BR/LG
S339
L10
18
BR/LG
3
L10
18
BR/LG
5
C322
L10
18
BR/LG
7
B40
14
LB
TRAILER TOW ELECTRIC BRAKE PROVISION
8
TRAILER TOW CONNECTOR
Z1
14
BK
S337
(8W-15-10)
(8W-15-11)
2
C323
Z1
14
BK
S309
(8W-15-10)
(8W-15-11)
Z1
12
BK
G302
(8W-15-10)
(8W-15-11)
2
BACK-UP LAMP FEED
LEFT BACK-UP LAMP
(8W-51-7)

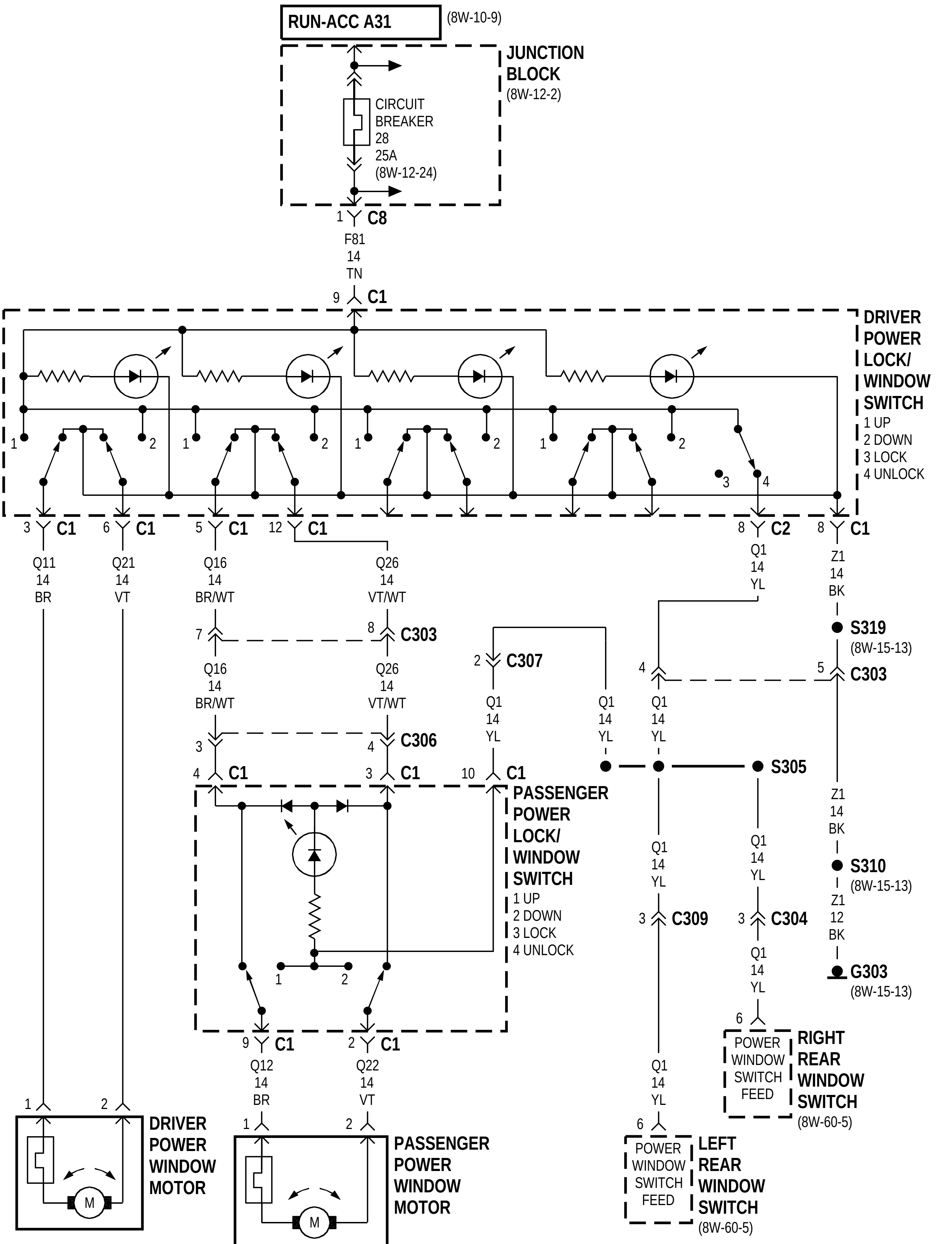

BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
FUSE
20
15A
(8W-12-19)
8 C7
A6 20 RD/OR
3 C323
S338
(8W-12-19)
LEFT TURN SIGNAL
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
9
L63 20 DG/RD
LHD RHD
26 C200
12 C204
1 C323
S335
L63 20 DG/RD
A6 20 RD/OR
BRAKE LAMP SWITCH OUTPUT
BRAKE LAMP SWITCH
(8W-33-3)
5
L50 20 WT/TN
S203
(8W-10-20)
24 C200
24 C204
S302
(8W-10-20)
RIGHT TURN SIGNAL
(8W-52-2)
3
L62 20 BR/RD
25 C200
11 C204
S312
(8W-70-2)
8 C323
L62 20 BK/RD
TRAILER TOW LEFT TURN RELAY
TRAILER TOW RIGHT TURN RELAY
6 C323
1 C322
S336
6 C322
L63 18 DG/RD
L73 20 YL
L50 18 WT/TN
L74 20 LG
LEFT TURN SIGNAL
LEFT TURN SIGNAL LAMP
(8W-52-3)
BRAKE LAMP SWITCH SIGNAL
LEFT TAIL/ STOP LAMP
(8W-51-3)
10 2 4
TRAILER TOW CONNECTOR

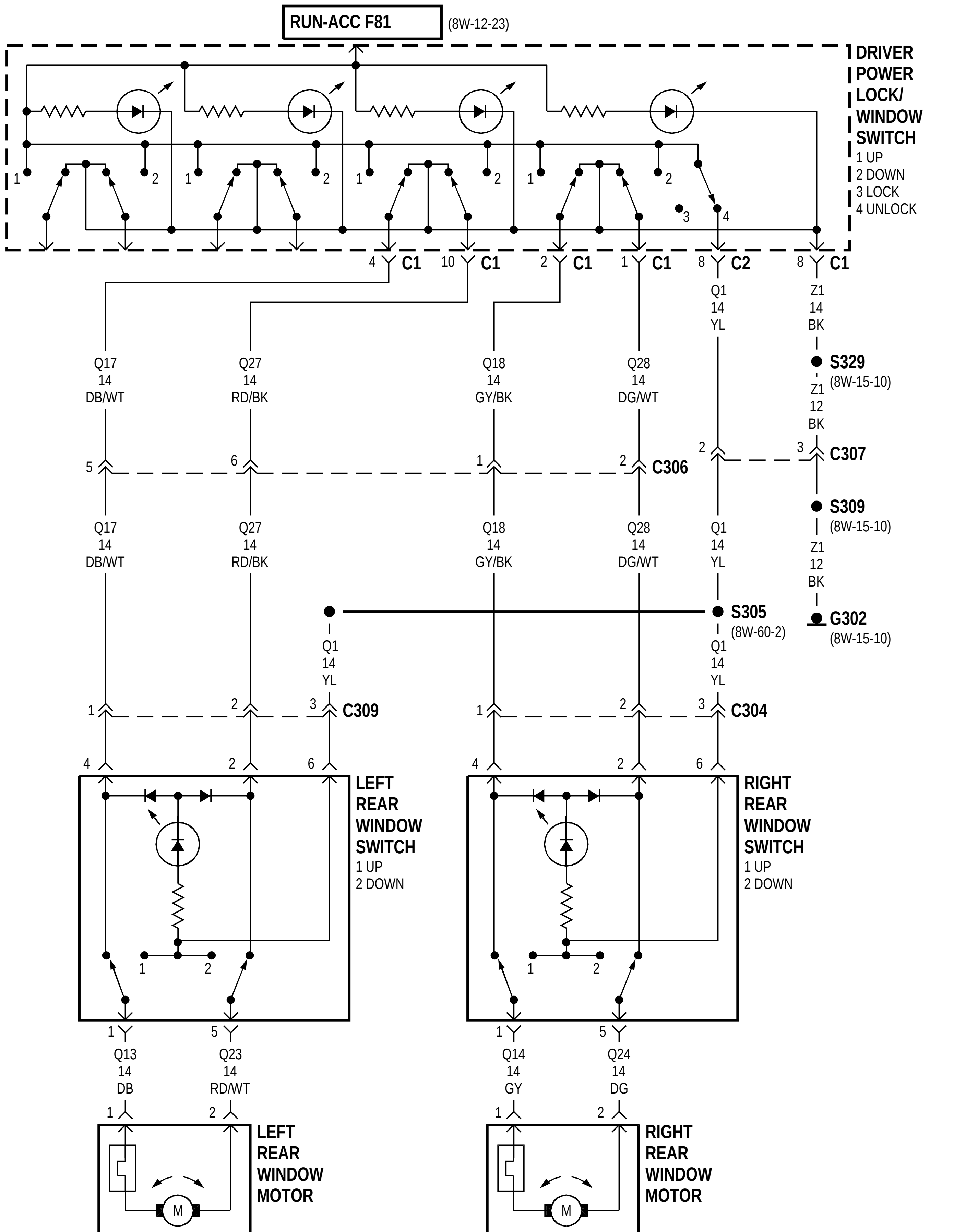
8W-60 POWER WINDOWS

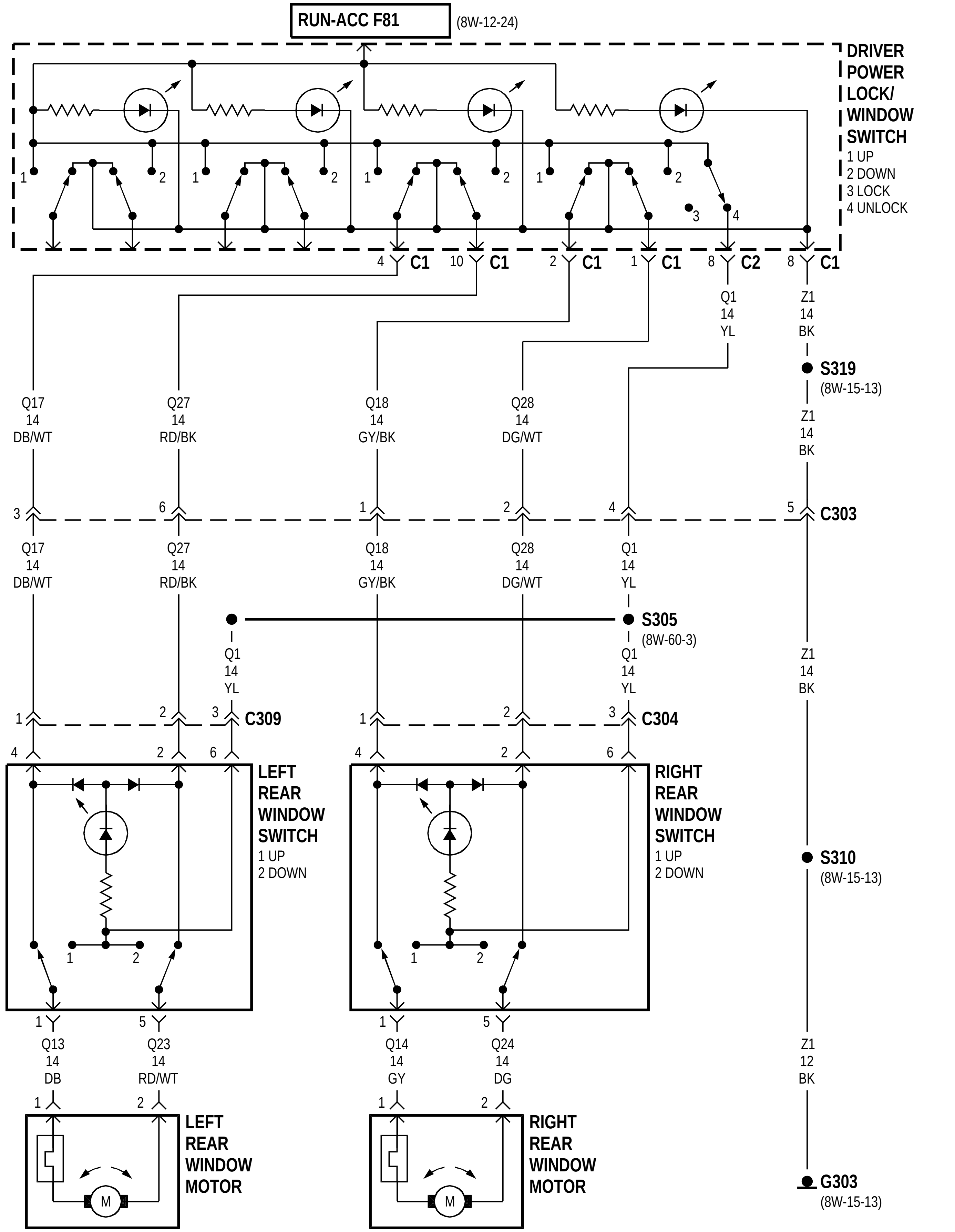
LHD



RUN-ACC A31
(8W-10-9)
JUNCTION BLOCK
(8W-12-2)
CIRCUIT BREAKER 28 25A (8W-12-23)
8 C5
F81 12TN
13 C201
33 C200
F81 12 TN
1 C307
F81 14TN
9 C1
DRIVER POWER LOCK/ WINDOW SWITCH
1 UP
2 DOWN
3 LOCK
4 UNLOCK
5 C1
12 C1
3 C1
6 C1
8 C2
8 C1
Q16 14 BR/WT
Q26 14 VT/WT
Q1 14 YL
Z1 14 BK
3 4 C306
S329
(8W-15-10)
1 2 3 C303
Z1 12 BK
4 C1
3 C1
10 C1
Q1 14 YL
PASSENGER POWER LOCK/ WINDOW SWITCH
1 UP
2 DOWN
3 LOCK
4 UNLOCK
2 3 C307
Q11 14 LB
Q21 14 WT
S305
S309
(8W-15-10)
9 C1
2 C1
3 C309
3 C304
Q12 14 BR
Q22 14 VT
G302
(8W-15-10)
1 2
DRIVER POWER WINDOW MOTOR
M
PASSENGER POWER WINDOW MOTOR
6
POWER WINDOW SWITCH FEED
LEFT REAR WINDOW SWITCH
(8W-60-4)
RIGHT REAR WINDOW SWITCH
(8W-60-4)


RUN-ACC A31
(8W-10-9)
JUNCTION
BLOCK
(8W-12-2)
CIRCUIT
BREAKER
28
25A
(8W-12-24)
1 C8
F81
14
TN
9 C1
DRIVER
POWER
LOCK/
WINDOW
SWITCH
1 UP
2 DOWN
3 LOCK
4 UNLOCK
3 C1
6 C1
5 C1
12 C1
8 C2
8 C1
Q11
14
BR
Q21
14
VT
Q16
14
BR/WT
Q26
14
VT/WT
Q1
14
YL
Z1
14
BK
7
8 C303
S319
(8W-15-13)
2 C307
4
5 C303
Q16
14
BR/WT
Q26
14
VT/WT
Q1
14
YL
Q1
14
YL
Q1
14
YL
3
4 C306
4 C1
3 C1
10 C1
S305
PASSENGER
POWER
LOCK/
WINDOW
SWITCH
1 UP
2 DOWN
3 LOCK
4 UNLOCK
Z1
14
BK
Q1
14
YL
Q1
14
YL
S310
(8W-15-13)
Z1
12
BK
3 C309
3 C304
Q1
14
YL
G303
(8W-15-13)
9 C1
2 C1
Q12
14
BR
Q22
14
VT
6
POWER
WINDOW
SWITCH
FEED
RIGHT
REAR
WINDOW
SWITCH
(8W-60-5)
Q1
14
YL
1
2
DRIVER
POWER
WINDOW
MOTOR
M
1
2
PASSENGER
POWER
WINDOW
MOTOR
M
6
POWER
WINDOW
SWITCH
FEED
LEFT
REAR
WINDOW
SWITCH
(8W-60-5)

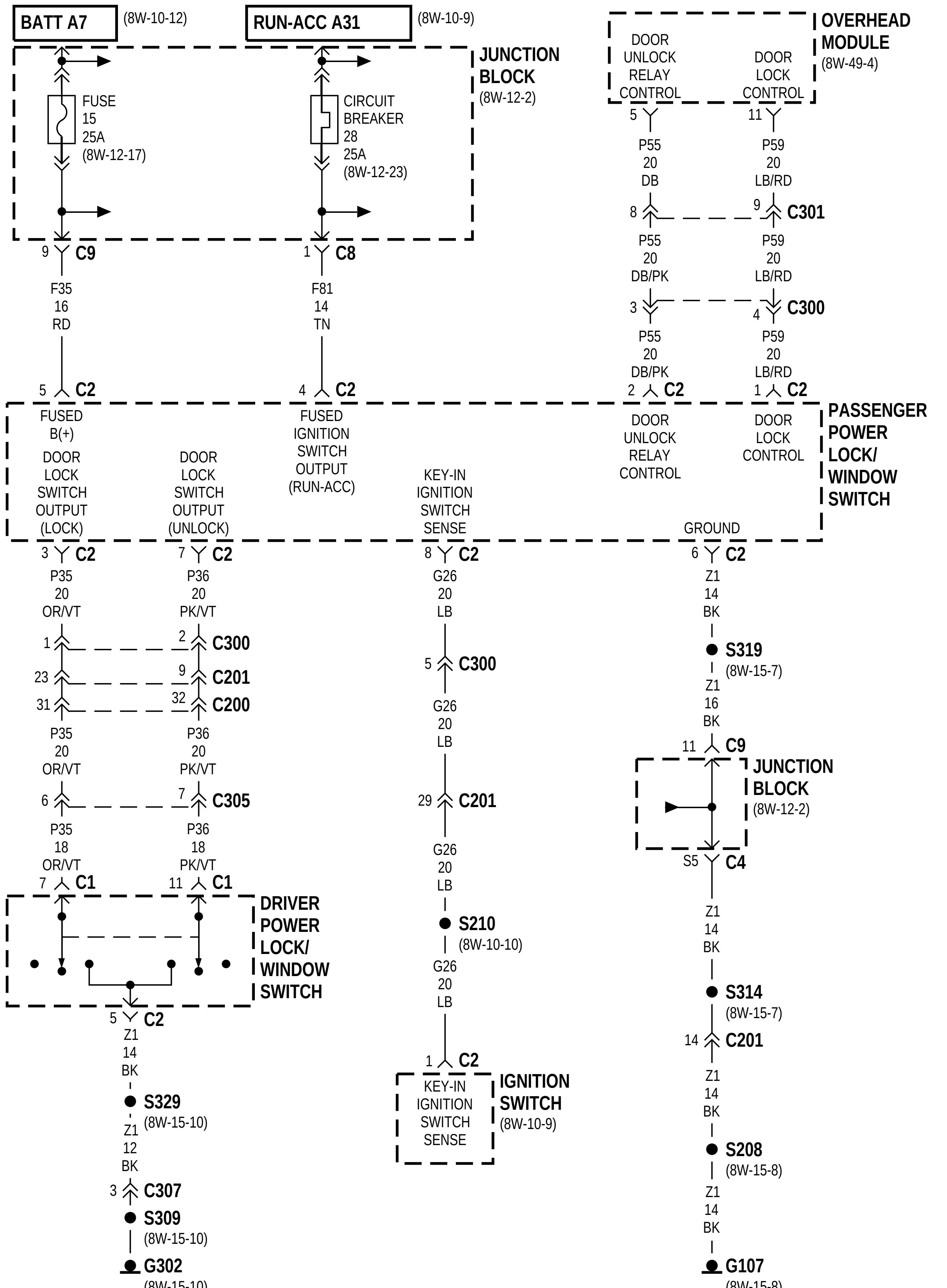

RUN-ACC F81
(8W-12-23)
DRIVER POWER LOCK/ WINDOW SWITCH
1 UP
2 DOWN
3 LOCK
4 UNLOCK
C1
C2
Q17 14 DB/WT
Q27 14 RD/BK
Q18 14 GY/BK
Q28 14 DG/WT
Q1 14 YL
Z1 14 BK
S329
(8W-15-10)
Z1 12 BK
C306
C307
S309
(8W-15-10)
S305
(8W-60-2)
G302
(8W-15-10)
C309
C304
LEFT REAR WINDOW SWITCH
1 UP
2 DOWN
RIGHT REAR WINDOW SWITCH
1 UP
2 DOWN
Q13 14 DB
Q23 14 RD/WT
Q14 14 GY
Q24 14 DG
LEFT REAR WINDOW MOTOR
RIGHT REAR WINDOW MOTOR
M



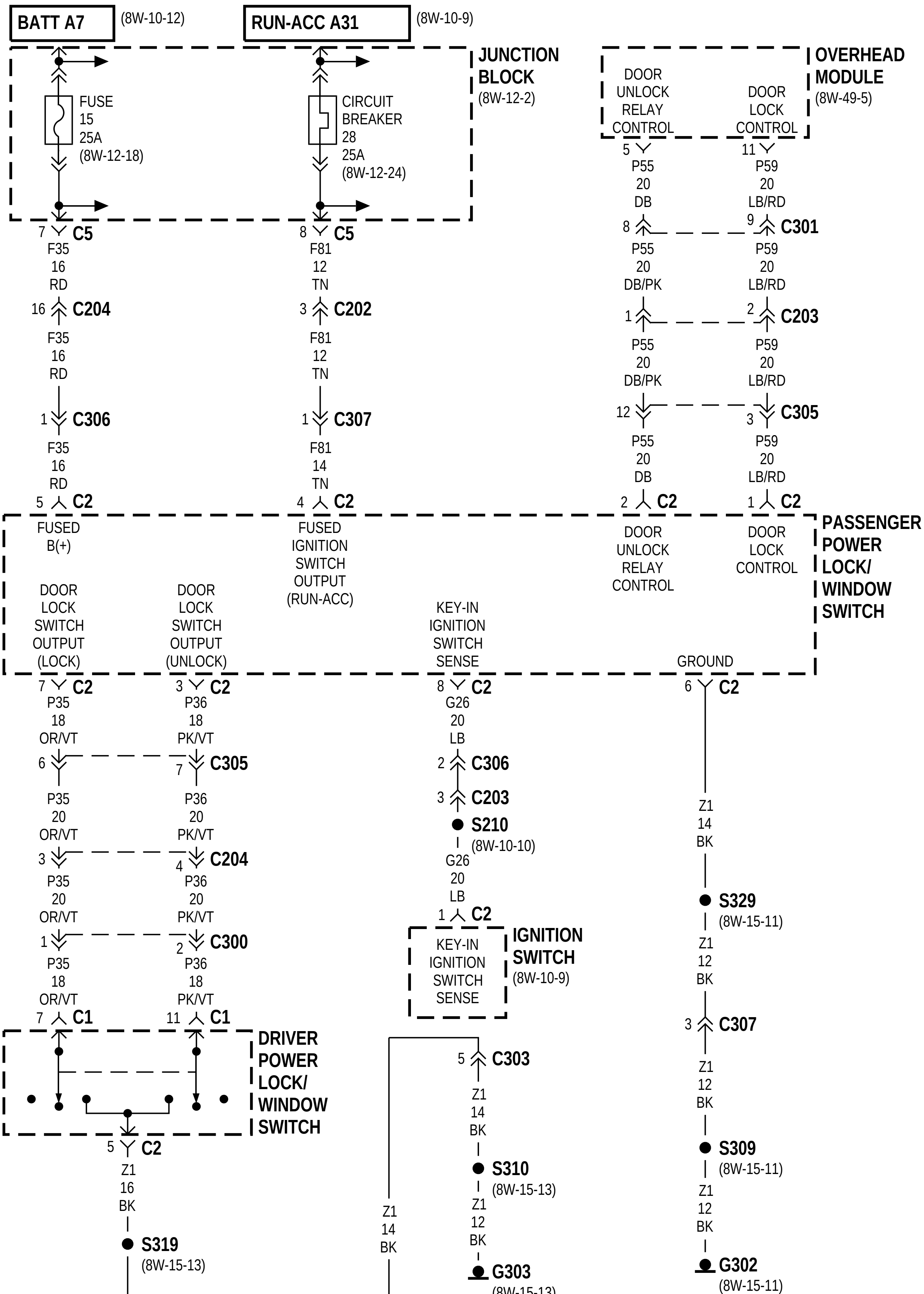
XJD06005 J008W-7

8W-61 POWER DOOR LOCKS

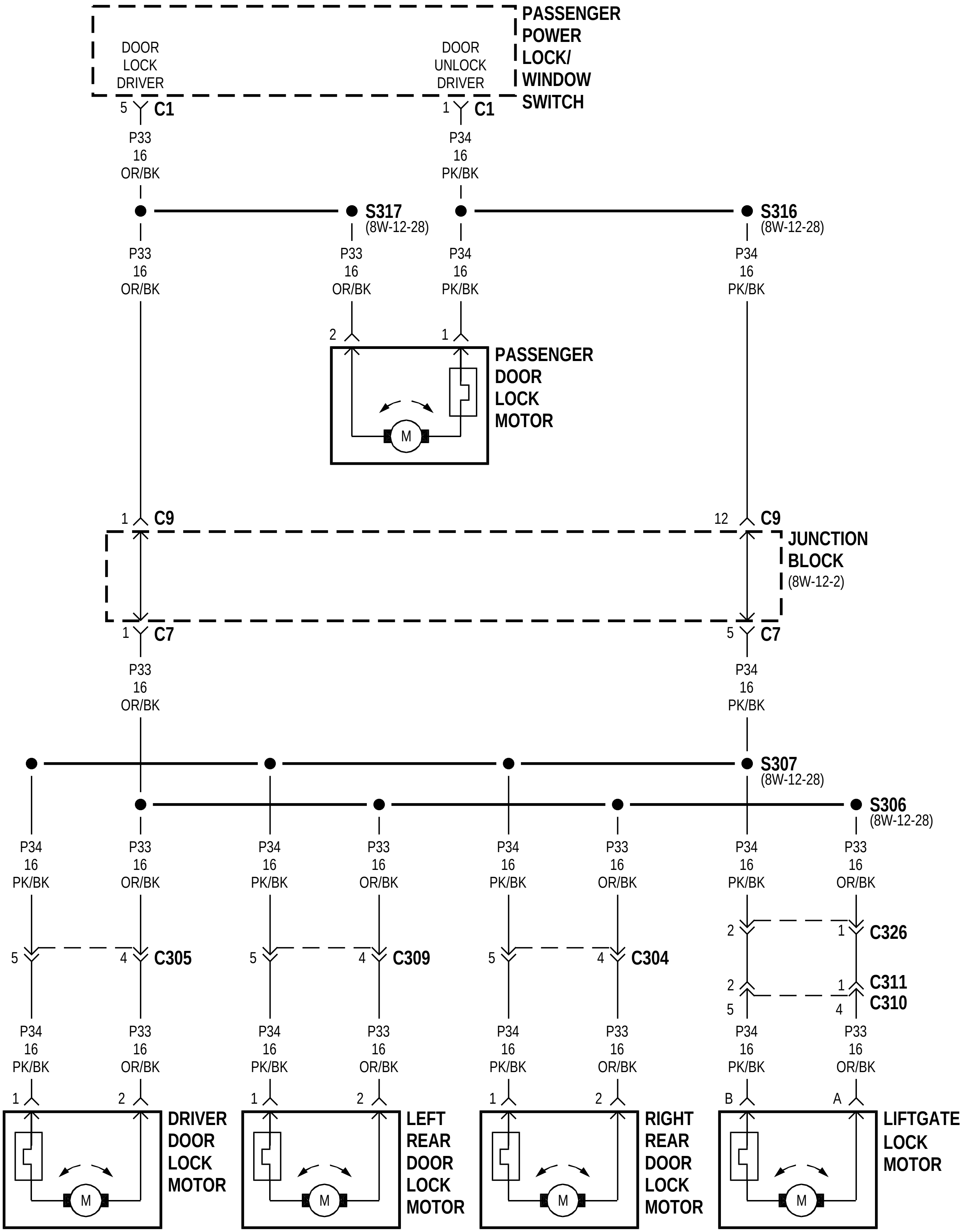
LHD

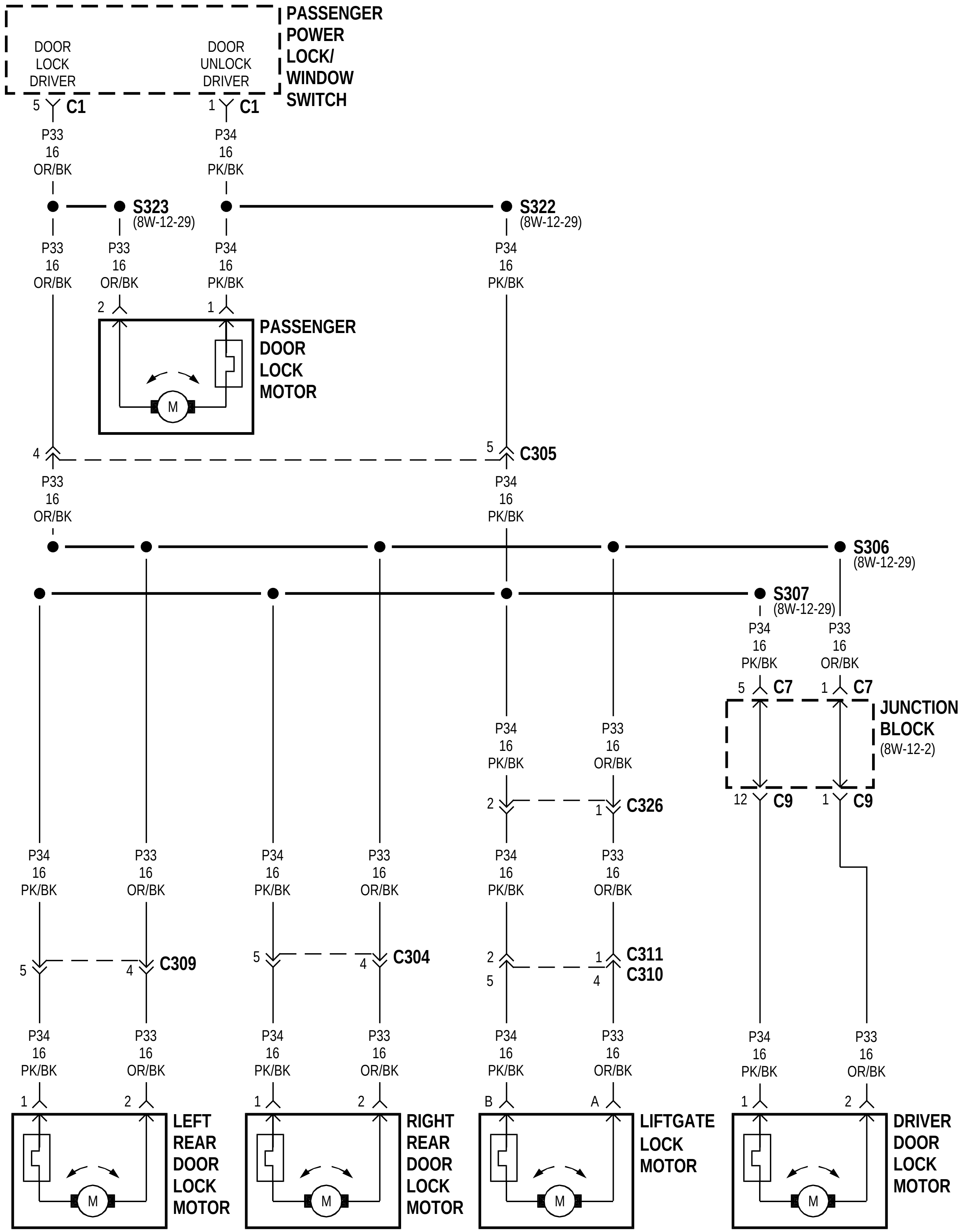


XJD06102


BATT A7
(8W-10-12)
RUN-ACC A31
(8W-10-9)
JUNCTION BLOCK
(8W-12-2)
FUSE
15
25A
(8W-12-18)
CIRCUIT BREAKER
28
25A
(8W-12-24)
OVERHEAD MODULE
(8W-49-5)
DOOR UNLOCK RELAY CONTROL
DOOR LOCK CONTROL
7 C5
F35 16 RD
16 C204
F35 16 RD
1 C306
F35 16 RD
5 C2
8 C5
F81 12 TN
3 C202
F81 12 TN
1 C307
F81 14 TN
4 C2
5
P55 20 DB
8 C301
P55 20 DB/PK
1 C203
P55 20 DB/PK
12 C305
P55 20 DB
2 C2
11
P59 20 LB/RD
9 C301
P59 20 LB/RD
2 C203
P59 20 LB/RD
3 C305
P59 20 LB/RD
1 C2
PASSENGER POWER LOCK/ WINDOW SWITCH
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
DOOR UNLOCK RELAY CONTROL
DOOR LOCK CONTROL
DOOR LOCK SWITCH OUTPUT (LOCK)
DOOR LOCK SWITCH OUTPUT (UNLOCK)
KEY-IN IGNITION SWITCH SENSE
GROUND
7 C2
P35 18 OR/VT
6 C305
P35 20 OR/VT
3 C204
P35 20 OR/VT
1 C300
P35 18 OR/VT
7 C1
3 C2
P36 18 PK/VT
7 C305
P36 20 PK/VT
4 C204
P36 20 PK/VT
2 C300
P36 18 PK/VT
11 C1
DRIVER POWER LOCK/ WINDOW SWITCH
5 C2
Z1 16 BK
S319
(8W-15-13)
8 C2
G26 20 LB
2 C306
3 C203
S210
(8W-10-10)
G26 20 LB
1 C2
IGNITION SWITCH
(8W-10-9)
KEY-IN IGNITION SWITCH SENSE
Z1 14 BK
5 C303
Z1 14 BK
S310
(8W-15-13)
Z1 12 BK
G303
(8W-15-13)
6 C2
Z1 14 BK
S329
(8W-15-11)
Z1 12 BK
3 C307
Z1 12 BK
S309
(8W-15-11)
Z1 12 BK
G302
(8W-15-11)

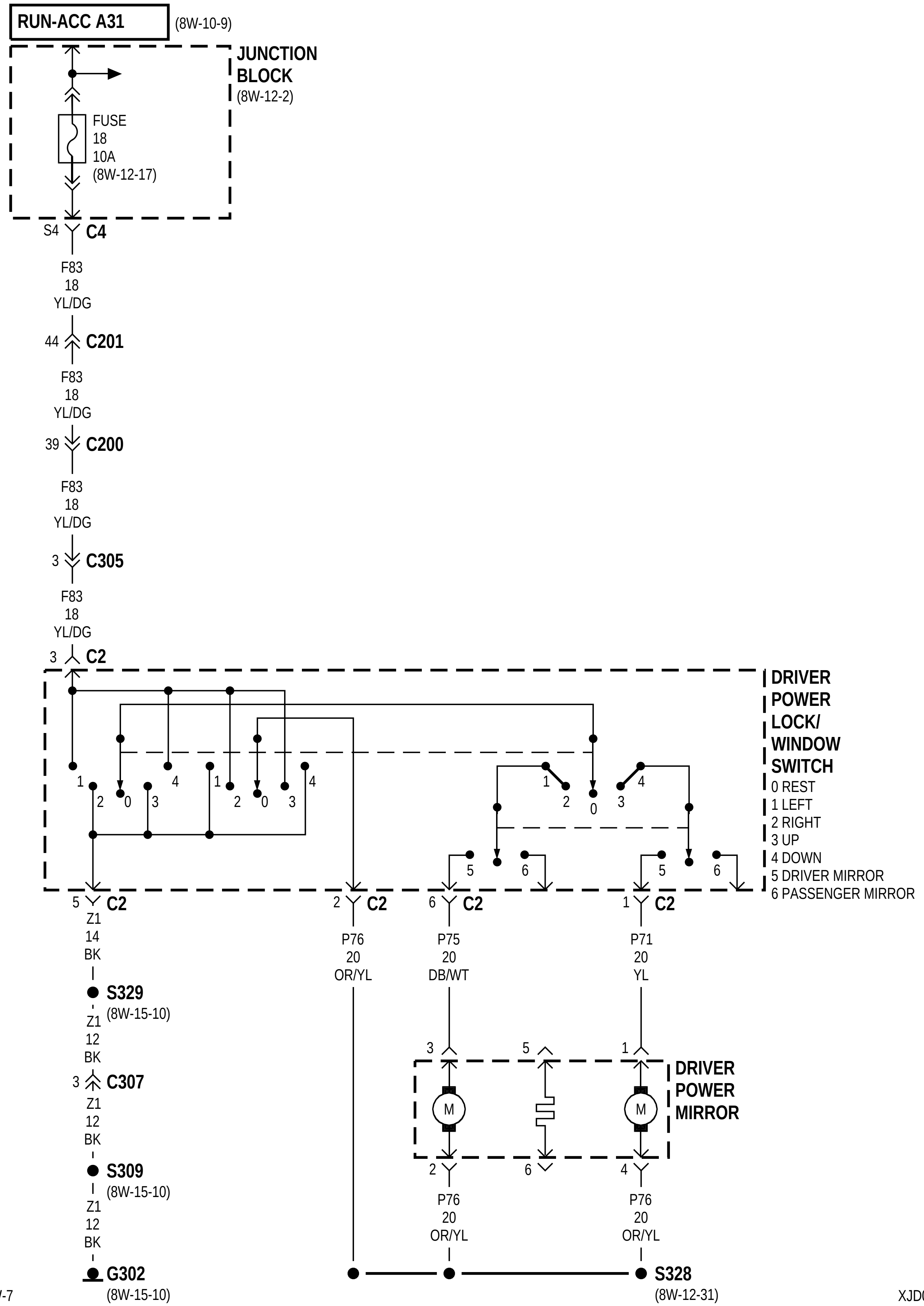
LHD

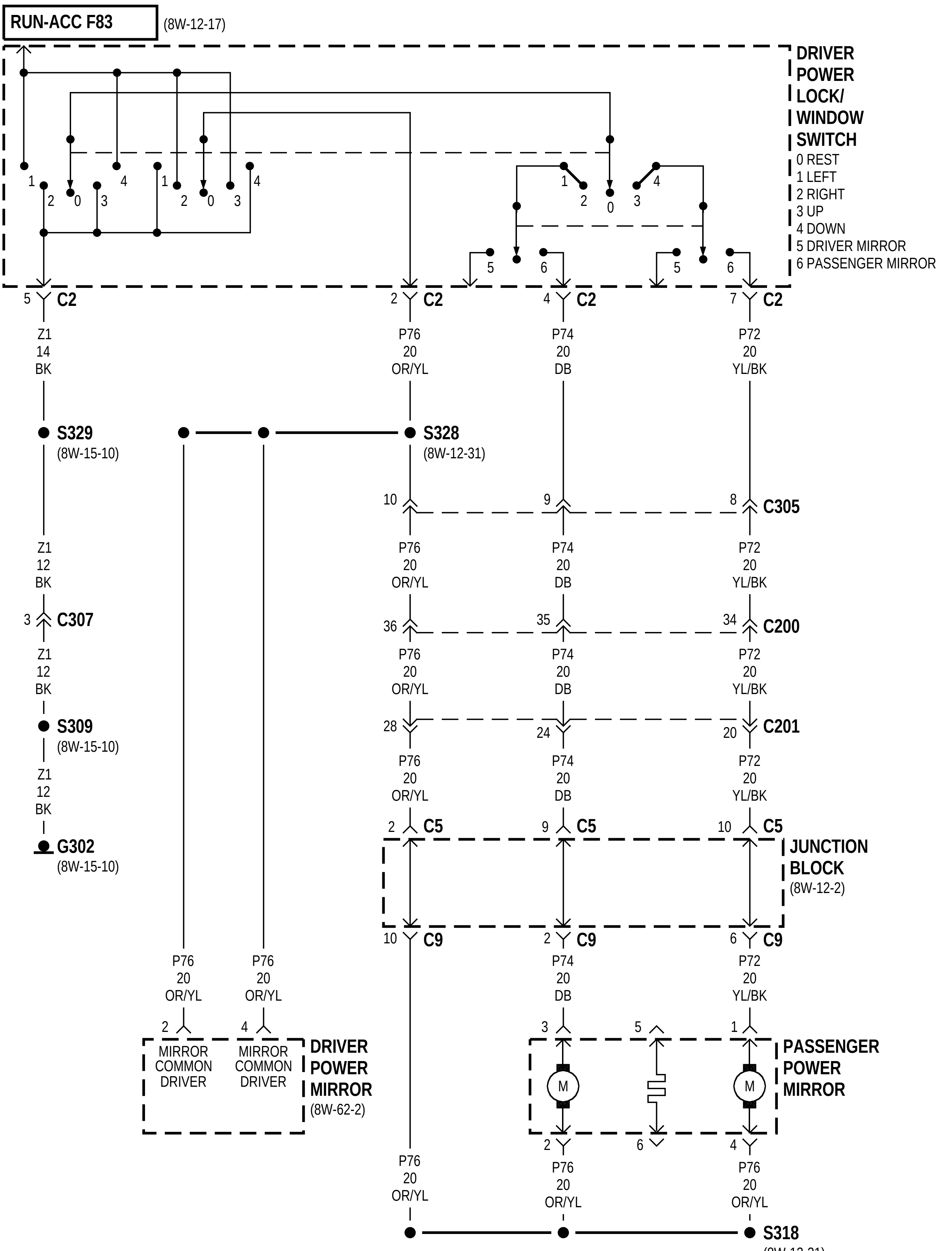

PASSENGER POWER LOCK/ WINDOW SWITCH
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
1 C1
P33 16 OR/BK
P34 16 PK/BK
S317 (8W-12-28)
S316 (8W-12-28)
2
1
PASSENGER DOOR LOCK MOTOR
M
1 C9
12 C9
JUNCTION BLOCK (8W-12-2)
1 C7
5 C7
S307 (8W-12-28)
S306 (8W-12-28)
5
4 C305
5
4 C309
5
4 C304
2
1 C326
2
1 C311
5
4 C310
P34 16 PK/BK
P33 16 OR/BK
1
2
B
A
DRIVER DOOR LOCK MOTOR
LEFT REAR DOOR LOCK MOTOR
RIGHT REAR DOOR LOCK MOTOR
LIFTGATE LOCK MOTOR


PASSENGER POWER LOCK/ WINDOW SWITCH
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
1 C1
P33 16 OR/BK
P34 16 PK/BK
S323 (8W-12-29)
S322 (8W-12-29)
PASSENGER DOOR LOCK MOTOR
M
4
5 C305
S306 (8W-12-29)
S307 (8W-12-29)
5 C7
1 C7
JUNCTION BLOCK (8W-12-2)
12 C9
1 C9
2
1 C326
5
4 C309
5
4 C304
2
5
1
4
C311
C310
1
2
LEFT REAR DOOR LOCK MOTOR
RIGHT REAR DOOR LOCK MOTOR
B
A
LIFTGATE LOCK MOTOR
DRIVER DOOR LOCK MOTOR

8W-62 POWER MIRRORS

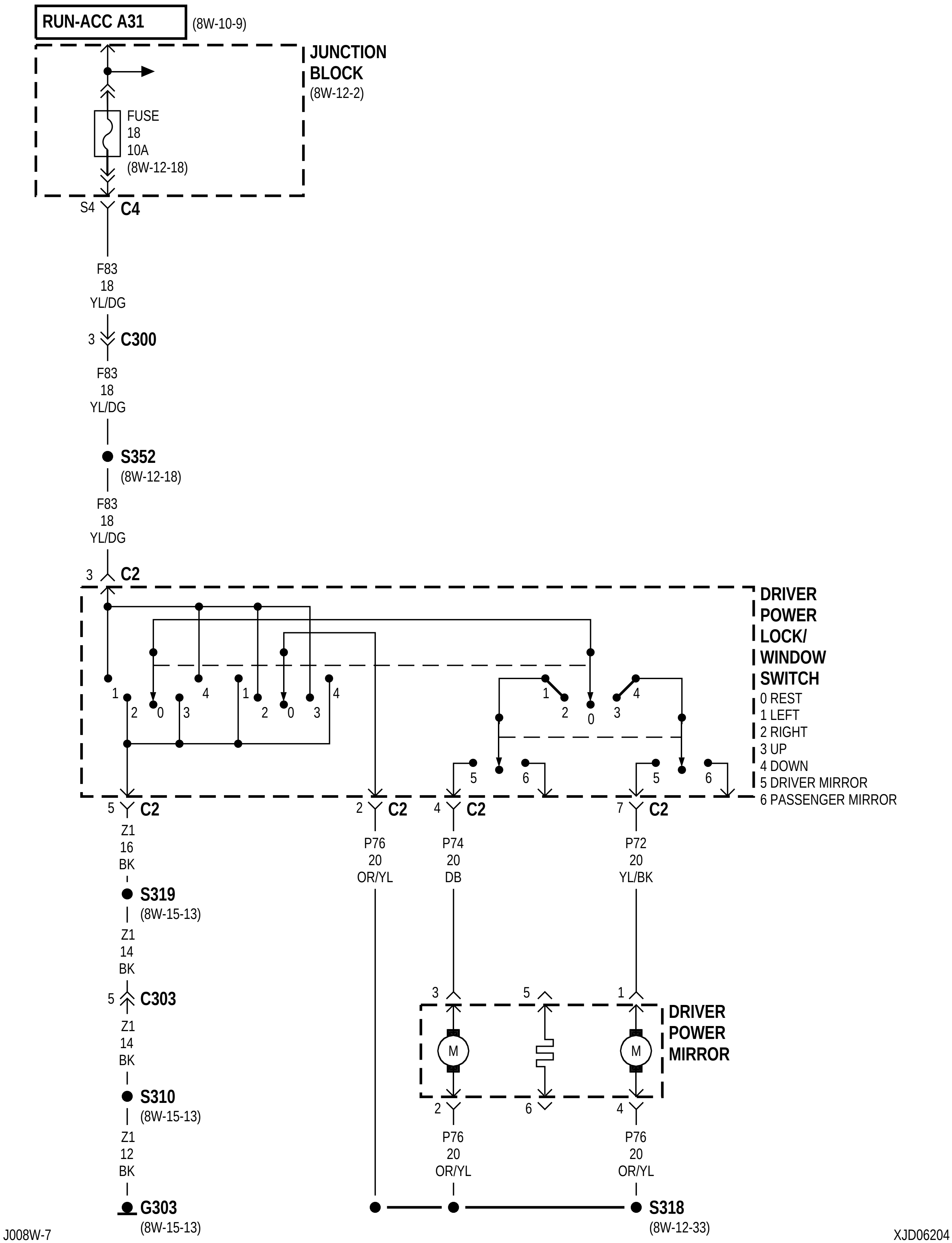
LHD FULL OPTIONS



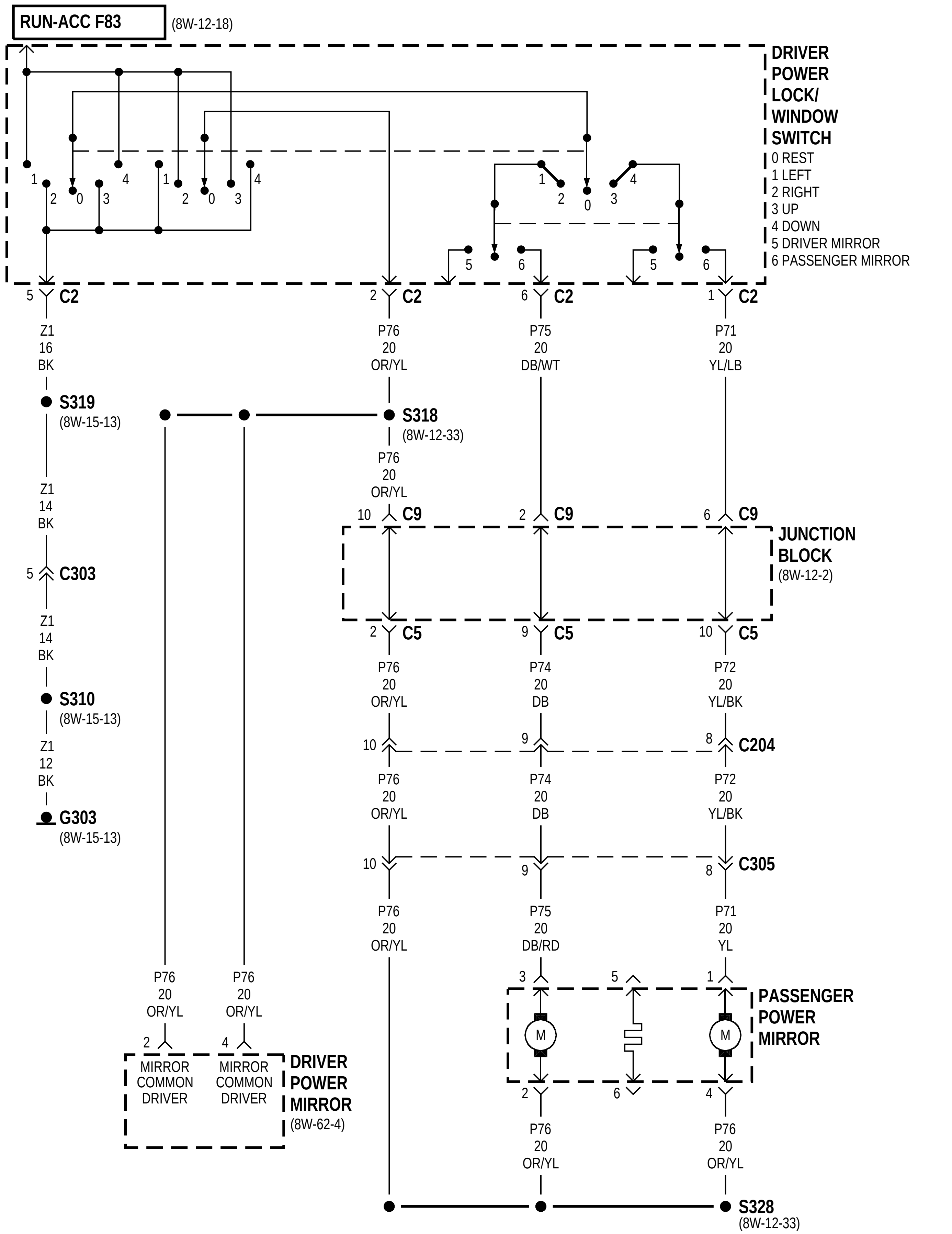


XJD06203 J008W-7

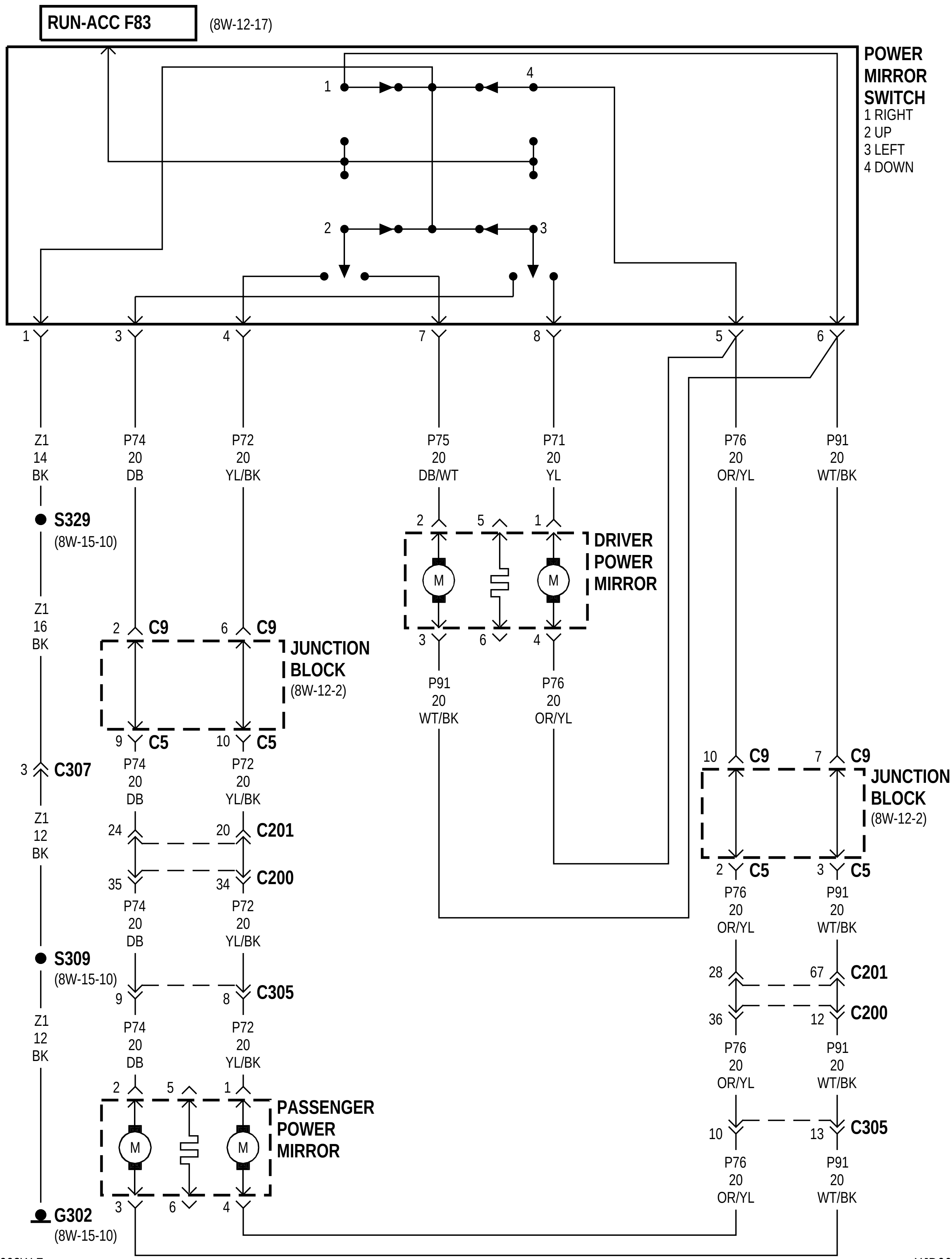
RHD FULL OPTIONS



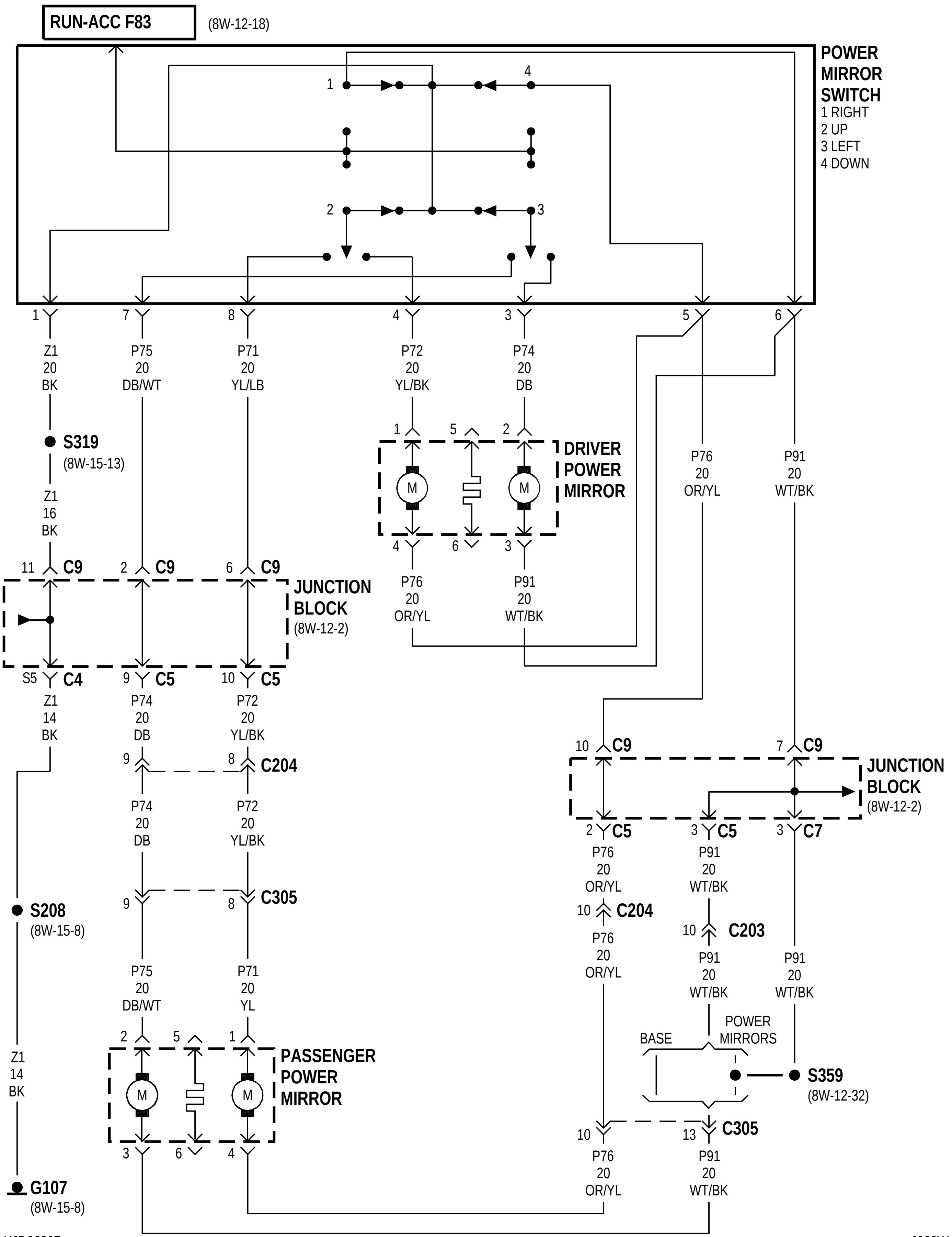
RHD FULL OPTIONS



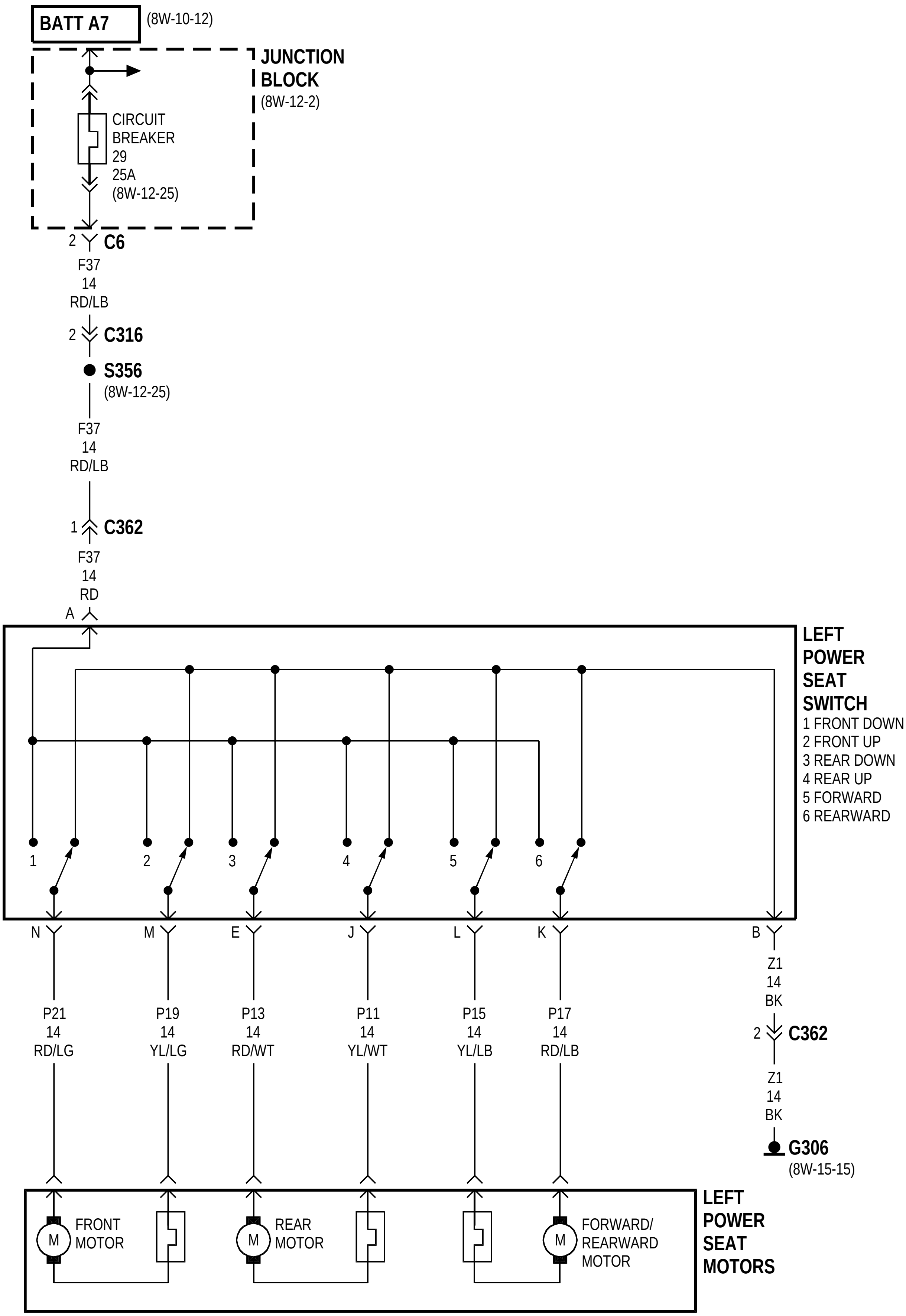
LHD EXCEPT FULL OPTIONS

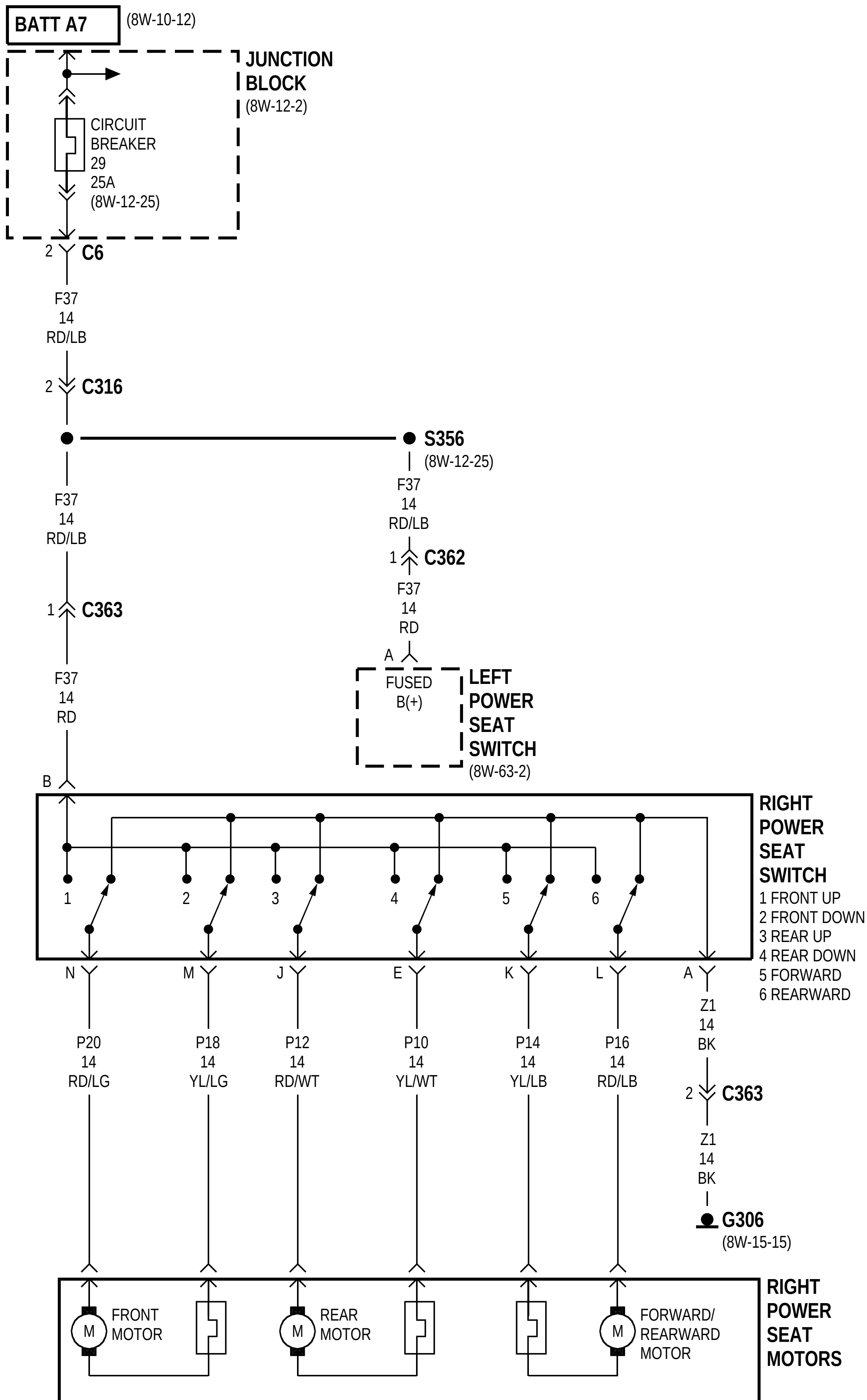


RHD EXCEPT FULL OPTIONS

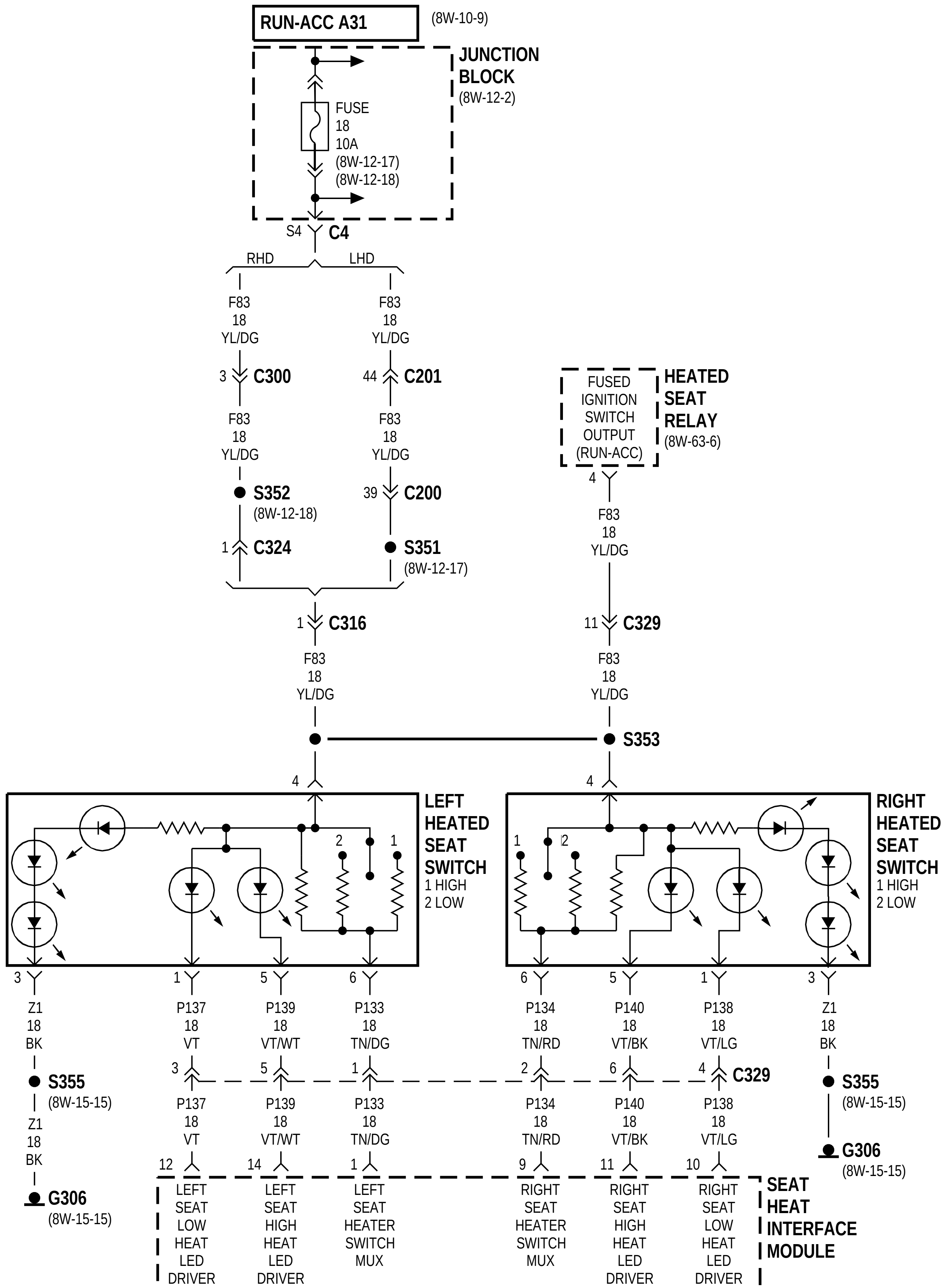


8W-63 POWER SEAT

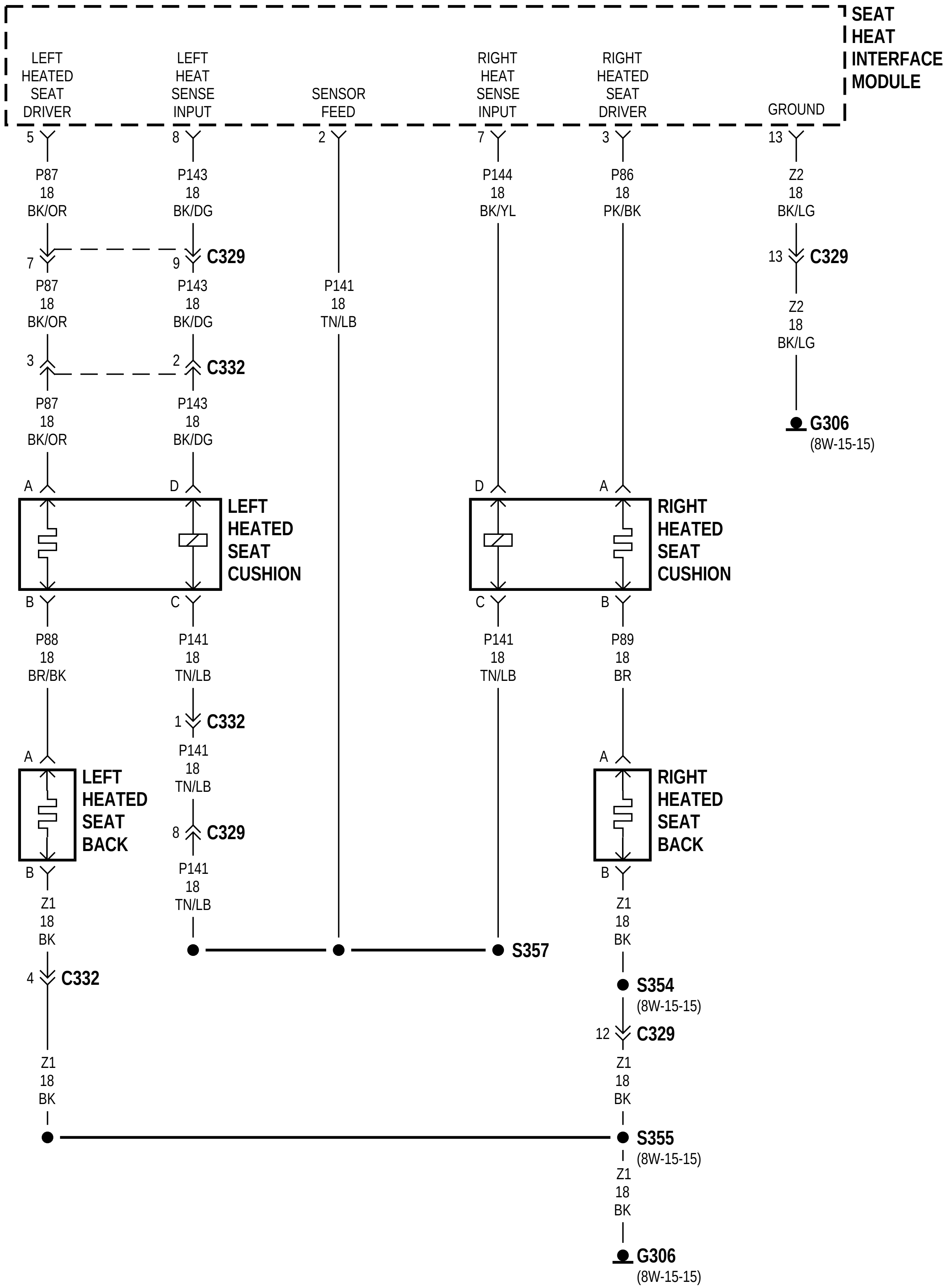

BATT A7
(8W-10-12)
JUNCTION
BLOCK
(8W-12-2)
CIRCUIT
BREAKER
29
25A
(8W-12-25)
2
C6
F37
14
RD/LB
2
C316
S356
(8W-12-25)
F37
14
RD/LB
1
C362
F37
14
RD
A
LEFT
POWER
SEAT
SWITCH
1 FRONT DOWN
2 FRONT UP
3 REAR DOWN
4 REAR UP
5 FORWARD
6 REARWARD
1
2
3
4
5
6
N
M
E
J
L
K
B
Z1
14
BK
P21
14
RD/LG
P19
14
YL/LG
P13
14
RD/WT
P11
14
YL/WT
P15
14
YL/LB
P17
14
RD/LB
2
C362
Z1
14
BK
G306
(8W-15-15)
M
FRONT
MOTOR
M
REAR
MOTOR
M
FORWARD/
REARWARD
MOTOR
LEFT
POWER
SEAT
MOTORS


BATT A7
(8W-10-12)
JUNCTION BLOCK
(8W-12-2)
CIRCUIT BREAKER 29 25A
(8W-12-25)
2 C6
F37 14 RD/LB
2 C316
S356
(8W-12-25)
F37 14 RD/LB
1 C362
F37 14 RD
A
FUSED B(+)
LEFT POWER SEAT SWITCH
(8W-63-2)
F37 14 RD/LB
1 C363
F37 14 RD
B
1 2 3 4 5 6
RIGHT POWER SEAT SWITCH
1 FRONT UP
2 FRONT DOWN
3 REAR UP
4 REAR DOWN
5 FORWARD
6 REARWARD
N M J E K L A
P20 14 RD/LG
P18 14 YL/LG
P12 14 RD/WT
P10 14 YL/WT
P14 14 YL/LB
P16 14 RD/LB
Z1 14 BK
2 C363
Z1 14 BK
G306
(8W-15-15)
M FRONT MOTOR
M REAR MOTOR
M FORWARD/ REARWARD MOTOR
RIGHT POWER SEAT MOTORS

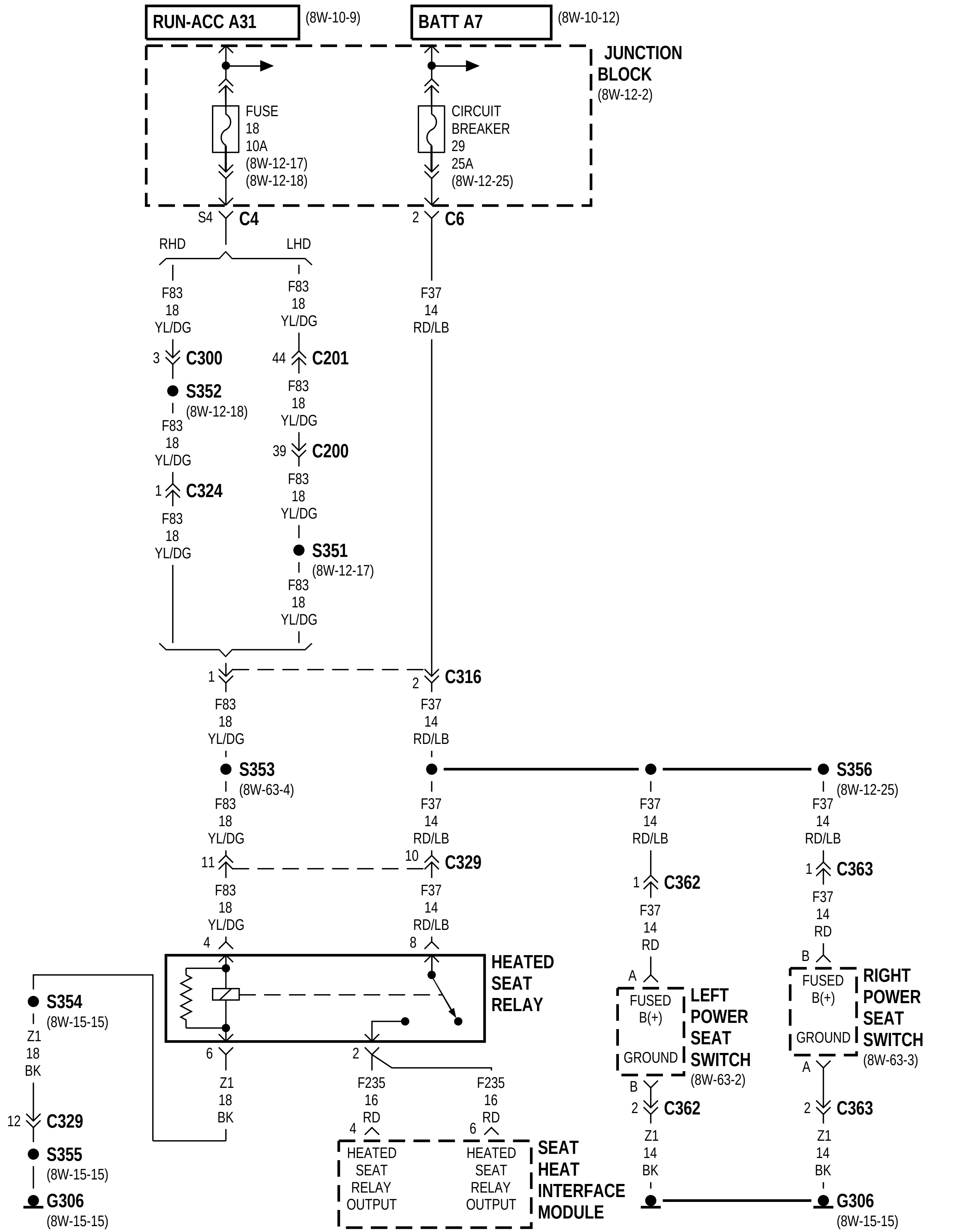
HEATED SEATS



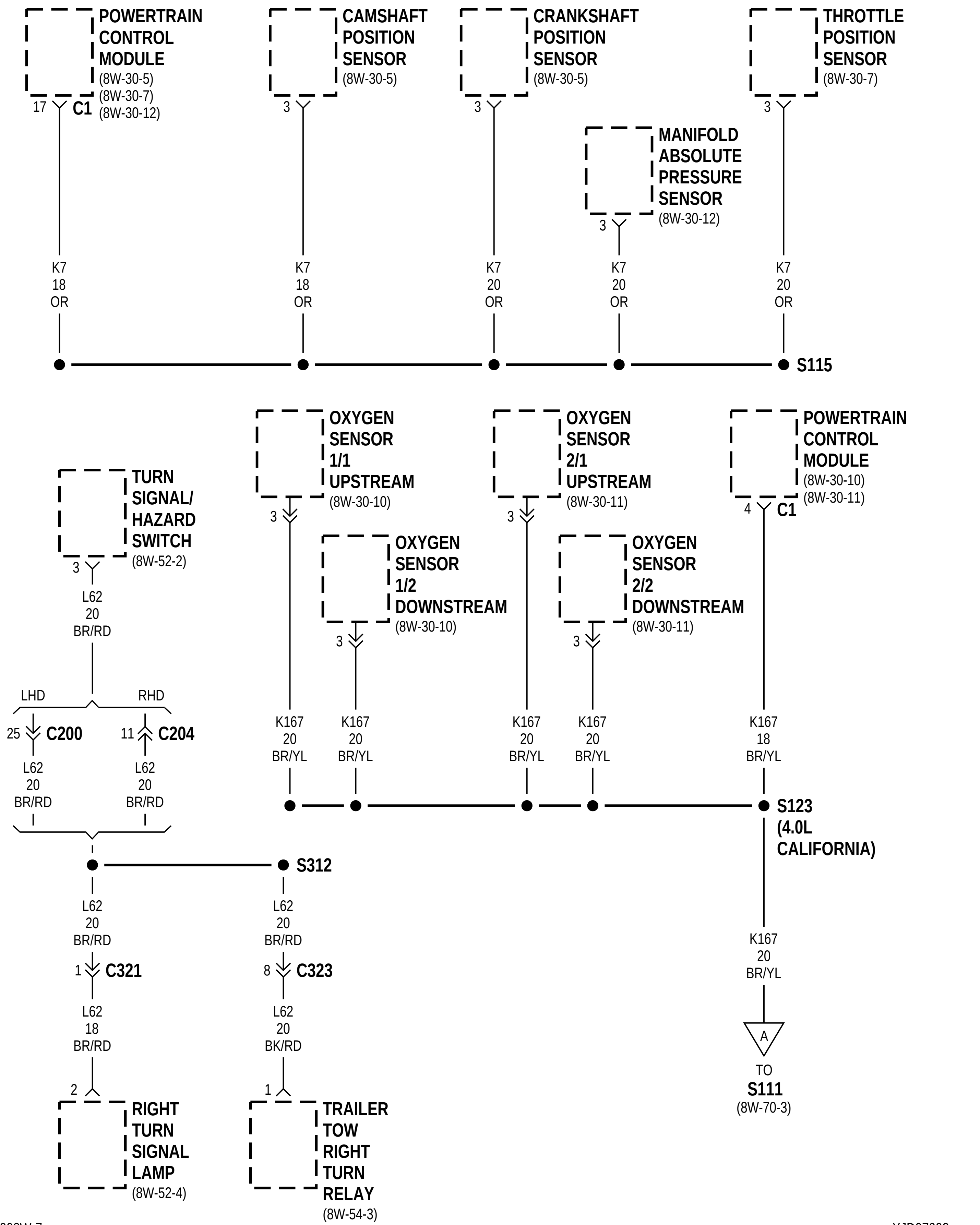
HEATED SEATS

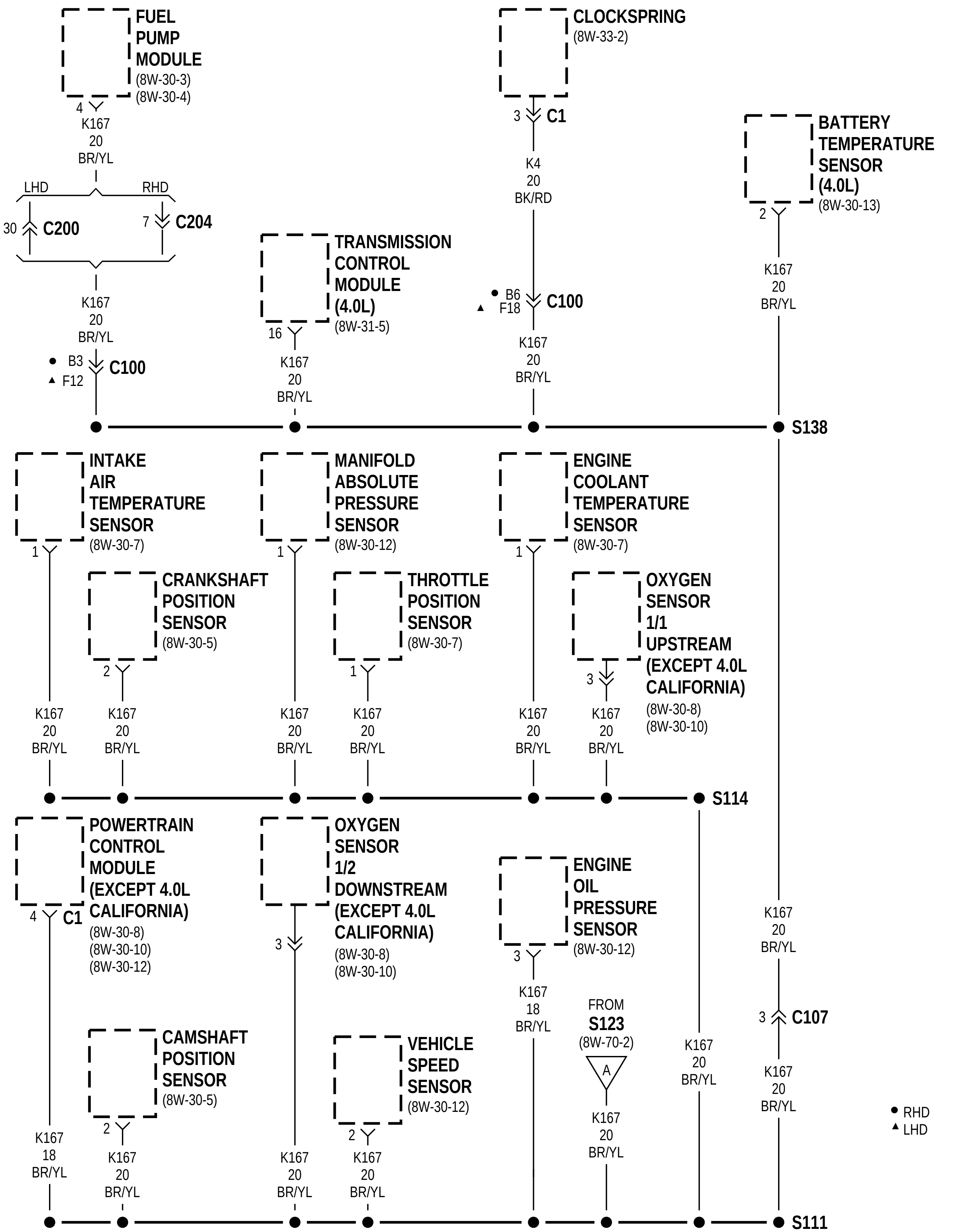


HEATED SEATS



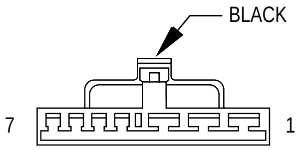
8W-70 SPLICE INFORMATION


POWERTRAIN CONTROL MODULE
(8W-30-5)
(8W-30-7)
(8W-30-12)
17
C1
CAMSHAFT POSITION SENSOR
(8W-30-5)
3
CRANKSHAFT POSITION SENSOR
(8W-30-5)
3
THROTTLE POSITION SENSOR
(8W-30-7)
3
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-12)
3
K7 18 OR
K7 18 OR
K7 20 OR
K7 20 OR
K7 20 OR
S115
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-10)
3
OXYGEN SENSOR 2/1 UPSTREAM
(8W-30-11)
3
POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-11)
4
C1
TURN SIGNAL/ HAZARD SWITCH
(8W-52-2)
3
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-10)
3
OXYGEN SENSOR 2/2 DOWNSTREAM
(8W-30-11)
3
L62 20 BR/RD
LHD
RHD
25
C200
11
C204
L62 20 BR/RD
L62 20 BR/RD
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 18 BR/YL
S123 (4.0L CALIFORNIA)
S312
L62 20 BR/RD
L62 20 BR/RD
1
C321
8
C323
L62 18 BR/RD
L62 20 BK/RD
K167 20 BR/YL
A
TO S111
(8W-70-3)
2
1
RIGHT TURN SIGNAL LAMP
(8W-52-4)
TRAILER TOW RIGHT TURN RELAY
(8W-54-3)


FUEL PUMP MODULE
(8W-30-3)
(8W-30-4)
4
K167 20 BR/YL
LHD
RHD
30 C200
7 C204
K167 20 BR/YL
● B3 ▲ F12 C100
TRANSMISSION CONTROL MODULE (4.0L)
(8W-31-5)
16
K167 20 BR/YL
CLOCKSPRING
(8W-33-2)
3 C1
K4 20 BK/RD
● B6 ▲ F18 C100
K167 20 BR/YL
BATTERY TEMPERATURE SENSOR (4.0L)
(8W-30-13)
2
K167 20 BR/YL
S138
INTAKE AIR TEMPERATURE SENSOR
(8W-30-7)
1
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-12)
1
ENGINE COOLANT TEMPERATURE SENSOR
(8W-30-7)
1
CRANKSHAFT POSITION SENSOR
(8W-30-5)
2
THROTTLE POSITION SENSOR
(8W-30-7)
1
OXYGEN SENSOR 1/1 UPSTREAM (EXCEPT 4.0L CALIFORNIA)
(8W-30-8)
(8W-30-10)
3
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
S114
POWERTRAIN CONTROL MODULE (EXCEPT 4.0L CALIFORNIA)
(8W-30-8)
(8W-30-10)
(8W-30-12)
4 C1
OXYGEN SENSOR 1/2 DOWNSTREAM (EXCEPT 4.0L CALIFORNIA)
(8W-30-8)
(8W-30-10)
3
ENGINE OIL PRESSURE SENSOR
(8W-30-12)
3
K167 18 BR/YL
K167 20 BR/YL
3 C107
K167 20 BR/YL
FROM S123 (8W-70-2)
A
K167 20 BR/YL
K167 20 BR/YL
CAMSHAFT POSITION SENSOR
(8W-30-5)
2
VEHICLE SPEED SENSOR
(8W-30-12)
2
K167 18 BR/YL
K167 20 BR/YL
K167 20 BR/YL
K167 20 BR/YL
● RHD
▲ LHD
S111

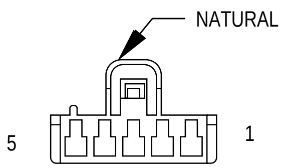
XJD07003

8W-80 CONNECTOR PIN-OUTS



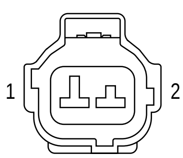
A/C-HEATER CONTROL-C1 OR HEATER CONTROL-C1

CAV	CIRCUIT	FUNCTION
1	Z8 12BK/VT	GROUND
2	C7 12BK/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	C90 20LG ▲	A/C SWITCH SENSE
7	E2 20OR ▲▲	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL



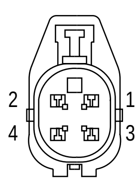
A/C-HEATER CONTROL-C2

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 20BK	GROUND
3	C36 20RD/WT ▲▲▲	BLEND DOOR FEEDBACK SIGNAL
3	C36 18RD/WT ▲▲	BLEND DOOR FEEDBACK SIGNAL
4	F15 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
5	-	-



A/C HIGH PRESSURE SWITCH (2.5L)

CAV	CIRCUIT	FUNCTION
1	C22 18DB/WT	A/C SWITCH SENSE
2	C21 20DB/PK	A/C SWITCH SENSE

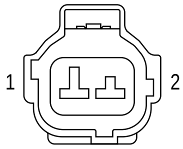


A/C HIGH PRESSURE SWITCH (4.0L)

CAV	CIRCUIT	FUNCTION
1	C21 20DB/PK	A/C SWITCH SENSE
2	C48 18TN	RADIATOR FAN REQUEST
3	C90 20LG	A/C SWITCH SENSE
4	C90 20LG	A/C SWITCH SENSE

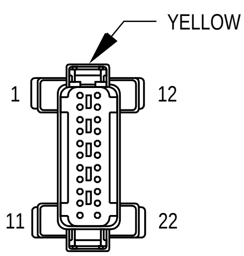
▲ A/C ONLY
▲▲ RHD
▲▲▲ LHD

J008W-7 XJD08004



A/C LOW PRESSURE SWITCH

CAV	CIRCUIT		FUNCTION
1	C21 20DB/PK	◇	A/C SWITCH SENSE
1	C22 18DB/WT	◇◇	PRESSURE SWITCH OUTPUT
2	C90 20LG	◇	A/C SWITCH SENSE
2	C21 20DB/PK	◇◇	A/C SWITCH SENSE

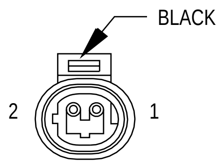


AIRBAG CONTROL MODULE

CAV	CIRCUIT		FUNCTION
1	R45 18DG/LB		DRIVER AIRBAG LINE 1
2	R43 18BK/LB		DRIVER AIRBAG LINE 2
3	-		-
4	-		-
5	R42 18BK/YL		PASSENGER AIRBAG LINE 2
6	R44 18DG/YL		PASSENGER AIRBAG LINE 1
7	-		-
8	-		-
9	-		-
10	Z6 18BK/PK	●	GROUND
10	Z6 18BK/YL	●●	GROUND
11	-		-
12	-		-
13	-		-
14	-		-
15	-		-
16	-		-
17	F23 18DB/YL		FUSED IGNITION SWITCH OUTPUT (ST-RUN)
18	D2 18WT/BK		CCD BUS(-)
19	D1 18VT/BR		CCD BUS(+)
20	F14 18LG/YL		FUSED IGNITION SWITCH OUTPUT (RUN)

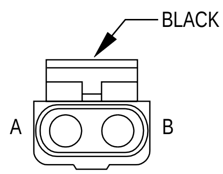
◇ 2.5L
◇◇ 4.0L

● FULL OPTIONS
●● BASE



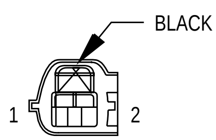
AMBIENT TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	G31 20VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
2	G32 20BK/LB	SENSOR GROUND



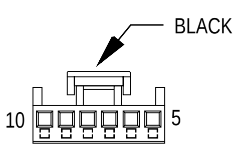
BACK-UP LAMP SWITCH

CAV	CIRCUIT	FUNCTION
A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
B	L10 18BR/LG	BACK UP LAMP FEED



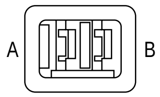
BATTERY TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND



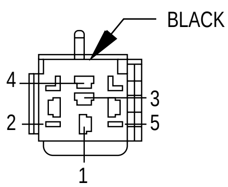
BLEND DOOR ACTUATOR

CAV	CIRCUIT	FUNCTION
5	-	-
6	-	-
7	D1 20DB/WT	GROUND
8	D3 20YL	BLEND DOOR FEEDBACK SIGNAL
9	-	-
10	D2 20OR	FUSED IGNITION SWITCH OUTPUT (RUN)



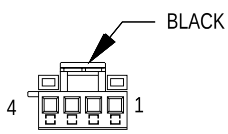
BLOWER MOTOR

CAV	CIRCUIT	FUNCTION
A	C1 12DG	BLOWER MOTOR RELAY OUTPUT
B	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER



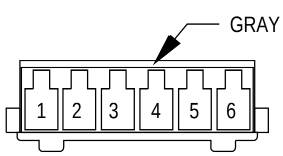
BLOWER MOTOR RELAY

CAV	CIRCUIT	FUNCTION
1	C1 12DG	BLOWER MOTOR RELAY OUTPUT
2	Z1 20BK	GROUND
3	-	-
4	A111 12RD/LG	FUSED B(+)
5	F15 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)



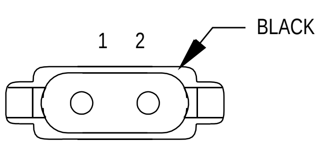
BLOWER MOTOR RESISTOR BLOCK

CAV	CIRCUIT	FUNCTION
1	C4 14TN	BLOWER MOTOR LOW DRIVER
2	C5 14LG	BLOWER MOTOR M1 DRIVER
3	C6 14LB	BLOWER MOTOR M2 DRIVER
4	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER



BRAKE LAMP SWITCH

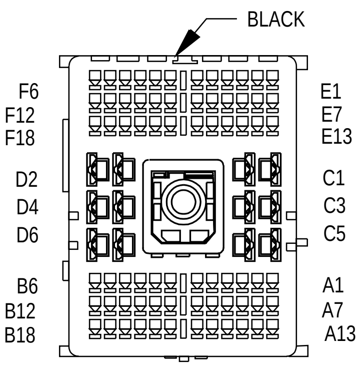
CAV	CIRCUIT		FUNCTION
1	K29 18WT/PK		BRAKE LAMP SWITCH SENSE
2	Z1 18BK		GROUND
3	V32 20YL/RD	▲	SPEED CONTROL POWER SUPPLY
3	V32 18YL/RD	●	SPEED CONTROL POWER SUPPLY
4	V30 20DB/RD		SPEED CONTROL BRAKE SWITCH OUTPUT
5	L50 20WT/TN		BRAKE LAMP SWITCH OUTPUT
6	F32 20PK/DB		FUSED B(+)



BRAKE WARNING PRESSURE SWITCH

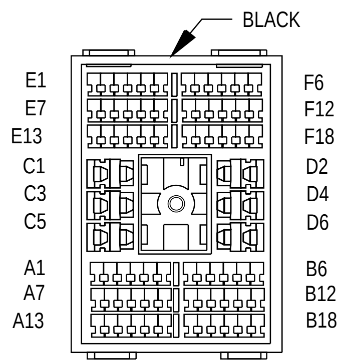
CAV	CIRCUIT	FUNCTION
1	G9 20GY/BK	RED BRAKE WARNING INDICATOR DRIVER
2	G99 20GY/WT	RED BRAKE WARNING INDICATOR DRIVER

● LHD
▲ RHD



C100
(LHD)

CAV	CIRCUIT	
A1	Z1 18BK	
A2	G106 20BK/WT	●
A3	G107 20BK/RD	
A4	L92 20PK	▲▲
A5	L139 20VT	▲▲
A6	C90 20LG	
A7	-	
A8	-	
A9	-	
A10	-	
A11	-	
A12	-	
A13	-	
A14	-	
A15	-	
A16	-	
A17	-	
A18	-	
B1	-	
B2	-	
B3	-	
B4	-	
B5	-	
B6	-	
B7	-	
B8	-	
B9	-	
B10	-	
B11	-	
B12	-	
B13	-	
B14	-	
B15	-	
B16	-	
B17	-	
B18	-	
C1	V3 16BR/WT	
C2	A1 12RD	
C3	V4 16BR/VT	
C4	F75 16VT	▲
C5	V5 16DG/YL	
C6	A2 12PK/BK	
D1	A3 14RD/WT	
D2	A141 14DG/WT	
D3	G34 16RD/GY	▲▲▲
D4	G34 16RD/GY	
D5	A111 12RD/LG	
D6	-	



C100
(LHD)

CAV	CIRCUIT	
A1	Z1 18BK	
A2	G106 20BK/WT	●
A3	G107 20BK/RD	
A4	L39 20LB	▲▲
A5	L139 20VT	▲▲
A6	C90 20LG	
A7	-	
A8	-	
A9	-	
A10	-	
A11	-	
A12	-	
A13	-	
A14	-	
A15	-	
A16	-	
A17	-	
A18	-	
B1	-	
B2	-	
B3	-	
B4	-	
B5	-	
B6	-	
B7	-	
B8	-	
B9	-	
B10	-	
B11	-	
B12	-	
B13	-	
B14	-	
B15	-	
B16	-	
B17	-	
B18	-	
C1	V3 16BR/WT	
C2	A1 12RD	
C3	V4 16BR/VT	
C4	F75 16VT	▲
C5	V5 16DG/YL	
C6	A2 12PK/BK	
D1	A3 14RD/WT	
D2	A141 16DG/WT	
D3	L3 16RD/OR	
D4	G34 16RD/GY	
D5	A111 12RD/LG	
D6	-	

(CONTINUED ON NEXT PAGE)

- ● 4.0L A/T
- ▲ POWER AMPLIFIER
- ▲▲ FOG LAMPS
- ■ DRL
- ▲▲▲ EXCEPT DRL

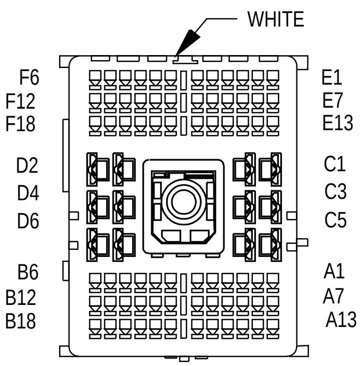
(CONTINUED)

CAV	CIRCUIT
E1	L50 20WT/TN
E2	G9 20GY/BK
E3	L10 18BR/LG
E4	V10 18BR
E5	V20 18BK/WT
E6	F34 18TN/BK
E7	Z12 18BK/TN
E8	G29 20BK/LB
E9	F20 18WT
E10	F1 20DB/GY ■■■
E11	D1 20VT/BR ●●
E11	D1 18VT/BR ◇◇
E12	D2 20WT/BK ●●
E12	D2 18WT/BK ◇◇
E13	F26 18PK/OR
E14	G99 20GY/WT
E15	K185 20OR/LB
E16	G86 18TN/OR
E17	G154 18VT/LG
E18	-
F1	D20 18LG/BK
F2	D21 20PK ◇◇◇
F2	D21 18PK ■
F3	L60 20TN
F4	L61 20LG/WT
F5	L9 20BK/PK
F6	L44 20VT/RD
F7	V30 20DB/RD
F8	F32 20PK/DB
F9	V32 18YL/RD
F10	K29 18WT/PK ▲
F10	K29 20WT/PK ◇
F11	K226 18DB/LG
F12	K167 20BR/YL
F13	G19 20LG/OR ●
F14	G31 20VT/LG
F15	G32 20BK/LB
F16	K78 18GY
F17	V37 18RD/LG
F18	K167 20BR/YL

CAV	CIRCUIT
E1	L50 20WT/TN
E2	G9 20GY/BK
E3	L10 18BR/LG
E4	V10 18BR
E5	V20 18BK/WT
E6	F34 18TN/BK
E7	Z12 18BK/TN
E8	G29 20BK/LB
E9	F20 18WT
E10	F1 20DB/GY ■■■
E11	D1 20VT/BR
E12	D2 20WT/BK
E13	-
E14	G99 20GY/WT
E15	K185 20OR/LB
E16	G86 20TN/OR
E17	G154 20VT/LG
E18	-
F1	D20 20LG/BK
F2	D21 20PK
F3	L60 20TN
F4	L61 20LG/WT
F5	L9 20BK/PK
F6	-
F7	V30 20DB/RD
F8	F32 20PK/DB
F9	V32 18YL/RD
F10	K29 20WT/PK
F11	K226 20DB/LG
F12	K167 20BR/YL
F13	G19 20LG/OR ●
F14	G31 20VT/LG
F15	G32 20BK/LB
F16	K78 20GY
F17	V37 20RD/LG
F18	K4 20BK/RD

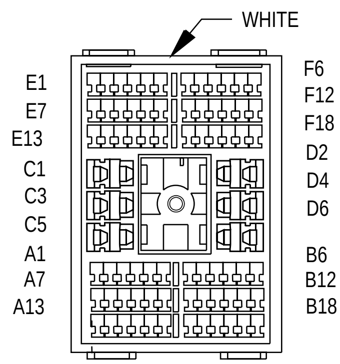
■ 2.5L
■■■ SENTRY KEY IMMOBILIZER MODULE
◇ 4.0L A/T
◇◇ EXCEPT 4.0L A/T
◇◇◇ EXCEPT 2.5L

● ABS
●● 4.0L A/T
▲ EXCEPT 4.0L A/T
▲▲ SPEED CONTROL



C100
(RHD)

CAV	CIRCUIT
A1	Z1 18BK
A2	G106 20BK/WT ●●
A3	G107 20BK/RD
A4	L92 20PK ●●●
A5	L139 20VT ●●●
A6	C90 20LG
A7	Z12 18BK/TN
A8	G29 20BK/LB
A9	F20 18WT
A10	G99 20GY/WT
A11	D1 18VT/BR ▼▼
A11	D1 20VT/BR ●●
A12	D2 18WT/BK ▼▼
A12	D2 20WT/BK ●●
A13	-
A14	G9 20GY/BK
A15	L10 18BR/LG
A16	V10 18BR
A17	V20 18BK/WT
A18	F34 18TN/BK
B1	K29 18WT/PK
B2	K226 18DB/LG
B3	K167 20BR/YL
B4	L50 18WT/TN
B5	V37 18RD/LG
B6	K167 20BR/YL
B7	D20 18LG/BK
B8	D21 18PK ▲▲
B8	D21 20PK
B9	L60 20TN
B10	L61 20LG/WT
B11	L9 20BK/PK
B12	L44 20VT/RD
B13	-
B14	-
B15	-
B16	-
B17	-
B18	-
C1	V3 16BR/WT
C2	A1 12RD
C3	V4 16BR/VT
C4	F75 16VT ▲▲▲
C5	V5 16DG/YL
C6	A2 12PK/BK
D1	A3 14RD/WT
D2	A141 14DG/WT
D3	-
D4	-
D5	A111 12RD/LG
D6	-



C100
(RHD)

CAV	CIRCUIT
A1	Z1 18BK
A2	G106 20BK/WT ●●
A3	G107 20BK/RD
A4	L39 20LB ●●●
A5	L139 20VT ●●●
A6	C90 20LG
A7	Z12 18BK/TN
A8	G29 20BK/LB
A9	F20 18WT
A10	G99 20GY/WT
A11	D1 20VT/BR
A12	D2 20WT/BK
A13	-
A14	G9 20GY/BK
A15	L10 18BR/LG
A16	V10 18BR
A17	V20 18BK/WT
A18	F34 18TN/BK
B1	K29 18WT/PK
B2	K226 20DB/LG
B3	K167 20BR/YL
B4	L50 20WT/TN
B5	V37 20RD/LG
B6	K4 20BK/RD
B7	D20 20LG/BK
B8	D21 20PK
B9	L60 20TN
B10	L61 20LG/WT
B11	L9 20BK/PK
B12	-
B13	-
B14	-
B15	-
B16	-
B17	-
B18	-
C1	V3 16BR/WT
C2	A1 12RD
C3	V4 16BR/VT
C4	F75 16VT ▲▲▲
C5	V5 16DG/YL
C6	A2 12PK/BK
D1	A3 14RD/WT
D2	A141 16DG/WT
D3	-
D4	-
D5	A111 12RD/LG
D6	-

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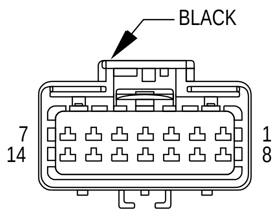
▲ ABS
▲▲ 2.5L
▲▲▲ POWER AMP
● DRL
●● 4.0L A/T
●●● FOG LAMPS
▼▼ EXCEPT 4.0L A/T

(CONTINUED)

CAV	CIRCUIT
E1	-
E2	-
E3	-
E4	-
E5	-
E6	-
E7	F45 20YL/RD
E8	T141 20YL
E9	-
E10	F1 20DB/GY ●●
E11	-
E12	-
E13	-
E14	-
E15	-
E16	-
E17	-
E18	-
F1	D20 18LG/BK
F2	-
F3	-
F4	-
F5	-
F6	-
F7	V30 20DB/RD
F8	F32 20PK/DB
F9	V32 18YL/RD
F10	-
F11	-
F12	-
F13	G19 20LG/OR ●
F14	G31 20VT/LG
F15	G32 20BK/LB
F16	-
F17	-
F18	-

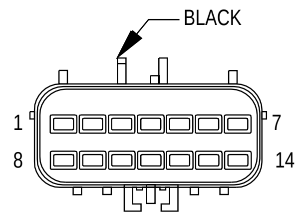
CAV	CIRCUIT
E1	-
E2	-
E3	-
E4	-
E5	-
E6	-
E7	F45 20YL/RD
E8	T141 20YL
E9	-
E10	F1 20DB/GY ●●
E11	-
E12	-
E13	-
E14	-
E15	-
E16	-
E17	-
E18	-
F1	-
F2	-
F3	-
F4	-
F5	-
F6	-
F7	V30 20DB/RD
F8	F32 20PK/DB
F9	V32 20YL/RD
F10	-
F11	-
F12	-
F13	G19 20LG/OR
F14	G31 20VT/LG
F15	G32 20BK/LB
F16	-
F17	-
F18	-

● ABS
●● SENTRY KEY IMMOBILIZER MODULE



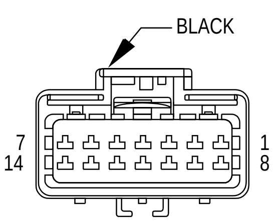
C106

CAV	CIRCUIT
1	-
2	L33 20RD
3	L61 20LG/WT
4	Z1 20BK
5	-
6	L34 20RD/OR
7	L77 20BR/YL
8	L39 20LB ▽
9	L43 20VT
10	L60 20TN
11	Z1 20BK/WT
12	L33 20RD/WT
13	L44 20VT/RD
14	L78 20DG/YL



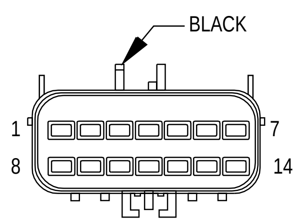
C106

CAV	CIRCUIT
1	-
2	L33 18RD
3	L61 20LG
4	Z1 18BK
5	-
6	L34 18RD/OR
7	L77 20BR
8	L39 20LB ▽
9	L43 18VT
10	L60 20TN
11	Z1 18BK
12	L33 20RD ▽
13	L44 18VT/RD
14	L78 20DG/YL



C107
(LHD 2.5L)

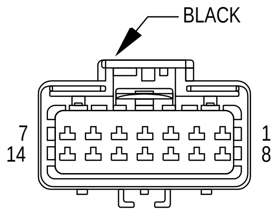
CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■
5	T41 20BK/WT
6	-
7	F142 18DG/WT
8	G107 20BK/RD
9	-
10	F12 18DB/WT
11	F20 18WT
12	-
13	-
14	A61 16DG/BK



C107
(LHD 2.5L)

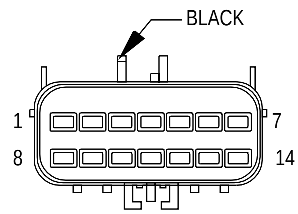
CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■
5	Z1 20 BK ▲▲
5	T41 18BK/WT ▲
6	-
7	F142 20DG/WT
8	G107 20BK/RD
9	-
10	F12 18DB/WT
11	F20 18WT
12	L10 18BR/LG
13	-
14	A61 14DG/BK

▽ FOG LAMPS
■ DRL
▲ A/T
▲▲ M/T



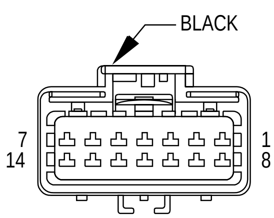
C107
(LHD 4.0L)

CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■■
5	T41 20BK/WT ●
5	Z1 18BK ●●
6	K22 20OR/DB ▲
7	A42 18DG
8	G107 20BK/RD ◂▸
9	Z12 18BK/TN ▲
10	F12 18DB/WT
11	K78 18GY ▽▽▽
12	G106 20BK/WT ◂▸
13	A242 18VT/OR
14	A61 16DG/BK



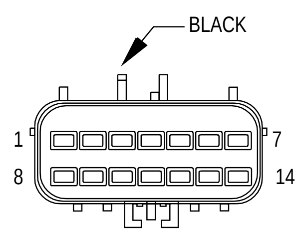
C107
(LHD 4.0L)

CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■■
5	T41 18BK/WT
6	K22 20OR/DB ▲
7	A42 20DG
8	G107 20BK/RD ◂▸
9	Z12 16BK/TN ▲
10	F12 18DB/WT
11	K78 18GY ▲
12	G106 20BK/WT ▲▲
13	A242 20VT/OR ▽▽
13	A242 20DG/OR ▽
14	A61 14DG/BK



C107
(RHD 2.5L)

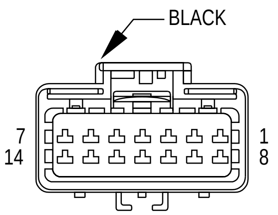
CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	-
5	T41 20BK/WT
6	-
7	F142 18DG/WT
8	G107 20BK/RD
9	-
10	F12 18DB/WT
11	F20 18WT
12	L10 18BR/LG
13	-
14	A61 16DG/BK



C107
(RHD 2.5L)

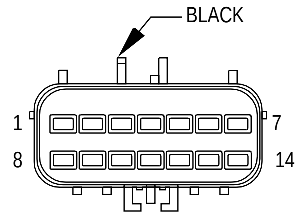
CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■■
5	Z1 20 BK ●●
5	T41 18BK/WT ●
6	-
7	F142 20DG/WT
8	G107 20BK/RD
9	-
10	F12 18DB/WT
11	F20 18WT
12	L10 18BR/LG
13	-
14	A61 14DG/BK

▲ 4.0L A/T
◂▸ 4WD
● A/T
●● M/T
▲▲ 4WD A/T
■■ DRL
▽ 2WD CALIFORNIA
▽▽ 4WD CALIFORNIA
▽▽▽ EXTENDED IDLE



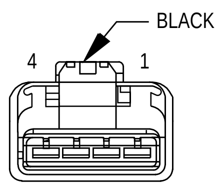
C107
(RHD 4.0L)

CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR
5	T41 20BK/WT ●
5	Z1 18BK ●●
6	K22 20OR/DB ■
7	A42 18DG
8	G107 20BK/RD ◂▸
9	Z12 18BK/TN ■
10	F12 18DB/WT
11	-
12	G106 20BK/WT
13	A242 18VT/OR
14	A61 16DG/BK



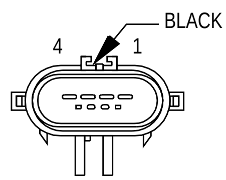
C107
(RHD 4.0L)

CAV	CIRCUIT
1	A142 18DG/OR
2	K20 18DG
3	K167 20BR/YL
4	G7 20WT/OR ■■
5	T41 18BK/WT
6	K22 20OR/DB ▲
7	A42 20DG
8	G107 20BK/RD ◂▸
9	Z12 16BK/TN ▲
10	F12 18DB/WT
11	-
12	G106 20BK/WT ▲▲
13	A242 20VT/OR ▽▽
13	A242 20DG/OR ▽
14	A61 14DG/BK



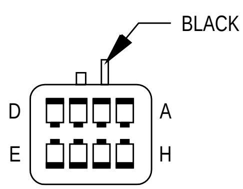
C108

CAV	CIRCUIT
1	T40 16BR
2	K72 18DG/OR
3	K20 18DG
4	C3 16DB/BK



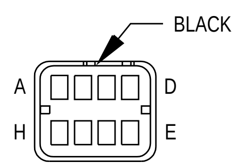
C108

CAV	CIRCUIT
1	T40 16BR
2	K72 16DG/OR
3	K20 16DG
4	C3 16DB/BK



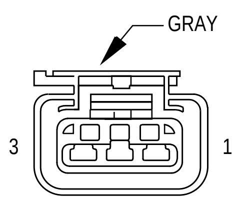
C109

CAV	CIRCUIT
A	B41 18YL/VT
B	B42 18TN/WT
C	B43 18PK/OR
D	B1 18YL/DB
E	B2 18YL
F	B3 18LG/DB
G	B4 18LG



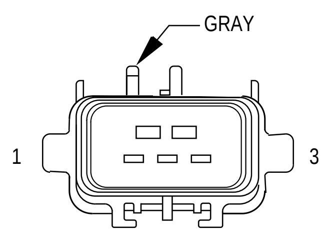
C109

CAV	CIRCUIT
A	B41 20YL/VT
B	B42 20TN/WT
C	B43 20PK/OR
D	B1 20YL/DB
E	B2 20YL
F	B3 20LG/DB
G	B4 20LG



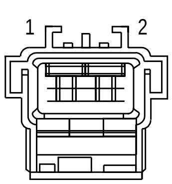
C112
(4.0L A/T 4WD)

CAV	CIRCUIT
1	Z1 20BK
2	G106 20BK/WT
3	G107 20BK/RD



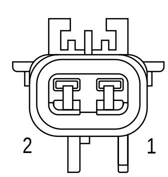
C112
(4.0L A/T 4WD)

CAV	CIRCUIT
1	Z1 20BK
2	G106 20BK/WT
3	G107 20BK/RD



C113
(M/T)

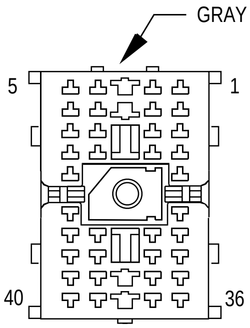
CAV	CIRCUIT
1	F20 18WT
2	L10 18BR/LG



C113
(M/T)

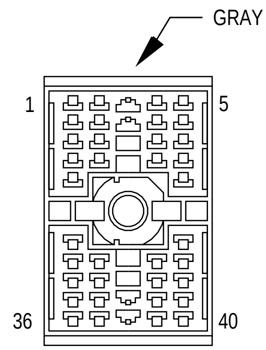
CAV	CIRCUIT
1	F20 18WT
2	L10 18BR/LG

▲ 4.0L A/T
◂▸ 4WD
● A/T
●● M/T
▲▲ 4WD A/T
■ 4.0L GAS (EXCEPT M/T 2WD)
■■ DRL
▽ 2WD CALIFORNIA
▽▽ 4WD CALIFORNIA



C200
(LHD)

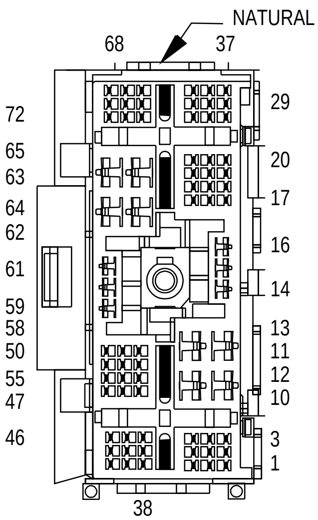
CAV	CIRCUIT
1	X53 18DG
2	X55 18BR/RD
3	-
4	X54 18VT
5	X56 18DB/RD
6	X51 18BR/YL
7	X57 18BR/LB
8	-
9	X52 18DB/WT
10	X58 18DB/OR
11	X60 18DG/RD ●
12	P91 20WT/BK
13	A141 16DG/WT
14	F75 14VT ●
15	K226 20DB/LG
16	L10 18BR/LG
17	G16 20BK/LB
18	-
19	-
20	-
21	-
22	-
23	L38 18BR/WT
24	L50 20WT/TN
25	L62 20BR/RD
26	L63 20DG/RD
27	V13 18BR
28	V20 18BK/WT
29	V23 18BR/PK
30	K167 20BR/YL
31	P35 20OR/VT ●●
32	P36 20PK/VT ●●
33	F81 12TN ●●
34	P72 20YL/BK
35	P74 20DB
36	P76 20OR/YL
37	C16 20LB/YL
38	-
39	F83 18YL/DG
40	G78 20TN/BK



C200
(LHD)

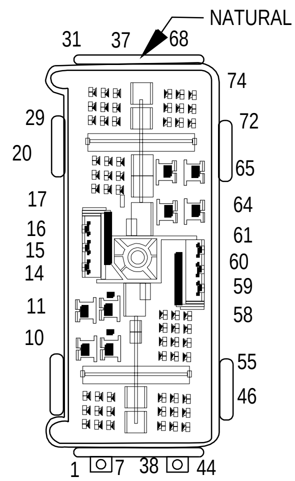
CAV	CIRCUIT
1	X53 16DG
2	X55 16BR/RD
3	-
4	X54 16VT
5	X56 16DB/RD
6	X51 16BR/YL
7	X57 16BR/LB
8	-
9	X52 16DB/WT
10	X58 16DB/OR
11	X60 16DG/RD ●
12	P91 20WT/BK
13	A141 16DG/WT
14	F75 16VT ●
15	K226 20DB/LG
16	L10 18BR/LG
17	G16 20BK/LB
18	-
19	-
20	-
21	-
22	-
23	-
24	L50 20WT/TN
25	L62 20BR/RD
26	L63 20DG/RD
27	V13 18BR/LG
28	V20 18BK/WT
29	V23 18BR/PK
30	K167 20BR/YL
31	P35 20OR/VT ●●
32	P36 20PK/VT ●●
33	F81 12TN ●●
34	P72 20YL/BK
35	P74 20DB
36	P76 20OR/YL
37	C16 20LB/YL C16 20LB/YL
38	-
39	F83 18YL/DG
40	G78 20TN/BK

● FULL OPTIONS (WITH POWER AMPLIFIER)
●● FULL OPTIONS



C201
(LHD)

CAV	CIRCUIT
1	F20 18WT
2	C16 20LB/YL
3	L5 20BK
4	C36 20RD/WT
5	F87 20WT/BK
6	M1 20PK
7	Z1 20BK
8	V6 16DB
9	P36 20PK/VT
10	A31 12BK/WT
11	A111 12RD/LG
12	C7 12BK/TN
13	F81 12TN
14	Z1 14BK
15	-
16	L3 16RD/OR
17	C81 20LB/WT
18	-
19	-
20	P72 20YL/BK
21	-
22	L4 16VT/WT
23	P35 20OR/VT
24	P74 20DB
25	Z8 20BK/VT
26	X3 20BK/RD
27	-
28	P76 20OR/YL
29	G26 20LB
30	-
31	-
32	G31 20VT/LG
33	-
34	-
35	G32 20BK/LB
36	-
37	-
38	-
39	V23 18BR/PK
40	F15 20DB/WT
41	-
42	E1 20TN
43	E2 20OR



C201
(LHD)

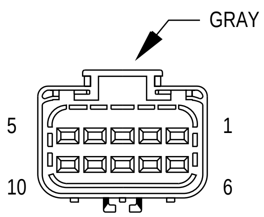
CAV	CIRCUIT
1	F20 18WT
2	C16 20LB/YL
3	L5 20BK
4	C36 20RD/WT
5	F87 20WT/BK
6	M1 20PK
7	Z1 20BK
8	V6 16DB
9	P36 20PK/VT
10	A31 12BK/WT
11	A111 12RD/LG
12	C7 12BK/TN
13	F81 12TN
14	Z1 14BK
15	-
16	L3 16RD/OR
17	C81 20LB/WT
18	-
19	-
20	P72 20YL/BK
21	-
22	L4 16VT/WT
23	P35 20OR/VT
24	P74 20DB
25	Z8 16BK/VT
26	X3 20BK/RD
27	-
28	P76 20OR/YL
29	G26 20LB
30	-
31	-
32	G31 20VT/LG
33	-
34	-
35	G32 20BK/LB
36	-
37	-
38	-
39	V23 18BR/PK
40	F15 20DB/WT
41	-
42	E1 20TN
43	E2 20OR

(CONTINUED)

(CONTINUED)

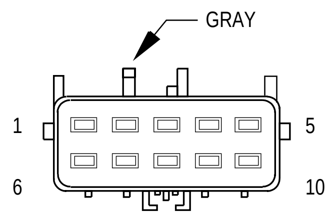
CAV	CIRCUIT
44	F83 18YL/DG
45	L7 18BK/YL
46	M2 20YL
47	-
48	-
49	-
50	F30 16RD
51	D1 18VT/BR
52	D2 18WT/BK
53	-
54	X12 16RD/WT
55	D1 20VT/BR
56	D2 20WT/BK
57	-
58	Z2 20BK/LG
59	C4 14TN
60	C5 14LG
61	C6 14LB
62	A22 12BK/OR
63	A41 14YL
64	A21 12DB
65	F38 16RD/LB
66	G9 20GY/BK
67	P91 20WT/BK
68	-
69	G10 20LG/RD
70	-
71	-
72	-
73	-
74	-

CAV	CIRCUIT
44	F83 18YL/DG
45	L7 18BK/YL
46	M2 20YL
47	-
48	-
49	-
50	F30 16RD
51	D1 20VT/BR
52	D2 20WT/BK
53	-
54	X12 16RD/WT
55	D1 20VT/BR
56	D2 20WT/BK
57	-
58	Z2 20BK/LG
59	C4 14TN
60	C5 14LG
61	C6 14LB
62	A22 12BK/OR
63	A41 14YL
64	A21 12DB
65	F38 16RD/LB
66	G9 20GY/BK
67	P91 20WT/BK
68	-
69	G10 20LG/RD
70	-
71	-
72	-
73	-
74	-



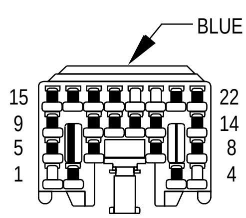
C202 (RHD)

CAV	CIRCUIT
1	C7 12BK/TN
2	-
3	F81 12TN ●
4	-
5	-
6	Z8 16BK/VT
7	A111 12RD/LG
8	C6 14LB
9	C5 14LG
10	C4 14TN



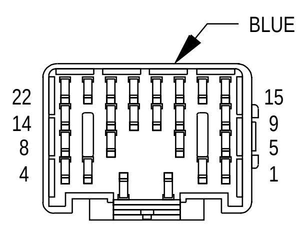
C202 (RHD)

CAV	CIRCUIT
1	C7 12BK/TN
2	-
3	F81 12TN ●
4	-
5	-
6	Z8 12BK/VT
7	A111 12RD/LG
8	C6 14LB
9	C5 14LG
10	C4 14TN



C203 (RHD)

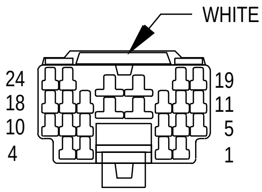
CAV	CIRCUIT
1	P55 20DB/PK ●
2	P59 20LB/RD ●
3	G26 20LB ●
4	G16 20BK/LB
5	V20 18BK/WT
6	V23 18BR/PK
7	V13 18BR/LG
8	-
9	-
10	P91 20WT/BK
11	G10 20LG/RD
12	E2 20OR
13	G9 20GY/BK
14	X60 16DG/RD
15	X58 16DB/OR
16	X57 16BR/LB
17	X56 16DB/RD
18	X55 16BR/RD
19	X54 16VT
20	X53 16DG
21	X52 16DB/WT
22	X51 16BR/YL



C203 (RHD)

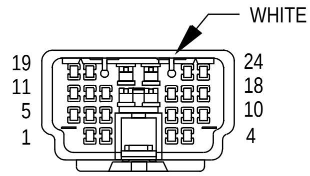
CAV	CIRCUIT
1	P55 20DB/PK ●
2	P59 20LB/RD ●
3	G26 20LB ●
4	G16 20BK/LB
5	V20 18BK/WT
6	V23 18BR/PK
7	V13 18BR
8	L38 18BR/WT
9	-
10	P91 20WT/BK
11	G10 20LG/RD
12	E2 20OR/BK
13	G9 20GY/BK
14	X60 18DG/RD ■ ■
15	X58 18DB/OR
16	X57 18BR/LB
17	X56 18DB/RD
18	X55 18BR/RD
19	X54 18VT
20	X53 18DG
21	X52 18DB/WT
22	X51 18BR/YL

■ ■ FULL OPTIONS W/ POWER AMPLIFIER
●● BASE AND FULL OPTIONS W/O POWER AMPLIFIER
● FULL OPTIONS



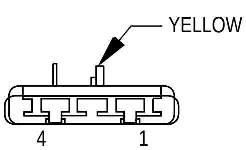
C204
(RHD)

CAV	CIRCUIT
1	F15 20DB/WT
2	C16 20BK/WT
3	P35 20OR/VT
4	P36 20PK/VT
5	G78 20TN/BK
6	K226 20DB/LG
7	K167 20BR/YL
8	P72 20YL/BK
9	P74 20DB
10	P76 20OR/YL
11	L62 20BR/RD
12	L63 20DG/RD
13	-
14	F23 18DB/YL
15	F14 18LG/YL
16	F35 16RD
17	Z1 20BK
18	C36 18RD/WT
19	D1 20VT/BR
20	D2 20WT/BK
21	F75 16VT ●
22	A141 16DG/WT
23	L10 18BR/LG
24	L50 20WT/TN



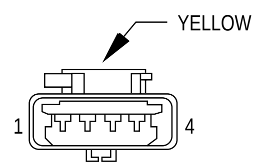
C204
(RHD)

CAV	CIRCUIT
1	F15 20DB/WT
2	C16 20LB/YL
3	P35 20OR/VT ●
4	P36 20PK/VT ●
5	G78 20TN/BK
6	K226 20DB/LG
7	K167 20BR/YL
8	P72 20YL/BK
9	P74 20DB
10	P76 20OR/YL
11	L62 20BR/RD
12	L63 20DG/RD
13	-
14	F23 18DB/YL
15	F14 18LG/YL
16	F35 16RD ●
17	Z1 20BK
18	C36 20RD/WT
19	D1 18VT/BR
20	D2 18WT/BK
21	F75 16VT ■■
22	A141 16DG/WT
23	L10 18BR/LG
24	L50 20WT/TN



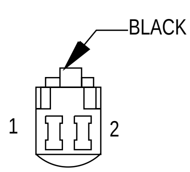
C205

CAV	CIRCUIT
1	R42 18BK/YL
2	R44 18DG/YL
3	R43 18BK/LB
4	R45 18DG/LB



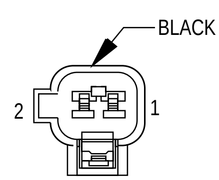
C205

CAV	CIRCUIT
1	R42 18BK/YL
2	R44 18DG/YL
3	R43 18BK/LB
4	R45 18DG/LB



C206
(A/T)

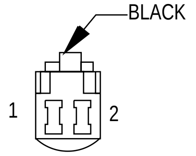
CAV	CIRCUIT
1	E2 20OR ■
1	E2 20OR/BK ▲
2	Z1 20BK



C206
(A/T)

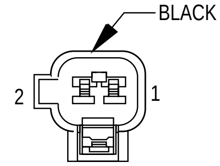
CAV	CIRCUIT
1	E2 20OR
	E2 20OR
2	Z1 20BK
	Z1 20BK

● FULL OPTIONS
▲ RHD
■ LHD
■■ FULL OPTIONS W/POWER AMP



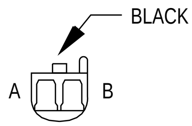
C206
(M/T)

CAV	CIRCUIT
1	E2 20OR ●
1	E2 20OR/BK ▲
2	Z1 20BK



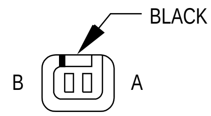
C206
(M/T)

CAV	CIRCUIT
1	E2 20OR
2	Z1 20BK



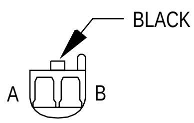
C207

CAV	CIRCUIT
A	M1 20PK
B	M2 20YL



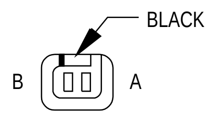
C207

CAV	CIRCUIT
A	M1 18PK
B	M2 18BK/WT



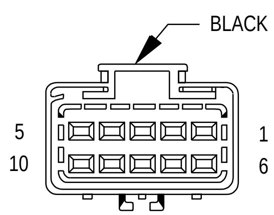
C208

CAV	CIRCUIT
A	M1 20PK
B	M2 20YL



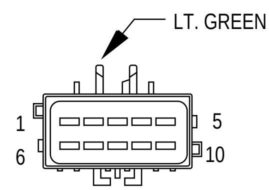
C208

CAV	CIRCUIT
A	M1 18PK
B	M2 18BK/WT



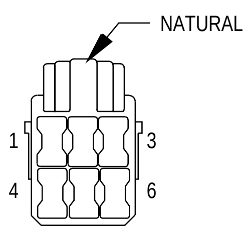
C209

CAV	CIRCUIT
1	Z1 20BK
2	C4 14TN
3	C5 14LG
4	C6 14LB
5	F15 20DB/WT
6	C36 20RD/WT
7	C7 12BK/TN
8	A111 12RD/LG
9	F15 20DB/WT
10	Z8 12BK/VT ●
10	Z8 20BK/VT ▲



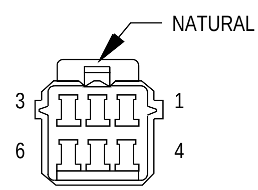
C209

CAV	CIRCUIT
1	D1 20DB/WT
2	C4 14TN
3	C5 14LG
4	C6 14LB
5	D2 20OR
6	D3 20YL
7	C7 12BK/TN
8	A111 12RD/LG
9	F15 20DB/WT
10	Z1 20BK



C300
(LHD)

CAV	CIRCUIT
1	P35 20OR/VT
2	P36 20PK/VT
3	P55 20DB/PK
4	P59 20LB/RD
5	G26 20LB
6	-



C300
(LHD)

CAV	CIRCUIT
1	P35 20OR/VT
2	P36 20PK/VT
3	P55 20DB/PK
4	P59 20LB/RD
5	G26 20LB
6	-

● RHD
▲ LHD

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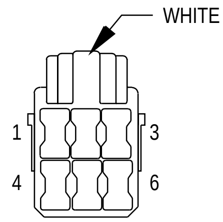
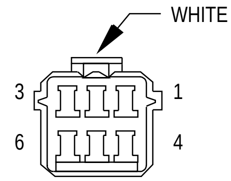


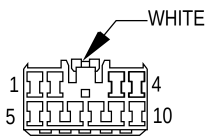
C300 (RHD)

CAV	CIRCUIT
1	P35 18OR/VT
2	P36 18PK/VT
3	F83 18YL/DG ●
4	-
5	-
6	-



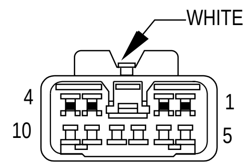
C300 (RHD)

CAV	CIRCUIT
1	P35 20OR/VT
2	P36 20PK/VT
3	F83 18YL/DG ●
4	-
5	-
6	-



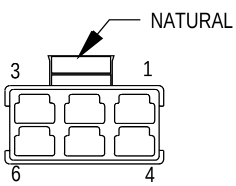
C301

CAV	CIRCUIT
1	D1 20VT/BR
2	D2 20WT/BK
3	G32 20BK/LB ■■
4	G31 20VT/LG ■■
5	Z2 20BK/LG ■■
6	F87 20WT/BK ■■
7	X3 20BK/RD
8	P55 20DB
9	P59 20LB/RD
10	-



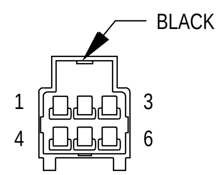
C301

CAV	CIRCUIT
1	D1 20VT/BR
2	D2 20WT/BK
3	G32 20BK/LB
4	G31 20VT/LG
5	Z2 20BK/LG
6	F87 20WT/BK
7	X3 20BK/RD
8	P55 20DB/PK
9	P59 20LB/RD
10	-



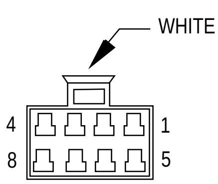
C303 (EXCEPT RHD FULL OPTIONS)

CAV	CIRCUIT
1	Q16 14BR/WT ■
2	Q26 14VT/WT ■
3	Q1 14YL ■
4	X80 18LB/BK
5	X82 18LB/RD
6	-



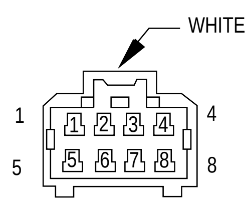
C303 (EXCEPT RHD FULL OPTIONS)

CAV	CIRCUIT
1	Q16 14BR/WT ■
1	V23 18BR/PK ●●
2	Q26 14VT/WT ■
3	Q1 14YL ■
4	X80 18LB/BK ▲▲
4	X56 18DB/RD ▲
5	X82 18LB/RD ▲▲
5	X54 18VT ▲
6	-



C303 (RHD FULL OPTIONS)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q17 14DB/WT
4	Q1 14YL
5	Z1 14BK
6	Q27 14RD/BK
7	Q16 14BR/WT
8	Q26 14VT/WT

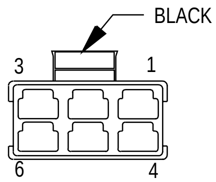


C303 (RHD FULL OPTIONS)

CAV	CIRCUIT
1	Q18 14GY/BK ■
1	V23 18BR/PK ●●
2	Q28 14DG/WT ■
3	Q17 14DB/WT ■
4	Q1 14YL ■
4	X56 18DB/RD ●●
5	Z1 14BK ■
5	X54 18VT ●●
6	Q27 14RD/BK ■
7	Q16 14BR/WT ■
8	Q26 14VT/WT ■

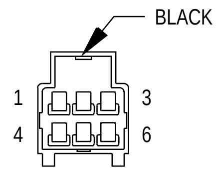
■ FULL OPTIONS
■■ OVERHEAD CONSOLE
● FULL OPTIONS AND POWER MIRRORS
●● BASE

▲ 4 SPEAKER SYSTEM
▲▲ 6 SPEAKER SYSTEM



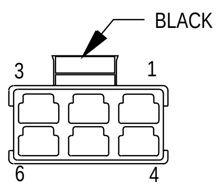
C304
(LHD)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



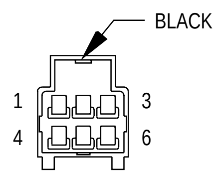
C304
(LHD)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



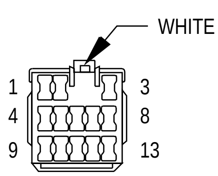
C304
(RHD)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



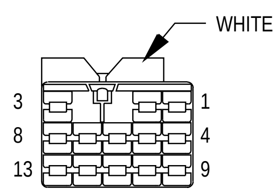
C304
(RHD)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



C305
(LHD)

CAV	CIRCUIT
1	X85 18BR/RD ■■
1	X55 18LG/RD ■
2	X87 18DG ■■
2	X53 18LG/BK ■
3	F83 18YL/DG ●
4	P33 16OR/BK ▲
5	P34 16PK/BK ▲
6	P35 20OR/VT ▲
7	P36 20PK/VT ▲
8	P72 20YL/BK
9	P74 20DB
10	P76 20OR/YL
11	C16 20LB/YL ●●
11	C16 20BK/WT ▲▲
12	-
13	P91 20WT/BK ●



C305
(LHD)

CAV	CIRCUIT
1	X85 18BR/RD ■■
1	X55 18BR/RD ■
2	X87 18LG/VT ■■
2	X53 18DG ■
3	F83 18YL/DG ●
4	P33 16OR/BK
5	P34 16PK/BK
6	P35 18OR/VT
7	P36 18PK/VT
8	P72 20YL/BK
9	P74 20DB
10	P76 20OR/YL
11	C16 20LB/YL
12	-
13	P91 20WT/BK ●

● FULL OPTIONS AND POWER MIRRORS
▲ POWER LOCK/WINDOWS
▲▲ POWER MIRRORS
■ 4 SPEAKERS
●● FULL OPTIONS
■■ 6 SPEAKERS

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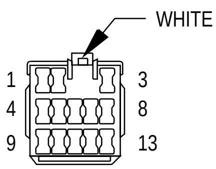
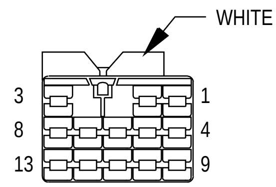


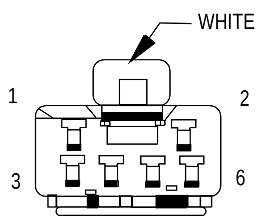
C305
(RHD)

CAV	CIRCUIT
1	X85 18BR/RD ■■
1	X55 18LG/RD ■
2	X87 18DG ■■
2	X53 18LG/BK ■
3	P59 20LB/RD
4	P33 16OR/BK ▲
5	P34 16PK/BK ▲
6	P35 20OR/VT ▲
7	P36 20PK/VT ▲
8	P71 20YL
9	P75 20DB/RD ●●
9	P75 20DB/WT ●
10	P76 20OR/YL
11	C16 20LB/YL ●●
11	C16 20BK/WT ▲▲
12	P55 20DB
13	P91 20WT/BK



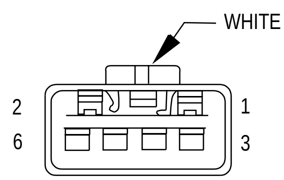
C305
(RHD)

CAV	CIRCUIT
1	X85 18BR/RD ■■
1	X55 18BR/RD ■
2	X87 18LG/VT ■■
2	X53 18DG ■
3	P59 20LB/RD
4	P33 16OR/BK
5	P34 16PK/BK
6	P35 18OR/VT
7	P36 18PK/VT
8	P72 20YL/BK
9	P74 20DB
10	P76 20OR/YL
11	C16 20LB/YL
12	P55 20DB/PK
13	P91 20WT/BK



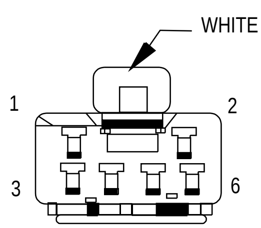
C306
(LHD)
(POWER WINDOWS)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q16 14BR/WT
4	Q26 14VT/WT
5	Q17 14DB/WT
6	Q27 14RD/BK



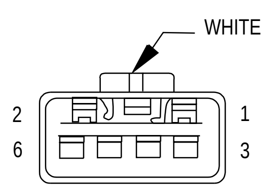
C306
(LHD)
(FULL OPTIONS)

CAV	CIRCUIT
1	Q18 14GY/BK
2	Q28 14DG/WT
3	Q16 14BR/WT
4	Q26 14VT/WT
5	Q17 14DB/WT
6	Q27 14RD/BK



C306
(RHD)
(POWER WINDOWS)

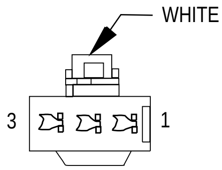
CAV	CIRCUIT
1	F35 16RD
2	G26 20LB
3	Q16 14BR/WT
4	Q26 14VT/WT
5	-
6	-



C306
(RHD)
(FULL OPTIONS)

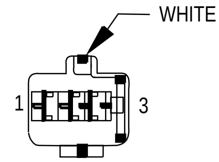
CAV	CIRCUIT
1	F35 16RD
2	G26 20LB
3	Q16 14BR/WT
4	Q26 14VT/WT
5	-
6	-

▲▲ POWER MIRRORS
●● FULL OPTIONS
● POWER MIRRORS W/O FULL OPTIONS
▲ POWER LOCK/WINDOW SWITCHES
■ 4 SPEAKERS
■■ 6 SPEAKERS



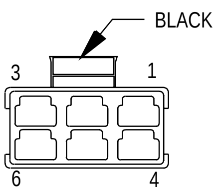
C307

CAV	CIRCUIT	
1	F81 14TN	●
2	Q1 14YL	
3	Z1 12BK	●
3	Z1 16BK	▲



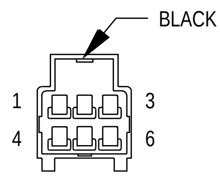
C307

CAV	CIRCUIT	
1	F81 12TN	●
2	Q1 14YL	●
3	Z1 12BK	



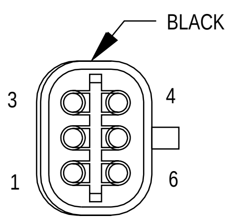
C309
(FULL OPTIONS)

CAV	CIRCUIT
1	Q17 14DB/WT
2	Q27 14RD/BK
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



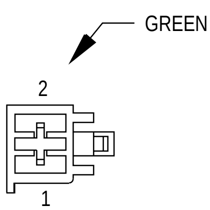
C309
(FULL OPTIONS)

CAV	CIRCUIT
1	Q17 14DB/WT
2	Q27 14RD/BK
3	Q1 14YL
4	P33 16OR/BK
5	P34 16PK/BK
6	-



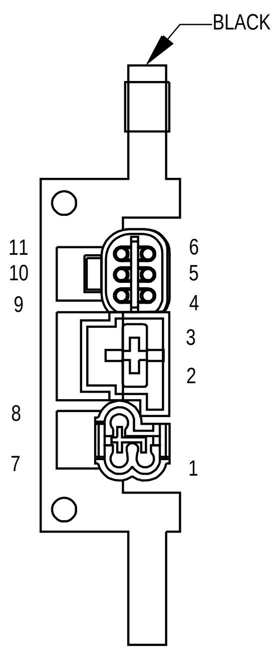
C311

CAV	CIRCUIT
1	P33 16OR/BK
2	P34 16PK/BK
3	G78 20TN/BK
4	L77 18BR/YL
5	M4 20GY/BK
6	Z1 18BK



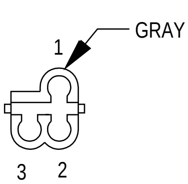
C312

CAV	CIRCUIT
1	Z1 12BK
2	C15 12BK/WT



C310

CAV	CIRCUIT
1	V20 18BK/WT
2	Z1 12BK
3	C15 12BK/WT
4	P33 16OR/BK
5	P34 16PK/BK
6	G78 20TN/BK
7	V23 18BR/PK
8	V13 18BR/LG
9	Z1 18BK
10	M4 20VT/YL
11	L77 18BR/YL



C313

CAV	CIRCUIT
1	V13 18BR/LG
2	V23 18BR/PK
3	V20 18BK/WT

▲ POWER MIRRORS
● FULL OPTIONS

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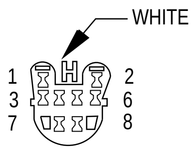
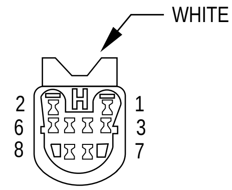
XJD08024



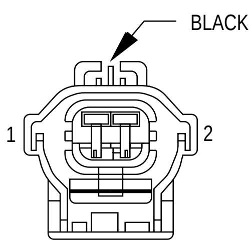
C314

CAV	CIRCUIT
1	X92 16TN/BK ▲
1	X52 18DB/WT ▲▲
2	X94 16TN/RD ▲
2	X58 18DB/OR ▲▲
3	X91 16BR/DB ▲
3	X51 18BR/YL ▲▲
4	X93 16BR/YL ▲
4	X57 18BR/LB ▲▲
5	M1 20PK
6	M2 20YL
7	M4 20GY/BK
8	-



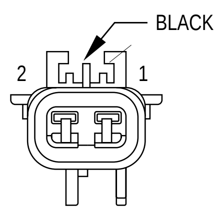
C314

CAV	CIRCUIT
1	X92 18TN/BK ▲
1	X52 18DB/WT ▲▲
2	X94 18TN/RD ▲
2	X58 18DB/OR ▲▲
3	X91 18WT/BK ▲
3	X51 18BR/YL ▲▲
4	X93 18WT/RD ▲
4	X57 18BR/LB ▲▲
5	M1 18PK ●
5	M1 20PK ●●
6	M2 20YL
7	M4 20GY/BK
8	-



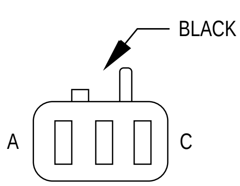
C316

CAV	CIRCUIT
1	F83 18YL/DG ■
2	F37 14RD/LB



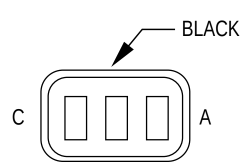
C316

CAV	CIRCUIT
1	F83 18YL/DG
2	F37 14RD/LB



C317

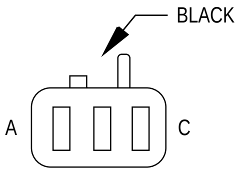
CAV	CIRCUIT
A	M2 18YL
B	G16 18BK/LB
C	Z1 18BK



C317

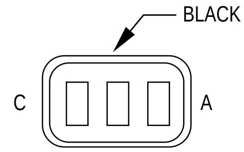
CAV	CIRCUIT
A	M2 20YL
B	G16 20BK/LB ●●
C	Z1 20BK

■ HEATED SEATS
▲ 6 SPEAKER
▲▲ 4 SPEAKER
●● LHD
● RHD



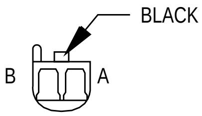
C318

CAV	CIRCUIT
A	M2 18YL
B	G16 18BK/LB
C	Z1 18BK



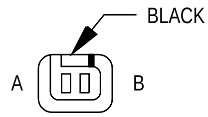
C318

CAV	CIRCUIT
A	M2 20YL
B	G16 20BK/LB ■
C	Z1 20BK



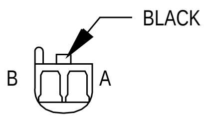
C319

CAV	CIRCUIT
A	M2 18YL
B	Z1 18BK



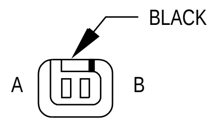
C319

CAV	CIRCUIT
A	M2 20YL
B	Z1 20BK



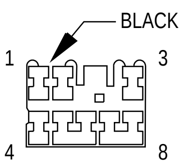
C320

CAV	CIRCUIT
A	M2 18YL
B	Z1 18BK



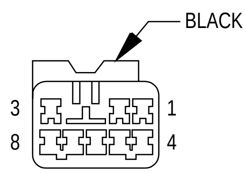
C320

CAV	CIRCUIT
A	M2 20YL
B	Z1 20BK



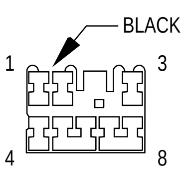
C321

CAV	CIRCUIT
1	L62 18BR/RD
2	Z1 18BK
3	-
4	-
5	L10 18BR/LG
6	L50 18WT/TN
7	L78 18DG/YL
8	-



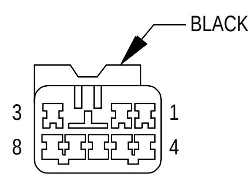
C321

CAV	CIRCUIT
1	L62 20BR/RD
2	Z1 18BK
3	-
4	L38 18BR/WT
5	L10 18BR/LG
6	L50 20WT/TN
7	L78 18DG/YL
8	-



C322
(W/O TRAILER TOW)

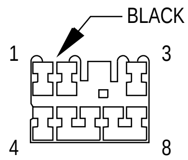
CAV	CIRCUIT
1	L63 18DG/RD
2	Z1 18BK
3	-
4	-
5	L10 18BR/LG
6	L50 18WT/TN
7	L77 18BR
8	-



C322
(W/O TRAILER TOW)

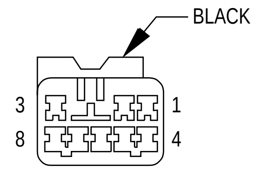
CAV	CIRCUIT
1	L63 20DG/RD
2	Z1 14BK
3	A6 20RD/OR
4	L38 18BR/WT
5	L10 18BR/LG
6	L50 20WT/TN
7	L77 18BR/YL
8	L62 20BR/RD

■ RHD



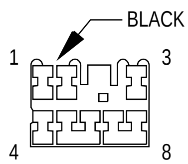
C322
(TRAILER TOW)

CAV	CIRCUIT
1	L63 18DG/RD
2	Z1 18BK
3	-
4	-
5	L10 18BR/LG
6	L50 18WT/TN
7	L77 18BR
8	-



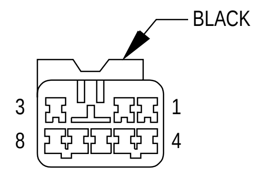
C322
(TRAILER TOW)

CAV	CIRCUIT
1	L63 20DG/RD
2	Z1 18BK
3	-
4	L38 18BR/WT
5	L10 18BR/LG
6	L50 20WT/TN
7	L77 18BR/YL
8	-



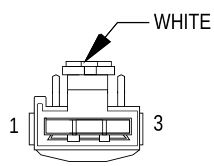
C323
(TRAILER TOW)

CAV	CIRCUIT
1	L63 20DG/RD
2	Z1 14BK
3	A6 20RD/OR
4	L38 20OR/WT
5	L10 18BR/LG
6	L50 20WT/TN
7	L77 20BR/YL
8	L62 20BK/RD



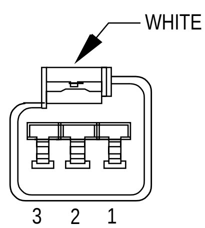
C323
(TRAILER TOW)

CAV	CIRCUIT
1	L63 20DG/RD
2	Z1 14BK
3	A6 20RD/OR
4	L38 18BR/WT
5	L10 18BR/LG
6	L50 20WT/TN
7	L77 18BR/YL
8	L62 20BR/RD



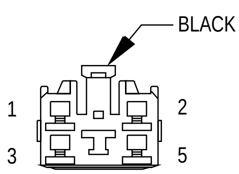
C324
(RHD)
(FULL OPTIONS)

CAV	CIRCUIT
1	F83 18YL/DG
2	X80 18LB/BK
3	X82 18LB/RD



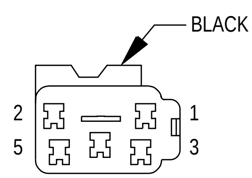
C324
(RHD)
(FULL OPTIONS)

CAV	CIRCUIT
1	F83 18YL/DG
2	X80 18LB/BK ■
3	X82 18LB/RD ■



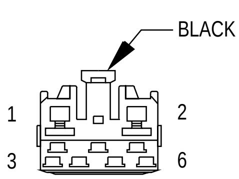
C326

CAV	CIRCUIT
1	P33 16OR/BK
2	P34 16PK/BK
3	M4 20GY/BK
4	C15 12BK/WT
5	L50 18WT/TN



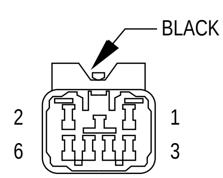
C326

CAV	CIRCUIT
1	P33 16OR/BK ●
2	P34 16PK/BK ●
3	M4 20GY/BK
4	C15 12BK/WT
5	L50 20WT/TN



C327

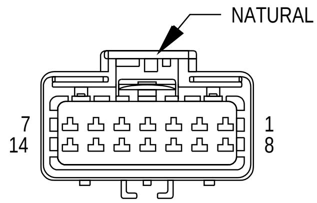
CAV	CIRCUIT
1	G78 20TN/BK
2	L77 18BR/YL
3	V13 18BR/LG
4	V23 18BR/PK
5	V20 18BK/WT
6	-



C327

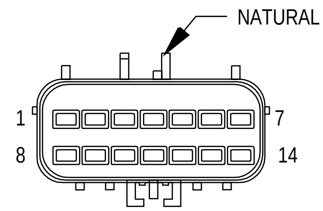
CAV	CIRCUIT
1	G78 20TN/BK
2	L77 18BR/YL
3	V13 18BR
4	V23 18BR/PK
5	V20 18BK/WT
6	-

■ W/ POWER AMPLIFIER
● FULL OPTIONS



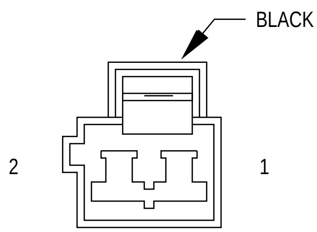
C329

CAV	CIRCUIT
1	P133 18TN/DG
2	P134 18TN/RD
3	P137 18VT
4	P138 18VT/LG
5	P139 18VT/WT
6	P140 18VT/BK
7	P87 18BK/OR
8	P141 18TN/LB
9	P143 18BK/DG
10	F37 14RD/LB
11	F83 18YL/DG
12	Z1 18BK
13	Z2 18BK/LG
14	-



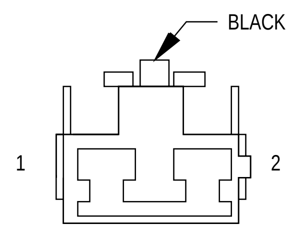
C329

CAV	CIRCUIT
1	P133 18TN/DG
2	P134 18TN/RD
3	P137 18VT
4	P138 18VT/LG
5	P139 18VT/WT
6	P140 18VT/BK
7	P87 18BK/OR
8	P141 18TN/LB
9	P143 18BK/DG
10	F37 14RD/LB
11	F83 18YL/DG
12	Z1 18BK
13	Z2 18BK/LG
14	-



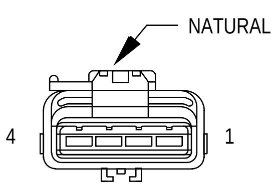
C330

CAV	CIRCUIT
1	L77 18BR/YL
2	Z1 18BK



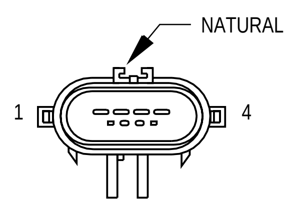
C330

CAV	CIRCUIT
1	L78 18BK/YL
2	Z1 18BK



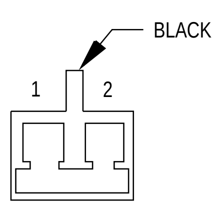
C332

CAV	CIRCUIT
1	P141 18TN/LB
2	P143 18BK/DG
3	P87 18BK/OR
4	Z1 18BK



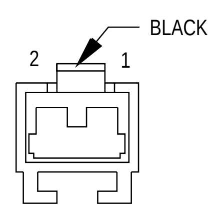
C332

CAV	CIRCUIT
1	P141 18TN/LB
2	P143 18BK/DG
3	P87 18BK/OR
4	Z1 18BK



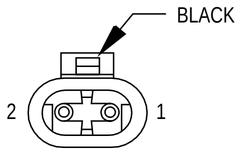
C333

CAV	CIRCUIT
1	L50 18WT/TN
2	Z1 18BK



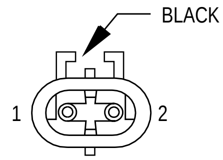
C333

CAV	CIRCUIT
1	L50 18DG/WT
2	Z1 18BK



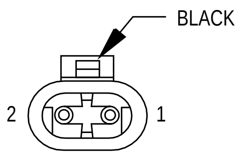
C362

CAV	CIRCUIT
1	F37 14RD/LB
2	Z1 14BK



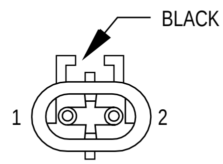
C362

CAV	CIRCUIT
1	F37 14RD
2	Z1 14BK



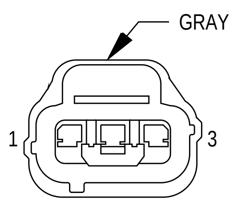
C363

CAV	CIRCUIT
1	F37 14RD/LB
2	Z1 14BK



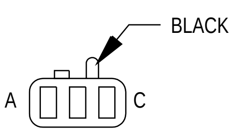
C363

CAV	CIRCUIT
1	F37 14RD
2	Z1 14BK



CAMSHAFT POSITION SENSOR

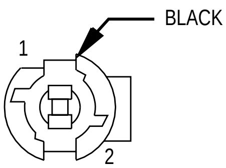
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND
3	K7 18OR	5V SUPPLY



CARGO LAMP/SWITCH

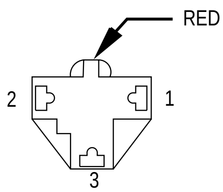
CAV	CIRCUIT	FUNCTION
A	M1 18PK ●	FUSED B(+)
A	M1 20PK ● ●	FUSED B(+)
B	M2 20YL	COURTESY LAMPS DRIVER
C	M4 20GY/BK	LIFTGATE COURTESY LAMP DRIVER

● RHD
● ● LHD



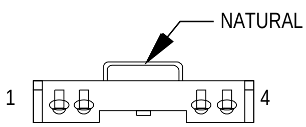
CENTER HIGH MOUNTED STOP LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L50 18DG/WT	BRAKE LAMP SWITCH OUTPUT



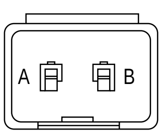
CIGAR LIGHTER

CAV	CIRCUIT	FUNCTION
1	F30 16RD	CIGAR LIGHTER RELAY OUTPUT
2	-	-
3	Z1 16BK	GROUND



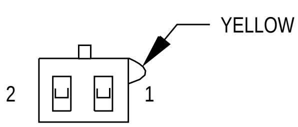
CLOCKSPRING - C1

CAV	CIRCUIT	FUNCTION
1	X3 20BK/RD	HORN RELAY CONTROL
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
3	K4 20BK/RD	SENSOR GROUND
4	-	-



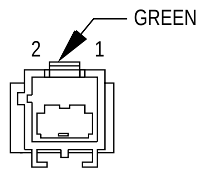
CLOCKSPRING - C2

CAV	CIRCUIT	FUNCTION
A	K167 20BR/YL	SENSOR GROUND
B	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL



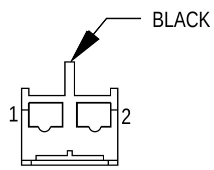
CLOCKSPRING - C3

CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER AIRBAG LINE 1
2	R43 18BK/LB	DRIVER AIRBAG LINE 2



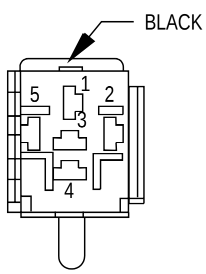
CLUTCH INTERLOCK SWITCH

CAV	CIRCUIT	FUNCTION
1	T141 20YL	IGNITION SWITCH OUTPUT (START)
2	F45 20YL/RD	FUSED B(+) ENGINE STARTER MOTOR RELAY



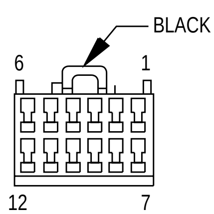
CLUTCH INTERLOCK SWITCH JUMPER

CAV	CIRCUIT	FUNCTION
1	F45 18YL	FUSED B(+) ENGINE STARTER MOTOR RELAY
2	F45 18YL	FUSED B(+) ENGINE STARTER MOTOR RELAY



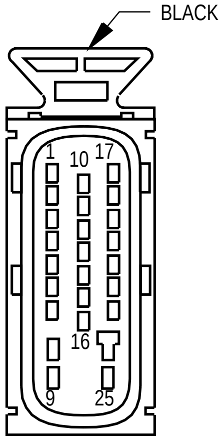
COMBINATION FLASHER

CAV	CIRCUIT	FUNCTION
1	L5 20BK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	L9 20BK/PK	FUSED B (+)
3	L12 20VT/TN	HAZARD FLASHER SELECT SIGNAL
4	L6 20RD/WT	FLASHER OUTPUT
5	Z1 20BK	GROUND



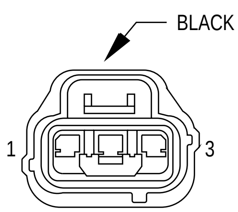
COMPASS

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	M1 20PK	FUSED B(+)
3	-	-
4	G31 20VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
5	D1 20VT/BR	CCD BUS (+)
6	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
7	M2 20YL	COURTESY LAMPS DRIVER
8	-	-
9	-	-
10	G32 20BK/LB	SENSOR GROUND
11	D2 20WT/BK	CCD BUS (-)
12	Z2 20BK/LG	GROUND



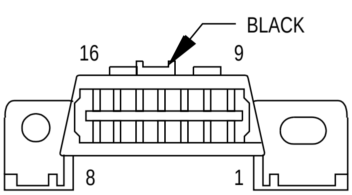
CONTROLLER ANTI-LOCK BRAKE

CAV	CIRCUIT	FUNCTION
1	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)
2	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
3	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)
4	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR (+)
5	-	-
6	B41 18YL/VT	G SWITCH NO. 1 SENSE
7	B42 18TN/WT	G SWITCH NO. 2 SENSE
8	Z1 12BK	GROUND
9	A20 12RD/DB	FUSED B(+)
10	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)
11	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
12	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
13	B43 18PK/OR	G SWITCH TEST SIGNAL
14	-	-
15	-	-
16	G83 18GY/BK	ABS RELAY CONTROL
17	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR (+)
18	B6 18WT/DB	RIGHT REAR WHEEL SPEED SENSOR (-)
19	-	-
20	D21 18PK	SCI TRANSMIT/ ISO 9141K
21	-	-
22	-	-
23	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
24	Z1 12BK	GROUND
25	A10 12RD/DG	FUSED B(+)



CRANKSHAFT POSITION SENSOR

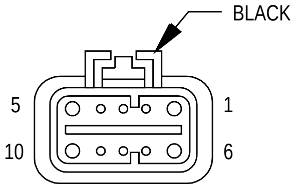
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K167 20BR/YL	SENSOR GROUND
3	K7 20OR	5V SUPPLY



DATA LINK CONNECTOR

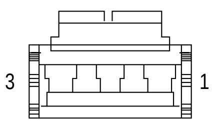
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	D1 18VT/BR	CCD BUS (+)
4	Z1 18BK	GROUND
5	Z12 18BK/TN	GROUND
6	D20 20LG/BK	SCI RECEIVE
7	D21 20PK	SCI TRANSMIT/ ISO 9141K
8	-	-
9	-	-
10	-	-
11	D2 18WT/BK	CCD BUS (-)
12	-	-
13	-	-
14	-	-
15	-	-
16	F34 18TN/BK	FUSED B(+)

J008W-7 XJD08032



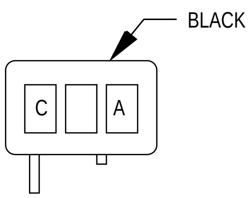
DAYTIME RUNNING LAMP MODULE

CAV	CIRCUIT	FUNCTION
1	L3 16RD	DIMMER SWITCH HIGH BEAM OUTPUT
2	-	-
3	-	-
4	G34 16RD/GY	HIGH BEAM INDICATOR DRIVER
5	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
6	A3 14RD/WT	FUSED B(+)
7	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL
8	Z12 16BK/TN	GROUND
9	-	-
10	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT



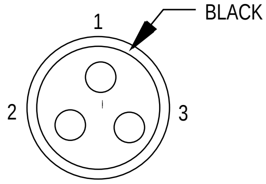
DOME LAMP (BASE/POLICE)

CAV	CIRCUIT	FUNCTION
1	-	-
2	M1 20PK	FUSED B(+)
3	M2 20YL	COURTESY LAMPS DRIVER



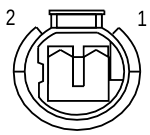
DOME LAMPS SWITCH (MIDLINE)

CAV	CIRCUIT	FUNCTION
A	Z1 20BK	GROUND
B	M2 20YL	COURTESY LAMPS DRIVER
C	M1 20PK	FUSED B(+)



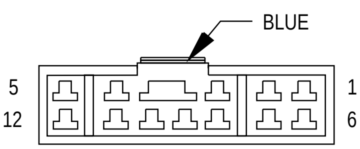
DRIVER DOOR
JAMB SWITCH

CAV	CIRCUIT	FUNCTION
1	M2 18YL	COURTESY LAMPS DRIVER
2	G16 18BK/LB	DRIVER DOOR AJAR SWITCH SENSE
3	Z1 18BK	GROUND



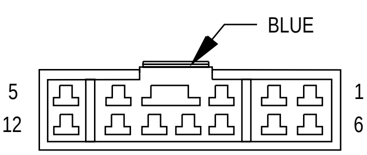
DRIVER DOOR
LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	DOOR UNLOCK DRIVER
2	P33 16OR/BK	DOOR LOCK DRIVER



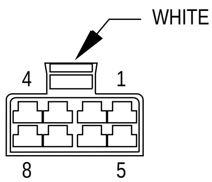
DRIVER POWER
LOCK/WINDOW
SWITCH-C1
(LHD)
(FULL OPTIONS)

CAV	CIRCUIT	FUNCTION
1	Q28 14DG/WT	MASTER WINDOW SWITCH RIGHT REAR DOWN
2	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER UP
3	Q16 14BR/WT	MASTER WINDOW SWITCH PASSENGER UP
4	Q17 14DB/WT	LEFT REAR WINDOW DRIVER UP
5	Q11 14LB	DRIVER WINDOW DRIVER UP
6	Q26 14VT/WT	MASTER WINDOW SWITCH PASSENGER DOWN
7	P35 18OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
8	Z1 14BK	GROUND
9	F81 14TN	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	Q27 14RD/BK	LEFT REAR WINDOW DRIVER DOWN
11	P36 18PK/VT	DOOR LOCK SWITCH OUPUT (UNLOOK)
12	Q21 14WT	DRIVER WINDOW DRIVER DOWN



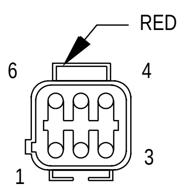
DRIVER POWER
LOCK/WINDOW
SWITCH-C1
(RHD)
(FULL OPTIONS)

CAV	CIRCUIT	FUNCTION
1	Q28 14DG/WT	MASTER WINDOW SWITCH RIGHT REAR DOWN
2	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER UP
3	Q11 14BR	DRIVER WINDOW DRIVER UP
4	Q17 14DB/WT	LEFT REAR WINDOW DRIVER UP
5	Q16 14BR/WT	MASTER WINDOW SWITCH PASSENGER UP
6	Q21 14VT	DRIVER WINDOW DRIVER DOWN
7	P35 18OR/VT	DOOR LOCK SWITCH OUTPUT (LOCK)
8	Z1 14BK	GROUND
9	F81 14TN	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	Q27 14RD/BK	LEFT REAR WINDOW DRIVER DOWN
11	P36 18PK/VT	DOOR LOCK SWITCH OUTPUT (UNLOCK)
12	Q26 14VT/WT	MASTER WINDOW SWITCH PASSENGER DOWN



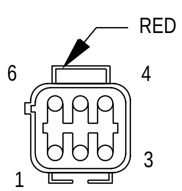
DRIVER POWER LOCK/WINDOW SWITCH-C2 (FULL OPTIONS)

CAV	CIRCUIT	FUNCTION
1	P71 20YL ■	LEFT POWER MIRROR VERTICAL DRIVER
1	P71 20YL/LB ●●	LEFT POWER MIRROR VERTICAL DRIVER
2	P76 20OR/YL	MIRROR COMMON DRIVER
3	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
4	P74 20DB	RIGHT POWER MIRROR HORIZONTAL DRIVER
5	Z1 14BK ■	GROUND
5	Z1 16BK ●●	GROUND
6	P75 20DB/WT	LEFT POWER MIRROR HORIZONTAL DRIVER
7	P72 20YL/BK	RIGHT POWER MIRROR VERTICAL DRIVER
8	Q1 14YL	POWER WINDOW SWITCH FEED



DRIVER POWER MIRROR (LHD)

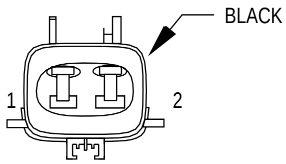
CAV	CIRCUIT	FUNCTION
1	P71 20YL	LEFT POWER MIRROR VERTICAL DRIVER
2	P75 20DB/WT ●	LEFT POWER MIRROR HORIZONTAL DRIVER
2	P76 20OR/YL ▲	MIRROR COMMON DRIVER
3	P91 20WT/BK ●	MIRROR COMMON DRIVER
3	P75 20DB/WT ▲	LEFT POWER MIRROR HORIZONTAL DRIVER
4	P76 20OR/YL	MIRROR COMMON DRIVER
5	C16 20BK/WT ●	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
5	C16 20LB/YL ▲	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z1 18BK ●	GROUND
6	Z1 16BK ▲	GROUND



DRIVER POWER MIRROR (RHD)

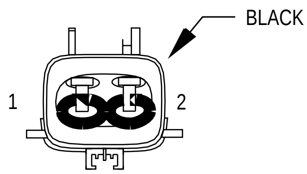
CAV	CIRCUIT	FUNCTION
1	P72 20YL/BK	RIGHT POWER MIRROR VERTICAL DRIVER
2	P74 20DB ●	RIGHT POWER MIRROR HORIZONTAL DRIVER
2	P76 20OR/YL ▲	MIRROR COMMON DRIVER
3	P91 20WT/BK ●	MIRROR COMMON DRIVER
3	P74 20DB ▲	RIGHT POWER MIRROR HORIZONTAL DRIVER
4	P76 20OR/YL	MIRROR COMMON DRIVER
5	C16 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z1 18BK	GROUND

● POWER MIRRORS
▲ FULL OPTIONS
■ LHD
●● RHD



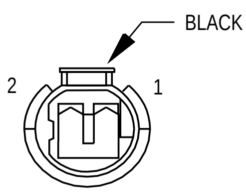
DRIVER POWER WINDOW MOTOR (LHD)

CAV	CIRCUIT	FUNCTION
1	Q11 14LB	LEFT FRONT WINDOW DRIVER UP
2	Q21 14WT	LEFT FRONT WINDOW DRIVER DOWN



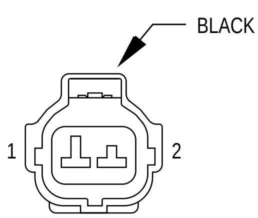
DRIVER POWER WINDOW MOTOR (RHD)

CAV	CIRCUIT	FUNCTION
1	Q11 14BR	LEFT WINDOW DRIVER UP
2	Q21 14VT	LEFT FRONT WINDOW DRIVER DOWN



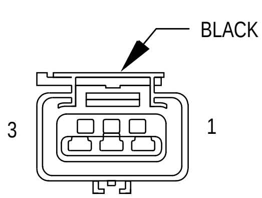
DUTY CYCLE EVAP/PURGE SOLENOID

CAV	CIRCUIT	FUNCTION
1	K52 18PK/BK	DUTY CYCLE EVAP PURGE/SOLENOID CONTROL
2	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)



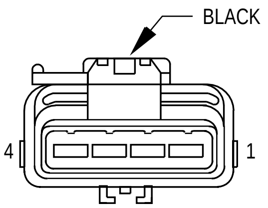
ENGINE COOLANT TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



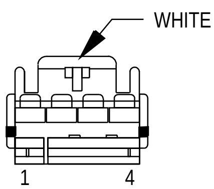
ENGINE OIL PRESSURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K6 18VT/OR	5V SUPPLY
2	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K167 18BR/YL	SENSOR GROUND



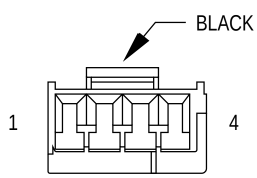
EVAP LEAK DETECTION PUMP

CAV	CIRCUIT	FUNCTION
1	-	-
2	K72 18DG/OR	GENERATOR DRIVER
3	K106 18WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K105 18WT/OR	LEAK DETECTION PUMP SWITCH SENSE



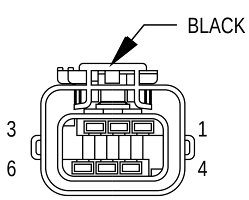
EXTENDED IDLE SWITCH (POLICE PACKAGE)

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	K78 20GY	IDLE ACTUATOR
3	F15 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
4	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL



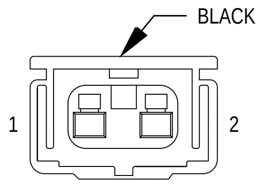
FRONT FOG LAMP SWITCH

CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
2	L39 20LB	FOG LAMP SWITCH OUTPUT
3	L139 20VT	FUSED HEADLAMP SWITCH OUTPUT
4	Z1 20BK	GROUND



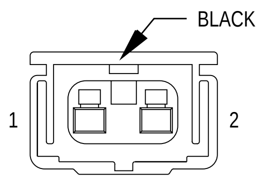
FRONT WIPER MOTOR

CAV	CIRCUIT	FUNCTION
1	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	V5 16DG/YL	WIPER PARK SWITCH SENSE
3	-	-
4	Z1 16BK	GROUND
5	V3 16BR/WT	WIPER LOW SPEED OUTPUT
6	V4 16BR/VT	WIPER HIGH SPEED OUTPUT



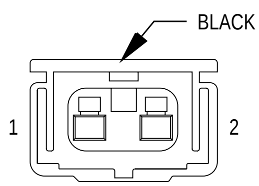
FUEL INJECTOR NO. 1 (2.5L)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER



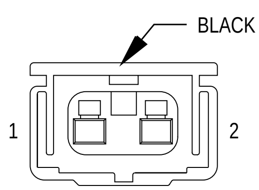
FUEL INJECTOR NO. 2 (2.5L)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER



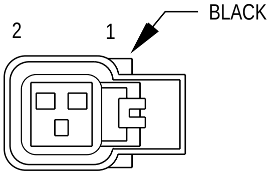
FUEL INJECTOR NO. 3 (2.5L)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER



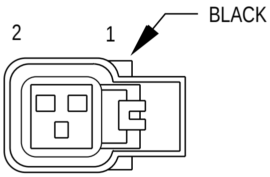
FUEL INJECTOR NO. 4 (2.5L)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER



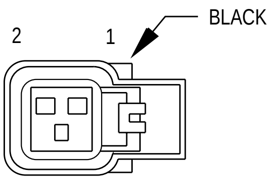
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER

FUEL INJECTOR NO. 1 (4.0L)



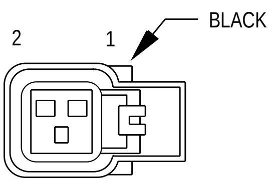
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER

FUEL INJECTOR NO. 2 (4.0L)



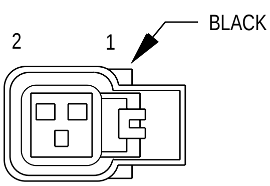
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER

FUEL INJECTOR NO. 3 (4.0L)



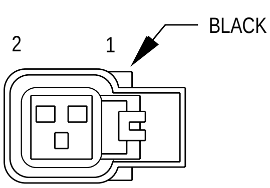
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER

FUEL INJECTOR NO. 4 (4.0L)



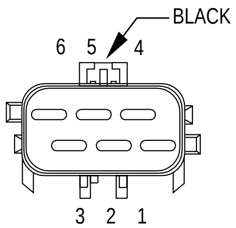
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K15 18PK/BK	FUEL INJECTOR NO. 5 DRIVER

FUEL INJECTOR NO. 5 (4.0L)



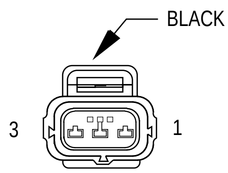
CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K16 18LG/BK	FUEL INJECTOR NO. 6 DRIVER

FUEL INJECTOR NO. 6 (4.0L)



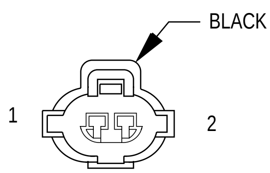
FUEL PUMP MODULE

CAV	CIRCUIT	FUNCTION
1	A141 16DG/WT	FUEL PUMP RELAY OUTPUT
2	-	-
3	K226 20DB/LG	FUEL LEVEL SENSOR SIGNAL
4	K167 20BR/YL	SENSOR GROUND
5	-	-
6	Z1 16BK	GROUND



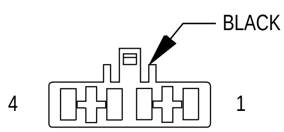
G SWITCH

CAV	CIRCUIT	FUNCTION
1	B42 20TN/WT	G SWITCH NO. 2 SENSE
2	B41 20YL/VT	G SWITCH NO.1 SENSE
3	B43 20PK/OR	G SWITCH TEST SIGNAL



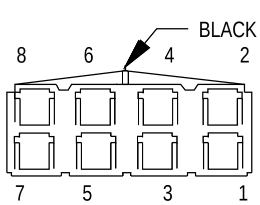
GENERATOR

CAV	CIRCUIT	FUNCTION
1	K72 16DG/OR	GENERATOR SOURCE
2	K20 16DG	GENERATOR FIELD



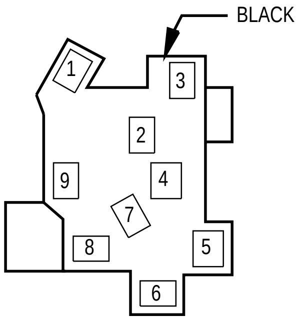
HEADLAMP BEAM SELECT SWITCH

CAV	CIRCUIT	FUNCTION
1	L4 16VT/WT	DIMMER SWITCH LOW BEAM OUTPUT
2	L2 14LG	HEADLAMP SWITCH OUTPUT
3	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
4	L20 14LG/WT	FUSED B (+)



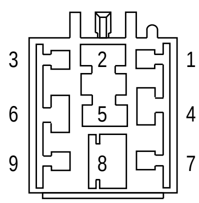
HEADLAMP DELAY MODULE

CAV	CIRCUIT	FUNCTION
1	-	-
2	A3 14RD/WT	FUSED B(+)
3	-	-
4	Z1 18BK	GROUND
5	-	-
6	L2 14LG	HEADLAMP SWITCH OUTPUT
	L2 14LG	HEADLAMP SWITCH OUTPUT
7	-	-
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (ST-RUN)



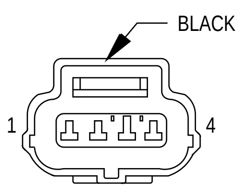
HEADLAMP SWITCH

CAV	CIRCUIT	FUNCTION
1	E1 20TN	PANEL LAMPS DIMMER SWITCH SIGNAL
2	L2 14LG	HEADLAMP SWITCH OUTPUT
3	M2 20YL	COURTESY LAMPS DRIVER
4	F34 18TN/BK	FUSED B(+)
	F34 18TN/BK •	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENSE
6	G16 20BK/LB	DRIVER DOOR AJAR SWITCH SENSE
7	L20 14LG/WT	FUSED B (+)
8	A3 14RD/WT	FUSED B (+)
	A3 14RD/WT	FUSED B (+)
9	L7 18BK/YL	HEADLAMP SWITCH OUTPUT



HEATED SEAT RELAY

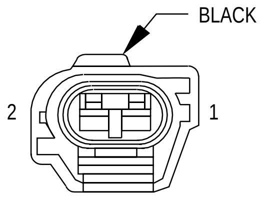
CAV	CIRCUIT	FUNCTION
1	-	-
2	F235 16RD	B(+) TO HEATED SEAT MODULE
	F235 16RD	B(+) TO HEATED SEAT MODULE
3	-	-
4	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	-	-
6	Z1 18BK	GROUND
7	-	-
8	F37 14RD/LB	FUSED B(+)



IDLE AIR CONTROL MOTOR

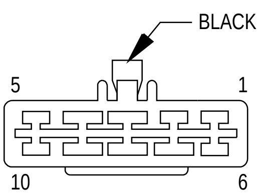
CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO. 3 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
4	K39 18GY/RD	IDLE AIR CONTROL NO. 1 DRIVER

• LHD



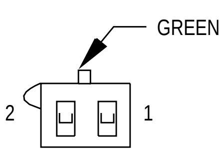
IGNITION COIL
(2.5L)

CAV	CIRCUIT	FUNCTION
1	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K19 18GY	IGNITION COIL NO. 1 DRIVER



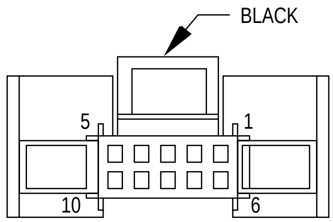
IGNITION
SWITCH - C1

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G9 20GY/BK	RED BRAKE WARNING INDICATOR DRIVER
3	A2 12PK/BK	FUSED B(+)
4	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
5	-	-
6	-	-
7	A1 12RD	FUSED B(+)
8	A31 12BK/WT	IGNITION SWITCH OUTPUT (RUN-ACC)
9	A21 12DB	IGNITION SWITCH OUTPUT (ST-RUN)
10	A41 14YL	IGNITION SWITCH OUTPUT (START)



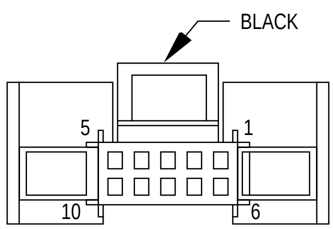
IGNITION
SWITCH - C2

CAV	CIRCUIT	FUNCTION
1	G26 20LB	KEY-IN IGNITION SWITCH SENSE
2	G16 20BK/LB	DRIVER DOOR AJAR SWITCH SENSE



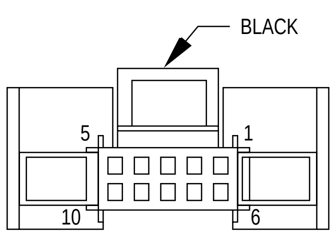
INSTRUMENT CLUSTER - C1 (LHD)

CAV	CIRCUIT	FUNCTION
1	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE
2	G99 20GY/WT	RED BRAKE WARNING INDICATOR DRIVER
3	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
4	G19 20LG/OR	ABS WARNING INDICATOR DRIVER
5	G34 16RD/GY	HIGH BEAM INDICATOR DRIVER
6	Z2 20BK/LG	GROUND
7	G29 20BK/LB	LOW WASHER FLUID SENSE
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (START-RUN)
9	M1 20PK	FUSED B(+)
10	L61 20LG/WT	LEFT TURN SIGNAL



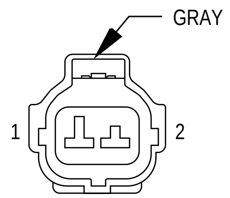
INSTRUMENT CLUSTER - C1 (RHD)

CAV	CIRCUIT	FUNCTION
1	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE
2	G99 20GY/WT	RED BRAKE WARNING INDICATOR DRIVER
3	E2 20OR	FUSED PANEL LAMPS SWITCH SIGNAL
4	G19 20LG/OR	ABS WARNING INDICATOR DRIVER
5	L3 16RD/OR	DIMMER SWITCH HIGH BEAM OUTPUT
6	Z2 20BK/LG	GROUND
7	G29 20BK/LB	LOW WASHER FLUID SENSE
8	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (START-RUN)
9	M1 20PK	FUSED B(+)
10	L61 20LG/WT	LEFT TURN SIGNAL



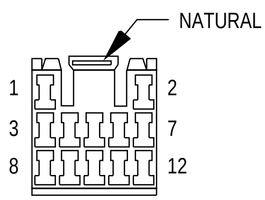
INSTRUMENT CLUSTER - C2

CAV	CIRCUIT	FUNCTION
1	D2 20WT/BK	CCD BUS (-)
2	D1 20VT/BR	CCD BUS (+)
3	C81 20LB/WT	REAR WINDOW DEFOGGER RELAY CONTROL
4	C80 20DB/WT	REAR WINDOW DEFOGGER SWITCH SENSE
5	G107 20BK/RD	4WD SWITCH SENSE (PART-TIME)
6	L60 20TN	RIGHT TURN SIGNAL
7	G106 20BK/WT	4WD SWITCH SENSE (FULL-TIME)
8	G26 20LB	KEY-IN IGNITION SWITCH SENSE
9	Z2 18BK/LG	GROUND
10	G10 20LG/RD	SEAT BELT SWITCH SENSE



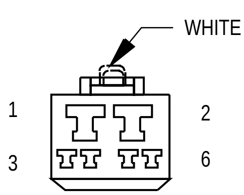
INTAKE AIR TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



JUNCTION BLOCK - C1

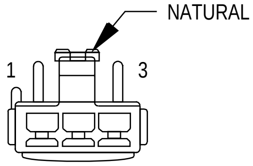
CAV	CIRCUIT	FUNCTION
1	L44 20VT/RD	FUSED RIGHT LOW BEAM OUTPUT
2	-	-
3	F45 20YL/RD	FUSED B(+) ENGINE STARTER MOTOR RELAY
4	-	-
5	L78 20DG/YL	FUSED HEADLAMP SWITCH OUTPUT
6	F15 20DB/WT ●●	FUSED IGNITION SWITCH OUTPUT (RUN)
7	-	-
8	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	L33 20RD	FUSED LEFT HIGH BEAM OUTPUT
10	L43 20VT	FUSED LEFT LOW BEAM OUTPUT
11	L34 20RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
12	M1 20PK	FUSED B(+)



JUNCTION BLOCK - C2

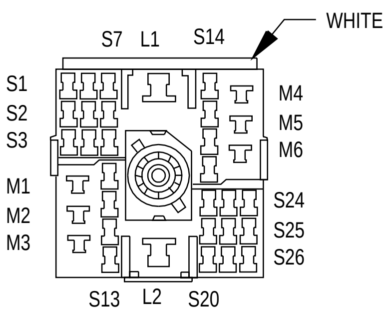
CAV	CIRCUIT	FUNCTION
1	A4 12BK/PK	FUSED B(+)
2	A7 10RD/BK	FUSED B(+)
3	-	-
4	X2 20DG/RD	HORN RELAY OUTPUT
5	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
6	L77 20BR/YL	FUSED HEADLAMP SWITCH OUTPUT

●● 4.0L



JUNCTION BLOCK - C3

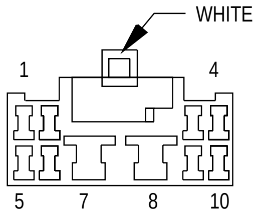
CAV	CIRCUIT		FUNCTION
1	M2 20YL		COURTESY LAMPS DRIVER
2	Z1 20BK	●	GROUND
3	M1 20PK		FUSED B(+)



JUNCTION BLOCK - C4

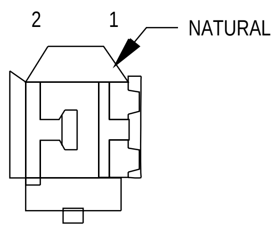
CAV	CIRCUIT		FUNCTION
L1	A31 12BK/WT		IGNITION SWITCH OUTPUT (RUN-ACC)
L2	A21 12DB		IGNITION SWITCH OUTPUT (ST-RUN)
M1	A41 14YL		IGNITION SWITCH OUTPUT (ST)
M2	A22 12BK/OR		IGNITION SWITCH OUTPUT (RUN)
M3	L7 18BK/YL		HEADLAMP SWITCH OUTPUT
M4	V6 16DB		FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
M5	F38 16RD/LB		FUSED B(+)
M6	F30 16RD		CIGAR LIGHTER RELAY OUTPUT
S1	E1 20TN		PANEL LAMPS DIMMER SWITCH SIGNAL
S2	E2 20OR		FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
S3	L4 16VT/WT		DIMMER SWITCH LOW BEAM OUTPUT
S4	F83 18YL/DG		FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
S5	Z1 14BK		GROUND
S6	-		-
S7	L3 16RD/OR		DIMMER SWITCH HIGH BEAM OUTPUT
S8	F15 20DB/WT		FUSED IGNITION SWITCH OUTPUT (RUN)
S9	X12 16RD/WT		FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
S10	-		-
S11	V23 18BR/PK		FUSED IGNITION SWITCH OUTPUT (RUN)
S12	F20 18WT		FUSED IGNITION SWITCH OUTPUT (ST-RUN)
S13	F87 20WT/BK		FUSED IGNITION SWITCH OUTPUT (ST-RUN)
S14	-		-
S15	-		-
S16	-		-
S17	-		-
S18	M1 20PK		FUSED B(+)
S19	C16 20LB/YL	●●	FUSED REAR WINDOW DEFFOGGER RELAY OUTPUT
S19	C16 20BK/WT	●●●	FUSED REAR WINDOW DEFFOGGER RELAY OUTPUT
S20	L5 20BK		FUSED IGNITION SWITCH OUTPUT (RUN)
S21	F14 18LG/YL		FUSED IGNITION SWITCH OUTPUT (RUN)
S22	X3 20BK/RD		HORN RELAY CONTROL
S23	F23 18DB/YL		FUSED IGNITION SWITCH OUTPUT (ST-RUN)
S24	-		
S25	M2 20YL		COURTESY LAMPS DRIVER
S26	C81 20LB/WT		REAR WINDOW DEFOGGER RELAY CONTROL

● OVERHEAD CONSOLE
●● LHD
●●● RHD



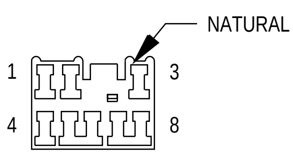
JUNCTION BLOCK - C5

CAV	CIRCUIT		FUNCTION
1	X3 20BK/RD		HORN RELAY CONTROL
2	P76 20OR/YL		MIRROR COMMON DRIVER
3	P91 20WT/BK		MIRROR COMMON DRIVER
4	-		-
5	C16 20LB/YL	▲▲	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	-		-
7	F35 16RD	▲▲	FUSED B(+)
8	F81 12TN		FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	P74 20DB	▲▲	LEFT POWER MIRROR HORIZONTAL DRIVER
9	P74 20DB	■■	RIGHT POWER MIRROR HORIZONTAL DRIVER
10	P72 20YL/BK	▲▲	LEFT POWER MIRROR VERTICAL DRIVER
10	P72 20YL/BK	■■	RIGHT POWER MIRROR VERTICAL DRIVER



JUNCTION BLOCK - C6

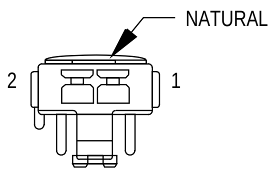
CAV	CIRCUIT		FUNCTION
1	C15 12BK/WT		REAR WINDOW DEFOGGER RELAY OUTPUT
2	F37 14RD/LB	■	FUSED B(+)



JUNCTION BLOCK - C7

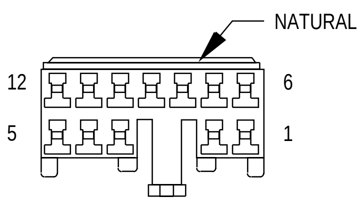
CAV	CIRCUIT		FUNCTION
1	P33 16OR/BK	●	DOOR LOCK DRIVER
2	L77 18BR/YL		FUSED HEADLAMP SWITCH OUTPUT
3	P91 20WT/BK	●●	MIRROR COMMON DRIVER
4	M1 20PK		FUSED B(+)
5	P34 16PK/BK	●	DOOR UNLOCK DRIVER
6	L78 18DG/YL		FUSED HEADLAMP SWITCH OUTPUT
7	M2 20YL		COURTESY LAMPS DRIVER
8	A6 20RD/OR		FUSED B(+)

● FULL OPTIONS
●● RHD EXCEPT FULL OPTIONS
▲ BASE
▲▲ RHD
■ POWER SEATS
■■ LHD



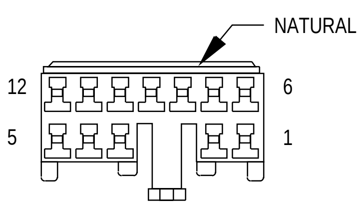
JUNCTION BLOCK - C8

CAV	CIRCUIT	FUNCTION
1	F81 14TN	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	-	-



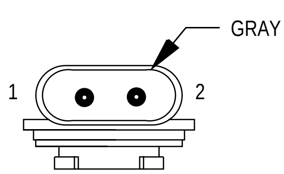
JUNCTION BLOCK - C9 (LHD)

CAV	CIRCUIT	FUNCTION
1	P33 16OR/BK	DOOR LOCK DRIVER
2	P74 20DB ●	RIGHT POWER MIRROR HORIZONTAL DRIVER
3	C16 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	-	-
5	-	-
6	P72 20YL/BK ●	RIGHT POWER MIRROR VERTICAL DRIVER
7	P91 20WT/BK ●	COMMON MIRROR DRIVER
8	-	-
9	F35 16RD	FUSED B(+)
10	P76 20OR/YL ●	MIRROR COMMON DRIVER
11	Z1 18BK ●	GROUND
11	Z1 16BK ▲	GROUND
12	P34 16PK/BK	DOOR UNLOCK DRIVER



JUNCTION BLOCK - C9 (RHD)

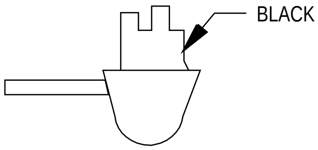
CAV	CIRCUIT	FUNCTION
1	P33 16OR/BK	DOOR LOCK DRIVER
2	P75 20DB/WT	LEFT POWER MIRROR HORIZONTAL DRIVER
3	C16 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	-	-
5	-	-
6	P71 20YL/LB	LEFT POWER MIRROR VERTICAL DRIVER
7	P91 20WT/BK ●	MIRROR COMMON DRIVER
8	-	-
9	-	-
10	P76 20OR/YL	MIRROR COMMON DRIVER
11	Z1 16BK ●	GROUND
12	P34 16PK/BK	DOOR UNLOCK DRIVER



LEFT BACK-UP LAMP

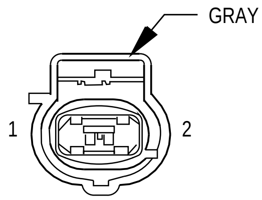
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L10 18BR/LG	BACK-UP LAMP FEED

● POWER MIRROR
▲ FULL OPTIONS



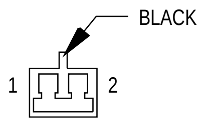
LEFT COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 18BK/WT	COURTESY LAMPS DRIVER



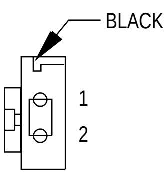
LEFT FOG LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L39 20LB	FOG LAMP RELAY OUTPUT



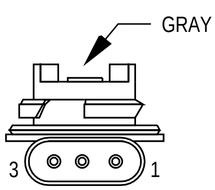
LEFT FRONT DOOR SPEAKER

CAV	CIRCUIT	FUNCTION
1	X85 18BK/RD ●	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
1	X55 18LG/RD ●●	LEFT FRONT SPEAKER (-)
1	X85 18LG/RD ▲	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
2	X87 18DG ●	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	X53 18LG/BK ●●	LEFT FRONT SPEAKER (+)
2	X87 18LG/BK ▲	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)



LEFT FRONT DOOR TWEETER

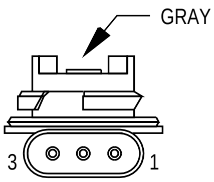
CAV	CIRCUIT	FUNCTION
1	X85 18LG/RD	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
2	X87 18LG/BK	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)



LEFT FRONT PARK/TURN SIGNAL LAMP NO. 1

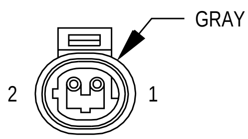
CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	L77 18BR	FUSED HEADLAMP SWITCH OUTPUT
3	Z1 18BK	GROUND

● 6 SPEAKER LHD
▲ 6 SPEAKER RHD
●● 4 SPEAKER



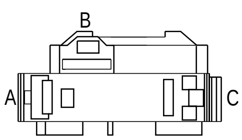
LEFT FRONT PARK/TURN SIGNAL LAMP NO. 2

CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	L77 18BR	FUSED HEADLAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



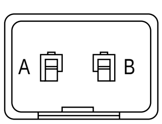
LEFT FRONT WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR (-)
2	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR (+)



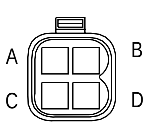
LEFT HEADLAMP

CAV	CIRCUIT	FUNCTION
A	L33 18RD	FUSED LEFT HIGH BEAM OUTPUT
	L33 20RD ●	FUSED LEFT HIGH BEAM OUTPUT
B	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
C	Z1 18BK	GROUND



LEFT HEATED SEAT BACK

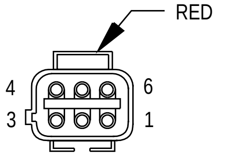
CAV	CIRCUIT	FUNCTION
A	P88 18BR/BK	LEFT HEATED SEAT BACK DRIVER
B	Z1 18BK	GROUND



LEFT HEATED SEAT CUSHION

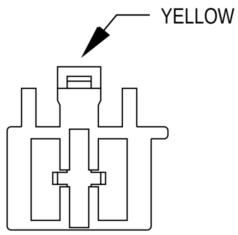
CAV	CIRCUIT	FUNCTION
A	P87 18BK/OR	LEFT HEATED SEAT DRIVER
B	P88 18BR/BK	LEFT HEATED SEAT BACK DRIVER
C	P141 18TN/LB	SENSOR FEED
D	P143 18BK/DG	LEFT HEAT SENSE INPUT

● FOG LAMPS



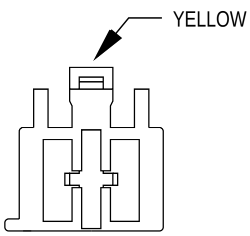
LEFT HEATED SEAT SWITCH

CAV	CIRCUIT	FUNCTION
1	P137 18VT	LEFT SEAT LOW HEAT LED DRIVER
2	-	-
3	Z1 18BK	GROUND
4	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P139 18VT/WT	LEFT SEAT HIGH HEAT LED DRIVER
6	P133 18TN/DG	LEFT SEAT HEATER SWITCH MUX



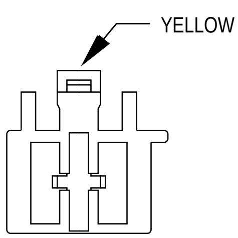
LEFT POWER SEAT FRONT VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P19 14YL/LG	LEFT POWER SEAT FRONT UP
2	P21 14RD/LG	LEFT POWER SEAT FRONT DOWN



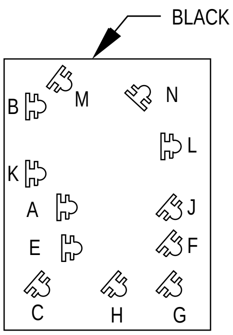
LEFT POWER SEAT HORIZONTAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P17 14RD/LB	LEFT POWER SEAT HORIZONTAL REARWARD
2	P15 14YL/LB	LEFT POWER SEAT HORIZONTAL FORWARD



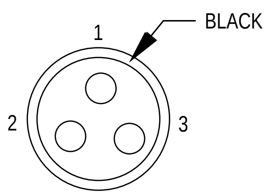
LEFT POWER SEAT REAR VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P13 14RD/WT	LEFT POWER SEAT REAR DOWN
2	P11 14YL/WT	LEFT POWER SEAT REAR UP



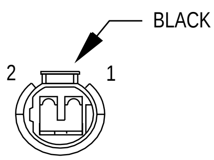
LEFT POWER SEAT SWITCH

CAV	CIRCUIT	FUNCTION
A	F37 14RD	FUSED B(+)
B	Z1 14BK	GROUND
C	-	-
E	P13 14RD/WT	LEFT POWER SEAT REAR DOWN
F	-	-
G	-	-
H	-	-
J	P11 14YL/WT	LEFT POWER SEAT REAR UP
K	P17 14RD/LB	LEFT POWER SEAT HORIZONTAL REARWARD
L	P15 14YL/LB	LEFT POWER SEAT HORIZONTAL FORWARD
M	P19 14YL/LG	LEFT POWER SEAT FRONT UP
N	P21 14RD/LG	LEFT POWER SEAT FRONT DOWN



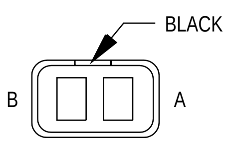
LEFT REAR DOOR JAMB SWITCH

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER



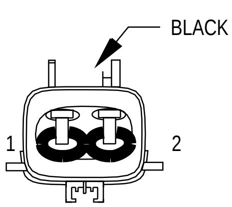
LEFT REAR DOOR LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	DOOR UNLOCK DRIVER
2	P33 16OR/BK	DOOR LOCK DRIVER



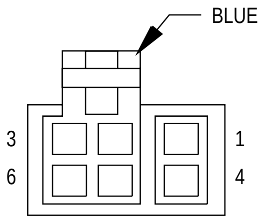
LEFT REAR WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
A	B3 20LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
B	B4 20LG	LEFT REAR WHEEL SPEED SENSOR (+)



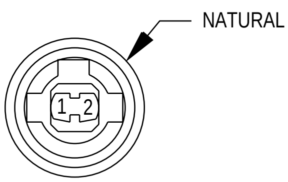
LEFT REAR WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q13 14DB	POWER WINDOW LEFT REAR B(+) UP
2	Q23 14RD/WT	LEFT REAR WINDOW DRIVER DOWN



LEFT REAR
WINDOW SWITCH

CAV	CIRCUIT	
1	Q13 14DB	POWER WINDOW LEFT REAR B(+) UP
2	Q27 14RD/BK	LEFT REAR WINDOW DRIVER DOWN
3	-	
4	Q17 14DB/WT	LEFT REAR WINDOW DRIVER UP
5	Q23 14RD/WT	LEFT REAR WINDOW DRIVER DOWN
6	Q1 14YL	POWER WINDOW SWITCH FEED

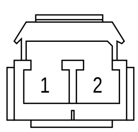


LEFT SIDE
MARKER LAMP

CAV	CIRCUIT	FUNCTION
1	L77 20BR	FUSED LEFT HEADLAMP SWITCH OUTPUT
2	L61 20LG	LEFT TURN SIGNAL

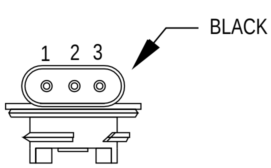
LEFT
SOUNDBAR
SPEAKER

CAV	CIRCUIT	FUNCTION
A	X57 18BR/LB ●	LEFT REAR SPEAKER (-)
A	X91 16BR/DB ▲	AMPLIFIED LEFT REAR SPEAKER (+)
B	X51 18BR/YL ●	LEFT REAR SPEAKER (+)
B	X93 16BR/YL ▲	AMPLIFIED LEFT REAR SPEAKER (-)



LEFT SPEED
CONTROL
SWITCH

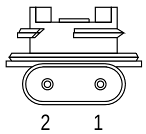
CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL



LEFT TAIL/
STOP LAMP

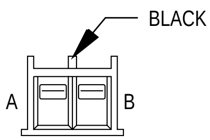
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L77 18BR	FUSED LEFT HEADLAMP SWITCH OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT

● 4 SPEAKER SYSTEM
▲ 6 SPEAKER SYSTEM



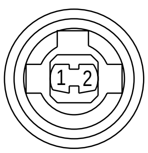
LEFT TURN SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L63 18DG/RD	LEFT TURN SIGNAL



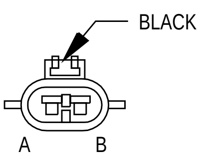
LEFT VISOR/ VANITY LAMP

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	Z1 20BK	GROUND



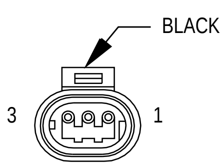
LICENSE LAMP

CAV	CIRCUIT	FUNCTION
1	L78 18BK/YL	FUSED HEADLAMP SWITCH OUTPUT
2	Z1 18BK	GROUND



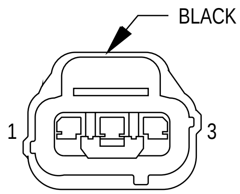
LIFTGATE LOCK MOTOR

CAV	CIRCUIT	FUNCTION
A	P33 16OR/BK	DOOR LOCK DRIVER
B	P34 16PK/BK	DOOR UNLOCK DRIVER



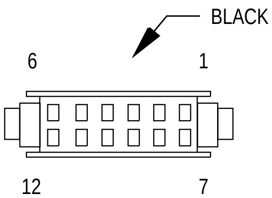
LIFTGATE SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE
3	M4 20VT/YL	LIFTGATE COURTESY LAMP DRIVER



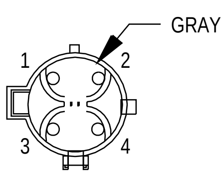
MANIFOLD ABSOLUTE PRESSURE SENSOR

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K1 18DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
3	K7 20OR	5V SUPPLY



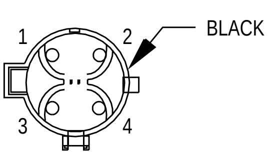
OVERHEAD MODULE

CAV	CIRCUIT	FUNCTION
1	M2 20YL	COURTESY LAMPS DRIVER
2	M1 20PK	FUSED B(+)
3	Z1 20BK	GROUND
4	-	-
5	P55 20DB	DOOR UNLOCK RELAY CONTROL
6	D1 20VT/BR	CCD BUS(+)
7	-	-
8	-	-
9	Z1 20BK	GROUND
10	X3 20BK/RD	HORN RELAY CONTROL
11	P59 20LB/RD	DOOR LOCK CONTROL
12	D2 20WT/BK	CCD BUS(-)



OXYGEN SENSOR 1/1 UPSTREAM

CAV	CIRCUIT	FUNCTION
1	A42 20DG ■■	FUSED AUTOMATIC SHUTDOWN RELAY OUTPUT
1	F142 20DG/WT ■	FUSED AUTOMATIC SHUTDOWN RELAY OUTPUT
2	Z1 20BK ■■	GROUND
2	Z1 18BK ■	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL



OXYGEN SENSOR 1/2 DOWNSTREAM

CAV	CIRCUIT	FUNCTION
1	F142 20DG/WT ■	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
1	A242 20VT/OR ■■	OXYGEN SENSOR RELAY OUTPUT
2	Z1 20BK ●	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL

■ 2.5L
■■ 4.0L

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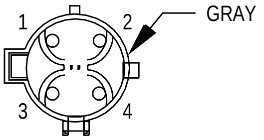
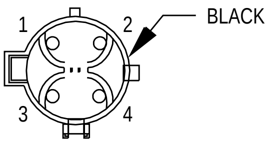


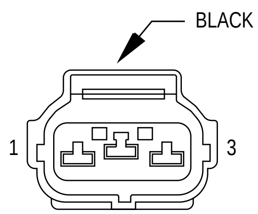
OXYGEN SENSOR 2/1 UPSTREAM (4.0L CALIFORNIA)

CAV	CIRCUIT	FUNCTION
1	A42 20DG	OXYGEN SENSOR RELAY OUTPUT
2	Z1 20BK	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL



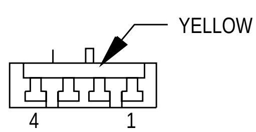
OXYGEN SENSOR 2/2 DOWNSTREAM (4.0L CALIFORNIA)

CAV	CIRCUIT	FUNCTION
1	A242 20VT/OR	OXYGEN SENSOR RELAY OUTPUT
2	Z1 20BK	GROUND
3	K167 20BR/YL	SENSOR GROUND
4	K341 18TN	OXYGEN SENSOR 2/2 SIGNAL



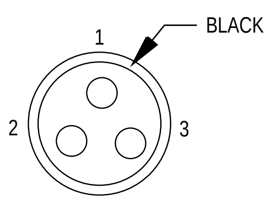
PARK/NEUTRAL POSITION SWITCH (2.5L A/T)

CAV	CIRCUIT	FUNCTION
1	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
2	T41 18BK/WT	PARK/NETURAL POSITION SWITCH SENSE
3	L10 18BR/LG	BACK-UP LAMP FEED



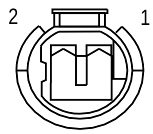
PASSENGER AIRBAG

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R42 18BK/YL	PASSENGER AIRBAG LINE 2
4	R44 18DG/YL	PASSENGER AIRBAG LINE 1



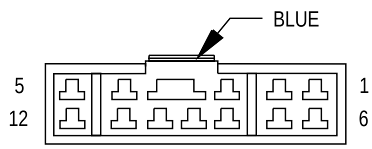
PASSENGER DOOR JAMB SWITCH

CAV	CIRCUIT	FUNCTION
1	M2 18YL	COURTESY LAMPS DRIVER
2	G16 18BK/LB	DRIVER DOOR AJAR SWITCH SENSE
3	Z1 18BK	GROUND



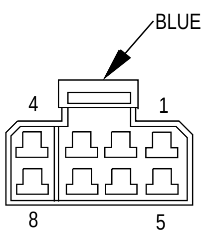
PASSENGER DOOR LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	DOOR UNLOCK DRIVER
2	P33 16OR/BK	DOOR LOCK DRIVER



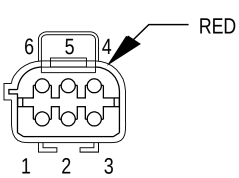
PASSENGER POWER LOCK/WINDOW SWITCH - C1 (FULL OPTIONS)

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	DOOR UNLOCK DRIVER
2	Q22 14VT	PASSENGER FRONT WINDOW DRIVER DOWN
3	Q26 14VT/WT	MASTER WINDOW SWITCH PASSENGER FRONT DOWN
4	Q16 14BR/WT	MASTER WINDOW SWITCH PASSENGER FRONT UP
5	P33 16OR/BK	DOOR LOCK DRIVER
6	-	-
7	-	-
8	-	-
9	Q12 14BR	PASSENGER FRONT WINDOW DRIVER UP
10	Q1 14YL	POWER WINDOW SWITCH FEED
11	-	-
12	-	-



PASSENGER POWER LOCK/WINDOW SWITCH - C2 (FULL OPTIONS)

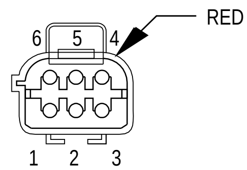
CAV	CIRCUIT	FUNCTION
1	P59 20LB/RD	DOOR LOCK CONTROL
2	P55 20DB/PK ■	DOOR UNLOCK RELAY CONTROL
2	P55 20DB ●●	DOOR UNLOCK RELAY CONTROL
3	P35 20OR/VT ■	DOOR LOCK SWITCH OUTPUT (LOCK)
3	P36 18PK/VT ●●	DOOR LOCK SWITCH OUTPUT (UNLOCK)
4	F81 14TN	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	F35 16RD	FUSED B(+)
6	Z1 14BK	GROUND
7	P36 20PK/VT ■	DOOR LOCK SWITCH OUTPUT (UNLOCK)
7	P35 18OR/VT ●●	DOOR LOCK SWITCH OUTPUT (LOCK)
8	G26 20LB	KEY-IN IGNITION SWITCH SENSE



PASSENGER POWER MIRROR (LHD)

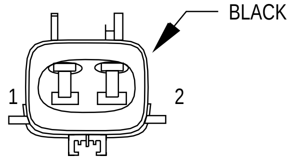
CAV	CIRCUIT	FUNCTION
1	P72 20YL/BK	RIGHT POWER MIRROR VERTICAL DRIVER
2	P74 20DB ●	RIGHT POWER MIRROR HORIZONTAL DRIVER
2	P76 20OR/YL ▲	MIRROR COMMON DRIVER
3	P91 20WT/BK ●	MIRROR COMMON DRIVER
3	P74 20DB ▲	RIGHT POWER MIRROR HORIZONTAL DRIVER
4	P76 20OR/YL	MIRROR COMMON DRIVER
5	C16 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z1 18BK	GROUND

● POWER MIRRORS
▲ FULL OPTIONS
■ LHD
●● RHD



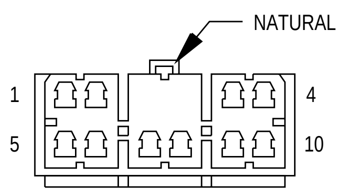
PASSENGER POWER MIRROR (RHD)

CAV	CIRCUIT	FUNCTION
1	P71 20YL	LEFT POWER MIRROR VERTICAL DRIVER
2	P75 20DB/WT ●	LEFT POWER MIRROR HORIZONTAL DRIVER
2	P76 20OR/YL ▲	MIRROR COMMON DRIVER
3	P91 20WT/BK ●	MIRROR COMMON DRIVER
3	P75 20DB/RD ▲	LEFT POWER MIRROR HORIZONTAL DRIVER
4	P76 20OR/YL	MIRROR COMMON DRIVER
5	C16 20BK/WT ●	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
5	C16 20LB/YL ▲	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
6	Z1 16BK	GROUND



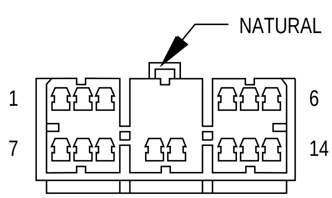
PASSENGER POWER WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q12 14BR	RIGHT FRONT WINDOW DRIVER (UP)
2	Q22 14VT	RIGHT FRONT WINDOW DRIVER (DOWN)



POWER AMPLIFIER - C1

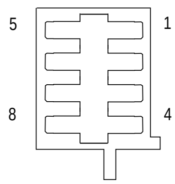
CAV	CIRCUIT	FUNCTION
1	X55 18BR/RD	LEFT FRONT SPEAKER (-)
2	X56 18DB/RD	RIGHT FRONT SPEAKER (-)
3	X58 18DB/OR	RIGHT REAR SPEAKER (-)
4	X60 18DG/RD	RADIO 12V OUTPUT
5	X53 18DG	LEFT FRONT SPEAKER (+)
6	X54 18VT	RIGHT FRONT SPEAKER (+)
7	X51 18BR/YL	LEFT REAR SPEAKER (+)
8	X57 18BR/LB	LEFT REAR SPEAKER (-)
9	X52 18DB/WT	RIGHT REAR SPEAKER (+)
10	-	-



POWER AMPLIFIER - C2

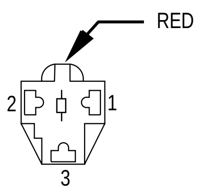
CAV	CIRCUIT	FUNCTION
1	F75 16VT	FUSED B(+)
2	F75 16VT	FUSED B(+)
3	-	-
4	X87 18LG/VT	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
5	X94 18TN/RD	AMPLIFIED RIGHT REAR SPEAKER (+)
6	X93 18WT/RD	AMPLIFIED LEFT REAR SPEAKER (-)
7	Z5 16BK/LB	GROUND
8	Z5 16BK/LB	GROUND
9	-	-
10	X80 18LB/BK	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
11	X82 18LB/RD	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
12	X85 18BR/RD	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
13	X92 18TN/BK	AMPLIFIED RIGHT REAR SPEAKER (-)
14	X91 18WT/BK	AMPLIFIED LEFT REAR SPEAKER (+)

● POWER MIRRORS
▲ FULL OPTIONS



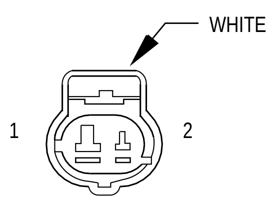
POWER MIRROR SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 20BK ●	GROUND
1	Z1 14BK ▲	GROUND
2	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	P74 20DB	RIGHT POWER MIRROR HORIZONTAL DRIVER
4	P72 20YL/BK	RIGHT POWER MIRROR VERTICAL DRIVER
5	P76 20OR/YL	MIRROR COMMON DRIVER
	P76 20OR/YL	MIRROR COMMON DRIVER
6	P91 20WT/BK	MIRROR COMMON DRIVER
	P91 20WT/BK	MIRROR COMMON DRIVER
7	P75 20 DB/WT	LEFT POWER MIRROR HORIZONTAL DRIVER
8	P71 20YL/LB ●	LEFT POWER MIRROR VERTICAL DRIVER
8	P71 20YL ▲	LEFT POWER MIRROR VERTICAL DRIVER



POWER OUTLET

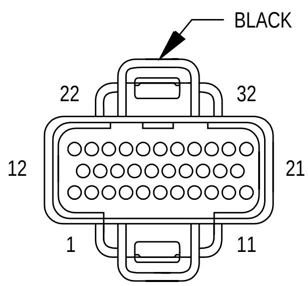
CAV	CIRCUIT	FUNCTION
1	F38 16RD/LB	FUSED B(+)
2	-	-
3	Z1 16BK	GROUND



POWER STEERING PRESSURE SWITCH (2.5L)

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	K10 18DB/BR	POWER STEERING PRESSURE SWITCH SENSE

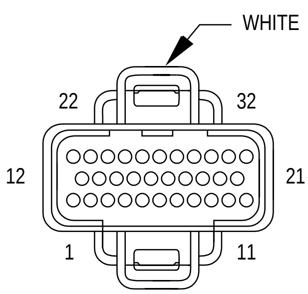
● RHD
▲ LHD



POWERTRAIN CONTROL MODULE - C1

CAV	CIRCUIT	FUNCTION
1	K18 18RD/YL ▲▲	IGNITION COIL NO. 3 DRIVER
2	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
3	-	-
4	K167 18BR/YL	SENSOR GROUND
5	-	-
6	T41 18BK/WT ▽▽	PARK/NEUTRAL POSITION SWITCH SENSE
6	Z1 18BK ▽	GROUND
7	K19 18GY	IGNITION COIL NO. 1 DRIVER
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	-	-
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 3 DRIVER
12	K10 18DB/BR ▲	POWER STEERING PRESSURE SWITCH SENSE
12	K78 18GY ●●	IDLE ACTUATOR
13	-	-
14	-	-
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5V SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/RD	IDLE AIR CONTROL NO. 1 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	-	-
22	A61 14DG/BK	FUSED B(+)
23	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD ■	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
28	-	-
29	K341 18TN ■	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z12 14BK/TN	GROUND
32	Z12 14BK/TN	GROUND

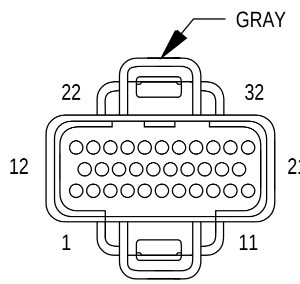
■ 4.0L CALIFORNIA
▽ 2.5L M/T
▽▽ EXCEPT 2.5L M/T
▲▲ 4.0L
▲ 2.5L
● 2.5L A/T
●● 4.0L A/T



POWERTRAIN CONTROL MODULE - C2

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K15 18PK/BK ●	FUEL INJECTOR NO. 5 DRIVER
7	-	-
8	-	-
9	K17 18DB/TN ●	IGNITION COIL NO. 2 DRIVER
10	K20 18DG	GENERATOR FIELD
11	K54 18OR/BK ●●	TORQUE CONVERTER CLUTCH SOLENOID CONTROL
12	K16 18LG/BK ●	FUEL INJECTOR NO. 6 DRIVER
13	-	-
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
24	-	-
25	-	-
26	-	-
27	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL
28	-	-
29	-	-
30	-	-
31	K6 18VT/OR	5V SUPPLY
32	-	-

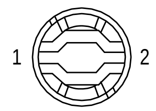
● 4.0L
●● 2.5L A/T



POWERTRAIN CONTROL MODULE - C3

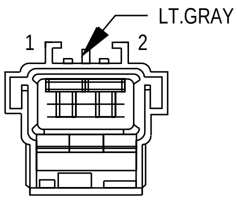
CAV	CIRCUIT	FUNCTION
1	C13 18DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
2	C27 18DB/PK	RADIATOR FAN RELAY CONTROL
3	K51 18DB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	-	-
7	-	-
8	K73 18BR/OR ●●	OXYGEN SENSOR UPSTREAM RELAY CONTROL
9	K74 18BR/VT ●●	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG ●	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18YL/RD	SPEED CONTROL POWER SUPPLY
12	F142 18DG/WT	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
13	C48 18TN	RADIATOR FAN REQUEST
14	K105 18WT/OR ●	LEAK DETECTION PUMP SWITCH SENSE
15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
16	-	-
17	-	-
18	-	-
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	DUTY CYCLE EVAP/PURGE SOLENOID CONTROL
21	-	-
22	C22 18DB/WT	A/C SWITCH SENSE
23	C90 18LG	A/C SELECT INPUT
24	K29 18WT/PK	BRAKE LAMP SWITCH SENSE
25	K72 18DG/OR	GENERATOR SOURCE
26	K226 18DB/LG	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT/ ISO 9141K
28	D2 18WT/BK	CCD BUS (-)
29	D20 18LG/BK	SCI RECEIVE
30	D1 18VT/BR	CCD BUS (+)
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL

● LEAK DETECT
●● 4.0L



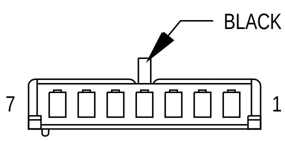
PRNDL ILLUMINATION (A/T)

CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
2	Z1 20BK	GROUND



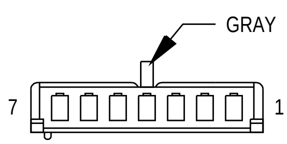
RADIATOR FAN MOTOR

CAV	CIRCUIT	FUNCTION
1	C25 12LB	RADIATOR FAN RELAY OUTPUT
2	Z1 12BK	GROUND



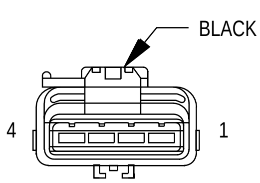
RADIO - C1

CAV	CIRCUIT	FUNCTION
1	X60 16DG/RD	RADIO 12V OUTPUT
2	X51 16BR/YL	LEFT REAR SPEAKER (+)
3	X52 16DB/WT	RIGHT REAR SPEAKER (+)
4	X53 16DG	LEFT FRONT SPEAKER (+)
5	X54 16VT	RIGHT FRONT SPEAKER (+)
6	X57 16BR/LB	LEFT REAR SPEAKER (-)
7	X58 16DB/OR	RIGHT REAR SPEAKER (-)



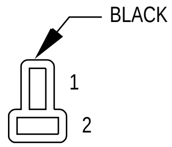
RADIO - C2

CAV	CIRCUIT	FUNCTION
1	-	-
2	X55 16BR/RD	LEFT FRONT SPEAKER (-)
3	X56 16DB/RD	RIGHT FRONT SPEAKER (-)
4	L7 18BK/YL	HEADLAMP SWITCH OUTPUT
5	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
6	X12 16RD/WT	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
7	M1 20PK	FUSED B(+)



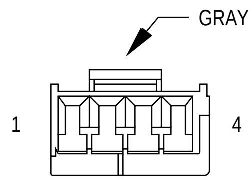
RAIL COIL (4.0L)

CAV	CIRCUIT	FUNCTION
1	K19 18GY	IGNITION COIL NO. 1 DRIVER
2	A142 18DG/OR	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
4	K18 18RD/YL	IGNITION COIL NO. 3 DRIVER



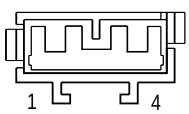
REAR WASHER PUMP

CAV	CIRCUIT	FUNCTION
1	V20 18BK/WT	REAR WASHER MOTOR CONTROL
2	Z1 18BK	GROUND
	Z1 18BK	GROUND



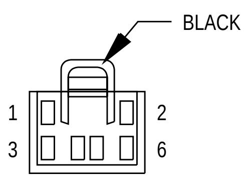
REAR WINDOW DEFOGGER SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	C80 20DB/WT	REAR WINDOW DEFOGGER SWITCH SENSE
3	C16 20LB/YL	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL



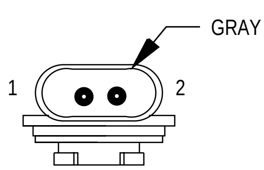
REAR WIPER MOTOR

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	V20 18BK/WT	REAR WASHER MOTOR CONTROL
3	V13 18BR/LG	REAR REAR WIPER MOTOR CONTROL
4	V23 18BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)



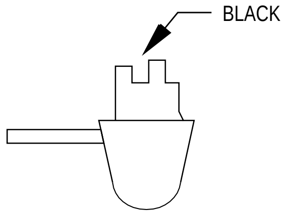
REAR WIPER/ WASHER SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	V20 18BK/WT	REAR WASHER MOTOR CONTROLLER
3	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
4	V13 18BR/LG	REAR WIPER MOTOR CONTROL
5	V23 18BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
6	V23 18BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN)



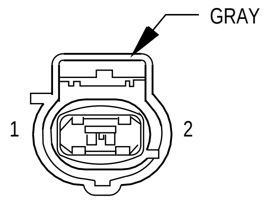
RIGHT BACK-UP LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L10 18BR/LG	BACK-UP LAMP FEED



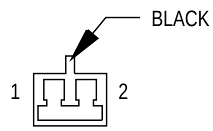
RIGHT COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 18BK/WT	COURTESY LAMPS DRIVER



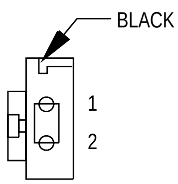
RIGHT FOG LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	L39 20LB	FOG LAMP RELAY OUTPUT



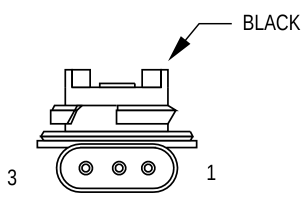
RIGHT FRONT DOOR SPEAKER

CAV	CIRCUIT	FUNCTION
1	X80 18LB/BK	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
2	X82 18LB/RD	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)



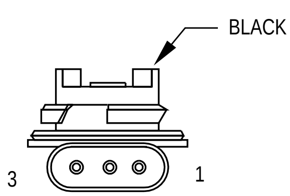
RIGHT FRONT DOOR TWEETER

CAV	CIRCUIT	FUNCTION
1	X80 18LB/BK	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
2	X82 18LB/RD	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)



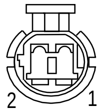
RIGHT FRONT PARK/TURN SIGNAL LAMP NO. 1

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	L78 18DG/YL	FUSED HEADLAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



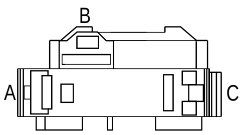
RIGHT FRONT PARK/TURN SIGNAL LAMP NO. 2

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	L78 18DG/YL	FUSED HEADLAMP SWITCH OUTPUT
3	Z1 18BK	GROUND



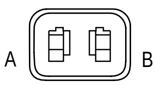
RIGHT FRONT WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
1	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)



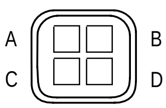
RIGHT HEADLAMP

CAV	CIRCUIT	FUNCTION
A	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
B	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
C	Z1 18BK	GROUND



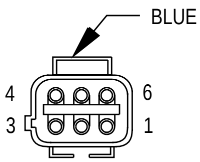
RIGHT HEATED SEAT BACK

CAV	CIRCUIT	FUNCTION
A	P89 18BR	RIGHT HEATED SEAT BACK DRIVER
B	Z1 18BK	GROUND



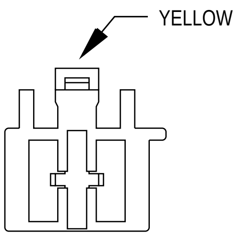
RIGHT HEATED SEAT CUSHION

CAV	CIRCUIT	FUNCTION
A	P86 18PK/BK	RIGHT HEAT SEAT DRIVER
B	P89 18BR	RIGHT HEATED SEAT BACK DRIVER
C	P141 18TN/LB	SENSOR FEED
D	P144 18BK/YL	RIGHT HEAT SENSE INPUT



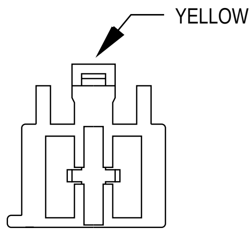
RIGHT HEATED SEAT SWITCH

CAV	CIRCUIT	FUNCTION
1	P138 18VT/LG	RIGHT SEAT LOW HEAT LED DRIVER
2	-	-
3	Z1 18BK	GROUND
4	F83 18YL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	P140 18VT/BK	RIGHT SEAT HIGH HEAT LED DRIVER
6	P134 18TN/RD	RIGHT SEAT HEATER SWITCH MUX



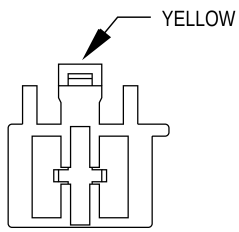
RIGHT POWER SEAT FRONT VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P18 14YL/LG	RIGHT POWER SEAT FRONT UP
2	P20 14RD/LG	RIGHT POWER SEAT FRONT DOWN



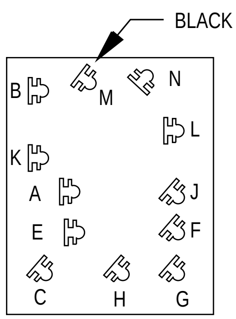
RIGHT POWER SEAT HORIZONTAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P16 14RD/LB	RIGHT POWER SEAT HORIZONTAL REARWARD
2	P14 14YL/LB	RIGHT POWER SEAT HORIZONTAL FORWARD



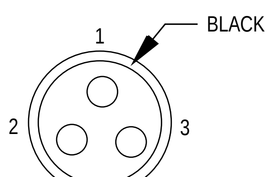
RIGHT POWER SEAT REAR VERTICAL MOTOR

CAV	CIRCUIT	FUNCTION
1	P10 14YL/WT	RIGHT POWER SEAT REAR UP
2	P12 14RD/WT	RIGHT POWER SEAT REAR DOWN



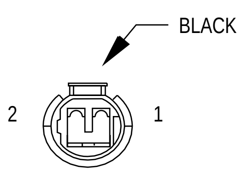
RIGHT POWER SEAT SWITCH

CAV	CIRCUIT	FUNCTION
A	Z1 14BK	GROUND
B	F37 14RD	FUSED B(+)
C	-	-
E	P10 14YL/WT	RIGHT POWER SEAT REAR UP
F	-	-
G	-	-
H	-	-
J	P12 14RD/WT	RIGHT POWER SEAT REAR DOWN
K	P14 14YL/LB	RIGHT POWER SEAT HORIZONTAL FORWARD
L	P16 14RD/LB	RIGHT POWER SEAT HORIZONTAL REARWARD
M	P18 14YL/LG	RIGHT POWER SEAT FRONT UP
N	P20 14RD/LG	RIGHT POWER SEAT FRONT DOWN



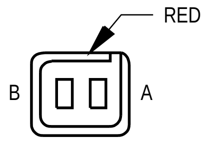
RIGHT REAR DOOR JAMB SWITCH

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 18BK	GROUND
3	M2 18YL	COURTESY LAMPS DRIVER



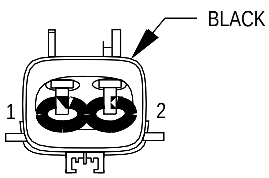
RIGHT REAR DOOR LOCK MOTOR

CAV	CIRCUIT	FUNCTION
1	P34 16PK/BK	DOOR UNLOCK DRIVER
2	P33 16OR/BK	DOOR LOCK DRIVER



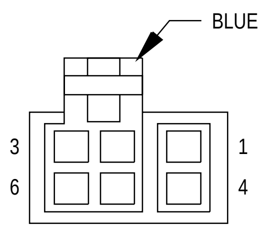
RIGHT REAR WHEEL SPEED SENSOR

CAV	CIRCUIT	FUNCTION
A	B1 20YL/DB	RIGHT REAR WHEEL SPEED SENSOR (-)
B	B2 20YL	RIGHT REAR WHEEL SPEED SENSOR (+)



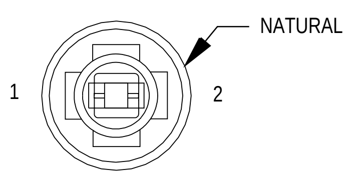
RIGHT REAR WINDOW MOTOR

CAV	CIRCUIT	FUNCTION
1	Q14 14GY	POWER WINDOW RIGHT REAR B(+) UP
2	Q24 14DG	RIGHT REAR WINDOW DRIVER DOWN



RIGHT REAR WINDOW SWITCH

CAV	CIRCUIT	FUNCTION
1	Q14 14GY	POWER WINDOW RIGHT REAR B(+) UP
2	Q28 14DG/WT	MASTER WINDOW SWITCH RIGHT REAR DOWN
3	-	-
4	Q18 14GY/BK	RIGHT REAR WINDOW DRIVER (UP)
5	Q24 14DG	RIGHT REAR WINDOW DRIVER (DOWN)
6	Q1 14YL	POWER WINDOW SWITCH FEED



RIGHT SIDE MARKER LAMP

CAV	CIRCUIT	FUNCTION
1	L78 20DG/YL	FUSED HEADLAMP SWITCH OUTPUT
2	L60 20TN	RIGHT TURN SIGNAL

RIGHT SOUNDBAR SPEAKER

CAV	CIRCUIT	FUNCTION
A	X58 18DB/OR ●	RIGHT REAR SPEAKER (-)
A	X92 16TN/BK ▲	AMPLIFIED RIGHT REAR SPEAKER (-)
B	X52 18DB/WT ●	RIGHT REAR SPEAKER (+)
B	X94 16TN/RD ▲	AMPLIFIED RIGHT REAR SPEAKER (+)

● 4 SPEAKER SYSTEM
▲ 6 SPEAKER SYSTEM

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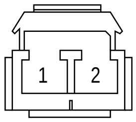
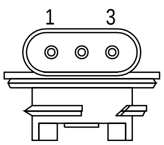


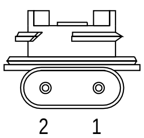
RIGHT SPEED
CONTROL SWITCH

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL



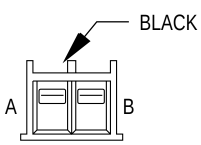
RIGHT TAIL/
STOP LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L78 18DG/YL	FUSED HEADLAMP SWITCH OUTPUT
3	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT



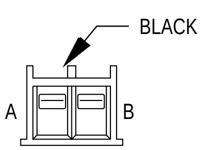
RIGHT TURN
SIGNAL LAMP

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L62 18BR/RD	RIGHT TURN SIGNAL



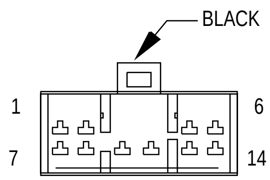
RIGHT VISOR/
VANITY
LAMP

CAV	CIRCUIT	FUNCTION
A	M1 20PK	FUSED B(+)
B	Z1 20BK	GROUND



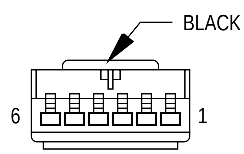
SEAT BELT
SWITCH

CAV	CIRCUIT	FUNCTION
A	G10 20LG/RD	SEAT BELT SWITCH SENSE
B	Z1 20BK	GROUND



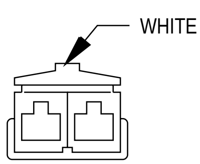
SEAT HEAT INTERFACE MODULE

CAV	CIRCUIT	FUNCTION
1	P133 18TN/DG	LEFT SEAT HEATER SWITCH MUX
2	P141 18TN/LB	SENSOR FEED
3	P86 18PK/BK	RIGHT HEAT ELEMENT OUTPUT
4	F235 16RD	HEATED SEAT RELAY OUTPUT
5	P87 18BK/OR	LEFT HEAT ELEMENT OUTPUT
6	F235 16RD	HEATED SEAT RELAY OUTPUT
7	P144 18BK/YL	RIGHT HEAT SENSE INPUT
8	P143 18BK/DG	LEFT HEAT SENSE INPUT
9	P134 18TN/RD	RIGHT SEAT HEATER SWITCH MUX
10	P138 18VT/LG	RIGHT SEAT LOW HEAT LED DRIVER
11	P140 18VT/BK	RIGHT SEAT HIGH HEAT LED DRIVER
12	P137 18VT	LEFT SEAT LOW HEAT LED DRIVER
13	Z2 18BK/LG	GROUND
14	P139 18VT/WT	LEFT SEAT HIGH HEAT LED DRIVER



SENTRY KEY IMMOBILIZER MODULE

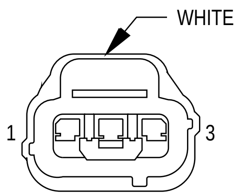
CAV	CIRCUIT	FUNCTION
1	D1 20VT/BR	CCD BUS (+)
2	D2 20WT/BK	CCD BUS (-)
3	Z2 20BK/LG	GROUND
4	F87 20WT/BK	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
5	Z2 20BK/LG	GROUND
6	F1 20DB/GY	FUSED B(+)



SHIFT LOCK SOLENOID

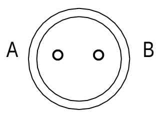
CAV	CIRCUIT	FUNCTION
1	K29 20WT/PK ●	BRAKE SWITCH SENSE
1	K29 18WT/PK ●●	BRAKE SWITCH SENSE
2	F15 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN)

● LHD
●● RHD



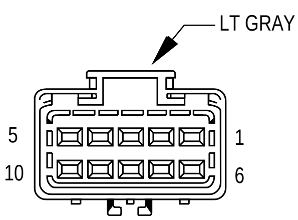
THROTTLE POSITION SENSOR

CAV	CIRCUIT	FUNCTION
1	K167 20BR/YL	SENSOR GROUND
2	K22 18OR/DB ▲▲	THROTTLE POSITION SENSOR SIGNAL
2	K22 20OR/DB ▲	THROTTLE POSITION SENSOR SIGNAL
3	K7 20OR	5V SUPPLY



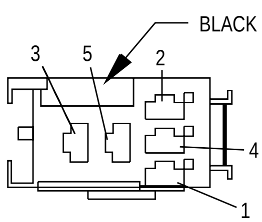
TORQUE CONVERTER CLUTCH SOLENOID (2.5L A/T)

CAV	CIRCUIT	FUNCTION
A	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
B	K54 18OR/BK	TORQUE CONVERTER CLUTCH SOLENOID CONTROL



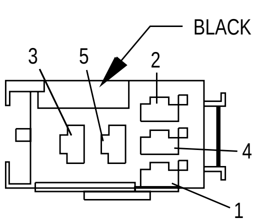
TRAILER TOW CONNECTOR

CAV	CIRCUIT	FUNCTION
1	-	-
2	L74 20LG	BRAKE LAMP SWITCH OUTPUT
3	L10 18BR/LG	BACK-UP LAMP FEED
4	A6 20RD/OR	FUSED B(+)
5	L77 20BR/YL	FUSED HEADLAMP SWITCH OUTPUT
6	-	-
7	B40 14LB	TRAILER TOW BRAKE B(+)
8	Z1 14BK	GROUND
9	-	-
10	L73 20YL	BRAKE LAMP SWITCH OUTPUT



TRAILER TOW LEFT TURN RELAY

CAV	CIRCUIT	FUNCTION
1	L63 20DG/RD	LEFT TURN SIGNAL
2	L50 20WT/TN	BRAKE LAMP SWITCH OUTPUT
3	A6 20RD/OR	FUSED B(+)
4	-	-
5	L73 20YL	BRAKE LAMP SWITCH OUTPUT

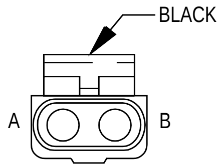


TRAILER TOW RIGHT TURN RELAY

CAV	CIRCUIT	FUNCTION
1	L62 20BK/RD	RIGHT TURN SIGNAL
2	L50 20WT/TN	BRAKE LAMP SWITCH OUTPUT
3	A6 20RD/OR	FUSED B(+)
4	-	-
5	L74 20LG	BRAKE LAMP SWITCH OUTPUT

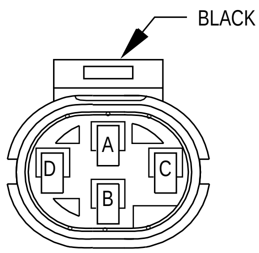
▲ 4.0L A/T
▲▲ EXCEPT 4.0L A/T

J008W-7 XJD08070



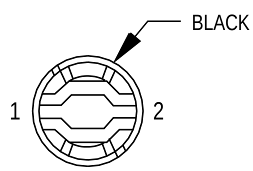
TRANSFER CASE SWITCH (231 4WD)

CAV	CIRCUIT	FUNCTION
A	G107 20BK/RD	4WD SWITCH SENSE (PART-TIME)
B	Z1 20BK	GROUND



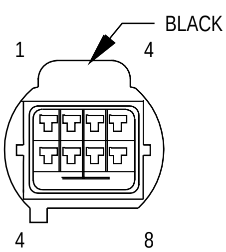
TRANSFER CASE SWITCH (242 4WD)

CAV	CIRCUIT	FUNCTION
A	Z1 20BK	GROUND
B	G106 20BK/WT	4WD SWITCH SENSE (FULL-TIME)
C	-	-
D	G107 20BK/RD	4WD SWITCH SENSE (PART-TIME)



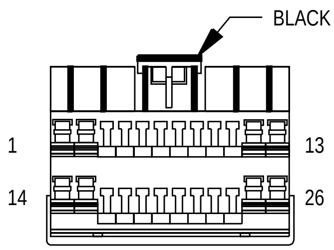
TRANSFER CASE SWITCH ILLUMINATION

CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
2	Z1 20BK	GROUND



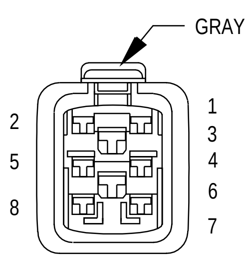
TRANSMISSION SOLENOID (4.0L)

CAV	CIRCUIT	FUNCTION
1	T52 20RD/BK	INPUT SPEED SENSOR SIGNAL
2	T60 20OR/WT	SOLENOID B CONTROL
3	T19 20WT	SOLENOID A CONTROL
4	T22 20DB/WT	SOLENOID C CONTROL
5	T31 20VT/LG	INPUT SPEED SENSOR GROUND
6	T13 20DB/BK	OUTPUT SPEED SENSOR GROUND
7	T14 20LG/WT	OUTPUT SPEED SENSOR SIGNAL
8	-	-



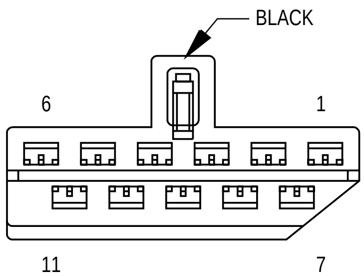
TRANSMISSION CONTROL MODULE (4.0L)

CAV	CIRCUIT	FUNCTION
1	T31 20VT/LG	INPUT SPEED SENSOR GROUND
2	T52 20RD/BK	INPUT SPEED SENSOR SIGNAL
3	T13 20DB/BK	OUTPUT SPEED SENSOR GROUND
4	T14 20LG/WT	OUTPUT SPEED SENSOR SIGNAL
5	-	-
6	D2 20WT/BK	CCD BUS (-)
7	D1 20VT/BR	CCD BUS (+)
8	-	-
9	T3 18VT	TRS T3 SENSE
10	-	-
11	T22 20DB/WT	SOLENOID C CONTROL
12	T19 20WT	SOLENOID A CONTROL
13	T60 20OR/WT	SOLENOID B CONTROL
14	D21 20PK	SCI TRANSMIT/ISO 9141K
15	-	-
16	K167 20BR/YL	SENSOR GROUND
17	K22 20OR/DB	THROTTLE POSITION SENSOR SIGNAL
18	L10 18BR/LG	BACK-UP LAMP FEED
19	-	-
20	-	-
21	T42 18VT/WT	TRS T42 SENSE
22	T1 18LG/BK	TRS T1 SENSE
23	K29 20WT/PK	BRAKE LAMP SWITCH SENSE
24	Z12 18BK/TN	GROUND
25	M1 20PK	FUSED B(+)
26	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)



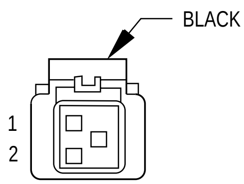
TRANSMISSION RANGE SENSOR (4.0L A/T)

CAV	CIRCUIT	FUNCTION
1	T42 18VT/WT	TRS T42 SENSE
2	T3 18VT	TRS T3 SENSE
3	F20 18WT	FUSED IGNITION SWITCH OUTPUT (ST-RUN)
4	T1 18LG/BK	TRS T1 SENSE
5	-	-
6	L10 18BR/LG	BACK-UP LAMP FEED
7	T41 20BK/WT	PARK/ NEUTRAL POSITION SWITCH SENSE
8	Z1 18BK	GROUND



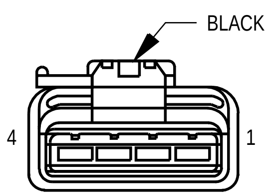
TURN SIGNAL/
HAZARD SWITCH

CAV	CIRCUIT	FUNCTION
1	L60 20TN	RIGHT TURN SIGNAL
2	-	-
3	L62 20BR/RD	RIGHT TURN SIGNAL
4	L55 20RD/WT	COMBINATION FLASHER INPUT
5	L6 20RD/WT	FLASHER OUTPUT
6	L12 20VT/TN	HAZARD FLASHER SELECT SIGNAL
7	-	-
8	-	-
9	L63 20DG/RD	LEFT TURN SIGNAL
10	L61 20LG/WT	LEFT TURN SIGNAL
11	L55 20RD/WT	COMBINATION FLASHER INPUT



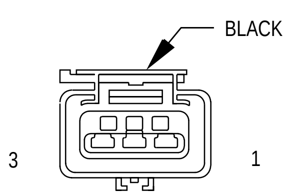
UNDERHOOD
LAMP/
SWITCH

CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	Z1 20BK	GROUND



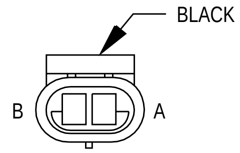
VEHICLE SPEED
CONTROL SERVO

CAV	CIRCUIT	FUNCTION
1	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	Z1 18BK	GROUND



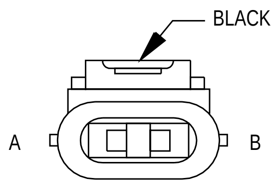
VEHICLE SPEED
SENSOR

CAV	CIRCUIT	FUNCTION
1	K6 18VT/OR	5V SUPPLY
2	K167 20BR/YL	SENSOR GROUND
3	G7 18WT/OR	VEHICLE SPEED SENSOR SIGNAL



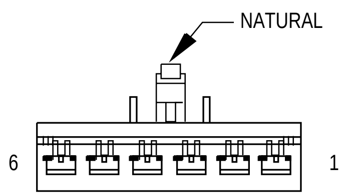
WASHER FLUID LEVEL SWITCH

CAV	CIRCUIT	FUNCTION
A	Z1 20BK	GROUND
B	G29 20BK/LB	LOW WASHER FLUID SENSE



WINDSHIELD WASHER PUMP

CAV	CIRCUIT	FUNCTION
A	V10 18BR	WASHER PUMP CONTROL
B	Z1 18BK	GROUND



WIPE/WASH SWITCH

CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	V5 16DG/YL	WIPER PARK SWITCH SENSE
3	V10 18BR	WASHER PUMP CONTROL
4	V3 16BR/WT	WIPER LOW SPEED OUTPUT
5	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
6	V4 16BR/VT	WIPER HIGH SPEED OUTPUT

8W-90 CONNECTOR LOCATIONS

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying component and connector locations in the vehicle. A connector index is provided. Use the wiring diagrams in each section for connector number identification. Refer to the index for the proper figure number.

CONNECTOR/GROUND LOCATIONS

For items that are not shown in this section N/S is placed in the Fig. column.

Connector Name/Number	Color	Location	Fig.
A/C-Heater Control or Heater Control - C1	BK	Center of Instrument Panel	22, 23
A/C-Heater Control - C2	NAT	Center of Instrument Panel	22, 23
A/C High Pressure Switch (2.5L)(LHD)		Near T/O for C107	8
A/C High Pressure Switch (2.5L)(RHD)		Right Side of Engine Compartment Near Power Distribution Center	7
A/C High Pressure Switch (4.0L)(LHD)		Right Side of Engine Compartment Near Power Distribution Center	12, 14
A/C High Pressure Switch (4.0L)(RHD)		Left Side of Engine Compartment Near T/O for A/C Compressor Clutch	15
A/C Low Pressure Switch (LHD)		Right Rear of Engine Compartment	4, 12
A/C Low Pressure Switch (RHD)		Left Rear of Engine Compartment	3, 11
Airbag Control Module	YL	Under Center Console	27, 32
Ambient Temperature Sensor	BK	Center Grill Opening	4, 5, 12, 13

Connector Name/Number	Color	Location	Fig.
Back-Up Lamp Switch (2.5L)	BK	Right Side of Transmission Near Shifter	19
Back-Up Lamp Switch (4.0L)	BK	Left Side of Transmission	20
Battery Temperature Sensor	BK	At Battery	6, 7, 12, 13, 14, 15
Blend Door Actuator	BK	T/O at T/O for C209 on HVAC Harness	N/S
Blower Motor		On HVAC Harness	N/S
Blower Motor Relay	BK	Near T/O for C209	N/S
Blower Motor Resistor Block	BK	On HVAC Harness	N/S
Brake Lamp Switch	GY	Near Brake Pedal	21, 24, 25
Brake Warning Pressure Switch (LHD)	BK	Left Side of Engine Compartment	2, 10
Brake Warning Pressure Switch (RHD)	BK	Right Side of Engine Compartment	5, 7, 13, 15
C100 (LHD)	BK	Left Lower Instrument Panel	6, 14, 21, 25
C100 (RHD)	WT	Right Lower Instrument Panel	24

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
C106	BK	Left Front Engine Compartment	1, 6, 7, 14, 15
C107 (2.5L)	BK	Rear of Engine Compartment	2, 3, 4, 5, 16
C107 (4.0L)	BK	Rear of Engine Compartment	12, 13, 17
C108	BK	Right Side of Engine Compartment	4, 5, 6, 7, 12, 13, 14, 15
C109	BK	Left Lower Instrument Panel	14, 15, 26, 27
C112 (4.0L A/T 4WD)	GY	Left Side of Transfer Case	20
C113 (M/T)		Rear Center of Engine Compartment	12, 17
C200 (LHD)	GY	Left Lower Instrument Panel	21, 26
C201 (LHD)	NAT	Lower Center of Instrument Panel	21
C202 (RHD)	GY	Lower Center of Instrument Panel	24, 27
C203 (RHD)	BL	Lower Center of Instrument Panel	24, 27
C204 (RHD)	WT	Lower Center of Instrument Panel	24, 27
C205 (LHD)	YL	Left Lower Instrument Panel	21, 22
C205 (RHD)	YL	Right Lower Instrument Panel	23, 24
C206	BK	At Center Console	26, 27, 32

Connector Name/Number	Color	Location	Fig.
C207	BK	Right Lower Instrument Panel	21, 24
C208	BK	Left Lower Instrument Panel	21, 24
C209 (LHD)	BK/LT GN	Right Lower Instrument Panel	32
C209 (RHD)	BK/LT GN	Left Lower Instrument Panel	27
C300 (LHD)	NAT	At Right Kick Panel	32
C300 (RHD)	WT	At Right Kick Panel	24
C301	WT	At Right Kick Panel	24, 32
C303	NAT/ BK (LHD) WT (RHD)	T/O at Junction Block - C7 T/O	N/S
C304	BK	Right Lower B Pillar	29
C305	WT	At Left Kick Panel	26, 27
C306	WT	At Left Kick Panel	26, 27
C307	WT	At Left Kick Panel	26, 27
C309	BK	Left Lower B Pillar	26, 27
C310	BK	Top Center of Liftgate	31
C311	BK	Top Center of Liftgate	31
C312	GN	Top Center of Liftgate	31
C313	GY	Top Center of Liftgate	31
C314	WT	At Soundbar	N/S
C316	BK	Under Right Front Seat	26, 27, 29
C317	BK	Left Lower A Pillar	26, 27

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
C318	BK	Right Lower A Pillar	29
C319	BK	Right Lower B Pillar	29
C320	BK	Left Lower B Pillar	26, 27
C321	BK	At Right Tail Lamp Harness	N/S
C322 (Trailer Tow)	BK	At Left Tail Lamp Harness	33
C322 (Without Trailer Tow)	BK	At Left Tail Lamp Harness	28
C323 (Trailer Tow)	BK	At Trailer Tow Harness	28, 33
C324 (RHD)	WT	In T/O for Junction Block - C7	N/S
C326	BK	At Left Rear Quarter Panel	28
C327	BK	At Left Rear Quarter Panel	28
C329	NAT	Under Right Front Seat	26, 27
C330	BK	Center of Liftgate	31
C332	NAT	Under Left Front Seat	26, 27
C333	BK	At Center High Mounted Stop Lamp Jumper	N/S
C362	BK	Under Left Front Seat	26, 27
C363	BK	Under Right Front Seat	26, 27
Camshaft Position Sensor	GY	Right Side of Engine	16, 17
Cargo Lamp/ Switch	BK	At Lamp	N/S
Center High Mounted Stop Lamp	BK	At Liftgate	N/S
Cigar Lighter	RD	Lower Center of Instrument Panel	22, 23
Clockspring - C1	NAT	At Clockspring	35
Clockspring - C2		At Clockspring	N/S
Clockspring - C3	YL	At Clockspring	35

Connector Name/Number	Color	Location	Fig.
Clutch Interlock Switch	GN	At Clutch Pedal	14, 24, 25
Clutch Interlock Switch Jumper (LHD)	BK	Lower Steering Column	N/S
Clutch Interlock Switch Jumper (RHD)	BK	Lower Steering Column	24
Combination Flasher	BK	Lower Left of Instrument Panel	21
Compass	BK	In Headliner	34
Controller Anti-Lock Brake	BK	Left Side of Engine Compartment	10, 11
Crankshaft Position Sensor	BK	Left Side of Transmission	20
Data Link Connector (LHD)	BK	Lower Left of Instrument Panel	21
Data Link Connector (RHD)	BK	Lower Right of Instrument Panel	N/S
Daytime Running Lamp Module	BK	Right Rear of Engine Compartment	6, 8, 14
Dome Lamp (Base/Police)		At Lamp	N/S
Dome Lamps Switch (Midline)	BK	At Switch	N/S
Driver Door Jamb Switch	BK	Left Lower A Pillar	N/S
Driver Door Lock Motor		At Motor	30
Driver Power Lock/Window Switch-C1	BL	At Switch	30
Driver Power Door Lock/Window Switch-C2	WT	At Switch	30
Driver Power Mirror	RD	At Mirror	30
Driver Power Window Motor	BK	At Motor	30
Duty Cycle EVAP/Purge Solenoid (LHD)	BK	Right Rear of Engine Compartment	2, 4, 10, 12

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Duty Cycle EVAP/Purge Solenoid (RHD)	BK	Left Rear of Engine Compartment	3, 11
Engine Coolant Temperature Sensor	BK	Front of Engine	16, 17
Engine Oil Pressure Sensor	BK	Right Side of Engine	16, 17
EVAP Leak Detection Pump	BK	In T/O for Power Distribution Center	N/S
Extended Idle Switch (Police Package)	WT	Instrument Panel Harness Near T/O to Power Outlet	N/S
Front Fog Lamp Switch	BK	Lower Center of Instrument Panel	22, 23
Front Wiper Motor	BK	At Wiper Motor	8, 9
Fuel Injector No. 1	BK	At Injector	16, 17
Fuel Injector No. 2	BK	At Injector	16, 17
Fuel Injector No. 3	BK	At Injector	16, 17
Fuel Injector No. 4	BK	At Injector	16, 17
Fuel Injector No. 5 (4.0L)	BK	At Injector	17
Fuel Injector No. 6 (4.0L)	BK	At Injector	17
Fuel Pump Module	BK	At Fuel Pump Module	28
G100 (4.0L)		Right Front of Engine Compartment	12, 13
G100 (2.5L)		Right Front of Engine Compartment at Battery Negative Terminal	N/S
G101		Right Side of Engine	16, 17
G102		Rear of Engine Compartment	2, 3, 4, 5, 12, 13
G104		T/O at Engine Starter Motor T/O on Battery Harness	N/S
G106		Left Side of Engine Compartment	2, 3, 10, 11
G107 (LHD)		Right Side of Instrument Panel	21
G107 (RHD)		Left Side of Instrument Panel	24
G108 (LHD)		Left Side of Instrument Panel	21
G108 (RHD)		Right Side of Instrument Panel	24
G200		Under Left Front Seat	27, 32
G300		In T/O for Airbag Control Module	N/S
G301		Near T/O for Power Amplifier	28
G302		At Left Rear Quarter Panel	28
G303		Under Right Front Seat	26, 27, 29
G304		T/O at T/O's for C326 and C327	N/S
G306		Under Right Front Seat	26, 27
G Switch	BK	Under Rear Seat	28, 29
Generator (2.5L)	BK	At Generator	N/S
Generator (4.0L)	BK	At Generator	18
Headlamp Beam Select Switch	BK	On Steering Column	35

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
HeadLamp Delay Module (LHD)	BK	Lower Left of Instrument Panel	21
Headlamp Delay Module (RHD)	BK	Lower Right of Instrument Panel	N/S
Headlamp Switch (LHD)	BK	Left Side of Instrument Panel	22
Headlamp Switch (RHD)	BK	Right Side of Instrument Panel	23
Heated Seat Relay		Under Right Front Seat	N/S
Idle Air Control Motor	BK	Left Side of Engine	16, 17
Ignition Coil (2.5L)	BK	Right Side of Engine	16
Ignition Switch - C1	BK	At Steering Column	21, 24, 35
Ignition Switch - C2	GN	At Steering Column	21, 24, 35
Instrument Cluster - C1	BK	At Instrument Cluster	21, 22, 23, 24
Instrument Cluster - C2	BK	At Instrument Cluster	21, 22, 23, 24
Intake Air Temperature Sensor	GY	Left Side of Engine	16, 17
Junction Block - C1	NAT	At Right Kick Panel Area	25, 29
Junction Block - C2	WT	At Right Kick Panel Area	25, 29
Junction Block - C3	NAT	At Right Kick Panel Area	29
Junction Block - C4	WT	At Right Kick Panel Area	24, 29
Junction Block - C5	WT	At Right Kick Panel Area	24, 29
Junction Block - C6	NAT	At Right Kick Panel Area	29

Connector Name/Number	Color	Location	Fig.
Junction Block - C7	NAT	At Right Kick Panel Area	29
Junction Block - C8	NAT	At Right Kick Panel Area	29
Junction Block - C9	NAT	At Right Kick Panel Area	29
Left Back-Up Lamp	GY	At Lamp	N/S
Left Courtesy Lamp	BK	Lower Left of Instrument Panel	21, 24
Left Fog Lamp	GY	At Lamp	1
Left Front Door Speaker	BK	At Speaker	30
Left Front Door Tweeter	BK	Left Front Door	30
Left Front Park/Turn Signal Lamp NO.1	GY	At Lamp	1
Left Front Park/Turn Signal Lamp NO.2	GY	At Lamp	1
Left Front Wheel Speed Sensor	GY	Left Side of Engine Compartment	10, 11
Left Headlamp		At Headlamp	1
Left Heated Seat Back		At Left Seat	N/S
Left Heated Seat Cushion		At Left Seat	N/S
Left Heated Seat Switch	RD	At Center Console	26, 27
Left Power Seat Front Vertical Motor	YL	Under Left Seat	N/S
Left Power Seat Horizontal Motor	YL	Under Left Seat	N/S
Left Power Seat Rear Vertical Motor	YL	Under Left Seat	N/S
Left Power Seat Switch	BK	At Switch	N/S
Left Rear Door Jamb Switch	BK	At Left B Pillar	N/S
Left Rear Door Lock Motor	BK	In Left Rear Door	30

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Left Rear Wheel Speed Sensor	BK	Under Rear Seat	28
Left Rear Window Motor	BK	In Left Rear Door	30
Left Rear Window Switch	BL	In Left Rear Door	30
Left Side Marker Lamp	NAT	At Lamp	1
Left Soundbar Speaker		At Soundbar	N/S
Left Speed Control Switch		On Steering Wheel	N/S
Left Tail/Stop Lamp	BK	At Lamp	N/S
Left Turn Signal Lamp		At Rear Lamp	N/S
Left Visor/Vanity Lamp	BK	Left Side of Headliner	34
License Lamp		At Lamp	N/S
Liftgate Lock Motor	BK	In Liftgate	31
Liftgate Switch	BK	In Liftgate	31
Manifold Absolute Pressure Sensor	BK	Left Side of Engine	16, 17
Overhead Module	BK	Front Center of Headliner	34
Oxygen Sensor 1/1 Upstream (2.5L)	GY	Left Side of Engine	16
Oxygen Sensor 1/1 Upstream (4.0L)	GY	Right Side of Transmission	20
Oxygen Sensor 1/1 Upstream (California)	GY	Left Side of Engine	17
Oxygen Sensor 1/2 Downstream (2.5L)	BK	Right Side of Transmission	19
Oxygen Sensor 1/2 Downstream (4.0L)	BK	Right Side of Transmission	20
Oxygen Sensor 1/2 Downstream (California)	BK	Left Side of Engine	17
Oxygen Sensor 2/1 Upstream (California)	GY	Left Side of Engine	17

Connector Name/Number	Color	Location	Fig.
Oxygen Sensor 2/2 Downstream (California)	BK	Left Side of Engine	20
Park/Neutral Position Switch (2.5L A/T)	BK	Left Side of Transmission	19
Passenger Airbag	YL	At Airbag	21, 22, 23, 24
Passenger Door Jamb Switch	BK	Kick Panel Area at Door Opening	N/S
Passenger Door Lock Motor		At Motor	30
Passenger Power Lock/Window Switch - C1	BL	At Switch	30
Passenger Power Lock/Window Switch - C2	BL	At Switch	30
Passenger Power Mirror	RD	At Mirror	30
Passenger Power Window Motor	BK	At Motor	30
Power Amplifier - C1	NAT	Under Left Rear Seat	28
Power Amplifier - C2	NAT	Under Left Rear Seat	28
Power Mirror Switch		At Switch	N/S
Power Outlet	RD	Lower Center of Instrument Panel	22, 23
Power Steering Pressure Switch (2.5L)	WT	Front of Engine	16
Powertrain Control Module - C1	BK	Left Side of Engine Compartment	8, 9, 16, 17
Powertrain Control Module - C2	WT	Left Side of Engine Compartment	8, 9, 16, 17
Powertrain Control Module - C3	GY	Left Side of Engine Compartment	8, 9, 2, 3, 10, 11

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
PRNDL Illumination (A/T)		At Center Console	26, 27
Radiator Fan Motor	LT GY	Front of Engine Compartment	2, 3, 6, 7, 10, 11, 14, 15
Radio - C1	BK	Center of Instrument Panel	22, 23
Radio - C2	GY	Center of Instrument Panel	22, 23
Rail Coil (4.0L)	BK	Right Side of Engine	17
Rear Washer Pump	BK	Left Front of Engine Compartment	2, 3, 8, 9, 10, 11
Rear Window Defogger Switch	GY	Center of Instrument Panel	22, 23
Rear Wiper Motor		In Liftgate	31
Rear Wiper/ Washer Switch	BK	Center of Instrument Panel	22, 23
Right Back-Up Lamp	GY	At Lamp	N/S
Right Courtesy Lamp	BK	Lower Right of Instrument Panel	21, 24
Right Fog Lamp	GY	At Lamp	1
Right Front Door Speaker	BK	At Speaker	30
Right Front Door Tweeter	BK	At Right Front Door	30
Right Front Park/Turn Signal Lamp NO.1	BK	At Lamp	1
Right Front Park/Turn Signal lamp NO.2	BK	At Lamp	1
Right Front Wheel Speed Sensor		Right Side of Engine Compartment	11, 12
Right Headlamp		At Headlamp	1

Connector Name/Number	Color	Location	Fig.
Right Heated Seat Back		At Right Seat	N/S
Right Heated Seat Cushion		At Right Seat	N/S
Right Heated Seat Switch	BL	At Center Console	26, 27
Right Power Seat Front Vertical Motor	YL	Under Right Seat	N/S
Right Power Seat Horizontal Motor	YL	Under Right Seat	N/S
Right Power Seat Rear Vertical Motor	YL	Under Right Seat	N/S
Right Power Seat Switch	BK	At Switch	N/S
Right Rear Door Jamb Switch	BK	At Right B Pillar	29
Right Rear Door Lock Motor	BK	In Right Rear Door	30
Right Rear Wheel Speed Sensor	RD	Under Rear Seat	28
Right Rear Window Motor	BK	In Right Rear Door	30
Right Rear Window Switch	BL	In Right Rear Door	30
Right Side Marker Lamp	NAT	At Lamp	1
Right Sound Bar Speaker		At Soundbar	N/S
Right Speed Control Switch		On Steering Wheel	N/S
Right Tail/Stop Lamp		At Lamp	N/S
Right Turn Signal Lamp		At Rear Lamp	N/S
Right Visor/Vanity Lamp	BK	Right Side of Headliner	34
Seat Belt Switch (LHD)	BK	T/O at T/O for Airbag Control Module	32
Seat Belt Switch (RHD)	BK	T/O at T/O for C206	N/S
Seat Heat Interface Module	BK	Under Right Front Seat	N/S

DESCRIPTION AND OPERATION (Continued)

Connector Name/Number	Color	Location	Fig.
Sentry Key Immobilizer Module	BK	At Steering Column	21, 24
Shift Lock Solenoid (LHD)	WT	At Steering Column	21, 35
Shift Lock Solenoid (RHD)	WT	At Steering Column	35
Throttle Position Sensor	WT	Left Side of Engine	16, 17
Torque Converter Clutch Solenoid (2.5L A/T)		Left Side of Transmission	19
Trailer Tow Connector	LT GY	At Rear Bumper	33
Trailer Tow Left Turn Relay	BK	At Left Rear Quarter Panel	33
Trailer Tow Right Turn Relay	BK	At Left Rear Quarter Panel	33
Transfer Case Switch (231 4WD)	BK	Left Side of Transmission	19, 20
Transfer Case Switch (242 4WD)	BK	Left Side of Transmission	20
Transfer Case Switch Illumination	BK	At Center Console	26, 27
Transmission Control Assembly or Transmission Solenoid (4.0L)	BK	Rear of Engine Compartment	12, 13
Transmission Control Module (4.0L)	BK	Under Instrument Panel near Transmission Tunnel	14, 15, 25

Connector Name/Number	Color	Location	Fig.
Transmission Range Sensor (4.0L A/T)	BK/GY	Rear of Engine Compartment	12, 13
Turn Signal/ Hazard Switch	BK	At Steering Column	21, 24, 35
Underhood Lamp/Switch	BK	At Lamp	2, 5, 10, 11
Vehicle Speed Control Servo (LHD)	BK	Right Front of Engine Compartment	4, 12, 14
Vehicle Speed Control Servo (RHD)	BK	Right Rear of Engine Compartment	5, 9, 13, 15
Vehicle Speed Sensor	BK	Left Side of Transmission	19, 20
Washer Fluid Level Switch	BK	Left Front of Engine Compartment	2, 3, 8, 9, 10, 11
Windshield Washer Pump	BK	Left Front of Engine Compartment	2, 3, 8, 9, 10, 11
Wipe/Wash Switch	NAT	At Steering Column	21, 24, 35

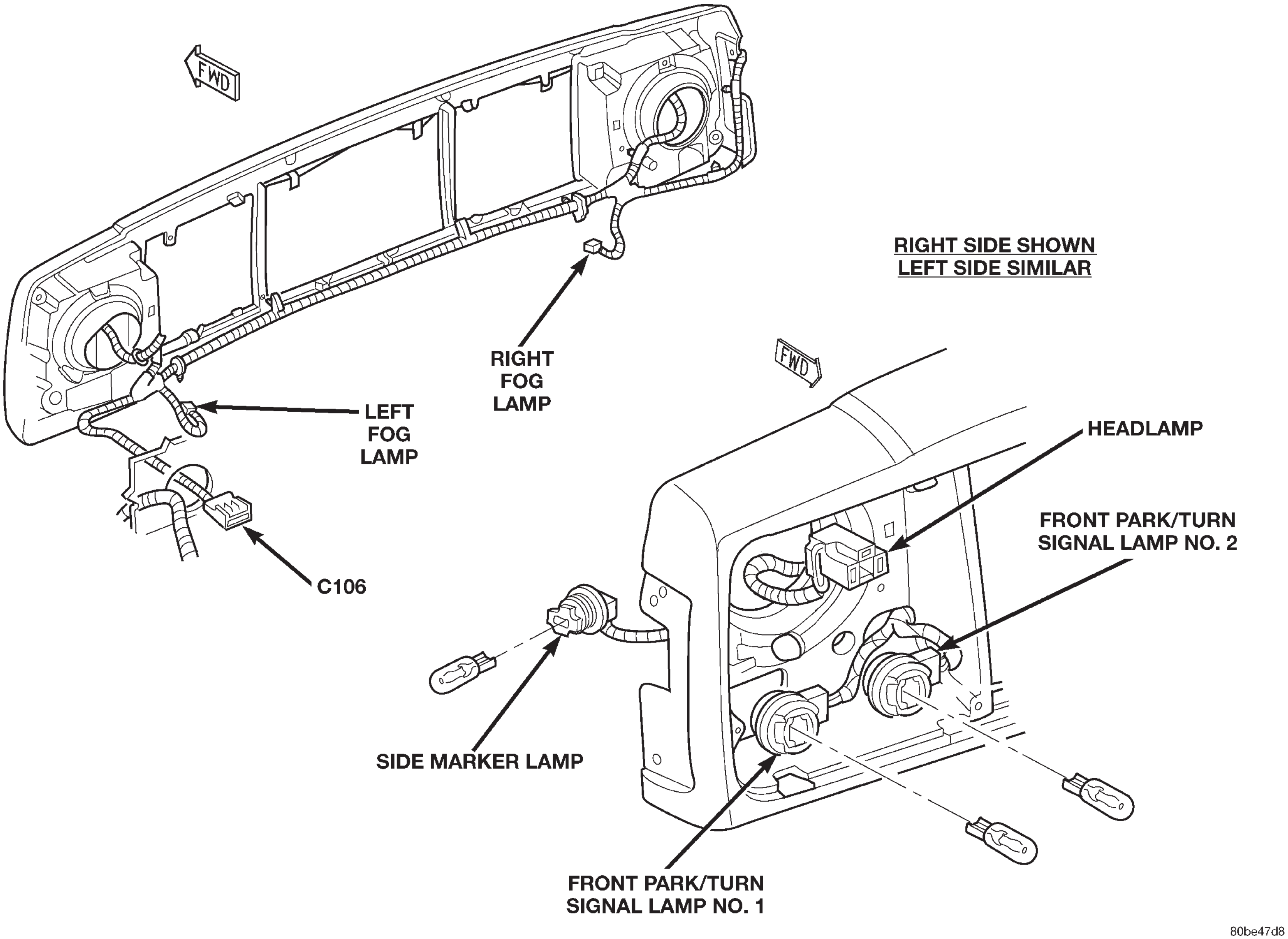


Fig. 1 Front End Lighting

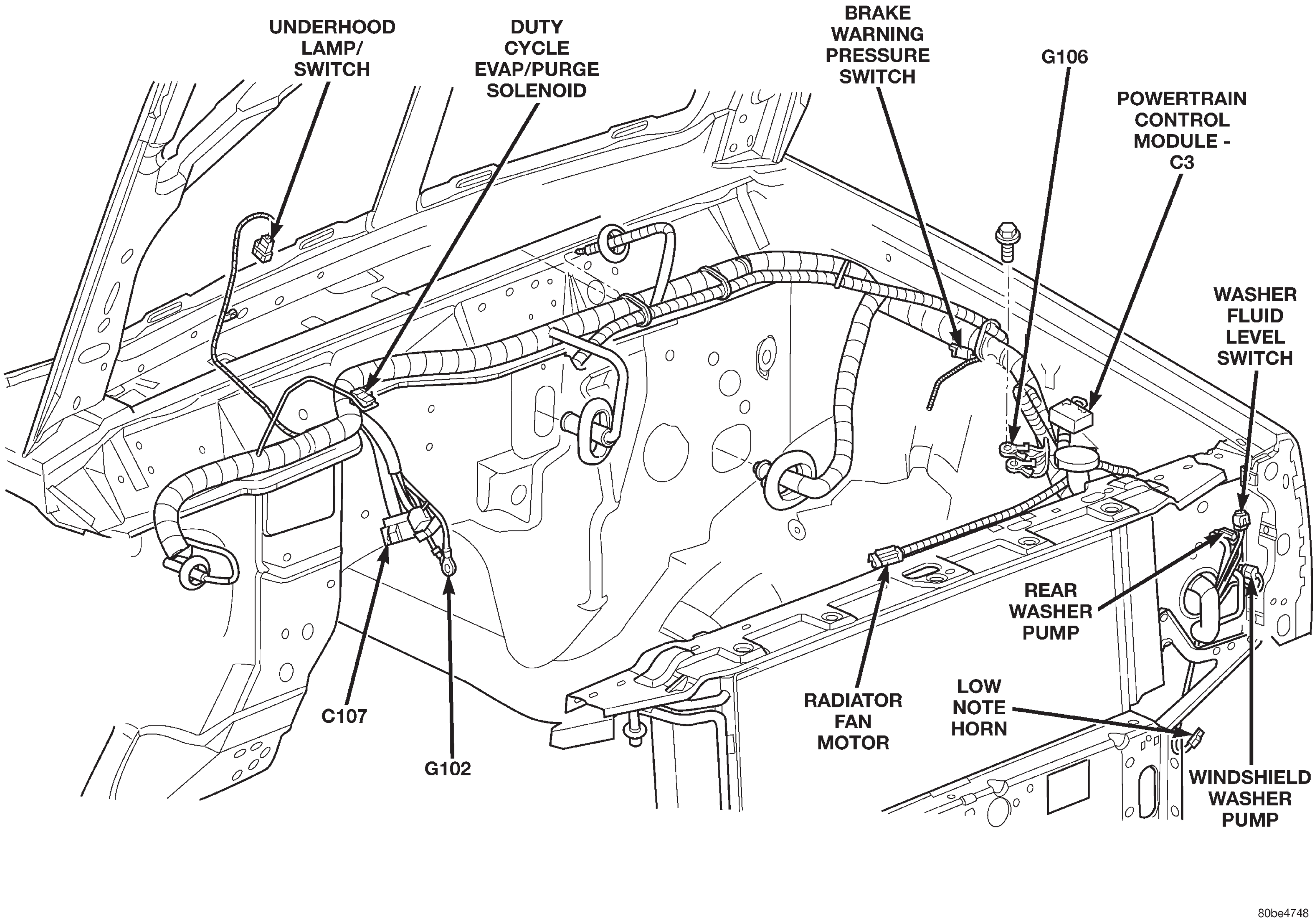


Fig. 2 Left Engine Compartment 2.5L Engine LHD

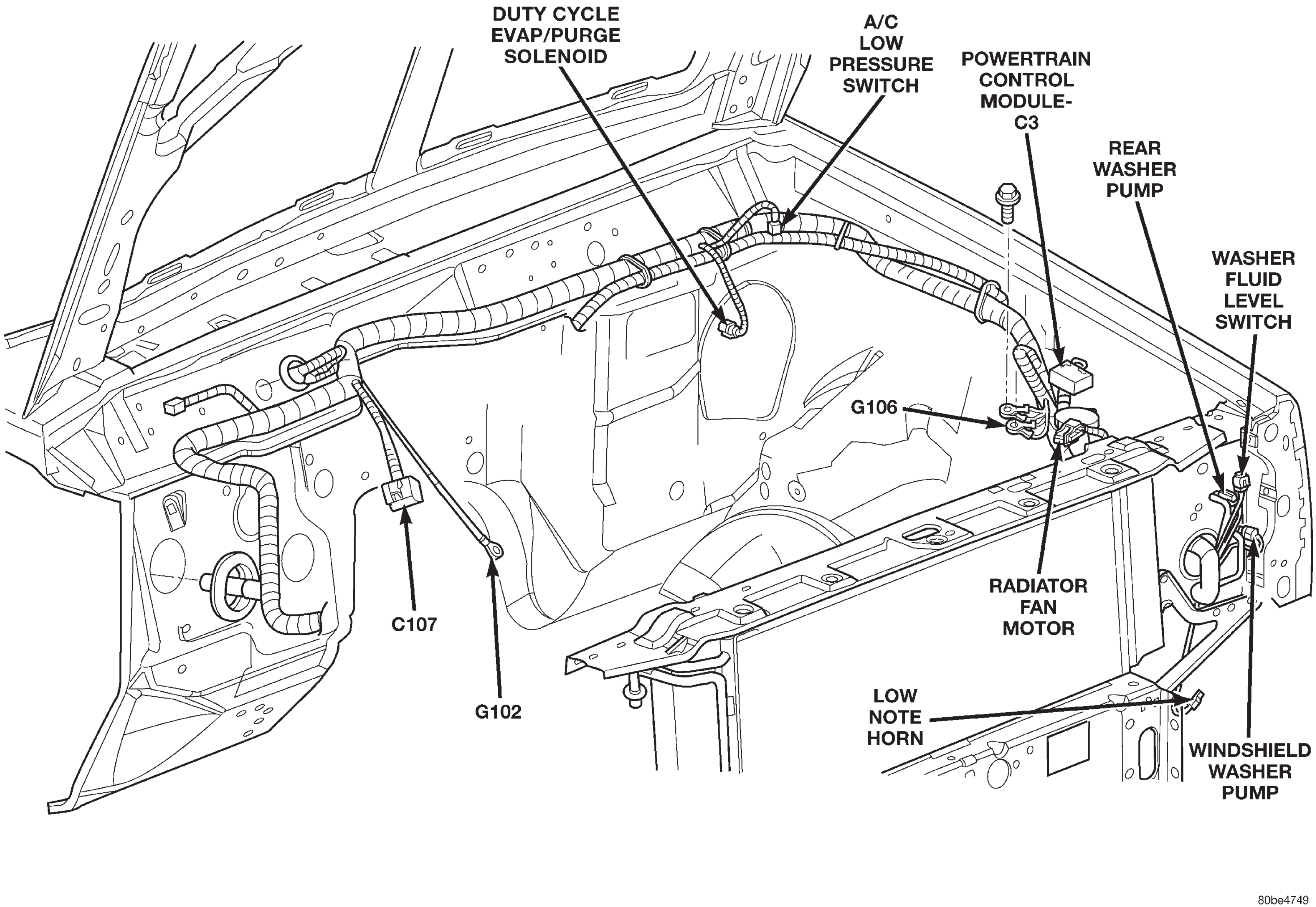


Fig. 3 Left Engine Compartment 2.5L Engine RHD

DESCRIPTION AND OPERATION (Continued)

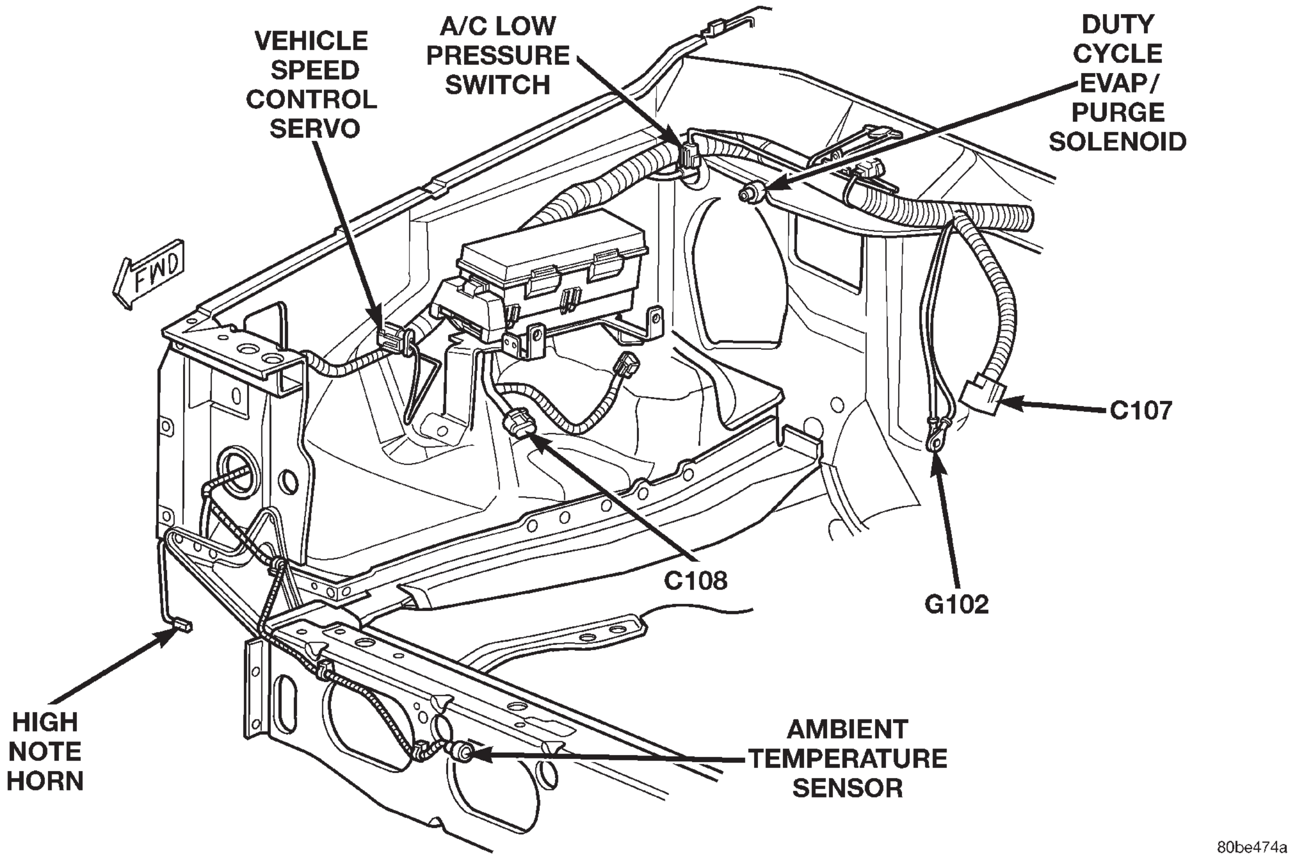


Fig. 4 Right Engine Compartment 2.5L Engine LHD

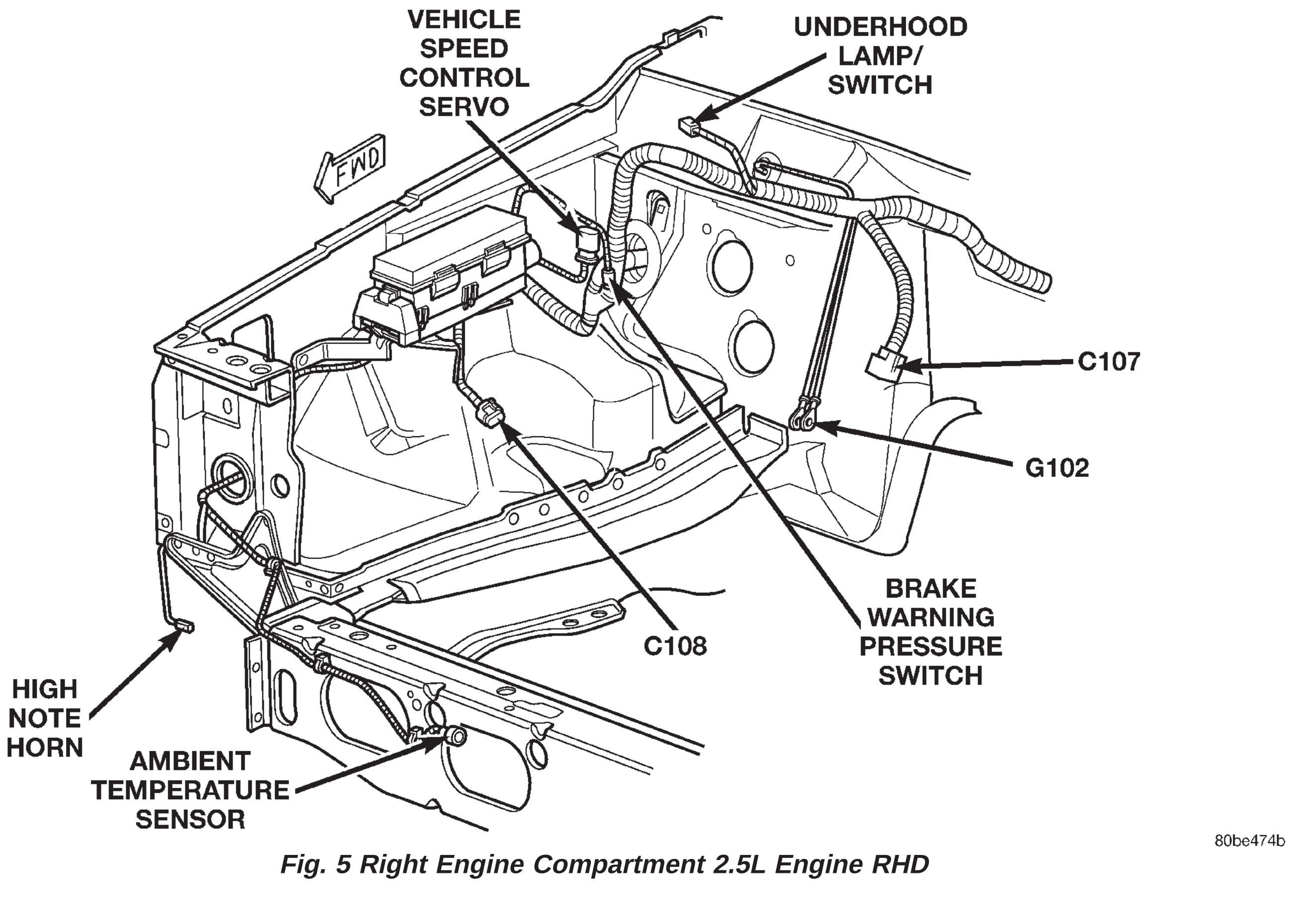


Fig. 5 Right Engine Compartment 2.5L Engine RHD

DESCRIPTION AND OPERATION (Continued)

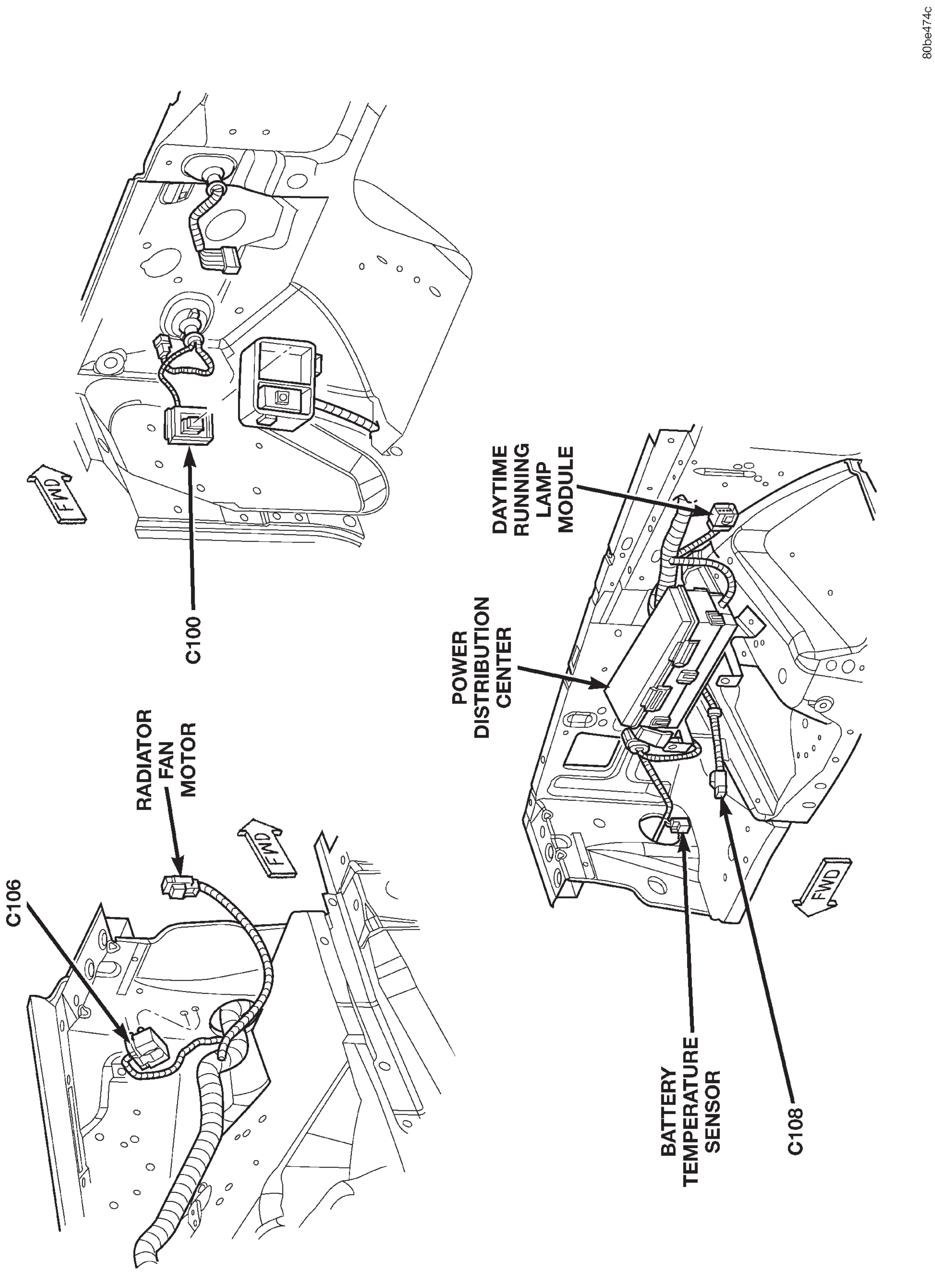


Fig. 6 Engine Compartment Auxiliary Views 2.5L Engine LHD

DESCRIPTION AND OPERATION (Continued)

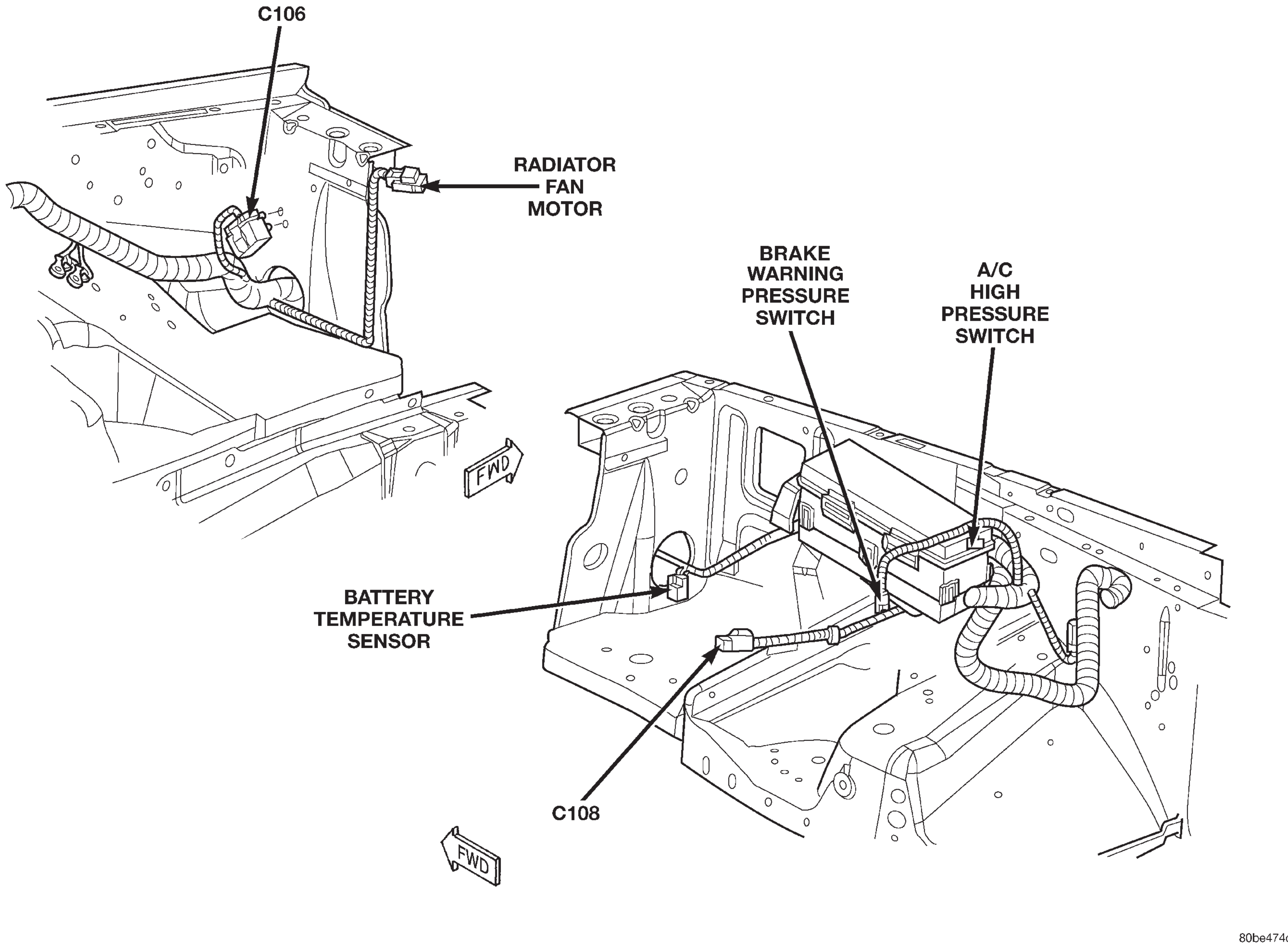


Fig. 7 Engine Compartment Auxiliary Views 2.5L Engine RHD

DESCRIPTION AND OPERATION (Continued)

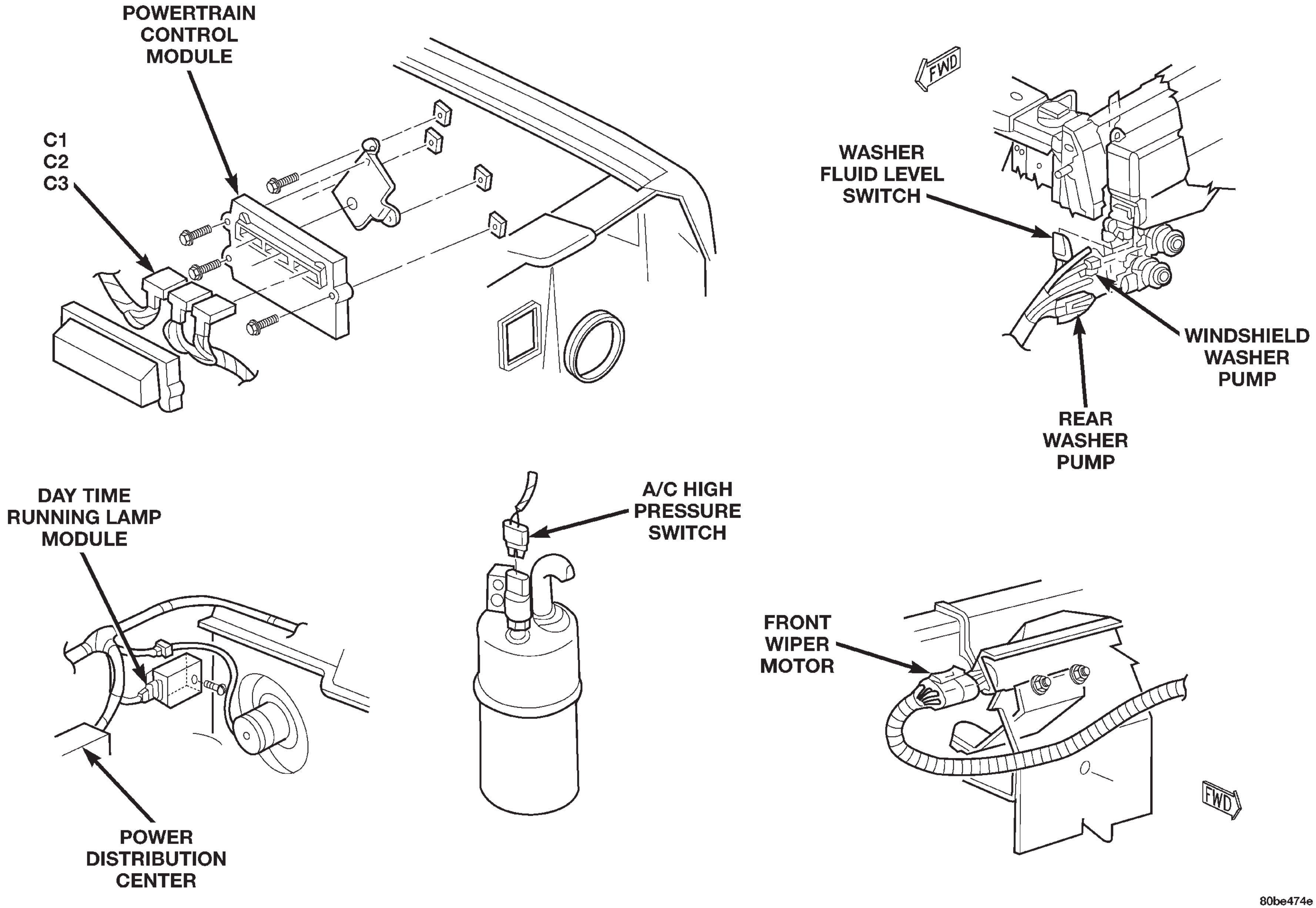


Fig. 8 Engine Compartment Components LHD

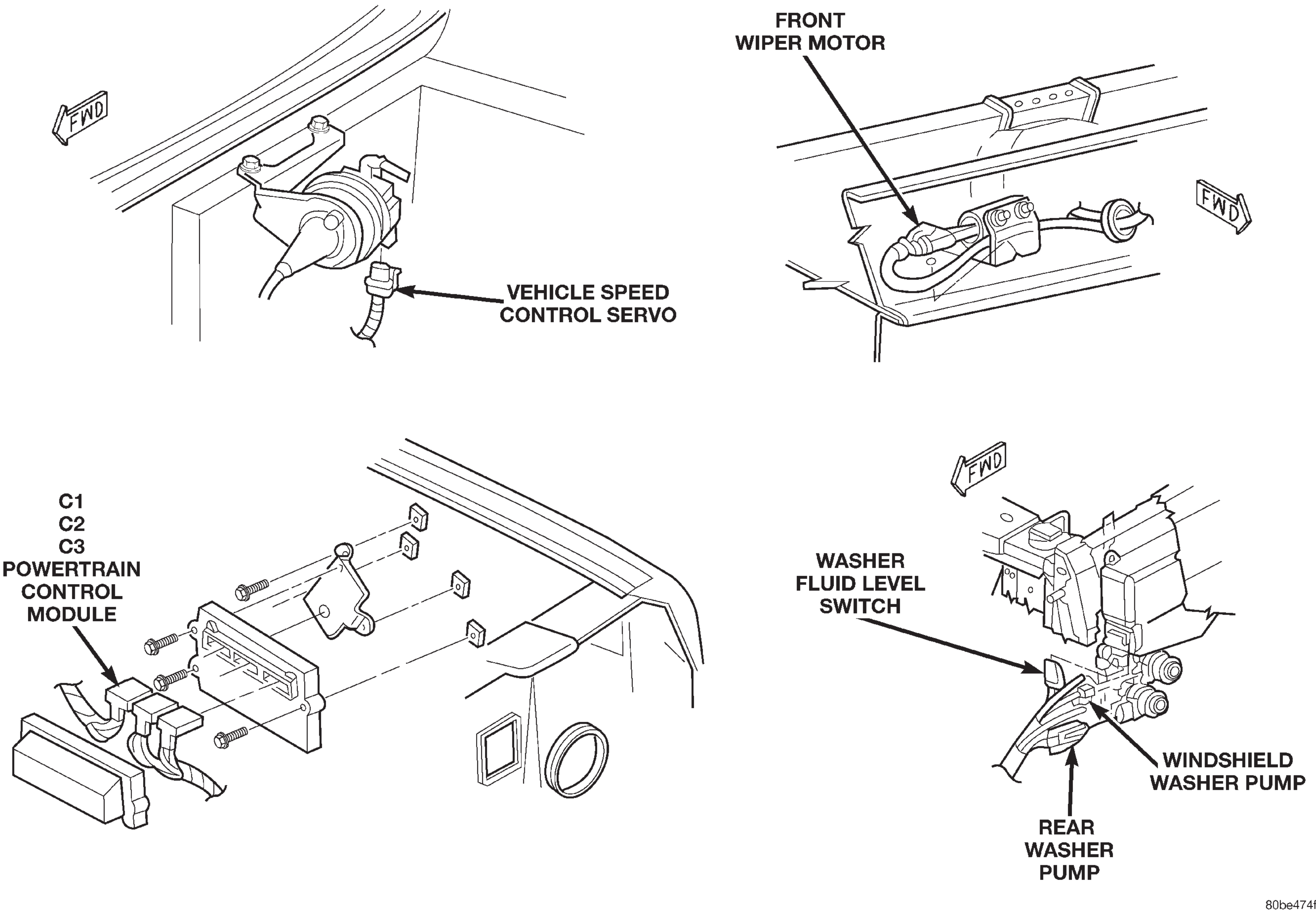


Fig. 9 Engine Compartment Components RHD

DESCRIPTION AND OPERATION (Continued)

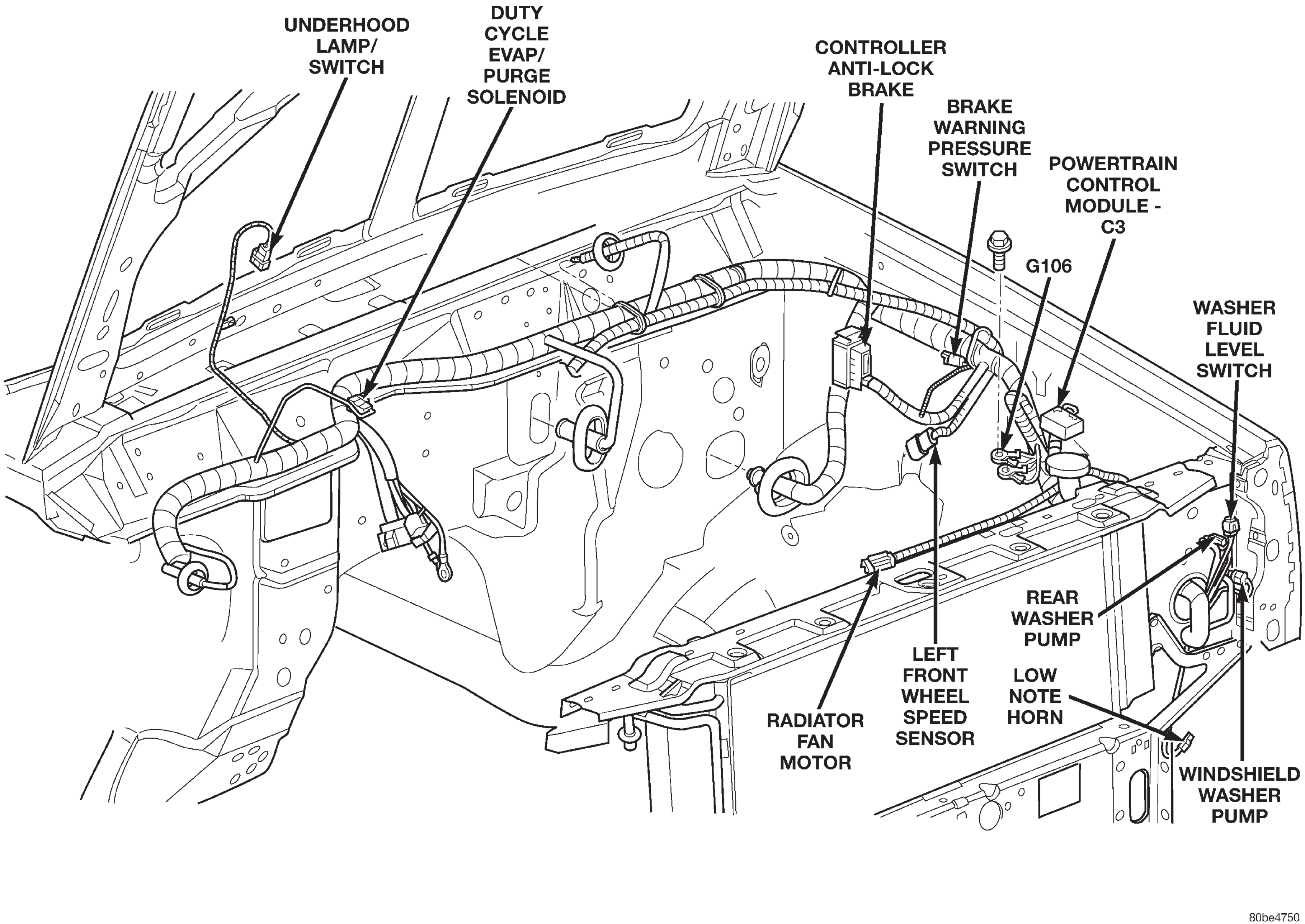


Fig. 10 Left Engine Compartment 4.0L Engine LHD

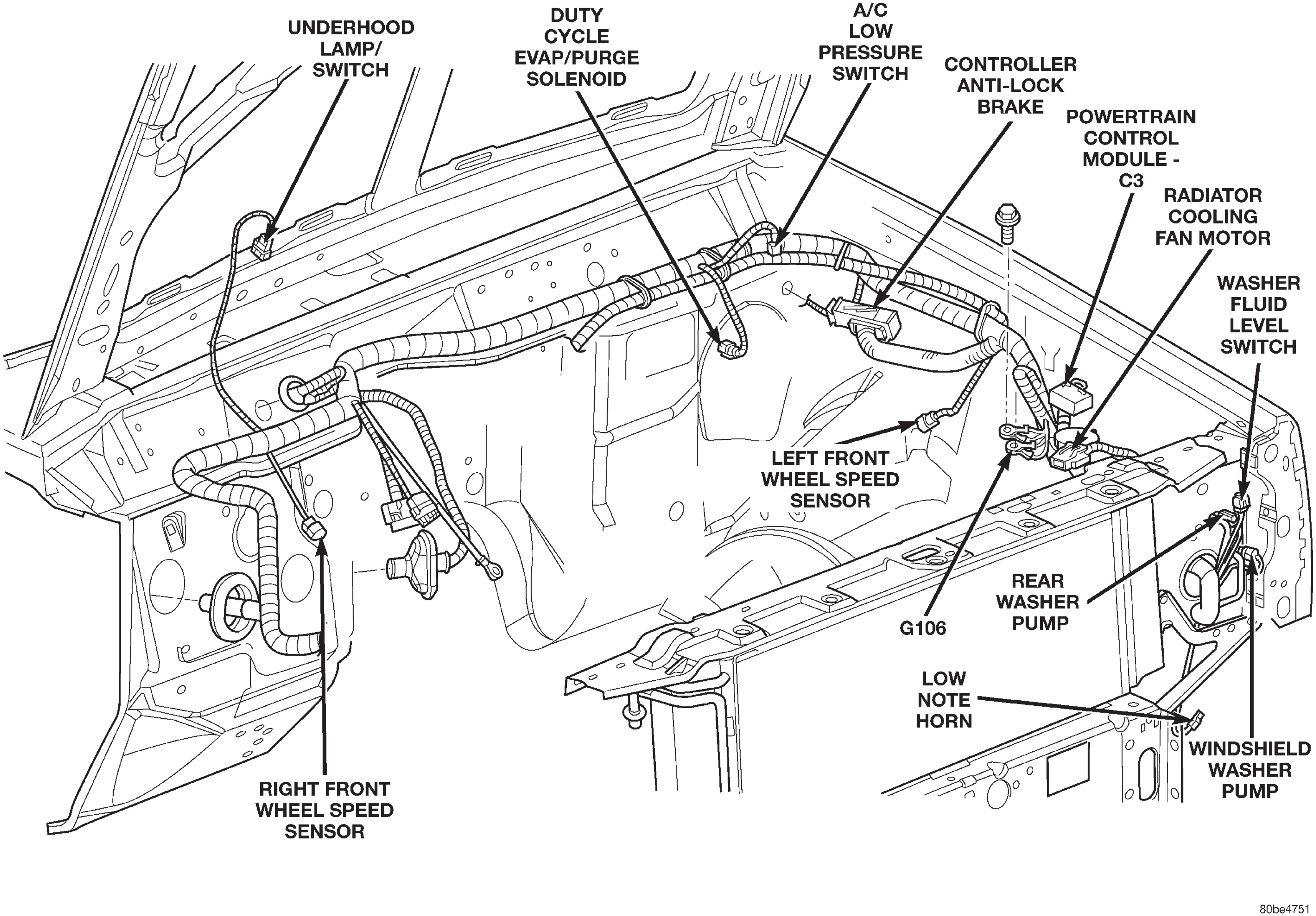


Fig. 11 Left Engine Compartment 4.0L Engine RHD

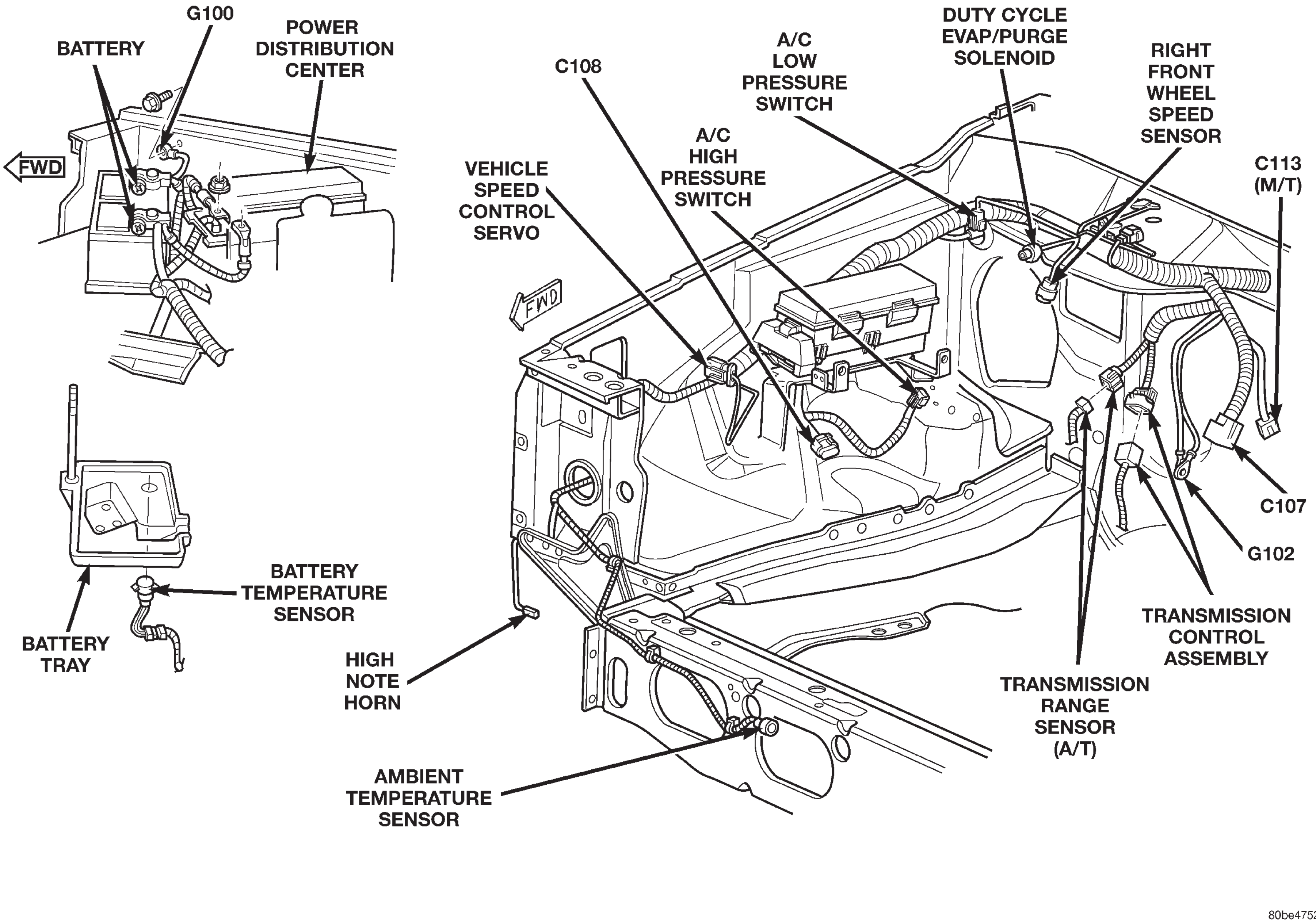


Fig. 12 Right Engine Compartment 4.0L Engine LHD

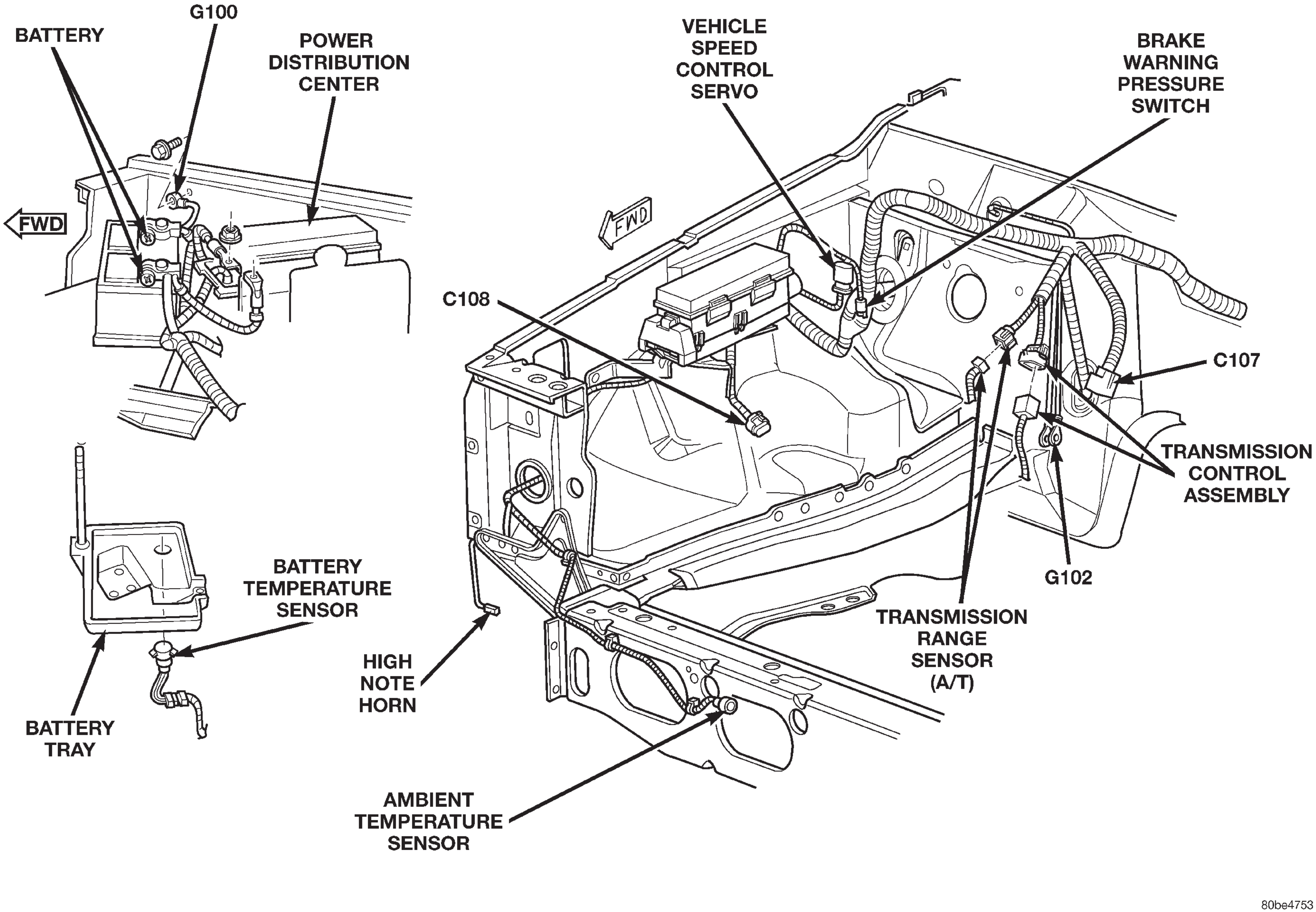


Fig. 13 Right Engine Compartment 4.0L Engine RHD

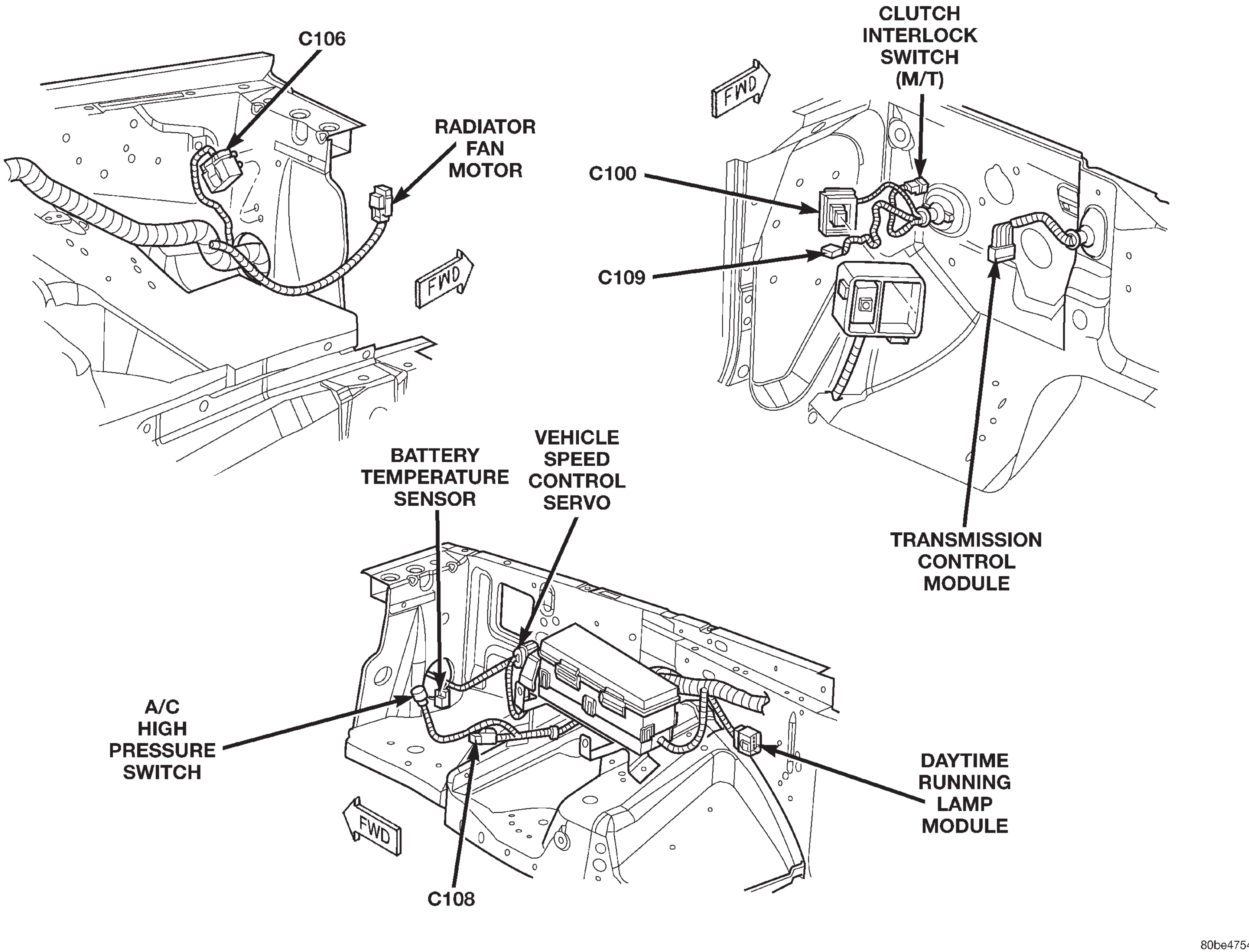


Fig. 14 Engine Compartment Auxiliary Views 4.0L Engine LHD

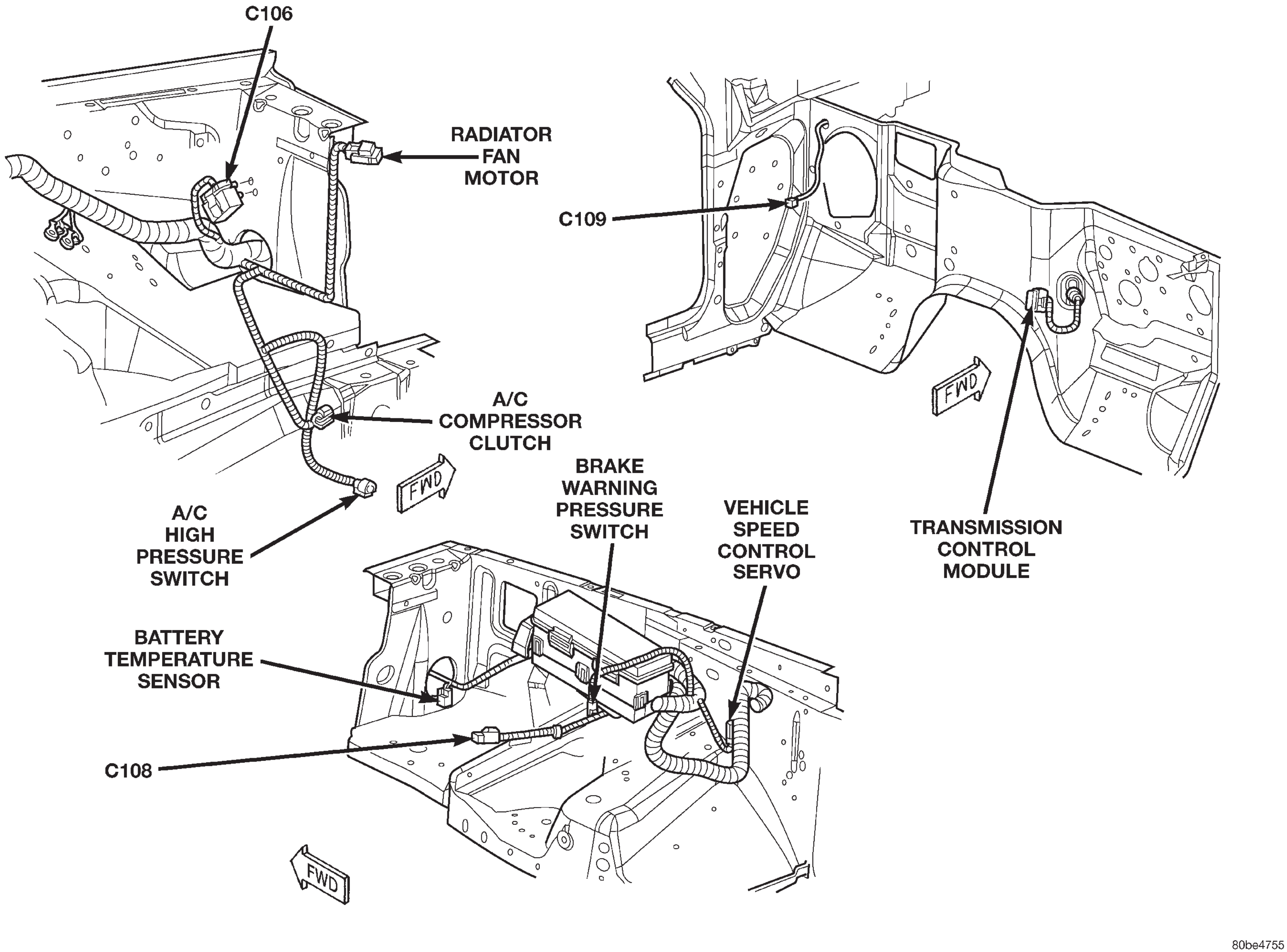


Fig. 15 Engine Compartment Auxiliary Views 4.0L Engine RHD

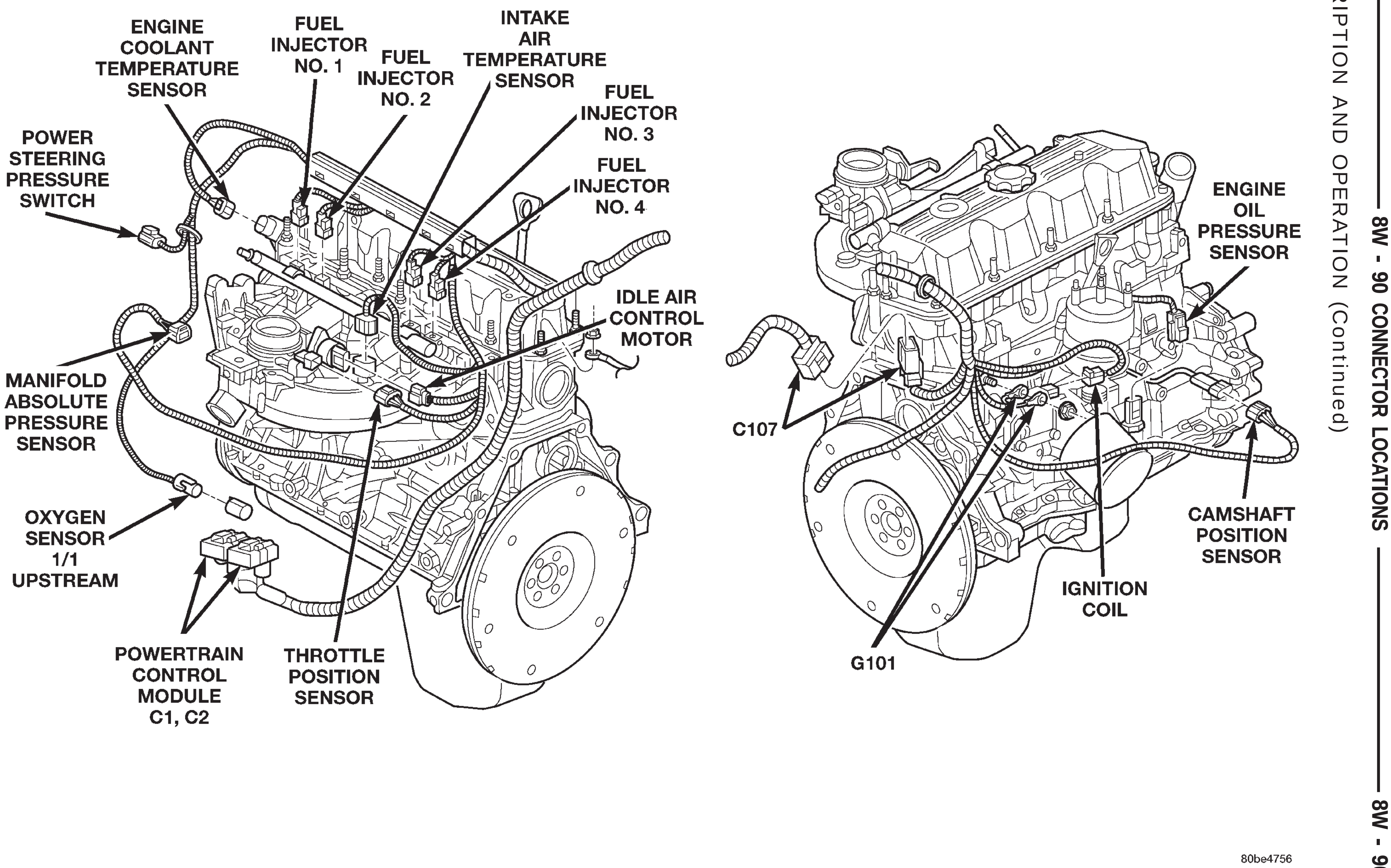


Fig. 16 2.5L Engine

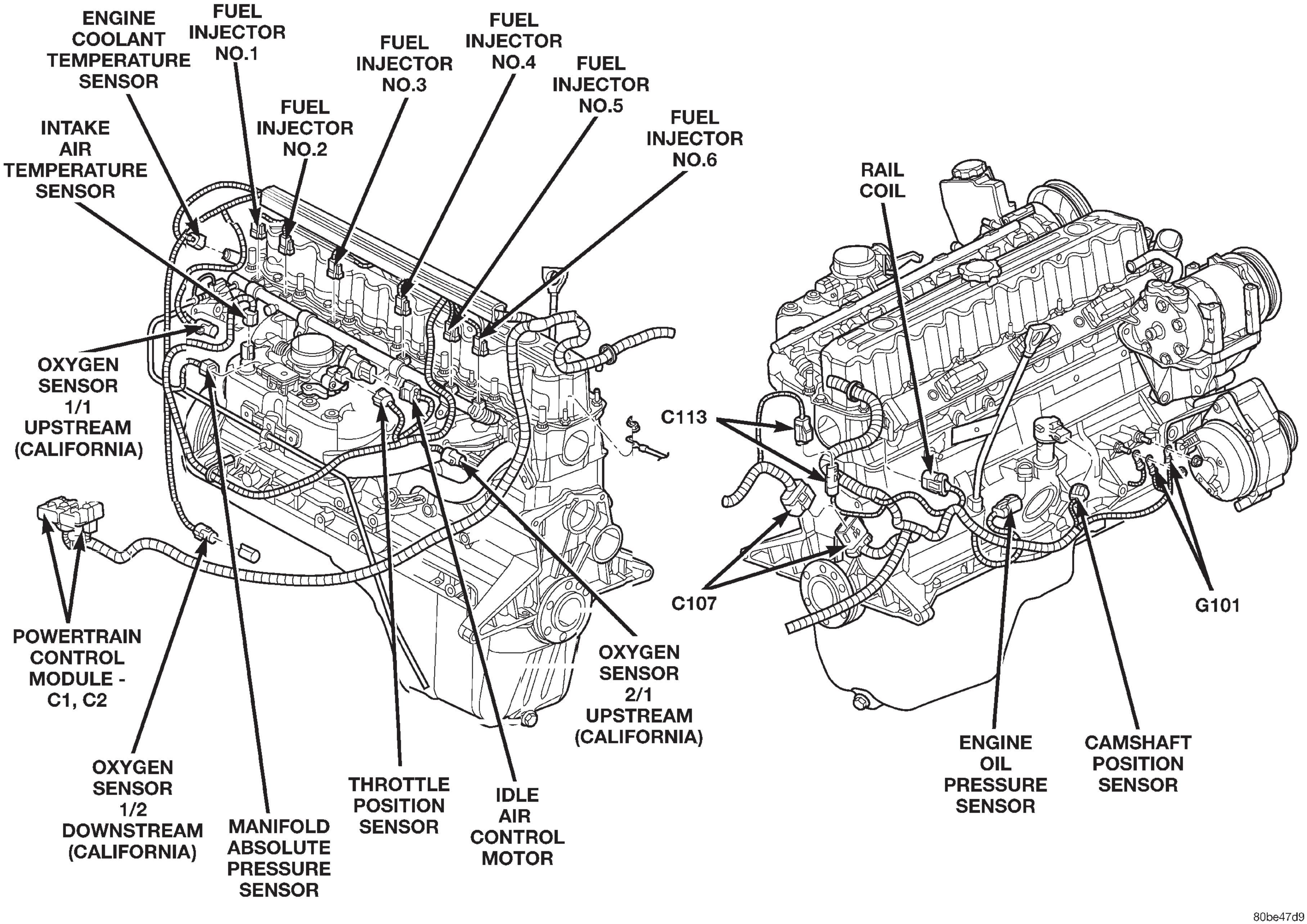


Fig. 17 4.0L Engine

DESCRIPTION AND OPERATION (Continued)

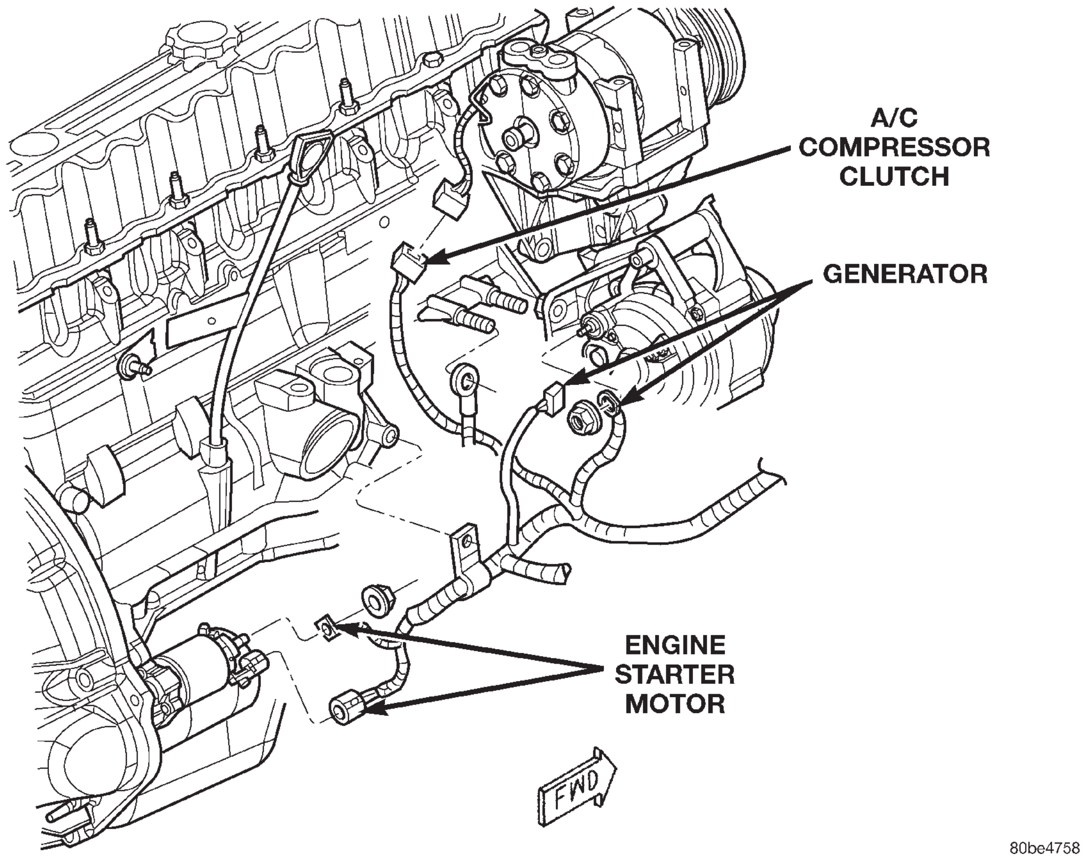


Fig. 18 4.0L Engine

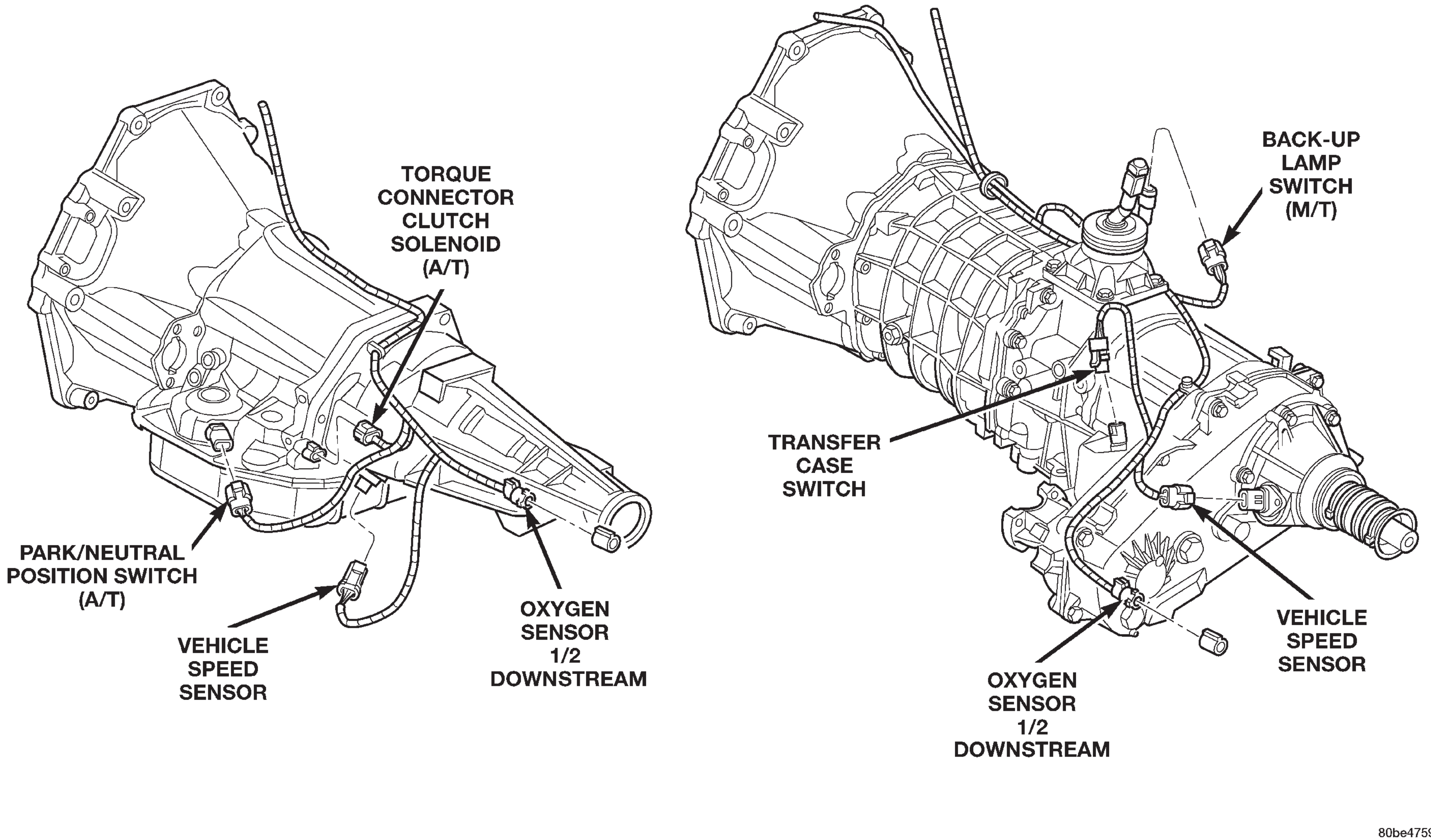


Fig. 19 Transmission Connectors 2.5L Engine

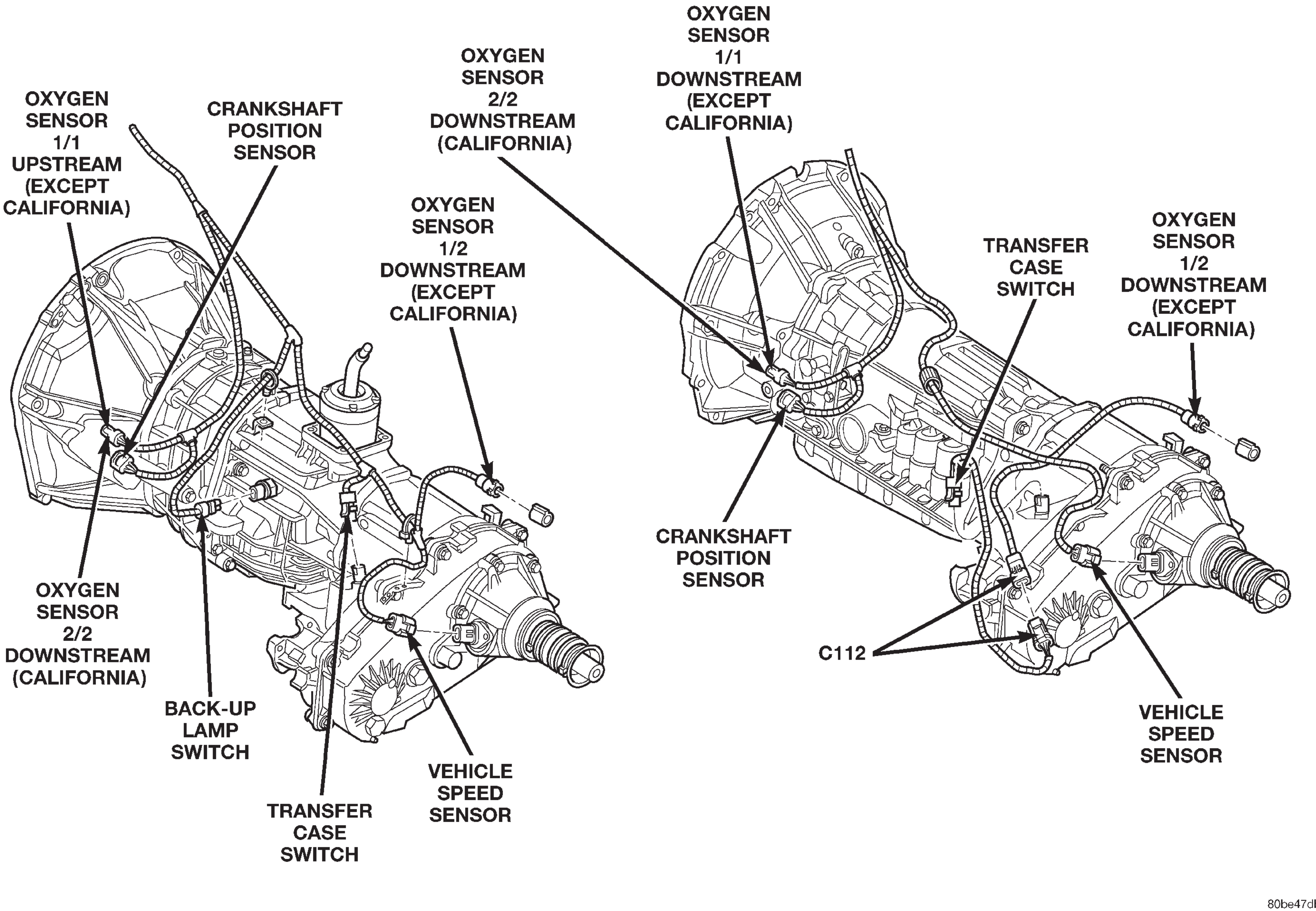


Fig. 20 Transmission Connectors 4.0L Engine

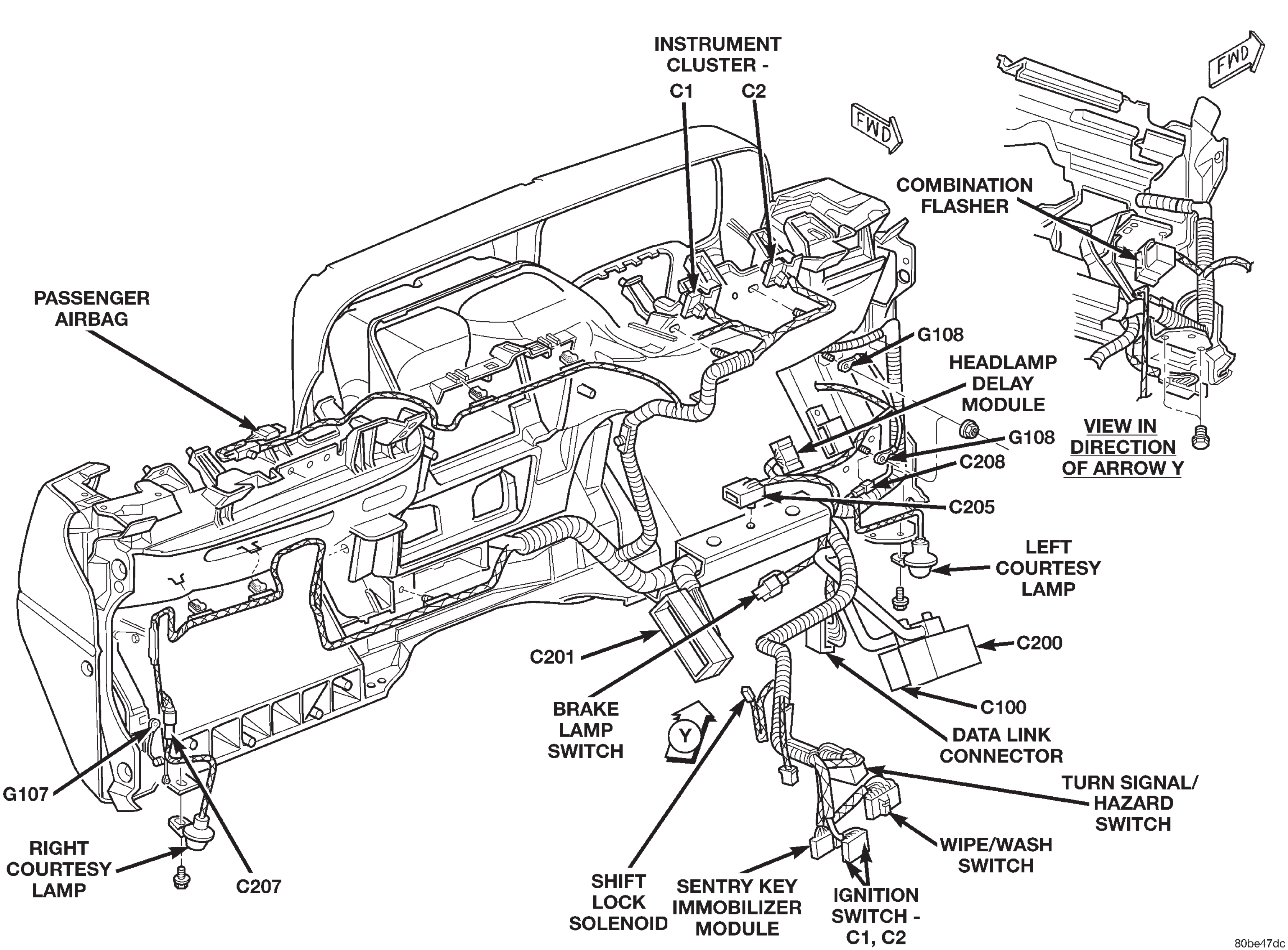


Fig. 21 Instrument Panel LHD

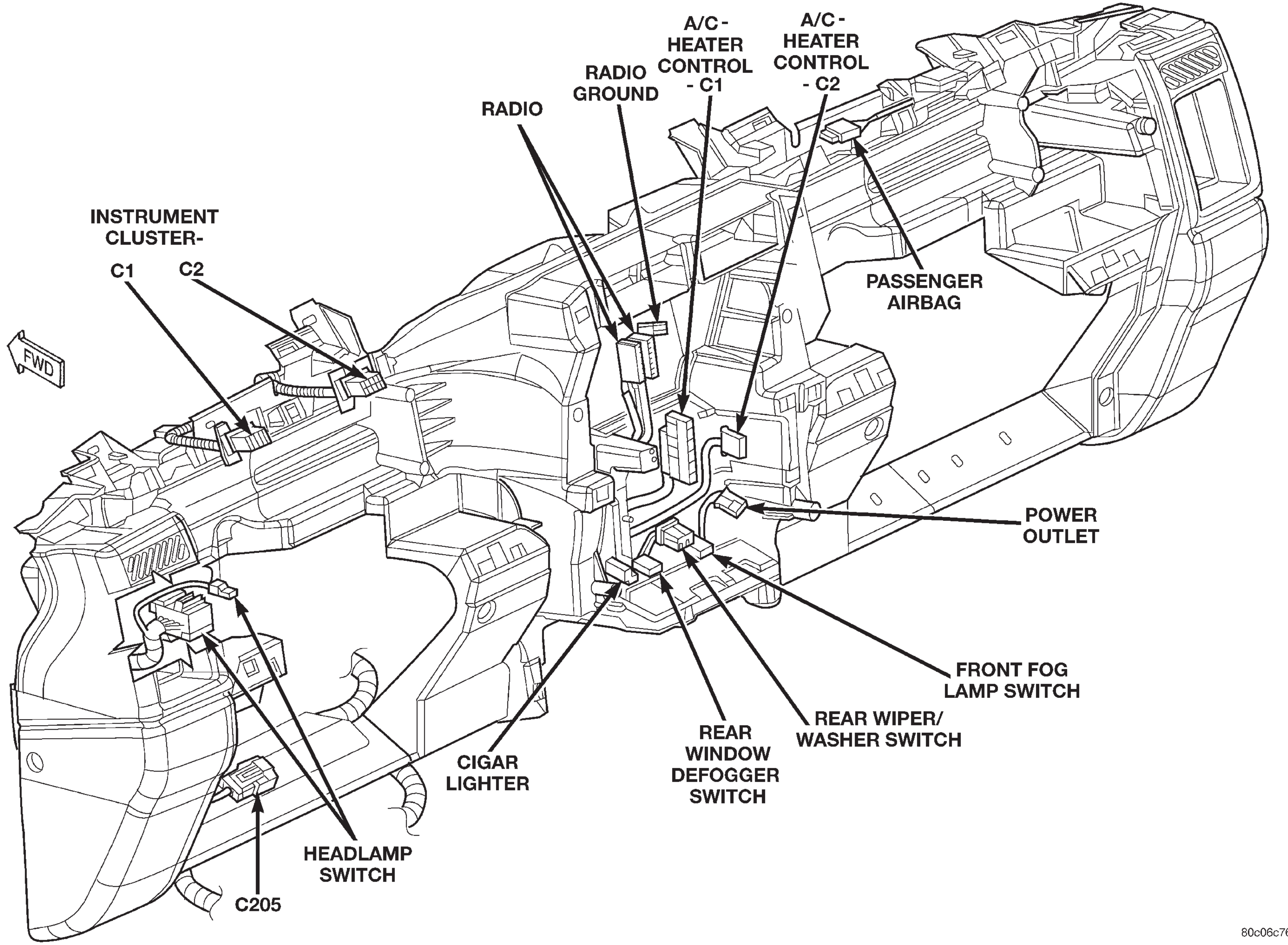


Fig. 22 Instrument Panel LHD

DESCRIPTION AND OPERATION (Continued)

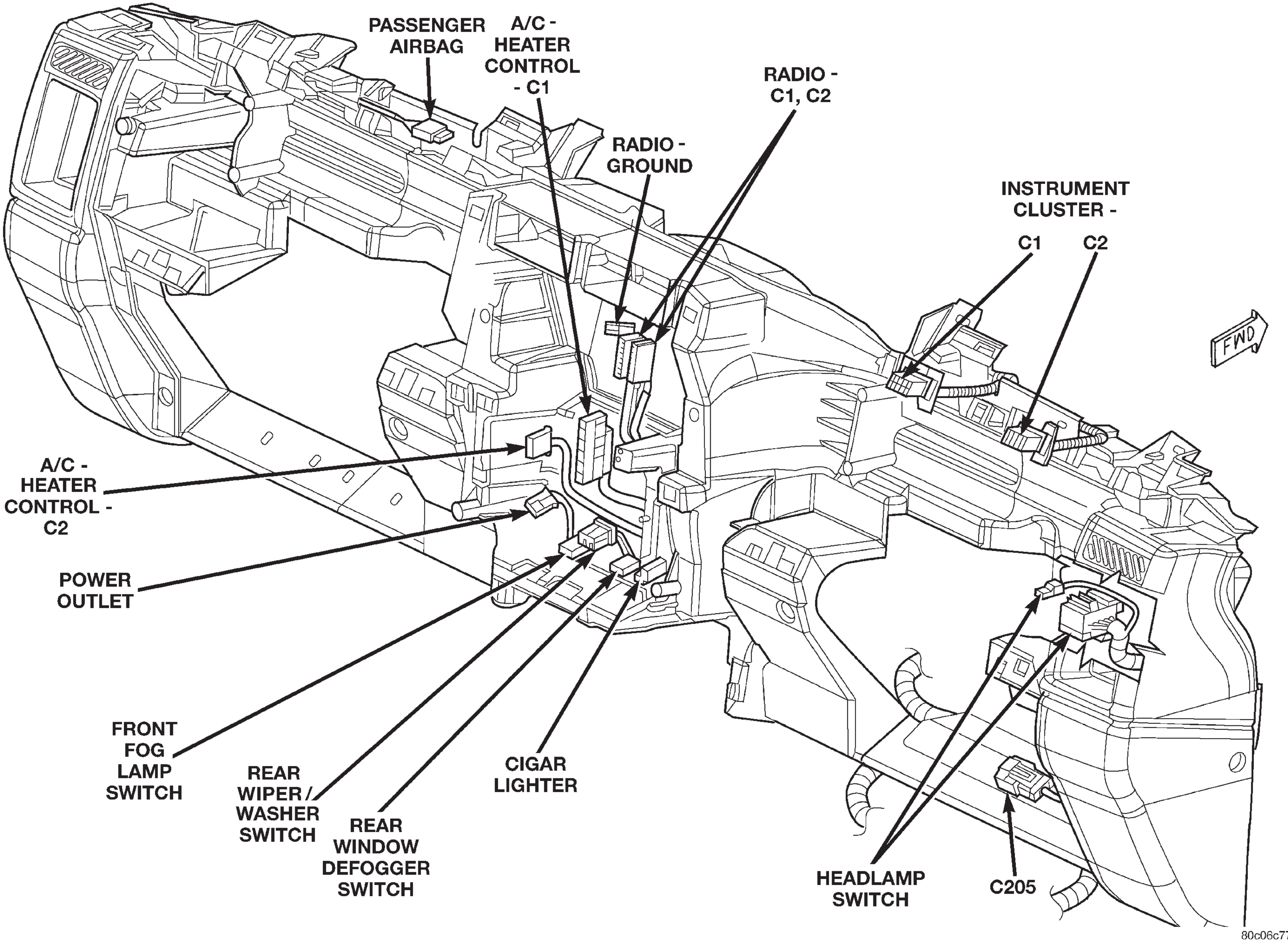


Fig. 23 Instrument Panel RHD

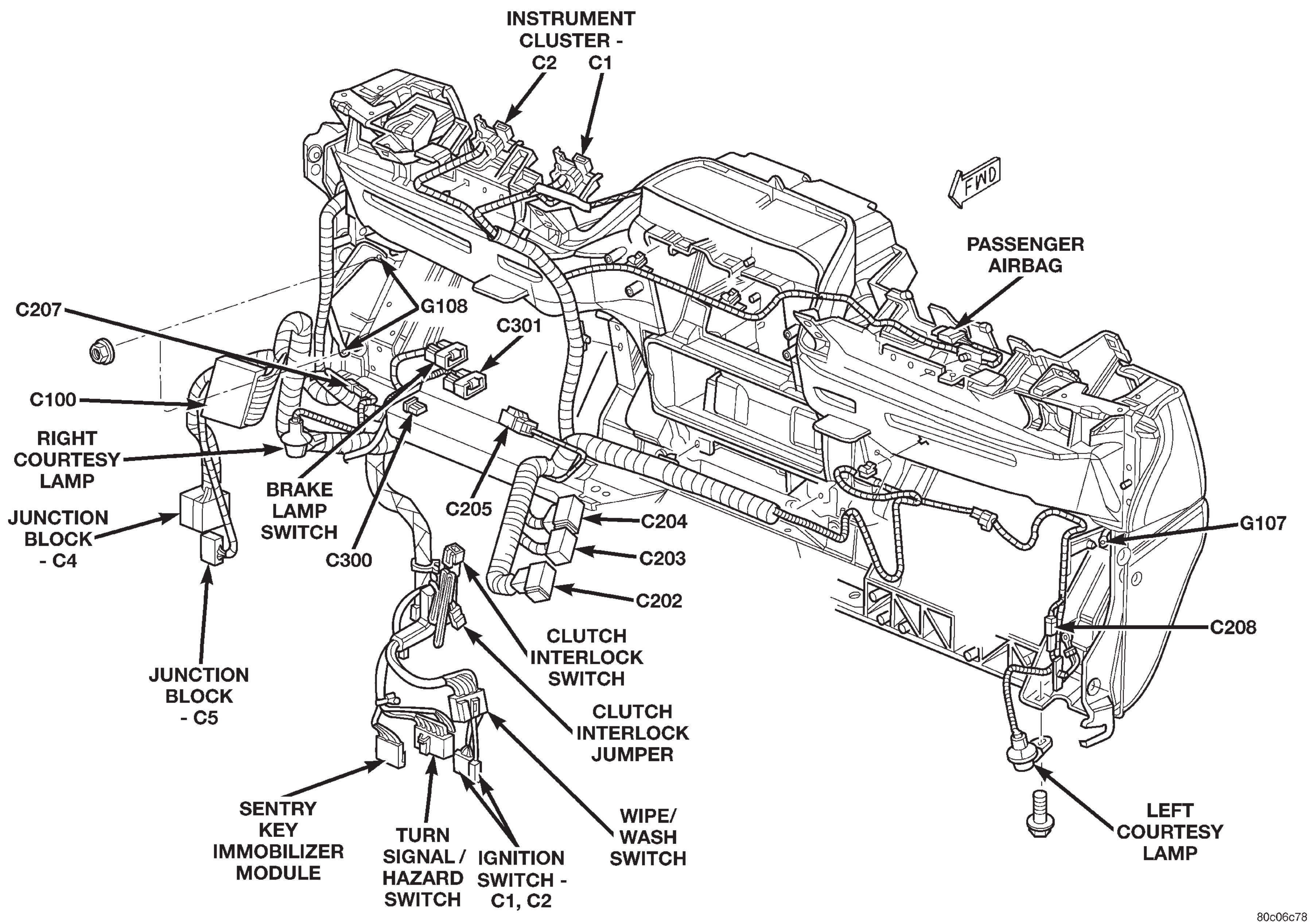


Fig. 24 Instrument Panel RHD

DESCRIPTION AND OPERATION (Continued)

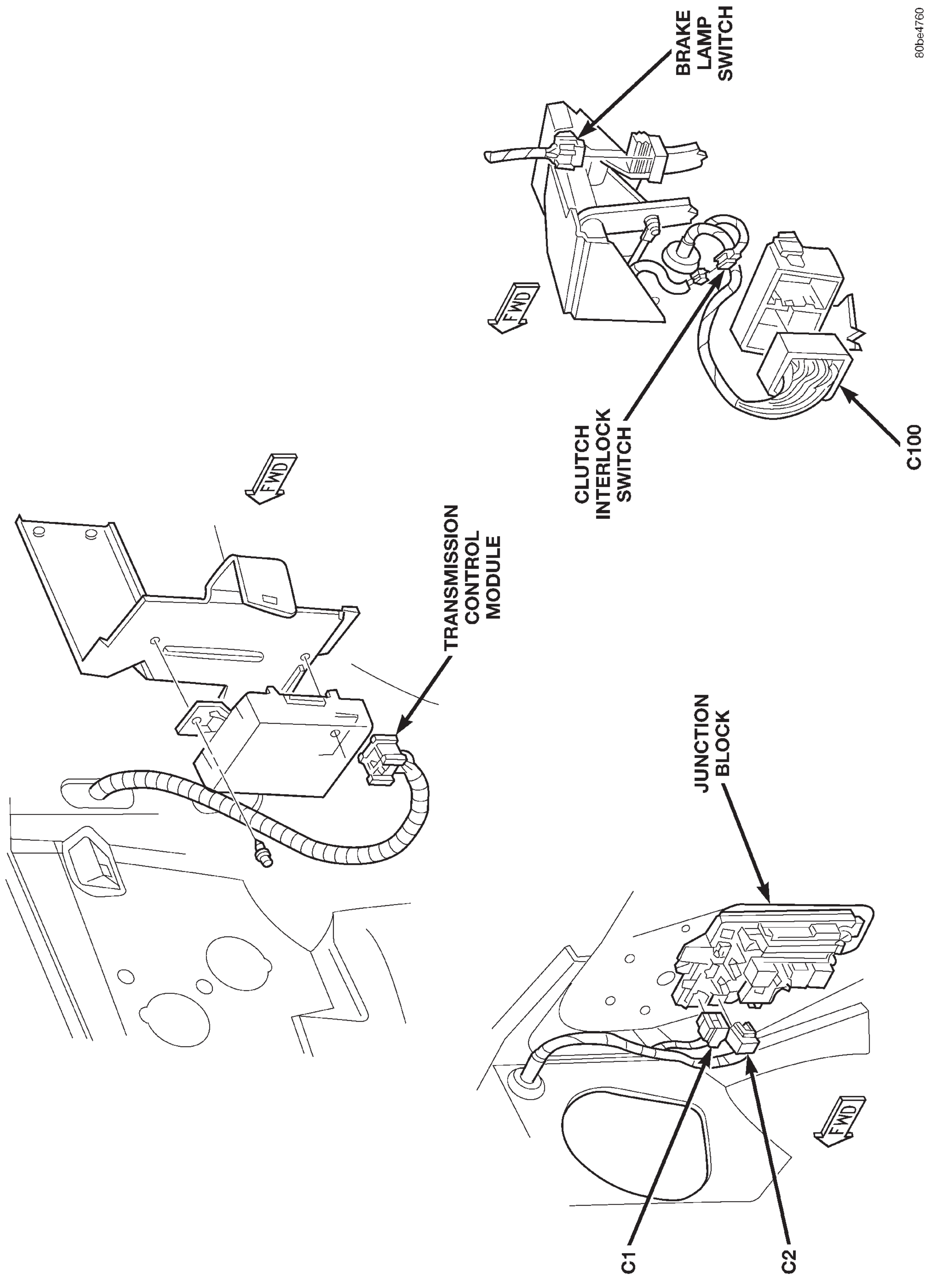


Fig. 25 Under Dash Components

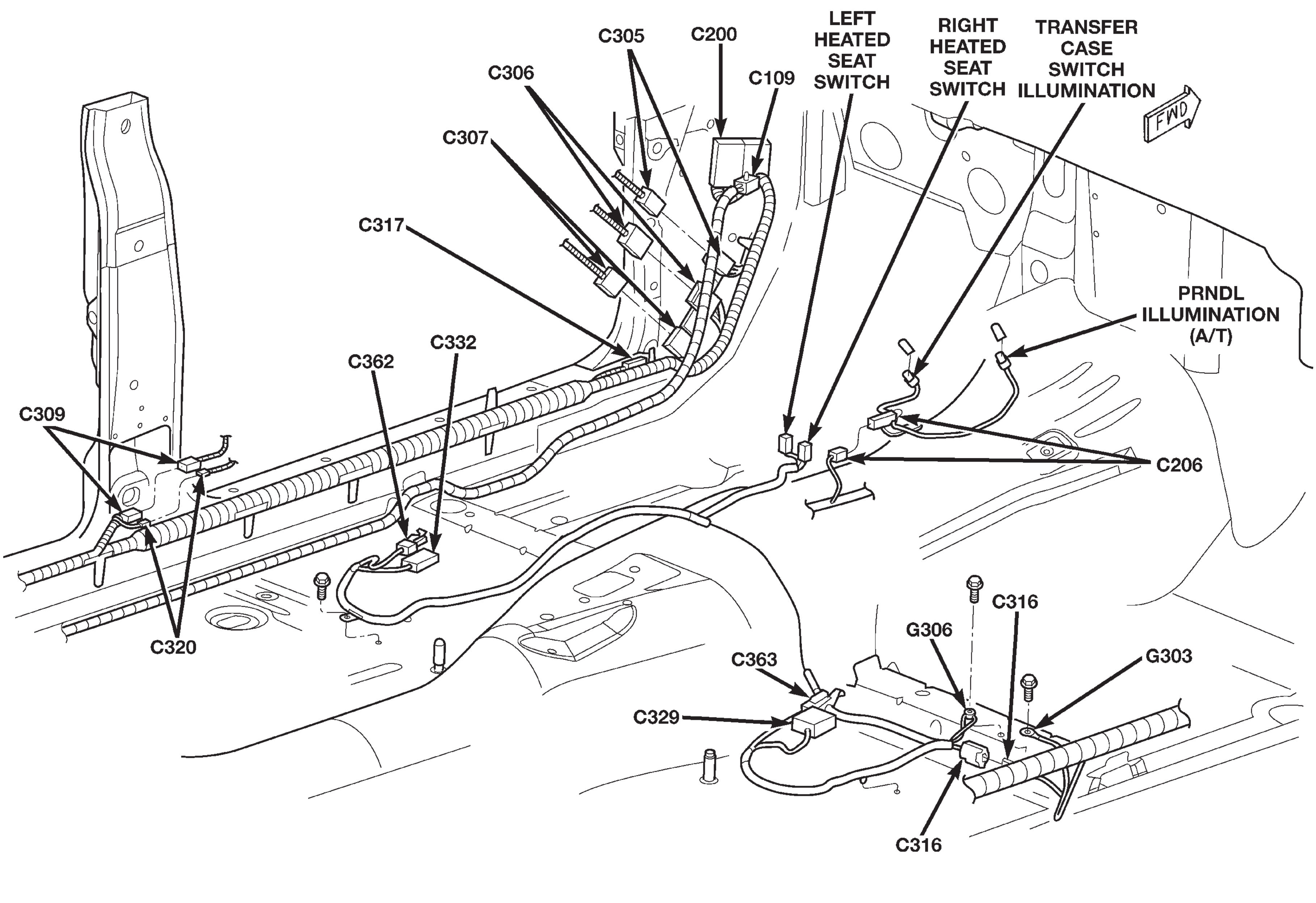


Fig. 26 Left Side Body LHD

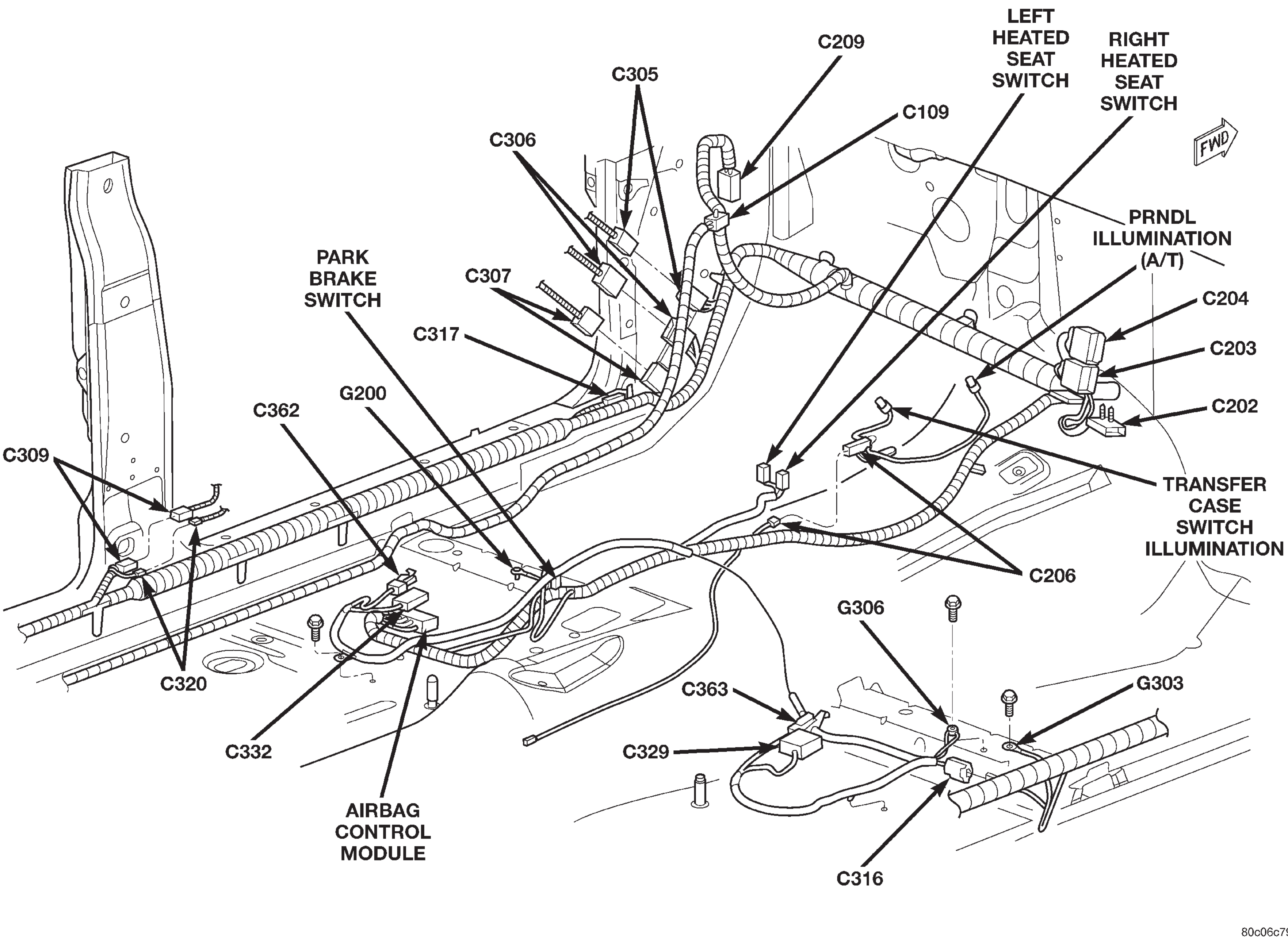


Fig. 27 Left Side Body RHD

DESCRIPTION AND OPERATION (Continued)

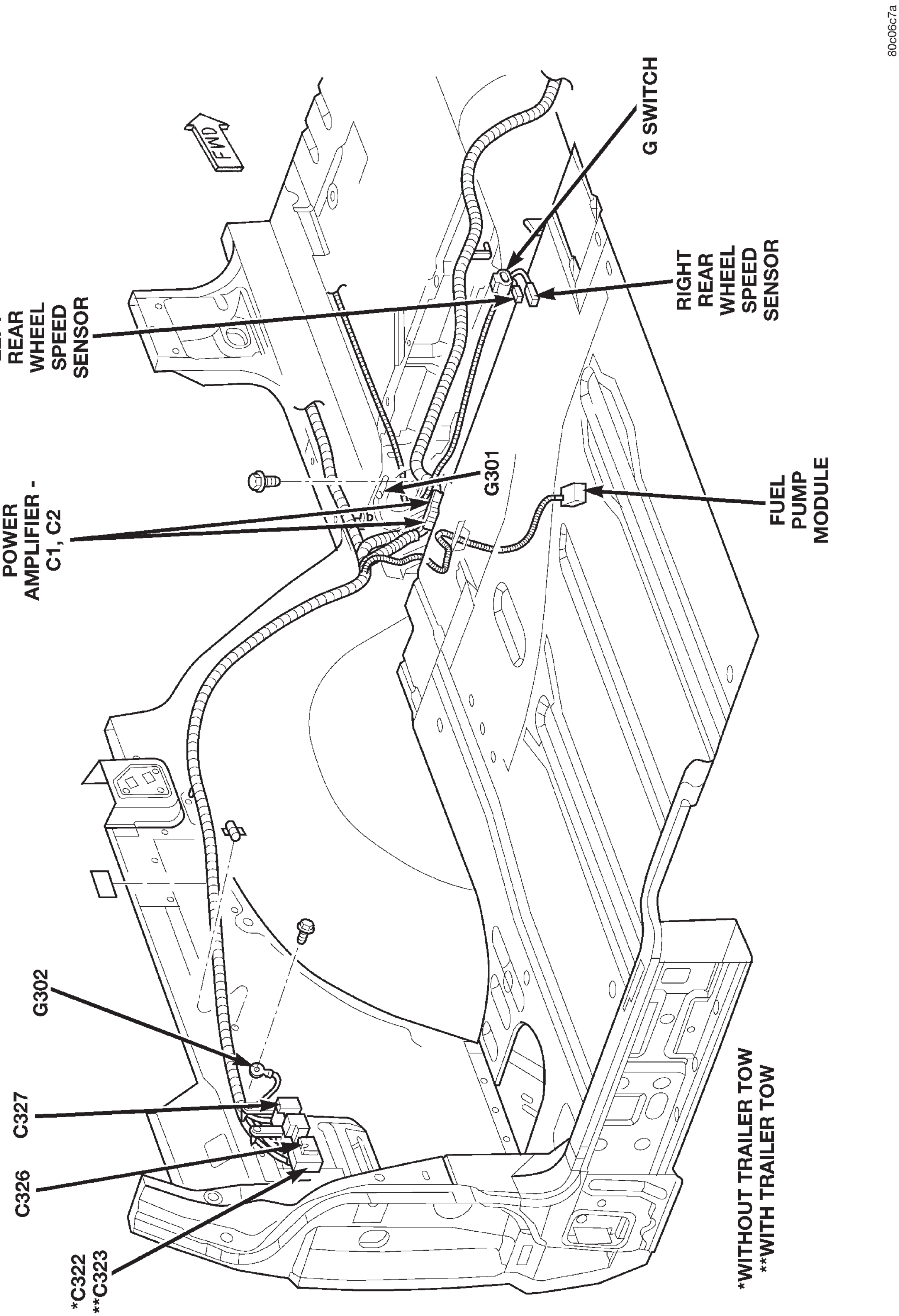


Fig. 28 Left Rear Body

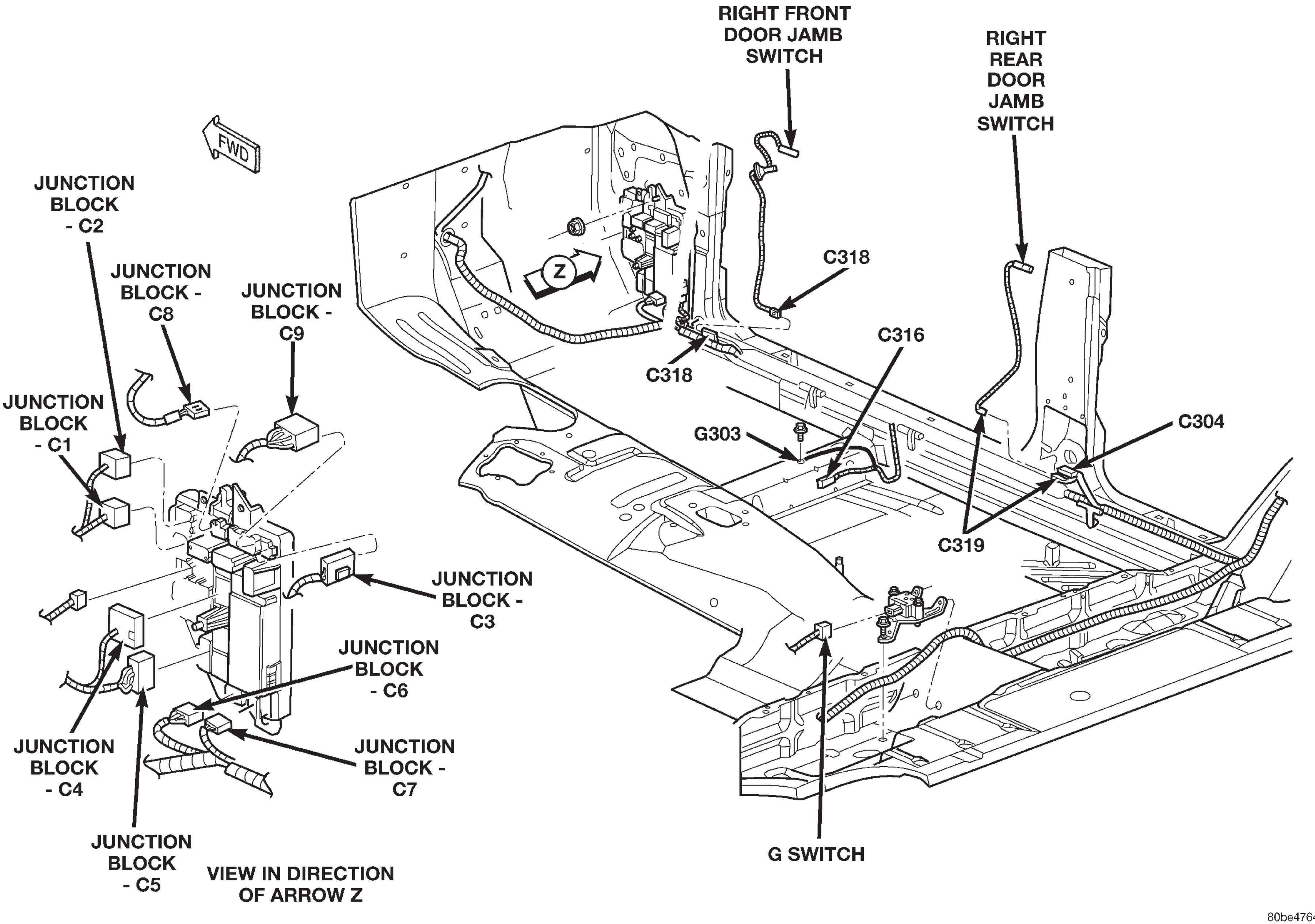


Fig. 29 Right Side Body and Junction Block

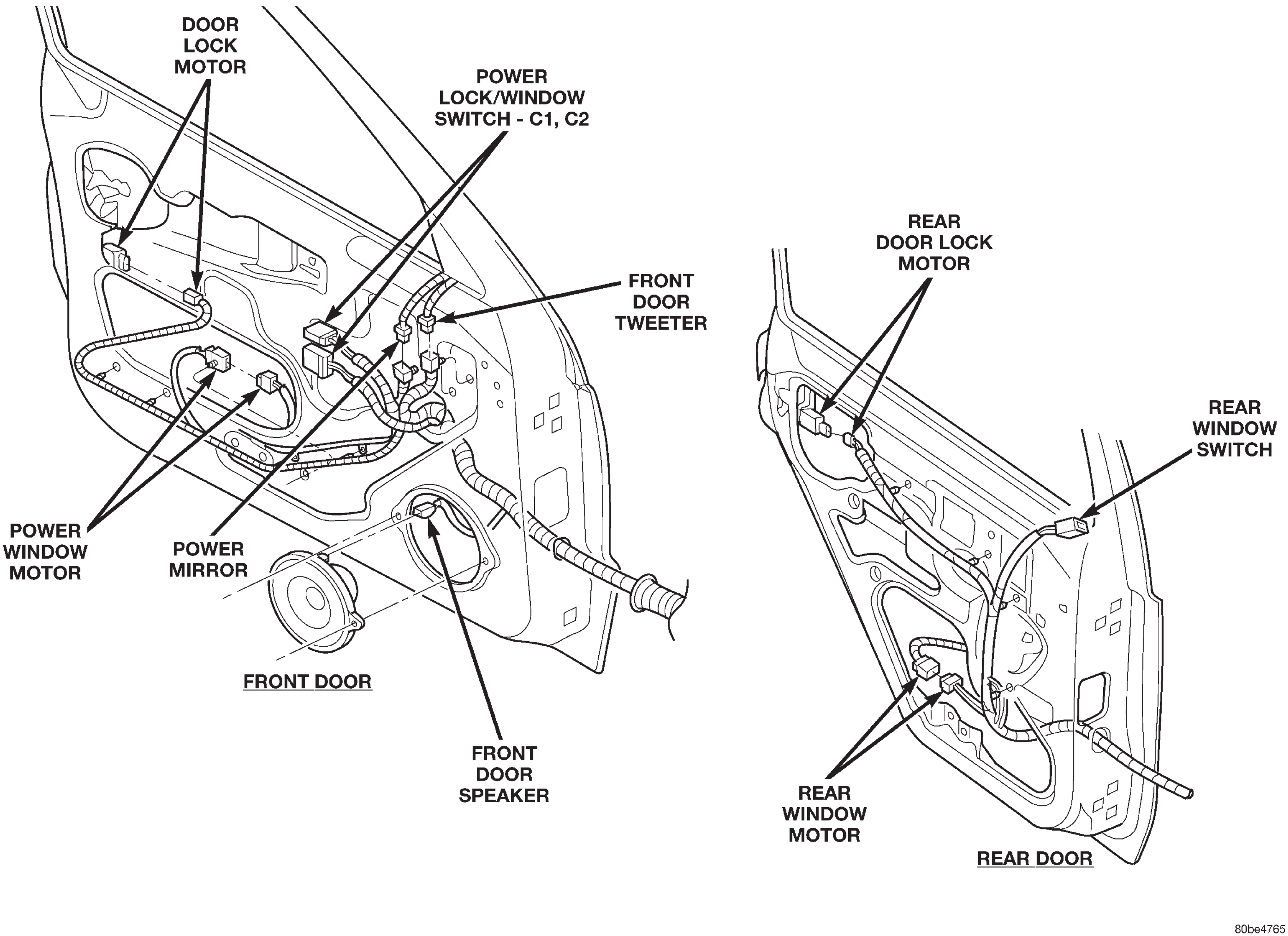


Fig. 30 Front and Rear Doors (Left Side Shown, Right Side Similar)

DESCRIPTION AND OPERATION (Continued)

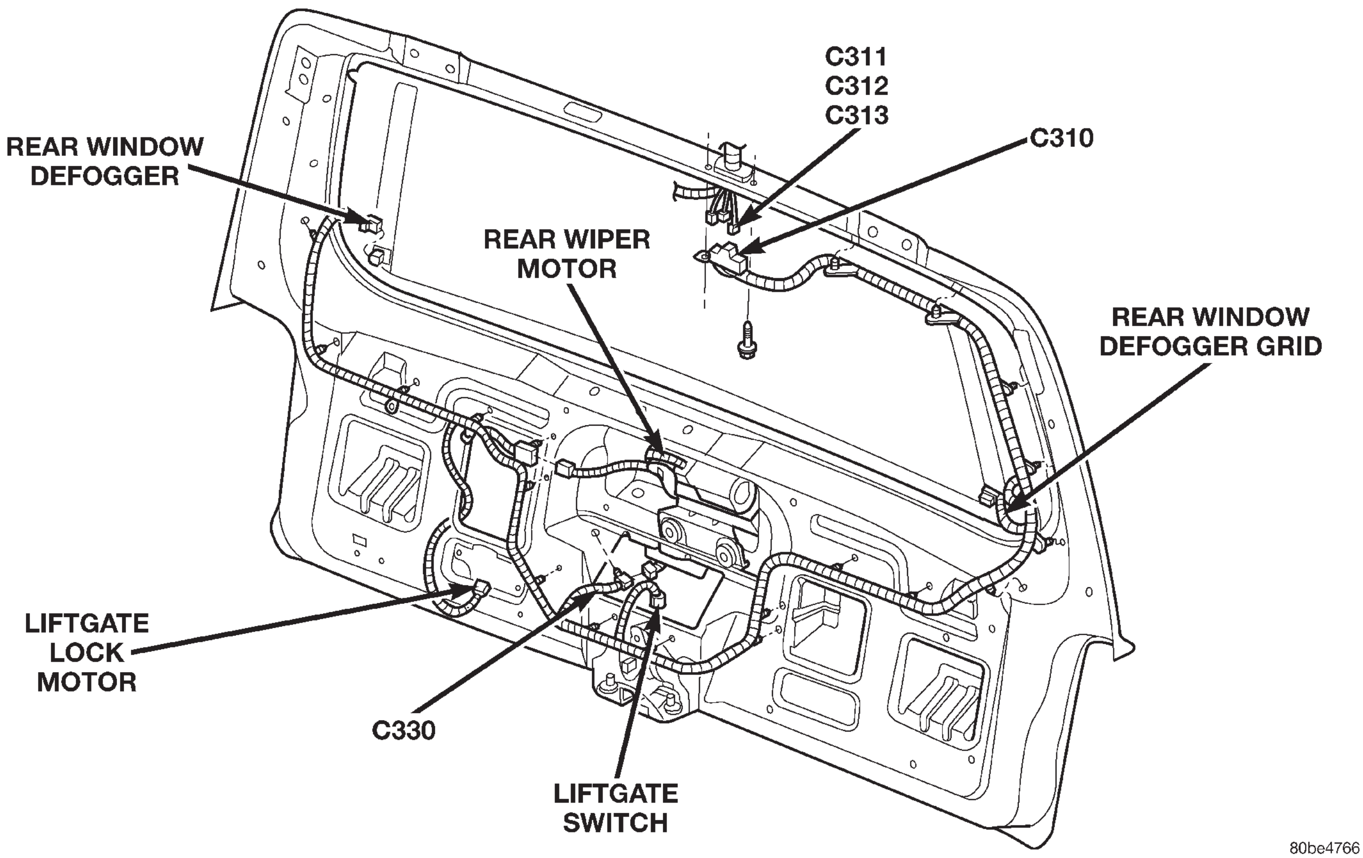


Fig. 31 Liftgate

DESCRIPTION AND OPERATION (Continued)

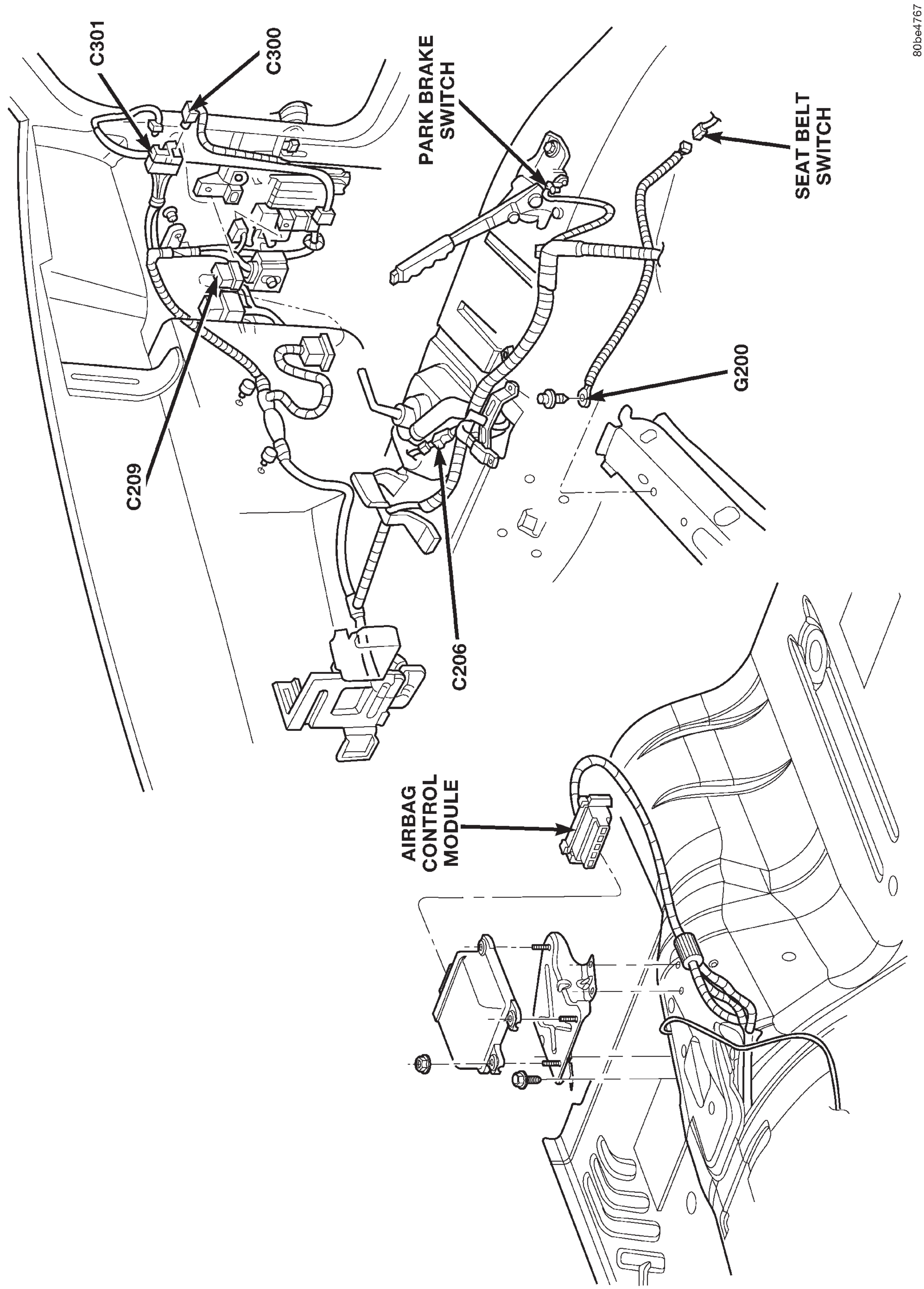


Fig. 32 Center Console LHD

DESCRIPTION AND OPERATION (Continued)

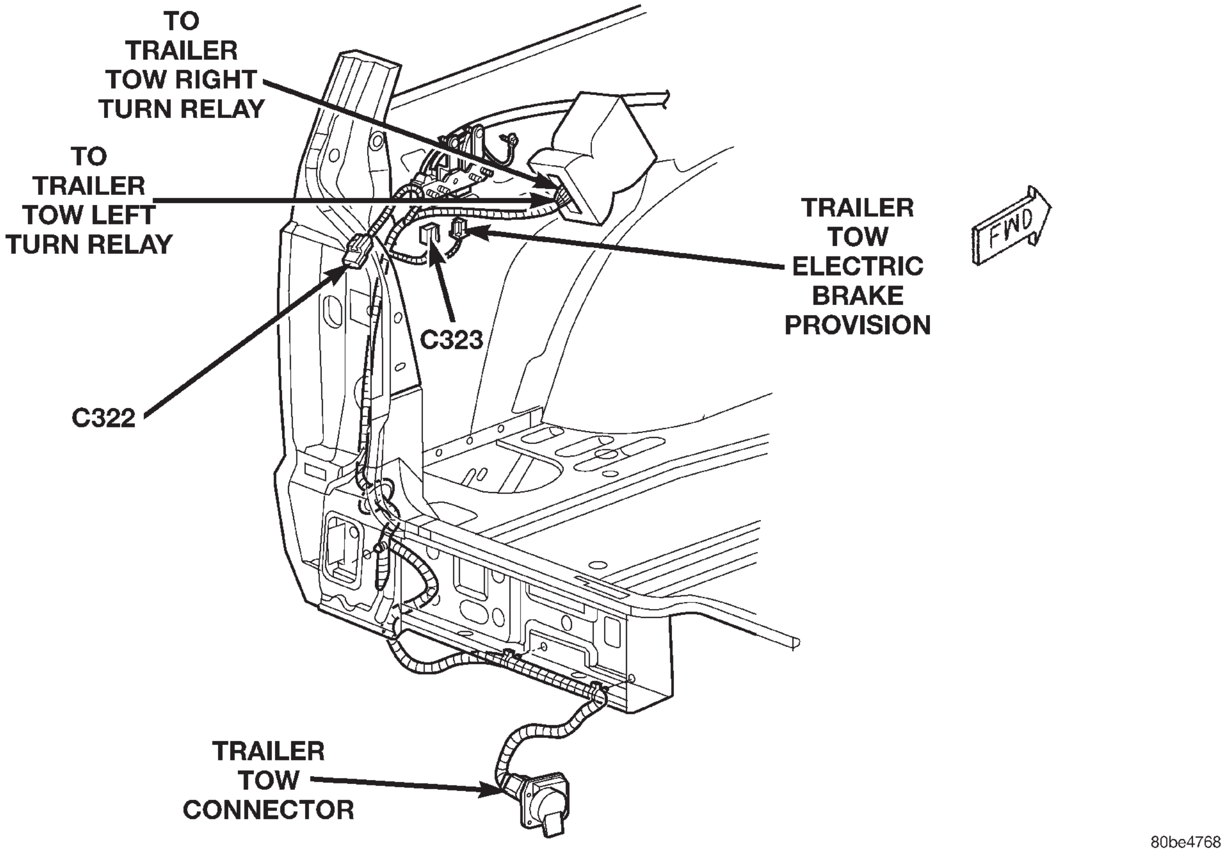


Fig. 33 Trailer Tow

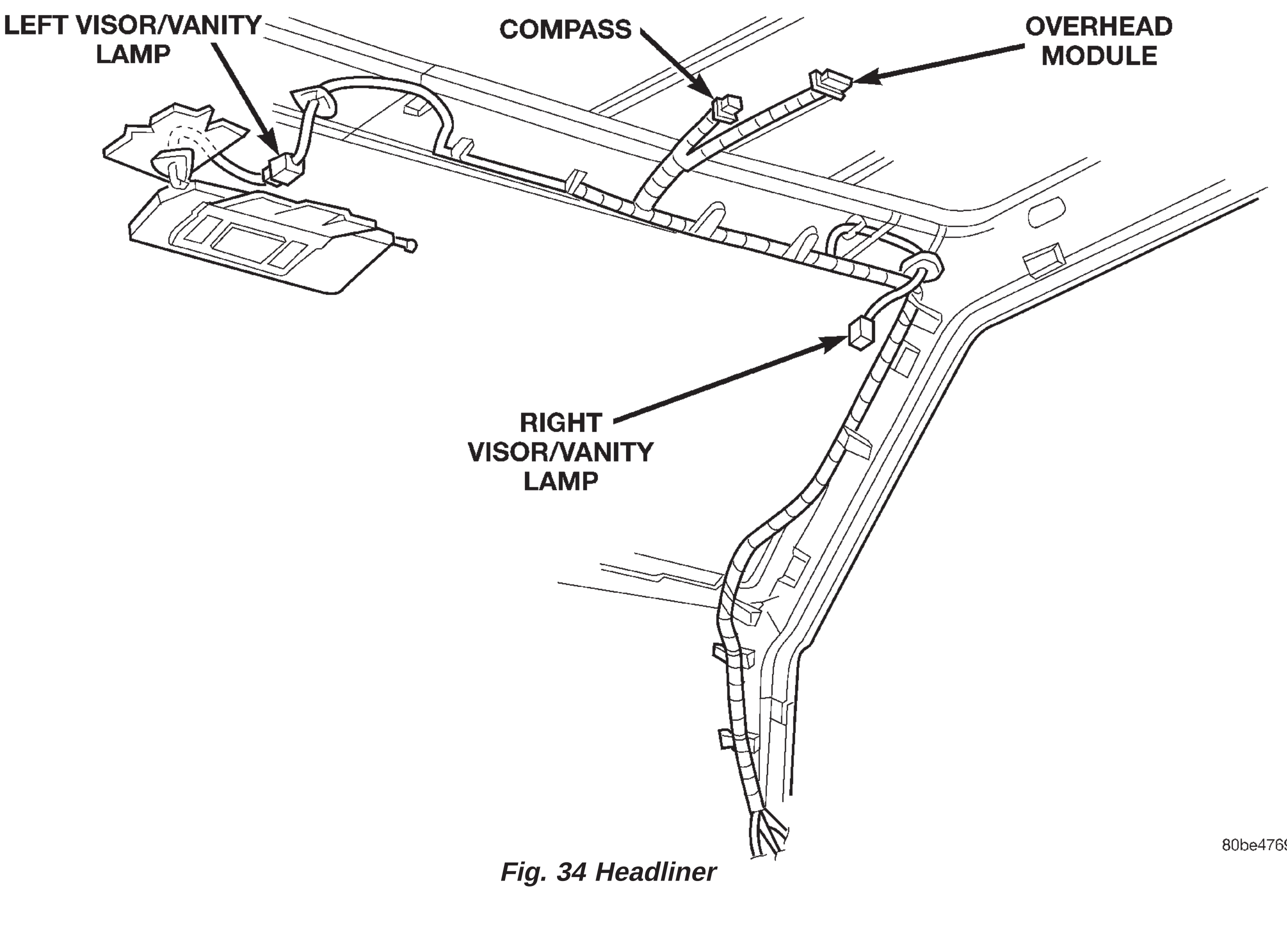


Fig. 34 Headliner

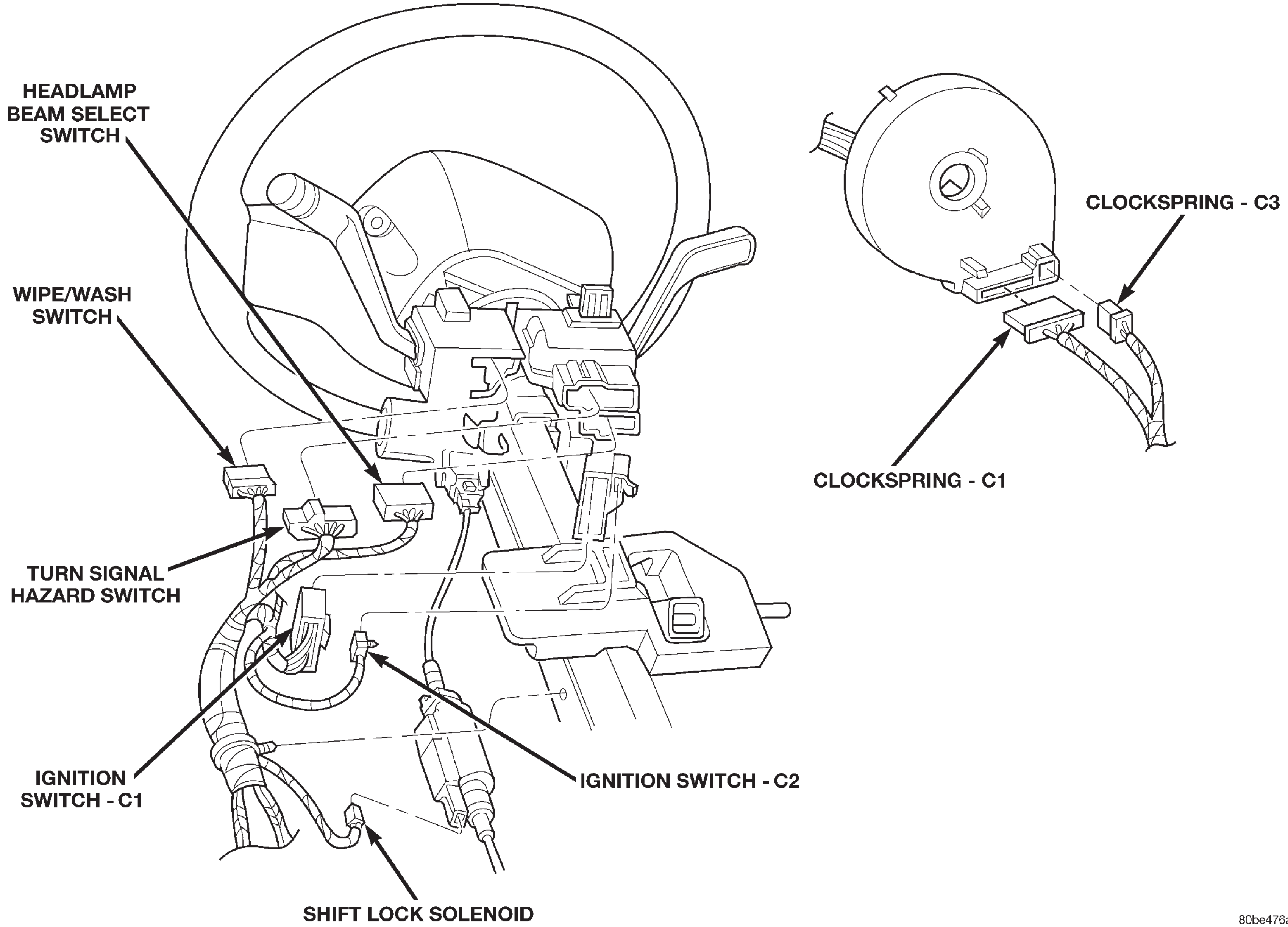


Fig. 35 Steering Column

8W-95 SPLICE LOCATIONS

DESCRIPTION AND OPERATION

INTRODUCTION

This section provides illustrations identifying the general location of the splices in this vehicle. A splice index is provided. Use the wiring diagrams in each section for splice number identification. Refer to the index for proper splice number.

SPLICE LOCATIONS

For splices that are not shown in the figures in this section a N/S is placed in the Fig. column.

Splice Number	Location	Fig.
S100	Near T/O for Right Headlamp	9
S101	Near T/O for Right Headlamp	9
S102	Near T/O for Right Headlamp	9
S103	Near T/O for Left Headlamp	9
S104	Near T/O for Left Headlamp	9
S105	Near T/O for Left Headlamp	9
S106	Near T/O for Left Headlamp	9
S107 (2.5L)	Near T/O for G101	11
S107 (4.0L)	Near T/O for Fuel Injector NO. 6	10
S108 (2.5L)	Near Fuel Injector T/O's	11
S108 (4.0L)	Near T/O for Ignition Coil Pack	10
S108 (4.0L) (California)	Near Fuel Injector T/O's	10
S109 (2.5L)	Near Fuel Injector T/O's	11
S109 (4.0L)	Near Fuel Injector T/O's	10
S110	Near Fuel Injector T/O's	11
S111 (2.5L)	Near T/O for G101	11
S111 (4.0L)	Near Fuel Injector T/O's	10
S112	Near Fuel Injector T/O's	10
S113 (2.5L)	Near T/O for Fuel Injector NO. 3	11
S113 (4.0L)	Between Fuel Injector NO. 2 and Fuel Injector NO. 3 T/O's	10
S114 (2.5L)	Near T/O for Fuel Injector NO. 2	11
S114 (4.0L)	Between Fuel Injector NO. 2 and Fuel Injector NO. 3 T/O's	10
S115 (2.5L)	Near T/O for Crankshaft Position Sensor	11
S115 (4.0L)	Near T/O for Idle Air Control Motor	10

Splice Number	Location	Fig.
S117	Near T/O for Powertrain Control Module - C2	N/S
S118	In T/O for Generator Terminal	N/S
S119 (2.5L)	In T/O for Engine Oil Pressure Sensor	11
S119 (4.0L)	Near Fuel Injector T/O's	10
S120 (A/T) (2.5L)	Near Fuel Injector T/O's	11
S121	Near Fuel Injector T/O's	10
S122	Near T/O for Ignition Coil Pack	10
S123 (4.0L) (California)	Near T/O for Powertrain Control Module - C2	N/S
S130	Near Grommet T/O for Junction Block - C2	3, 4, 7, 8
S131	Near Grommet T/O for Junction Block - C2	3, 4, 7, 8
S132 (LHD) (2.5L)	Near Grommet T/O for Junction Block - C2	7
S132 (LHD) (4.0L)	Near T/O for A/C Low Pressure Switch	3
S132 (LHD) (M/T ABS)	Near T/O for Underhood Lamp	3
S132 (RHD)	Near Grommet T/O for C100	4, 8
S133 (DRL)	Near Grommet T/O for Junction Block - C2 or A/C Low Pressure Switch	3, 7
S133 (LHD)	Near Grommet T/O for Front Wiper Motor	1, 5
S133 (RHD)	Near T/O for A/C Low Pressure Switch	2, 6
S134 (LHD)	Near T/O for Underhood Lamp or C107	3
S134 (RHD) (ABS)	Near T/O for Transmission Control Module	2

DESCRIPTION AND OPERATION (Continued)

Splice Number	Location	Fig.
S135 (LHD) (2.5L)	Near T/O for A/C High Pressure Switch	7
S135 (LHD) (4.0L)	Near T/O for C107	3
S135 (LHD) (4.0L) (M/T ABS)	Near T/O for Right Front Wheel Speed Sensor	3
S135 (RHD)	Near T/O for Underhood Lamp	4, 8
S135 (RHD) (ABS)	Near Grommet T/O for C100	4, 8
S136	Near T/O for C107	3
S138 (2.5L)	Near Grommet T/O for Front Wiper Motor	5, 6
S138 (4.0L)	Near T/O for Transmission Control Module or C107	1, 2
S139 (LHD) (A/T)	Near T/O for Brake Warning Pressure Switch	1
S139 (LHD)(M/T ABS)	Near Grommet T/O for C100	1
S139 (RHD)	Near T/O for A/C Low Pressure Switch	2
S140	Near T/O for Transmission Control Module	1, 2
S141 (LHD)	Near Grommet T/O for Front Wiper Motor	1
S141 (RHD)	Near T/O for C107	2, 6
S142 (4.0L LHD)	Near Grommet T/O for Front Wiper Motor	1
S142 (4.0L RHD)	Near Grommet T/O for Transmission Control Module	4
S143 (LHD)	Near Grommet T/O for C100	1, 5
S143 (RHD)	Near T/O for C107	4, 8
S144 (LHD)	Near Grommet T/O for C100	1
S144 (RHD)	Near T/O for G106	2
S144 (RHD) (ABS)	Near T/O for A/C Low Pressure Switch	2
S145 (LHD)	Near Grommet T/O for C100	1
S145 (RHD)	Near T/O for G106	2
S145 (RHD) (ABS)	Near T/O for A/C Low Pressure Switch	2
S158	Near T/O for Left Headlamp	9
S159	Near Grommet T/O for Junction Block - C2	3, 4, 7, 8

Splice Number	Location	Fig.
S161 (A/T)	Near T/O for Vehicle Speed Sensor	11
S166	Near T/O for Power Distribution Center	3, 7
S168	Near T/O for C107	5, 6
S200	In T/O for Headlamp Switch	12, 13
S201 (LHD)	Near T/O for C200	12
S201 (RHD)	Near T/O for Data Link Connector	13
S203	In T/O for Brake Lamp Switch	12, 13
S204 (LHD)	In T/O for Brake Lamp Switch	12
S204 (RHD)	Near T/O for Shift Lock Solenoid	13
S205 (LHD)	In T/O for C100	12
S205 (RHD)	Near T/O for C202, C203 and C204	13
S206	In Lower Instrument Panel Trough	12, 13
S207	In Lower Instrument Panel Trough	12, 13
S208 (LHD)	In Lower Instrument Panel Trough	12
S208 (RHD)	Near T/O for Cigar Lighter	13
S209	In Lower Instrument Panel Trough	12, 13
S210	In Lower Instrument Panel Trough	12, 13
S211	In Lower Instrument Panel Trough	12, 13
S212 (LHD)	Between Trough and T/O to Turn Signal/Hazard Switch	12
S212 (RHD)	In Lower Instrument Panel Trough	13
S213	Near T/O to Turn Signal/ Hazard Switch	12, 13
S214 (LHD)	Near T/O for A/C-Heater Control - C1, C2 and G107	12
S214 (RHD)	Near T/O for Instrument Cluster - C1	13
S215 (LHD)	Near T/O for Cigar Lighter	12
S215 (RHD)	Near T/O for A/C-Heater Control - C2	13

DESCRIPTION AND OPERATION (Continued)

Splice Number	Location	Fig.
S216 (LHD)	Near T/O for Instrument Cluster - C2	12
S216 (RHD)	Near T/O for Junction Block -C4 and C5	13
S217 (Police Package)	In Lower Instrument Panel Trough	12
S218 (RHD)	In T/O for C100	13
S219 (LHD)	In T/O for C209	14
S219 (RHD)	Near T/O for Junction Block - C4 and C5	13
S221	Near T/O for Clockspring - C2	N/S
S222	Near T/O for Clockspring - C2	N/S
S225	In T/O for C301	14
S227	In T/O for Headlamp Switch	12, 13
S228	Near T/O for Blower Motor Resistor Block	N/S
S238	In T/O for Combination Flasher	12, 13
S239	In T/O for Combination Flasher	12, 13
S301	In T/O for Power Amplifier	15
S302	Near T/O for Fuel Pump Module	15
S303	Near T/O for C326 and C327	15
S304	Near T/O for G303	16
S305	Under Right Rear Seat	16
S306	Under Right Rear Seat	16
S307 (LHD With Power Amplifier, RHD)	Under Right Rear Seat	16
S307 (LHD Without Power Amplifier)	Under Left Rear Seat	15
S309	Near T/O for C326 and C327	17
S310 (LHD)	Near T/O for C304 and C319	16
S310 (RHD)	Near T/O for C314 and C321	16
S311	Near T/O for C326 and C327	17
S312	Under Left Rear Seat	15

Splice Number	Location	Fig.
S312 (LHD with Power Amplifier, RHD)	Near T/O for C304 and C319	16
S313	Near T/O for C206 at Center Console	N/S
S314	Near T/O for C209	14
S315	Near T/O for C205	14
S316	Near T/O for Power Window Motor	20
S317	Near T/O for Power Window Motor	20
S318	Near T/O for Front Door Speaker	20
S319	Near T/O for Front Door Speaker	20
S320	Near T/O for Front Door Speaker	20
S321	Near T/O for Front Door Speaker	20
S322	Near T/O for Power Window Motor	21
S323	Near T/O for Power Window Motor	21
S324	Near T/O for C320	15
S326	Near T/O for Front Door Speaker	21
S327	Near T/O for Front Door Speaker	21
S328	Near T/O for Front Door Speaker	21
S329	Near T/O for Front Door Speaker	21
S334	Near T/O for Liftgate Switch	22
S335	Near T/O for Trailer Tow Right Turn Relay	18
S336	Near T/O for C322	18
S337	Near T/O for C322	18
S338	Near T/O for C323	18
S339	Near T/O for C323	18
S340	Near Grommet for Trailer Tow Connector	18
S341	In Left Tail Lamp Harness near C321	N/S

DESCRIPTION AND OPERATION (Continued)

Splice Number	Location	Fig.
S342 (With Remote Keyless Entry)	In T/O for Overhead Module	23
S344	In T/O for Overhead Module	23
S345 (With Remote Keyless Entry)	In T/O for Overhead Module	23
S346	In T/O for Overhead Module	23
S347 (With Remote Keyless Entry)	In T/O for Compass	N/S
S347 (Without Remote Keyless Entry)	In T/O for Overhead Module	23

Splice Number	Location	Fig.
S348	In Right Tail Lamp Harness near C322	N/S
S349 (RHD)	In T/O for C209	N/S
S351	Near T/O for C305 and C306	15
S352	In T/O for C300	N/S
S353	Near T/O for C316	19
S354	In T/O for C329	N/S
S355	Near T/O for C329 and C363	19
S356	Near T/O for C316	19
S357	Near T/O for Heated Seat Relay	N/S
S359 (RHD)	Near T/O for C209	N/S
S361	Near T/O for Right Visor/Vanity Lamp	23

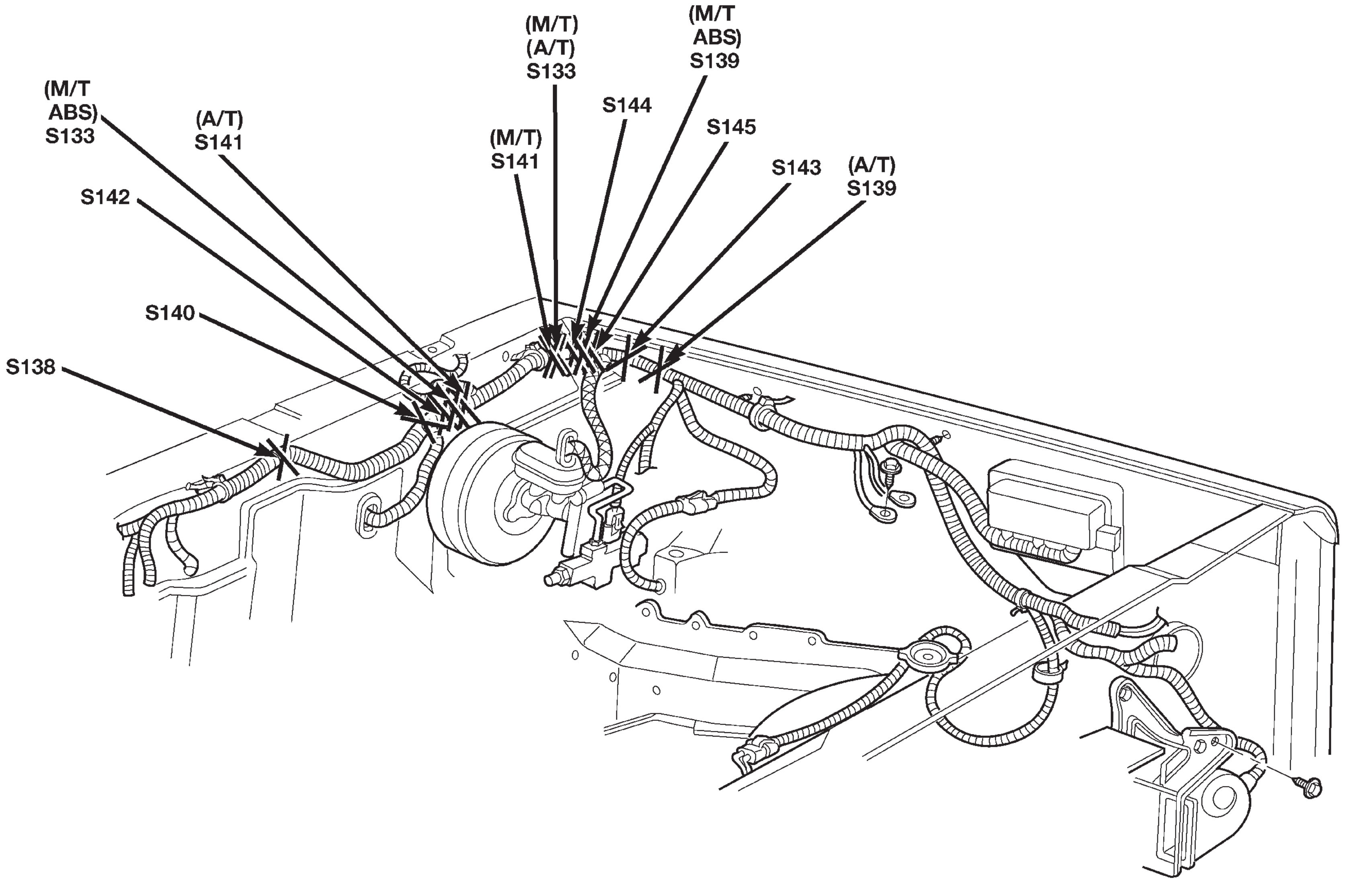


Fig. 1 Left Engine Compartment Splices 4.0L Engine LHD

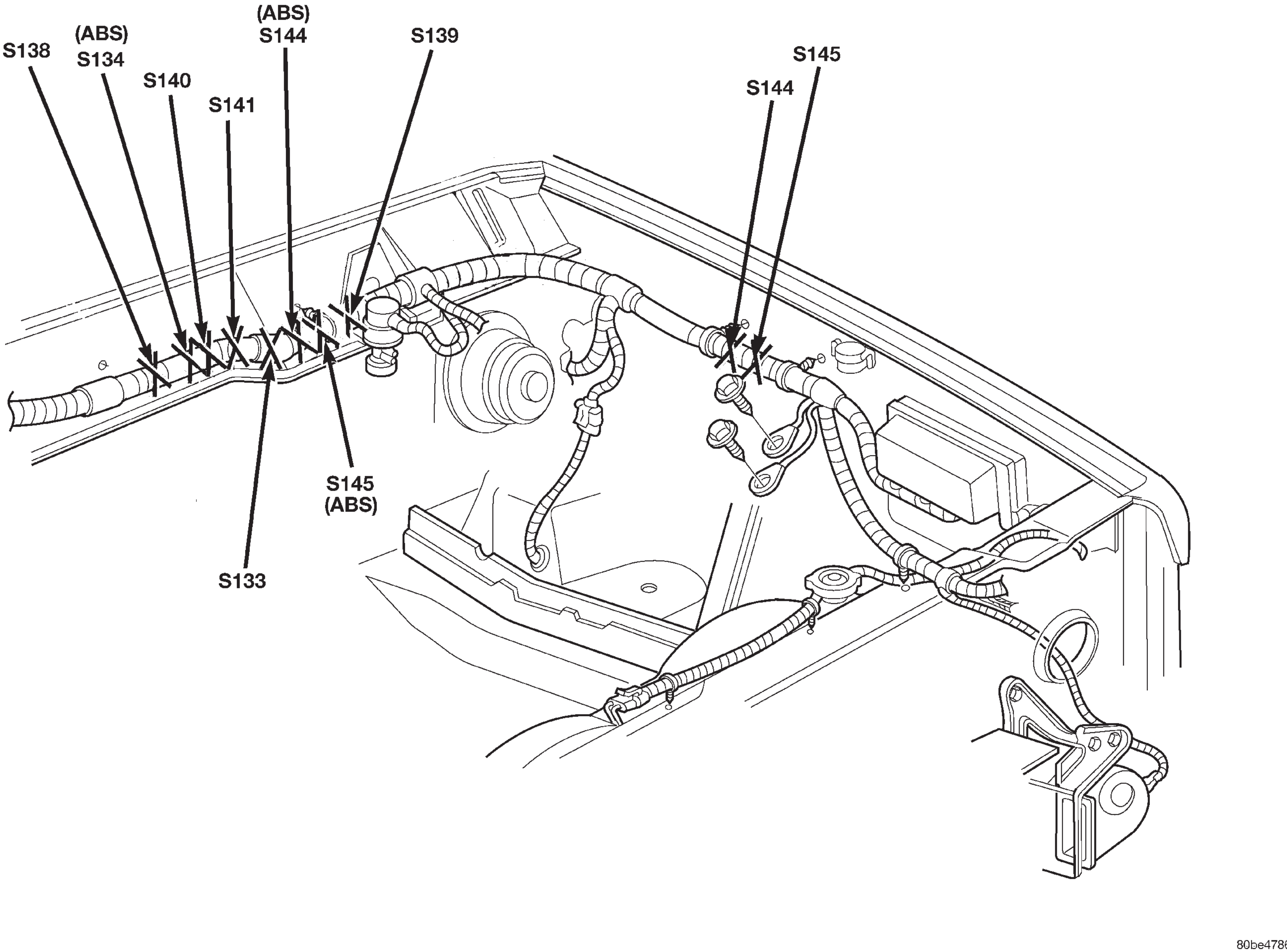


Fig. 2 Left Engine Compartment Splices 4.0L Engine RHD

DESCRIPTION AND OPERATION (Continued)

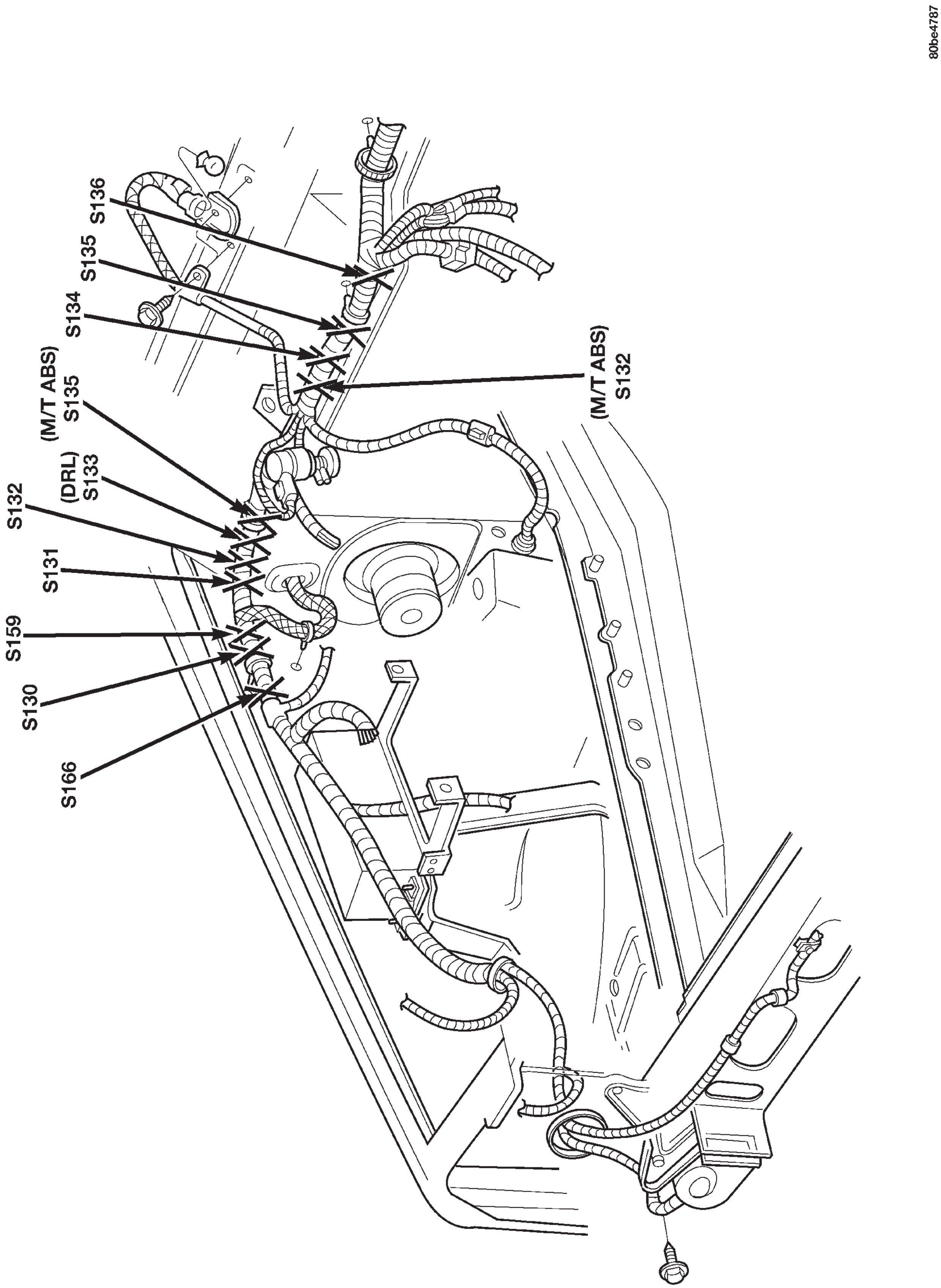


Fig. 3 Right Engine Compartment Splices 4.0L Engine LHD

DESCRIPTION AND OPERATION (Continued)

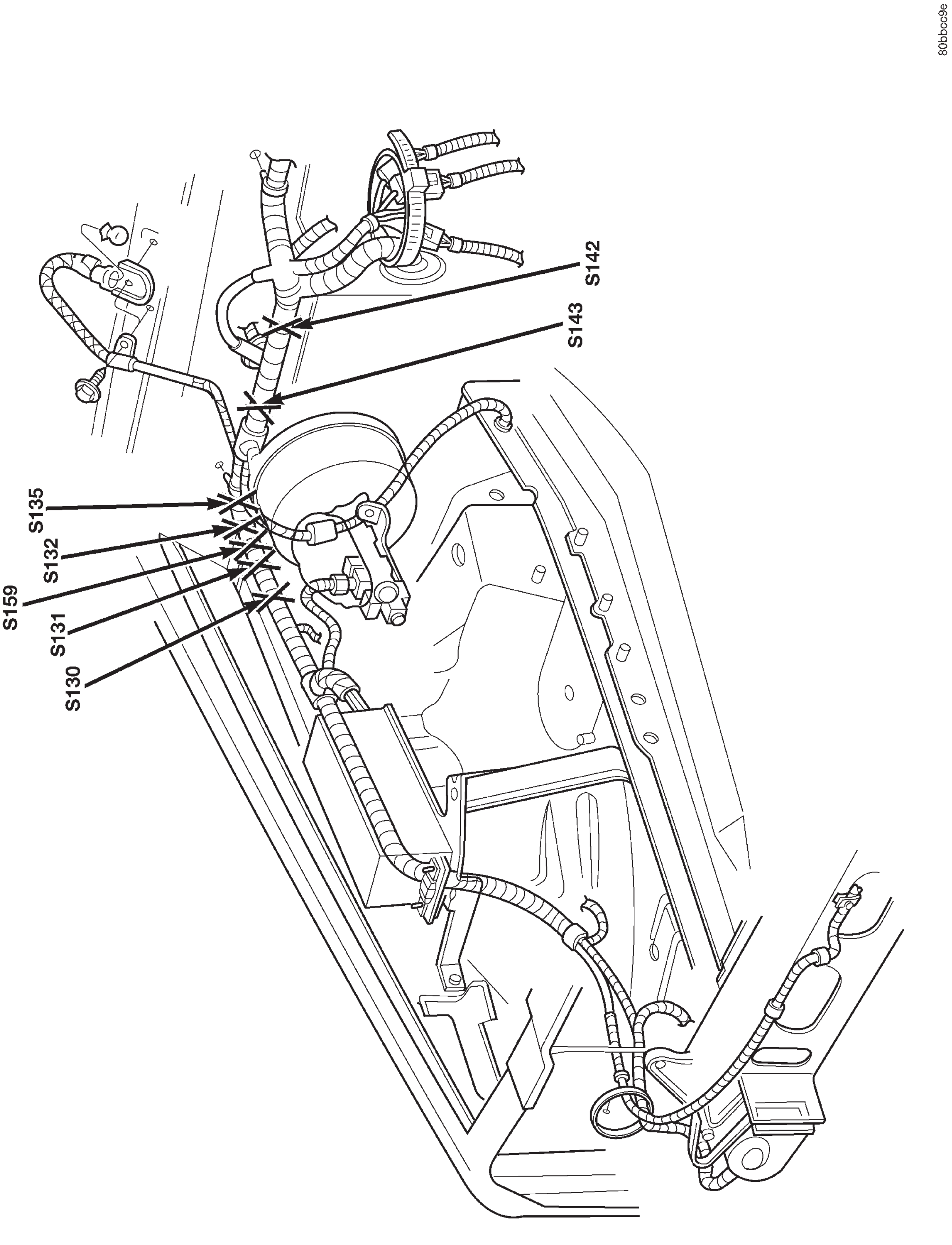


Fig. 4 Right Engine Compartment Splices 4.0L Engine RHD

DESCRIPTION AND OPERATION (Continued)

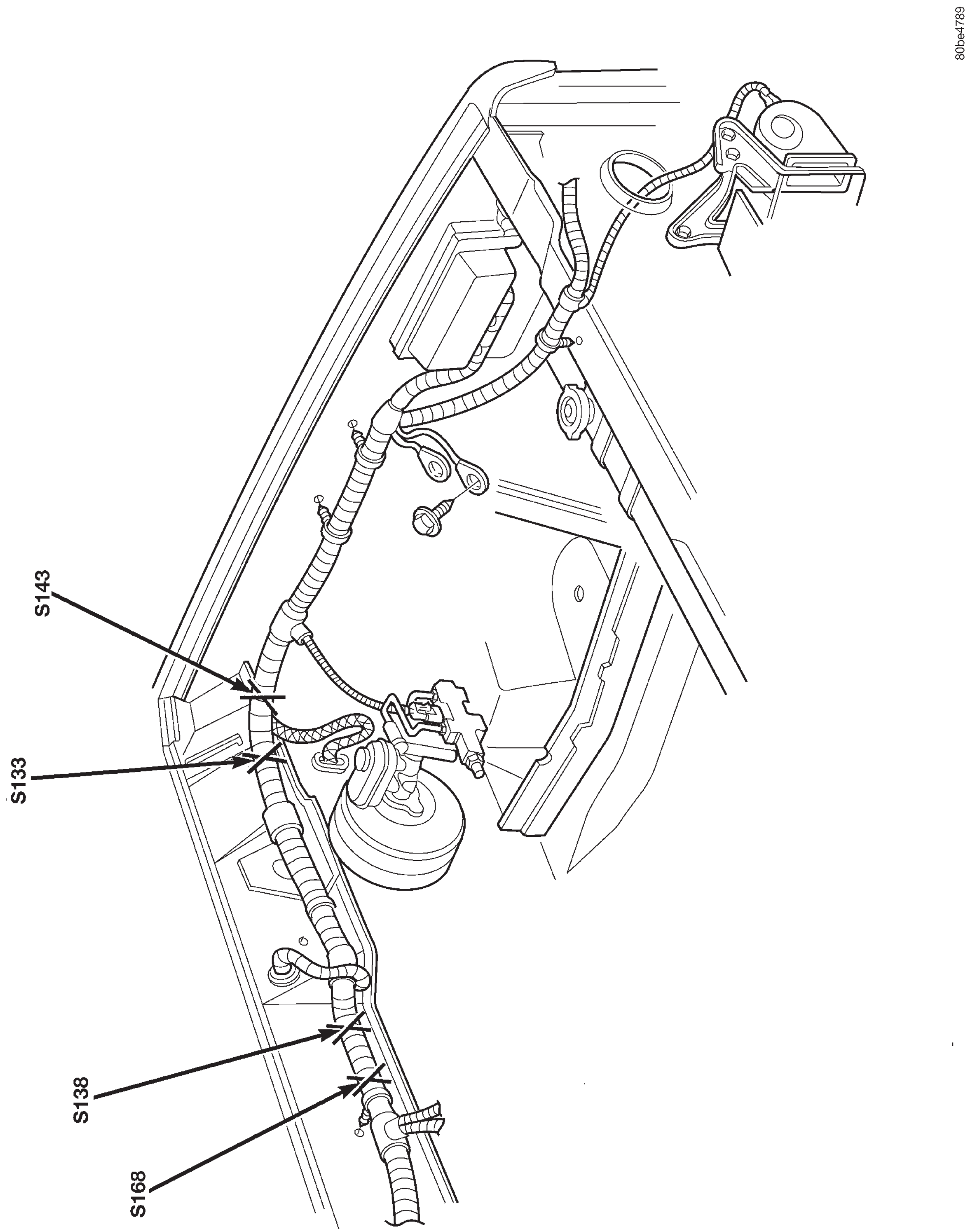


Fig. 5 Left Engine Compartment Splices 2.5L Engine LHD

DESCRIPTION AND OPERATION (Continued)

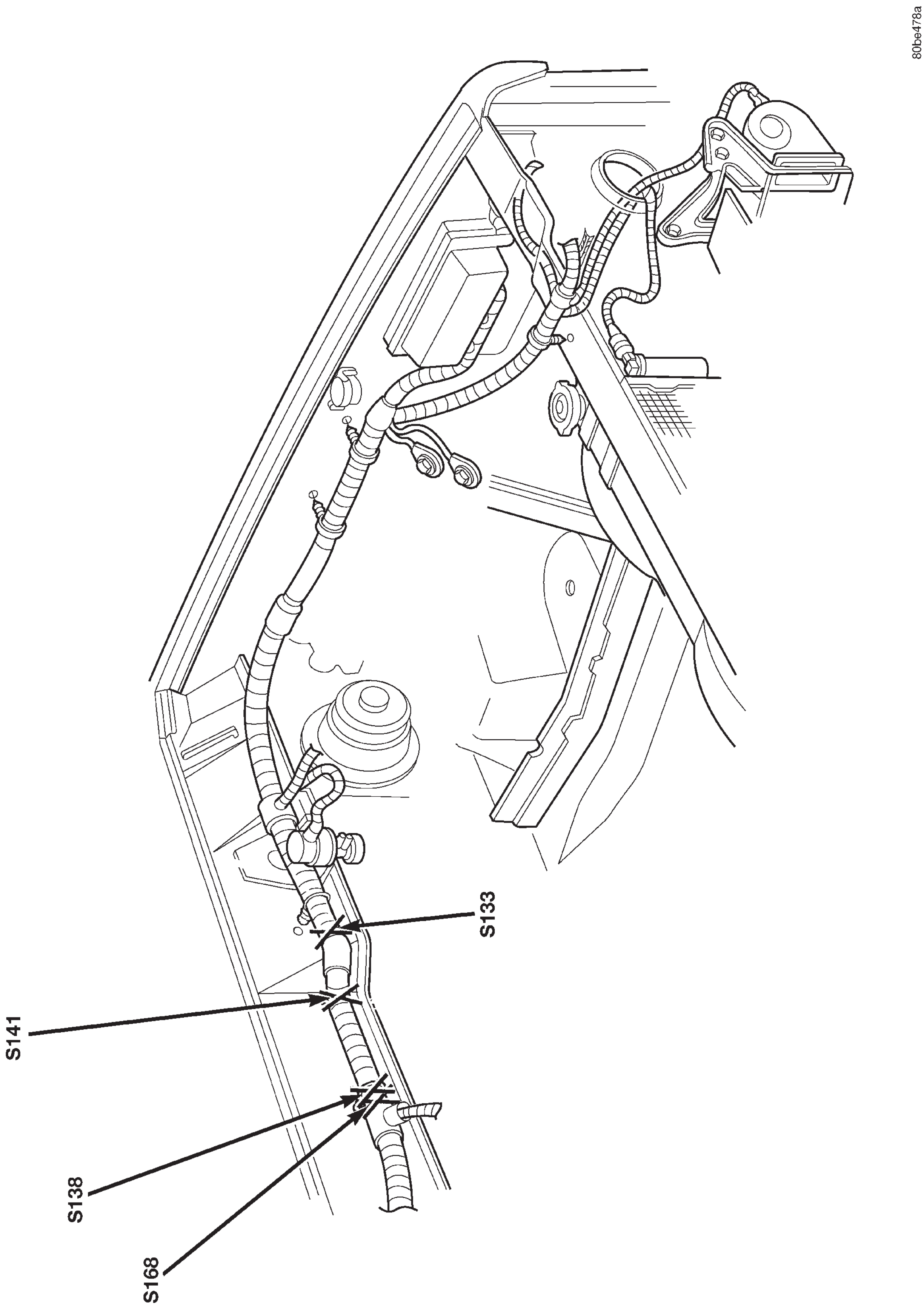


Fig. 6 Left Engine Compartment Splices 2.5L Engine RHD

DESCRIPTION AND OPERATION (Continued)

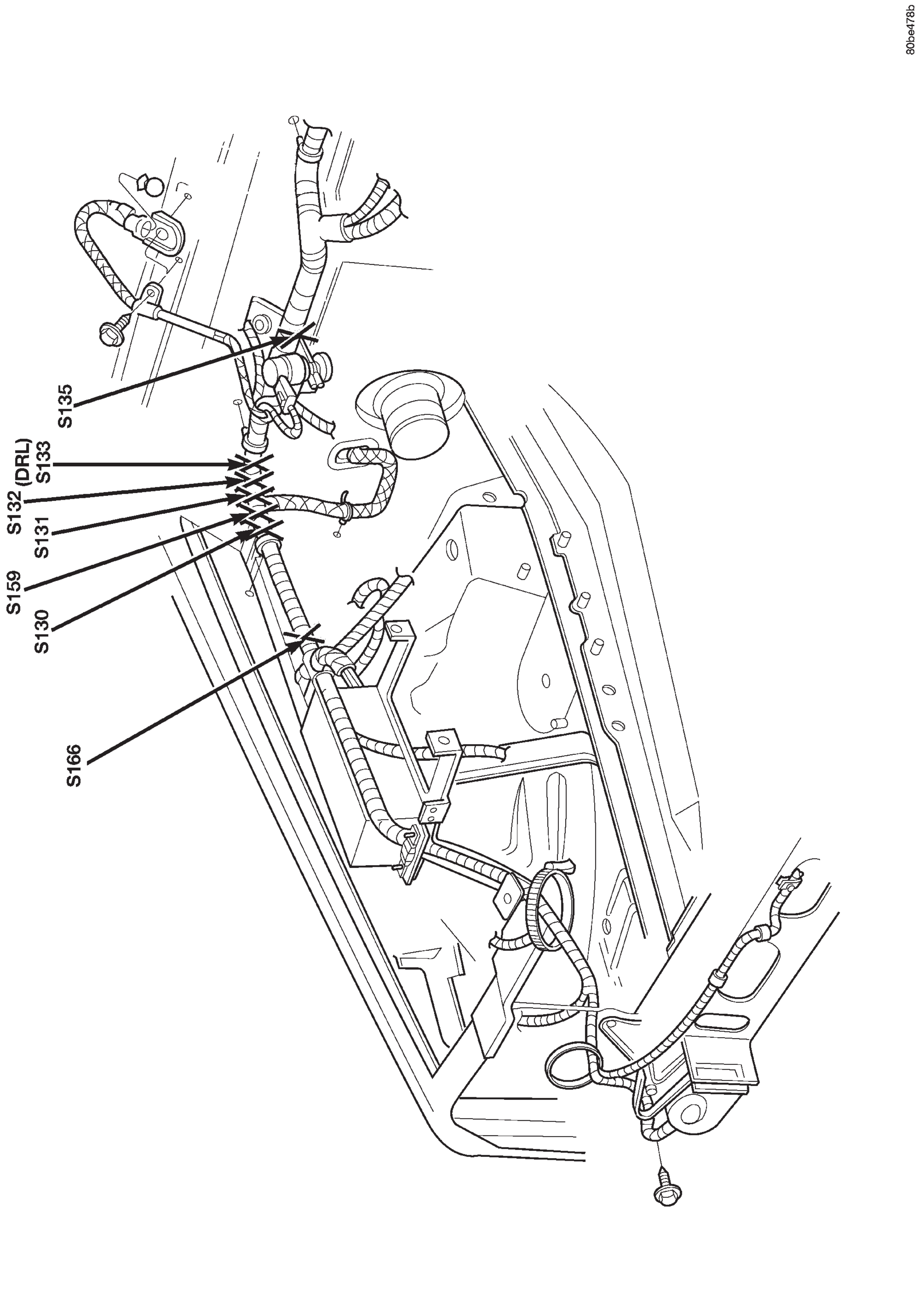


Fig. 7 Right Engine Compartment Splices 2.5L Engine LHD

DESCRIPTION AND OPERATION (Continued)

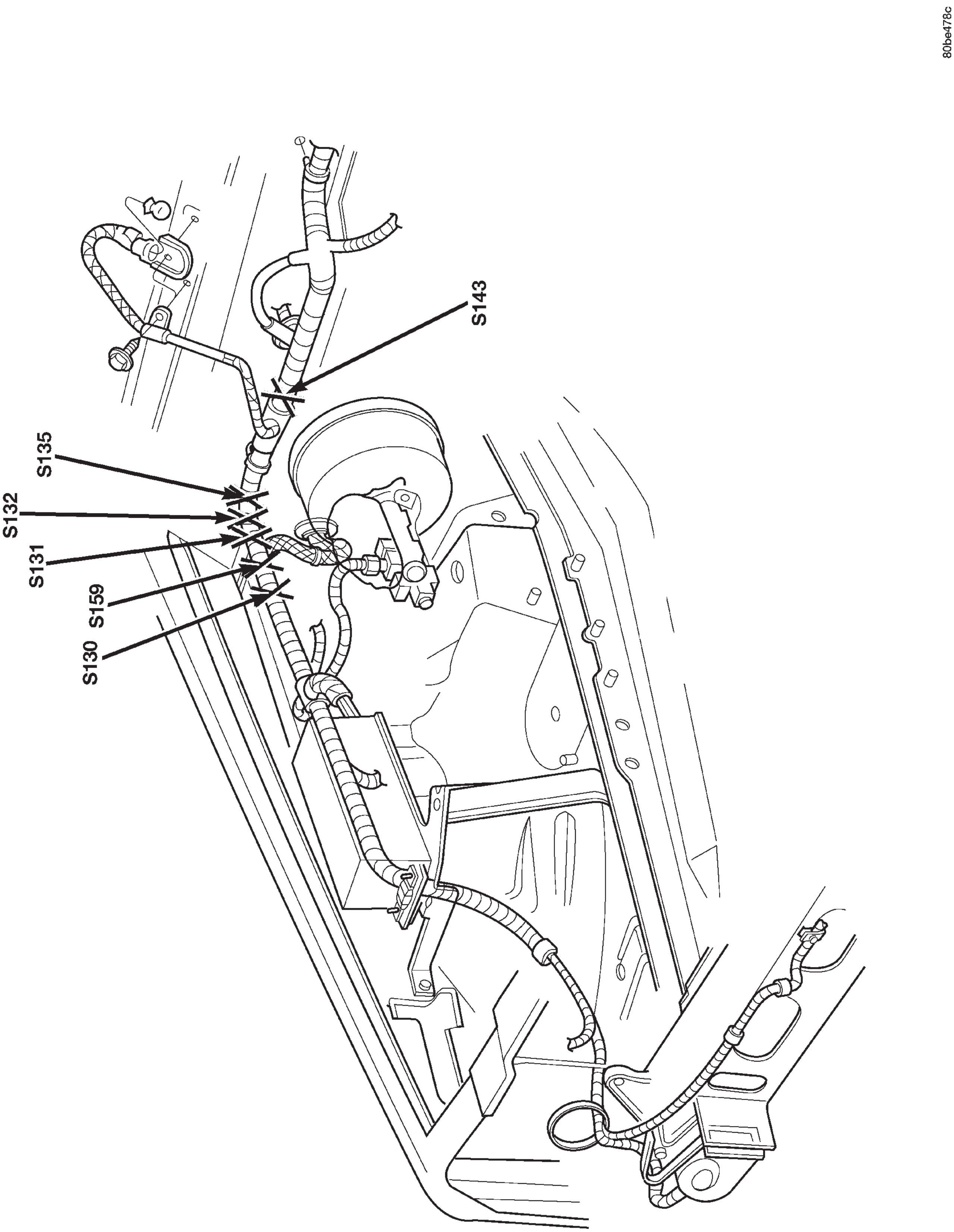


Fig. 8 Right Engine Compartment Splices 2.5L Engine RHD

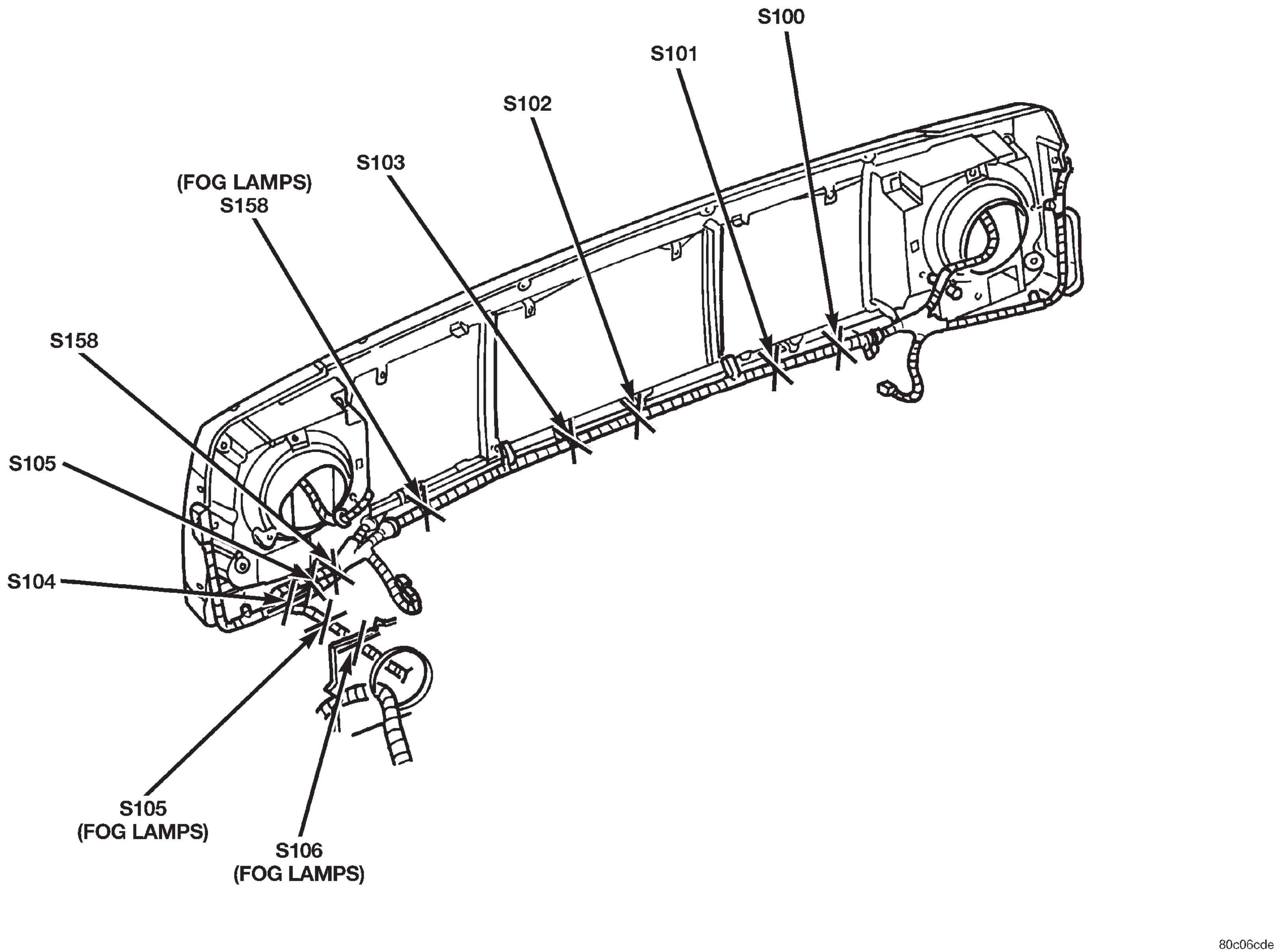


Fig. 9 Front End Lighting Splices

DESCRIPTION AND OPERATION (Continued)

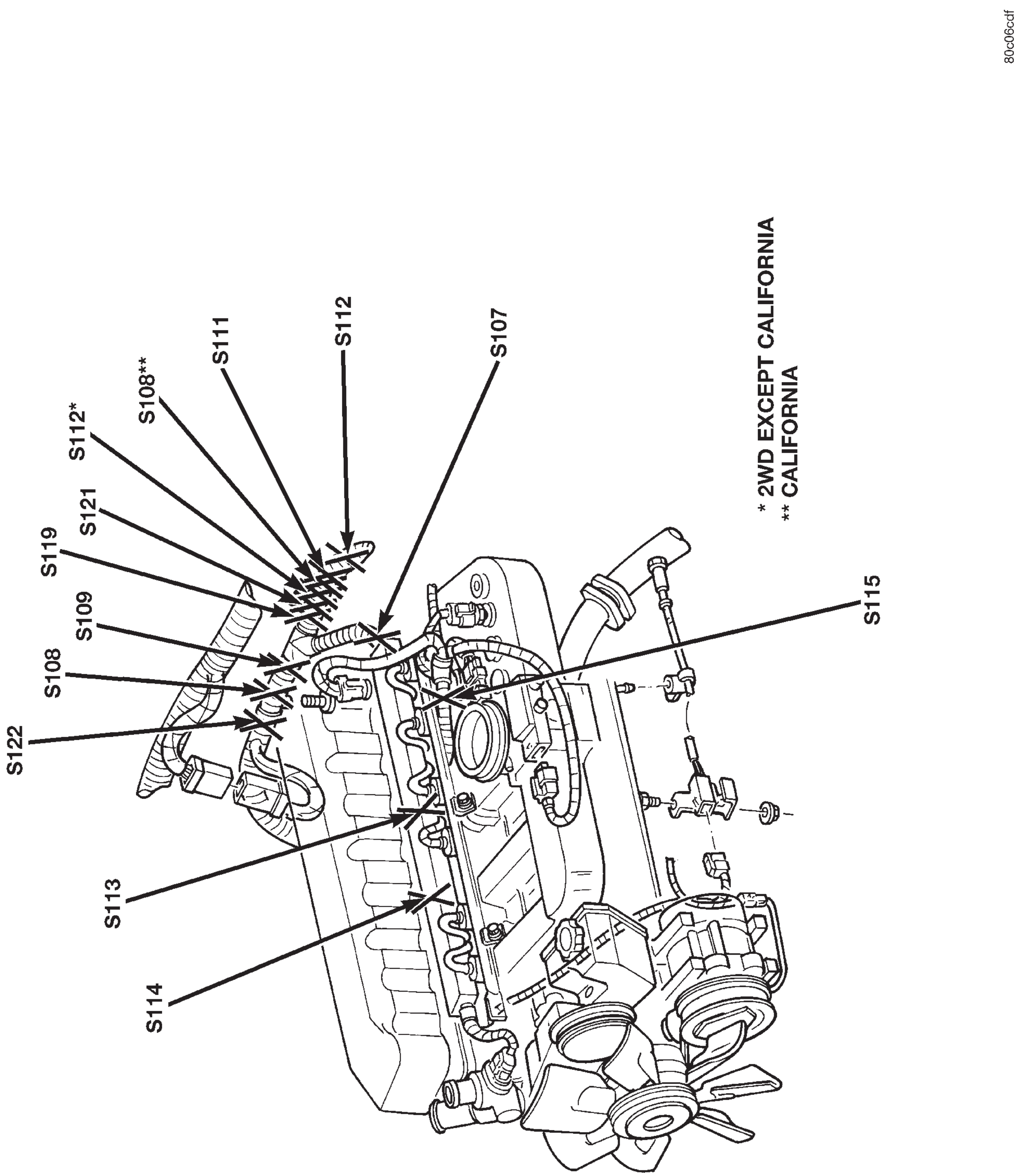


Fig. 10 Engine Wiring Splices 4.0L Engine

DESCRIPTION AND OPERATION (Continued)

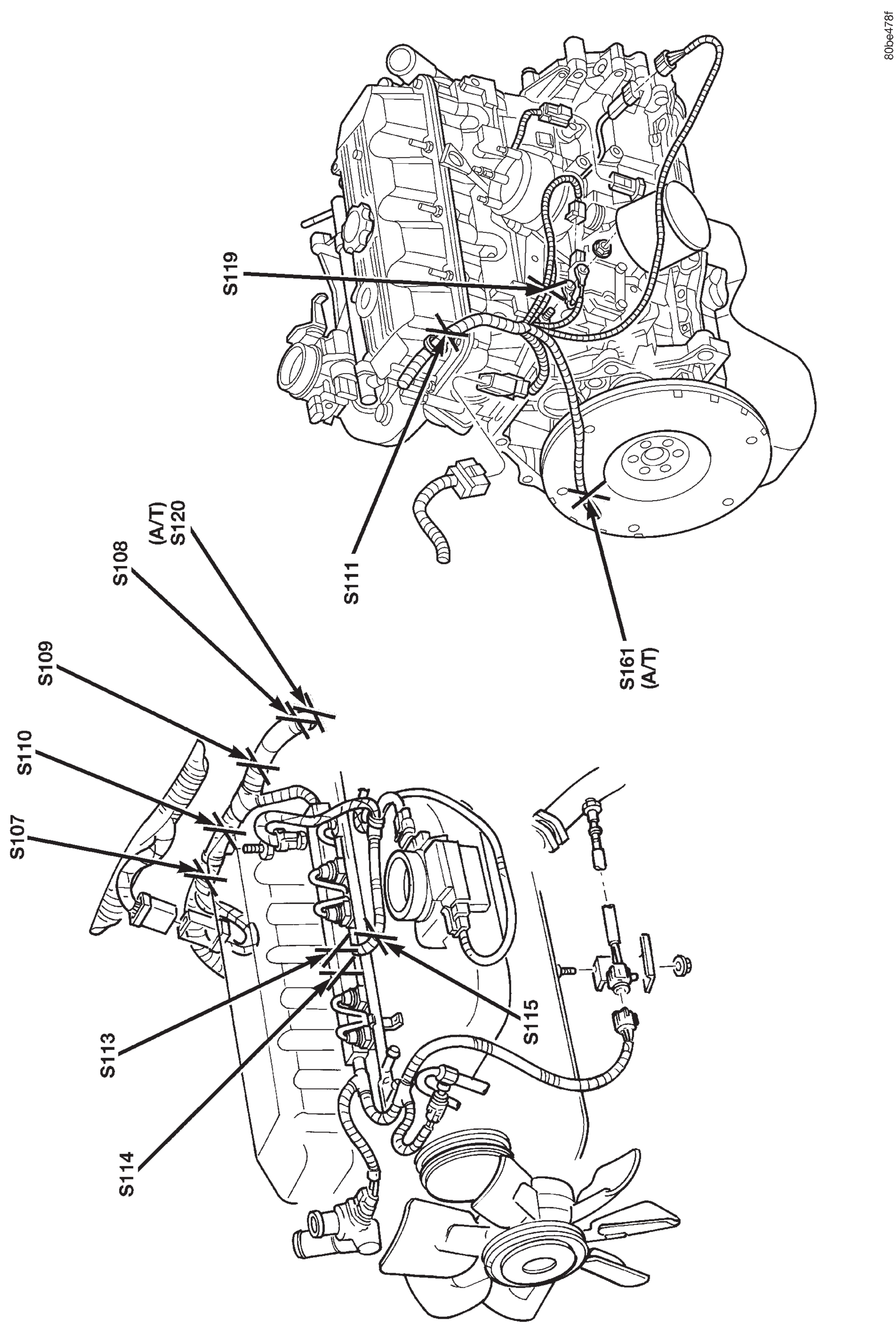


Fig. 11 Engine Wiring Splices 2.5L Engine

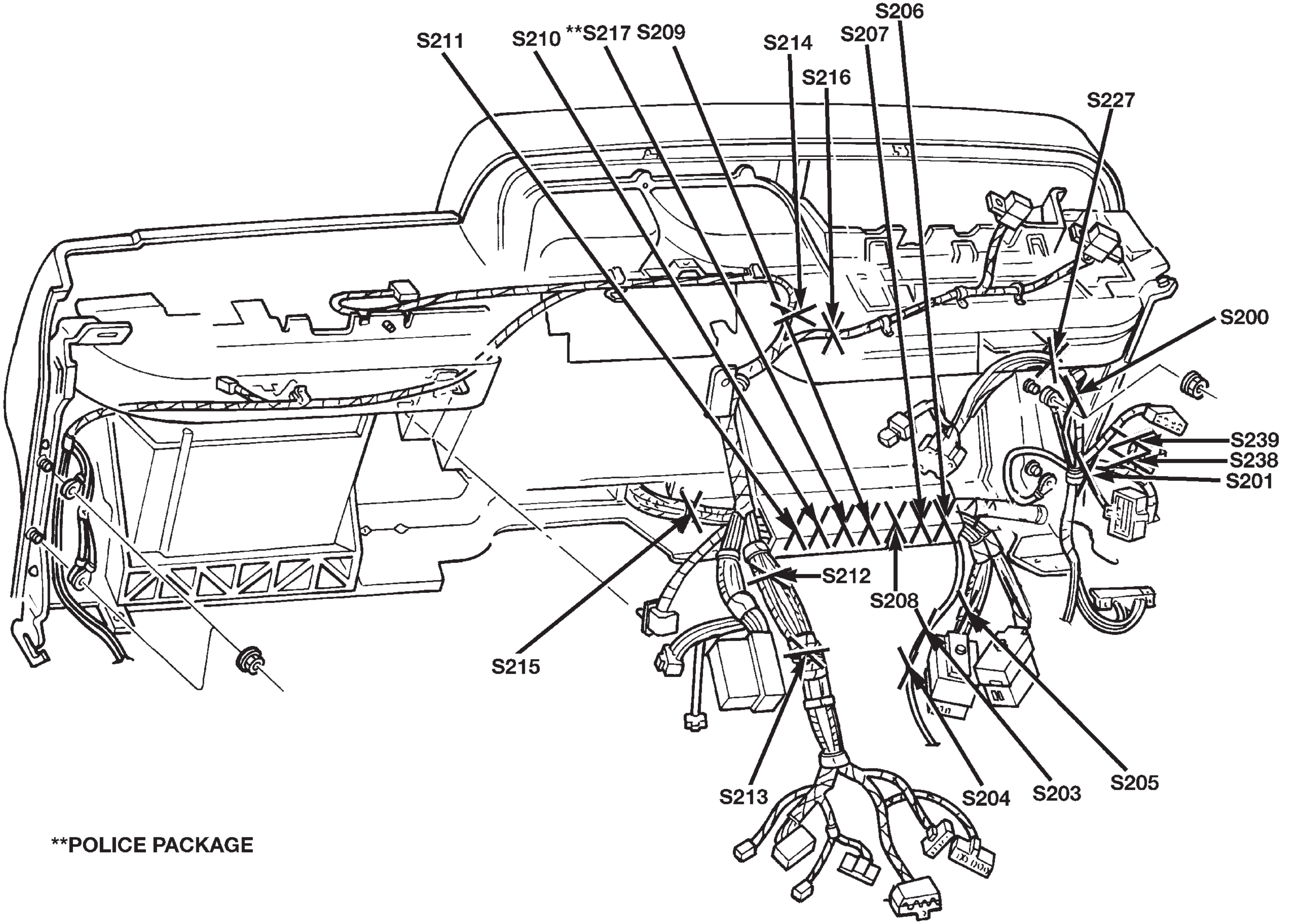


Fig. 12 Instrument Panel Wiring Splices LHD

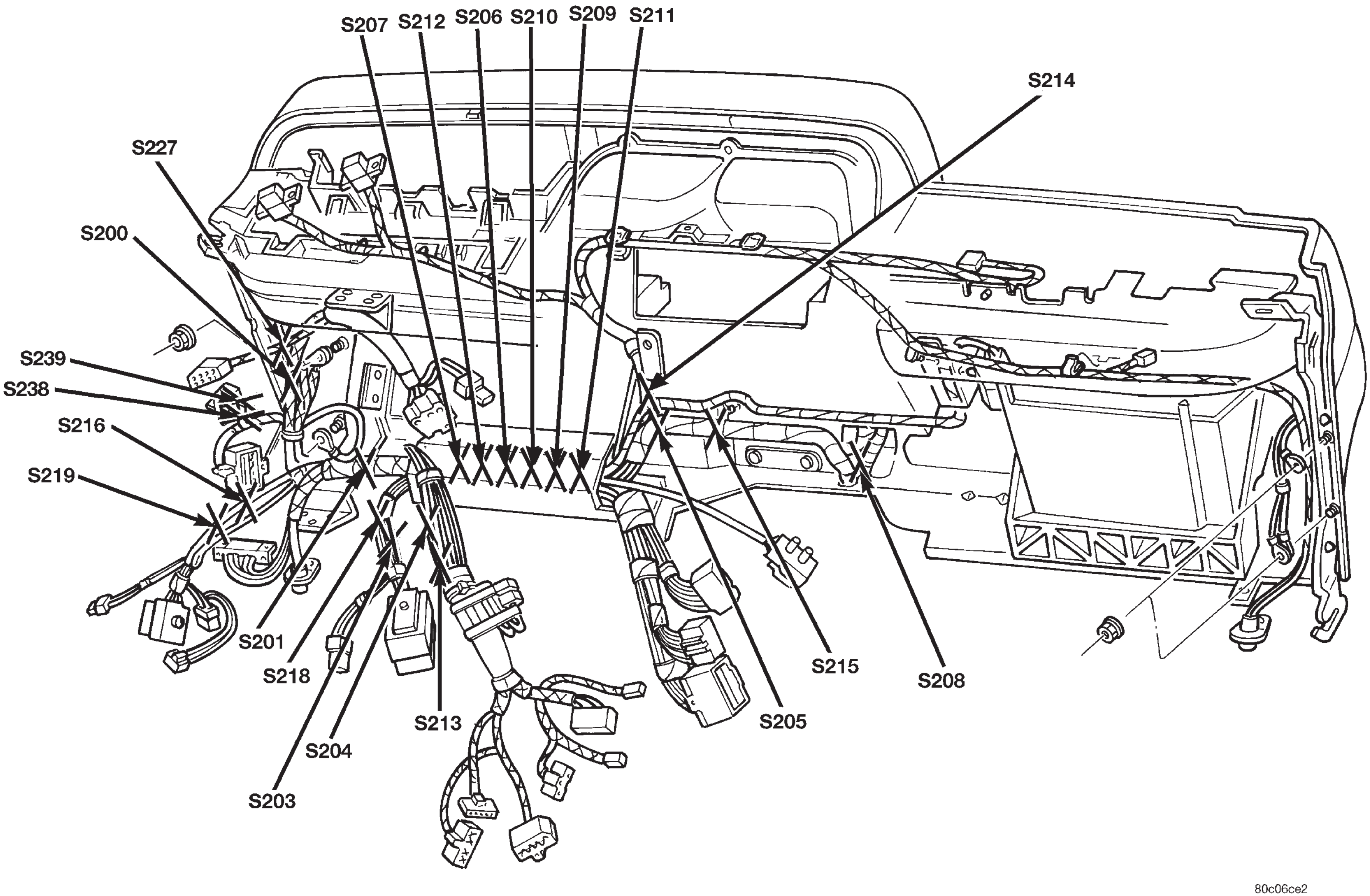


Fig. 13 Instrument Panel Wiring Splices RHD

DESCRIPTION AND OPERATION (Continued)

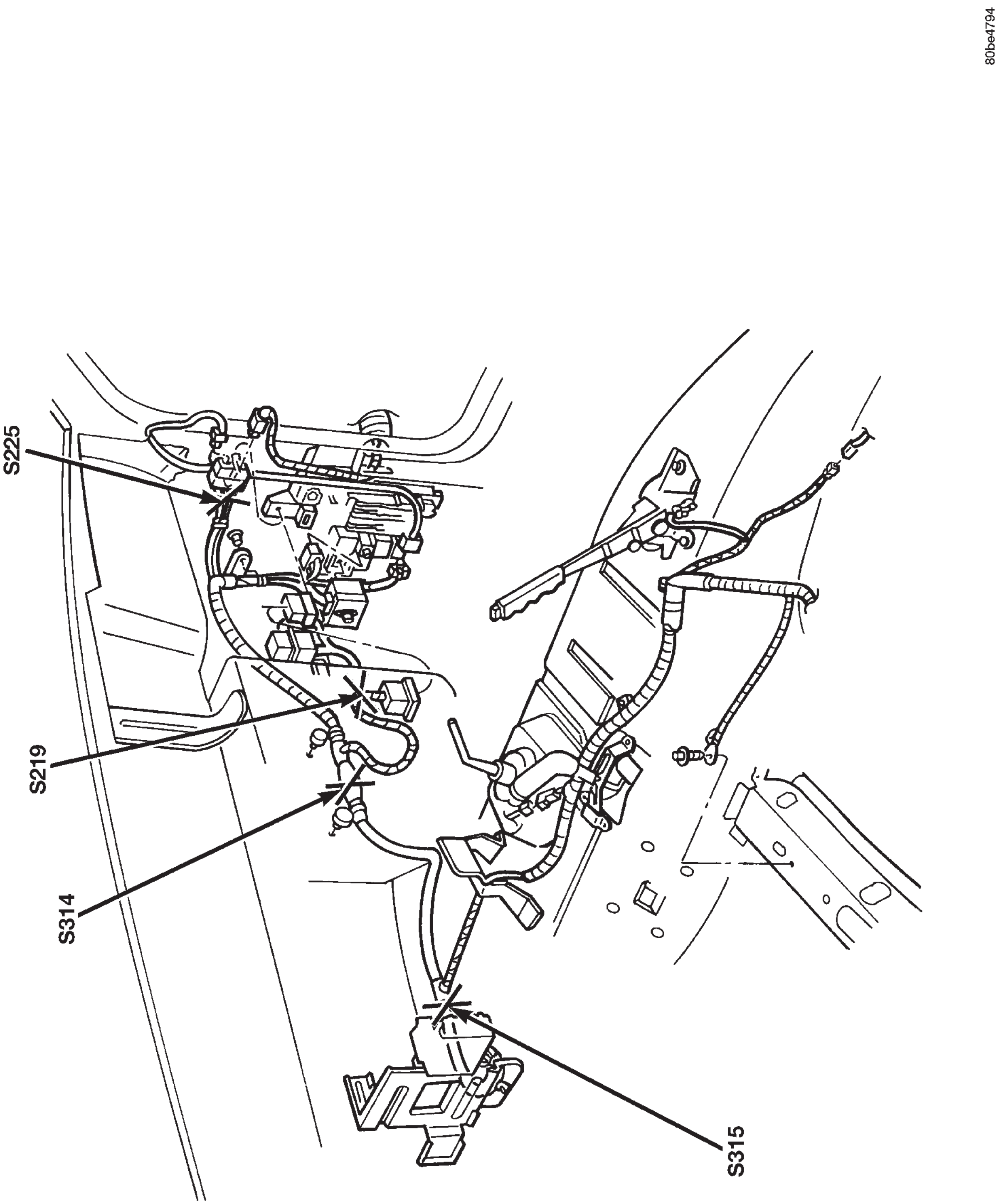


Fig. 14 Instrument Panel to Body Harness Splices

DESCRIPTION AND OPERATION (Continued)

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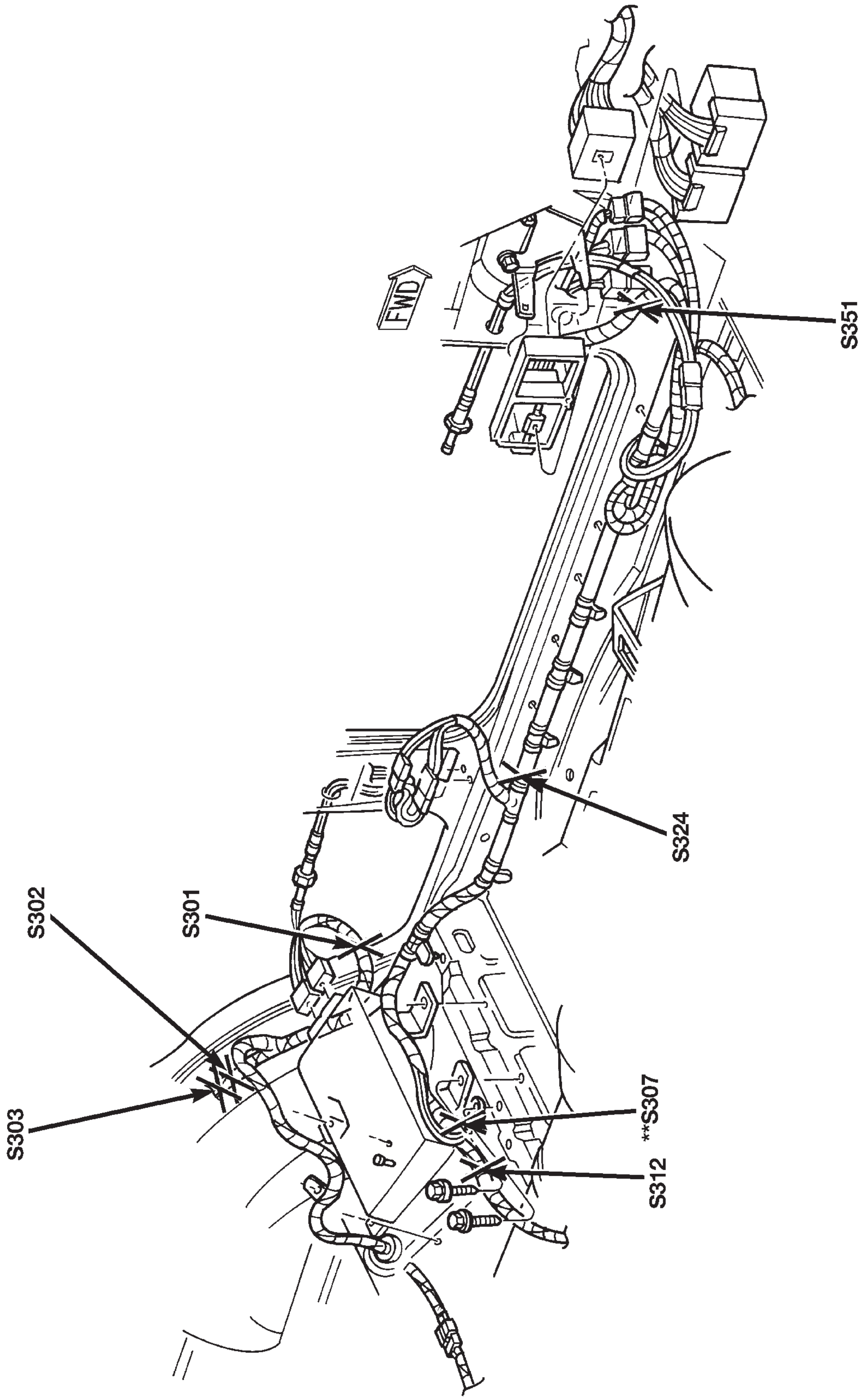

** LHD WITHOUT POWER AMPLIFIER

Fig. 15 Left Side Body Harness Splices

DESCRIPTION AND OPERATION (Continued)

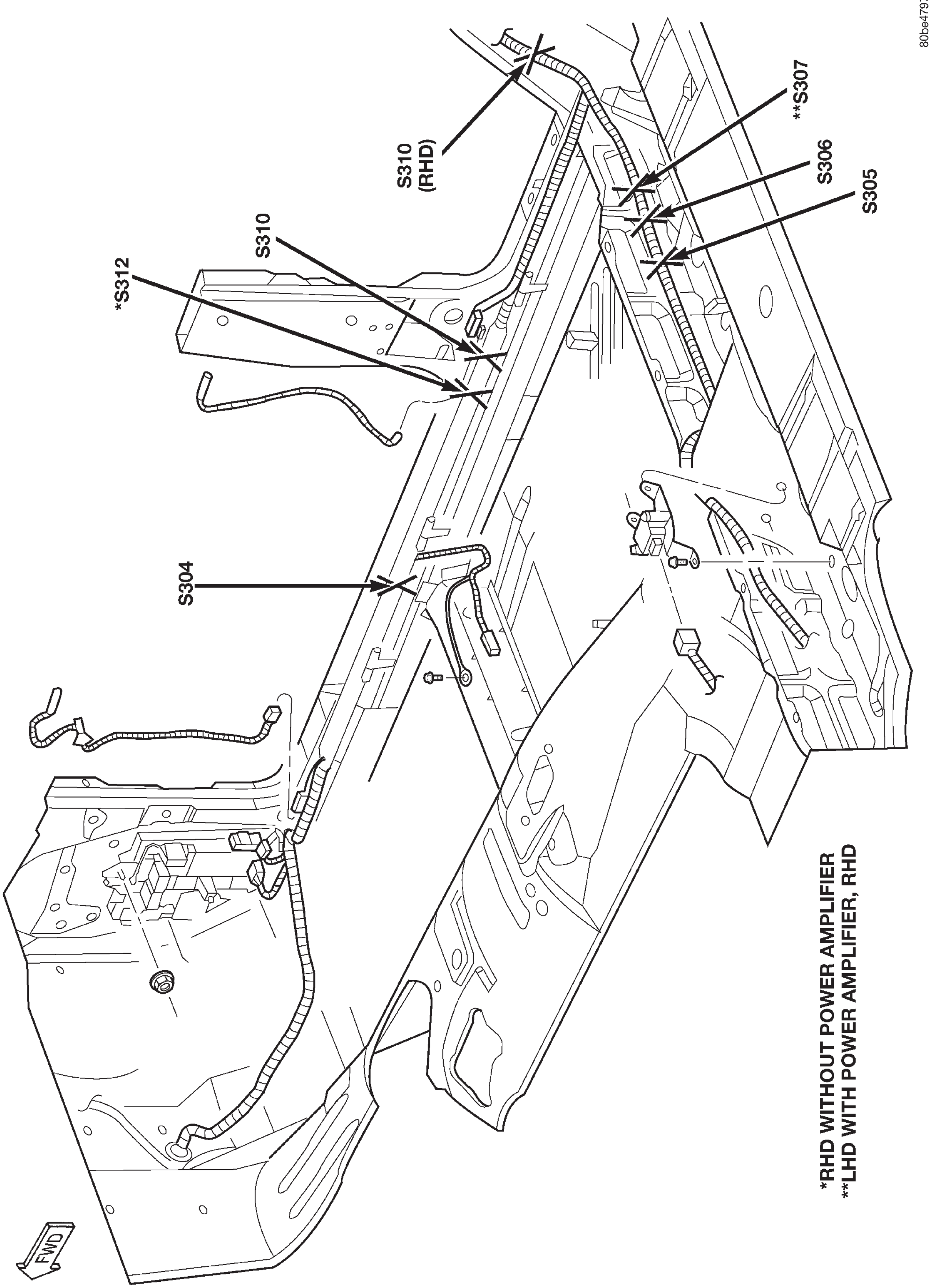

Fig. 16 Right Side Body Harness Splices

DESCRIPTION AND OPERATION (Continued)

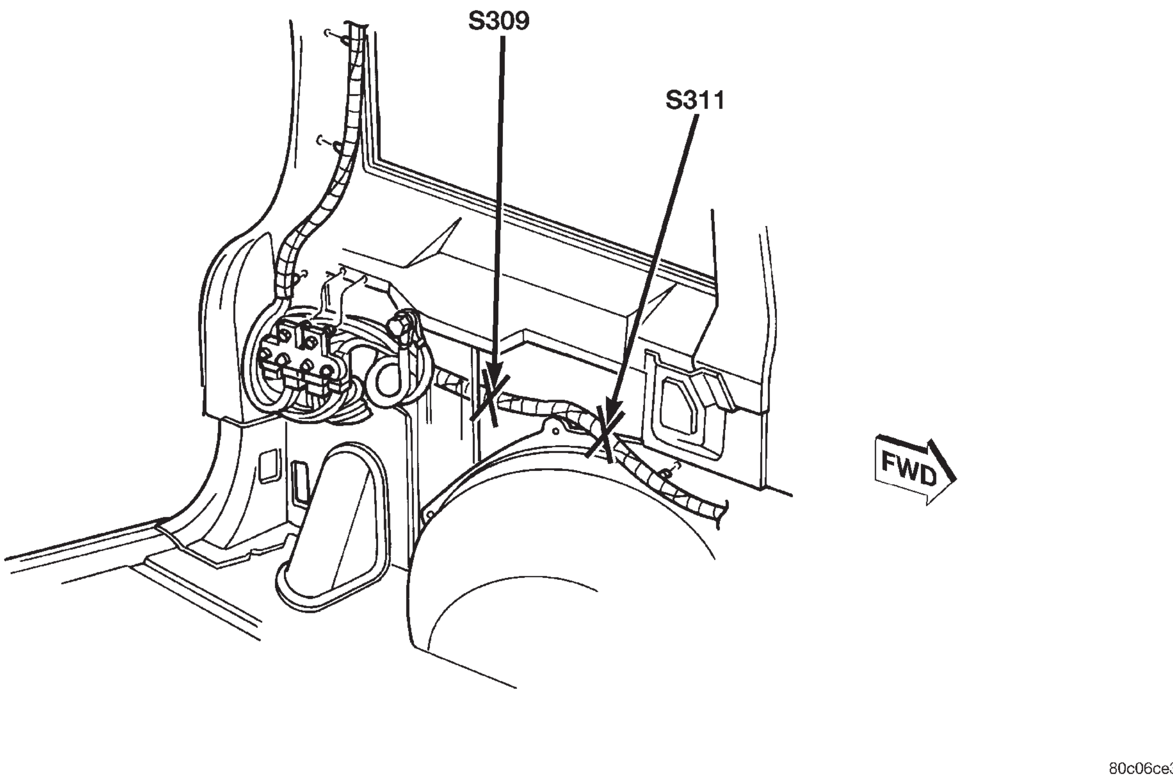

Fig. 17 Left Side Body Harness Splices

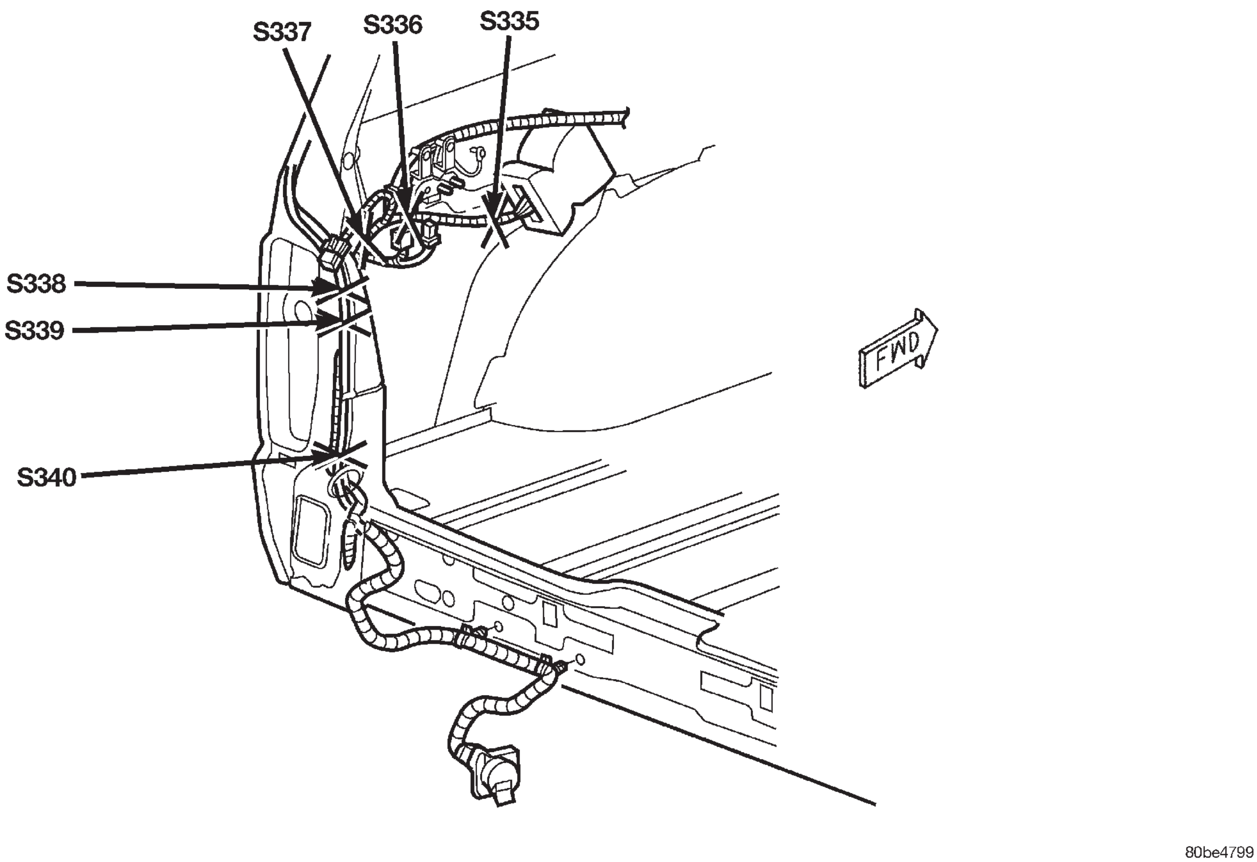

Fig. 18 Trailer Tow Splices

DESCRIPTION AND OPERATION (Continued)

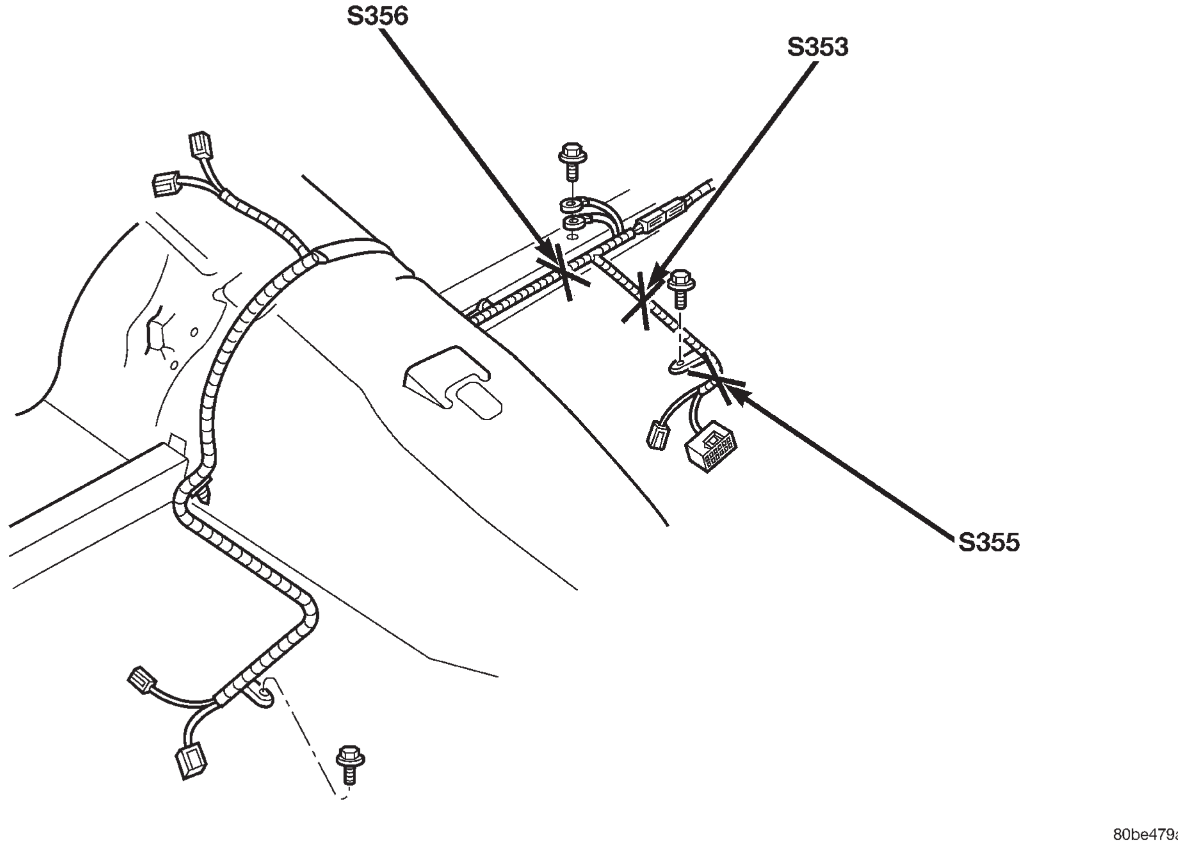

Fig. 19 Power Seat Splices

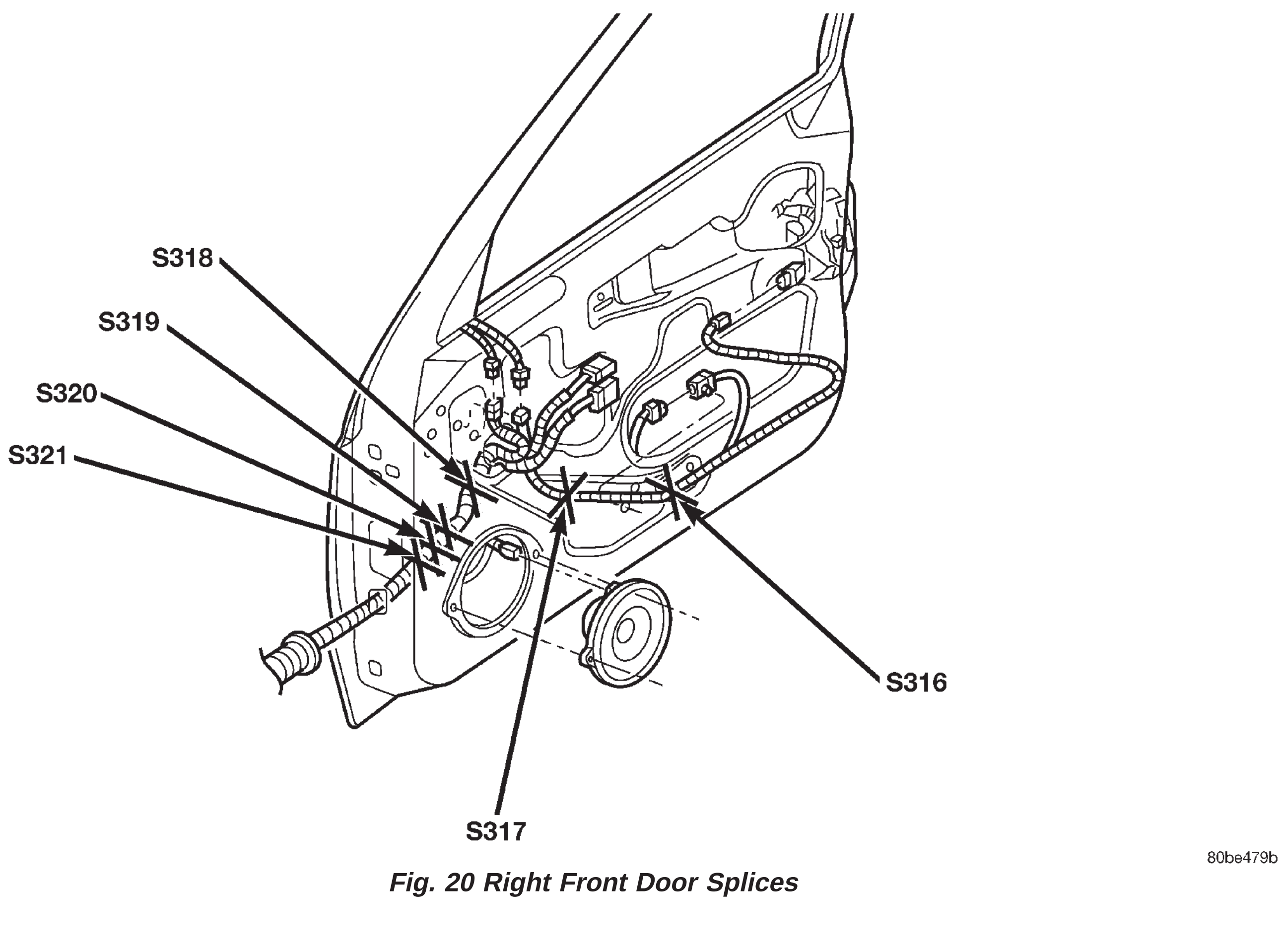

Fig. 20 Right Front Door Splices

DESCRIPTION AND OPERATION (Continued)

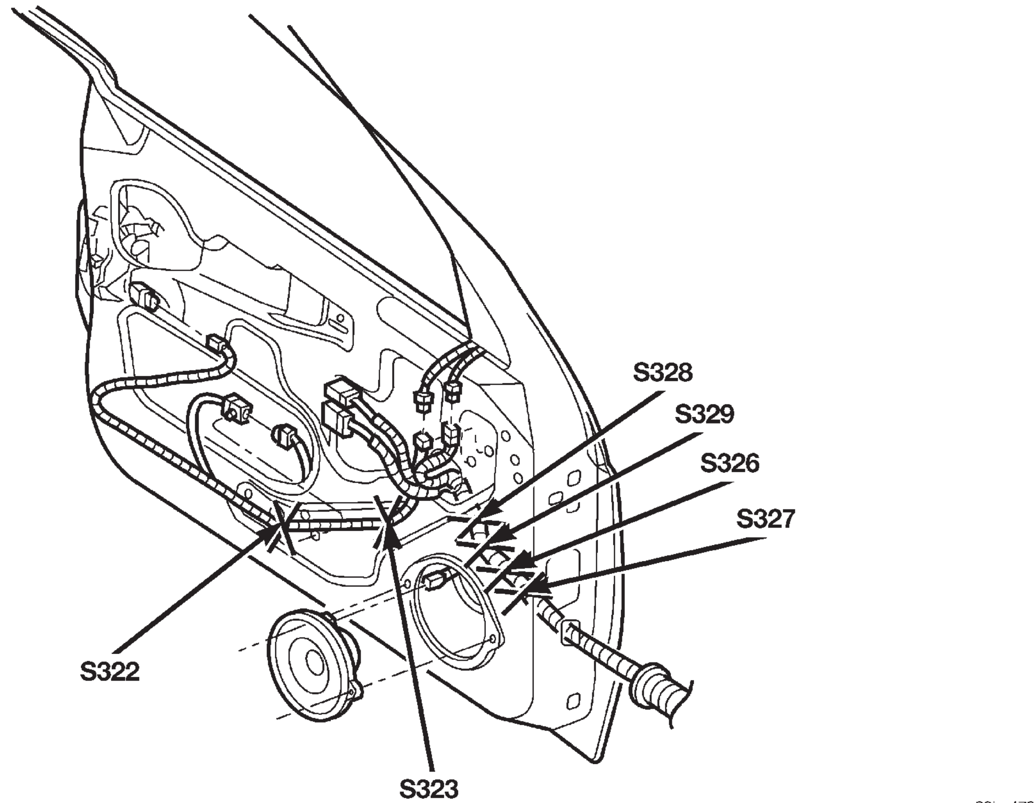

Fig. 21 Left Front Door Splices

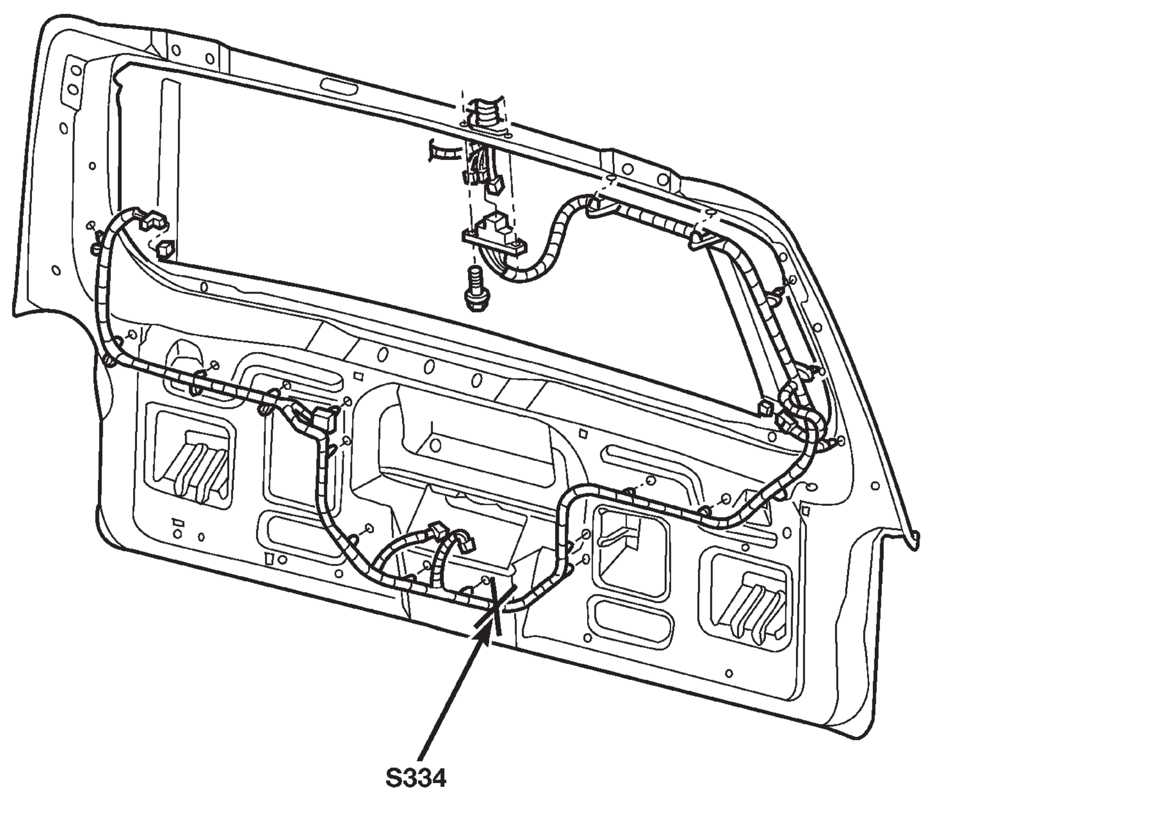

Fig. 22 Liftgate Splices

DESCRIPTION AND OPERATION (Continued)

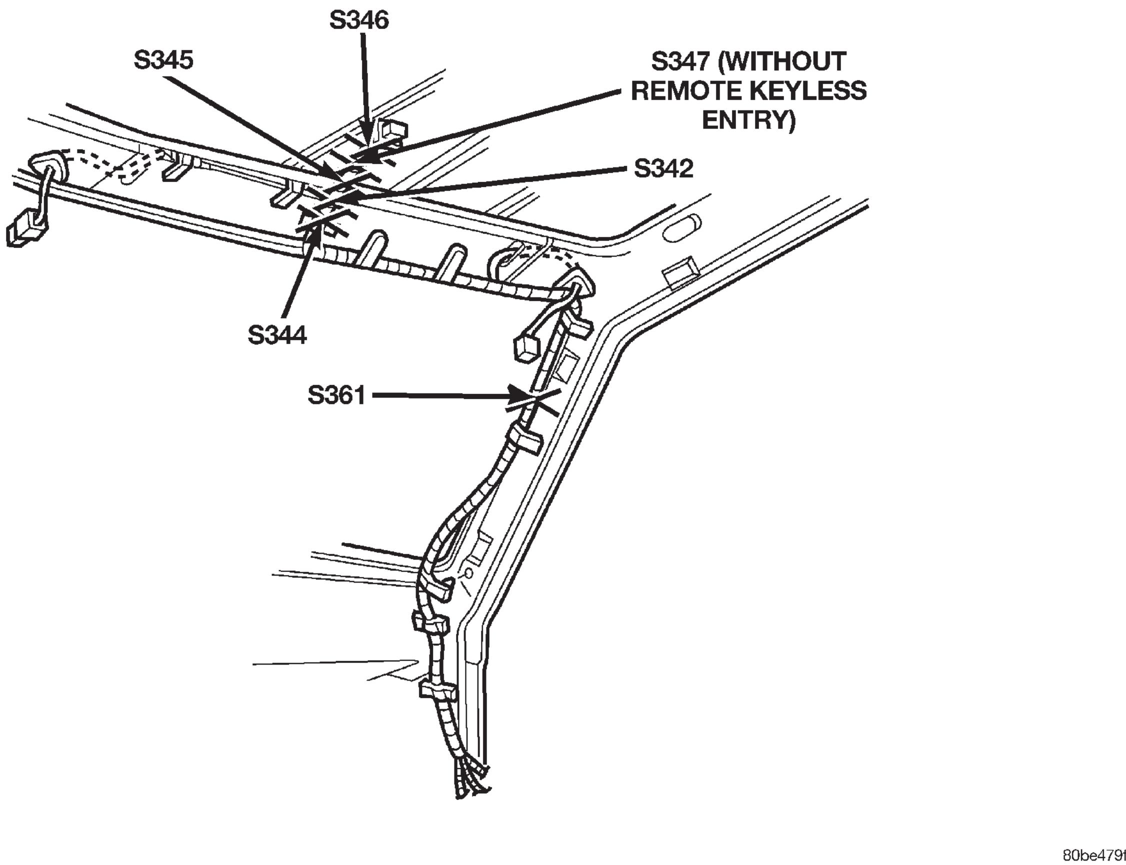

Fig. 23 Headliner Splices

ENGINE

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2.5L ENGINE

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DESCRIPTION AND OPERATION

ENGINE

DESCRIPTION

The 2.5 liter (150 CID) four-cylinder engine is an In-line, lightweight, overhead valve engine.

This engine is designed for unleaded fuel. The engine cylinder head has dual quench-type combustion chambers that create turbulence and fast burning of the air/fuel mixture. This results in good fuel economy.

The cylinders are numbered 1 through 4 from front to rear. The firing order is 1-3-4-2 (Fig. 1).

The crankshaft rotation is clockwise, when viewed from the front of the engine. The crankshaft rotates within five main bearings and the camshaft rotates within four bearings.

The engine Build Date Code is located on a machined surface on the right side of the cylinder block between the No.3 and No.4 cylinders (Fig. 2).

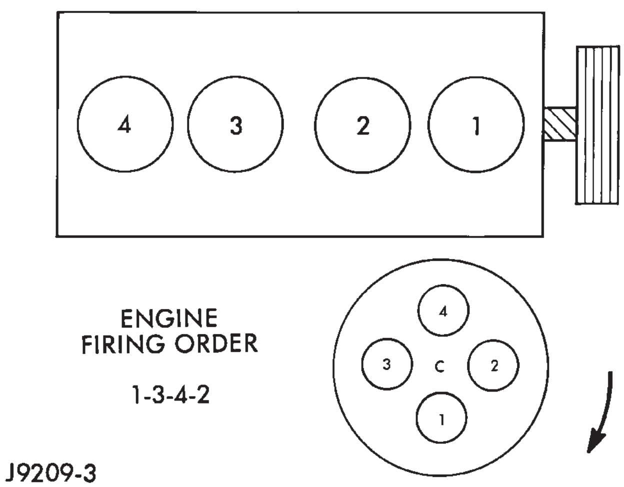


Fig. 1 Engine Firing Order

The digits of the code identify:

- 1st Digit—The year (8 = 1998).
- 2nd & 3rd Digits—The month (01 - 12).
- 4th & 5th Digits—The engine type/fuel system/compression ratio (HX = A 2.5 liter (150 CID) 9.1:1 compression ratio engine with a multi-point fuel injection system).
- 6th & 7th Digits—The day of engine build (01 - 31).

FOR EXAMPLE: Code * 801HX23 * identifies a 2.5 liter (150 CID) engine with a multi-point fuel injection system, 9.1:1 compression ratio and built on January 23, 1998.

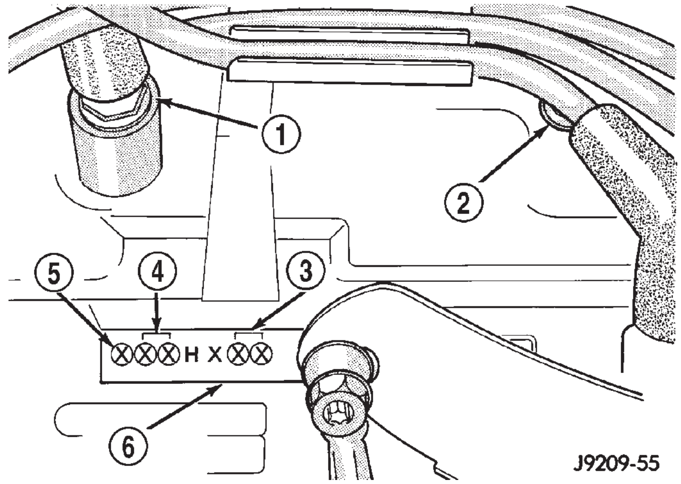


Fig. 2 Build Date Code Location

1 – NO. 4 CYLINDER
2 – NO. 3 CYLINDER
3 – DAY
4 – MONTH
5 – YEAR
6 – MACHINED SURFACE

LUBRICATION SYSTEM

DESCRIPTION

A gear—type positive displacement pump is mounted at the underside of the block opposite the No. 4 main bearing.

OPERATION

The pump draws oil through the screen and inlet tube from the sump at the rear of the oil pan. The oil is driven between the drive and idler gears and pump body, then forced through the outlet to the block. An oil gallery in the block channels the oil to the inlet side of the full flow oil filter. After passing through the filter element, the oil passes from the center outlet of the filter through an oil gallery that channels the oil up to the main gallery which extends the entire length of the block.

Galleries extend downward from the main oil gallery to the upper shell of each main bearing. The crankshaft is drilled internally to pass oil from the main bearing journals (except number 4 main bearing journal) to the connecting rod journals. Each connecting rod bearing cap has a small squirt hole, oil passes through the squirt hole and is thrown off as the rod rotates. This oil throwoff lubricates the camshaft lobes, distributor drive gear, cylinder walls, and piston pins.

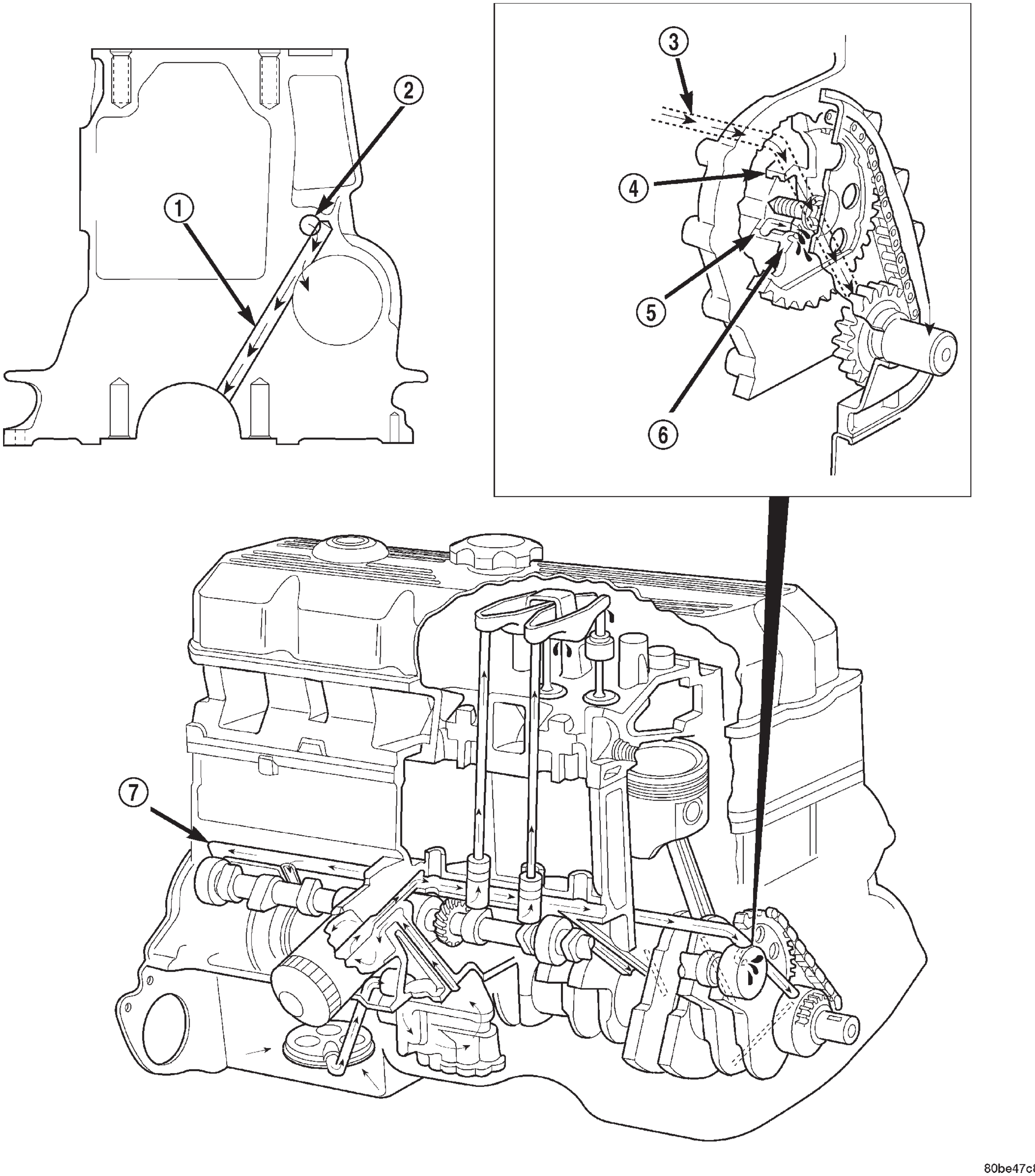
The hydraulic valve tappets receive oil directly from the main oil gallery. Oil is provided to the camshaft bearing through galleries. The front camshaft bearing journal passes oil through the camshaft

DESCRIPTION AND OPERATION (Continued)

sprocket to the timing chain. Oil drains back to the oil pan under the number one main bearing cap.

The oil supply for the rocker arms and bridged pivot assemblies is provided by the hydraulic valve tappets which pass oil through hollow push rods to a hole in the corresponding rocker arm. Oil from the rocker arm lubricates the valve train components, then passes down through the push rod guide holes in the cylinder head past the valve tappet area, and returns to the oil pan.

DESCRIPTION AND OPERATION (Continued)



Oil Lubrication System—2.5L Engine

1 – CAM/CRANK MAIN GALLERY (7)
2 – TAPPET GALLERY
3 – TAPPET GALLERY
4 – CAMSHAFT BEARING
5 – NUMBER 1 CAMSHAFT BEARING JOURNAL
6 – CAMSHAFT SPROCKET
7 – TAPPET GALLERY

DESCRIPTION AND OPERATION (Continued)

CYLINDER BLOCK

DESCRIPTION

The cylinder block is a cast iron inline four cylinder design. The cylinder block is drilled forming galleries for both oil and coolant.

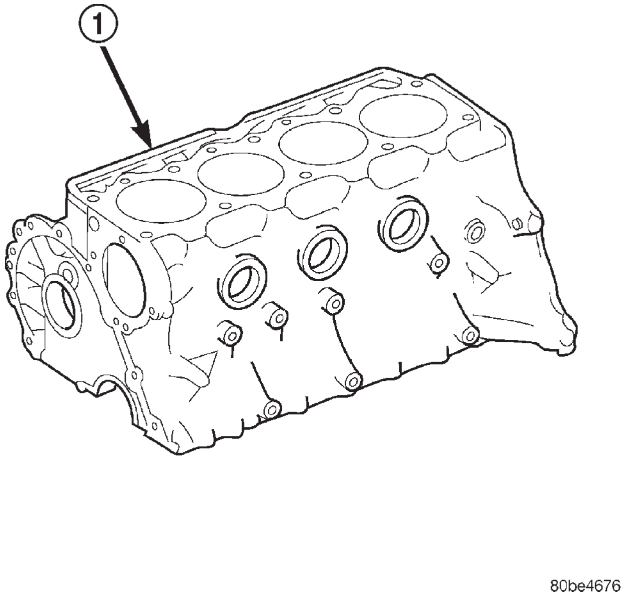


Fig. 3 Cylinder Block—2.5L

1 – CYLINDER BLOCK

CYLINDER HEAD

DESCRIPTION

The cylinder head is made of cast iron containing eight valves made of chrome plated heat resistant steel, valve stem seals, springs, retainers and keepers. The cylinder head, valve seats and guides can be resurfaced for service purposes.

The cylinder head uses dual quench-type design combustion chambers which cause turbulence in the cylinders allowing faster burning of the air/fuel mixture, resulting in better fuel economy.

The valve guides are integral to the cylinder head, They are not replaceable. However, they are serviceable.

CRANKSHAFT

DESCRIPTION

The crankshaft is constructed of nodular cast iron.

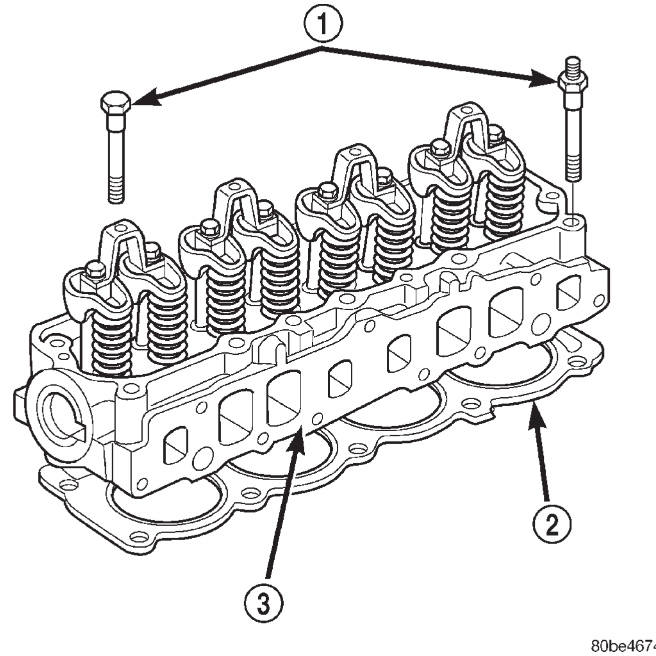


Fig. 4 Cylinder Head

1 – CYLINDER HEAD BOLTS
2 – CYLINDER HEAD GASKET
3 – CYLINDER HEAD

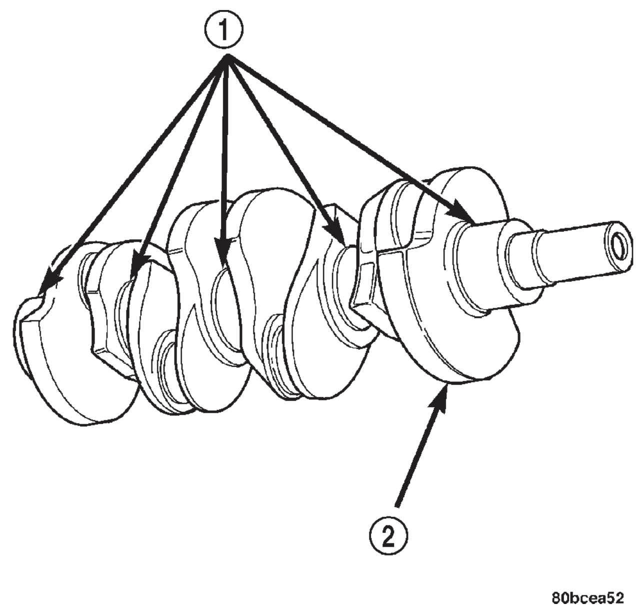


Fig. 5 Crankshaft—Typical

1 – MAIN BEARING JOURNALS
2 – COUNTER BALANCE WEIGHTS

DESCRIPTION AND OPERATION (Continued)

PISTON AND CONNECTING ROD

DESCRIPTION

The pistons are made of a high strength aluminum alloy, the piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The connecting rods are made of cast iron.

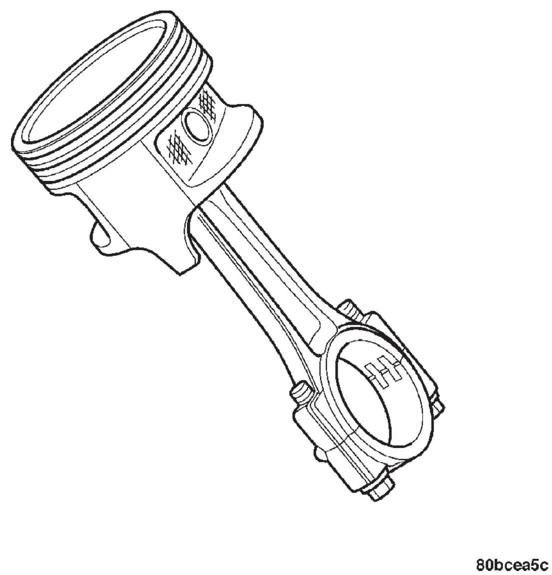


Fig. 6 Piston and Connecting Rod Assembly

CAMSHAFT

DESCRIPTION

The camshaft is made of cast iron with eight machined lobes and four bearing journals.

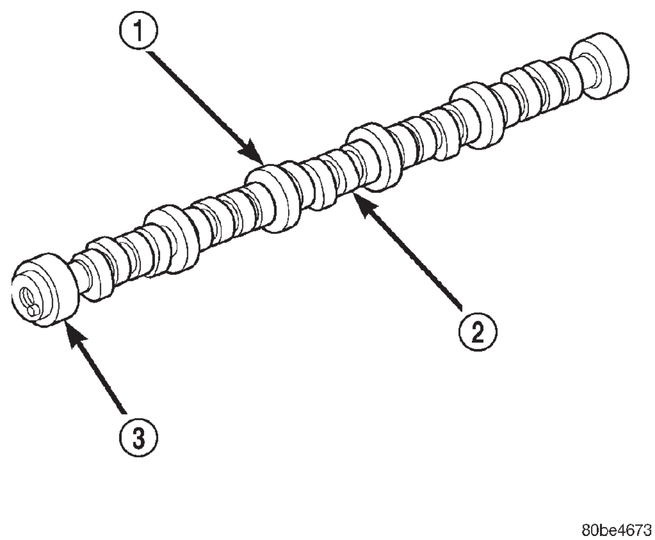


Fig. 7 Camshaft—Typical

1 – CAMSHAFT
2 – LOBES
3 – BEARING JOURNAL

OPERATION

When the camshaft rotates, the lobes actuate the tappets and push rods forcing upward on the rocker arms which applies downward force on the valves.

ROCKER ARM

DESCRIPTION

The rocker arms are made of stamped steel and have a operational ratio of 1.6:1.

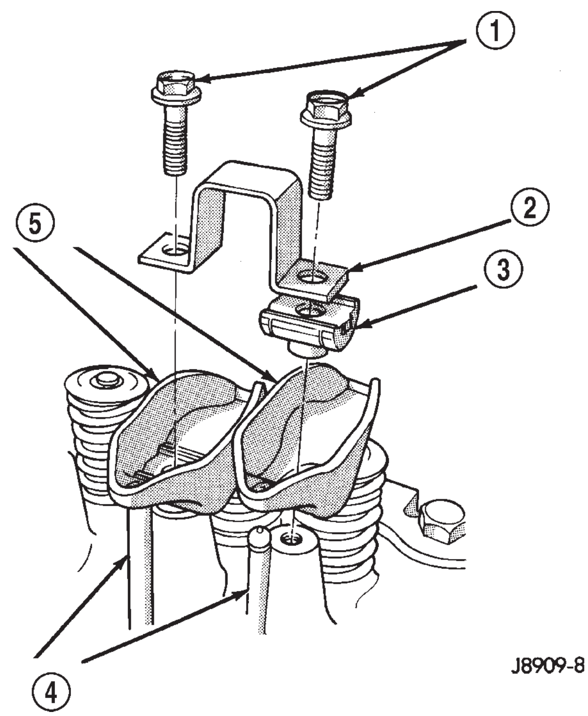


Fig. 8 Rocker Arms—Typical

1 – CAPSCREWS
2 – BRIDGE
3 – PIVOT ASSEMBLY
4 – PUSH RODS
5 – ROCKER ARMS

OPERATION

When the push rods are forced upward by the camshaft lobes the push rod presses upward on the rocker arms, the rocker arms pivot, forcing downward pressure on the valves forcing the valves to move downward and off from their seats.

VALVES

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. All valves use three bead lock keepers to retain the valve spring and promote valve rotation (Fig. 9).

DESCRIPTION AND OPERATION (Continued)

VALVE SPRING

DESCRIPTION

The valve springs are made of high strength chrome silicon steel. The springs are common for both intake and exhaust valves.

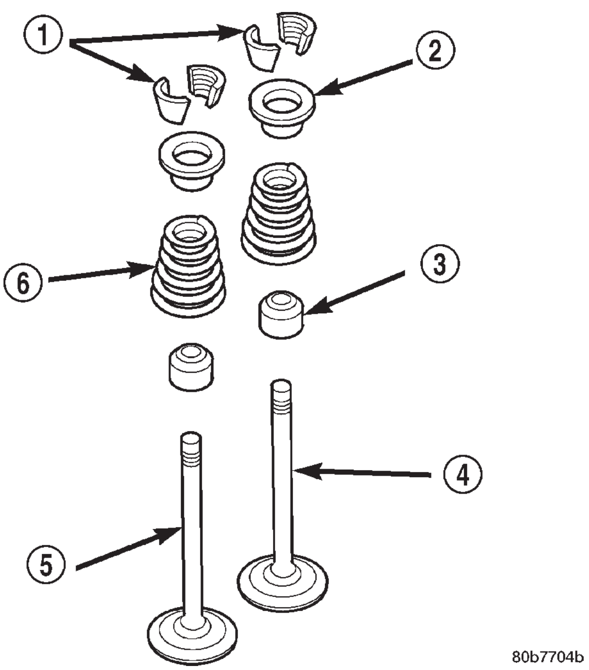


Fig. 9 Valve and Keeper Configuration 2.5L Engine

1 – VALVE LOCKS (3–BEAD)
2 – RETAINER
3 – VALVE STEM OIL SEAL
4 – INTAKE VALVE
5 – EXHAUST VALVE
6 – VALVE SPRING

CYLINDER HEAD COVER

DESCRIPTION

The cylinder head cover is made of die cast aluminum and incorporates the Crankcase Ventilation (CCV) Hoses and the oil fill opening.

HYDRAULIC TAPPET

DESCRIPTION

Valve lash is controlled by hydraulic tappets located inside the cylinder block, in tappet bores above the camshaft.

VALVE GUIDE

DESCRIPTION

The valve guides are integral to the cylinder head, They are not replaceable. However, they are serviceable.

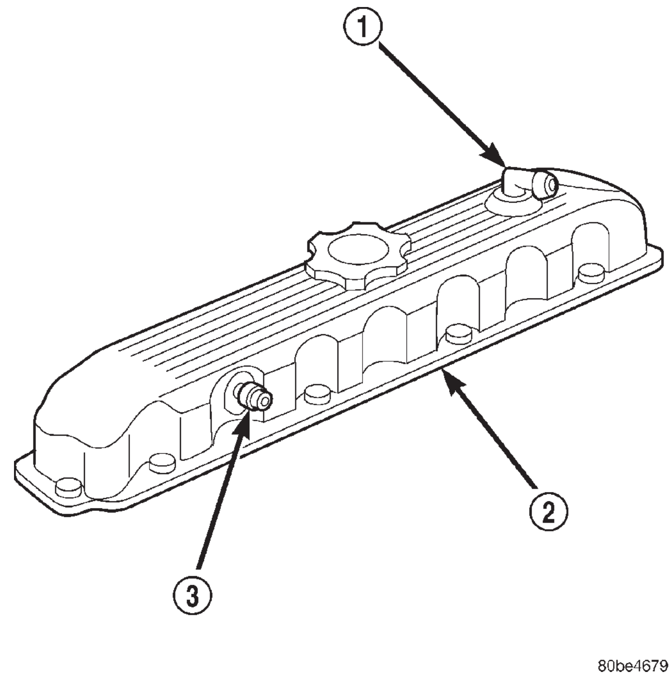


Fig. 10 Cylinder Head Cover

1 – AIR INLET FITTING
2 – CYLINDER HEAD COVER
3 – FIXED ORIFICE FITTING

OIL PAN

DESCRIPTION

The oil pan is made of stamped steel. The oil pan gasket is a one piece steel backbone silicone coated gasket.

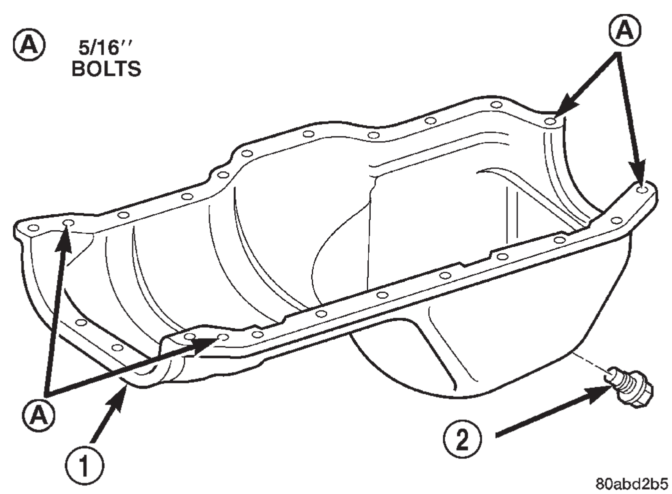


Fig. 11 Oil Pan

1 – OIL PAN
2 – OIL PAN DRAIN PLUG

DESCRIPTION AND OPERATION (Continued)

VALVE STEM SEAL

DESCRIPTION

The valve stem seals are made of rubber and incorporate a garter spring to maintain consistent lubrication control (Fig. 9).

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is made of cast aluminum and uses seven bolts to mount to the cylinder head. This mounting style improves sealing and reduces the chance of leaks.

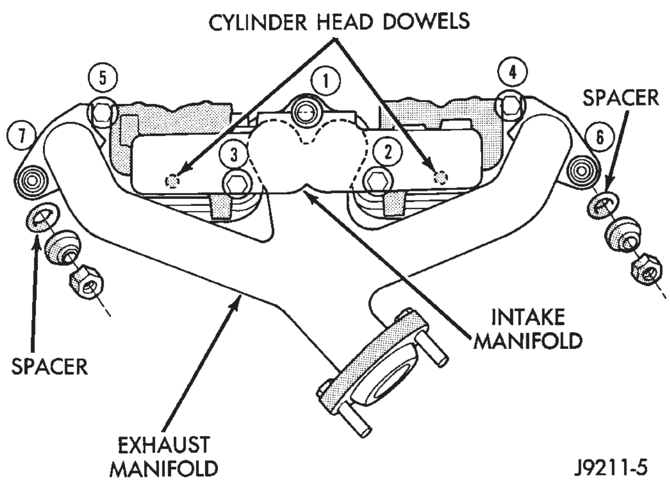


Fig. 12 Intake and Exhaust Manifold

EXHAUST MANIFOLD

DESCRIPTION

The exhaust manifold is log style and is made of high silicon molybdenum cast iron. The exhaust manifold shares a common gasket with the intake manifold. The exhaust manifold also incorporates a ball flange outlet for improved sealing and strain free connections (Fig. 12).

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 performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

Refer to the Service Diagnosis—Performance chart and the Service Diagnosis—Mechanical chart for possible causes and corrections of malfunctions. Refer to Group 14, Fuel System for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test.
- Cylinder Combustion Pressure Leakage Test.
- Engine Cylinder Head Gasket Failure Diagnosis.
- Intake Manifold Leakage Diagnosis.

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS—PERFORMANCE

ENGINE PERFORMANCE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE WILL NOT CRANK	1. Weak or dead battery	1. Charge/Replace Battery. Refer to Group 8A, Battery, for correct procedures. Check charging system. Refer to Group 8C, Charging Systems, for correct procedures.
	2. Corroded or loose battery connections	2. Clean/tighten suspect battery/ starter connections
	3. Faulty starter or related circuit(s)	3. Check starting system. Refer to Group 8B, Starting Systems, for correct diagnostics/procedures
	4. Siezed accessory drive component	4. Remove accessory drive belt and attempt to start engine. If engine starts, repair/replace siezed component.
	5. Engine internal mechanical failure or hydro-static lock	5. Refer to Group 9, Engine, for correct diagnostics/procedures
ENGINE CRANKS BUT WILL NOT START	1. No spark	1. Check for spark. Refer to Group 8D, Ignition System, for correct procedures.
	2. No fuel	2. Perform fuel pressure test, and if necessary, inspect fuel injector(s) and driver circuits. Refer to Group 14, Fuel System, for correct procedures.
	3. Low or no engine compression	3. Perform cylinder compression pressure test. Refer to Group 9, Engine, for correct procedures.
ENGINE LOSS OF POWER	1. Worn or burned distributor rotor	1. Install new distributor rotor
	2. Worn distributor shaft	2. Remove and repair distributor (Refer to group 8D, Ignition System
	3. Worn or incorrect gapped spark plugs	3. Clean plugs and set gap. (Refer to group 8D, Ignition System)
	4. Dirt or water in fuel system	4. Clean system and replace fuel filter
	5. Faulty fuel pump	5. Install new fuel pump
	6. Incorrect valve timing	6. Correct valve timing
	7. Blown cylinder head gasket	7. Install new cylinder head gasket
	8. Low compression	8. Test cylinder compression
	9. Burned, warped, or pitted valves	9. Install/Reface valves as necessary
	10. Plugged or restricted exhaust system	10. Install new parts as necessary
	11. Faulty ignition cables	11. Replace any cracked or shorted cables

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	12. Faulty ignition coil	12. Test and replace, as necessary (Refer to Group 8D, ignition system)
ENGINE STALLS OR ROUGH IDLE	1. Carbon build-up on throttle plate	1. Remove throttle body and de-carbon. (Refer to Group 14 for correct procedures)
	2. Engine idle speed too low	2. Check Idle Air Control circuit. (Refer to Group 14, Fuel System)
	3. Worn or incorrectly gapped spark plugs	3. Replace or clean and re-gap spark plugs (Refer to group 8D, Ignition System)
	4. Worn or burned distributor rotor	4. Install new distributor rotor
	5. Spark plug cables defective or crossed	5. Check for correct firing order or replace spark plug cables. (Refer to Group 8D, Ignition System for correct procedures.)
	6. Faulty coil	6. Test and replace, if necessary (Refer to group 8D, Ignition System)
	7. Intake manifold vacuum leak	7. Inspect intake manifold gasket and vacuum hoses. Replace if necessary (Refer to Group 11, Exhaust System & Intake Manifold)
	8. EGR valve leaking or stuck open	8. Test and replace, if necessary (Refer to group 25, Emission Control Systems)
ENGINE MISSES ON ACCELERATION	1. Worn or incorrectly gapped spark plugs	1. Replace spark plugs or clean and set gap. (Refer to group 8D, Ignition System)
	2. Spark plug cables defective or crossed	2. Check Idle Air Control circuit. (Refer to Group 14, Fuel System)
	3. Dirt in fuel system	3. Clean fuel system
	4. Burned, warped or pitted valves	4. Install new valves
	5. Faulty coil	5. Test and replace as necessary (refer to group 8D, Ignition System)

SERVICE DIAGNOSIS—MECHANICAL

ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	1. High or low oil level in crankcase	1. Check for correct oil level. Adjust oil level by draining or adding as needed
	2. Thin or diluted oil	2. Change oil (Refer to Engine Oil Service in this group)
	3. Low oil pressure	3. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Dirt in tappets/lash adjusters	4. Clean/replace hydraulic tappets/lash adjusters
	5. Bent push rod(s)	5. Install new push rods
	6. Worn rocker arms	6. Inspect oil supply to rocker arms and replace worn arms as needed
	7. Worn tappets/lash adjusters	7. Install new hydraulic tappets/lash adjusters
	8. Worn valve guides	8. Inspect all valve guides and replace as necessary
	9. Excessive runout of valve seats or valve faces	9. Grind valves and seats
CONNECTING ROD NOISE	1. Insufficient oil supply	1. Check engine oil level. (Refer to group 0, Lubrication and Maintenance)
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	4. Excessive connecting rod bearing clearance	Measure bearings for correct clearance with plasti-gage. Repair as necessary
	5. Connecting rod journal out of round	5. Replace crankshaft or grind journals
	6. Misaligned connecting rods	6. Replace bent connecting rods
MAIN BEARING NOISE	1. Insufficient oil supply	1. Check engine oil level. (Refer to group 0, Lubrication and Maintenance)
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	4. Excessive main bearing clearance	4. Measure bearings for correct clearance. Repair as necessary
	5. Excessive end play	5. Check crankshaft thrust bearing for excessive wear on flanges
	6. Crankshaft main journal out of round or worn	6. Grind journals or replace crankshaft
	7. Loose flywheel or torque converter	7. Inspect crankshaft, flexplate/ flywheel and bolts for damage. Tighten to correct torque

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW OIL PRESSURE	1. Low oil level	1. Check oil level and fill if necessary
	2. Faulty oil pressure sending unit	2. Install new sending unit
	3. Clogged oil filter	3. Install new oil filter
	4. Worn oil pump	4. Replace worn gears or oil pump assy
	5. Thin or diluted oil	5. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	6. Excessive bearing clearance	6. Measure bearings for correct clearance
	7. Oil pump relief valve stuck	7. Remove valve to inspect, clean and reinstall
	8. Oil pump suction tube loose, broken, bent or clogged	8. Inspect suction tube and clean or replace if necessary
	9. Oil pump cover warped or cracked	9. Install new oil pump
OIL LEAKS	1. Misaligned or deteriorated gaskets	1. Replace gasket
	2. Loose fastener, broken or porous metal part	2. Tighten, repair or replace the part
	3. Front or rear crankshaft oil seal leaking	3. Replace seal
	4. Leaking oil gallery plug or cup plug	4. Remove and reseal threaded plug. Replace cup style plug
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. PCV System malfunction	1. Refer to group 25, Emission Control System for correct operation
	2. Defective valve stem seal(s)	2. Repair or replace seal(s)
	3. Worn or broken piston rings	3. Hone cylinder bores. Install new rings
	4. Scuffed pistons/cylinder walls	4. Hone cylinder bores and replace pistons as required
	5. Carbon in oil control ring groove	5. Remove rings and de-carbon piston
	6. Worn valve guides	6. Inspect/replace valve guides as necessary
	7. Piston rings fitted too tightly in grooves	7. Remove rings and check ring end gap and side clearance. Replace if necessary

DIAGNOSIS AND TESTING (Continued)

INTAKE MANIFOLD LEAKAGE DIAGNOSIS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.

(2) Spray a small stream of water at the suspected leak area.

(3) If a change in RPM is observed the area of the suspected leak has been found.

(4) Repair as required.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.

(2) Remove the spark plugs.

(3) Secure the throttle in the wide-open position.

(4) Disable the fuel system. (Refer to Group 14, Fuel System for the correct procedure)

(5) Disconnect the ignition coil.

(6) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(7) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

Refer to Engine Specifications for the correct engine compression pressures.

ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS

A leaking engine cylinder head gasket usually results in loss of power, loss of coolant and engine misfiring.

An engine cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- An engine cylinder head gasket leaking between adjacent cylinders is indicated by a loss of power and/or engine misfire.
- An engine cylinder head gasket leaking between a cylinder and an adjacent water jacket is indicated by coolant foaming or overheating and loss of coolant.

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders; follow the procedures outlined in Cylinder Compression Pressure Test. 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. 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.

Remove the radiator cap.

Start the engine and allow it to warm up until the engine thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

If bubbles are not visible, install a radiator pressure tester and pressurize the coolant system.

If a cylinder is leaking combustion pressure into the water jacket, the tester pointer will pulsate with every combustion stroke of the cylinder.

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.

(1) Check the coolant level and fill as required. DO NOT install the radiator cap.

(2) Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

(3) Remove the spark plugs.

(4) Remove the oil filler cap.

(5) Remove the air cleaner.

(6) Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

(7) Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to the Cylinder Combustion Pressure Leakage Test Diagnosis chart.

DIAGNOSIS AND TESTING (Continued)

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

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 per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.

(4) **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.

(3) 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.

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(5) If the leakage occurs at the 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 and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

(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.

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:

(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, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil

DIAGNOSIS AND TESTING (Continued)

filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

ENGINE OIL PRESSURE

(1) Disconnect connector and remove oil pressure sending unit.

(2) Install Oil Pressure Line and Gauge Tool C-3292 or equivalent. Start engine and record pressure. Refer to Oil Pressure in Engine Specifications for the correct pressures.

SERVICE PROCEDURES

VALVE TIMING

- Disconnect the spark plug wires and remove the spark plugs.
- Remove the engine cylinder head cover.
- Remove the capscrews, bridge and pivot assembly, and rocker arms from above the No.1 cylinder.
- Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridge.
- Rotate the crankshaft until the No.4 piston is at top dead center (TDC) on the compression stroke.
- Rotate the crankshaft counterclockwise (viewed from the front of the engine) 90°.
- Install a dial indicator on the end of the No.1 cylinder intake valve push rod. Use rubber tubing to secure the indicator stem on the push rod.
- Set the dial indicator pointer at zero.
- Set the dial indicator pointer at zero.
- Rotate the crankshaft clockwise (viewed from the front of the engine) until the dial indicator pointer indicates 0.305 mm (0.012 inch) travel distance (lift).
- The timing notch index on the vibration damper should be aligned with the TDC mark on the timing degree scale.
- If the timing notch is more than 13 mm (1/2 inch) away from the TDC mark in either direction, the valve timing is incorrect.
- If the valve timing is incorrect, the cause may be a broken camshaft pin. It is not necessary to replace the camshaft because of pin failure. A spring pin is available for service replacement.

VALVE, GUIDE AND SEAL

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

Clean all grime and gasket material from the engine cylinder head machined gasket surface.

Inspect for cracks in the combustion chambers and valve ports.

Inspect for cracks on the exhaust seat.

Inspect for cracks in the gasket surface at each coolant passage.

Inspect valves for burned, cracked or warped heads.

Inspect for scuffed or bent valve stems.

Replace valves displaying any damage.

VALVE REFACING

(1) Use a valve refacing machine to reface the intake and exhaust valves to the specified angle.

(2) After refacing, a margin of at least 0.787 mm (0.031 inch) must remain (Fig. 13). If the margin is less than 0.787 mm (0.031 inch), the valve must be replaced.

VALVE SEAT REFACING

(1) Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.

(2) Use tapered stones to obtain the specified seat width when required.

(3) Control valve seat runout to a maximum of 0.0635 mm (0.0025 in.)— (Fig. 14).

VALVE STEM OIL SEAL REPLACEMENT

Valve stem oil seals are installed on each valve stem to prevent rocker arm lubricating oil from entering the combustion chamber through the valve guide bores. One seal is marked INT (intake valve) and the other is marked EXH (exhaust valve).

Replace the oil seals whenever valve service is performed or if the seals have deteriorated.

SERVICE PROCEDURES (Continued)

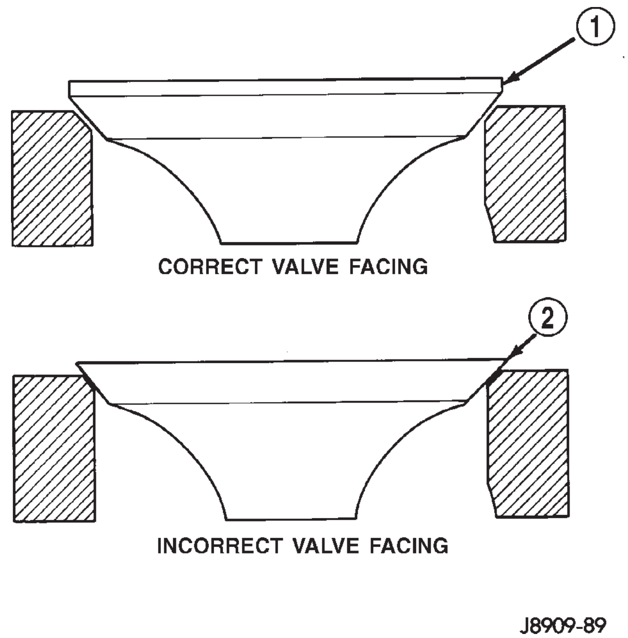


Fig. 13 Valve Facing Margin

1 – 0.787 MM (1/32 INCH) VALVE MARGIN
2 – NO MARGIN

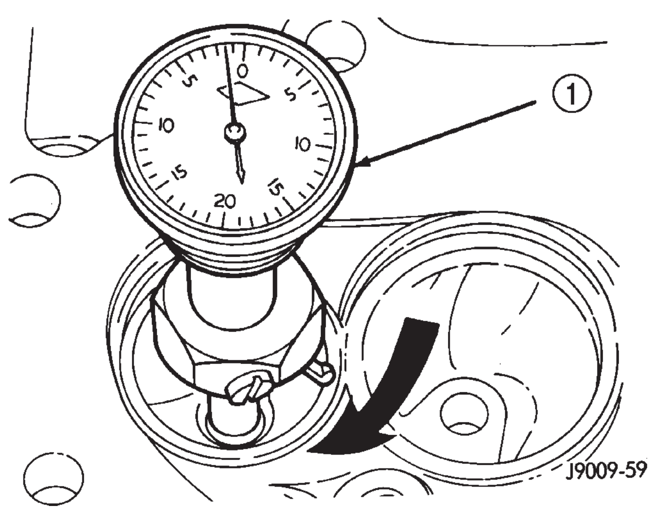


Fig. 14 Measurement of Valve Seat Runout

1 – DIAL INDICATOR

VALVE GUIDES

The valve guides are an integral part of the engine cylinder head and are not replaceable.

When the valve stem guide clearance is excessive, the valve guide bores must be reamed oversize. Service valves with oversize stems are available in 0.076 mm (0.003 inch) and 0.381 mm (0.015 inch) increments.

Corresponding oversize valve stem seals are also available and must be used with valves having 0.381 mm (0.015 inch) oversize stems, 0.076mm (.003in.) oversize stems do not require oversize seals.

NOTE: If the valve guides are reamed oversize, the valve seats must be ground to ensure that the valve seat is concentric to the valve guide.

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

Valve stem-to-guide clearance may be measured by either of the following two methods.

PREFERRED METHOD:

(1) Remove the valve from the head.

(2) Clean the valve stem guide bore with solvent and a bristle brush.

(3) Insert a telescoping gauge into the valve stem guide bore approximately 9.525 mm (.375 inch) from the valve spring side of the head (Fig. 15).

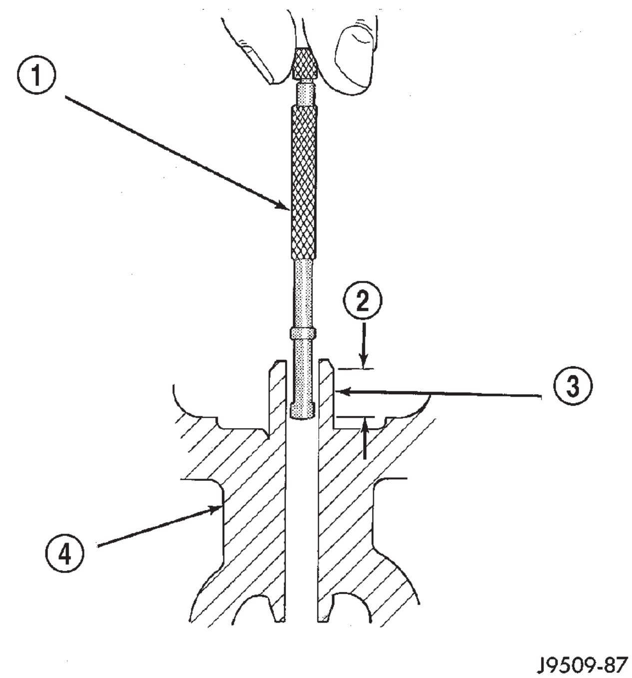


Fig. 15 Measurement of Valve Guide Bore Diameter

1 – GAUGE
2 – 9.525 MM (3/8 INCH)
3 – VALVE STEM GUIDE
4 – CYLINDER HEAD

(4) Remove and measure telescoping gauge with a micrometer.

(5) Repeat the measurement with contacts lengthwise to engine cylinder head.

(6) Compare the crosswise to lengthwise measurements to determine out-of-roundness. If the measurements differ by more than 0.0635 mm (0.0025 in.), ream the guide bore to accommodate an oversize valve stem.

(7) Compare the measured valve guide bore diameter with specifications (7.95-7.97 mm or 0.313-0.314

SERVICE PROCEDURES (Continued)

inch). If the measurement differs from specification by more than 0.076 mm (0.003 inch), ream the guide bore to accommodate an oversize valve stem.

ALTERNATIVE METHOD:

(1) Use a dial indicator to measure the lateral movement of the valve stem (stem-to-guide clearance). This must be done with the valve installed in its guide and just off the valve seat (Fig. 16).

(2) Correct clearance is 0.025-0.0762 mm (0.001-0.003 inch). If indicated movement exceeds the specification ream the valve guide to accommodate an oversize valve stem.

NOTE: Valve seats must be ground after reaming the valve guides to ensure that the valve seat is concentric to the valve guide.

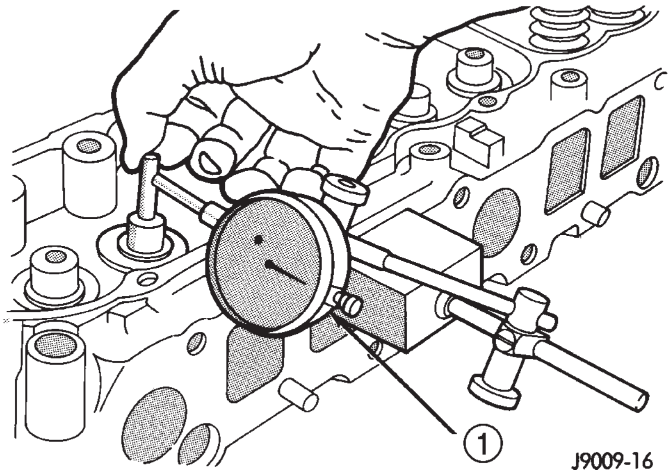


Fig. 16 Measurement of Lateral Movement Of Valve Stem

1 – DIAL INDICATOR

VALVE SPRING TENSION TEST

Use a Universal Valve Spring Tester and a torque wrench to test each valve spring for the specified tension value (Fig. 17).

Replace valve springs that are not within specifications.

PISTON—FITTING

BORE GAUGE METHOD

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

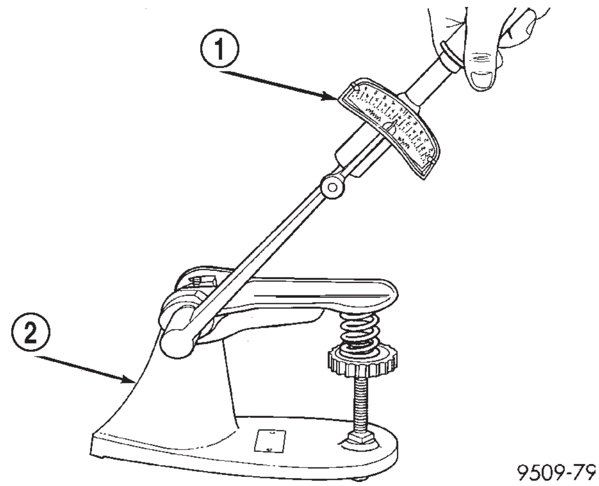


Fig. 17 Valve Spring Tester

1 – TORQUE WRENCH
2 – VALVE SPRING TESTER

(2) Measure the inside diameter of the cylinder bore at a point 49.5 mm (1-15/16 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 19).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. **The coated piston connecting rod assembly can be used to service previous built engines and MUST be replaced as complete sets.** Tin coated pistons should not be used as replacements for coated pistons.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results (Fig. 18). Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

SERVICE PROCEDURES (Continued)

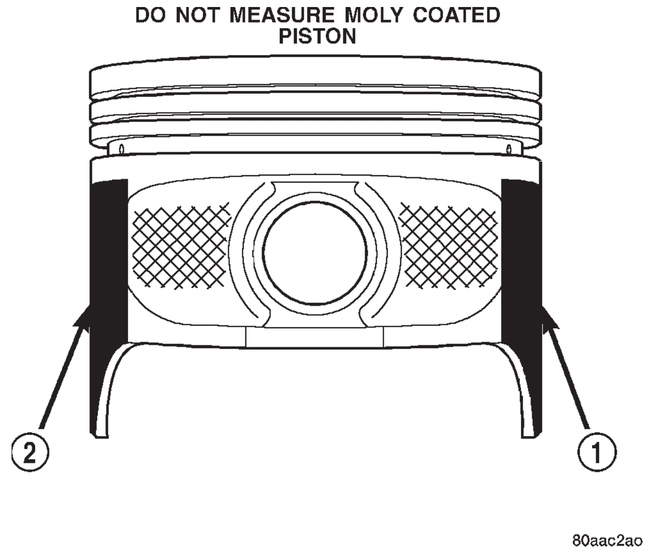


Fig. 18 Moly Coated Piston

1 – MOLY COATED
2 – MOLY COATED

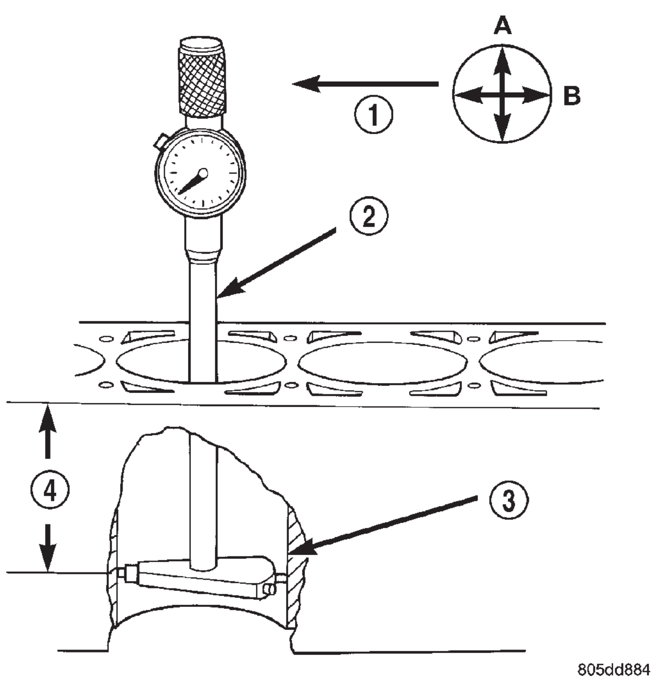


Fig. 19 Bore Gauge

1 – FRONT
2 – BORE GAUGE
3 – CYLINDER BORE
4 – 49.5 MM
(1–15/16 in)

PISTON SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 - 98.448 mm (3.8755 - 3.8759 in.)	A
98.448 - 98.458 mm (3.8759 - 3.8763 in.)	B
98.458 - 98.468 mm (3.8763 - 3.8767 in.)	C
98.468 - 98.478 mm (3.8767 - 3.8771 in.)	D
98.478 - 98.488 mm (3.8771 - 3.8775 in.)	E
98.488 - 98.498 mm (3.8775 - 3.8779 in.)	F

PISTON RING—FITTING

(1) Carefully clean the carbon from all ring grooves. Oil drain openings in the oil ring groove and pin boss must be clear. DO NOT remove metal from the grooves or lands. This will change ring-to-groove clearances and will damage the ring-to-land seating.

(2) Be sure the piston ring grooves are free of nicks and burrs.

(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 20) (Fig. 21). Rotate the ring in the groove. It must move freely around circumference of the groove.

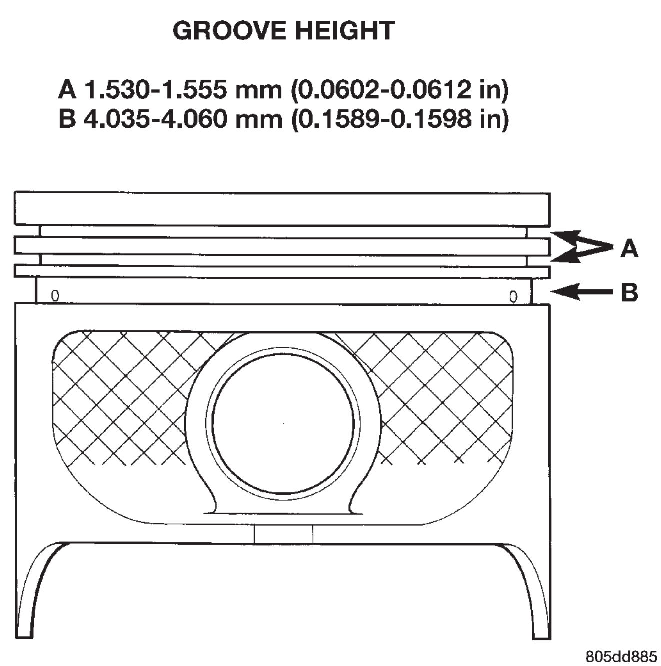


Fig. 20 Piston Dimensions

SERVICE PROCEDURES (Continued)

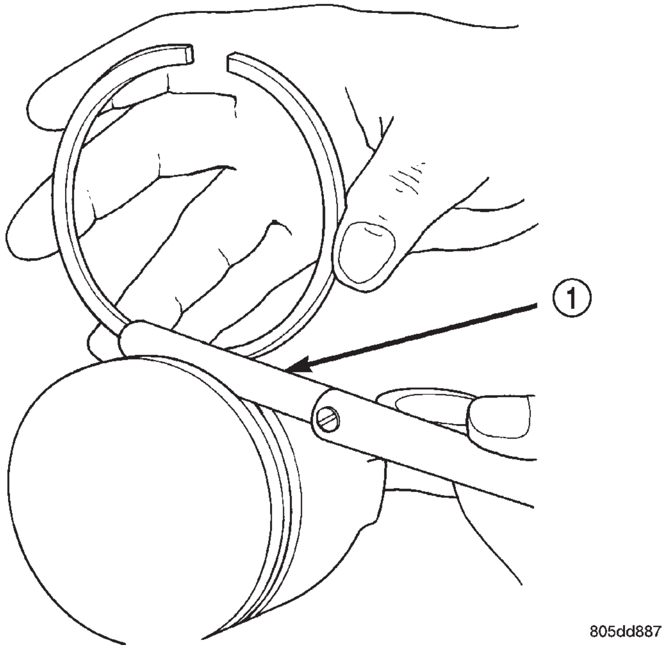


Fig. 21 Ring Side Clearance Measurement
1 – FEELER GAUGE

RING SIDE CLEARANCE CHART

ITEM	SPECIFICATION
Top Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Second Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Oil Control Ring	0.06 - 0.21 mm (0.0024 - 0.0083 in.)

(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 22).

(5) The oil control rings are symmetrical, and can be installed with either side up. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The top compression ring can be identified by the shiny coating on the outer sealing surface and can be installed with either side up. (Fig. 23).

(7) The second compression ring has a slight chamfer on the bottom of the inside edge and a dot on the top for correct installation (Fig. 24).

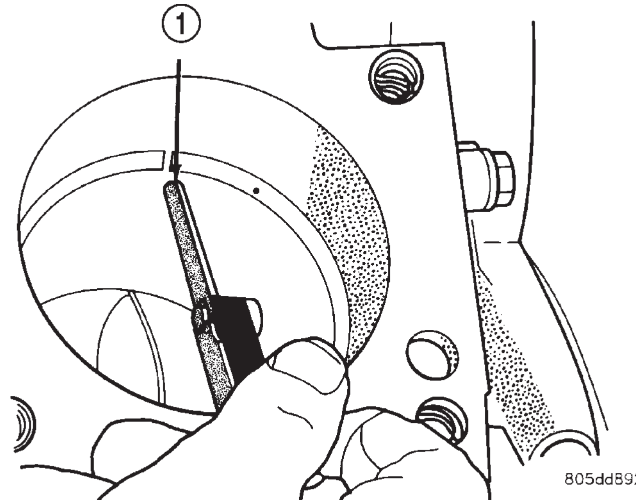


Fig. 22 Gap Measurement
1 – FEELER GAUGE

RING GAP MEASUREMENT CHART

ITEM	SPECIFICATION
Top Compression Ring	0.229 - 0.610 mm (0.0090 - 0.0240 in.)
Second Compression Ring	0.483 - 0.965 mm (0.0190 - 0.080 in.)
Oil Control Ring	0.254 - 1.500 mm (0.010 - 0.060 in.)

(8) Using a ring installer, install the second compression ring with the dot facing up (Fig. 24) (Fig. 26).

(9) Using a ring installer, install the top compression ring (either side up).

Ring Gap Orientation

- Position the gaps on the piston as shown (Fig. 27).
- Oil spacer - Gap on center line of piston skirt.
- Oil rails - gap 180° apart on centerline of piston pin bore.
- No. 2 Compression ring - Gap 180° from top oil rail gap.
- No. 1 Compression ring - Gap 180° from No. 2 compression ring gap.

SERVICE PROCEDURES (Continued)

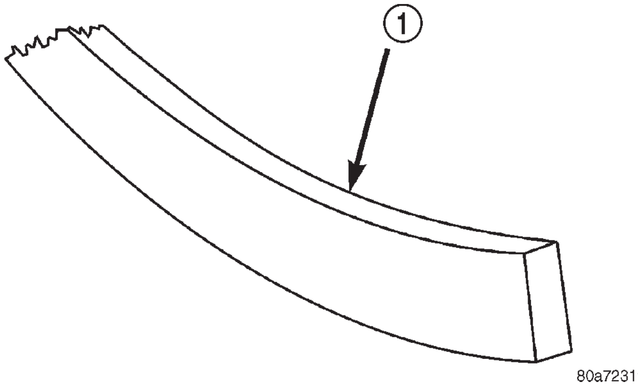


Fig. 23 Top Compression ring identification

1 – TOP COMPRESSION RING

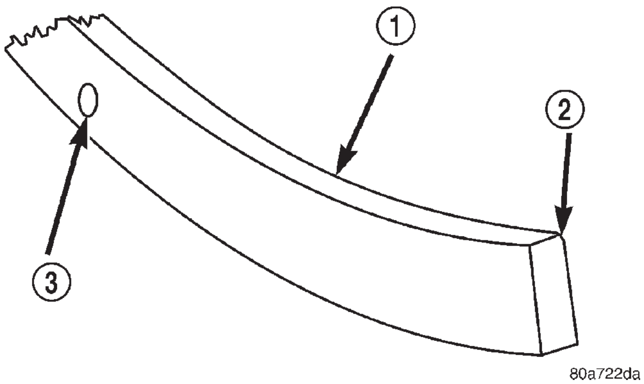


Fig. 24 Second Compression Ring Identification

1 – SECOND COMPRESSION RING
2 – CHAMFER
3 – ONE DOT

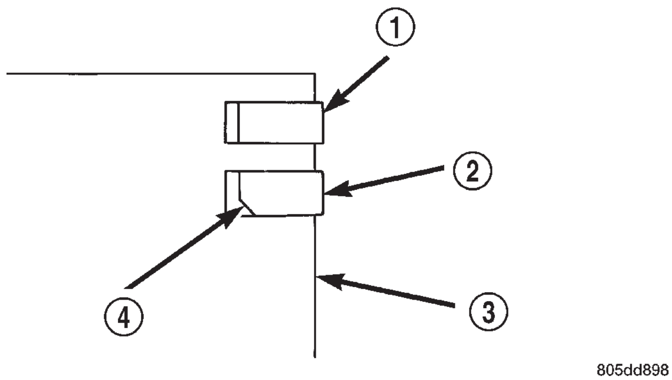


Fig. 25 Compression Ring Chamfer Location

1 – TOP COMPRESSION RING
2 – SECOND COMPRESSION RING
3 – PISTON
4 – CHAMFER

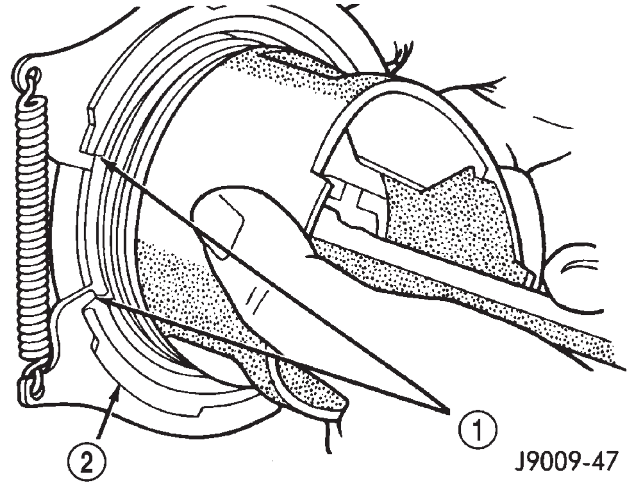


Fig. 26 Compression Ring Installation

1 – COMPRESSION RING
2 – RING EXPANDER RECOMMENDED

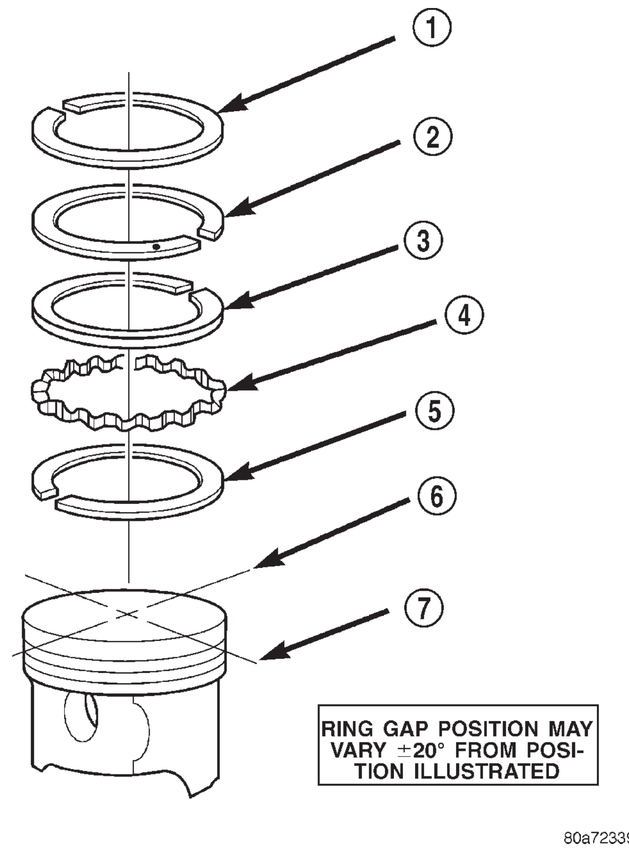


Fig. 27 Ring Gap Orientation

1 – TOP COMPRESSION RING
2 – BOTTOM COMPRESSION RING
3 – TOP OIL CONTROL RAIL
4 – OIL RAIL SPACER
5 – BOTTOM OIL CONTROL RAIL
6 – IMAGINARY LINE PARALLEL TO PISTON PIN
7 – IMAGINARY LINE THROUGH CENTER OF PISTON SKIRT

SERVICE PROCEDURES (Continued)

CONNECTING ROD BEARINGS—FITTING

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 28) (Fig. 29). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 30). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

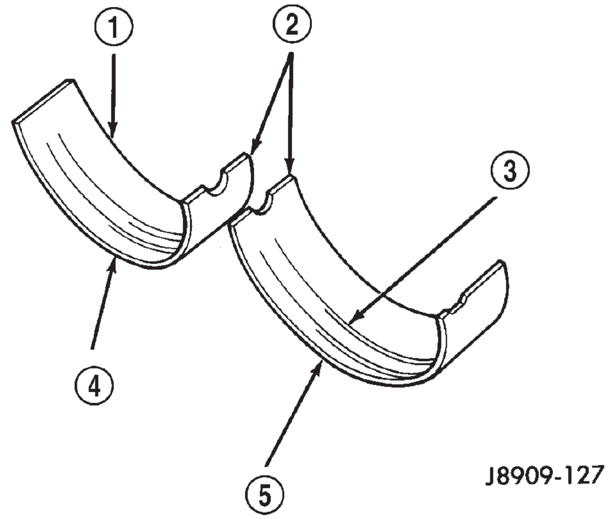


Fig. 28 Connecting Rod Bearing Inspection

1 – UPPER BEARING HALF
2 – MATING EDGES
3 – GROOVES CAUSED BY ROD BOLTS SCRATCHING JOURNAL DURING INSTALLATION
4 – WEAR PATTERN — ALWAYS GREATER ON UPPER BEARING
5 – LOWER BEARING HALF

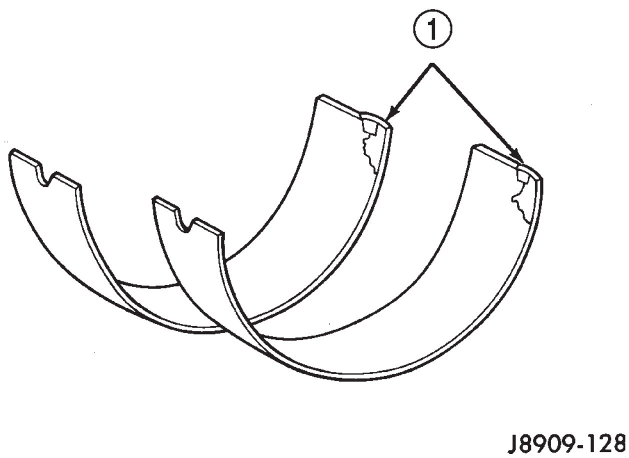


Fig. 29 Locking Tab Inspection

1 – ABNORMAL CONTACT AREA CAUSED BY LOCKING TABS NOT FULLY SEATED OR BEING BENT

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

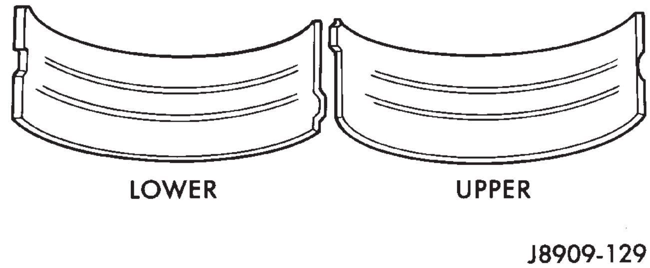


Fig. 30 Scoring Caused by Insufficient Lubrication or by Damaged Crankshaft Pin Journal

(1) Wipe the oil from the connecting rod journal.

(2) Use short rubber hose sections over rod bolts during installation.

(3) Lubricate the upper bearing insert and install in connecting rod.

(4) Use piston ring compressor to install the rod and piston assemblies. The oil squirt holes in the rods must face the camshaft. The arrow on the piston crown should point to the front of the engine (Fig. 31). Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

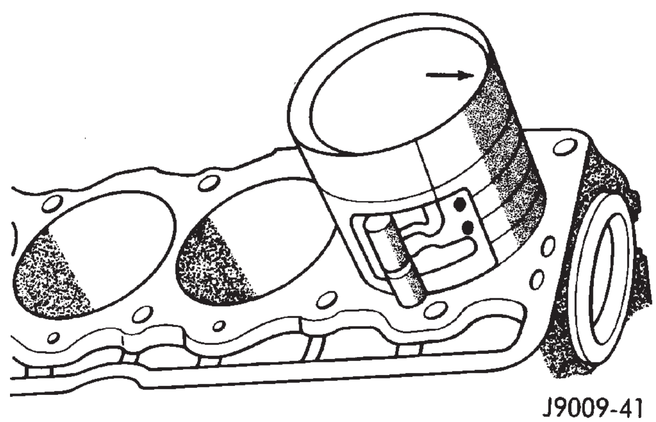


Fig. 31 Rod and Piston Assembly Installation

(5) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(6) Install bearing cap and connecting rod on the journal and tighten nuts to 45 N·m (33 ft. lbs.) torque. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(7) Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (Fig. 32). Refer to

SERVICE PROCEDURES (Continued)

Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

(8) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

(9) If bearing-to-journal clearance exceeds the specification, install a pair of 0.0254 mm (0.001 inch) undersize bearing inserts. All the odd size inserts must be on the bottom. The sizes of the service replacement bearing inserts are stamped on the backs of the inserts. Measure the clearance as described in the previous steps.

(10) The clearance is measured with a pair of 0.0254 mm (0.001 inch) undersize bearing inserts installed. This will determine if two 0.0254 mm (0.001 inch) undersize inserts or another combination is needed to provide the correct clearance (refer to Connecting Rod Bearing Fitting Chart).

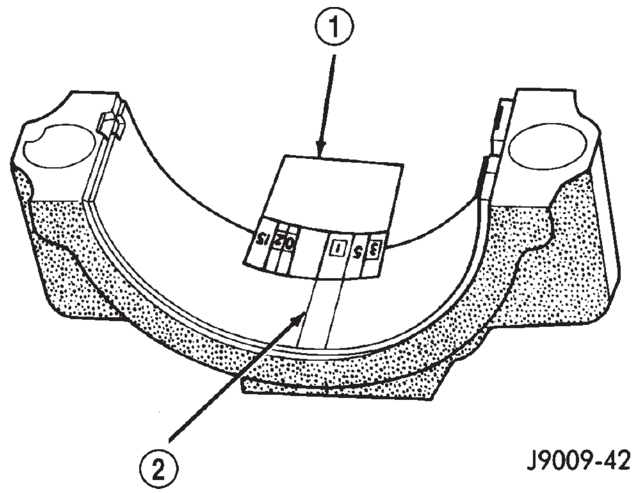


Fig. 32 Measuring Bearing Clearance with Plastigage

1 – PLASTIGAGE SCALE
2 – COMPRESSED PLASTIGAGE

CONNECTING ROD BEARING FITTING CHART

CRANKSHAFT JOURNAL		CORRESPONDING CONNECTING ROD BEARING INSERT	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	53.2257-53.2079 mm (2.0955-2.0948 in.)	Yellow - Standard	Yellow - Standard
Orange	53.2079 - 53.1901 mm (2.0948 - 2.0941 in.) 0.0178 mm (0.0007 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	53.1901 - 53.1724 mm (2.0941 - 2.0934 in.) 0.0356 mm (0.0014 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Red	52.9717 - 52.9539 mm (2.0855 - 2.0848 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

SERVICE PROCEDURES (Continued)

(11) **FOR EXAMPLE:** If the initial clearance was 0.0762 mm (0.003 inch), 0.025 mm (0.001 inch) undersize inserts would reduce the clearance by 0.025 mm (0.001 inch). The clearance would be 0.002 inch and within specification. A 0.051 mm (0.002 inch) undersize insert would reduce the initial clearance an additional 0.013 mm (0.0005 inch). The clearance would then be 0.038 mm (0.0015 inch).

(12) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(13) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 45 N·m (33 ft. lbs.) torque.

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange (Fig. 33). Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

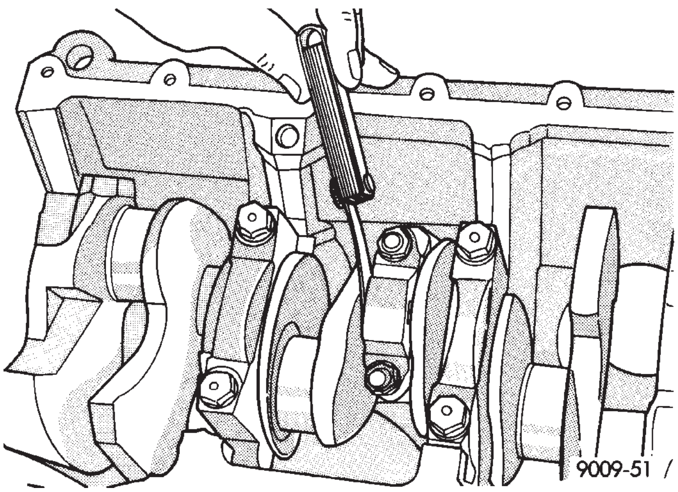


Fig. 33 Checking Connecting Rod Side Clearace—Typical

FITTING CRANKSHAFT MAIN BEARINGS

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 34). In general the lower bearing half will a heaver wear pattern.

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

FITTING BEARINGS (CRANKSHAFT INSTALLED)

The main bearing caps, numbered (front to rear) from 1 through 5 have an arrow to indicate the forward position. The upper main bearing inserts are grooved to provide oil channels while the lower inserts are smooth.

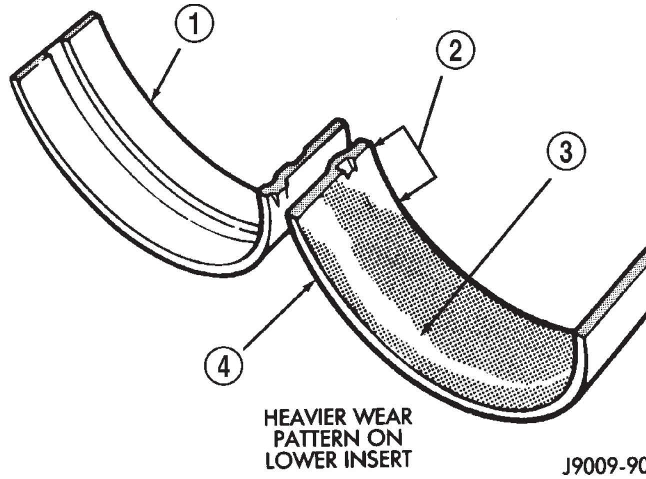


Fig. 34 Main Bearing Wear Patterns

1 – UPPER INSERT
2 – NO WEAR IN THIS AREA
3 – LOW AREA IN BEARING LINING
4 – LOWER INSERT

Each bearing insert pair is selectively fitted to its respective journal to obtain the specified operating clearance. In production, the select fit is obtained by using various-sized color-coded bearing insert pairs as listed in the Main Bearing Fitting Chart. The bearing color code appears on the edge of the insert. **The size is not stamped on bearing inserts used for engine production.**

The main bearing journal size (diameter) is identified by a color-coded paint mark on the adjacent cheek. The rear main journal, is identified by a color-coded paint mark on the crankshaft rear flange.

When required, upper and lower bearing inserts of different sizes may be used as a pair. A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce the clearance by 0.013 mm (0.0005 inch). **Never use a pair of bearing inserts with greater than a 0.025 mm (0.001 inch) difference in size. Refer to the Bearing Insert Pair Chart.**

BEARING INSERT PAIR CHART

INSERT	CORRECT	INCORRECT
UPPER	STANDARD	STANDARD
LOWER	0.025 mm (0.001 in.) UNDERSIZE	0.051 mm (0.002 in.) UNDERSIZE

SERVICE PROCEDURES (Continued)

NOTE: When replacing inserts, the odd size inserts must be either all on the top (in cylinder block) or all on the bottom (in main bearing cap).

Once the bearings have been properly fitted, proceed to Crankshaft Main Bearing—Installation.

BEARING-TO-JOURNAL CLEARANCE (CRANKSHAFT INSTALLED)

When using Plastigage, check only one bearing clearance at a time.

Install the grooved main bearings into the cylinder block and the non-grooved bearings into the bearing caps.

Install the crankshaft into the upper bearings dry.

Place a strip of Plastigage across full width of the crankshaft journal to be checked.

Install the bearing cap and tighten the bolts to 108 N·m (80 ft. lbs.) torque.

NOTE: DO NOT rotate the crankshaft. This will cause the Plastigage to shift, resulting in an inaccurate reading. Plastigage must not be permitted to crumble. If brittle, obtain fresh stock.

Remove the bearing cap. Determine the amount of clearance by measuring the width of the compressed Plastigage with the scale on the Plastigage envelope (Fig. 35). Refer to Engine Specifications for the proper clearance.

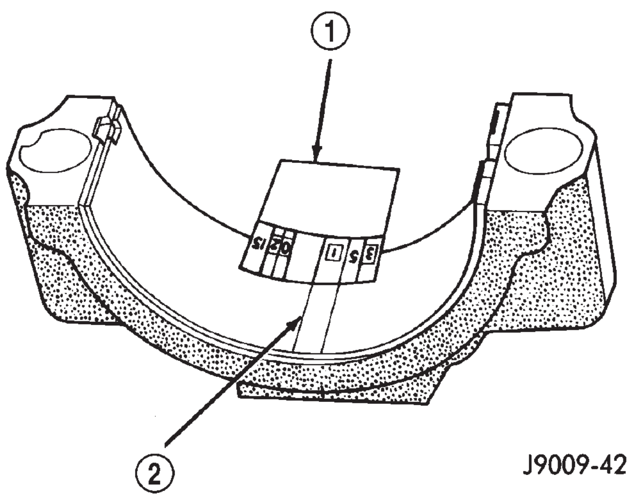


Fig. 35 Measuring Bearing Clearance with Plastigage

1 – PLASTIGAGE SCALE
2 – COMPRESSED PLASTIGAGE

Plastigage should indicate the same clearance across the entire width of the insert. If clearance varies, it may indicate a tapered journal or foreign material trapped behind the insert.

If the specified clearance is indicated and there are no abnormal wear patterns, replacement of the bearing inserts is not necessary. Remove the Plastigage from the crankshaft journal and bearing insert. Proceed to Crankshaft Main Bearing—Installation.

If the clearance exceeds specification, install a pair of 0.025 mm (0.001 inch) undersize bearing inserts and measure the clearance as described in the previous steps.

The clearance indicated with the 0.025 mm (0.001 inch) undersize insert pair installed will determine if this insert size or some other combination will provide the specified clearance. **FOR EXAMPLE:** If the clearance was 0.0762 mm (0.003 inch) originally, a pair of 0.0254 mm (0.001 inch) undersize inserts would reduce the clearance by 0.0254 mm (0.001 inch). The clearance would then be 0.0508 mm (0.002 inch) and within the specification. A 0.051 mm (0.002 inch) undersize bearing insert and a 0.0254 mm (0.001 inch) undersize insert would reduce the original clearance an additional 0.0127 mm (0.0005 inch). The clearance would then be 0.0381 mm (0.0015 inch).

CAUTION: Never use a pair of inserts that differ more than one bearing size as a pair.

FOR EXAMPLE: DO NOT use a standard size upper insert and a 0.051 mm (0.002 inch) undersize lower insert.

If the clearance exceeds specification using a pair of 0.051 mm (0.002 inch) undersize bearing inserts, measure crankshaft journal diameter with a micrometer. If the journal diameter is correct, the crankshaft bore in the cylinder block may be misaligned, which requires cylinder block replacement or machining to true bore.

If journals 1 through 5 diameters are less than 63.4517 mm (2.4981 inches), replace crankshaft or grind crankshaft down to accept the appropriate undersize bearing inserts.

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block (refer to Cylinder Block - Disassemble).

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper and out of round is 0.013 mm (0.0005 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

SERVICE PROCEDURES (Continued)

MAIN BEARING FITTING CHART

CRANKSHAFT JOURNALS		CORRESPONDING CRANKSHAFT BEARING INSERT	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	63.5025 - 63.4898 mm (2.5001 - 2.4996 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4898 - 63.4771mm (2.4996 - 2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Yellow - Standard	Blue- Undersize 0.025 mm (0.001 in.)
Blue	63.4771 - 63.4644 mm (2.4991 - 2.4986 in.) 0.0254 mm (0.001 in.) Undersize	Blue- Undersize 0.025 mm (0.001 in.)	Blue- Undersize 0.025 mm (0.001 in.)
Green	63.4644 - 63.4517 mm (2.4986 - 2.4981 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2485 - 63.2358 mm (2.4901 - 2.4896 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

FORM-IN-PLACE GASKETS

There are several places where form-in-place gaskets are used on the engine. **DO NOT use form-in-place gasket material unless specified.** Care must be taken when applying form-in-place gaskets. Bead size, continuity and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over. A continuous bead of the proper width is essential to obtain a leak-free joint.

Two types of form-in-place gasket materials are used in the engine area (Mopar Silicone Rubber Adhesive Sealant and Mopar Gasket Maker). Each have different properties and cannot be used interchangeably.

MOPAR SILICONE RUBBER ADHESIVE SEALANT

Mopar Silicone Rubber Adhesive Sealant, normally black in color, is available in 3 ounce tubes. Moisture in the air causes the sealant material to cure. This material is normally used on flexible metal flanges. It has a shelf life of a year and will not properly cure if over aged. Always inspect the package for the expiration date before use.

MOPAR GASKET MAKER

Mopar Gasket Maker, normally red in color, is available in 6 cc tubes. This anaerobic type gasket material cures in the absence of air when squeezed between smooth machined metallic surfaces. It will not cure if left in the uncovered tube. DO NOT use on flexible metal flanges.

SURFACE PREPARATION

Parts assembled with form-in-place gaskets may be disassembled without unusual effort. In some instances, it may be necessary to lightly tap the part with a mallet or other suitable tool to break the seal between the mating surfaces. A flat gasket scraper may also be lightly tapped into the joint but care must be taken not to damage the mating surfaces.

Scrape or wire brush all gasket surfaces to remove all loose material. Inspect stamped parts to ensure gasket rails are flat. Flatten rails with a hammer on a flat plate, if required. Gasket surfaces must be free of oil and dirt. Make sure the old gasket material is removed from blind attaching holes.

GASKET APPLICATION

Assembling parts using a form-in-place gasket requires care.

SERVICE PROCEDURES (Continued)

Mopar Silicone Rubber Adhesive Sealant should be applied in a continuous bead approximately 3 mm (0.12 inch) in diameter. All mounting holes must be circled. For corner sealing, a 3 or 6 mm (1/8 or 1/4 inch) 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 use of a locating dowel is recommended during assembly to prevent smearing the material off location.

Mopar Gasket Maker should be applied sparingly to one gasket surface. The sealant diameter should be 1.00 mm (0.04 inch) or less. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing the material off location.

ENGINE PERFORMANCE

It is important that the vehicle is operating to its optimum performance level to maintain fuel economy and the lowest emission levels. If vehicle is not operating to these standards, refer to Engine Diagnosis outlined in this section. The following procedures can assist in achieving the proper engine diagnosis.

(1) Test cranking amperage draw. Refer to Electrical Group 8B, Cold Cranking Test.

(2) Check intake manifold bolt torque; Refer to Group 11, Exhaust System and Intake Manifold.

(3) Perform cylinder compression test. Refer to Cylinder Compression Pressure Test in the Engine Diagnosis area of this section.

(4) Clean or replace spark plugs as necessary and adjust gap as specified in Electrical Group 8D. Tighten to specifications.

(5) Test resistance of spark plug cables. Refer to Electrical Group 8D, Spark Plug Cables.

(6) Inspect the primary wires. Test coil output voltage and primary resistance. Replace parts as necessary. Refer to Electrical Group 8D, for specifications.

(7) Test fuel pump for pressure. Refer to Group 14, Fuel System Specifications.

(8) The air filter elements should be replaced as specified in Lubrication and Maintenance, Group 0.

(9) Inspect crankcase ventilation system as out lined in Group 0, Lubrication and Maintenance. For emission controls see Group 25, Emission Controls for service procedures.

(10) Road test vehicle as a final test.

HONING CYLINDER BORES

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823 equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880 or a light honing oil available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings (Fig. 36).

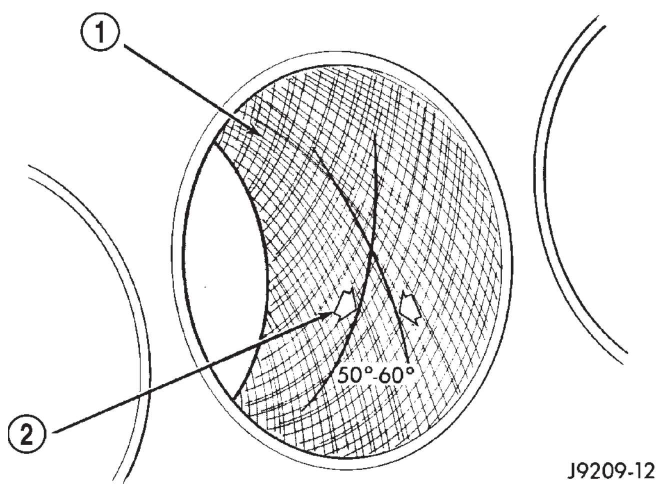


Fig. 36 Cylinder Bore Crosshatch Pattern

1 – CROSSHATCH PATTERN
2 – INTERSECT ANGLE

(4) A controlled hone motor speed between 200 and 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 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush

SERVICE PROCEDURES (Continued)

to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn 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.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

SERVICE ENGINE ASSEMBLY (SHORT BLOCK)

A service replacement engine assembly (short block) may be installed whenever the original cylinder block is defective or damaged beyond repair. It consists of the cylinder block, crankshaft, piston and rod assemblies. If needed, the camshaft must be procured separately and installed before the engine is installed in the vehicle.

A short block is identified with the letter “S” stamped on the same machined surface where the build date code is stamped for complete engine assemblies.

Installation includes the transfer of components from the defective or damaged original engine. Follow the appropriate procedures for cleaning, inspection and torque tightening.

HYDROSTATIC LOCK

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

(1) Perform the Fuel Pressure Release Procedure (refer to Group 14, Fuel System).

(2) Disconnect the negative cable from the battery.

(3) Inspect air cleaner, induction system and intake manifold to ensure system is dry and clear of foreign material.

(4) Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the plugs from the engine.

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

(5) With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.

(6) Identify the fluid in the cylinders (i.e. coolant, fuel, oil, etc.).

(7) Make sure all fluid has been removed from the cylinders.

(8) Repair engine or components as necessary to prevent this problem from occurring again.

(9) Squirt engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.

(10) Install new spark plugs. Tighten the spark plugs to 37 N·m (27 ft. lbs.) torque.

(11) Drain engine oil. Remove and discard the oil filter.

(12) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(13) Install a new oil filter.

(14) Fill engine crankcase with the specified amount and grade of oil (refer to Group 0, Lubrication and Maintenance).

(15) Connect the negative cable to the battery.

(16) Start the engine and check for any leaks.

ENGINE OIL SERVICE

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

In gasoline engines. use an engine oil that is API Service Grade Certified (Fig. 37).

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 37).

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 10W-30 specifies a multiple viscosity engine oil.

When choosing an engine oil, consider the range of temperatures the vehicle will be operated in before the next oil change. Select an engine oil that is best

SERVICE PROCEDURES (Continued)

Fig. 37 Engine Oil Container Standard Notations

suited to your area's particular ambient temperature range and variation (Fig. 38).

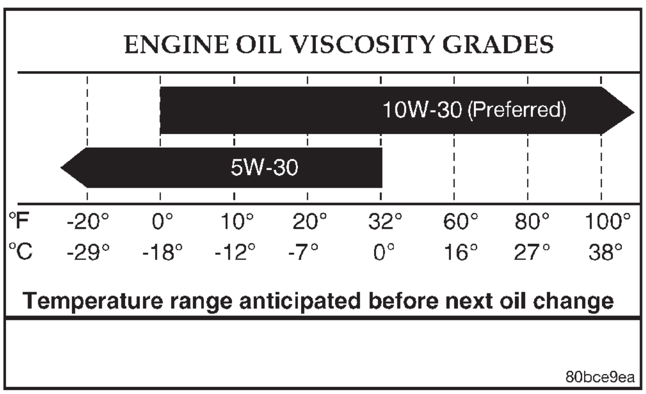


Fig. 38 Temperature/Engine Oil Viscosity

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.

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, oil foaming and oil pressure loss can result.

The engine oil level indicator (Dipstick) is located at the right rear of the 2.5L engine. Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick (Fig. 39).

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, note oil level reading (Fig. 39).

(6) Add oil only if level is below the ADD mark on dipstick.

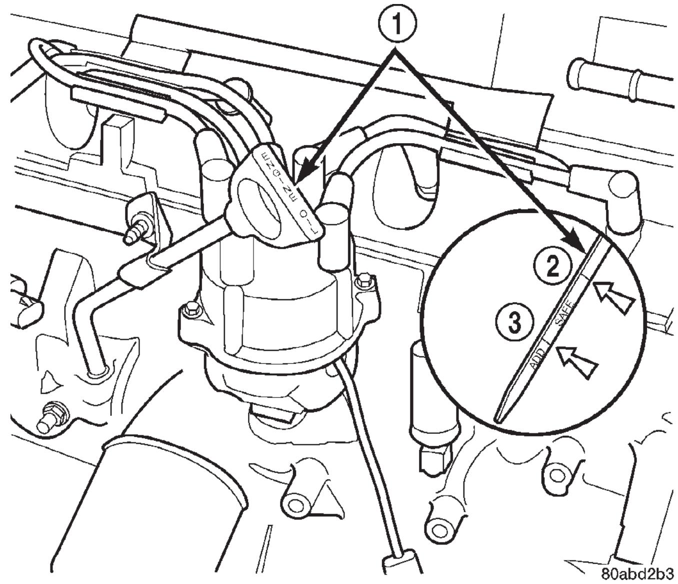


Fig. 39 Engine Oil Dipstick—2.5L Engine

1 – DIPSTICK
2 – SAFE
3 – ADD

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands.

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.

(8) Install oil fill cap.

(9) Start engine and inspect for leaks.

(10) Stop engine and inspect oil level.

SERVICE PROCEDURES (Continued)

ENGINE OIL FILTER CHANGE

FILTER SPECIFICATION

CAUTION: Do not use oil filter with metric threads. The proper oil filter has SAE type 3/4 X 16 threads. An oil filter with metric threads can result in oil leaks and engine failure.

All Jeep engines are equipped with a high quality full-flow, throw-away type oil filter. Chrysler Corporation recommends a Mopar or equivalent oil filter be used.

OIL FILTER REMOVAL

(1) Position a drain pan under the oil filter.
(2) Using a suitable oil filter wrench loosen filter.
(3) Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss (Fig. 40).

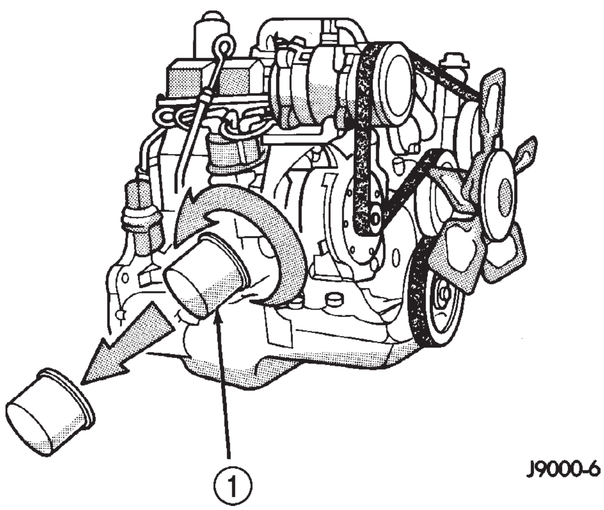


Fig. 40 Oil Filter—2.5L Engine

1 – OIL FILTER

(4) When filter separates from adapter nipple, tip gasket end upward to minimize oil spill. Remove filter from vehicle.
(5) With a wiping cloth, clean the gasket sealing surface (Fig. 41) of oil and grime.

OIL FILTER INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil or chassis grease.
(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 41) hand tighten filter one full turn, do not over tighten.
(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

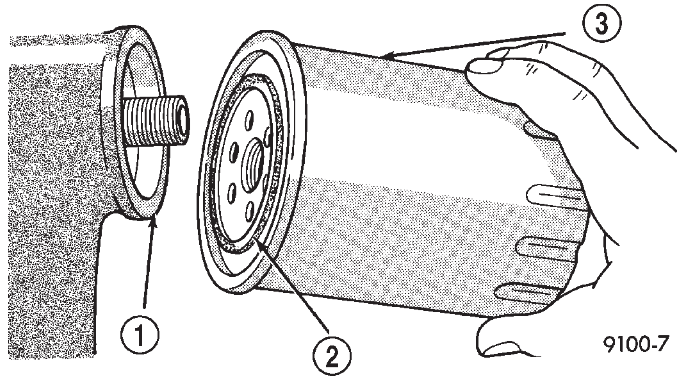


Fig. 41 Oil Filter Sealing Surface—Typical

1 – SEALING SURFACE
2 – RUBBER GASKET
3 – OIL FILTER

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 at beginning of this section.

REMOVAL AND INSTALLATION

ENGINE MOUNTS—FRONT

The front mounts support the engine at each side. These supports are made of resilient rubber.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle.
(3) Support the engine.
(4) Remove through bolt nut (Fig. 42). DO NOT remove the through bolt.
(5) Remove the retaining bolts and nuts from the support cushions (Fig. 42).
(6) Remove the through bolt.
(7) Remove the support cushions.

INSTALLATION

(1) If the engine support bracket was removed, position the LEFT bracket (Fig. 42) and the RIGHT bracket (Fig. 43) onto the cylinder block. Install the bolts and stud nuts.
(a) RIGHT SIDE (Fig. 43) —Tighten the bolts to 61 N·m (45 ft. lbs.) torque. Tighten the stud nuts to 46 N·m (34 ft. lbs.) torque.
(b) LEFT SIDE (Fig. 42) —Tighten the bolts to 61 N·m (45 ft. lbs.) torque.
(2) If the support cushion brackets were removed, position the brackets onto the lower front sill (Fig. 42) (Fig. 44). Install the bolts and stud nuts. Tighten the bolts to 54 N·m (40 ft. lbs.) torque and the stud nuts to 41 N·m (30 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

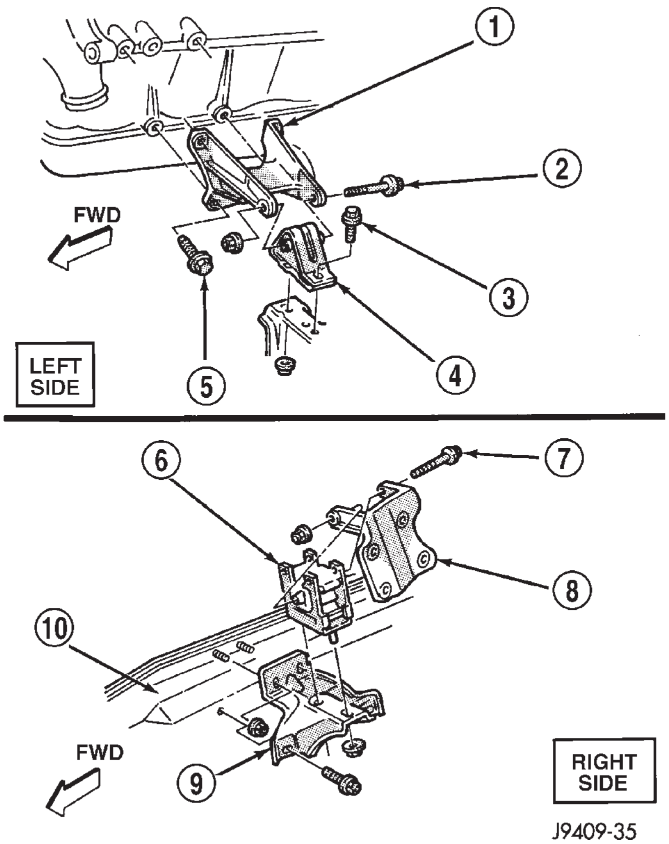


Fig. 42 Front Mounts

1 – ENGINE SUPPORT BRACKET
2 – THROUGH BOLT
3 – RETAINING BOLT
4 – SUPPORT CUSHION
5 – ATTACHING BOLT
6 – SUPPORT CUSHION
7 – THROUGH BOLT
8 – ENGINE SUPPORT BRACKET
9 – SUPPORT CUSHION BRACKET
10 – SILL

(3) Place the support cushions onto the support cushion brackets (Fig. 42). Tighten the right support cushion nuts to 65 N·m (48 ft. lbs.) torque. Tighten the left support cushion bolt and nut to 41 N·m (30 ft. lbs.) torque.

(4) Install the through bolt and the retaining nut (Fig. 42). Tighten the through bolt nut to 65 N·m (48 ft. lbs.) torque.

(5) Remove the engine support.

(6) Lower the vehicle.

(7) Connect negative cable to battery.

ENGINE MOUNT—REAR

A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

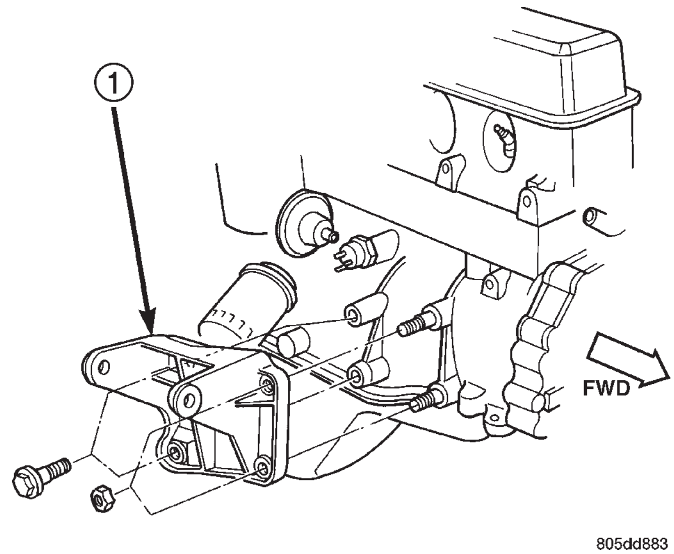


Fig. 43 Engine Support Bracket—Right Side

1 – ENGINE SUPPORT BRACKET

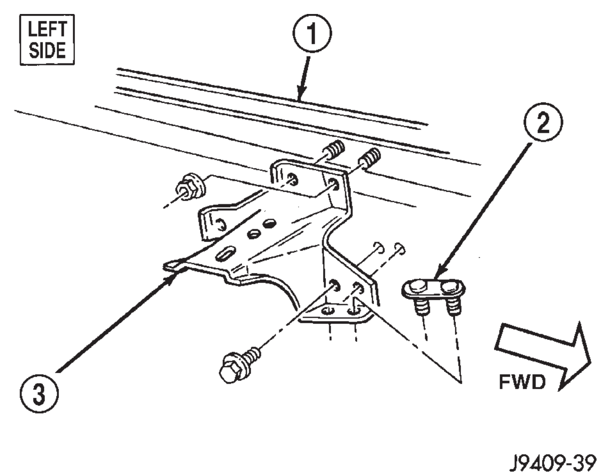


Fig. 44 Support Cushion Bracket—Left Side

1 – LOWER FRONT SILL
2 – TRACK BAR MOUNTING PLATE
3 – SUPPORT CUSHION BRACKET

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle and support the transmission.

(3) Remove the nuts holding the support cushion to the crossmember (Fig. 45) (Fig. 46). Remove the crossmember.

MANUAL TRANSMISSION:

a. Remove the support cushion nuts and remove the cushion.

b. If necessary, remove the bolts holding the transmission support bracket to the transmission (Fig. 45). Remove the bracket.

REMOVAL AND INSTALLATION (Continued)

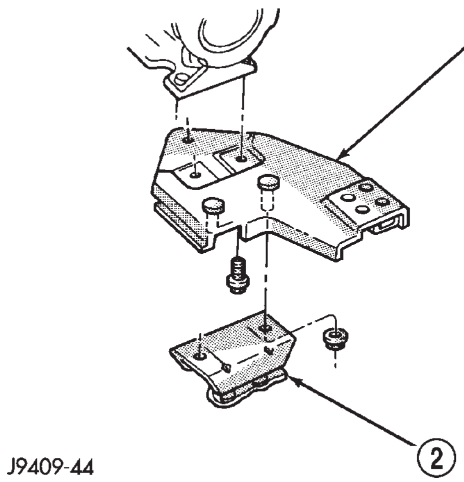


Fig. 45 Rear Mount (Manual Transmission)

1 – TRANSMISSION SUPPORT BRACKET
2 – SUPPORT CUSHION

AUTOMATIC TRANSMISSION:

a. Remove the support cushion bolts and remove the cushion and the transmission support bracket.

b. If necessary on 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission (Fig. 46). Remove the adaptor bracket.

INSTALLATION

MANUAL TRANSMISSION:

a. If removed, position the transmission support bracket to the transmission and install the bolts. Tighten the bolts to 43 N·m (32 ft. lbs.) torque.

b. Position the support cushion onto the transmission support bracket. Install and tighten the nuts to 46 N·m (34 ft. lbs.) torque.

AUTOMATIC TRANSMISSION:

a. If removed, position the transmission support adaptor bracket (2WD vehicles) to the transmission and install the bolts. Tighten the bolts to 75 N·m (55 ft. lbs.) torque.

b. Position the transmission support bracket and support cushion to the transmission and install the bolts. Tighten the bolts to 75 N·m (55 ft. lbs.) torque.

(1) Position the crossmember onto the support cushion studs and install the nuts. Tighten the nuts to 22 N·m (192 in. lbs.) torque.

(2) Install the crossmember to sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.

(3) Remove the transmission support.

(4) Lower the vehicle.

(5) Connect negative cable to battery.

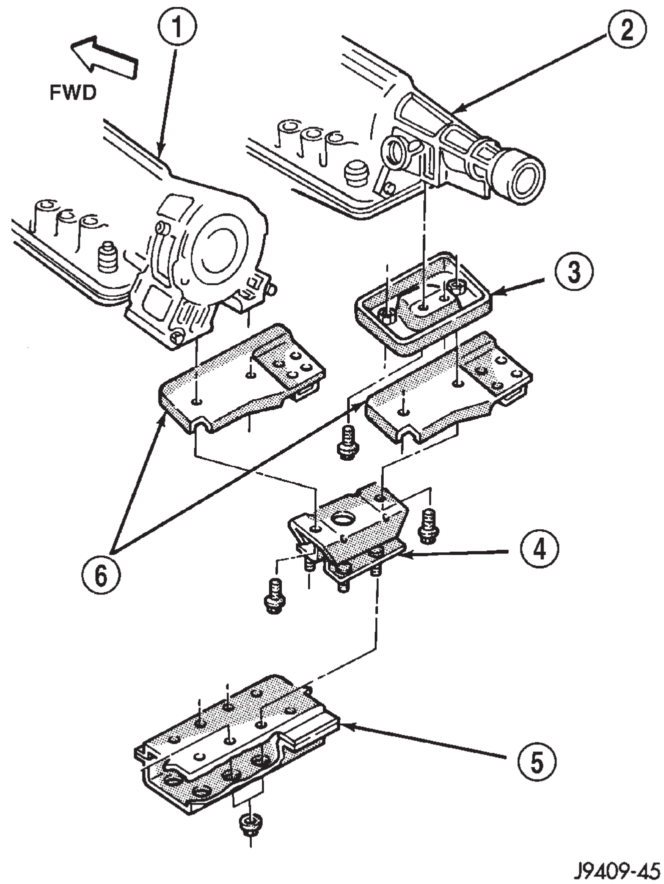


Fig. 46 Rear Mount (Automatic Transmission)

1 – 4×4
2 – 2×4
3 – TRANSMISSION SUPPORT ADAPTOR BRACKET
4 – SUPPORT CUSHION
5 – CROSSMEMBER ASSEMBLY
6 – TRANSMISSION SUPPORT BRACKET

ENGINE

REMOVAL

(1) Disconnect the battery cables. Remove the battery.

(2) Mark the hinge locations on the hood panel for alignment reference during installation. Remove the engine compartment lamp. Remove the hood.

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. USE CARE TO PREVENT SCALDING BY HOT COOLANT. CAREFULLY RELEASE THE PRESSURE BEFORE REMOVING THE RADIATOR DRAIN COCK AND CAP.

(3) Loosen the radiator drain cock and radiator cap to drain the coolant. DO NOT waste usable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(4) Remove the air cleaner assembly (Fig. 47).

(5) Remove the lower radiator hose.

REMOVAL AND INSTALLATION (Continued)

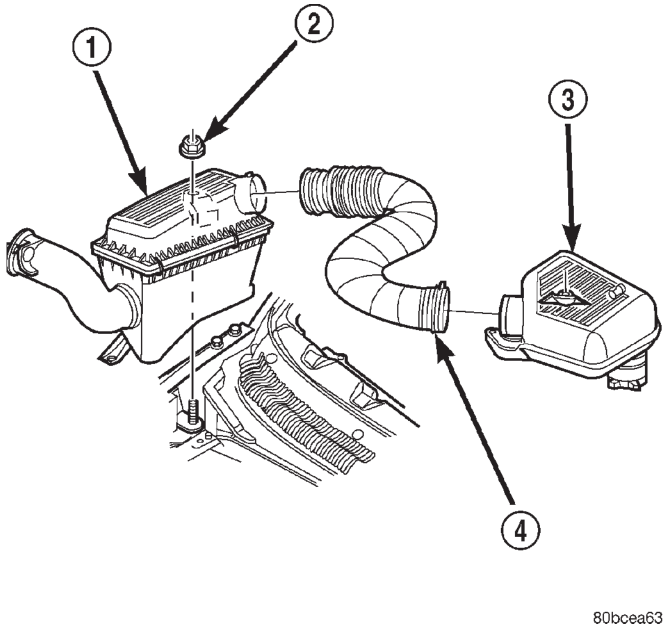


Fig. 47 Air Cleaner and Resonator Removal and Installation

1 – AIR CLEANER ASSEMBLY
2 – NUT AND WASHER
3 – RESONATOR ASSEMBLY
4 – AIR INLET HOSE

(6) Remove the upper radiator hose and coolant recovery hose (Fig. 48).

(7) Remove the fan shroud (Fig. 48).

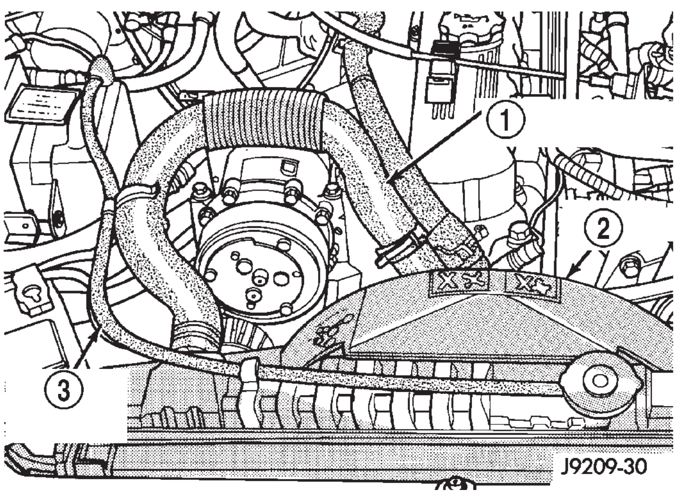


Fig. 48 Upper Radiator Hose, Coolant Recovery Hose & Fan Shroud

1 – UPPER RADIATOR HOSE
2 – FAN SHROUD
3 – COOLANT RECOVERY HOSE

(8) Remove the radiator/condenser (if equipped with air conditioning).

(9) Remove fan assembly and install a 5/16 x 1/2-inch SAE capscrew through fan pulley into water pump flange. This will maintain the pulley and water pump in alignment when crankshaft is rotated.

(10) Disconnect the heater hoses.

(11) Disconnect the throttle cable, speed control cable (if equipped) and transmission cable (if equipped).

(12) Disconnect the body ground at the firewall.

(13) Disconnect the wires from the starter motor solenoid.

(14) Disconnect all fuel injection harness connections.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE TURNED OFF). BEFORE DISCONNECTING FUEL LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(15) Perform fuel pressure release procedure. (refer to Group 14, Fuel System for the proper procedure).

(16) Remove latch clip and disconnect the quick-connect fuel line at the fuel rail

(17) Recover refrigerant (if equipped with A/C). (Refer to group 24, Heating and Air Conditioning for proper procedures.)

(18) Disconnect suction/discharge hose from A/C compressor and cap off ports to prevent intrusion of foreign material or refrigerant oil loss.

(19) Remove the power brake vacuum check valve from the booster, if equipped.

(20) If equipped with power steering :

(a) Disconnect the power steering hoses from the fittings at the steering gear.

(b) Drain the pump reservoir.

(c) Cap the fittings on the hoses and steering gear to prevent foreign material from entering the system.

(21) Identify, tag and disconnect all necessary wire connectors and vacuum hoses.

(22) Raise the vehicle.

(23) Remove the oil filter.

(24) Remove the starter motor.

(25) Disconnect the exhaust pipe from the exhaust manifold.

(26) Remove the flywheel housing access cover.

(27) Remove the upper flywheel and converter housing bolts and loosen the bottom bolts.

(28) Remove the engine support cushion-to-engine compartment bracket bolts.

(29) Remove the engine shock damper bracket from the sill.

(30) Lower the vehicle.

(31) Attach a lifting device to the engine.

REMOVAL AND INSTALLATION (Continued)

(32) Raise the engine slightly off the front supports.

(33) Place a support stand under the converter or flywheel housing.

(34) Lift the engine out of the engine compartment and install on an engine stand.

(35) Install the oil filter to keep foreign material out of the engine.

INSTALLATION

(1) Remove the oil filter.

(2) Lift the engine off the stand and lower it into the engine compartment. For easier installation, it may be useful to remove the engine support cushions from the engine support brackets as an aide for alignment of the engine-to-transmission.

(3) Insert the transmission shaft into the clutch spline. (M/T models)

(4) Align the flywheel housing with the engine.

(5) Install and tighten the flywheel housing lower bolts.

(6) Install the engine support cushions (if removed).

(7) Lower the engine and engine support cushions onto the engine compartment brackets.

(8) Remove the engine lifting device.

(9) Raise the vehicle.

(10) Install the converter-housing access cover.

(11) Install the exhaust pipe support.

(12) Install the starter motor and connect the cable. Tighten the bolts to 45 N·m (33 ft. lbs.) torque.

(13) Tighten the engine support cushion through-bolt nuts.

(14) Connect the exhaust pipe to the manifold.

(15) Install the oil filter.

(16) Lower the vehicle.

(17) Connect the coolant hoses and tighten the clamps.

(18) If equipped with power steering:

(a) Remove the protective caps

(b) Connect the hoses to the fittings at the steering gear. Tighten the nut to 52 N·m (38 ft. lbs.) torque.

(c) Fill the pump reservoir with fluid.

(19) Remove the pulley-to-water pump flange alignment capscrew and install the fan assembly.

(20) Install the fan shroud and radiator and condenser (if equipped with air conditioning).

(21) Connect the radiator hoses.

(22) Connect the oxygen sensor wire connector.

(23) Connect the throttle cable and install the rod. Connect the transmission and speed control cables (if equipped)

(24) Connect the fuel supply line to the injector rail. push until a “click” is heard. Re-install latch clip.

(25) Connect all the vacuum hoses and wire connectors.

(26) Connect suction/discharge hose to compressor. (if equipped)

(27) Fill the power steering reservoir.

(28) Connect the battery cables.

(29) Install the air cleaner (Fig. 47).

(30) Install the hood.

(31) Add engine oil and coolant.

(32) Start the engine and inspect for leaks.

(33) Stop the engine and check the fluid levels. Add fluid, as required.

(34) Recharge air conditioning (Refer to group 24, Heating and Air Conditioning for proper procedures).

INTAKE MANIFOLD

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove the air inlet hose and resonator from the throttle body and air cleaner (Fig. 49).

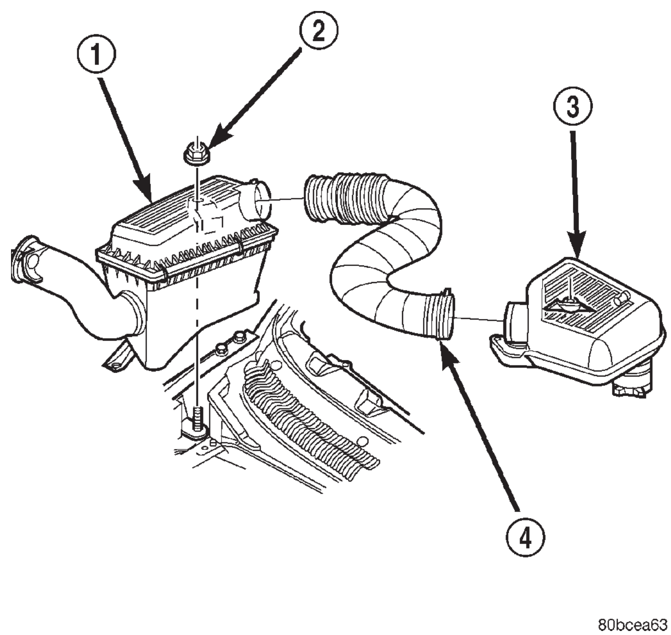


Fig. 49 Air Cleaner, Resonator and air Inlet Hose Removal and Installation

1 – AIR CLEANER ASSEMBLY
2 – NUT AND WASHER
3 – RESONATOR ASSEMBLY
4 – AIR INLET HOSE

(3) Loosen the accessory drive belt tension and remove the belt from the power steering pump (refer to Group 07, Cooling Systems for proper procedures).

(4) Remove the power steering pump and brackets from the water pump and intake manifold. Secure power steering pump and bracket out of the way.

REMOVAL AND INSTALLATION (Continued)

(5) Perform fuel system pressure release procedure (refer to Group 14, Fuel System for correct procedure).

(6) Disconnect fuel supply tube from the fuel rail. Some fuel lines require a special tool for removal/installation (refer to Group 14, Fuel System - Quick Connect Fittings).

(7) Disconnect the accelerator cable, the cruise control cable (if equipped), and the transmission line pressure cable (if equipped) from the throttle body and remove them from the cable bracket.

CAUTION: When disconnecting the cruise control connector at the throttle body, DO NOT pry the connector off with pliers or screwdriver. Use finger pressure only. Prying the connector off could break it.

(8) Disconnect the electrical connectors. Pull the harnesses away from the manifold and secure them so they do not interfere with the manifold removal and installation process.

- The throttle position sensor.
- The idle air control motor.
- The coolant temperature sensor at the thermostat.
- The manifold air temperature sensor at the intake manifold.
- The fuel injectors.
- The oxygen sensor.

(9) Disconnect the crankcase ventilation (CCV) vacuum hose and manifold absolute pressure (MAP) sensor vacuum hose connector at the intake manifold.

(10) Disconnect vacuum hose from vacuum port on the intake manifold.

(11) Disconnect CCV hose at the cylinder head cover (Fig. 50).

(12) Remove the molded vacuum harness.

(13) Disconnect the vacuum brake booster hose at the intake manifold.

(14) Remove bolts 2 through 5 securing the intake manifold to the cylinder head (Fig. 51). Slightly loosen bolt No.1 and nuts 6 and 7.

(15) Remove the intake manifold and gaskets. Drain the coolant from the manifold.

INSTALLATION

(1) Clean the intake manifold and cylinder head mating surfaces. **DO NOT allow foreign material to enter either the intake manifold or the ports in the cylinder head.**

(2) Install the new intake manifold gasket over the locating dowels.

(3) Position the manifold in place and finger tighten the mounting bolts.

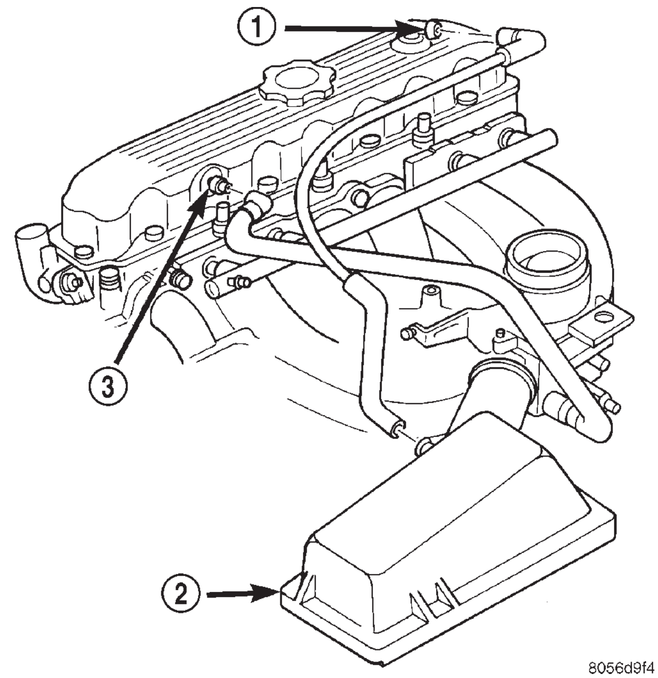


Fig. 50 Crankcase Ventilation (CCV) Hose—2.5L Engine

1 – AIR INLET FITTING
2 – AIR FILTER COVER
3 – FIXED ORIFICE FITTING

(4) Tighten the fasteners in sequence and to the specified torque (Fig. 51).

- Fastener No.1—Tighten to 41 N·m (30 ft. lbs.) torque.
- Fasteners Nos.2 through 5—Tighten to 31 N·m (23 ft. lbs.) torque.
- Fasteners Nos.6 and 7—Tighten to 23 N·m (17 ft. lbs.) torque.

(5) Connect fuel supply tube to the fuel rail inlet. Push tube until a “click” is heard. **Before connecting the fuel line to the fuel rail replace the O-rings at the quick-connect fuel line coupling.**

(6) Pull out on the fuel supply tube to ensure that it is locked in place.

(7) Connect the molded vacuum hoses to the vacuum port on the intake manifold and the cylinder head cover.

(8) Connect the electrical connectors.

- The throttle position sensor.
- The idle air control motor.
- The coolant temperature sensor at the thermostat housing.
- The fuel injectors.
- The air manifold temperature sensor.
- The oxygen sensor.

(9) Connect the CCV vacuum hose and MAP sensor vacuum hose connectors to the throttle body.

REMOVAL AND INSTALLATION (Continued)

(10) Install the power steering pump and bracket assembly to the water pump and intake manifold. Hand start the three (3) tensioner bracket to p/s pump to intake manifold bolts and the two (2) tensioner bracket to water pump bolts.

(11) Tighten the power steering pump bolts to 28 N·m (21 ft. lbs.) Tighten the tensioner bracket to water pump bolts to 28 N·m (21 ft. lbs.).

(12) Connect the accelerator cable, cruise control cable (if equipped), and the transmission line pressure cable (if equipped) to the hold-down bracket and the throttle lever.

(13) Install and tension the accessory drive belt. Refer to Group 7, Cooling System for the proper procedure.

CAUTION: Ensure that the accessory drive belt is routed correctly. Failure to do so can cause the water pump to turn in the opposite direction resulting in engine overheating. Refer to Group 7, Cooling System for the proper procedure.

(14) Connect the air inlet hose and resonator to the throttle body and the air cleaner.

(15) Connect the battery negative cable.

(16) Start the engine and check for leaks.

EXHAUST MANIFOLD

REMOVAL

(1) Disconnect the battery negative cable.

(2) Raise the vehicle.

(3) Disconnect the exhaust pipe from the engine exhaust manifold.

(4) Lower the vehicle.

(5) Remove intake manifold (refer to procedure in this section)

(6) Remove fasteners 2 through 5 and remove the intake manifold (Fig. 51).

(7) Remove fasteners 1, 6 and 7 and remove the engine exhaust manifold (Fig. 51).

INSTALLATION

(1) Clean the intake and engine exhaust manifolds and cylinder head mating surfaces. **DO NOT allow foreign material to enter either the intake manifold or the ports in the cylinder head.**

(2) Install a new intake manifold gasket over the alignment dowels on the cylinder head.

(3) Install the engine exhaust manifold assembly. **Exhaust manifold must be centrally located over the end studs and spacer (Fig. 51).**

(4) Tighten bolt No.1 to 41 N·m (30 ft. lbs.) torque (Fig. 51).

(5) Install the intake manifold on the cylinder head dowels (Fig. 51).

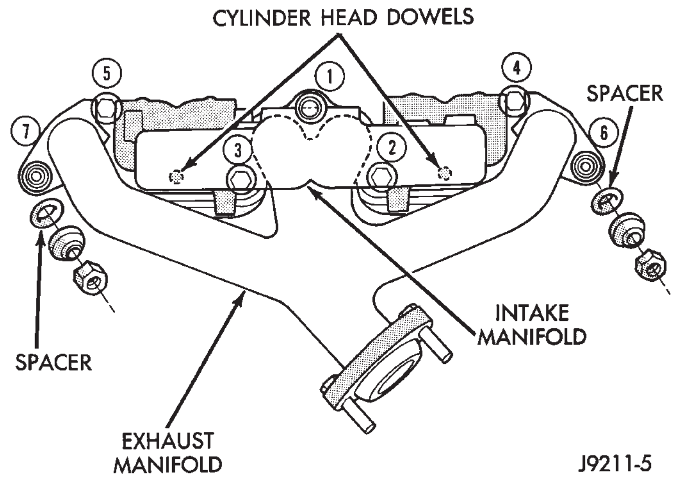


Fig. 51 Intake/Exhaust Manifold Removal/ Installation—2.5L Engine

(6) Install bolts 2 through 5 (Fig. 51). Tighten these bolts to 31 N·m (23 ft. lbs.) torque.

(7) Install new engine exhaust manifold spacers over the engine exhaust manifold mounting studs in the cylinder head (Fig. 51).

(8) Tighten nuts 6 and 7 to 23 N·m (17 ft. lbs.) torque (Fig. 51).

(9) Install all components to the intake manifold.

(10) Raise the vehicle.

(11) Connect the exhaust pipe to the engine exhaust manifold. Tighten the bolts to 31 N·m (23 ft. lbs.) torque.

(12) Lower the vehicle.

(13) Connect the battery negative cable.

(14) Start the engine and check for leaks.

CYLINDER HEAD COVER

A cured gasket is part of the engine cylinder head cover.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Disconnect the Crankcase Ventilation (CCV) vacuum hose from engine cylinder head cover (Fig. 52).

(3) Remove the air inlet hose and resonator from the air cleaner and throttle body.

(4) Remove the engine cylinder head cover mounting bolts.

(5) Remove the engine cylinder head cover (Fig. 52).

(6) Remove any original sealer from the cover sealing surface of the engine cylinder head and clean the surface using a fabric cleaner.

(7) Remove all residue from the sealing surface using a clean, dry cloth.

REMOVAL AND INSTALLATION (Continued)

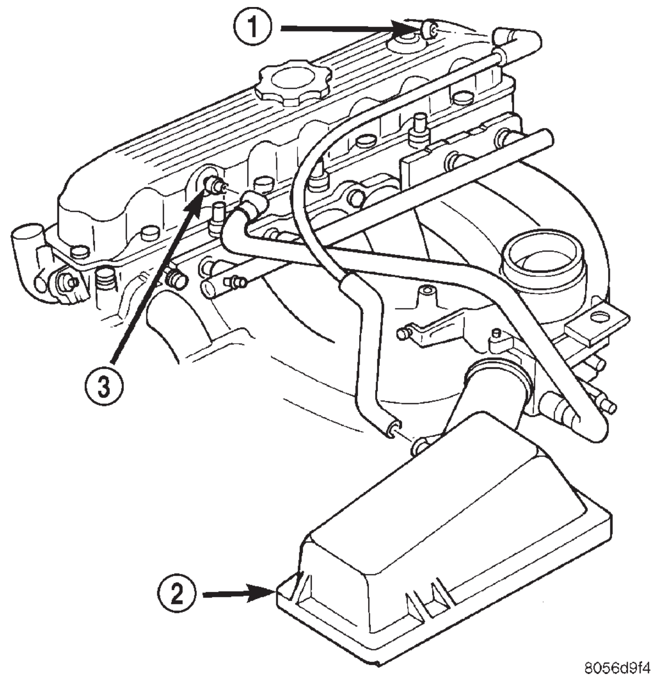


Fig. 52 Engine Cylinder Head Cover

1 – AIR INLET FITTING
2 – AIR FILTER COVER
3 – FIXED ORIFICE FITTING

INSTALLATION

(1) Inspect the engine cylinder head cover for cracks. Replace the cover, if cracked.

NOTE: The original dark grey gasket material should NOT be removed. If sections of the gasket material are missing or are compressed, replace the engine cylinder head cover. However, sections with minor damage such as small cracks, cuts or chips may be repaired with a hand held applicator. The new material must be smoothed over to maintain gasket height. Allow the gasket material to cure prior to engine cylinder head cover installation.

(2) If a replacement cover is installed, transfer the CCV valve grommet the oil filler cap from the original cover to the replacement cover.

(3) Install engine cylinder head cover. Tighten the mounting bolts to 13 N·m (115 in. lbs.) torque.

(4) Connect the CCV hoses (Fig. 52).

(5) Connect negative cable to battery.

(6) Install the air inlet hose and resonator.

ROCKER ARMS AND PUSH RODS

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Remove the engine cylinder head cover. (Refer to procedure in this section)

(2) Check for rocker arm bridges which are causing misalignment of the rocker arm to valve tip area.

(3) Remove the capscrews at each bridge and pivot assembly (Fig. 53). Alternately loosen the capscrews one turn at a time to avoid damaging the bridges.

(4) Remove the bridges, pivots and corresponding pairs of rocker arms (Fig. 53). Place them on a bench in the same order as removed.

(5) Remove the push rods and place them on a bench in the same order as removed.

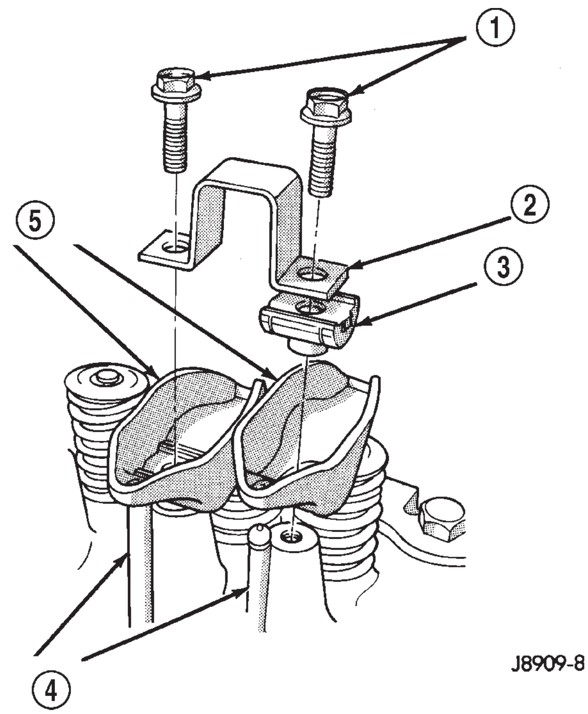


Fig. 53 Rocker Arm Assembly

1 – CAPSCREWS
2 – BRIDGE
3 – PIVOT ASSEMBLY
4 – PUSH RODS
5 – ROCKER ARMS

(6) Clean all the components with cleaning solvent.

(7) Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSTALLATION

(1) Lubricate the ball ends of the push rods with Mopar Engine Oil Supplement, or equivalent and install push rods in their original locations. Ensure that the bottom end of each push rod is centered in the tappet plunger cap seat.

(2) Using Mopar Engine Oil Supplement, or equivalent, lubricate the area of the rocker arm that the

REMOVAL AND INSTALLATION (Continued)

pivot contacts. Install rocker arms, pivots and bridge above each cylinder in their original position.

(3) Loosely install the capscrews through each bridge.

(4) At each bridge, tighten the capscrews alternately, one turn at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(5) Install the engine cylinder head cover.

VALVE SPRING AND SEAL

This procedure can be done with the engine cylinder head installed on the block.

REMOVAL

Each valve spring is held in place by a retainer and a set of conical valve locks. The locks can be removed only by compressing the valve spring.

(1) Remove the engine cylinder head cover. Refer to procedure in this section.

(2) Remove cap screws, bridge and pivot assemblies and rocker arms for access to each valve spring to be removed.

(3) Remove push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order and position as removed.**

(4) Inspect the springs and retainer for cracks and possible signs of weakening.

(5) Remove the spark plug(s) adjacent to the cylinder(s) below the valve springs to be removed.

(6) Install a 14 mm (1/2 inch) (thread size) air hose adaptor in the spark plug hole.

(7) Connect an air hose to the adapter and apply air pressure slowly. Maintain at least 621 kPa (90 psi) of air pressure in the cylinder to hold the valves against their seats. For vehicles equipped with an air conditioner, use a flexible air adaptor when servicing the No.1 cylinder.

(8) Tap the retainer or tip with a rawhide hammer to loosen the lock from the retainer. Use Valve Spring Compressor Tool MD-998772A to compress the spring and remove the locks (Fig. 54).

(9) Remove valve spring and retainer (Fig. 54).

(10) Remove valve stem oil seals (Fig. 54). Note the valve seals are different for intake and exhaust valves. The top of each seal is marked either INT (intake/black in color) or EXH (exhaust/brown in color). DO NOT mix the seals.

INSTALLATION

Inspect the valve stems, especially the grooves. An Arkansas smooth stone should be used to remove nicks and high spots.

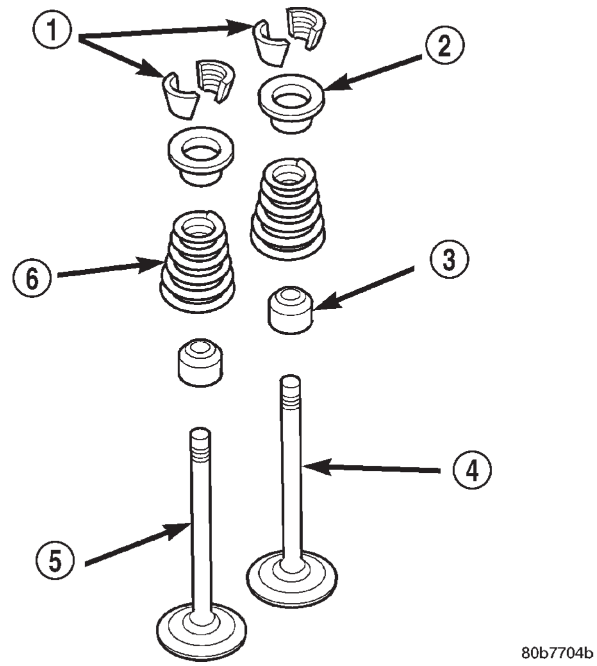


Fig. 54 Valve and Valve Components

1 – VALVE LOCKS (3–BEAD)
2 – RETAINER
3 – VALVE STEM OIL SEAL
4 – INTAKE VALVE
5 – EXHAUST VALVE
6 – VALVE SPRING

CAUTION: Install oil seals carefully to prevent damage from the sharp edges of the valve spring lock grove.

(1) Lightly push the valve seal over the valve stem and valve guide boss. Be sure the seal is completely seated on the valve guide boss.

(2) Install valve spring and retainer.

(3) Compress the valve spring with Valve Spring Compressor Tool MD-998772A and insert the valve locks. Release the spring tension and remove the tool. Tap the spring from side-to-side to ensure that the spring is seated properly on the engine cylinder head.

(4) Release air pressure and disconnect the air hose. Remove the adaptor from the spark plug hole and install the spark plug.

(5) Repeat the procedures for each remaining valve spring to be removed.

(6) Install the push rods. Ensure the bottom end of each rod is centered in the plunger cap seat of the hydraulic valve tappet.

(7) Install the rocker arms, pivots and bridge at their original location.

(8) Tighten the bridge cap screws alternately, one at a time, to avoid damaging the bridge. Tighten the cap screws to 28 N·m (21 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(9) Install the engine cylinder head cover.

CYLINDER HEAD

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Disconnect negative cable from battery.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(2) Drain the coolant and disconnect the hoses at the engine thermostat housing. DO NOT waste reusable coolant. If the solution is clean and is being drained only to service the engine or cooling system, drain the coolant into a clean container for reuse.

(3) Remove the air cleaner assembly.

(4) Remove the engine cylinder head cover. (Refer to procedure in this section)

(5) Remove the capscrews, bridge and pivot assemblies and rocker arms (Fig. 55).

(6) Remove the push rods (Fig. 55). **Retain the push rods, bridges, pivots and rocker arms in the same order as removed.**

(7) Loosen the accessory drive belt at the power steering pump bracket, if equipped or at the idler pulley bracket (refer to Group 7, Cooling System for the proper procedure).

(8) If equipped with air conditioning, perform the following:

(a) Remove the bolts from the A/C compressor mounting bracket and set the compressor aside.

(b) Remove the air conditioner compressor bracket bolts from the engine cylinder head.

(c) Loosen the through bolt at the bottom of the bracket.

(9) If equipped, disconnect the power steering pump bracket. Set the pump and bracket aside. DO NOT disconnect the hoses.

(10) Perform fuel pressure release procedure (Refer to Group 14, fuel systems for proper procedures).

(11) Remove the latch clip and disconnect the fuel supply hose.

(12) Remove the intake and engine exhaust manifolds from the engine cylinder head (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(13) Number and disconnect the ignition wires and remove the spark plugs.

(14) Disconnect the coolant temperature sending unit connector.

(15) Remove the engine cylinder head bolts.

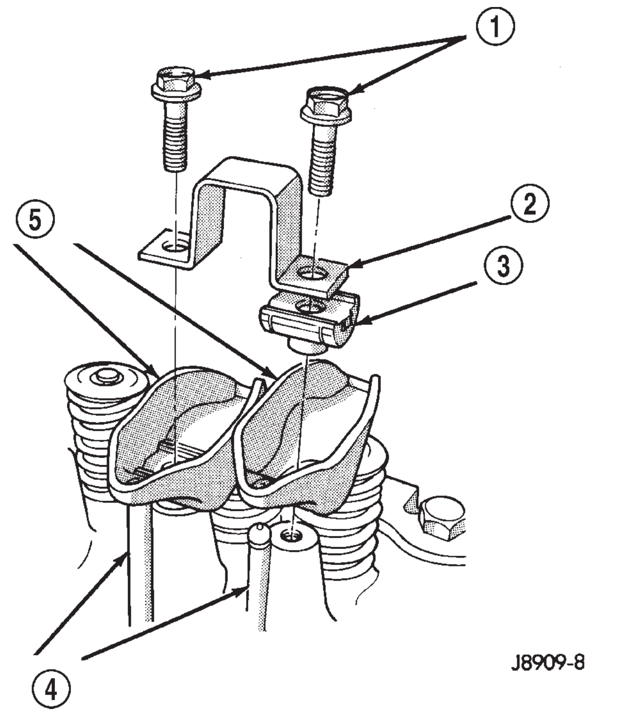


Fig. 55 Rocker Arm Assembly

1 – CAPSCREWS
2 – BRIDGE
3 – PIVOT ASSEMBLY
4 – PUSH RODS
5 – ROCKER ARMS

(16) Remove the engine cylinder head and gasket (Fig. 56).

(17) If this was the first time the bolts were removed, put a paint dab on the top of the bolt. If the bolts have a paint dab on the top of the bolt or it isn't known if they were used before, discard the bolts.

(18) Stuff clean lint free shop towels into the cylinder bores.

NOTE: If valves, springs, or seals are to be inspected/replaced at this time, refer to Valves and Valve Springs later in this section for proper inspection procedures.

INSTALLATION

The engine cylinder head gasket is a composition gasket. The gasket is to be installed DRY. **DO NOT use a gasket sealing compound on the gasket.**

If the engine cylinder head is to be replaced and the original valves used, measure the valve stem diameter. Only standard size valves can be used with a service replacement engine cylinder head unless the replacement head valve stem guide bores are reamed to accommodate oversize valve stems. Remove all carbon buildup and reface the valves.

REMOVAL AND INSTALLATION (Continued)

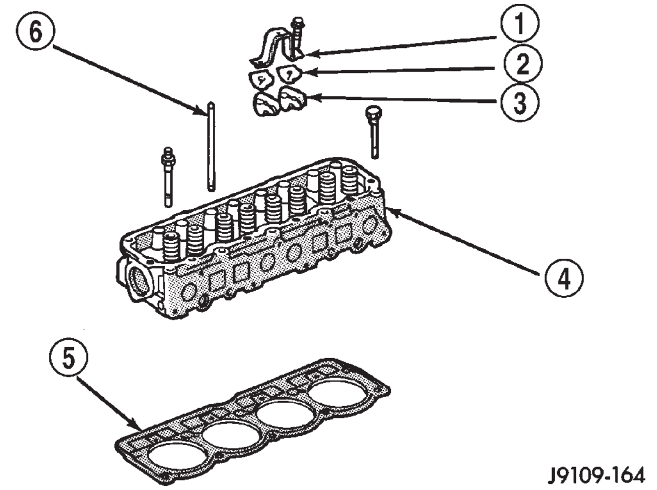


Fig. 56 Engine Cylinder Head Assembly

1 – BRIDGE
2 – PIVOT ASM.
3 – ROCKER ARM
4 – CYLINDER HEAD
5 – HEAD GASKET
6 – PUSH ROD

(1) Fabricate two engine cylinder head alignment dowels from used head bolts (Fig. 57). Use the longest head bolt. Cut the head of the bolt off below the hex head. Then cut a slot in the top of the dowel to allow easier removal with a screwdriver.

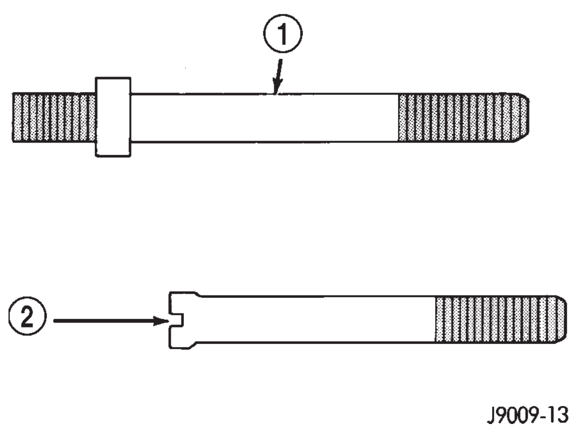


Fig. 57 Fabricate Alignment Dowels

1 – USED CYLINDER HEAD BOLT
2 – SLOT

(2) Install one dowel in bolt hole No.10 and the other dowel in bolt hole No.8 (Fig. 58).

(3) Remove the shop towels from the cylinder bores. Coat the bores with clean engine oil.

(4) Place the engine cylinder head gasket (with the numbers facing up) over the dowels.

(5) Place the engine cylinder head over the dowels.

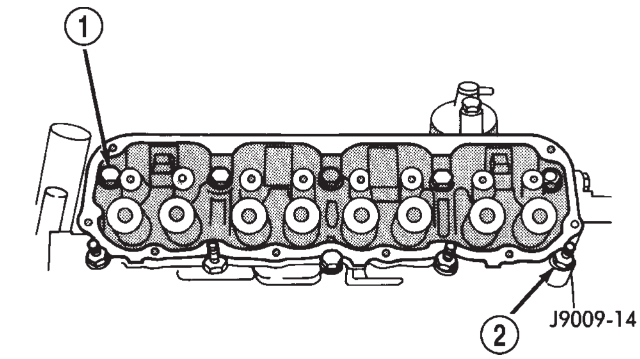


Fig. 58 Alignment Dowel Locations

1 – ALIGNMENT DOWEL
2 – ALIGNMENT DOWEL

CAUTION: Engine cylinder head bolts should be reused only once. Replace the head bolts if they were used before or if they have a paint dab on the top of the bolt.

(6) Coat the threads of bolt No.7, only, with Loctite PST sealant or equivalent.

(7) Install all head bolts, except No.8 and No.10.

(8) Remove the dowels.

(9) Install No.8 and No.10 head bolts.

CAUTION: During the final tightening sequence, bolt No.7 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.7.

(10) Tighten the engine cylinder head bolts in sequence according to the following procedure (Fig. 59) :

(a) Tighten all bolts in sequence (1 through 10) to 30 N·m (22 ft. lbs.) torque.

(b) Tighten all bolts in sequence (1 through 10) to 61 N·m (45 ft. lbs.) torque.

(c) Check all bolts to verify they are set to 61 N·m (45 ft. lbs.) torque.

(d) Tighten bolts (in sequence):

• Bolts 1 through 6 to 149 N·m (110 ft. lbs.) torque.
• Bolt 7 to 136 N·m (100 ft. lbs.) torque.
• Bolts 8 through 10 to 149 N·m (110 ft. lbs.) torque.

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.

(11) Connect the coolant temperature sending unit connector.

(12) Install the spark plugs and tighten to 37 N·m (27 ft. lbs.) torque. Connect the ignition wires.

REMOVAL AND INSTALLATION (Continued)

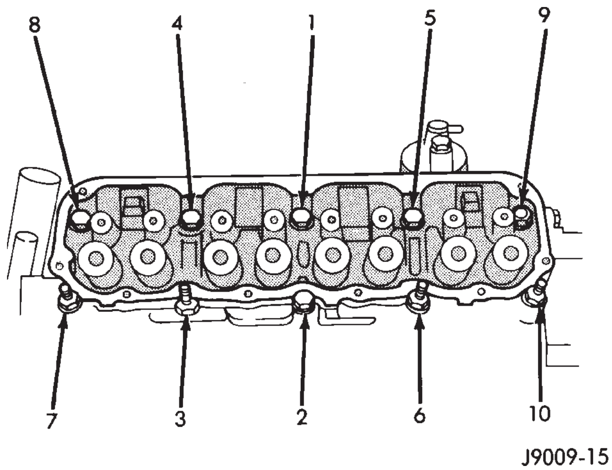


Fig. 59 Engine cylinder head Bolt Tightening Sequence

(13) Install the intake and exhaust manifolds (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).

(14) Install the fuel supply line. Push until a “click” is heard. Reinstall latch clip.

(15) If equipped, attach the power steering pump and bracket.

(16) Install the push rods, rocker arms, pivots and bridges in the order they were removed.

(17) Install the engine cylinder head cover.

(18) Attach the air conditioning compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.

(19) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

CAUTION: The accessory drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(20) Install the accessory drive belt and correctly tension the belt (refer to Group 7, Cooling System for the proper procedure).

(21) Install the air cleaner assembly.

(22) Connect the hoses to the thermostat housing and fill the cooling system to the specified level (refer to Group 7, Cooling Systems for the proper procedure).

(23) Install the coolant temperature sending unit connector.

(24) Connect negative cable to battery.

(25) Connect the upper radiator hose and heater hose at the thermostat housing.

(26) Fill the cooling system. Check for leaks.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(27) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the thermostat opens. Add coolant, if required.

CYLINDER HEAD

DISASSEMBLY

(1) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.

(2) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals.

(3) Use an Arkansas smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.

(4) Remove the valves, and place them in a rack in the same order as removed.

ASSEMBLY

(1) Thoroughly clean the valve stems and the valve guide bores.

(2) Lightly lubricate the stem.

(3) Install the valve in the original valve guide bore.

(4) Install the replacement valve stem oil seals on the valve stems. If the 0.381 mm (0.015 inch) oversize valve stems are used, oversize oil seals are required.

(5) Position the valve spring and retainer on the engine cylinder head and compress the valve spring with Valve Spring Compressor Tool MD-998772A.

(6) Install the valve locks and release the tool.

(7) Tap the valve spring from side to side with a hammer to ensure that the spring is properly seated at the engine cylinder head. Also tap the top of the retainer to seat the valve locks.

HYDRAULIC TAPPETS

REMOVAL

Retain all the components in the same order as removed.

(1) Remove the engine cylinder head cover (refer to procedure earlier in this section)

(2) Remove the bridge and pivot assemblies and rocker arms by removing the capscrews at each bridge. Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridges.

(3) Remove the push rods.

(4) Remove the tappets through the push rod openings in the cylinder head with a Hydraulic Valve Tappet Removal/Installation Tool (Fig. 60).

REMOVAL AND INSTALLATION (Continued)

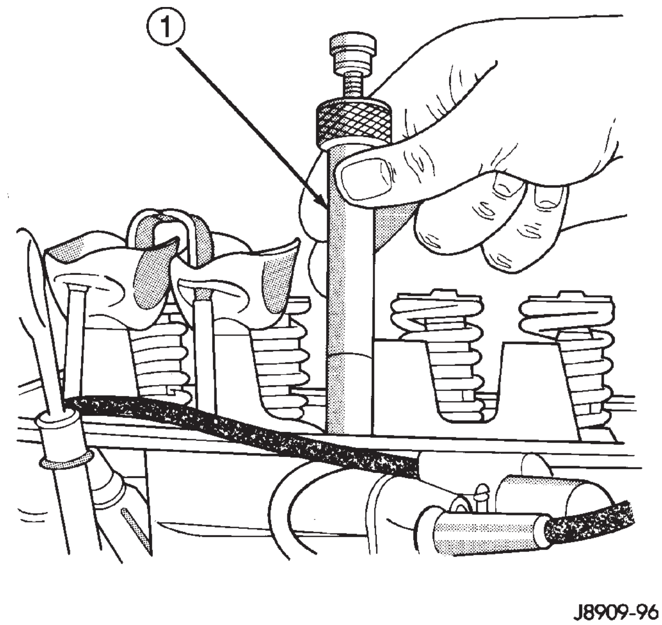


Fig. 60 Hydraulic Valve Tappet Removal/Installation Tool

1 – HYDRAULIC VALVE TAPPET REMOVAL/INSTALLATION TOOL

INSTALLATION

It is not necessary to charge the tappets with engine oil. They will charge themselves within a very short period of engine operation.

(1) Dip each tappet in Mopar Engine Oil Supplement, or equivalent.

(2) Use Hydraulic Valve Tappet Removal/Installation Tool to install each tappet in the same bore from where it was originally removed.

(3) Install the push rods in their original locations.

(4) Install the rocker arms and bridge and pivot assemblies at their original locations. Loosely install the capscrews at each bridge.

(5) Tighten the capscrews alternately, one turn at a time, to avoid damaging the bridges. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(6) Install the engine cylinder head cover.

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt and fan shroud.

(3) Remove the vibration damper retaining bolt and washer.

(4) Use Vibration Damper Removal Tool 7697 to remove the damper from the crankshaft (Fig. 61).

INSTALLATION

(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key.

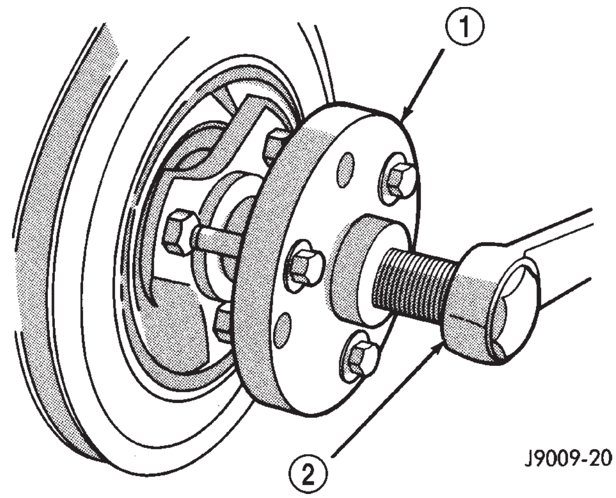


Fig. 61 Vibration Damper Removal Tool 7697

1 – VIBRATION DAMPER REMOVAL TOOL
2 – WRENCH

With the key in position, align the keyway on the vibration damper hub with the crankshaft key and tap the damper onto the crankshaft.

(2) Install the vibration damper retaining bolt and washer.

(3) Tighten the damper retaining bolt to 108 N·m (80 ft. lbs.) torque.

(4) Install the serpentine drive belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(5) Connect negative cable to battery.

TIMING CASE COVER OIL SEAL

REMOVAL

This procedure is done with the timing case cover installed.

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt.

(3) Remove the vibration damper.

(4) Remove the radiator shroud.

(5) Carefully remove the oil seal. Make sure seal bore is clean.

INSTALLATION

(1) Position the replacement oil seal on Timing Case Cover Alignment and Seal Installation Tool 6139 with seal open end facing inward. Apply a light film of Perfect Seal, or equivalent, on the outside diameter of the seal. Lightly coat the crankshaft with engine oil.

(2) Position the tool and seal over the end of the crankshaft and insert a draw screw tool into Seal Installation Tool 6139 (Fig. 62). Tighten the nut against the tool until it contacts the cover.

REMOVAL AND INSTALLATION (Continued)

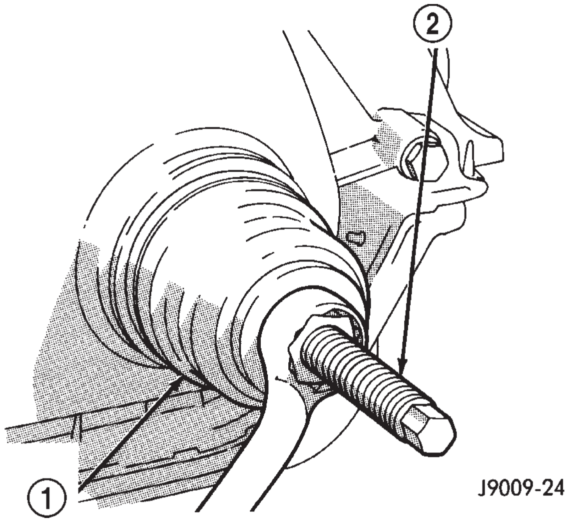


Fig. 62 Timing Case Cover Oil Seal Installation

1 – SEAL INSTALLATION TOOL
2 – DRAW SCREW TOOL

(3) Remove the tools. Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(4) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) Install the serpentine belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(6) Install the radiator shroud.

(7) Connect negative cable to battery.

TIMING CASE COVER

REMOVAL

(1) Disconnect battery negative cable.

(2) Remove accessory drive belt (Refer to Group 07, Cooling System for proper procedure)

(3) Remove the accessory drive brackets that are attached to the timing case cover.

(4) Remove the fan and hub assembly and remove the fan shroud.

(5) Remove the A/C compressor (if equipped) and generator bracket assembly from the engine cylinder head and move to one side.

(6) Remove the vibration damper (Fig. 63).

(7) Remove the oil pan-to-timing case cover bolts and timing case cover-to-cylinder block bolts.

(8) Remove the timing case cover and gasket from the engine.

(9) Pry the crankshaft oil seal from the front of the timing case cover (Fig. 63).

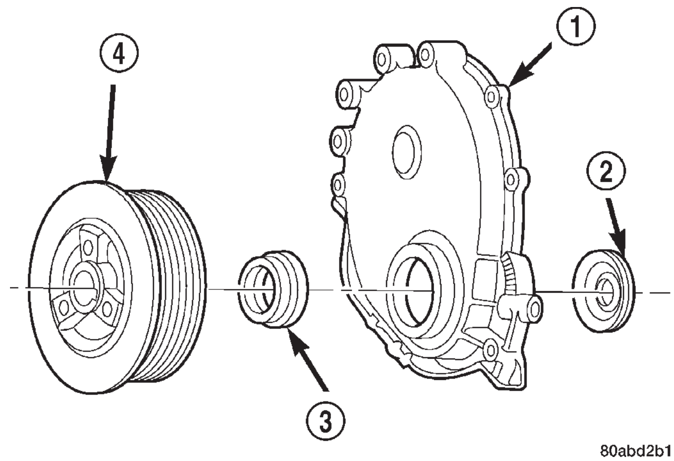


Fig. 63 Timing Case Cover Components

1 – TIMING CASE COVER
2 – OIL SLINGER
3 – CRANKSHAFT OIL SEAL
4 – VIBRATION DAMPER PULLEY

INSTALLATION

(1) Clean the timing case cover, oil pan and cylinder block gasket surfaces.

(2) Install a new crankshaft oil seal in the timing case cover. The open end of the seal should be toward the inside of the cover. Support the cover at the seal area while installing the seal. Force it into position with Seal Installation Tool 6139.

(3) Position the gasket on the cylinder block.

(4) Position the timing case cover on the oil pan gasket and the cylinder block.

(5) Insert Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 64).

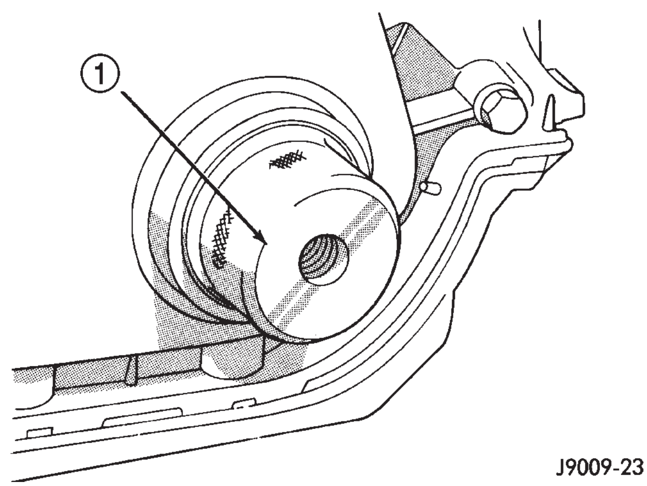


Fig. 64 Timing Case Cover Alignment and Seal Installation Tool 6139

1 – TIMING CASE COVER ALIGNMENT AND SEAL INSTALLATION TOOL

REMOVAL AND INSTALLATION (Continued)

(6) Install the timing case cover-to-cylinder block and the oil pan-to-timing case cover bolts.

(7) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover bolts to 9.5 N·m (84 in. lbs.) torque.

(8) Remove the cover alignment tool.

(9) Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(10) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(11) Install the A/C compressor (if equipped) and generator bracket assembly.

(12) Install the engine fan and hub assembly and shroud.

(13) Install the accessory drive belt and tighten to obtain the specified tension.

(14) Connect negative cable to battery.

TIMING CHAIN AND SPROCKETS

The chain drive system ie equipped with a timing chain tensioner which reduces noise and prolongs timing chain life. In addition, it compensates for wear and temperature changes on the valve train for proper engine operation.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the fan and shroud.

(3) Remove the serpentine drive belt.

(4) Remove the crankshaft vibration damper.

(5) Remove the timing case cover.

(6) Rotate crankshaft until the “0” timing mark is closest to and on the center line with camshaft sprocket timing mark (Fig. 65).

(7) Remove the oil slinger from the crankshaft.

(8) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly (Fig. 66).

(9) To replace the timing chain tensioner, the oil pan must be removed.

INSTALLATION

(1) Turn the tensioner lever to the unlocked (down) position (Fig. 67).

(2) Pull the tensioner block toward the tensioner lever to compress the spring. Hold the block and turn the tensioner lever to the lock position (Fig. 67).

(3) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in the crankshaft keyway, install the crankshaft, camshaft sprockets and timing chain. Ensure the timing marks on the sprockets are properly aligned (Fig. 65).

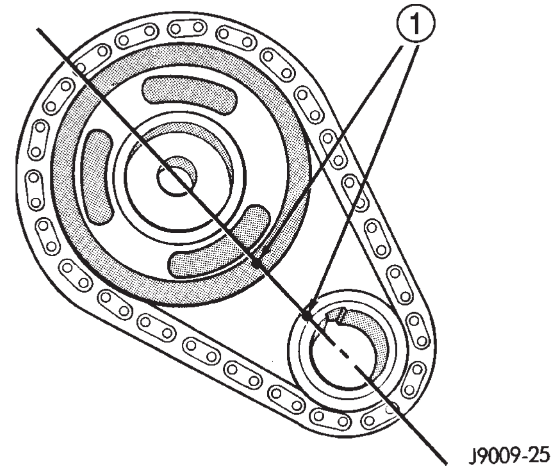


Fig. 65 Crankshaft—Camshaft Alignment

1 – TIMING MARKS

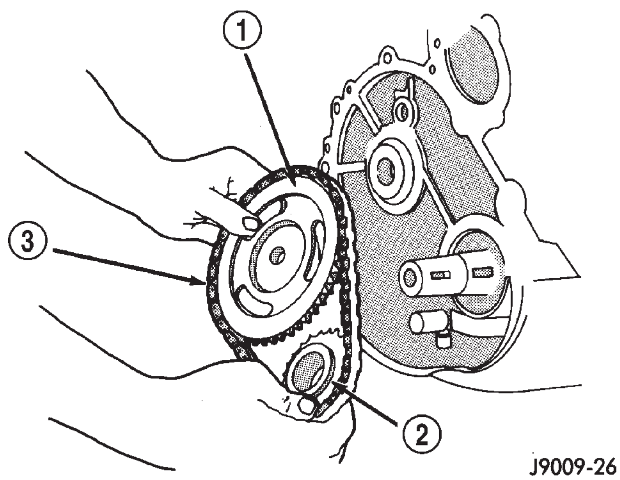


Fig. 66 Camshaft and Crankshaft Sprockets and Chain

1 – CAMSHAFT SPROCKET
2 – CRANKSHAFT SPROCKET
3 – CHAIN

(4) Install the camshaft sprocket retaining bolt and washer. Tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 68). Count the number of chain pins between the timing marks of both sprockets. There must be 20 pins.

(6) Turn the chain tensioner lever to the unlocked (down) position (Fig. 67).

(7) Install the oil slinger.

(8) Replace the oil seal in the timing case cover.

(9) Install the timing case cover and gasket.

REMOVAL AND INSTALLATION (Continued)

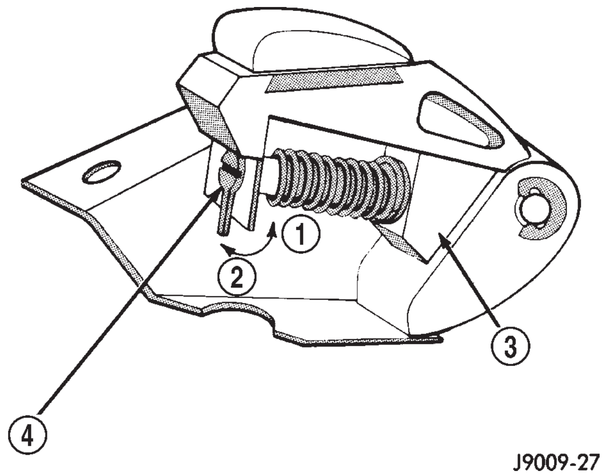


Fig. 67 Loading Timing Chain Tensioner

1 – LOCK
2 – UNLOCK
3 – TENSIONER BLOCK
4 – TENSIONER LEVER

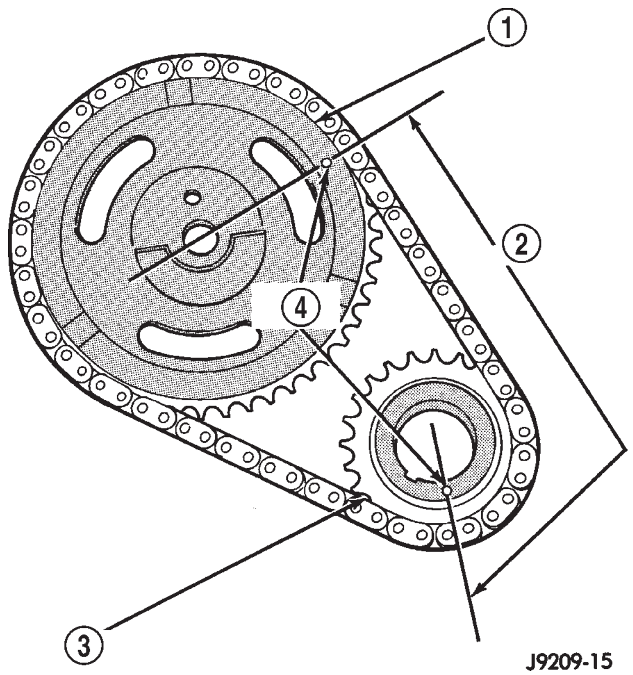


Fig. 68 Verify Sprocket—Chain Installation

1 – CAMSHAFT SPROCKET
2 – 20 PINS
3 – CRANKSHAFT SPROCKET
4 – TIMING MARKS

(10) With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(11) Install the fan and shroud.

(12) Connect negative cable to battery.

CAMSHAFT

REMOVAL

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. RELEASE THE PRESSURE BEFORE REMOVING THE DRAIN COCK, CAP AND DRAIN PLUGS.

(1) Disconnect negative cable from battery.

(2) Drain the cooling system. DO NOT waste reusable coolant. If the solution is clean, drain it into a clean container for reuse.

(3) Remove the radiator or radiator and condenser, if equipped with A/C.

(4) Scribe a mark on the distributor housing in line with the lip of the rotor.

(5) Scribe a mark on the distributor housing near the clamp and continue the scribe mark on the cylinder block in line with the distributor mark.

(6) For ease of installation, note the position of the rotor and distributor housing in relation to adjacent engine components.

(7) Remove the distributor and ignition wires.

(8) Remove the engine cylinder head cover.

(9) Remove the rocker arms, bridges and pivots.

(10) Remove the push rods.

(11) Remove the hydraulic valve tappets from the engine cylinder head.

(12) Remove the vibration damper.

(13) Remove the timing case cover.

(14) Remove the timing chain and sprockets.

(15) Remove the camshaft (Fig. 69).

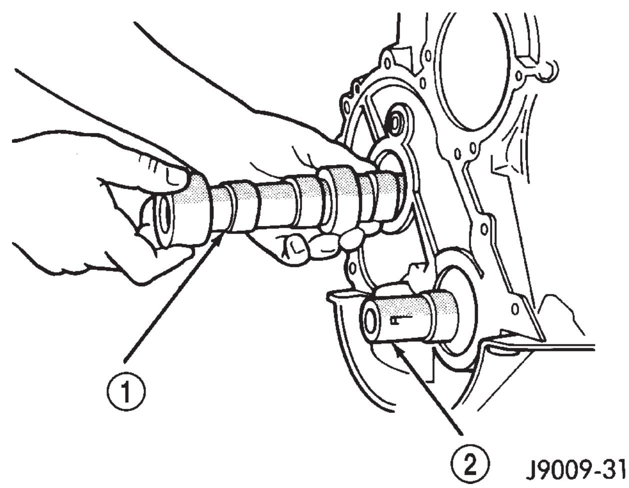


Fig. 69 Camshaft

1 – CAMSHAFT
2 – CRANKSHAFT

INSTALLATION

(1) Inspect the cam lobes for wear.

REMOVAL AND INSTALLATION (Continued)

(2) Inspect the bearing journals for uneven wear pattern or finish.

(3) Inspect the bearings for wear.

(4) Inspect the distributor drive gear for wear.

(5) If the camshaft appears to have been rubbing against the timing case cover, examine the oil pressure relief holes in the rear cam journal. The oil pressure relief holes must be free of debris.

(6) Lubricate the camshaft with Mopar Engine Oil Supplement, or equivalent.

(7) Carefully install the camshaft to prevent damage to the camshaft bearings (Fig. 69).

(8) Turn the tensioner lever to the unlocked (down) position (Fig. 70).

(9) Pull the tensioner block toward the tensioner lever to compress the spring. Hold the block and turn the tensioner lever to the lock position (Fig. 70).

(10) Install the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned.

(11) Install the camshaft sprocket retaining bolt and washer. Tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(12) Release the timing chain tensioner by moving the lever to the unlock position (Fig. 70).

(13) Install the timing case cover with a replacement oil seal (Fig. 71). Refer to Timing Case Cover Installation.

(14) Install the vibration damper.

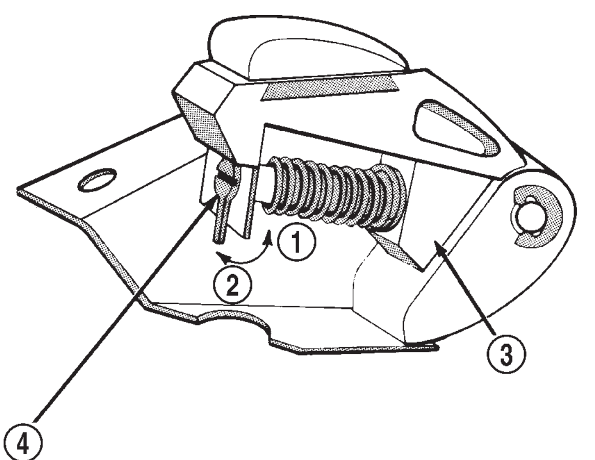


Fig. 70 Loading Timing Chain Tensioner

1 – LOCK
2 – UNLOCK
3 – TENSIONER BLOCK
4 – TENSIONER LEVER

(15) Install the hydraulic valve tappets.

(16) Install the push rods.

(17) Install the rocker arms, bridges and pivots.

(18) Install the engine cylinder head cover.

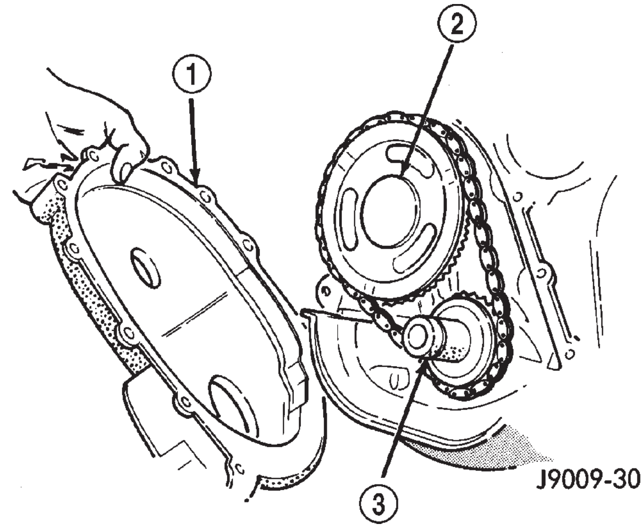


Fig. 71 Timing Case Cover

1 – TIMING CASE COVER
2 – CAMSHAFT
3 – CRANKSHAFT

(19) Position the oil pump gear. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.

(20) Install the distributor and ignition wires. Refer to Distributor in the Component Removal/Installation section of Group 8D, Ignition Systems.

(21) Install the radiator or radiator and condenser, if equipped with A/C.

(22) Fill the cooling system.

(23) Connect negative cable to battery.

CAMSHAFT PIN REPLACEMENT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) Disconnect negative cable from battery.

(2) Drain the radiator. DO NOT waste reusable coolant. Drain the coolant into a clean container.

(3) Remove the fan and shroud.

(4) Disconnect the radiator overflow tube, radiator hoses, automatic transmission fluid cooler pipes (if equipped).

(5) Remove the radiator.

(6) If equipped with air conditioning:

CAUTION: DO NOT loosen or disconnect any air conditioner system fittings. Move the condenser and receiver/drier aside as a complete assembly.

REMOVAL AND INSTALLATION (Continued)

(a) Remove the A/C compressor serpentine drive belt idler pulley.

(b) Disconnect and remove the generator.

(c) Remove the A/C condenser attaching bolts and move the condenser and receiver/drier assembly up and out of the way.

(7) Remove the serpentine drive belt.

(8) Remove the crankshaft vibration damper.

(9) Remove the timing case cover. Clean the gasket material from the cover.

(10) Rotate crankshaft until the crankshaft sprocket timing mark is closest to and on the center line with the camshaft sprocket timing mark (Fig. 72).

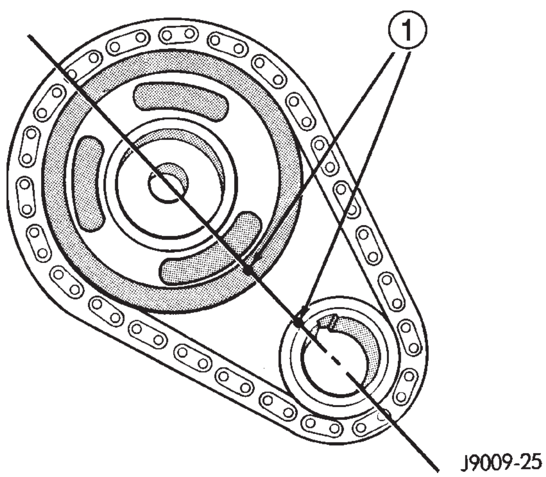


Fig. 72 Timing Chain Alignment

1 – TIMING MARKS

(11) Remove camshaft sprocket retaining bolt.

(12) Remove the crankshaft oil slinger.

(13) Remove the sprockets and chain as an assembly (Fig. 73).

CAUTION: The following procedural step must be accomplished to prevent the camshaft from damaging the rear camshaft plug during pin installation.

(14) Inspect the damaged camshaft pin.

(15) If the pin is a spring-type pin, remove the broken pin by inserting a self-tapping screw into the pin and carefully pulling the pin from the camshaft.

(16) If the pin is a dowel-type pin, center-punch it. Ensure the exact center is located when center-punching the pin.

CAUTION: Cover the opened oil pan area to prevent metal chips from entering the pan.

(17) Drill into the pin center with a 4 mm (5/32 inch) drill bit.

(18) Insert a self-tapping screw into the drilled pin and carefully pull the pin from the camshaft.

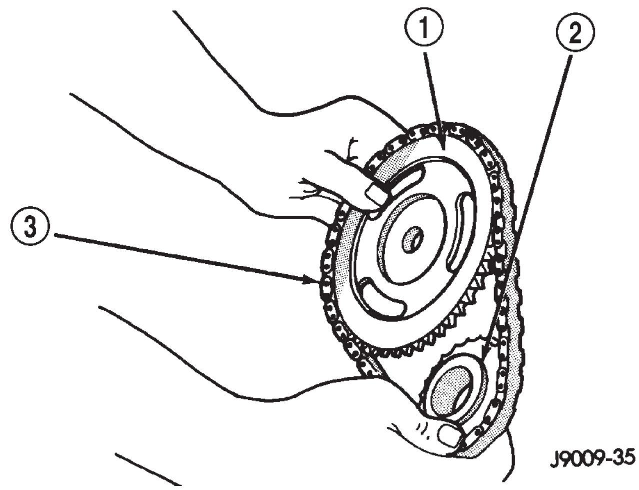


Fig. 73 Camshaft and Crankshaft Sprocket and Chain

1 – CAMSHAFT SPROCKET
2 – CRANKSHAFT SPROCKET
3 – CHAIN

INSTALLATION

(1) Clean the camshaft pin hole.

(2) Compress the center of the replacement spring pin with vise grips.

(3) Carefully drive the pin into the camshaft pin hole until it is seated.

(4) Install the camshaft sprocket, crankshaft sprocket and timing chain with the timing marks aligned (Fig. 72).

(5) To verify correct installation of the timing chain, turn the crankshaft to position the camshaft sprocket timing mark as shown in (Fig. 74). Count the number of chain pins between the timing marks of both sprockets. There must be 20 pins.

(6) Install the crankshaft oil slinger.

(7) Tighten the camshaft sprocket bolt to 108 N·m (80 ft. lbs.) torque.

(8) Check the valve timing.

(9) Coat both sides of the replacement timing case cover gasket with gasket sealer. Apply a 3 mm (1/8 inch) bead of Mopar Silicone Rubber Adhesive Sealant, or equivalent to the joint formed at the timing case cover and cylinder block.

(10) Position the timing case cover on the oil pan gasket and the cylinder block.

(11) Place Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening of the cover (Fig. 75).

(12) Install the timing case cover-to-cylinder block bolts. Install the oil pan-to-timing case cover bolts.

(13) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m

REMOVAL AND INSTALLATION (Continued)

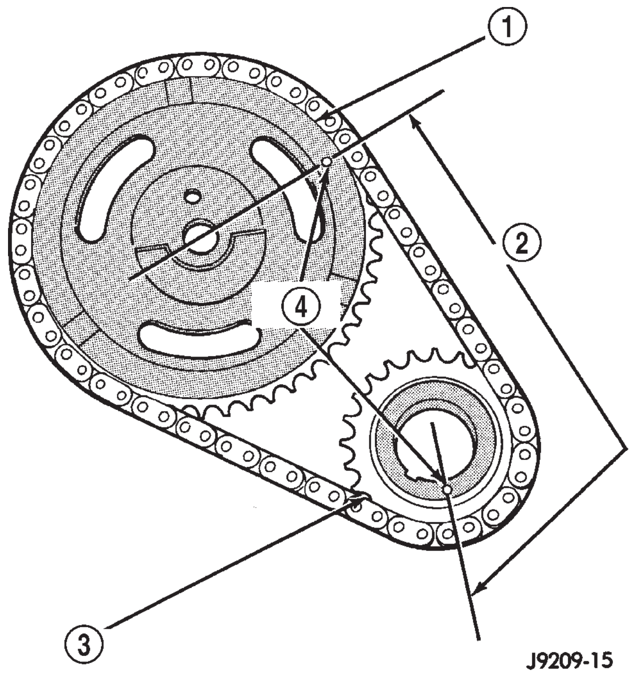


Fig. 74 Verify Crankshaft—Camshaft Installation

1 – CAMSHAFT SPROCKET
2 – 20 PINS
3 – CRANKSHAFT SPROCKET
4 – TIMING MARKS

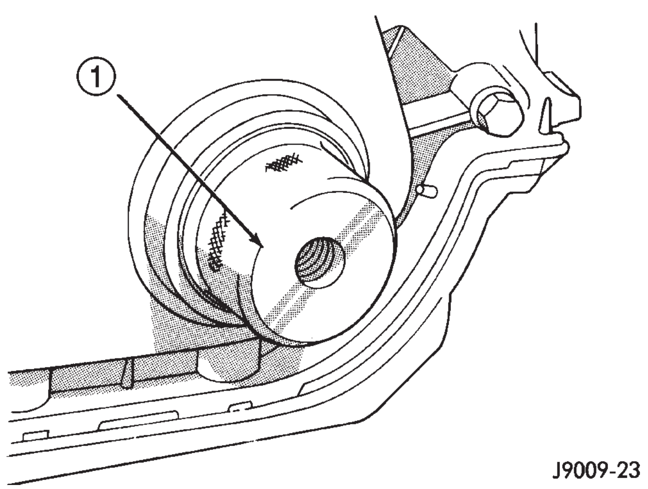


Fig. 75 Timing Case Cover Alignment and Seal Installation Tool 6139

1 – TIMING CASE COVER ALIGNMENT AND SEAL INSTALLATION TOOL

(120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(14) Remove the cover alignment tool and install a replacement oil seal into the cover.

(15) Install the vibration damper on the crankshaft.

(16) Lubricate and tighten the damper bolt to 108 N·m (80 ft. lbs.) torque.

(17) If equipped with air conditioning:

(a) Install the A/C compressor serpentine drive belt idler pulley.

(b) Install the generator.

(c) Install the A/C condenser and receiver/drier assembly.

(18) Install the serpentine drive belt on the pulleys and tighten (refer to Group 7, Cooling System for the specifications and procedures).

(19) Install the radiator. Connect the radiator hoses and automatic transmission fluid cooler pipes, if equipped. Fill the cooling system.

(20) Install the fan and shroud.

(21) Connect negative cable to battery.

CAMSHAFT BEARINGS

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm (0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated.

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available, such as recommended tool 8544 Camshaft Bushing Remover Installer.

Camshaft end play is maintained by the load placed on the camshaft by the oil pump and distributor drive gear. The helical cut of the gear holds the camshaft sprocket thrust face against the cylinder block face.

CRANKSHAFT MAIN BEARINGS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the spark plugs.

(3) Raise the vehicle.

(4) Remove the oil pan and oil pump.

(5) Remove only one main bearing cap and lower insert at a time (Fig. 76).

(6) Remove the lower insert from the bearing cap.

(7) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 77). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool

REMOVAL AND INSTALLATION (Continued)

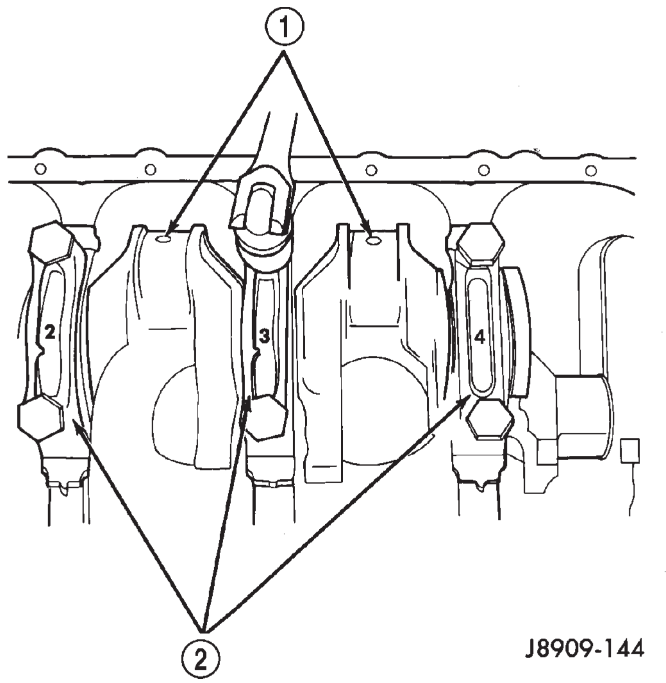


Fig. 76 Removing Main Bearing Caps and Lower Inserts

1 – CONNECTING ROD JOURNAL
2 – MAIN BEARING CAPS

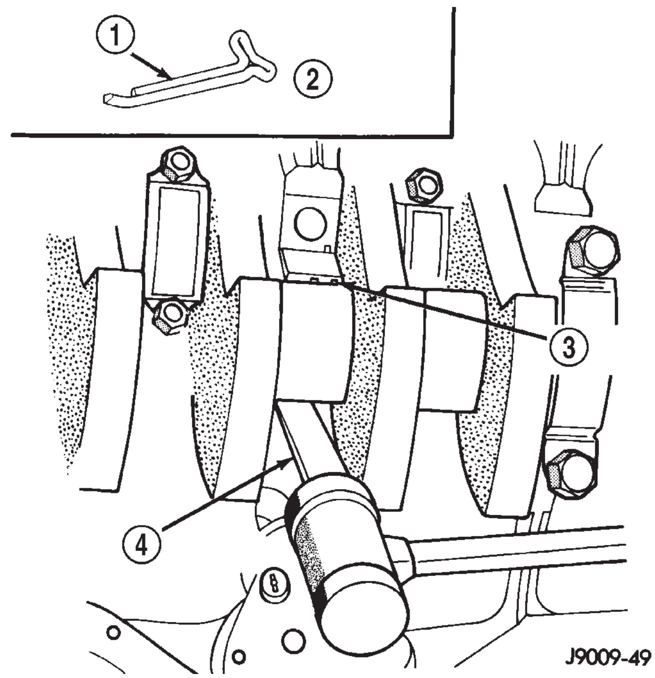


Fig. 77 Removing Upper Inserts

1 – COTTER PIN
2 – FABRICATED TOOL
3 – BEARING INSERT
4 – TONGUE DEPRESSOR

to remove the bearing insert (Fig. 77). After moving the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.

(8) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

INSTALLATION

(1) Lubricate the bearing surface of each insert with engine oil.

(2) Loosen all the main bearing caps. Install the main bearing upper inserts.

(3) Install the lower bearing inserts into the main bearing caps.

(4) Install the main bearing cap(s) and lower insert(s).

(5) Clean the rear main bearing cap (No.5) mating surfaces.

(6) Apply Mopar® Gasket Maker, or equivalent on the rear bearing cap (Fig. 78). The bead should be 3 mm (0.125 in) thick. DO NOT apply Mopar® Gasket Maker, or equivalent to the lip of the seal.

(7) Install the rear main bearing cap. DO NOT strike the cap more than twice for proper engagement.

(8) Tighten the bolts of caps 1, 3, 4 and 5 to 54 N·m (40 ft. lbs.) torque. Now tighten these bolts to 95 N·m (70 ft. lbs.) torque. Finally, tighten these bolts to 108 N·m (80 ft. lbs.) torque.

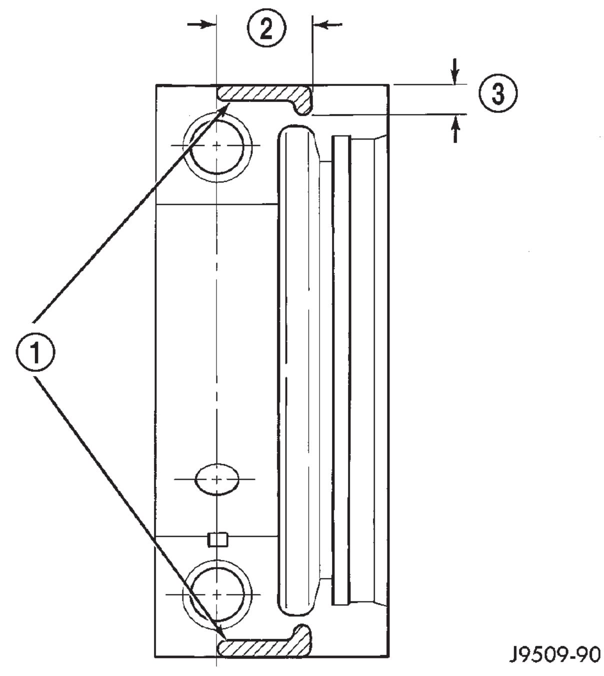


Fig. 78 Location of Mopar® Gasket Maker

1 – MOPAR® GASKET MAKER (OR EQUIVALENT)
2 – 19 mm (.75 IN)
3 – 6 mm (0.025 IN)

REMOVAL AND INSTALLATION (Continued)

(9) Push the crankshaft forward and backward. Load the crankshaft front or rear and tighten cap bolt No.2 to 54 N·m (40 ft. lbs.) torque. Then tighten to 95 N·m (70 ft. lbs.) torque and finally tighten to 108 N·m (80 ft. lbs.) torque.

(10) Rotate the crankshaft after tightening each main bearing cap to ensure the crankshaft rotates freely.

(11) Check crankshaft end play. Crankshaft end play is controlled by the thrust bearing which is flange and installed at the No.2 main bearing position.

(a) Attach a magnetic base dial indicator to the cylinder block at either the front or rear of the engine.

(b) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(c) Pry the crankshaft forward, position the dial indicator to zero.

(d) Pry the crankshaft forward and backward. Note the dial indicator readings. End play is the difference between the high and low measurements (Fig. 79). Correct end play is 0.038-0.165 mm (0.0015-0.0065 inch). The desired specifications are 0.051-0.064 mm (0.002-0.0025 inch).

(e) If end play is not within specification, inspect crankshaft thrust faces for wear. If no wear is apparent, replace the thrust bearing and measure end play. If end play is still not within specification, replace the crankshaft.

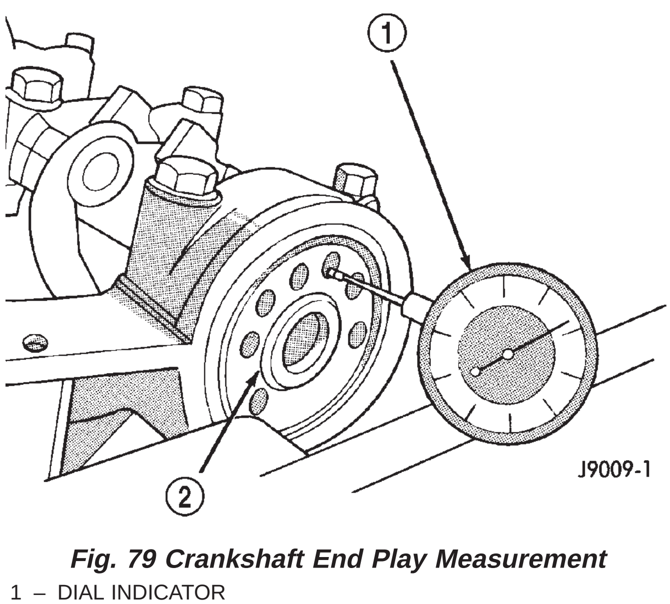


Fig. 79 Crankshaft End Play Measurement

1 – DIAL INDICATOR
2 – CRANKSHAFT

(12) If the crankshaft was removed, install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble).

(13) Install the oil pan.

(14) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(15) Install new rearmain seal. Refer to Rear Main Seal in this section.

(16) Lower the vehicle.

(17) Install the spark plugs. Tighten the plugs to 37 N·m (27 ft. lbs.) torque.

(18) Fill the oil pan with engine oil to the safe mark on the dipstick level.

(19) Connect negative cable to battery.

OIL PAN

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Remove the oil pan drain plug and drain the engine oil.

(4) Disconnect the exhaust pipe at the engine exhaust manifold.

(5) Disconnect the exhaust hanger at the catalytic converter and lower the pipe.

(6) Remove the engine starter motor.

(7) Remove the flywheel/torque converter housing access cover.

(8) Position a jack stand directly under the engine vibration damper.

(9) Place a piece of wood (2 x 2) between the jack stand and the engine vibration damper.

(10) Remove the engine mount through bolts.

(11) Using the jack stand, raise the engine until adequate clearance is obtained to remove the oil pan.

(12) If equipped, disconnect the transmission cooler lines and oxygen sensor harness from oil pan mounting studs.

(13) Remove the oil pan bolts and studs. Carefully remove the oil pan and gasket.

INSTALLATION

(1) Clean the block and pan gasket surfaces.

(2) Fabricate 4 alignment dowels from 1/4 x 1 1/2 inch bolts. Cut the head off the bolts and cut a slot into the top of the dowel. This will allow easier installation and removal with a screwdriver (Fig. 80).

(3) Install two dowels in the timing case cover. Install the other two dowels in the cylinder block (Fig. 81).

(4) Apply Mopar® Silicone Adhesive Sealant onto the cylinder block in four location as shown (Fig. 82)

(5) Slide the one-piece gasket over the dowels and onto the block and timing case cover.

(6) Position the oil pan over the dowels and onto the gasket.

(7) Install the 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque. Install the 5/16

REMOVAL AND INSTALLATION (Continued)

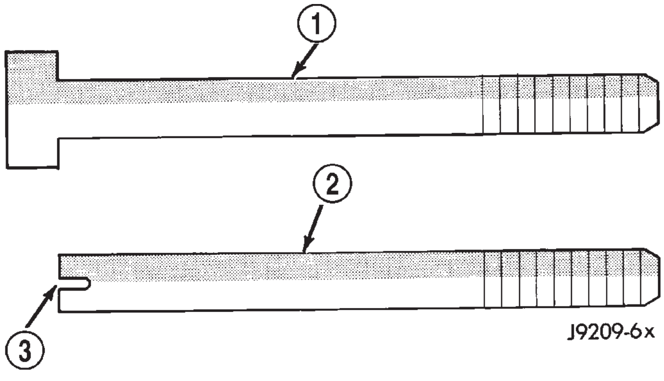


Fig. 80 Fabrication of Alignment Dowels

1 – 1/4′′ × 1 1/2′′ BOLT
2 – DOWEL
3 – SLOT

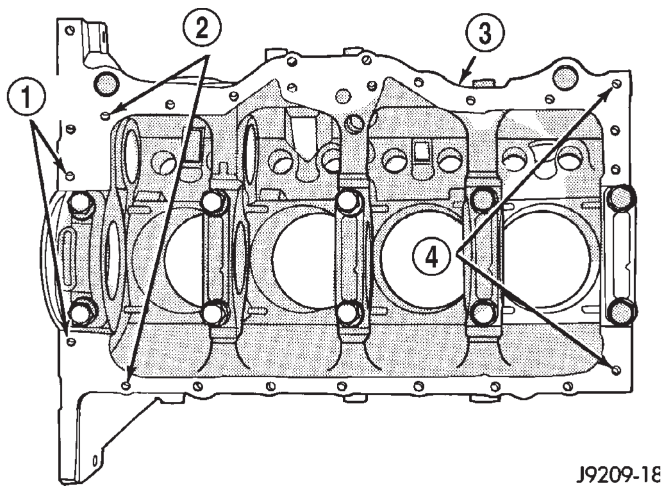


Fig. 81 Position of Dowels in Cylinder Block

1 – 5/16′′ HOLES
2 – DOWEL HOLES
3 – CYLINDER BLOCK
4 – 5/16′′ HOLES

inch oil pan bolts (Fig. 83). Tighten these bolts to 15 N·m (132 in. lbs.) torque.

(8) Remove the dowels. Install the remaining 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque.

(9) Lower the engine until it is properly located on the engine mounts.

(10) Install the through bolts and tighten the nuts.

(11) Lower the jack stand and remove the piece of wood.

(12) Install the flywheel and torque converter housing access cover.

(13) Install the engine starter motor.

(14) Connect the exhaust pipe to the hanger and to the engine exhaust manifold.

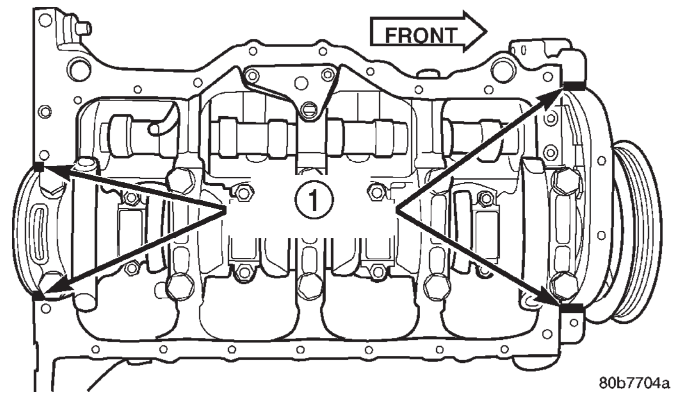


Fig. 82 Location of Mopar® Silicone Adhesive Sealant on Cylinder Block

1 – SEALER LOCATIONS

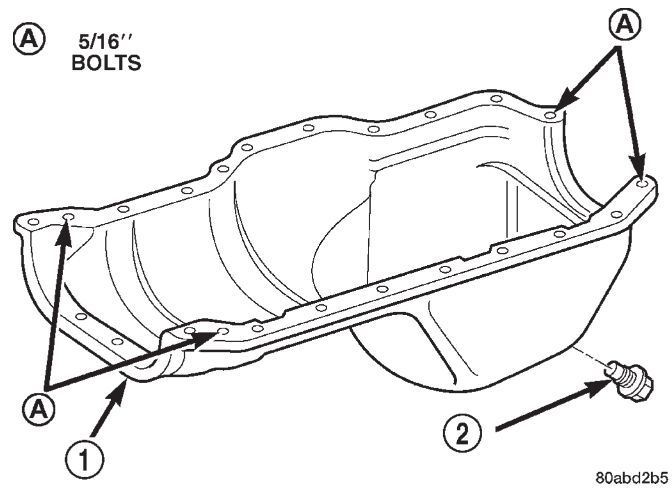


Fig. 83 Position of 5/16 inch Oil Pan Bolts

1 – OIL PAN
2 – OIL PAN DRAIN PLUG

(15) Install the oil pan drain plug (Fig. 83). Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(16) Lower the vehicle.

(17) Connect negative cable to battery.

(18) Fill the oil pan with engine oil to the specified level.

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 FAN. DO NOT WEAR LOOSE CLOTHING.

(19) Start the engine and inspect for leaks.

OIL PUMP

The positive-displacement gear-type oil pump is driven by the distributor shaft, which is driven by a gear on the camshaft. Oil is siphoned into the pump

REMOVAL AND INSTALLATION (Continued)

through an inlet tube and strainer assembly that is pressed into the pump body.

The pump incorporates a nonadjustable pressure relief valve to limit maximum pressure to 517 kPa (75 psi). In the relief position, the valve permits oil to bypass through a passage in the pump body to the inlet side of the pump.

Oil pump removal or replacement will not affect the distributor timing because the distributor drive gear remains in mesh with the camshaft gear.

REMOVAL

(1) Drain the engine oil.

(2) Remove the oil pan.

(3) Remove the pump-to-cylinder block attaching bolts. Remove the pump assembly with gasket (Fig. 84).

CAUTION: If the oil pump is not to be serviced, DO NOT disturb position of oil inlet tube and strainer assembly in pump body. If the tube is moved within the pump body, a replacement tube and strainer assembly must be installed to assure an airtight seal.

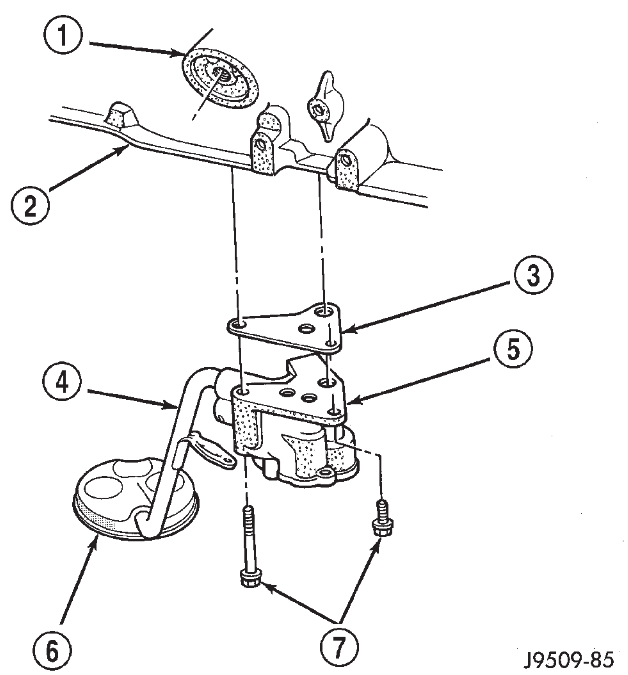


Fig. 84 Oil Pump Assembly

1 – OIL FILTER ADAPTOR
2 – BLOCK
3 – GASKET
4 – OIL INLET TUBE
5 – OIL PUMP
6 – STRAINER ASSEMBLY
7 – ATTACHING BOLTS

INSTALLATION

(1) Install the oil pump on the cylinder block using a replacement gasket. Tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(2) Install the oil pan and gasket.

(3) Fill the oil pan with oil to the specified level.

PISTON AND CONNECTING ROD

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the rocker arms, bridges and pivots.

(3) Remove the push rods.

(4) Remove the engine cylinder head.

(5) Position the pistons one at a time near the bottom of the stroke. Use a ridge reamer to remove the ridge from the top end of the cylinder walls. Use a protective cloth to collect the cuttings.

(6) Raise the vehicle.

(7) Drain the engine oil.

(8) Remove the oil pan and gasket.

(9) Remove the connecting rod bearing caps and inserts. Mark the caps and rods with the cylinder bore location. The connecting rods and caps are stamped with a two letter combination (Fig. 85).

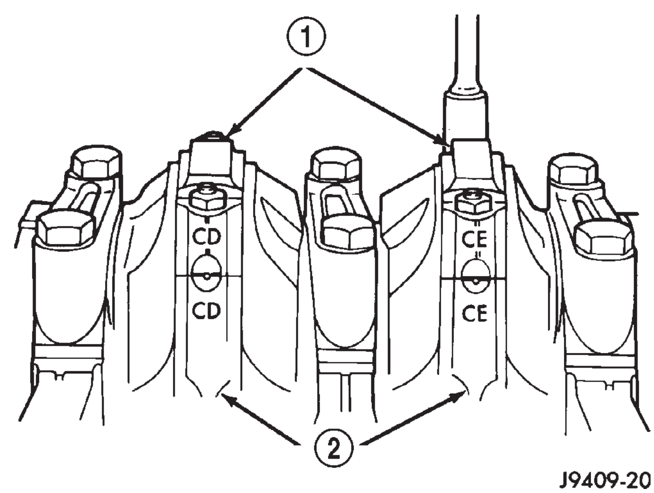


Fig. 85 Stamped Connecting Rods and Caps

1 – CONNECTING ROD CAP
2 – CONNECTING ROD

(10) Lower the vehicle until it is about 2 feet from the floor.

CAUTION: Ensure that the connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose, slipped over the rod bolts will provide protection during removal.

(11) Have an assistant push the piston and connecting rod assemblies up and through the top of the cylinder bores (Fig. 86).

REMOVAL AND INSTALLATION (Continued)

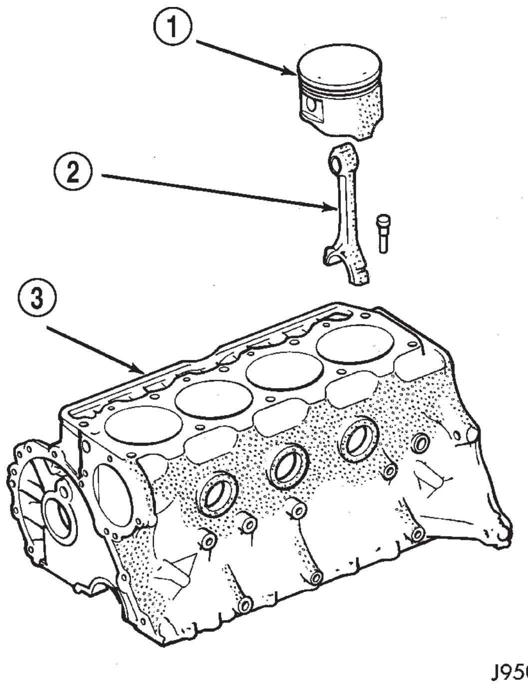


Fig. 86 Removal of Connecting Rod and Piston Assembly

1 – PISTON
2 – CONNECTING ROD
3 – CYLINDER BLOCK

INSTALLATION

(1) Clean the cylinder bores thoroughly. Apply a light film of clean engine oil to the bores with a clean lint-free cloth.

(2) Install the piston rings on the pistons if removed.

(3) Lubricate the piston and rings with clean engine oil.

CAUTION: Ensure that connecting rod bolts do not scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose slipped over the connecting rod bolts will provide protection during installation.

(5) Use a piston ring compressor to install the connecting rod and piston assemblies through the top of the cylinder bores (Fig. 87).

(6) Ensure the arrow on the piston top points to the front of the engine (Fig. 87).

(7) Raise the vehicle.

(8) Each bearing insert is fitted to its respective journal to obtain the specified clearance between the bearing and the journal. In production, the select fit is obtained by using various-sized, color-coded bearing inserts as listed in the Connecting Rod Bearing Fitting Chart. The color code appears on the edge of

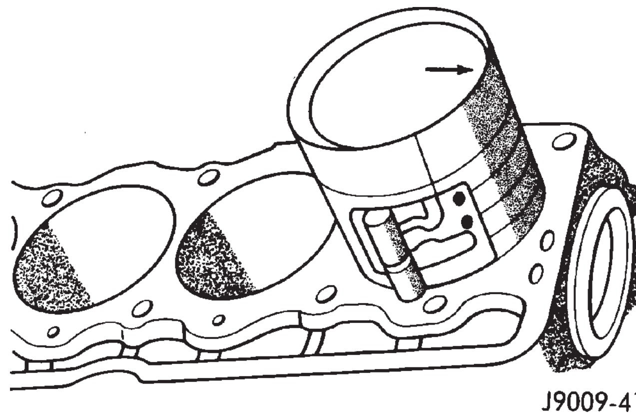


Fig. 87 Rod and Piston Assembly Installation

the bearing insert. The size is not stamped on inserts used for production of engines.

(9) The rod journal is identified during the engine production by a color-coded paint mark on the adjacent cheek or counterweight toward the flange (rear) end of the crankshaft. The color codes used to indicate journal sizes are listed in the Connecting Rod Bearing Fitting Chart.

(10) When required, upper and lower bearing inserts of different sizes may be used as a pair (refer to Connecting Rod Bearing Fitting Chart). A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce clearance 0.013 mm (0.0005 inch).

CAUTION: DO NOT intermix bearing caps. Each connecting rod and bearing cap are stamped with the cylinder number. The stamp is located on a machined surface adjacent to the oil squirt hole that faces the camshaft side of the cylinder block.

(11) Install the connecting rod bearing caps and inserts in the same positions as removed.

CAUTION: Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(13) Install the oil pan and gaskets as outlined in the installation procedure.

(14) Lower the vehicle.

(15) Install the engine cylinder head, push rods, rocker arms, bridges, pivots and engine cylinder head cover.

(16) Fill the crankcase with engine oil.

REAR MAIN OIL SEAL

REMOVAL

(1) Remove the flywheel or converter drive plate. Discard the old bolts.

REMOVAL AND INSTALLATION (Continued)

(2) Pry out the seal from around the crankshaft flange, making sure not to scratch or nick the crankshaft. (Fig. 88).

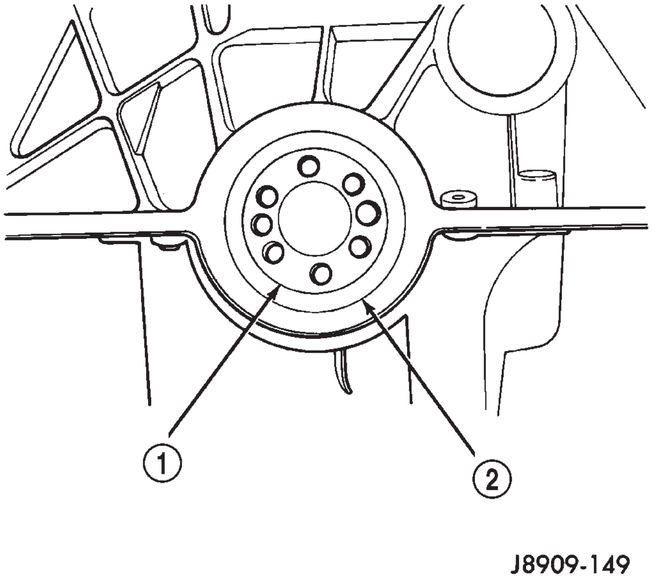


Fig. 88 Replacement of Rear Crankshaft Oil Seal

1 – CRANKSHAFT
2 – CRANKSHAFT OIL SEAL

INSTALLATION

(1) Wipe the seal surface area of the crankshaft until it is clean.

(2) Coat the outer lip of the replacement rear main bearing seal with engine oil.

(3) Carefully position the seal into place. Use rear main Seal Installer Tool 6271A to install the seal flush with the cylinder block.

CAUTION: The felt lip must be located inside the flywheel mounting surface. If the lip is not positioned correctly the flywheel could tear the seal.

(4) Install the flywheel or converter drive plate. New bolts MUST be used when installing the flywheel or converter plate. Tighten the new bolts to 68 N·m (50 ft. lbs.) torque. Turn the bolts an additional 60°.

DISASSEMBLY AND ASSEMBLY

CYLINDER BLOCK

DISASSEMBLY

(1) Drain the engine oil. Remove and discard the oil filter.

(2) Remove the water pump from the cylinder block.

(3) Remove the distributor from the cylinder block.

(4) Remove the vibration damper.

(5) Remove the timing case cover and lay the cover upside down.

(6) Position a drift punch into the slot in the back of the cover and tap the old seal out.

(7) Remove the timing chain bumper.

(8) Remove the oil slinger from crankshaft.

(9) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly.

(10) Remove the camshaft.

(11) Remove the oil pan and gasket.

(12) Remove the timing chain tensioner.

(13) Remove the front and rear oil galley plugs.

(14) Remove the connecting rods and the pistons. Remove the connecting rod and piston assemblies through the top of the cylinder bores.

(15) Remove the crankshaft.

ASSEMBLY

(1) Install the crankshaft.

(2) Install the connecting rods and the pistons through the top of the cylinder bores.

(3) Install the front and rear oil galley plugs.

(4) Install the timing chain tensioner.

(5) Install the camshaft.

(6) Install the sprockets and chain as an assembly.

(7) Install the oil slinger to the crankshaft.

(8) Install the timing chain bumper.

(9) Install the timing case cover seal.

(10) Install the timing case cover.

(11) Install the oil pan gasket and oil pan.

(12) Install the vibration damper.

(13) Install the water pump. Tighten the mounting bolts to 31 N·m (270 in. lbs.) torque.

(14) Remove the distributor from the cylinder block.

(15) Lubricate the oil filter seal with clean engine oil. Tighten oil filter to 18 N·m (13 ft. lbs.) torque.

(16) Install the engine into the vehicle.

(17) Fill the engine with clean lubrication oil.

(18) Fill the cooling system.

CLEANING AND INSPECTION

ROCKER ARMS AND PUSH RODS

CLEANING

Clean all the components with cleaning solvent.

Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSPECTION

Inspect the pivot surface area of each rocker arm. Replace any that are scuffed, pitted, cracked or excessively worn.

CLEANING AND INSPECTION (Continued)

Inspect the valve stem tip contact surface of each rocker arm and replace any rocker arm that is deeply pitted.

Inspect each push rod end for excessive wear and replace as required. If any push rod is excessively worn because of lack of oil, replace it and inspect the corresponding hydraulic tappet for excessive wear.

Inspect the push rods for straightness by rolling them on a flat surface or by shining a light between the push rod and the flat surface.

A wear pattern along the length of the push rod is not normal. Inspect the engine cylinder head for obstruction if this condition exists.

ENGINE CYLINDER HEAD

CLEANING

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and block mating surfaces.

CYLINDER BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole, the filter bypass hole (Fig. 89).
- The front and rear oil galley holes (Fig. 90) (Fig. 91).
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Mopar® Thread Sealant with Teflon to the threads of the front and rear oil galley plugs. Tighten the plugs to 41 N·m (30 ft. lbs.) torque.

INSPECTION

Inspect the cylinder bores for signs of scorring, pitting or cracks. If the cylinder bores are scorred or pitted the cylinder bores will require boreing or honing to clean them up. Refer to Honing Cylinder Bores in this Section. If the cylinder bore(s) are cracked the cylinder block must be replaced.

Inspect the cylinder block to cylinder head mating surface for flatness and/or pitting.

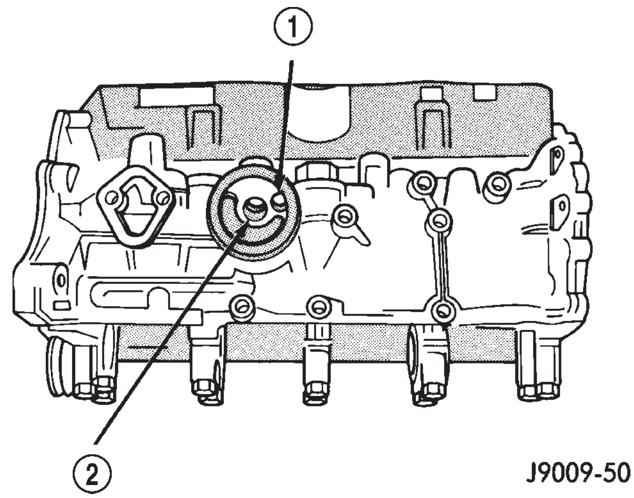


Fig. 89 Oil Filter Adaptor Hole

1 – FILTER BYPASS HOLE
2 – OIL FILTER ADAPTOR HOLE

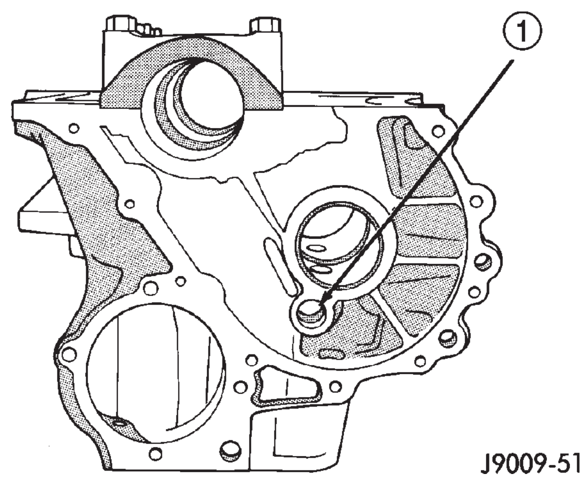


Fig. 90 Front Oil Galley Hole

1 – FRONT OIL GALLEY HOLE

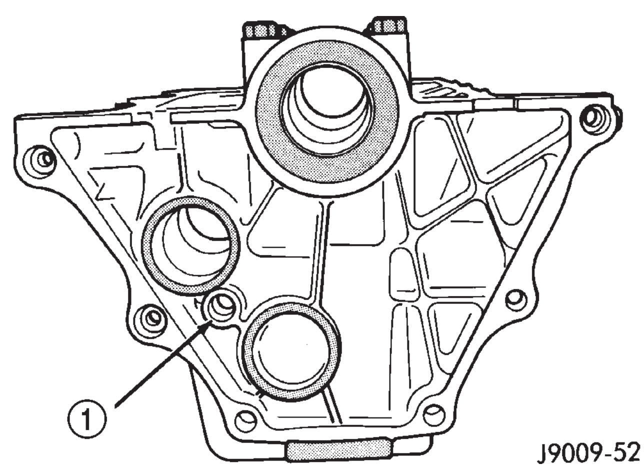


Fig. 91 Rear Oil Galley Hole

1 – REAR OIL GALLEY HOLE

SPECIFICATIONS

ENGINE SPECIFICATIONS

ENGINE DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	In-line 4 Cylinder
Bore and Stroke	98.4 x 81.0 mm (3.88 x 3.19 in.)
Displacement	2.5L (150 cu. in.)
Compression Ratio	9.1:1
Compression Pressure Range	827 to 1,034 kPa (120 to 150 psi)
Max. Variation Between Cylinders	206 kPa (30 psi)
Firing Order	1–3–4–2
Lubrication	Pressure Feed–Full Flow Filtration
Cooling System	Liquid Cooled–Forced Circulation
Cylinder Block	Cast Iron
Crankshaft	Cast Nodular Iron
Cylinder Head	Cast Iron
Camshaft	Cast Iron
Pistons	Aluminum Alloy
Cylinder Combustion Cavity	Double Quench
Connecting Rods	Cast Iron
CAMSHAFT	
Hydraulic Tappet Clearance	Zero Lash
Bearing Clearance	0.025 - 0.076 mm (0.001 - 0.003 in.)
Bearing Journal Diameter	
No. 1	51.54 - 51.56 mm (2.029 - 2.030 in.)
No. 2	51.28 - 51.31 mm (2.019 - 2.020 in.)
No. 3	51.03 - 51.05 mm (2.009 - 2.010 in.)
No. 4	50.78 - 50.80 mm (1.999 - 2.000 in.)
Base Circle Runout (Max)	0.03 mm (0.001 in.)
Camshaft Lobe Lift	
Exhaust	6.579 mm (0.259 in.)
Intake	6.477 mm (0.255 in.)
Camshaft Duration	
Intake	253.3°
Exhaust	259°
VALVES	
Valve Lift	
Exhaust	10.528 mm (0.4145 in.)
Intake	10.350 mm (0.4075 in.)
Intake Valve Timing	
Opens	15.4° (BTDC)
Closes	58° (ABDC)
Duration	253.3°
Exhaust Valve Timing	
Opens	52.8° (BBDC)
Closes	26.2° (ATDC)
Duration	259°
Valve Overlap	41.6°
Valve Lenght (Overall)	
Intake	124.435 - 125.070 mm (4.899 - 4.924 in.)
Exhaust	125.120 - 125.755 mm (4.927 - 4.952 in.)
Valve Stem Diameter	7.899 - 7.925 mm (0.311 - 0.312 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Stem to Guide Clearance	0.025 - 0.076 mm (0.001 - 0.003 in.)
ValveFace Angle	
Intake	46.5°
Exhaust	46.5°
Valve Head Diameter	
Intake	48.387 - 48.641 mm (1.905 - 1.915 in.)
Exhaust	37.973 - 38.227 mm (1.495 - 1.505 in.)
Tip Refinishing (Max Alowable)	0.25 mm (0.010 in.)
VALVE SPRINGS	
Free Length (Approx.)	47.65 mm (1.876 in.)
Spring Load	
Valve Closed	316 to 351 N @ 41.656 mm (71 to 79 Lbs. @ 1.64 in.)
Valve Open	898.6 to 969.7 N @ 30.89 mm (202 to 218 Lbs. @ 1.216 in.)
Inside Diameter (Top)	21.0 mm to 21.51 mm (0.827 to 0.847 in.)
Installed Height	41.656 mm (1.640 in.)
CRANKSHAFT	
End Play	0.038 to 0.165 mm (0.0015 to 0.0065 in.)
Main Bearing Journal Diameter	63.489 to 63.502 mm (2.4996 to 2.5001 in.)
Main Bearing Journal Width	
No. 1	27.58 to 27.89 mm (1.086 to 1.098 in.)
No. 2	32.28 to 32.33 mm (1.271 to 1.273 in.)
No. 3-4-5	30.02 to 30.18 mm (1.182 to 1.188 in.)
Main Bearing Clearance	0.03 to 0.06 mm (0.001 to 0.0025 in.)
Main Bearing Clearance (Preferred)	0.051 mm (0.002 in.)
Connecting Rod Journal Diameter	53.17 to 53.23 mm (2.0934 to 2.0955 in.)
Connecting Rod Journal Width	27.18 to 27.33 mm (1.070 to 1.076 in.)
Out of Round - Max	0.013 mm (0.0005 in.)
Taper - Max	0.013 mm (0.0005 in.)
CYLINDER BLOCK	
Deck Height	236.73 mm (9.320 in.)
Deck Clearance	0.000 mm (0.000 in.)
Cylinder Bore Diameter—Standard	98.45 to 98.48 mm (3.8759 to 3.8775 in.)
Cylinder Bore Diameter—	
Taper (Max)	0.025 mm (0.001 in.)
Out of Round (Max)	0.025 mm (0.001 in.)
Tappet Bore Diameter	23.000 to 23.025 mm (0.9055 to 0.9065 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Flatness Max	0.20 mm for total length (0.008 in. for total length)
Main Bearing Bore Diameter	68.3514 to 68.3768 mm (2.691 to 2.692 in.)
CONNECTING RODS	
Total Weight (Less Bearing)	663 to 671 grams (23.39 to 23.67 oz.)
Length (Center to Center)	155.52 to 155.62 mm (6.123 to 6.127 in.)
Piston Pin Bore Diameter	23.59 to 23.62 mm (0.9288 to 0.9298 in.)
Bore (Less Bearings)	56.08 to 56.09 mm (2.2080 to 2.2085 in.)
Bearing Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Clearance (Preferred)	0.044 to 0.050 mm (0.0015 to 0.0020 in.)
Side Clearance	0.25 to 0.48 mm (0.010 to 0.019 in.)
Twist (Max)	0.002 mm per mm (0.002 in. per in.)
Bend (Max)	0.006 mm per mm (0.006 in. per inch.)
CYLINDER HEAD	
Combustion Chamber	49.9 to 52.9 cc (3.04 to 3.23 cu. in.)
Valve Guide I. D. (Integral)	7.95 to 7.97 mm (0.313 to 0.314 in.)
Valve Seat Angle	
Intake	44.5°
Exhaust	44.5°
Valve Seat Width	1.01 to 1.52 mm (0.040 to 0.060 in.)

DESCRIPTION	SPECIFICATION
Valve Seat Runout	0.064 mm (0.0025 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness (Max)	0.20 mm for total length (0.008 in. for total length)
ROCKER ARMS, PUSH RODS & TAPPETS	
Rocker Arm Ratio	1.6:1
Push Rod Length (Blue)	241.300 to 241.808 mm (9.500 to 9.520 in.)
Push Rod Diameter	7.92 to 8.00 mm (0.312 to 0.315 in.)
Hydraulic Tappet Diameter	22.962 to 22.974 mm (0.904 to 0.9045 in.)
Tappet to Bore Clearance	0.025 to 0.063 mm (0.001 to 0.0025 in.)
PISTON	
Weight (Less Pin)	417 to 429 grams (14.7 to 15.1 oz.)
Compression Height	40.61 to 40.72 mm (1.599 to 1.603 in.)
Piston to Bore Clearance	0.018 to 0.038 mm (0.0008 to 0.0015 in.)
Piston Ring Groove Height	
Compression Rings	1.530 to 1.555 mm (0.0602 to 0.0612 in.)
Oil Control Ring	4.035 to 4.060 mm (0.1589 to 0.1598 in.)
Piston Ring Groove Diameter	
Compression Ring #1	88.39 to 88.65 mm (3.48 to 3.49 in.)
Compression Ring #2	87.63 to 87.88 mm (89.66 to 89.92 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Oil Control Ring	89.66 to 89.92 mm (3.53 to 3.54 in.)
Piston Pin Bore Diameter	23.650 to 23.658 mm (0.9312 to 0.9315 in.)
Piston Pin Diameter	23.637 to 23.640 mm (0.9306 to 0.9307 in.)
Piston to Pin Clearance	0.0102 to 0.0208 mm (0.0005 to 0.0009 in.)
PISTON RINGS	
Ring Gap Clearance	
Top Compression Ring	0.229 to 0.610 mm (0.0090 to 0.0240 in.)
2nd Compression Ring	0.483 to 0.965 mm (0.0190 to 0.0380 in.)
Oil Control Steel Rails	0.254 to 1.500 mm (0.010 to 0.060 in.)
Ring Side Clearance	
Compression Rings	0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Oil Control Rings	0.06 to 0.21 mm (0.0024 to 0.0083 in.)

DESCRIPTION	SPECIFICATION
OIL PUMP AND OIL PRESSURE	
Gear to Body Clearance	
(Radial)	0.051 to 0.102 mm (0.002 to 0.004 in.)
(Radial Preferred)	0.051 mm (0.002 in.)
Gear End Clearance—	
Plastigage	0.051 to 0.152 mm (0.002 to 0.006 in.)
Plastigage Preferred	0.051 mm (0.002 in.)
Feeler Gauge	0.1016 to 0.2032 mm (0.004 to 0.008 in.)
Feeler Gauge Preferred	0.1778 mm (0.007 in.)
Min. Pressure (600 rpm)	89.6 kPa (13 psi)
Min. Pressure at Idle (800 rpm)	172 to 241 kPa (25 to 35 psi)
Min. Pressure at 1600 rpm and Higher	255 to 517 kPa (37 to 75 psi)
Oil Pressure Relief	517 kPa (75 psi)

SPECIFICATIONS (Continued)

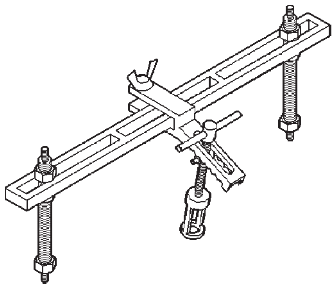
SPECIFICATIONS—TORQUE

TORQUE CHART 2.5L ENGINE

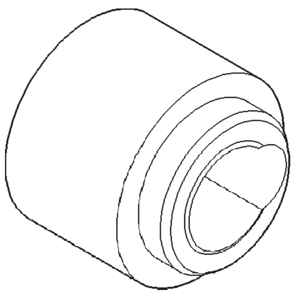
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs
A/C Compressor Bracket to Engine—Bolts	47	35	—
A/C Compressor Mounting Bolts	28	—	250
Block Heater Nut	1.8	—	16
Camshaft Sprocket Bolt	108	80	—
Clutch Cover to Flywheel Bolts	31	23	—
Connecting Rod Cap Nuts	45	33	—
Cylinder Block Drain Plugs	41	30	—
Cylinder Head Bolts #1–10 & #12–14	149	110	—
Cylinder Head Bolt #11	135	100	—
Cylinder Head Cover Bolts	13	—	115
Dipstick Tube Bracket to Cylinder Block—Bolt	19	—	168
Distributor Hold-Down Clamp Bolt	23	—	204
Engine Front Insulator Bracket— Bolts	81	60	—
Insulator Bracket—Nuts	47	35	—
Insulator—Through Bolt	81	60	—
Engine Rear Support Cushion /Crossmember—Nuts	22	—	192
Support Cushion/Bracket Nuts	46	34	—
Transmission Support Bracket— Bolts	43	32	—
Transmission Support Bracket /Cushion—Bolt	75	55	—
Transmission Support Adaptor Bracket—Bolts	75	55	—
Exhaust Manifold/Pipe Nuts	27	20	—
Exhaust Manifold			
Bolt #1	41	30	—
Bolts #2-5	31	23	—
Nuts 6 and 7	14	—	126
Flywheel/Converter Housing Bolts	38	28	—
Flywheel to Crankshaft Bolts	143	105	—
Front Cover to Block Bolts 1/4-20	7	—	60
Front Cover to Block 5/16-18	22	—	192
Generator Mounting—Bolts	57	42	—
Generator Mounting Bracket to Engine—Bolts	47	35	—
Main Bearing Cap Bolts	108	80	—
Oil Filter Adaptor Bolt	102	75	—
Oil Filter Connector	68	50	—
Oil Filter	18	13	—
Oil Galley Plug	41	30	—
Oil Pan 1/4-20 Bolts	9.5	—	84
Oil Pan 5/16-18 Bolts	15	—	132
Oil Pan Drain Plug	34	25	—
Oil Pressure Sending Unit	15	—	130
Oil Pump Short Attaching Bolts	23	—	204
Oil Pump Long Attaching Bolts	23	—	204
Oil Pump Cover Bolts	8	—	70
Rocker Arm—Bolts	28	21	—
Spark Plugs	37	27	—
Starter Motor Mounting Bolts	45	33	—
Thermostat Housing Bolts	18	—	156
Throttle Body Bolts	10	—	90
Vibration Damper Bolt	108	80	—
Water Pump to Block Bolts	31	23	—

SPECIAL TOOLS

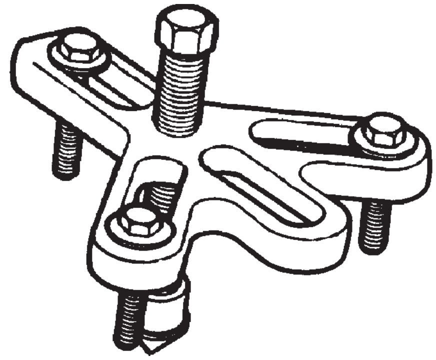
2.5L ENGINE SPECIAL TOOLS



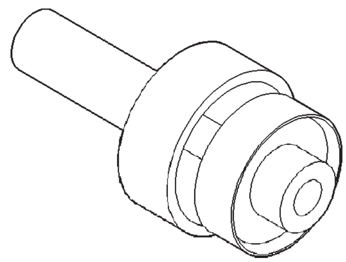
Valve Spring Compressor Tool MD-998772A



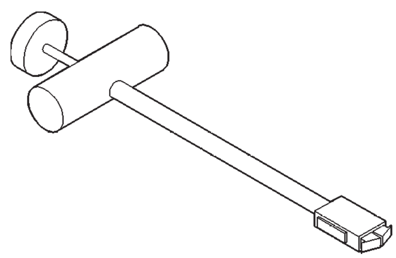
Timing Case Cover Alignment and Seal installation Tool 6139



Vibration Damper Removal Tool 7697



Rear Main Seal Installer Tool 6271A



Hydraulic Valve Tappet Removal/Installation Tool C-4129–A

4.0L ENGINE

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

ENGINE

DESCRIPTION

The 4.0 Liter (242 CID) six-cylinder engine is an In-line, lightweight, overhead valve engine.

This engine is designed for unleaded fuel. The engine cylinder head has dual quench-type combustion chambers that create turbulence and fast burning of the air/fuel mixture. This results in good fuel economy.

The cylinders are numbered 1 through 6 from front to rear. The firing order is 1-5-3-6-2-4 (Fig. 1).

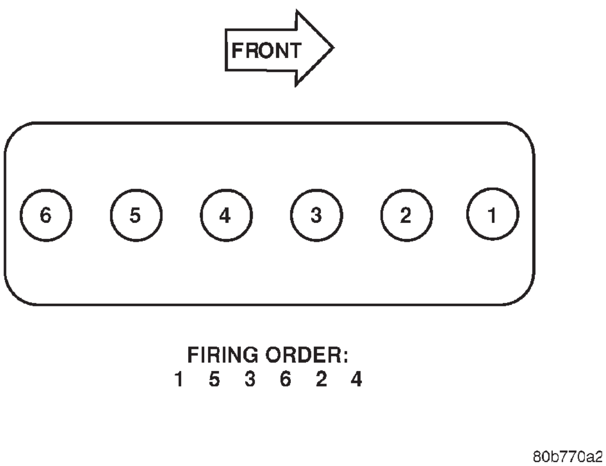


Fig. 1 Engine Firing Order

The crankshaft rotation is clockwise, when viewed from the front of the engine. The crankshaft rotates within seven main bearings. The camshaft rotates within four bearings.

BUILD DATE CODE

The engine Build Date Code is located on a machined surface on the right side of the cylinder block between the No.2 and No.3 cylinders (Fig. 2).

The digits of the code identify:

- 1st Digit—The year (8 = 1998).
- 2nd & 3rd Digits—The month (01 - 12).
- 4th & 5th Digits—The engine type/fuel system/ compression ratio (MX = A 4.0 Liter (242 CID) 8.7:1 compression ratio engine with a multi-point fuel injection system).
- 6th & 7th Digits—The day of engine build (01 - 31).

(1) **FOR EXAMPLE:** Code * 801MX12 * identifies a 4.0 Liter (242 CID) engine with a multi-point fuel injection system, 8.7:1 compression ratio and built on January 12, 1998.

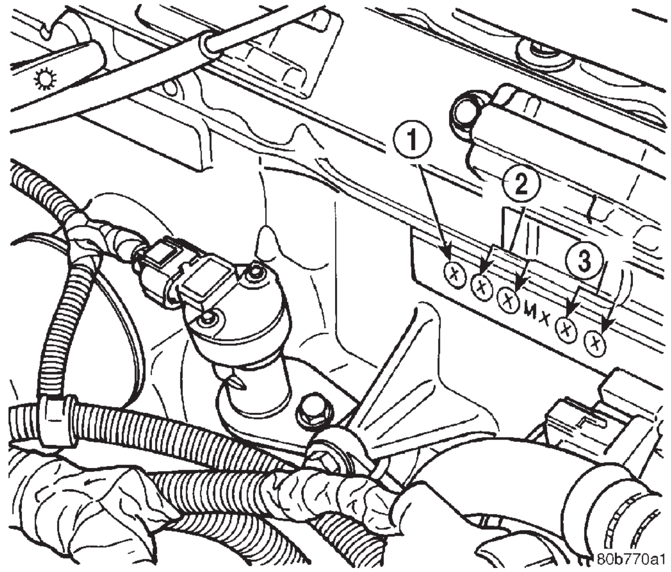


Fig. 2 Build Date Code Location

1 – YEAR
2 – MONTH
3 – DAY

LUBRICATION SYSTEM

DESCRIPTION

A gear—type positive displacement pump is mounted at the underside of the block opposite the No. 4 main bearing.

OPERATION

The pump draws oil through the screen and inlet tube from the sump at the rear of the oil pan. The oil is driven between the drive and idler gears and pump body, then forced through the outlet to the block. An oil gallery in the block channels the oil to the inlet side of the full flow oil filter. After passing through the filter element, the oil passes from the center outlet of the filter through an oil gallery that channels the oil up to the main gallery which extends the entire length of the block.

Galleries extend downward from the main oil gallery to the upper shell of each main bearing. The crankshaft is drilled internally to pass oil from the main bearing journals (except number 4 main bearing journal) to the connecting rod journals. Each connecting rod bearing cap has a small squirt hole, oil passes through the squirt hole and is thrown off as the rod rotates. This oil throwoff lubricates the camshaft lobes, distributor drive gear, cylinder walls, and piston pins.

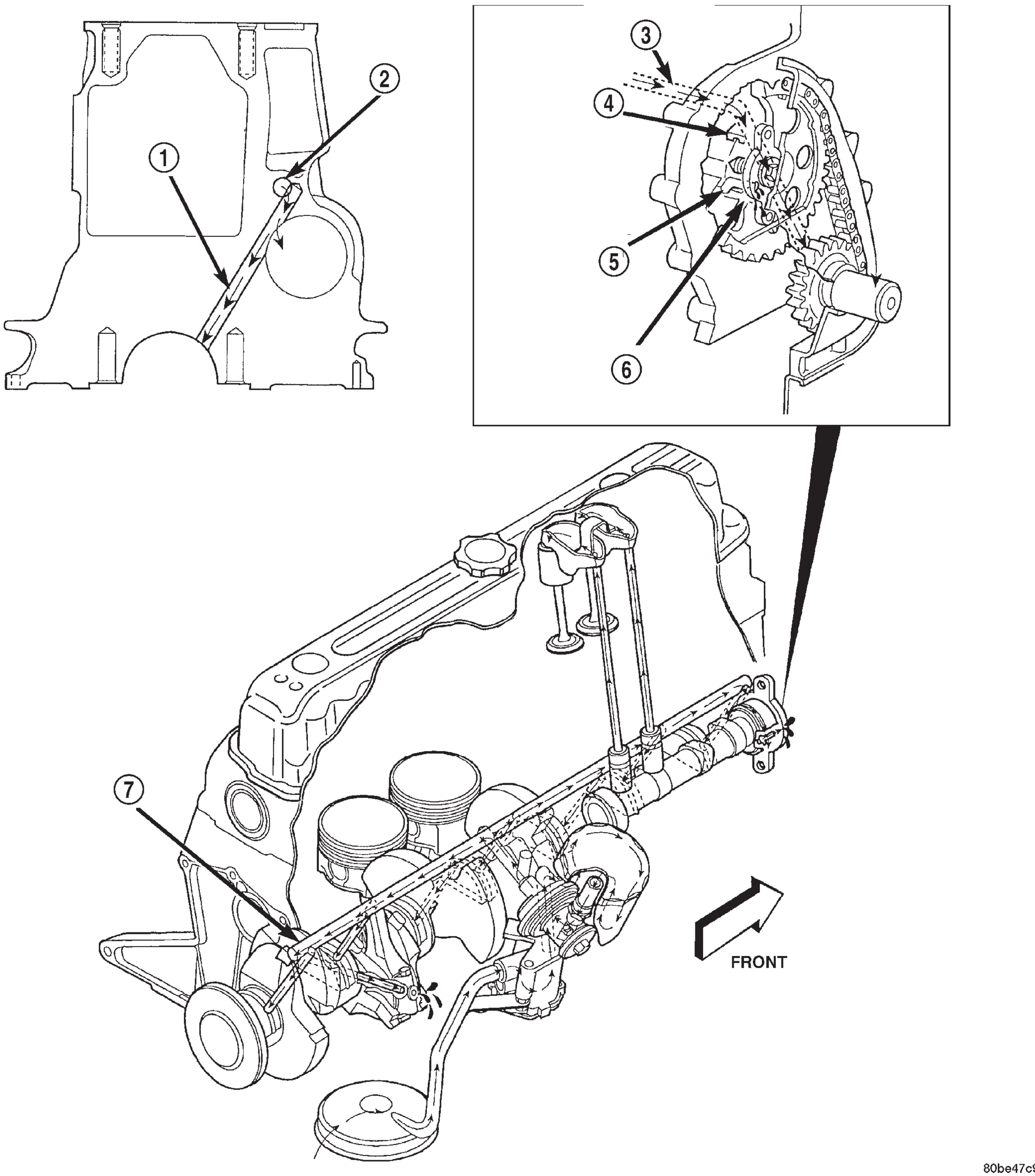
The hydraulic valve tappets receive oil directly from the main oil gallery. Oil is provided to the camshaft bearing through galleries. The front camshaft bearing journal passes oil through the camshaft

DESCRIPTION AND OPERATION (Continued)

sprocket to the timing chain. Oil drains back to the oil pan under the number one main bearing cap.

The oil supply for the rocker arms and bridged pivot assemblies is provided by the hydraulic valve tappets which pass oil through hollow push rods to a hole in the corresponding rocker arm. Oil from the rocker arm lubricates the valve train components, then passes down through the push rod guide holes in the cylinder head past the valve tappet area, and returns to the oil pan.

DESCRIPTION AND OPERATION (Continued)



Oil Lubrication System—4.0L Engine

1 – CAM/CRANK MAIN GALLERY (7)
2 – TAPPET GALLERY
3 – TAPPET GALLERY
4 – CAMSHAFT BEARING
5 – NUMBER 1 CAMSHAFT BEARING JOURNAL
6 – CAMSHAFT SPROCKET
7 – TAPPET GALLERY

DESCRIPTION AND OPERATION (Continued)

CYLINDER BLOCK

DESCRIPTION

The cylinder block is a cast iron inline six cylinder design. The cylinder block is drilled forming galleries for both oil and coolant (Fig. 3).

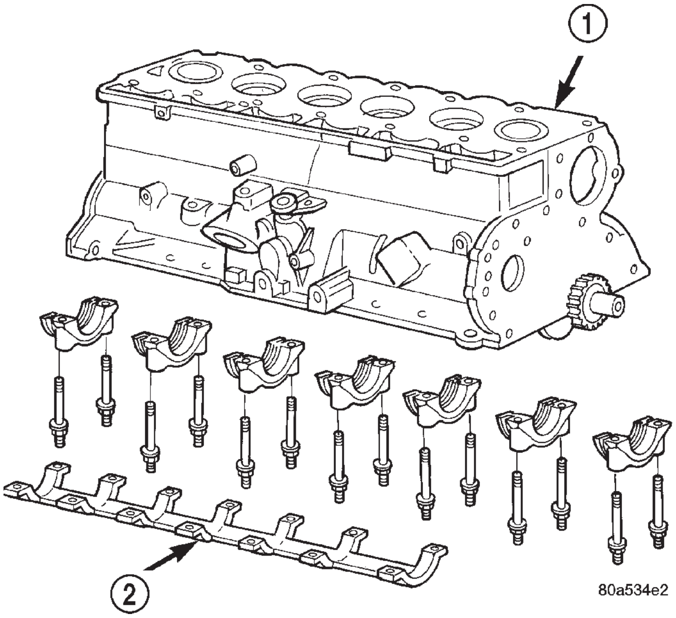


Fig. 3 4.0L Cylinder Block with Main Bearing Caps and Cap Brace

1 – BLOCK
2 – MAIN BEARING CAP BRACE

CYLINDER HEAD

DESCRIPTION

The cylinder head is made of cast iron containing twelve valves made of chrome plated heat resistant steel, valve stem seals, springs, retainers and keepers. The cylinder head and valve seats can be resurfaced for service purposes.

The valve guides are integral to the cylinder head, They are not replaceable. However, they are serviceable.

The cylinder head uses dual quench-type design combustion chambers which cause turbulence in the cylinders allowing faster burning of the air/fuel mixture, resulting in better fuel economy (Fig. 4).

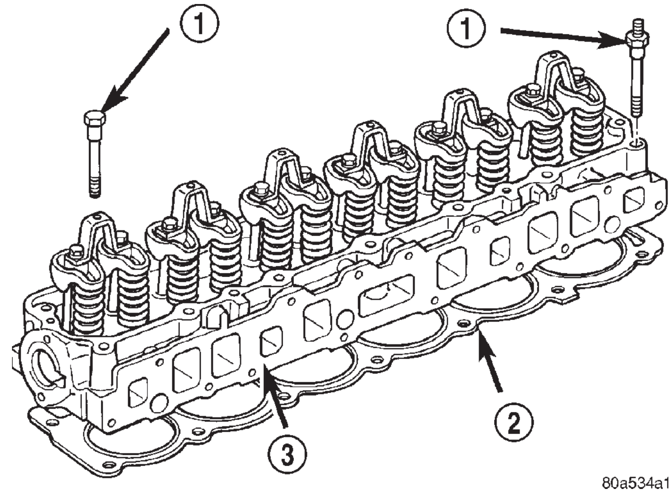


Fig. 4 Cylinder Head 4.0L Engine

1 – CYLINDER HEAD BOLTS
2 – CYLINDER HEAD GASKET
3 – CYLINDER HEAD

CRANKSHAFT

DESCRIPTION

The crankshaft is constructed of nodular cast iron. The crankshaft is a crosshaped four throw design with eight counterweights for balancing purposes. The crankshaft is supported by seven select main bearings with the number three serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The select fit main bearing markings are located on the crankshaft counter weights. The crankshaft rear oil seal is a two piece design. The front oil seal is a one piece design retained in the timing chain cover (Fig. 5).

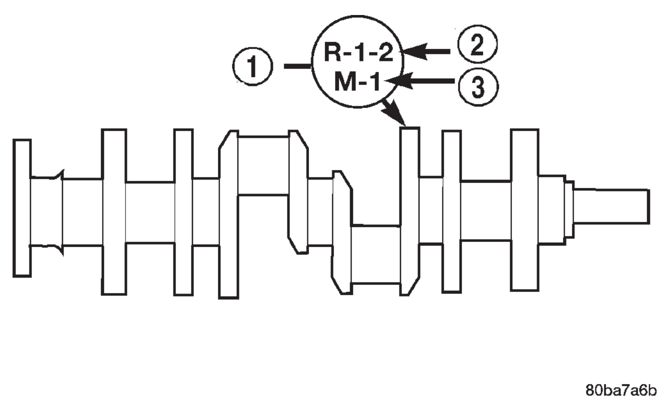


Fig. 5 Crankshaft with Select Fit Marking Location

1 – 1/4” LETTERS
2 – (ROD)
3 – (MAIN)

DESCRIPTION AND OPERATION (Continued)

PISTON AND CONNECTING ROD

DESCRIPTION

The pistons are made of a high strength aluminum alloy with an anodized top ring groove and crown. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The connecting rods are made of ductile iron. A pressed fit piston pin is used to attach the piston and connecting rod.

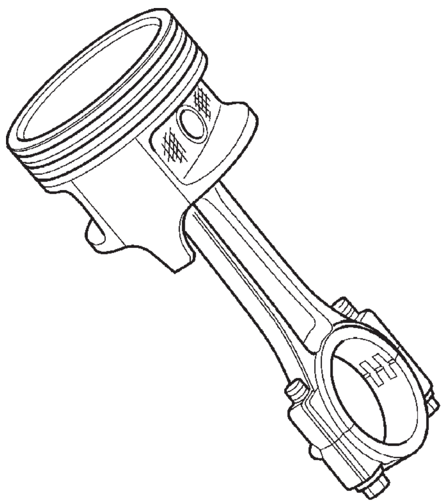


Fig. 6 Piston and Connecting Rod Assembly

CAMSHAFT

DESCRIPTION

The camshaft is made of gray cast iron with twelve machined lobes and four bearing journals. When the camshaft rotates the lobes actuate the tappets and push rods, forcing upward on the rocker arms which applies downward force on the valves.

ROCKER ARM

DESCRIPTION

The rocker arms are made of stamped steel and have a operational ratio of 1.6:1. When the push rods are forced upward by the camshaft lobes the push rod presses upward on the rocker arms, the rocker arms pivot, forcing downward pressure on the valves forcing the valves to move downward and off from their seats (Fig. 8).

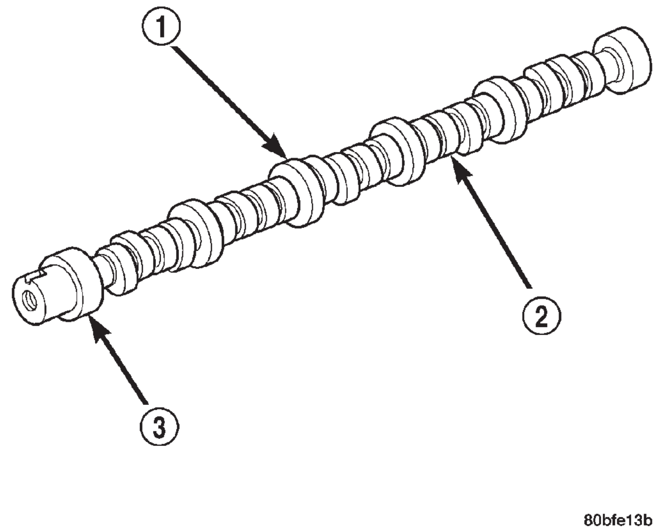


Fig. 7 Camshaft—Typical

1 – CAMSHAFT
2 – LOBES
3 – BEARING JOURNAL

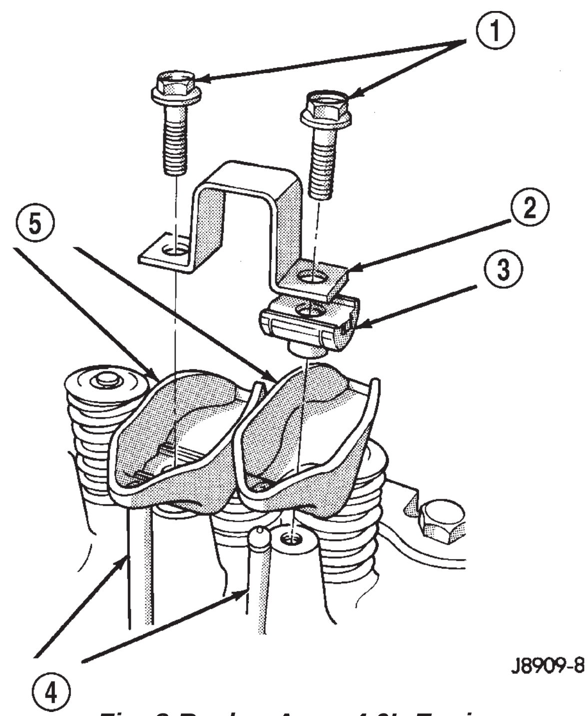


Fig. 8 Rocker Arms 4.0L Engine

1 – CAPSCREWS
2 – BRIDGE
3 – PIVOT ASSEMBLY
4 – PUSH RODS
5 – ROCKER ARMS

DESCRIPTION AND OPERATION (Continued)

VALVES

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. All valves use three bead locks to promote valve rotation (Fig. 9).

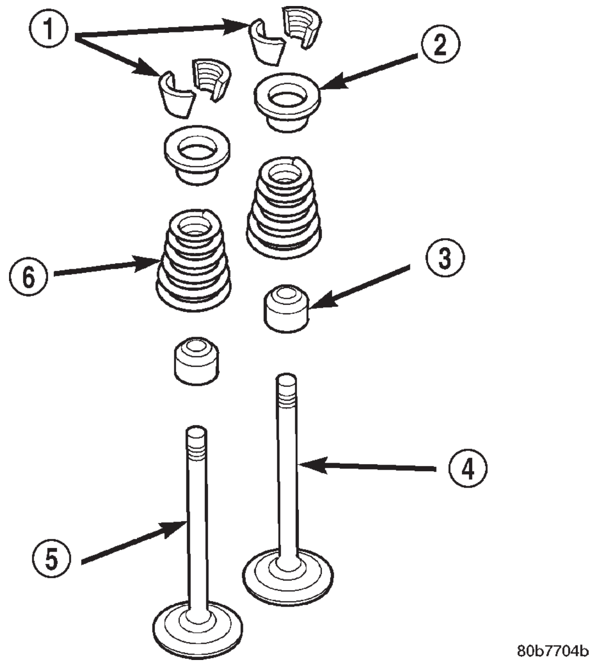


Fig. 9 Valve and Keeper Configuration 4.0L Engine

1 – VALVE LOCKS (3–BEAD)
2 – RETAINER
3 – VALVE STEM OIL SEAL
4 – INTAKE VALVE
5 – EXHAUST VALVE
6 – VALVE SPRING

VALVE SPRING

DESCRIPTION

The valve springs are made of high strength silicon chrome spring steel. The springs are common for both intake and exhaust valves. (Fig. 9).

CYLINDER HEAD COVER

DESCRIPTION

The cylinder head cover (Fig. 10) is made of stamped steel and incorporates the Crankcase Ventilation (CCV) Hoses and the oil fill opening.

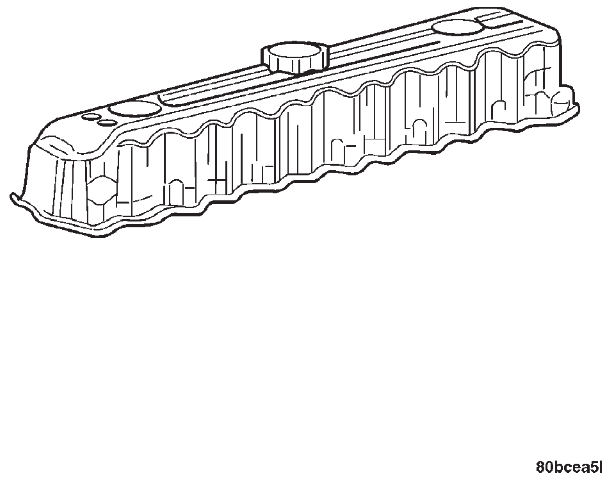


Fig. 10 Cylinder Head Cover

HYDRAULIC TAPPET

DESCRIPTION

Valve lash is controlled by hydraulic tappets located inside the cylinder block, in tappet bores above the camshaft.

VALVE GUIDE

DESCRIPTION

The valve guides are integral to the cylinder head, They are not replaceable. However, they are serviceable.

OIL PAN

DESCRIPTION

The oil pan is made of stamped steel. The oil pan gasket is a one piece steel backbone silicone coated gasket.

VALVE STEM SEAL

DESCRIPTION

The valve stem seals are made of rubber and incorporate a garter spring to maintain consistent lubrication control (Fig. 9).

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is made of cast aluminum and uses eleven bolts to mount to the cylinder head. This mounting style improves sealing and reduces the chance of leaks.

DESCRIPTION AND OPERATION (Continued)

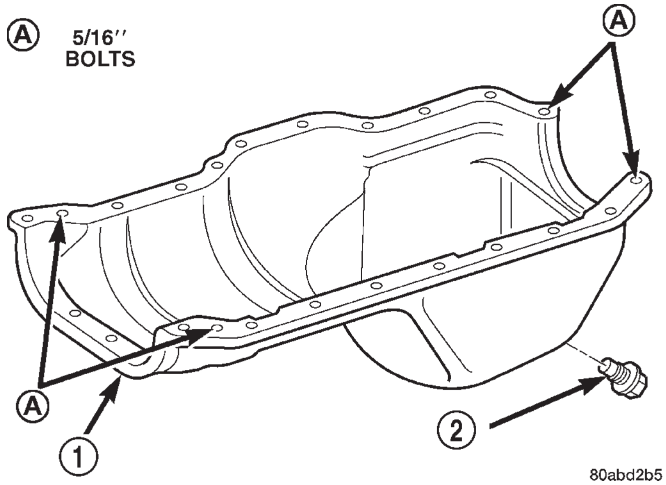


Fig. 11 Oil Pan

1 – OIL PAN
2 – OIL PAN DRAIN PLUG

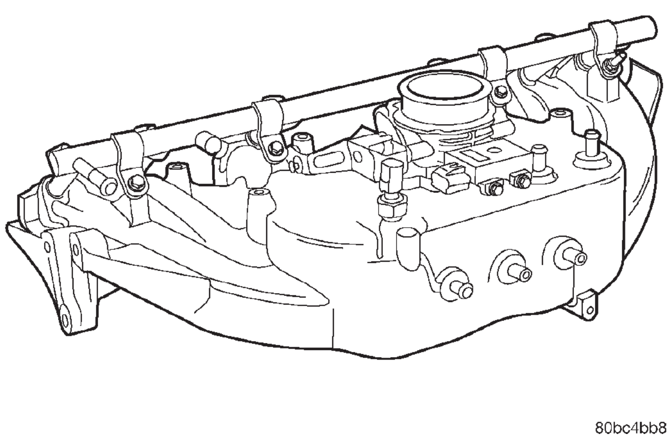


Fig. 12 Intake Manifold 4.0L Engine

EXHAUST MANIFOLD

DESCRIPTION

The two exhaust manifolds are log style and are made of high silicon molybdenum cast iron. The exhaust manifolds share a common gasket with the intake manifold. The exhaust manifolds also incorporate ball flange outlets for improved sealing and strain free connections.

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 performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

Refer to the Service Diagnosis—Performance chart and the Service Diagnosis—Mechanical chart for possible causes and corrections of malfunctions. Refer to Group 14, Fuel System for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test.
- Cylinder Combustion Pressure Leakage Test.
- Engine Cylinder Head Gasket Failure Diagnosis.
- Intake Manifold Leakage Diagnosis.

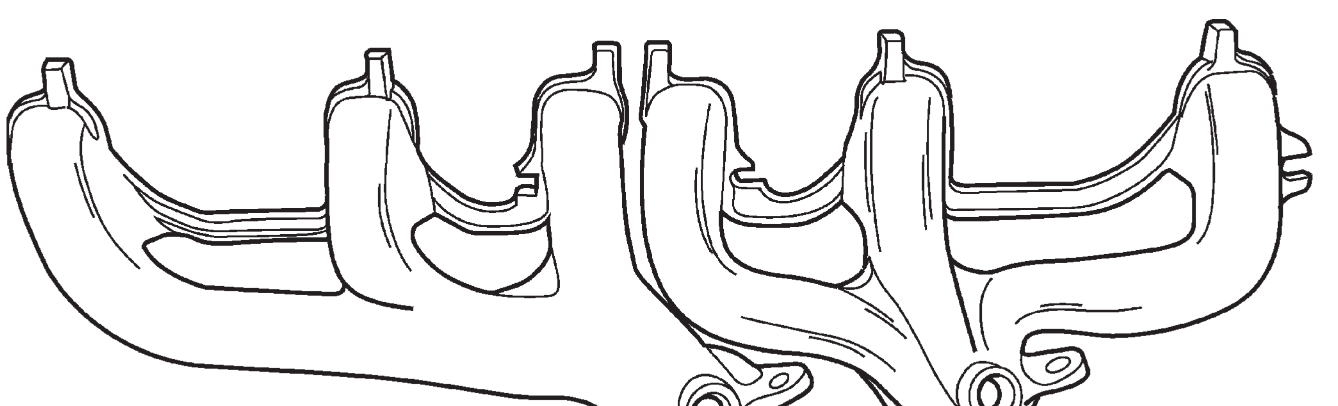


Fig. 13 Exhaust Manifolds 4.0L Engine

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS—PERFORMANCE

ENGINE PERFORMANCE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE WILL NOT CRANK	1. Weak or dead battery	1. Charge/Replace Battery. Refer to Group 8A, Battery, for correct procedures. Check charging system. Refer to Group 8C, Charging Systems, for correct procedures.
	2. Corroded or loose battery connections	2. Clean/tighten suspect battery/ starter connections
	3. Faulty starter or related circuit(s)	3. Check starting system. Refer to Group 8B, Starting Systems, for correct diagnostics/procedures
	4. Siezed accessory drive component	4. Remove accessory drive belt and attempt to start engine. If engine starts, repair/replace siezed component.
	5. Engine internal mechanical failure or hydro-static lock	5. Refer to Group 9, Engine, for correct diagnostics/procedures
ENGINE CRANKS BUT WILL NOT START	1. No spark	1. Check for spark. Refer to Group 8D, Ignition System, for correct procedures.
	2. No fuel	2. Perform fuel pressure test, and if necessary, inspect fuel injector(s) and driver circuits. Refer to Group 14, Fuel System, for correct procedures.
	3. Low or no engine compression	3. Perform cylinder compression pressure test. Refer to Group 9, Engine, for correct procedures.
ENGINE LOSS OF POWER	1. Worn or burned distributor rotor	1. Install new distributor rotor
	2. Worn distributor shaft	2. Remove and repair distributor (Refer to group 8D, Ignition System
	3. Worn or incorrect gapped spark plugs	3. Clean plugs and set gap. (Refer to group 8D, Ignition System)
	4. Dirt or water in fuel system	4. Clean system and replace fuel filter
	5. Faulty fuel pump	5. Install new fuel pump
	6. Incorrect valve timing	6. Correct valve timing
	7. Blown cylinder head gasket	7. Install new cylinder head gasket
	8. Low compression	8. Test cylinder compression
	9. Burned, warped, or pitted valves	9. Install/Reface valves as necessary
	10. Plugged or restricted exhaust system	10. Install new parts as necessary
	11. Faulty ignition cables	11. Replace any cracked or shorted cables

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	12. Faulty ignition coil	12. Test and replace, as necessary (Refer to Group 8D, ignition system)
ENGINE STALLS OR ROUGH IDLE	1. Carbon build-up on throttle plate	1. Remove throttle body and de-carbon. (Refer to Group 14 for correct procedures)
	2. Engine idle speed too low	2. Check Idle Air Control circuit. (Refer to Group 14, Fuel System)
	3. Worn or incorrectly gapped spark plugs	3. Replace or clean and re-gap spark plugs (Refer to group 8D, Ignition System)
	4. Worn or burned distributor rotor	4. Install new distributor rotor
	5. Spark plug cables defective or crossed	5. Check for correct firing order or replace spark plug cables. (Refer to Group 8D, Ignition System for correct procedures.)
	6. Faulty coil	6. Test and replace, if necessary (Refer to group 8D, Ignition System)
	7. Intake manifold vacuum leak	7. Inspect intake manifold gasket and vacuum hoses. Replace if necessary (Refer to Group 11, Exhaust System & Intake Manifold)
	8. EGR valve leaking or stuck open	8. Test and replace, if necessary (Refer to group 25, Emission Control Systems)
ENGINE MISSES ON ACCELERATION	1. Worn or incorrectly gapped spark plugs	1. Replace spark plugs or clean and set gap. (Refer to group 8D, Ignition System)
	2. Spark plug cables defective or crossed	2. Check Idle Air Control circuit. (Refer to Group 14, Fuel System)
	3. Dirt in fuel system	3. Clean fuel system
	4. Burned, warped or pitted valves	4. Install new valves
	5. Faulty coil	5. Test and replace as necessary (refer to group 8D, Ignition System)

SERVICE DIAGNOSIS—MECHANICAL

ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	1. High or low oil level in crankcase	1. Check for correct oil level. Adjust oil level by draining or adding as needed
	2. Thin or diluted oil	2. Change oil (Refer to Engine Oil Service in this group)
	3. Low oil pressure	3. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	4. Dirt in tappets/lash adjusters	4. Clean/replace hydraulic tappets/lash adjusters
	5. Bent push rod(s)	5. Install new push rods
	6. Worn rocker arms	6. Inspect oil supply to rocker arms and replace worn arms as needed
	7. Worn tappets/lash adjusters	7. Install new hydraulic tappets/lash adjusters
	8. Worn valve guides	8. Inspect all valve guides and replace as necessary
	9. Excessive runout of valve seats or valve faces	9. Grind valves and seats
CONNECTING ROD NOISE	1. Insufficient oil supply	1. Check engine oil level. (Refer to group 0, Lubrication and Maintenance)
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	4. Excessive connecting rod bearing clearance	Measure bearings for correct clearance with plasti-gage. Repair as necessary
	5. Connecting rod journal out of round	5. Replace crankshaft or grind journals
	6. Misaligned connecting rods	6. Replace bent connecting rods
MAIN BEARING NOISE	1. Insufficient oil supply	1. Check engine oil level. (Refer to group 0, Lubrication and Maintenance)
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. Refer to this group for engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	4. Excessive main bearing clearance	4. Measure bearings for correct clearance. Repair as necessary
	5. Excessive end play	5. Check crankshaft thrust bearing for excessive wear on flanges
	6. Crankshaft main journal out of round or worn	6. Grind journals or replace crankshaft
	7. Loose flywheel or torque converter	7. Inspect crankshaft, flexplate/ flywheel and bolts for damage. Tighten to correct torque

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW OIL PRESSURE	1. Low oil level	1. Check oil level and fill if necessary
	2. Faulty oil pressure sending unit	2. Install new sending unit
	3. Clogged oil filter	3. Install new oil filter
	4. Worn oil pump	4. Replace worn gears or oil pump assy
	5. Thin or diluted oil	5. Change oil to correct viscosity. Refer to this group for correct procedure/engine oil specifications
	6. Excessive bearing clearance	6. Measure bearings for correct clearance
	7. Oil pump relief valve stuck	7. Remove valve to inspect, clean and reinstall
	8. Oil pump suction tube loose, broken, bent or clogged	8. Inspect suction tube and clean or replace if necessary
	9. Oil pump cover warped or cracked	9. Install new oil pump
OIL LEAKS	1. Misaligned or deteriorated gaskets	1. Replace gasket
	2. Loose fastener, broken or porous metal part	2. Tighten, repair or replace the part
	3. Front or rear crankshaft oil seal leaking	3. Replace seal
	4. Leaking oil gallery plug or cup plug	4. Remove and reseal threaded plug. Replace cup style plug
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. PCV System malfunction	1. Refer to group 25, Emission Control System for correct operation
	2. Defective valve stem seal(s)	2. Repair or replace seal(s)
	3. Worn or broken piston rings	3. Hone cylinder bores. Install new rings
	4. Scuffed pistons/cylinder walls	4. Hone cylinder bores and replace pistons as required
	5. Carbon in oil control ring groove	5. Remove rings and de-carbon piston
	6. Worn valve guides	6. Inspect/replace valve guides as necessary
	7. Piston rings fitted too tightly in grooves	7. Remove rings and check ring end gap and side clearance. Replace if necessary

INTAKE MANIFOLD LEAKAGE DIAGNOSIS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

DIAGNOSIS AND TESTING (Continued)

(1) Start the engine.

(2) Spray a small stream of water at the suspected leak area.

(3) If a change in RPM is observed the area of the suspected leak has been found.

(4) Repair as required.

CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.

(2) Remove the spark plugs.

(3) Secure the throttle in the wide-open position.

(4) Disable the fuel system. (Refer to Group 14, Fuel System for the correct procedure)

(5) Disconnect the ignition coil.

(6) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(7) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

Refer to Engine Specifications for the correct engine compression pressures.

ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS

A leaking engine cylinder head gasket usually results in loss of power, loss of coolant and engine misfiring.

An engine cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- An engine cylinder head gasket leaking between adjacent cylinders is indicated by a loss of power and/or engine misfire.
- An engine cylinder head gasket leaking between a cylinder and an adjacent water jacket is indicated by coolant foaming or overheating and loss of coolant.

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders; follow the procedures outlined in Cylinder Compression Pressure Test. 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. 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.

Remove the radiator cap.

Start the engine and allow it to warm up until the engine thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

If bubbles are not visible, install a radiator pressure tester and pressurize the coolant system.

If a cylinder is leaking combustion pressure into the water jacket, the tester pointer will pulsate with every combustion stroke of the cylinder.

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.

(1) Check the coolant level and fill as required. DO NOT install the radiator cap.

(2) Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

(3) Remove the spark plugs.

(4) Remove the oil filler cap.

(5) Remove the air cleaner.

(6) Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

(7) Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to the Cylinder Combustion Pressure Leakage Test Diagnosis chart.

DIAGNOSIS AND TESTING (Continued)

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

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 per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.

(4) **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.

(3) 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.

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(5) If the leakage occurs at the 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 and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

(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.

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:

(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, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil

DIAGNOSIS AND TESTING (Continued)

filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

ENGINE OIL PRESSURE

(1) Disconnect connector and remove oil pressure sending unit.

(2) Install Oil Pressure Line and Gauge Tool C-3292 or equivalent. Start engine and record pressure. Refer to Oil Pressure in Engine Specifications for the correct pressures.

SERVICE PROCEDURES

VALVE TIMING

Disconnect the spark plug wires and remove the spark plugs.

Remove the engine cylinder head cover.

Remove the capscrews, bridge and pivot assembly, and rocker arms from above the No.1 cylinder.

Alternately loosen each capscrew, one turn at a time, to avoid damaging the bridge.

Rotate the crankshaft until the No.6 piston is at top dead center (TDC) on the compression stroke.

Rotate the crankshaft counterclockwise (viewed from the front of the engine) 90°.

Install a dial indicator on the end of the No.1 cylinder intake valve push rod. Use rubber tubing to secure the indicator stem on the push rod.

Set the dial indicator pointer at zero.

Rotate the crankshaft clockwise (viewed from the front of the engine) until the dial indicator pointer indicates 0.305 mm (0.012 inch) travel distance (lift).

The timing notch index on the vibration damper should be aligned with the TDC mark on the timing degree scale.

If the timing notch is more than 13 mm (1/2 inch) away from the TDC mark in either direction, the valve timing is incorrect.

If the valve timing is incorrect, the cause may be a broken camshaft pin. It is not necessary to replace the camshaft because of pin failure. A spring pin is available for service replacement.

VALVE SERVICE

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

Clean all grime and gasket material from the engine cylinder head machined gasket surface.

Inspect for cracks in the combustion chambers and valve ports.

Inspect for cracks on the exhaust seat.

Inspect for cracks in the gasket surface at each coolant passage.

Inspect valves for burned, cracked or warped heads.

Inspect for scuffed or bent valve stems.

Replace valves displaying any damage.

VALVE REFACING

(1) Use a valve refacing machine to reface the intake and exhaust valves to the specified angle.

(2) After refacing, a margin of at least 0.787 mm (0.031 inch) must remain (Fig. 14). If the margin is less than 0.787 mm (0.031 inch), the valve must be replaced.

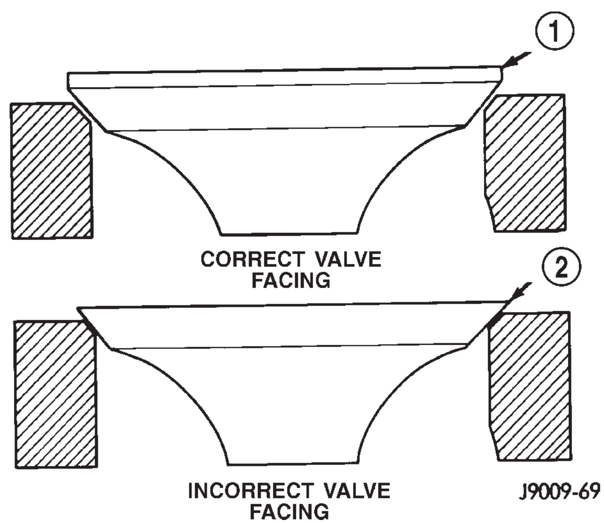


Fig. 14 Valve Facing Margin

1 – VALVE MARGIN
2 – NO MARGIN

SERVICE PROCEDURES (Continued)

VALVE SEAT REFACING

(1) Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.

(2) Use tapered stones to obtain the specified seat width when required.

(3) Control valve seat runout to a maximum of 0.0635 mm (0.0025 in.) (Fig. 15).

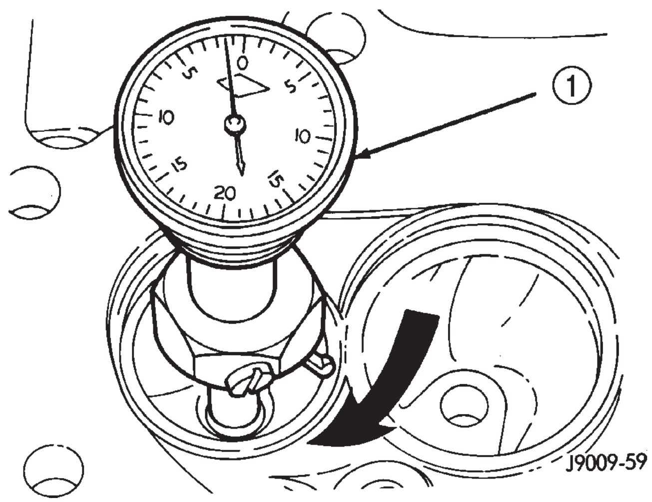


Fig. 15 Measurement of Valve Seat Runout

1 – DIAL INDICATOR

VALVE STEM OIL SEAL REPLACEMENT

Valve stem oil seals are installed on each valve stem to prevent rocker arm lubricating oil from entering the combustion chamber through the valve guide bores. One seal is marked INT (intake valve) and the other is marked EXH (exhaust valve).

Replace the oil seals whenever valve service is performed or if the seals have deteriorated.

VALVE GUIDES

The valve guides are an integral part of the engine cylinder head and are not replaceable.

When the valve stem guide clearance is excessive, the valve guide bores must be reamed oversize. Service valves with oversize stems are available in 0.076 mm (0.003 inch) and 0.381 mm (0.015 inch) increments.

Corresponding oversize valve stem seals are also available and must be used with valves having 0.381 mm (0.015 inch) oversize stems.

NOTE: If the valve guides are reamed oversize, the valve seats must be ground to ensure that the valve seat is concentric to the valve guide.

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

Valve stem-to-guide clearance may be measured by either of the following two methods.

PREFERRED METHOD

(1) Remove the valve from the head.

(2) Clean the valve stem guide bore with solvent and a bristle brush.

(3) Insert a telescoping gauge into the valve stem guide bore approximately 9.525 mm (.375 inch) from the valve spring side of the head (Fig. 16).

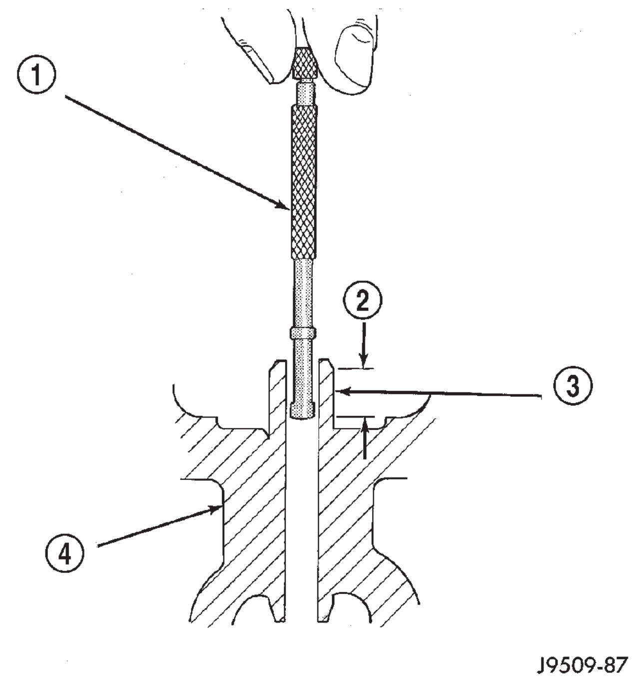


Fig. 16 Measurement of Valve Guide Bore Diameter

1 – GAUGE
2 – 9.525 MM (3/8 INCH)
3 – VALVE STEM GUIDE
4 – CYLINDER HEAD

(4) Remove and measure telescoping gauge with a micrometer.

(5) Repeat the measurement with contacts lengthwise to engine cylinder head.

(6) Compare the crosswise to lengthwise measurements to determine out-of-roundness. If the measurements differ by more than 0.0635 mm (0.0025 in.), ream the guide bore to accommodate an oversize valve stem.

(7) Compare the measured valve guide bore diameter with specifications (7.95-7.97 mm or 0.313-0.314 inch). If the measurement differs from specification by more than 0.076 mm (0.003 inch), ream the guide bore to accommodate an oversize valve stem.

SERVICE PROCEDURES (Continued)

ALTERNATIVE METHOD

(1) Use a dial indicator to measure the lateral movement of the valve stem (stem-to-guide clearance). This must be done with the valve installed in its guide and just off the valve seat (Fig. 17).

(2) Correct clearance is 0.025-0.0762 mm (0.001-0.003 inch). If indicated movement exceeds the specification ream the valve guide to accommodate an oversize valve stem.

NOTE: Valve seats must be ground after reaming the valve guides to ensure that the valve seat is concentric to the valve guide.

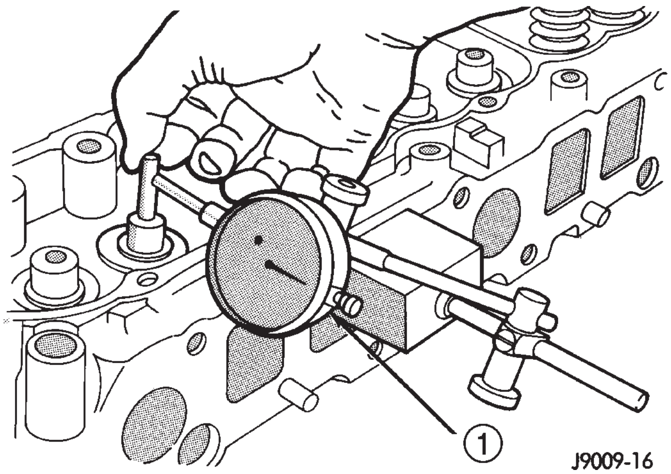


Fig. 17 Measurement of Lateral Movement of Valve Stem

1 – DIAL INDICATOR

VALVE SPRING TENSION TEST

Use a universal Valve Spring Tester and a torque wrench to test each valve spring for the specified tension value (Fig. 18).

Replace valve springs that are not within specifications.

PISTON FITTING

BORE GAGE METHOD

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at a point 49.5 mm (1-15/16 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 20).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. **The**

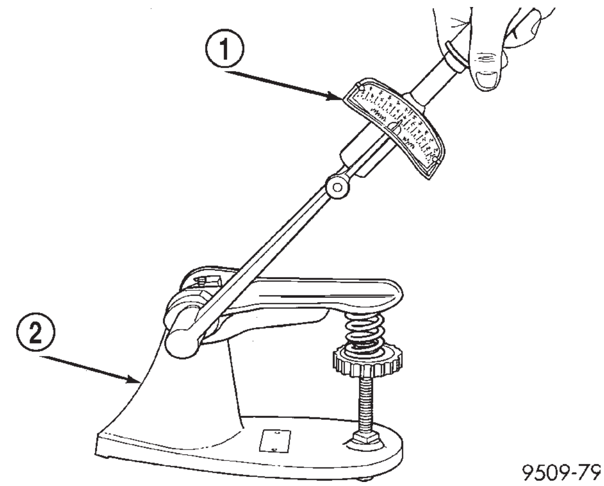


Fig. 18 Valve Spring Tester

1 – TORQUE WRENCH

2 – VALVE SPRING TESTER

coated piston connecting rod assembly can be used to service previous built engines and MUST be replaced as complete sets. Tin coated pistons should not be used as replacements for coated pistons.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results (Fig. 19). Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

PISTON RING—FITTING

(1) Carefully clean the carbon from all ring grooves. Oil drain openings in the oil ring groove and pin boss must be clear. DO NOT remove metal from the grooves or lands. This will change ring-to-groove clearances and will damage the ring-to-land seating.

(2) Be sure the piston ring grooves are free of nicks and burrs.

(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 21) (Fig. 22). Rotate the ring in the groove. It must move freely around circumference of the groove.

(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 23).

SERVICE PROCEDURES (Continued)

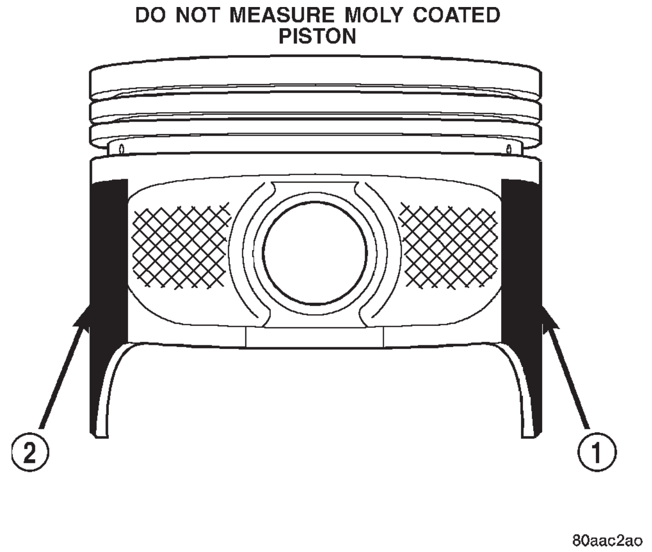


Fig. 19 Moly Coated Piston

1 – MOLY COATED
2 – MOLY COATED

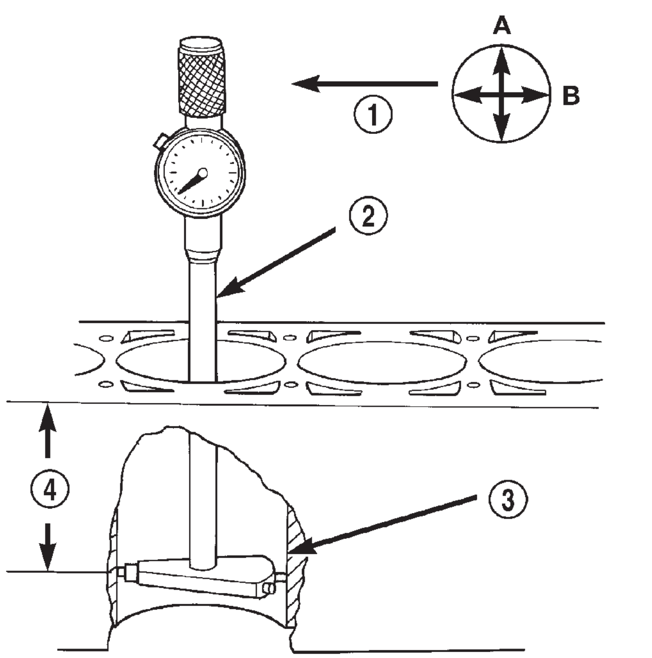


Fig. 20 Bore Gauge

1 – FRONT
2 – BORE GAUGE
3 – CYLINDER BORE
4 – 49.5 MM (1–15/16 in)

PISTON SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 - 98.448 mm (3.8755 - 3.8759 in.)	A
98.448 - 98.458 mm (3.8759 - 3.8763 in.)	B
98.458 - 98.468 mm (3.8763 - 3.8767 in.)	C
98.468 - 98.478 mm (3.8767 - 3.8771 in.)	D
98.478 - 98.488 mm (3.8771 - 3.8775 in.)	E
98.488 - 98.498 mm (3.8775 - 3.8779 in.)	F

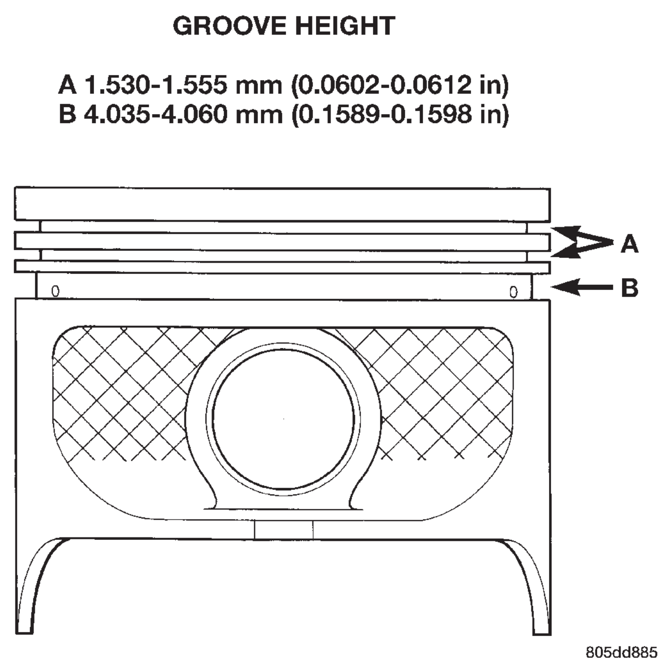


Fig. 21 Piston Dimensions

(5) The oil control rings are symmetrical, and can be installed with either side up. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The top compression ring can be identified by the shiny coating on the outer sealing surface and can be installed with either side up. (Fig. 24).

SERVICE PROCEDURES (Continued)

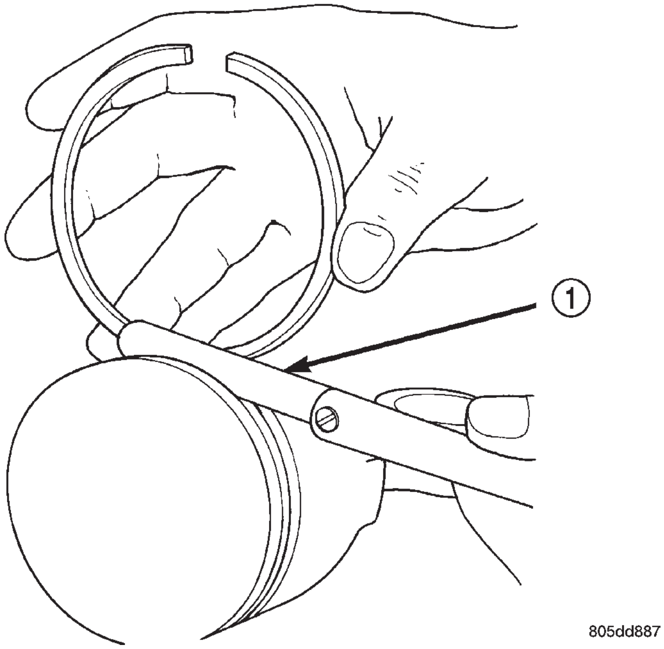


Fig. 22 Ring Side Clearance Measurement

1 – FEELER GAUGE

RING SIDE CLEARANCE CHART

ITEM	SPECIFICATION
Top Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Second Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Oil Control Ring	0.06 - 0.21 mm (0.0024 - 0.0083 in.)

(7) The second compression ring has a slight chamfer on the bottom of the inside edge and a dot on the top for correct installation (Fig. 25).

(8) Using a ring installer, install the second compression ring with the dot facing up (Fig. 25) (Fig. 27).

(9) Using a ring installer, install the top compression ring (either side up).

Ring Gap Orientation

• Position the gaps on the piston as shown (Fig. 28).

• Oil spacer - Gap on center line of piston skirt.

• Oil rails - gap 180° apart on centerline of piston pin bore.

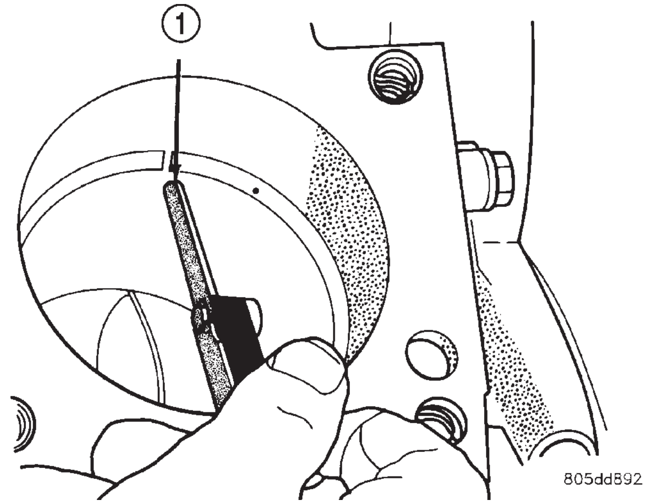


Fig. 23 Gap Measurement

1 – FEELER GAUGE

RING GAP MEASUREMENT CHART

ITEM	SPECIFICATION
Top Compression Ring	0.229 - 0.610 mm (0.0090 - 0.0240 in.)
Second Compression Ring	0.483 - 0.965 mm (0.0190 - 0.080 in.)
Oil Control Ring	0.254 - 1.500 mm (0.010 - 0.060 in.)

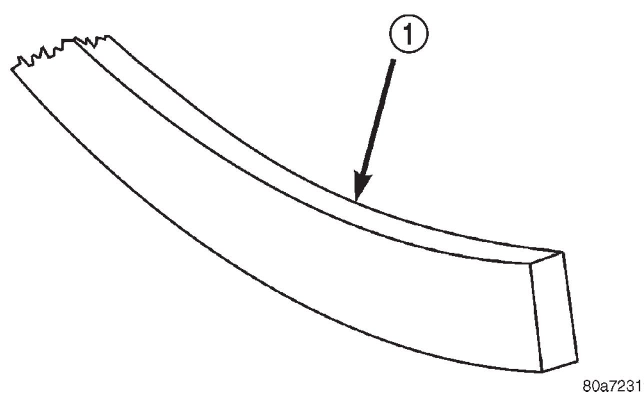


Fig. 24 Top Compression ring identification

1 – TOP COMPRESSION RING

• No. 2 Compression ring - Gap 180° from top oil rail gap.

• No. 1 Compression ring - Gap 180° from No. 2 compression ring gap.

SERVICE PROCEDURES (Continued)

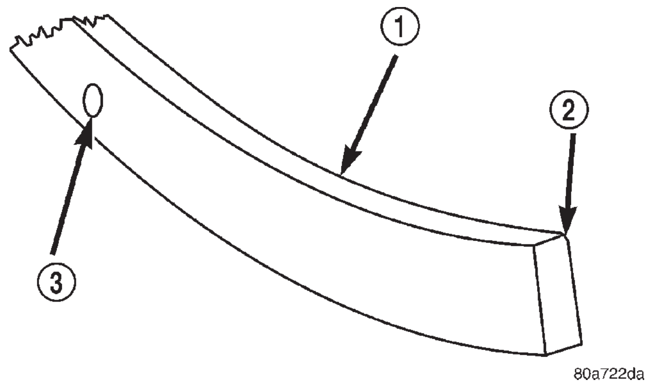


Fig. 25 Second Compression Ring Identification

1 – SECOND COMPRESSION RING
2 – CHAMFER
3 – ONE DOT

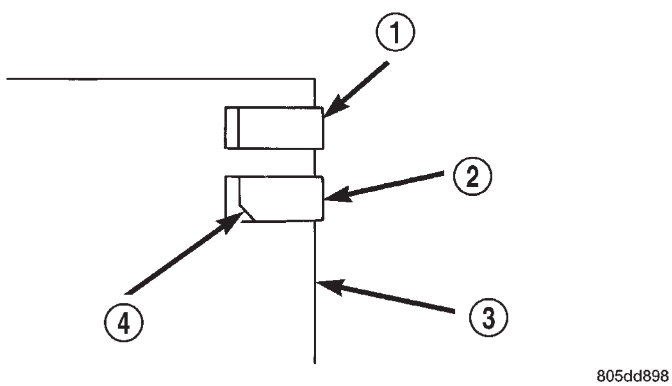


Fig. 26 Compression Ring Chamfer Location

1 – TOP COMPRESSION RING
2 – SECOND COMPRESSION RING
3 – PISTON
4 – CHAMFER

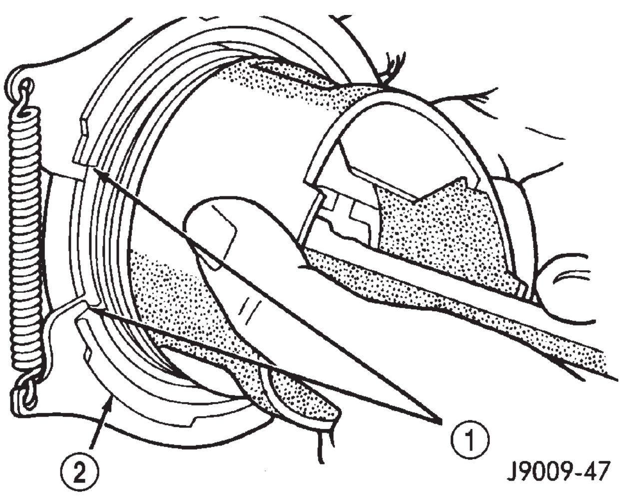


Fig. 27 Compression Ring Installation

1 – COMPRESSION RING
2 – RING EXPANDER RECOMMENDED

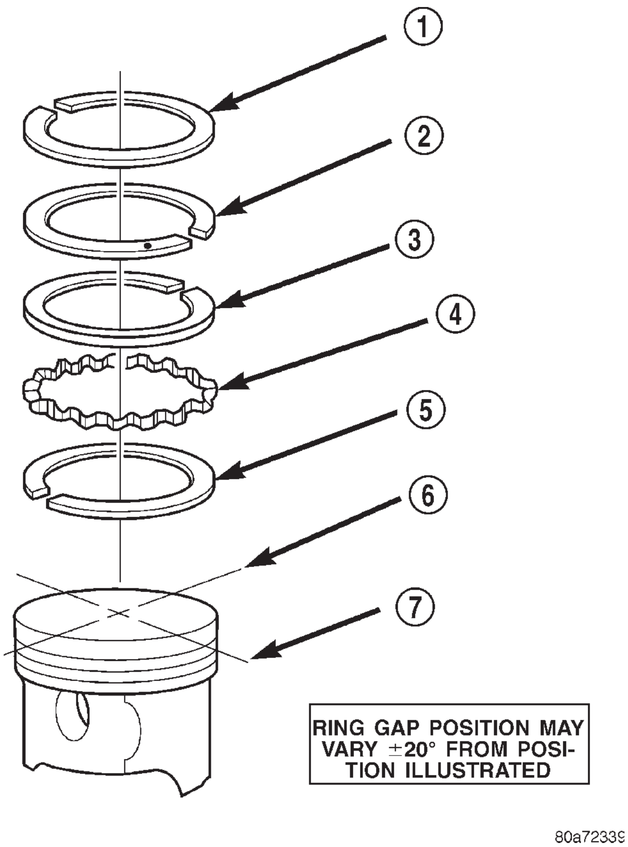


Fig. 28 Ring Gap Orientation

1 – TOP COMPRESSION RING
2 – BOTTOM COMPRESSION RING
3 – TOP OIL CONTROL RAIL
4 – OIL RAIL SPACER
5 – BOTTOM OIL CONTROL RAIL
6 – IMAGINARY LINE PARALLEL TO PISTON PIN
7 – IMAGINARY LINE THROUGH CENTER OF PISTON SKIRT

FITTING CONNECTING ROD BEARINGS

INSPECTION

BEARINGS

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 29) (Fig. 30). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 31). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

CONNECTING RODS

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod

SERVICE PROCEDURES (Continued)

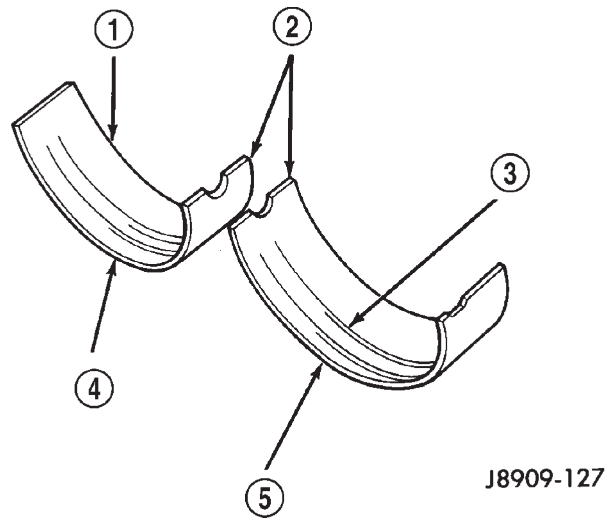


Fig. 29 Connecting Rod Bearing Inspection

1 – UPPER BEARING HALF
2 – MATING EDGES
3 – GROOVES CAUSED BY ROD BOLTS SCRATCHING JOURNAL DURING INSTALLATION
4 – WEAR PATTERN — ALWAYS GREATER ON UPPER BEARING
5 – LOWER BEARING HALF

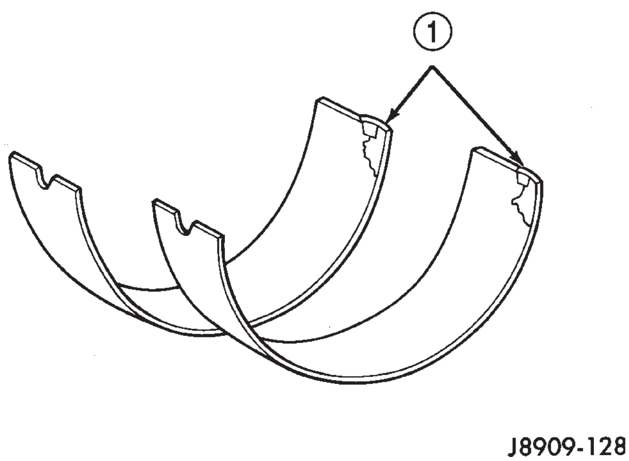


Fig. 30 Locking Tab Inspection

1 – ABNORMAL CONTACT AREA CAUSED BY LOCKING TABS NOT FULLY SEATED OR BEING BENT

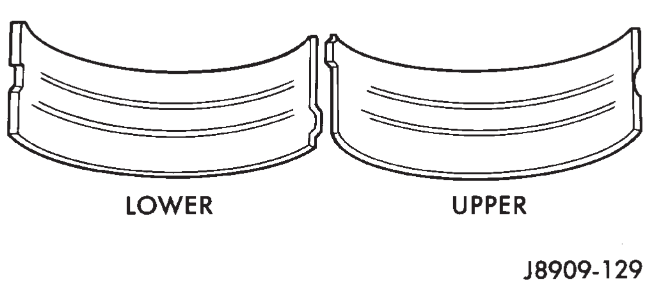


Fig. 31 Scoring Caused by Insufficient Lubrication or by Damaged Crankshaft Pin Journal

alignment. Replace misaligned, bent or twisted connecting rods.

BEARING-TO-JOURNAL CLEARANCE

(1) Wipe the oil from the connecting rod journal.

(2) Use short rubber hose sections over rod bolts during installation.

(3) Lubricate the upper bearing insert and install in connecting rod.

(4) Use piston ring compressor to install the rod and piston assemblies. The oil squirt holes in the rods must face the camshaft. The arrow on the piston crown should point to the front of the engine (Fig. 32). Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

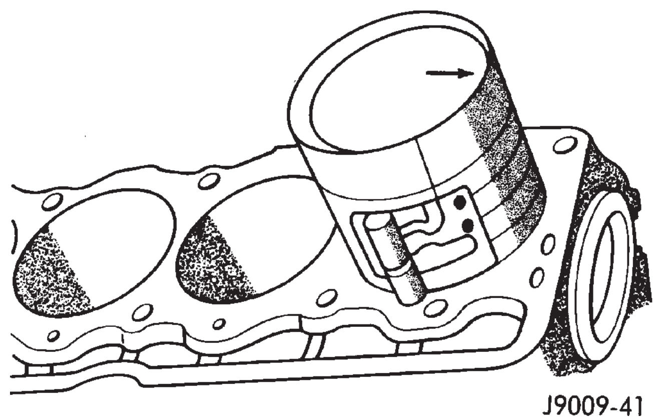


Fig. 32 Rod and Piston Assembly Installation

(5) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(6) Install bearing cap and connecting rod on the journal and tighten nuts to 45 N·m (33 ft. lbs.) torque. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(7) Remove the bearing cap and determine amount of bearing-to- journal clearance by measuring the width of compressed Plastigage (Fig. 33). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

(8) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

SERVICE PROCEDURES (Continued)

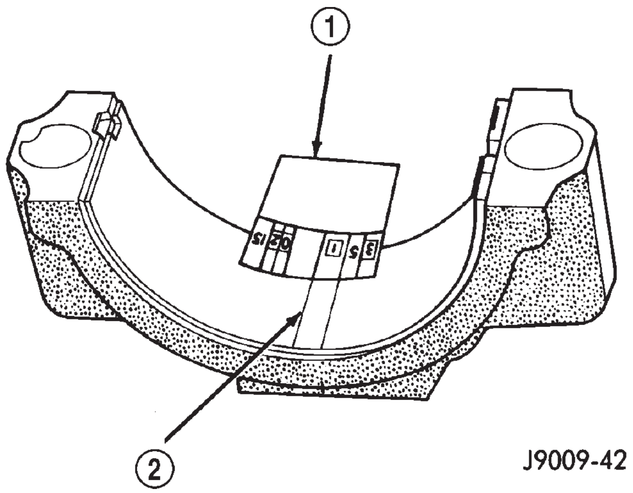


Fig. 33 Measuring Bearing Clearance with Plastigage

1 – PLASTIGAGE SCALE
2 – COMPRESSED PLASTIGAGE

(9) If bearing-to-journal clearance exceeds the specification, install a pair of 0.0254 mm (0.001 inch) undersize bearing inserts. All the odd size inserts must be on the bottom. The sizes of the service replacement bearing inserts are stamped on the backs of the inserts. Measure the clearance as described in the previous steps.

(10) The clearance is measured with a pair of 0.0254 mm (0.001 inch) undersize bearing inserts installed. This will determine if two 0.0254 mm (0.001 inch) undersize inserts or another combination is needed to provide the correct clearance (refer to Connecting Rod Bearing Fitting Chart).

CONNECTING ROD BEARING FITTING CHART

CRANKSHAFT JOURNAL		CORRESPONDING ROD BEARING INSERT	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	53.2257 - 53.2079 mm (2.0955 - 2.0948 in.)	Yellow - Standard	Yellow - Standard
Orange	53.2079 - 53.1901 mm (2.0948 - 2.0941 in.) 0.0178 mm (0.0007 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	53.1901 - 53.1724 mm (2.0941 - 2.0934 in.) 0.0356 mm (0.0014 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Red	52.9717 - 52.9539 mm (2.0855 - 2.0848 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

(11) **FOR EXAMPLE:** If the initial clearance was 0.0762 mm (0.003 inch), 0.025 mm (0.001 inch) undersize inserts would reduce the clearance by 0.025 mm (0.001 inch). The clearance would be 0.002 inch and within specification. A 0.051 mm (0.002 inch) undersize insert would reduce the initial clearance an additional 0.013 mm (0.0005 inch). The clearance would then be 0.038 mm (0.0015 inch).

(12) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(13) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 45 N·m (33 ft. lbs.) torque.

SIDE CLEARANCE MEASUREMENT

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange (Fig. 34). Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

SERVICE PROCEDURES (Continued)

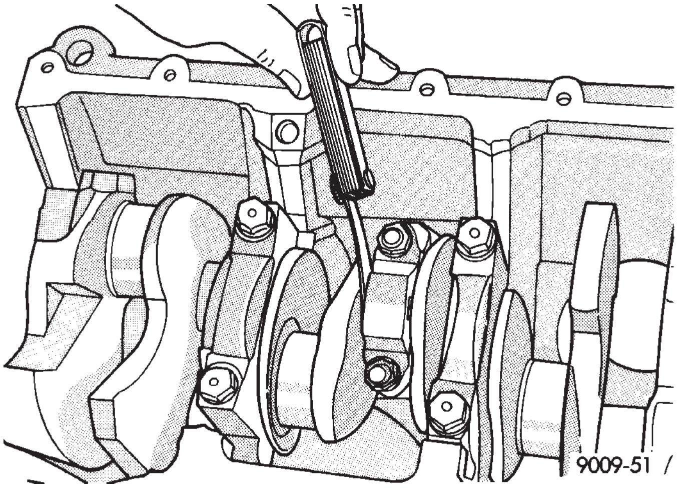


Fig. 34 Checking Connecting Rod Side Clearance—Typical

FITTING CRANKSHAFT MAIN BEARINGS

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 35). In general the lower bearing half will have a heaver wear pattern.

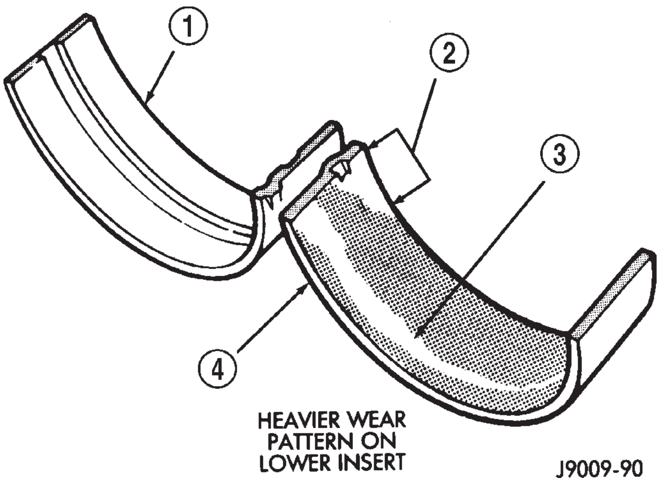


Fig. 35 Main Bearing Wear Patterns

1 – UPPER INSERT
2 – NO WEAR IN THIS AREA
3 – LOW AREA IN BEARING LINING
4 – LOWER INSERT

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

FITTING BEARINGS (CRANKSHAFT INSTALLED)

The main bearing caps, numbered (front to rear) from 1 through 7 have an arrow to indicate the forward position. The upper main bearing inserts are grooved to provide oil channels while the lower inserts are smooth.

Each bearing insert pair is selectively fitted to its respective journal to obtain the specified operating clearance. In production, the select fit is obtained by using various-sized color-coded bearing insert pairs as listed in the Main Bearing Fitting Chart. The bearing color code appears on the edge of the insert. **The size is not stamped on bearing inserts used for engine production.**

The main bearing journal size (diameter) is identified by a color-coded paint mark (Fig. 36) on the adjacent cheek or counterweight towards the rear of the crankshaft (flange end). The rear main journal, is identified by a color-coded paint mark on the crankshaft rear flange.

When required, upper and lower bearing inserts of different sizes may be used as a pair. A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce the clearance by 0.013 mm (0.0005 inch). **Never use a pair of bearing inserts with greater than a 0.025 mm (0.001 inch) difference in size. Refer to the Bearing Insert Pair Chart.**

NOTE: When replacing inserts, the odd size inserts must be either all on the top (in cylinder block) or all on the bottom (in main bearing cap).

Once the bearings have been properly fitted, proceed to Crankshaft Main Bearing—Installation.

BEARING-TO-JOURNAL CLEARANCE (CRANKSHAFT INSTALLED)

When using Plastigage, check only one bearing clearance at a time.

Install the grooved main bearings into the cylinder block and the non-grooved bearings into the bearing caps.

Install the crankshaft into the upper bearings dry.

Place a strip of Plastigage across full width of the crankshaft journal to be checked.

Install the bearing cap and tighten the bolts to 108 N·m (80 ft. lbs.) torque.

NOTE: DO NOT rotate the crankshaft. This will cause the Plastigage to shift, resulting in an inaccurate reading. Plastigage must not be permitted to crumble. If brittle, obtain fresh stock.

Remove the bearing cap. Determine the amount of clearance by measuring the width of the compressed Plastigage with the scale on the Plastigage envelope

SERVICE PROCEDURES (Continued)

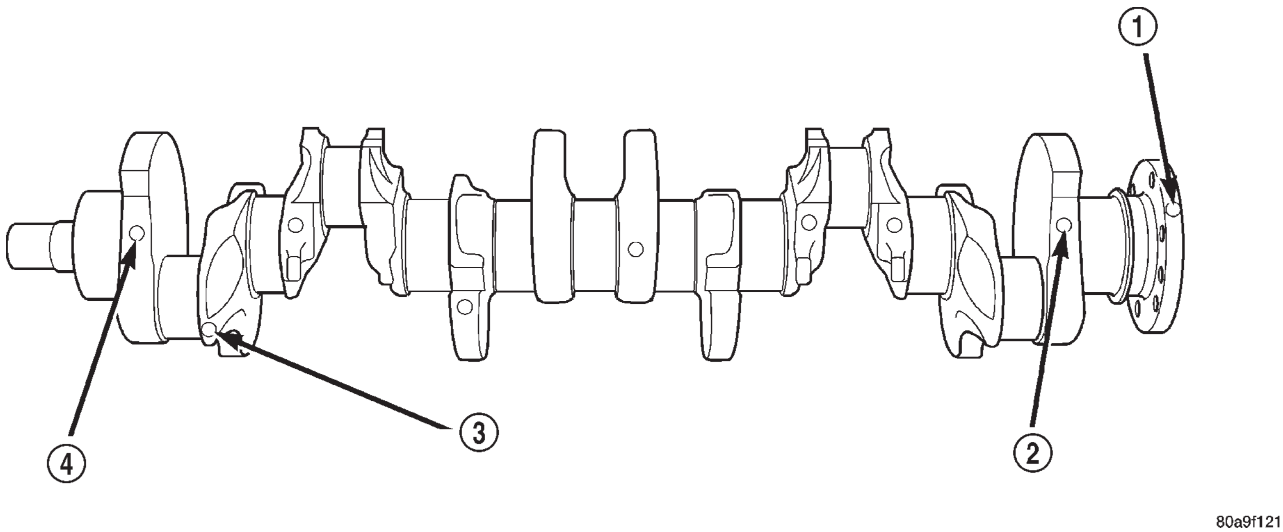


Fig. 36 Crankshaft Journal Size Paint I. D. Location

1 – NO. 7 MAIN JOURNAL SIZE PAINT MARK
2 – NO. 6 CONNECTING ROD JOURNAL SIZE PAINT MARK
3 – NO. 1 CONNECTING ROD JOURNAL SIZE PAINT MARK
4 – NO. 1 MAIN JOURNAL SIZE PAINT MARK

BEARING INSERT PAIRS CHART

INSERT	CORRECT	INCORRECT
UPPER	STANDARD	STANDARD
LOWER	0.025 mm (0.001 in.) UNDERSIZE	0.051 mm (0.002 in.) UNDERSIZE

(Fig. 37). Refer to Engine Specifications for the proper clearance.

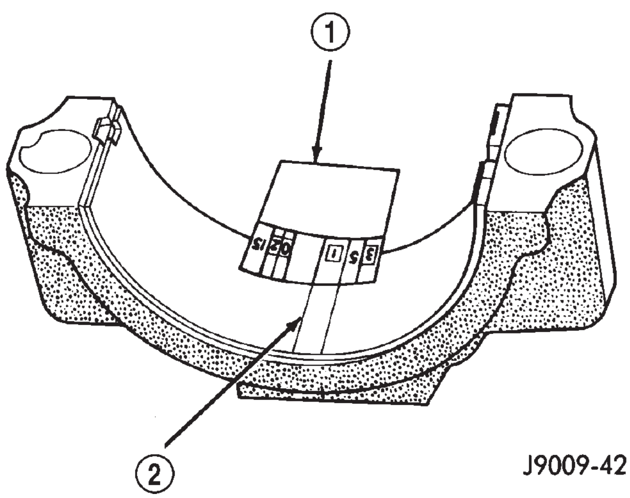


Fig. 37 Measuring Bearing Clearance with Plastigage

1 – PLASTIGAGE SCALE
2 – COMPRESSED PLASTIGAGE

Plastigage should indicate the same clearance across the entire width of the insert. If clearance varies, it may indicate a tapered journal or foreign material trapped behind the insert.

If the specified clearance is indicated and there are no abnormal wear patterns, replacement of the bearing inserts is not necessary. Remove the Plastigage from the crankshaft journal and bearing insert. Proceed to Crankshaft Main Bearing—Installation.

If the clearance exceeds specification, install a pair of 0.025 mm (0.001 inch) undersize bearing inserts and measure the clearance as described in the previous steps.

The clearance indicate with the 0.025 mm (0.001 inch) undersize insert pair installed will determine if this insert size or some other combination will provide the specified clearance. **FOR EXAMPLE:** If the clearance was 0.0762 mm (0.003 inch) originally, a pair of 0.0254 mm (0.001 inch) undersize inserts would reduce the clearance by 0.0254 mm (0.001 inch). The clearance would then be 0.0508 mm (0.002 inch) and within the specification. A 0.051 mm (0.002 inch) undersize bearing insert and a 0.0254 mm (0.001 inch) undersize insert would reduce the original clearance an additional 0.0127 mm (0.0005 inch). The clearance would then be 0.0381 mm (0.0015 inch).

CAUTION: Never use a pair of inserts that differ more than one bearing size as a pair.

FOR EXAMPLE: DO NOT use a standard size upper insert and a 0.051 mm (0.002 inch) undersize lower insert.

SERVICE PROCEDURES (Continued)

If the clearance exceeds specification using a pair of 0.051 mm (0.002 inch) undersize bearing inserts, measure crankshaft journal diameter with a micrometer. If the journal diameter is correct, the crankshaft bore in the cylinder block may be mis-aligned, which requires cylinder block replacement or machining to true bore.

Replace the crankshaft or grind to accept the appropriate undersize bearing inserts if:

- Journal diameters 1 through 6 are less than 63.4517 mm (2.4981 inches)
- Journal 7 diameter is less than 63.4365 mm (2.4975 inches).

Once the proper clearances have been obtained, proceed to Crankshaft Main Bearing—Installation.

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block (refer to Cylinder Block - Disassemble).

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper and out of round is 0.013 mm (0.0005 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

Install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble and Crankshaft Main Bearings - Installation).

MAIN BEARING FITTING CHART

Crankshaft Journals #1-6		Corresponding Crankshaft Bearing Insert	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	63.5025 -63.4898 mm (2.5001 - 2.4996 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4898 - 63.4771 mm (2.4996 - 2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	63.4771 - 63.4644 mm (2.4991 - 2.4986 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4644 - 63.4517 mm (2.4986 - 2.4981 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2485 - 63.2358 mm (2.4901 - 2.4896 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

SERVICE PROCEDURES (Continued)

Crankshaft Journal #7 Only		Corresponding Bearing Insert	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	63.4873 - 63.4746 mm (2.4995 - 2.4990 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4746 - 63.4619 mm (2.4996 - 2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	63.4619 - 63.4492 mm (2.4985 - 2.4980 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4492 - 63.4365 mm (2.4980 - 2.4975 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2333 - 63.2206 mm (2.4895 - 2.4890 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

FORM-IN-PLACE GASKETS

There are several places where form-in-place gaskets are used on the engine. **DO NOT use form-in-place gasket material unless specified.** Care must be taken when applying form-in-place gaskets. Bead size, continuity and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over. A continuous bead of the proper width is essential to obtain a leak-free joint.

Two types of form-in-place gasket materials are used in the engine area (Mopar Silicone Rubber Adhesive Sealant and Mopar Gasket Maker). Each have different properties and cannot be used interchangeably.

MOPAR SILICONE RUBBER ADHESIVE SEALANT

Mopar Silicone Rubber Adhesive Sealant, normally black in color, is available in 3 ounce tubes. Moisture in the air causes the sealant material to cure. This material is normally used on flexible metal flanges. It has a shelf life of a year and will not properly cure if over aged. Always inspect the package for the expiration date before use.

MOPAR GASKET MAKER

Mopar Gasket Maker, normally red in color, is available in 6 cc tubes. This anaerobic type gasket material cures in the absence of air when squeezed between smooth machined metallic surfaces. It will not cure if left in the uncovered tube. DO NOT use on flexible metal flanges.

SURFACE PREPARATION

Parts assembled with form-in-place gaskets may be disassembled without unusual effort. In some instances, it may be necessary to lightly tap the part with a mallet or other suitable tool to break the seal between the mating surfaces. A flat gasket scraper may also be lightly tapped into the joint but care must be taken not to damage the mating surfaces.

Scrape or wire brush all gasket surfaces to remove all loose material. Inspect stamped parts to ensure gasket rails are flat. Flatten rails with a hammer on a flat plate, if required. Gasket surfaces must be free of oil and dirt. Make sure the old gasket material is removed from blind attaching holes.

GASKET APPLICATION

Assembling parts using a form-in-place gasket requires care.

Mopar Silicone Rubber Adhesive Sealant should be applied in a continuous bead approximately 3 mm (0.12 inch) in diameter. All mounting holes must be circled. For corner sealing, a 3 or 6 mm (1/8 or 1/4 inch) drop is placed in the center of the gasket con-

SERVICE PROCEDURES (Continued)

tact 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 use of a locating dowel is recommended during assembly to prevent smearing the material off location.

Mopar Gasket Maker should be applied sparingly to one gasket surface. The sealant diameter should be 1.00 mm (0.04 inch) or less. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing the material off location.

ENGINE PERFORMANCE

It is important that the vehicle is operating to its optimum performance level to maintain fuel economy and the lowest emission levels. If vehicle is not operating to these standards, refer to Engine Diagnosis outlined in this section. The following procedures can assist in achieving the proper engine diagnosis.

(1) Test cranking amperage draw. Refer to Electrical Group 8B, Cold Cranking Test.

(2) Check intake manifold bolt torque; Refer to Group 11, Exhaust System and Intake Manifold.

(3) Perform cylinder compression test. Refer to Cylinder Compression Pressure Test in the Engine Diagnosis area of this section.

(4) Clean or replace spark plugs as necessary and adjust gap as specified in Electrical Group 8D. Tighten to specifications.

(5) Test resistance of spark plug cables. Refer to Electrical Group 8D, Spark Plug Cables.

(6) Inspect the primary wires. Test coil output voltage and primary resistance. Replace parts as necessary. Refer to Electrical Group 8D, for specifications.

(7) Test fuel pump for pressure. Refer to Group 14, Fuel System Specifications.

(8) The air filter elements should be replaced as specified in Lubrication and Maintenance, Group 0.

(9) Inspect crankcase ventilation system as out lined in Group 0, Lubrication and Maintenance. For emission controls see Group 25, Emission Controls for service procedures.

(10) Road test vehicle as a final test.

HONING CYLINDER BORES

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823 equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880 or a light honing oil available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings (Fig. 38).

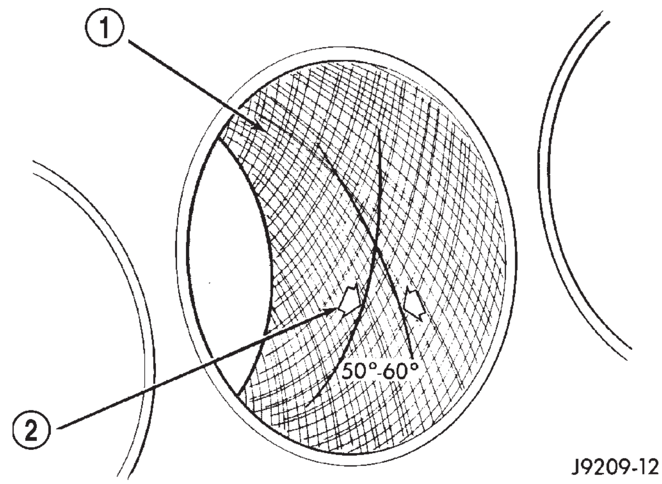


Fig. 38 Cylinder Bore Crosshatch Pattern

1 – CROSSHATCH PATTERN
2 – INTERSECT ANGLE

(4) A controlled hone motor speed between 200 and 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 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

SERVICE PROCEDURES (Continued)

REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn 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.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

SERVICE ENGINE ASSEMBLY (SHORT BLOCK)

A service replacement engine assembly (short block) may be installed whenever the original cylinder block is defective or damaged beyond repair. It consists of the cylinder block, crankshaft, piston and rod assemblies. If needed, the camshaft must be procured separately and installed before the engine is installed in the vehicle.

A short block is identified with the letter "S" stamped on the same machined surface where the build date code is stamped for complete engine assemblies.

Installation includes the transfer of components from the defective or damaged original engine. Follow the appropriate procedures for cleaning, inspection and torque tightening.

HYDROSTATIC LOCK

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

(1) Perform the Fuel Pressure Release Procedure (refer to Group 14, Fuel System).

(2) Disconnect the negative cable from the battery.

(3) Inspect air cleaner, induction system and intake manifold to ensure system is dry and clear of foreign material.

(4) Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the plugs from the engine.

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

(5) With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.

(6) Identify the fluid in the cylinders (i.e. coolant, fuel, oil, etc.).

(7) Make sure all fluid has been removed from the cylinders.

(8) Repair engine or components as necessary to prevent this problem from occurring again.

(9) Squirt engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.

(10) Install new spark plugs. Tighten the spark plugs to 37 N·m (27 ft. lbs.) torque.

(11) Drain engine oil. Remove and discard the oil filter.

(12) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(13) Install a new oil filter.

(14) Fill engine crankcase with the specified amount and grade of oil (refer to Group 0, Lubrication and Maintenance).

(15) Connect the negative cable to the battery.

(16) Start the engine and check for any leaks.

ENGINE OIL SERVICE

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR provides engine oils that conform to the latest recommended service grades.

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 39).

Fig. 39 Engine Oil Container Standard Notations

SERVICE PROCEDURES (Continued)

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 10W–30 specifies a multiple viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 40).

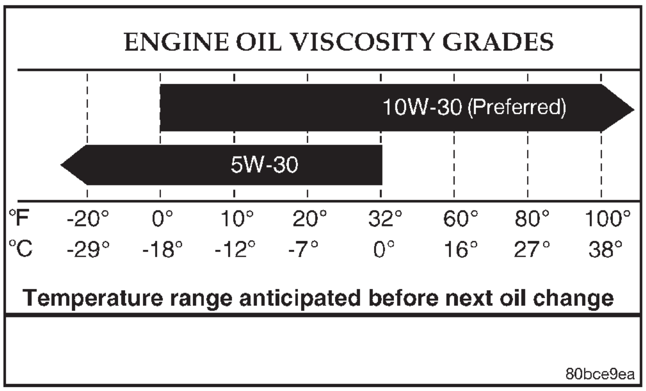


Fig. 40 Temperature/Engine Oil Viscosity

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.

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, oil foaming and oil pressure loss can result.

The engine oil level indicator (Dipstick) is located at the right rear of the 4.0L engine. Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick (Fig. 41).

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, take oil level reading (Fig. 41).

(6) Add oil only if level is below the ADD mark on dipstick.

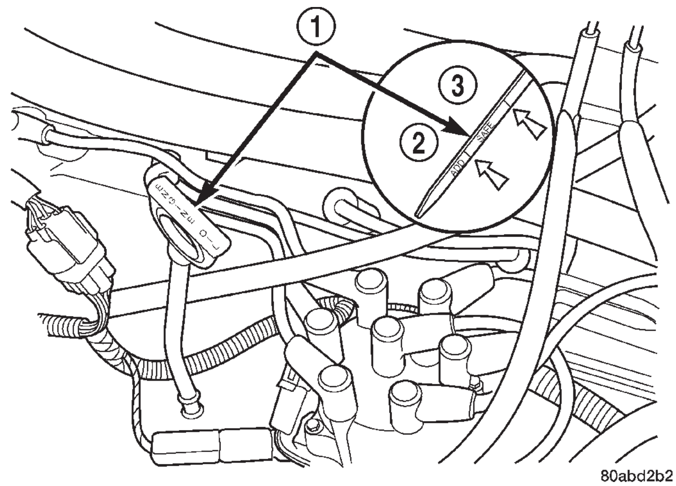


Fig. 41 Engine Oil Dipstick—4.0L Engine

1 – DIPSTICK
2 – ADD
3 – SAFE

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands.

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.

(8) Install oil fill cap.

(9) Start engine and inspect for leaks.

(10) Stop engine and inspect oil level.

ENGINE OIL FILTER CHANGE

FILTER SPECIFICATION

CAUTION: Do not use oil filter with metric threads. The proper oil filter has SAE type 3/4 X 16 threads. An oil filter with metric threads can result in oil leaks and engine failure.

All Jeep engines are equipped with a high quality full-flow, throw-away type oil filter. DaimlerChrysler

SERVICE PROCEDURES (Continued)

Corporation recommends a Mopar or equivalent oil filter be used.

OIL FILTER REMOVAL

(1) Position a drain pan under the oil filter.

(2) Using a suitable oil filter wrench loosen filter.

(3) Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss or filter adapter housing (Fig. 42).

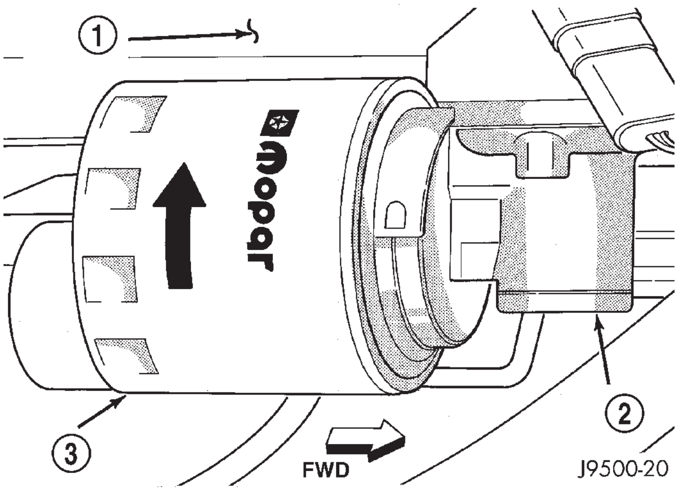


Fig. 42 Oil Filter—4.0L Engine

1 – CYLINDER BLOCK
2 – ADAPTER
3 – OIL FILTER

(4) When filter separates from adapter nipple, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

(5) Make sure old gasket comes off with oil filter. With a wiping cloth, clean the gasket sealing surface (Fig. 43) of oil and grime.

OIL FILTER INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil or chassis grease.

(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 43) hand tighten filter one full turn, do not over tighten.

(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

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 at beginning of this section.

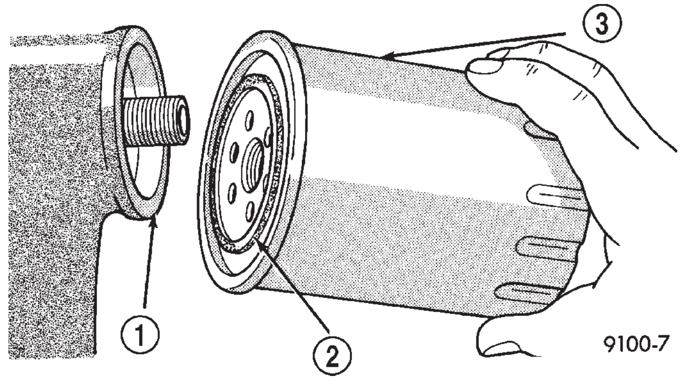


Fig. 43 Oil Filter Sealing Surface—Typical

1 – SEALING SURFACE
2 – RUBBER GASKET
3 – OIL FILTER

REMOVAL AND INSTALLATION

ENGINE MOUNTS—FRONT

The front mounts support the engine at each side. These supports are made of resilient rubber.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Support the engine.

(4) Remove the nut from the through bolt (Fig. 44). DO NOT remove the through bolt.

(5) Remove the retaining bolts and nuts from the support cushions (Fig. 44).

(6) Remove the through bolt.

(7) Remove the support cushions.

INSTALLATION

(1) If the engine support bracket was removed, position the bracket onto the block and install the attaching bolts (Fig. 44). Tighten the engine support bracket bolts to 61 N·m (45 ft. lbs.) torque.

(2) If the support cushion bracket was removed, position the bracket onto the lower front sill (Fig. 45). Install support cushion bracket bolts and nuts. Tighten the bolts to 54 N·m (40 ft. lbs.) torque. Tighten the nuts to 41 N·m (30 ft. lbs.) torque.

(3) Place the support cushion into position on the support cushion bracket (Fig. 44). Install and tighten the bolts and nuts to 41 N·m (30 ft. lbs.) torque.

(4) Install the through bolt and the retaining nut (Fig. 44). Tighten the through bolt nut to 65 N·m (48 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

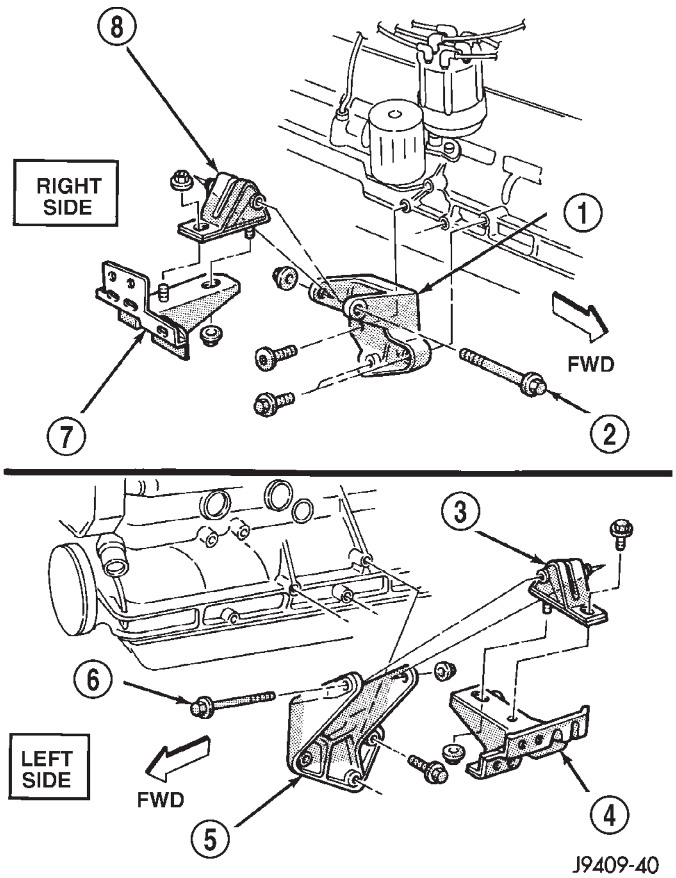


Fig. 44 Front Mounts

1 – ENGINE SUPPORT BRACKET
2 – THROUGH BOLT
3 – SUPPORT CUSHION
4 – SUPPORT CUSHION BRACKET
5 – ENGINE SUPPORT BRACKET
6 – THROUGH BOLT
7 – SUPPORT CUSHION BRACKET
8 – SUPPORT CUSHION

(5) Remove the engine support.
(6) Lower the vehicle.
(7) Connect negative cable to battery.

ENGINE MOUNT—REAR

A resilient rubber cushion supports the transmission at the rear between the transmission extension housing and the rear support crossmember or skid plate.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Raise the vehicle and support the transmission.
(3) Remove the nuts holding the support cushion to the crossmember (Fig. 46) (Fig. 47). Remove the crossmember.

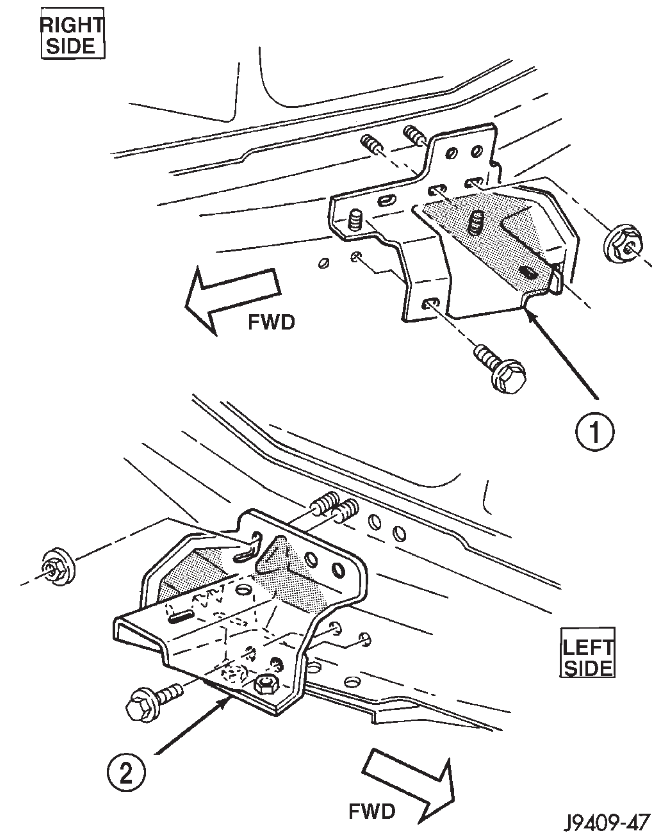


Fig. 45 Support Cushion Bracket

1 – SUPPORT CUSHION BRACKET
2 – SUPPORT CUSHION BRACKET

MANUAL TRANSMISSION

(Fig. 46)

a. Remove the support cushion nuts and remove the cushion.

b. Remove the transmission support bracket bolts and remove the bracket from the transmission.

AUTOMATIC TRANSMISSION

(Fig. 47)

a. Remove the support cushion bolts and remove the cushion and the support bracket from the transmission (4WD) or from the adaptor bracket (2WD).

b. On 2WD vehicles, remove the bolts holding the transmission support adaptor bracket to the transmission (Fig. 47). Remove the adaptor bracket.

INSTALLATION

MANUAL TRANSMISSION:

a. Install the transmission support bracket to the transmission. Install the bolts and tighten to 46 N·m (34 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

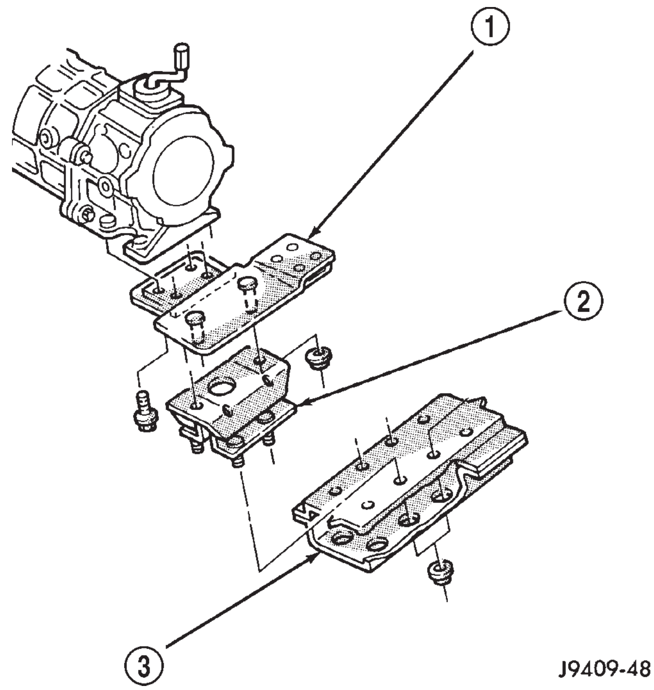


Fig. 46 Rear Mount(Manual Transmission)

1 – TRANSMISSION SUPPORT BRACKET
2 – SUPPORT CUSHION
3 – CROSSMEMBER ASSEMBLY

b. Install the support cushion to the support bracket. Install the nuts and tighten to 75 N·m (55 ft. lbs.) torque.

AUTOMATIC TRANSMISSION:

a. On 2WD vehicles, position the transmission support adaptor bracket to the transmission. Install the bolts and tighten to 75 N·m (55 ft. lbs.) torque.

b. Position the transmission support bracket and support cushion to the adaptor bracket (2WD) or the transmission (4WD). Install the bolts and tighten to 75 N·m (55 ft. lbs.) torque.

(1) Position the crossmember onto the support cushion studs. Install the stud nuts and tighten to 22 N·m (192 in. lbs) torque.

(2) Install crossmember-to-sill bolts and tighten to 41 N·m (30 ft. lbs.) torque.

(3) Remove the transmission support.

(4) Lower the vehicle.

(5) Connect negative cable to battery.

ENGINE ASSEMBLY

REMOVAL

(1) Disconnect the battery cables. Remove the battery.

(2) Mark the hinge locations on the hood panel for alignment reference during installation. Remove the engine compartment lamp. Remove the hood.

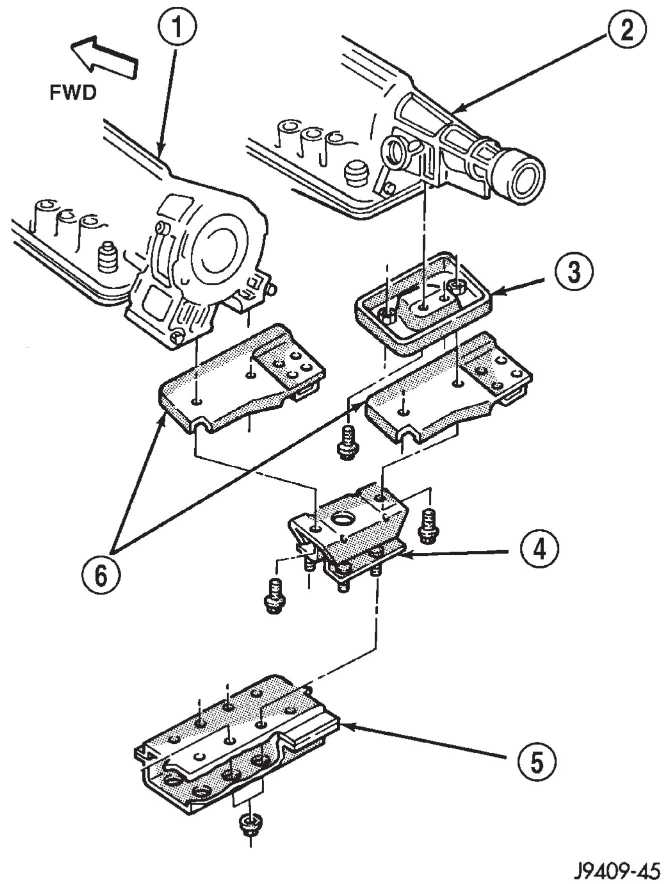


Fig. 47 Rear Mount(Automatic Transmission)

1 – 4×4
2 – 2×4
3 – TRANSMISSION SUPPORT ADAPTOR BRACKET
4 – SUPPORT CUSHION
5 – CROSSMEMBER ASSEMBLY
6 – TRANSMISSION SUPPORT BRACKET

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. USE CARE TO PREVENT SCALDING BY HOT COOLANT. CAREFULLY RELEASE THE PRESSURE BEFORE REMOVING THE RADIATOR DRAIN COCK AND CAP.

(3) Remove the air cleaner assembly.

(4) Loosen the radiator drain cock and radiator cap to drain the coolant. DO NOT waste usable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(5) Remove the lower radiator hose.

(6) Remove the upper radiator hose and coolant recovery hose (Fig. 48).

(7) Remove upper radiator support retaining bolts and remove radiator support.

(8) Remove the fan shroud (Fig. 48) and electric cooling fan.

(9) Disconnect the transmission fluid cooler tubing (automatic transmission).

REMOVAL AND INSTALLATION (Continued)

(10) Disconnect radiator fan switch wire connector.

(11) **Vehicles with Air Conditioning:**

(a) Discharge A/C system (refer to group 24, Heating and Air Conditioning for proper procedures)

(b) Disconnect the suction/discharge hose and cap off compressor ports to prevent foreign material and refrigerant oil loss.

(12) Remove the radiator or radiator and condenser (if equipped with A/C).

(13) Remove the fan assembly from the idler pulley.

(14) Disconnect the heater hoses at the engine thermostat housing and water pump (Fig. 48) (Fig. 49).

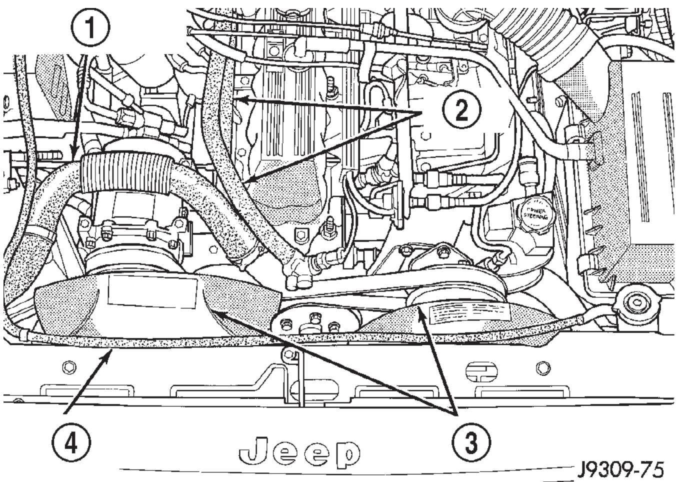


Fig. 48 Upper Radiator Hose, Coolant Recovery Hose, Fan Shroud & Heater hoses

1 – UPPER RADIATOR HOSE
2 – HEATER HOSES
3 – FAN SHROUDS
4 – COOLANT RECOVERY HOSE

(15) Disconnect the throttle cable.

(16) Disconnect the speed control cable (if equipped).

(17) Disconnect the line pressure cable (if equipped with automatic transmission).

(18) Disconnect the fuel injector harness at the injectors.

(19) Disconnect the distributor electrical connection and the oil pressure switch connector.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE TURNED OFF). BEFORE DISCONNECTING FUEL LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED.

(20) Perform the Fuel System Pressure Release procedure (refer to Group 14, Fuel System).

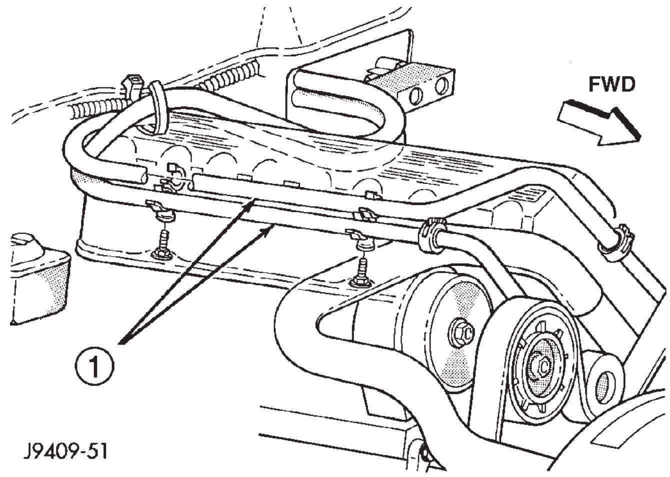


Fig. 49 Heater Hoses (RH Drive Vehicle)

1 – HEATER HOSES

(21) Remove the latch clip and disconnect fuel supply line.

(22) Remove the power brake vacuum check valve from the booster, if equipped.

(23) If equipped with power steering :

(a) Disconnect the hoses from the fittings at the steering gear.

(b) Drain the pump reservoir.

(c) Cap the fittings on the hoses and steering gear to prevent foreign objects from entering the system.

(24) Identify, tag and disconnect all necessary wire connectors and vacuum hoses.

(25) Raise and support the vehicle.

(26) Disconnect the wires from the starter motor solenoid.

(27) Remove the starter motor.

(28) Disconnect the exhaust pipe from the manifold.

(29) Disconnect the engine speed sensor wire connection.

(30) Remove the exhaust pipe support.

(31) Remove the flywheel and converter housing access cover.

(32) **Vehicles with Automatic Transmission:**

(a) Mark the converter and drive plate location.

(b) Remove the converter-to-drive plate bolts.

(33) Remove the upper flywheel and converter housing bolts and loosen the bottom bolts.

(34) Remove the engine mount cushion-to-engine compartment bracket bolts.

(35) Lower the vehicle.

(36) Attach a lifting device to the engine.

(37) Raise the engine off the front supports.

(38) Place a support or floor jack under the converter (or flywheel) housing.

REMOVAL AND INSTALLATION (Continued)

(39) Remove the remaining converter (or flywheel) housing bolts.

(40) Lift the engine out of the engine compartment.

INSTALLATION

CAUTION: When installing the engine into a vehicle equipped with an automatic transmission, be careful not to damage the trigger wheel on the flywheel.

(1) Attach a lifting device to the engine and lower the engine into the engine compartment. For easier installation, it may be necessary to remove the engine mount cushions from the engine mount bracket as an aide in alignment of the engine to the transmission.

(2) **Vehicles with Manual Transmission:**

(a) Insert the transmission shaft into the clutch spline.

(b) Align the flywheel housing with the engine.

(c) Install and tighten the flywheel housing lower bolts finger tight.

(3) **Vehicles with Automatic Transmission:**

(a) Align the transmission torque converter housing with the engine.

(b) Loosely install the converter housing lower bolts and install the next higher bolt and nut on each side.

(c) Tighten all 4 bolts finger tight.

(4) Install the engine mount cushions (if removed).

(5) Lower the engine and engine mount cushions onto the engine compartment brackets. Install the bolts and finger tighten the nuts.

(6) Remove the engine lifting device.

(7) Raise and support the vehicle.

(8) Install the remaining flywheel and converter housing bolts. Tighten all bolts to 38 N·m (28 ft. lbs.) torque.

(9) **Vehicles with Automatic Transmission:**

(a) Install the converter-to-drive plate bolts.

(b) Ensure the installation reference marks are aligned.

(10) Install the flywheel and converter housing access cover.

(11) Install the exhaust pipe support and tighten the screw.

(12) Tighten the engine mount-to-bracket bolts.

(13) Connect the engine speed sensor wire connections and tighten the screws.

(14) Connect the exhaust pipe to the manifold.

(15) Install the starter motor and connect the cable.

(16) Connect the wires to the starter motor solenoid.

(17) Lower the vehicle.

(18) Connect all the vacuum hoses and wire connectors identified during engine removal.

(19) **Vehicles with Power Steering:**

(a) Remove the protective caps

(b) Connect the hoses to the fittings at the steering gear. Tighten the nut to 52 N·m (38 ft. lbs.) torque.

(c) Fill the pump reservoir with fluid.

(20) Install the power brake vacuum check valve to the booster, if equipped.

(21) Connect the fuel supply hose the fuel rail. Push until a “click” is heard. Install latch clip

(22) Connect the fuel injector harness to the injectors.

(23) Connect the distributor electrical connector and oil pressure switch connector.

(24) Connect the line pressure cable (if equipped with automatic transmission).

(25) Connect the speed control cable, if equipped.

(26) Connect the throttle cable.

(27) Connect the heater hoses at the engine thermostat housing and water pump.

(28) Install the fan assembly to the idler pulley.

(29) Connect the suction/discharge hose to the compressor.

(30) Connect automatic transmission fluid cooler lines, if equipped.

(31) Install the fan shroud, electric cooling fan and radiator and condenser (if equipped with A/C).

(32) Connect the electric fan connector.

(33) Install upper radiator support.

(34) Connect the upper radiator hose.

(35) Connect the lower radiator hose.

(36) Align the hood to the scribe marks. Install the hood.

(37) Install the air cleaner assembly.

(38) Install the battery and connect the battery cable.

(39) Add the proper amount of engine oil and coolant.

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 FAN. DO NOT WEAR LOOSE CLOTHING.

(40) Start the engine, inspect for leaks and correct the fluid levels, as necessary.

(41) Charge the air conditioning system (refer to Group 24, Heating and Air Conditioning for proper procedures).

REMOVAL AND INSTALLATION (Continued)

INTAKE AND EXHAUST MANIFOLD

REMOVAL

NOTE: THE ENGINE INTAKE AND EXHAUST MANIFOLD MUST BE REMOVED AND INSTALLED TOGETHER. THE MANIFOLDS USE A COMMON GASKET AT THE CYLINDER HEAD.

(1) Disconnect the battery negative cable.

(2) Remove air cleaner inlet hose from the resonator assembly.

(3) Remove the air cleaner assembly.

(4) Remove the throttle cable, vehicle speed control cable (if equipped) and the transmission line pressure cable.

(5) Disconnect the following electrical connections and secure their harness out of the way:

- Throttle Position Sensor
- Idle Air Control Motor
- Coolant Temperature Sensor (at thermostat housing)
- Intake Air Temperature Sensor
- Oxygen Sensor
- Crank Position Sensor
- Six (6) Fuel Injector Connectors
- Manifold Absolute Pressure (MAP) Sensor.

(6) Disconnect HVAC, and Brake Booster vacuum supply hoses at the intake manifold.

(7) Perform the fuel pressure release procedure. (Refer to Group 14, Fuel Systems for correct procedure)

(8) Disconnect and remove the fuel system supply line from the fuel rail assembly. (Refer to Group 14, Quick Connect Fittings for correct procedures)

(9) Remove the accessory drive belt (refer to Group 7, Cooling System). Loosen the tensioner.

(10) Remove the power steering pump from the intake manifold and set aside.

(11) Raise the vehicle.

(12) Disconnect the exhaust pipes from the engine exhaust manifolds.

(13) Lower the vehicle.

(14) Remove the intake manifold and engine exhaust manifolds.

INSTALLATION

If the manifold is being replaced, ensure all the fitting, etc. are transferred to the replacement manifold.

(1) Install a new engine exhaust/intake manifold gasket over the alignment dowels on the cylinder head.

(2) Position the engine exhaust manifolds to the cylinder head. Install fastener Number 3 and finger tighten at this time (Fig. 50).

(3) Install intake manifold on the cylinder head dowels.

(4) Install washer and fastener Numbers 1, 2, 4, 5, 8, 9, 10 and 11 (Fig. 50).

(5) Install washer and fastener Numbers 6 and 7 (Fig. 50).

(6) Tighten the fasteners in sequence and to the specified torque (Fig. 50).

- Fastener Numbers 1 through 5—Tighten to 33 N·m (24 ft. lbs.) torque.
- Fastener Numbers 6 and 7—Tighten to 31 N·m (23 ft. lbs.) torque.
- Fastener Numbers 8 through 11—Tighten to 33 N·m (24 ft. lbs.) torque.

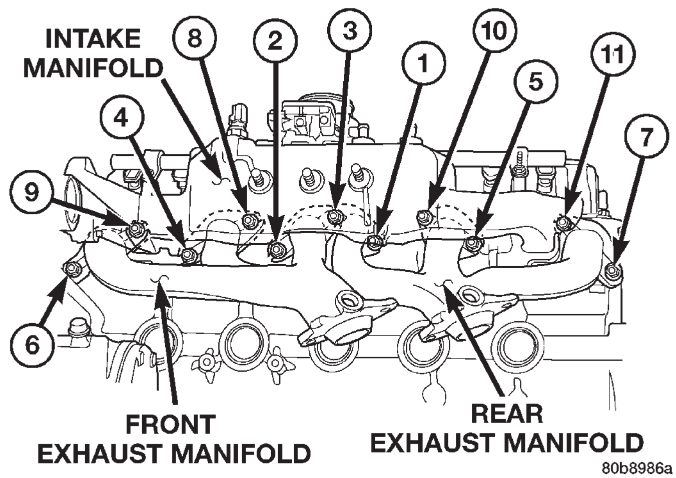


Fig. 50 Intake and Exhaust Manifolds—4.0L

(7) Install the power steering pump to the intake manifold.

(8) Install the accessory drive belt. (Refer to Group 7, Cooling System for the correct procedures)

(9) Install the fuel system supply line to the fuel rail assembly. **Before connecting the fuel supply line to the fuel rail inspect the O-rings and replace if necessary. Refer to Group 14, Fuel System for the correct procedure.**

(10) Connect all electrical connections on the intake manifold.

(11) Connect the vacuum hoses previously removed.

(12) Install throttle cable, vehicle speed control cable (if equipped).

(13) Install the transmission line pressure cable (if equipped). Refer to Group 21, Transmission for the adjustment procedures.

(14) Install air cleaner assembly.

(15) Connect air inlet hose to the resonator assembly.

(16) Raise the vehicle.

(17) Connect the exhaust pipes to the engine exhaust manifolds. Tighten the bolts to 31 N·m (23 ft. lbs.)

REMOVAL AND INSTALLATION (Continued)

(18) Lower the vehicle.
(19) Connect the battery negative cable.
(20) Start the engine and check for leaks.

EXHAUST MANIFOLD—4.0L ENGINE

The intake and engine exhaust manifolds on the 4.0L engine must be removed and installed together. The manifolds use a common gasket at the cylinder head.

Refer to Intake Manifold—4.0L Engine in this section for the proper removal and installation procedures.

CYLINDER HEAD COVER

The cylinder head cover is isolated from the cylinder head via grommets and a reusable molded rubber gasket. The grommet and limiter are retained in the cylinder head cover.

There are two cylinder head bolts that have a pin to locate the cylinder head cover gasket, they are located at position 8 and 9 (Fig. 52)

REMOVAL

(1) Disconnect negative cable from battery.
(2) Disconnect the Crankcase Ventilation (CCV) vacuum hose from engine cylinder head cover.
(3) Disconnect the fresh air inlet hose from the engine cylinder head cover.
(4) Disconnect the accelerator, transmission, and speed (if equipped) control cables from the throttle body (Fig. 51).
(5) Remove the three bolts that fasten the control cable bracket to the intake manifold.
(6) Remove control cables from cylinder head cover clip.
(7) Position control cables and bracket away from cylinder head cover secure with tie straps.
(8) Remove the engine cylinder head cover mounting bolts.
(9) Remove the engine cylinder head cover and gasket.

INSTALLATION

(1) If a replacement cover is installed, transfer the CCV valve grommet and oil filler cap from the original cover to the replacement cover.
(2) Install cylinder head cover and gasket. Tighten the mounting bolts to 10 N·m (85 in. lbs.) torque.
(3) Connect the CCV hoses.
(4) Install control cables and bracket on intake manifold and tighten bolts to 8.7 N·m (77 in. lbs.) torque.
(5) Connect control cables to throttle body linkage.
(6) Snap control cables into cylinder head cover clip.
(7) Connect negative cable to battery.

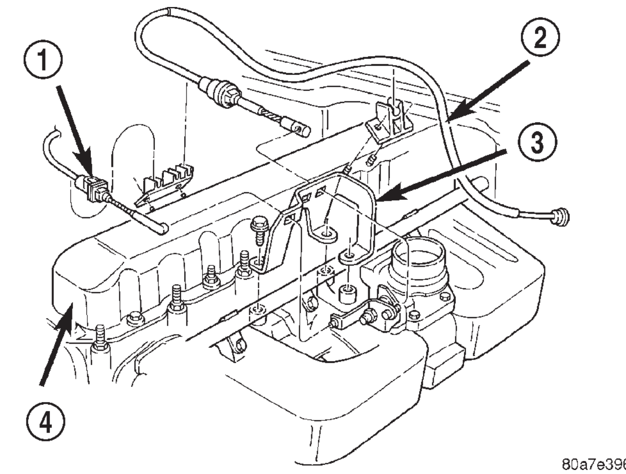


Fig. 51 Engine Cylinder Head Cover

1 – TRANS CONTROL CABLE
2 – ACCELERATOR CABLE
3 – CONTROL CABLE BRACKET
4 – CYLINDER HEAD COVER

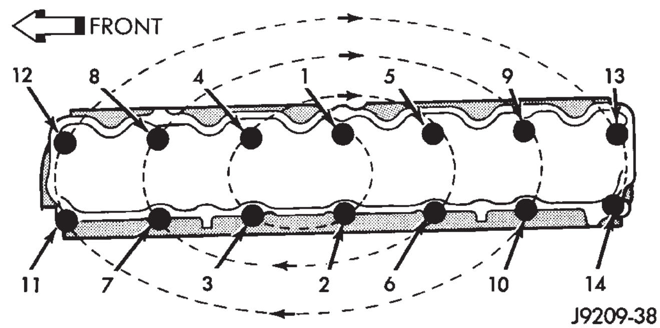


Fig. 52 Cylinder Head Cover Gasket Locator Pins at #8 & #9

ROCKER ARMS AND PUSH RODS

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Remove the engine cylinder head cover.
(2) Check for rocker arm bridges which are causing misalignment of the rocker arm to valve tip area.
(3) Remove the capscrews at each bridge and pivot assembly (Fig. 53). Alternately loosen the capscrews one turn at a time to avoid damaging the bridges.
(4) Remove the bridges, pivots and corresponding pairs of rocker arms (Fig. 53). Place them on a bench in the same order as removed.
(5) Remove the push rods and place them on a bench in the same order as removed.

INSTALLATION

(1) Lubricate the ball ends of the push rods with Mopar Engine Oil Supplement, or equivalent and install push rods in their original locations. Ensure

REMOVAL AND INSTALLATION (Continued)

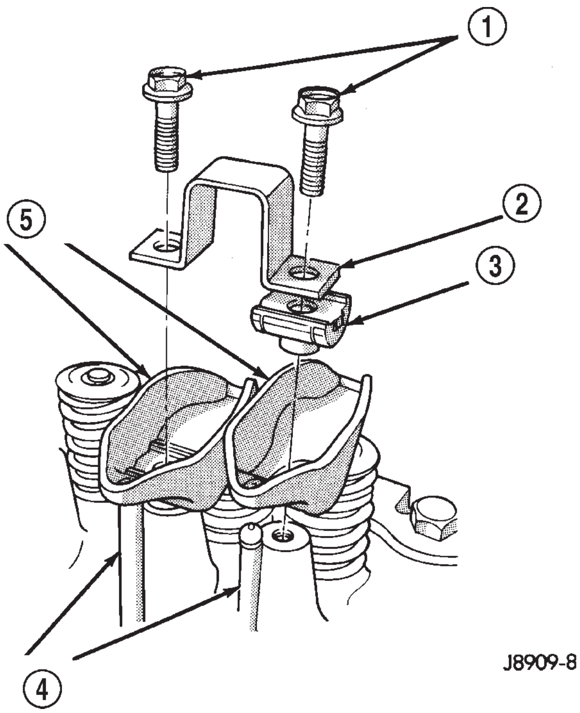


Fig. 53 Rocker Arm Assembly

1 – CAPSCREWS
2 – BRIDGE
3 – PIVOT ASSEMBLY
4 – PUSH RODS
5 – ROCKER ARMS

that the bottom end of each push rod is centered in the tappet plunger cap seat.

(2) Using Mopar Engine Oil Supplement, or equivalent, lubricate the area of the rocker arm that the pivot contacts. Install rocker arms, pivots and bridge above each cylinder in their originally position.

(3) Loosely install the capscrews through each bridge.

(4) At each bridge, tighten the capscrews alternately, one turn at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(5) Install the engine cylinder head cover.

VALVE SPRINGS AND OIL SEALS

This procedure can be done with the engine cylinder head installed on the block.

REMOVAL

Inspect the valve stems, especially the grooves. An Arkansas smooth stone should be used to remove nicks and high spots.

Each valve spring is held in place by a retainer and a set of conical valve locks. The locks can be removed only by compressing the valve spring.

(1) Remove the engine cylinder head cover.

(2) Remove cap screws, bridge and pivot assemblies and rocker arms for access to each valve spring to be removed.

(3) Remove push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order and position as removed.**

(4) Inspect the springs and retainer for cracks and possible signs of weakening.

(5) Remove the spark plug(s) adjacent to the cylinder(s) below the valve springs to be removed.

(6) Connect an air hose to the adapter and apply air pressure slowly. Maintain at least 621 kPa (90 psi) of air pressure in the cylinder to hold the valves against their seats. For vehicles equipped with an air conditioner, use a flexible air adaptor when servicing the No.1 cylinder.

(7) Tap the retainer or tip with a rawhide hammer to loosen the lock from the retainer. Use Valve Spring Compressor Tool MD-998772A to compress the spring and remove the locks (Fig. 54).

(8) Remove valve spring and retainer (Fig. 54).

(9) Remove valve stem oil seals (Fig. 54). Note the valve seals are different for intake and exhaust valves. The top of each seal is marked either INT (intake/black in color) or EXH (exhaust/brown in color). DO NOT mix the seals.

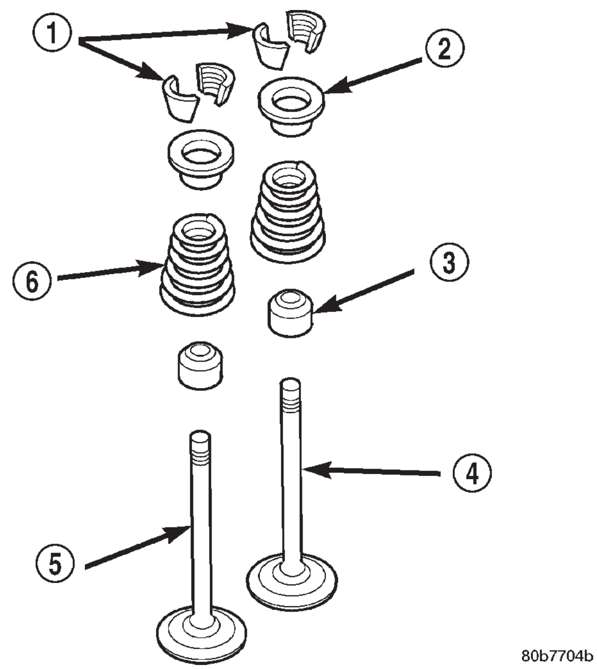


Fig. 54 Valve and Valve Components

1 – VALVE LOCKS (3–BEAD)
2 – RETAINER
3 – VALVE STEM OIL SEAL
4 – INTAKE VALVE
5 – EXHAUST VALVE
6 – VALVE SPRING

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

CAUTION: Install oil seals carefully to prevent damage from the sharp edges of the valve spring lock grove.

(1) Lightly push the valve seal over the valve stem and valve guide boss. Be sure the seal is completely seated on the valve guide boss.

(2) Install valve spring and retainer.

(3) Compress the valve spring with Valve Spring Compressor Tool MD-998772A and insert the valve locks. Release the spring tension and remove the tool. Tap the spring from side-to-side to ensure that the spring is seated properly on the engine cylinder head.

(4) Release air pressure and disconnect the air hose. Remove the adaptor from the spark plug hole and install the spark plug.

(5) Repeat the procedures for each remaining valve spring to be removed.

(6) Install the push rods. Ensure the bottom end of each rod is centered in the plunger cap seat of the hydraulic valve tappet.

(7) Install the rocker arms, pivots and bridge at their original location.

(8) Tighten the bridge cap screws alternately, one at a time, to avoid damaging the bridge. Tighten the cap screws to 28 N·m (21 ft. lbs.) torque.

(9) Install the engine cylinder head cover.

CYLINDER HEAD

This procedure can be done with the engine in or out of the vehicle.

REMOVAL

(1) Disconnect the battery negative cable.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(2) Drain the coolant and disconnect the hoses at the engine thermostat housing and the water pump inlet. DO NOT waste reusable coolant. If the solution is clean and is being drained only to service the engine or cooling system, drain the coolant into a clean container for reuse.

(3) Remove the air cleaner assembly.

(4) Remove the engine cylinder head cover.

(5) Remove the capscrews, bridge and pivot assemblies and rocker arms.

(6) Remove the push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order as removed.**

(7) Loosen the accessory drive belt at the power steering pump. (Refer to Group 7, Cooling System for the correct procedure). Slip the belt off of the power steering pulley.

(8) Remove the A/C compressor mounting bolts and secure the compressor to the side.

(9) Remove the power steering pump and bracket from the intake manifold and water pump. Set the pump and bracket aside. DO NOT disconnect the hoses.

(10) Perform the Fuel System Pressure Release procedure. (Refer to Group 14, Fuel System)

(11) Disconnect the fuel supply line at the fuel rail. (Refer to Group 14, Quick-Connect Fittings for the correct procedures)

(12) Remove the intake and engine exhaust manifolds from the engine cylinder head. (Refer to Group 11, Exhaust System and Intake Manifold for the proper procedures)

(13) Disconnect the coil rail electrical connectors and remove the coil rail.

(14) Remove spark plugs.

(15) Disconnect the temperature sending unit wire connector.

(16) Remove the engine cylinder head bolts. Bolt No.14 cannot be removed until the head is moved forward (Fig. 55). Pull bolt No.14 out as far as it will go and then suspend the bolt in this position (tape around the bolt).

(17) Remove the engine cylinder head and gasket (Fig. 55).

(18) If this was the first time the bolts were removed, put a paint dab on the top of the bolt. If the bolts have a paint dab on the top of the bolt or it isn't known if they were used before, discard the bolts.

(19) Stuff clean lint free shop towels into the cylinder bores.

NOTE: If the valves, springs, or seals are to be inspected/replaced at this time, refer to Valves and Valve Springs in this section for proper inspection procedures.

INSTALLATION

The engine cylinder head gasket is a composition gasket. The gasket is to be installed DRY. **DO NOT use a gasket sealing compound on the gasket.**

If the engine cylinder head is to be replaced and the original valves used, measure the valve stem diameter. Only standard size valves can be used with a service replacement engine cylinder head unless the replacement head valve stem guide bores are reamed to accommodate oversize valve stems. Remove all carbon buildup and reface the valves.

REMOVAL AND INSTALLATION (Continued)

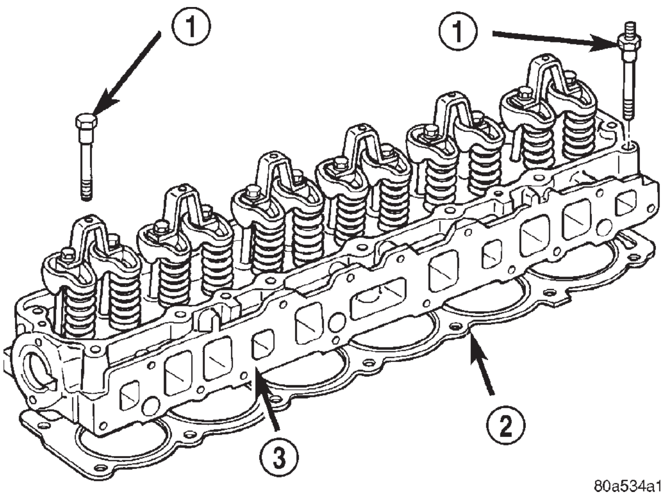


Fig. 55 Engine Cylinder Head Assembly

1 – CYLINDER HEAD BOLTS
2 – CYLINDER HEAD GASKET
3 – CYLINDER HEAD

(1) Remove the shop towels from the cylinder bores. Coat the bores with clean engine oil.

(2) Position the engine cylinder head gasket (with the numbers facing up) using the alignment dowels in the cylinder block, to position the gasket.

CAUTION: Engine cylinder head bolts should be reused only once. Replace the head bolts if they were used before or if they have a paint dab on the top of the bolt.

(3) With bolt No.14 held in place (tape around bolt), install the engine cylinder head over the same dowels used to locate the gasket. Remove the tape from bolt No.14.

(4) Coat the threads of stud bolt No.11 with Loctite 592 sealant, or equivalent.

(5) Tighten the engine cylinder head bolts in sequence according to the following procedure (Fig. 56).

CAUTION: During the final tightening sequence, bolt No.11 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.11.

(a) Tighten all bolts in sequence (1 through 14) to 30 N·m (22 ft. lbs.) torque.

(b) Tighten all bolts in sequence (1 through 14) to 61 N·m (45 ft. lbs.) torque.

(c) Check all bolts to verify they are set to 61 N·m (45 ft. lbs.) torque.

(d) Tighten bolts in sequence:

• Bolts 1 through 10 to 149 N·m (110 ft. lbs.) torque.

• Bolt 11 to 135 N·m (100 ft. lbs.) torque.

• Bolts 12 through 14 to 149 N·m (110 ft. lbs.) torque.

CYLINDER HEAD BOLTS

POSITION	DESCRIPTION
1,4,5,12,13	1/2 in.-13 BOLT
8,9	1/2 in.-13 BOLT WITH DOWEL POINT
2,3,6,7,10,11,14	1/2 in.-13 WITH 7/16 in.-14 STUD END
All bolts are 12 point drives for rocker cover clearance	

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.

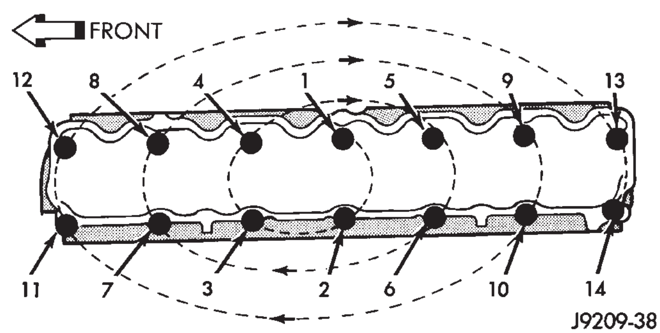


Fig. 56 Engine Cylinder Head Bolt Tightening Sequence

(6) Install the spark plugs and tighten to 37 N·m (27 ft. lbs.) torque.

(7) Connect the temperature sending unit wire connector.

(8) Install the ignition coil rail and coil rail electrical connectors.

(9) Install the intake and engine exhaust manifolds (refer to procedures in this section).

(10) Install the fuel line and the vacuum advance hose.

(11) Attach the power steering pump and bracket.

(12) Install the push rods, rocker arms, pivots and bridges in the order they were removed (refer to Rocker Arms and Push Rods in this section).

(13) Install the engine cylinder head cover.

(14) Attach the air conditioner compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.

(15) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

CAUTION: The serpentine drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(16) Install the serpentine drive belt. (refer to Group 7, Cooling System for the proper procedure).

(17) Install the air cleaner and ducting.

(18) Connect the hoses to the engine thermostat housing and fill the cooling system to the specified level (refer to Group 7, Cooling Systems for the proper procedure).

(19) The automatic transmission throttle linkage and cable must be adjusted after completing the engine cylinder head installation (refer to Group 21, Transmissions for the proper procedures).

(20) Install the temperature sending unit and connect the wire connector.

(21) If equipped with air conditioning, install A/C compressor and charge A/C system (refer to Group 24 Heating and Air Conditioning).

(22) Connect negative cable to battery.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(23) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the engine thermostat opens. Add coolant, if required.

VALVES AND VALVE SPRINGS

This procedure is done with the engine cylinder head removed from the block.

REMOVAL

(1) Remove the engine cylinder head from the cylinder block.

(2) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.

(3) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals.

(4) Use a smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.

(5) Remove the valves, and place them in a rack in the same order as removed.

INSTALLATION

(1) Thoroughly clean the valve stems and the valve guide bores.

(2) Lightly lubricate the stem.

(3) Install the valve in the original valve guide bore.

(4) Install the replacement valve stem oil seals on the valve stems. If the 0.381 mm (0.015 inch) oversize valve stems are used, oversize oil seals are required.

(5) Position the valve spring and retainer on the engine cylinder head and compress the valve spring with Valve Spring Compressor Tool MD-998772A.

(6) Install the valve locks and release the tool.

(7) Tap the valve spring from side to side with a hammer to ensure that the spring is properly seated at the engine cylinder head. Also tap the top of the retainer to seat the valve locks.

(8) Install the engine cylinder head.

HYDRAULIC TAPPETS

Retain all the components in the same order as removed.

REMOVAL

(1) Remove the engine cylinder head (Refer to cylinder head r&i in this section).

(2) Remove the push rods.

(3) Remove the tappets through the push rod openings in the cylinder block with a Hydraulic Valve Tappet Removal/Installation Tool (Fig. 57).

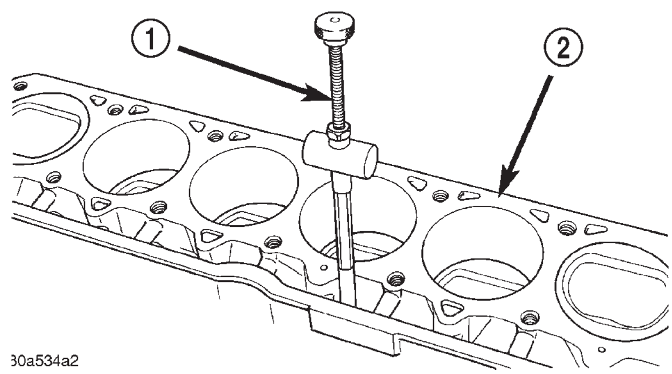


Fig. 57 Hydraulic Valve Tappet Removal—Installation Tool

1 – HYDRAULIC TAPPET REMOVAL TOOL
2 – CYLINDER BLOCK

INSTALLATION

It is not necessary to charge the tappets with engine oil. They will charge themselves within a very short period of engine operation.

(1) Dip each tappet in Mopar Engine Oil Supplement, or equivalent.

(2) Use Hydraulic Valve Tappet Removal/Installation Tool to install each tappet in the same bore from where it was originally removed.

(3) Install the cylinder head assy (Refer to cylinder head r&i in this section).

(4) Install the push rods in their original locations.

REMOVAL AND INSTALLATION (Continued)

(5) Install the rocker arms and bridge and pivot assemblies at their original locations. Loosely install the capscrews at each bridge.

(6) Tighten the capscrews alternately, one turn at a time, to avoid damaging the bridges. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(7) Pour the remaining Mopar Engine Oil Supplement, or equivalent over the entire valve actuating assembly. The Mopar Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1 609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(8) Install the engine cylinder head cover.

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt and fan shroud. Refer to Group 7, Cooling Systems for the procedures.

(3) Remove the vibration damper retaining bolt and washer.

(4) Use Vibration Damper Removal Tool 7697 to remove the damper from the crankshaft (Fig. 58).

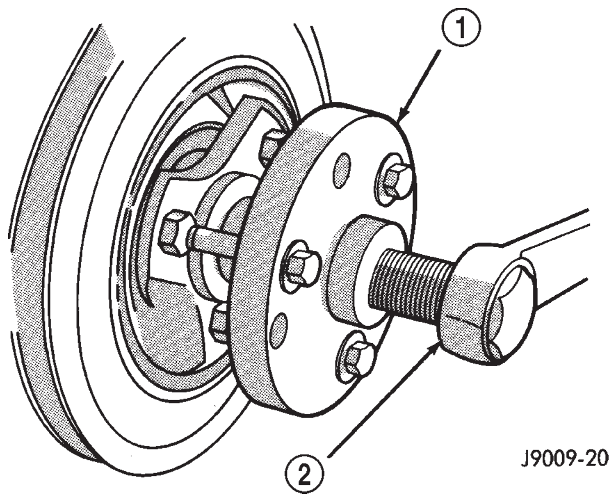


Fig. 58 Vibration Damper Removal Tool 7697

1 – VIBRATION DAMPER REMOVAL TOOL
2 – WRENCH

INSTALLATION

(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in position, align the keyway on the vibration damper hub with the crankshaft key and tap the damper onto the crankshaft.

(2) Install the vibration damper retaining bolt and washer.

(3) Tighten the damper retaining bolt to 108 N·m (80 ft. lbs.) torque.

(4) Install the serpentine drive belt. (Refer to Group 7, Cooling Systems for the proper specifications and procedures).

(5) Connect negative cable to battery.

TIMING CASE COVER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the vibration damper.

(3) Remove the fan and hub assembly and remove the fan shroud.

(4) Remove the accessory drive brackets that are attached to the timing case cover.

(5) Remove the A/C compressor (if equipped) and generator bracket assembly from the engine cylinder head and move to one side.

(6) Remove the oil pan-to-timing case cover bolts and timing case cover-to-cylinder block bolts.

(7) Remove the timing case cover and gasket from the engine.

(8) Pry the crankshaft oil seal from the front of the timing case cover (Fig. 59).

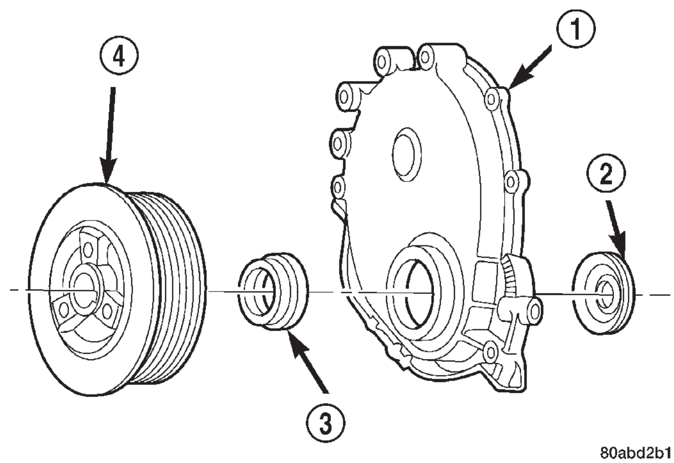


Fig. 59 Timing Case Cover Components

1 – TIMING CASE COVER
2 – OIL SLINGER
3 – CRANKSHAFT OIL SEAL
4 – VIBRATION DAMPER PULLEY

INSTALLATION

Clean the timing case cover, oil pan and cylinder block gasket surfaces.

(1) Install a new crankshaft oil seal in the timing case cover. The open end of the seal should be toward the inside of the cover. Support the cover at the seal area while installing the seal. Force it into position with Seal Installation Tool 6139.

(2) Position the gasket on the cylinder block.

REMOVAL AND INSTALLATION (Continued)

(3) Position the timing case cover on the oil pan gasket and the cylinder block.

(4) Insert Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 60).

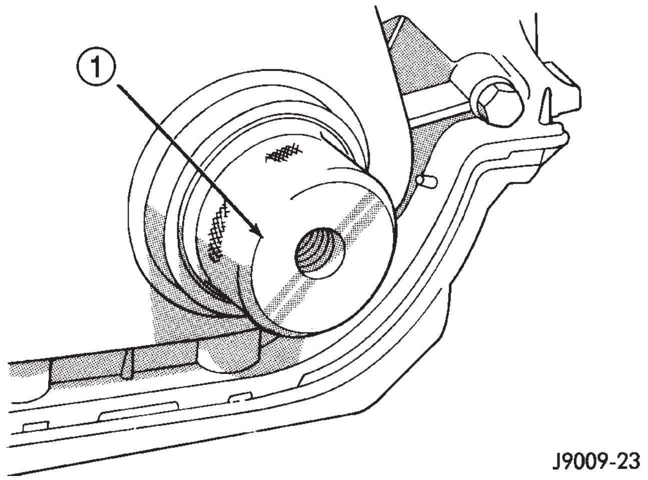


Fig. 60 Timing Case Cover Alignment and Seal Installation Tool 6139

1 – TIMING CASE COVER ALIGNMENT AND SEAL INSTALLATION TOOL

(5) Install the timing case cover-to-cylinder block and the oil pan-to-timing case cover bolts.

(6) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 9.5 N·m (84 in. lbs.) torque.

(7) Remove the cover alignment tool.

(8) Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(9) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(10) Install the A/C compressor (if equipped) and generator bracket assembly.

(11) Install the engine fan and hub assembly and shroud.

(12) Install the serpentine drive belt.

(13) Connect negative cable to battery.

TIMING CHAIN AND SPROCKETS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the fan and shroud.

(3) Remove the serpentine drive belt.

(4) Remove the crankshaft vibration damper.

(5) Remove the timing case cover.

(6) Rotate crankshaft until the “0” timing mark is closest to and on the center line with camshaft sprocket timing mark (Fig. 61).

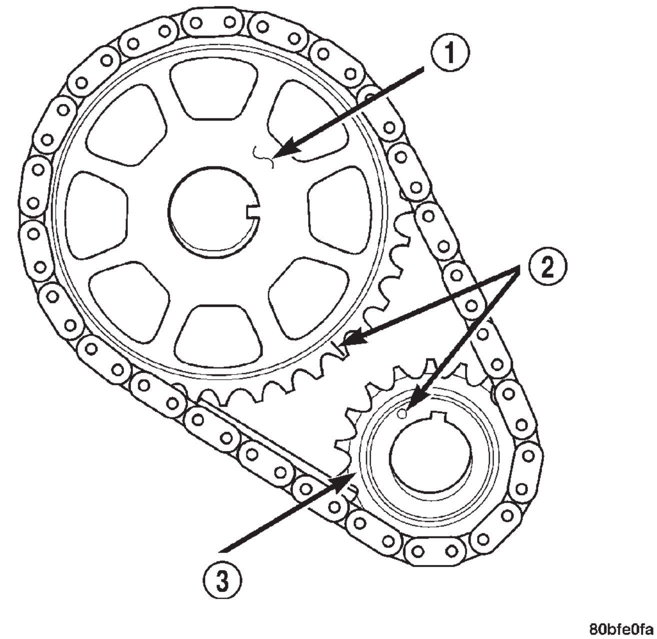


Fig. 61 Crankshaft—Camshaft Alignment

1 – CAMSHAFT SPROCKET
2 – TIMING MARKS
3 – CRANKSHAFT SPROCKET

(7) Remove the oil slinger from the crankshaft.

(8) Remove the camshaft sprocket bolt and washer (Fig. 62).

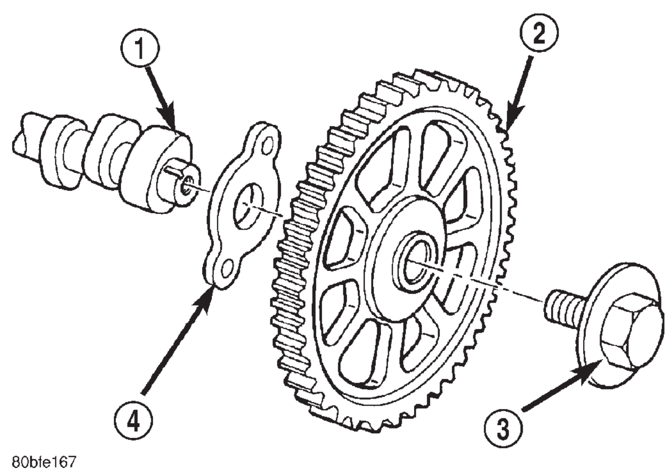


Fig. 62 Camshaft Sprocket and Thrust Plate

1 – CAMSHAFT
2 – CAMSHAFT SPROCKET W/INTEGRAL KEY
3 – BOLT & CUP WASHER
4 – THRUST PLATE

(9) Remove the crankshaft sprocket, camshaft sprocket and timing chain as an assembly.

REMOVAL AND INSTALLATION (Continued)

(10) Installation of the timing chain with the timing marks on the crankshaft and camshaft sprockets properly aligned ensures correct valve timing. A worn or stretched timing chain will adversely affect valve timing. If the timing chain deflects more than 12.7 mm (1/2 inch) replace it.

INSTALLATION

Assemble the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned (Fig. 61).

(1) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in the keyway on the crankshaft, install the assembly on the crankshaft and camshaft.

(2) Install the camshaft sprocket bolt and washer (Fig. 62). Tighten the bolt to 68 N·m (50 ft. lbs.) torque.

(3) To verify correct installation of the timing chain, rotate the crankshaft 2 revolutions. The camshaft and crankshaft sprocket timing mark should align (Fig. 61).

(4) Install the crankshaft oil slinger.

(5) Replace the oil seal in the timing case cover.

(6) Install the timing case cover and gasket.

(7) With the key installed in the crankshaft keyway, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(8) Install the serpentine drive belt. (refer to Group 7, Cooling System for the proper procedure).

(9) Install the fan and hub assembly. Install the shroud.

(10) Connect negative cable to battery.

CAMSHAFT

REMOVAL

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. RELEASE THE PRESSURE BEFORE REMOVING THE DRAIN COCK, CAP AND DRAIN PLUGS.

(1) Disconnect negative cable from battery.

(2) Drain the cooling system. DO NOT waste reusable coolant. If the solution is clean, drain it into a clean container for reuse.

(3) Remove the radiator or radiator and condenser, if equipped with A/C (refer to Group 7, Cooling System for the proper procedure).

(4) Remove the engine cylinder head cover.

(5) Remove the rocker arms, bridges and pivots.

(6) Remove the push rods.

(7) Remove the engine cylinder head and gasket.

(8) Remove the hydraulic valve tappets from the engine cylinder block.

(9) Remove the vibration damper.

(10) Remove the timing case cover.

(11) Rotate the crankshaft until the crankshaft sprocket timing mark is aligned on centerline with the camshaft sprocket timing mark (Fig. 64).

(12) Remove the timing chain and sprockets.

(13) Remove the front bumper and/or grille, as required.

(14) Remove the two thrust plate retaining screws, thrust plate and camshaft (Fig. 63).

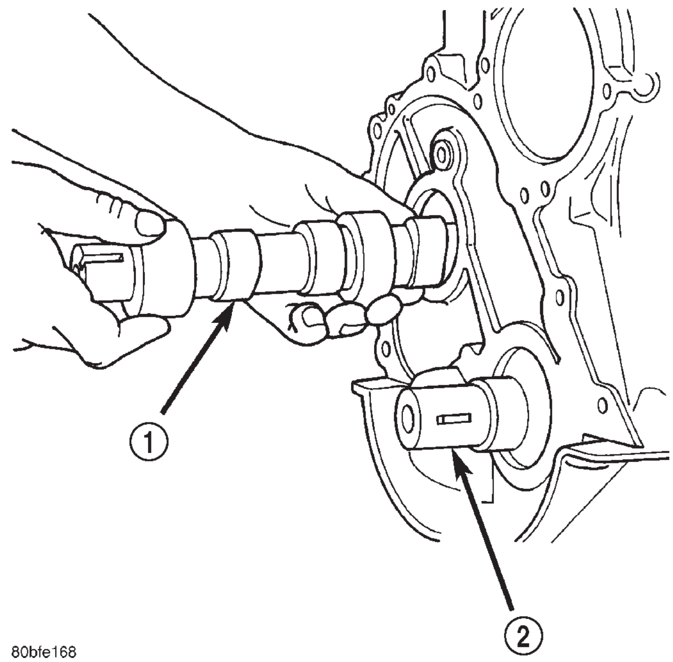


Fig. 63 Camshaft

1 – CAMSHAFT
2 – CRANKSHAFT

INSTALLATION

(1) Inspect the cam lobes for wear.

(2) Inspect the bearing journals for uneven wear pattern or finish.

(3) Inspect the bearings for wear.

(4) Inspect the distributor drive gear for wear.

(5) If the camshaft appears to have been rubbing against the thrust washer, examine the oil pressure relief holes in the rear cam journal. The oil pressure relief holes must be free of debris.

(6) Lubricate the camshaft with Mopar Engine Oil Supplement, or equivalent.

(7) Carefully install the camshaft to prevent damage to the camshaft bearings (Fig. 63).

(8) Position thrust plate and install retaining screws. Tighten screws to 24 N·m (18 ft. lbs.).

(9) Install the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned.

(10) Install the camshaft sprocket bolt/cup washer. Tighten the bolt to 68 N·m (50 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

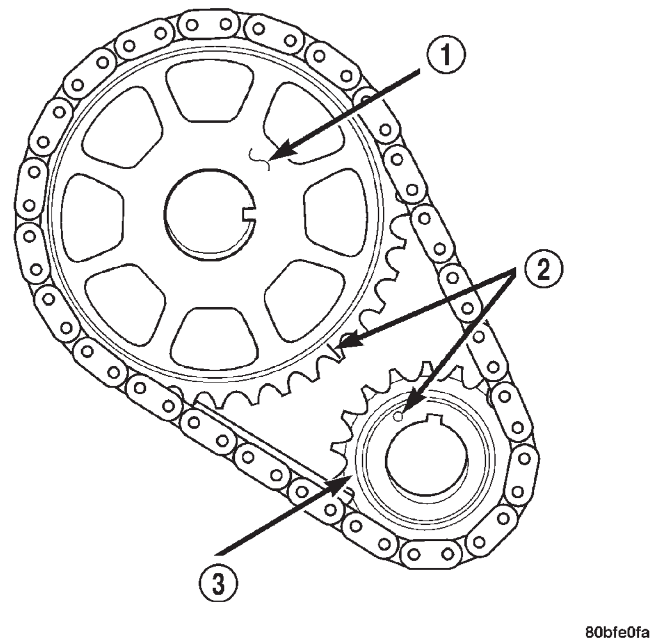


Fig. 64 Crankshaft / Camshaft Sprocket Timing Mark Alignment

1 – CAMSHAFT SPROCKET
2 – TIMING MARKS
3 – CRANKSHAFT SPROCKET

(11) Install the timing case cover with a replacement oil seal (Fig. 65). Refer to Timing Case Cover Installation.

(12) Install the vibration damper (Fig. 65).

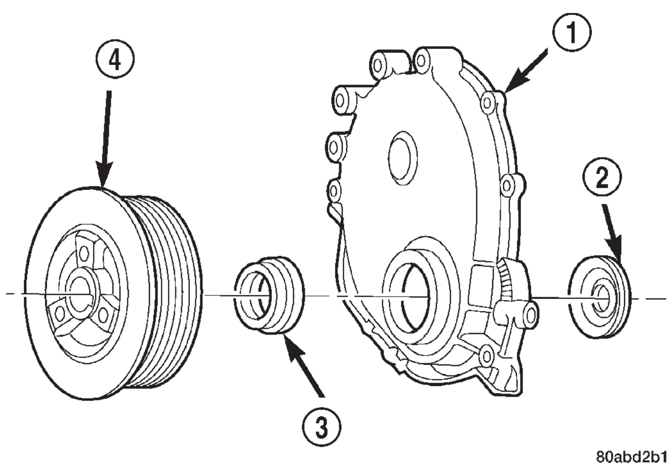


Fig. 65 Timing Case Cover Components

1 – TIMING CASE COVER
2 – OIL SLINGER
3 – CRANKSHAFT OIL SEAL
4 – VIBRATION DAMPER PULLEY

(13) Install the hydraulic valve tappets.

(14) Install the cylinder head gasket with the numbers facing up.

(15) Install the cylinder head and head bolts (Refer to cylinder head R&I in this section for torque values and tightening sequence).

(16) Install the push rods.

(17) Install the rocker arms and pivot and bridge assemblies. Tighten each of the capscrews for each bridge alternately, one turn at a time, to avoid damaging the bridge (Refer to Rocker Arms and Push Rods in this section).

(18) Install the engine cylinder head cover.

(19) Install the serpentine drive belt. (refer to Group 7, Cooling System for the proper procedure).

NOTE: During installation, lubricate the hydraulic valve tappets and all valve components with Mopar Engine Oil Supplement, or equivalent. The Mopar Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(20) Install the radiator, connect the hoses and fill the cooling system to the specified level (refer to Group 7, Cooling System for the proper procedure).

(21) Check the ignition timing and adjust as necessary.

(22) Install the grille and bumper, if removed.

(23) Connect negative cable to battery.

CAMSHAFT BEARINGS

REMOVAL

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm (0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated. Camshaft end play is maintained by the thrust plate.

(1) Remove the camshaft. Refer to Camshaft in this section for procedure.

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available, such as recommended tool 8544 Camshaft Bushing Remover Installer.

(2) Using Special tool, remove the camshaft bearings.

INSTALLATION

(1) Inspect the camshaft bearing journals for uneven wear pattern or finish.

(2) Inspect the camshaft lobes and distributor gear for wear.

REMOVAL AND INSTALLATION (Continued)

(3) Inspect the camshaft thrust plate for wear. If the plate shows excessive wear inspect the camshaft oil pressure relief holes in the rear cam jounral. The relief holes must be clean and free of debris.

CAUTION: Make sure outside diameter of number 1 bearing is clean. Make sure that the bearing is properly installed in the engine block, align the oil hole in the bearing with the oil gallery in the bearing bore. Failure to do so will cause inadequate oil supply for the sprockets and timing chain.

(4) Using special tool, install new camshaft bearings.

(5) Lubricate the camshaft with Mopar® engine oil supplement, or equivalent.

(6) Carefully install the camshaft to prevent damage to the camshaft bearings

(7) Position the thrust plate and install the two retaining screws. Tighten screws to 24 N·m (18 ft. lbs.).

(8) Install the camshaft sprocket, crankshaft sprocket and timing chain with the timing marks aligned. Install the sprocket bolt.

(9) Tighten the camshaft sprocket bolt and washer to 68 N·m (50 ft. lbs.).

(10) To verify correct installation of the timing chain, turn the crankshaft two full revolutions then position the camshaft sprocket timing mark as shown in (Fig. 66).

(11) Install the timing chain cover refer to the procedure in this section.

CRANKSHAFT MAIN BEARINGS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the spark plugs.

(3) Raise the vehicle.

(4) Remove the oil pan and oil pump.

(5) Remove main bearing cap brace (Fig. 67).

(6) Remove only one main bearing cap and lower insert at a time (Fig. 68).

(7) Remove the lower insert from the bearing cap.

(8) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 69). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool to remove the bearing insert (Fig. 69). After moving the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.

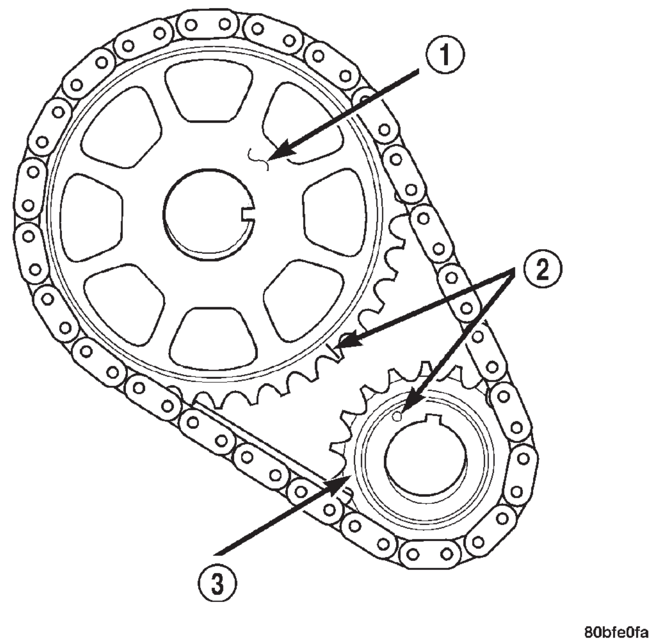


Fig. 66 Crankshaft / Camshaft Chain Drive Installation—Typical

1 – CAMSHAFT SPROCKET
2 – TIMING MARKS
3 – CRANKSHAFT SPROCKET

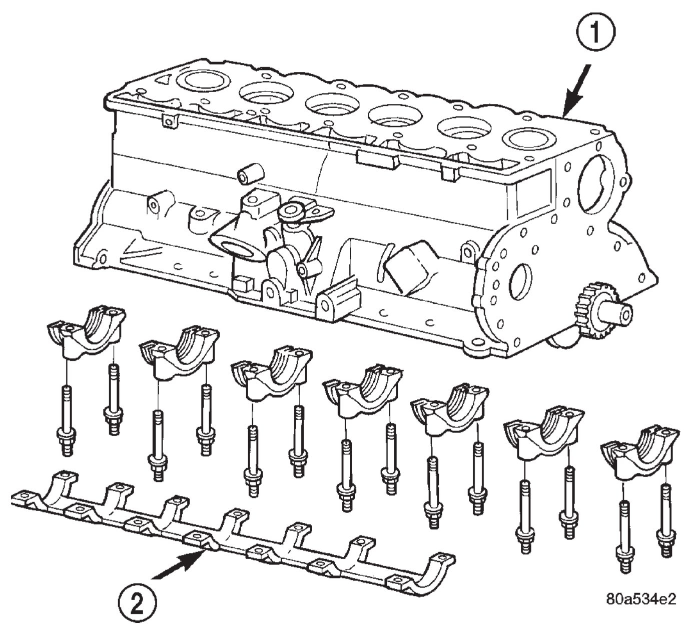


Fig. 67 Main Bearing Caps and Brace.

1 – BLOCK
2 – MAIN BEARING CAP BRACE

(9) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

REMOVAL AND INSTALLATION (Continued)

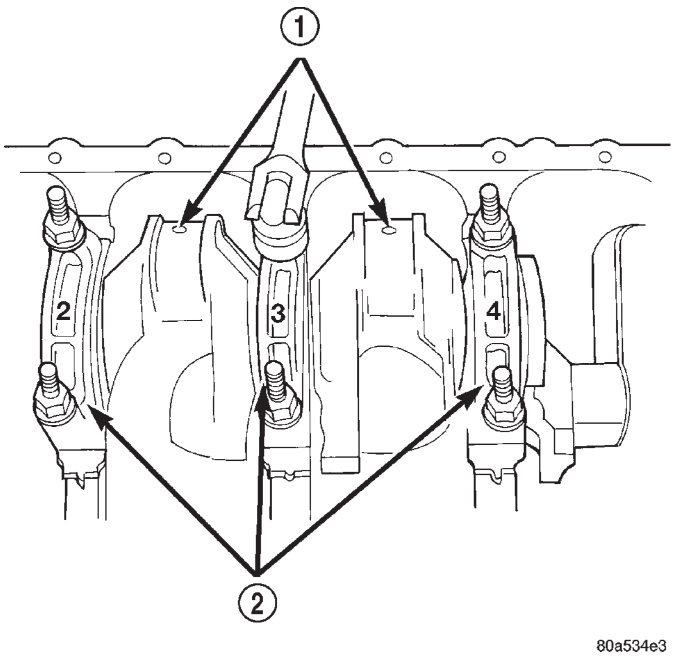


Fig. 68 Removing Main Bearing Caps and Lower Inserts

1 – CONNECTING ROD JOURNAL
2 – MAIN BEARING CAPS

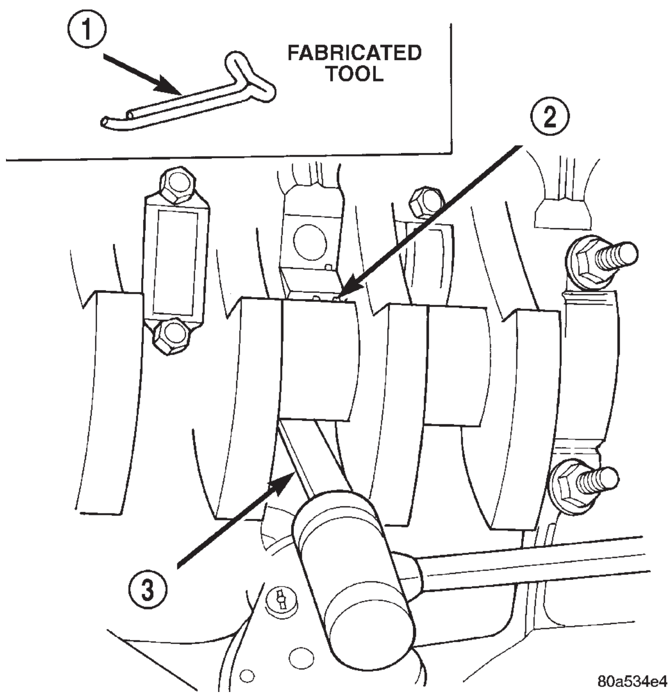


Fig. 69 Removing Upper Inserts

1 – COTTER PIN
2 – BEARING INSERT
3 – TONGUE DEPRESSOR

INSTALLATION

(1) Lubricate the bearing surface of each insert with engine oil.

(2) Loosen all the main bearing caps. Install the main bearing upper inserts.

(3) Install the lower bearing inserts into the main bearing caps.

(4) On the rear main cap, apply Mopar® Gasket Maker sealer on both sides of cylinder block as shown in (Fig. 70). The dab of sealer should be 3 mm (0.125 in.) in diameter.

(5) Apply Mopar® Gasket Maker on the rear bearing cap. The bead should be 2.3 mm (0.09 in.) in diameter. DO NOT apply sealer to the lip of the seal.

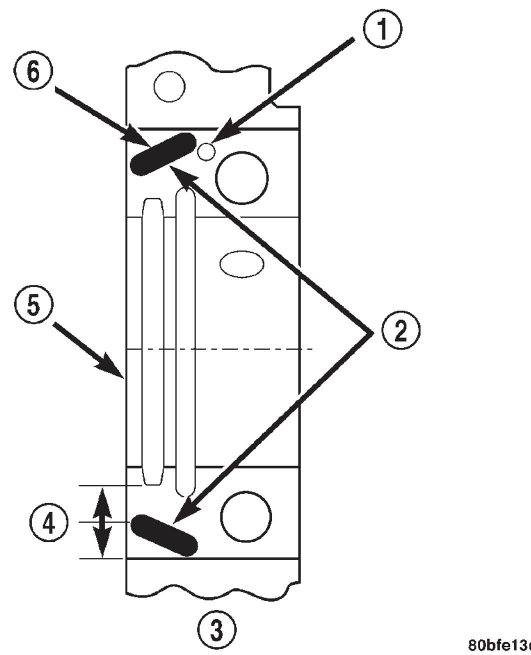


Fig. 70 Location of Sealer

1 – DOWEL
2 – SEALER LOCATIONS
3 – CYLINDER BLOCK
4 – HALFWAY BETWEEN
5 – REAR FACE OF CYLINDER BLOCK
6 – 3mm (0.125 in.)

(6) Install the main bearing cap(s) and lower insert(s).

(7) Tighten the bolts of caps 1, 2, 4, 5, 6, and 7 to 54 N·m (40 ft. lbs.) torque. Now tighten these bolts to 95 N·m (70 ft. lbs.) torque. Finally, tighten these bolts to 108 N·m (80 ft. lbs.) torque.

(8) Push the crankshaft forward and backward. Load the crankshaft front or rear and tighten cap bolt No.3 to 54 N·m (40 ft. lbs.) torque. Then tighten to 95 N·m (70 ft. lbs.) torque and finally tighten to 108 N·m (80 ft. lbs.) torque.

(9) Rotate the crankshaft after tightening each main bearing cap to ensure the crankshaft rotates freely.

(10) Check crankshaft end play. Crankshaft end play is controlled by the thrust bearing which is flange and installed at the No.2 main bearing position.

REMOVAL AND INSTALLATION (Continued)

(a) Attach a magnetic base dial indicator to the cylinder block at either the front or rear of the engine.

(b) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(c) Pry the crankshaft forward, position the dial indicator to zero.

(d) Pry the crankshaft forward and backward. Note the dial indicator readings. End play is the difference between the high and low measurements (Fig. 71). Correct end play is 0.038-0.165 mm (0.0015-0.0065 inch). The desired specifications are 0.051-0.064 mm (0.002-0.0025 inch).

(e) If end play is not within specification, inspect crankshaft thrust faces for wear. If no wear is apparent, replace the thrust bearing and measure end play. If end play is still not within specification, replace the crankshaft.

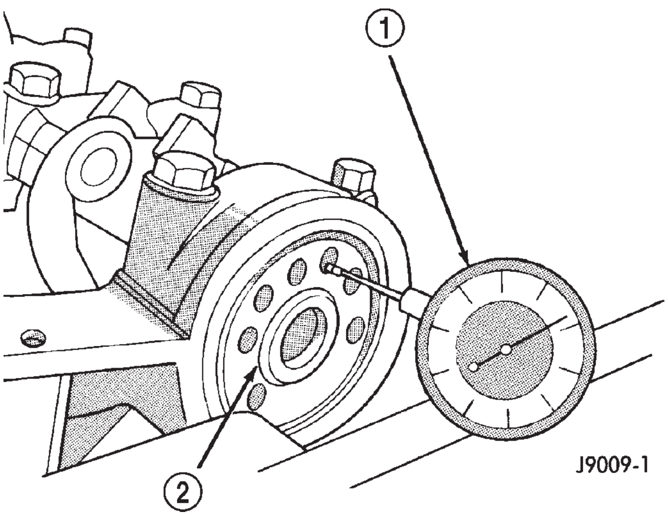


Fig. 71 Crankshaft End Play Measurement

1 – DIAL INDICATOR
2 – CRANKSHAFT

(11) If the crankshaft was removed, install the crankshaft into the cylinder block (refer to Cylinder Block - Assemble).

(12) Install main bearing cap brace tighten nuts to 47 N·m (35 ft. lbs.) torque.

(13) Install oil pump assy. and tighten attaching bolts to 23 N·m (17 ft. lbs.)

(14) Install the oil pan.

(15) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(16) Lower the vehicle.

(17) Install the spark plugs. Tighten the plugs to 37 N·m (27 ft. lbs.) torque.

(18) Fill the oil pan with engine oil to the full mark on the dipstick level.

(19) Connect negative cable to battery.

OIL PAN

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Remove the oil pan drain plug and drain the engine oil.

(4) Disconnect the exhaust pipe at the exhaust manifold.

(5) Disconnect the exhaust hanger at the catalytic converter and lower the pipe.

(6) Remove the starter motor.

(7) Remove the engine flywheel and transmission torque converter housing access cover.

(8) If equipped with an oil level sensor, disconnect the sensor.

(9) Position a jack stand directly under the engine vibration damper.

(10) Place a piece of wood (2 x 2) between the jack stand and the engine vibration damper.

(11) Remove the engine mount through bolts.

(12) Using the jack stand, raise the engine until adequate clearance is obtained to remove the oil pan.

(13) Remove transmission oil cooling lines (if equipped) and oxygen sensor wiring supports that are attached to the oil pan studs.

(14) Remove the oil pan bolts and studs. Carefully slide the oil pan and gasket to the rear. If equipped with an oil level sensor, take care not to damage the sensor.

INSTALLATION

(1) Clean the block and pan gasket surfaces.

(2) Fabricate 4 alignment dowels from 1 1/2 x 1/4 inch bolts. Cut the head off the bolts and cut a slot into the top of the dowel. This will allow easier installation and removal with a screwdriver (Fig. 72).

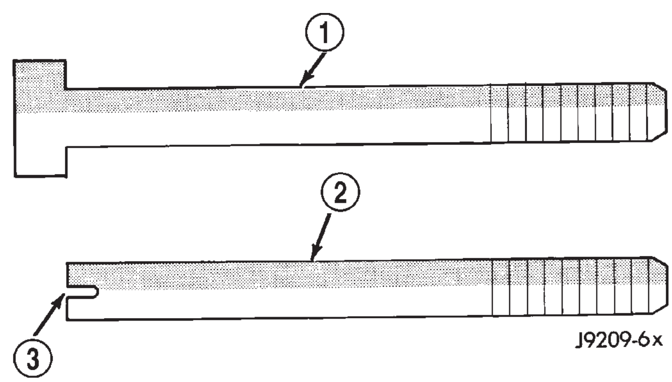


Fig. 72 Fabrication of Alignment Dowels

1 – 1/4″ × 1 1/2″ BOLT
2 – DOWEL
3 – SLOT

REMOVAL AND INSTALLATION (Continued)

(3) Install two dowels in the timing case cover. Install the other two dowels in the cylinder block (Fig. 73).

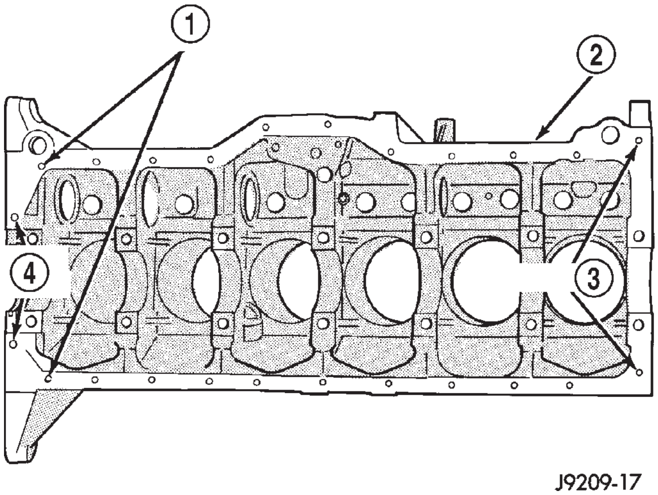


Fig. 73 Position of Dowels in Cylinder Block

1 – DOWEL HOLES
2 – CYLINDER BLOCK
3 – 5/16'' HOLES
4 – 5/16'' HOLES

(4) Apply Mopar® Silicone Rubber Adhesive Sealant on cylinder block to rear main bearing cap corners and cylinder block to front cover joints (four places) (Fig. 74).

(5) Slide the one-piece gasket over the dowels and onto the block and timing case cover.

(6) Position the oil pan over the dowels and onto the gasket. If equipped with an oil level sensor, take care not to damage the sensor.

(7) Install the 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque. Install the 5/16 inch oil pan bolts (Fig. 75). Tighten these bolts to 15 N·m (132 in. lbs.) torque.

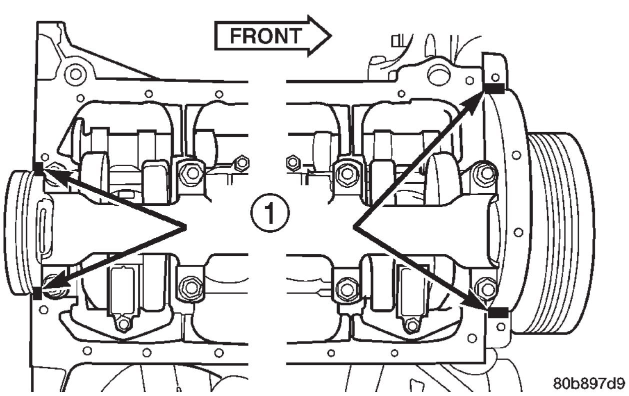


Fig. 74 Oil Pan Sealer Location

1 – SEALER LOCATIONS

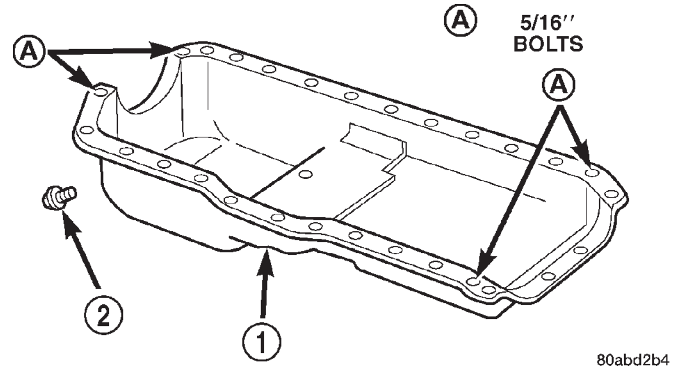


Fig. 75 Position of 5/16 inch Oil Pan Bolts

1 – OIL PAN
2 – OIL PAN DRAIN PLUG

(8) Remove the dowels. Install the remaining 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque.

(9) Lower the engine until it is properly located on the engine mounts.

(10) Install the through bolts and tighten the nuts.

(11) Lower the jack stand and remove the piece of wood.

(12) Install the engine flywheel and transmission torque converter housing access cover.

(13) Install the engine starter motor.

(14) Connect the exhaust pipe to the hanger and to the engine exhaust manifold.

(15) Install transmission oil cooling lines (if equipped) and oxygen sensor wiring supports that attach to the oil pan studs.

(16) Install the oil pan drain plug (Fig. 75). Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(17) Lower the vehicle.

(18) Connect negative cable to battery.

(19) Fill the oil pan with engine oil to the specified level.

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 FAN. DO NOT WEAR LOOSE CLOTHING.

(20) Start the engine and inspect for leaks.

PISTONS AND CONNECTING RODS

REMOVAL

(1) Remove the engine cylinder head cover.

(2) Remove the rocker arms, bridges and pivots.

(3) Remove the push rods.

(4) Remove the engine cylinder head.

(5) Position the pistons one at a time near the bottom of the stroke. Use a ridge reamer to remove the

REMOVAL AND INSTALLATION (Continued)

ridge from the top end of the cylinder walls. Use a protective cloth to collect the cuttings.

(6) Raise the vehicle.

(7) Drain the engine oil.

(8) Remove the oil pan and gasket.

(9) Remove main bearing cap brace (Fig. 76).

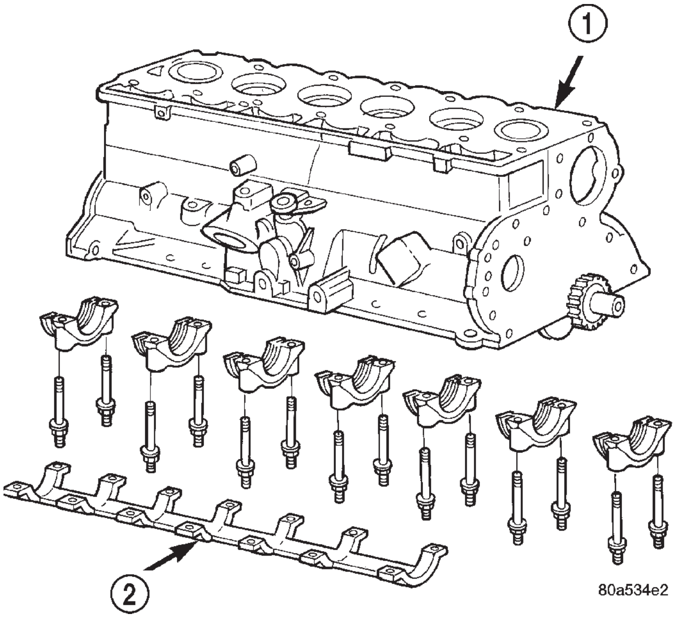


Fig. 76 Main Bearings Caps and Brace

1 – BLOCK
2 – MAIN BEARING CAP BRACE

(10) Remove the connecting rod bearing caps and inserts. Mark the caps and rods with the cylinder bore location. The connecting rods and caps are stamped with a two letter combination (Fig. 77).

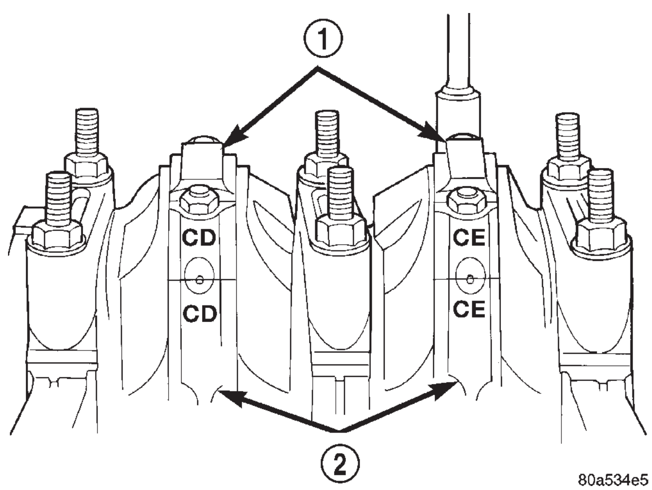


Fig. 77 Stamped Connecting Rods and Caps

1 – CONNECTING ROD CAP
2 – CONNECTING ROD

(11) Lower the vehicle until it is about 2 feet from the floor.

CAUTION: Ensure that the connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose, slipped over the rod bolts will provide protection during removal.

(12) Have an assistant push the piston and connecting rod assemblies up and through the top of the cylinder bores (Fig. 78).

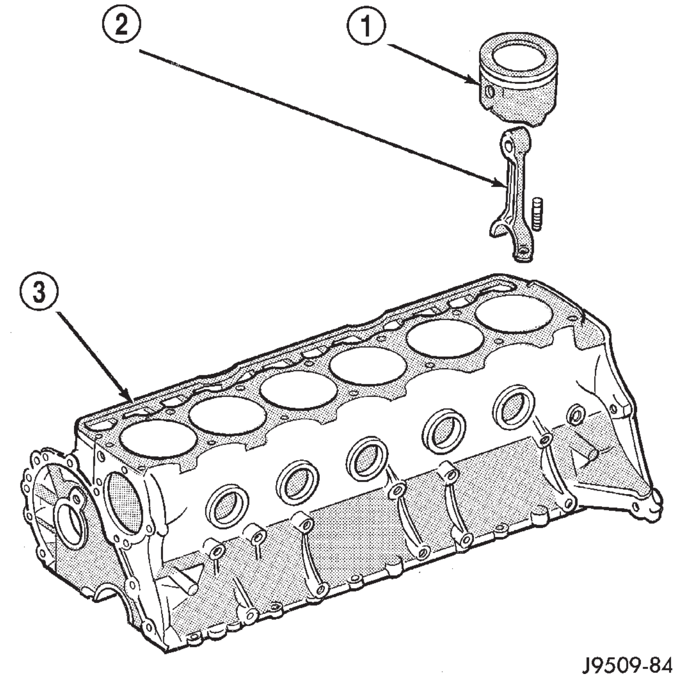


Fig. 78 Removal of Connecting Rod and Piston Assembly

1 – PISTON
2 – CONNECTING ROD
3 – BLOCK

INSTALLATION

(1) Clean the cylinder bores thoroughly. Apply a light film of clean engine oil to the bores with a clean lint-free cloth.

(2) Install the piston rings on the pistons if removed.

(3) Lubricate the piston and rings with clean engine oil.

CAUTION: Ensure that connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose slipped over the connecting rod bolts will provide protection during installation.

REMOVAL AND INSTALLATION (Continued)

(4) Use a piston ring compressor to install the connecting rod and piston assemblies through the top of the cylinder bores (Fig. 79).

(5) Ensure the arrow on the piston top points to the front of the engine (Fig. 79).

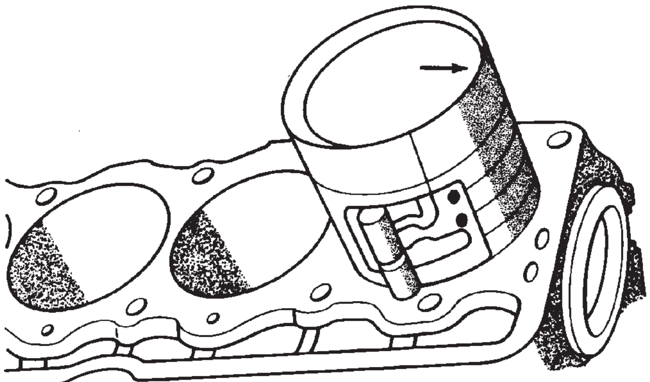


Fig. 79 Rod and Piston Assembly Installation

(6) Raise the vehicle.

(7) Each bearing insert is fitted to its respective journal to obtain the specified clearance between the bearing and the journal. In production, the select fit is obtained by using various-sized, color-coded bearing inserts as listed in the Connecting Rod Bearing Fitting Chart. The color code appears on the edge of the bearing insert. The size is not stamped on inserts used for production of engines.

(8) The rod journal is identified during the engine production by a color-coded paint mark on the adjacent cheek or counterweight toward the flange (rear) end of the crankshaft. The color codes used to indicate journal sizes are listed in the Connecting Rod Bearing Fitting Chart.

(9) When required, upper and lower bearing inserts of different sizes may be used as a pair (refer to Connecting Rod Bearing Fitting Chart). A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce clearance 0.013 mm (0.0005 inch).

CAUTION: DO NOT intermix bearing caps. Each connecting rod and bearing cap are stamped with the cylinder number. The stamp is located on a machined surface adjacent to the oil squirt hole that faces the camshaft side of the cylinder block.

(10) Install the connecting rod bearing caps and inserts in the same positions as removed.

CAUTION: Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(11) Install main bearing cap brace (Fig. 76). Tighten nuts to 47 N·m (35 ft. lbs.).

(12) Install the oil pan and gaskets as outlined in the installation procedure.

(13) Lower the vehicle.

(14) Install the engine cylinder head, push rods, rocker arms, bridges, pivots and engine cylinder head cover.

(15) Fill the crankcase with engine oil.

CRANKSHAFT OIL SEALS—REAR

The crankshaft rear main bearing oil seal consists of two half pieces of viton with a single lip that effectively seals the rear of the crankshaft. Replace the upper and lower seal halves as a unit to ensure leak-free operation.

REMOVAL

(1) Remove transmission inspection cover.

(2) Remove oil pan. Refer to procedure in this section

(3) Remove main bearing cap brace.

(4) Remove rear main bearing cap (No.7).

(5) Push upper seal out of the groove. Ensure that the crankshaft and seal groove are not damaged.

(6) Remove lower half of the seal from the bearing cap.

INSTALLATION

(1) Wipe the seal surface area of the crankshaft until it is clean.

(2) Apply a thin coat of engine oil.

(3) Coat lip of the seal with engine oil.

(4) Carefully position the upper seal into the groove in the cylinder block. The lip of the seal faces toward the front of the engine.

(5) Apply Mopar® Gasket Maker sealer on both sides of cylinder block as shown in (Fig. 80). The dab of sealer should be 3 mm (0.125 in.) in diameter.

(6) Apply Mopar® Gasket Maker on the rear bearing cap (Fig. 80). The bead should be 2.3 mm (0.09 in.) in diameter. DO NOT apply sealer to the lip of the seal.

(7) Position the lower seal into the bearing cap recess and seat it firmly. Be sure the seal is flush with the cylinder block pan rail.

(8) Coat the outer curved surface of the lower seal with soap and the lip of the seal with engine oil.

(9) Install the rear main bearing cap. DO NOT strike the cap more than twice for proper engagement.

(10) Tighten all main bearing bolts to 108 N·m (80 ft. lbs.) torque.

(11) Install the main bearing cap brace. Tighten nuts to 47 N·m (35 ft. lbs.).

(12) Install the oil pan gasket and oil pan. Tighten 1/4 – 20 screws to 14 N·m (120 in. lbs.). Tighten 5/16 – 18 screws to 18 N·m (156 in. lbs.)

REMOVAL AND INSTALLATION (Continued)

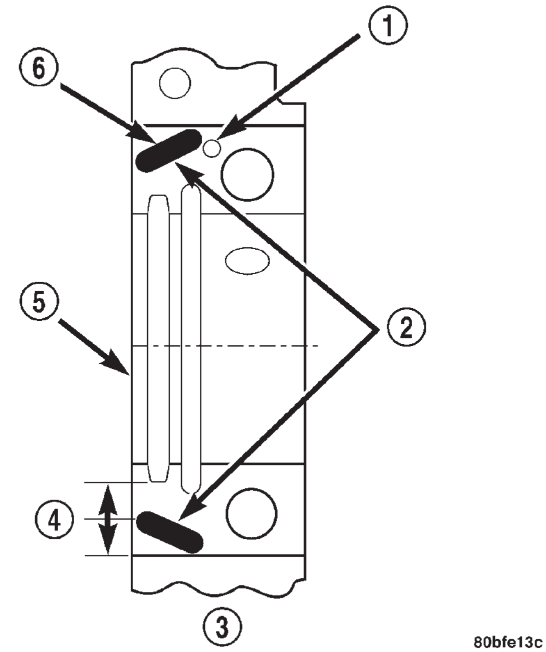


Fig. 80 Location of Sealer

1 – DOWEL
2 – SEALER LOCATIONS
3 – CYLINDER BLOCK
4 – HALFWAY BETWEEN
5 – REAR FACE OF CYLINDER BLOCK
6 – 3mm (0.125 in.)

(13) Apply Mopar® Silicone Rubber Adhesive Sealant on cylinder block to rear main bearing cap corners and cylinder block to front cover joints (four places) (Fig. 81)

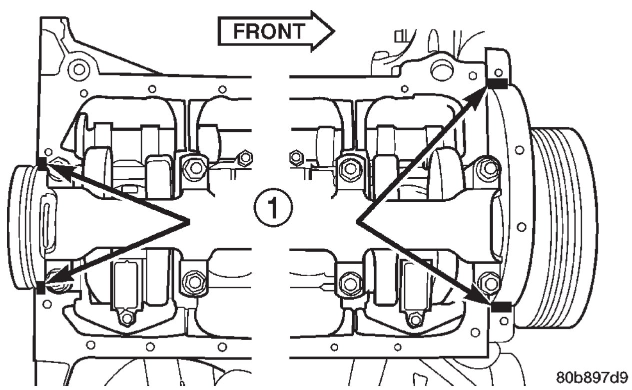


Fig. 81 Oil Pan Sealer Location

1 – SEALER LOCATIONS

(14) Install transmission inspection cover.

OIL PUMP

A gear-type oil pump is mounted at the underside of the cylinder block opposite the No.4 main bearing.

The pump incorporates a nonadjustable pressure relief valve to limit maximum pressure to 517 kPa (75 psi). In the relief position, the valve permits oil to bypass through a passage in the pump body to the inlet side of the pump.

Oil pump removal or replacement will not affect the distributor timing because the distributor drive gear remains in mesh with the camshaft gear.

REMOVAL

(1) Drain the engine oil.

(2) Remove the oil pan.

(3) Remove the pump-to-cylinder block attaching bolts. Remove the pump assembly with gasket (Fig. 82).

CAUTION: If the oil pump is not to be serviced, DO NOT disturb position of oil inlet tube and strainer assembly in pump body. If the tube is moved within the pump body, a replacement tube and strainer assembly must be installed to assure an airtight seal.

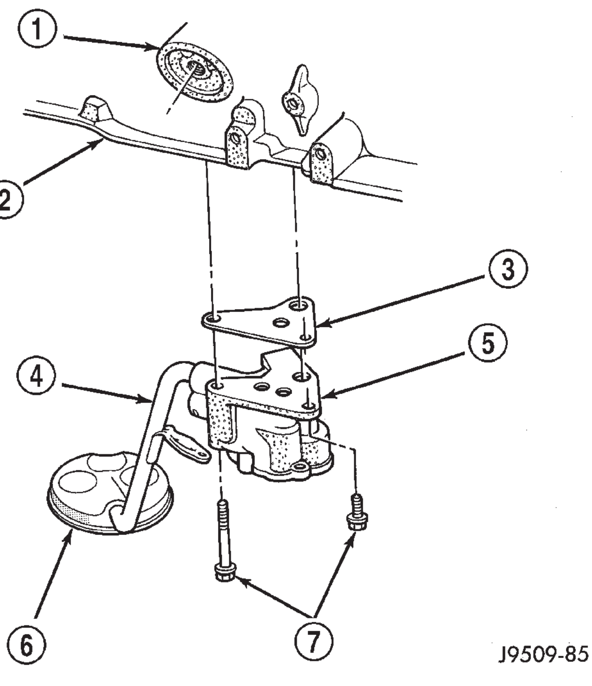


Fig. 82 Oil Pump Assembly

1 – OIL FILTER ADAPTOR
2 – BLOCK
3 – GASKET
4 – OIL INLET TUBE
5 – OIL PUMP
6 – STRAINER ASSEMBLY
7 – ATTACHING BOLTS

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install the oil pump on the cylinder block using a replacement gasket. Tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(2) Install the oil pan.

(3) Fill the oil pan with oil to the specified level.

TIMING CASE COVER OIL SEAL

This procedure is done with the timing case cover installed.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt.

(3) Remove the vibration damper.

(4) Remove the radiator shroud.

(5) Carefully remove the oil seal. Make sure seal bore is clean.

INSTALLATION

(1) Position the replacement oil seal on Timing Case Cover Alignment and Seal Installation Tool 6139 with seal open end facing inward. Apply a light film of Perfect Seal, or equivalent, on the outside diameter of the seal. Lightly coat the crankshaft with engine oil.

(2) Position the tool and seal over the end of the crankshaft and insert a draw screw tool into Seal Installation Tool 6139 (Fig. 83). Tighten the nut against the tool until it contacts the cover.

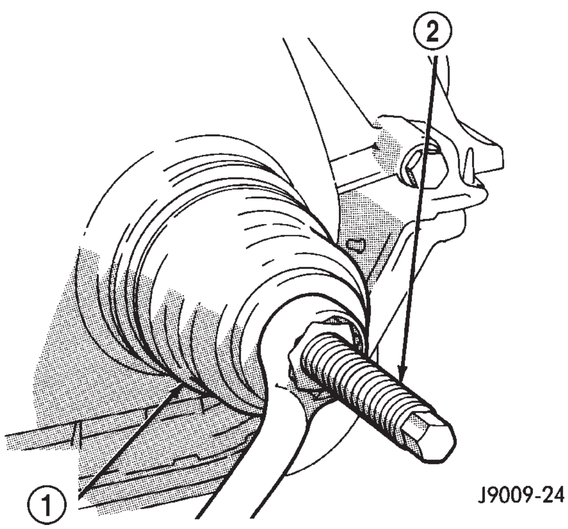


Fig. 83 Timing Case Cover Oil Seal Installation

1 – SEAL INSTALLATION TOOL
2 – DRAW SCREW TOOL

(3) Remove the tools. Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(4) Apply Mopar Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper, washer and bolt. Lubricate and tighten the bolt to 108 N·m (80 ft. lbs.) torque.

(5) Install the serpentine belt and tighten to the specified tension (refer to Group 7, Cooling Systems for the proper specifications and procedures).

(6) Install the radiator shroud.

(7) Connect negative cable to battery.

DISASSEMBLY AND ASSEMBLY

CYLINDER BLOCK

DISASSEMBLY

Refer to the applicable sections for detailed instructions.

(1) Drain the engine oil. Remove and discard the oil filter.

(2) Remove the water pump from the cylinder block.

(3) Remove the vibration damper.

(4) Remove the timing case cover and lay the cover upside down.

(5) Position a drift punch into the slot in the back of the cover and tap the old seal out.

(6) Remove the oil slinger from crankshaft.

(7) Remove the camshaft retaining bolt and remove the sprockets and chain as an assembly.

(8) Remove the camshaft.

(9) Remove the oil pan and gasket.

(10) Remove the front and rear oil galley plugs.

(11) Remove the oil pump.

(12) Remove the connecting rods and the pistons. Remove the connecting rod and piston assemblies through the top of the cylinder bores.

(13) Remove the crankshaft.

ASSEMBLY

Refer to the applicable sections for detailed instructions.

(1) Install the crankshaft.

(2) Install the connecting rods and the pistons through the top of the cylinder bores.

(3) Install the oil pump.

(4) Install the oil pan and gasket.

(5) Install the camshaft.

(6) Install the sprockets and chain as an assembly.

(7) Install the oil slinger from the crankshaft.

(8) Install the timing case cover seal.

(9) Install the timing case cover.

(10) Install the vibration damper.

(11) Install the water pump. Tighten the mounting bolts to 31 N·m (23 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Lubricate the oil filter seal with clean engine oil. Tighten oil filter to 18 N·m (156 in. lbs.) torque.

(13) Install the engine into the vehicle.

(14) Fill the engine with clean lubrication oil (refer to Group 0, Lubrication and Maintenance).

(15) Fill the cooling system.

CLEANING AND INSPECTION

CYLINDER HEAD

CLEANING

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and engine exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and block mating surfaces.

CYLINDER HEAD COVER

CLEANING

Remove any original sealer from the cover sealing surface of the engine cylinder head and clean the surface using a fabric cleaner.

Remove all residue from the sealing surface using a clean, dry cloth.

INSPECTION

Inspect the engine cylinder head cover for cracks. Replace the cover, if cracked.

The original dark grey gasket material should NOT be removed. If sections of the gasket material are missing or are compressed, replace the engine cylinder head cover. However, sections with minor damage such as small cracks, cuts or chips may be repaired with a hand held applicator. The new material must be smoothed over to maintain gasket height. Allow the gasket material to cure prior to engine cylinder head cover installation.

ROCKER ARMS AND PUSH RODS

CLEANING

Clean all the components with cleaning solvent.

Use compressed air to blow out the oil passages in the rocker arms and push rods.

INSPECTION

Inspect the pivot surface area of each rocker arm. Replace any that are scuffed, pitted, cracked or excessively worn.

Inspect the valve stem tip contact surface of each rocker arm and replace any rocker arm that is deeply pitted.

Inspect each push rod end for excessive wear and replace as required. If any push rod is excessively worn because of lack of oil, replace it and inspect the corresponding hydraulic tappet for excessive wear.

Inspect the push rods for straightness by rolling them on a flat surface or by shining a light between the push rod and the flat surface.

A wear pattern along the length of the push rod is not normal. Inspect the engine cylinder head for obstruction if this condition exists.

HYDRAULIC TAPPETS

CLEANING

Clean each tappet assembly in cleaning solvent to remove all varnish, gum and sludge deposits.

INSPECTION

Inspect for indications of scuffing on the side and base of each tappet body.

Inspect each tappet base for concave wear with a straightedge positioned across the base. If the base is concave, the corresponding lobe on the camshaft is also worn. Replace the camshaft and defective tappets.

After cleaning and inspection, test each tappet for specified leak-down rate tolerance to ensure zero-lash operation (Fig. 84).

Swing the weighted arm of the hydraulic valve tappet tester away from the ram of the Leak-Down Tester.

(1) Place a 7.925-7.950 mm (0.312-0.313 inch) diameter ball bearing on the plunger cap of the tappet.

(2) Lift the ram and position the tappet (with the ball bearing) inside the tester cup.

(3) Lower the ram, then adjust the nose of the ram until it contacts the ball bearing. DO NOT tighten the hex nut on the ram.

(4) Fill the tester cup with hydraulic valve tappet test oil until the tappet is completely submerged.

(5) Swing the weighted arm onto the push rod and pump the tappet plunger up and down to remove air. When the air bubbles cease, swing the weighted arm away and allow the plunger to rise to the normal position.

(6) Adjust the nose of the ram to align the pointer with the SET mark on the scale of the tester and tighten the hex nut.

CLEANING AND INSPECTION (Continued)

(7) Slowly swing the weighted arm onto the push rod.

(8) Rotate the cup by turning the handle at the base of the tester clockwise one revolution every 2 seconds.

(9) Observe the leak-down time interval from the instant the pointer aligns with the START mark on the scale until the pointer aligns with the 0.125 mark. A normally functioning tappet will require 20-110 seconds to leak-down. Discard tappets with leak-down time interval not within this specification.

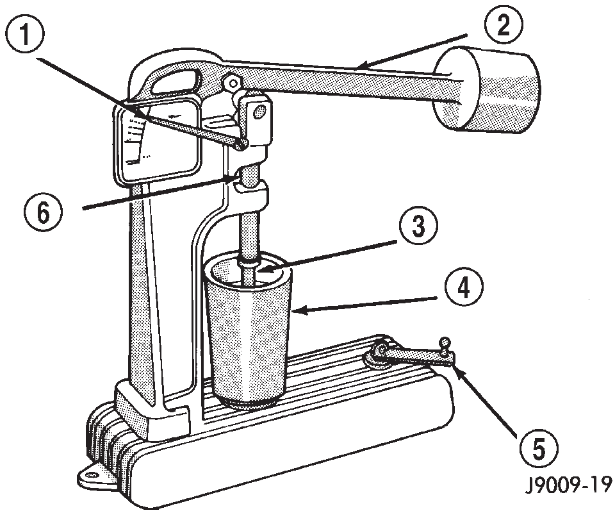


Fig. 84 Leak-Down Tester

1 – POINTER
2 – WEIGHTED ARM
3 – RAM
4 – CUP
5 – HANDLE
6 – PUSH ROD

CYLINDER BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 34 N·m (25 ft. lbs.) torque.

INSPECTION

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter (Fig. 85). To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

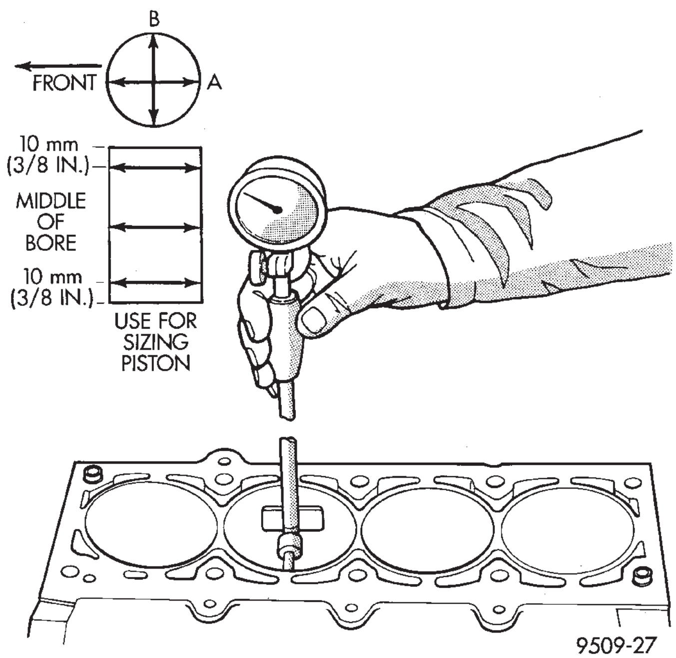


Fig. 85 Cylinder Bore Measurement

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

(6) Determine out-of-roundness by comparing the difference between each measurement.

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder must be bored and then honed to accept an oversize piston. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

SPECIFICATIONS

SPECIFICATIONS

4.0L ENGINE

DESCRIPTION	SPECIFICATION
Engine Type	In-line 6 Cylinder
Bore and Stroke	98.4 x 86.69 mm (3.88 x 3.413 in.)
Displacement	4.0L (242 cu. in.)
Compression Ratio	8.8:1
Firing Order	1–5–3–6–2–4
Lubrication	Pressure Feed–Full Flow Filtration
Cooling System	Liquid Cooled–Forced Circulation
Cylinder Block	Cast Iron
Crankshaft	Cast Nodular Iron
Cylinder Head	Cast Iron
Camshaft	Cast Iron
Pistons	Aluminum Alloy
Combustion Chamber	Dual-Quench
Connecting Rods	Cast Malleable Iron
CAMSHAFT	
Hydraulic Tappet Clearance	Zero Lash
Bearing Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Bearing Journal Diameter	
No. 1	51.54 to 51.56 mm (2.029 to 2.030 in.)
No. 2	51.28 to 51.31 mm (2.019 to 2.020 in.)
No. 3	51.03 to 51.05 mm (2.009 to 2.010 in.)
No. 4	50.78 to 50.80 mm (1.999 to 2.000 in.)
Base Circle Runout (MAX)	0.03 mm (0.001 in.)
Valve Lift	
Intake	10.350 mm (0.4075 in.)
Exhaust	10.528 mm (0.4145 in.)
Valve Timing	
Intake	
Opens	12.4° BTDC
Closes	60.9° ABDC
Exhaust	
Opens	49.8 BBDC
Closes	29.2° ATDC
Valve Overlap	41.6°
Intake Duration	253.3°
Exhaust Duration	259.°
CRANKSHAFT	
End Play	0.038 to 0.165 mm (0.0015 to 0.0065 in.)
Main Bearing Journal Diameter	
No. 1-6	63.489 to 63.502 mm (2.4996 to 2.5001 in.)
No. 7	63.449 to 63.487 mm (2.4980 to 2.4995 in.)
Main Bearing Journal Width	
No. 1	27.58 to 27.89 mm (1.086 to 1.098 in.)
No. 3	32.28 to 32.33 mm (1.271 to 1.273 in.)
No. 2-4-5-6-7	30.02 to 30.18 mm (1.182 to 1.188 in.)
Main Bearing Clearance	0.03 to 0.06 mm (0.001 to 0.0025 in.)
Preferred	0.051 mm (0.002 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Connecting Rod Journal Diameter	53.17 to 53.23 mm (2.0934 to 2.0955 in.)
Connecting Rod Journal Width	27.18 to 27.33 mm (1.070 to 1.076 in.)
Out-of-Round (MAX)	0.013 mm (0.0005 in.)
Taper (MAX)	0.013 mm (0.0005 in.)
CYLINDER BLOCK	
Deck Height	240.03 to 240.18 mm (9.450 to 9.456 in.)
Deck Clearance (Below Block)	0.546 mm (0.0215 in.)
Cylinder Bore Diameter	
Standard	98.45 to 98.48 mm (3.8759 to 3.8775 in.)
Taper	0.025 mm (0.001 in.)
Out-ofRound	0.025 mm (0.001 in.)
Tappet Bore Diameter	23.000 to 23.025 mm (0.9055 to 0.9065 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max.	0.20 mm max. for total length (0.008 in. max. for total length)
Main Bearing Bore Diameter	68.3514 to 68.3768 mm (2.691 to 2.692 in.)
CONNECTING ROD	
Total Weight (Less Bearing)	663 to 671 grams (23.39 to 23.67 oz.)
Length (Center-to-Center)	155.52 to 155.62 mm (6.123 to 6.127 in.)
Piston Pin Bore Diameter	23.59 to 23.62 mm (0.9288 to 0.9298 in.)

DESCRIPTION	SPECIFICATION
Bore (Less Bearings)	56.08 to 56.09 mm (2.2080 to 2.2085 in.)
Bearing Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Preferred	0.044 to 0.050 mm (0.0015 to 0.0020 in.)
Side Clearance	0.25 to 0.48 mm (0.010 to 0.019 in.)
Twist (Max.)	0.002 mm per mm (0.002 in. per inch)
Bend (Max.)	0.002 mm per mm (0.002 in. per inch.)
CYLINDER COMPRESSION PRESSURE	
Pressure Range	827 to 1,034 kPa (120 to 150 psi)
Max. Variation Between Cylinders	206 kPa (30 psi)
CYLINDER HEAD	
Combustion Chamber	55.22 to 58.22 cc (3.37 to 3.55 cu. in.)
Valve Guide I. D. (Integral)	7.95 to 7.97 mm (0.313 to 0.314 in.)
Valve Stem-to-Guide Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Valve Seat Angle	
Intake	44.5°
Exhaust	44.5°
Valve Seat Width	1.02 to 1.52 mm (0.040 to 0.060 in.)
Valve Seat Runout	0.064 mm (0.0025 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Flatness Max.	0.20 mm - max. for total length (0.008 in. max. for total length)
ROCKER ARMS, PUSH RODS & TAPPETS	
Rocker Arm Ratio	1.6:1
Push Rod Length (Pink)	244.856 to 245.364 mm (9.640 to 9.660 in.)
Push Rod Diameter	7.92 to 8.00 mm (0.312 to 0.315 in.)
Hydraulic Tappet Diameter	22.962 to 22.974 mm (0.904 to 0.9045 in.)
Tappet-to-Bore Clearance	0.025 to 0.063 mm (0.001 to 0.0025 in.)
VALVES	
Valve Length (Overall)	
Intake	122.479 to 122.860 mm (4.822 to 4.837 in.)
Exhaust	122.860 to 123.241 mm (4.837 to 4.852 in.)
Valve Stem Diameter	7.899 to 7.925 mm (0.311 to 0.312 in.)
Stem-to-Guide Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Valve Head Diameter	
Intake	48.387 to 48.641 mm (1.905 to 1.915 in.)
Exhaust	37.973 to 38.227 mm (1.495 to 1.505 in.)
Valve Face Angle	
Intake	46.5°
Exhaust	46.5°
Tip Refinishing (Max. Allowable)	0.25 mm (0.010 in.)

DESCRIPTION	SPECIFICATION
VALVE SPRINGS	
Free Length (Approx.)	47.65 mm (1.876 in.)
Spring Load	
Valve Closed	316 to 351 N @ 41.656 mm (71 to 79 lbf. @ 1.64 in.)
Valve Open	898.6 to 969.7 N @ 30.89 mm (202 to 218 lbf @ 1.216 in.)
Inside Diameter	21.0 mm to 21.51 mm (0.827 to 0.847 in.)
Installed Height	41.656 mm (1.64 in.)
PISTONS	
Weight (Less Pin)	417 to 429 grams (14.7 to 15.1 oz.)
Piston Pin Bore (Centerline to Piston Top)	40.61 to 40.72 mm (1.599 to 1.603 in.)
Piston-to-Bore Clearance	0.018 to 0.038 mm (0.0008 to 0.0015 in.)
Ring Gap Clearance	
Top Compression Ring	0.229 to 0.610 mm (0.0090 to 0.0240 in.)
2nd Compression Ring	0.483 to 0.965 mm (0.0190 to 0.0380 in.)
Oil Control Steel Rails	0.254 to 1.500 mm (0.010 to 0.060 in.)
Ring Side Clearance	
Compression Rings	0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Oil Control Rings	0.06 to 0.21 mm (0.0024 to 0.0083 in.)
Piston Ring Groove Height	
Compression Rings	1.530 to 1.555 mm (0.0602 to 0.0612 in.)
Oil Control Ring	4.035 to 4.060 mm (0.1589 to 0.1598 in.)

SPECIFICATIONS (Continued)

DESCRIPTION	SPECIFICATION
Piston Ring Groove Diameter	
No.1 Compression Ring	88.39 to 88.65 mm (3.48 to 3.49 in.)
No.2 Compression Ring	87.63 to 87.88 mm (3.45 to 3.46 in.)
Oil Control Ring	89.66 to 89.92 mm (3.53 to 3.54 in.)
Piston Pin Bore Diameter	23.650 to 23.658 mm (0.9312 to 0.9315 in.)
Piston Pin Diameter	23.637 to 23.640 mm (0.9306 to 0.9307 in.)
Piston-to-Pin Clearance	0.0102 to 0.0208 mm (0.0005 to 0.0009 in.)
Piston-to-Pin Connecting Rod (Press Fit)	8.9 kN (2000 lbf.)
OIL PUMP	
Gear-to-Body Clearance	0.051 to 0.102 mm
(Radial)	(0.002 to 0.004 in.)
Gear-to-Body Clearance (Radial) Preferred	0.051 mm (0.002 in.)
Gear End Clearance Plastigage	0.051 to 0.152 mm (0.002 to 0.006 in.)
Gear End Clearance Plastigage (Preferred)	0.051 mm (0.002 in.)
Gear End Clearance Feeler Gauge	0.1016 to 0.2032 mm (0.004 to 0.008 in.)
Gear End Clearance Feeler Gauge (Preferred)	0.1778 mm (0.007 in.)
Oil Pressure	
At Idle Speed	89.6 kPa (13 psi)
At 1600 rpm & Higher	255 to 517 kPa (37 to 75 psi)
Oil Pressure Relief	517 kPa (75 psi)

TORQUE SPECIFICATIONS

4.0L ENGINE

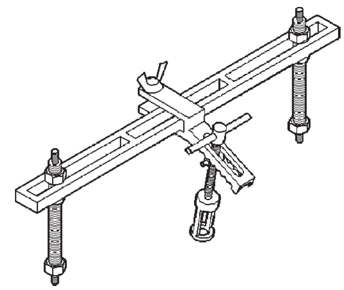
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
A/C Compressor—Bolts	28	—	250
Block Heater—Nut	2	—	16
Camshaft Sprocket—Bolt	68	50	—
Camshaft Thrust Plate to Cylinder Block—Screws	24	18	—
Clutch Cover to Flywheel—Bolts	54	40	—
Coil Bracket to Block—Bolts	22	—	192
Connecting Rod—Nuts	45	33	—
Cylinder Block—Drain Plugs	34	25	—
Cylinder Head—Bolts	135	100	—
Cylinder Head Cover—Bolts	10	—	85
Distributor Clamp—Bolts	23	—	204
Engine Mounts—Front			
Support Bracket Bolts	61	45	—
Support Cushion Bolts/Nuts	41	30	—
Support Cushion Bracket Bolts	54	40	—
Support Cushion Bracket Stud Nuts	41	30	—
Support Cushion Thru-Bolt	65	48	—
Engine Mounts—Rear			
Crossmember to Sill Bolts—(Automatic)	41	30	—
Insulator Stud Assembly—Nut	41	30	—
Support Cushion/Crossmember—Nuts	22	—	192
Support Cushion/Bracket—Nuts (Manual)	75	55	—
Transmission Support Bracket—Bolt (Manual)	46	34	—
Transmission Support Bracket/Cushion—Bolt (4WD Auto)	75	55	—
Transmission Support Adaptor Bracket—Bolts (2WD Auto)	75	55	—
Exhaust Manifold/Pipe—Nuts	27	20	—

SPECIFICATIONS (Continued)

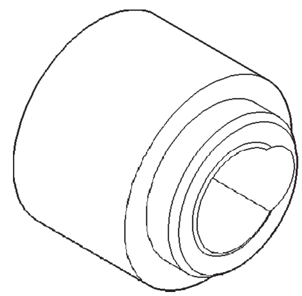
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Intake/Exhaust Manifold			
Fasteners #1-5	33	24	—
Fasteners #6 and 7	14	—	126
Fasteners #8-11	33	24	—
Flywheel to Converter Housing—Bolts	38	28	—
Flywheel to Crankshaft—Bolts	143	105	—
Front Cover to Block—Bolts			
1/4-20	7	—	60
5/16-18	22	—	192
Fuel Rail—Bolts/Stud	12	—	108
Generator—Bolts	57	42	—
Generator Bracket to Engine—Bolts	47	35	—
Idler Pulley to Cylinder Head—Bolt	47	35	—
Main Bearing Cap—Bolts	108	80	—
Oil Filter	18	—	156
Oil Filter Connector to			
Adaptor	47	35	—
Block	68	50	—
Adaptor Bolts	102	50	—
Oil Galley—Plug	41	30	—
Oil Pan—Bolts			
1/4-20	9.5	—	84
5/16-18	15	—	132
Oil Pan—Drain Plug	34	25	—
Oil Pump			
Mounting Bolts	23	—	204
Cover Bolts	8	—	70
Rocker Arm Assembly to Cylinder			
Head—Capscrews	30	21	—
Spark Plugs	37	27	—
Starter Motor—Mounting Bolts	45	33	—
Thermostat Housing—Bolts	18	—	156
Throttle Body—Bolts	10	—	90
Vibration Damper—Bolt	108	80	—
Water Pump to Block—Bolts	23	17	—

SPECIAL TOOLS

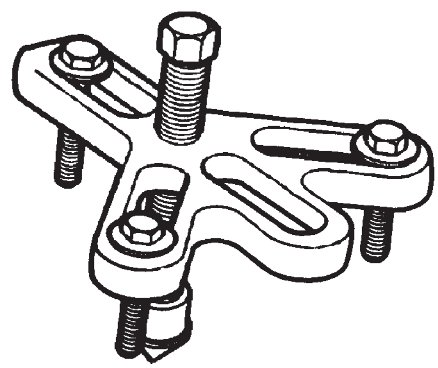
4.0L ENGINE



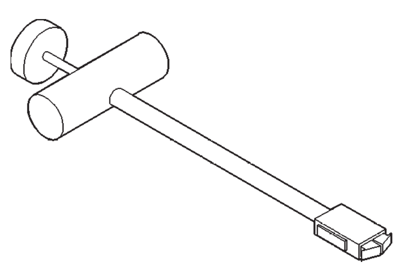
Valve Spring Compressor Tool MD-998772A



Timing Case Cover Alignment and Seal installation Tool 6139



Vibration Damper Removal Tool 7697



Hydraulic Valve Tappet Removal/Installation Tool C-4129–A

EXHAUST SYSTEM

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DESCRIPTION AND OPERATION

EXHAUST SYSTEM

DESCRIPTION

The basic exhaust system consists of exhaust manifold(s), exhaust pipe with oxygen sensors, catalytic converter(s), heat shield(s), muffler and tailpipe (Fig. 1) (Fig. 2) (Fig. 3)

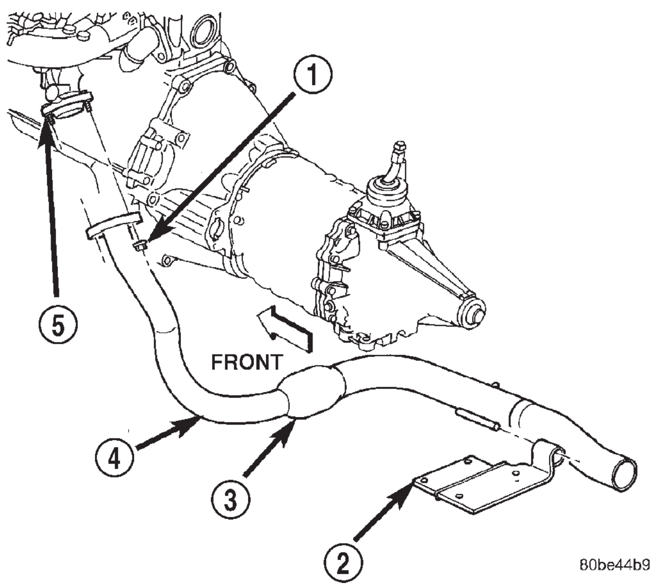

Fig. 1 Exhaust Pipe—2.5L

1 – NUT
2 – TRANSMISSION SUPPORT
3 – MINI CATALYTIC CONVERTER
4 – EXHAUST PIPE
5 – EXHAUST MANIFOLD

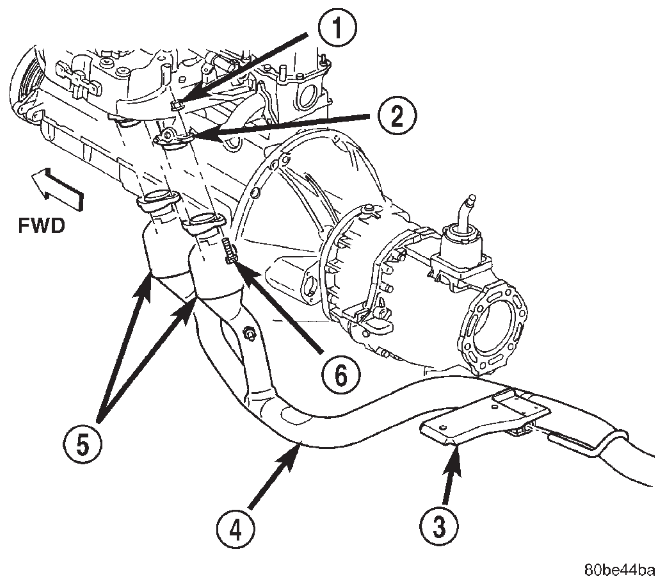

Fig. 2 Exhaust Pipe—4.0L

1 – NUT
2 – EXHAUST MANIFOLD
3 – TRANSMISSION SUPPORT
4 – EXHAUST PIPE
5 – MINI CATALYTIC CONVERTER
6 – BOLT

DESCRIPTION AND OPERATION (Continued)

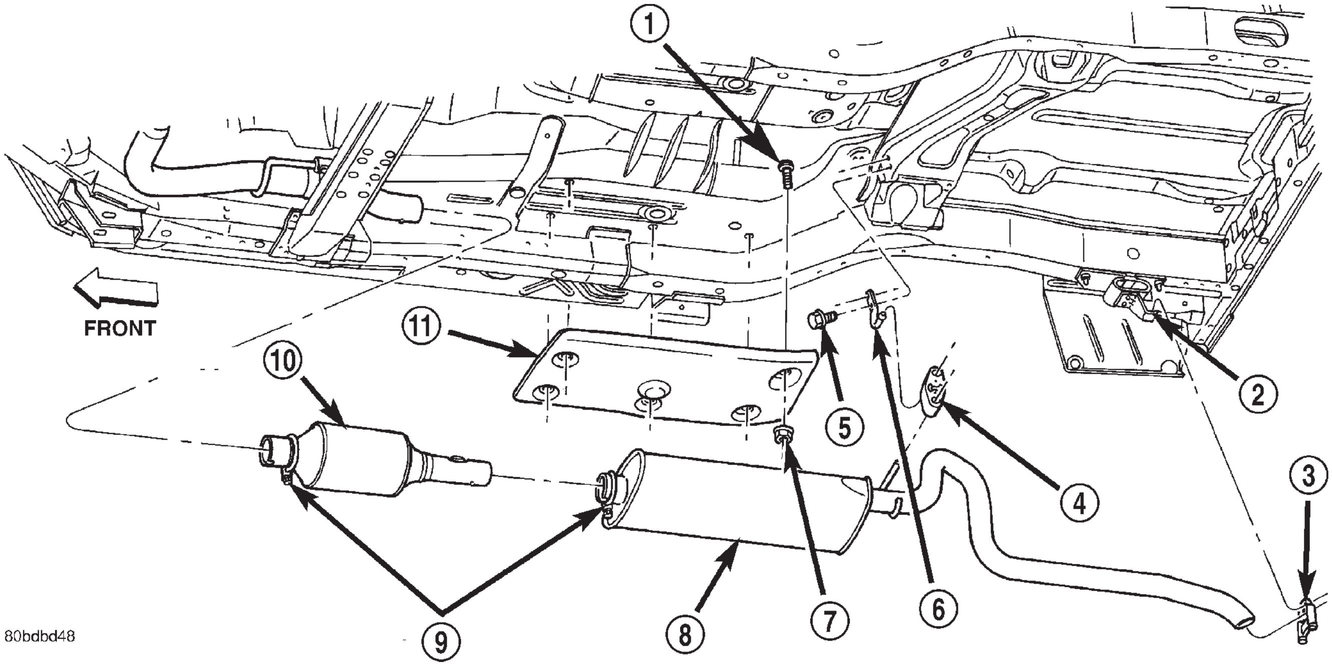

Fig. 3 Exhaust System—Typical

1 – STUD
2 – TAIL PIPE HANGER
3 – CLAMP
4 – ISOLATOR
5 – BOLT
6 – TAIL PIPE HANGER
7 – NUT
8 – MUFFLER
9 – CLAMP
10 – CATALYTIC CONVERTER
11 – HEAT SHIELD

CATALYTIC CONVERTERS

DESCRIPTION

California emissions vehicles incorporate two mini catalytic converters into the exhaust system. These catalytic converters are made of stainless steel designed to operate at extremely high temperatures.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

DESCRIPTION AND OPERATION (Continued)

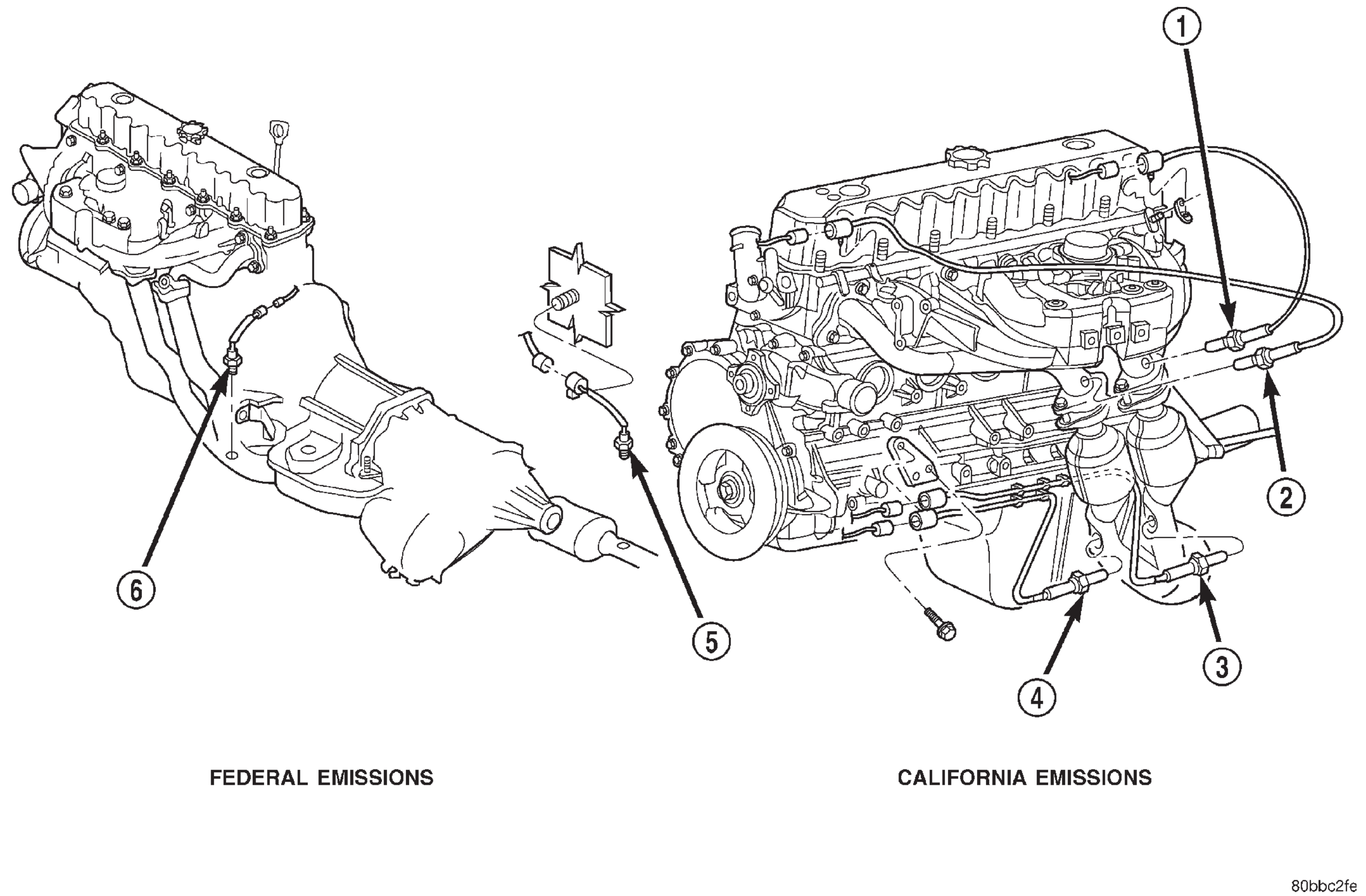

Fig. 4 4.0L Catalytic Converter and O2 Sensor Configuration—(California Emissions only)

1 – O2 SENSOR
2 – O2 SENSOR
3 – O2 SENSOR
4 – O2 SENSOR
5 – O2 SENSOR
6 – O2 SENSOR

Federal emission vehicles use only one catalytic converter, However, California emission vehicles incorporate two mini catalytic converters located after the exhaust manifolds and before the inline catalytic converter (Fig. 4).

MUFFLER

DESCRIPTION

Both the 2.5L and 4.0L engines use a galvanized steel muffler to control exhaust noise levels and exhaust back pressure.

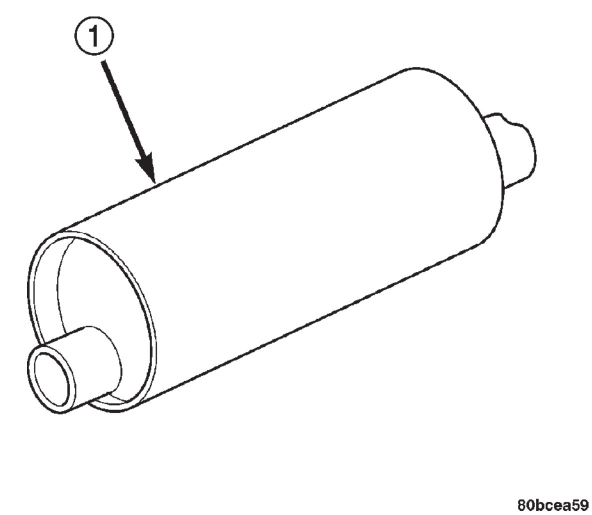

Fig. 5 Muffler—Typical

1 – MUFFLER

DESCRIPTION AND OPERATION (Continued)

TAILPIPE

DESCRIPTION

The tail pipe is also made of galvanized steel.

OPERATION

The tailpipe channels the exhaust out of the muffler and out from under the vehicle to control noise and prevent exhaust gas fumes from entering the passenger compartment.

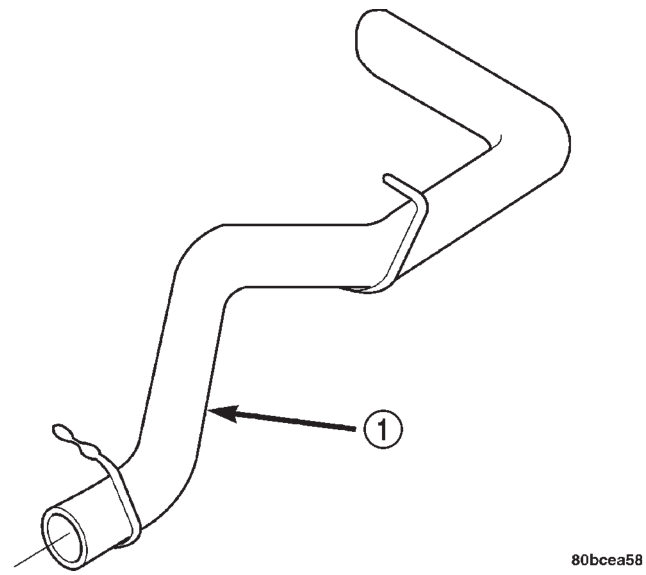

Fig. 6 Tailpipe—Typical

1 – TAILPIPE

DIAGNOSIS AND TESTING

EXHAUST SYSTEM

EXHAUST SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE OR LEAKING EXHAUST GASES	1. Leaks at pipe joints.	1. Tighten clamps/bolts at leaking joints.
	2. Rusted or blown out muffler.	2. Replace muffler. Inspect exhaust system.
	3. Broken or rusted out exhaust pipe.	3. Replace exhaust pipe.
	4. Exhaust pipe leaking at manifold flange.	4. Tighten/replace flange attaching nuts/bolts.
	5. Exhaust manifold cracked or broken.	5. Replace exhaust manifold.
	6. Leak between exhaust manifold and cylinder head.	6. Tighten exhaust manifold to cylinder head bolts.
	7. Catalytic converter rusted or blown out.	7. Replace catalytic converter assy.
	8. Restriction in exhaust system.	8. Remove restriction, if possible. Replace restricted part if necessary.
When servicing and replacing exhaust system components, disconnect the oxygen sensor connector(s). Allowing the exhaust to hang by the oxygen sensor wires will damage the harness and/or sensor.		

REMOVAL AND INSTALLATION

EXHAUST PIPE

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector. Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

REMOVAL

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with Mopar® Rust Penetrant (Fig. 7) (Fig. 8). Allow 5 minutes for penetration.

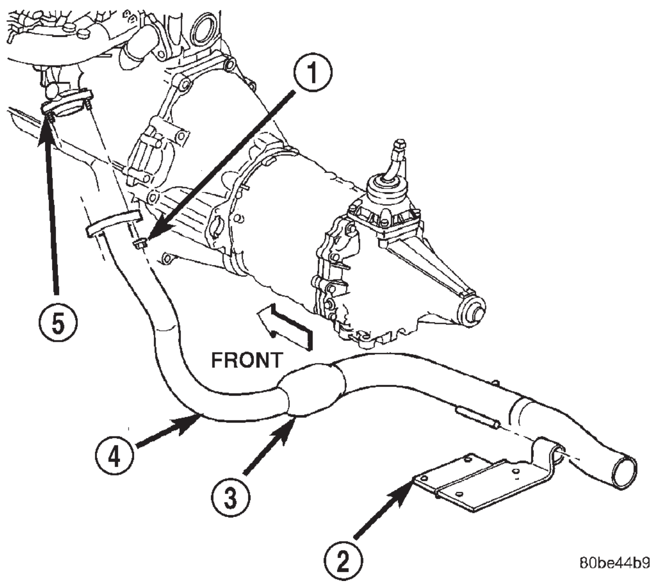

Fig. 7 Exhaust Pipe Removal—2.5L

1 – NUT
2 – TRANSMISSION SUPPORT
3 – MINI CATALYTIC CONVERTER
4 – EXHAUST PIPE
5 – EXHAUST MANIFOLD

(3) Disconnect the oxygen sensor connector(s).

(4) Disconnect the exhaust pipe from the engine exhaust manifold. Discard the seal (4.0L engine, only).

(5) Support the transmission and remove the rear crossmember.

(6) Remove the clamp nuts and clamp. To remove the exhaust pipe from the catalytic converter, apply heat until the metal becomes cherry red. Disconnect the exhaust pipe from the catalytic converter. Remove the exhaust pipe.

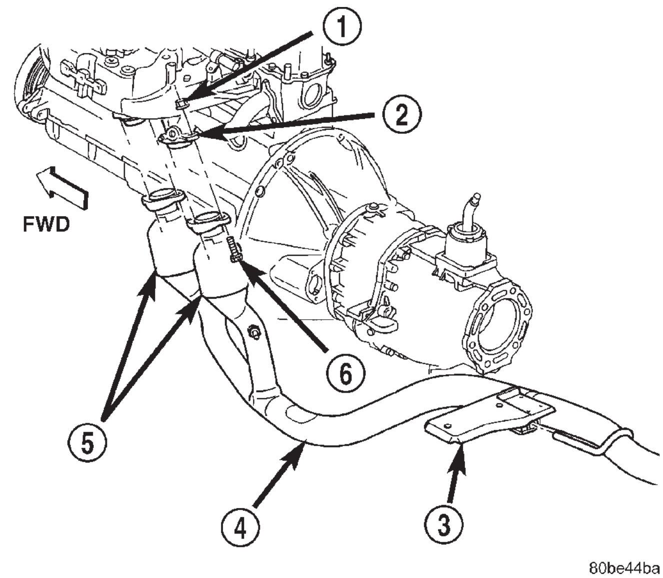

Fig. 8 Exhaust Pipe Removal—4.0L

1 – NUT
2 – EXHAUST MANIFOLD
3 – TRANSMISSION SUPPORT
4 – EXHAUST PIPE
5 – MINI CATALYTIC CONVERTER
6 – BOLT

INSTALLATION

(1) Assemble exhaust pipe to manifold and catalytic converter loosely to permit proper alignment of all parts.

(2) Use a new clamp and tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(3) Connect the exhaust pipe to the engine exhaust manifold (Fig. 7) (Fig. 8). Install a new seal between the exhaust manifold and the exhaust pipe (4.0L engine only). Tighten the nuts to 31 N·m (23 ft. lbs.) torque.

(4) Install the rear crossmember. Install and tighten the four (4) crossmember to rear mount nuts to 22 N·m (16 ft. lbs.) Install and tighten the crossmember to sill bolts to 42 N·m (31 ft. lbs.) torque. Remove the support from the transmission.

(5) Carefully coat the threads on the oxygen sensor(s) with anti-seize compound. Install the sensor and tighten the nut to 27 N·m (20 ft. lbs.) torque.

(6) Lower the vehicle.

(7) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

REMOVAL AND INSTALLATION (Continued)

CATALYTIC CONVERTER

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector. Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the clamps from the catalytic converter and muffler connection (Fig. 9).

(3) Disconnect and remove the oxygen sensor from the catalytic converter.

(4) Heat the catalytic converter and muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(5) While the metal is still cherry red, twist the muffler assembly back and forth to separate it from the catalytic converter.

(6) Disconnect the exhaust pipe from the catalytic converter (Fig. 9). If needed, heat up the pipes to separate.

INSTALLATION

(1) Connect the catalytic converter to the exhaust pipe and the muffler/tailpipe assy. (Fig. 9). Use a new clamp and tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.

(3) Install a new clamp at the muffler and catalytic converter connection (Fig. 9). Tighten the clamp nut to 61 N·m (45 ft. lbs.) torque.

(4) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 27 N·m (20 ft. lbs.) torque.

(5) Lower the vehicle.

(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

MUFFLER AND TAILPIPE

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are either clamped together or welded together.

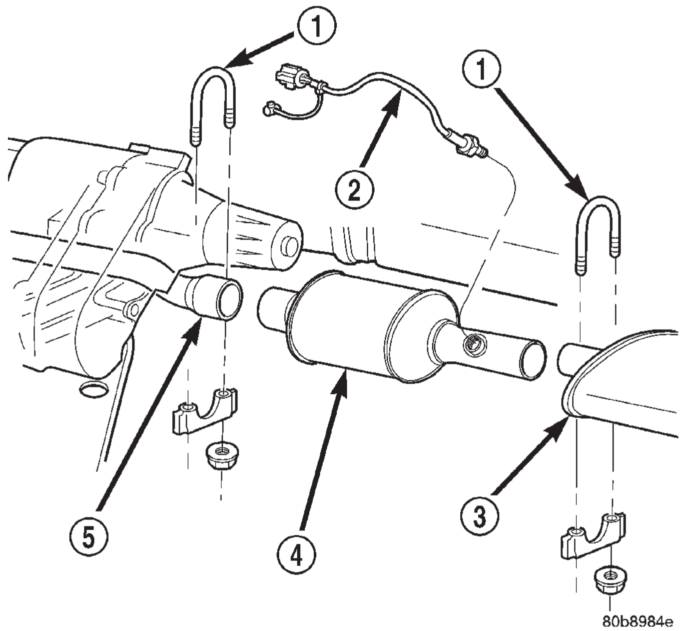

Fig. 9 Catalytic Converter to Muffler and Exhaust Pipe Connection

1 – EXHAUST CLAMP ASSEMBLY
2 – OXYGEN SENSOR
3 – MUFFLER
4 – CATALYTIC CONVERTER
5 – EXHAUST PIPE

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINE.

CAUTION: When servicing exhaust system components, disconnect the oxygen sensor connector. Allowing the exhaust system to hang by the oxygen sensor harness will damage the wiring and/or sensor.

REMOVAL

(1) Raise and support the vehicle.

(2) Disconnect front tailpipe hanger from the insulator (Fig. 10).

(3) Remove the front exhaust clamp from the catalytic converter and muffler connection (Fig. 11).

(4) Heat the catalytic converter-to-muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(5) While the metal is still cherry red, remove the exhaust muffler/tailpipe assembly from the catalytic converter.

(6) Slide the muffler/tailpipe assy. rearward and out of the rear exhaust tailpipe mounting bracket (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

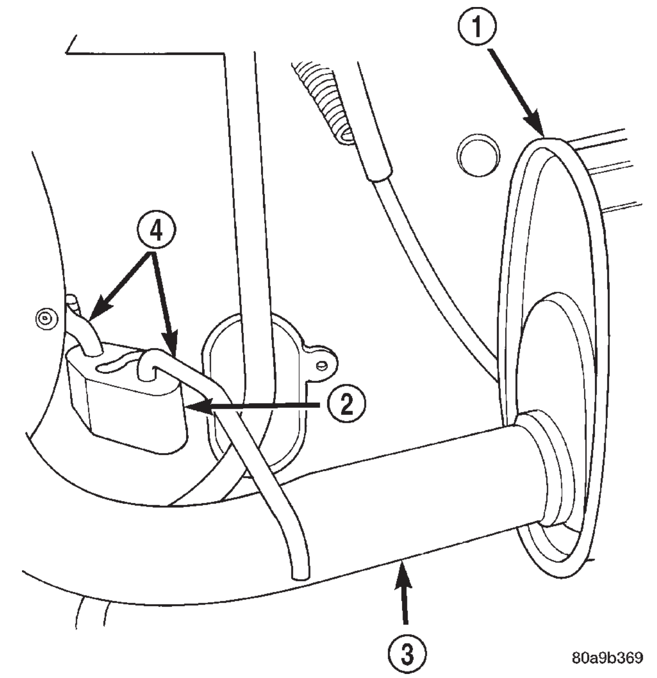

Fig. 10 Front Exhaust Tailpipe Hanger

1 – MUFFLER
2 – INSULATOR
3 – TAILPIPE
4 – FRONT TAILPIPE HANGER

(7) Remove the muffler from the exhaust tailpipe:

- To remove an original equipment exhaust muffler/tailpipe combination, cut the exhaust tailpipe close to the muffler. Collapse the part remaining in the muffler and remove.
- To remove a service exhaust tailpipe/muffler combination, apply heat until the metal becomes cherry red. Remove the exhaust tailpipe/muffler clamp and twist the exhaust tailpipe out of the muffler.

INSTALLATION

(1) Install the muffler onto the catalytic converter. Install the clamp and tighten the nut finger tight.

(2) Install the exhaust tailpipe into the rear of the muffler.

(3) Install the exhaust tailpipe/muffler assembly on the rear exhaust tailpipe mounting bracket. Make sure that the exhaust tailpipe has sufficient clearance from the floor pan.

(4) Install front tailpipe hanger into the insulator (Fig. 10).

(5) Align the muffler and tighten the nuts on the muffler-to-catalytic converter clamp to 61 N·m (45 ft. lbs.) torque (Fig. 11).

(6) Align the tailpipe and install a new clamp at the muffler to tailpipe connection.

(7) Tighten the muffler to tailpipe clamp to 61 N·m (45 ft. lbs.)

(8) Lower the vehicle.

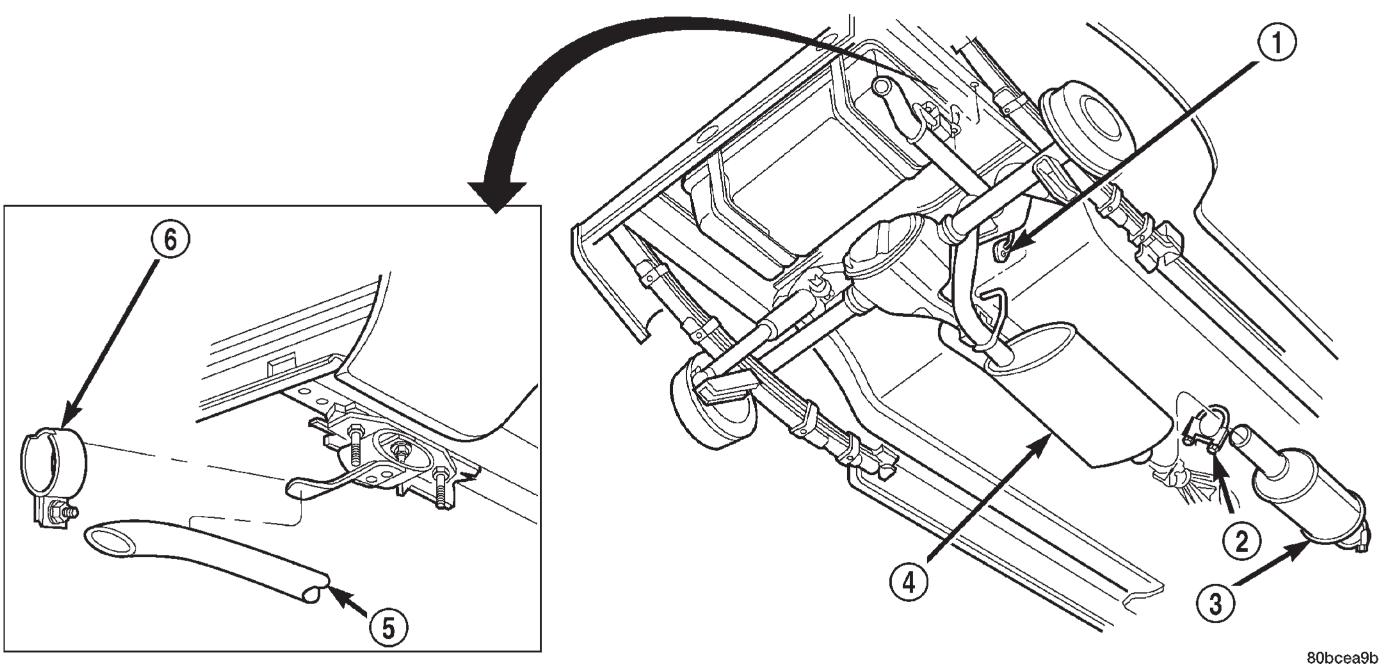

Fig. 11 Muffler/Tailpipe Removal and Installation

1 – MUFFLER AND TAIL PIPE HANGER
2 – CLAMP
3 – CATALYTIC CONVERTER
4 – MUFFLER AND TAIL PIPE ASSEMBLY
5 – TAIL PIPE
6 – TAIL PIPE HANGER CLAMP

REMOVAL AND INSTALLATION (Continued)

(9) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

HEAT SHIELDS

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the screws and/or nuts holding the heat shields to the frame and/or floor pan (Fig. 12).

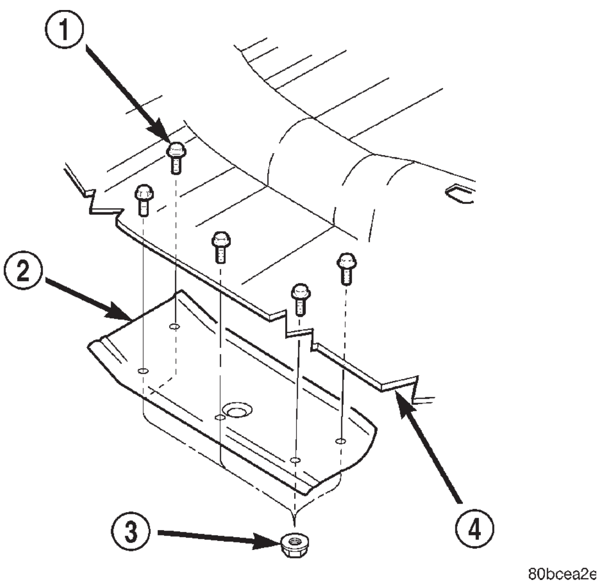

Fig. 12 Heat Shield Removal/Installation

1 – BOLTS
2 – MUFFLER HEAT SHIELD
3 – NUTS
4 – FLOOR PAN

(3) When removing muffler heat shield, the muffler front support bracket must be removed first.
(4) Slide the shields out around the exhaust system.

INSTALLATION

(1) Position the heat shields to the floor pan or the frame and install the screws and/or nuts.
(2) Tighten the nuts and/or screws to 45 N·m (33 ft. lbs.) (Fig. 12).
(3) Lower the vehicle.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Catalytic Converter/Exhaust Pipe			
Exhaust Clamp—Nuts	61	45	—
Crossmember to Sill—Bolts	42	31	—
Crossmember to Transmission Mount—Nuts	22	16	—
Exhaust Pipe to Manifold—Nuts	31	23	—
Exhaust Manifold to Engine 2.5L			
Engine—			
Bolt #1	41	40	—
Bolts #2–5	31	23	—
Nuts #6&7	31	23	—
Exhaust Manifold to Engine 4.0L			
Engine—			
Nuts #6&7	31	23	—
Nuts/Bolts #1,2,3,4,5,8,9,10&11	33	24	—
Muffler to Catalytic Converter—			
Exhaust Clamp Nut	61	45	—
Oxygen Sensors	27	20	—
Rear Tail Pipe Hanger—Nuts	54	40	—

FRAME AND BUMPERS

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DESCRIPTION AND OPERATION

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DESCRIPTION AND OPERATION

FRAME AND BUMPERS

FRAME

DESCRIPTION

Jeep Cherokee vehicles do not have a conventional frame. They are constructed as a unitized body and frame. Jeep unibodies are constructed from special high strength steel and coated metals. This process reduces weight and provides strength to withstand the forces applied against structural members. The structural members provide a unibody that has great structural strength.

BUMPERS

DESCRIPTION

The bumpers on the Jeep Cherokee are made up of the main bumper beam, the end caps, air deflector (front bumper) and mounting brackets. Some Cherokee models also have a tow hook support bracket.

OPERATION

The bumpers are fastened to the unitized body frame rails. The bumper end caps are fastened to the bumper and the body side sheet metal.

BUMPERS

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REMOVAL AND INSTALLATION

FRONT BUMPER END CAP

REMOVAL

(1) Remove the rivet attaching the end cap to the air deflector.

(2) Remove the bolts and nuts attaching the end cap to the bumper (Fig. 1).

(3) Pull back the wheelhouse liner and remove the screws attaching the end cap to the front fender.

(4) Lifting the end cap from the bottom, tilt slightly upward and slide it outward to disengage the retainer tab from the bumper (Fig. 2).

(5) Separate the end cap from the bumper.

INSTALLATION

(1) Position the end cap on the bumper and engage the retaining tab.

(2) Install the screws attaching the end cap to the front fender.

(3) Install the bolts attaching the end cap to the bumper. Tighten the nut to 9 N·m (7 ft. lbs.) torque.

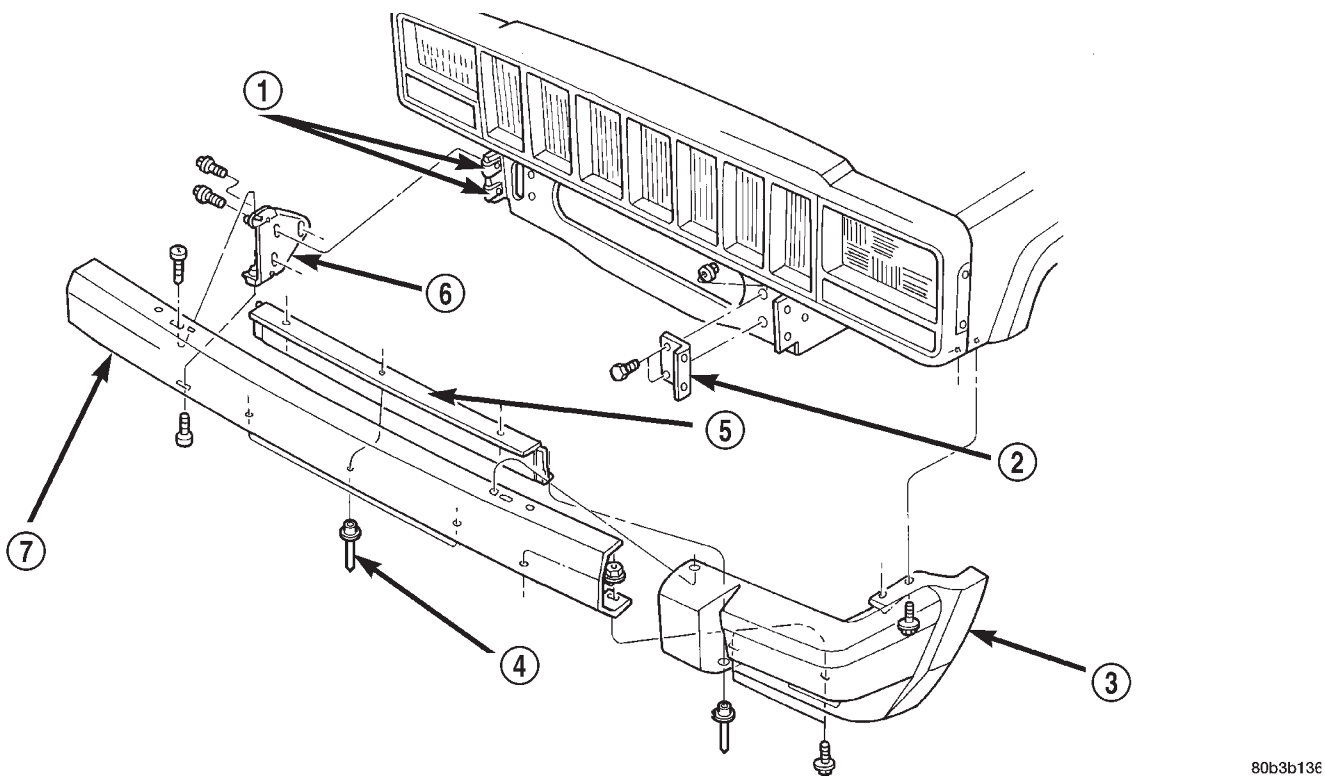

Fig. 1 Front Bumper

1 – U-NUT
2 – TOW HOOK SUPPORT BRACKET
3 – END CAP
4 – RIVET
5 – AIR DEFLECTOR
6 – MOUNTING BRACKET
7 – BUMPER

REMOVAL AND INSTALLATION (Continued)

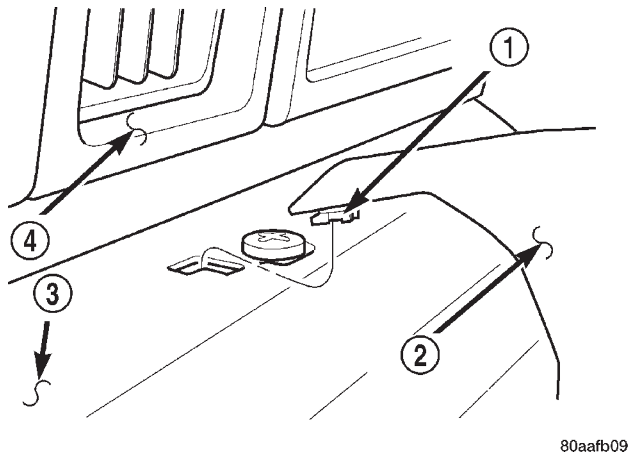

Fig. 2 Bumper End Cap

1 – RETAINER TAB
2 – BUMPER END CAP
3 – BUMPER
4 – GRILLE

(4) Install the rivet attaching the end cap to air deflector.

FRONT BUMPER

REMOVAL

(1) Remove bumper end caps.
(2) If equipped, disengage fog lamp wire harness connectors.
(3) Disconnect vacuum line from reservoir (Fig. 3).
(4) Remove Torx-head bolts that attach bumper to mounting brackets (Fig. 1).
(5) Remove bumper from vehicle.
(6) If necessary, remove bolts attaching bumper mounting brackets to frame.

INSTALLATION

(1) If removed, install bolts attaching bumper mounting brackets to frame. Tighten bolts to 55 N·m (41 ft. lbs.) torque.
(2) Position bumper on front of vehicle.
(3) Install Torx-head bolts that attach bumper to mounting brackets. Tighten bolts to 55 N·m (41 ft. lbs.) torque.
(4) Connect vacuum line to reservoir.
(5) If equipped, engage fog lamp wire harness connectors.
(6) Install bumper end caps.

FRONT TOW HOOK

REMOVAL

(1) Remove bolts attaching tow hook to tow hook reinforcement (Fig. 4).
(2) Separate tow hook from reinforcement.

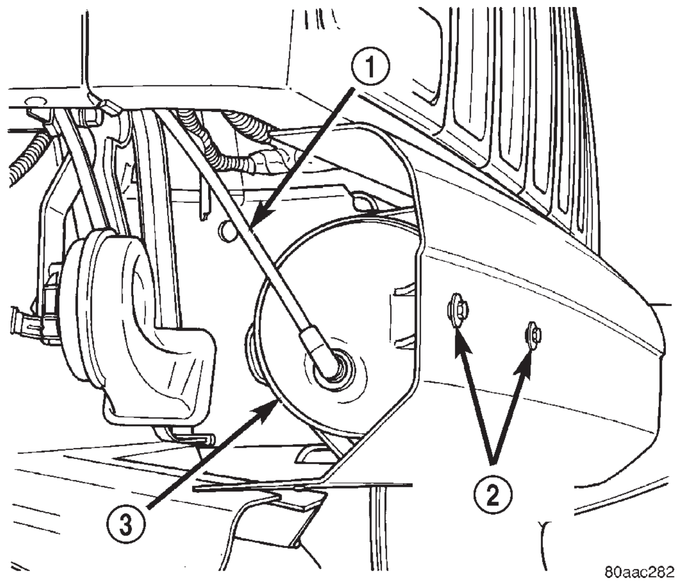

Fig. 3 Vacuum Reservoir

1 – VACUUM LINE
2 – RESERVOIR SCREWS
3 – VACUUM RESERVOIR

(3) If necessary, remove bolt attaching tow hook reinforcement to frame.

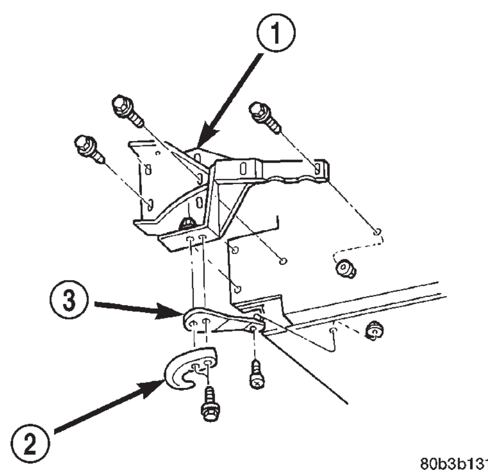

Fig. 4 Front Tow Hook

1 – MOUNTING BRACKET
2 – TOW HOOK
3 – TOW HOOK REINFORCEMENT

INSTALLATION

(1) If removed, install bolt attaching tow hook reinforcement to frame. Tighten bolt to 30 N·m (22 ft. lbs.) torque.
(2) Position tow hook on reinforcement.
(3) Install bolts attaching tow hook to tow hook reinforcement. Tighten bolts to 100 N·m (74 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

REAR BUMPER END CAP

REMOVAL

(1) Remove the screws attaching the bumper end cap to the quarter panel and the bumper (Fig. 5).

(2) Lift the end cap slightly upward and slide it rearward to release it from the retainer.

(3) Separate the end cap from the vehicle.

INSTALLATION

(1) Position the end cap on the rear of the retainer and the outer edge of the bumper.

(2) Slide the end cap forward onto the retainer. Ensure the end cap overlaps the lip of the rear wheelhouse liner.

(3) Install the screw attaching the front of the end cap to the underside of the quarter panel and bumper.

REAR BUMPER

REMOVAL

(1) For vehicles equipped with a trailer hitch, remove hitch before removing bumper. If necessary, refer to removal procedure within Group 13, Frame and Bumpers.

(2) Remove bumper end caps.

(3) Remove upper nuts that attach bumper to bumper support brackets (Fig. 5).

(4) Remove lower bolts that attach bumper to bumper support brackets.

(5) Remove bumper from vehicle.

(6) If necessary, remove bumper support brackets from the rear sill.

INSTALLATION

(1) If removed, install bumper support brackets on the rear sill. Tighten bolts to 55 N·m (41 ft. lbs.) torque.

(2) Position bumper on support brackets.

(3) Install bolts that attach bumper to bumper support brackets. Tighten nuts to 55 N·m (41 ft. lbs.) torque.

(4) Install bumper end caps.

(5) If removed, install trailer hitch.

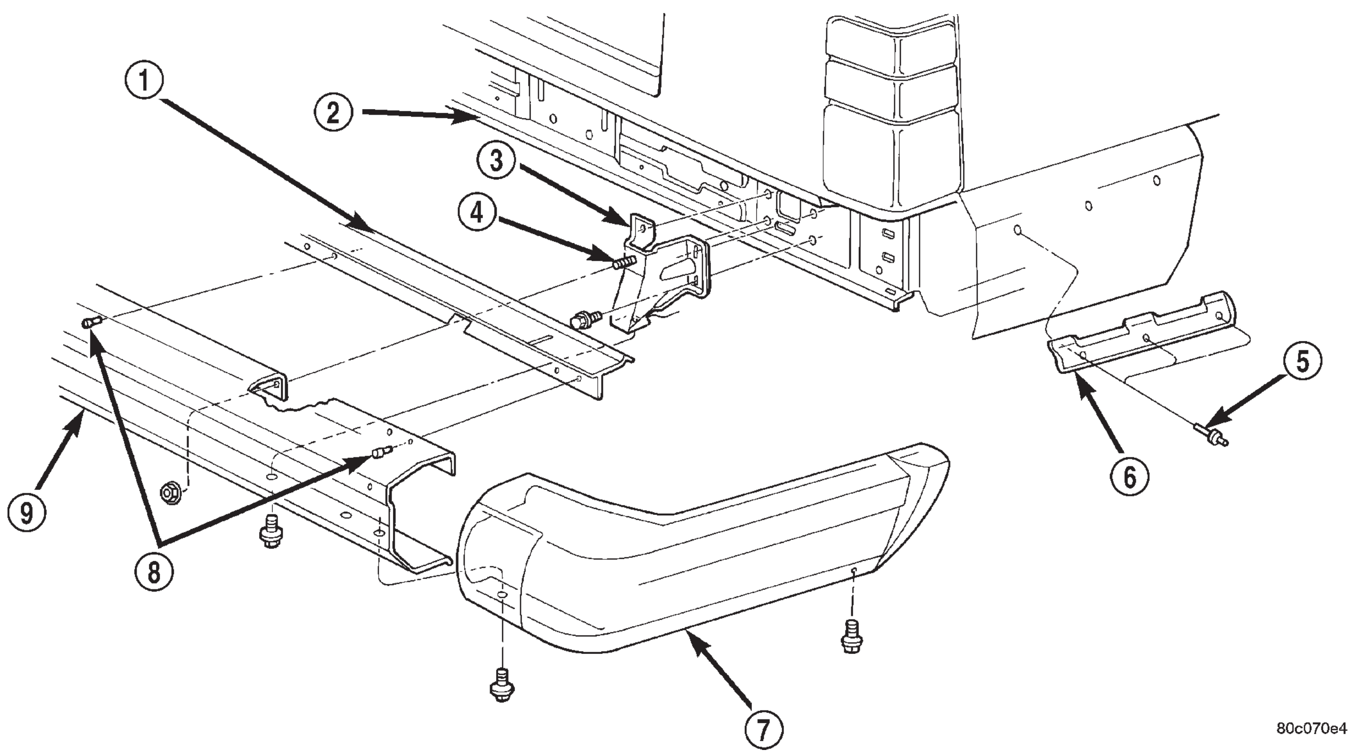

Fig. 5 REAR BUMPER END CAP

1 – SPLASH SHIELD
2 – REAR SILL
3 – BRACKET
4 – STUD
5 – RIVET
6 – RETAINER
7 – END CAP
8 – PLASTIC BLIND RIVET
9 – BUMPER

REMOVAL AND INSTALLATION (Continued)

REAR TOW HOOK

REMOVAL

(1) Remove bolts that attach tow hook bracket and tow hook to frame rail (Fig. 6).

(2) Remove bracket and tow hook from frame rail.

INSTALLATION

(1) Position bracket and tow hook on frame rail.

(2) Install bolts that attach tow hook bracket and tow hook to frame rail. Tighten bolts to 94 N·m (70 ft. lbs.) torque.

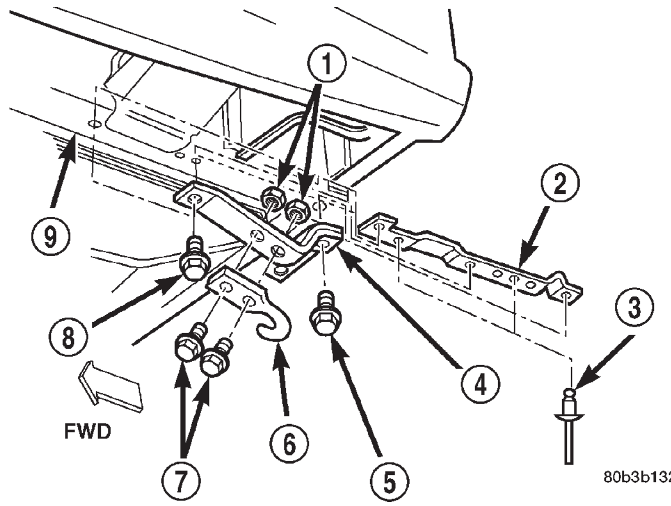

Fig. 6 Rear Tow Hook

1 – WELD NUT
2 – FRAME REINFORCEMENT BRACKET
3 – RIVET
4 – SUPPORT BRACKET
5 – BOLT
6 – TOW HOOK
7 – BOLT
8 – BOLT
9 – FRAME RAIL

FRAME

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REMOVAL AND INSTALLATION

FRONT SKID PLATE

REMOVAL

(1) Remove the screws that attach skid plate to side sills.

(2) Remove the nuts that attach the skid plate to the crossmember (Fig. 1).

(3) Remove the skid plate from the vehicle.

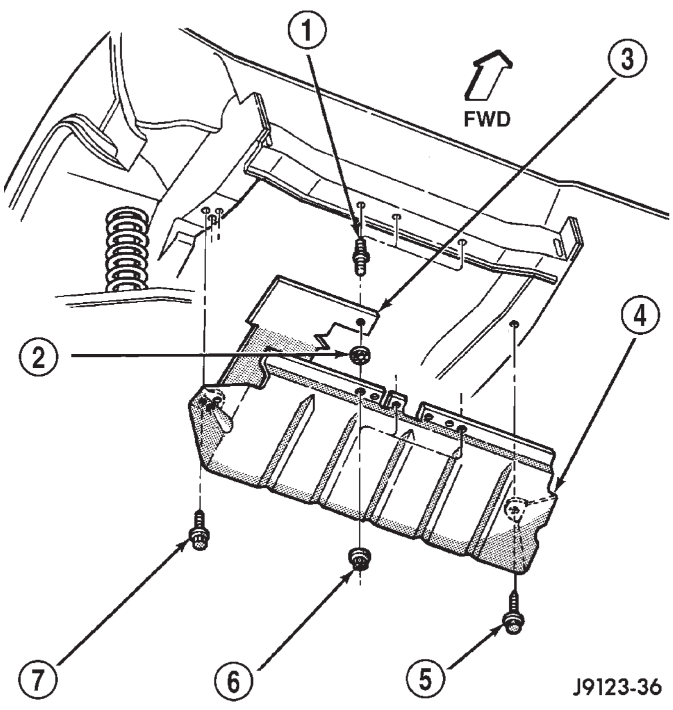

Fig. 1 Front Skid Plate

1 – STUD
2 – PUSH NUT
3 – SPLASH SHIELD
4 – SKID PLATE
5 – SCREW
6 – NUT
7 – SCREW

INSTALLATION

(1) Position the skid plate at front crossmember and side sills.

(2) Install the nuts to attach the skid plate to crossmember.

(3) Install the screws to attach skid plate to side sills.

TRANSFER CASE SKID PLATE

REMOVAL

(1) Support skid plate.

(2) Remove bolts that attach skid plate to transmission support crossmember and frame sill (Fig. 2).

(3) Remove support and skid plate from vehicle.

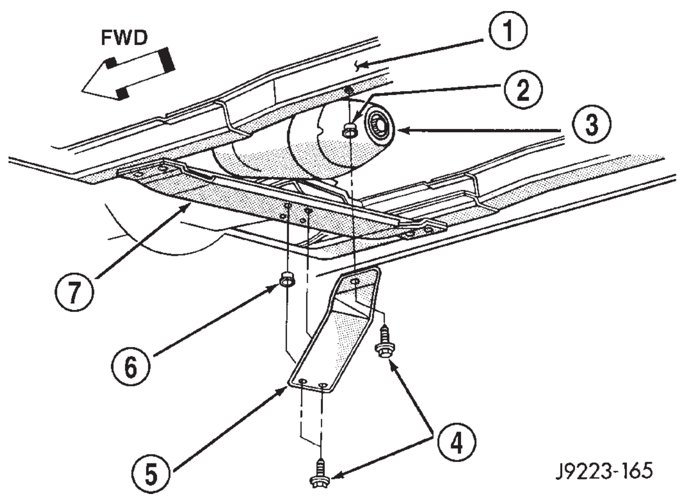

Fig. 2 Transfer Case Skid Plate

1 – FRAME SILL
2 – NUT-SERT
3 – TRANSFER CASE
4 – BOLT
5 – SKID PLATE
6 – NUT-SERT
7 – CROSSMEMBER

INSTALLATION

(1) Position and support skid plate at frame sill and transmission support crossmember.

(2) Attach skid plate to frame sill and crossmember with bolts. Tighten bolts to 22 N·m (16 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

FUEL TANK SKID PLATE

REMOVAL

(1) Position a support under skid plate.

(2) Remove bolts that attach skid plate to underbody side rails (Fig. 3).

(3) Remove support and skid plate from vehicle.

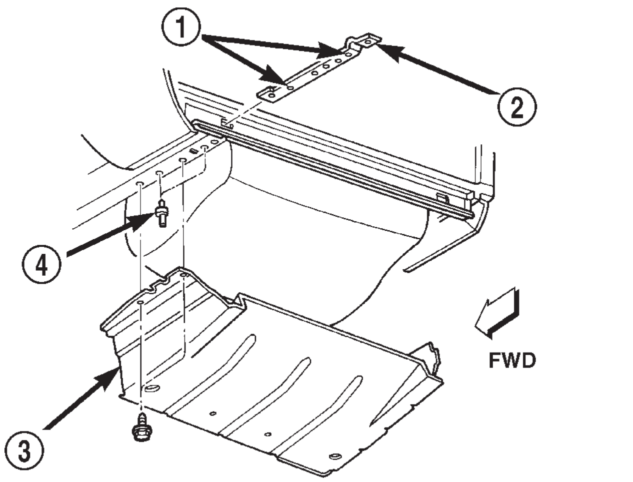

Fig. 3 Fuel Tank Skid Plate

1 – RIVET HOLES
2 – REINFORCEMENT
3 – FUEL TANK SKID PLATE
4 – BLIND RIVET

INSTALLATION

(1) Position and support skid plate under fuel tank.

(2) Install bolts to attach skid plate to underbody rails. Tighten bolts to 74 N·m (55 ft. lbs.) torque.

(3) Remove support from under skid plate.

TRAILER HITCH

REMOVAL

(1) If necessary, remove the trailer tow wire harness connector from the hitch (Fig. 4).

(2) Support the hitch.

(3) Remove the bolts that attach the trailer hitch to the frame sills and reinforcement brackets (Fig. 5).

(4) If equipped, remove the fuel tank skid plate.

NOTE: The reinforcement brackets are held on the frame sills with two blind rivets.

INSTALLATION

(1) Install frame reinforcement brackets, if removed. Slide the brackets through the vehicle rear sill openings and attach to the frame sills with blind rivets.

(2) Using an adequate lifting device, position hitch at the proper location for installation on vehicle and support it.

(3) If equipped, position fuel tank skid plate on vehicle frame sills.

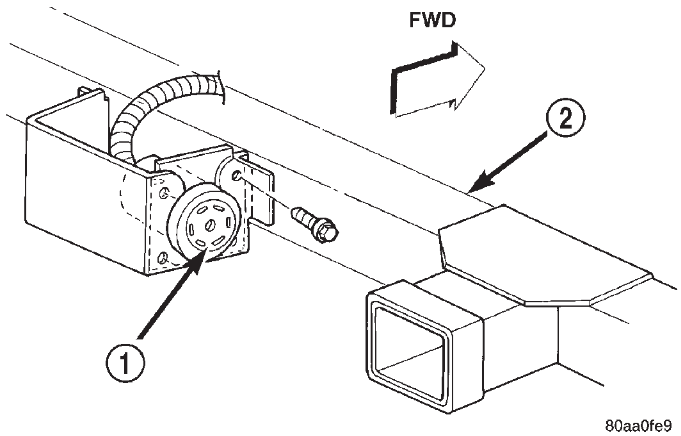

Fig. 4 Trailer Hitch Harness Connector

1 – CONNECTOR
2 – TRAILER HITCH

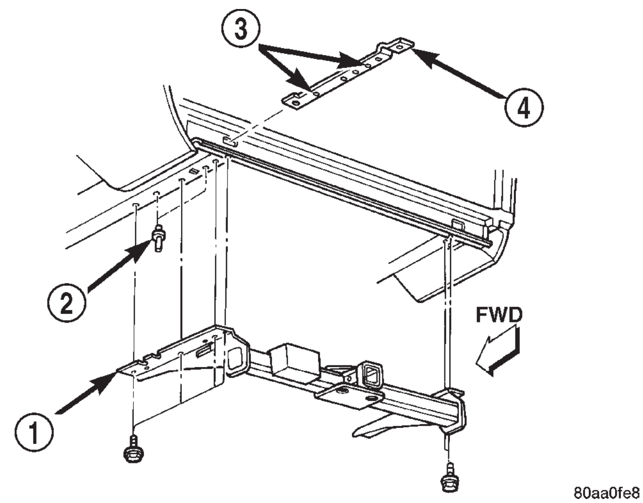

Fig. 5 Trailer Hitch

1 – TRAILER HITCH
2 – BLIND RIVET
3 – RIVET HOLES
4 – REINFORCEMENT

(4) Loosely install the bolts to attach the trailer hitch (and the skid plate) to frame sills and reinforcement brackets.

(5) Tighten all bolts/nuts to 74 N·m (55 ft. lbs.) torque.

(6) Remove the lift/support.

(7) If removed, attach the trailer wire harness connector to the hitch.

SPECIFICATIONS

FRAME DIMENSIONS

Frame dimensions are listed in millimeter scale. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location (Fig. 6).

SPECIFICATIONS (Continued)

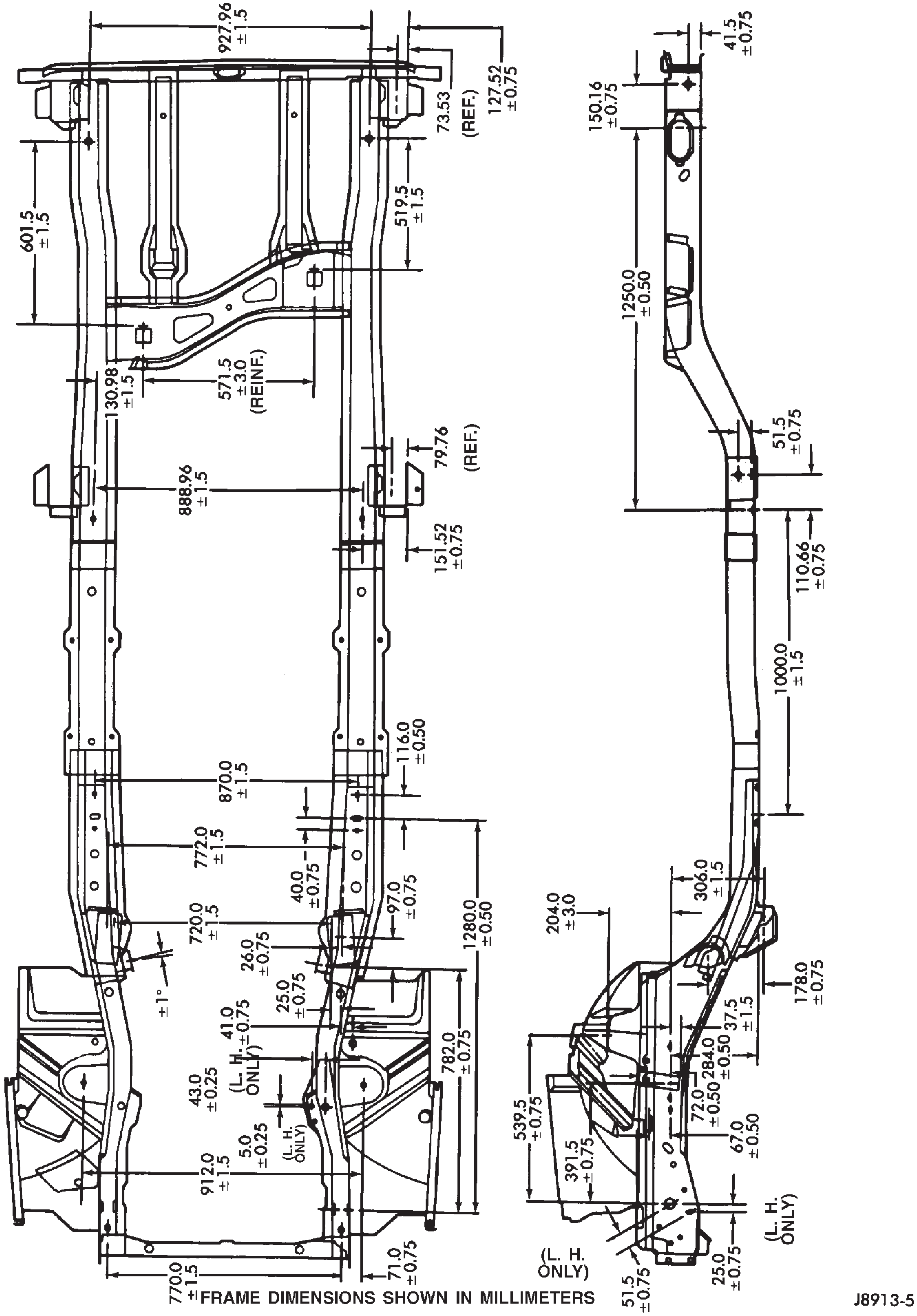

Fig. 6 Frame Dimensions

SPECIFICATIONS (Continued)

FRAME TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Front Skid Plate Screw	42 N·m (31 ft. lbs.)
Front Skid Plate Nut	17 N·m (125 in. lbs.)
Transfer Case Skid Plate Bolt	22 N·m (16 ft. lbs.)
Fuel Tank Skid Plate Bolt	74 N·m (55 ft. lbs.)
Front Bumper End Cap to Mounting Bracket Nut	9 N·m (7 ft. lbs.)
Front Bumper Mounting Bracket to Frame Bolt	55 N·m (41 ft. lbs.)
Front Bumper to Mounting Bracket Bolt	55 N·m (41 ft. lbs.)
Front Tow Hook Bolt	100 N·m (74 ft. lbs.)
Front Tow Hook Reinforcement Bolt	30 N·m (22 ft. lbs.)
Rear Bumper to Mtg. Bracket Nut	55 N·m (41 ft. lbs.)
Rear Bumper Mtg. Bracket to Rear Sill Bolt	55 N·m (41 ft. lbs.)
Rear Tow Hook Bolt	94 N·m (70 ft. lbs.)
Trailer Tow Reinforcement Brkt Bolt	74 N·m (55 ft. lbs.)

FUEL SYSTEM

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FUEL DELIVERY SYSTEM

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

PCM VIN REPROGRAMMING

OPERATION

USE THE DRB SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

FUEL DELIVERY SYSTEM

DESCRIPTION

The fuel delivery system consists of:

• the fuel pump module containing the electric fuel pump, fuel filter/fuel pressure regulator, fuel gauge sending unit (fuel level sensor) and a separate fuel filter located at bottom of pump module

DESCRIPTION AND OPERATION (Continued)

- fuel tubes/lines/hoses
- quick-connect fittings
- fuel injector rail
- fuel injectors
- fuel tank
- fuel tank filler/vent tube assembly
- fuel tank filler tube cap
- accelerator pedal
- throttle cable

OPERATION

Fuel is returned through the fuel pump module and back into the fuel tank through the fuel filter/fuel pressure regulator. A separate fuel return line from the engine to the tank is not used.

The fuel tank assembly consists of: the fuel tank, fuel pump module assembly, fuel pump module locknut/gasket, and rollover valve (refer to Group 25, Emission Control System for rollover valve information).

A fuel filler/vent tube assembly using a pressure/vacuum, 1/4 turn fuel filler cap is used. The fuel filler tube contains a flap door located below the fuel fill cap.

Also to be considered part of the fuel system is the evaporation control system. This is designed to reduce the emission of fuel vapors into the atmosphere. The description and function of the Evaporative Control System is found in Group 25, Emission Control Systems.

Both fuel filters (at bottom of fuel pump module and within fuel pressure regulator) are designed for extended service. They do not require normal scheduled maintenance. Filters should only be replaced if a diagnostic procedure indicates to do so.

FUEL PUMP MODULE

DESCRIPTION

The fuel pump module is installed in the top of the fuel tank (Fig. 1) or (Fig. 2). The fuel pump module contains the following components:

- A combination fuel filter/fuel pressure regulator
- A separate fuel pick-up filter (strainer)
- An electric fuel pump
- A threaded locknut to retain module to tank
- A gasket between tank flange and module
- Fuel gauge sending unit (fuel level sensor)
- Fuel supply tube (line) connection

The fuel gauge sending unit, pick-up filter and fuel filter/fuel pressure regulator may be serviced separately. If the electrical fuel pump requires service, the entire fuel pump module must be replaced.

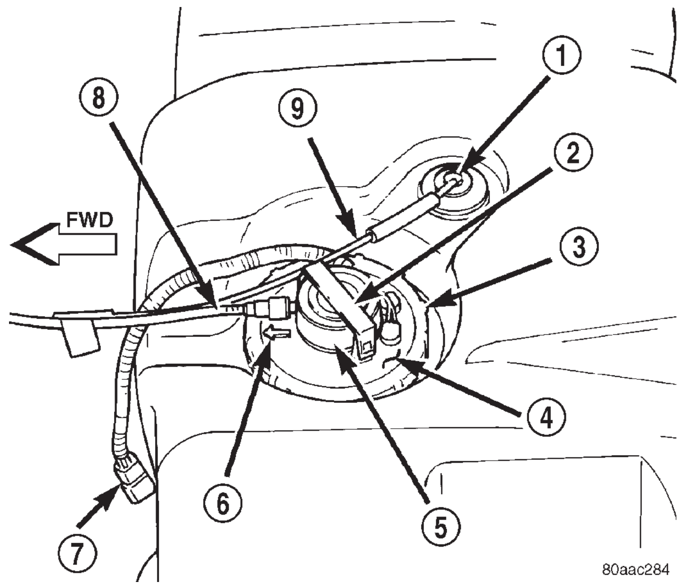


Fig. 1 Fuel Tank/Fuel Pump Module (Top View)

1 – ROLLOVER VALVE
2 – RETAINER CLAMP
3 – LOCKNUT
4 – FUEL PUMP MODULE
5 – FUEL FILTER/FUEL PRESSURE REGULATOR
6 – ALIGNMENT ARROW
7 – PIGTAIL HARNESS
8 – FUEL SUPPLY TUBE
9 – EVAP CANISTER VENT LINE

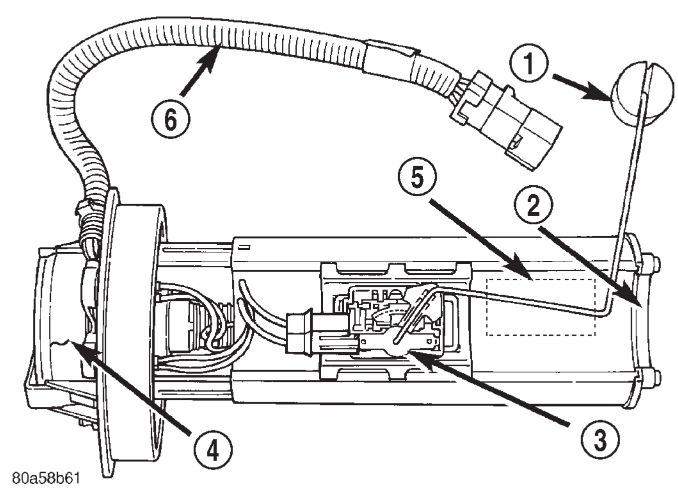


Fig. 2 Fuel Pump Module Components

1 – FUEL GAUGE FLOAT
2 – PICK-UP FILTER
3 – FUEL GAUGE SENDING UNIT
4 – FUEL FILTER/FUEL PRESSURE REGULATOR
5 – ELECTRIC FUEL PUMP
6 – PIGTAIL WIRING HARNESS

OPERATION

Refer to Fuel Pump, Fuel Filter/Fuel Pressure Regulator and Fuel Gauge Sending Unit.

DESCRIPTION AND OPERATION (Continued)

FUEL PUMP

DESCRIPTION

The fuel pump is located inside of the fuel pump module. A 12 volt, permanent magnet, electric motor powers the fuel pump.

OPERATION

Voltage to operate the electric pump is supplied through the fuel pump relay.

Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

Check Valve Operation: The pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** Refer to the Fuel Pressure Leak Down Test for more information.

FUEL GAUGE SENDING UNIT

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 (card).

OPERATION

The fuel pump module has 4 different circuits (wires). Two of these circuits are used for the fuel gauge sending unit for fuel gauge operation, and for certain OBD II emission requirements. The other 2 wires are used for electric fuel pump operation.

For Fuel Gauge Operation: A constant input voltage source of about 12 volts (battery voltage) is supplied to the resistor track on the fuel gauge sending unit. This is fed directly from the Powertrain Control Module (PCM). **NOTE: For diagnostic purposes, this 12V power source can only be verified with the circuit opened (fuel pump module electrical connector unplugged). With the connectors plugged, output voltages will vary from about.6 volts at FULL, to about 8.6 volts at EMPTY (about 8.6 volts at EMPTY for Jeep models, and about 7.0 volts at EMPTY for Dodge Truck models).** The resistor track is used to vary the voltage (resistance) depending on fuel tank float level. As fuel level increases, the float and arm move up, which decreases voltage. As fuel level decreases, the float and arm move down, which increases voltage. The varied voltage signal is returned back to the PCM through the sensor return circuit.

Both of the electrical circuits between the fuel gauge sending unit and the PCM are hard-wired (not multi-plexed). After the voltage signal is sent from the resistor track, and back to the PCM, the PCM will interpret the resistance (voltage) data and send a message across the multi-plex bus circuits to the instrument panel cluster. Here it is translated into the appropriate fuel gauge level reading. Refer to Instrument Panel for additional information.

For OBD II Emission Monitor Requirements: The PCM will monitor the voltage output sent from the resistor track on the sending unit to indicate fuel level. The purpose of this feature is to prevent the OBD II system from recording/setting false misfire and fuel system monitor diagnostic trouble codes. The feature is activated if the fuel level in the tank is less than approximately 15 percent of its rated capacity. If equipped with a Leak Detection Pump (EVAP system monitor), this feature will also be activated if the fuel level in the tank is more than approximately 85 percent of its rated capacity.

FUEL FILTER/FUEL PRESSURE REGULATOR

DESCRIPTION

The combination fuel filter and fuel pressure regulator is located on the top of fuel pump module (Fig. 1).

OPERATION

A combination fuel filter and fuel pressure regulator is used on all engines. A separate frame mounted fuel filter is not used with any engine.

Fuel Pressure Regulator Operation: The pressure regulator is a mechanical device that is not controlled by engine vacuum or the Powertrain Control Module (PCM).

The regulator is calibrated to maintain fuel system operating pressure of approximately 339 kPa ± 34 kPa (49.2 psi ± 5 psi) at the fuel injectors. It contains a diaphragm, calibrated springs and a fuel return valve. The internal fuel filter is also part of the assembly.

Fuel is supplied to the filter/regulator by the electric fuel pump through an opening tube at the bottom of filter/regulator (Fig. 3).

The regulator acts as a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine. A second check valve is located at the outlet end of the electric fuel pump. **Refer to Fuel Pump—Description and**

DESCRIPTION AND OPERATION (Continued)

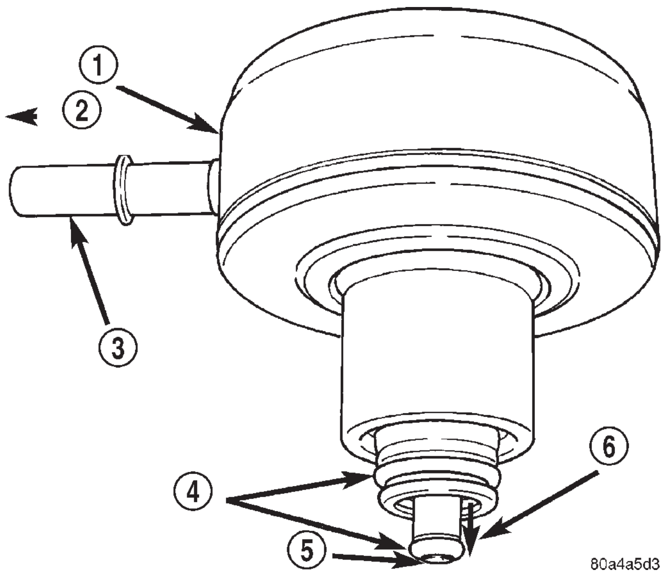


Fig. 3 Fuel Filter/Fuel Pressure Regulator

1 – FUEL FILTER/FUEL PRESSURE REGULATOR
2 – TO FUEL INJECTORS
3 – FUEL SUPPLY TUBE
4 – O-RINGS
5 – FUEL INLET FROM PUMP
6 – FUEL RETURN TO TANK

Operation for more information. Also refer to the Fuel Pressure Leak Down Test and the Fuel Pump Pressure Tests.

If fuel pressure at the pressure regulator exceeds approximately 49 psi, an internal diaphragm closes and excess fuel is routed back into the tank through the pressure regulator. A separate fuel return line is not used.

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.

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.

A rollover valve(s) is mounted into the top of the fuel tank (or pump module). Refer to Emission Control System for rollover valve information.

An evaporation control system is connected to the rollover valve(s) to reduce emissions of fuel vapors into the atmosphere. 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. Certain models are also equipped with a self-diagnosing system using a Leak Detection Pump (LDP). Refer to Emission Control System for additional information.

FUEL INJECTORS

DESCRIPTION

An individual fuel injector (Fig. 4) is used for each individual cylinder.

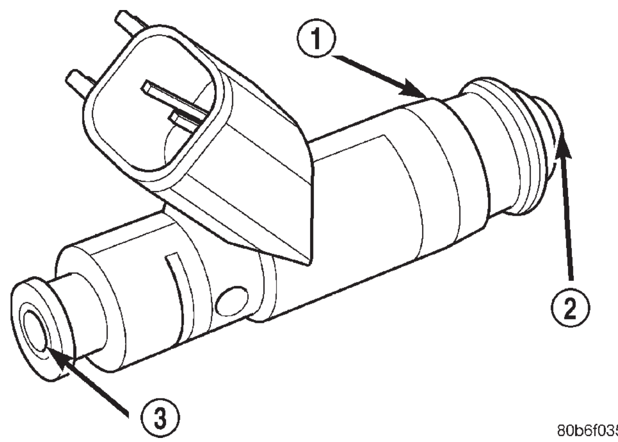


Fig. 4 Fuel Injector—Typical

1 – FUEL INJECTOR
2 – NOZZLE
3 – TOP (FUEL ENTRY)

OPERATION

The top (fuel entry) end of the injector (Fig. 4) is attached into an opening on the fuel rail.

The fuel injectors are electrical solenoids. 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 pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

The nozzle (outlet) ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the powertrain control module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust

DESCRIPTION AND OPERATION (Continued)

injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

FUEL INJECTOR RAIL/FUEL DAMPER—2.5L ENGINE

DESCRIPTION

The fuel injector rail is used to mount the fuel injectors to the engine (Fig. 5). On the 2.5L 4–cylinder engine, a **fuel damper** is located at the front of the fuel rail (Fig. 5).

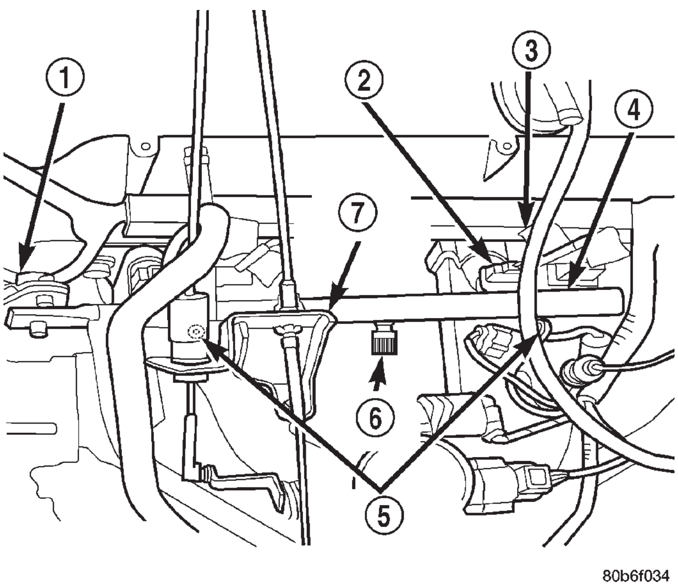


Fig. 5 Fuel Injector Rail/Fuel Damper—2.5L Engine

1 – FUEL DAMPER
2 – FUEL INJECTOR
3 – NUMBERED TAG
4 – FUEL RAIL
5 – FUEL RAIL MOUNTING BOLTS/NUTS
6 – TEST PORT
7 – CABLE BRACKET

OPERATION

The fuel injector rail supplies the necessary fuel to each individual fuel injector.

The fuel damper is used only to help control fuel pressure pulsations. These pulsations are the result of the firing of the fuel injectors. It is **not used** as a fuel pressure regulator. The fuel pressure regulator is **not mounted** to the fuel rail on any engine. It is located on the fuel tank mounted fuel pump module. Refer to Fuel Filter/Fuel Pressure Regulator in this group for information.

The fuel rail is not repairable.

FUEL RAIL/FUEL DAMPER—4.0L ENGINE

DESCRIPTION

The fuel rail is mounted to the intake manifold (Fig. 6). It is used to mount the fuel injectors to the engine. On the 4.0L 6–cylinder engine, a **fuel damper** is located near the center of the fuel rail (Fig. 6).

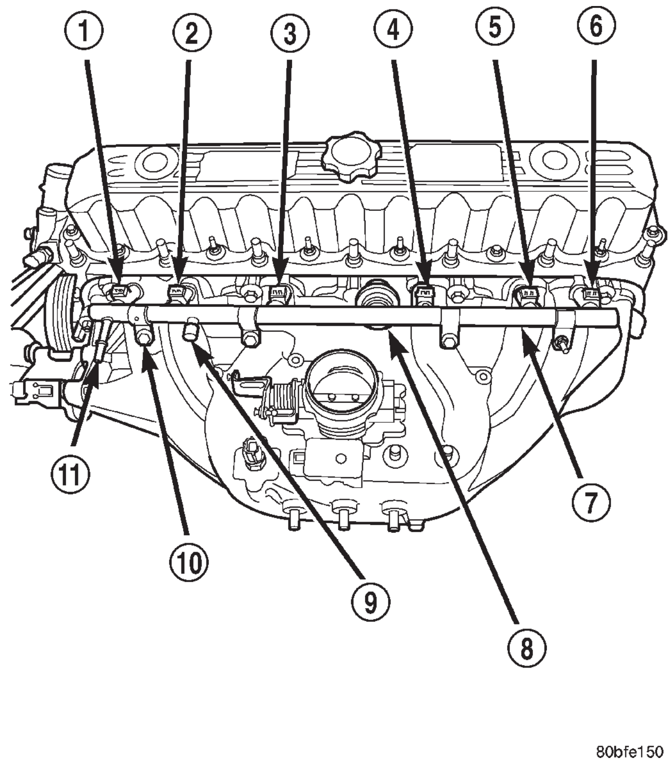


Fig. 6 Fuel Rail/Fuel Damper—4.0L Engine

1 – INJ. #1
2 – INJ. #2
3 – INJ. #3
4 – INJ. #4
5 – INJ. #5
6 – INJ. #6
7 – FUEL INJECTOR RAIL
8 – FUEL DAMPER
9 – PRESSURE TEST PORT CAP
10 – MOUNTING BOLTS (4)
11 – QUICK-CONNECT FITTING

OPERATION

The fuel injector rail supplies the necessary fuel to each individual fuel injector.

The fuel damper is used only to help control fuel pressure pulsations. These pulsations are the result of the firing of the fuel injectors. It is **not used** as a fuel pressure regulator. The fuel pressure regulator is **not mounted** to the fuel rail on any engine. It is located on the fuel tank mounted fuel pump module.

DESCRIPTION AND OPERATION (Continued)

Refer to Fuel Filter/Fuel Pressure Regulator in this group for information.

The fuel rail is not repairable.

FUEL TANK FILLER TUBE CAP

DESCRIPTION

The plastic fuel tank filler tube cap is threaded onto the end of the fuel fill tube. Certain models are equipped with a 1/4 turn cap.

OPERATION

The loss of any fuel or vapor out of fuel filler tube is prevented by the use of a pressure-vacuum fuel fill cap. Relief valves inside the cap will release fuel tank pressure at predetermined pressures. Fuel tank vacuum will also be released at predetermined values. This cap must be replaced by a similar unit if replacement is necessary. This is in order for the system to remain effective.

CAUTION: Remove fill cap before servicing any fuel system component to relieve tank pressure. If equipped with a California emissions package and a Leak Detection Pump (LDP), the cap must be tightened securely. If cap is left loose, a Diagnostic Trouble Code (DTC) may be set.

FUEL TUBES/LINES/HOSES AND CLAMPS

DESCRIPTION

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.

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, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected 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 system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps.

QUICK-CONNECT FITTINGS

DESCRIPTION

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal. Refer to Quick-Connect Fittings Removal/Installation for more information.

CAUTION: The interior components (o-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

DIAGNOSIS AND TESTING

FUEL PUMP PRESSURE TEST

Use this test in conjunction with the Fuel Pump Capacity Test, Fuel Pressure Leak Down Test and Fuel Pump Amperage Test found elsewhere in this group.

Check Valve Operation: The electric fuel pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** When the electric fuel pump is activated, fuel pressure should **immediately** (1–2 seconds) rise to specification.

All fuel systems are equipped with a fuel tank module mounted, combination fuel filter/fuel pressure regulator. The fuel pressure regulator is not controlled by engine vacuum.

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. BEFORE DISCONNECTING FUEL LINE AT FUEL RAIL, THIS PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

(1) Remove protective cap at fuel rail test port. Connect the 0–414 kPa (0-60 psi) fuel pressure gauge

DIAGNOSIS AND TESTING (Continued)

(from gauge set 5069) to test port pressure fitting on fuel rail (Fig. 7). **The DRB III Scan Tool along with the PEP module, the 500 psi pressure transducer, and the transducer-to-test port adapter may also be used in place of the fuel pressure gauge.**

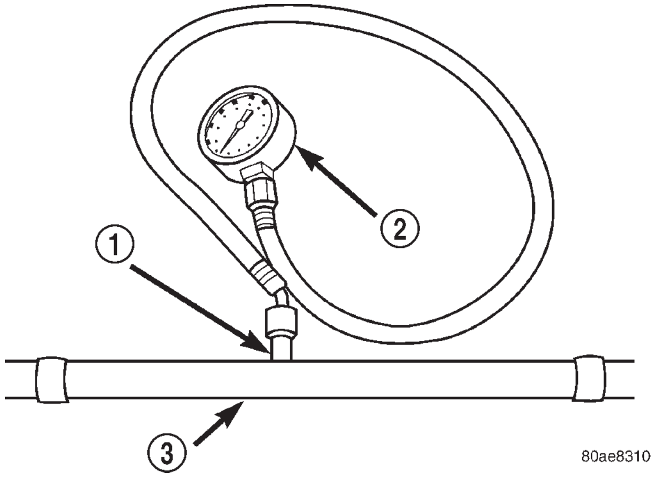


Fig. 7 Fuel Pressure Test Gauge (Typical Gauge Installation at Test Port)

1 – SERVICE (TEST) PORT
2 – FUEL PRESSURE TEST GAUGE
3 – FUEL RAIL

(2) Start and warm engine and note pressure gauge reading. Fuel pressure should be 339 kPa ± 34 kPa (49.2 psi ± 5 psi) at idle.

(3) If engine runs, but pressure is below 44.2 psi, check for a kinked fuel supply line somewhere between fuel rail and fuel pump module. If line is not kinked, but specifications for either the Fuel Pump Capacity, Fuel Pump Amperage or Fuel Pressure Leak Down Tests were not met, replace fuel pump module assembly. Refer to Fuel Pump Module Removal/Installation.

(4) If operating pressure is above 54.2 psi, electric fuel pump is OK, but fuel pressure regulator is defective. Replace fuel filter/fuel pressure regulator. Refer to Fuel Filter/Fuel Pressure Regulator Removal/Installation for more information.

(5) Install protective cap to fuel rail test port.

FUEL PUMP CAPACITY TEST

Before performing this test, verify fuel pump pressure. Refer to Fuel Pump Pressure Test. Use this test in conjunction with the Fuel Pressure Leak Down Test.

(1) Release fuel system pressure. Refer to Fuel Pressure Release Procedure.

(2) Disconnect fuel supply line at fuel rail. Refer to Quick-Connect Fittings. Some engines may require air cleaner housing removal before line disconnection.

(3) Obtain correct Fuel Line Pressure Test Adapter Tool Hose. Tool number 6539 is used for 5/16” fuel lines and tool number 6631 is used for 3/8” fuel lines.

(4) Connect correct Fuel Line Pressure Test Adapter Tool Hose into disconnected fuel supply line. Insert other end of Adaptor Tool Hose into a graduated container.

(5) Remove fuel fill cap.

(6) To activate fuel pump and pressurize system, obtain DRB scan tool and actuate ASD Fuel System Test.

(7) A good fuel pump will deliver at least 1/4 liter of fuel in 7 seconds. Do not operate fuel pump for longer than 7 seconds with fuel line disconnected as fuel pump module reservoir may run empty.

(a) If capacity is lower than specification, but fuel pump can be heard operating through fuel fill cap opening, check for a kinked/damaged fuel supply line somewhere between fuel rail and fuel pump module.

(b) If line is not kinked/damaged, and fuel pressure is OK, but capacity is low, replace fuel filter/fuel pressure regulator. The filter/regulator may be serviced separately on certain applications. Refer to Fuel Filter/Fuel Pressure Regulator Removal/Installation for additional information.

(c) If both fuel pressure and capacity are low, replace fuel pump module assembly. Refer to Fuel Pump Module Removal/Installation.

FUEL PRESSURE LEAK DOWN TEST

Use this test in conjunction with the Fuel Pump Pressure Test and Fuel Pump Capacity Test.

Check Valve Operation: The electric fuel pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** When the electric fuel pump is activated, fuel pressure should **immediately** (1–2 seconds) rise to specification.

Abnormally long periods of cranking to restart a **hot** engine that has been shut down for a short period of time may be caused by:

• Fuel pressure bleeding past a fuel injector(s).

• Fuel pressure bleeding past the check valve in the fuel pump module.

(1) Disconnect the fuel inlet line at fuel rail. Refer to Fuel Tubes/Lines/Hoses and Clamps in this section of the group for procedures. On some engines, air

DIAGNOSIS AND TESTING (Continued)

cleaner housing removal may be necessary before fuel line disconnection.

(2) Obtain correct Fuel Line Pressure Test Adapter Tool Hose. Tool number 6539 is used for 5/16” fuel lines and tool number 6631 is used for 3/8” fuel lines.

(3) Connect correct Fuel Line Pressure Test Adapter Tool Hose between disconnected fuel line and fuel rail (Fig. 8).

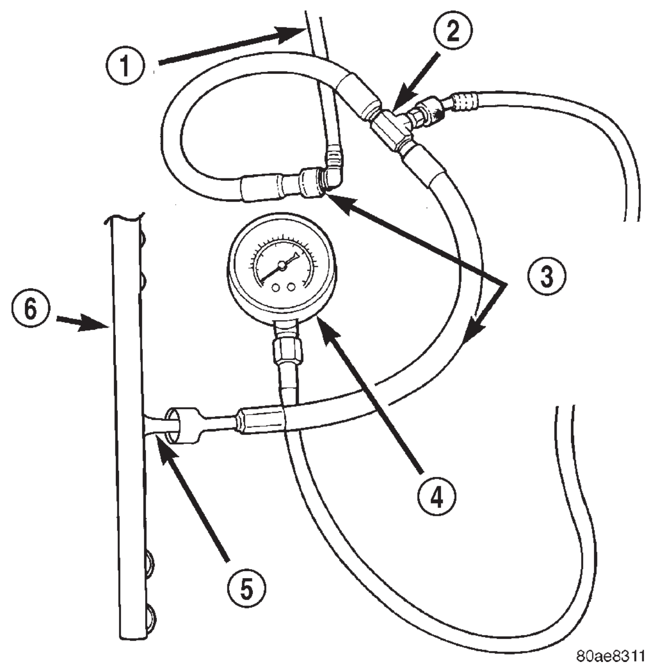


Fig. 8 Connecting Adapter Tool—Typical

1 – VEHICLE FUEL LINE
2 – TEST PORT “T”
3 – SPECIAL TOOL 6923, 6631, 6541 OR 6539
4 – FUEL PRESSURE TEST GAUGE
5 – FUEL LINE CONNECTION AT RAIL
6 – FUEL RAIL

(4) Connect the 0-414 kPa (0-60 psi) fuel pressure test gauge (from Gauge Set 5069) to the test port on the appropriate Adaptor Tool. **The DRB III Scan Tool along with the PEP module, the 500 psi pressure transducer, and the transducer-to-test port adapter may also be used in place of the fuel pressure gauge.**

The fittings on both tools must be in good condition and free from any small leaks before performing the proceeding test.

(5) Start engine and bring to normal operating temperature.

(6) Observe test gauge. Normal operating pressure should be 339 kPa ± 34 kPa (49.2 psi ± 5 psi).

(7) Shut engine off.

(8) Pressure should not fall below **30 psi for five minutes.**

(9) If pressure falls below 30 psi, it must be determined if a fuel injector, the check valve within the fuel pump module, or a fuel tube/line is leaking.

(10) Again, start engine and bring to normal operating temperature.

(11) Shut engine off.

(12) **Testing for fuel injector or fuel rail leakage:** Clamp off the rubber hose portion of Adaptor Tool between the fuel rail and the test port “T” on Adapter Tool. If pressure now holds at or above 30 psi, a fuel injector or the fuel rail is leaking.

(13) **Testing for fuel pump check valve, filter/regulator check valve or fuel tube/line leakage:** Clamp off the rubber hose portion of Adaptor Tool between the vehicle fuel line and test port “T” on Adapter Tool. If pressure now holds at or above 30 psi, a leak may be found at a fuel tube/line. If no leaks are found at fuel tubes or lines, one of the check valves in either the electric fuel pump or filter/regulator may be leaking.

Note: A quick loss of pressure usually indicates a defective check valve in the filter/regulator. A slow loss of pressure usually indicates a defective check valve in the electric fuel pump.

The electric fuel pump is not serviced separately. Replace the fuel pump module assembly. The filter/regulator may be replaced separately on certain applications. Refer to Fuel Filter/Fuel Pressure Regulator Removal/Installation for additional information.

FUEL PUMP AMPERAGE TEST

This amperage (current draw) test is to be done in conjunction with the Fuel Pump Pressure Test, Fuel Pump Capacity Test and Fuel Pressure Leak Down Test. Before performing the amperage test, be sure the temperature of the fuel tank is above 50° F (10° C).

The DRB Scan Tool along with the DRB Low Current Shunt (LCS) adapter (Fig. 9) and its test leads will be used to check fuel pump amperage specifications.

(1) Be sure fuel tank contains fuel before starting test. If tank is empty or near empty, amperage readings will be incorrect.

(2) Obtain LCS adapter.

(3) Plug cable from LCS adapter into DRB scan tool at SET 1 receptacle.

(4) Plug DRB into vehicle 16–way connector (data link connector).

(5) Connect (-) and (+) test cable leads into LCS adapter receptacles. Use **10 amp (10A +)** receptacle and common (-) receptacles.

(6) Gain access to MAIN MENU on DRB screen.

(7) Press DVOM button on DRB.

DIAGNOSIS AND TESTING (Continued)

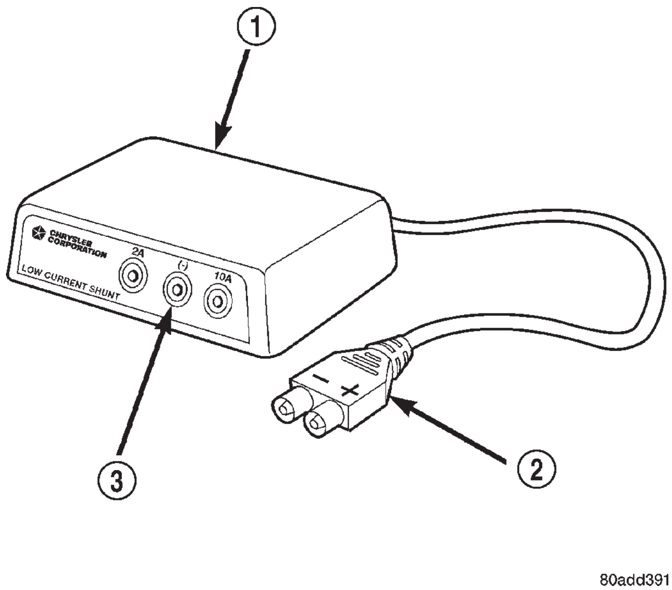


Fig. 9 Low Current Shunt Adapter

1 – LOW CURRENT SHUNT ADAPTER
2 – PLUG TO DRB
3 – TEST LEAD RECEPTACLES

(8) Using left/right arrow keys, highlight CHANNEL 1 function on DRB screen.

(9) Press ENTER three times.

(10) Using up/down arrow keys, highlight RANGE on DRB screen (screen will default to 2 amp scale).

(11) Press ENTER to change 2 amp scale to 10 amp scale. **This step must be done to prevent damage to DRB scan tool or LCS adapter (blown fuse).**

(12) Remove cover from Power Distribution Center (PDC).

(13) Remove fuel pump relay from PDC. Refer to label on PDC cover for relay location.

WARNING: BEFORE PROCEEDING TO NEXT STEP, NOTE THE FUEL PUMP WILL BE ACTIVATED AND SYSTEM PRESSURE WILL BE PRESENT. THIS WILL OCCUR AFTER CONNECTING TEST LEADS FROM LCS ADAPTER INTO FUEL PUMP RELAY CAVITIES. THE FUEL PUMP WILL OPERATE EVEN WITH IGNITION KEY IN OFF POSITION. BEFORE ATTACHING TEST LEADS, BE SURE ALL FUEL LINES AND FUEL SYSTEM COMPONENTS ARE CONNECTED.

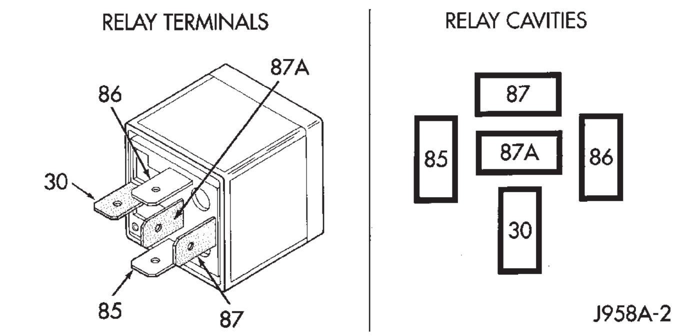
CAUTION: TO PREVENT POSSIBLE DAMAGE TO THE VEHICLE ELECTRICAL SYSTEM AND LCS ADAPTER, THE TEST LEADS MUST BE CONNECTED INTO RELAY CAVITIES EXACTLY AS SHOWN IN FOLLOWING STEPS.

Depending upon vehicle model, year or engine configuration, three different types of relays may be used: Type-1, type-2 and type–3.

(14) If equipped with **type–1 relay** (Fig. 10), attach test leads from LCS adapter into PDC relay cavities number 30 and 87. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 10).

(15) If equipped with **type–2 relay** (Fig. 11), attach test leads from LCS adapter into PDC relay cavities number 30 and 87. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 11).

(16) If equipped with **type–3 relay** (Fig. 12), attach test leads from LCS adapter into PDC relay cavities number 3 and 5. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 12).



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

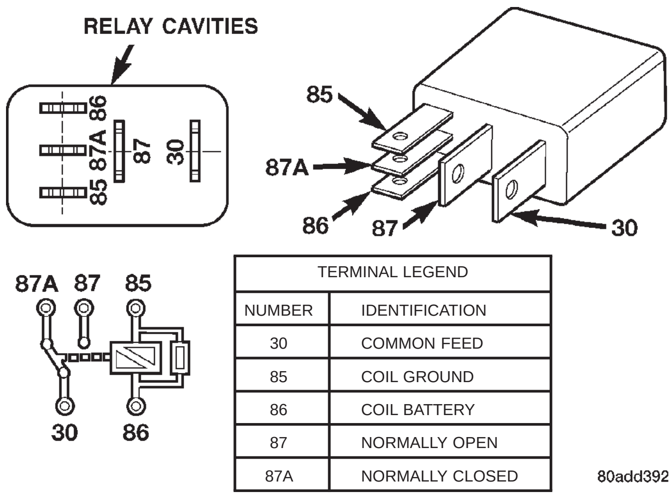
Fig. 10 Type–1 Relay

(17) When LCS adapter test leads are attached into relay cavities, fuel pump **will be activated.** Determine fuel pump amperage on DRB screen. Amperage should be below 10.0 amps. If amperage is below 10.0 amps, and specifications for the Fuel Pump Pressure, Fuel Pump Capacity and Fuel Pressure Leak Down tests were met, the fuel pump module is OK.

(18) If amperage is more than 10.0 amps, replace fuel pump module assembly. The electric fuel pump is not serviced separately.

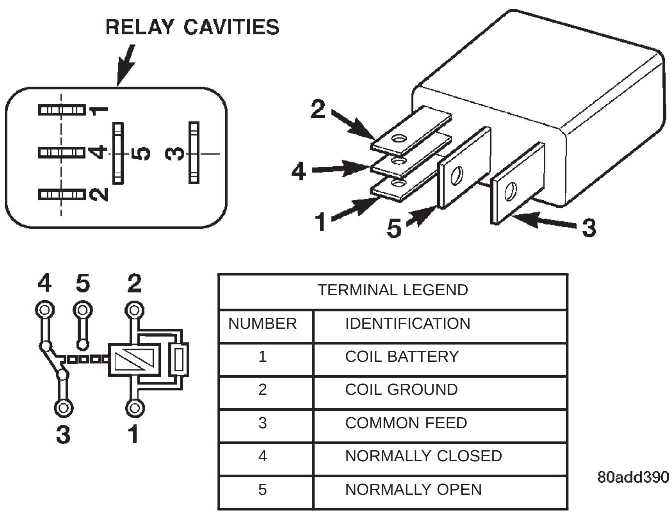
(19) Disconnect test leads from relay cavities immediately after testing.

DIAGNOSIS AND TESTING (Continued)



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 11 Type–2 Relay



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
1	COIL BATTERY
2	COIL GROUND
3	COMMON FEED
4	NORMALLY CLOSED
5	NORMALLY OPEN

Fig. 12 Type–3 Relay

FUEL GAUGE SENDING UNIT

The fuel gauge sending unit contains a variable resistor (track). As the float moves up or down, electrical resistance will change. Refer to Instrument Panel and Gauges for Fuel Gauge testing. To test the gauge sending unit only, it must be removed from vehicle. The unit is part of the fuel pump module. Refer to Fuel Pump Module Removal/Installation for procedures. Measure the resistance across the sending unit terminals. With float in up position, resistance should be 20 ohms (+/- 5%). With float in down position, resistance should be 270 ohms (+/- 5%).

FUEL INJECTOR TEST

To perform a complete test of the fuel injectors and their circuitry, use the DRB scan tool and refer to the appropriate Powertrain Diagnostics Procedures manual. To test the injector only, refer to the following:

Disconnect the fuel injector wire harness connector from the injector. The injector is equipped with 2 electrical terminals (pins). Place an ohmmeter across the terminals. Resistance reading should be approximately 12 ohms ±1.2 ohms at 20°C (68°F).

SERVICE PROCEDURES

FUEL SYSTEM PRESSURE RELEASE PROCEDURE

Use following procedure if the fuel injector rail is, or is not equipped with a fuel pressure test port.

(1) Remove fuel fill cap.

(2) Remove fuel pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.

(3) Start and run engine until it stalls.

(4) Attempt restarting engine until it will no longer run.

(5) Turn ignition key to OFF position.

CAUTION: Steps 1, 2, 3 and 4 must be performed to relieve high pressure fuel from within fuel rail. Do not attempt to use following steps to relieve this pressure as excessive fuel will be forced into a cylinder chamber.

(6) Unplug connector from any fuel injector.

(7) Attach one end of a jumper wire with alligator clips (18 gauge or smaller) to either injector terminal.

(8) Connect other end of jumper wire to positive side of battery.

(9) Connect one end of a second jumper wire to remaining injector terminal.

CAUTION: Powering an injector for more than a few seconds will permanently damage the injector.

(10) Momentarily touch other end of jumper wire to negative terminal of battery for no more than a few seconds.

(11) Place a rag or towel below fuel line quick-connect fitting at fuel rail.

(12) Disconnect quick-connect fitting at fuel rail. Refer to Quick-Connect Fittings.

(13) Return fuel pump relay to PDC.

(14) One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. The DRB scan tool must be used to erase a DTC.

QUICK-CONNECT FITTINGS

Also refer to Fuel Tubes/Lines/Hoses and Clamps.

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Safety latch clips are

SERVICE PROCEDURES (Continued)

used on certain components/lines. Certain fittings may require use of a special tool for disconnection.

DISCONNECTING

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSE, FITTING OR LINE, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

CAUTION: The interior components (o-rings, spacers) of some types of quick-connect fitting are not serviced separately. If service parts are not available, do not attempt to repair a damaged fitting or fuel line. If repair is necessary, replace complete fuel line assembly.

(1) Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure in this group.

(2) Disconnect negative battery cable from battery.

(3) Clean fitting of any foreign material before disassembly.

(4) **Single-Tab Type Fitting:** This type of fitting is equipped with a single pull tab (Fig. 13). The tab is removable. After tab is removed, quick-connect fitting can be separated from fuel system component.

(a) Press release tab on side of fitting to release pull tab (Fig. 14). **If release tab is not pressed prior to releasing pull tab, pull tab will be damaged.**

(b) While pressing release tab on side of fitting, use screwdriver to pry up pull tab (Fig. 14).

(c) Raise pull tab until it separates from quick-connect fitting (Fig. 15).

(5) **Two-Tab Type Fitting:** This type of fitting is equipped with tabs located on both sides of fitting (Fig. 16). The tabs are supplied for disconnecting quick-connect fitting from component being serviced.

(a) To disconnect quick-connect fitting, squeeze plastic retainer tabs (Fig. 16) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer.

(b) Pull fitting from fuel system component being serviced.

(c) 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.

(6) **Plastic Retainer Ring Type Fitting:** This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 17) usually black in color.

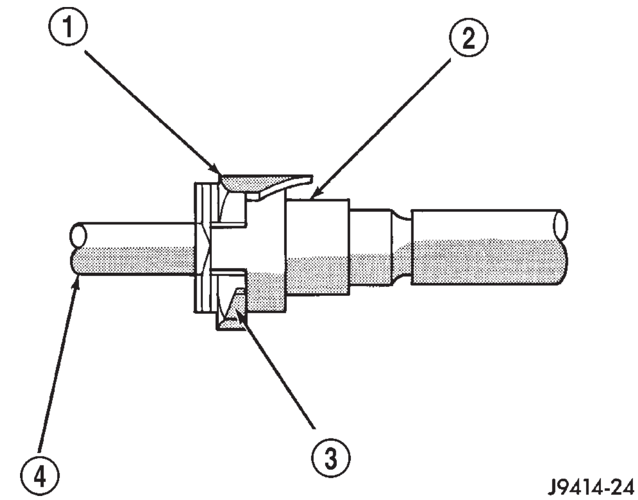


Fig. 13 Single-Tab Type Fitting

1 – PULL TAB
2 – QUICK-CONNECT FITTING
3 – PRESS HERE TO REMOVE PULL TAB
4 – INSERTED TUBE END

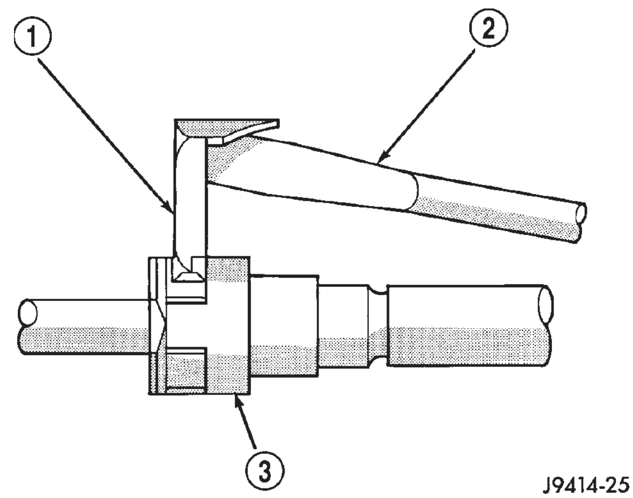


Fig. 14 Disconnecting Single-Tab Type Fitting

1 – PULL TAB
2 – SCREWDRIVER
3 – QUICK-CONNECT FITTING

(a) 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. 17). 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.**

(b) After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.

SERVICE PROCEDURES (Continued)

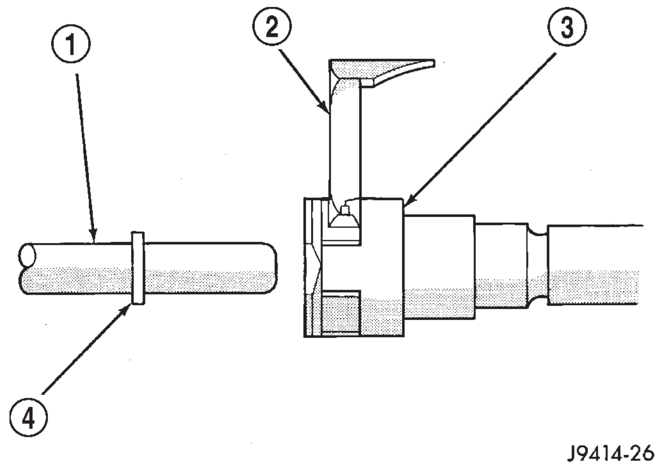


Fig. 15 Removing Pull Tab

1 – FUEL TUBE OR FUEL SYSTEM COMPONENT
2 – PULL TAB
3 – QUICK-CONNECT FITTING
4 – FUEL TUBE STOP

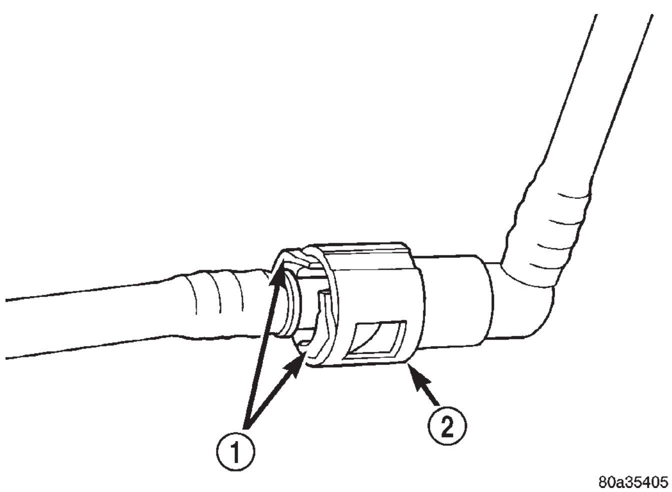


Fig. 16 Typical Two-Tab Type Quick-Connect Fitting

1 – TAB(S)
2 – QUICK-CONNECT FITTING

(c) Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

(7) **Latch Clips:** Depending on vehicle model and engine, 2 different types of safety latch clips are used (Fig. 18) or (Fig. 19). Type-1 is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.

(a) Type 1: Pry up on latch clip with a screwdriver (Fig. 18).

(b) Type 2: Separate and unlatch 2 small arms on end of clip (Fig. 19) and swing away from fuel line.

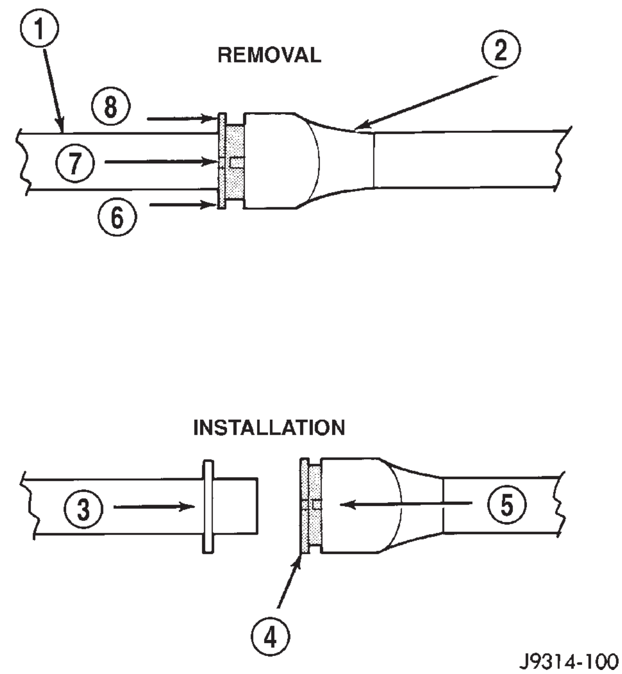


Fig. 17 Plastic Retainer Ring Type Fitting

1 – FUEL TUBE
2 – QUICK CONNECT FITTING
3 – PUSH
4 – PLASTIC RETAINER
5 – PUSH
6 – PUSH
7 – PUSH
8 – PUSH

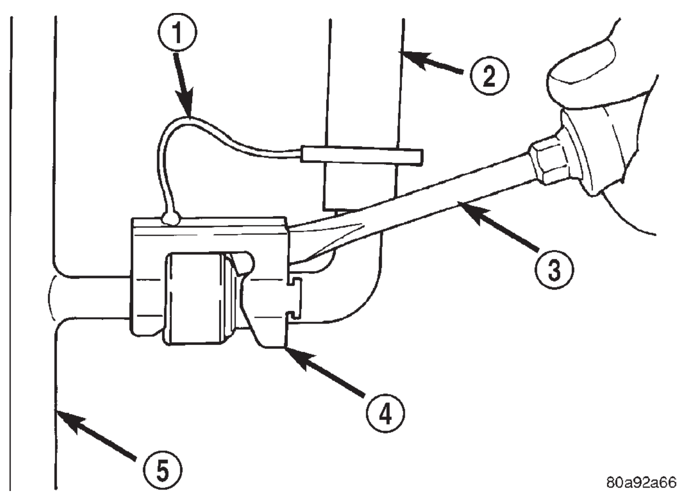


Fig. 18 Latch Clip—Type 1

1 – TETHER STRAP
2 – FUEL LINE
3 – SCREWDRIVER
4 – LATCH CLIP
5 – FUEL RAIL

(c) Slide latch clip toward fuel rail while lifting with screwdriver.

SERVICE PROCEDURES (Continued)

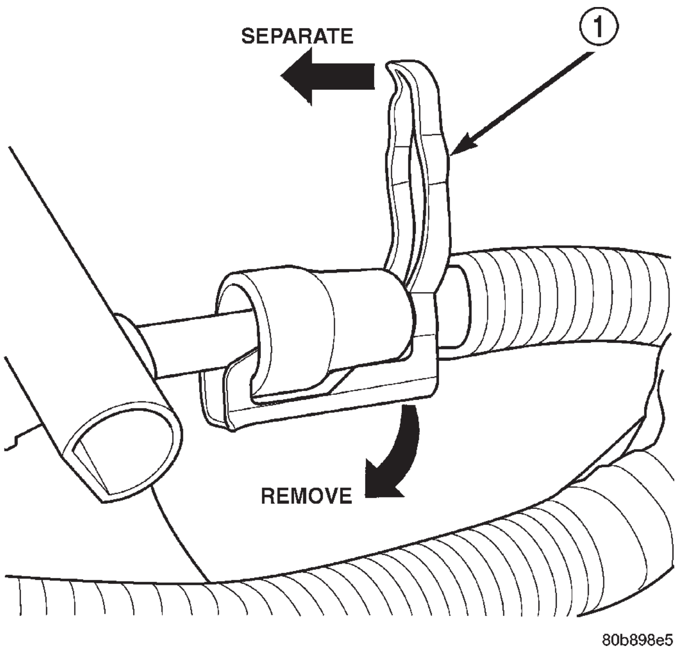


Fig. 19 Latch Clip—Type 2

1 – LATCH CLIP

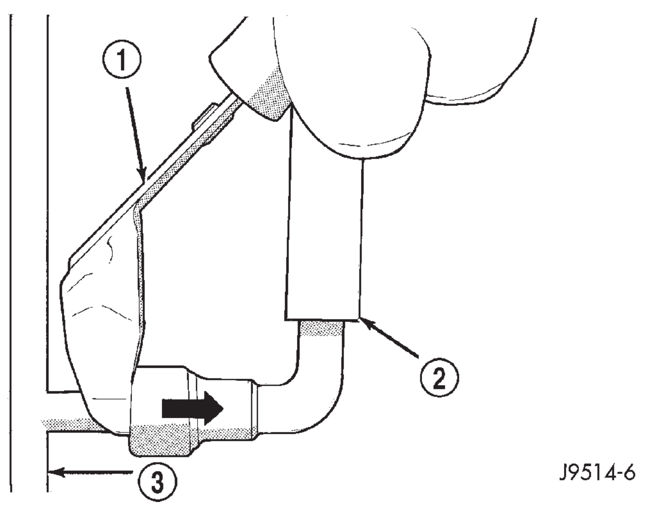


Fig. 20 Fuel Line Disconnection Using Special Tool

1 – SPECIAL FUEL LINE TOOL
2 – FUEL LINE
3 – FUEL RAIL

(d) Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (Fig. 20). Use tool to release locking fingers in end of line.

(e) With special tool still inserted, pull fuel line from fuel rail.

(f) After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.

(8) Disconnect quick-connect fitting from fuel system component being serviced.

CONNECTING

(1) Inspect quick-connect fitting body and fuel system component for damage. Replace as necessary.

(2) 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.

(3) Insert quick-connect fitting into fuel tube or fuel system component until built-on stop on fuel tube or component rests against back of fitting.

(4) Continue pushing until a click is felt.

(5) Single-tab type fitting: Push new tab down until it locks into place in quick-connect fitting.

(6) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(7) Latch Clip Equipped: Install latch clip (snaps into position). **If latch clip will not fit, this indicates fuel line is not properly installed to fuel rail (or other fuel line). Recheck fuel line connection.**

(8) Connect negative cable to battery.

(9) Start engine and check for leaks.

REMOVAL AND INSTALLATION

FUEL FILTER/FUEL PRESSURE REGULATOR

The combination Fuel Filter/Fuel Pressure Regulator is located on the fuel pump module. The fuel pump module is located on top of fuel tank.

The filter/regulator may be removed without removing fuel pump module although fuel tank must be removed.

REMOVAL

(1) Remove fuel tank. Refer to Fuel Tank Removal/Installation.

(2) Clean area around filter/regulator.

(3) Disconnect fuel line at filter/regulator. Refer to Quick-Connect Fittings in this group for procedures.

(4) Remove retainer clamp from top of filter/regulator (Fig. 21). Clamp snaps to tabs on pump module. Discard old clamp.

(5) Pry filter/regulator from top of pump module with 2 screwdrivers. Unit is snapped into module.

(6) Discard gasket below filter/regulator (Fig. 22).

(7) Before discarding filter/regulator assembly, inspect assembly to verify that o-rings (Fig. 23) are intact. If the smallest of the two o-rings can not be found on bottom of filter/regulator, it may be necessary to remove it from the fuel inlet passage in fuel pump module.

REMOVAL AND INSTALLATION (Continued)

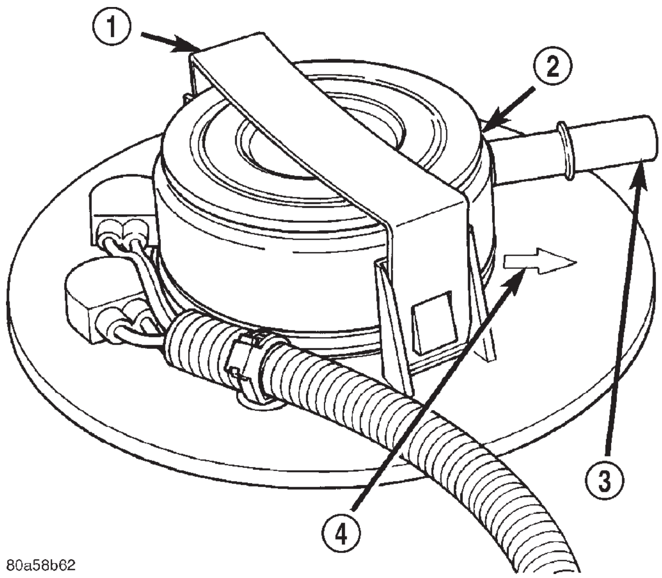


Fig. 21 Fuel Filter/Fuel Pressure Regulator

1 – RETAINER CLAMP
2 – FUEL FILTER/FUEL PRESSURE REGULATOR
3 – FUEL SUPPLY TUBE
4 – ALIGNMENT ARROW

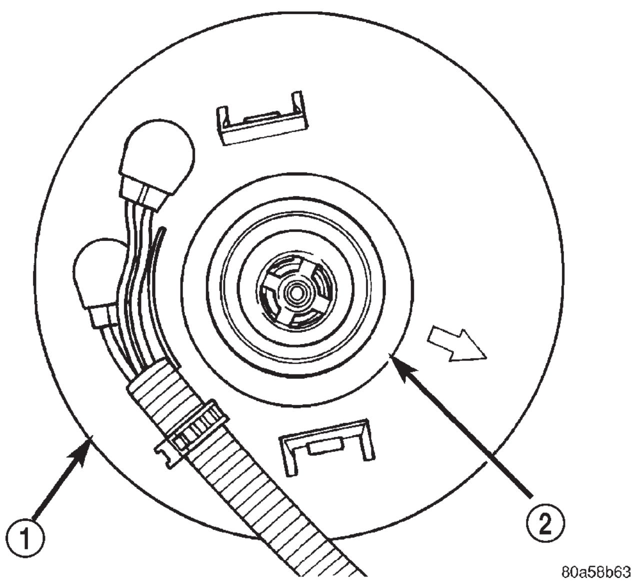


Fig. 22 Fuel Filter/Fuel Pressure Regulator Gasket

1 – TOP OF MODULE
2 – GASKET

INSTALLATION

(1) Clean recessed area in pump module where filter/regulator is to be installed.

(2) Obtain new filter/regulator (two new o-rings should already be installed).

(3) Apply a small amount of clean engine oil to o-rings. **Do not install o-rings separately into**

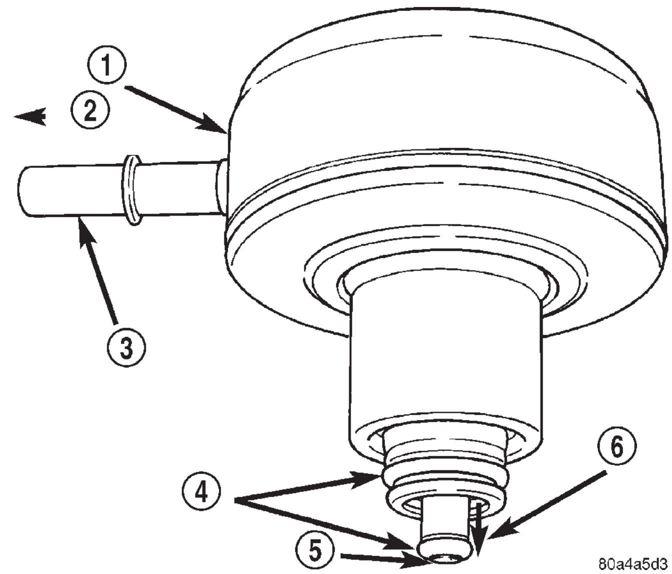


Fig. 23 Fuel Filter/Fuel Pressure Regulator O-Rings

1 – FUEL FILTER/FUEL PRESSURE REGULATOR
2 – TO FUEL INJECTORS
3 – FUEL SUPPLY TUBE
4 – O-RINGS
5 – FUEL INLET FROM PUMP
6 – FUEL RETURN TO TANK

fuel pump module. They will be damaged when installing filter/regulator.

(4) Install new gasket to top of fuel pump module.

(5) Press new filter/regulator into top of pump module until it snaps into position (a positive click must be heard or felt).

(6) The arrow (Fig. 21) molded into top of fuel pump module should be pointed towards front of vehicle (12 o'clock position).

(7) Rotate filter/regulator until fuel supply tube (fitting) is pointed towards front of vehicle (12 o'clock position).

(8) Install new retainer clamp (clamp snaps over top of filter/regulator and locks to flanges on pump module).

(9) Connect fuel line at filter/regulator. Refer to Quick-Connect Fittings in this group for procedures.

(10) Install fuel tank. Refer to Fuel Tank Removal/ Installation.

FUEL PUMP MODULE

Fuel tank removal will be necessary for fuel pump module removal.

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING THE FUEL PUMP MODULE, FUEL SYSTEM PRESSURE MUST BE RELEASED.

REMOVAL AND INSTALLATION (Continued)

(1) Drain fuel tank and remove tank. Refer to the Fuel Tank Removal/Installation section of this group.

(2) Thoroughly wash and clean area around pump module to prevent contaminants from entering tank.

(3) Disconnect fuel line at filter/regulator. Refer to Quick-Connect Fittings in this group for procedures.

(4) The plastic fuel pump module locknut is threaded onto fuel tank (Fig. 24). Install Special Tool 6856 to fuel pump module locknut and remove locknut (Fig. 25). The fuel pump module will spring up when locknut is removed.

(5) Remove module from fuel tank.

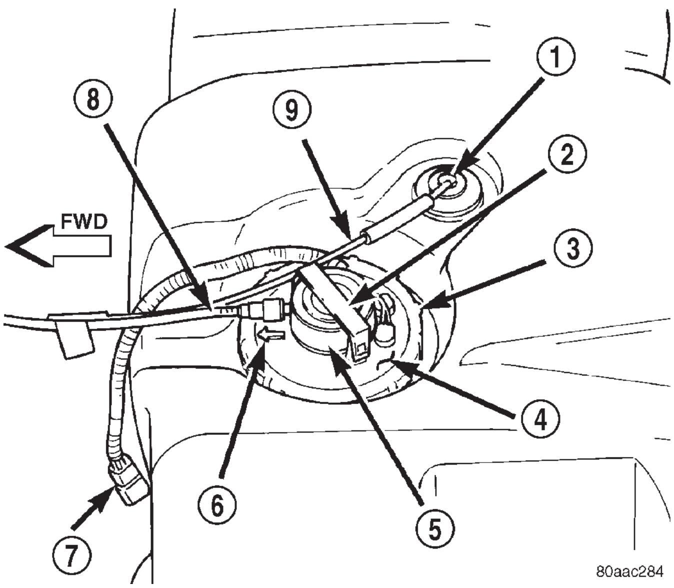


Fig. 24 Top View of Fuel Tank and Fuel Pump Module

1 – ROLLOVER VALVE
2 – RETAINER CLAMP
3 – LOCKNUT
4 – FUEL PUMP MODULE
5 – FUEL FILTER/FUEL PRESSURE REGULATOR
6 – ALIGNMENT ARROW
7 – PIGTAIL HARNESS
8 – FUEL SUPPLY TUBE
9 – EVAP CANISTER VENT LINE

INSTALLATION

CAUTION: Whenever fuel pump module is serviced, module gasket must be replaced.

(1) Thoroughly clean locknut threads and mating fuel tank threads. Use a soap/water solution. Do not use carburetor cleaner to clean threads.

(2) Using a new gasket, position gasket and fuel pump module into opening in fuel tank.

(3) Apply clean water to gasket and locknut threads.

(4) Position locknut over top of fuel pump module.

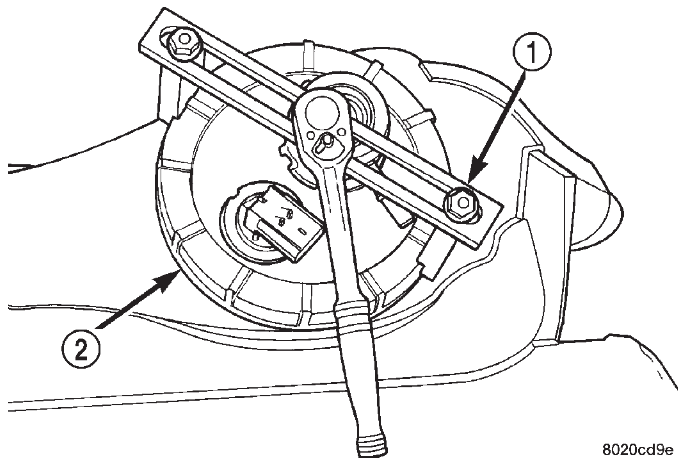


Fig. 25 Locknut Removal/Installation—Typical

1 – SPECIAL TOOL 6856
2 – LOCKNUT

(5) Rotate module until molded arrow (Fig. 24) is pointed toward front of vehicle (12 o'clock position). This step must be done to prevent float/float rod assembly from contacting sides of fuel tank.

(6) Install Special Tool 6856 to locknut.

(7) Tighten locknut to 74 N·m (55 ft. lbs.) torque.

(8) Rotate fuel filter/fuel pressure regulator until its fitting is pointed toward front of vehicle (12 o'clock position).

(9) Connect fuel line at filter/regulator. Refer to Quick-Connect Fittings in this group for procedures.

(10) Install fuel tank. Refer to Fuel Tank Installation in this section.

FUEL PUMP INLET FILTER

The fuel pump inlet filter (strainer) is located on the bottom of fuel pump module (Fig. 26). The fuel pump module is located on top of fuel tank.

REMOVAL

(1) Remove fuel tank. Refer to Fuel Tank Removal/Installation.

(2) Remove fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Remove filter by prying from bottom of module with 2 screwdrivers. Filter is snapped to module.

(4) Clean bottom of pump module.

INSTALLATION

(1) Snap new filter to bottom of module.

(2) Install fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Install fuel tank. Refer to Fuel Tank Removal/Installation.

REMOVAL AND INSTALLATION (Continued)

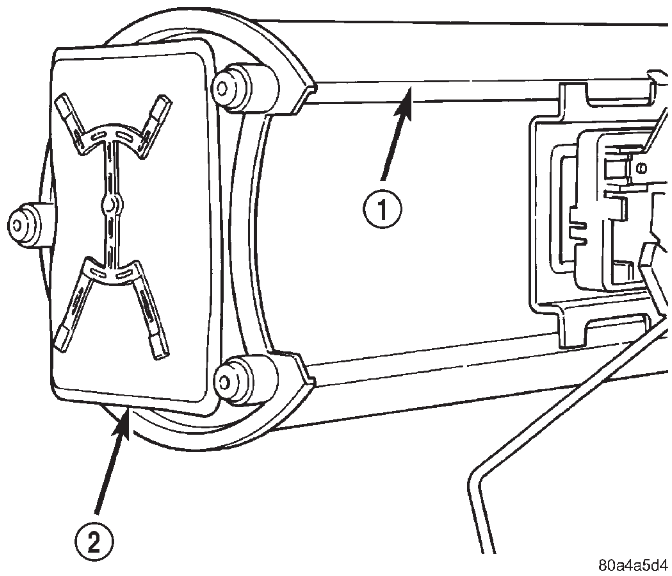


Fig. 26 Fuel Pump Inlet Filter

1 – FUEL PUMP MODULE
2 – FUEL PUMP INLET FILTER

FUEL GAUGE SENDING UNIT

The fuel gauge sending unit (fuel level sensor) and float assembly is located on the side of fuel pump module (Fig. 27). The fuel pump module is located within the fuel tank.

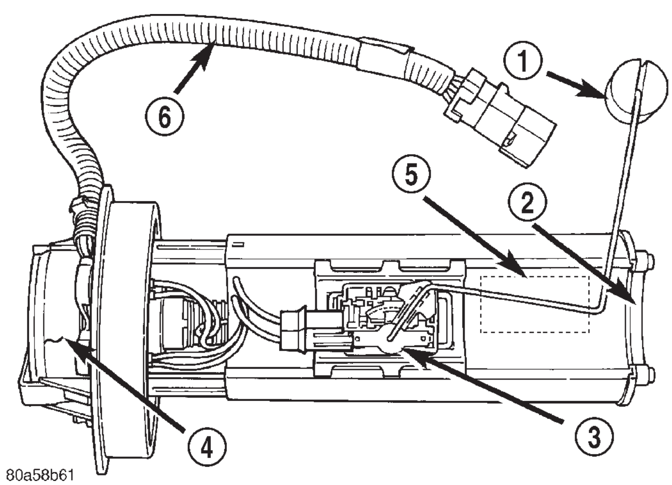


Fig. 27 Fuel Gauge Sending Unit Location

1 – FUEL GAUGE FLOAT
2 – PICK-UP FILTER
3 – FUEL GAUGE SENDING UNIT
4 – FUEL FILTER/FUEL PRESSURE REGULATOR
5 – ELECTRIC FUEL PUMP
6 – PIGTAIL WIRING HARNESS

REMOVAL

(1) Remove fuel tank. Refer to Fuel Tank Removal/ Installation.

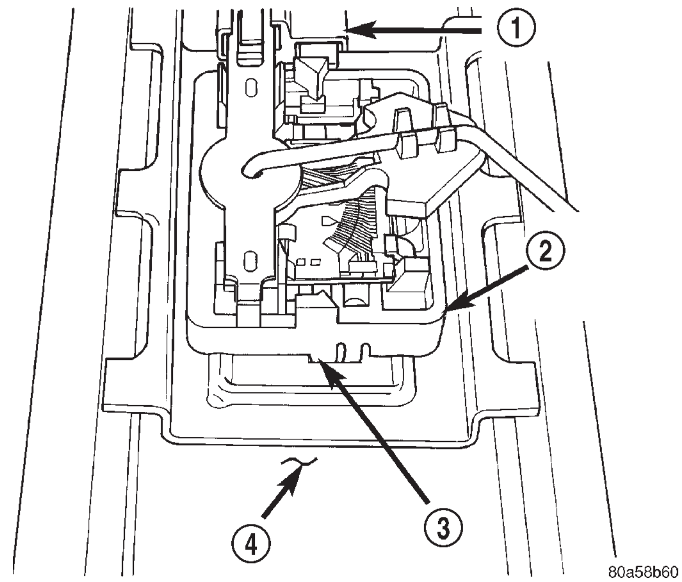


Fig. 28 Fuel Gauge Sending Unit Release Tab

1 – ELECTRICAL CONNECTOR
2 – FUEL GAUGE SENDING UNIT
3 – RELEASE TAB
4 – FUEL PUMP MODULE

(2) Remove fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Remove electrical wire connector at sending unit terminals.

(4) Press on release tab (Fig. 28) to remove sending unit from pump module.

INSTALLATION

(1) Position sending unit to pump module and snap into place.

(2) Connect electrical connector to terminals.

(3) Install fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(4) Install fuel tank. Refer to Fuel Tank Removal/ Installation.

FUEL INJECTOR RAIL/FUEL DAMPER—2.5L ENGINE

REMOVAL

The fuel damper is not serviced separately.

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL RAIL.

(1) Remove fuel tank filler tube cap.

(2) Perform Fuel System Pressure Release Procedure as described in this Group.

(3) Disconnect negative battery cable from battery.

REMOVAL AND INSTALLATION (Continued)

(4) Remove air tube at top of throttle body. Note: Some engine/vehicles may require removal of air cleaner ducts at throttle body.

(5) Remove injector harness electrical connectors at each injector. Each injector connector should have a numerical tag attached identifying its corresponding cylinder (Fig. 29). If not, identify each connector before removal.

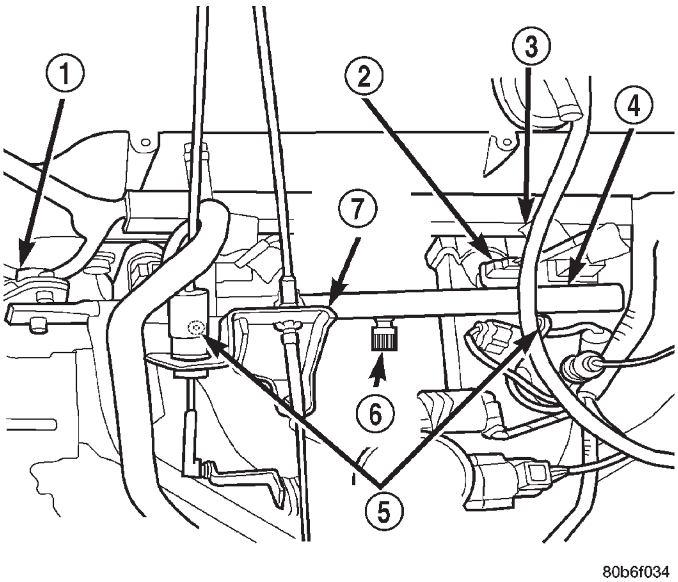


Fig. 29 Fuel Rail Mounting—2.5L Engine

1 – FUEL DAMPER
2 – FUEL INJECTOR
3 – NUMBERED TAG
4 – FUEL RAIL
5 – FUEL RAIL MOUNTING BOLTS/NUTS
6 – TEST PORT
7 – CABLE BRACKET

(6) Disconnect fuel supply line latch clip and fuel line at fuel rail. Refer to Quick-Connect Fittings in this group for procedures.

(7) Disconnect throttle cable at throttle body. Refer to Throttle Cable Removal/Installation in this group for procedures.

(8) Disconnect speed control cable at throttle body (if equipped). Refer to Speed Control Cable in Group 8H, Speed Control System for procedures.

(9) Disconnect automatic transmission cable at throttle body (if equipped).

(10) Remove cable routing bracket (Fig. 29) at intake manifold.

(11) Remove nut securing crankshaft position sensor pigtail harness to fuel rail mounting stud. Remove clamp and harness from fuel rail mounting stud.

(12) Clean dirt/debris from each fuel injector at intake manifold.

(13) Remove fuel rail mounting nuts/bolts (Fig. 29).

(14) Remove fuel rail by gently rocking until all the fuel injectors are out of intake manifold.

INSTALLATION

(1) Clean each injector bore at intake manifold.

(2) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(3) Position tips of all fuel injectors into the corresponding injector bore in intake manifold. Seat injectors into manifold.

(4) Install and tighten fuel rail mounting bolts to 11 ±3 N·m (100 ±25 in. lbs.) torque.

(5) Position crankshaft position sensor pigtail wire harness clamp and wire harness to fuel rail mounting stud. Install nut securing harness to fuel rail mounting stud.

(6) Connect tagged injector harness connectors to appropriate injector.

(7) Connect fuel line and fuel line latch clip to fuel rail. Refer Quick-Connect Fittings in this group for procedures.

(8) Install protective cap to pressure test port fitting (if equipped).

(9) Install cable routing bracket to intake manifold.

(10) Connect throttle cable at throttle body.

(11) Connect speed control cable at throttle body (if equipped).

(12) Connect automatic transmission cable at throttle body (if equipped).

(13) Install air tube (or duct) at top of throttle body.

(14) Install fuel tank cap.

(15) Connect negative battery cable to battery.

(16) Start engine and check for fuel leaks.

FUEL INJECTOR RAIL/FUEL DAMPER—4.0L ENGINE

REMOVAL

The fuel damper is not serviced separately.

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL RAIL.

(1) Remove fuel tank filler tube cap.

(2) Perform Fuel System Pressure Release Procedure.

(3) Disconnect negative battery cable from battery.

(4) Remove air tube at top of throttle body. Note: Some engine/vehicles may require removal of air cleaner ducts at throttle body.

REMOVAL AND INSTALLATION (Continued)

(5) Disconnect electrical connectors at all 6 fuel injectors. To remove connector refer to (Fig. 30). Push red colored slider away from injector (1). While pushing 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, note wiring location before removal.

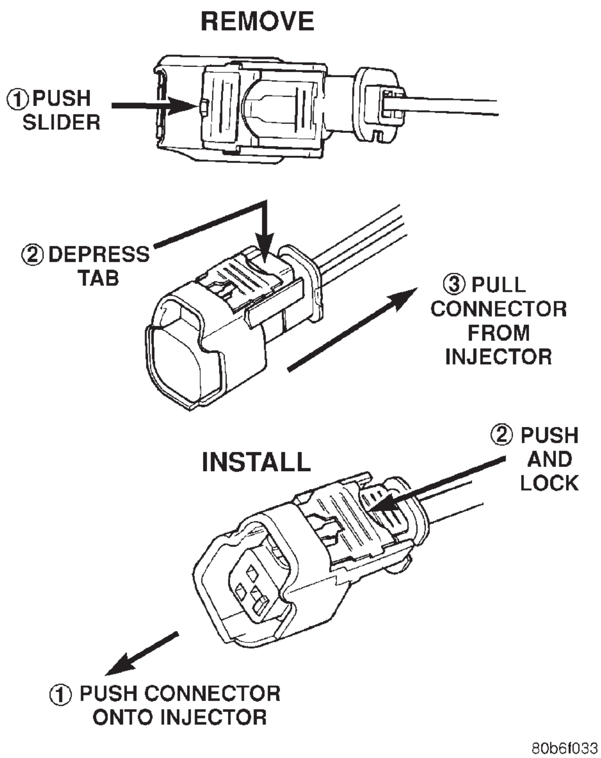


Fig. 30 Remove/Install Fuel Injector Connector—2.5L/4.0L Engine

(6) Disconnect fuel supply line latch clip and fuel line at fuel rail. Refer to Quick-Connect Fittings.

(7) Disconnect throttle cable at throttle body. Refer to Throttle Cable Removal/Installation.

(8) Disconnect speed control cable at throttle body (if equipped). Refer to Speed Control Cable in Group 8H, Speed Control System.

(9) Disconnect automatic transmission cable at throttle body (if equipped).

(10) Remove cable routing bracket at intake manifold.

(11) If equipped, remove wiring harnesses at injection rail studs by removing nuts.

(12) Clean dirt/debris from each fuel injector at intake manifold.

(13) Remove fuel rail mounting nuts/bolts (Fig. 31).

(14) Remove fuel rail by gently rocking until all the fuel injectors are out of intake manifold.

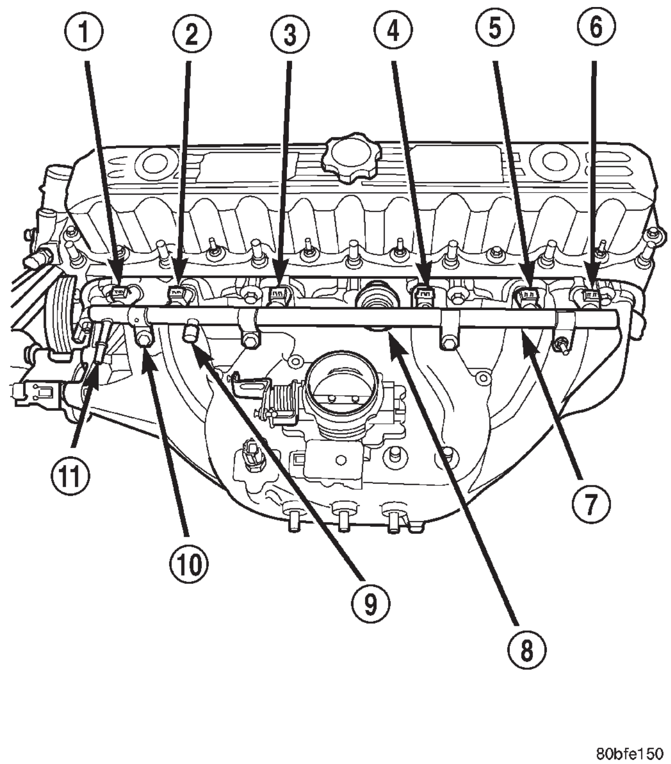


Fig. 31 Fuel Rail Mounting—4.0L Engine

1 – INJ. #1
2 – INJ. #2
3 – INJ. #3
4 – INJ. #4
5 – INJ. #5
6 – INJ. #6
7 – FUEL INJECTOR RAIL
8 – FUEL DAMPER
9 – PRESSURE TEST PORT CAP
10 – MOUNTING BOLTS (4)
11 – QUICK-CONNECT FITTING

INSTALLATION

(1) Clean each injector bore at intake manifold.

(2) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(3) Position tips of all fuel injectors into the corresponding injector bore in intake manifold. Seat injectors into manifold.

(4) Install and tighten fuel rail mounting bolts to 11 ±3 N·m (100 ±25 in. lbs.) torque.

(5) If equipped, connect wiring harnesses to injection rail studs.

(6) Connect electrical connectors at all fuel injectors. To install connector, refer to (Fig. 30). Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.

(7) Connect fuel line and fuel line latch clip to fuel rail. Refer Quick-Connect Fittings..

REMOVAL AND INSTALLATION (Continued)

(8) Install protective cap to pressure test port fitting (if equipped).

(9) Install cable routing bracket to intake manifold.

(10) Connect throttle cable at throttle body.

(11) Connect speed control cable at throttle body (if equipped).

(12) Connect automatic transmission cable at throttle body (if equipped).

(13) Install air tube (or duct) at top of throttle body.

(14) Install fuel tank cap.

(15) Connect negative battery cable to battery.

(16) Start engine and check for fuel leaks.

FUEL INJECTORS

REMOVAL

(1) Remove fuel rail. Refer to Fuel Injector Rail Removal in this section.

(2) Disconnect clip(s) that retain fuel injector(s) to fuel rail (Fig. 32).

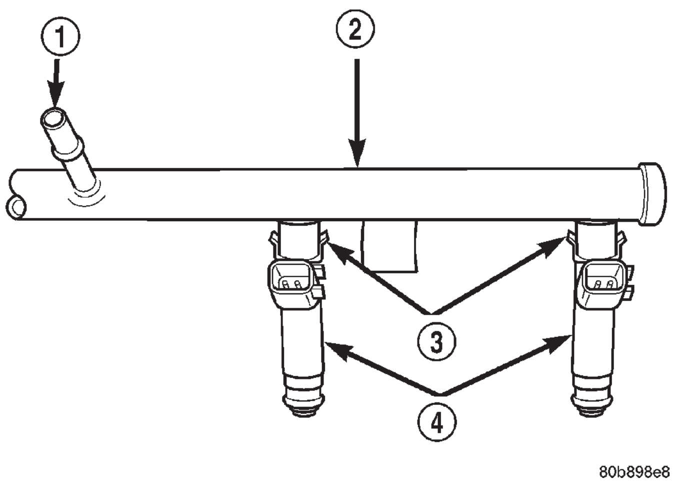


Fig. 32 Fuel Injector Mounting

1 – INLET FITTING
2 – FUEL INJECTOR RAIL
3 – CLIP
4 – FUEL INJECTOR

INSTALLATION

(1) Install fuel injector(s) into fuel rail assembly and install retaining clip(s).

(2) If same injector(s) is being reinstalled, install new o-ring(s).

(3) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(4) Install fuel rail. Refer to Fuel Rail Installation.

(5) Start engine and check for fuel leaks.

FUEL TANK

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL TANK.

Two different procedures may be used to drain fuel tank (lowering tank or using DRB scan tool).

The quickest draining procedure involves lowering the fuel tank.

As an alternative procedure, the electric fuel pump may be activated allowing tank to be drained at fuel rail connection. Refer to DRB 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. Attach end of special test hose tool number 6541, 6539, 6631 or 6923 at fuel rail disconnection (tool number will depend on model and/or engine application). Position opposite end of this hose tool to an approved gasoline draining station. Activate fuel pump and drain tank until empty.

If electric fuel pump is not operating, tank must be lowered for fuel draining. Refer to following procedures.

REMOVAL

(1) Disconnect negative battery cable at battery.

(2) Release fuel system pressure. Refer to the Fuel System Pressure Release Procedure in this group.

(3) Raise and support vehicle.

(4) If Equipped: Remove fuel tank skid plate. Refer to Group 23, Body for procedures.

(5) Remove 4 fuel hose shield mounting bolts and remove fuel hose shield (Fig. 33) from body.

(6) Remove fuel tank fill hose and vent hose clamps at fuel tank filler tube (Fig. 34). Remove both hoses at fuel filler tube (Fig. 34).

(7) Remove exhaust tailpipe heat shield mounting bolts and remove shield.

CAUTION: To protect fuel tank from exhaust heat, this shield must reinstalled after tank installation.

(8) Place a hydraulic jack to bottom of fuel tank.

WARNING: PLACE A SHOP TOWEL AROUND FUEL LINES TO CATCH ANY EXCESS FUEL.

(9) Disconnect fuel supply line from fuel extension line near front of fuel tank (Fig. 35). Refer to Fuel Tubes/Lines/Hoses and Clamps in this group. Also refer to Quick-Connect Fittings for procedures.

(10) Disconnect EVAP canister vent line near front of tank (Fig. 35).

REMOVAL AND INSTALLATION (Continued)

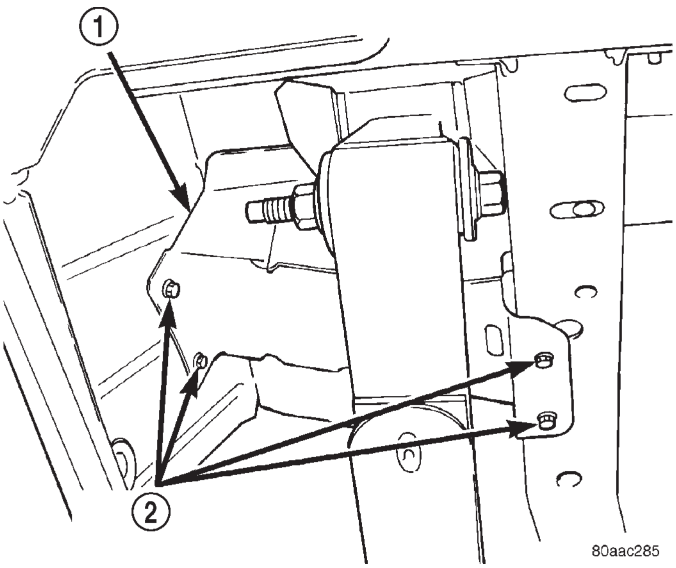


Fig. 33 Fuel Hose Shield

1 – FUEL HOSE SHIELD
2 – MOUNTING BOLTS (4)

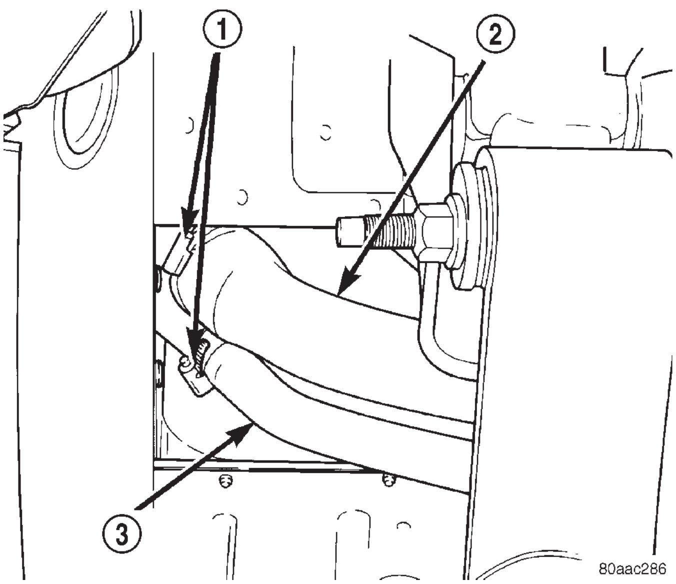


Fig. 34 Fuel Fill and Vent Hoses

1 – CLAMPS
2 – FUEL FILL HOSE
3 – FUEL VENT HOSE

(11) Disconnect fuel pump module electrical connector (pigtail harness) near front of tank (Fig. 35). Harness connector is clipped to body.

(12) Remove two fuel tank strap nuts (Fig. 36). Position both tank support straps away from tank.

(13) Carefully lower right side of tank while feeding both fuel hoses through access hole in body. **Fuel Tank Full And Not Drained Using DRB Scan Tool:** To prevent fuel loss through hoses, keep left side of tank higher than right side while lowering.

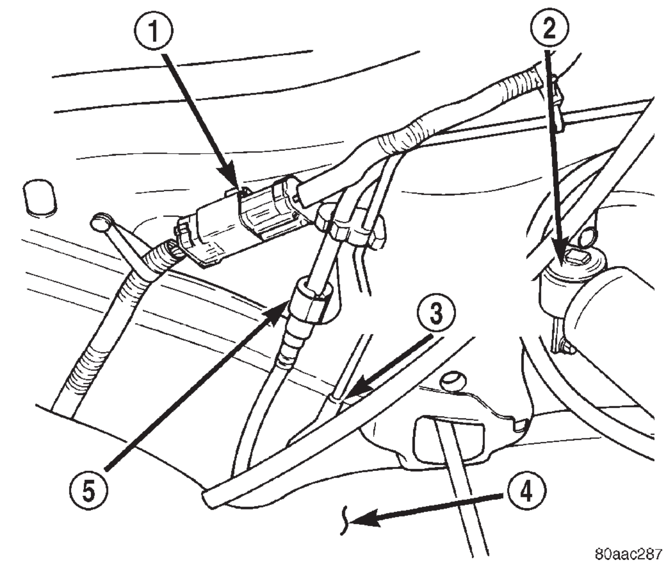


Fig. 35 Fuel Tank Connections at Front of Fuel Tank

1 – FUEL PUMP MODULE CONNECTOR
2 – LEFT-REAR SHOCK ABSORBER
3 – EVAP CANISTER VENT LINE CONNECTION
4 – FRONT OF FUEL TANK
5 – FUEL SUPPLY LINE CONNECTION

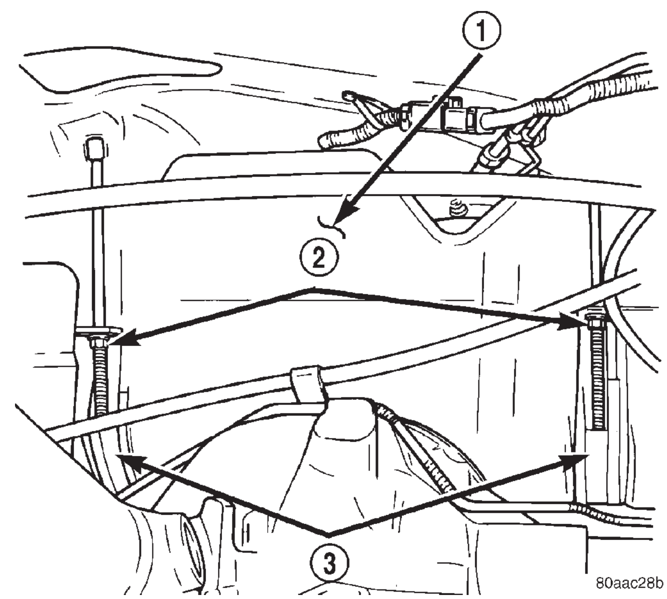


Fig. 36 Fuel Tank Mounting Straps/Nuts

1 – FRONT OF FUEL TANK
2 – NUTS (2)
3 – STRAPS (2)

Do not allow hose openings to drop lower than top of tank.

(14) Continue lowering tank until clear of vehicle. Place tank on floor with left side (hose side) higher than right side.

(15) Drain tank by removing fuel fill hose at tank. Fuel fill hose is largest of 2 hoses (Fig. 37). Insert the

REMOVAL AND INSTALLATION (Continued)

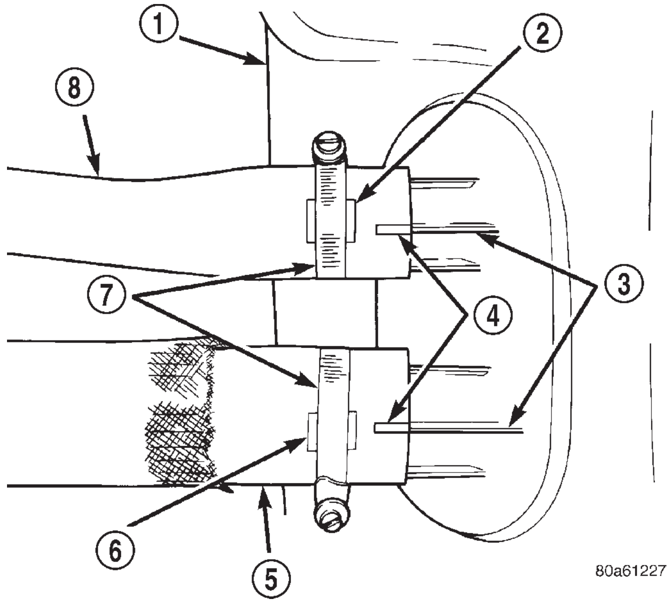


Fig. 37 Fuel Fill/Vent Hose Index Marks

1 – FUEL TANK
2 – CLAMP INDEX MARKS
3 – TANK INDEX TANGS
4 – HOSE INDEX MARKS
5 – FUEL FILL HOSE
6 – CLAMP INDEX MARKS
7 – CLAMPS
8 – FUEL VENT HOSE

drain hose (from an approved gasoline draining station) into hose opening. Drain tank until empty.

(16) If fuel pump module removal is necessary, refer to Fuel Pump Module Removal/Installation in this group for procedures.

INSTALLATION

(1) If fuel pump module is being installed, refer to Fuel Pump Module Removal/Installation in this group for procedures.

(2) Install fuel fill/vent hoses to tank fittings. To prevent hose from kinking, rotate each hose until index mark on hose is aligned to index tang on fuel tank (Fig. 37).

(3) Install hose clamps to hoses. Position clamps between index marks on each hose (Fig. 37).

(4) Position fuel tank to hydraulic jack.

(5) Raise tank into position while guiding fuel fill and vent hoses into and through access hole in body.

(6) Continue raising tank until positioned to body.

(7) Attach two fuel tank mounting straps and mounting nuts. Tighten nuts to 10 N·m (90 in. lbs.) torque. Do not over tighten nuts.

(8) Install both fuel hoses to fuel fill tube. Tighten both retaining clamps.

(9) Position fuel hose shield to body. Install and tighten 4 mounting bolts.

(10) Connect fuel pump module pigtail harness electrical connector near front of tank.

(11) Connect fuel pump module supply line near front of tank. Refer to Quick-Connect Fittings for procedures.

(12) Connect EVAP hose near front of tank.

(13) Install exhaust tailpipe heat shield.

(14) Install fuel tank skid plate (if equipped).

(15) Lower vehicle and connect battery cable to battery.

FUEL TANK FILLER TUBE CAP

REMOVAL/INSTALLATION

If replacement of the 1/4 turn fuel tank filler tube cap is necessary, it must be replaced with an identical cap to be sure of correct system operation.

CAUTION: Remove the fuel tank filler tube cap to relieve fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or before draining the fuel tank.

ACCELERATOR PEDAL

REMOVAL

The accelerator pedal is connected to the throttle body linkage by the throttle cable. The cable is protected by a plastic sheathing and is connected to the throttle body linkage by a ball socket. It is connected to the upper part of the accelerator pedal arm by a plastic retainer (clip) (Fig. 38). This retainer (clip) snaps into the top of the accelerator pedal arm. Retainer tabs (built into the cable sheathing) (Fig. 38) fasten the cable to the dash panel.

Dual throttle return springs (attached to the throttle shaft) are used to close the throttle.

CAUTION: Never attempt to remove or alter these springs.

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing the accelerator pedal or throttle cable.

(1) From inside the vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of accelerator pedal arm (Fig. 38). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove accelerator pedal mounting bracket nuts. Remove accelerator pedal assembly.

REMOVAL AND INSTALLATION (Continued)

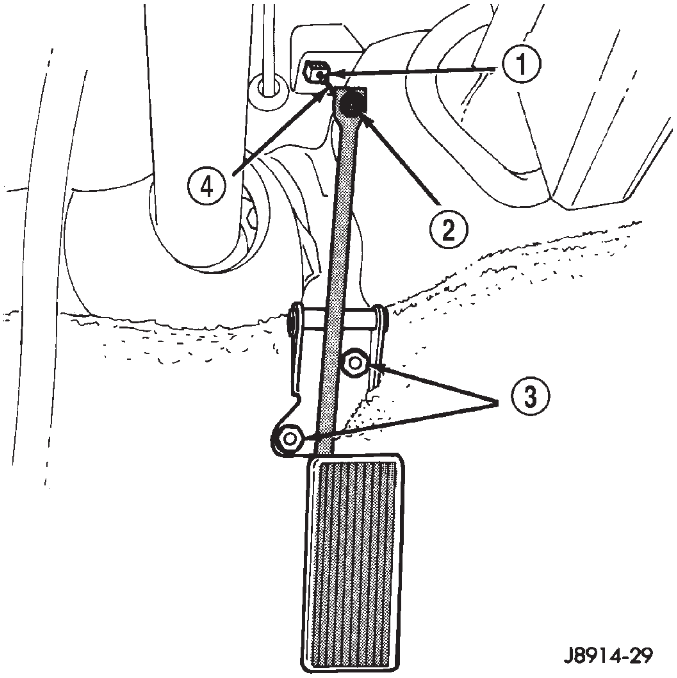


Fig. 38 Accelerator Pedal Mounting—Typical

1 – RETAINER TABS
2 – CLIP
3 – MOUNTING NUTS
4 – CABLE

INSTALLATION

(1) Place accelerator pedal assembly over studs protruding from floor pan. Tighten mounting nuts to 5 N·m (36 in. lbs.) torque.

(2) Slide throttle cable into opening in top of pedal arm. Push plastic cable retainer (clip) into accelerator pedal arm opening until it snaps into place.

(3) Before starting engine, operate accelerator pedal to check for any binding.

THROTTLE CABLE

REMOVAL

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of accelerator pedal arm (Fig. 38). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove cable core wire at pedal arm.

(3) From inside vehicle, pinch both sides of cable housing retainer tabs (Fig. 38) at dash panel. Remove cable housing from dash panel and pull into engine compartment.

(4) Remove cable from cable guide on engine cylinder head (valve) cover.

(5) Remove throttle cable ball end socket at throttle body by pushing ball socket towards rear of vehicle (ball snaps off throttle body pin) (Fig. 39).

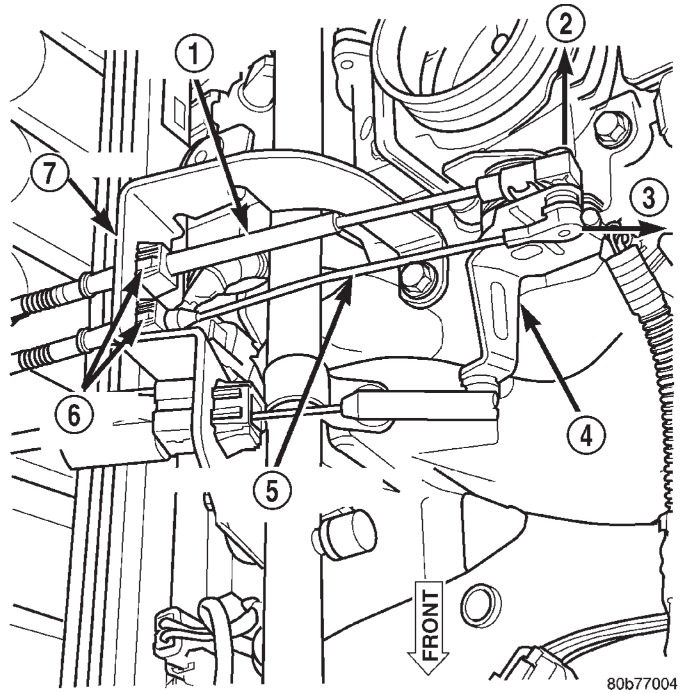


Fig. 39 Throttle Cable at Throttle Body

1 – ACCELERATOR CABLE
2 – OFF
3 – OFF
4 – THROTTLE BODY BELLCRANK
5 – SPEED CONTROL CABLE
6 – RELEASE TABS
7 – BRACKET

(6) Remove throttle cable from throttle body mounting bracket by compressing release tabs (Fig. 39) and pushing cable through hole in bracket.

(7) Remove throttle cable from vehicle.

INSTALLATION

(1) Slide throttle cable through hole in throttle body bracket until retainer tabs lock into bracket.

(2) Connect cable ball end to throttle body linkage ball (snaps on).

(3) Snap cable into cable guide on engine cylinder head (valve) cover.

(4) Push other end of cable through opening in dash panel until retaining tabs lock into panel.

(5) From inside drivers compartment, slide throttle cable core wire into opening in top of accelerator pedal arm. Push cable retainer (clip) into pedal arm opening until it snaps in place.

(6) Before starting engine, operate accelerator pedal to check for any binding.

SPECIFICATIONS

FUEL TANK CAPACITY

Models	Liters	U. S. Gallons
All	76	20
Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.		

FUEL SYSTEM PRESSURE

339 kPa ± 34 kPa (49.2 psi ± 2 psi).

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 supports 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 gasolines 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 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.

SPECIFICATIONS (Continued)

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.

TORQUE CHART

DESCRIPTION	TORQUE
Accelerator Pedal Bracket Mounting Nuts	5 N·m (36 in. lbs.)
Fuel Hose Clamps	3 N·m (25 in. lbs.)
Fuel Rail Mounting Bolts	11 N·m (100 in. lbs.)
Fuel Tank Mounting Strap Nuts	10 N·m (90 in. lbs.)
Fuel Pump Module Locknut	74 N·m (55 ft. lbs.)

FUEL INJECTION SYSTEM

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

POWERTRAIN CONTROL MODULE (PCM)

DESCRIPTION

The Powertrain Control Module (PCM) is located in the engine compartment (Fig. 1). The PCM is referred to as JTEC.

OPERATION

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant tem-

DESCRIPTION AND OPERATION (Continued)

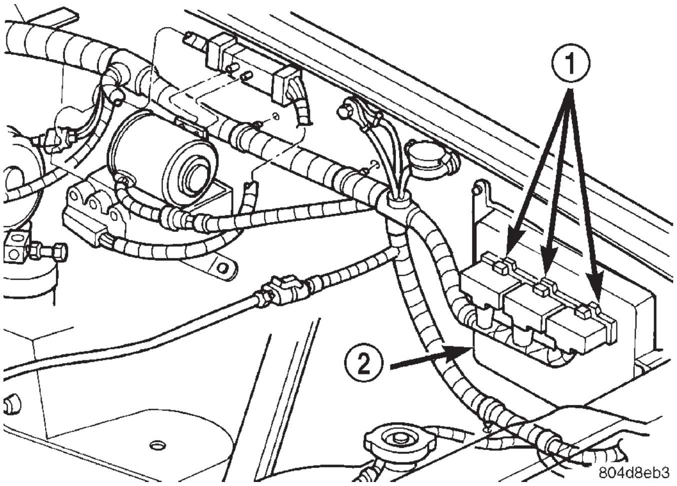


Fig. 1 PCM Location

1 – (3) 32–WAY CONNECTORS
2 – PCM

perature, throttle position, transmission gear selection (automatic transmission), vehicle speed, power steering pump pressure (2.5L engine only), and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

NOTE: PCM Inputs:

- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage
- Brake switch
- CCD bus (+) circuits
- CCD bus (-) circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connection for DRB scan tool
- Engine coolant temperature sensor
- Extended idle switch (4.0L engine with police package)
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Power steering pressure switch (2.5L engine only)
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Vehicle speed sensor

NOTE: PCM Outputs:

- A/C clutch relay
- Auto shutdown (ASD) relay
- CCD bus (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
- Data link connection for DRB scan tool
- EGR valve control solenoid (if equipped)
- EVAP canister purge solenoid
- Five volt sensor supply (primary)
- Five volt sensor supply (secondary)
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Idle air control (IAC) motor
- Ignition coil
- Leak detection pump (if equipped)
- Malfunction indicator lamp (Check engine lamp). Driven through CCD circuits.
- Radiator cooling fan relay
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (if equipped). Driven through CCD circuits.
- Transmission convertor clutch circuit

MODES OF OPERATION

OPERATION

As input signals to the Powertrain Control Module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

The PCM will operate in two different modes: **Open Loop and Closed Loop**.

During Open Loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen (O2S) sensors is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O2S) sensors input. This input indicates

DESCRIPTION AND OPERATION (Continued)

to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

- The PCM pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.
- Intake manifold air temperature sensor input is monitored.
- Throttle position sensor (TPS) is monitored.
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged.
- The O2S sensor heater element is energized via the ASD relay. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.

ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The PCM receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the PCM receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the A/C compressor clutch relay. This is done if A/C has been selected by the vehicle operator and specified pressures are met at the high and low–pressure A/C switches. Refer to Group 24, Heating and Air Conditioning for additional information.
- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

DESCRIPTION AND OPERATION (Continued)

IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Extended idle switch (4.0L engine with police package only)
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensors
- Power steering pressure switch (2.5L engine only)

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.
- The PCM operates the A/C compressor clutch through the A/C compressor clutch relay. This is done if A/C has been selected by the vehicle operator and specified pressures are met at the high and low–pressure A/C switches. Refer to Group 24, Heating and Air Conditioning for additional information.

The optional Extended Idle Switch is used to raise and hold the engine idle speed to approximately 1000 rpm. This is when the shifter is in either the Park or Neutral position and throttle pedal is not used. A rocker-type switch (extended idle switch) is mounted to the instrument panel. This switch will supply a ground circuit (input) to the PCM. **The switch is available only with 4.0L engine when supplied with optional police package.**

On 2.5L 4–cylinder engines, a power steering pressure switch is used to supply an input to the PCM when steering pump pressure is high. This will raise engine speed. Refer to Power Steering Pressure Switch in this group for additional information. **The 4.0L 6–cylinder engine does not use this switch.**

CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O2S) sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

ACCELERATION MODE

This is an Open Loop mode. The PCM recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the PCM receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Vehicle speed sensor

DESCRIPTION AND OPERATION (Continued)

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply a ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the PCM receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal (in the distributor)

During wide open throttle conditions, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.

IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

AUTOMATIC SHUTDOWN (ASD) RELAY SENSE—PCM INPUT

DESCRIPTION

The ASD relay is located in the Power Distribution Center (PDC). The PDC is located in the engine compartment. Refer to label on PDC cover for relay location.

OPERATION

A 12 volt signal at this input indicates to the PCM that the ASD has been activated. The relay is used to connect the oxygen sensor heater element, ignition coil and fuel injectors to 12 volt + power supply.

This input is used only to sense that the ASD relay is energized. If the powertrain control module (PCM) does not see 12 volts at this input when the ASD should be activated, it will set a diagnostic trouble code (DTC).

BATTERY VOLTAGE—PCM INPUT

OPERATION

The battery voltage input provides power to the Powertrain Control Module (PCM). It also informs the PCM what voltage level is supplied to the ignition coil and fuel injectors.

If battery voltage is low, the PCM will increase injector pulse width (period of time that the injector is energized). This is done to compensate for the reduced flow through injector caused by the lowered voltage.

BRAKE SWITCH—PCM INPUT

OPERATION

When the brake light switch is activated, the Powertrain Control Module (PCM) receives an input indicating that the brakes are being applied. After receiving this input, the PCM maintains idle speed to a scheduled rpm through control of the Idle Air Control (IAC) motor. The brake switch input is also used to disable vent and vacuum solenoid output signals to the speed control servo.

FIVE VOLT SENSOR SUPPLIES—PRIMARY AND SECONDARY

DESCRIPTION

Two different Powertrain Control Module (PCM) five volt supply circuits are used; primary and secondary.

OPERATION

These 2 circuits will:

- supply the required 5 volt power source to the Crankshaft Position (CKP) sensor.
- supply the required 5 volt power source to the Camshaft Position (CMP) sensor.
- supply a reference voltage for the Manifold Absolute Pressure (MAP) sensor.
- supply a reference voltage for the Throttle Position Sensor (TPS) sensor.
- supply the required 5 volt power source to the oil pressure sensor.
- supply the required 5 volt power source for the Vehicle Speed Sensor (VSS) (if equipped).

DESCRIPTION AND OPERATION (Continued)

- supply the 5 volt power source to the transmission pressure sensor (if equipped with an RE automatic transmission).

FUEL LEVEL SENSOR—PCM INPUT

DESCRIPTION

The fuel level sensor (fuel gauge sending unit) is located on the fuel pump module.

OPERATION

Refer to Fuel Gauge Sending Unit in the Fuel Delivery section for information.

ENGINE COOLANT TEMPERATURE SENSOR—PCM INPUT

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to sense engine coolant temperature. The sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

- for engine coolant temperature gauge operation through CCD or PCI (J1850) communications
- Injector pulse-width
- Spark-advance curves
- ASD relay shut-down times
- Idle Air Control (IAC) motor key-on steps
- Pulse-width prime-shot during cranking
- O2 sensor closed loop times
- Purge solenoid on/off times
- EGR solenoid on/off times (if equipped)
- Leak Detection Pump operation (if equipped)
- Radiator fan relay on/off times (if equipped)
- Target idle speed

EXTENDED IDLE SWITCH—PCM INPUT

DESCRIPTION

USED ONLY WITH OPTIONAL POLICE PACKAGE WHEN EQUIPPED WITH A 4.0L ENGINE: The extended idle switch is a rocker-type switch mounted to the instrument panel.

OPERATION

The extended idle switch is used to raise the engine idle speed to approximately 1000 rpm by supplying a ground circuit to the Powertrain Control Module (PCM). This idle speed control can only be operated when the shifter is in either the Park or Neutral position.

OXYGEN SENSOR—PCM INPUT

DESCRIPTION

The Oxygen Sensors (O2S) are attached to, and protrude into the vehicle exhaust system. Depending on the emission package, the vehicle may contain either 2 or 4 sensors. On non-California emissions packages, 2 sensors are used: upstream (referred to as 1/1) and downstream (referred to as 1/2). On California emissions packages, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2).

OPERATION

An O2 sensor is a galvanic battery that provides the PCM with a voltage signal (0-1 volt) inversely proportional to the amount of oxygen in the exhaust. In other words, if the oxygen content is low, the voltage output is high; if the oxygen content is high the output voltage is low. The PCM uses this information to adjust injector pulse-width to achieve the 14.7–to–1 air/fuel ratio necessary for proper engine operation and to control emissions.

An O2 sensor must have a source of oxygen from outside of the exhaust stream for comparison. Current O2 sensors receive their fresh oxygen (outside air) supply through the wire harness. This is why it is important to never solder an O2 sensor connector, or pack the connector with grease.

Four wires (circuits) are used on each O2 sensor: a 12–volt feed circuit for the sensor heating element; a ground circuit for the heater element; a low-noise sensor return circuit to the PCM, and an input circuit from the sensor back to the PCM to detect sensor operation.

Oxygen Sensor Heaters/Heater Relays: On a certain non-California emission package, the heaters on both sensors are fed battery voltage from the ASD relay which is controlled by the PCM. Refer to ASD relay for more information. On another non-Califor-

DESCRIPTION AND OPERATION (Continued)

nia emission package, the heaters on both sensors are fed battery voltage from the two O2S heater relays. The O2S relays are also controlled by the PCM. On the California emission package, the heaters on all 4 sensors are fed battery voltage from the two O2S Heater Relays.

The O2 sensor uses a Positive Thermal Co-efficient (PTC) heater element. As temperature increases, resistance increases. At ambient temperatures around 70°F, the resistance of the heating element is approximately 6 ohms. As the sensor's temperature increases, resistance in the heater element increases. This allows the heater to maintain the optimum operating temperature of approximately 930°-1100°F (500°-600° C). Although the sensors operate the same, there are physical differences, due to the environment that they operate in, that keep them from being interchangeable.

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 certain O2 sensor input(s) 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.

Upstream Sensor (Non-California Emissions): The upstream O2S sensor (1/1 sensor) is located in the exhaust downpipe before the catalytic convertor. It provides an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensor. The PCM will change the air/fuel ratio until the upstream sensor inputs a voltage that the PCM has determined will make the downstream sensor output (oxygen content) correct.

The upstream oxygen sensor also provides an input to determine catalyst efficiency.

Downstream Sensor (Non-California Emissions): The downstream heated oxygen sensor (1/2 sensor) is located near the outlet end of the catalytic convertor. The downstream sensor is also used to determine the correct air fuel ratio. As the oxygen content changes at the downstream the PCM calculates how much air fuel ratio change is required. The PCM then looks at the upstream oxygen sensor voltage and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensor also provides an input to determine catalyst efficiency.

Upstream Sensors (California Emissions): Two upstream sensors are used (1/1 and 2/1). The 1/1 sensor is the first sensor to receive exhaust gases from the #1 cylinder. Both of the upstream O2S sensors are located in the exhaust manifold just before the mini-catalytic convertors. They provide an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensors. The PCM will change the air/fuel ratio until the upstream sensors input a voltage that the PCM has determined will make the downstream sensors output (oxygen content) correct.

The upstream oxygen sensors also provide an input to determine mini-catalyst efficiency.

Downstream Sensors (California Emissions): Two downstream sensors are used (1/2 and 2/2). The downstream sensors are located in the exhaust downpipes just after the mini-catalytic convertors. The downstream is also used to determine the correct air fuel ratio. As the oxygen content changes at the downstream the PCM calculates how much air fuel ratio change is required. The PCM then looks at the upstream oxygen sensor voltage and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensors also provide an input to determine mini-catalyst efficiency.

IGNITION CIRCUIT SENSE—PCM INPUT

DESCRIPTION

This circuit ties the ignition switch to the Powertrain Control Module (PCM).

OPERATION

The ignition circuit sense input tells the PCM the ignition switch has energized the ignition circuit.

Battery voltage is also supplied to the PCM through the ignition switch when the ignition is in the RUN or START position. This is referred to as the "ignition sense" circuit and is used to "wake up" the PCM. Voltage on the ignition input can be as low as 6 volts and the PCM will still function. Voltage is supplied to this circuit to power the PCM's 8-volt regulator and to allow the PCM to perform fuel, ignition and emissions control functions. The battery voltage on this line is supplied to the 8-volt regulator which then passes on a power-up supply to the 5-volt regulator.

DESCRIPTION AND OPERATION (Continued)

INTAKE MANIFOLD AIR TEMPERATURE SENSOR—PCM INPUT

DESCRIPTION

The 2–wire Intake Manifold Air Temperature (IAT) sensor is installed in the intake manifold with the sensor element extending into the air stream.

The IAT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as intake manifold temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

The IAT sensor provides an input voltage to the Powertrain Control Module (PCM) indicating the density of the air entering the intake manifold based upon intake manifold temperature. At key-on, a 5–volt power circuit is supplied to the sensor from the PCM. The sensor is grounded at the PCM through a low-noise, sensor-return circuit.

The PCM uses this input to calculate the following:

- Injector pulse-width
- Adjustment of spark timing (to help prevent spark knock with high intake manifold air-charge temperatures)

The resistance values of the IAT sensor is the same as for the Engine Coolant Temperature (ECT) sensor.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—PCM INPUT

DESCRIPTION

The Manifold Absolute Pressure (MAP) sensor is attached to the side of the engine throttle body with 2 screws. The sensor is connected to the throttle body with a rubber L-shaped fitting.

OPERATION

The MAP sensor is used as an input to the Powertrain Control Module (PCM). It contains 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 manifold absolute pressure (MAP) equals Barometric pressure, the pulse width will be at maximum.

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. To operate the sensor, it is supplied a regulated 4.8 to 5.1 volts. Ground is provided through the low-noise, sensor return circuit at the PCM.

The MAP sensor input is the number one contributor to fuel injector 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 at a higher altitude, because the air density changes with altitude. It will also help to correct for varying barometric pressure. Barometric pressure and altitude have a direct inverse correlation; as altitude goes up, barometric goes down. At key-on, the PCM powers up and looks at 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 voltage 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 a known good sensor.

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 (WOT), based upon Throttle Position Sensor (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 input to aid in calculating the following:

- Manifold pressure
- Barometric pressure
- Engine load
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (certain automatic transmissions only)
- Idle speed
- Decel fuel shutoff

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 manifold pressure 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 condition the signal and provide temperature compensation.

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; meaning as pressure changes, voltage changes proportionately.

DESCRIPTION AND OPERATION (Continued)

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 approximately 29.92 in Hg. For every 100 feet of altitude, barometric pressure drops.10 in. Hg. If a storm goes through it can change barometric pressure from what should be present for that altitude. You should know what the average pressure and corresponding barometric pressure is for your area.

OIL PRESSURE SENSOR—PCM INPUT

DESCRIPTION

The 3–wire, solid-state engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

The oil pressure sensor uses three circuits. They are:

- A 5–volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3–wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5–volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

POWER GROUNDS

OPERATION

The Powertrain Control Module (PCM) has 2 main grounds. Both of these grounds are referred to as power grounds. All of the high-current, noisy, electrical devices are connected to these grounds as well as all of the sensor returns. The sensor return comes into the sensor return circuit, passes through noise suppression, and is then connected to the power ground.

The power ground is used to control ground circuits for the following PCM loads:

- Generator field winding
- Fuel injectors
- Ignition coil(s)
- Certain relays/solenoids
- Certain sensors

POWER STEERING PRESSURE SWITCH—PCM INPUT

DESCRIPTION

A pressure sensing switch (Fig. 2) is included in the power steering system (mounted on the high-pressure line). This switch will be used only on vehicles equipped with a 2.5L engine and power steering.

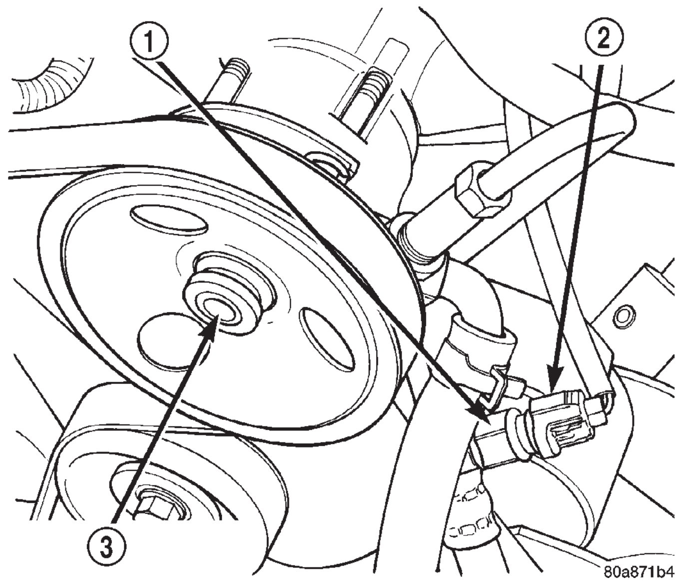


Fig. 2 Power Steering Pump Pressure Switch—2.5L Engine

1 – POWER STEERING PRESSURE SWITCH
2 – ELECTRICAL CONNECTOR
3 – POWER STEERING PUMP

OPERATION

The power steering pressure switch provides an input to the Powertrain Control Module (PCM). This input is provided during periods of high pump load and low engine rpm; such as during parking maneuvers. The PCM will then increase the idle speed through the Idle Air Control (IAC) motor. This is done to prevent the engine from stalling under the increased load.

When steering pump pressure exceeds 3275 kPa ± 690 kPa (475 psi ± 100 psi), the normally closed switch will open and the PCM will increase the engine idle speed. This will prevent the engine from stalling.

DESCRIPTION AND OPERATION (Continued)

When pump pressure drops to approximately 1379 kPa (200 psi), the switch circuit will re-close and engine idle speed will return to its previous setting.

SENSOR RETURN—PCM INPUT

OPERATION

The Sensor Return circuits are internal to the Powertrain Control Module (PCM).

Sensor Return provides a low–noise ground reference for all engine control system sensors. Refer to Power Grounds for more information.

THROTTLE POSITION SENSOR (TPS)—PCM INPUT

DESCRIPTION

The 3–wire Throttle Position Sensor (TPS) is mounted on the throttle body and is connected to the throttle blade.

OPERATION

The TPS is a 3–wire variable resistor that provides the Powertrain Control Module (PCM) with an input signal (voltage) that represents the throttle blade position of the throttle body. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the resistance (output voltage) of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from.26 volts at minimum throttle opening (idle), to 4.49 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.

The PCM needs to identify the actions and position of the throttle blade at all times. This information is needed to assist in performing the following calculations:

- Ignition timing advance
- Fuel injection pulse-width
- Idle (learned value or minimum TPS)
- Off-idle (0.06 volt)
- Wide Open Throttle (WOT) open loop (2.608 volts above learned idle voltage)
- Deceleration fuel lean out
- Fuel cutoff during cranking at WOT (2.608 volts above learned idle voltage)
- A/C WOT cutoff (certain automatic transmissions only)

VEHICLE SPEED AND DISTANCE SENSOR—PCM INPUT

DESCRIPTION

The 3–wire Vehicle Speed Sensor (VSS) is located on the speedometer pinion gear adapter. If equipped with 4WD, this adapter is located on the extension housing of the transfer case (drivers side). If equipped with 2WD, this adapter is located on the left side of the transmission extension housing.

OPERATION

The VSS is a 3–circuit (3–wire), magnetic, hall-effect sensor.

The 3 circuits are:

- A 5–volt power supply from the Powertrain Control Module (PCM).
- A ground is provided for the sensor though a low-noise sensor return circuit in the PCM.
- An input to the PCM is used to determine vehicle speed and distance traveled.

The speed sensor generates 8 pulses per sensor revolution. These signals, in conjunction with a closed throttle signal from the throttle position sensor, indicate a closed throttle deceleration to the PCM. When the vehicle is stopped at idle, a closed throttle signal is received by the PCM (but a speed sensor signal is not received).

Under deceleration conditions, the PCM adjusts the Idle Air Control (IAC) motor to maintain a desired MAP value. Under idle conditions, the PCM adjusts the IAC motor to maintain a desired engine speed.

AUTO SHUTDOWN (ASD) RELAY—PCM OUTPUT

DESCRIPTION

The 5–pin, 12–volt, Automatic Shutdown (ASD) relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

OPERATION

The ASD relay supplies battery voltage (12+ volts) to the fuel injectors and ignition coil(s). With certain emissions packages it also supplies 12–volts to the oxygen sensor heating elements.

The ground circuit for the coil within the ASD relay is controlled by the Powertrain Control Module (PCM). The PCM operates the ASD relay by switching its ground circuit on and off.

The ASD relay will be shut–down, meaning the 12–volt power supply to the ASD relay will be de-activated by the PCM if:

DESCRIPTION AND OPERATION (Continued)

• the ignition key is left in the ON position. This is if the engine has not been running for approximately 1.8 seconds.

• there is a crankshaft position sensor signal to the PCM that is lower than pre-determined values.

The PCM will sense if or when the ASD relay has been activated through a “sense circuit”. Refer to Automatic Shut-Down (ASD) Relay Sense-PCM Input for additional information.

CCD BUS (+/-) CIRCUITS-PCM OUTPUTS

OPERATION

The Powertrain Control Module (PCM) sends certain output signals through the CCD bus circuits. These signals are used to control certain instrument panel located items and to determine certain identification numbers.

Refer to Group 8E, Instrument Panel and Gauges for additional information.

DATA LINK CONNECTOR—PCM INPUT AND OUTPUT

DESCRIPTION

The data link connector is located at the lower edge of the instrument panel near the steering column.

OPERATION

The 16–way data link connector (diagnostic scan tool connector) links the Diagnostic Readout Box (DRB) scan tool or the Mopar Diagnostic System (MDS) with the Powertrain Control Module (PCM).

FUEL INJECTORS—PCM OUTPUT

DESCRIPTION

The fuel injectors are connected to the engine with the fuel injector rail.

OPERATION

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector with its respective cylinder number.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage (12 volts +) is supplied to the injectors through the ASD relay. The ASD relay will shutdown the 12 volt power source to the fuel injectors if the PCM senses the ignition is on, but the engine is not running. This occurs after the engine has not been running for approximately 1.8 seconds.

The PCM determines injector on-time (pulse width) based on various inputs.

FUEL PUMP RELAY-PCM OUTPUT

DESCRIPTION

The 5–pin, 12–volt, fuel pump relay is located in the Power Distribution Center (PDC). Refer to the label on the PDC cover for relay location.

OPERATION

The Powertrain Control Module (PCM) energizes the electric fuel pump through the fuel pump relay. The fuel pump relay is energized by first applying battery voltage to it when the ignition key is turned ON, and then applying a ground signal to the relay from the PCM.

Whenever the ignition key is turned ON, the electric fuel pump will operate. But, the PCM will shutdown the ground circuit to the fuel pump relay in approximately 1–3 seconds unless the engine is operating or the starter motor is engaged.

IDLE AIR CONTROL (IAC) MOTOR—PCM OUTPUT

DESCRIPTION

The IAC stepper motor is mounted to the throttle body, and regulates the amount of air bypassing the control of the throttle plate. As engine loads and ambient temperatures change, engine rpm changes. A pintle on the IAC stepper motor protrudes into a passage in the throttle body, controlling air flow through the passage. The IAC is controlled by the Powertrain Control Module (PCM) to maintain the target engine idle speed.

OPERATION

At idle, engine speed can be increased by retracting the IAC motor pintle and allowing more air to pass through the port, or it can be decreased by restricting the passage with the pintle and diminishing the amount of air bypassing the throttle plate.

The IAC is called a stepper motor because it is moved (rotated) in steps, or increments. Opening the IAC opens an air passage around the throttle blade which increases RPM.

DESCRIPTION AND OPERATION (Continued)

The PCM uses the IAC motor to control idle speed (along with timing) and to reach a desired MAP during decel (keep engine from stalling).

The IAC motor has 4 wires with 4 circuits. Two of the wires are for 12 volts and ground to supply electrical current to the motor windings to operate the stepper motor in one direction. The other 2 wires are also for 12 volts and ground to supply electrical current to operate the stepper motor in the opposite direction.

To make the IAC go in the opposite direction, the PCM just reverses polarity on both windings. If only 1 wire is open, the IAC can only be moved 1 step (increment) in either direction. To keep the IAC motor in position when no movement is needed, the PCM will energize both windings at the same time. This locks the IAC motor in place.

In the IAC motor system, the PCM will count every step that the motor is moved. This allows the PCM to determine the motor pintle position. If the memory is cleared, the PCM no longer knows the position of the pintle. So at the first key ON, the PCM drives the IAC motor closed, regardless of where it was before. This zeros the counter. From this point the PCM will back out the IAC motor and keep track of its position again.

When engine rpm is above idle speed, the IAC is used for the following:

- Off-idle dashpot (throttle blade will close quickly but idle speed will not stop quickly)
- Deceleration air flow control
- A/C compressor load control (also opens the passage slightly before the compressor is engaged so that the engine rpm does not dip down when the compressor engages)
- Power steering load control

The PCM can control polarity of the circuit to control direction of the stepper motor.

IAC Stepper Motor Program: The PCM is also equipped with a memory program that records the number of steps the IAC stepper motor most recently advanced to during a certain set of parameters. For example: The PCM was attempting to maintain a 1000 rpm target during a cold start-up cycle. The last recorded number of steps for that may have been 125. That value would be recorded in the memory cell so that the next time the PCM recognizes the identical conditions, the PCM recalls that 125 steps were required to maintain the target. This program allows for greater customer satisfaction due to greater control of engine idle.

Another function of the memory program, which occurs when the power steering switch (if equipped), or the A/C request circuit, requires that the IAC stepper motor control engine rpm, is the recording of the last targeted steps into the memory cell. The PCM can anticipate A/C compressor loads. This is accomplished by delaying compressor operation for approximately 0.5 seconds until the PCM moves the IAC stepper motor to the recorded steps that were loaded into the memory cell. Using this program helps eliminate idle-quality changes as loads change. Finally, the PCM incorporates a “No-Load” engine speed limiter of approximately 1800 - 2000 rpm, when it recognizes that the TPS is indicating an idle signal and IAC motor cannot maintain engine idle.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the IAC motor through the PCM.

RADIATOR FAN RELAY—PCM OUTPUT

DESCRIPTION

The electric radiator cooling fan relay is located in the Power Distribution Center (PDC).

OPERATION

An electric radiator cooling fan is used with certain models/engines. It is controlled by the Powertrain Control Module (PCM) through the radiator fan relay. **Not Equipped With A/C:** The relay is energized when coolant temperature is above 103°C (217°F). It will then de-energize when coolant temperature drops to 98°C (208°F). Refer to Cooling Systems for additional information. **Equipped With A/C:** In addition to using coolant temperatures to control cooling fan operation, a two-gang A/C high-pressure switch is also used to control cooling fan operation. When equipped with this high-pressure switch, the cooling fan **will not operate** each time the A/C clutch is engaged. Refer to Heating and Air Conditioning for additional information.

THROTTLE BODY

DESCRIPTION

The throttle body is located on the intake manifold. Fuel does not enter the intake manifold through the throttle body. Fuel is sprayed into the manifold by the fuel injectors.

OPERATION

Filtered air from the air cleaner enters the intake manifold through the throttle body. The throttle body contains an air control passage controlled by an Idle Air Control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

Certain sensors are attached to the throttle body. The accelerator pedal cable, speed control cable and

DESCRIPTION AND OPERATION (Continued)

transmission control cable (when equipped) are connected to the throttle body linkage arm.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

DIAGNOSIS AND TESTING

VISUAL INSPECTION

A visual inspection for loose, disconnected or incorrectly routed wires and hoses should be made. This should be done before attempting to diagnose or service the fuel injection system. A visual check will help spot these faults and save unnecessary test and diagnostic time. A thorough visual inspection will include the following checks:

(1) Verify the three 32–way electrical connectors are fully inserted into the connector of the Powertrain Control Module (PCM) (Fig. 3).

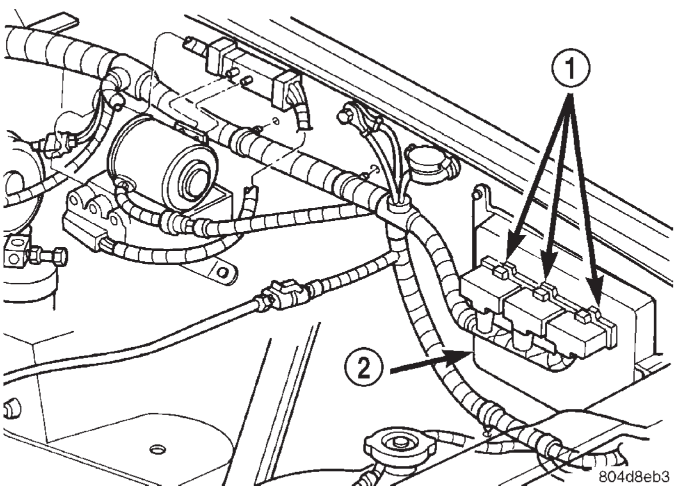


Fig. 3 Powertrain Control Module (PCM)

1 – (3) 32–WAY CONNECTORS
2 – PCM

(2) Inspect battery cable connections. Be sure they are clean and tight.

(3) Inspect fuel pump relay and air conditioning compressor clutch relay (if equipped). Inspect ASD relay connections. Inspect starter motor relay connections. Inspect relays for signs of physical damage and corrosion. The relays are located in Power Distribution Center (PDC) (Fig. 4). Refer to label on PDC cover for relay location.

(4) 2.5L Engine: Inspect ignition coil primary connection. Verify coil secondary cable is firmly connected to coil (Fig. 5).

(5) 4.0L Engine: Inspect ignition coil connection (Fig. 6).

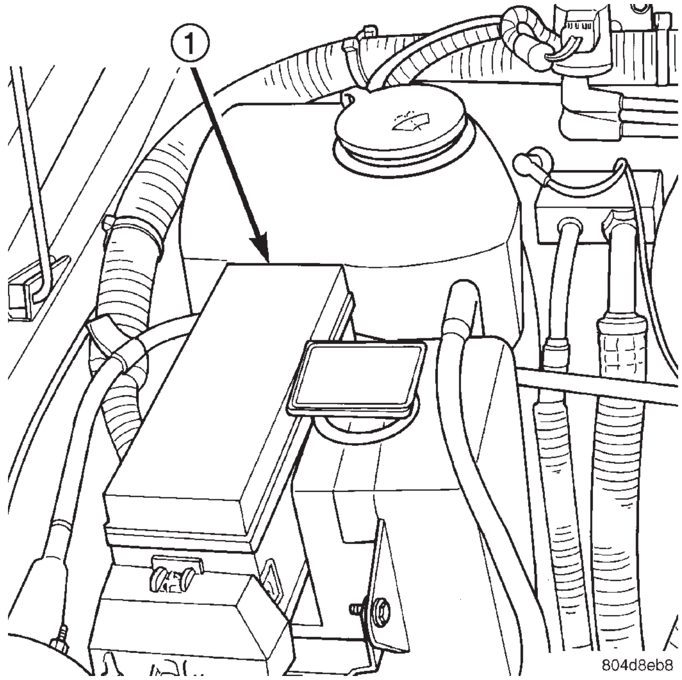


Fig. 4 Power Distribution Center (PDC)

1 – POWER DISTRIBUTION CENTER (PDC)

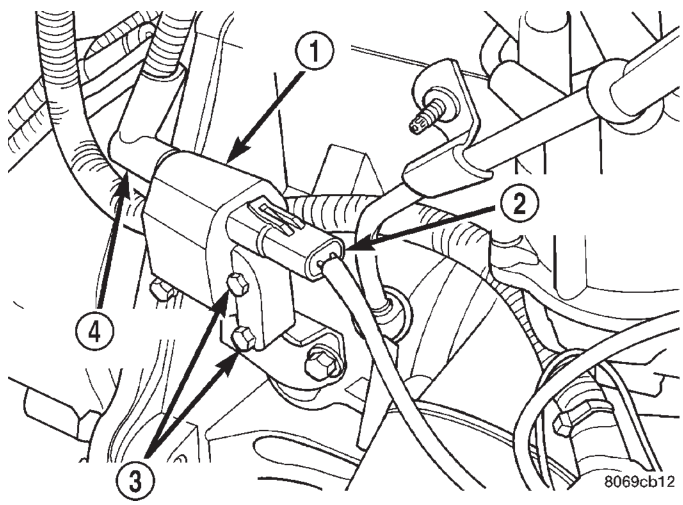


Fig. 5 Ignition Coil—2.5L Engine

1 – IGNITION COIL
2 – ELECTRICAL CONNECTOR
3 – MOUNTING BOLTS
4 – SECONDARY CABLE

(6) 2.5L Engine: Verify that distributor cap is correctly attached to distributor. Be sure that spark plug cables are firmly connected to the distributor cap and spark plugs are in their correct firing order. Be sure that coil cable is firmly connected to distributor cap and coil.

DIAGNOSIS AND TESTING (Continued)

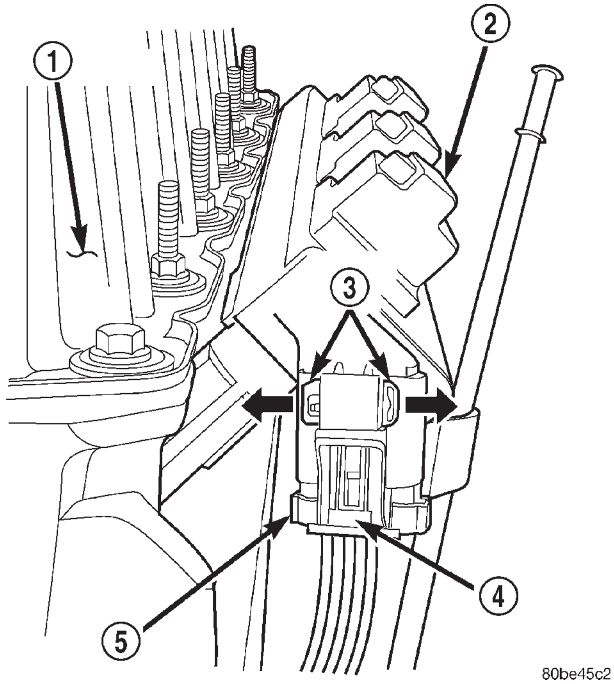


Fig. 6 Ignition Coil—4.0L Engine

1 – REAR OF VALVE COVER
2 – COIL RAIL
3 – SLIDE TAB
4 – RELEASE LOCK
5 – COIL CONNECTOR

(7) Connect vehicle to an oscilloscope and inspect spark events for fouled or damaged spark plugs or cables.

(8) Verify generator output wire, generator connector and ground wire are firmly connected to generator.

(9) Inspect system body grounds for loose or dirty connections. Refer to Group 8, Wiring for ground locations.

(10) Verify crankcase ventilation (CCV) operation. Refer to Group 25, Emission Control System for additional information.

(11) Inspect fuel tube quick-connect fitting-to-fuel rail connections.

(12) Verify hose connections to all ports of vacuum fittings on intake manifold are tight and not leaking.

(13) Inspect accelerator cable, transmission throttle cable (if equipped) and cruise control cable connections (if equipped). Check their connections to throttle arm of throttle body for any binding or restrictions.

(14) If equipped with vacuum brake booster, verify vacuum booster hose is firmly connected to fitting on intake manifold. Also check connection to brake vacuum booster.

(15) Inspect air cleaner inlet and air cleaner element for dirt or restrictions.

(16) Inspect radiator grille area, radiator fins and air conditioning condenser for restrictions.

(17) Verify intake manifold air temperature sensor wire connector is firmly connected to harness connector (Fig. 7) or (Fig. 8).

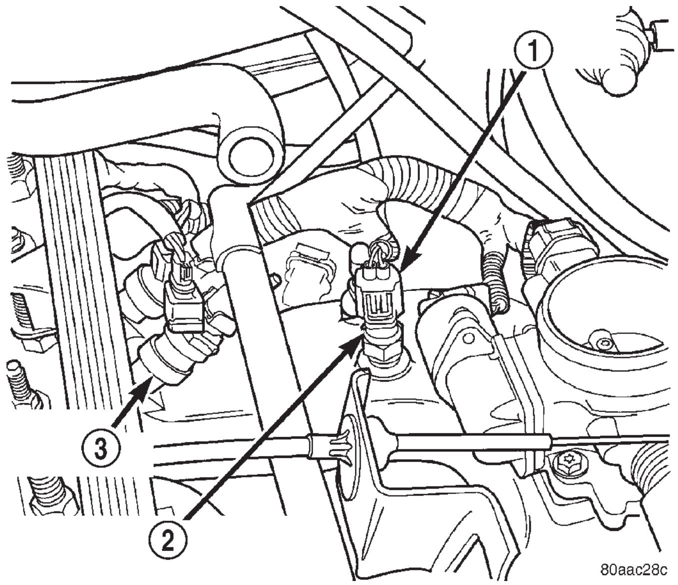


Fig. 7 Intake Manifold Air Temp. Sensor Location—2.5L Engine

1 – ELECTRICAL CONNECTOR
2 – INTAKE MANIFOLD TEMPERATURE SENSOR
3 – FUEL INJECTOR

(18) Verify MAP sensor electrical connector is firmly connected to MAP sensor (Fig. 8). Also verify rubber L-shaped fitting from MAP sensor to throttle body is firmly connected (Fig. 9).

(19) Verify fuel injector wire harness connectors are firmly connected to injectors in correct order. Each harness connector is numerically tagged with injector number (INJ 1, INJ 2 etc.) of its corresponding fuel injector and cylinder number.

(20) Verify harness connectors are firmly connected to idle air control (IAC) motor and throttle position sensor (TPS) (Fig. 8).

(21) Verify wire harness connector is firmly connected to engine coolant temperature sensor (Fig. 10).

(22) Raise and support vehicle.

DIAGNOSIS AND TESTING (Continued)

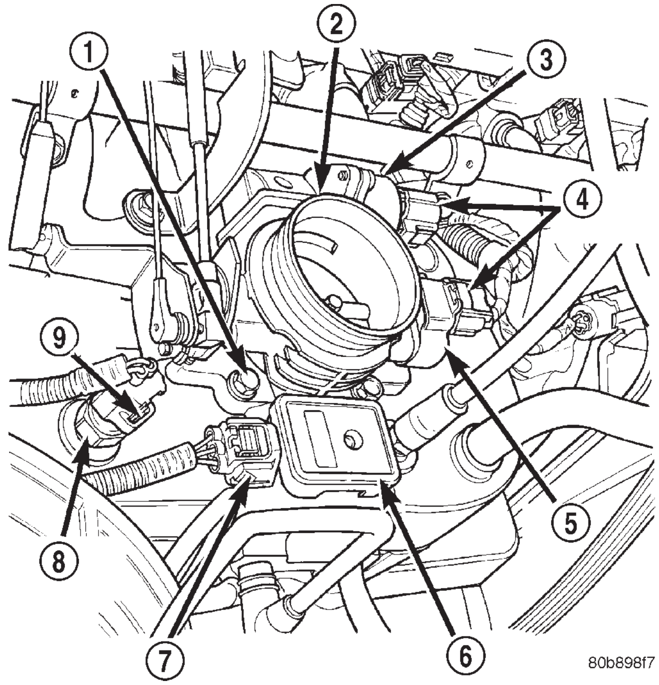


Fig. 8 Sensor Locations—4.0L Engine

1 – MOUNTING BOLTS (4)
2 – THROTTLE BODY
3 – IAC MOTOR
4 – ELEC. CONN.
5 – TPS
6 – MAP SENSOR
7 – ELEC. CONN.
8 – IAT SENSOR
9 – ELEC. CONN.

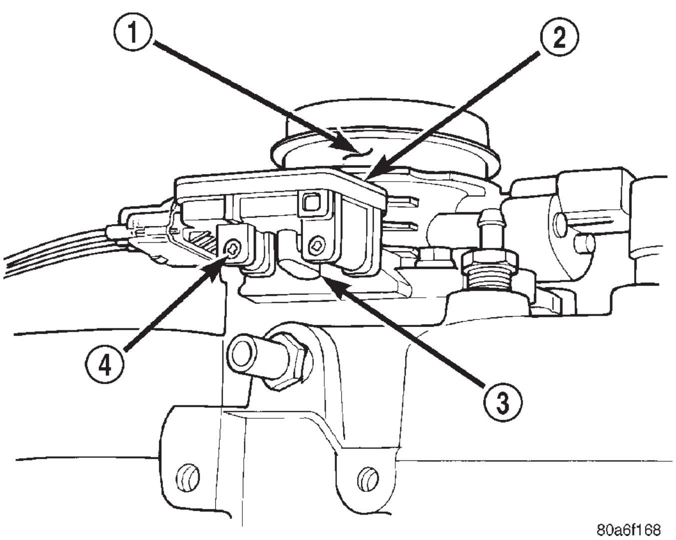


Fig. 9 Rubber L-Shaped Fitting—MAP Sensor-to-Throttle Body

1 – THROTTLE BODY
2 – MAP SENSOR
3 – RUBBER FITTING
4 – MOUNTING SCREWS (2)

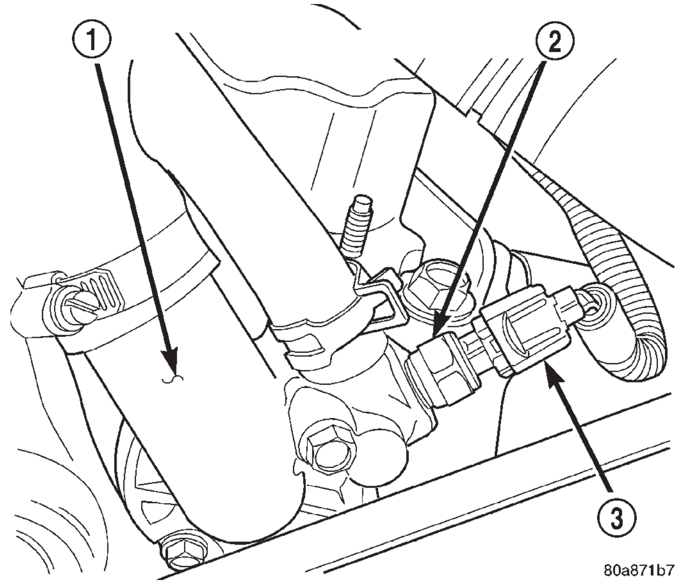


Fig. 10 Engine Coolant Temperature Sensor—Typical

1 – THERMOSTAT HOUSING
2 – ENGINE COOLANT TEMPERATURE SENSOR
3 – ELECTRICAL CONNECTOR

(23) Verify that all oxygen sensor wire connectors are firmly connected to sensors. Inspect sensors and connectors for damage (Fig. 11), (Fig. 12), (Fig. 13) or (Fig. 14).

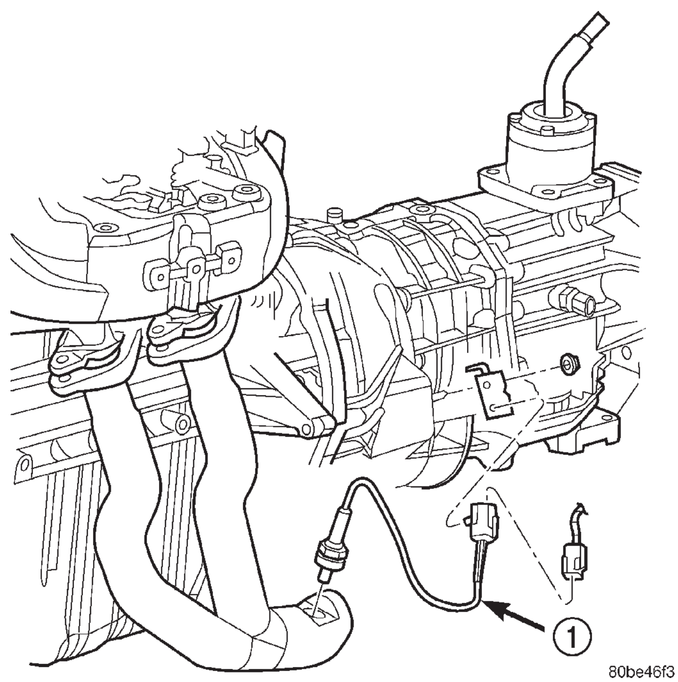


Fig. 11 Front Oxygen Sensor—4.0L—Federal Emissions

1 – 1/1 O2S

DIAGNOSIS AND TESTING (Continued)

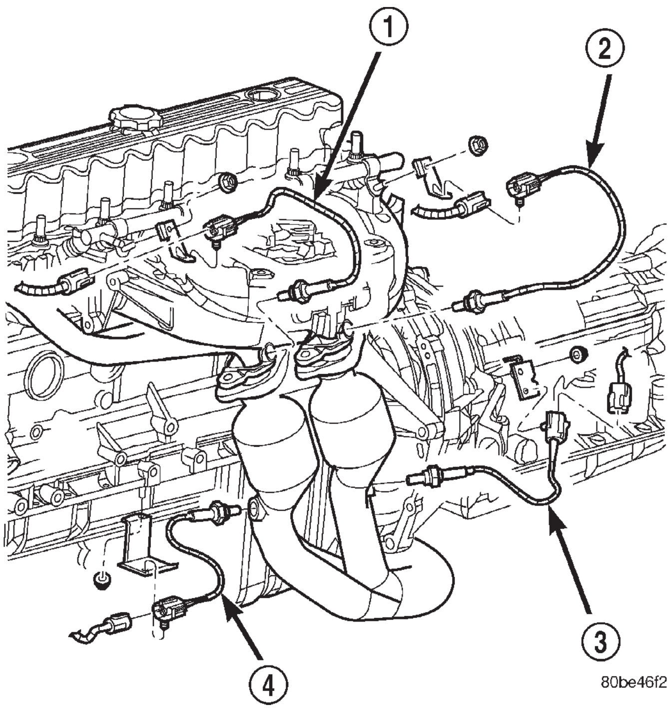


Fig. 12 Oxygen Sensors—4.0L—California Emissions

1 – 1/1 O2S
2 – 2/1 O2S
3 – 2/2 O2S
4 – 1/2 O2S

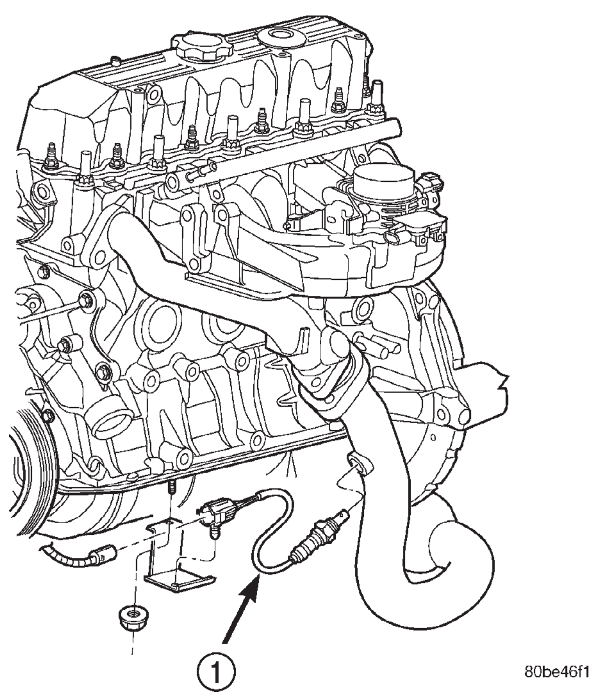


Fig. 13 Front Oxygen Sensor—2.5L—Federal Emissions

1 – 1/1 O2S

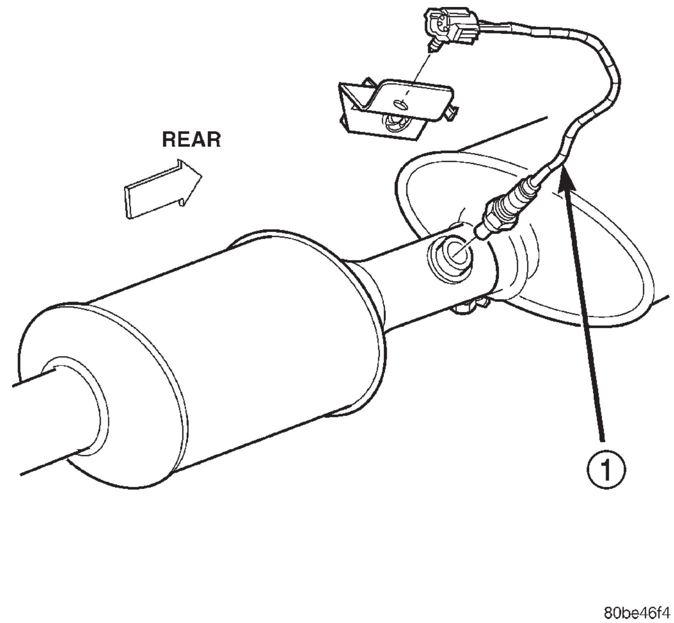


Fig. 14 Rear Oxygen Sensor—2.5L/4.0L—Federal Emissions

1 – 1/2 O2S

(24) Inspect for pinched or leaking fuel tubes. Inspect for pinched, cracked or leaking fuel hoses.

(25) Inspect for exhaust system restrictions such as pinched exhaust pipes, collapsed muffler or plugged catalytic convertor.

(26) If equipped with automatic transmission, verify electrical harness is firmly connected to park/neutral switch. Refer to Automatic Transmission section of Group 21.

(27) Verify that electrical harness connector is firmly connected to the vehicle speed sensor (Fig. 15).

(28) 2.5L 4–Cylinder Engine Only: Verify good electrical connection at power steering pressure switch (Fig. 16). This switch is not used with 4.0L engines.

(29) Verify good electrical connections at fuel pump module connector at front of fuel tank (Fig. 17).

(30) Verify good EVAP canister vent line connection at front of fuel tank (Fig. 17).

(31) Verify good fuel supply line connection at front of fuel tank (Fig. 17).

(32) Inspect all fuel lines/hoses for cracks or leaks.

(33) Inspect transmission torque convertor housing (automatic transmission) or clutch housing (manual transmission) for damage to timing ring on drive plate/flywheel.

(34) Verify battery cable and solenoid feed wire connections to starter solenoid are tight and clean. Inspect for chaffed wires or wires rubbing up against other components.

DIAGNOSIS AND TESTING (Continued)

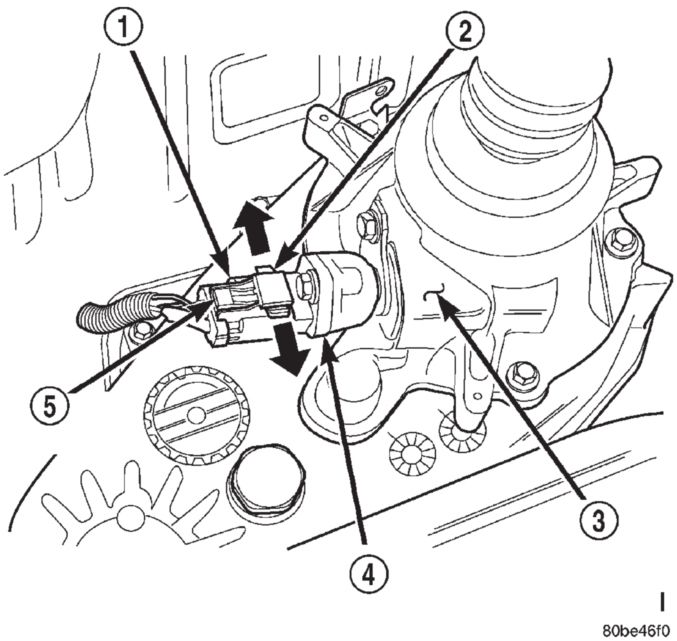


Fig. 15 Vehicle Speed Sensor—Typical—4WD Shown

1 – SENSOR ELECTRICAL CONNECTOR
2 – SLIDE TAB
3 – 4WD TRANSFER CASE EXTENSION
4 – VEHICLE SPEED SENSOR
5 – RELEASE LOCK

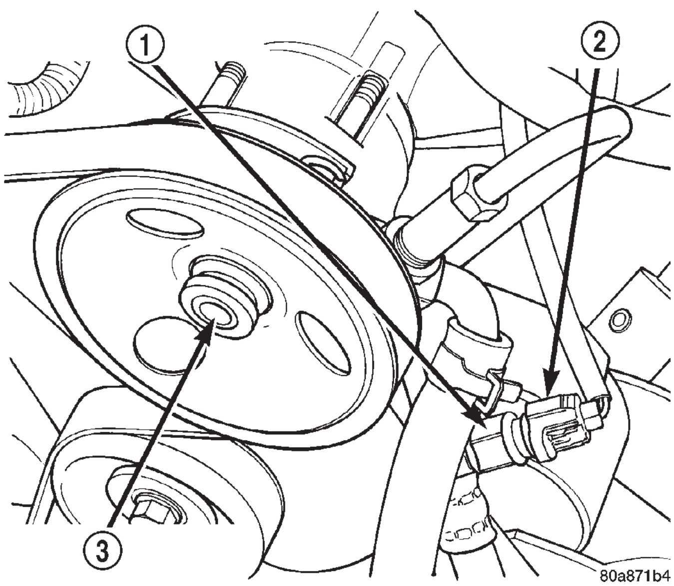


Fig. 16 Power Steering Pressure Switch—2.5L Engine

1 – POWER STEERING PRESSURE SWITCH
2 – ELECTRICAL CONNECTOR
3 – POWER STEERING PUMP

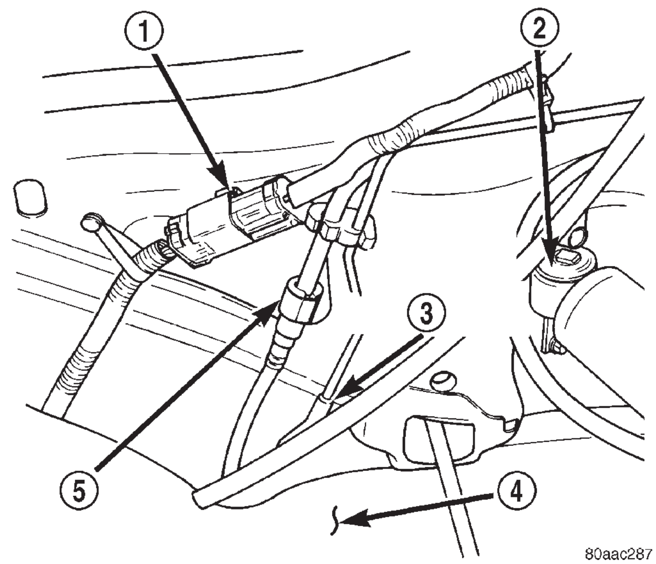
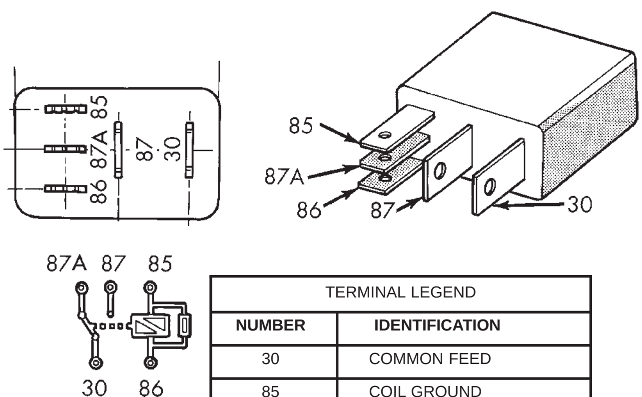


Fig. 17 Fuel Tank Connections at Front of Fuel Tank

1 – FUEL PUMP MODULE CONNECTOR
2 – LEFT-REAR SHOCK ABSORBER
3 – EVAP CANISTER VENT LINE CONNECTION
4 – FRONT OF FUEL TANK
5 – FUEL SUPPLY LINE CONNECTION

ASD AND FUEL PUMP RELAYS

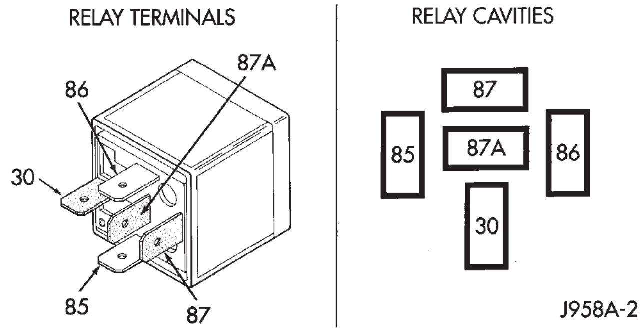
The following description of operation and tests apply only to the Automatic Shutdown (ASD) and fuel pump relays. The terminals on the bottom of each relay are numbered. Two different types of relays may be used, (Fig. 18) or (Fig. 19).



TERMINAL LEGEND	
NUMBER	**IDENTIFICATION**
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 18 ASD and Fuel Pump Relay Terminals—Type 1

DIAGNOSIS AND TESTING (Continued)



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 19 ASD and Fuel Pump Relay Terminals—Type 2

OPERATION

- Terminal number 30 is connected to battery voltage. For both the ASD and fuel pump relays, terminal 30 is connected to battery voltage at all times.
- The PCM grounds the coil side of the relay through terminal number 85.
- Terminal number 86 supplies voltage to the coil side of the relay.
- When the PCM de-energizes the ASD and fuel pump relays, terminal number 87A connects to terminal 30. This is the Off position. In the off position, voltage is not supplied to the rest of the circuit. Terminal 87A is the center terminal on the relay.
- When the PCM energizes the ASD and fuel pump relays, terminal 87 connects to terminal 30. This is the On position. Terminal 87 supplies voltage to the rest of the circuit.

TESTING

The following procedure applies to the ASD and fuel pump relays.

(1) Remove relay from connector before testing.

(2) With the relay removed from the vehicle, use an ohmmeter to check the resistance between terminals 85 and 86. The resistance should be between 75 ±5 ohms.

(3) Connect the ohmmeter between terminals 30 and 87A. The ohmmeter should show continuity between terminals 30 and 87A.

(4) Connect the ohmmeter between terminals 87 and 30. The ohmmeter should not show continuity at this time.

(5) Connect one end of a jumper wire (16 gauge or smaller) to relay terminal 85. Connect the other end of the jumper wire to the ground side of a 12 volt power source.

(6) Connect one end of another jumper wire (16 gauge or smaller) to the power side of the 12 volt power source. **Do not attach the other end of the jumper wire to the relay at this time.**

WARNING: DO NOT ALLOW OHMMETER TO CONTACT TERMINALS 85 OR 86 DURING THIS TEST.

(7) Attach the other end of the jumper wire to relay terminal 86. This activates the relay. The ohmmeter should now show continuity between relay terminals 87 and 30. The ohmmeter should not show continuity between relay terminals 87A and 30.

(8) Disconnect jumper wires.

(9) Replace the relay if it did not pass the continuity and resistance tests. If the relay passed the tests, it operates properly. Check the remainder of the ASD and fuel pump relay circuits. Refer to the Wiring Diagrams.

THROTTLE BODY MINIMUM AIR FLOW CHECK PROCEDURE

The following test procedure has been developed to check throttle body calibrations for correct idle conditions. The procedure should be used to diagnose the throttle body for conditions that may cause idle problems. **This procedure should be used only after normal diagnostic procedures have failed to produce results that indicate a throttle body related problem. Be sure to check for proper operation of the idle air control motor before performing this test.**

A special fixed orifice tool (number 6714) (Fig. 20) must be used for the following test. This tool has a fixed internal diameter of 0.185”.

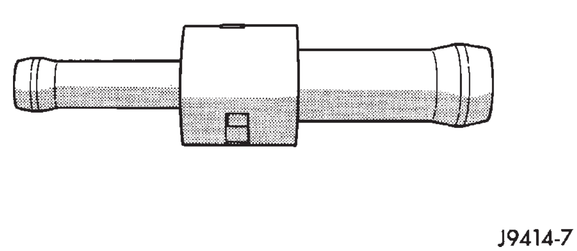


Fig. 20 6714 Fixed Orifice Tool

DIAGNOSIS AND TESTING (Continued)

(1) Start the engine and bring to operating temperature. Be sure all accessories are off before performing this test.

(2) Shut off engine and remove air duct at throttle body.

(3) **2.5L 4–Cylinder Engine:** Near front/top of valve cover, disconnect CCV tube at fixed orifice fitting (Fig. 21). Insert Special Tool 6714 into end of disconnected CCV tube (insert either end of tool into tube). Let tool and tube hang disconnected at side of engine.

(4) **4.0L 6–Cylinder Engine:** Disconnect CCV tube (Fig. 22) at intake manifold fitting. Attach a short piece of rubber hose to special tool 6714 (insert rubber hose to either end of tool). Install rubber hose/tool to intake manifold fitting. Let CCV tube hang disconnected at side of engine.

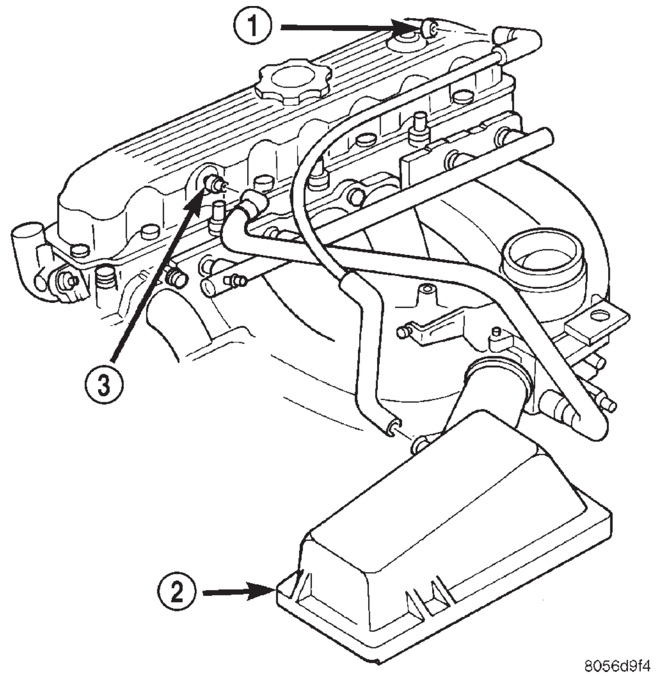


Fig. 21 Install Orifice Tool 2.5L 4–Cylinder Engine

1 – AIR INLET FITTING
2 – AIR FILTER COVER
3 – FIXED ORIFICE FITTING

(5) Connect DRB scan tool to 16–way data link connector. This connector is located at lower edge of instrument panel near steering column. Refer to appropriate Powertrain Diagnostic Procedures service manual for DRB operation.

(6) Start engine and allow to warm up.

(7) Using the DRB scan tool, scroll through menus as follows: select—Stand Alone DRB III, select the year 2000 Diagnostics, select—Engine, select—System Test, select—Minimum Air Flow.

(8) The DRB scan tool will count down to stabilize idle rpm and display minimum air flow idle rpm. The idle rpm should be between **500 and 900 rpm.** If idle speed is outside these specifications, replace throttle body. Refer to Throttle Body Removal/Installation.

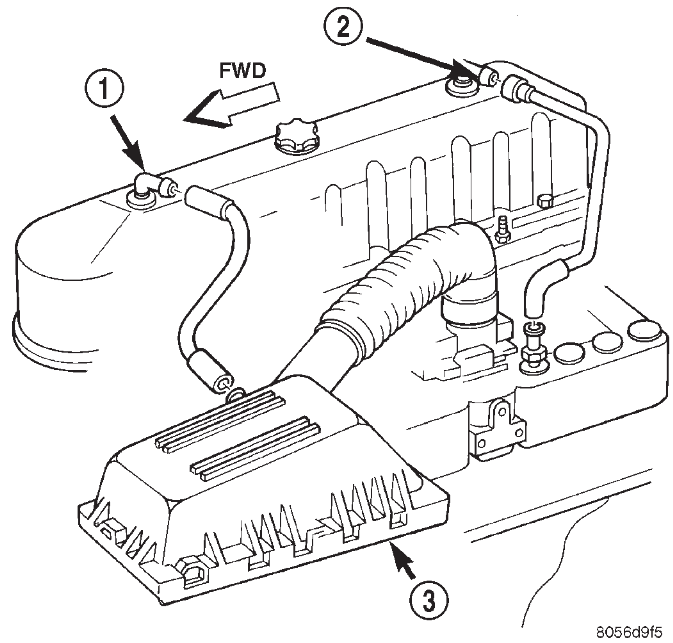


Fig. 22 Install Orifice Tool 4.0L 6–Cylinder Engine

1 – AIR INLET FITTING
2 – FIXED ORIFICE FITTING
3 – AIR FILTER COVER

(9) Disconnect DRB scan tool from vehicle.

(10) Remove orifice tool and connect CCV tube to engine.

(11) Install air duct to throttle body.

REMOVAL AND INSTALLATION

AUTOMATIC SHUTDOWN (ASD) RELAY

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 23). Refer to label on PDC cover for relay location.

REMOVAL

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

(1) Install relay to PDC.

(2) Install cover to PDC.

REMOVAL AND INSTALLATION (Continued)

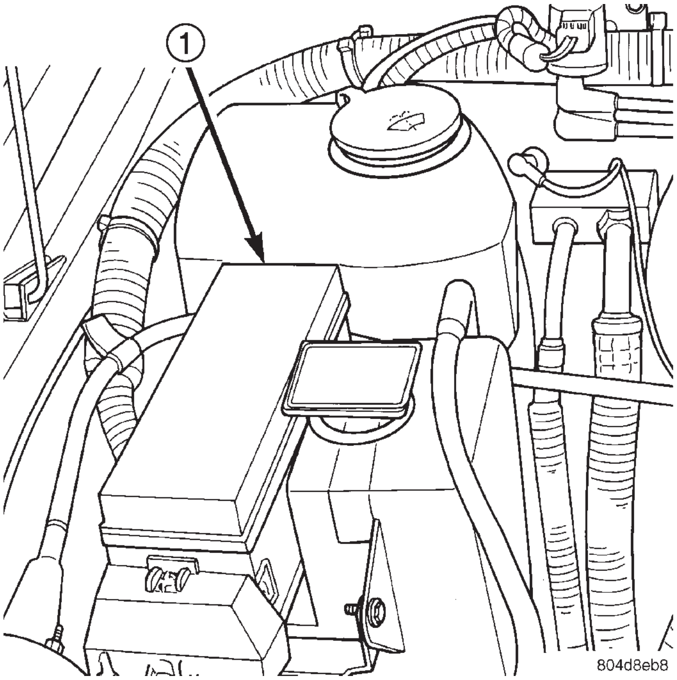


Fig. 23 Power Distribution Center (PDC)

1 – POWER DISTRIBUTION CENTER (PDC)

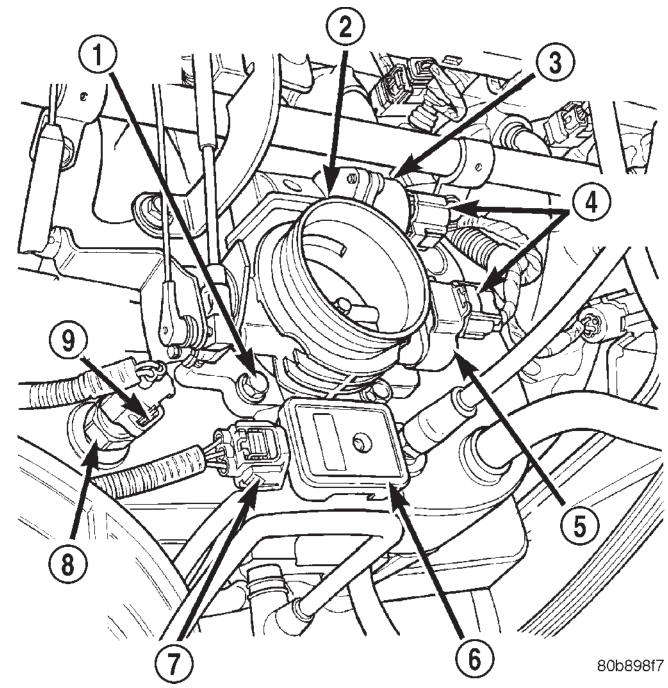


Fig. 24 Throttle Body and Sensor Locations—4.0L Engine

1 – MOUNTING BOLTS (4)
2 – THROTTLE BODY
3 – IAC MOTOR
4 – ELEC. CONN.
5 – TPS
6 – MAP SENSOR
7 – ELEC. CONN.
8 – IAT SENSOR
9 – ELEC. CONN.

FUEL PUMP RELAY

The fuel pump relay is located in the Power Distribution Center (PDC) (Fig. 23). Refer to label on PDC cover for relay location.

REMOVAL

(1) Remove PDC cover.
(2) Remove relay from PDC.
(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.
(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

(1) Install relay to PDC.
(2) Install cover to PDC.

THROTTLE BODY

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

REMOVAL

(1) Remove air cleaner tube at throttle body.
(2) Disconnect throttle body electrical connectors at MAP sensor, IAC motor and TPS (Fig. 24) or (Fig. 25).
(3) Remove all control cables from throttle body (lever) arm. Refer to the Accelerator Pedal and Throttle Cable section of this group for additional information.
(4) Remove four throttle body mounting bolts.
(5) Remove throttle body from intake manifold.
(6) Discard old throttle body-to-intake manifold gasket.

INSTALLATION

(1) Clean mating surfaces of throttle body and intake manifold.
(2) Install new throttle body-to-intake manifold gasket.
(3) Install throttle body to intake manifold.
(4) Install four mounting bolts. Tighten bolts to 11 N·m (100 in. lbs.) torque.
(5) Install control cables.
(6) Install electrical connectors.
(7) Install air cleaner at throttle body.

REMOVAL AND INSTALLATION (Continued)

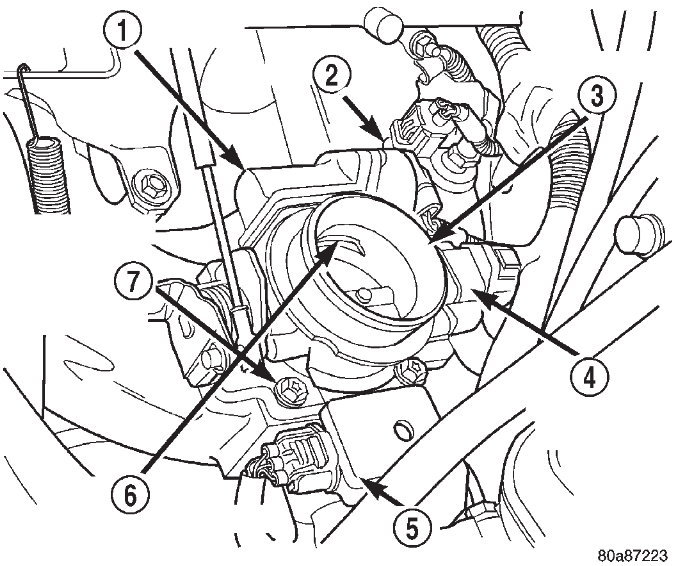


Fig. 25 Throttle Body and Sensor Locations—2.5L Engine

1 – IDLE AIR CONTROL MOTOR
2 – IAT SENSOR
3 – THROTTLE BODY
4 – THROTTLE POSITION SENSOR
5 – MAP SENSOR
6 – IDLE AIR CONTROL PASSAGE INLET
7 – THROTTLE BODY MOUNTING BOLTS (4)

THROTTLE POSITION SENSOR (TPS)

The TPS is mounted to the throttle body (Fig. 24) or (Fig. 25).

REMOVAL

(1) Remove air cleaner tube at throttle body.
(2) Disconnect TPS electrical connector.
(3) Remove TPS mounting screws (Fig. 26).
(4) Remove TPS.

INSTALLATION

The throttle shaft end of the throttle body slides into a socket in the TPS (Fig. 27). The TPS must be installed so that it can be rotated a few degrees. (If the sensor will not rotate, install the sensor with the throttle shaft on the other side of the socket tangs). The TPS will be under slight tension when rotated.

(1) Install TPS and retaining screws.
(2) Tighten screws to 7 N·m (60 in. lbs.) torque.
(3) Connect TPS electrical connector to TPS.
(4) Manually operate throttle (by hand) to check for any TPS binding before starting engine.
(5) Install air cleaner tube to throttle body.

IDLE AIR CONTROL (IAC) MOTOR

The IAC motor is located on the side of the throttle body (Fig. 24) or (Fig. 25).

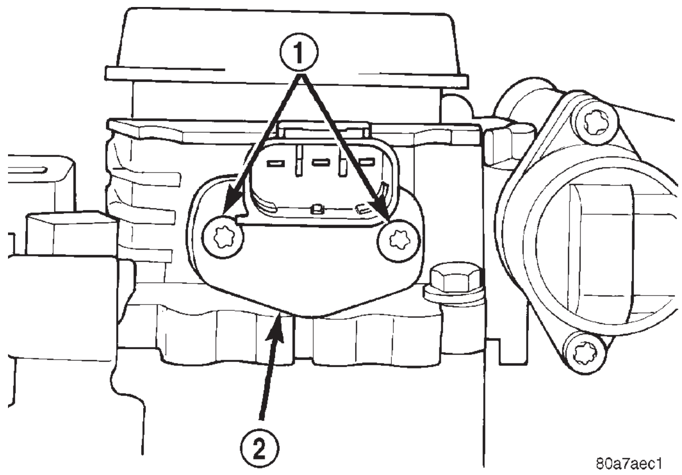


Fig. 26 TPS Mounting Screws

1 – MOUNTING SCREWS
2 – TPS

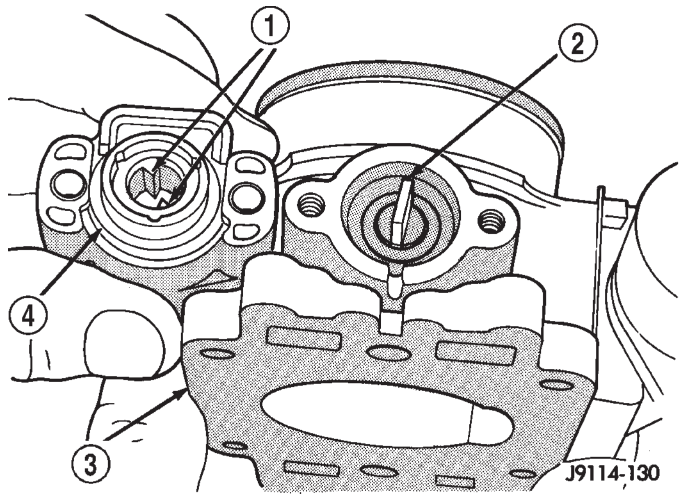


Fig. 27 Throttle Position Sensor—Installation

1 – TANGS
2 – THROTTLE SHAFT
3 – THROTTLE BODY
4 – TPS

REMOVAL

(1) Remove air cleaner tube at throttle body.
(2) Disconnect electrical connector from IAC motor.
(3) Remove two mounting bolts (screws) (Fig. 28).
(4) Remove IAC motor from throttle body.

INSTALLATION

(1) Install IAC motor to throttle body.
(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.
(3) Install electrical connector.
(4) Install air cleaner tube to throttle body.

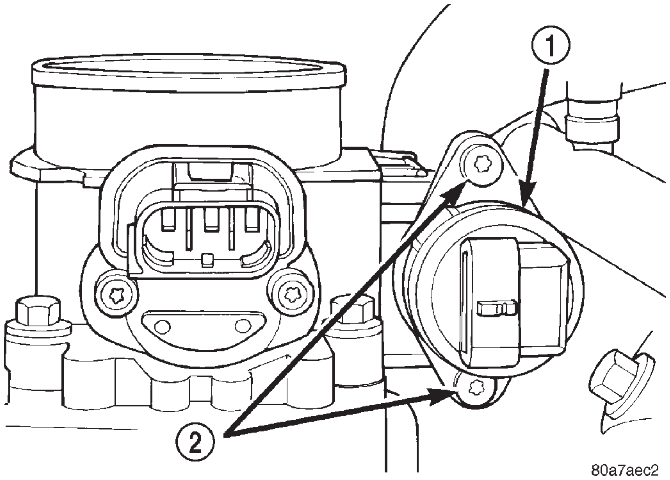


Fig. 28 Mounting Bolts (Screws)—IAC Motor

1 – IDLE AIR CONTROL MOTOR
2 – MOUNTING SCREWS

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

The MAP sensor is mounted to the side of the throttle body (Fig. 24) or (Fig. 25). An L-shaped rubber fitting is used to connect the MAP sensor to throttle body (Fig. 29).

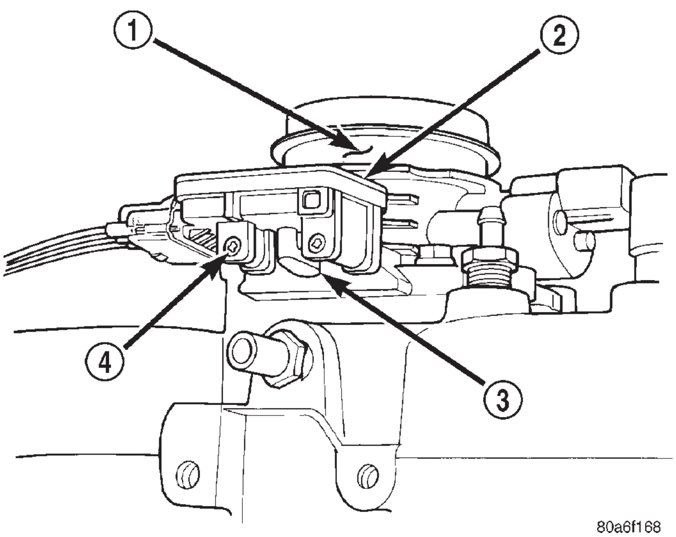


Fig. 29 MAP Sensor Mounting

1 – THROTTLE BODY
2 – MAP SENSOR
3 – RUBBER FITTING
4 – MOUNTING SCREWS (2)

REMOVAL

(1) Remove air cleaner intake tube at throttle body.

(2) Remove two MAP sensor mounting bolts (screws) (Fig. 29).

(3) While removing MAP sensor, slide the rubber L-shaped fitting (Fig. 29) from throttle body.

(4) Remove rubber L-shaped fitting from MAP sensor.

INSTALLATION

(1) Install rubber L-shaped fitting to MAP sensor.

(2) Position sensor to throttle body while guiding rubber fitting over throttle body vacuum nipple.

(3) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.

(4) Install air cleaner intake tube.

POWERTRAIN CONTROL MODULE (PCM)

The PCM is located in the engine compartment next to the air cleaner assembly (Fig. 30).

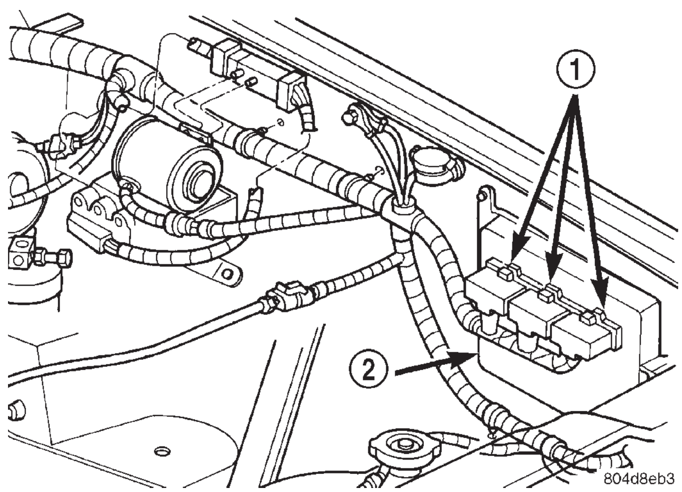


Fig. 30 PCM Location

1 – (3) 32–WAY CONNECTORS
2 – PCM

REMOVAL

To avoid possible voltage spike damage to the PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

(1) Disconnect negative battery cable at battery.

(2) Remove cover over electrical connectors. Cover snaps onto PCM.

(3) Carefully unplug the three 32–way connectors (Fig. 31) from PCM.

(4) Remove three PCM mounting bolts and remove PCM from vehicle.

INSTALLATION

(1) Install PCM and mounting bolts to vehicle.

(2) Tighten bolts to 4 N·m (35 in. lbs.).

(3) Check pin connectors in the PCM and the three 32–way connectors for corrosion or damage. Also, the pin heights in connectors should all be same. Repair as necessary before installing connectors.

REMOVAL AND INSTALLATION (Continued)

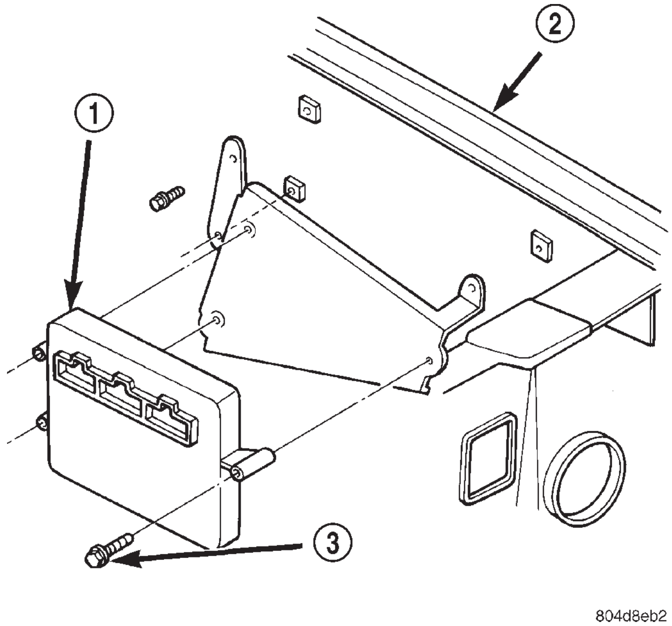


Fig. 31 PCM Mounting

1 – PCM
2 – L. F. FENDER
3 – PCM MOUNTING BOLTS (3)

(4) Install three 32–way connectors.

(5) Install cover over electrical connectors. Cover snaps onto PCM.

(6) Install battery cable.

(7) Use the DRB scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.

POWER STEERING PRESSURE SWITCH—2.5L ENGINE

This switch is not used with 4.0L six-cylinder engines.

The power steering pressure switch is installed in the power steering high-pressure hose (Fig. 32).

REMOVAL

(1) Disconnect electrical connector from power steering pressure switch.

(2) Place a small container or shop towel beneath switch to collect any excess fluid.

(3) Remove switch. Use back-up wrench on power steering line to prevent line bending.

INSTALLATION

(1) Install power steering switch into power steering line.

(2) Tighten to 14–22 N·m (124–195 in. lbs.) torque.

(3) Connect electrical connector to switch.

(4) Check power steering fluid and add as necessary.

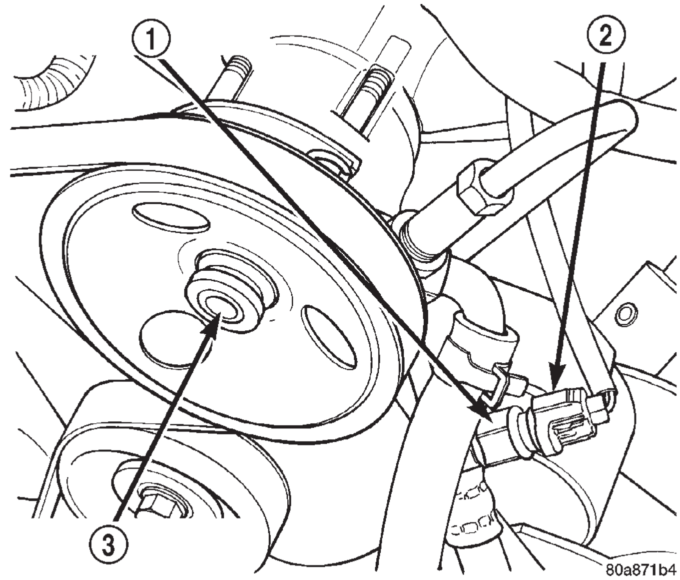


Fig. 32 Power Steering Pressure Switch

1 – POWER STEERING PRESSURE SWITCH
2 – ELECTRICAL CONNECTOR
3 – POWER STEERING PUMP

(5) Start engine and again check power steering fluid. Add fluid if necessary.

OXYGEN SENSOR

REMOVAL

Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness. For sensor operation, it must have a comparison source of oxygen from outside the exhaust system. This fresh air is supplied to the sensor through its pigtail wiring harness.

Refer to (Fig. 33), (Fig. 34), (Fig. 35) or (Fig. 36) for O2S (oxygen sensor) location.

WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

(1) Raise and support vehicle.

(2) Disconnect wire connector from O2S sensor.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

(3) Remove O2S sensor with an oxygen sensor removal and installation tool.

(4) Clean threads in exhaust pipe using appropriate tap.

REMOVAL AND INSTALLATION (Continued)

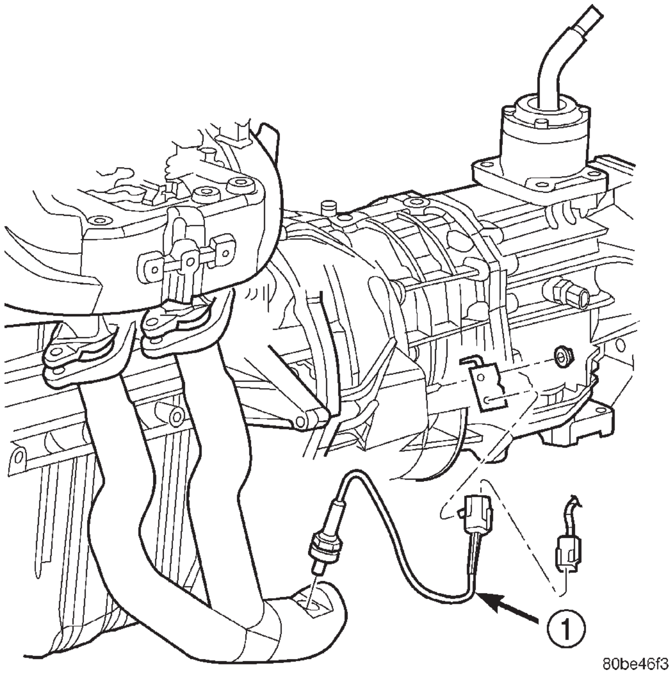


Fig. 33 Front Oxygen Sensor—4.0L—Federal Emissions

1 – 1/1 O2S

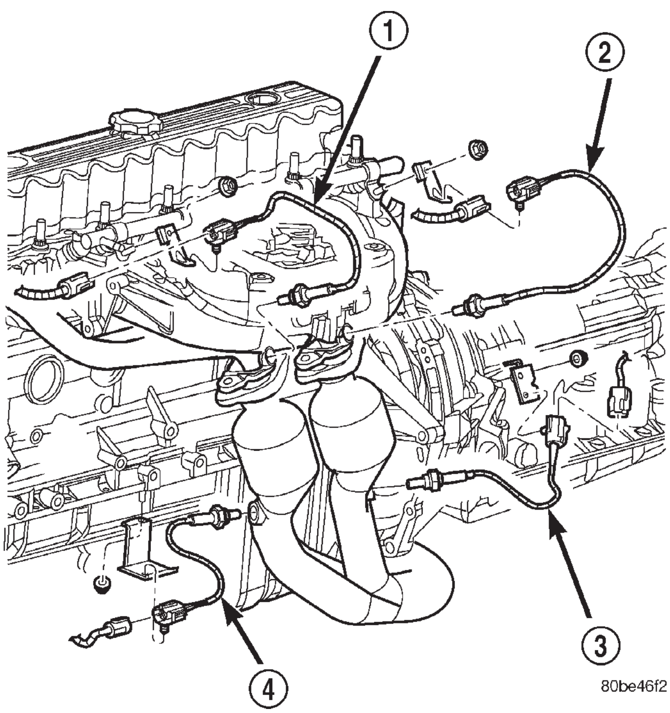


Fig. 34 Oxygen Sensors—4.0L—California Emissions

1 – 1/1 O2S
2 – 2/1 O2S
3 – 2/2 O2S
4 – 1/2 O2S

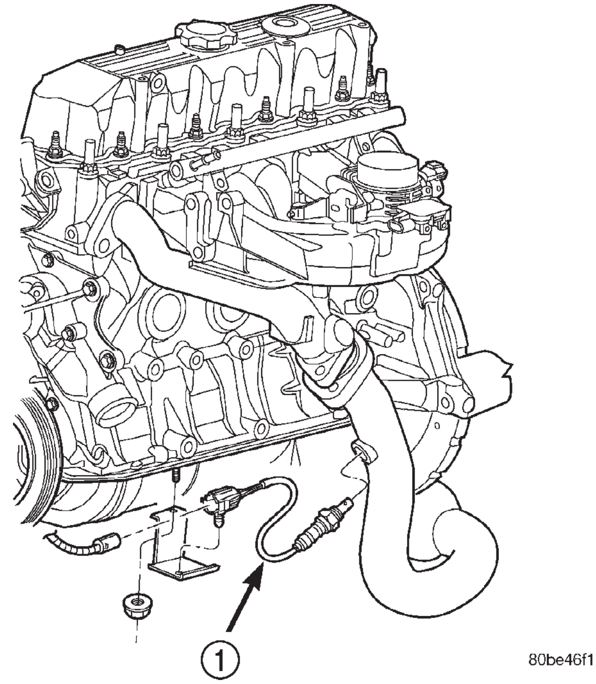


Fig. 35 Front Oxygen Sensor—2.5L—Federal Emissions

1 – 1/1 O2S

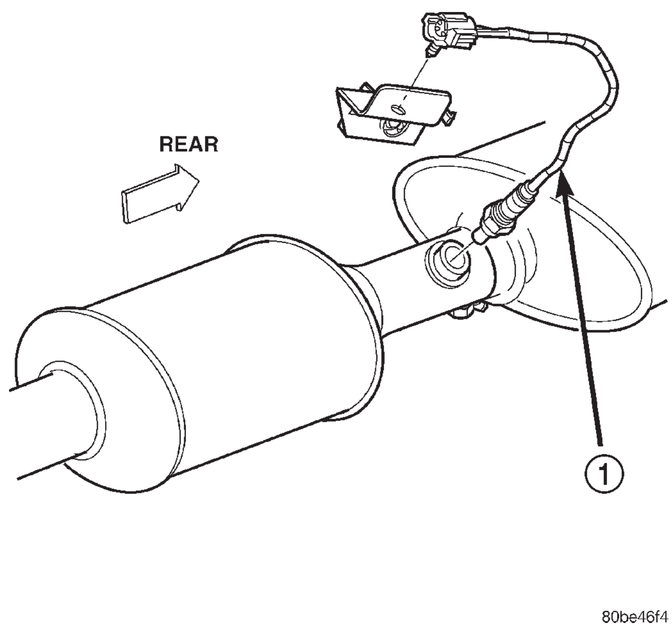


Fig. 36 Rear Oxygen Sensor—2.5L/4.0L—Federal Emissions

1 – 1/2 O2S

INSTALLATION

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

REMOVAL AND INSTALLATION (Continued)

(1) Install O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.

(2) Connect O2S sensor wire connector.

(3) Lower vehicle.

AIR CLEANER ELEMENT (FILTER)

REMOVAL

(1) Unlock air tube clamp (Fig. 37) at air cleaner cover. To unlock clamp, attach adjustable pliers to clamp and rotate pliers as shown in (Fig. 38).

(2) Remove air tube at cover.

(3) Pry back three clips retaining air cleaner cover to air cleaner housing.

(4) Remove housing cover and remove air cleaner element.

(5) Clean inside of housing before replacing element.

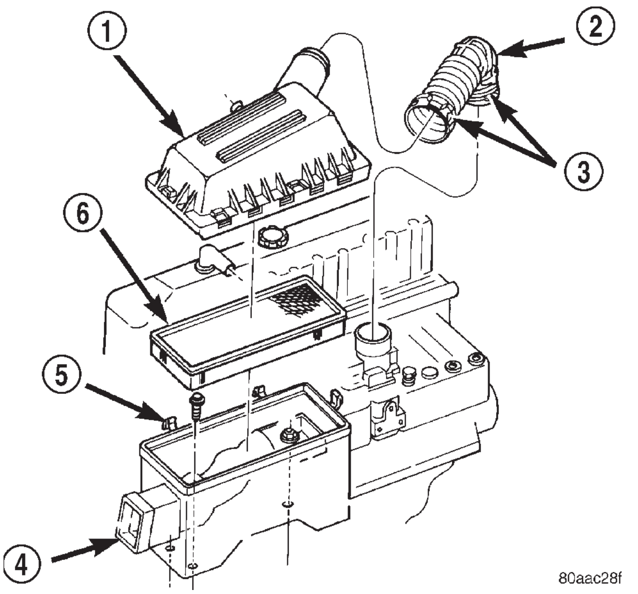


Fig. 37 Air Cleaner Housing and Element (Filter)

1 – COVER
2 – AIR TUBE
3 – CLAMPS (2)
4 – HOUSING
5 – CLIPS (3)
6 – ELEMENT (FILTER)

INSTALLATION

(1) Install air cleaner element into housing.

(2) Install air cleaner cover to housing (three clips). Be sure cover is properly seated to air cleaner housing.

(3) Install air tube and clamp to cover. Compress clamp snugly with adjustable pliers as shown in (Fig. 39).

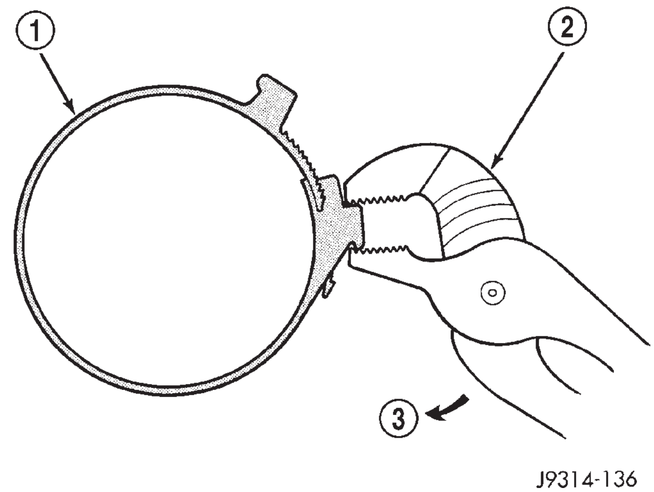


Fig. 38 Clamp Removal

1 – CLAMP
2 – ADJUSTABLE PLIERS
3 – REMOVAL

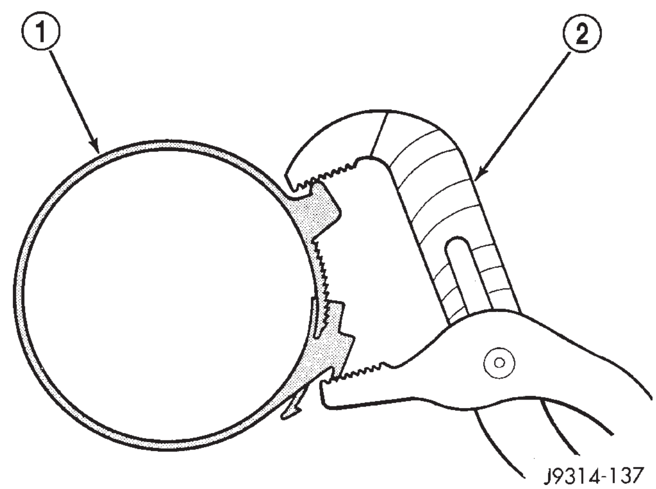


Fig. 39 Clamp Installation

1 – CLAMP
2 – ADJUSTABLE PLIERS

ENGINE COOLANT TEMPERATURE SENSOR

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR. REFER TO GROUP 7, COOLING.

The coolant temperature sensor is installed in the thermostat housing (Fig. 40).

REMOVAL

(1) Partially drain cooling system until coolant level is below cylinder head. Observe the **WARNINGS** in Group 7, Cooling.

REMOVAL AND INSTALLATION (Continued)

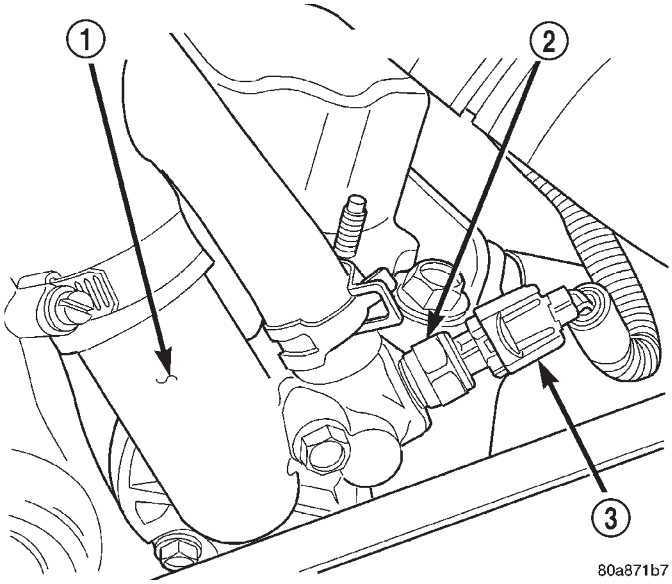


Fig. 40 Engine Coolant Temperature Sensor—Typical

1 – THERMOSTAT
2 – ENGINE COOLANT TEMPERATURE SENSOR
3 – ELECTRICAL CONNECTOR

(2) Disconnect coolant temperature sensor wire connector.

(3) Remove sensor from thermostat housing.

INSTALLATION

(1) Apply sealant to sensor threads (new replacement sensors will have sealant already applied).

(2) Install coolant temperature sensor into thermostat housing. Tighten to 11 N·m (8 ft. lbs.) torque.

(3) Connect wire connector.

(4) Fill cooling system. Refer to Group 7, Cooling System.

INTAKE MANIFOLD AIR TEMPERATURE SENSOR

The intake manifold air temperature (IAT) sensor is installed into intake manifold plenum near throttle body (Fig. 41) or (Fig. 42).

REMOVAL

(1) Disconnect electrical connector from IAT sensor.

(2) Remove sensor from intake manifold.

INSTALLATION

(1) Install IAT sensor into intake manifold. Tighten sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect electrical connector to sensor.

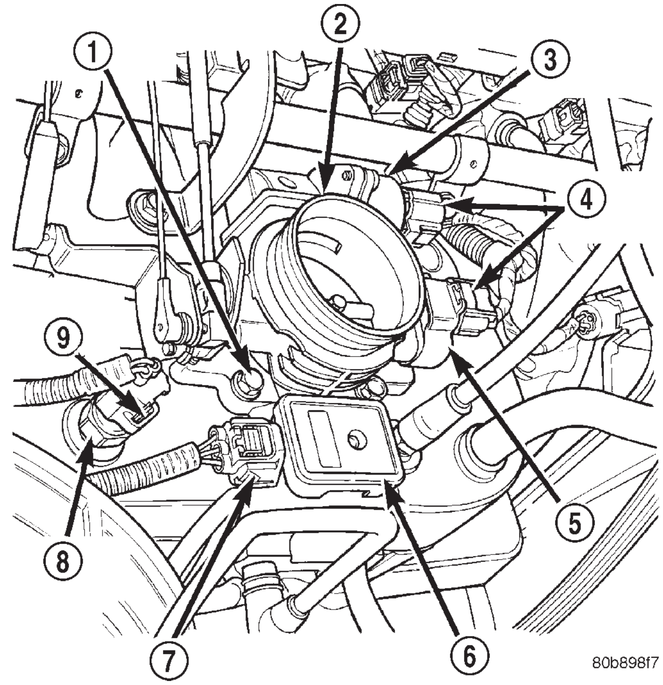


Fig. 41 IAT Sensor Location—4.0L Engine

1 – MOUNTING BOLTS (4)
2 – THROTTLE BODY
3 – IAC MOTOR
4 – ELEC. CONN.
5 – TPS
6 – MAP SENSOR
7 – ELEC. CONN.
8 – IAT SENSOR
9 – ELEC. CONN.

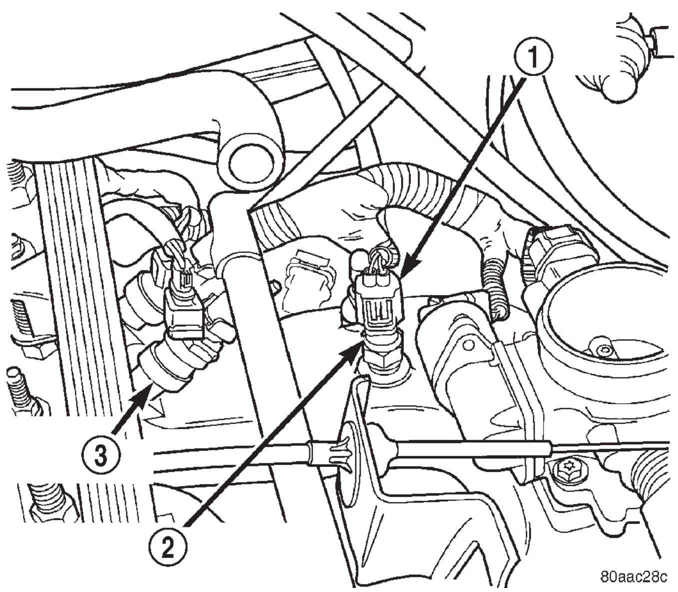


Fig. 42 IAT Sensor Location—2.5L Engine

1 – ELECTRICAL CONNECTOR
2 – INTAKE MANIFOLD TEMPERATURE SENSOR
3 – FUEL INJECTOR

REMOVAL AND INSTALLATION (Continued)

VEHICLE SPEED SENSOR

The Vehicle Speed Sensor (VSS) is located on the speedometer pinion gear adapter. If equipped with 4WD, this adapter is located on the transfer case extension (left side) (Fig. 43). If equipped with 2WD, this adapter is located on the extension housing of the transmission (left side).

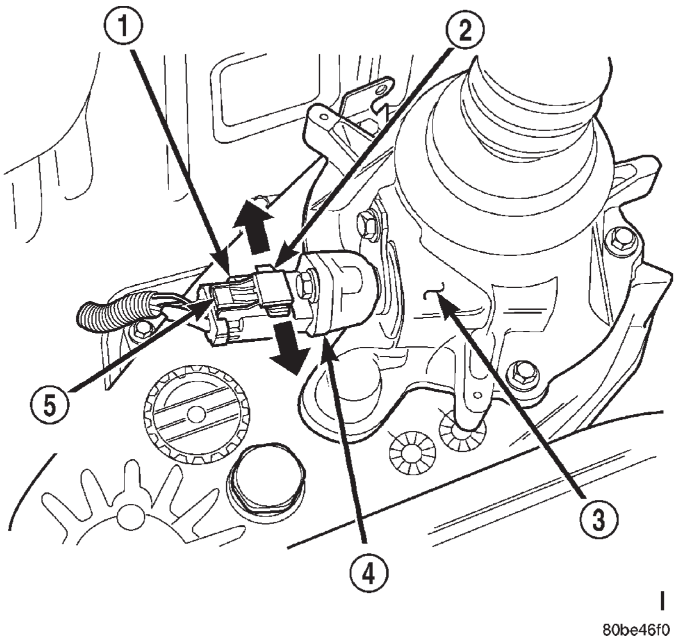


Fig. 43 VSS Location—4WD Shown

1 – SENSOR ELECTRICAL CONNECTOR
2 – SLIDE TAB
3 – 4WD TRANSFER CASE EXTENSION
4 – VEHICLE SPEED SENSOR
5 – RELEASE LOCK

REMOVAL

(1) Raise and support vehicle.

(2) Disconnect electrical connector from sensor by pushing slide tab (Fig. 43). After slide tab has been positioned, push in on secondary release lock (Fig. 43) on side of connector and pull connector from sensor.

(3) Remove sensor mounting bolt (Fig. 44).

(4) Remove sensor (pull straight out) from speedometer pinion gear adapter (Fig. 44). Do not remove gear adapter from transmission.

INSTALLATION

(1) Clean inside of speedometer pinion gear adapter before installing speed sensor.

(2) Install sensor into speedometer gear adapter and install mounting bolt. **Before tightening bolt, verify speed sensor is fully seated (mounted flush) to speedometer pinion gear adapter.**

(3) Tighten sensor mounting bolt to 2.2 N·m (20 in. lbs.) torque.

(4) Connect electrical connector to sensor.

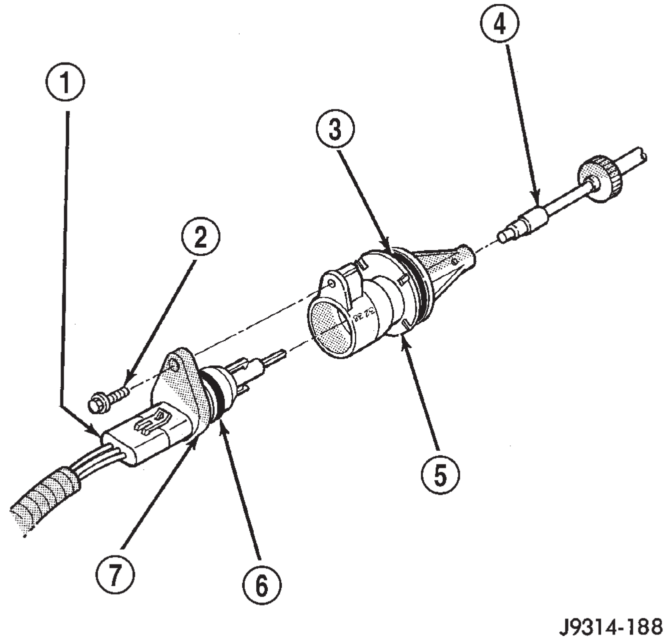


Fig. 44 VSS Removal/Installation

1 – ELECTRICAL CONNECTOR
2 – SENSOR MOUNTING BOLT
3 – O-RING
4 – SPEEDOMETER PINION GEAR
5 – SPEEDOMETER PINION GEAR ADAPTER
6 – O-RING
7 – VEHICLE SPEED SENSOR

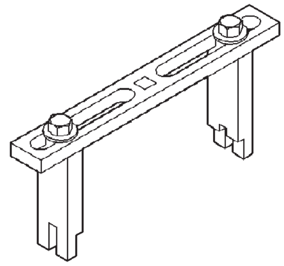
SPECIFICATIONS

TORQUE CHART

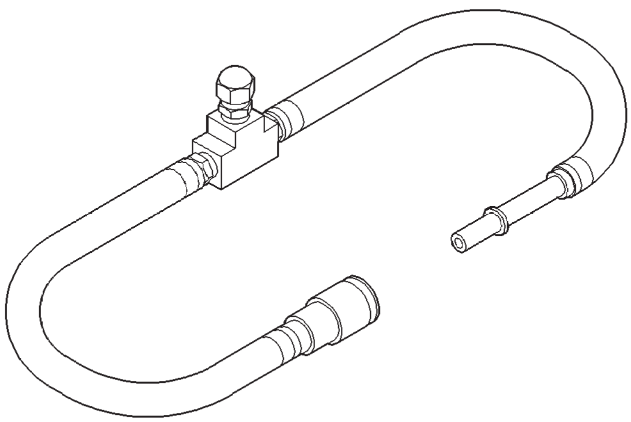
DESCRIPTION	TORQUE
Air Cleaner Housing Mount. Bolts	8 N·m (71 in. lbs.)
Engine Coolant Temperature Sensor	11 N·m (96 in. lbs.)
IAC Motor-To-Throttle Body Bolts	7 N·m (60 in. lbs.)
Intake Manifold Air Temp. Sensor	28 N·m (20 ft. lbs.)
MAP Sensor Mounting Screws	3 N·m (25 in. lbs.)
Oxygen Sensor	30 N·m (22 ft. lbs.)
PCM Mounting Screws	4 N·m (35 in. lbs.)
Power Steering Pressure Switch	14–22 N·m (124–195 in. lbs.)
Throttle Body Mounting Bolts	11 N·m (100 in. lbs.)
Throttle Position Sensor Mounting Screws	7 N·m (60 in. lbs.)
Vehicle Speed Sensor Mounting Bolt	2.2 N·m (20 in. lbs.)

SPECIAL TOOLS

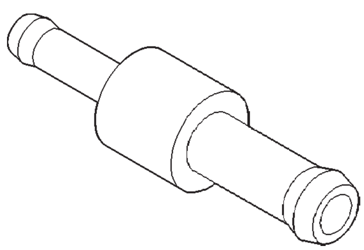
FUEL SYSTEM



Spanner Wrench—6856

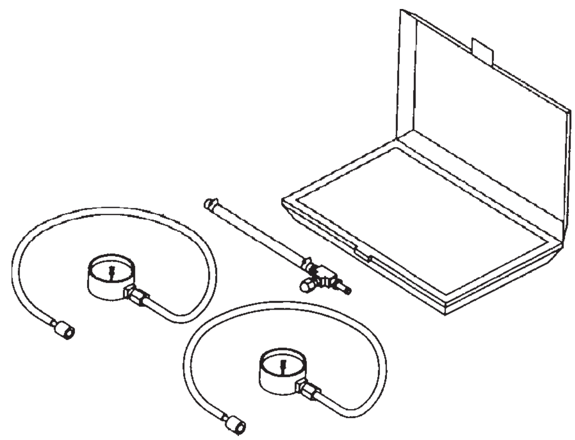


Adapters, Fuel Pressure Test—6539 and/or 6631

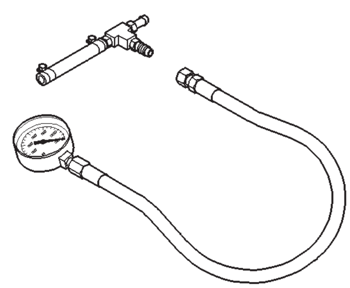


Fitting, Air Metering—6714

O2S (Oxygen Sensor) Remover/Installer—C-4907



Test Kit, Fuel Pressure—5069



Test Kit, Fuel Pressure—C-4799-B

Fuel Line Removal Tool—6782

STEERING

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POWER STEERING

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DESCRIPTION AND OPERATION

STEERING SYSTEM

DESCRIPTION

The power steering system has a hydraulic pump. The pump is a constant flow rate and displacement, vane-type pump. The pump on the 4.0L engine has a reservoir mounted to it (Fig. 1). The 2.5L engine has a remote mounted reservoir.

The steering gear (Fig. 1) used is a recirculating ball type gear with 14:1 gear ratio. A tilt and non-tilt column provide steering input.

NOTE: Right hand drive (RHD) and left hand drive (LHD) service procedures and torque specifications for steering linkage, gear and column are the same. The power steering pump procedures are different. Refer to appropriate service procedures regarding each component in the system.

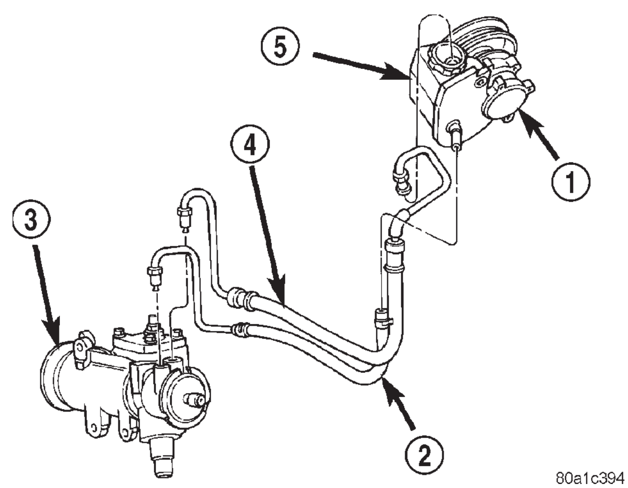

Fig. 1 Power Steering Gear & Pump - 4.0L

1 – 4.0 L PUMP
2 – RETURN HOSE
3 – STEERING GEAR
4 – PRESSURE HOSE
5 – RESERVOIR

OPERATION

The steering gear acts as a rolling thread between the worm shaft and the rack piston. Power assist is provided by the hydraulic pump. When the steering wheel is turned the worm shaft turns which moves the rack piston. The rack piston movement turns the pitman shaft which is connected to the steering linkage by the pitman arm.

DIAGNOSIS AND TESTING

POWER STEERING SYSTEM DIAGNOSIS CHARTS

STEERING NOISE

There is some noise in all power steering systems. One of the most common is a hissing sound evident at a standstill parking. Or when the steering wheel is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Steering intermediate shaft to dash panel seal. 2. Noisy valve in power steering gear.	1. Check and repair seal at dash panel. 2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose. 2. Loose or damaged suspension components/track bar. 3. Loose or damaged steering linkage. 4. Internal gear noise. 5. Pressure hose in contact with other components.	1. Tighten bolts to specification. 2. Inspect and repair suspension. 3. Inspect and repair steering linkage. 4. Replace gear. 5. Reposition hose.
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
WHINE OR GROWL	1. Low fluid level. 2. Pressure hose in contact with other components. 3. Internal pump noise. 4. Air in the system.	1. Fill to proper level. 2. Reposition hose. 3. Replace pump. 4. Perform pump initial operation.
SUCKING AIR SOUND	1. Loose return line clamp. 2. O-ring missing or damaged on hose fitting. 3. Low fluid level. 4. Air leak between pump and reservoir.	1. Replace clamp. 2. Replace o-ring. 3. Fill to proper level. 4. Repair as necessary.
SCRUBBING OR KNOCKING	1. Wrong tire size. 2. Wrong gear.	1. Verify tire size. 2. Verify gear.

DIAGNOSIS AND TESTING (Continued)

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level.	1. Fill to proper level.
	2. Tire pressure.	2. Adjust tire pressure.
	3. Steering component.	3. Inspect and lube.
	4. Loose belt.	4. Adjust or replace.
	5. Low pump pressure.	5. Pressure test and replace if necessary.
	6. Column shaft coupler binding.	6. Replace coupler.
	7. Steering gear worn or out of adjustment.	7. Repair or replace gear.
	8. Ball joints binding.	8. Inspect and repair as necessary.

INSUFFICIENT ASSIST OR POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Lack of lubrication.	4. Inspect and lubricate steering and suspension compnents.
	5. Low pump pressure.	5. Pressure test and repair as necessary.
	6. Internal gear leak.	6. Pressure and flow test, and repair as necessary.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate steering and suspension compnents.
	4. High friction in steering gear.	4. Test and adjust as necessary.
	5. Ball joints binding.	5. Inspect and repair as necessary.

Some roads will cause a vehicle to drift, due to the crown in the road.

DIAGNOSIS AND TESTING (Continued)

LOOSE STEERING AND VEHICLE LEADS/DRIFTS

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components.	1. Repair as necessary.
	2. Worn or loose wheel bearings.	2. Repair as necessary.
	3. Steering gear mounting.	3. Tighten gear mounting bolts to specification.
	4. Gear out of adjustment.	4. Adjust gear to specification.
	5. Worn or loose steering coupler.	5. Repair as necessary.
VEHICLE PULLS TO ONE SIDE DURING BRAKING	1. Tire Pressure.	1. Adjust tire pressure.
	2. Air in brake hydrauliics system.	2. Bleed brake system.
	3. Worn brake components.	3. Repair as necessary.
VEHICLE LEADS OR DRIFTS FROM STRAIGHT AHEAD DIRECTION ON UNCROWNED ROAD.	1. Tire pressure.	1. Adjust tire pressure.
	2. Radial tire lead.	2. Cross front tires.
	3. Brakes dragging.	3. Repair as necessary.
	4. Wheel alignment.	4. Align vehicle.
	5. Weak or broken spring.	5. Replace spring.
	6. Loose or worn steering/ suspension components.	6. Repair as necessary.
	7. Cross caster out of spec.	7. Adjust or replace axle as necessary.

POWER STEERING PUMP

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DESCRIPTION AND OPERATION

POWER STEERING PUMP

DESCRIPTION

Hydraulic pressure for the power steering system is provided by a belt driven power steering pump (Fig. 1). The pump shaft has a pressed-on high strength plastic drive pulley that is belt driven by the crankshaft pulley. The reservoir is attached to the pump body with spring clips on the 4.0L engine. A remote pump reservoir is used on the 2.5L engine mounted to the fan shroud. The power steering pump is connected to the steering gear by the pressure and return hoses.

OPERATION

The power steering pump is a constant flow rate and displacement, vane-type pump. The pump internal parts operate submerged in fluid. The flow control orifice is part of the high pressure line fitting. The pressure relief valve inside the flow control valve limits the pump pressure.

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

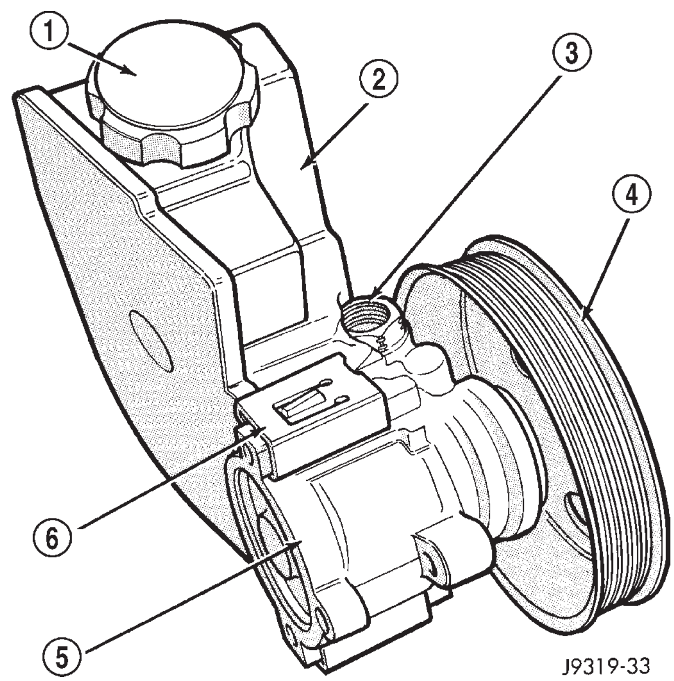


Fig. 1 Pump With Integral Reservoir

1 – CAP
2 – FLUID RESERVOIR (TYPICAL)
3 – HIGH-PRESSURE FITTING
4 – DRIVE PULLEY
5 – PUMP BODY
6 – RESERVOIR CLIP

POWER STEERING PRESSURE LINE

DESCRIPTION

The hose consists of two metal ends and rubber center section that contains a tuning cable.

OPERATION

Power steering pressure line, is used to transfer high pressure power steering fluid, from the power steering pump to the power steering gear.

DESCRIPTION AND OPERATION (Continued)

POWER STEERING RETURN LINE

DESCRIPTION

Power steering return line is a hose which is clamped at the pump and the gear.

OPERATION

Power steering return line, is used to transfer low pressure power steering fluid, from the power steering gear to the power steering pump.

DIAGNOSIS AND TESTING

POWER FLOW AND PRESSURE

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Power Steering Analyzer Tool Kit 6815 (Fig. 2) and Adapter Kit 6893.

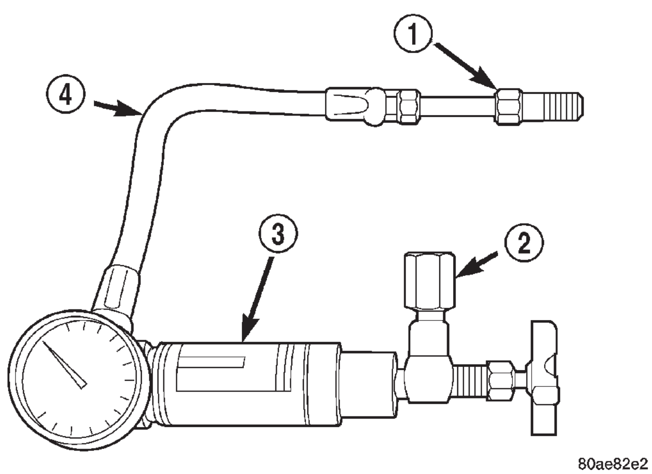


Fig. 2 Power Steering Analyzer

1 – TUBE
2 – ADAPTER FITTINGS
3 – ANALYZER
4 – GAUGE HOSE

FLOW AND PRESSURE TEST

(1) Check the power steering belt to ensure it is in good condition and adjusted properly.

(2) Connect pressure gauge hose from the Power Steering Analyzer to Tube 6865.

(3) Connect Adapter 6826 to Power Steering Analyzer test valve end.

(4) Disconnect high pressure hose at the pump. Use a container for dripping fluid.

(5) Connect Tube 6865 to the pump hose fitting.

(6) Connect the power steering hose from the steering gear to Adapter 6826.

(7) Open the test valve completely.

(8) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge and to get air out of the fluid. Then shut off engine.

(9) Check fluid level, add fluid as necessary. Start engine again and let idle.

(10) Gauge should read below 862 kPa (125 psi), if above, inspect the hoses for restrictions and repair as necessary. The initial pressure reading should be in the range of 345-552 kPa (50-80 psi).

(11) Increase the engine speed to 1500 RPM and read the flow meter. The reading should be 2.4 - 2.8 GPM, if the reading is below this specification the pump should be replaced.

CAUTION: The next step involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than three seconds as the pump could be damaged.

(12) Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 345 kPa (50 psi) of each other.**

- Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
- Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.

(13) Open the test valve, turn steering wheel extreme left and right positions against the stops. Record the highest indicated pressure at each position. Compare readings to specifications. If highest output pressures are not the same against either stop, the gear is leaking internally and must be repaired.

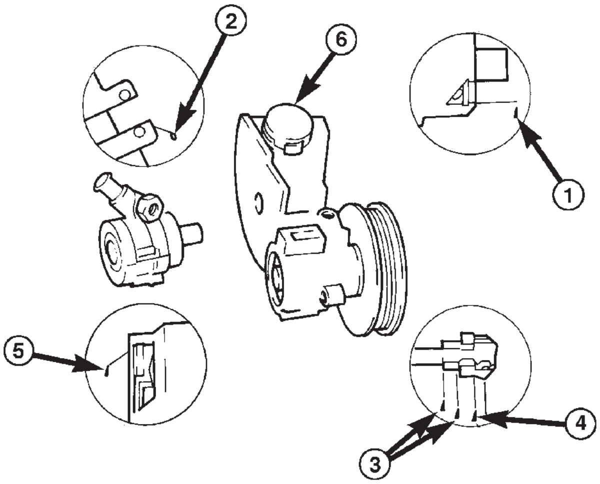
CAUTION: Do not force the pump to operate against the stops for more than 2 to 3 seconds at a time because, pump damage will result.

PUMP SPECIFICATIONS

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM)
2.5L	9653 kPa (1400 psi)	1500 RPM 2.4 - 2.8 GPM
4.0L	9653 kPa (1400 psi)	

DIAGNOSIS AND TESTING (Continued)

PUMP LEAKAGE DIAGNOSIS



1. BUSHING (BEARING) WORN, SEAL WORN. REPLACE PUMP.
2. REPLACE RESERVOIR O-RING SEAL.
3. TORQUE HOSE FITTING NUT TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
4. TORQUE FITTING TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
5. REPLACE PUMP.
6. CHECK OIL LEVEL: IF LEAKAGE PERSISTS WITH THE LEVEL CORRECT AND CAP TIGHT, REPLACE THE CAP.

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SERVICE PROCEDURES

POWER STEERING PUMP - INITIAL OPERATION

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

CAUTION: Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal ambient temperature.

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two minutes.

(2) Start the engine and let run for a few seconds then turn 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) Slowly turn the steering wheel right and left, lightly contacting the wheel stops at least 20 times.

(6) Check the fluid level add if necessary.

(7) Lower the vehicle, start the engine and turn the steering wheel slowly from lock to lock.

(8) Stop the engine and check the fluid level and refill as required.

(9) If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

REMOVAL AND INSTALLATION

POWER STEERING PUMP

NOTE: The power steering pump is mounted in the same position on LHD and RHD vehicles. On 4.0L RHD vehicles the front bracket is different. The service procedures are the same.

REMOVAL

(1) Remove serpentine drive belt, refer to Group 7 Cooling.

(2) Remove pressure and return hoses from pump, and drain pump.

(3) Remove 3 pump mounting bolts through pulley access holes.

(4) Loosen the 3 pump bracket bolts (Fig. 3) and (Fig. 4).

(5) Tilt pump downward and remove from engine.

(6) Remove pulley from pump.

INSTALLATION

(1) Install pulley on pump.

(2) Install pump on engine.

(3) Tighten pump bracket bolts to 47 N·m (35 ft. lbs.).

(4) Install 3 pump mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(5) Install the pressure and return hoses to pump.

(6) Install drive belt, refer to Group 7 Cooling.

(7) Add power steering fluid and perform Power Steering Pump Initial Operation.

PUMP RESERVOIR-2.5L

REMOVAL

(1) Remove the hoses from the bottom of the reservoir and drain the reservoir.

(2) Remove the push-in fastener from the top of the fan shroud.

(3) Slide reservoir up off the fan shroud.

INSTALLATION

(1) Slide reservoir down onto fan shroud.

(2) Install the push-in fastener in the top of fan shroud.

REMOVAL AND INSTALLATION (Continued)

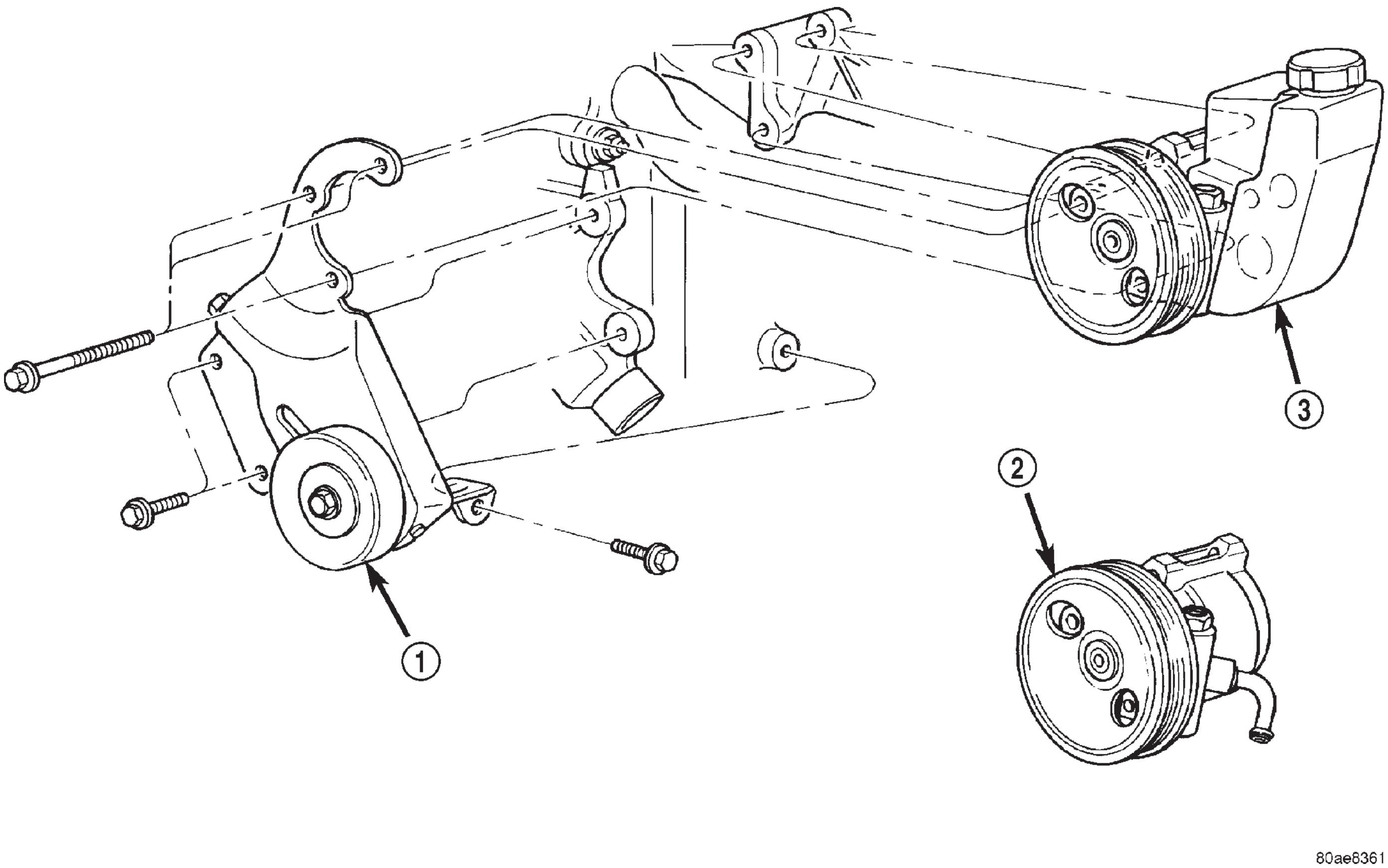


Fig. 3 Pump Mounting LHD

1 – PUMP BRACKET
2 – PUMP ASSEMBLY 2.5L
3 – PUMP ASSEMBLY 4.0L

(3) Install the pump hoses.

(4) Fill reservoir to proper level. Refer to Power Steering Pump Initial Operation.

DISASSEMBLY AND ASSEMBLY

PUMP PULLEY

DISASSEMBLY

(1) Remove pump assembly.

(2) Remove pulley from pump with Puller C-4333 or equivalent puller (Fig. 5).

ASSEMBLY

NOTE: The pulley is marked front for installation.

(1) Replace pulley if bent, cracked, or loose.

(2) Install pulley on pump with Installer C-4063-B or equivalent installer (Fig. 6). The pulley must be flush with the end of the shaft. Ensure the tool and pulley are aligned with the pump shaft.

(3) Install pump assembly.

(4) With Serpentine Belt, run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**

PUMP RESERVOIR

DISASSEMBLY

(1) Remove power steering pump.

(2) Clean exterior of pump.

(3) Clamp the pump body in a soft jaw vice.

(4) Pry up tab and slide the retaining clips off (Fig. 7).

NOTE: Use new retaining clips for installation.

(5) Remove fluid reservoir from pump body. Remove and discard O-ring seal.

ASSEMBLY

(1) Lubricate new O-ring Seal with Mopar Power Steering Fluid or equivalent.

DISASSEMBLY AND ASSEMBLY (Continued)

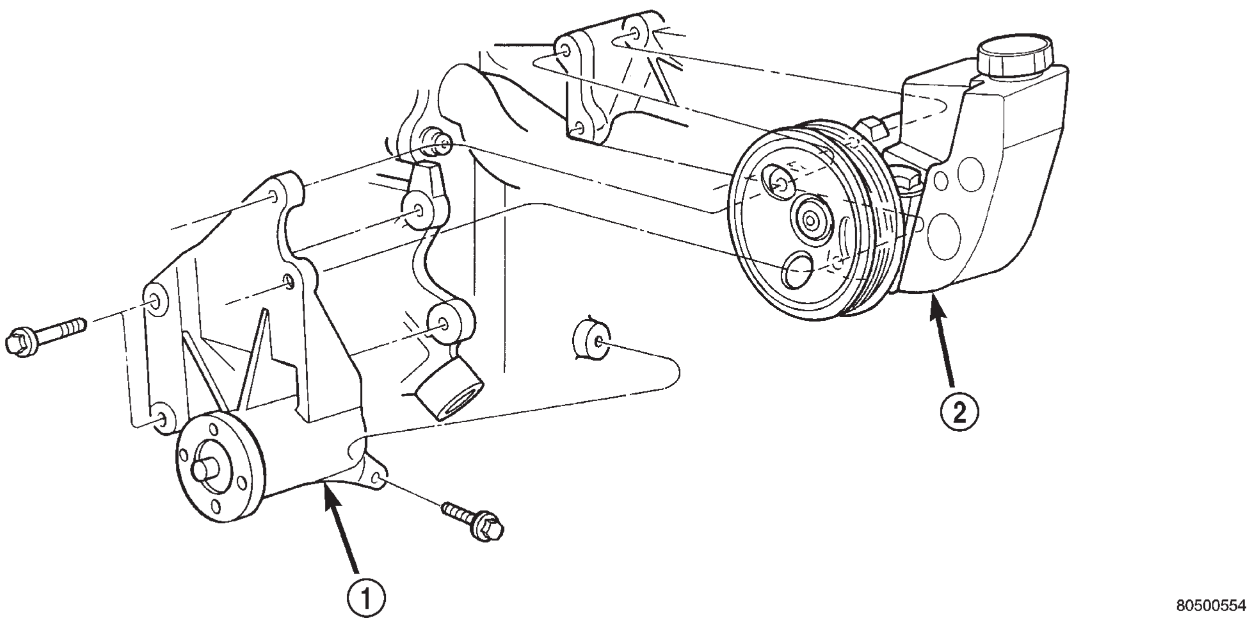


Fig. 4 Pump Mounting 4.0L RHD

1 – BRACKET
2 – PUMP ASSEMBLY

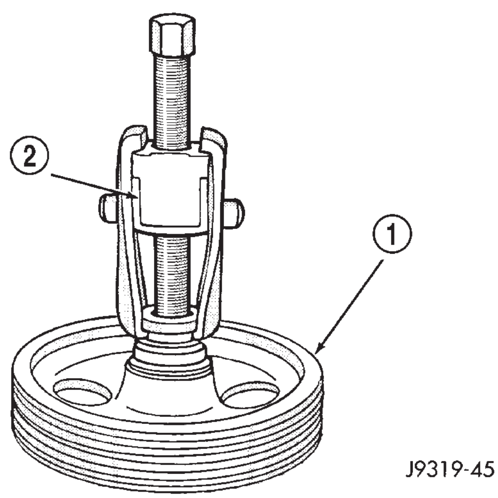


Fig. 5 Pulley Removal

1 – POWER STEERING PUMP DRIVE PULLEY
2 – SPECIAL TOOL C-4333

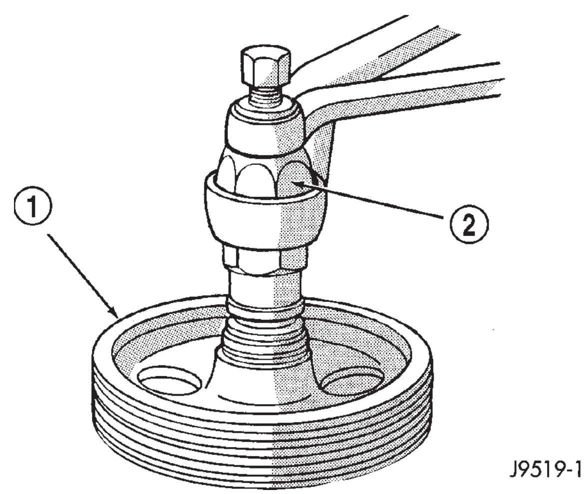


Fig. 6 Pulley Installation

1 – POWER STEERING PUMP DRIVE PULLEY
2 – SPECIAL TOOL C-4063–B

(2) Install O-ring seal in housing.
(3) Install reservoir onto housing.
(4) Slide and tap in **new** reservoir retainer clips until tab locks to housing.
(5) Install power steering pump.
(6) Add power steering fluid, refer to Pump Initial Operation.

DISASSEMBLY AND ASSEMBLY (Continued)

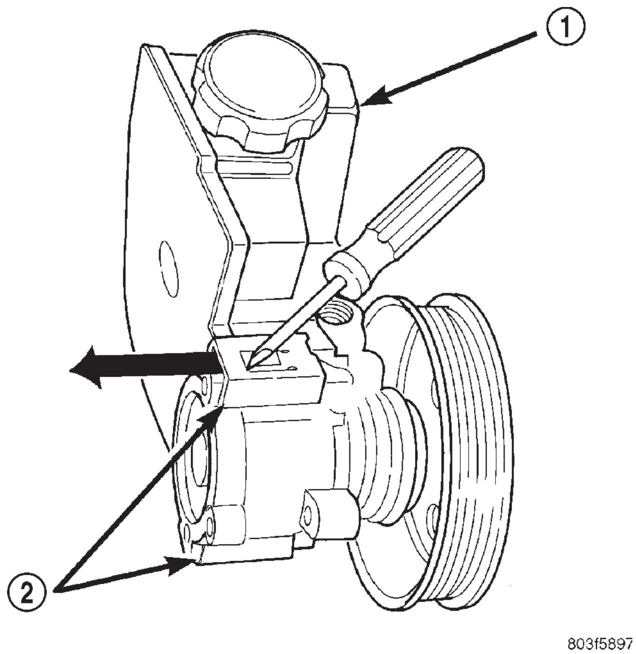


Fig. 7 Pump Reservoir Clips

1 – RESERVOIR
2 – RETAINING CLIPS

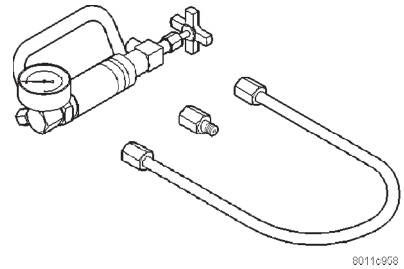
SPECIFICATIONS

TORQUE CHART

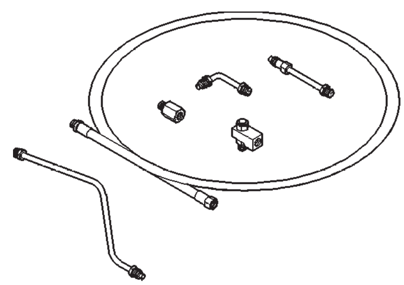
DESCRIPTION	TORQUE
Power Steering Pump	
Bracket to Pump	28 N·m (21 ft. lbs.)
Bracket to Engine	47 N·m (35 ft. lbs.)
Flow Control Valve	75 N·m (55 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)

SPECIAL TOOLS

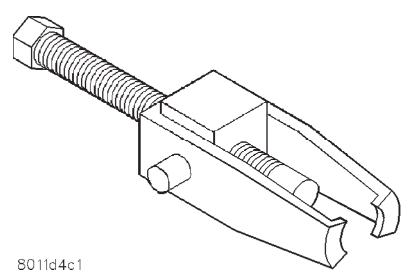
POWER STEERING PUMP



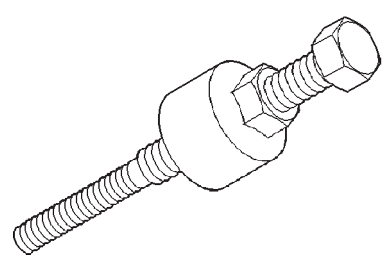
Analyzer Set, Power Steering Flow/Pressure 6815



Adapters, Power Steering Flow/Pressure Tester 6893



Puller C-4333



Installer, Power Steering Pulley C-4063B

POWER STEERING GEAR

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DESCRIPTION AND OPERATION

POWER STEERING GEAR

DESCRIPTION

The power steering gear is a recirculating ball type gear with a 14:1 ratio.

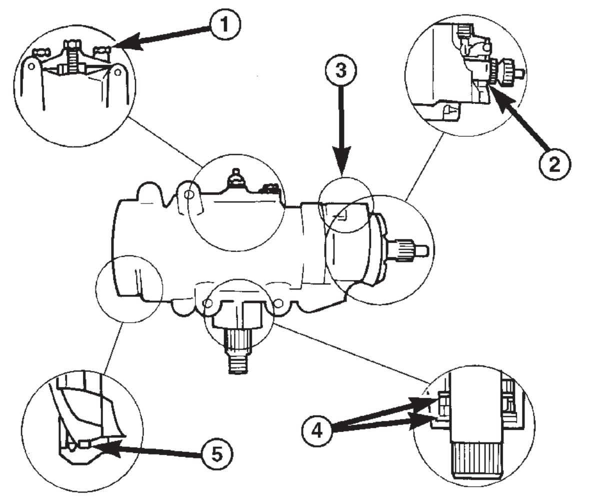
OPERATION

The gear acts as a rolling thread between the worm shaft and rack piston. The worm shaft is supported by a thrust bearing at the lower end and a bearing assembly at the upper end. When the worm shaft is turned the rack piston moves. The rack piston teeth mesh with the pitman shaft. Turning the worm shaft turns the pitman shaft, which turns the steering linkage.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

DIAGNOSIS AND TESTING

POWER STEERING GEAR LEAKAGE



1. SIDE COVER LEAK - TORQUE SIDE COVER BOLTS TO SPECIFICATION. REPLACE THE SIDE COVER SEAL IF THE LEAKAGE PERSISTS.
2. ADJUSTER PLUG SEAL - REPLACE THE ADJUSTER PLUG SEALS.
3. PRESSURE LINE FITTING - TORQUE THE HOSE FITTING NUT TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE THE SEAL.
4. PITMAN SHAFT SEALS - REPLACE THE SEALS.
5. TOP COVER SEAL - REPLACE THE SEAL.

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REMOVAL AND INSTALLATION

STEERING GEAR

REMOVAL

(1) Place the front wheels in the straight ahead position with the steering wheel centered.
(2) Disconnect and cap the fluid hoses from steering gear.
(3) Remove the column coupler shaft from the gear.
(4) Remove pitman arm from gear.
(5) Remove the steering gear retaining bolts and remove the gear (Fig. 1).

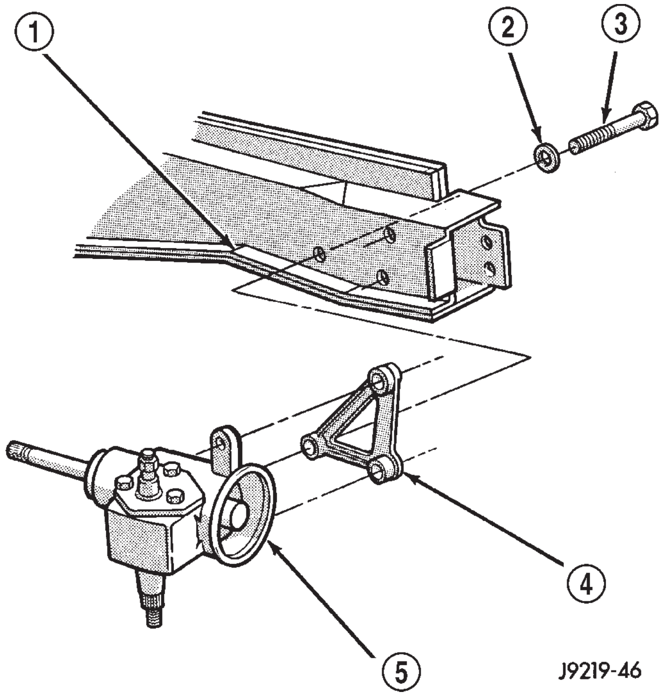


Fig. 1 Steering Gear Mounting (LHD)

1 – FRAME
2 – WASHER
3 – SCREW
4 – ADAPTER
5 – GEAR

INSTALLATION

(1) Install steering gear (and bracket) on the frame rail and tighten bolts to 95 N·m (70 ft. lbs.).
(2) Align the column coupler shaft to steering gear. Install a **new** pinch bolt and tighten to 49 N·m (36 ft. lbs.).
(3) Align and install the pitman arm and tighten nut to 251 N·m (185 ft. lbs.).
(4) Connect fluid hoses to steering gear and tighten to 28 N·m (21 ft. lbs.).
(5) Fill power steering system to proper level.

DISASSEMBLY AND ASSEMBLY

HOUSING END PLUG

DISASSEMBLY

(1) Unseat and remove retaining ring from groove with a punch through the hole in the end of the housing (Fig. 2).

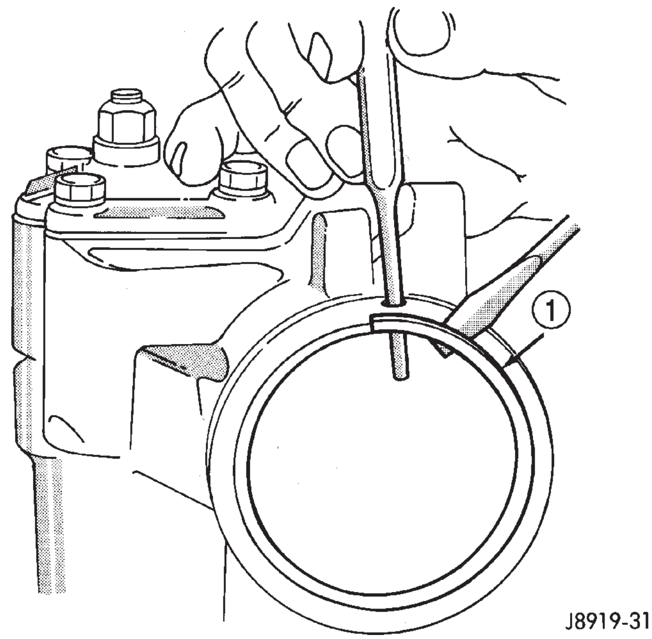


Fig. 2 End Plug Retaining Ring

1 – RETAINING RING

(2) Slowly rotate stub shaft with 12 point socket COUNTER-CLOCKWISE to force the end plug out from housing.

CAUTION: Do not turn stub shaft any further than necessary. The rack piston balls will drop out of the rack piston circuit if the stub shaft is turned too far.

(3) Remove O-ring from the housing (Fig. 3).

ASSEMBLY

(1) Lubricate O-ring with power steering fluid and install into the housing.
(2) Install end plug by tapping the plug lightly with a plastic mallet into the housing.
(3) Install retaining ring so one end of the ring covers the housing access hole (Fig. 4).

PITMAN SHAFT/SEALS/BEARING

DISASSEMBLY

(1) Clean exposed end of pitman shaft and housing with a wire brush.
(2) Remove preload adjuster nut (Fig. 5).

DISASSEMBLY AND ASSEMBLY (Continued)

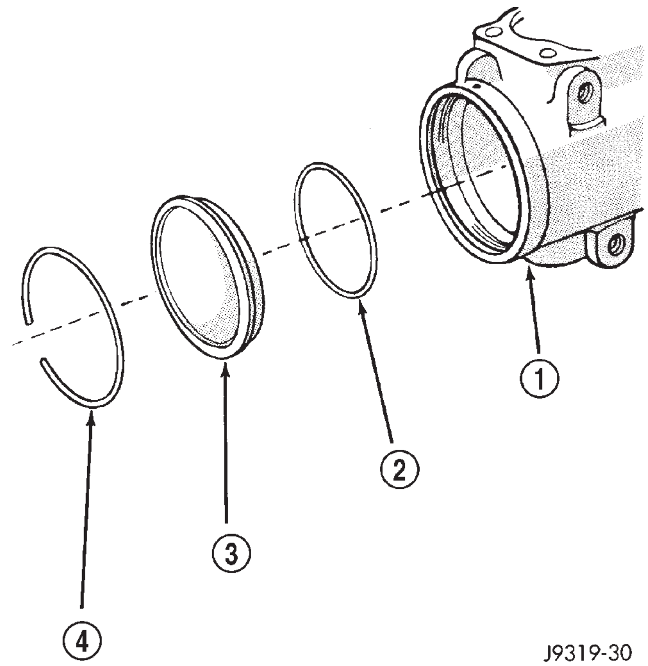


Fig. 3 End Plug Components

1 – HOUSING ASSEMBLY
2 – HOUSING END PLUG O-RING SEAL
3 – HOUSING END PLUG
4 – RETAINING RING

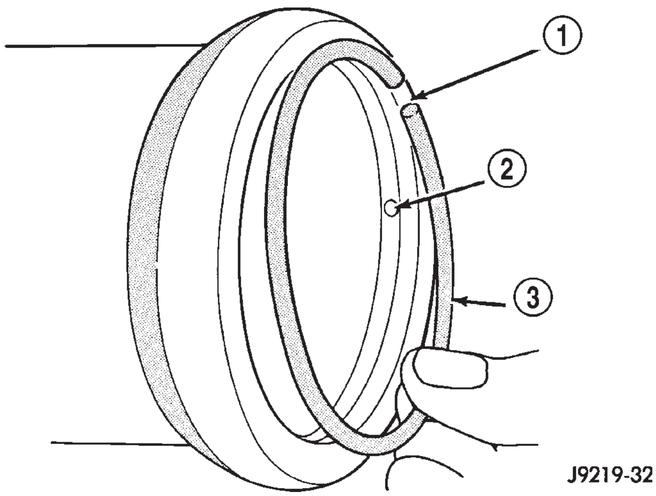


Fig. 4 Installing The Retaining Ring

1 – RING CAP
2 – PUNCH ACCESS HOLE
3 – RETAINER RING

(3) Rotate the stub shaft with a 12 point socket from stop to stop and count the number of turns.

(4) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

(5) Remove side cover bolts and remove side cover, gasket and pitman shaft as an assembly (Fig. 5).

NOTE: The pitman shaft will not clear the housing if it is not centered.

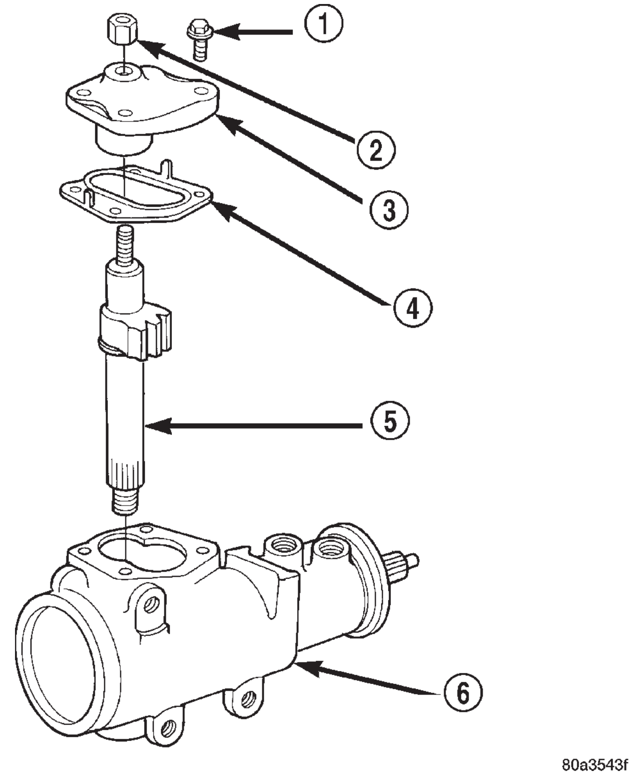


Fig. 5 Side Cover and Pitman Shaft

1 – SIDE COVER BOLTS
2 – PRELOAD ADJUSTER NUT
3 – SIDE COVER
4 – GASKET SEAL
5 – PITMAN SHAFT GEAR
6 – HOUSING ASSEMBLY

(6) Remove pitman shaft from the side cover.

(7) Remove dust seal from the housing with a seal pick (Fig. 6).

CAUTION: Use care not to score the housing bore when prying out seals and washer.

(8) Remove retaining ring with snap ring pliers.

(9) Remove washer from the housing.

(10) Remove oil seal from the housing with a seal pick.

(11) Remove pitman shaft bearing from housing with a bearing driver and handle (Fig. 7).

ASSEMBLY

(1) Install pitman shaft bearing into housing with a bearing driver and handle.

(2) Coat the oil seal and washer with **special grease** supplied with the new seal.

(3) Install the oil seal with a driver and handle.

(4) Install backup washer.

DISASSEMBLY AND ASSEMBLY (Continued)

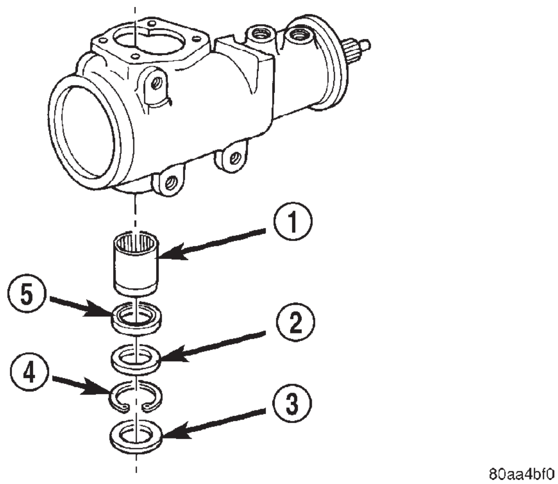


Fig. 6 Pitman Shaft Seals & Bearing

1 – BEARING
2 – WASHER
3 – DUST SEAL
4 – RETAINER
5 – OIL SEAL

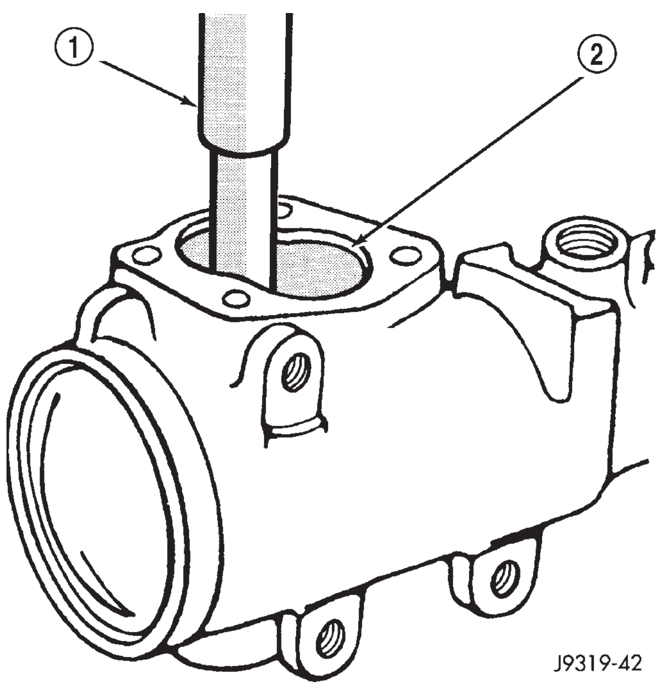


Fig. 7 Needle Bearing Removal

1 – REMOVER
2 – SIDE COVER AREA

(5) Install the retainer ring with snap ring pliers.

(6) Coat the dust seal with **special grease** supplied with the new seal.

(7) Install dust seal with a driver and handle.

(8) Install pitman shaft to side cover by screwing shaft in until it fully seats to side cover.

(9) Install preload adjuster nut. **Do not tighten nut until after Over-Center Rotation Torque adjustment has been made.**

(10) Install gasket to side cover and bend tabs around edges of side cover (Fig. 5).

(11) Install pitman shaft assembly and side cover to housing.

(12) Install side cover bolts and tighten to 60 N·m (44 ft. lbs.).

(13) Perform over-center rotation torque adjustment.

SPOOL VALVE

DISASSEMBLY

(1) Remove lock nut (Fig. 8).

(2) Remove adjuster nut with Spanner Wrench C-4381.

(3) Remove thrust support assembly out of the housing (Fig. 9).

(4) Pull stub shaft and valve assembly from the housing (Fig. 10).

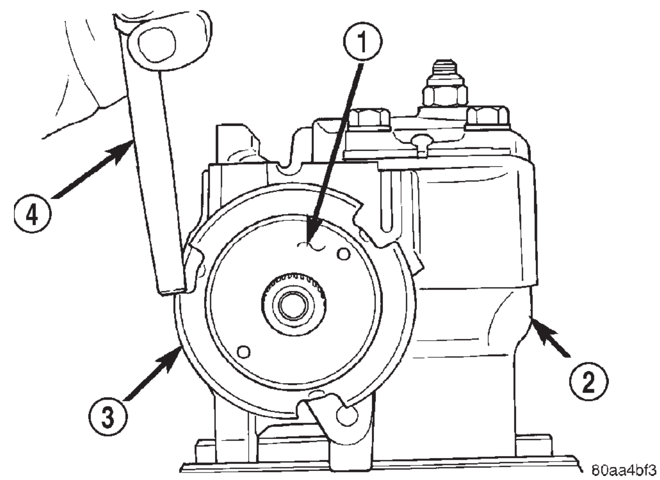


Fig. 8 Lock Nut and Adjuster Nut

1 – ADJUSTER NUT
2 – STEERING GEAR
3 – LOCK NUT
4 – PUNCH

(5) Remove stub shaft from valve assembly by lightly tapping shaft on a block of wood to loosen shaft. Then disengage stub shaft pin from hole in spool valve and separate the valve assembly from stub shaft (Fig. 11).

(6) Remove spool valve from valve body by pulling and rotating the spool valve from the valve body (Fig. 12).

(7) Remove spool valve O-ring and valve body teflon rings and O-rings underneath the teflon rings (Fig. 13).

DISASSEMBLY AND ASSEMBLY (Continued)

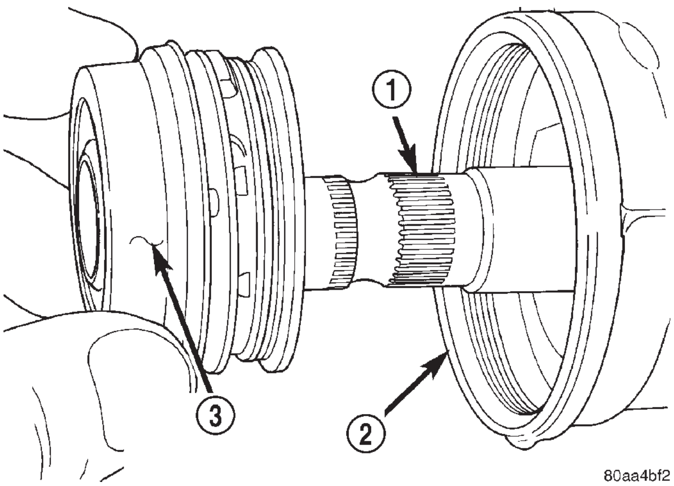


Fig. 9 Thrust Support Assembly

1 – STUB SHAFT
2 – HOUSING
3 – THRUST SUPPORT ASSEMBLY

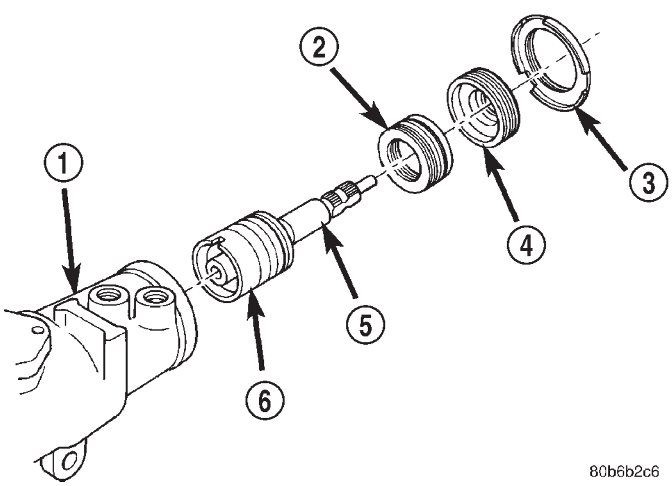


Fig. 10 Valve Assembly With Stub Shaft

1 – GEAR
2 – THRUST SUPPORT
3 – LOCK NUT
4 – ADJUSTER NUT
5 – STUB SHAFT
6 – VALVE ASSEMBLY

(8) Remove the O-ring between the worm shaft and the stub shaft.

ASSEMBLY

NOTE: Clean and dry all components, then lubricate with power steering fluid.

(1) Install spool valve spool O-ring.
(2) Install spool valve in valve body by pushing and rotating. Hole in spool valve for stub shaft pin must be accessible from opposite end of valve body.

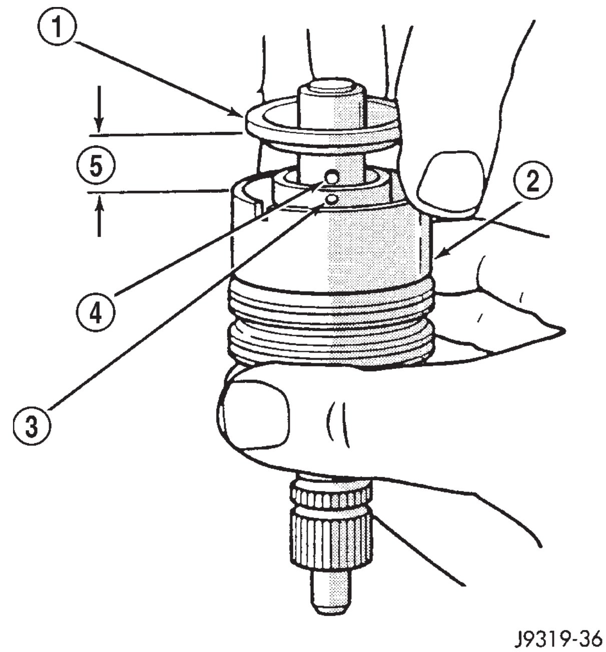


Fig. 11 Stub Shaft

1 – STUB SHAFT
2 – VALVE BODY
3 – HOLE IN SPOOL
4 – SHAFT PIN
5 – 6mm (1/4”)

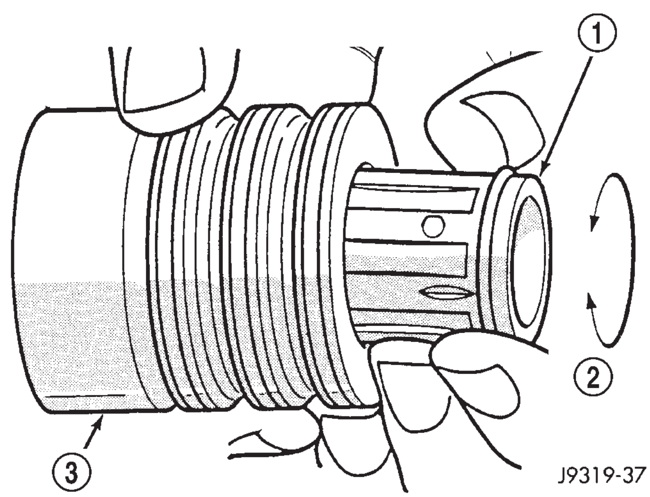


Fig. 12 Spool Valve

1 – SPOOL VALVE
2 – ROTATE VALVE TO REMOVE
3 – VALVE BODY

(3) Install stub shaft in valve spool and engage locating pin on stub shaft into spool valve hole (Fig. 14).

NOTE: Notch in stub shaft cap must fully engage valve body pin and seat against valve body shoulder.

DISASSEMBLY AND ASSEMBLY (Continued)

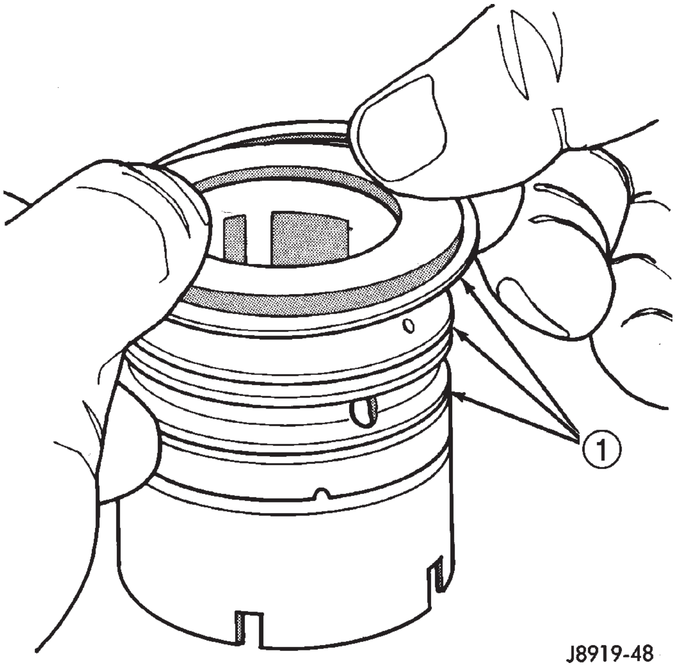


Fig. 13 Valve Seals

1 – O-RING SEALS

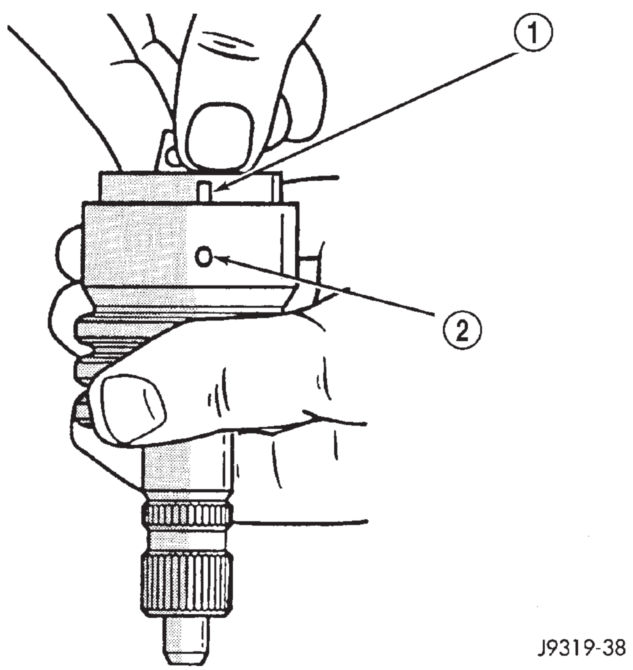


Fig. 14 Stub Shaft Installation

1 – NOTCH IN CAP
2 – VALVE BODY PIN

(4) Install O-rings and teflon rings over the O-rings on valve body.

(5) Install O-ring into the back of the stub shaft cap (Fig. 15).

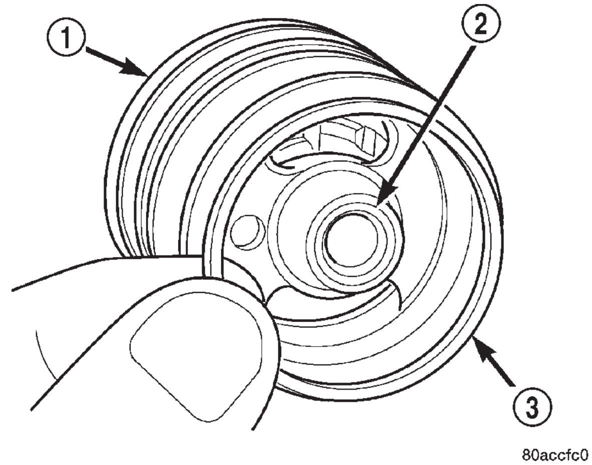


Fig. 15 Stub Shaft Cap O-Ring

1 – VALVE BODY
2 – STUB SHAFT CAP
3 – O-RING

(6) Install stub shaft and valve assembly in the housing. Line up worm shaft to slots in the valve assembly.

(7) Install thrust support assembly.

NOTE: The thrust support is serviced as an assembly. If any component of the thrust support is damaged the assembly must be replaced.

(8) Install adjuster nut and lock nut.

(9) Adjust Thrust Bearing Preload and Over-Center Rotating Torque.

RACK PISTON AND WORM SHAFT

DISASSEMBLY

(1) Remove housing end plug.

(2) Remove rack piston plug (Fig. 16).

(3) Remove side cover and pitman shaft.

(4) Turn stub shaft COUNTERCLOCKWISE until the rack piston begins to come out of the housing.

(5) Insert Arbor C-4175 into bore of rack piston (Fig. 17) and hold tool tightly against worm shaft.

(6) Turn the stub shaft with a 12 point socket COUNTERCLOCKWISE, this will force the rack piston onto the tool and hold the rack piston balls in place.

(7) Remove the rack piston and tool together from housing.

(8) Remove tool from rack piston.

(9) Remove rack piston balls.

(10) Remove clamp bolts, clamp and ball guide (Fig. 18).

(11) Remove teflon ring and O-ring from the rack piston (Fig. 19).

DISASSEMBLY AND ASSEMBLY (Continued)

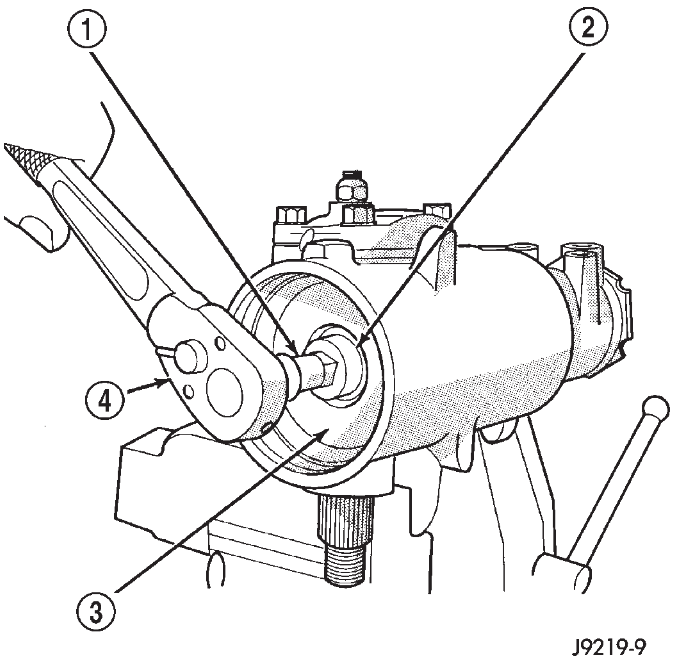


Fig. 16 Rack Piston End Plug

1 – EXTENSION
2 – END PLUG
3 – RACK PISTON
4 – RATCHET

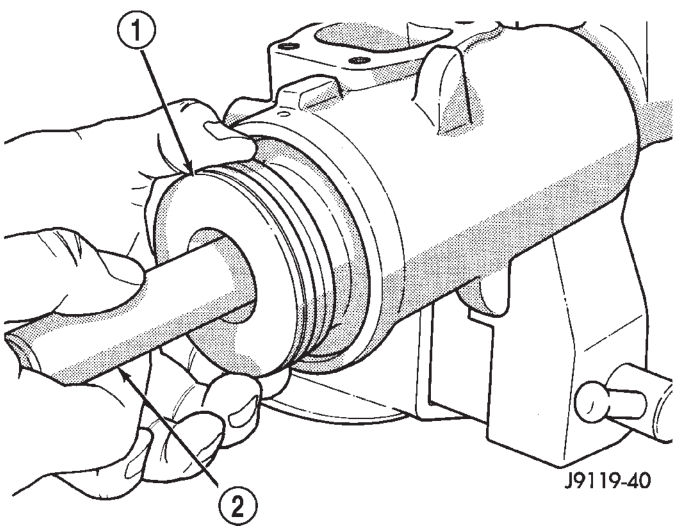


Fig. 17 Rack Piston with Arbor

1 – RACK PISTON
2 – SPECIAL TOOL C-4175

(12) Remove the adjuster lock nut and adjuster nut from the stub shaft.

(13) Pull the stub shaft with the spool valve and thrust support assembly out of the housing.

(14) Remove the worm shaft from the housing (Fig. 20).

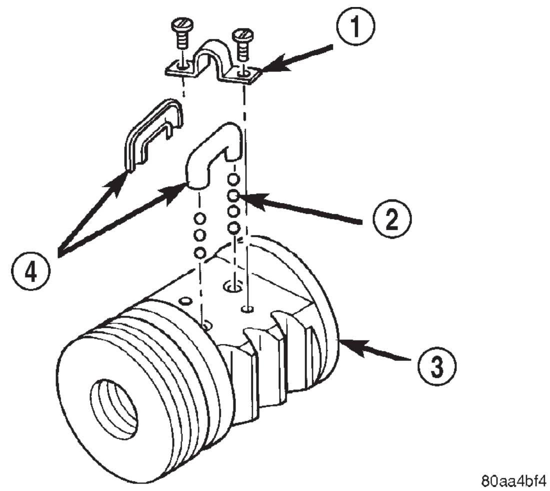


Fig. 18 Rack Piston

1 – CLAMP
2 – BALLS
3 – RACK PISTON
4 – BALL GUIDE

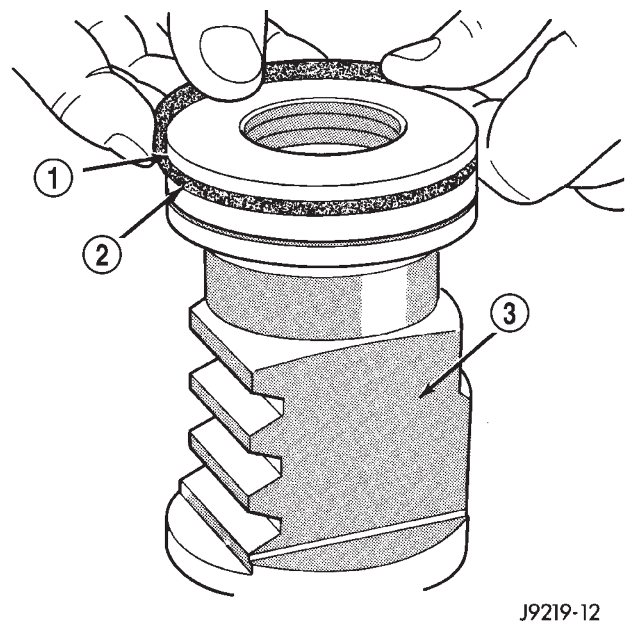


Fig. 19 Rack Piston Teflon Ring and O-Ring

1 – TEFLON SEAL
2 – BACK-UP O-RING MUST BE INSTALLED UNDER PISTON RING
3 – RACK PISTON NUT

ASSEMBLY

NOTE: Clean and dry all components and lubricate with power steering fluid.

(1) Check for scores, nicks or burrs on the rack piston finished surface. Slight wear is normal on the worm gear surfaces.

DISASSEMBLY AND ASSEMBLY (Continued)

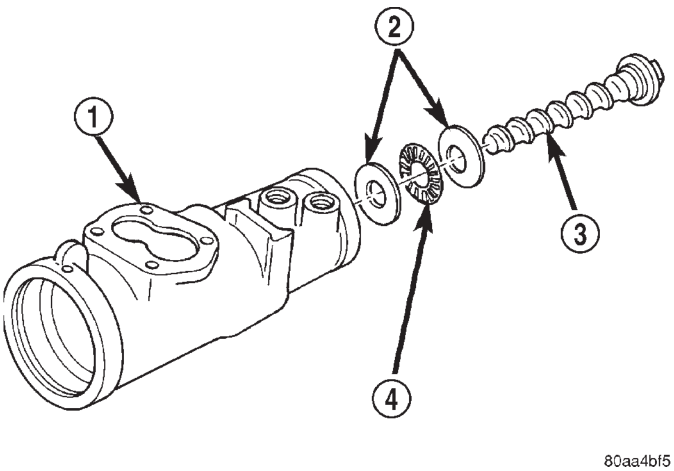


Fig. 20 Worm Shaft

1 – GEAR HOUSING
2 – BEARING RACE
3 – WORM SHAFT
4 – BEARING

(2) Install O-ring and teflon ring on the rack piston.

(3) Install worm shaft in the rack piston and align worm shaft spiral groove with rack piston ball guide hole (Fig. 21).

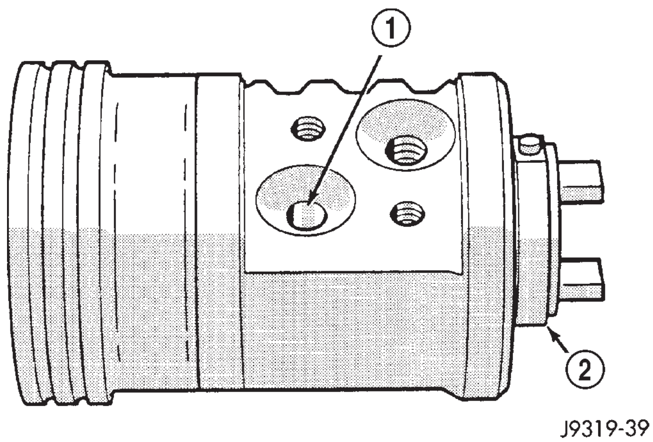


Fig. 21 Installing Balls in Rack Piston

1 – INSTALL BALLS IN THIS HOLE WHILE SLOWLY ROTATING WORM COUNTER CLOCKWISE
2 – WORM FLANGE

CAUTION: The rack piston balls must be installed alternately into the rack piston and ball guide. This maintains worm shaft preload. There are 12 black balls and 12 silver (Chrome) balls. The black balls are smaller than the silver balls.

(4) Lubricate and install rack piston balls through return guide hole while turning worm shaft COUNTERCLOCKWISE (Fig. 21).

(5) Install remaining balls in guide using grease to hold the balls in place (Fig. 22).

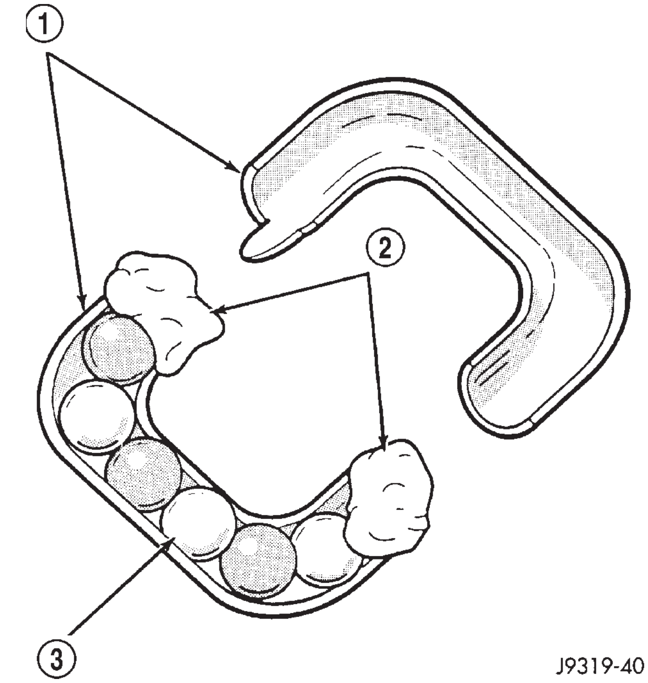


Fig. 22 Balls in the Return Guide

1 – GUIDE
2 – PETROLEUM JELLY
3 – BALLS

(6) Install the guide onto rack piston and install clamp and clamp bolts. Tighten bolts to 4.8 N·m (43 in. lbs.).

(7) Insert Arbor C-4175 into bore of rack piston and hold tool tightly against worm shaft.

(8) Turn the worm shaft COUNTERCLOCKWISE while pushing on the arbor. This will force the rack piston onto the arbor and hold the rack piston balls in place.

(9) Install the races and thrust bearing on the worm shaft and install shaft in the housing (Fig. 20).

(10) Install the stub shaft with spool valve, thrust support assembly and adjuster nut in the housing.

(11) Install the rack piston and arbor tool into the housing.

(12) Hold arbor tightly against worm shaft and turn stub shaft CLOCKWISE until rack piston is seated on worm shaft.

(13) Install pitman shaft and side cover in the housing.

(14) Install rack piston plug and tighten to 150 N·m (111 ft. lbs.).

(15) Install housing end plug.

(16) Adjust worm shaft thrust bearing preload and over-center rotating torque.

ADJUSTMENTS

STEERING GEAR

CAUTION: Steering gear must be adjusted in the proper order. If adjustments are not performed in order, gear damage and improper steering response may result.

NOTE: Adjusting the steering gear in the vehicle is not recommended. Remove gear from the vehicle and drain the fluid. Then mount gear in a vise to perform adjustments.

WORM THRUST BEARING PRELOAD

(1) Mount the gear carefully into a vise.

CAUTION: Do not overtighten the vise on the gear case. This may affect the adjustment

(2) Remove adjuster plug locknut (Fig. 23).

(3) Rotate the stub shaft back and forth with a 12 point socket to drain the remaining fluid.

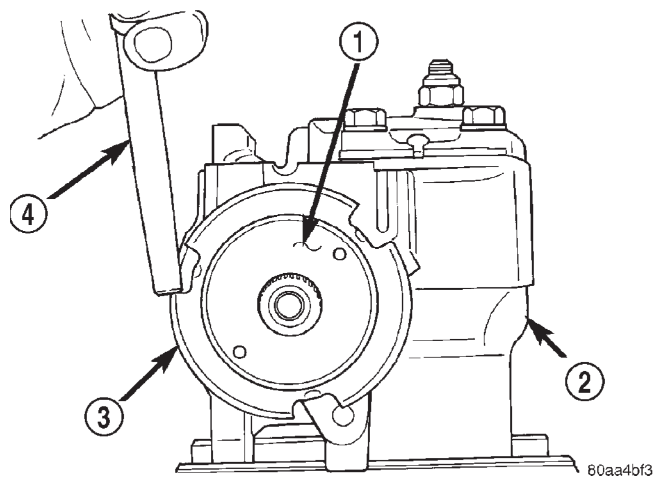


Fig. 23 Adjuster Lock Nut

1 – ADJUSTER NUT
2 – STEERING GEAR
3 – LOCK NUT
4 – PUNCH

(4) Turn the adjuster in with Spanner Wrench C-4381. Tighten the plug and thrust bearing in the housing until firmly bottomed in the housing about 34 N·m (25 ft. lbs.).

(5) Place an index mark on the housing even with one of the holes in adjuster plug (Fig. 24).

(6) Measure back (counterclockwise) 5.08 mm (0.20 in) and mark housing (Fig. 25).

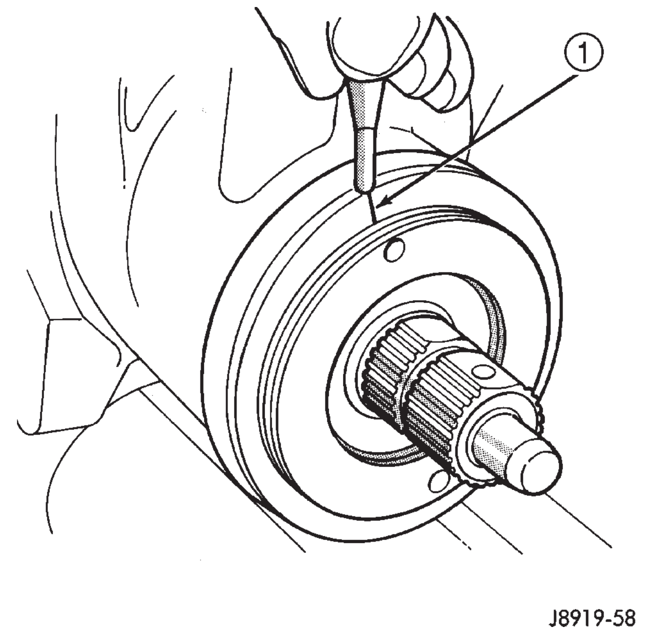


Fig. 24 Alignment Marking On Housing

1 – INDEX

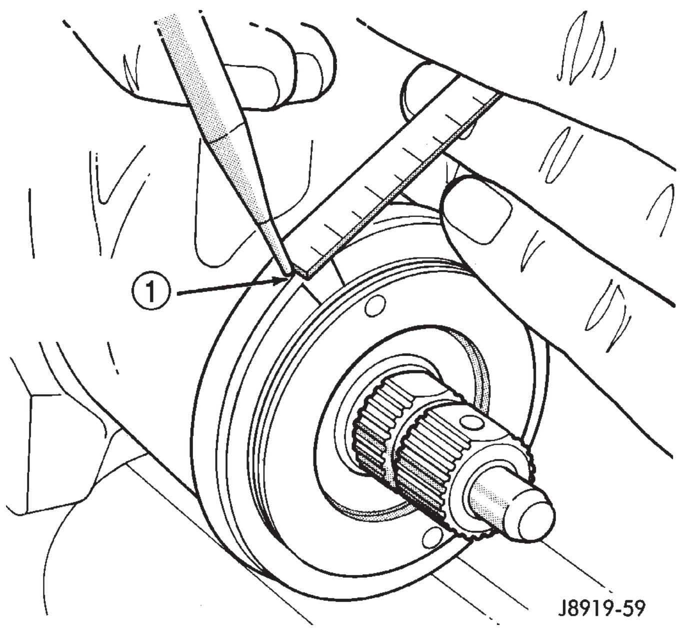


Fig. 25 Second Marking On Housing

1 – REFERENCE MARK

(7) Rotate adjustment cap back (counterclockwise) with spanner wrench until hole is aligned with the second mark (Fig. 26).

(8) Install and tighten locknut to 108 N·m (80 ft. lbs.). Be sure adjustment cap does not turn while tightening the locknut.

ADJUSTMENTS (Continued)

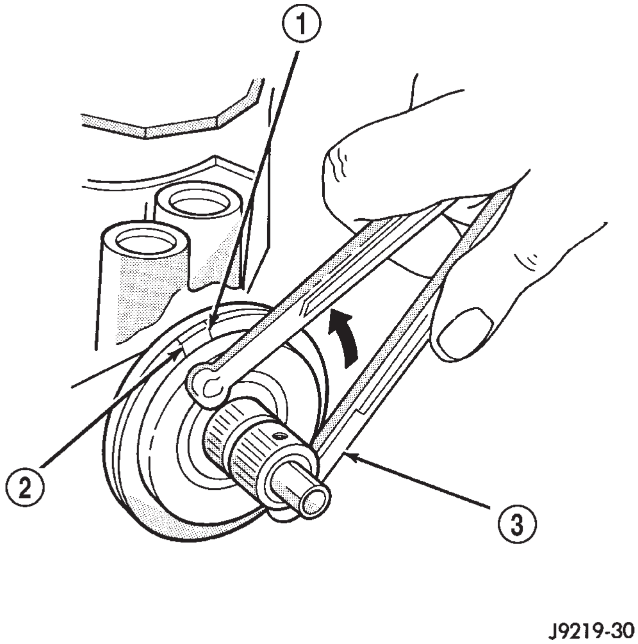


Fig. 26 Aligning To The Second Mark

1 – FIRST MARK
2 – SECOND MARK
3 – SPANNER WRENCH

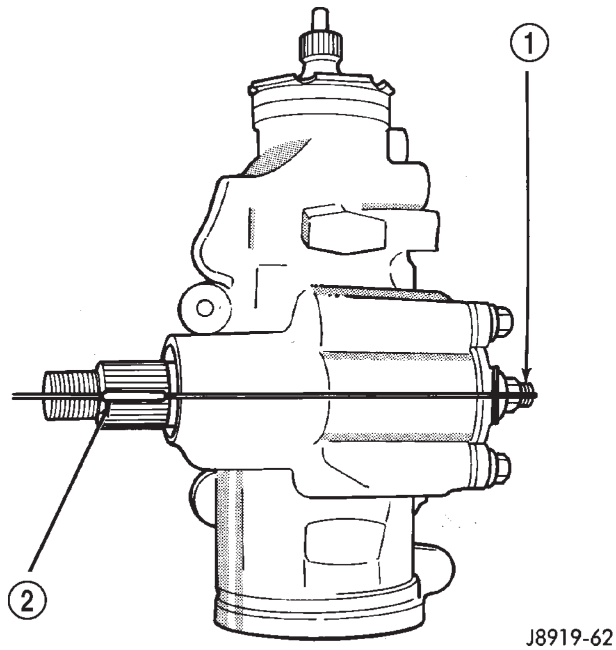


Fig. 27 Steering Gear Centered

1 – ADJUSTMENT SCREW
2 – MASTER SPLINE

OVER-CENTER

NOTE: Before performing this procedure, the worm bearing preload adjustment must be performed.

(1) Rotate the stub shaft with a 12 point socket from stop to stop and count the number of turns.

(2) Starting at either stop, turn the stub shaft back 1/2 the total number of turns. This is the center of the gear travel (Fig. 27).

(3) Place the torque wrench in the vertical position on the stub shaft. Rotate the wrench 45 degrees each side of the center and record the highest rotational torque in this range (Fig. 28). This is the Over-Center Rotating Torque.

NOTE: The stub shaft must rotate smoothly without sticking or binding.

(4) Rotate the stud shaft between 90° and 180° to the left of center and record the left off-center preload. Repeat this to the right of center and record the right off-center preload. The average of these two recorded readings is the Preload Rotating Torque.

(5) The Over-Center Rotating Torque should be 0.40-0.70 N·m (3-7 in. lbs.) **higher** than the Preload Rotating Torque.

(6) If an adjustment to the Over-Center Rotating Torque is necessary, first loosen the adjuster lock nut. Then turn the pitman shaft adjuster screw back (COUNTERCLOCKWISE) until fully extended, then turn back in (CLOCKWISE) one full turn.

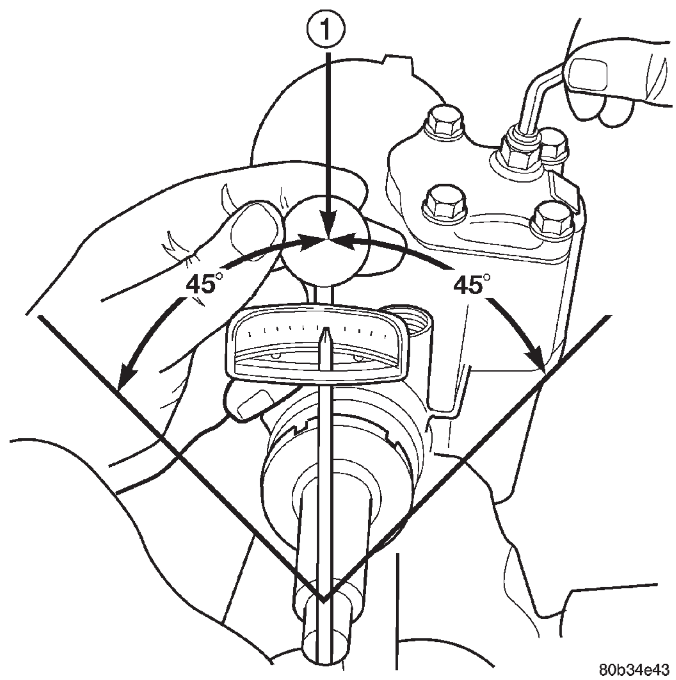


Fig. 28 Checking Over-center Rotation Torque

1 – CENTER

(7) Remeasure Over-Center Rotating Torque. If necessary turn the adjuster screw and repeat mea-

ADJUSTMENTS (Continued)

surement until correct Over-Center Rotating Torque is reached.

NOTE: To increase the Over-Center Rotating Torque turn the screw CLOCKWISE.

(8) Prevent the adjuster screw from turning while tightening adjuster lock nut. Tighten the adjuster lock nut to 49 N·m (36 ft. lbs.).

SPECIFICATIONS

POWER STEERING GEAR

Steering Gear
Type . . . . Recirculating Ball
Gear Ratio
RHD 14:1
LHD 14:1
Worm Shaft Bearing
Preload . . . . 0.45–1.13 N·m (4–10 in. lbs.)
Pitman Shaft Overcenter Drag
New Gear (under 400 miles) . . . . . 0.45–0.90 N·m (4–8 in. lbs.) + Worm Shaft Preload
Used Gear (over 400 miles) . . . . 0.5–0.6 N·m (4–5 in. lbs.) + Worm Shaft Preload

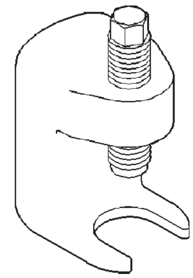
TORQUE CHART

DESCRIPTION	TORQUE
Power Steering Gear	
Adjustment Cap Locknut	108 N·m (80 ft. lbs.)
Adjustment Screw Locknut	49 N·m (36 ft. lbs.)
Gear to Frame Bolts	95 N·m (70 ft. lbs.)
Pitman Shaft Nut	251 N·m (185 ft. lbs.)
Rack Piston Plug	102 N·m (75 ft. lbs.)
Side Cover Bolts	60 N·m (44 ft. lbs.)
Pressure Line	28 N·m (21 ft. lbs.)
Return Line	28 N·m (21 ft. lbs.)
Return Guide Clamp Bolt	58 N·m (43 ft. lbs.)

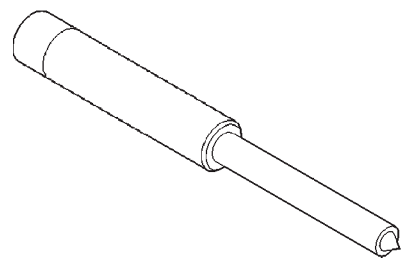
SPECIAL TOOLS

POWER STEERING GEAR

Remover/Installer, Steering Plug C-4381



Remover, Pitman Arm C-4150A



Remover/Installer Steering Rack Piston C-4175

STEERING LINKAGE

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

STEERING LINKAGE

DESCRIPTION

The steering linkage consist of a pitman arm, drag link, tie rod, tie rod ends and a steering damper (Fig. 1) and (Fig. 2). The service procedures and torque specifications are the same for LHD and RHD vehicles.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

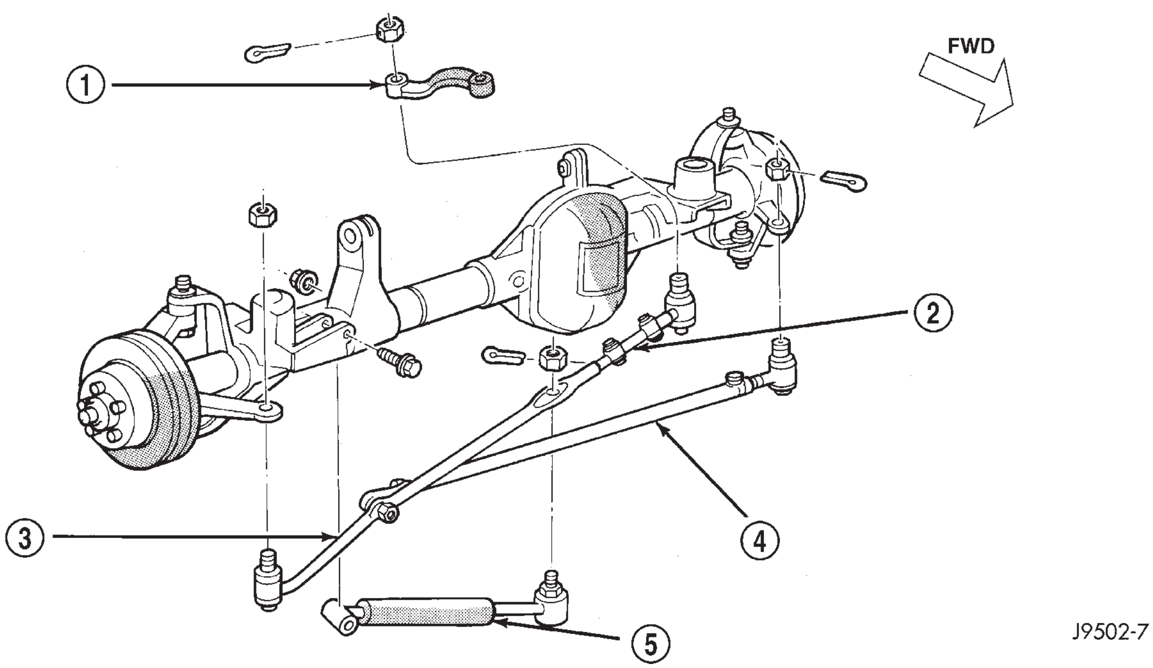


Fig. 1 Steering Linkage—LHD

1 – PITMAN ARM
2 – ADJUSTMENT SLEEVE
3 – DRAG LINK
4 – TIE ROD
5 – STEERING DAMPENER

DESCRIPTION AND OPERATION (Continued)

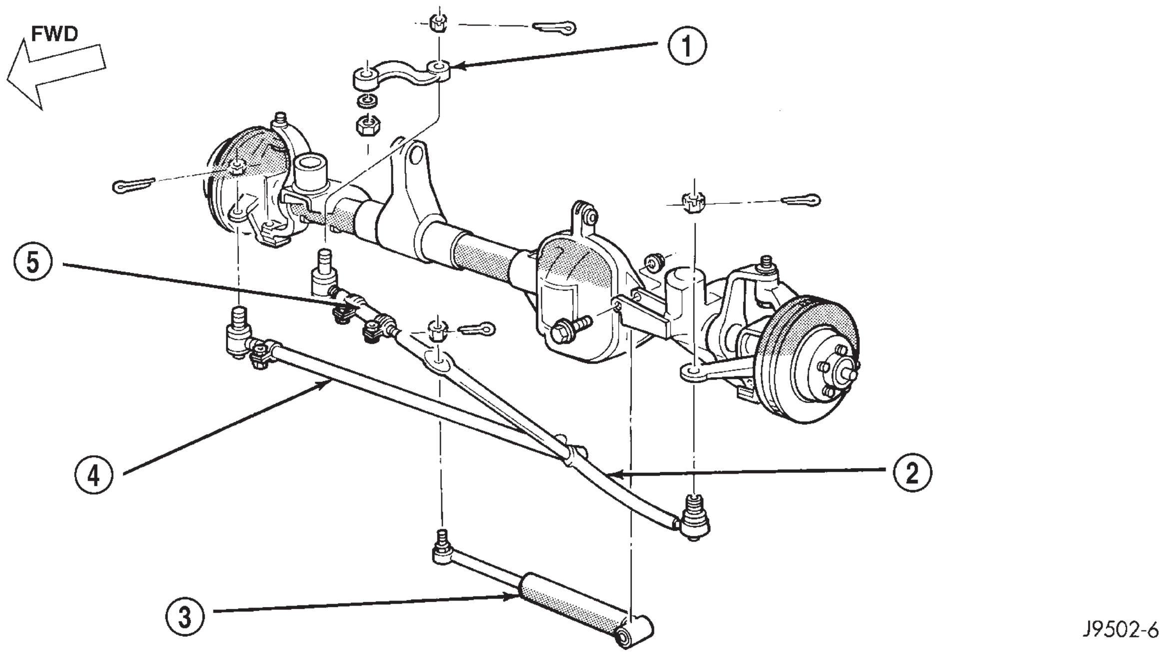


Fig. 2 Steering Linkage—RHD

1 – PITMAN ARM
2 – DRAG LINK
3 – STEERING DAMPNER
4 – TIE ROD
5 – ADJUSTMENT SLEEVE

SERVICE PROCEDURES

STEERING LINKAGE

The tie rod end and ball stud seals should be inspected during all oil changes. If a seal is damaged, it should be replaced. Before installing a new seal, inspect ball stud at the throat opening. Check for lubricant loss, contamination, ball stud wear or corrosion. If these conditions exist, replace the tie rod. A replacement seal can be installed if lubricant is in good condition. Otherwise, a complete replacement ball stud end should be installed.

CAUTION: If any steering components are replaced or serviced an alignment must be performed, to ensure the vehicle meets all alignment specifications.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

REMOVAL AND INSTALLATION

TIE ROD

CAUTION: Use a Puller tool C-3894-A for tie rod removal. Failure to use this tool could damage the ball stud and seal (Fig. 3).

REMOVAL

(1) Remove the cotter pins and nuts at the tie rod ball studs and drag link.

(2) Loosen the ball studs with a puller tool to remove the tie rod.

(3) Loosen clamp bolts and unthread the tie rod end from the tube.

INSTALLATION

(1) Thread the tie rod end into the tube and position the clamp to it’s original position (Fig. 4). Tighten the clamp bolts to 27 N·m (20 ft. lbs.).

(2) Install the tie rod on the drag link and steering knuckle. Install the retaining nuts.

(3) Tighten the ball stud nut on the steering knuckle to 47 N·m (35 ft. lbs.). Tighten the ball stud nut to drag link to 74 N·m (55 ft. lbs.). Install new cotter pins.

REMOVAL AND INSTALLATION (Continued)

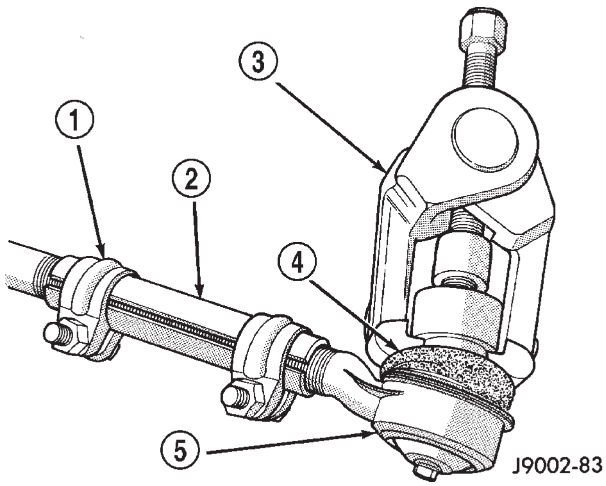


Fig. 3 Ball Stud Puller

1 – CLAMP
2 – ADJUSTMENT SLEEVE
3 – PULLER TOOL C-3894–A
4 – SEAL
5 – TIE-ROD END

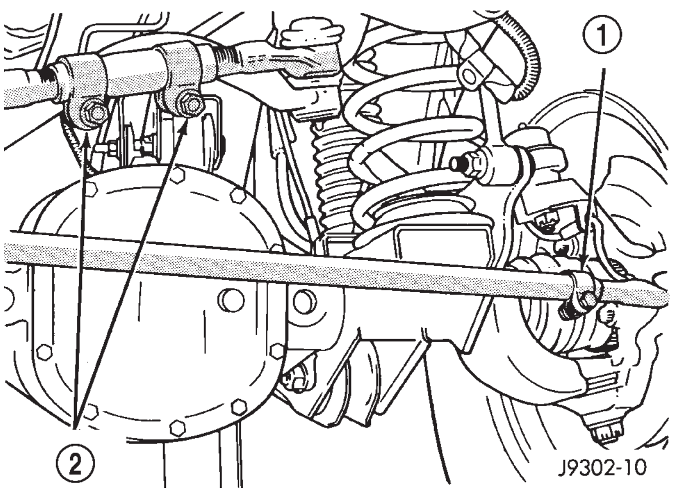


Fig. 4 Tie Rod/Drag Link Clamps

1 – TIE ROD CLAMP
2 – DRAG LINK CLAMPS

PITMAN ARM

REMOVAL

(1) Remove the cotter pin and nut from the drag link at the pitman arm.

(2) Remove the drag link ball stud from the pitman arm with a puller.

(3) Remove the nut and washer from the steering gear shaft. Mark the pitman shaft and pitman arm for installation reference. Remove the pitman arm from steering gear with Puller C-4150-A (Fig. 5).

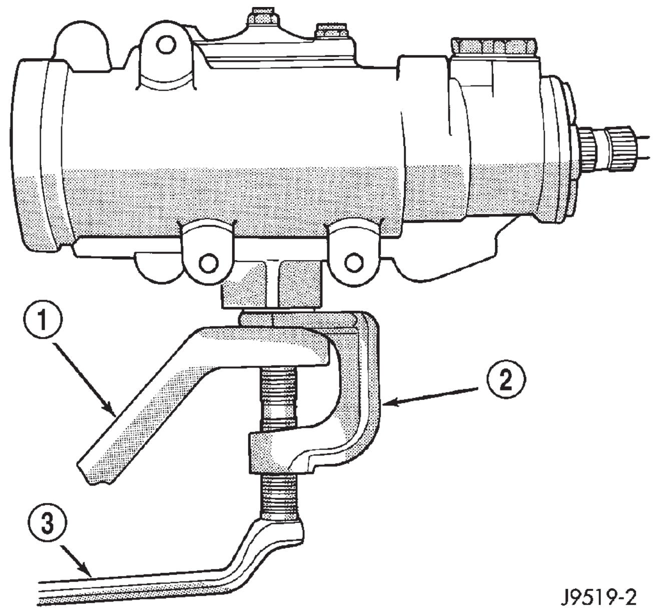


Fig. 5 Pitman Arm Puller

1 – PITMAN ARM
2 – SPECIAL TOOL C-4150-A
3 – WRENCH

INSTALLATION

(1) Align and install the pitman arm on steering gear shaft.

(2) Install the washer and nut on the shaft and tighten nut to 251 N·m (185 ft. lbs.).

(3) Install drag link ball stud to pitman arm install nut and tighten to 74 N·m (55 ft. lbs.). Install a new cotter pin.

DRAG LINK

REMOVAL

(1) Remove cotter pins and nuts from drag link

(2) Remove the steering damper ball stud from the drag link.

(3) Remove tie rod from drag link

(4) Remove drag link from the steering knuckle and pitman arm.

INSTALLATION

(1) Install the drag link onto steering knuckle and pitman arm.

(2) Install nut at steering knuckle and tighten to 47 N·m (35 ft. lbs.). Install new cotter pins.

(3) Install nut at pitman arm and tighten to 74 N·m (55 ft. lbs.). Install new cotter pins.

(4) Install tie rod onto drag link and install nut. Tighten nut to 74 N·m (55 ft. lbs.) and install new cotter pins.

REMOVAL AND INSTALLATION (Continued)

(5) Install steering damper onto drag link and install nut. Tighten nut to 74 N·m (55 ft. lbs.) and install a new cotter pin.

STEERING DAMPER

REMOVAL

(1) Remove the steering damper retaining bolt from the axle bracket.
(2) Remove the cotter pin and nut from the ball stud at the drag link.
(3) Remove the steering damper ball stud from the drag link with Puller C-3894-A.

INSTALLATION

(1) Install steering damper onto the axle bracket and drag link.
(2) Install steering damper bolt in axle bracket and tighten nut to 75 N·m (55 ft. lbs.).
(3) Install ball stud nut at the drag link and tighten nut to 75 N·m (55 ft. lbs.). Install a new cotter pin.

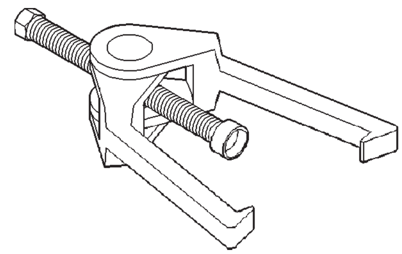
SPECIFICATIONS

TORQUE CHART

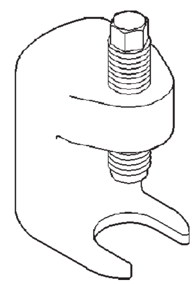
DESCRIPTION	TORQUE
Pitman Arm	
Shaft	251 N·m (185 ft. lbs.)
Drag Link	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	49 N·m (36 ft. lbs.)
Tie Rod Ends	
Ball Studs	74 N·m (55 ft. lbs.)
Clamp	27 N·m (20 ft. lbs.)
Tie Rod	
Ball Stud	47 N·m (35 ft. lbs.)
Steering Damper	
Frame	74 N·m (55 ft. lbs.)
Drag Link	74 N·m (55 ft. lbs.)

SPECIAL TOOLS

STEERING LINKAGE



Puller C-3894–A



Remover Pitman C-4150A

STEERING COLUMN

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

STEERING COLUMN

DESCRIPTION

The standard non-tilt and tilt steering column has been designed to be serviced as an assembly. The key cylinder, switches, clock spring, trim shrouds and steering wheel are serviced separately. On the non-tilt column the upper mounting bracket is also serviced separately.

The column is mounted to the column support bracket studs and secured by four nuts. The column is connected to the steering gear by a one piece collapsible shaft with a coupler at each end. The couplers secure the shaft to the steering column and steering gear.

SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

To service the steering wheel, switches or airbag, refer to Group 8M and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG 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.

REMOVAL AND INSTALLATION

STEERING COLUMN

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO GROUP 8M RESTRAINT SYSTEMS FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.

CAUTION: Keep clock spring from turning during removal and installation. Failure to do so may damage the clock spring.

REMOVAL

(1) Position front wheels **straight ahead.**

(2) Remove and isolate the negative battery ground cable.

(3) Remove the airbag, refer to Group 8M Restraint Systems for service procedures.

NOTE: If equipped with cruise control, disconnect clock spring harness from cruise switch harness on the steering wheel.

(4) Remove the steering wheel with an appropriate puller (Fig. 1).

CAUTION: Ensure the puller bolts are fully engaged into the steering wheel and not into the clockspring, before attempting to remove the wheel. Failure to do so may damage the steering wheel.

(5) Turn ignition cylinder to the on position and remove cylinder by pressing release through lower shroud access hole (Fig. 2).

REMOVAL AND INSTALLATION (Continued)

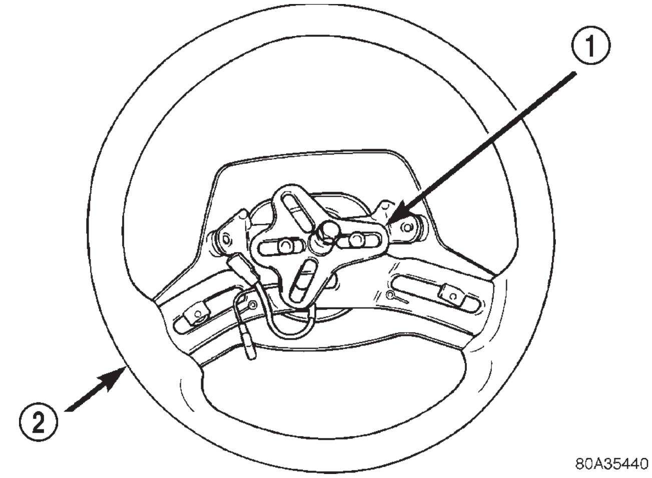


Fig. 1 Steering Wheel

1 – PULLER
2 – STEERING WHEEL

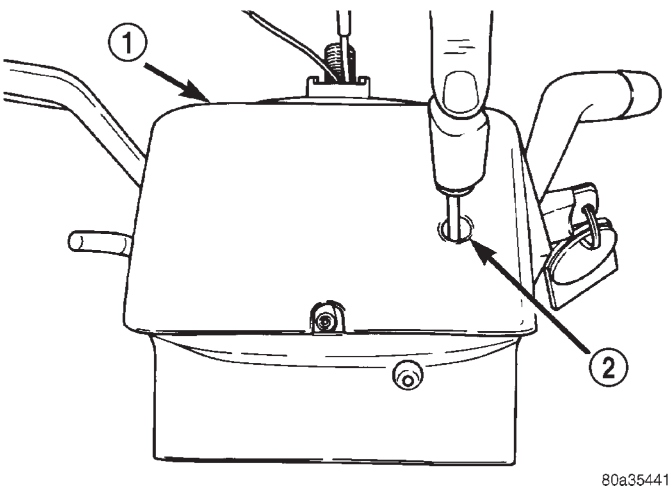


Fig. 2 Key Cylinder Release Access Hole

1 – LOWER SHROUD
2 – RELEASE ACCESS HOLE

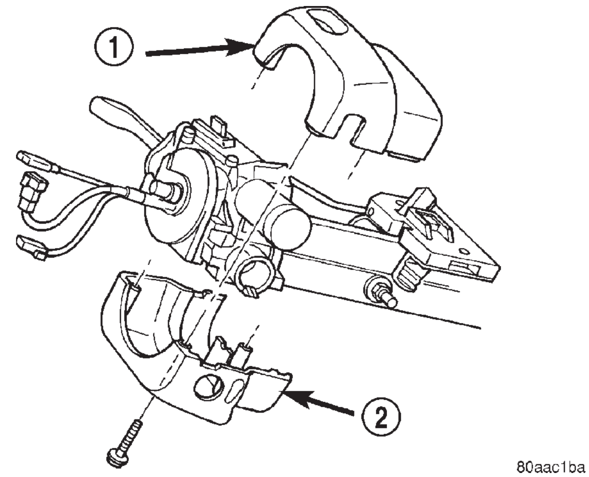


Fig. 3 Column Shrouds

1 – UPPER SHROUD
2 – LOWER SHROUD

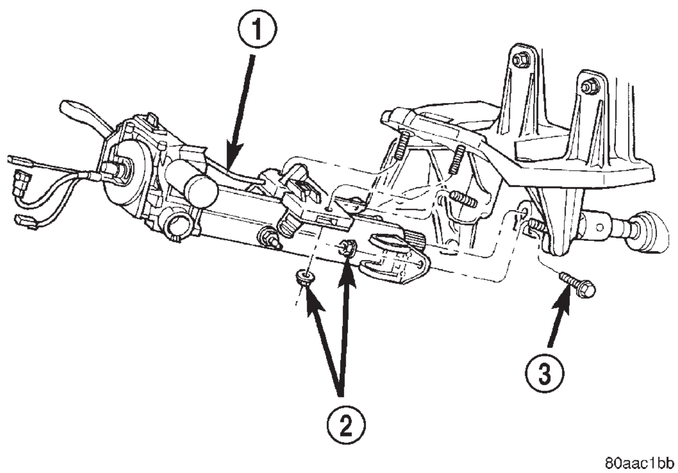


Fig. 4 Tilt Steering Column Mounting

1 – STEERING COLUMN
2 – MOUNTING NUTS
3 – COUPLER BOLT

(6) Remove knee blocker cover and knee blocker, Refer to Group 8E Instrument Panel Systems.

(7) Remove screws from the lower column shroud (Fig. 3) and remove lower shroud.

(8) Remove the steering coupler bolt and column mounting nuts (Fig. 4) then lower column off the mounting stud.

(9) Remove upper column shroud (Fig. 3).

(10) Disconnect and remove the wiring harness from the column (Fig. 5).

NOTE: If vehicle is equipped with automatic transmission, remove shifter interlock cable. Refer to Group 21 Transmission and Transfer Case for procedure.

(11) Remove column.

(12) Remove nut and bolt from the upper column mounting bracket on non-tilt column (Fig. 6). Remove the bracket from the column and **note the mounting location and orientation of the bracket.**.

(13) Remove clock spring, switches, (SKIM if equipped) and ignition key cylinder, refer to Group 8 Electrical for service procedures.

INSTALLATION

(1) Install upper column mounting bracket on non-tilt column. Install the mounting bolt and tighten the nut to 17 N·m (150 in. lbs.).

(2) Install switches, refer to Group 8 Electrical for service procedures.

REMOVAL AND INSTALLATION (Continued)

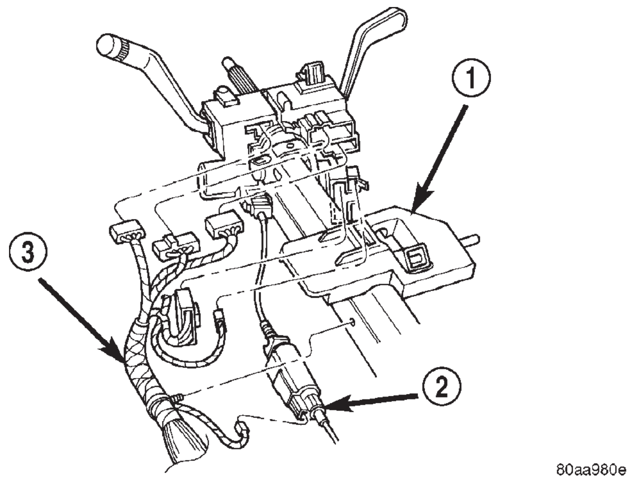


Fig. 5 Steering Column Harness

1 – STEERING COLUMN
2 – INTERLOCK CABLE
3 – COLUMN HARNESS

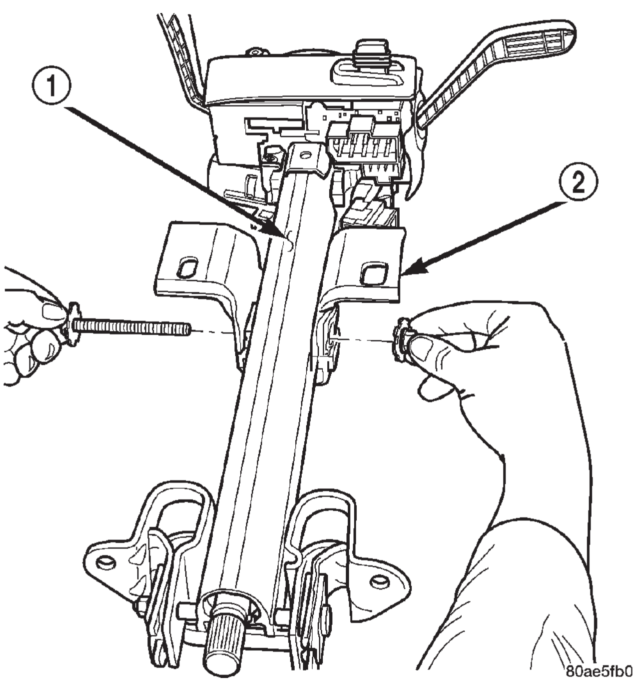


Fig. 6 Non-Tilt Column

1 – NON-TILT COLUMN
2 – UPPER BRACKET

(3) Align and install column into the steering coupler.

(4) Install column harness and connect harness to switches.

NOTE: If vehicle is equipped with automatic transmission install shifter interlock cable. Refer to Group 21 Transmission and Transfer Case for installation and adjustment.

(5) Install upper column shrouds.
(6) Install column onto the mounting studs.
(7) Install mounting nuts and tighten to 23 N·m (17 ft. lbs.).
(8) Install steering column coupler bolt and tighten to 49 N·m (36 ft. lbs.).
(9) Center the clock spring (if necessary) and install it on the column, refer to Group 8 Electrical for service procedures.
(10) Install lower column shroud and install mounting screws.
(11) Install ignition cylinder.
(12) Install knee blocker and knee blocker cover, Refer to Group 8E Instrument Panel Systems.
(13) Install steering wheel and tighten nut to 54 N·m (40 ft. lbs.).

NOTE: If equipped with cruise control, connect clock spring harness to cruise switch harness on the steering wheel.

(14) Install airbag, refer to Group 8M Restraint Systems for service procedures.
(15) Install negative battery terminal.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Tilt Steering Column	
Steering Wheel Nut	54 N·m (40 ft. lbs.)
Mounting Nuts	23 N·m (17 ft. lbs.)
Coupler Bolt	49 N·m (36 ft. lbs.)
Non-Tilt Steering Column	
Steering Wheel Nut	54 N·m (40 ft. lbs.)
Mounting Nuts	23 N·m (17 ft. lbs.)
Coupler Bolt	49 N·m (36 ft. lbs.)
Upper Bracket Nut	17 N·m (150 in. lbs.)

TRANSMISSION AND TRANSFER CASE

TABLE OF CONTENTS

AX5 MANUAL TRANSMISSION

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

AX5 MANUAL TRANSMISSION

DESCRIPTION

The AX5 is a five speed manual transmission with fifth gear being the overdrive range. An adapter housing is used to attach the transmission to the transfer case on 4-wheel drive applications. A standard style extension housing is used for the 2-wheel drive applications. The shift mechanism is integral to the transmission assembly and mounted in the shift tower portion of the adapter/extension housing (Fig. 1).

GEAR RATIOS

Gear ratios for the AX5 manual transmission are as follows:
- First gear: 3.93:1
- Second gear: 2.33:1
- Third gear: 1.45:1
- Fourth gear: 1.00:1
- Fifth gear: 0.85:1
- Reverse gear: 4.74:1

TRANSMISSION IDENTIFICATION

The AX5 identification code is on the bottom surface of the transmission case near the fill plug (Fig. 2). The first number is year of manufacture. The second and third numbers indicate month of manufacture. The next series of numbers is the transmission serial number.

OPERATION

The manual transmission receives power through the clutch assembly from the engine. The clutch disc is splined to the transmission input shaft and is turned at engine speed at all times that the clutch is

DESCRIPTION AND OPERATION (Continued)

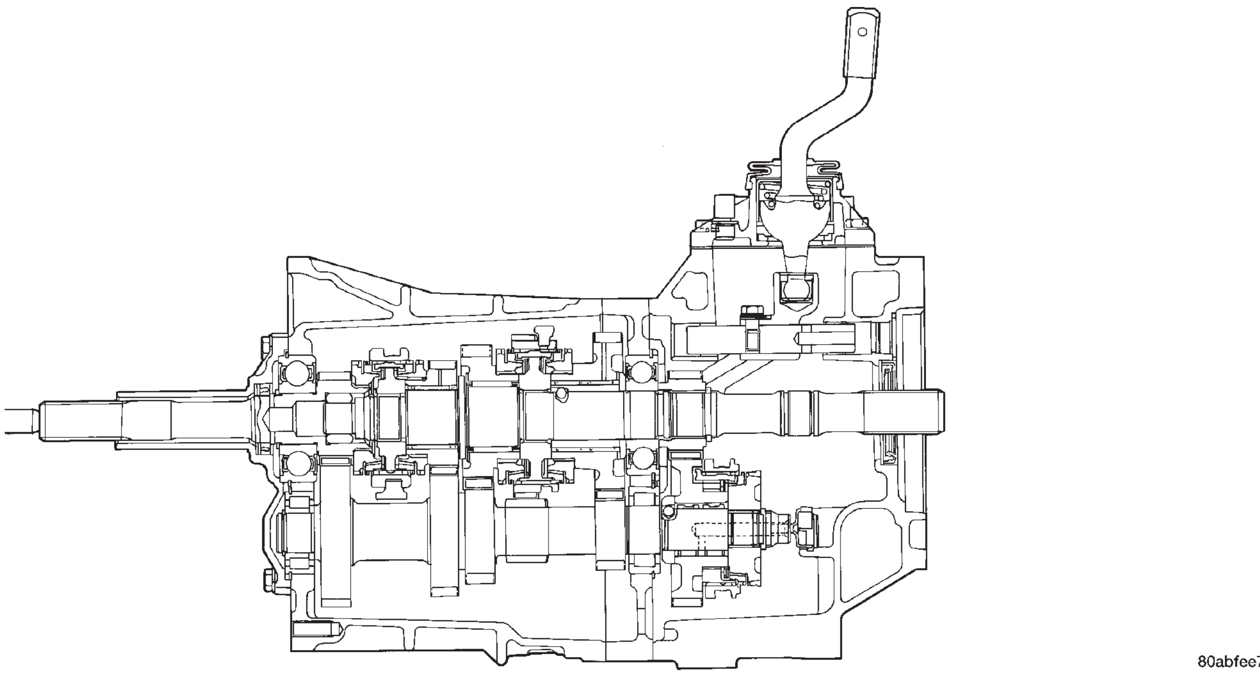


Fig. 1 AX5 Manual Transmission

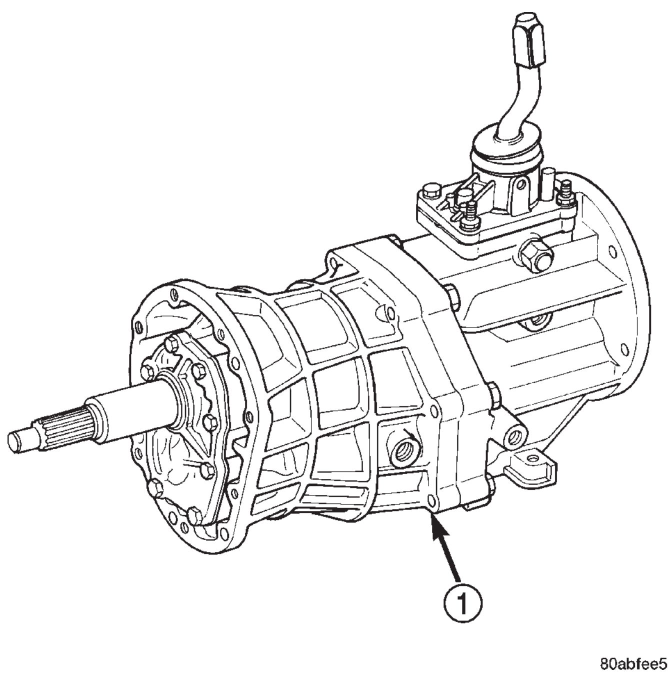


Fig. 2 Transmission Identification

1 – I. D. CODE ON CASE NEAR DRAIN PLUG

engaged. The input shaft is connected to the transmission countershaft through the mesh of fourth speed gear on the input shaft and the fourth countershaft gear. At this point, all the transmission gears are spinning.

The driver selects a particular gear by moving the shift lever to the desired gear position. This movement moves the internal transmission shift components to begin the shift sequence. As the shift lever moves the selected shift rail, the shift fork attached to that rail begins to move. The fork is positioned in a groove in the outer circumference of the synchronizer sleeve. As the shift fork moves the synchronizer sleeve, the synchronizer begins to speed-up or slow down the selected gear (depending on whether we are up-shifting or down-shifting). The synchronizer does this by having the synchronizer hub splined to the mainshaft, or the countershaft in some cases, and moving the blocker ring into contact with the gear's friction cone. As the blocker ring and friction cone come together, the gear speed is brought up or down to the speed of the synchronizer. As the two speeds match, the splines on the inside of the synchronizer sleeve become aligned with the teeth on the blocker ring and the friction cone and eventually will slide over the teeth, locking the gear to the mainshaft, or countershaft, through the synchronizer.

LUBRICANT

DESCRIPTION

Recommended lubricant for AX5 transmissions is Mopar® 75W–90, API Grade GL–3 gear lubricant, or equivalent.

Correct lubricant level is from the bottom edge, to no more than 6 mm (1/4 in.) below the bottom edge of the fill plug hole.

The fill plug is on the passenger side of the adapter housing (Fig. 3). The drain plug is on the bottom of the case.

DESCRIPTION AND OPERATION (Continued)

Approximate dry fill lubricant capacity is:

- 3.3 liters (3.49 quarts) for 4–wheel drive applications.
- 3.5 liters (3.70 quarts) for 2–wheel drive applications.

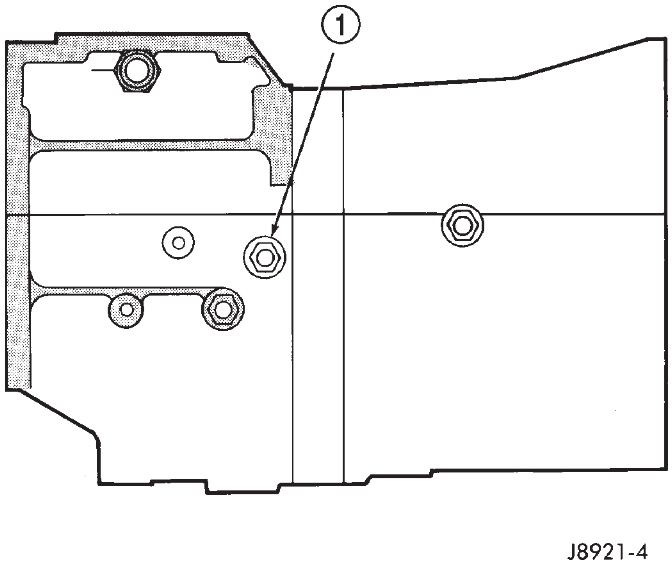


Fig. 3 Fill Plug Location

1 – FILL PLUG LOCATION

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing the disc to slip, grab, and/or chatter.

A correct lubricant level check can only be made when the vehicle is level. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an underfill or overfill condition. Always check the lubricant level after any addition of fluid to avoid an incorrect lubricant level condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper, or contaminated lubricants. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. If a leak goes undetected for an extended period, the first indications of component damage are usually hard shifting and noise.

Component damage, incorrect clutch adjustment, or a damaged clutch pressure plate or disc are additional probable causes of increased shift effort. Incorrect adjustment or a worn/damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear–in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper, or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL AND INSTALLATION

TRANSMISSION

REMOVAL

(1) Shift transmission into first or third gear.

(2) Raise and support vehicle on suitable safety stands.

(3) Support engine with adjustable jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(4) Remove crossmember/skid plate.

(5) Disconnect necessary exhaust system components.

(6) Remove skid plate, if equipped.

(7) Remove slave cylinder (Fig. 4) from clutch housing.

(8) Mark rear propeller shaft and rear axle yokes for installation alignment (Fig. 5).

REMOVAL AND INSTALLATION (Continued)

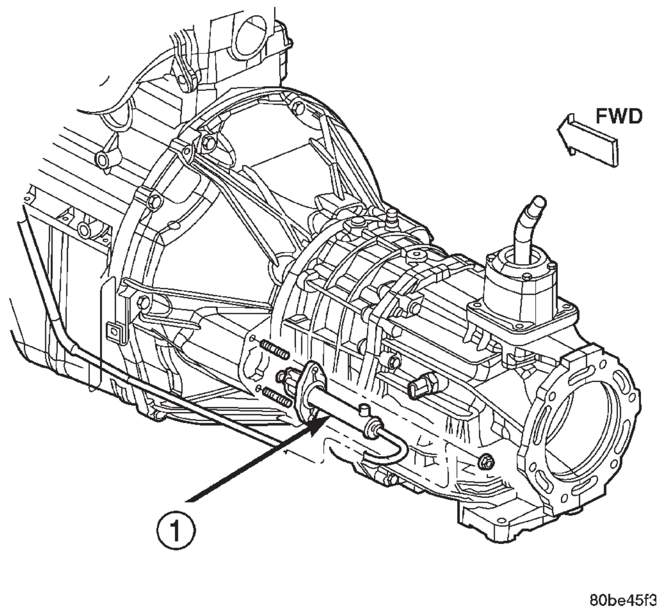


Fig. 4 Slave Cylinder—Typical

1 – CLUTCH SLAVE CYLINDER

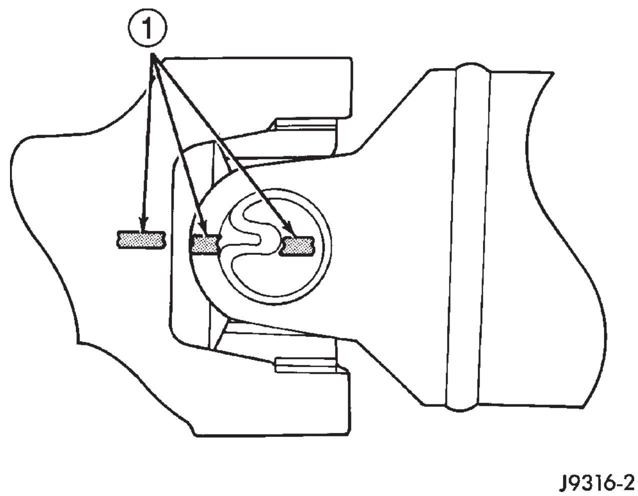


Fig. 5 Marking Propeller Shaft And Axle Yokes

1 – REFERENCE MARKS

(9) Mark front propeller shaft, axle, and transfer case yokes for installation alignment, if equipped.

(10) Remove propeller shaft(s).

(11) Unclip wire harnesses from transmission and transfer case, if equipped.

(12) Disconnect transfer case vent hose, if equipped.

(13) Disengage any wire connectors attached to transmission or transfer case, if equipped, components.

(14) Support transfer case, if equipped, with transmission jack.

(15) Secure transfer case, if equipped, to jack with safety chains.

(16) Disconnect transfer case shift linkage at transfer case, if equipped.

(17) Remove nuts attaching transfer case to transmission, if equipped.

(18) Remove transfer case, if equipped.

(19) Remove crankshaft position sensor (Fig. 6).

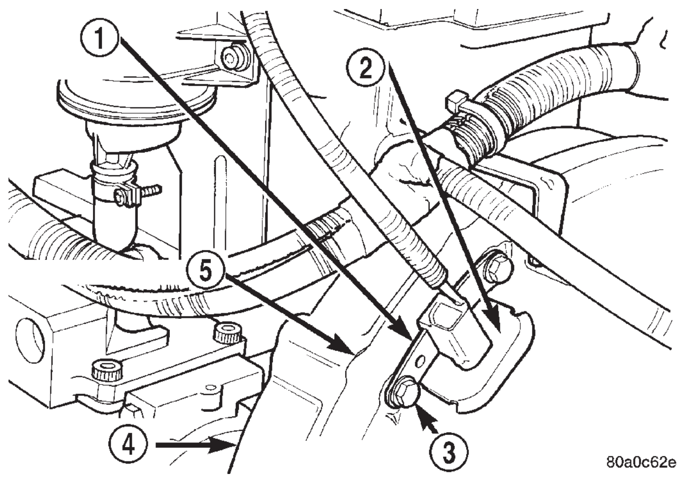


Fig. 6 Crankshaft Position Sensor —2.5 and 4.0L Engine

1 – ENGINE SPEED SENSOR
2 – GROMMET
3 – MOUNTING BOLT(S)
4 – LEFT REAR OF ENGINE
5 – TRANSMISSION

CAUTION: It is important that the crankshaft position sensor be removed prior to transmission removal. The sensor can easily be damaged if left in place during removal operations.

(20) Support engine with adjustable jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(21) Support transmission with transmission jack.

(22) Secure transmission to jack with safety chains.

(23) Disconnect rear cushion and bracket from transmission.

(24) Remove rear crossmember.

(25) Disconnect transmission shift lever as follows:

(a) Lower transmission approximately 7–8 cm (3 in.) for access to shift lever.

(b) Reach up and around transmission case and unseat shift lever dust boot from transmission shift tower (Fig. 7). Move boot upward on shift lever for access to retainer that secures lever in shift tower.

(c) Reach up and around transmission case and press shift lever retainer downward with finger pressure. Turn retainer counterclockwise to release it.

(d) Lift lever and retainer out of shift tower (Fig. 7). Do not remove the shift lever from the floor con-

REMOVAL AND INSTALLATION (Continued)

sole shifter boots. Leave the lever in place for transmission installation.

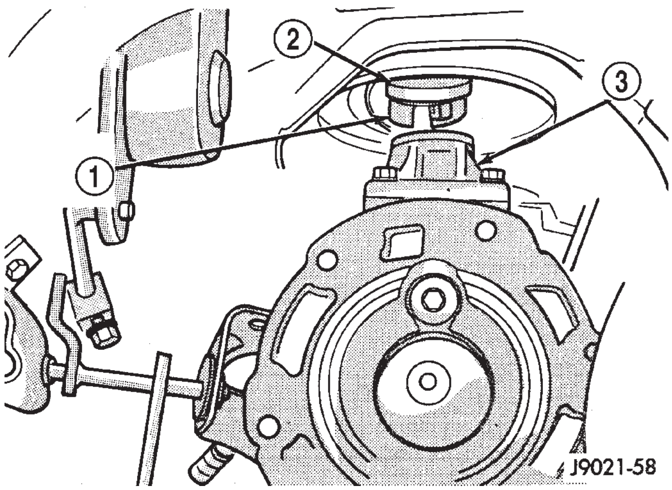


Fig. 7 Removing/Installing Shift Lever

1 – SHIFT LEVER RETAINER
2 – DUST BOOT
3 – SHIFT TOWER

(26) Remove clutch housing brace rod.

(27) Remove clutch housing-to-engine bolts.

(28) Pull transmission jack rearward until input shaft clears clutch. Then slide transmission out from under vehicle.

(29) Remove clutch release bearing, release fork, and retainer clip.

(30) Remove clutch housing from transmission (Fig. 8).

INSTALLATION

(1) Install clutch housing (Fig. 8) on transmission. Tighten housing bolts to 46 N·m (34 ft. lbs.) torque.

(2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease.

(3) Install release bearing, fork, and retainer clip.

(4) Position and secure transmission on transmission jack.

(5) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar® high temp grease.

(6) Raise transmission and align transmission input shaft and clutch disc splines. Then slide transmission into place.

(7) Install and tighten clutch housing-to-engine bolts to the appropriate torque: **Be sure the housing is properly seated on engine block before tightening bolts.**

• Tighten 3/8” diameter bolts to 37 N·m (27 ft.lbs.).

• Tighten 7/16” diameter bolts to 58 N·m (43 ft.lbs.).

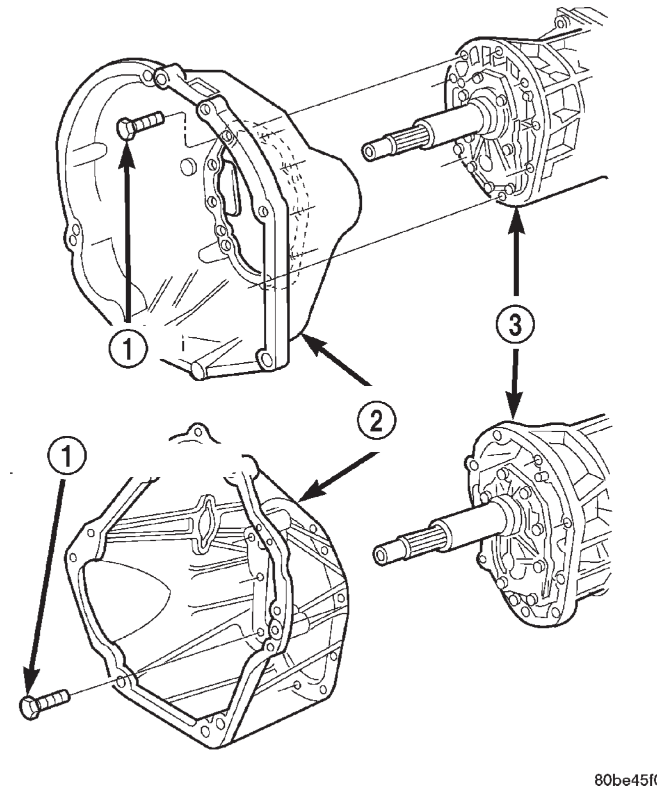


Fig. 8 Clutch Housing

1 – HOUSING-TO-TRANSMISSION BOLTS (46 N·m/34 ft. lbs.)
2 – CLUTCH HOUSING
3 – TRANSMISSION

• Tighten M12 bolts to 75 N·m (55 ft.lbs.).

(8) Install clutch housing brace rod.

(9) Lower transmission approximately 7–8 cm (3 in.) for access to shift tower. Be sure transmission is in first or third gear.

(10) Reach up and around transmission and insert shift lever in shift tower. Press lever retainer downward and turn it clockwise to lock it in place. Then install lever dust boot on shift tower.

(11) Install rear crossmember. Tighten crossmember-to-frame bolts to 41 N·m (31 ft. lbs.) torque.

(12) Install fasteners to hold rear cushion and bracket to transmission. Then tighten transmission-to-rear support bolts/nuts to 54 N·m (40 ft. lbs.) torque.

(13) Remove support stands from engine and transmission.

(14) Install and connect crankshaft position sensor.

(15) Position transfer case on transmission jack, if equipped.

(16) Secure transfer case to jack with safety chains, if equipped.

(17) Raise transfer case, if equipped, and align transfer case input shaft to the transmission output shaft.

REMOVAL AND INSTALLATION (Continued)

(18) Slide transfer case forward until case is seated on transmission, if necessary.

(19) Install nuts to attach transfer case to transmission, if equipped. Tighten transfer case-to-transmission nuts to 35 N·m (26 ft. lbs.) torque.

(20) Connect transfer case shift linkage at transfer case, if equipped.

(21) Connect transfer case vent hose, if equipped.

(22) Secure wire harnesses in clips/tie straps on transmission and transfer case, if equipped.

(23) Engage wire connectors attached to all necessary transmission or transfer case, if equipped, components.

(24) Install rear propeller shaft slip yoke to transmission or transfer case, if equipped, output shaft.

(25) Align marks on rear propeller shaft and rear axle yokes (Fig. 9).

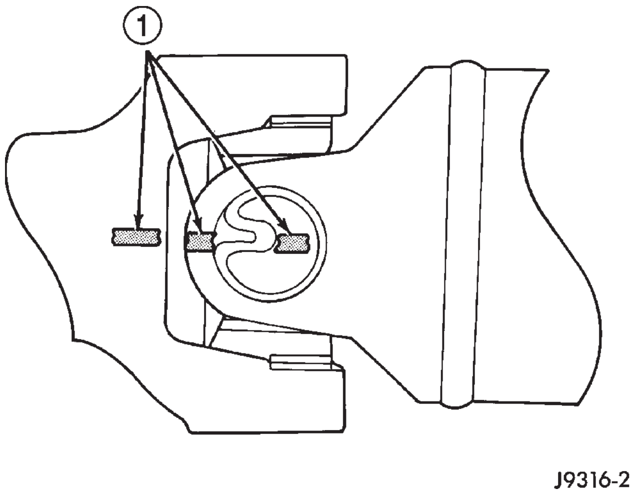


Fig. 9 Align Propeller Shaft And Rear Axle Yokes Alignment Marks

1 – REFERENCE MARKS

(26) Install and tighten propeller shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(27) Align marks on front propeller shaft, axle, and transfer case yokes, if equipped.

(28) Install and tighten propeller shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(29) Install slave cylinder in clutch housing.

(30) Install skid plate, if equipped. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(31) Fill transmission and transfer case, if equipped, with recommended lubricants. Refer to the Lubricant Recommendation sections of the appropriate component for correct fluid.

(32) Lower vehicle.

FRONT BEARING RETAINER SEAL

REMOVAL

(1) Remove release bearing and lever from the transmission.

(2) Remove the bolts holding the front bearing retainer to the transmission case.

(3) Remove the front bearing retainer from the transmission case.

(4) Using a suitable pry tool, remove the front bearing retainer seal.

INSTALLATION

(1) Using Tool Handle C-4171 and Seal Installer 8211, install new seal in to the front bearing retainer (Fig. 10).

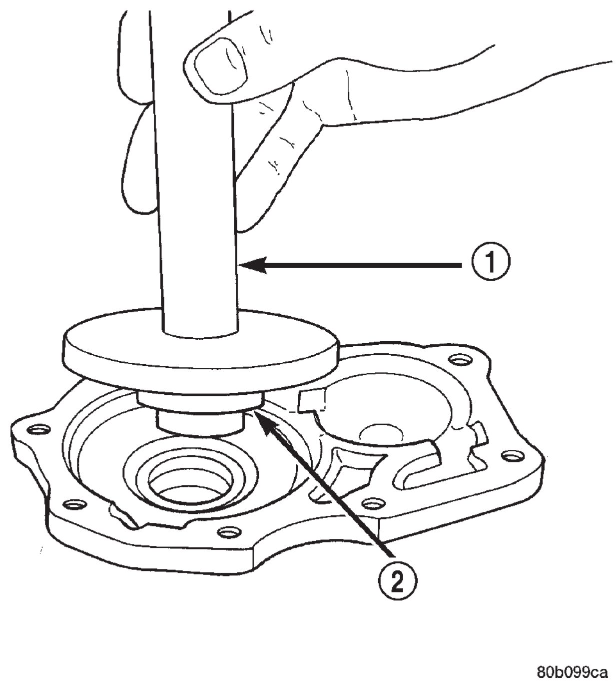


Fig. 10 Install Front Bearing Retainer Seal

1 – SPECIAL TOOL C-4171

2 – SPECIAL TOOL 8211 (AX5) OR 8209 (AX15)

(2) Remove any residual gasket material from the sealing surfaces of the bearing retainer and the transmission case.

(3) Install new front bearing retainer gasket to the front bearing retainer.

(4) Install the front bearing retainer onto the transmission case.

(5) Install the bolts to hold the bearing retainer onto the transmission case.

(6) Tighten the bolts to 17 N·m (12 ft. lbs.).

(7) Install release bearing and lever onto the transmission.

REMOVAL AND INSTALLATION (Continued)

EXTENSION HOUSING SEAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedures.

(3) Using a suitable seal puller or screw with a slide hammer, remove the extension housing seal (Fig. 11).

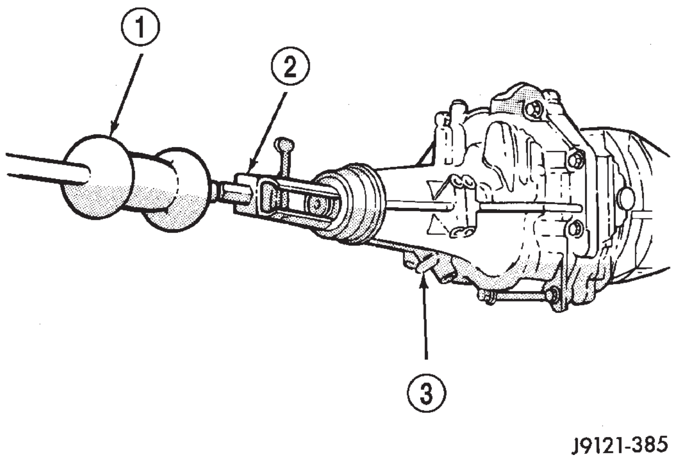


Fig. 11 Remove Extension Housing Seal

1 – SLIDE HAMMER
2 – SEAL PULLER
3 – 2WD EXTENSION HOUSING

INSTALLATION

(1) Clean seal bore of extension housing of any residual sealer material from original seal.

(2) Using Tool Handle C-4171 and Seal Installer 8212, install new extension housing seal so that the seal is located 0 ± 0.5 mm (0 ± 0.02 in.) to the face of the extension housing (Fig. 12).

(3) Install propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedures.

(4) Check and add fluid to transmission as necessary. Refer to the Recommended Lubricant section for proper fluid requirements.

(5) Lower vehicle.

ADAPTER HOUSING SEAL

REMOVAL

(1) Hoist and support vehicle.

(2) Remove transfer case.

(3) Using a suitable pry tool, or a slide hammer mounted screw, remove the adapter housing seal (Fig. 13).

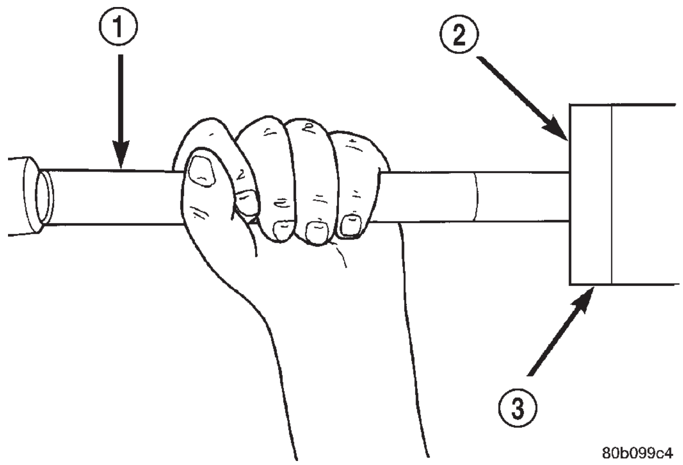


Fig. 12 Install Extension Housing Seal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 8212
3 – EXTENSION HOUSING

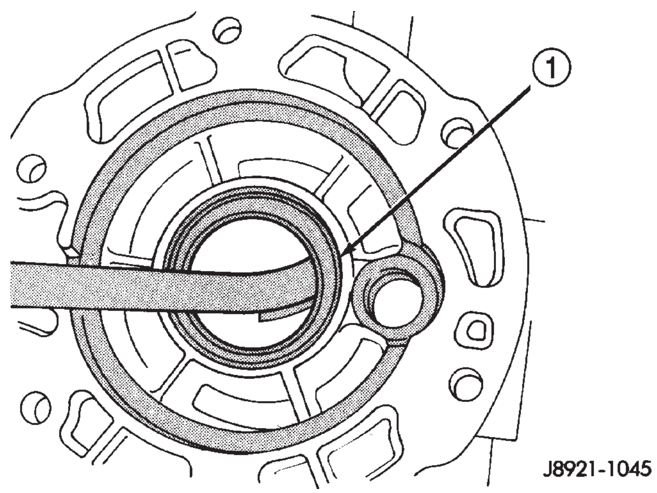


Fig. 13 Remove Adapter Housing Seal

1 – ADAPTER HOUSING OIL SEAL

INSTALLATION

(1) Clean seal bore of adapter housing of any residual sealer material from original seal.

(2) Using Tool Handle C-4171 and Seal Installer 8208, install new seal so that the seal is located 0 ± 0.2 mm (0 ± 0.008 in.) to the seal bore face of adapter housing (Fig. 14).

(3) Install transfer case.

(4) Check and add fluid to transmission as necessary. Refer to the Recommended Lubricant section for proper fluid requirements.

(5) Lower vehicle.

REMOVAL AND INSTALLATION (Continued)

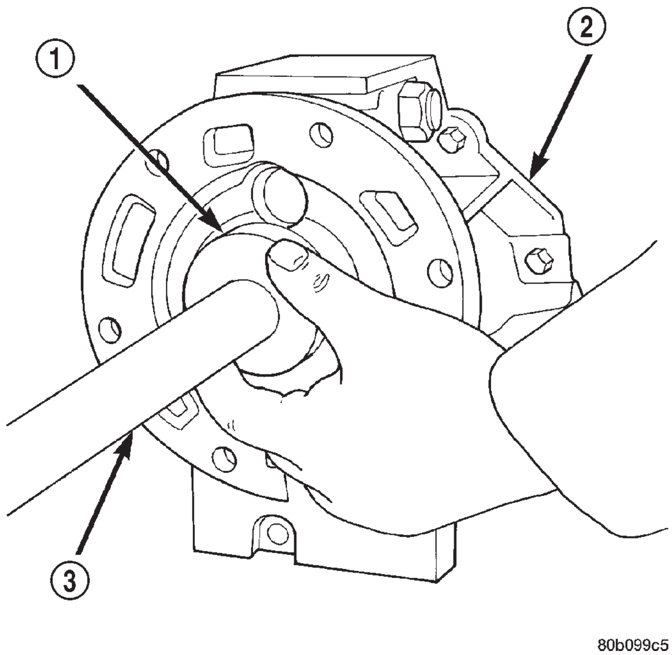


Fig. 14 Install Adapter Housing Seal

1 – SPECIAL TOOL 8208
2 – ADAPTER HOUSING
3 – SPECIAL TOOL C-4171

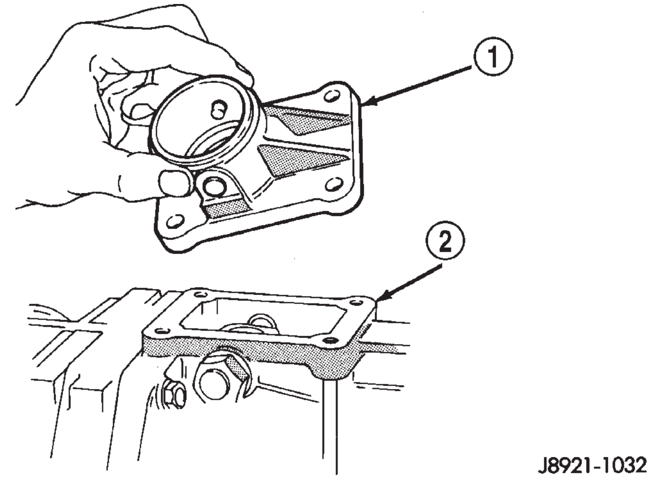


Fig. 15 Remove Shift Tower

1 – SHIFT TOWER
2 – ADAPTER/EXTENSION HOUSING

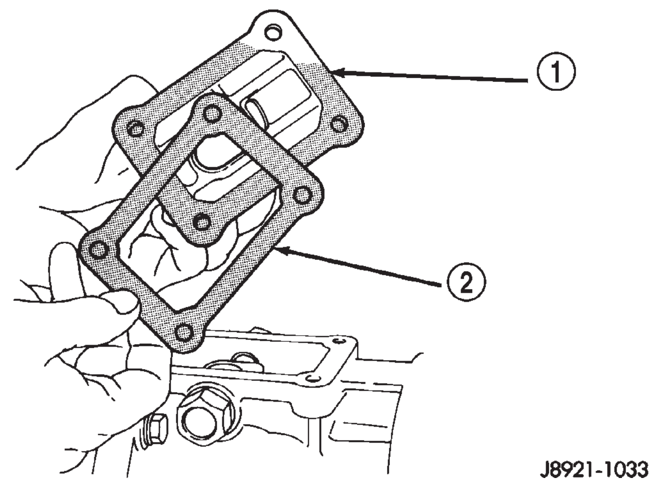


Fig. 16 Remove Shift Tower Gasket

1 – SHIFT TOWER
2 – GASKET

DISASSEMBLY AND ASSEMBLY

ADAPTER/EXTENSION HOUSING AND FRONT BEARING RETAINER

DISASSEMBLY

(1) Drain transmission lubricant, if necessary.

(2) Remove release bearing and lever.

(3) Remove clutch housing bolts and remove housing (Fig. 17).

(4) Remove vehicle speed sensor and speedometer adapter, if necessary.

(5) Remove bolts holding shift tower to transmission case.

(6) Remove shift tower from transmission case (Fig. 15).

(7) Remove shift tower gasket from shift tower or transmission case (Fig. 16).

(8) Remove detent ball plug (Fig. 18).

(9) Remove detent spring and ball with pencil magnet (Fig. 19), (Fig. 20).

DISASSEMBLY AND ASSEMBLY (Continued)

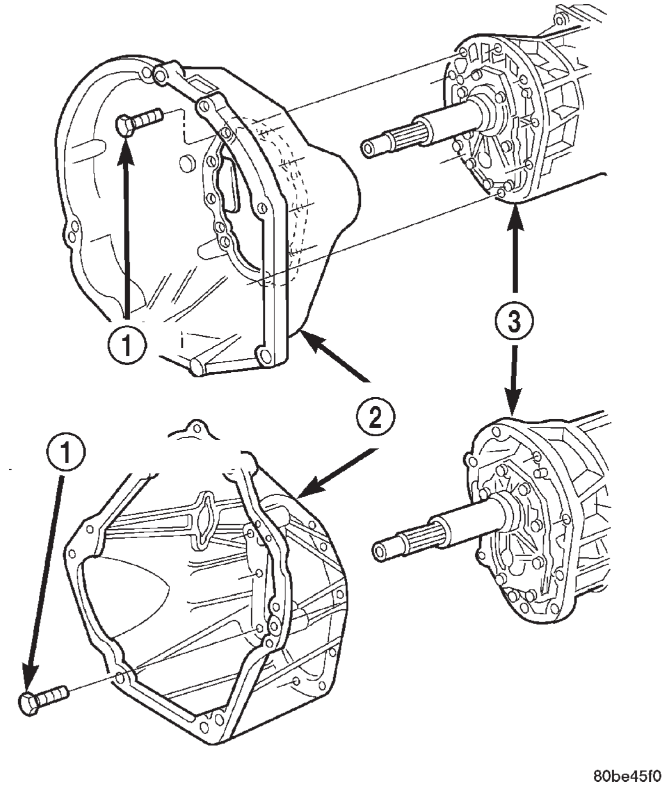


Fig. 17 Clutch Housing

1 – HOUSING-TO-TRANSMISSION BOLTS (46 N·m/34 ft. lbs.)
2 – CLUTCH HOUSING
3 – TRANSMISSION

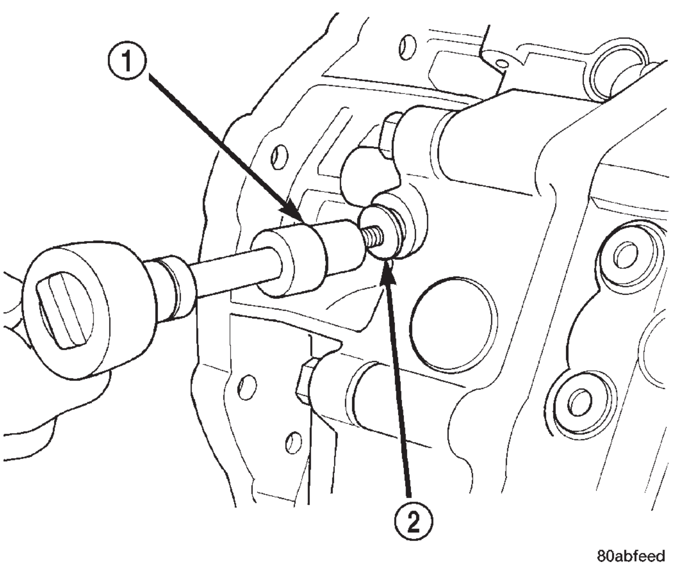


Fig. 18 Remove Detent Ball Plug

1 – TORX BIT
2 – DETENT BALL PLUG

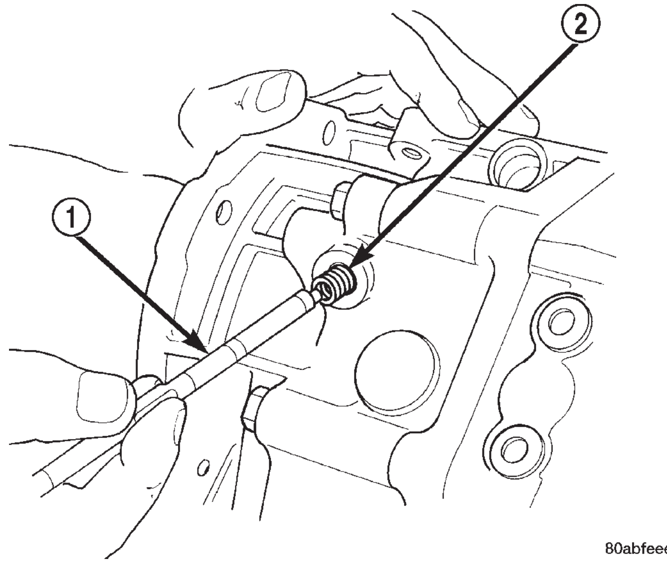


Fig. 19 Remove Detent Spring

1 – PENCIL MAGNET
2 – DETENT BALL SPRING

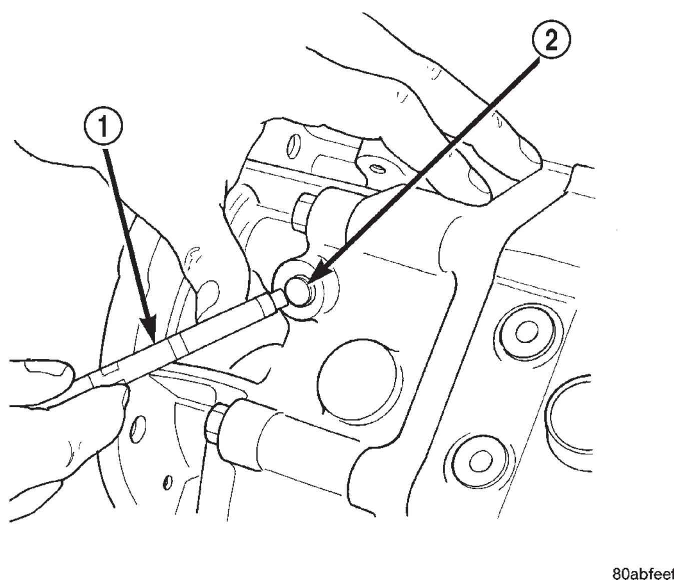


Fig. 20 Remove Detent Ball

1 – PENCIL MAGNET
2 – SHIFT DETENT BALL

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Remove shift arm retainer bolt (Fig. 21).
(11) Remove shift arm restrictor pins (Fig. 22).

NOTE: The restrictor pins are not interchangeable and are color coded. Note which color restrictor pin is removed from each side of the transmission and be sure to install it into the same location.

(12) Remove shift lever shaft plug (Fig. 23).
(13) Remove shifter shaft with large magnet (Fig. 24).
(14) Remove the shift arm from the adapter housing.

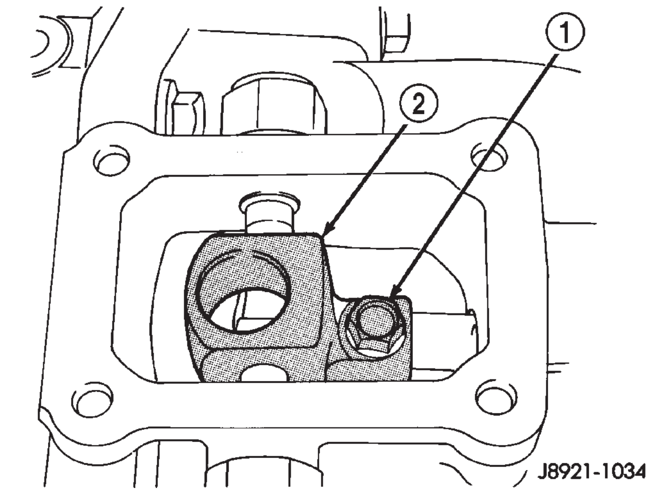


Fig. 21 Shift Arm Retainer Bolt Removal

1 – RETAINER BOLT
2 – SHIFT ARM

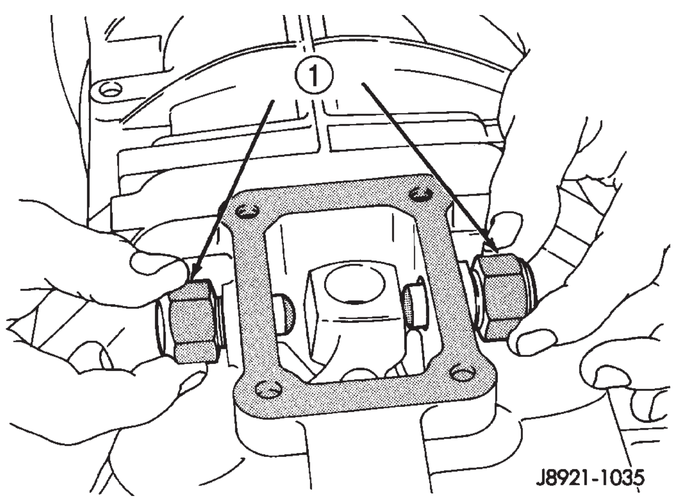


Fig. 22 Shift Arm Restrictor Pins

1 – RESTRICTOR PINS

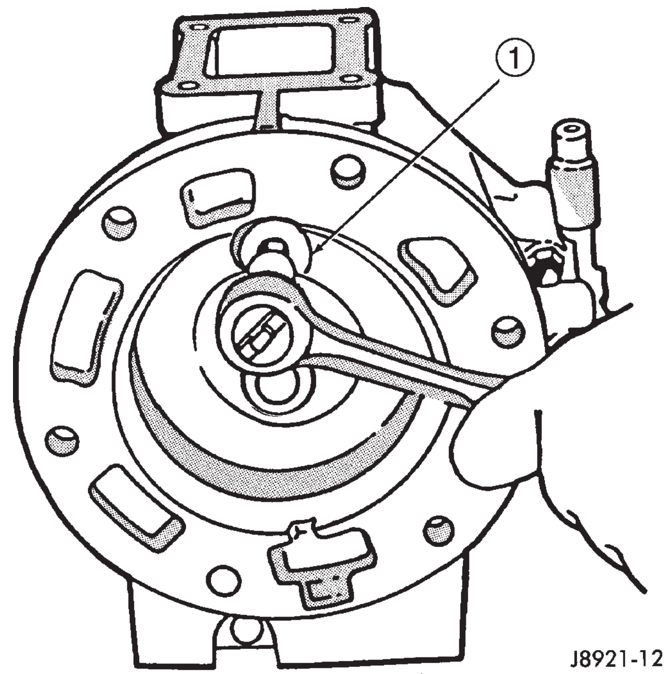


Fig. 23 Removing Shift Lever Shaft Plug

1 – SHIFT LEVER SHAFT PLUG

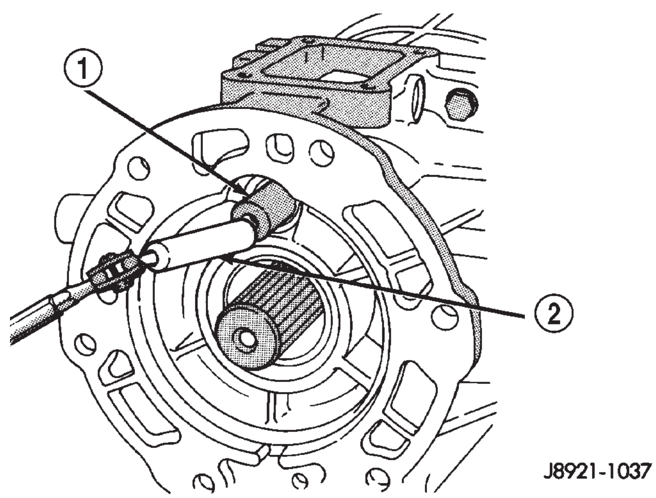


Fig. 24 Remove Shifter Shaft

1 – SHIFT ARM SHAFT
2 – LARGE MAGNET

(15) Remove adapter/extension housing bolts.
(16) Loosen adapter/extension housing by tapping it loose with plastic mallet (Fig. 25).

DISASSEMBLY AND ASSEMBLY (Continued)

(17) Remove adapter/extension housing (Fig. 26).

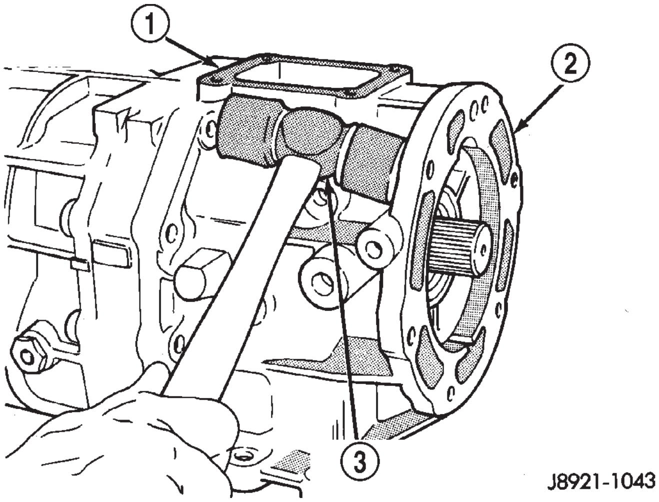


Fig. 25 Loosen Adapter/Extension Housing

1 – INTERMEDIATE PLATE
2 – ADAPTER HOUSING
3 – RUBBER FACED MALLET

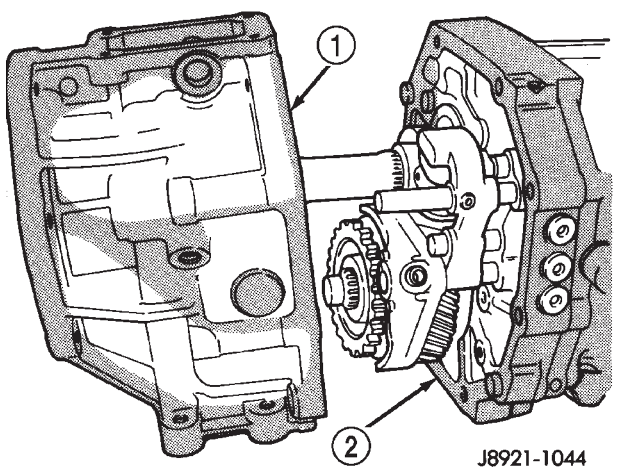


Fig. 26 Remove Adapter/Extension Housing–Typical

1 – ADAPTER HOUSING
2 – INTERMEDIATE PLATE

(18) On 4x2 transmissions;

(a) Remove speedometer gear retaining snap-ring from output shaft.

(b) Remove speedometer gear from output shaft and remove speedometer gear lock ball from output shaft.

(c) Remove speedometer drive gear locating snap-ring (Fig. 27).

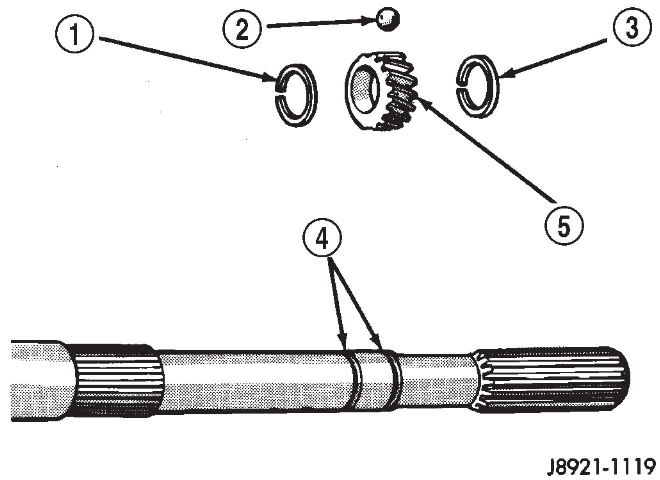


Fig. 27 Speedometer Drive Gear Assembly

1 – SNAP RING
2 – LOCK BALL
3 – SNAP RING
4 – OUTPUT SHAFT GROOVES
5 – SPEEDOMETER GEAR

(19) Remove the bolts holding the front bearing retainer to the transmission case.

(20) Remove the bearing retainer from transmission case (Fig. 28).

(21) Remove input shaft bearing snap-ring (Fig. 29).

(22) Remove countershaft front bearing snap-ring.

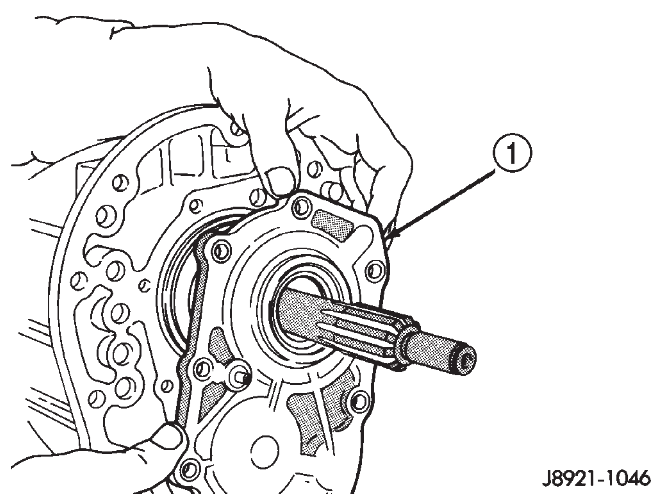


Fig. 28 Remove Front Bearing Retainer

1 – FRONT BEARING RETAINER

DISASSEMBLY AND ASSEMBLY (Continued)

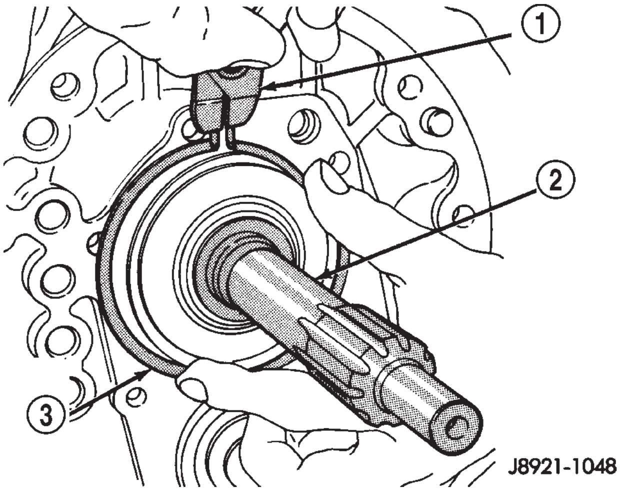


Fig. 29 Remove Input Shaft Bearing Snap-ring

1 – SNAP RING PLIERS
2 – INPUT SHAFT
3 – INPUT SHAFT BEARING SNAP RING

(23) Separate intermediate plate and transmission case by tapping them loose with plastic mallet (Fig. 30).

(24) Separate the intermediate plate from the transmission case (Fig. 31).

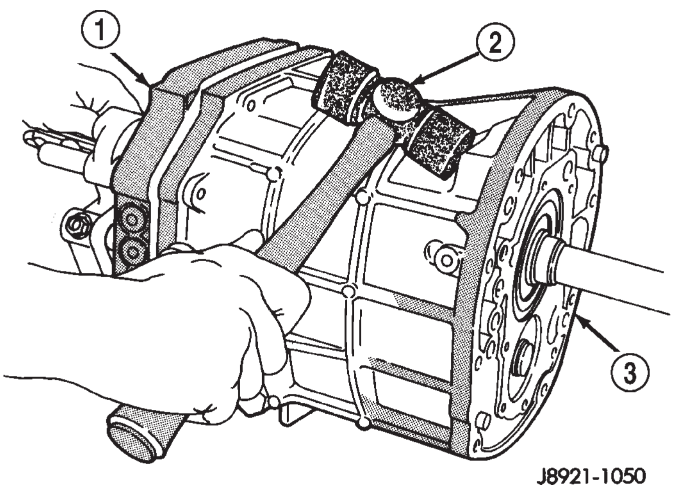


Fig. 30 Separate Intermediate Plate and Transmission Case

1 – INTERMEDIATE PLATE
2 – RUBBER MALLET
3 – GEAR CASE

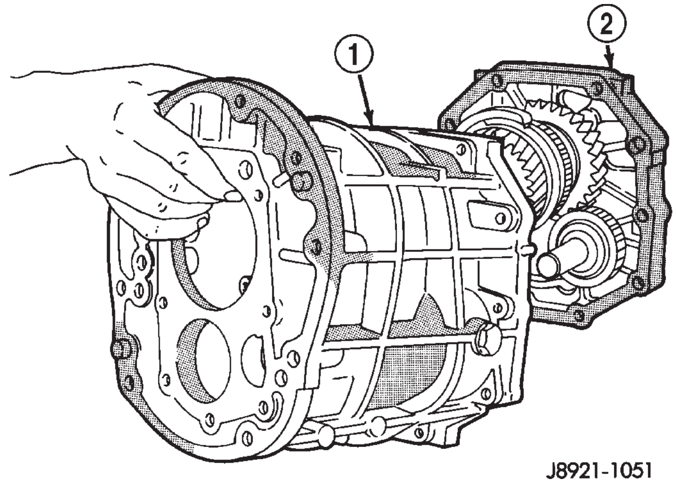


Fig. 31 Remove Intermediate Plate from Transmission Case

1 – GEAR CASE
2 – INTERMEDIATE PLATE

ASSEMBLY

(1) Remove any residual sealer from transmission case, intermediate plate, and adapter/extension housing.

(2) Apply a 1/8 to 3/16 inch wide bead of Threebond® Liquid Gasket TB1281, P/N 83504038, as shown, making sure to keep sealer bead to inside of bolt holes (Fig. 32).

(3) Align geartrain and shift rails with mating holes in transmission case and install transmission case to the intermediate plate (Fig. 33). Verify that the transmission case is seated on the intermediate plate locating pins.

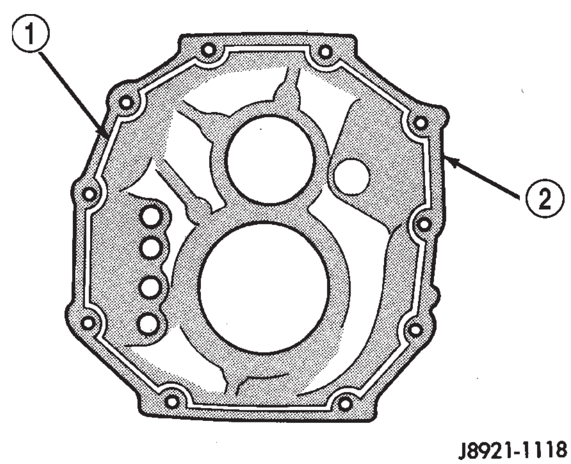


Fig. 32 Apply Sealer to Transmission Gear Case

1 – SEALER BEAD (1/8” - 3/16” WIDE)
2 – GEAR CASE

DISASSEMBLY AND ASSEMBLY (Continued)

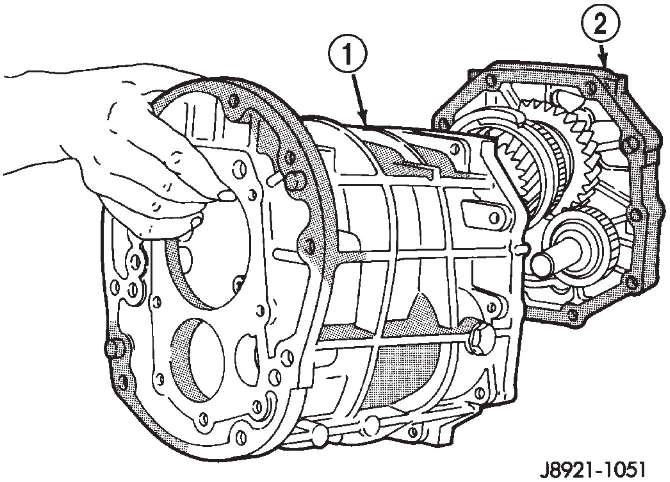


Fig. 33 Install Transmission Gear Case to the Intermediate Plate

1 – GEAR CASE
2 – INTERMEDIATE PLATE

(4) Install new front bearing snap rings (Fig. 34).

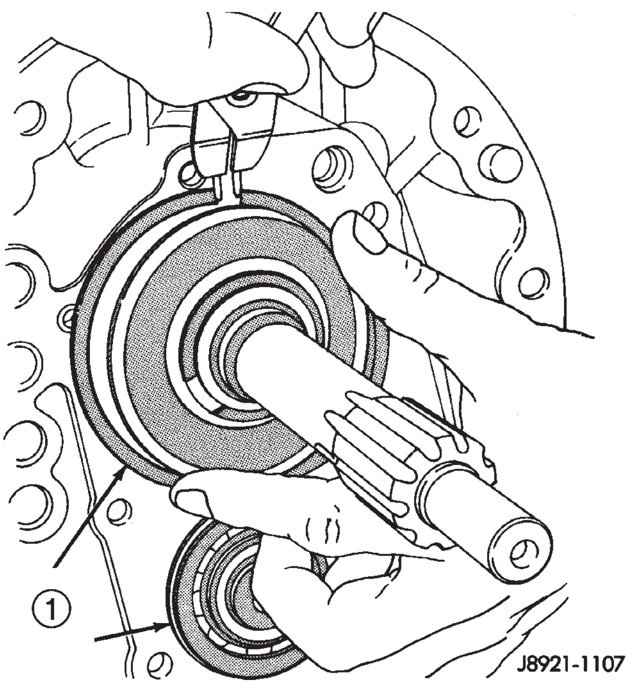


Fig. 34 Install Front Bearing Snap-rings

1 – FRONT BEARING SNAP RINGS

(5) Install front bearing retainer gasket to front bearing retainer.

(6) Install the front bearing retainer (Fig. 35) and tighten bolts to 17 N·m (12 ft. lbs.).

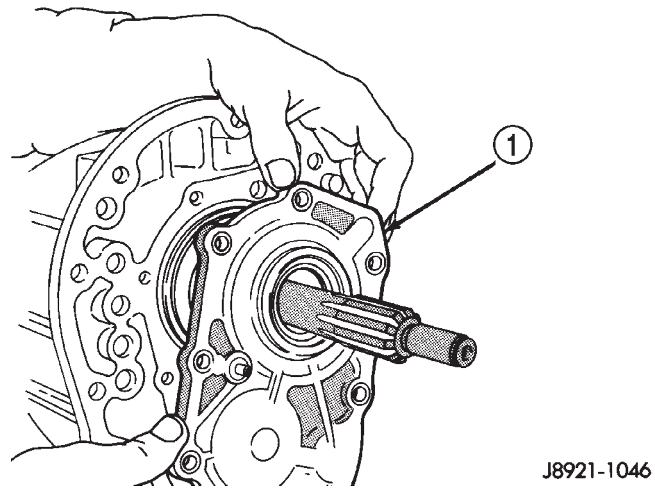


Fig. 35 Install Front Bearing Retainer

1 – FRONT BEARING RETAINER

(7) On 4x2 transmissions;

(a) Install speedometer drive gear locating snap-ring (Fig. 36).

(b) Install speedometer gear lock ball in output shaft and install speedometer gear onto output shaft.

(c) Install speedometer gear retaining snap-ring onto output shaft.

(8) Apply a 1/8 to 3/16 inch wide bead of Threebond® Liquid Gasket TB1281, P/N 83504038, to sealing surface of adapter/extension housing, making sure to keep sealer bead to inside of bolt holes.

(9) Install adapter or extension housing on intermediate plate (Fig. 37). Tighten housing bolts to 34 N·m (25 ft. lbs.) torque.

(10) Position shift arm in shifter tower opening of adapter or extension housing (Fig. 38). Be sure that the shifter arm is engaged into the shift rails.

DISASSEMBLY AND ASSEMBLY (Continued)

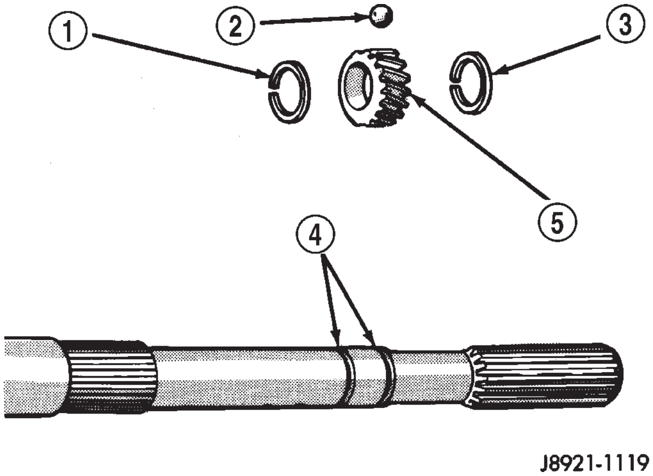


Fig. 36 Speedometer Drive Gear Assembly

1 – SNAP RING
2 – LOCK BALL
3 – SNAP RING
4 – OUTPUT SHAFT GROOVES
5 – SPEEDOMETER GEAR

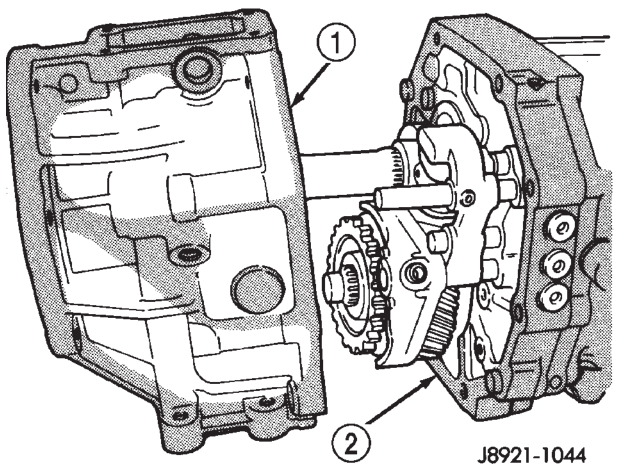


Fig. 37 Install Adapter/Extension Housing–Typical

1 – ADAPTER HOUSING
2 – INTERMEDIATE PLATE

(11) Start shifter arm shaft in hole in back of adapter or extension housing. Align shift arm and shifter arm shaft and insert shifter arm shaft through the shifter arm and into the forward portion of the adapter or extension housing (Fig. 39).

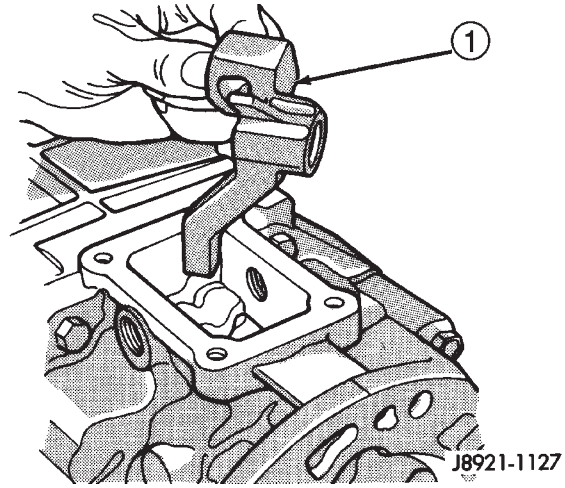


Fig. 38 Position Shift Arm in Adapter or Extension Housing

1 – SHIFT ARM

(12) Rotate the shifter arm shaft until the hole in the shift arm is aligned with the hole in the shaft.

(13) Install the shift arm retainer bolt and tighten to 38 N·m (28 ft. lbs.) (Fig. 40).

(14) Install and tighten shifter arm shaft plug to 18 N·m (13 ft. lbs.) torque (Fig. 41).

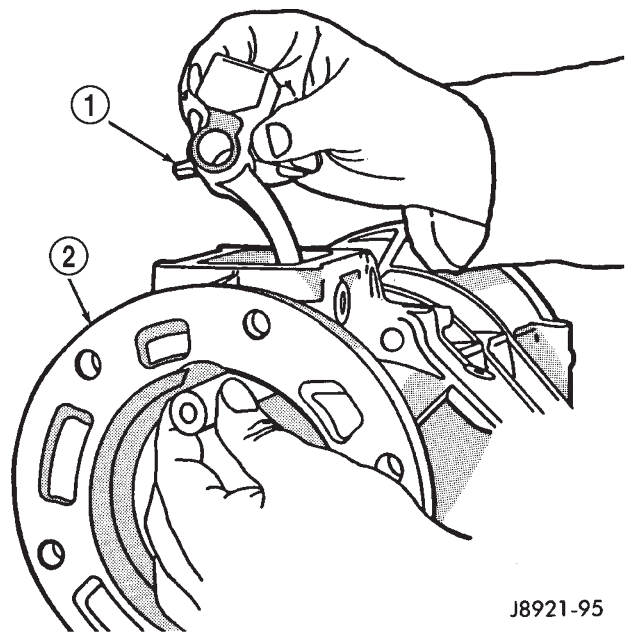


Fig. 39 Install Shifter Arm Shaft

1 – SHIFT ARM
2 – ADAPTER OR EXTENSION HOUSING

DISASSEMBLY AND ASSEMBLY (Continued)

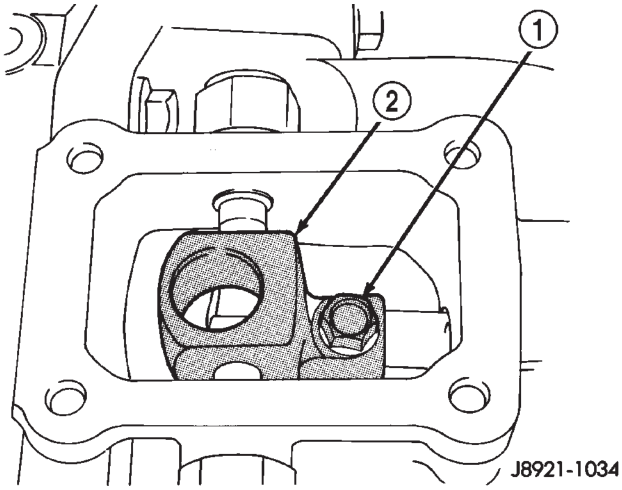


Fig. 40 Install Shift Arm Retainer Bolt

1 – RETAINER BOLT
2 – SHIFT ARM

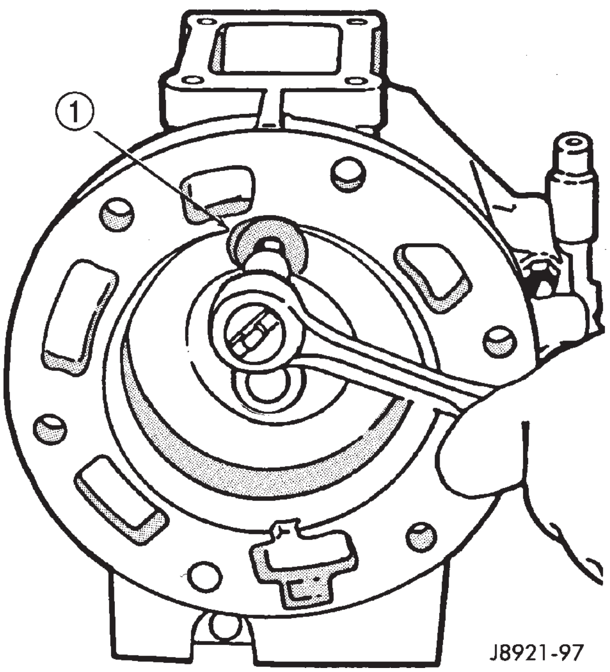


Fig. 41 Shifter Arm Shaft Plug Installation

1 – SHAFT PLUG

(15) Install shift restrictor pins in shift tower and tighten to 27 N·m (20 ft. lbs.) (Fig. 42).

NOTE: The restrictor pins are not interchangeable and are color coded. Be sure to install the pin into the same location from which it was removed.

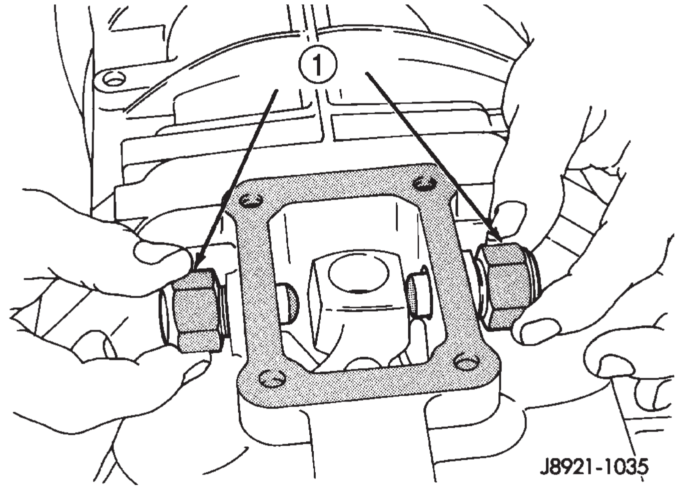


Fig. 42 Install Shifter Restrictor Pins

1 – RESTRICTOR PINS

(16) Install shift detent ball in detent opening of case (Fig. 43).

(17) Install detent spring in case (Fig. 44).

(18) Install detent plug and tighten to 19 N·m (14 ft. lbs.) (Fig. 45).

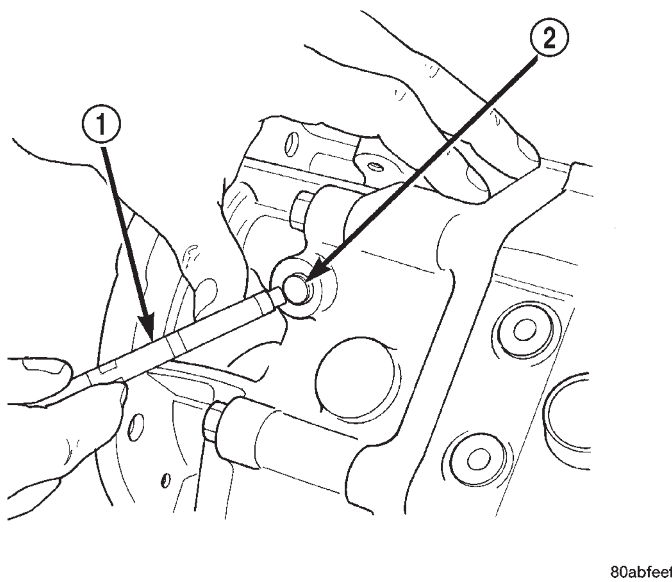


Fig. 43 Install Detent Ball

1 – PENCIL MAGNET
2 – SHIFT DETENT BALL

DISASSEMBLY AND ASSEMBLY (Continued)

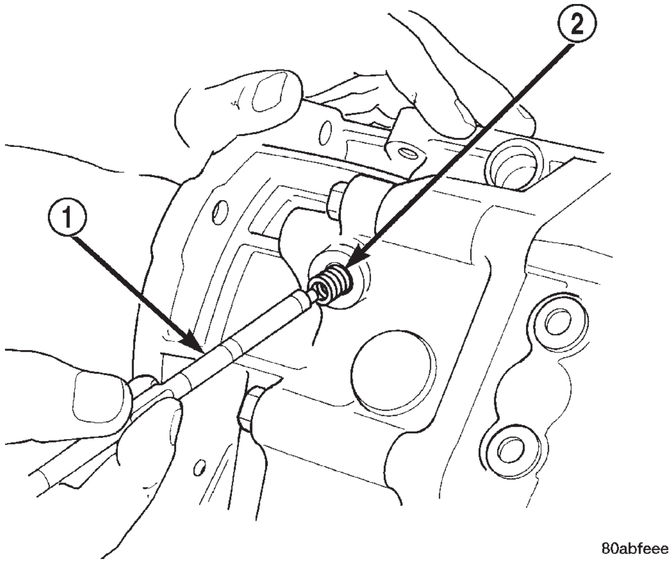


Fig. 44 Install Detent Spring

1 – PENCIL MAGNET
2 – DETENT BALL SPRING

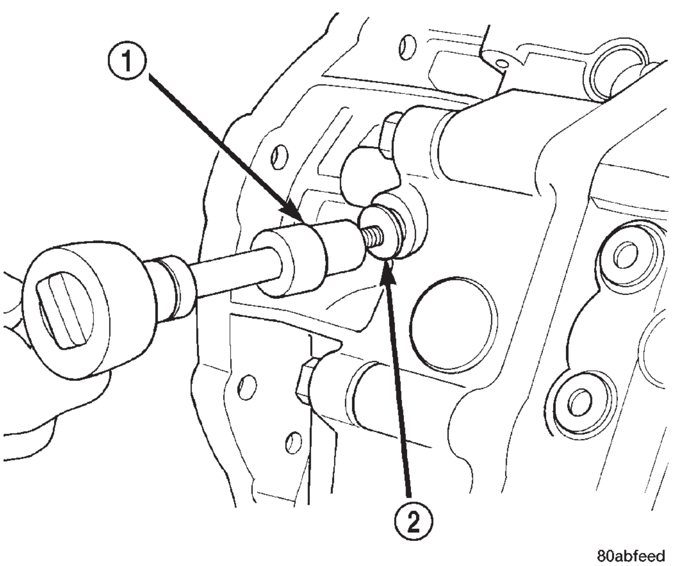


Fig. 45 Install Detent Ball Plug

1 – TORX BIT
2 – DETENT BALL PLUG

(19) Install shift tower gasket onto shift tower.

(20) Install the shift tower oil deflector and gasket onto the adapter or extension housing.

(21) Install shift tower onto transmission case (Fig. 46).

(22) Install bolts to hold shift tower to transmission case. Tighten tower bolts to 18 N·m (13 ft. lbs.) torque.

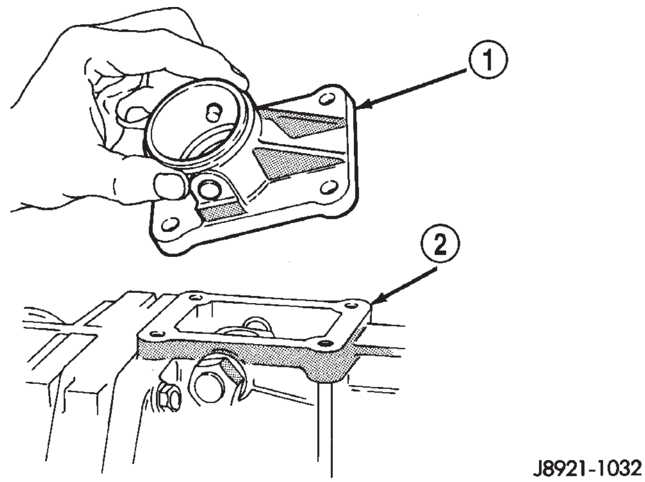


Fig. 46 Install Shift Tower

1 – SHIFT TOWER
2 – ADAPTER/EXTENSION HOUSING

(23) Install new metal o-ring onto the backup lamp switch.

(24) Install backup lamp switch (Fig. 47). Tighten switch to 44 N·m (32.5 ft. lbs.) torque.

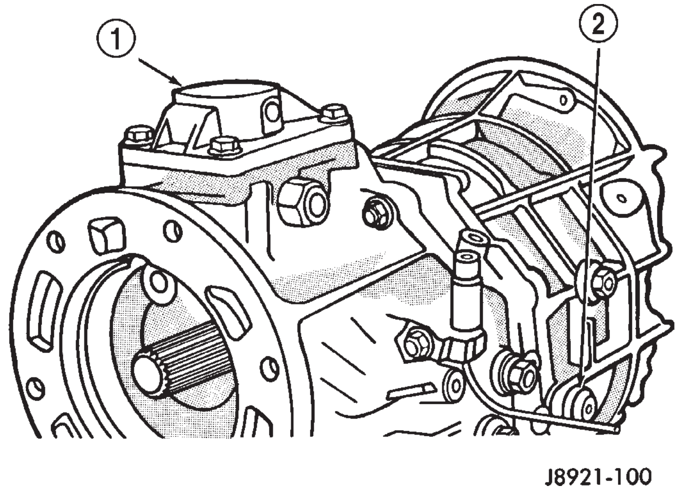


Fig. 47 Install Backup Lamp Switch

1 – SHIFT TOWER
2 – BACKUP LAMP SWITCH

(25) Install new seal in adapter/extension housing.

(26) Install vehicle speed sensor, if necessary.

(27) Install clutch housing, release bearing, release fork and retainer clip.

DISASSEMBLY AND ASSEMBLY (Continued)

SHIFT MECHANISM AND GEARTRAIN

DISASSEMBLY

(1) Install suitable bolts and washers in intermediate plate (Fig. 48). Then clamp plate and gear assembly in vise. Use enough washers to prevent bolts from touching. Also be sure vise jaws are clamped on bolt heads.

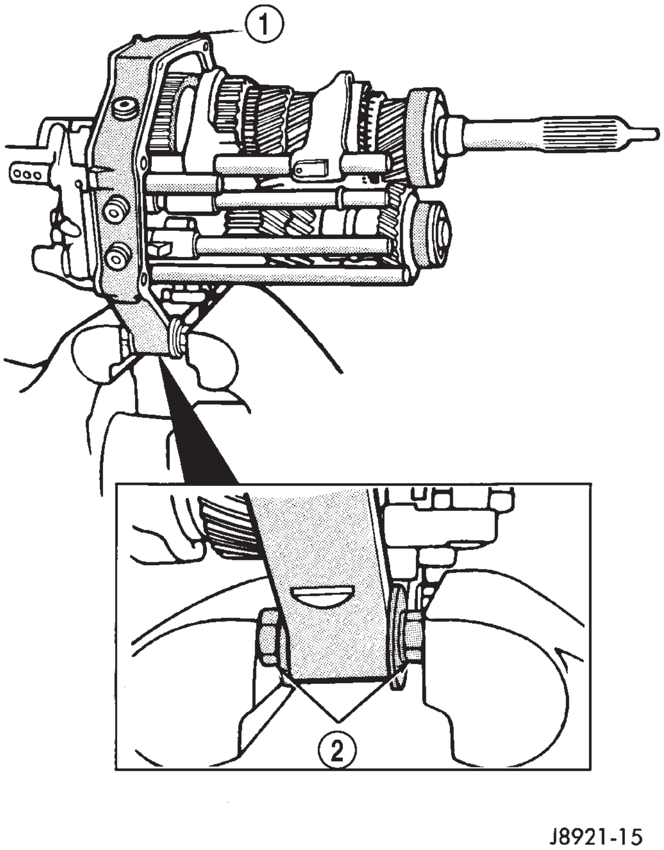


Fig. 48 Positioning Intermediate Plate In Vise

1 – INTERMEDIATE PLATE
2 – BOLTS

(2) Remove countershaft fifth gear retaining snap-ring (Fig. 49).

(3) Remove bolt holding fifth gear shift fork to shift rail (Fig. 50).

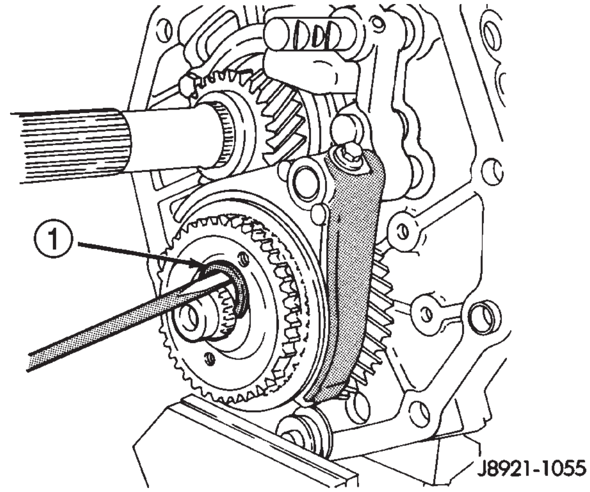


Fig. 49 Remove Fifth Gear Snap-ring

1 – FIFTH GEAR SNAP RING (SELECT FIT)

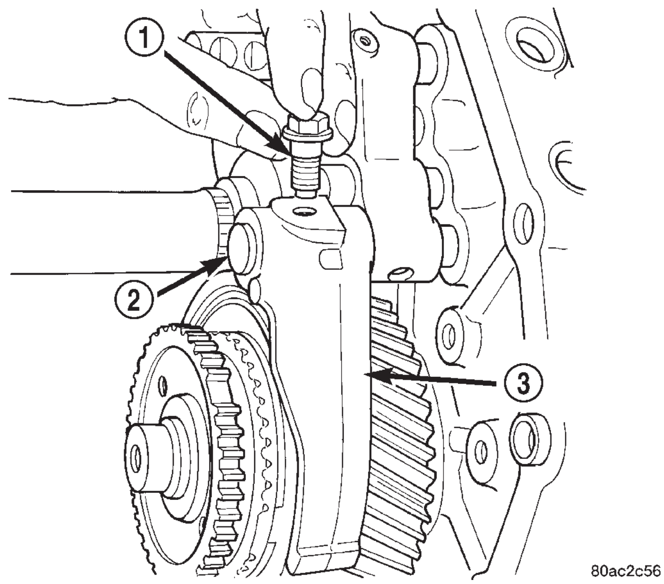


Fig. 50 Remove Shift Fork Retainer Bolt

1 – SHIFT FORK RETAINER BOLT
2 – FIFTH GEAR SHIFT RAIL
3 – FIFTH GEAR SHIFT FORK

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Remove fifth gear blocker ring from countershaft assembly with Puller L-4407 (Fig. 51).

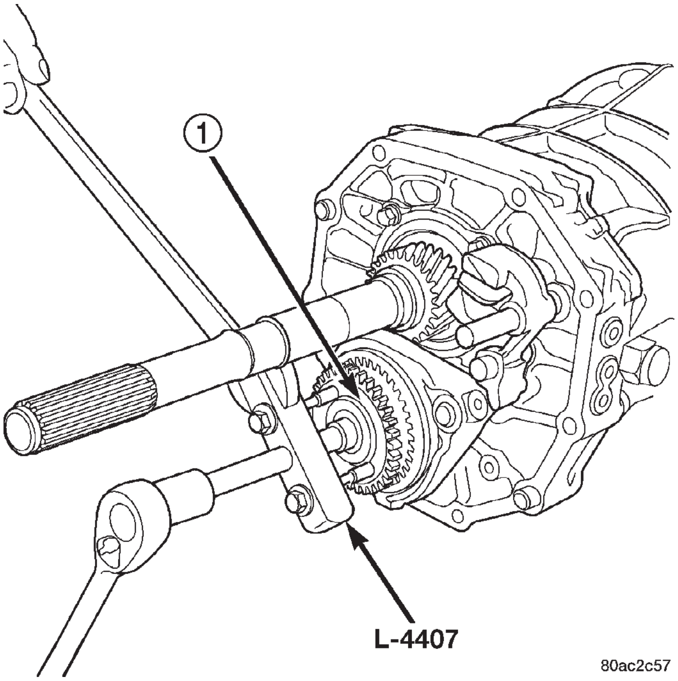


Fig. 51 Remove Fifth Gear Blocker Ring

1 – FIFTH GEAR BLOCKER RING

(5) Remove fifth gear synchro ring (Fig. 52).

(6) Remove the countershaft fifth gear assembly from countershaft (Fig. 53).

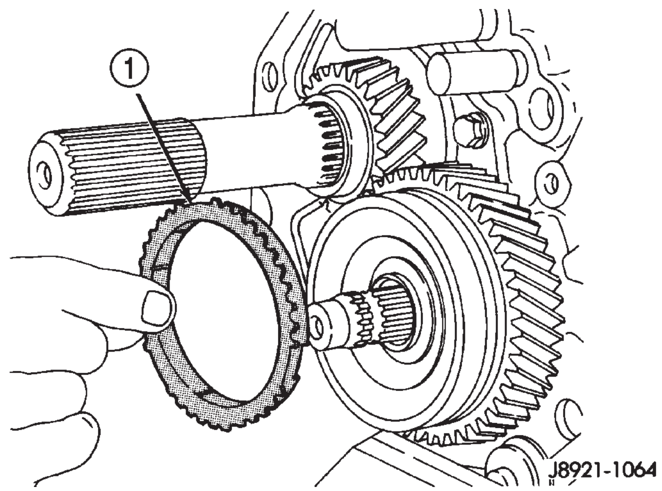


Fig. 52 Remove Fifth Gear Synchro Ring

1 – FIFTH GEAR SYNCHRO RING

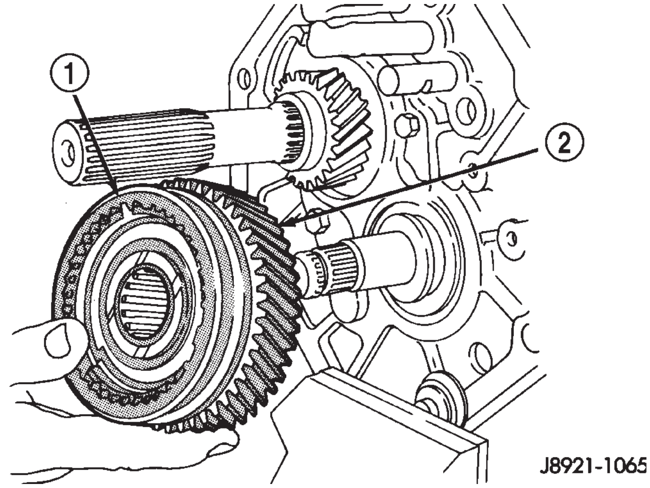


Fig. 53 Remove Fifth Gear and Synchro Assembly

1 – FIFTH GEAR SYNCHRO SLEEVE ASSEMBLY
2 – COUNTER FIFTH GEAR

(7) Remove fifth gear thrust ring from countershaft (Fig. 54).

(8) Remove fifth gear thrust ring lock ball from countershaft (Fig. 55).

NOTE: There are many lock balls, check balls, interlock balls, and interlock pins used in various places in the transmission. Whenever a pin or ball is removed, it should be identified in such a way that it can be reinstalled in the same location from which it was removed.

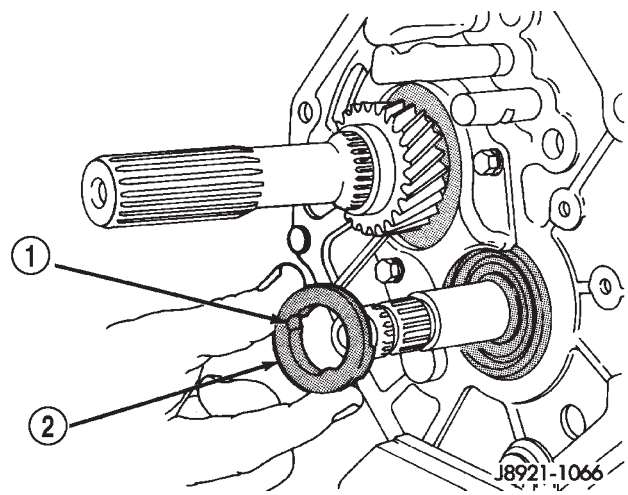


Fig. 54 Remove Fifth Gear Thrust Ring

1 – LOCK BALL NOTCH
2 – FIFTH GEAR THRUST RING

DISASSEMBLY AND ASSEMBLY (Continued)

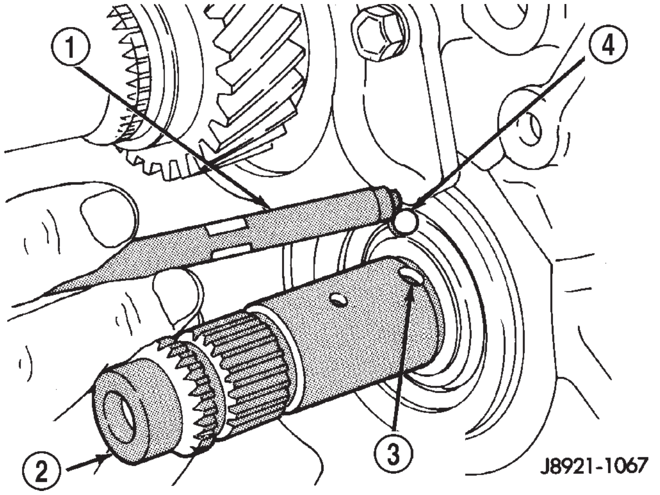


Fig. 55 Remove Fifth Gear Thrust Ring Lock Ball

1 – PENCIL MAGNET
2 – CLUSTER GEAR
3 – LOCK BALL RECESS
4 – THRUST RING LOCK BALL

(9) Remove bolt holding reverse idler gear shaft lock plate to the intermediate plate.

(10) Remove reverse idler gear shaft and reverse idler gear assembly (Fig. 56).

NOTE: Be sure to retrieve the pin and compression spring from the reverse idler shaft.

(11) Remove bolts holding output shaft rear bearing retainer to the intermediate plate and remove retainer (Fig. 57).

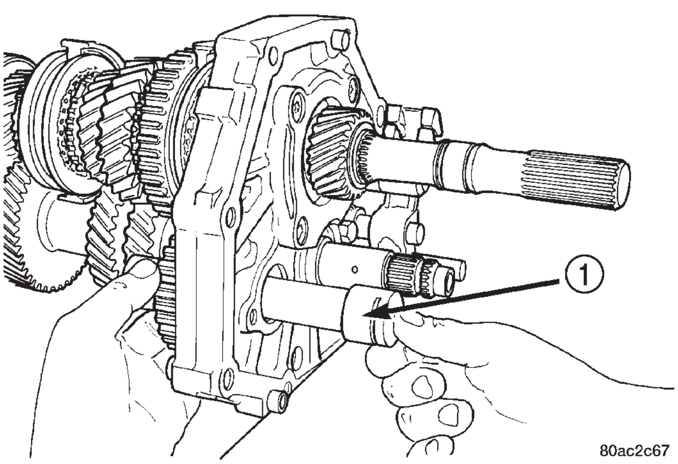


Fig. 56 Remove Reverse Idler Shaft

1 – REVERSE IDLER SHAFT

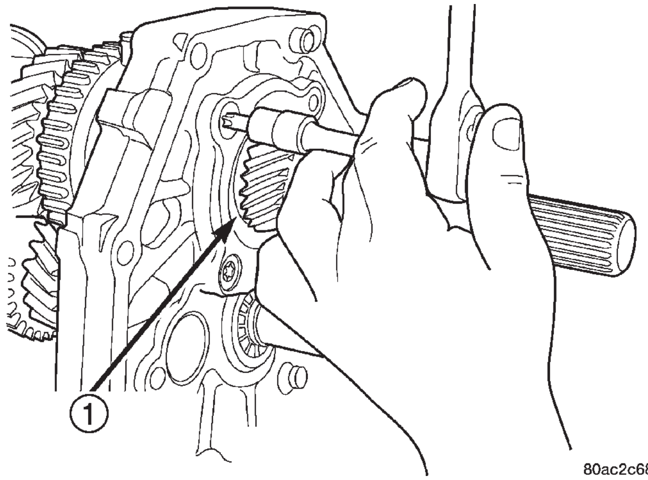


Fig. 57 Remove Output Shaft Rear Bearing Retainer

1 – OUTPUT SHAFT REAR BEARING RETAINER

(12) Remove bolts holding 1–2 and 3–4 shift forks to the shift rails (Fig. 58) and discard bolts.

(13) Remove bolts holding reverse shift arm bracket to intermediate plate (Fig. 59).

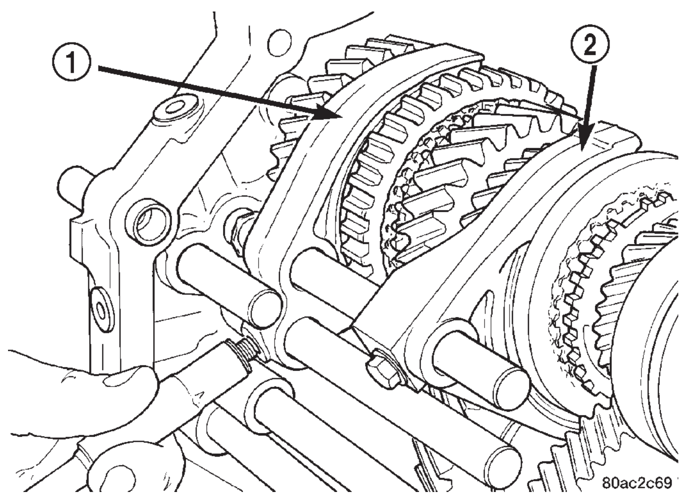


Fig. 58 Remove Shift Fork To Shift Rail Bolts

1 – 1–2 SHIFT FORK
2 – 3–4 SHIFT FORK

DISASSEMBLY AND ASSEMBLY (Continued)

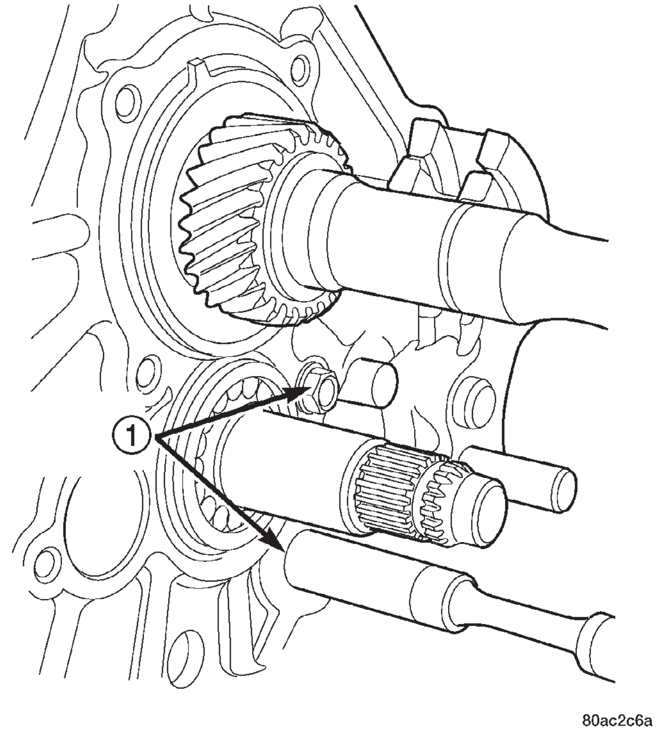


Fig. 59 Remove Reverse Shift Arm Bracket Bolts

1 – REVERSE SHIFT ARM BOLTS

(14) Remove snap-ring holding output shaft rear bearing into the intermediate plate (Fig. 60).

(15) Remove countershaft rear bearing snap-ring.

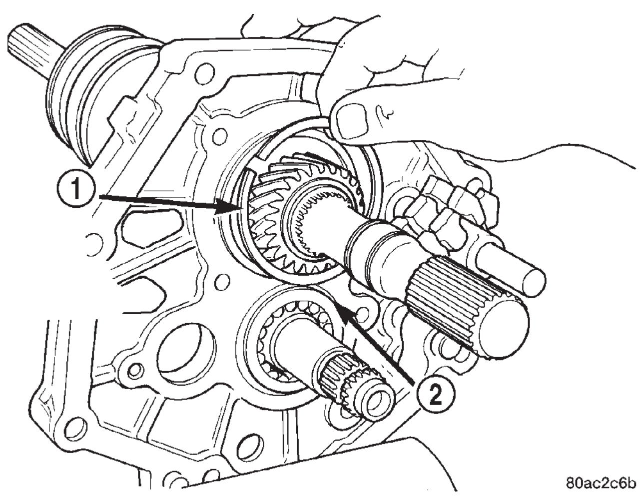


Fig. 60 Remove Output Shaft Rear Bearing Snap-ring

1 – OUTPUT SHAFT REAR BEARING SNAP-RING
2 – COUNTERSHAFT REAR BEARING SNAP-RING

(16) With aid of an assistant, support the mainshaft and countershaft. Tap on the rear of the mainshaft and countershaft with a suitable plastic mallet. This will release the countershaft from the countershaft rear bearing and the mainshaft rear bearing from the intermediate plate. The countershaft will release from the countershaft bearing first and can be removed by moving the countershaft rearward and downward (Fig. 61).

(17) Remove the mainshaft by moving the mainshaft forward until the mainshaft rear bearing is clear of the intermediate plate and then rotating the mainshaft downward out of the shift forks (Fig. 62).

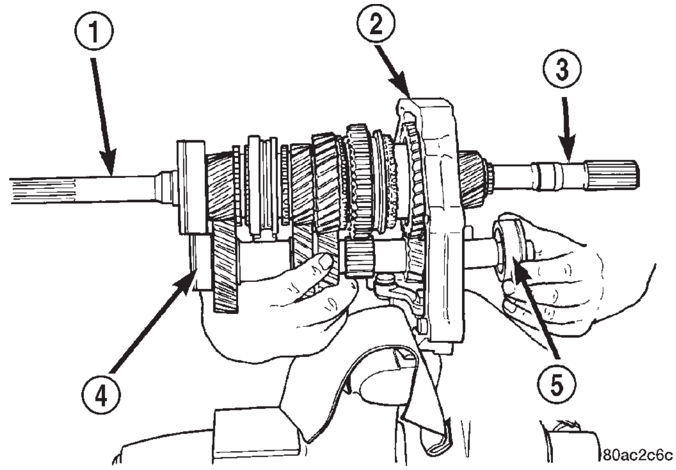


Fig. 61 Remove Countershaft and Countershaft Rear Bearing

1 – INPUT SHAFT
2 – INTERMEDIATE PLATE
3 – OUTPUT SHAFT
4 – COUNTERSHAFT
5 – COUNTERSHAFT REAR BEARING

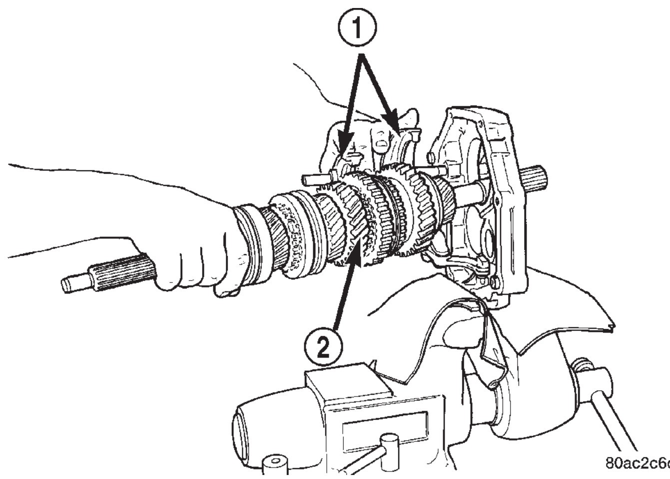


Fig. 62 Remove Mainshaft

1 – SHIFT FORKS
2 – MAINSHAFT

(18) Remove the 3–4 shift fork from the 3–4 shift rail (Fig. 63).

(19) Remove the snap-ring from near the end of the 1–2 shift rail to allow the removal of the 1–2 shift fork.

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Remove the 1–2 shift fork from the 1–2 and the 3–4 shift rails (Fig. 64).

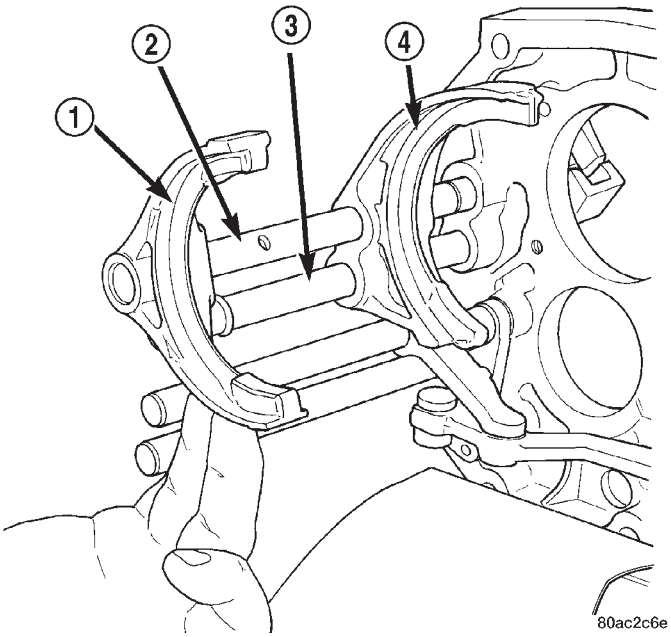


Fig. 63 Remove 3–4 Shift Fork

1 – 3–4 SHIFT FORK
2 – 3–4 SHIFT RAIL
3 – 1–2 SHIFT RAIL
4 – 1–2 SHIFT FORK

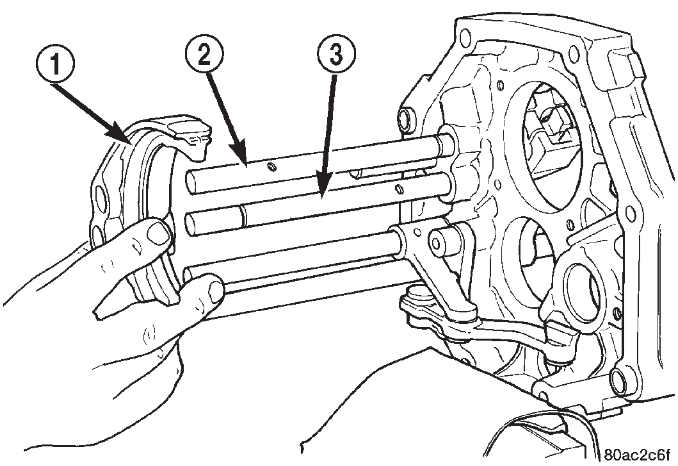


Fig. 64 Remove 1–2 Shift Fork

1 – 1–2 SHIFT FORK
2 – 3–4 SHIFT RAIL
3 – 1–2 SHIFT RAIL

(21) Remove threaded plugs from intermediate plate. Then remove lock ball and spring from plug holes with pencil magnet (Fig. 65). Note that the bottom spring is shorter in length than the other two springs.

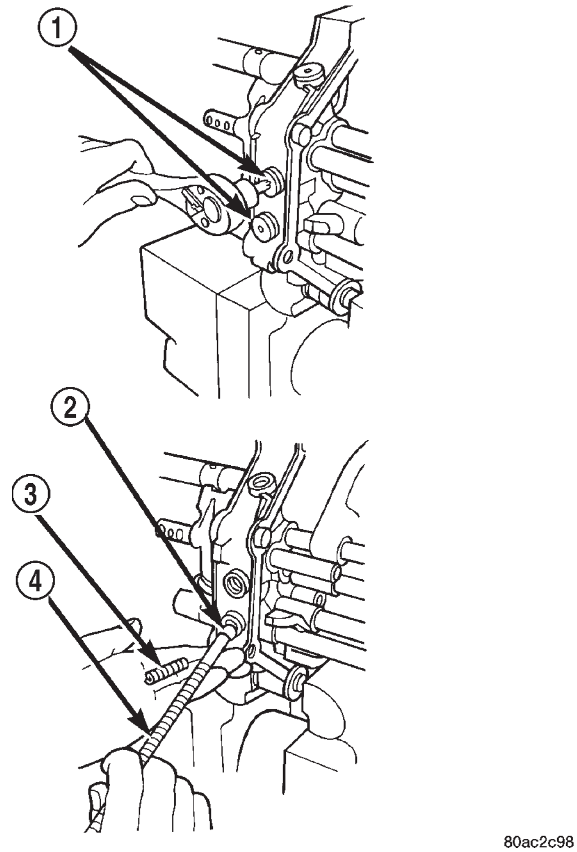


Fig. 65 Remove Lock Ball And Spring

1 – THREADED PLUGS
2 – LOCK BALL
3 – SPRING
4 – PENCIL MAGNET

(22) Remove the intermediate plate from the vise, rotate the plate 180°, and reinstall the plate in the vise using the same bolt and washer mounting set-up.

CAUTION: The interlock balls and pins are different sizes and shapes. Be sure to correctly identify which position an item is removed from to ensure that it is reinstalled in the same location.

DISASSEMBLY AND ASSEMBLY (Continued)

(23) Remove fifth gear shift rail (Fig. 66).

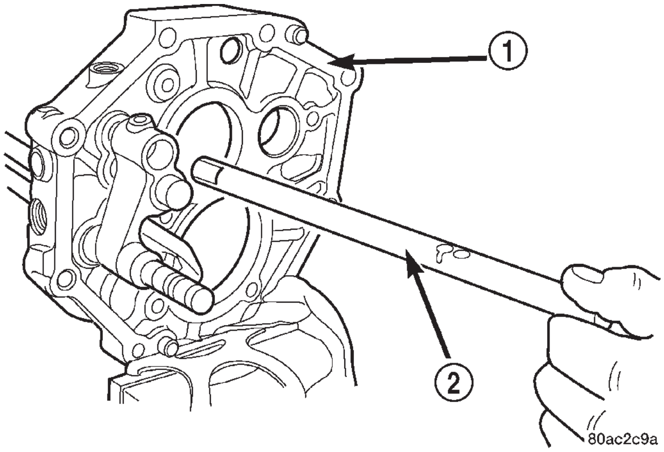


Fig. 66 Remove Fifth Gear Shift Rail

1 – INTERMEDIATE PLATE
2 – FIFTH GEAR SHIFT RAIL

(24) Remove fifth gear check ball (Fig. 67) and interlock pin.

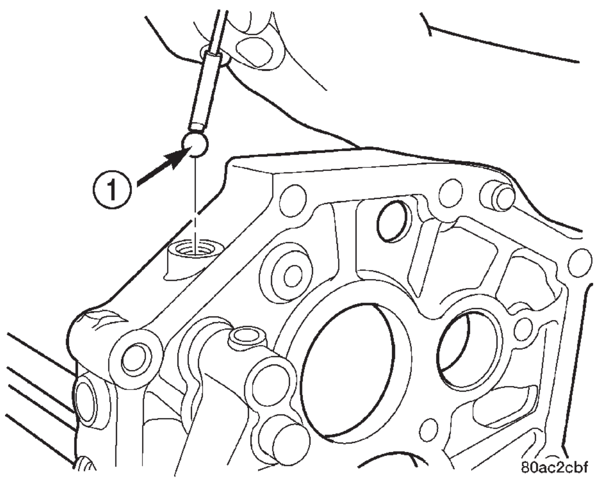


Fig. 67 Remove Fifth Gear Check Ball

1 – FIFTH GEAR CHECK BALL

(25) Remove reverse shift head and rail assembly (Fig. 68).

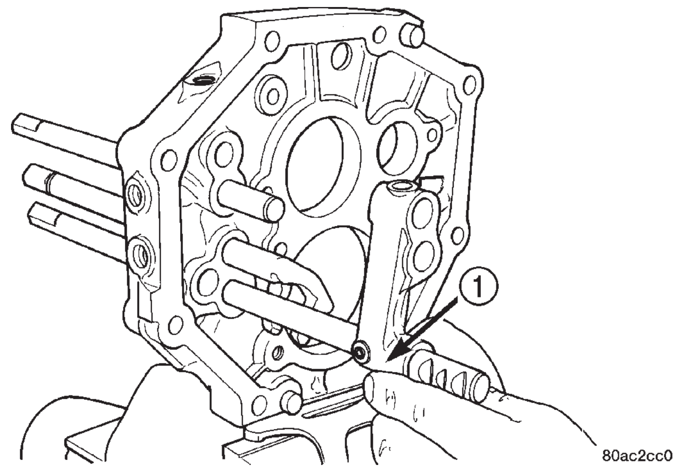


Fig. 68 Remove Reverse Shift Head And Rail Assembly

1 – REVERSE SHIFT HEAD AND RAIL ASSEMBLY

(26) Remove snap-ring holding reverse shift rail into intermediate plate.

(27) Remove reverse shift rail and reverse shift fork and arm assembly from intermediate plate (Fig. 69).

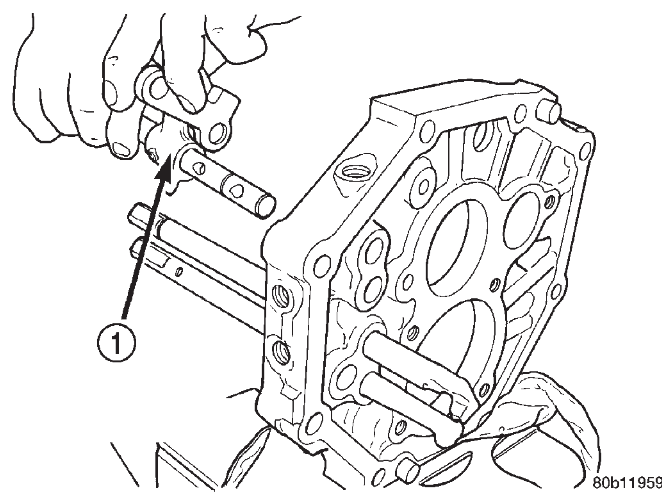


Fig. 69 Remove Reverse Shift Rail

1 – REVERSE SHIFT RAIL AND REVERSE FORK ASSEMBLY

DISASSEMBLY AND ASSEMBLY (Continued)

(28) Remove interlock pin from reverse shift rail (Fig. 70).

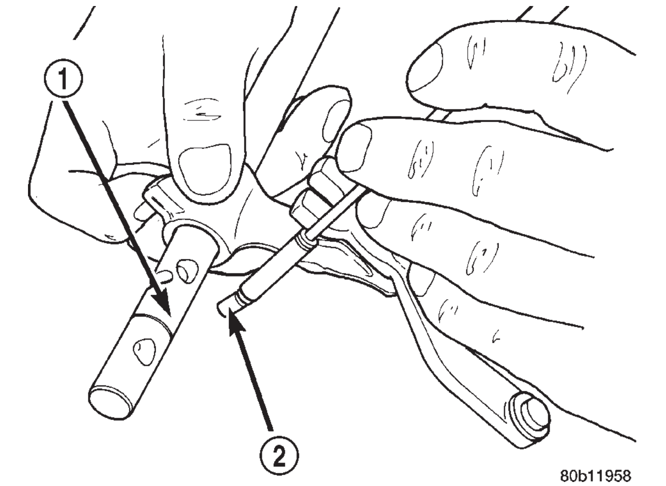


Fig. 70 Remove Interlock Pin From Reverse Shift Rail

1 – REVERSE SHIFT RAIL
2 – INTERLOCK PIN

(29) Remove reverse elongated check ball (Fig. 71).

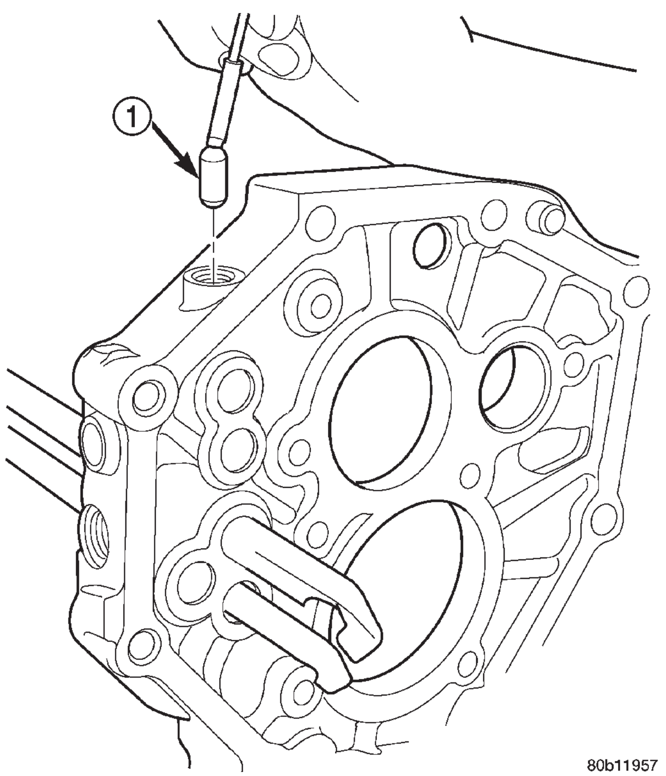


Fig. 71 Remove Reverse Check Ball

1 – REVERSE CHECK BALL

(30) Remove snap-ring on 3–4 shift rail.

(31) Remove 1–2 shift rail from intermediate plate.

(32) Remove interlock pin from 1–2 shift rail (Fig. 72).

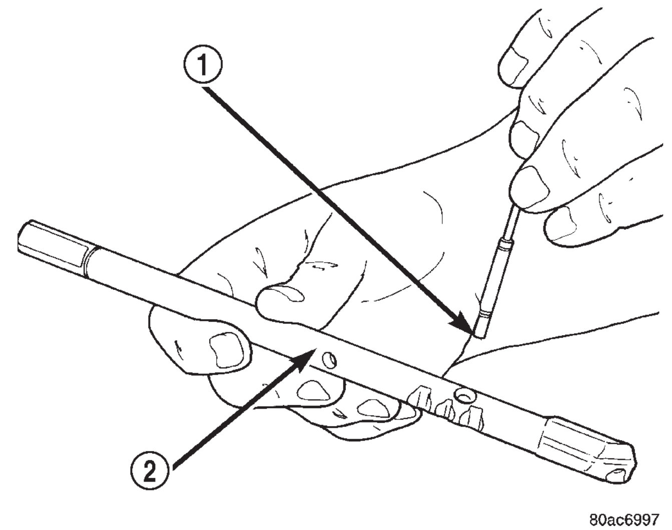


Fig. 72 Remove 1–2 Shift Rail Interlock Pin

1 – INTERLOCK PIN
2 – 1–2 SHIFT RAIL

(33) Remove 1–2 shift rail elongated check ball from intermediate plate (Fig. 73).

(34) Remove 3–4 shift rail from intermediate plate.

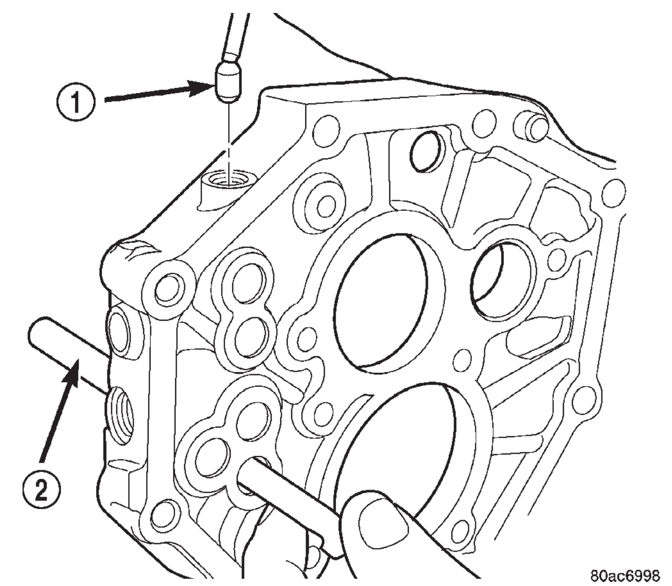


Fig. 73 Remove 1–2 Check Ball

1 – 1–2 CHECK BALL
2 – 3–4 SHIFT RAIL

DISASSEMBLY AND ASSEMBLY (Continued)

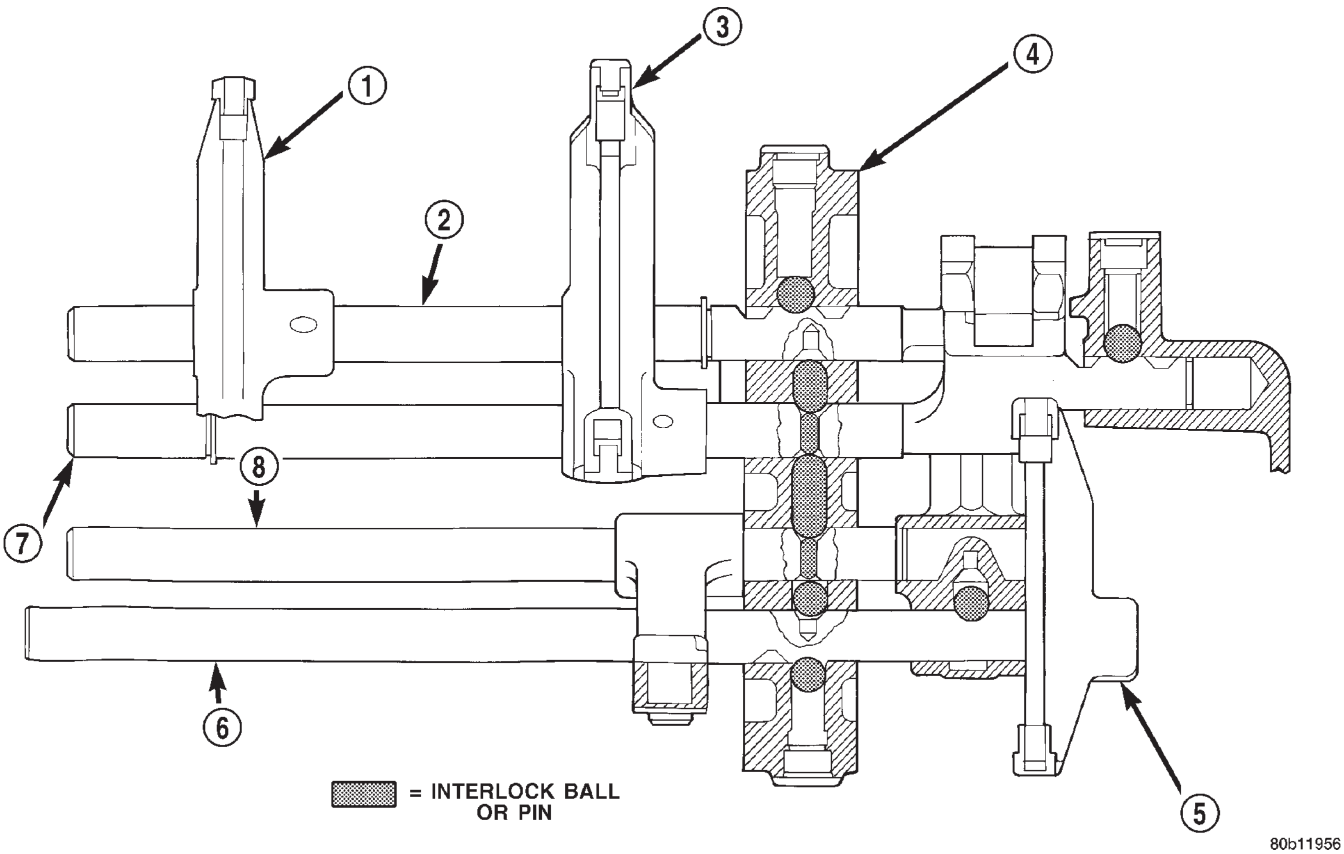


Fig. 74 Shift Rail Components

1 – 3–4 FORK
2 – 3–4 SHIFT RAIL
3 – 1–2 FORK
4 – INTERMEDIATE PLATE
5 – FIFTH GEAR FORK
6 – FIFTH GEAR SHIFT RAIL
7 – 1–2 SHIFT RAIL
8 – REVERSE SHIFT RAIL

ASSEMBLY

Refer to (Fig. 74) while assembling and installing the shift rail components. Also, verify that all shift rail components are in their neutral position when installing the check balls and interlock pins.

(1) Install the 3–4 shift rail into the intermediate plate.

(2) Install the 1–2 elongated check ball into the intermediate plate (Fig. 75).

(3) Install the interlock pin into the 1–2 shift rail (Fig. 76).

(4) Install the 1–2 shift rail into the intermediate plate.

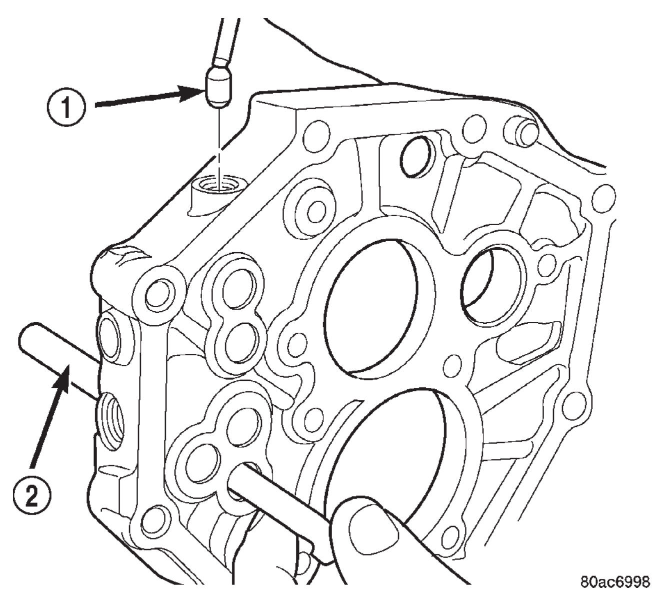


Fig. 75 Install 1–2 Check Ball

1 – 1–2 CHECK BALL
2 – 3–4 SHIFT RAIL

DISASSEMBLY AND ASSEMBLY (Continued)

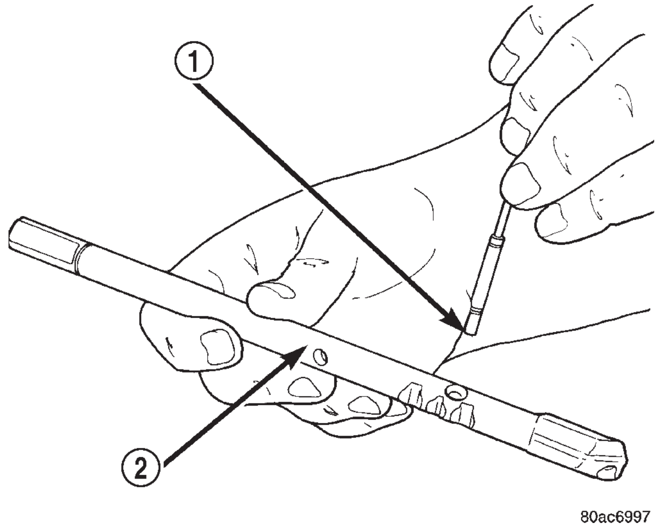


Fig. 76 Install 1–2 Shift Rail Interlock Pin

1 – INTERLOCK PIN
2 – 1–2 SHIFT RAIL

(5) Install snap-ring onto 3–4 shift rail.

(6) Install the reverse check ball into the intermediate plate (Fig. 77).

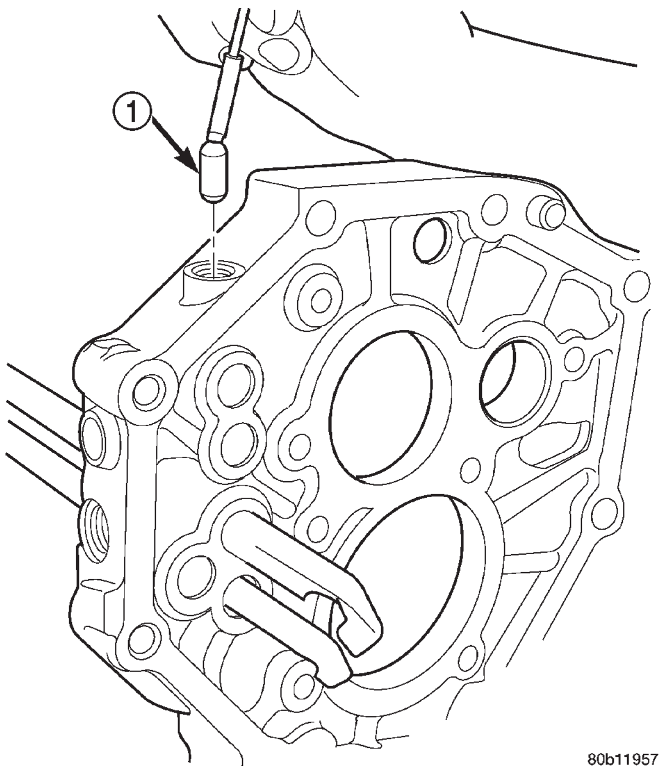


Fig. 77 Install Reverse Check Ball

1 – REVERSE CHECK BALL

(7) Install the interlock pin into the reverse shift rail (Fig. 78).

(8) Assemble the reverse arm bracket to the reverse fork (Fig. 79).

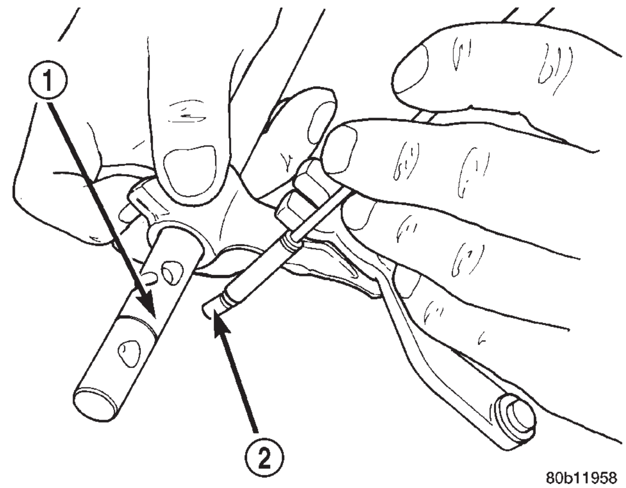


Fig. 78 Install Reverse Interlock Pin

1 – REVERSE SHIFT RAIL
2 – INTERLOCK PIN

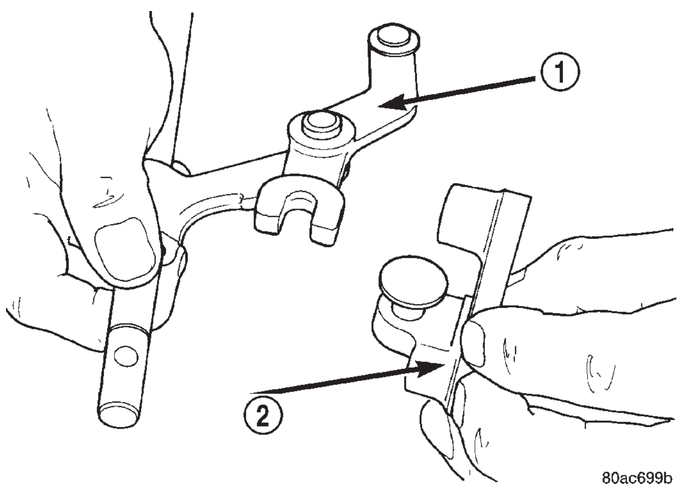


Fig. 79 Install Reverse Arm Bracket to Fork

1 – REVERSE SHIFT FORK
2 – REVERSE ARM BRACKET

(9) Install reverse shift rail into intermediate plate and position reverse arm bracket to intermediate plate (Fig. 80).

DISASSEMBLY AND ASSEMBLY (Continued)

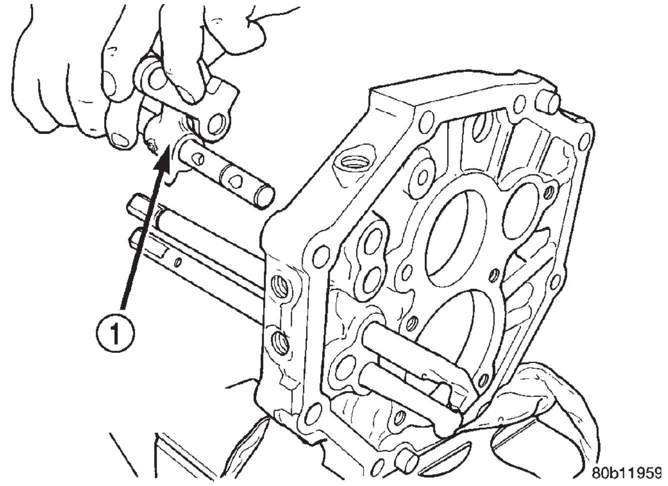


Fig. 80 Install Reverse Shift Rail

1 – REVERSE SHIFT RAIL AND REVERSE FORK ASSEMBLY

(10) Install snap-ring onto reverse shift rail (Fig. 81).

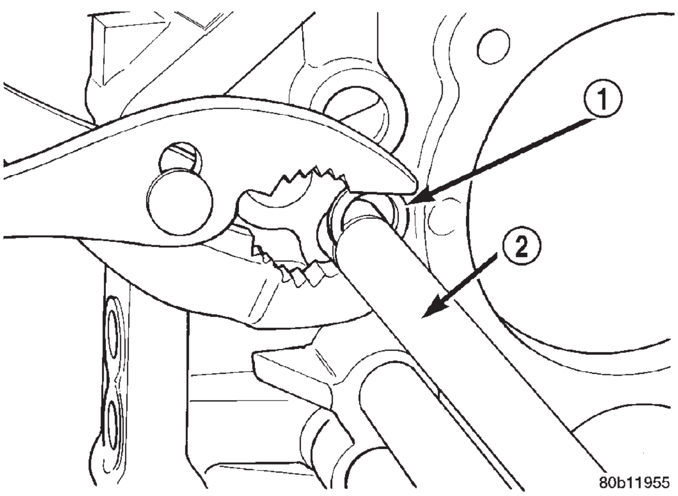


Fig. 81 Install Reverse Snap-ring

1 – SNAP RING
2 – REVERSE SHIFT RAIL

(11) Install reverse shift head and rail assembly into the intermediate plate.

(12) Install the fifth gear interlock ball and check ball (Fig. 82).

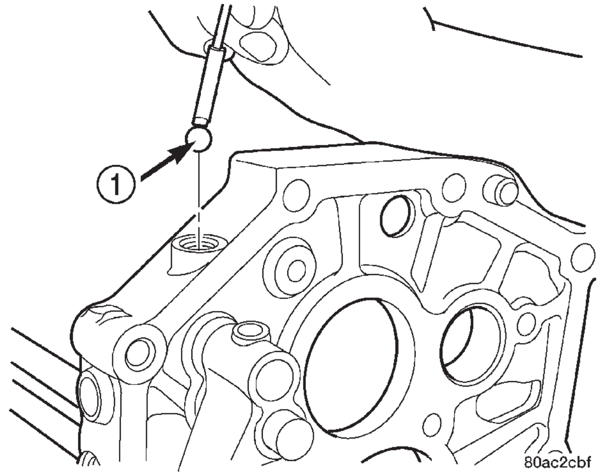


Fig. 82 Install Fifth Gear Check Ball

1 – FIFTH GEAR CHECK BALL

(13) Install fifth gear shift rail (Fig. 83).

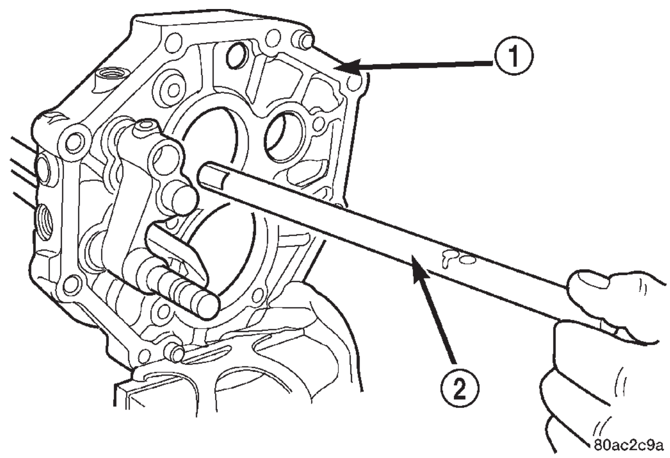


Fig. 83 Install Fifth Gear Shift Rail

1 – INTERMEDIATE PLATE
2 – FIFTH GEAR SHIFT RAIL

(14) Remove the intermediate plate from the vise, rotate the plate 180°, and reinstall the plate in the vise using the same bolt and washer mounting set-up.

(15) Install the shift rail detent balls in the intermediate plate.

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Install the shift rail detent springs in the intermediate plate. Note that the bottom detent spring is shorter than the others.

(17) Install the shift rail detent plugs in the intermediate plate.

(18) Install the 1–2 shift fork onto the 1–2 and 3–4 shift rails (Fig. 84).

(19) Install the snap-ring onto the 1–2 shift rail.

(20) Install the 3–4 shift fork onto the 3–4 shift rail (Fig. 85).

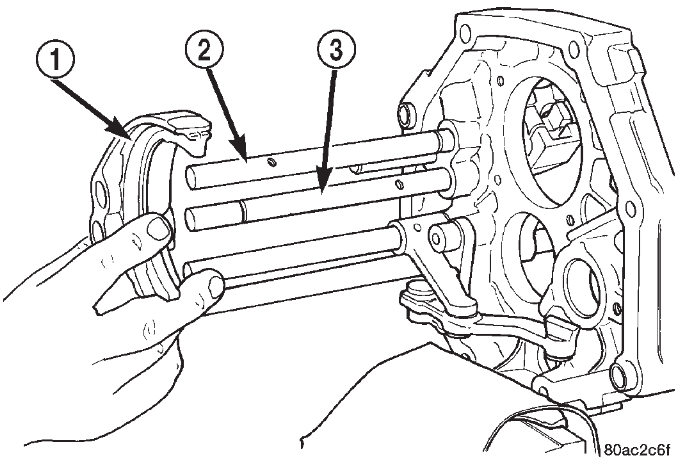


Fig. 84 Install 1–2 Shift Fork

1 – 1–2 SHIFT FORK
2 – 3–4 SHIFT RAIL
3 – 1–2 SHIFT RAIL

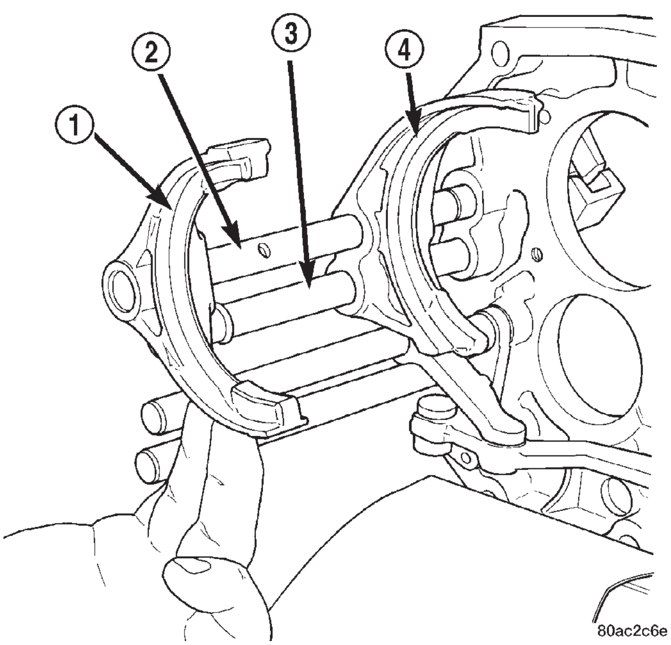


Fig. 85 Install 3–4 Shift Fork

1 – 3–4 SHIFT FORK
2 – 3–4 SHIFT RAIL
3 – 1–2 SHIFT RAIL
4 – 1–2 SHIFT FORK

(21) Install mainshaft into the intermediate plate by guiding the output shaft through opening in intermediate plate until the shift forks are aligned with the appropriate synchronizer sleeves. The mainshaft rear bearing will be started in the intermediate plate but not fully driven in at this point.

(22) While an assistant supports the mainshaft, align rear of countershaft with inner race of countershaft rear bearing.

(23) Raise countershaft upward until gears mesh with the mating gears on the mainshaft.

(24) Using a suitable rubber mallet, tap on the input shaft and the front of the countershaft equally to install the mainshaft rear bearing into the intermediate plate and the rear of the countershaft into the rear countershaft bearing. It may be necessary to occasionally hold the countershaft into the intermediate plate and tap the countershaft rear bearing onto the countershaft and into the intermediate plate.

(25) Install snap-rings onto the rear mainshaft and countershaft bearings.

(26) Install the bolts to hold the reverse shift arm bracket to the intermediate plate.

(27) Install new bolts to hold the shift forks to the shift rails (Fig. 86).

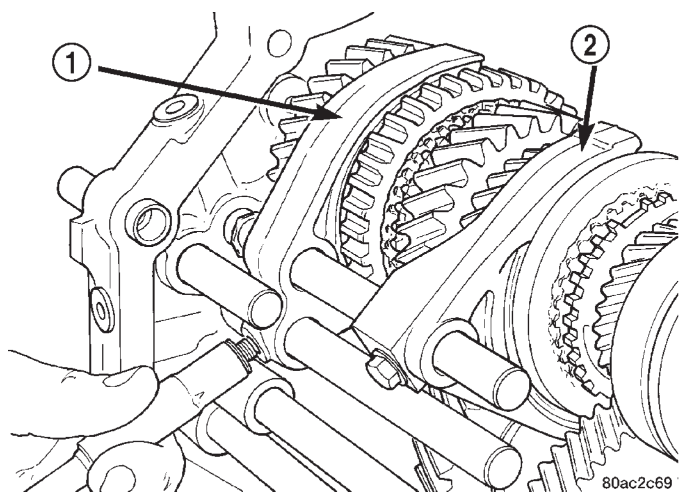


Fig. 86 Install Shift Fork Bolts

1 – 1–2 SHIFT FORK
2 – 3–4 SHIFT FORK

(28) Position the mainshaft rear bearing retainer over the output shaft and onto the intermediate plate.

(29) Install new bolts to hold the bearing retainer to the intermediate plate.

(30) Move the reverse shift arm into the reverse gear position. The reverse gear position is with the arm moved away from the intermediate plate (Fig. 87).

(31) Install the reverse idler gear assembly into position on the mainshaft and reverse shift arm.

DISASSEMBLY AND ASSEMBLY (Continued)

(32) Install the compression spring and pin into the reverse idler gear shaft (Fig. 88).

(33) Install the reverse idler shaft through the intermediate plate and reverse idler gear assembly (Fig. 89) until the idler shaft pin contacts the gear assembly. Make sure that the notched cut-out in the idler shaft is to the rear of the transmission.

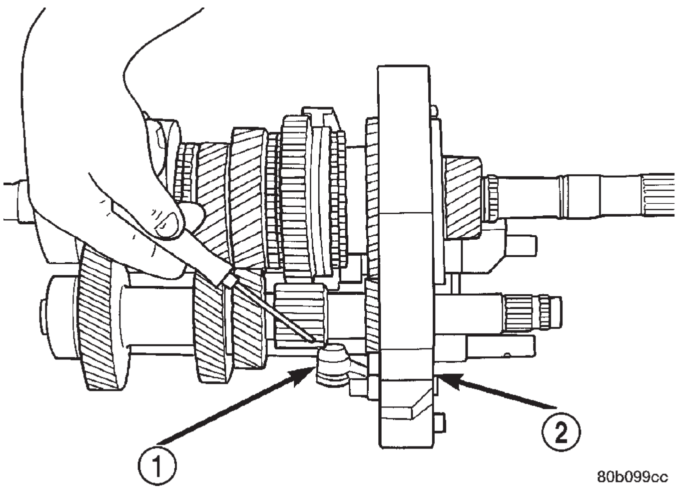


Fig. 87 Reverse Shift Arm Position

1 – REVERSE SHIFT ARM
2 – INTERMEDIATE PLATE

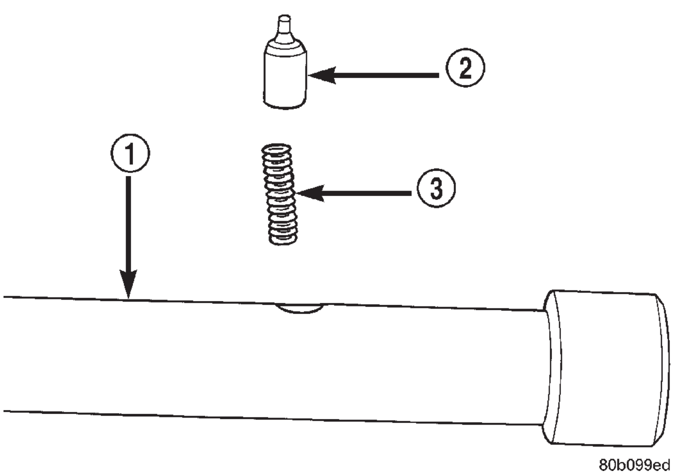


Fig. 88 Install Compression Spring And Pin

1 – REVERSE IDLER GEAR SHAFT
2 – PIN
3 – COMPRESSION SPRING

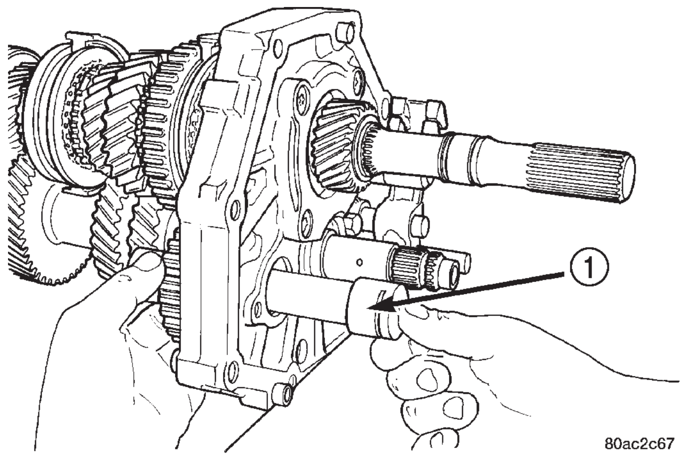


Fig. 89 Install Reverse Idler Shaft

1 – REVERSE IDLER SHAFT

(34) Align the pin with the alignment notch in the reverse idler gear assembly (Fig. 90). The alignment notch in the reverse idler gear race/hub is a small relief cut above one of the main longitudinal slots. Be sure that the pin is aligned with the proper slot, the opposite slot has an oil drain hole which the pin will drop into. The assembly will then be locked onto the shaft and will need to be disassembled in order to be removed.

(35) Depress compression spring and pin in reverse idler gear shaft (Fig. 91).

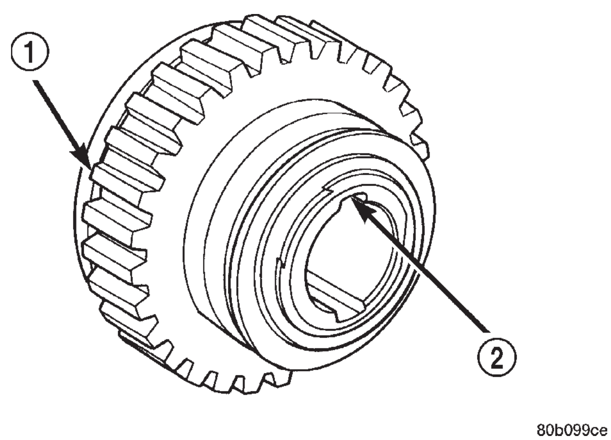


Fig. 90 Align Idler Shaft Pin

1 – REVERSE IDLER GEAR ASSEMBLY
2 – ALIGNMENT NOTCH

(36) Install the reverse idler gear shaft the remainder of the way through the reverse idler gear assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

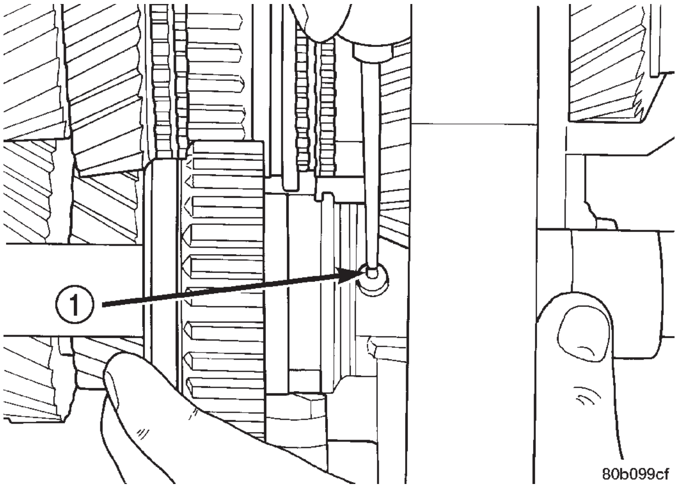


Fig. 91 Depress Pin In Reverse Idler Gear Shaft

1 – DEPRESS PIN

(37) Position the reverse idler gear shaft lock plate onto the intermediate plate.

(38) Install a new bolt to hold the idler gear shaft lock plate to the intermediate plate.

(39) Install the fifth gear thrust ring lock ball to the countershaft (Fig. 92).

(40) Install the fifth gear thrust ring onto the countershaft and over the lock ball (Fig. 93).

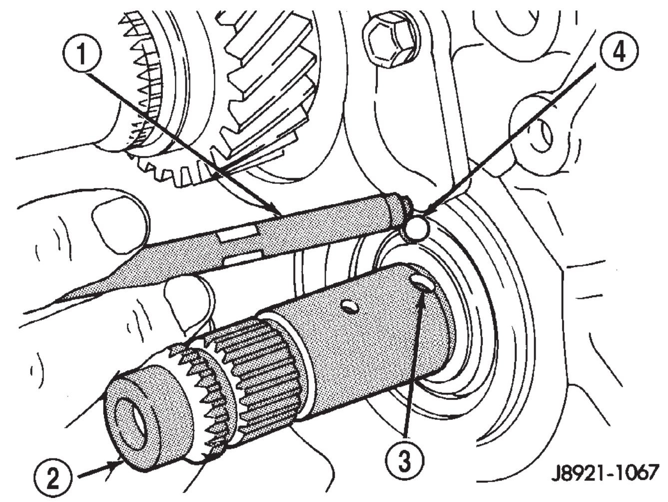


Fig. 92 Install Fifth Gear Thrust Ring Lock Ball

1 – PENCIL MAGNET
2 – CLUSTER GEAR
3 – LOCK BALL RECESS
4 – THRUST RING LOCK BALL

(41) Install fifth gear shift fork to the countershaft fifth gear assembly.

(42) Install the countershaft fifth gear bearings into the countershaft fifth gear assembly.

(43) Position the countershaft fifth gear assembly on the countershaft. Ensure that the fifth gear fork is installed onto the fifth gear shift rail.

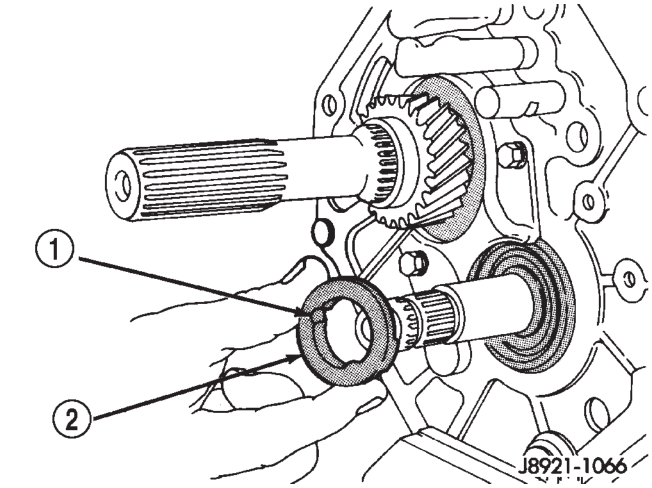


Fig. 93 Install Fifth Gear Thrust Ring

1 – LOCK BALL NOTCH
2 – FIFTH GEAR THRUST RING

(44) Install the fifth gear synchro ring.

(45) Position the fifth gear blocker ring onto the countershaft.

(46) Using a suitable mallet and spacer, tap the fifth gear blocker ring onto the countershaft.

(47) Install new bolt to hold fifth gear shift fork to the fifth gear shift rail (Fig. 94).

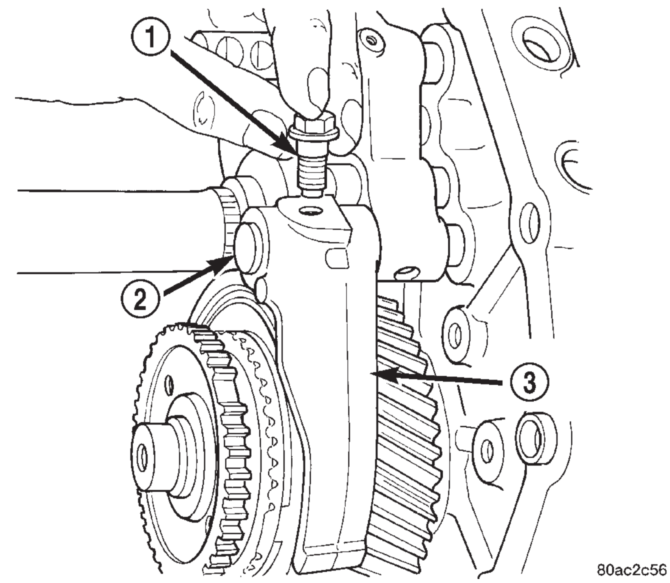


Fig. 94 Install Fifth Gear Retainer Bolt

1 – SHIFT FORK RETAINER BOLT
2 – FIFTH GEAR SHIFT RAIL
3 – FIFTH GEAR SHIFT FORK

(48) Measure countershaft fifth gear thrust clearance.

(49) Select a snap-ring so that the thrust clearance is 0.10–0.30 mm (0.004–0.010 in.).

(50) Install snap-ring to hold fifth gear blocker ring onto countershaft.

DISASSEMBLY AND ASSEMBLY (Continued)

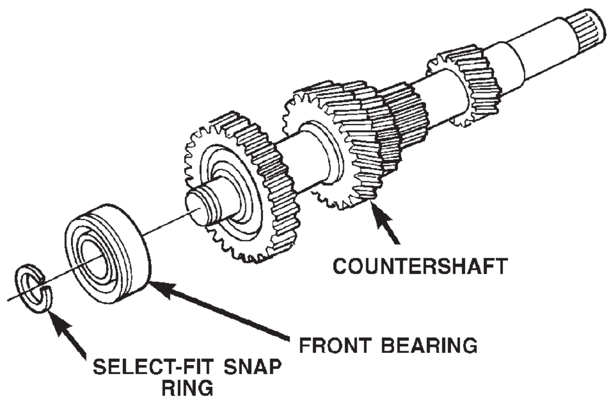
(51) Remove intermediate plate from vise and remove bolts and washers from intermediate.

COUNTERSHAFT

DISASSEMBLY

(1) Remove select fit snap-ring holding the countershaft front bearing onto the countershaft (Fig. 95).

(2) Using Bearing Splitter P-334, a suitable spacer on center of countershaft, and a shop press, remove the countershaft front bearing from the countershaft.



I. D. MARK	SNAP RING THICKNESS MM (IN.)	
1	2.05 - 2.10	(0.0807 - 0.0827)
2	2.10 - 2.15	(0.0827 - 0.0846)
3	2.15 - 2.20	(0.0846 - 0.0866)
4	2.20 - 2.25	(0.0866 - 0.0886)
5	2.25 - 2.30	(0.0886 - 0.0906)
6	2.30 - 2.35	(0.0906 - 0.0925)

80ac6a0a

Fig. 95 Countershaft Front Bearing Snap-ring

ASSEMBLY

(1) Remove any nicks or burrs on countershaft hub with fine emery or crocus cloth.

(2) Position countershaft front bearing on end of countershaft.

(3) Using Special Tool 8109 and a shop press, press bearing onto countershaft.

(4) Select the thickest snap-ring that will fit into the snap-ring groove of the countershaft (Fig. 95).

(5) Install snap-ring to hold countershaft front bearing onto countershaft.

INPUT SHAFT

DISASSEMBLY

(1) Verify that the 3–4 synchronizer is in the neutral position.

(2) Separate input shaft from output shaft (Fig. 96). Note that the output shaft pilot bearing is an uncaged roller type bearing.

(3) Remove the output shaft pilot bearing rollers from the input shaft and the output shaft.

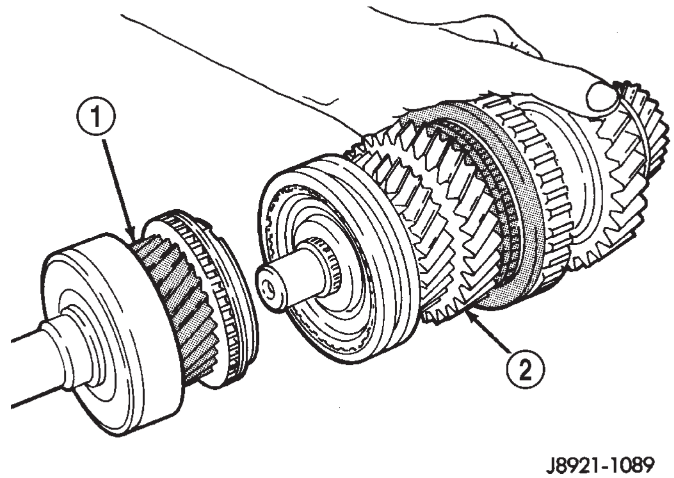


Fig. 96 Separate Input and Output Shafts

1 – INPUT SHAFT ASSEMBLY
2 – OUTPUT SHAFT AND GEAR ASSEMBLY

(4) Remove the fourth gear synchronizer ring from the input shaft (Fig. 97).

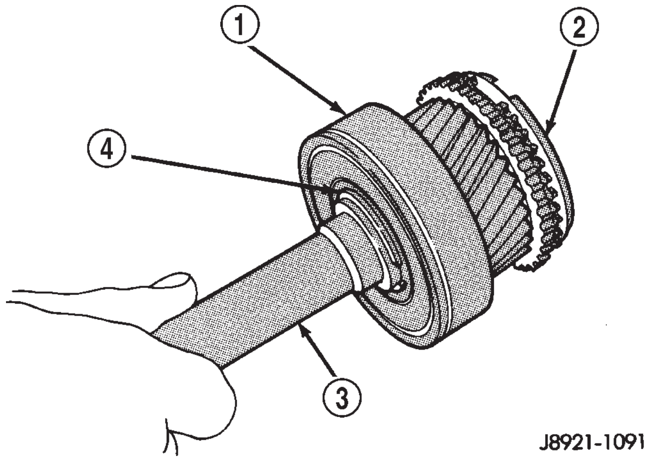


Fig. 97 Input Shaft Components

1 – BEARING
2 – SYNCHRO RING
3 – INPUT SHAFT
4 – BEARING SNAP RING

(5) Remove the select fit snap-ring holding the input shaft bearing onto the input shaft.

(6) Using Bearing Splitter P-334 and a shop press, remove the bearing from the input shaft.

ASSEMBLY

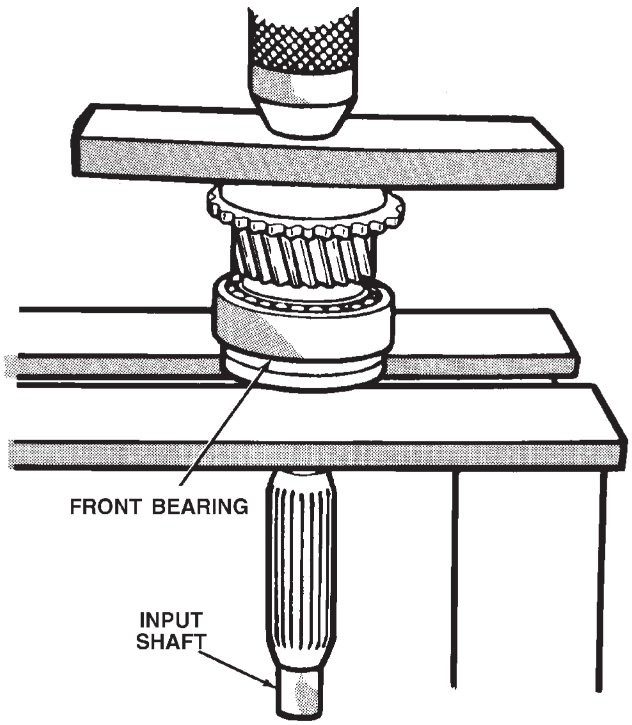
(1) Position input shaft bearing onto input shaft.

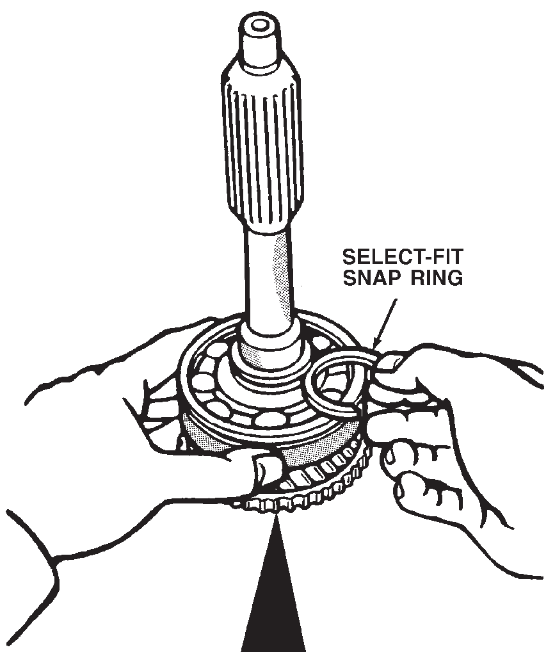
(2) Using Driver L-4507, drive bearing onto input shaft.

(3) Select the thickest snap-ring that will fit into the snap-ring groove of the input shaft (Fig. 98).

(4) Lubricate output shaft pilot bearing bore of input shaft with petroleum jelly.

DISASSEMBLY AND ASSEMBLY (Continued)





I. D. Mark	Snap Ring Thickness mm (in.)
0	2.05-2.10 (0.0807-0.0827)
1	2.10-2.15 (0.0827-0.0846)
2	2.15-2.20 (0.0846-0.0866)
3	2.20-2.25 (0.0866-0.0886)
4	2.25-2.30 (0.0886-0.0906)
5	2.30-2.35 (0.0906-0.0925)

J8921-50

Fig. 98 Select Input Shaft Bearing Snap-ring

(5) Install output shaft pilot bearing rollers in input shaft bore (Fig. 99). Ensure to use sufficient petroleum jelly to hold rollers in position.

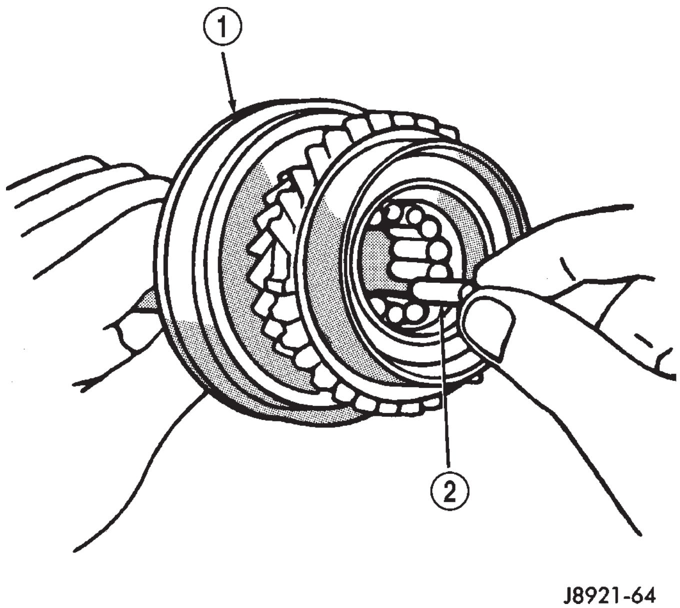


Fig. 99 Install Output Shaft Pilot Bearing Rollers

1 – INPUT SHAFT
2 – BEARING ROLLERS

(6) Install the fourth gear synchronizer ring onto the input shaft.

(7) Install input shaft to output shaft. Use care when mating the two shafts not to displace any output shaft pilot bearing rollers.

OUTPUT SHAFT

DISASSEMBLY

(1) Remove input shaft and output shaft pilot bearing rollers from output shaft.

(2) Measure and note thrust clearance of output shaft gears (Fig. 100). Clearance should be 0.10 – 0.25 mm (0.004 – 0.010 in.).

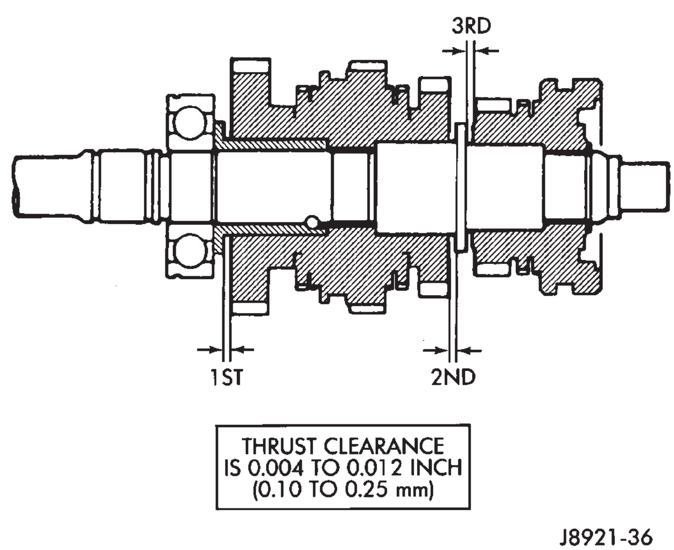


Fig. 100 Check Output Shaft Gear Thrust Clearance

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove output shaft fifth gear snap ring with two screwdrivers (Fig. 101).

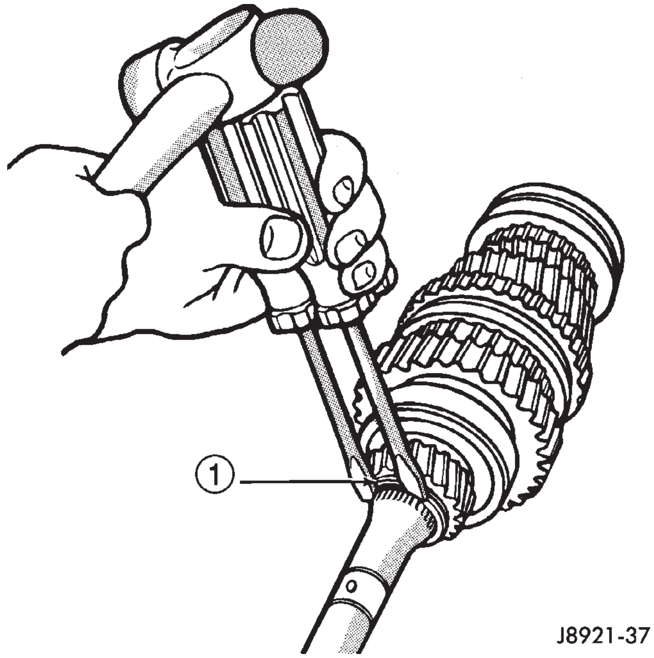


Fig. 101 Remove Fifth Gear Snap-ring

1 – SNAP RING

(4) Using Bearing Splitter P-334 or suitable press plates positioned under first gear, press fifth gear, rear bearing, first gear, and first gear bearing inner race off output shaft (Fig. 102).

(5) Remove first gear needle roller bearing from output shaft.

(6) Remove first gear bearing inner race lock ball with pencil magnet (Fig. 103).

(7) Remove first gear synchronizer ring.

(8) Using Bearing Splitter P-334 or suitable press plates positioned under second gear, press 1–2 synchronizer, reverse gear, and second gear from output shaft (Fig. 104).

(9) Remove second gear needle roller bearing from the output shaft or second gear.

(10) Remove select fit snap-ring holding the 3–4 synchronizer onto the output shaft (Fig. 105).

(11) Using Bearing Splitter P-334 or suitable press plates positioned under third gear, press the 3–4 synchronizer and third gear from output shaft (Fig. 106).

(12) Remove third gear needle roller bearing from output shaft or gear.

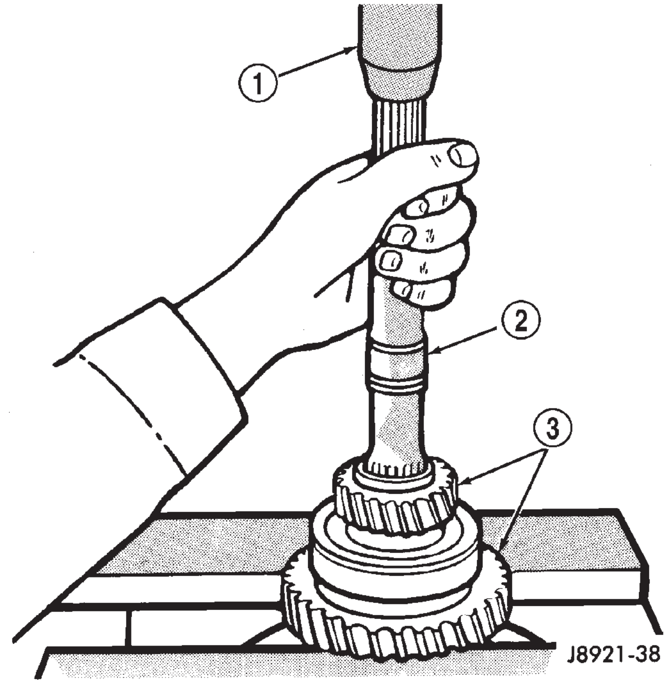


Fig. 102 Remove Fifth Gear, First Gear Bearing, And Race

1 – PRESS RAM
2 – OUTPUT SHAFT
3 – FIRST-FIFTH GEAR-BEARING ASSEMBLY

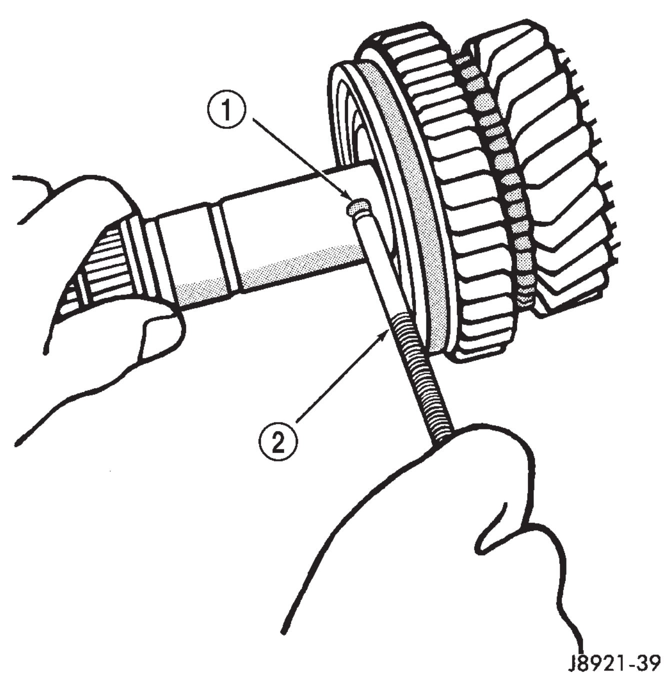


Fig. 103 Remove First Gear Bearing Inner Race Lock Ball

1 – LOCK BALL
2 – PENCIL MAGNET

DISASSEMBLY AND ASSEMBLY (Continued)

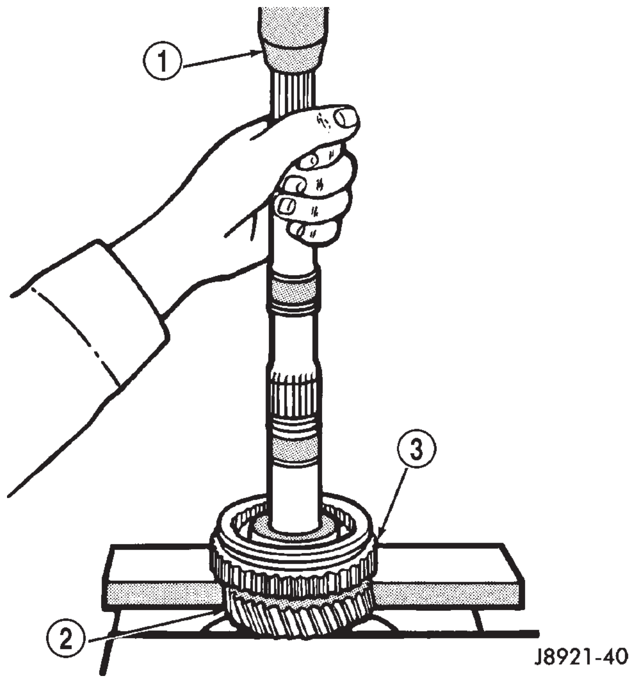


Fig. 104 Remove Second Gear, Reverse Gear, And 1–2 Synchronizer

1 – PRESS RAM
2 – SECOND GEAR
3 – 1–2 SYNCHRONIZER HUB

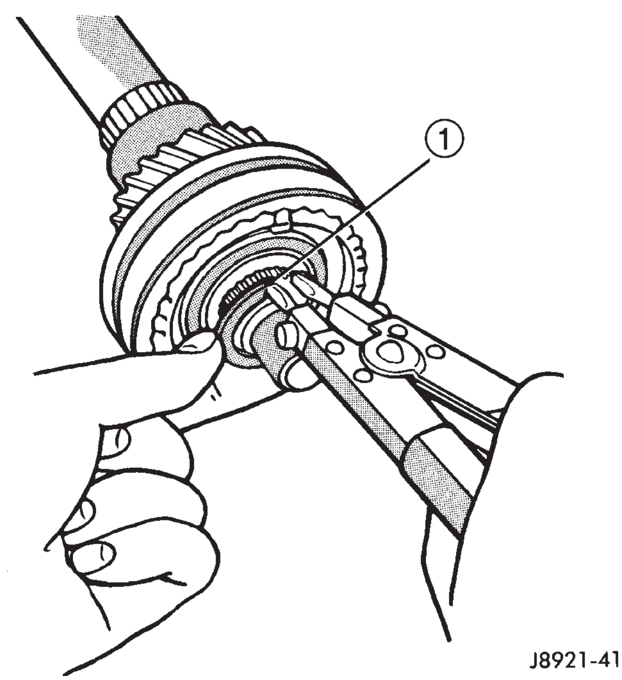


Fig. 105 Remove 3–4 Synchronizer Snap Ring

1 – 3–4 SYNCHRONIZER SNAP RING

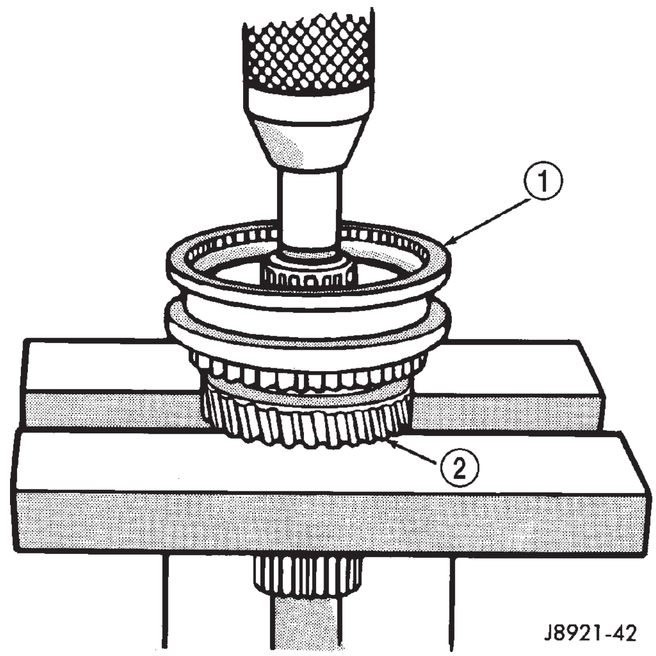


Fig. 106 Remove 3–4 Synchronizer And Third Gear

1 – 3–4 SYNCHRONIZER
2 – THIRD GEAR

ASSEMBLY

TRANSMISSION ASSEMBLY INFORMATION

Lubricate the transmission components with Mopar® 75W–90, GL 3 gear lubricant during assembly. Use petroleum jelly to lubricate seal lips and/or hold parts in place during installation.

Refer to (Fig. 107) during assembly for AX5 gear assembly identification.

(1) Lubricate transmission components with specified gear lubricant.

(2) If necessary, assemble 1–2 and 3–4 synchronizer hubs, sleeves, springs and key inserts (Fig. 108).

(3) Install third gear needle bearing onto the output shaft.

(4) Install third gear over bearing and onto output shaft flange.

(5) Install third gear synchronizer ring to third gear.

(6) Position the 3–4 synchronizer onto the output shaft.

(7) Using Adapter 6747-1A and a shop press, press the 3–4 synchronizer onto the output shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

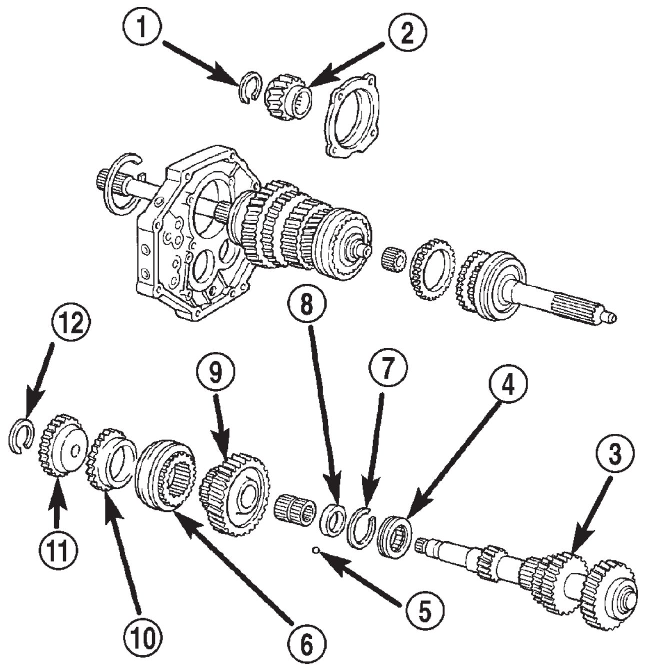


Fig. 107 Geartrain Components

1 – SNAP RING
2 – FIFTH GEAR
3 – COUNTER GEAR
4 – BEARING
5 – LOCK BALL
6 – SYNCHRO HUB/SLEEVE
7 – SNAP RING
8 – SPACER
9 – COUNTER 5TH GEAR
10 – SYNCHRO RING
11 – 5TH SPLINE GEAR
12 – SNAP RING

(8) Select the thickest snap-ring that will fit into the snap-ring groove of the output shaft (Fig. 109).

(9) Install snap-ring to hold 3–4 synchronizer onto output shaft.

(10) Verify third gear thrust clearance with feeler gauge (Fig. 110). Clearance should be 0.10 – 0.25 mm (0.004 – 0.010 in.). If clearance is out of specification, refer to Cleaning and Inspection section within this group.

(11) Install second gear needle bearing onto output shaft.

(12) Install second gear over bearing and onto output shaft flange.

(13) Install second gear synchronizer ring onto second gear.

(14) Position 1–2 synchronizer assembly onto splines of output shaft.

(15) Using Driver MD-998805, Adapter 6747-1A, and a shop press, press the 1–2 synchronizer onto the output shaft.

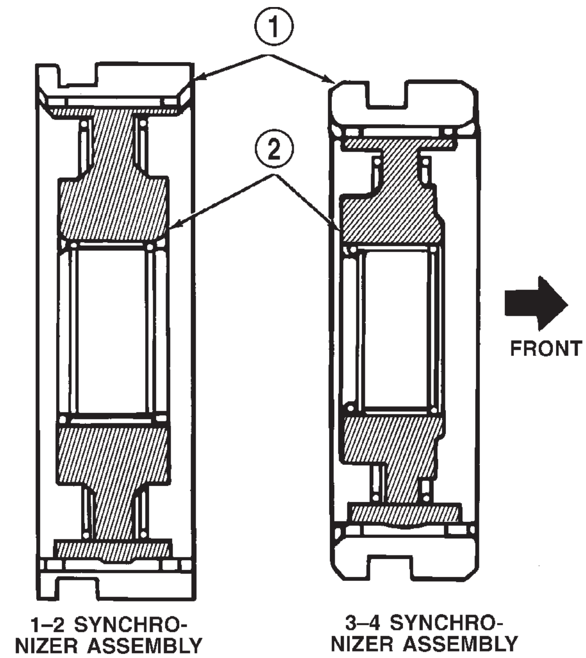
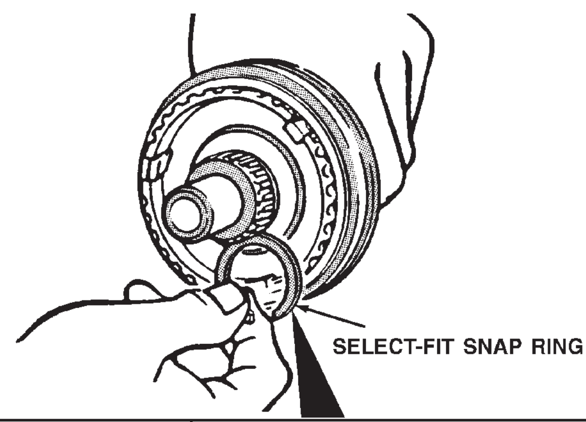


Fig. 108 Synchronizer Identification

1 – SLEEVES
2 – HUBS



I. D. Mark	Snap Ring Thickness mm (in.)
C-1	1.75-1.80 (0.0689-0.0709)
D	1.80-1.85 (0.0709-0.0728)
D-1	1.85-1.90 (0.0728-0.0748)
E	1.90-1.95 (0.0748-0.0768)
E-1	1.95-2.00 (0.0768-0.0787)
F	2.00-2.05 (0.0788-0.0807)
F-1	2.05-2.10 (0.0807-0.0827)

J8921-55

Fig. 109 Select 3–4 Synchronizer Snap-ring

(16) Install first gear synchronizer ring into 1–2 synchronizer.

(17) Install first gear bearing inner race lock ball in output shaft (Fig. 111).

(18) Install first gear needle bearing onto output shaft (Fig. 112).

DISASSEMBLY AND ASSEMBLY (Continued)

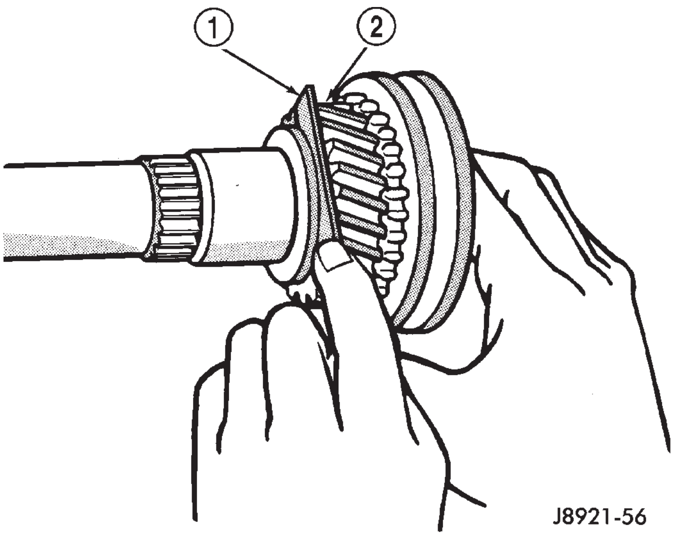


Fig. 110 Check Third Gear Clearance

1 – FEELER GAUGE
2 – THIRD GEAR

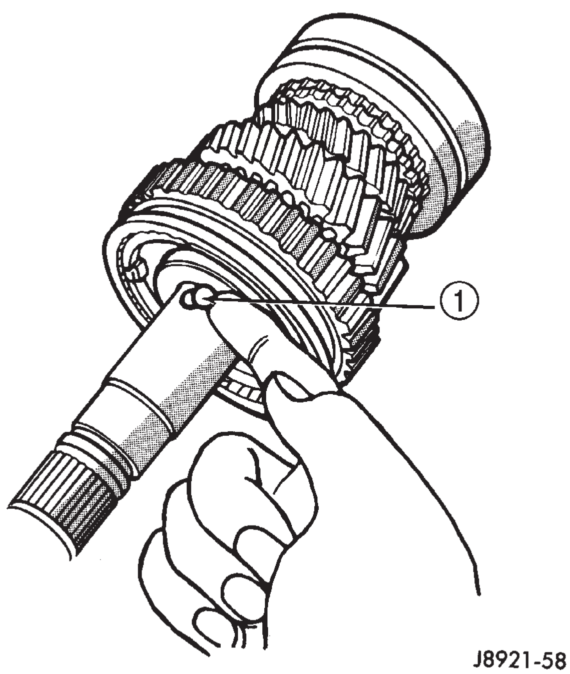


Fig. 111 Install First Gear Bearing Inner Race Lock Ball

1 – FIRST GEAR LOCK BALL

(19) Install first gear onto output shaft and over bearing.

(20) Install first gear bearing inner race onto output shaft and inside first gear bearing. Rotate bearing race until race installs over lock ball.

(21) Position output shaft rear bearing onto output shaft. Ensure that the snap ring groove in bearing outer race is toward rear of output shaft.

(22) Using Driver L-4507 and suitable mallet, drive bearing onto output shaft.

(23) Install snap-ring onto output shaft rear bearing outer race.

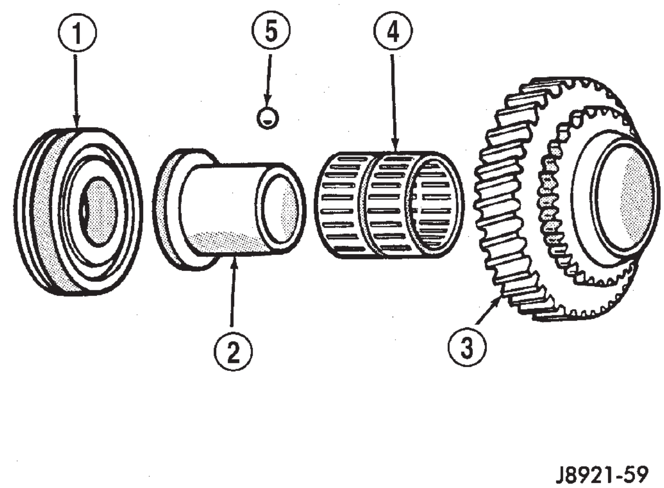


Fig. 112 First Gear Components

1 – REAR BEARING
2 – INNER RACE
3 – FIRST GEAR
4 – NEEDLE BEARING
5 – FIRST GEAR LOCK BALL

(24) Check first–second gear thrust clearance (Fig. 113). Standard clearance is 0.10 – 0.25 mm (0.004 – 0.010 in.). If clearance is out of specification, refer to Cleaning and Inspection section within this group.

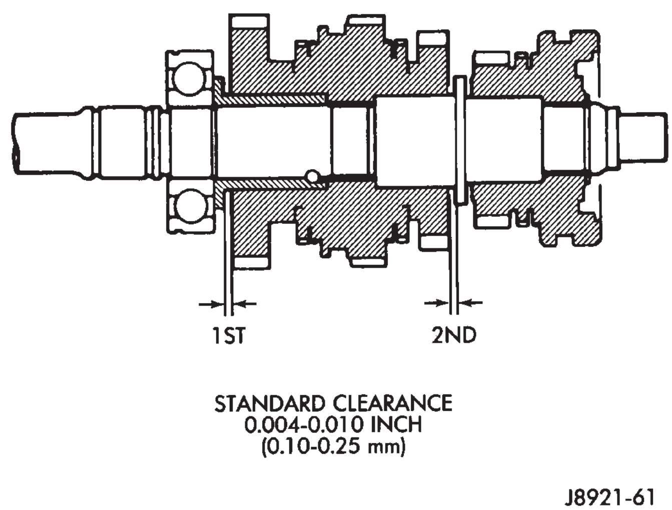


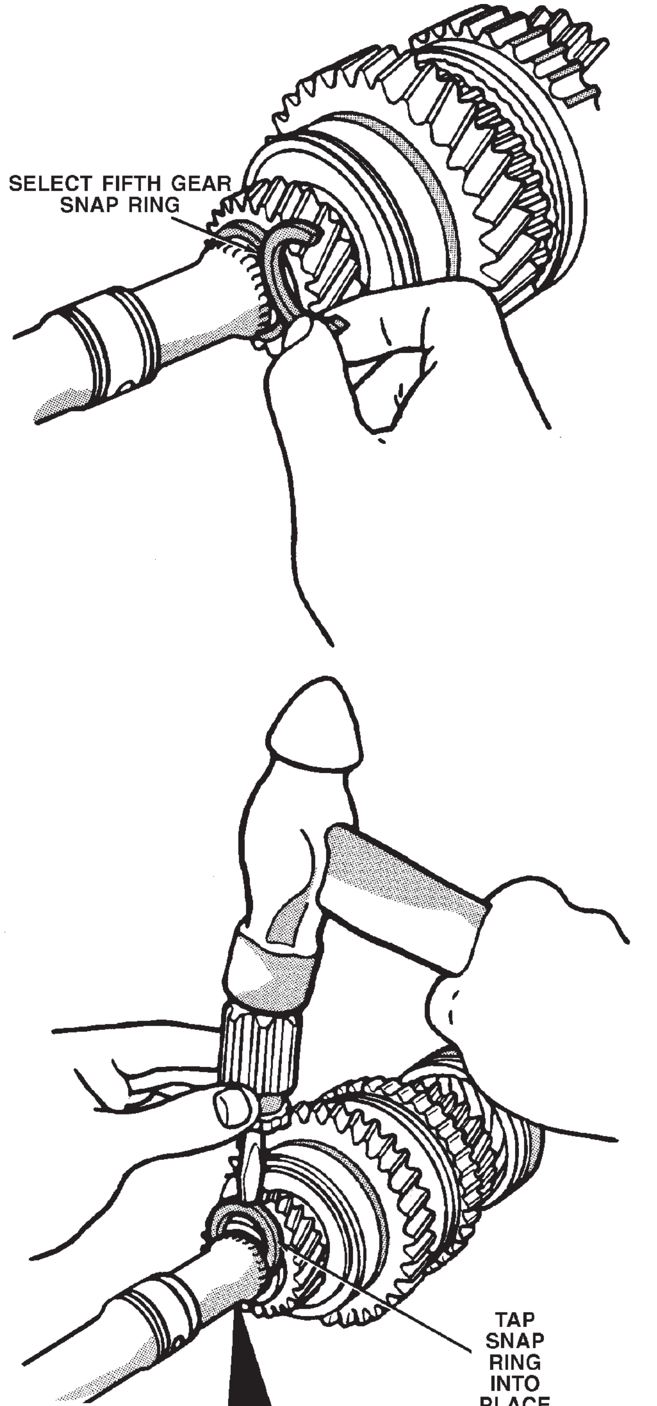
Fig. 113 Check First–Second Gear Thrust Clearance

(25) Position fifth gear onto output shaft with the gear's short shoulder toward the rear of shaft. Ensure that the gear and output shaft splines are aligned.

(26) Using Adapter 6747-1A, Driver L-4507, and a shop press, press fifth gear onto output shaft.

(27) Select the thickest snap-ring that will fit into the snap-ring groove of the output shaft (Fig. 114).

DISASSEMBLY AND ASSEMBLY (Continued)



I. D. Mark	Snap Ring Thickness mm (in.)
A	2.67-2.72 (0.1051-0.1071)
B	2.73-2.78 (0.1075-0.1094)
C	2.79-2.84 (0.1098-0.1118)
D	2.85-2.90 (0.1122-0.1142)
E	2.91-2.96 (0.1146-0.1165)
F	2.97-3.02 (0.1169-0.1189)
G	3.03-3.08 (0.1193-0.1213)
H	3.09-3.14 (0.1217-0.1236)
J	3.15-3.20 (0.1240-0.1260)
K	3.21-3.26 (0.1264-0.1283)
L	3.27-3.32 (0.1287-0.1307)

J8921-63

Fig. 114 Select/Install Fifth Gear Snap Ring

(28) Install snap-ring to hold fifth gear onto output shaft.

SEMI-SYNCHRONIZED REVERSE IDLER GEAR

DISASSEMBLY

(1) Remove snap-ring holding the reverse idler gear onto the reverse idler gear hub/race (Fig. 115).

(2) Remove the plate washer from the reverse idler gear hub/race (Fig. 116).

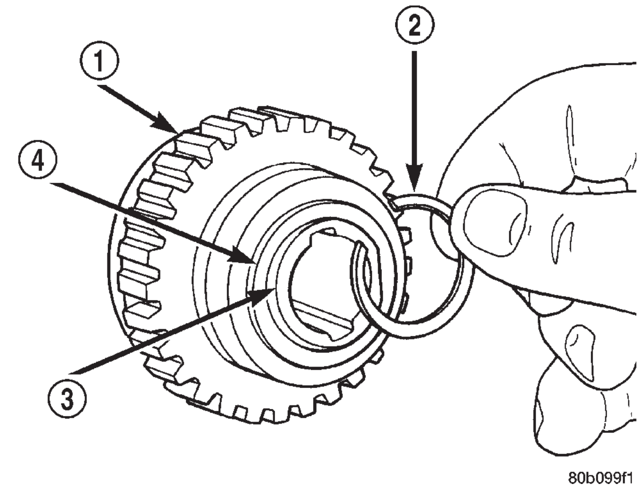


Fig. 115 Remove Reverse Idler Gear Snap-ring

1 – REVERSE IDLER GEAR
2 – SNAP-RING
3 – REVERSE IDLER GEAR HUB
4 – PLATE WASHER

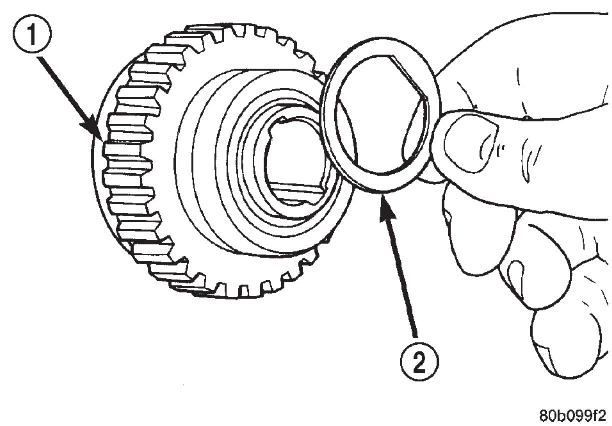


Fig. 116 Remove Reverse Idler Gear Plate Washer

1 – REVERSE IDLER GEAR
2 – PLATE WASHER

(3) Remove the reverse idler gear from the reverse idler gear hub/race (Fig. 117).

(4) Remove the reverse idler gear synchronizer ring from the reverse idler gear hub/race (Fig. 118).

DISASSEMBLY AND ASSEMBLY (Continued)

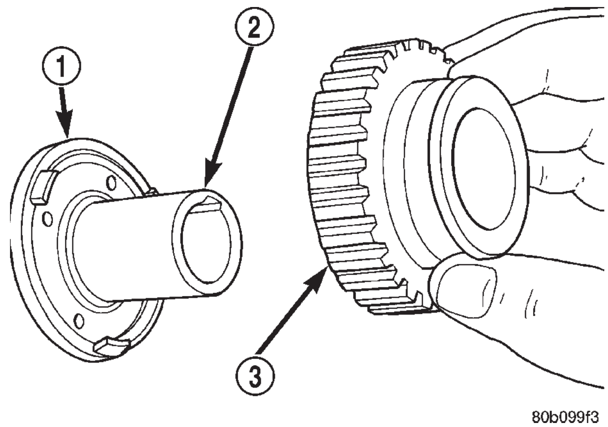


Fig. 117 Remove Reverse Idler Gear

1 – REVERSE SYNCHRONIZER RING
2 – REVERSE IDLER GEAR HUB
3 – REVERSE IDLER GEAR

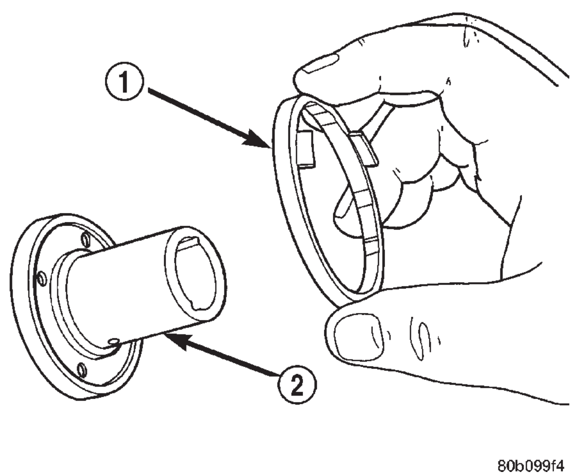


Fig. 118 Remove Reverse Idler Gear Synchronizer Ring

1 – REVERSE SYNCHRONIZER RING
2 – REVERSE IDLER GEAR HUB

ASSEMBLY

(1) Install the reverse idler gear synchronizer ring onto the reverse idler gear hub/race. Apply a film of 75W-90 GL-3 transmission oil to the contact surface of the synchronizer ring prior to assembly.

(2) Install the reverse idler gear onto the reverse idler gear hub/race. Apply a film of 75W-90 GL-3 transmission oil to the reverse idler gear bushing prior to assembly. Verify that the teeth on the synchronizer ring are properly engaged into the recesses of the reverse idler gear.

(3) Install the plate washer over the reverse idler gear hub/race and onto the reverse idler gear.

(4) Install the snap-ring to hold the reerse idler gear onto the reverse idler hub/race.

CLEANING AND INSPECTION

AX5 MANUAL TRANSMISSION COMPONENTS

GENERAL INFORMATION

Clean the transmission components in solvent. Dry the cases, gears, shift mechanism and shafts with compressed air. Dry the bearings with clean, dry shop towels only. Never use compressed air on the bearings. This could cause severe damage to the bearing roller and race surfaces.

If output shaft or inner race flange thickness is within specification but any gear thrust clearance is out of specification, replace the necessary gear and gear needle bearing as an assembly.

GEAR CASE, ADAPTER/EXTENSION HOUSING, INTERMEDIATE PLATE

Clean the case, housing, and intermediate plate with solvent and dry with compressed air. Replace the case if cracked, porous, or if any of the bearing and gear bores are damaged.

Inspect the threads in the case, housing, and plate. Minor thread damage can be repaired with steel thread inserts, if necessary. Do not attempt to repair any threads which show evidence of cracks around the threaded hole.

OUTPUT SHAFT

Check thickness of the output shaft and inner bearing race flanges with a micrometer or vernier calipers (Fig. 119).

- Minimum thickness for shaft flange is 4.80 mm (0.189 in.)
- Minimum thickness for first gear bearing inner race flange is 3.99 mm (0.157 in.)

Measure diameter of the output shaft journal surfaces with a micrometer. Replace the shaft if either of these surfaces are worn beyond specified limits.

- Second gear surface minimum diameter is 37.964 mm (1.495 in.)
- Third gear surface minimum diameter is 34.984 mm (1.377 in.)

Measure diameter of the first gear bearing inner race. Minimum diameter is 38.985 mm (1.535 in.).

Measure output shaft runout with a dial indicator (Fig. 120). Runout should not exceed 0.05 mm (0.002 in.).

Replace output shaft or first gear inner bearing race if measurement of any surface is out of specification. Do not attempt to repair out of specification components.

CLEANING AND INSPECTION (Continued)

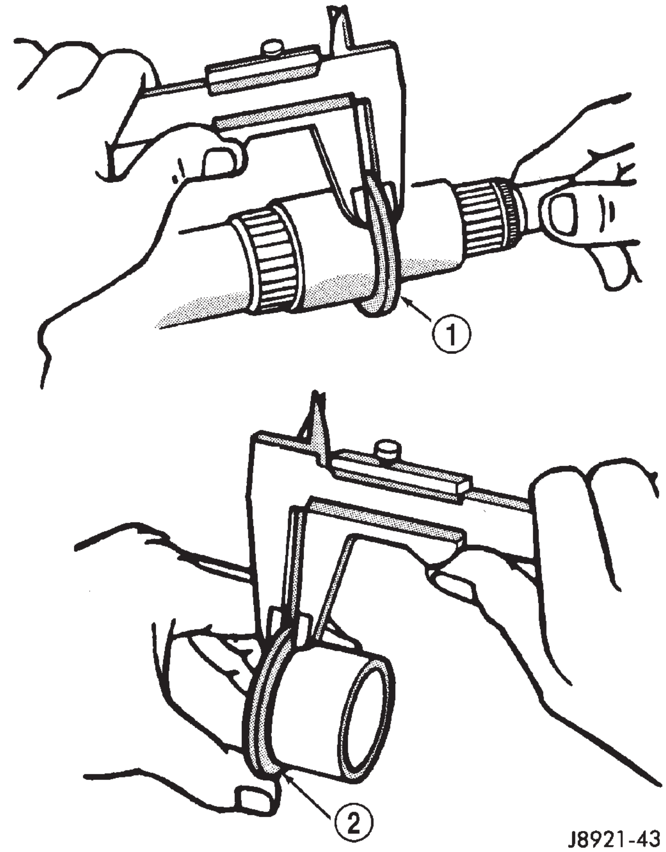


Fig. 119 Check Shaft And Bearing Race Flange Thickness

1 – OUTPUT SHAFT FLANGE
2 – INNER RACE FLANGE

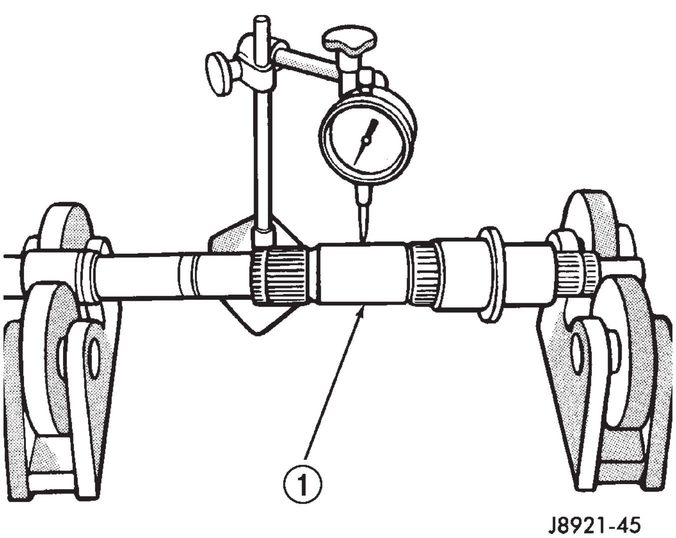


Fig. 120 Check Output Shaft Runout

1 – OUTPUT SHAFT JOURNAL

COUNTERSHAFT

Inspect the countershaft gear teeth. Replace the countershaft if any teeth are worn or damaged. Inspect the bearing surfaces and replace shaft if any surface shows damage or wear.

Check condition of the countershaft front bearing. Replace the bearing if worn, noisy, or damaged.

GEAR AND SYNCHRONIZER

Install the needle bearing and inner race in the first gear. Then check oil clearance between the gear and inner race (Fig. 121). Clearance should be 0.009 – 0.032 mm (0.0004 – 0.0013 in.).

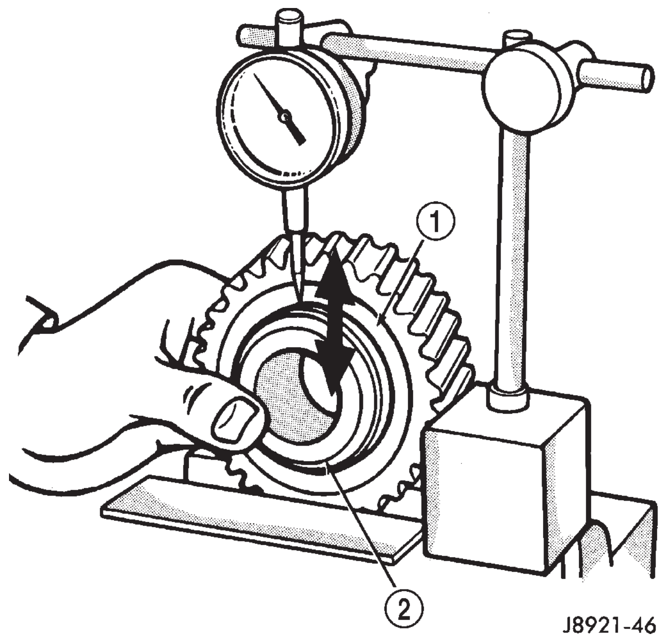


Fig. 121 Check Gear–To–Race Clearance

1 – GEAR
2 – INNER RACE

Install the needle bearings and the second, third and counter fifth gears on the output shaft. Then check oil clearance between the gears and shaft with a dial indicator (Fig. 122). Oil clearance for all three gears is 0.009 – 0.0013 mm (0.0004 – 0.0013 in.).

Check synchronizer ring wear (Fig. 123). Insert each ring in matching gear. Measure clearance between each ring and gear with feeler gauge. Replace ring if clearance exceeds 2.0 mm (0.078 in.).

Check shift fork–to–synchronizer hub clearance with a feeler gauge (Fig. 124). Replace the fork if clearance exceeds 1.0 mm (0.039 in.).

(1) Inspect all mainshaft gear teeth. Replace any gear which shows any worn or damaged teeth.

CLEANING AND INSPECTION (Continued)

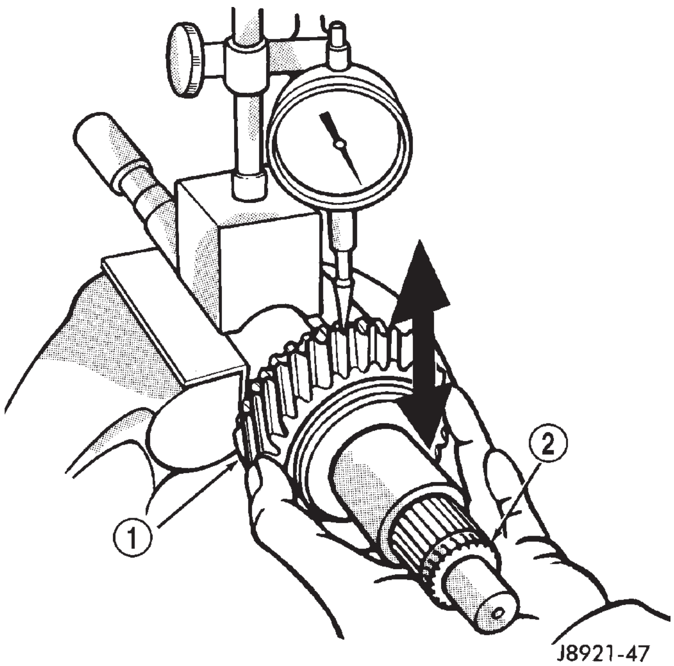


Fig. 122 Check Gear–To–Shaft Oil Clearance

1 – GEAR BEING CHECKED
2 – OUTPUT SHAFT

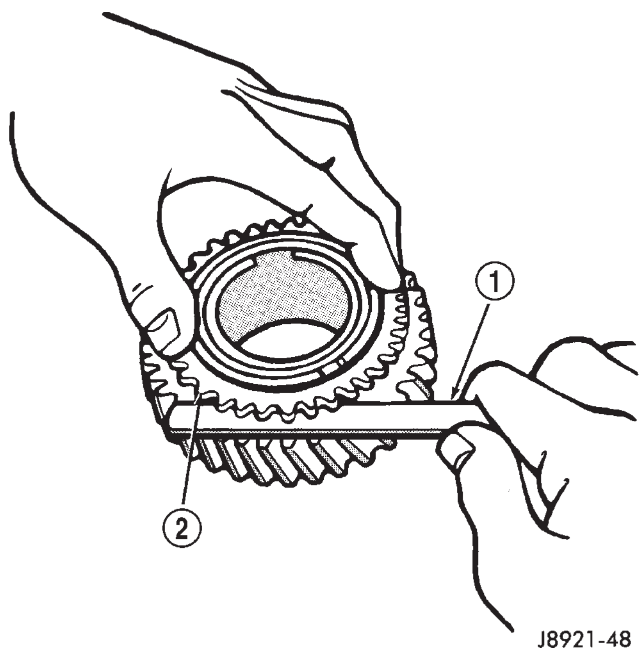


Fig. 123 Check Synchronizer Ring Wear

1 – FEELER GAUGE
2 – SYNCHRONIZER RING

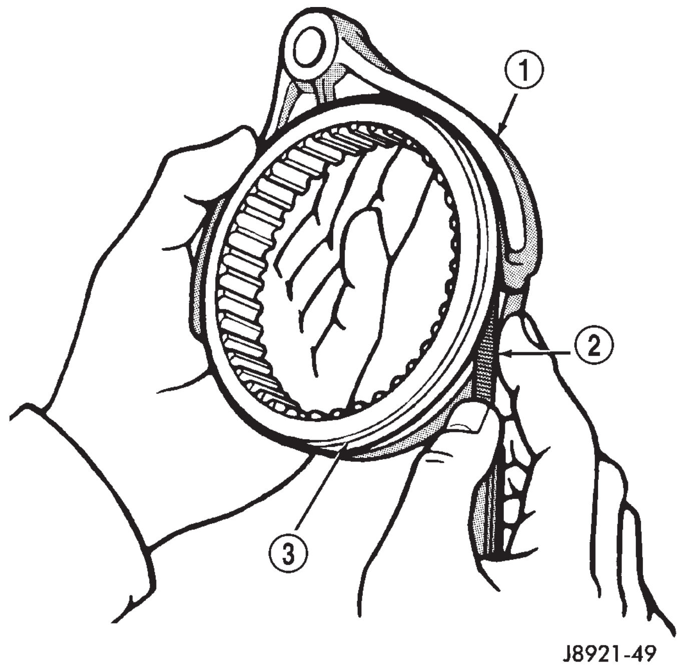


Fig. 124 Check Fork–To–Hub Clearance

1 – SHIFT FORK
2 – FEELER GAUGE
3 – SYNCHRONIZER SLEEVE

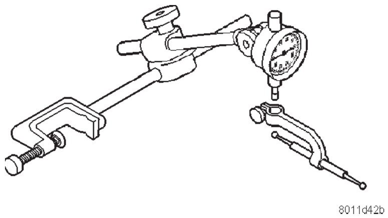
SPECIFICATIONS

TORQUE

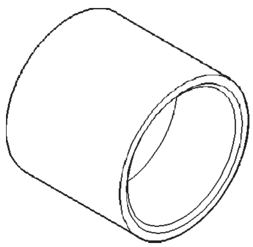
DESCRIPTION	TORQUE
Plugs, Access	19 N·m (14 ft.lbs.)
Bolts, Adapter Housing	34 N·m (25 ft.lbs.)
Switch, Back-up Light	44 N·m (32.5 ft.lbs.)
Plugs, Drain and Fill	44 N·m (32.5 ft.lbs.)
Bolts, Front Bearing Retainer	17 N·m (12 ft.lbs.)
Plugs, Interlock and Detent	19 N·m (14 ft.lbs.)
Screws, Propeller Shaft Clamp	16–23 N·m (140–200 in.lbs.)
Bolts, Rear Mount to Transmission	33–60 N·m (24–44 ft.lbs.)
Nut, Rear Mount Clevis	54–75 N·m (40–55 ft.lbs.)
Nuts, Rear Mount to Crossmember	41–68 N·m (30–50 ft.lbs.)
Pins, Restrictor	27.4 N·m (20 ft.lbs.)
Bolts, Reverse Shift Arm Bracket	18 N·m (13 ft.lbs.)
Screw, Shift Arm Set	38 N·m (28 ft.lbs.)
Screws, Shift Fork Set	20 N·m (15 ft.lbs.)
Nut, Shift Knob	20–34 N·m (15–25 ft.lbs.)
Screws, Shifter Floor Cover	2–3 N·m (17–30 in.lbs.)
Bolts, Shift Tower	18 N·m (13 ft.lbs.)
Nuts, Transfer Case Mounting	30–41 N·m (22–30 ft.lbs.)

SPECIAL TOOLS

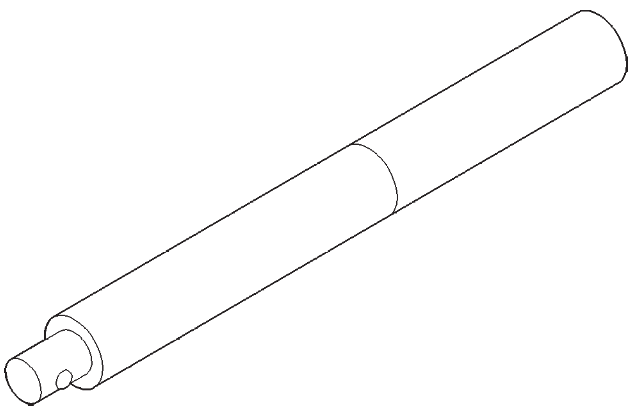
AX5



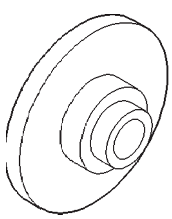
C-3339 Dial Indicator Set



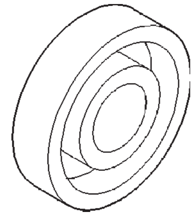
C-3995-A Installer, Extension Housing Seal



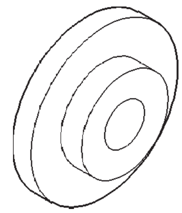
C-4171 Handle, Universal Tool



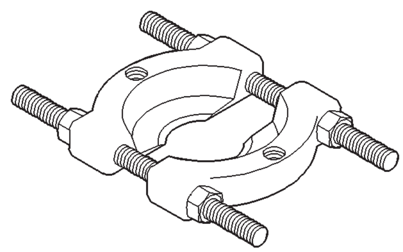
8211 Installer, Seal



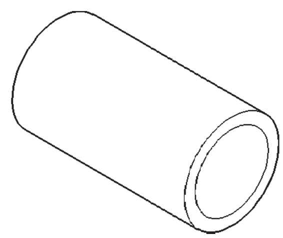
8212 Installer, Seal



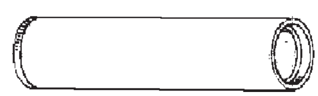
8208 Installer, Seal



P-334 Splitter, Bearing

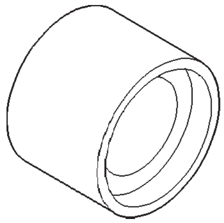


8109 Cup, Installer

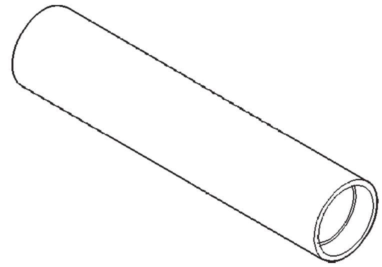


L-4507 Tube, Driver

SPECIAL TOOLS (Continued)



6747–1A Adapter, Fixture



MD-998805 Installer, Seal

NV3550 MANUAL TRANSMISSION

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GENERAL INFORMATION

NV3550 MANUAL TRANSMISSION

DESCRIPTION

The NV3550 is a medium-duty, 5-speed, constant mesh, fully synchronized manual transmission. Fifth gear is an overdrive range with a ratio of 0.78:1. The NV3550 is available in two and four–wheel drive configurations.

The transmission gear case consists of two aluminum housings. The clutch housing is a removable component. It is not an integral part of the transmission front housing.

A combination of roller and ball bearings are used to support the transmission shafts in the two housings. The transmission gears all rotate on caged type needle bearings. A roller bearing is used between the input and output shaft.

The NV3550 has a single shaft shift mechanism with three shift forks all mounted on the shaft. The shaft is supported in the front and rear housings by bushings and one linear ball bearing. Internal shift components consist of the forks, shaft, shift lever socket, and detent components (Fig. 1).

GEAR RATIOS

Gear ratios for the NV3550 are as follows:

RANGE	RATIO
FIRST	4.01:1
SECOND	2.32:1
THIRD =	1.40:1
FOURTH =	1:1
FIFTH =	0.78:1
REVERSE =	3.55:1

IDENTIFICATION

The NV3550 identification and part number bar code tags (Fig. 2) are located on the top of the transmission, forward of the shift tower.

OPERATION

The manual transmission receives power through the clutch assembly from the engine. The clutch disc is splined to the transmission input shaft and is turned at engine speed at all times that the clutch is engaged. The input shaft is connected to the transmission countershaft through the mesh of fourth speed gear on the input shaft and the fourth countershaft gear. At this point, all the transmission gears are spinning.

The driver selects a particular gear by moving the shift lever to the desired gear position. This movement moves the internal transmission shift components to begin the shift sequence. As the shift lever moves the selected shift rail, the shift fork attached to that rail begins to move. The fork is positioned in a groove in the outer circumference of the synchronizer sleeve. As the shift fork moves the synchronizer sleeve, the synchronizer begins to speed-up or slow down the selected gear (depending on whether we are up-shifting or down-shifting). The synchronizer does this by having the synchronizer hub splined to the mainshaft, or the countershaft in some cases, and moving the blocker ring into contact with the gear's friction cone. As the blocker ring and friction cone come together, the gear speed is brought up or down to the speed of the synchronizer. As the two speeds match, the splines on the inside of the synchronizer sleeve become aligned with the teeth on the blocker ring and the friction cone and eventually will slide over the teeth, locking the gear to the mainshaft, or countershaft, through the synchronizer.

GENERAL INFORMATION (Continued)

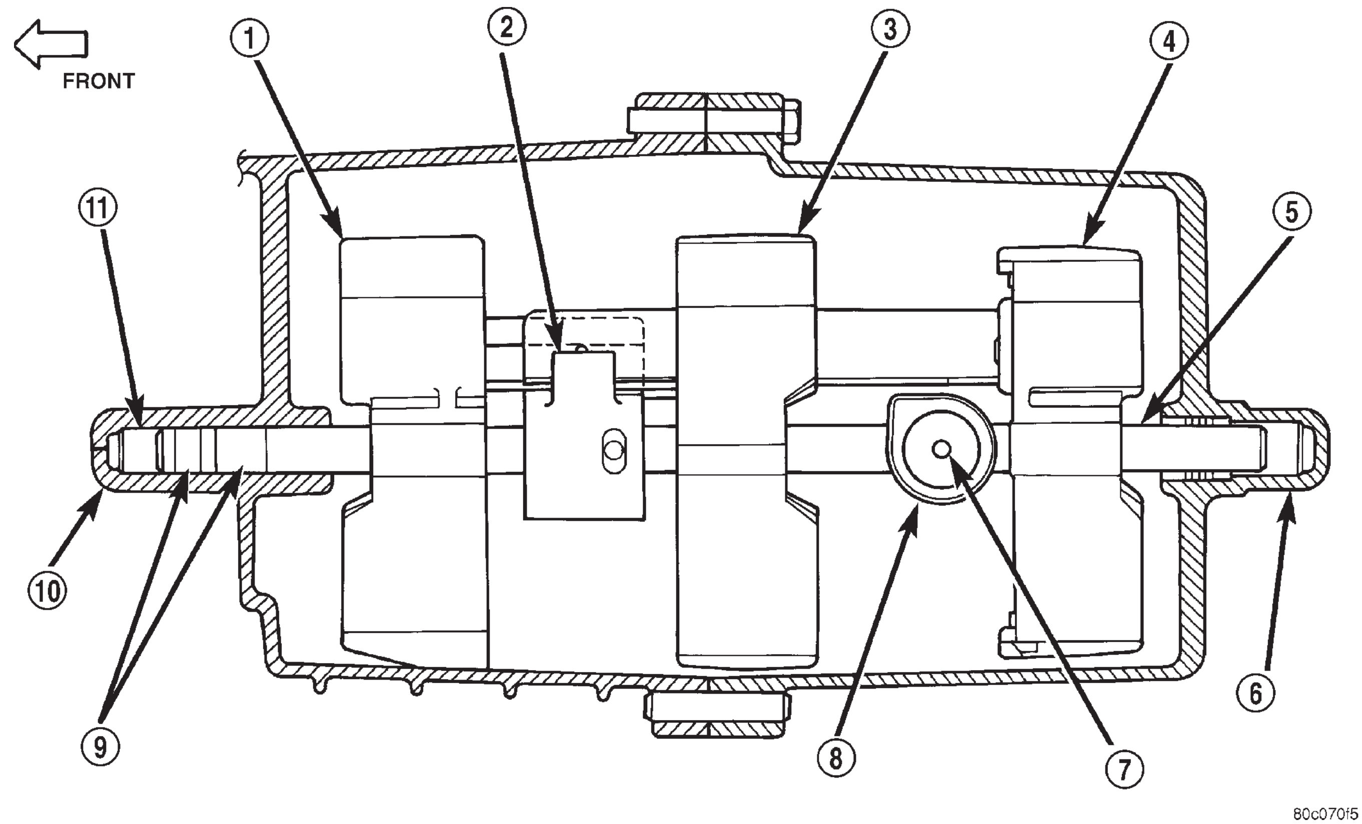


Fig. 1 NV3550 Shift Mechanism

1 – 3-4 FORK
2 – SHIFT SHAFT LEVER AND BUSHING
3 – 1-2 FORK
4 – FIFTH-REVERSE FORK
5 – SHIFT SHAFT
6 – REAR HOUSING
7 – ROLL PIN
8 – SHIFT LEVER SOCKET
9 – SHAFT RAIL DETENTS
10 – FRONT HOUSING
11 – SHIFT SHAFT

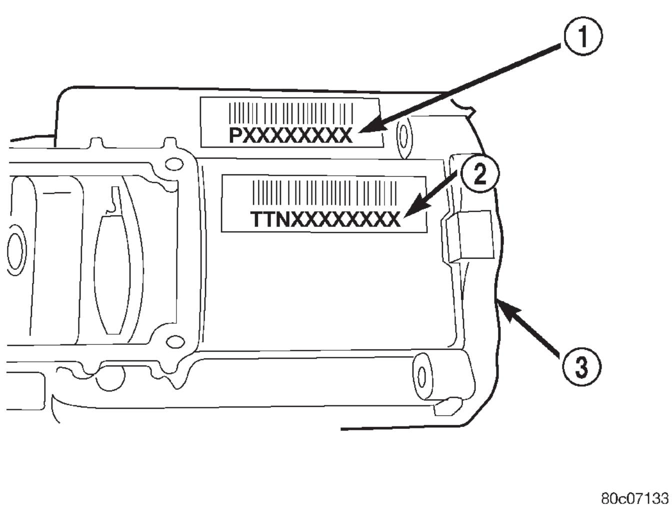


Fig. 2 NV3550 Identification

1 – PART NUMBER TAG
2 – IDENTIFICATION TAG
3 – FRONT OF REAR HOUSING

LUBRICANT

DESCRIPTION

Required lubricant for the NV3550 is Mopar® Manual Transmission Lubricant, P/N 4761526. This is the **only** lubricant to be used in NV3550 transmissions. No other lubricants are acceptable, or recommended.

The correct transmission lubricant level is to the bottom edge of the fill plug hole (Fig. 3).

The transmission must be level to obtain an accurate lubricant level check. A drive–on type of hoist is recommended for this purpose.

Lubricant capacity of the NV3500 is approximately 2.28 liters (4.8 pints). This represents the approximate quantity needed to refill the transmission after a lubricant change or overhaul.

DRAIN AND FILL PLUG LOCATIONS

The NV3550 fill plug is located in the front housing. The drain plug is at the bottom rear of the housing (Fig. 3).

GENERAL INFORMATION (Continued)

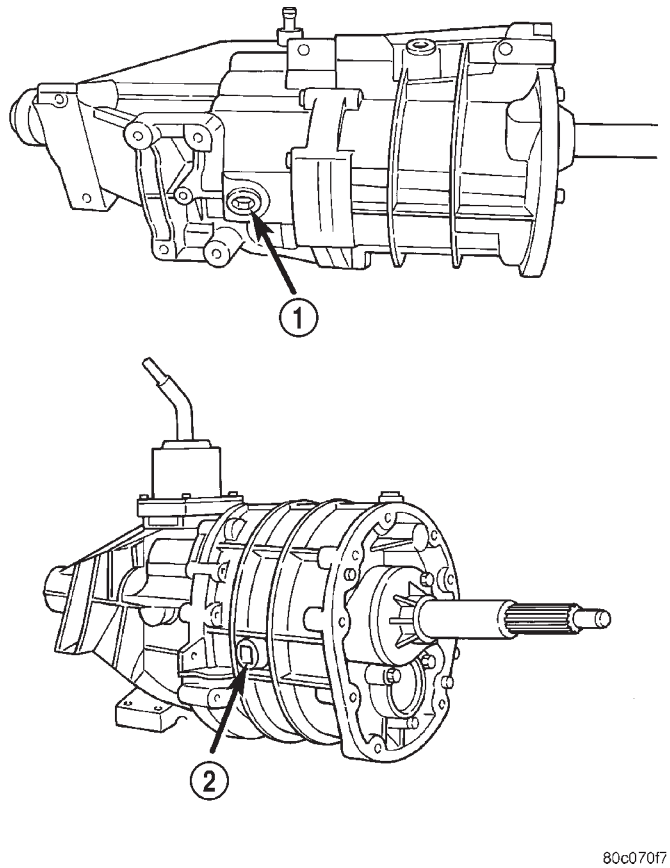


Fig. 3 Drain and Fill Plug Locations

1 – DRAIN PLUG
2 – FILL PLUG

A correct lubricant level check can only be made when the vehicle is level; use a drive–on hoist to ensure this. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an under-or-overfill condition.

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the housings, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non–recommended sealer.

A leak at the front of the transmission will be from either a loose or damaged, front bearing retainer or retainer seal. Lubricant may also drip from the transmission clutch housing after extended operation. If the leak is severe, it will contaminate the clutch disc causing slip, grab and chatter.

Transmissions filled from air or electrically powered lubricant containers can be under filled. Always check the lubricant level after filling to avoid an under fill condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants, transmission component damage, clutch linkage malfunction, or by a damaged clutch pressure plate or disc.

Substantial lubricant leaks can result in gear, shift component, synchro and bearing damage. If a leak goes undetected for an extended period, the first indications of a problem are usually hard shifting and noise.

Incorrect or contaminated lubricants can also contribute to hard shifting. The consequence of using non–recommended lubricants is noise, excessive wear, internal bind and hard shifting.

Improper clutch release is a frequent cause of hard shifting. Incorrect adjustment or a worn, damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result.

Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing stiff and/or noisy shifts. In most cases, this condition will decline as the rings wear in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears can generate a mild whine that may only be audible at extreme speeds.

Severe, obviously audible transmission noise is generally the result of a lubricant problem. Insufficient, improper, or contaminated lubricant can promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL AND INSTALLATION

TRANSMISSION

REMOVAL

(1) Shift transmission into first or third gear.

(2) Remove the floor console and shift boot as necessary to access the bottom of the shift lever at the shift tower attachment.

REMOVAL AND INSTALLATION (Continued)

(3) Install nuts on two M6X1.0 bolts and thread the bolts into the threaded holes at the base of the shift lever.

(4) Tighten the nuts equally until the shift lever loosens on the shift tower stub shaft.

(5) Remove the shift lever from the shift tower.

(6) Raise and support vehicle on suitable safety stands.

(7) Support engine with adjustable jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(8) Remove crossmember/skid plate.

(9) Disconnect necessary exhaust system components.

(10) Remove skid plate, if equipped.

(11) Remove slave cylinder (Fig. 4) from clutch housing.

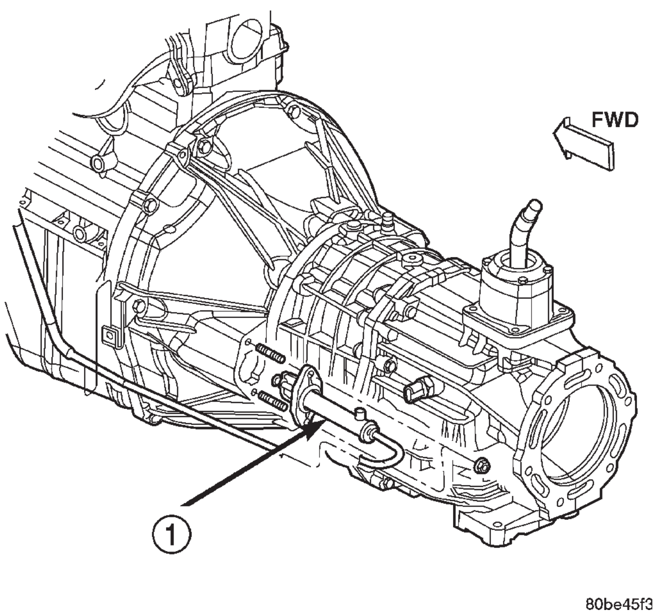


Fig. 4 Slave Cylinder

1 – CLUTCH SLAVE CYLINDER

(12) Mark rear propeller shaft and rear axle yokes for installation alignment (Fig. 5).

(13) Mark front propeller shaft, axle, and transfer case yokes for installation alignment, if equipped.

(14) Remove propeller shaft(s).

(15) Unclip wire harnesses from transmission and transfer case, if equipped.

(16) Disconnect transfer case vent hose, if equipped.

(17) Disengage any wire connectors attached to transmission or transfer case, if equipped, components.

(18) Support transfer case, if equipped, with transmission jack.

(19) Secure transfer case, if equipped, to jack with safety chains.

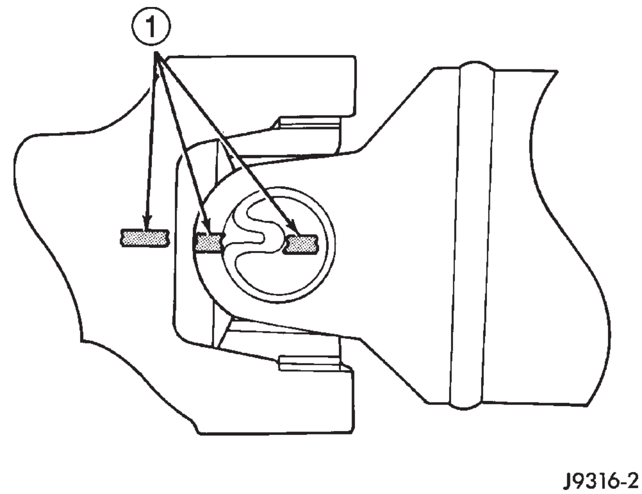


Fig. 5 Marking Propeller Shaft And Axle Yokes

1 – REFERENCE MARKS

(20) Disconnect transfer case shift linkage at transfer case, if equipped.

(21) Remove nuts attaching transfer case to transmission, if equipped.

(22) Remove transfer case, if equipped.

(23) Remove crankshaft position sensor (Fig. 6).

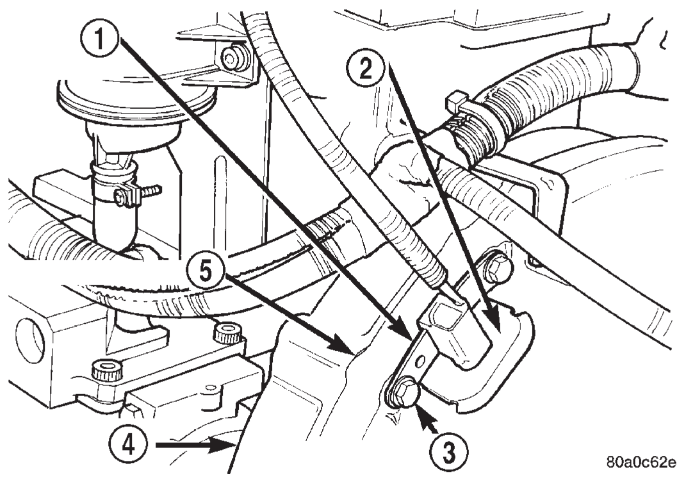


Fig. 6 Crankshaft Position Sensor —2.5 and 4.0L Engine

1 – ENGINE SPEED SENSOR
2 – GROMMET
3 – MOUNTING BOLT(S)
4 – LEFT REAR OF ENGINE
5 – TRANSMISSION

CAUTION: It is important that the crankshaft position sensor be removed prior to transmission removal. The sensor can easily be damaged if left in place during removal operations.

REMOVAL AND INSTALLATION (Continued)

(24) Support engine with adjustable jack stand. Position wood block between jack and oil pan to avoid damaging pan.

(25) Support transmission with transmission jack.

(26) Secure transmission to jack with safety chains.

(27) Disconnect rear cushion and bracket from transmission.

(28) Remove rear crossmember.

(29) Remove clutch housing-to-engine bolts.

(30) Pull transmission jack rearward until input shaft clears clutch. Then slide transmission out from under vehicle.

(31) Remove clutch release bearing, release fork, and retainer clip.

(32) Remove clutch housing from transmission (Fig. 7).

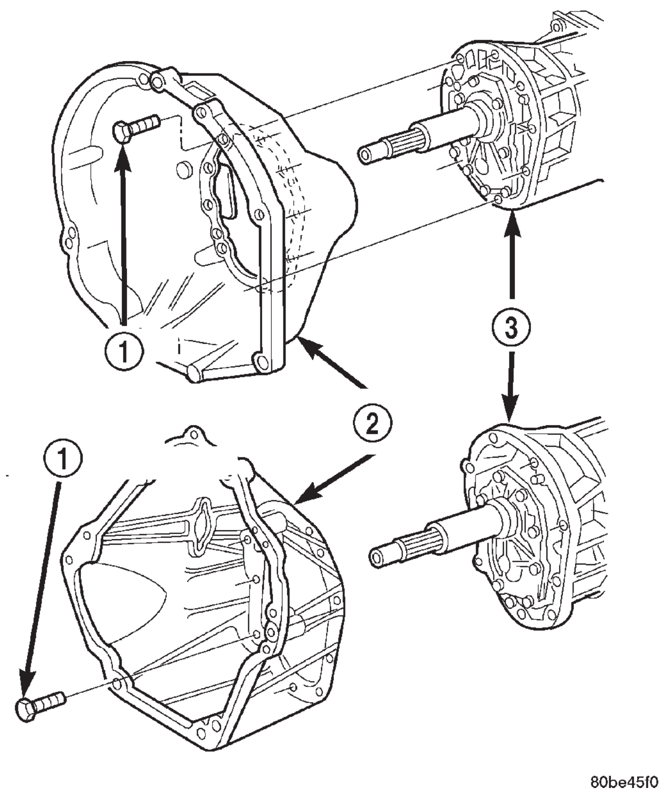


Fig. 7 Clutch Housing

1 – HOUSING-TO-TRANSMISSION BOLTS (46 N·m/34 ft. lbs.)
2 – CLUTCH HOUSING
3 – TRANSMISSION

INSTALLATION

(1) Install clutch housing (Fig. 7) on transmission. Tighten housing bolts to 46 N·m (34 ft. lbs.) torque.

(2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease.

(3) Install release bearing, fork, and retainer clip.

(4) Position and secure transmission on transmission jack.

(5) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar® high temp grease.

(6) Raise transmission and align transmission input shaft and clutch disc splines. Then slide transmission into place.

(7) Install and tighten clutch housing-to-engine bolts to the appropriate torque: **Be sure the housing is properly seated on engine block before tightening bolts.**

- Tighten 3/8” diameter bolts to 37 N·m (27 ft.lbs.).
- Tighten 7/16” diameter bolts to 58 N·m (43 ft.lbs.).
- Tighten M12 bolts to 75 N·m (55 ft.lbs.).

(8) Be sure transmission is in first or third gear.

(9) Install rear crossmember. Tighten crossmember-to-frame bolts to 41 N·m (31 ft. lbs.) torque.

(10) Install fasteners to hold rear cushion and bracket to transmission. Then tighten transmission-to-rear support bolts/nuts to 54 N·m (40 ft. lbs.) torque.

(11) Remove support stands from engine and transmission.

(12) Install and connect crankshaft position sensor.

(13) Position transfer case on transmission jack, if equipped.

(14) Secure transfer case to jack with safety chains, if equipped.

(15) Raise transfer case, if equipped, and align transfer case input shaft to the transmission output shaft.

(16) Slide transfer case forward until case is seated on transmission, if necessary.

(17) Install nuts to attach transfer case to transmission, if equipped. Tighten transfer case-to-transmission nuts to 35 N·m (26 ft. lbs.) torque.

(18) Connect transfer case shift linkage at transfer case, if equipped.

(19) Connect transfer case vent hose, if equipped.

(20) Secure wire harnesses in clips/tie straps on transmission and transfer case, if equipped.

(21) Engage wire connectors attached to all necessary transmission or transfer case, if equipped, components.

(22) Install rear propeller shaft slip yoke to transmission or transfer case, if equipped, output shaft.

(23) Align marks on rear propeller shaft and rear axle yokes (Fig. 8).

(24) Install and tighten propeller shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(25) Align marks on front propeller shaft, axle, and transfer case yokes, if equipped.

(26) Install and tighten propeller shaft U–joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(27) Install slave cylinder in clutch housing.

REMOVAL AND INSTALLATION (Continued)

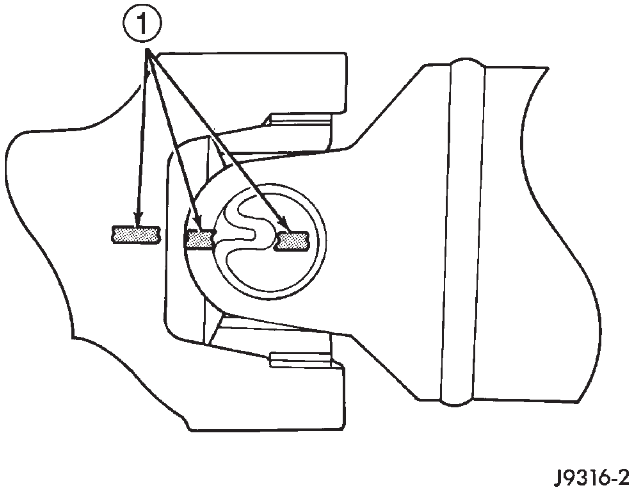


Fig. 8 Align Propeller Shaft And Rear Axle Yokes Alignment Marks

1 – REFERENCE MARKS

(28) Install skid plate, if equipped. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(29) Fill transmission and transfer case, if equipped, with recommended lubricants. Refer to the Lubricant Recommendation sections of the appropriate component for correct fluid.

(30) Lower vehicle.

(31) Install nuts on two M6X1.0 bolts and thread the bolts into the threaded holes at the base of the shift lever.

(32) Tighten the nuts equally until the shift lever will slide over the shift tower stub shaft.

(33) Install the floor console and shift boot.

SHIFT TOWER

REMOVAL

(1) Shift transmission into Neutral.

(2) Unscrew and remove the shift lever extension from the shift

(3) Remove any floor console components necessary to access the transmission shift tower.

(4) Remove the bolts holding the shift tower to the isolator plate and transmission gear case.

(5) Remove the shift tower (Fig. 9) from the transmission.

INSTALLATION

(1) Shift transmission into third gear.

(2) Clean the mating surfaces of shift tower and transmission gear case with suitable wax and grease remover.

(3) Install the shift tower onto the transmission case. No sealant is necessary between the shift tower and transmission case.

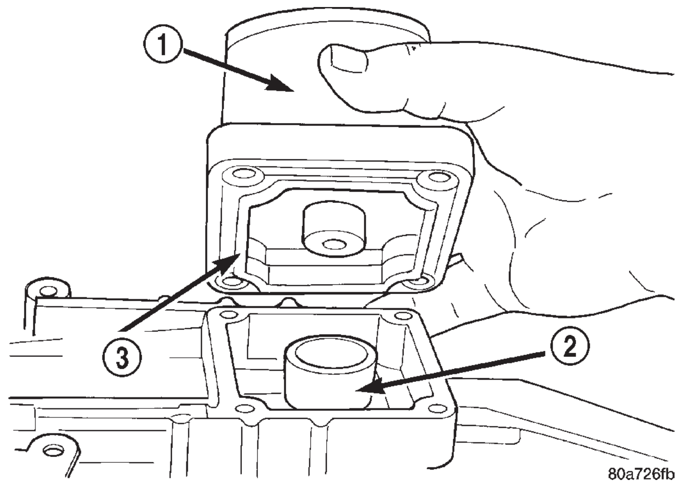


Fig. 9 Remove Shift Tower

1 – SHIFT TOWER AND LEVER ASSEMBLY
2 – SHIFT SOCKET
3 – SEAL

(4) Install the bolts to hold the shift tower to the isolator plate and the transmission gear case. Tighten the shift tower bolts to 8.5 N·m (6.3 ft. lbs.).

(5) Install the shift lever extension and any floor console components previously removed.

YOKE SEAL—2WD

REMOVAL

(1) Raise vehicle.

(2) Mark propeller shaft and axle yoke for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Seal Remover C-3985-B (Fig. 10) from transmission housing.

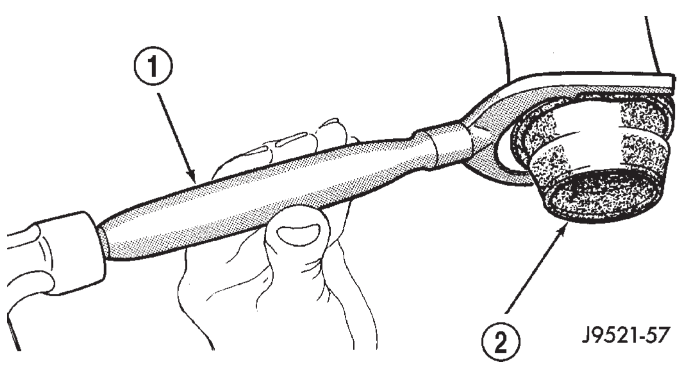


Fig. 10 Removing Transmission Housing Yoke Seal

1 – SPECIAL TOOL C-3985–B
2 – SEAL

INSTALLATION

(1) Place seal in position on transmission housing.

(2) Drive seal into transmission housing with Seal Installer C-3972-A (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines.

(4) Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

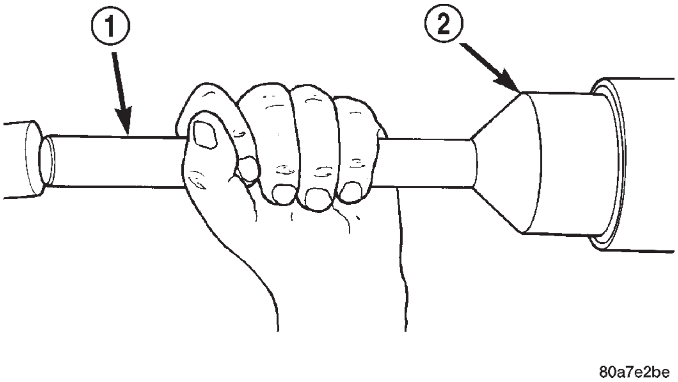


Fig. 11 Installing Transmission Housing Yoke Seal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

REAR HOUSING YOKE BUSHING

REMOVAL

(1) Remove housing yoke seal.

(2) Insert Remover 6957 into rear housing. Tighten tool to bushing and remove bushing (Fig. 12).

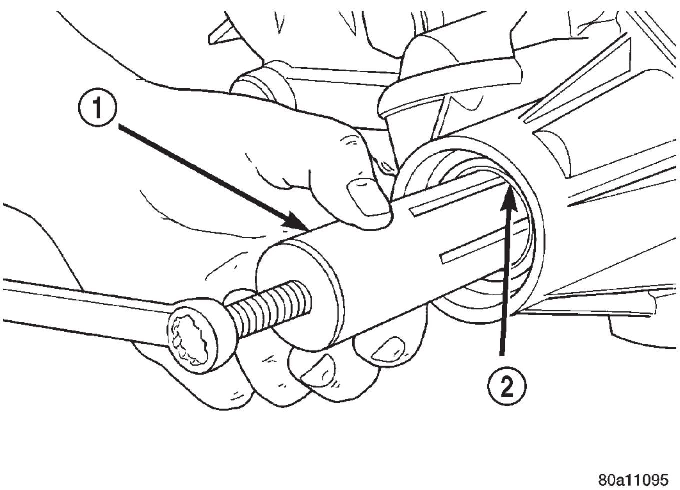


Fig. 12 Bushing Removal—Typical

1 – REMOVER 6957
2 – EXTENSION HOUSING BUSHING

INSTALLATION

(1) Align bushing oil hole with oil slot in rear housing.

(2) Tap bushing into place with Installer 6951 and Handle C-4171.

(3) Install new oil seal in housing using Seal Installer C-3972–A (Fig. 13).

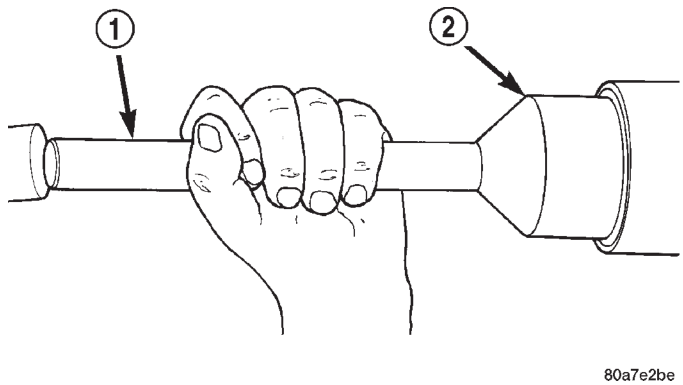


Fig. 13 Rear Housing Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3972–A

DISASSEMBLY AND ASSEMBLY

TRANSMISSION

DISASSEMBLY

FRONT HOUSING

(1) If necessary, temporarily reinstall shift lever assembly. Shift transmission into Neutral.

(2) If lubricant was not drained out of transmission during removal, remove drain plug and drain lubricant into container at this time.

(3) Inspect drain plug magnet for debris.

(4) Remove backup light switch. Switch is located on passenger side of rear housing (Fig. 14).

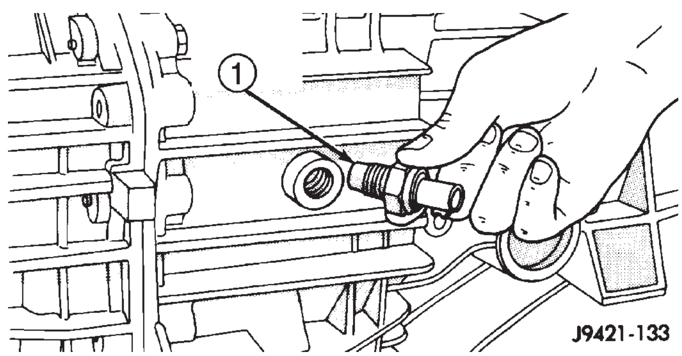


Fig. 14 Backup Light Switch Location

1 – BACKUP LIGHT SWITCH

(5) If necessary, remove shift tower bolts and remove tower and lever assembly (Fig. 15).

(6) Remove shift shaft lock bolt (Fig. 16). Bolt is located at top of front housing just forward of shift tower. Bolt is a shoulder bolt that secures the shift shaft bushing and lever.

(7) Use Remover 8117 and suitable slide hammer to remove shift shaft detent plug.

DISASSEMBLY AND ASSEMBLY (Continued)

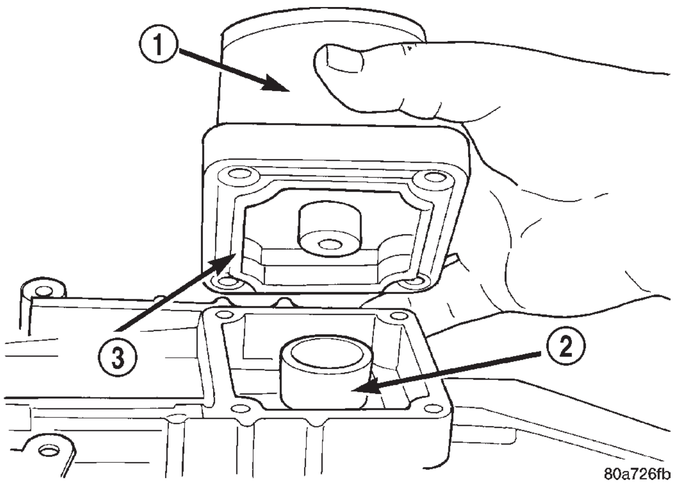


Fig. 15 Shift Tower Removal

1 – SHIFT TOWER AND LEVER ASSEMBLY
2 – SHIFT SOCKET
3 – SEAL

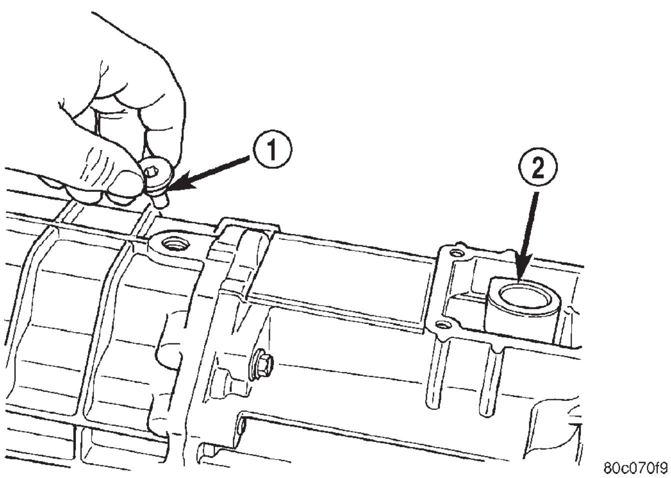


Fig. 16 Shift Shaft Lock Bolt Removal

1 – SHIFT SHAFT LOCK BOLT
2 – SHAFT SOCKET

(8) Remove shift shaft detent plunger and spring (Fig. 17). Use pencil magnet to remove spring then plunger, if necessary.

(9) Remove bolts attaching input shaft bearing retainer to front housing (Fig. 18).

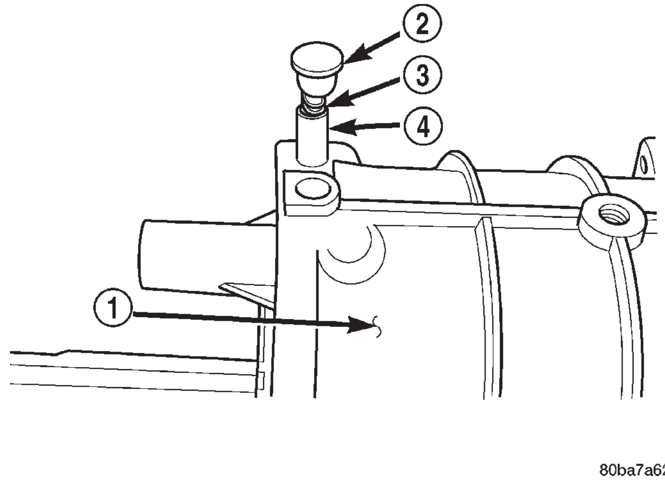


Fig. 17 Detent Plunger And Spring Removal

1 – FRONT HOUSING
2 – PLUG
3 – SPRING
4 – PLUNGER

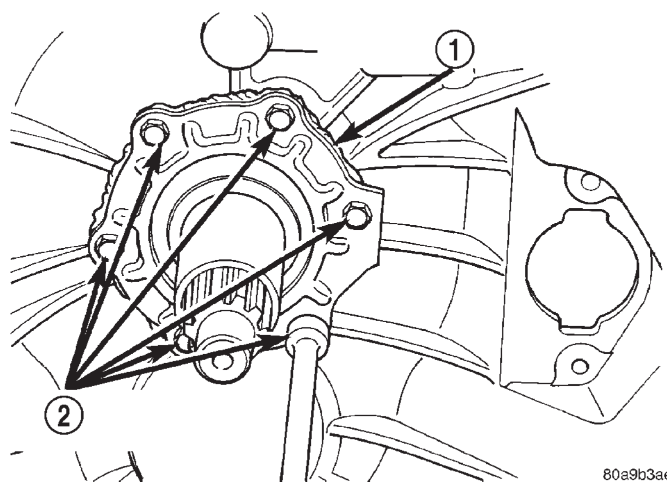


Fig. 18 Input Shaft Bearing Retainer Bolt Removal—Typical

1 – INPUT SHAFT BEARING RETAINER
2 – RETAINER BOLTS

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Remove input shaft bearing retainer. Use pry tool to carefully lift retainer and break sealer bead (Fig. 19).

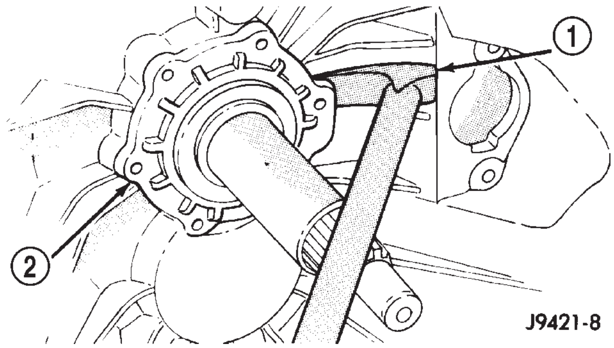


Fig. 19 Loosening Bearing Retainer Sealer Bead—Typical

1 – PRY TOOL
2 – INPUT SHAFT BEARING RETAINER

(11) Remove bearing retainer from input shaft (Fig. 20).

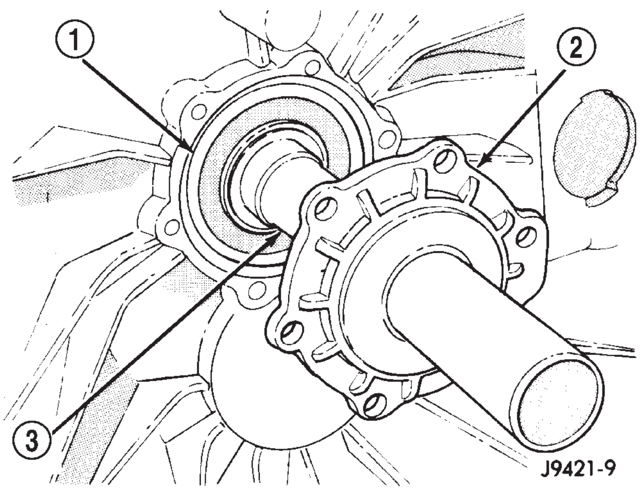


Fig. 20 Input Shaft Bearing Retainer Removal—Typical

1 – SHAFT BEARING
2 – BEARING RETAINER
3 – INPUT SHAFT

(12) Remove snap ring that secures input shaft in front bearing (Fig. 21).

(13) Remove bolts that attach front housing to rear housing (Fig. 22). Three bolts at extreme rear of housing are actually for the output shaft bearing retainer. It is not necessary to remove all three bolts at this time. Leave at least one bolt in place until geartrain is ready to be removed from case.

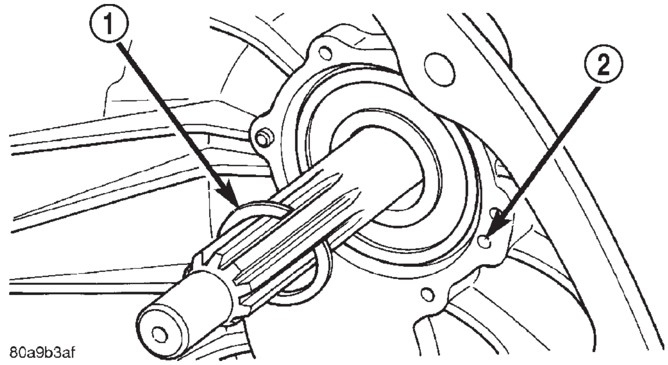


Fig. 21 Input Shaft Snap Ring Removal—Typical

1 – INPUT SHAFT SNAP RING
2 – OIL FEED

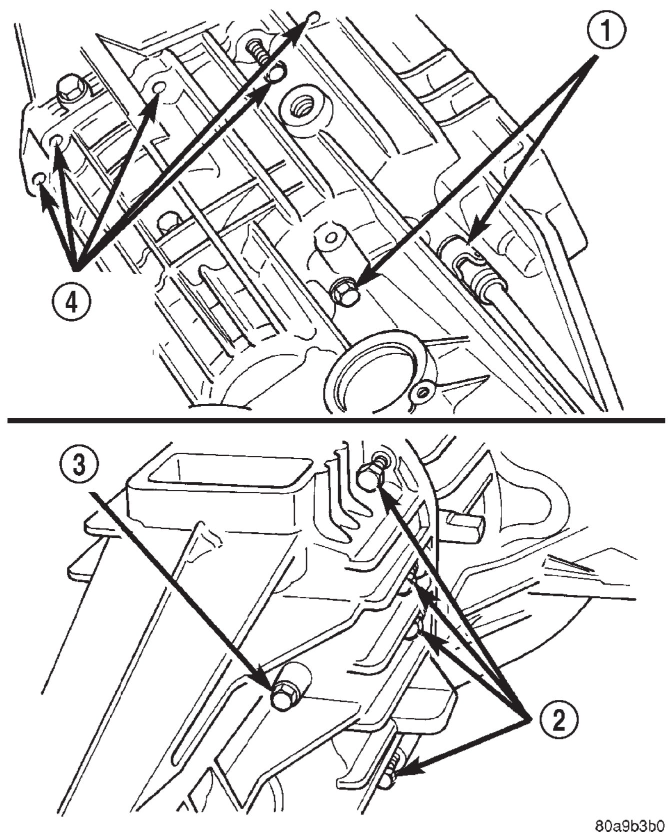


Fig. 22 Housing And Bearing Retainer Bolt Locations

1 – RETAINER BOLTS
2 – HOUSING BOLTS
3 – RETAINER BOLT
4 – HOUSING BOLT LOCATIONS

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Separate front housing from rear housing (Fig. 23). Use plastic mallet to tap front housing off alignment dowels.

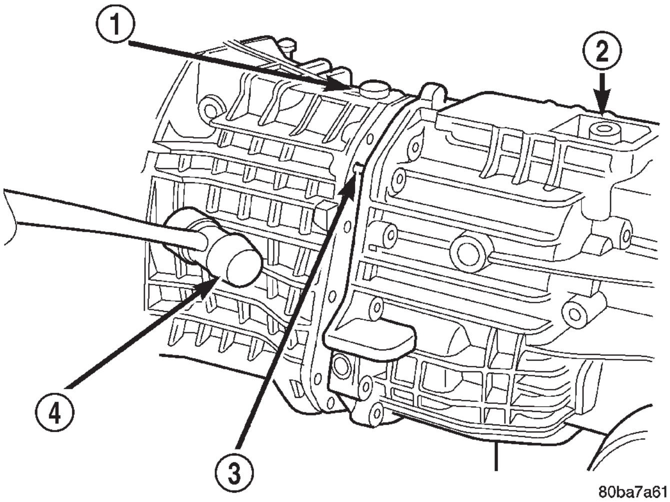


Fig. 23 Front Housing Removal

1 – FRONT HOUSING
2 – REAR HOUSING
3 – DOWELS (2)
4 – PLASTIC MALLET

(15) Remove and inspect input shaft bearing. Inspect countershaft front bearing race (Fig. 24).

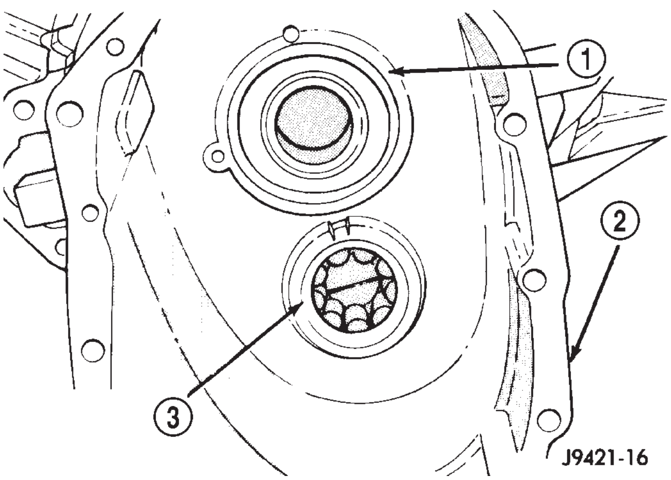


Fig. 24 Input Shaft Bearing and Countershaft Front Bearing Race Location

1 – INPUT SHAFT BEARING
2 – FRONT HOUSING
3 – COUNTERSHAFT FRONT BEARING

(16) Note position of input shaft, shift shaft and forks, and geartrain components in housing (Fig. 25).

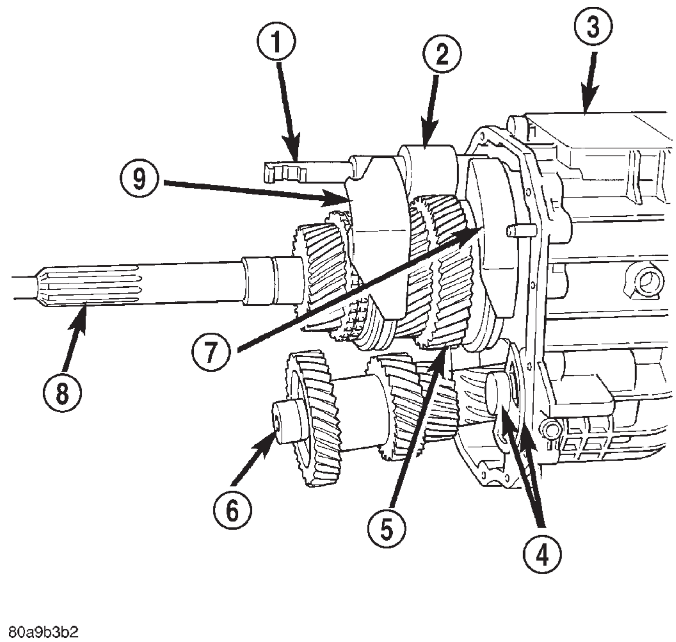


Fig. 25 Geartrain And Shift Component Identification

1 – SHIFT SHAFT
2 – BUSHING
3 – REAR HOUSING
4 – REVERSE IDLER AND SUPPORT
5 – OUTPUT SHAFT AND GEARS
6 – COUNTERSHAFT
7 – 1–2 FORK
8 – INPUT SHAFT
9 – 3–4 FORK

SHIFT SHAFT, SHIFT FORKS AND REVERSE IDLER SEGMENT

(1) Unseat the roll pin that secures the shift socket tot he shift shaft with Special Tool 6858 as follows:

(a) Position Tool 6858 on the shift shaft. Center the tool over the roll pin and verify that the tool legs are firmly seated on the shift socket (Fig. 26).

(b) Tilt the socket toward the side of the case. This positions the roll pin at a slight angle to avoid trapping the pin between the gear teeth.

(c) Tighten the tool punch to press the roll pin downward and out of the shift socket (Fig. 26). The roll pin does not have to be completely removed from the shift socket. The roll pin must only be clear of the shift shaft. Be careful not to push the pin into the geartrain.

(2) Using a hammer and suitable punch, drive out roll pin that secures shift bushing and lever to shift shaft (Fig. 27).

NOTE: Be sure to use the proper size punch to avoid bending the shift shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

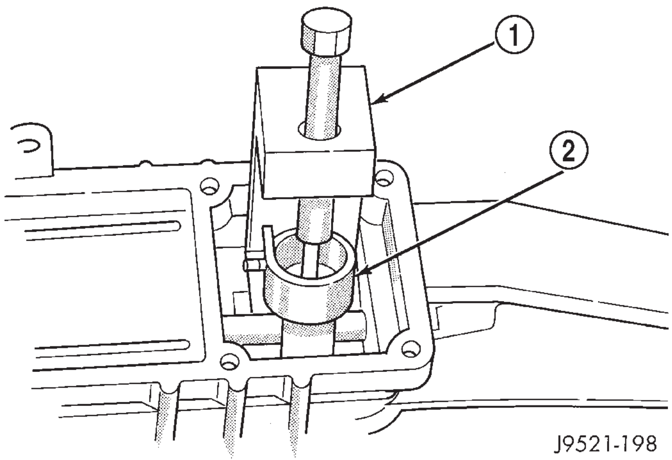


Fig. 26 Removing the Shift Socket Roll Pin

1 – SPECIAL TOOL 6858
2 – SHIFT SOCKET

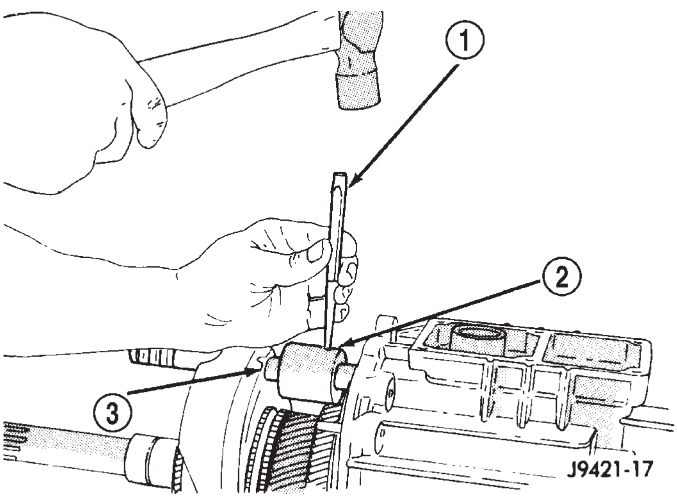


Fig. 27 Removing Shift Shaft Lever And Bushing Roll Pin

1 – PIN PUNCH
2 – BUSHING AND LEVER
3 – SHIFT SHAFT

(3) Pull shift shaft straight out of rear housing, shift socket, fifth-reverse fork, and 1-2 fork (Fig. 28).

(4) Remove shift socket from rear housing (Fig. 29).

(5) Remove lever and bushing (Fig. 30).

(6) Remove 3-4 fork. Rotate 3-4 fork around synchro sleeve until fork clears shift arms on 1-2 and fifth-reverse forks. Then remove 3-4 fork (Fig. 31).

(7) Remove the reverse idler shaft support bolt (front bolt) (Fig. 32).

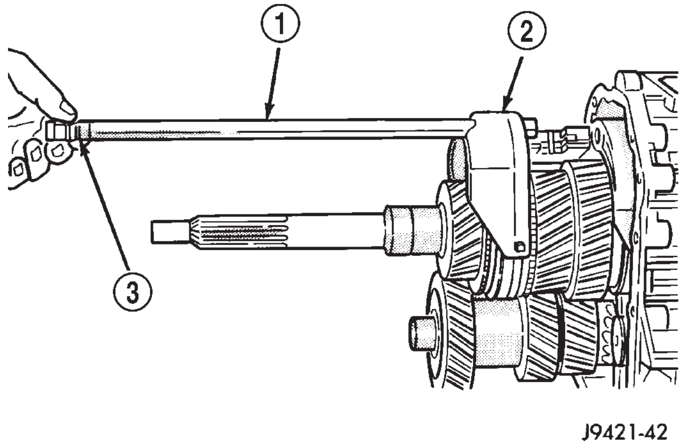


Fig. 28 Shift Shaft Removal

1 – SHIFT SHAFT
2 – 3–4 FORK
3 – SHAFT DETENT NOTCHES

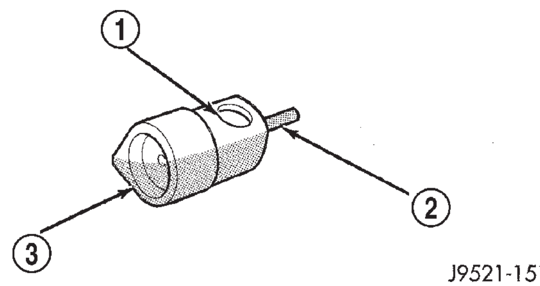


Fig. 29 Shift Socket And Roll Pin

1 – SHAFT BORE
2 – ROLL PIN
3 – SHIFT SOCKET

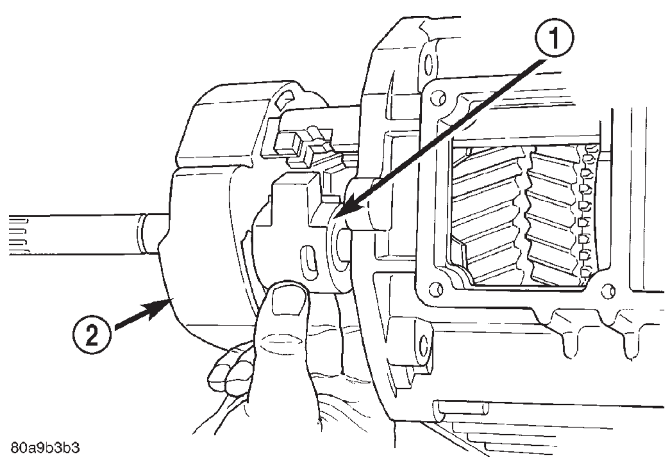


Fig. 30 Removing Shift Shaft Lever And Bushing

1 – SHAFT LEVER AND BUSHING
2 – 3–4 FORK

DISASSEMBLY AND ASSEMBLY (Continued)

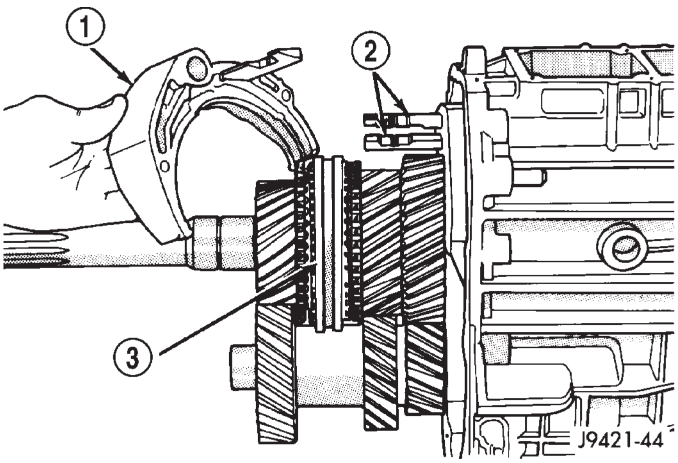


Fig. 31 Removing 3-4 Shift Fork

1 – 3–4 FORK
2 – 1–2 AND 5TH-REVERSE FORK ARMS
3 – 3–4 SYNCHRO SLEEVE

(8) Loosen rear reverse idler shaft bolt (rear bolt) (Fig. 32).

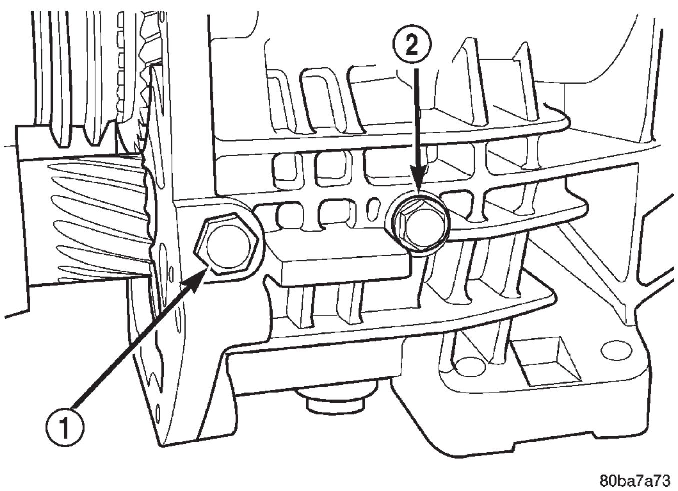


Fig. 32 Reverse Idler Shaft/Support Bolts

1 – SUPPORT BOLT
2 – SHAFT BOLT

(9) Remove reverse idler shaft support segment by sliding it straight out of housing.

(10) Support geartrain and rear housing on Assembly Fixture Tool 6747 as follows:

(a) Adjust height of reverse idler pedestal rod until the reverse idle shaft bottoms in Cup 8115.

(b) Position Adapters 6747-1A and 6747-2A on Assembly Fixture 6747.

(c) Slide fixture tool onto input shaft, countershaft and idler gear (Fig. 33).

(d) Stand geartrain and rear housing upright on fixture (Fig. 34). Have helper hold fixture tool in place while housing and geartrain is being rotated into upright position.

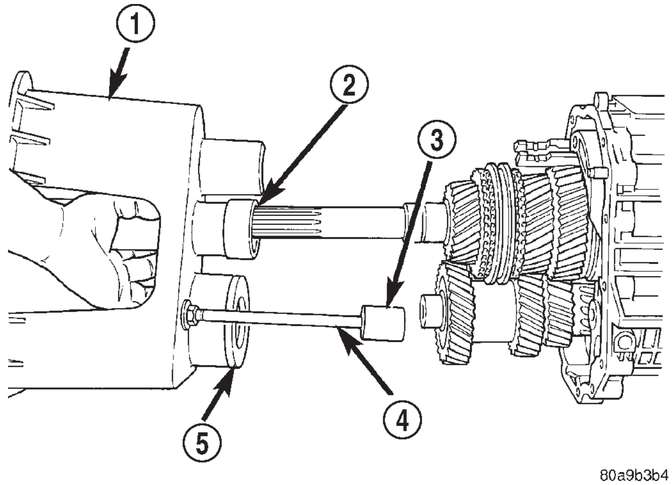


Fig. 33 Installing Assembly Fixture On Geartrain

1 – SPECIAL TOOL 6747
2 – SPECIAL TOOL 6747–1A
3 – SPECIAL TOOL 8115
4 – REVERSE IDLER PEDESTAL
5 – SPECIAL TOOL 6747–2A

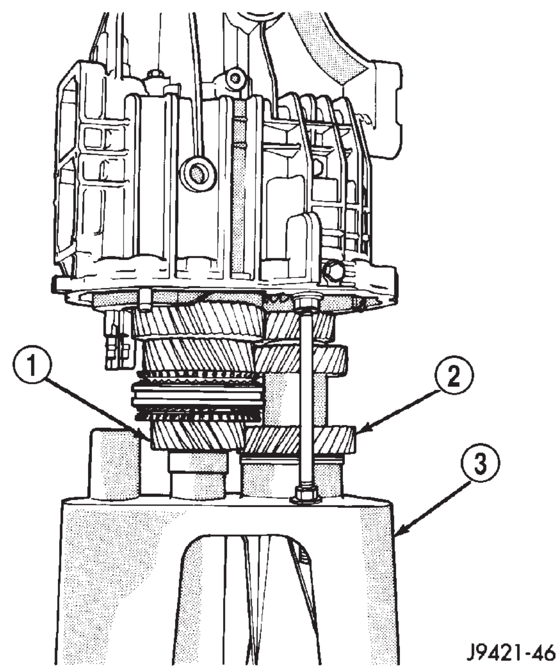


Fig. 34 Geartrain And Housing Mounted On Fixture Tool

1 – INPUT SHAFT
2 – COUNTERSHAFT
3 – SPECIAL TOOL 6747

(11) Remove rear bolt holding reverse idler shaft in housing.

DISASSEMBLY AND ASSEMBLY (Continued)

REAR HOUSING REMOVAL—2WD

(1) On 2-wheel drive transmission, remove three bolts that attach output shaft bearing retainer to rear case (Fig. 35). Bolts are rear of shift tower opening.

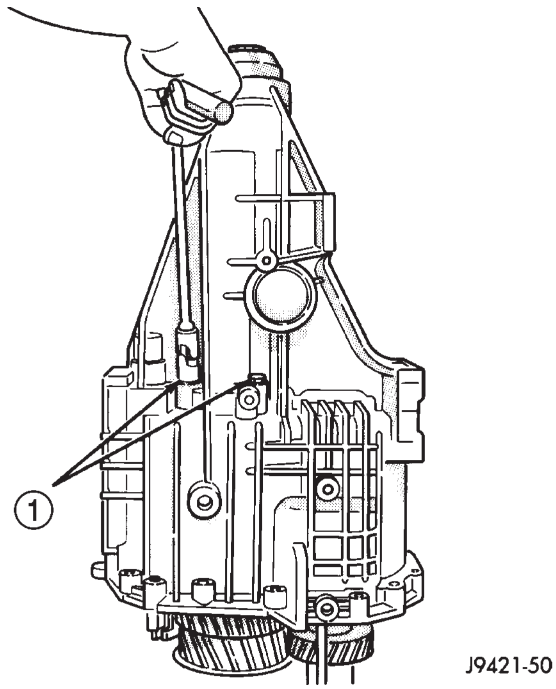


Fig. 35 Removing/Installing Output Shaft Bearing Retainer Bolts—2WD

1 – OUTPUT SHAFT BEARING RETAINER BOLTS (THIRD BOLT IS AT OPPOSITE SIDE OF CASE)

(2) Unseat output shaft bearing from bearing bore in rear housing. Use plastic or rawhide mallet to tap rear housing upward and off output shaft bearing as shown (Fig. 36).

(3) Lift rear housing up and off geartrain (Fig. 37).

(4) Remove countershaft rear bearing from countershaft (Fig. 38).

(5) Examine condition of bearing bore and idler shaft notch in rear housing. Replace housing if any of these components are damaged.

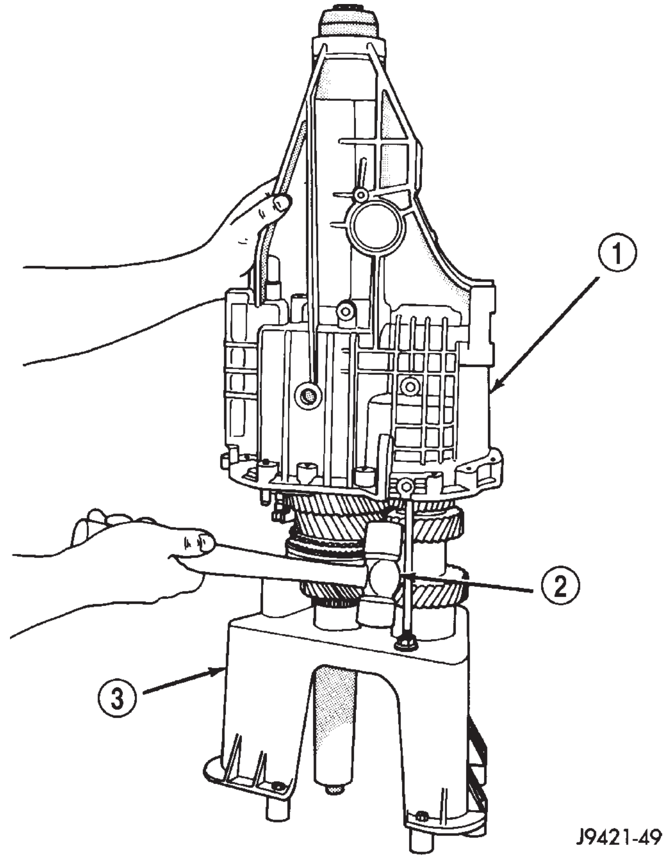


Fig. 36 Unseating Rear Housing From Output Shaft Bearing—2WD

1 – REAR HOUSING
2 – PLASTIC OR RAWHIDE MALLET
3 – FIXTURE TOOL

REAR ADAPTER HOUSING REMOVAL—4WD

(1) Locate dimples in face of rear seal (Fig. 39). Use a suitable slide hammer mounted screw to remove seal by inserting screw into seal at dimple locations (Fig. 40).

DISASSEMBLY AND ASSEMBLY (Continued)

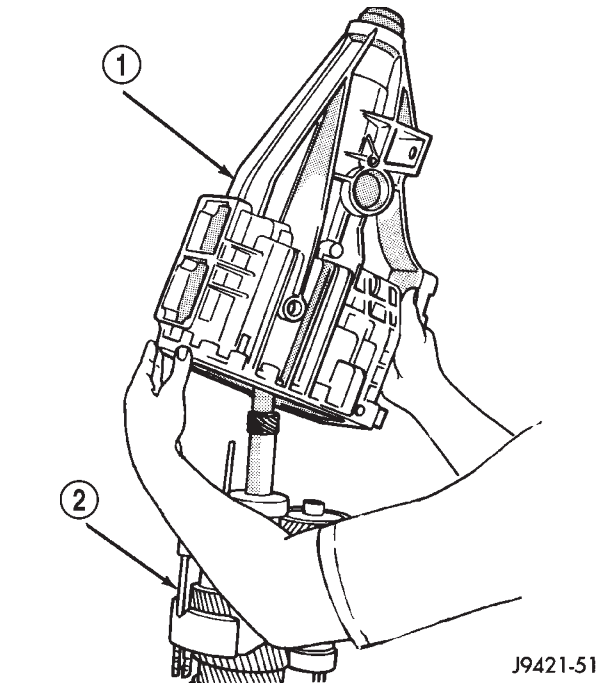


Fig. 37 Rear Housing Removal—2WD

1 – REAR HOUSING
2 – SHIFT FORKS AND GEARTRAIN

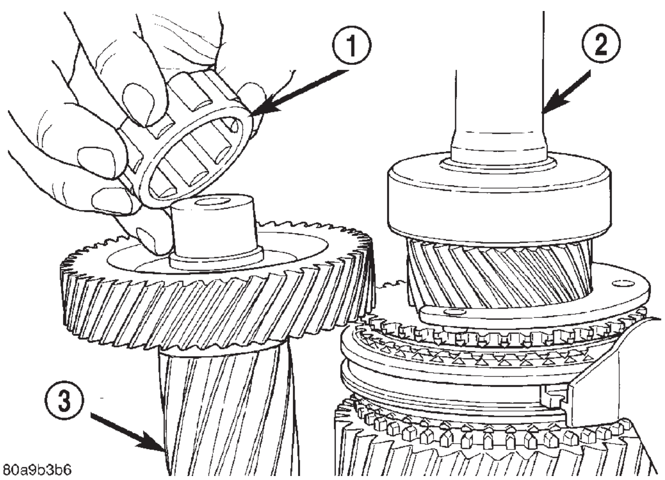


Fig. 38 Remove Countershaft Rear Bearing

1 – COUNTERSHAFT REAR BEARING
2 – OUTPUT SHAFT
3 – COUNTER SHAFT

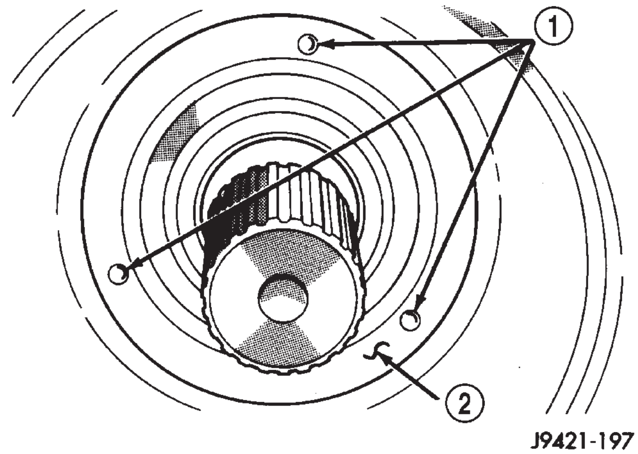


Fig. 39 Location Of Dimples In Seal Face—4WD

1 – LOCATION OF DIMPLES
2 – SEAL FACE

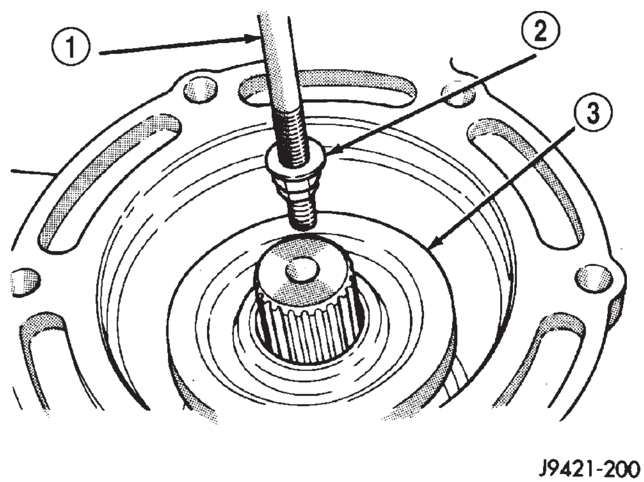


Fig. 40 Rear Seal Removal—4WD

1 – SLIDE HAMMER
2 – REMOVER TOOL
3 – REAR SEAL

(2) Remove rear bearing snap ring from output shaft with heavy duty snap ring pliers (Fig. 41).

(3) Lift rear adapter housing upward and off geartrain (Fig. 42).

DISASSEMBLY AND ASSEMBLY (Continued)

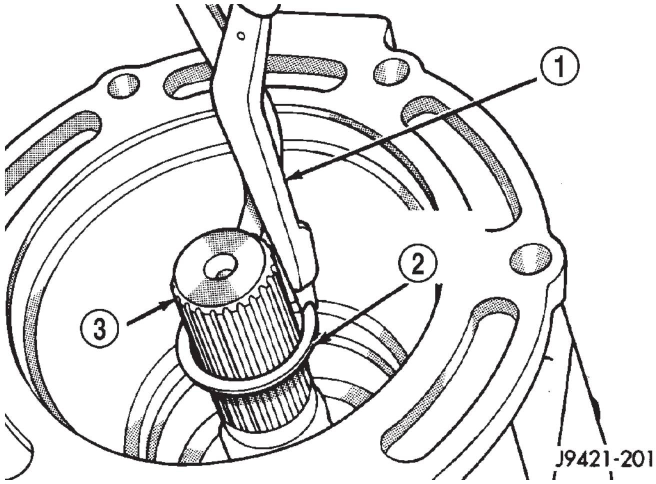


Fig. 41 Rear Bearing Snap Ring Removal—4WD

1 – HEAVY DUTY SNAP RING PLIERS
2 – REAR BEARING SNAP RING
3 – OUTPUT SHAFT

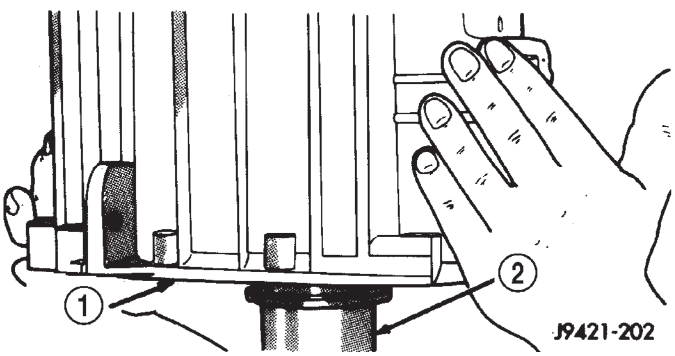


Fig. 42 Rear Adapter Housing Removal

1 – REAR ADAPTER HOUSING
2 – OUTPUT SHAFT

(4) Remove bearing retainer bolts and remove rear bearing retainer and rear bearing (Fig. 43). Use hammer handle to push or tap bearing out of housing if needed.

(5) Examine condition of bearing bore, countershaft rear bearing race and idler shaft notch in rear housing. Replace housing if race, bore or notch are worn or damaged.

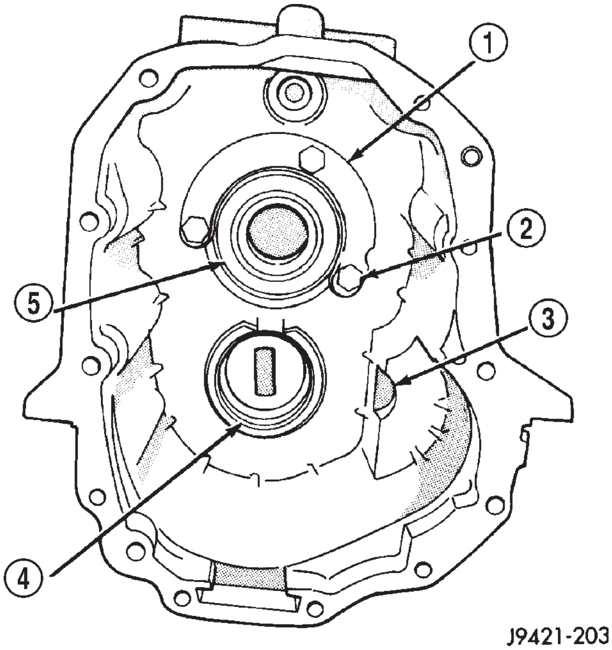


Fig. 43 Rear Adapter Housing Components

1 – BEARING RETAINER
2 – RETAINER BOLTS (3)
3 – IDLER SHAFT NOTCH
4 – COUNTERSHAFT REAR BEARING RACE
5 – REAR BEARING

GEARTRAIN DISASSEMBLY FROM FIXTURE

(1) Remove reverse idler gear assembly from assembly fixture cup.

(2) Remove 1-2 and fifth-reverse forks from synchro sleeves.

(3) Slide countershaft out of fixture tool.

(4) Remove output shaft bearing retainer from rear surface of fifth gear (retainer will drop onto gear after bolts are removed).

(5) Lift and remove output shaft and gears off input shaft.

(6) Lift and remove input shaft, pilot bearing and fourth gear synchro ring from assembly fixture tool.

DISASSEMBLY AND ASSEMBLY (Continued)

OUTPUT SHAFT

NOTE: The synchronizer hubs and sleeves are different and must not be intermixed. It is recommended that each synchronizer unit be removed as an assembly to avoid intermixing parts. It is also recommended that each synchro hub and sleeve be marked with a scriber or paint for correct assembly reference.

(1) Remove snap ring that secures 3-4 synchro hub on output shaft.

(2) Remove 3-4 synchro assembly, third gear synchro ring, and third gear with shop press and Remover Tool 1130. Position Tool 1130 between second and third gears.

(3) Remove third gear needle bearing (Fig. 44).

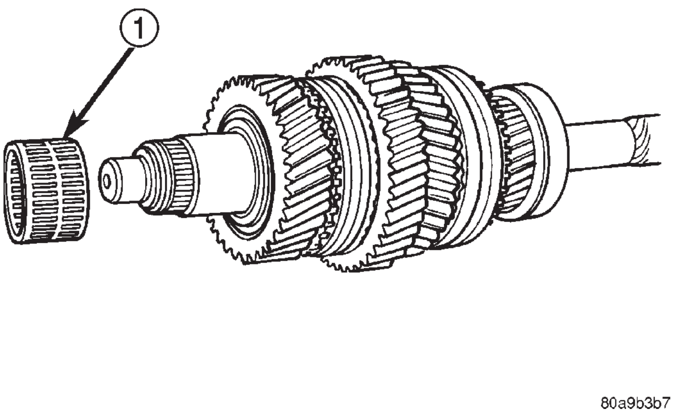


Fig. 44 Third Gear Needle Bearing Removal

1 – THIRD GEAR NEEDLE BEARING

(4) Remove retaining ring that secures two-piece thrust washer on shaft (Fig. 45). Use small pry tool to remove retaining ring.

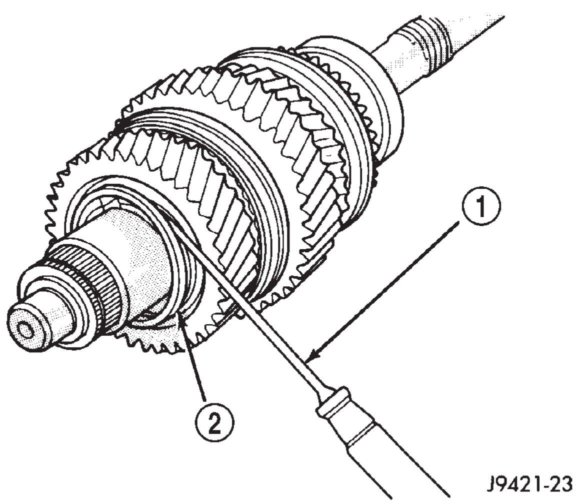


Fig. 45 Thrust Washer Retaining Ring Removal

1 – PRY TOOL
2 – THRUST WASHER RETAINING RING

(5) Remove two-piece thrust washer (Fig. 46). Note position of washer locating lugs in shaft notches for installation reference.

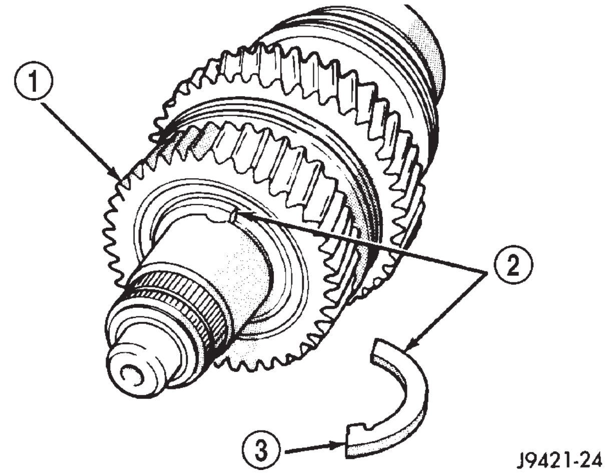


Fig. 46 Two-Piece Thrust Washer Removal

1 – SECOND GEAR
2 – THRUST WASHER (2–PIECE)
3 – WASHER LOCATING LUG

(6) Remove second gear and needle bearing (Fig. 47).

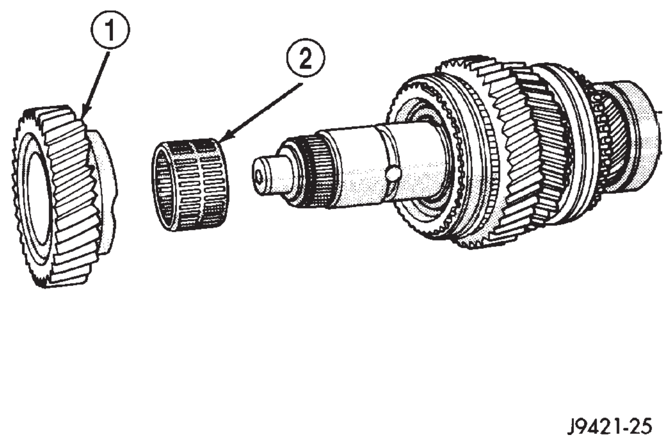


Fig. 47 Second Gear And Needle Bearing Removal

1 – SECOND GEAR
2 – SECOND GEAR NEEDLE BEARING

(7) Remove second gear synchro ring, synchro friction cone, and synchro cone (Fig. 48).

(8) Remove interm ring.

(9) Remove 1-2 synchro hub snap ring.

(10) Remove 1-2 synchro hub and sleeve and first gear from output shaft with shop press and Remover Tool 1130 (Fig. 49). Position Tool 1130 between first and reverse gears.

DISASSEMBLY AND ASSEMBLY (Continued)

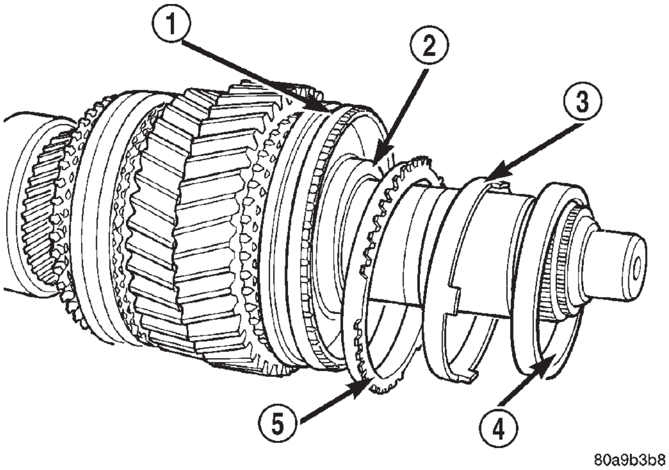


Fig. 48 Second Gear Synchro Ring And Cones Removal

1 – 1–2 SYNCHRO HUB AND SLEEVE
2 – INTERM RING
3 – SYNCHRO FRICTION CONE
4 – SYNCHRO CONE
5 – SYNCHRO RING

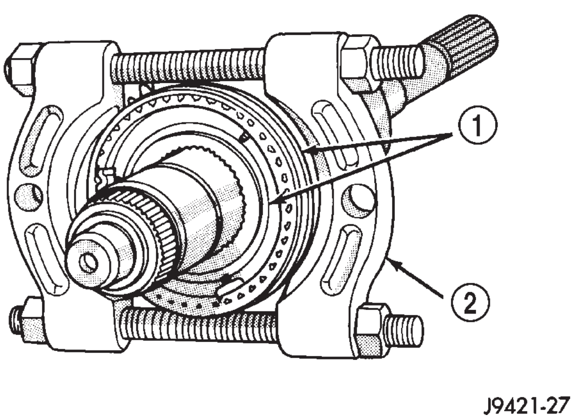


Fig. 49 Hub And Sleeve Removal—1-2 Synchro

1 – 1–2 SYNCHRO HUB AND SLEEVE
2 – SPECIAL TOOL
1130

(11) Remove first gear needle bearing (Fig. 50).

(12) Remove output shaft bearing snap ring (Fig. 51).

(13) On 2-wheel drive models, remove output shaft bearing.

(14) Remove fifth gear (Fig. 52).

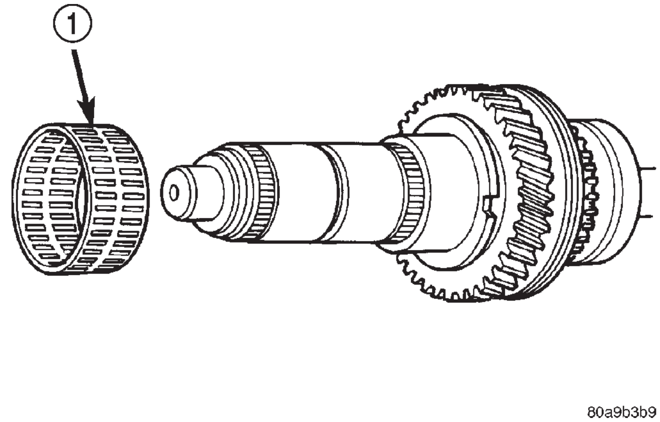


Fig. 50 First Gear Needle Bearing Removal

1 – FIRST GEAR NEEDLE BEARING

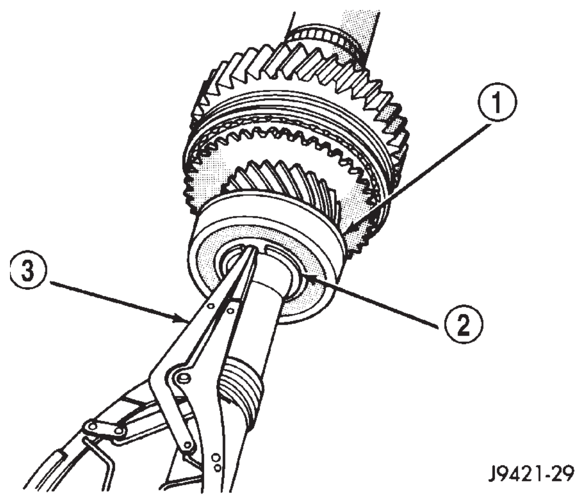


Fig. 51 Output Shaft Bearing Snap Ring Removal

1 – OUTPUT SHAFT BEARING
2 – BEARING SNAP RING
3 – SNAP RING PLIERS

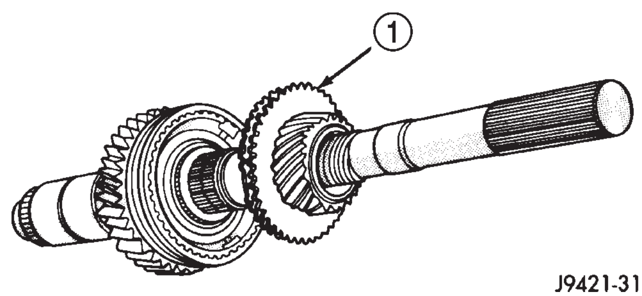


Fig. 52 Fifth Gear Removal

1 – FIFTH GEAR AND SYNCHRO RING

DISASSEMBLY AND ASSEMBLY (Continued)

(15) Remove fifth gear needle bearing. Spread bearing apart just enough to clear shoulder on output shaft (Fig. 53).

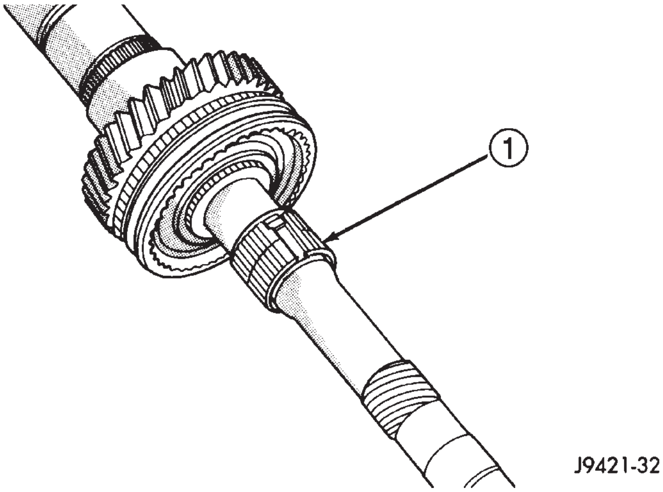


Fig. 53 Fifth Gear Needle Bearing Removal

1 – FIFTH GEAR NEEDLE BEARING (SPREAD BEARING TO CLEAR SHOULDER ON SHAFT)

(16) Remove fifth-reverse synchro hub snap ring (Fig. 54).

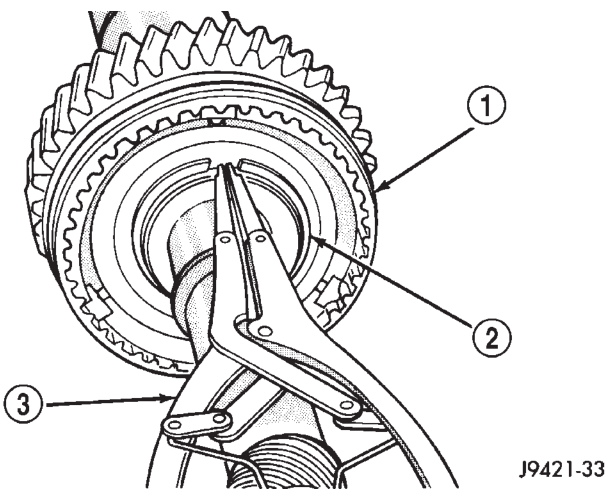


Fig. 54 Fifth-Reverse Synchro Hub Snap Ring Removal

1 – FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
2 – SYNCHRO HUB SNAP RING
3 – SNAP RING PLIERS

(17) Remove fifth-reverse synchro hub and sleeve with shop press (Fig. 55).

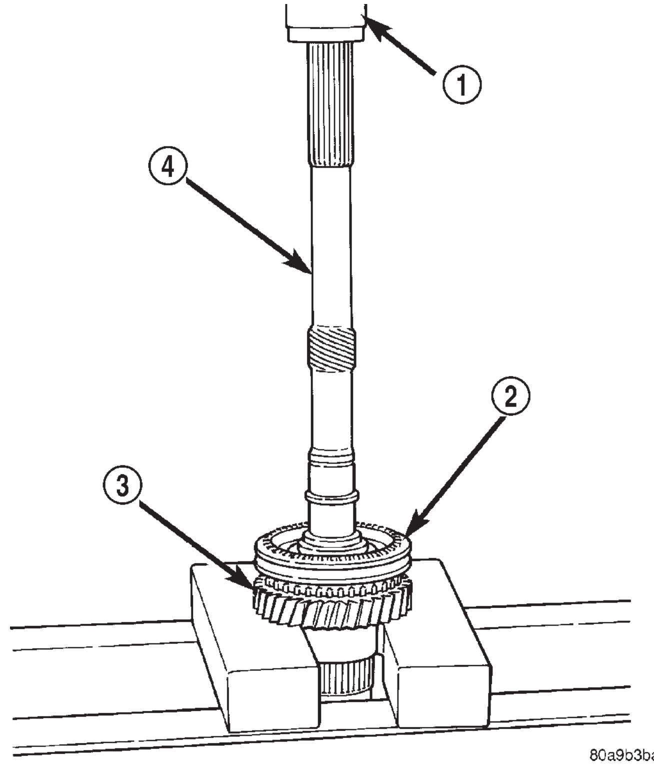


Fig. 55 Fifth-Reverse Synchro Hub And Sleeve Removal

1 – PRESS
2 – FIFTH-REVERSE SYNCHRO HUB AND SLEEVE
3 – REVERSE GEAR
4 – OUTPUT SHAFT

(18) Remove reverse gear and needle bearing (Fig. 56).

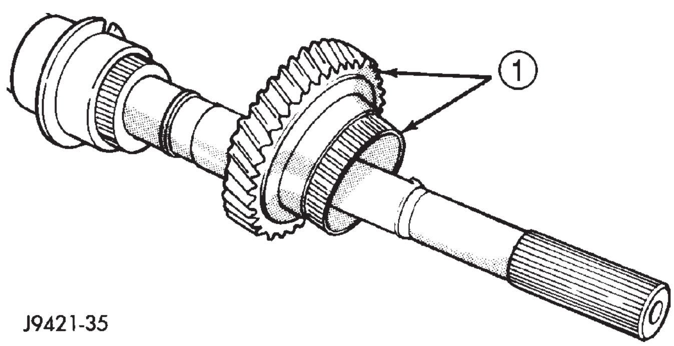


Fig. 56 Reverse Gear And Needle Bearing Removal

1 – REVERSE GEAR AND NEEDLE BEARING

DISASSEMBLY AND ASSEMBLY (Continued)

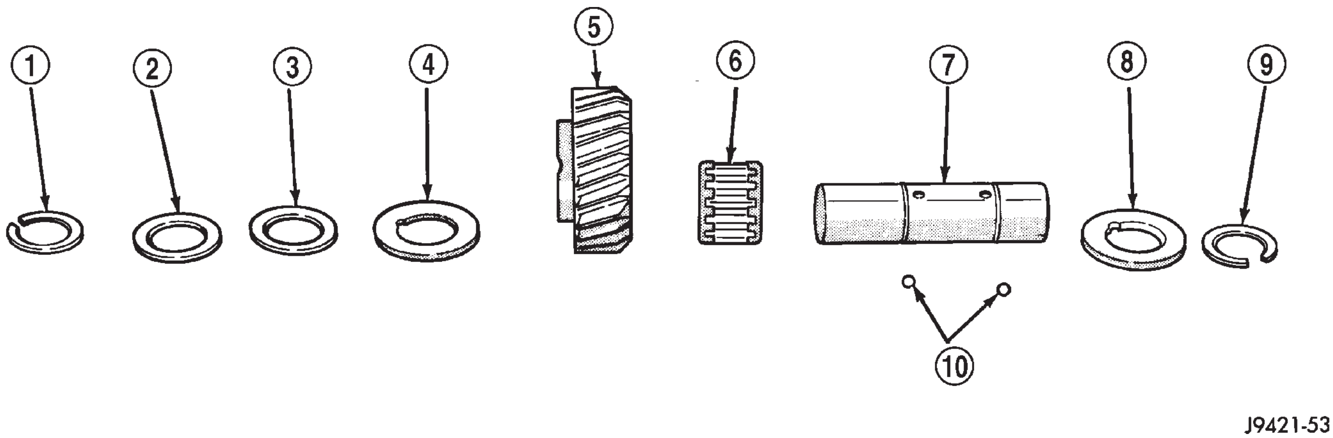


Fig. 57 Reverse Idler Components

1 – SNAP RING
2 – FLAT WASHER
3 – WAVE WASHER
4 – THRUST WASHER
5 – REVERSE IDLER GEAR
6 – IDLER GEAR BEARING
7 – IDLER SHAFT
8 – THRUST WASHER
9 – SNAP RING
10 – THRUST WASHER LOCK BALLS

REVERSE IDLER DISASSEMBLY

(1) Remove idler gear snap rings (Fig. 57).

(2) Remove thrust washer, wave washer, thrust plate and idler gear from shaft.

(3) Remove idler gear needle bearing from shaft.

ASSEMBLY

Gaskets are not used in the NV3550 transmission. Sealers are used at all case joints. Recommended sealers are Mopar® Gasket Maker for all case joints and Mopar® silicone sealer, or equivalent, for the input shaft bearing retainer. Apply these products as indicated in the assembly procedures.

NOTE: It is very important that the transmission shift components be in Neutral position during assembly. This is necessary to prevent damaging synchro and shift components when the housings are installed.

The 3-4, 1-2 and fifth-reverse synchro hub snap rings can be fitted selectively. New snap rings are available in 0.05 mm (0.0019 in.) thickness increments. Use the thickest snap ring that will fit in each snap ring groove.

SYNCHRONIZER

The easiest method of assembling each synchro is to install the springs, struts and detent balls one at a time as follows:

(1) Slide the sleeve part way onto the hub. Leave enough room to install the spring in the hub and the strut in the hub groove.

(2) Install the first spring in the hub. Then install a strut over the spring. Be sure the spring is seated in the spring bore in the strut.

(3) Slide the sleeve onto the hub just far enough to hold the first strut and spring in place.

(4) Place the detent ball in the top of the strut. Then carefully work the sleeve over the ball to hold it in place. A small flat blade screwdriver can be used to press the ball into place while moving the sleeve over it.

(5) Repeat the procedure for the remaining springs, struts and balls. Tape, or a rubber band can be used to temporarily secure each strut and ball as they are installed.

(6) Verify synchro assembly. Be sure the three springs, struts and detent balls are all in place (Fig. 58).

DISASSEMBLY AND ASSEMBLY (Continued)

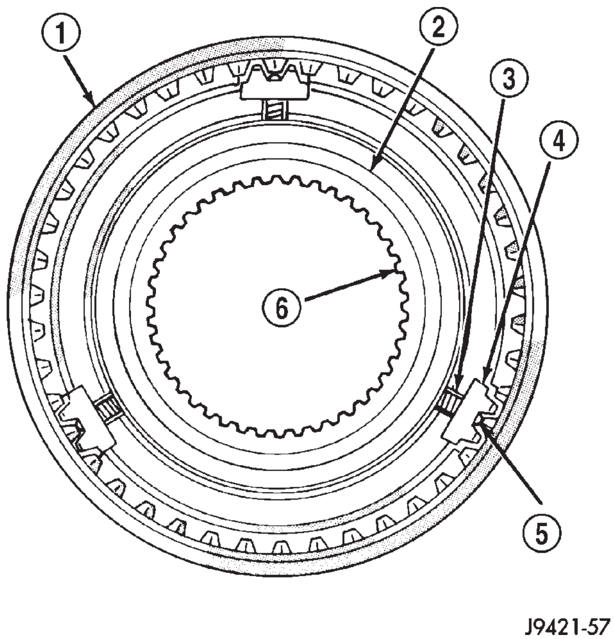


Fig. 58 Assembled View Of Synchro Components

1 – SLEEVE
2 – HUB SHOULDER
3 – SPRING (3)
4 – STRUT (3)
5 – DETENT BALL (3)
6 – HUB

OUTPUT SHAFT

(1) Lubricate shaft, gears and bearings with recommended lubricant during assembly. Petroleum jelly can be used to hold parts in place.

(2) Check bearing surfaces of output shaft for nicks or scratches. Smooth surfaces with 320/400 grit emery cloth if necessary. Apply oil to emery cloth and shaft surface before polishing.

(3) Inspect and replace any synchro ring that exhibits wear or damage. Completely immerse each synchro ring in lubricant before installation.

(4) Lubricate and install reverse gear needle bearing on shaft (Fig. 59). Slide bearing up against shoulder on output shaft.

(5) Install reverse gear over needle bearing (Fig. 60).

(6) Install solid brass synchro ring on reverse gear (Fig. 61).

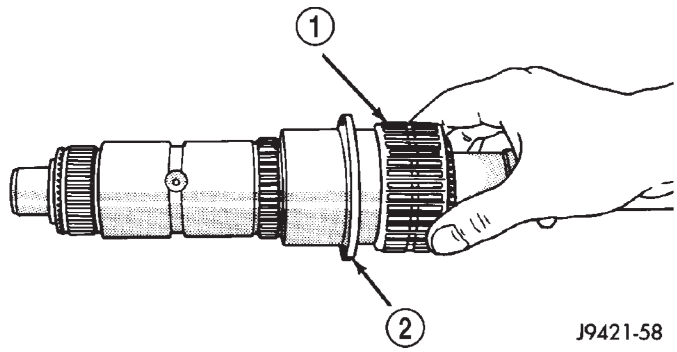


Fig. 59 Reverse Gear Bearing Installation

1 – REVERSE GEAR BEARING
2 – SHOULDER

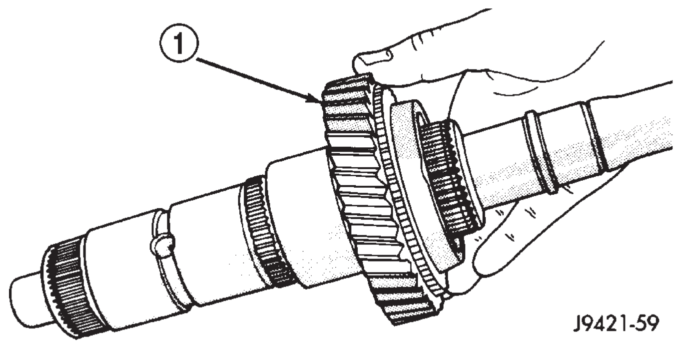


Fig. 60 Reverse Gear Installation

1 – REVERSE GEAR

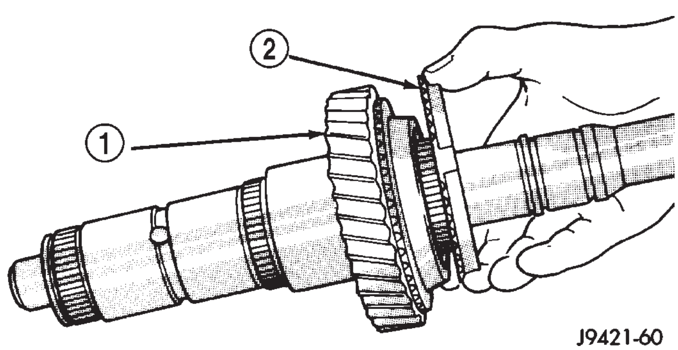


Fig. 61 Reverse Gear Synchro Ring Installation

1 – REVERSE GEAR
2 – SYNCHRO RING (SOLID BRASS)

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Assemble fifth-reverse synchro hub, sleeve, struts, springs and detent balls, if not previously done.

CAUTION: The fifth-reverse synchro hub and sleeve can be installed backwards if care is not exercised. One side of the hub has shoulders around the hub bore. Make sure this side of the hub is facing the front of the shaft. In addition, one side of the sleeve is tapered. Be sure the sleeve is installed so the tapered side will be facing the front of the shaft.

(8) Start fifth-reverse synchro assembly on output shaft splines by hand. Then seat synchro onto shaft with shop press and Remover 6310-1 (Fig. 62).

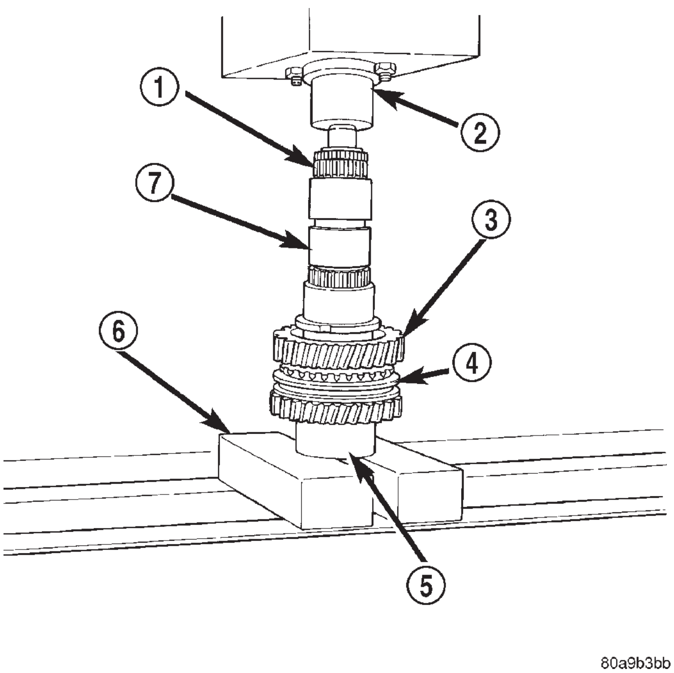


Fig. 62 Fifth-Reverse Synchro Assembly Installation

1 – SPACER
2 – PRESS RAM
3 – REVERSE GEAR
4 – FIFTH-REVERSE SYNCHRO ASSEMBLY
5 – SPECIAL TOOL 6310–1
6 – PRESS BLOCKS
7 – OUTPUT SHAFT

(9) Install new fifth-reverse hub snap ring (Fig. 63) as follows:

(a) Snap rings are available in thicknesses from 2.00 mm to 2.20 mm (0.078 to 0.086 in.).

(b) Install thickest snap ring that will fit in shaft groove.

(c) Verify that snap ring is completely seated in groove before proceeding.

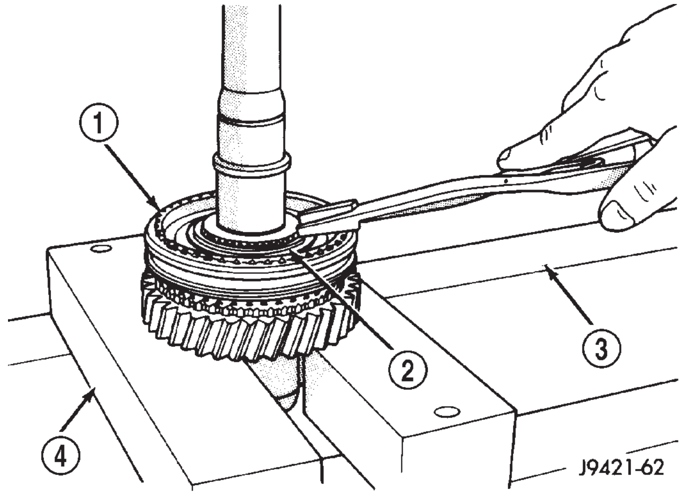


Fig. 63 Installing Fifth-Reverse Synchro Hub Snap Ring

1 – FIFTH-REVERSE SYNCHRO ASSEMBLY
2 – SNAP RING
3 – PRESS BED
4 – PRESS BLOCKS

(10) Install fifth gear synchro ring in synchro hub and sleeve (Fig. 64).

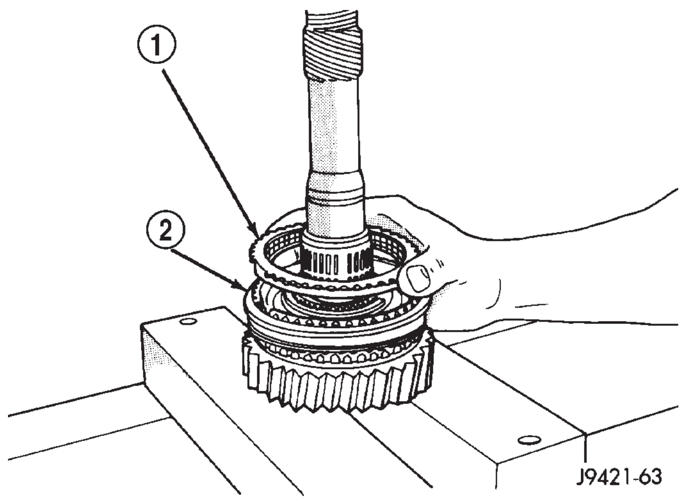


Fig. 64 Installing Fifth Gear Synchro Ring

1 – FIFTH-SPEED SYNCHRO RING
2 – FIFTH-REVERSE SYNCHRO ASSEMBLY

(11) Install fifth gear bearing. Spread bearing only enough to clear shoulder on output shaft (Fig. 65). Be sure bearing is properly seated after installation.

(12) Install fifth gear on shaft and onto bearing (Fig. 66).

DISASSEMBLY AND ASSEMBLY (Continued)

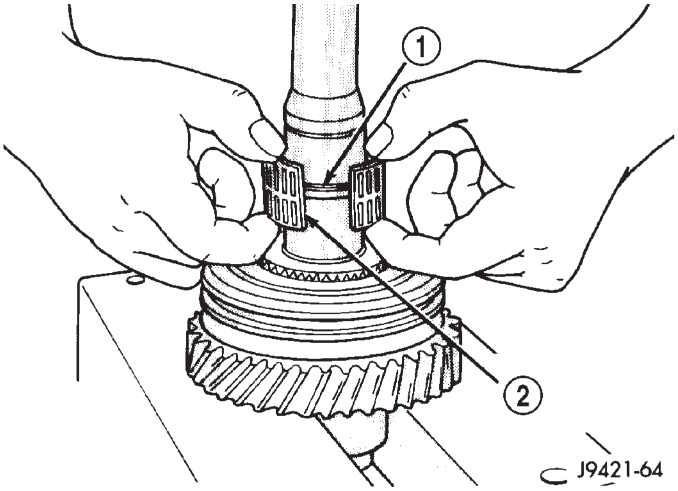


Fig. 65 Installing Fifth Gear Bearing

1 – SHAFT SHOULDER
2 – FIFTH GEAR BEARING

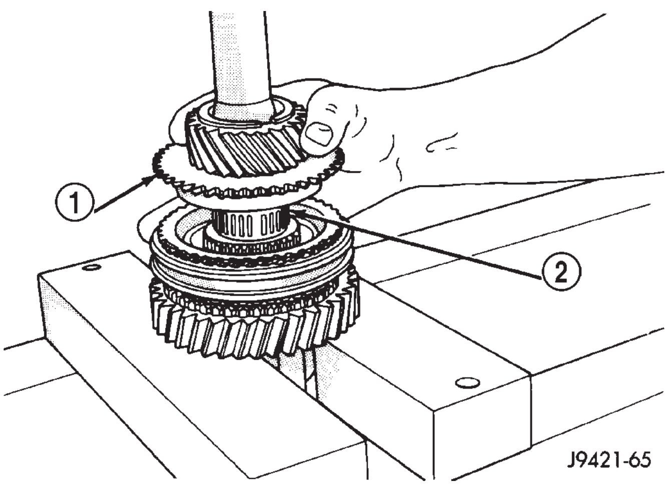


Fig. 66 Fifth Gear Installation

1 – FIFTH GEAR
2 – BEARING

(13) Invert output shaft and set the shaft in Remover 6310-1 so that fifth gear is seated on the tool (Fig. 67).

(14) Install first gear bearing on output shaft (Fig. 67). Be sure bearing is seated on shaft shoulder and is properly joined.

(15) Install first gear on shaft and over bearing (Fig. 68). Make sure bearing synchro cone is facing up as shown.

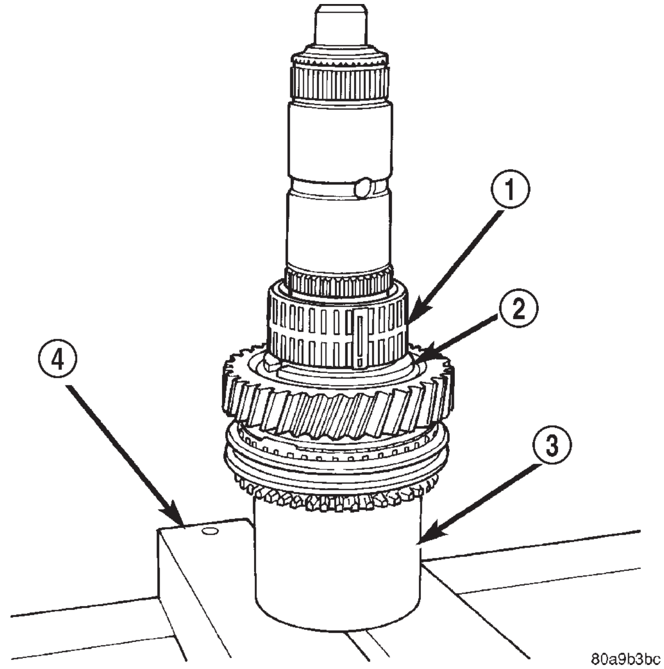


Fig. 67 First Gear Bearing Installation

1 – FIRST GEAR BEARING
2 – SHAFT SHOULDER
3 – SPECIAL TOOL 6310–1
4 – PRESS BLOCKS

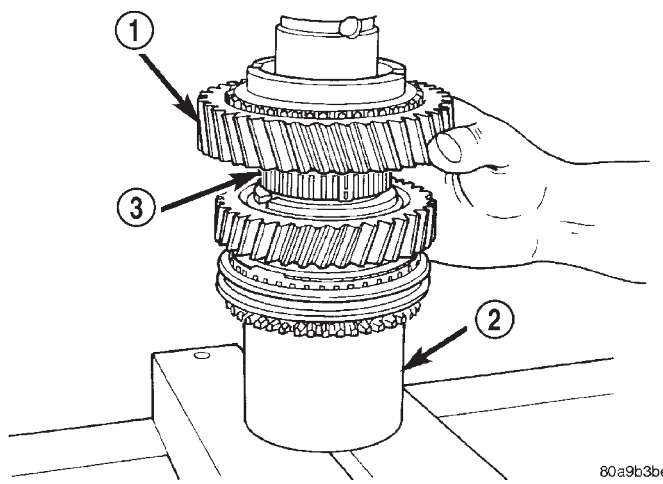


Fig. 68 First Gear Installation

1 – FIRST GEAR
2 – SPECIAL TOOL 6310–1
3 – BEARING

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Install first gear synchro ring (Fig. 69).

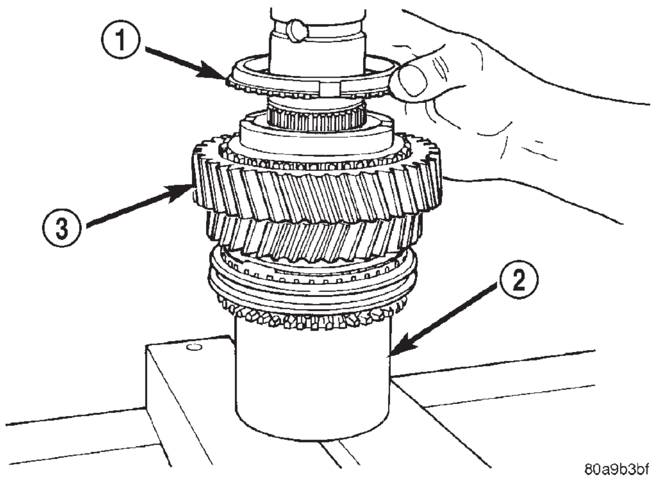


Fig. 69 First Gear Synchro Ring Installation

1 – FIRST GEAR SYNCHRO RING
2 – SPECIAL TOOL 6310–1
3 – FIRST GEAR

(17) Assemble 1-2 synchro hub sleeve, springs, struts and detent balls.

CAUTION: The 1-2 synchro hub and sleeve can be installed backwards if care is not exercised. One side of the synchro sleeve is marked First Gear Side. Be sure this side of the sleeve will face first gear after installation.

(18) Start 1-2 synchro assembly on shaft by hand (Fig. 70). Be sure synchro sleeve is properly positioned. Side marked first side must be facing first gear.

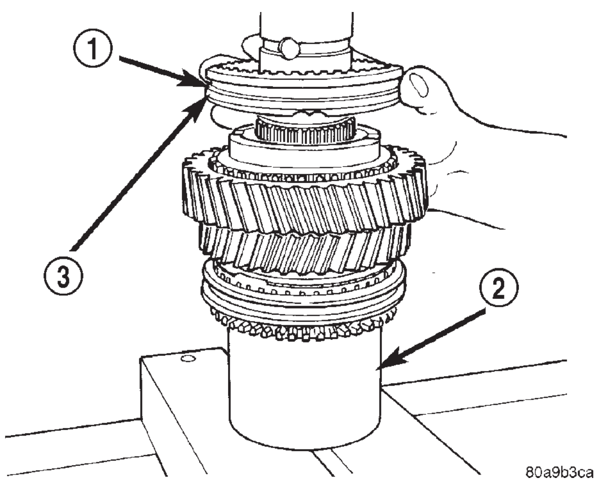


Fig. 70 Starting 1-2 Synchro On Shaft

1 – 1–2 SYNCHRO ASSEMBLY
2 – SPECIAL TOOL 6310–1
3 – BE SURE THIS IS "FIRST GEAR SIDE" OF SYNCHRO SLEEVE

(19) Press 1-2 synchro onto output shaft using suitable size pipe tool and shop press (Fig. 71).

CAUTION: Take time to align the synchro ring and sleeve as hub the is being pressed onto the shaft. The synchro ring can be cracked if it becomes mis-aligned.

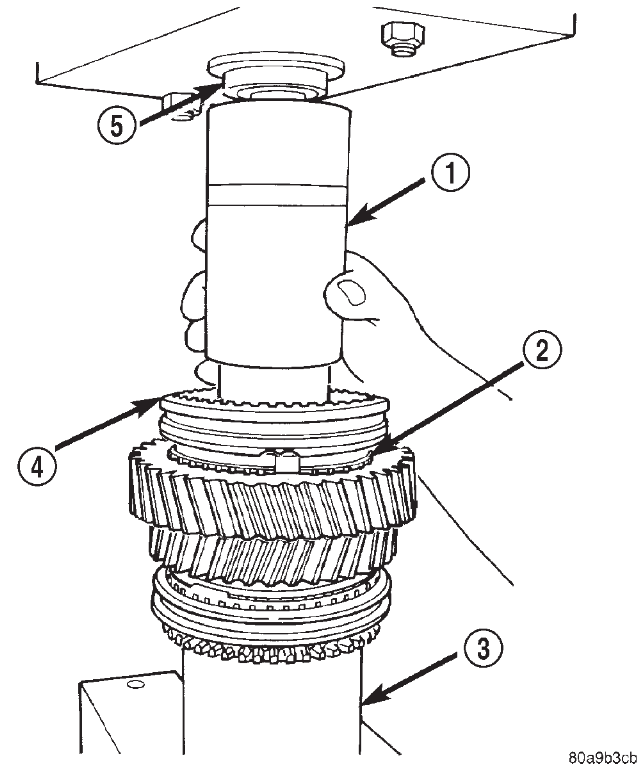


Fig. 71 Pressing 1-2 Synchro Assembly Onto Output Shaft

1 – SUITABLE SIZE PIPE TOOL
2 – SYNCHRO RING
3 – SPECIAL TOOL 6310–1
4 – 1–2 SYNCHRO ASSEMBLY
5 – PRESS RAM

(20) Install interm ring.

(21) Install new 1-2 synchro hub snap ring (Fig. 72) as follows:

(a) Snap rings are available in thicknesses from 1.80 mm to 2.00 mm (0.070 to 0.078 in.).

(b) Install thickest snap ring that will fit in shaft groove.

(c) Verify that snap ring is completely seated in groove before proceeding.

(22) Install second gear synchro ring in 1-2 synchro hub and sleeve (Fig. 73). Be sure synchro ring is properly seated in sleeve.

DISASSEMBLY AND ASSEMBLY (Continued)

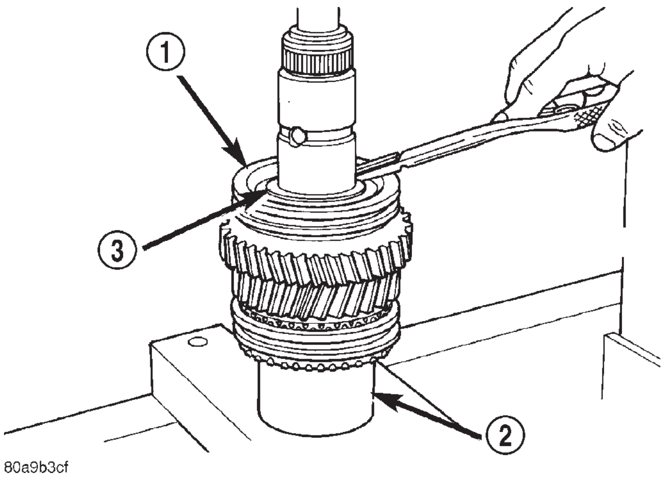


Fig. 72 Installing 1-2 Synchro Hub Snap Ring

1 – 1–2 SYNCHRO
2 – SPECIAL TOOL 6310–1
3 – SYNCHRO SNAP RING

(23) Install synchro friction cone and synchro cone in synchro ring.

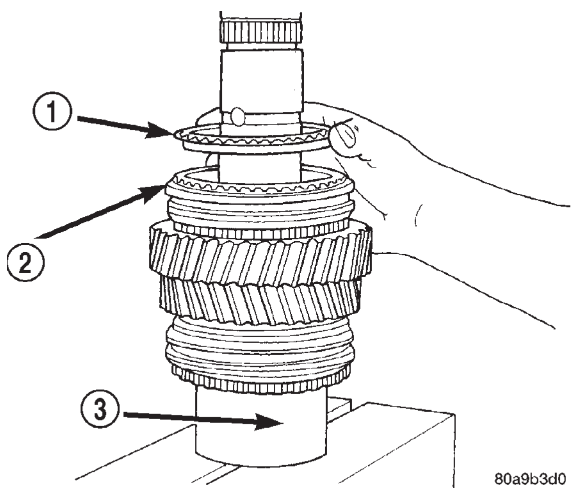


Fig. 73 Second Gear Synchro Ring Installation

1 – SECOND GEAR SYNCHRO RING
2 – 1–2 SYNCHRO
3 – SPECIAL TOOL 6310–1

(24) Install second gear needle bearing on shaft (Fig. 74).

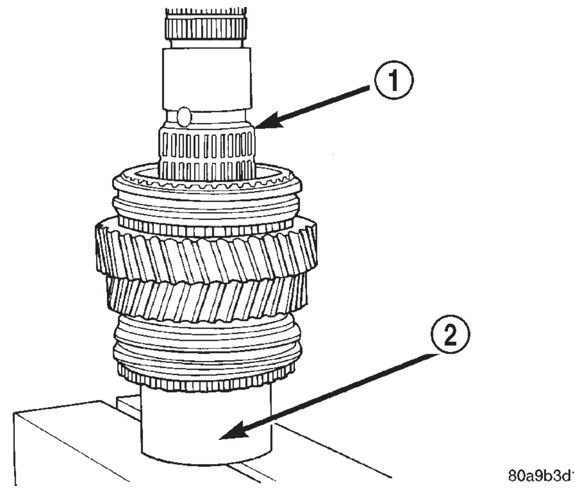


Fig. 74 Second Gear Bearing Installation

1 – SECOND GEAR BEARING
2 – SPECIAL TOOL 6310–1

(25) Install second gear onto shaft and bearing (Fig. 75). Make sure that second gear is fully seated on synchro components.

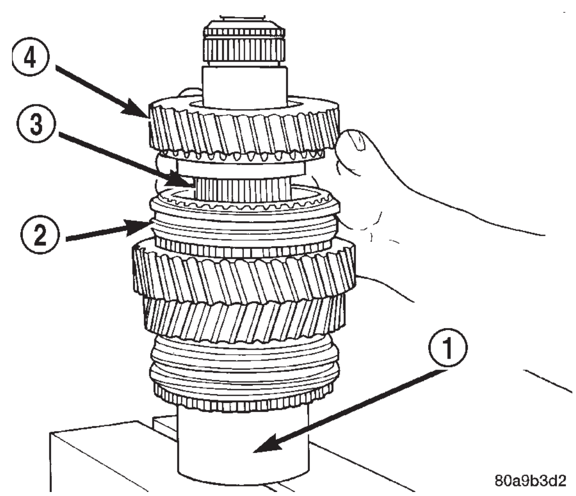


Fig. 75 Second Gear Installation

1 – SPECIAL TOOL 6310–1
2 – 1–2 SYNCHRO ASSEMBLY
3 – BEARING
4 – SECOND GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

(26) Install two-piece thrust washer (Fig. 76). Be sure washer halves are seated in shaft groove and that washer lugs are seated in shaft lug bores. Also, ensure that the i.d. grooves and markings noted during removal are facing the correct direction.

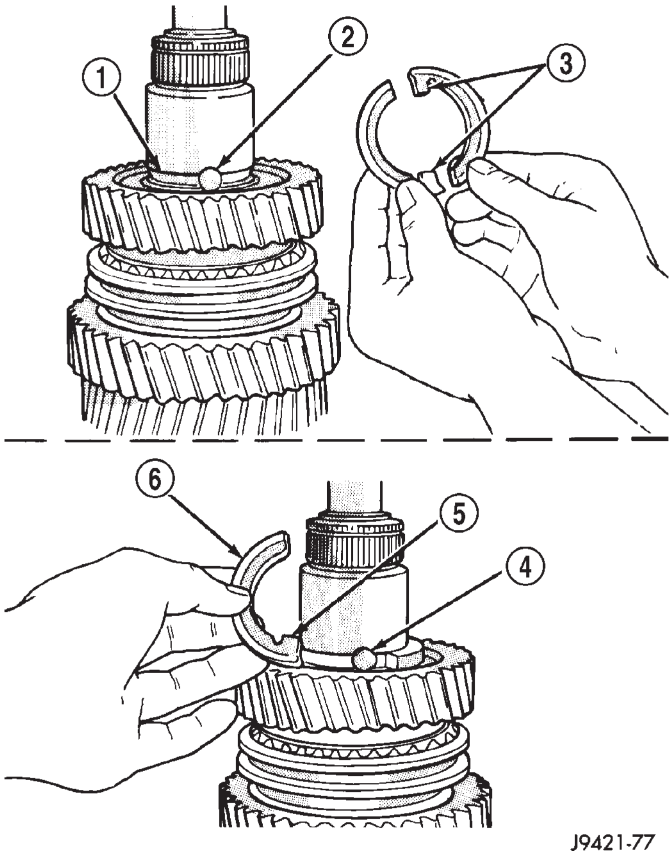


Fig. 76 Installing Two-Piece Thrust Washer

1 – WASHER GROOVE IN SHAFT
2 – LUG BORE
3 – THRUST WASHER LUGS
4 – LUG BORE
5 – LUG
6 – WASHER HALF

(27) Start retaining ring around two-piece thrust washer (Fig. 77). Make sure that the locating dimple is between the thrust washer halves.

(28) Seat thrust washer retaining ring with plastic mallet (Fig. 78).

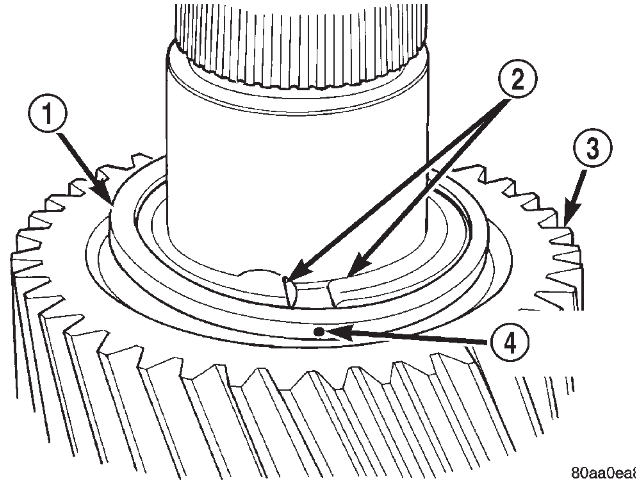


Fig. 77 Starting Retaining Ring Over Two-Piece Thrust Washer

1 – THRUST WASHER RETAINING RING
2 – THRUST WASHER HALVES
3 – SECOND GEAR
4 – LOCATING DIMPLE

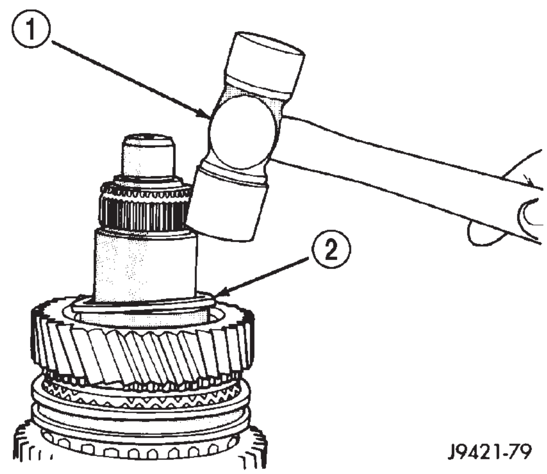


Fig. 78 Seating Thrust Washer Retaining Ring

1 – PLASTIC MALLET
2 – THRUST WASHER RETAINING RING

DISASSEMBLY AND ASSEMBLY (Continued)

(29) Install third gear needle bearing on shaft (Fig. 79).

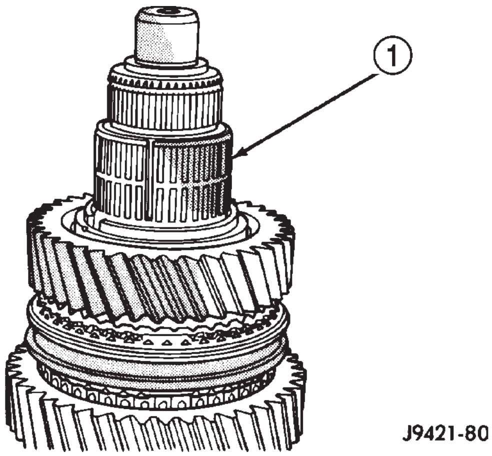


Fig. 79 Third Gear Bearing Installation

1 – THIRD GEAR BEARING

(30) Install third gear on shaft and bearing (Fig. 80).

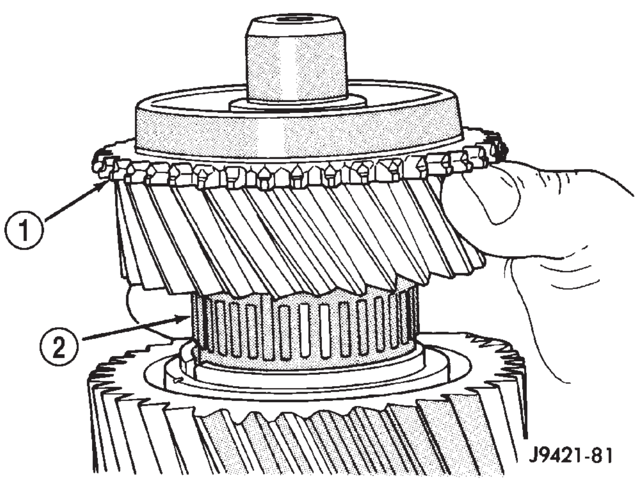


Fig. 80 Installing Third Gear

1 – THIRD GEAR
2 – BEARING

(31) Install third speed synchro ring on third gear (Fig. 81).

(32) Assemble 3-4 synchro hub, sleeve, springs, struts and detent balls.

CAUTION: The 3-4 synchro hub and sleeve can be installed backwards if care is not exercised. One side of the sleeve has grooves in it. Be sure this side of sleeve is also facing the front of the shaft.

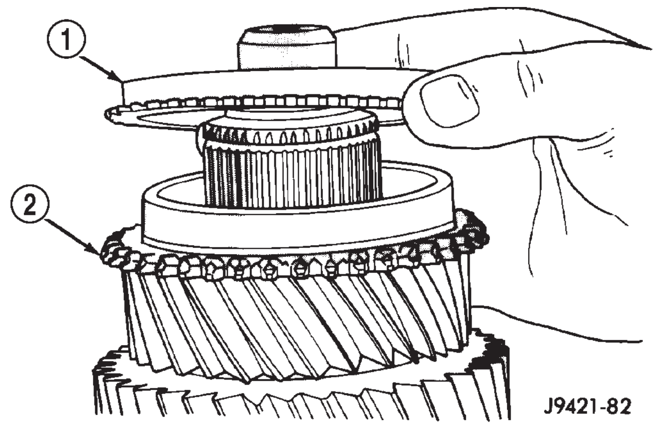


Fig. 81 Third Speed Synchro Ring Installation

1 – THIRD SPEED SYNCHRO RING
2 – THIRD GEAR

(33) Start 3-4 synchro hub on output shaft splines by hand (Fig. 82).

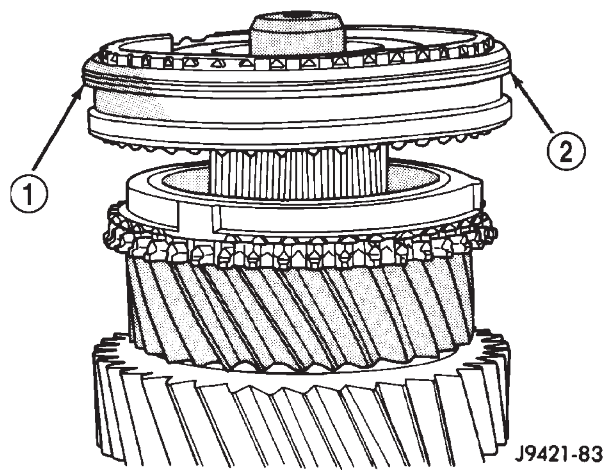


Fig. 82 Starting 3-4 Synchro Hub On Output Shaft

1 – GROOVED SIDE OF SLEEVE (TO FRONT)
2 – 3–4 SYNCHRO ASSEMBLY

(34) Press 3-4 synchro assembly onto output shaft with shop press and suitable size pipe tool (Fig. 83). Make sure that the tool presses on hub as close to output shaft as possible but does not contact the shaft splines.

DISASSEMBLY AND ASSEMBLY (Continued)

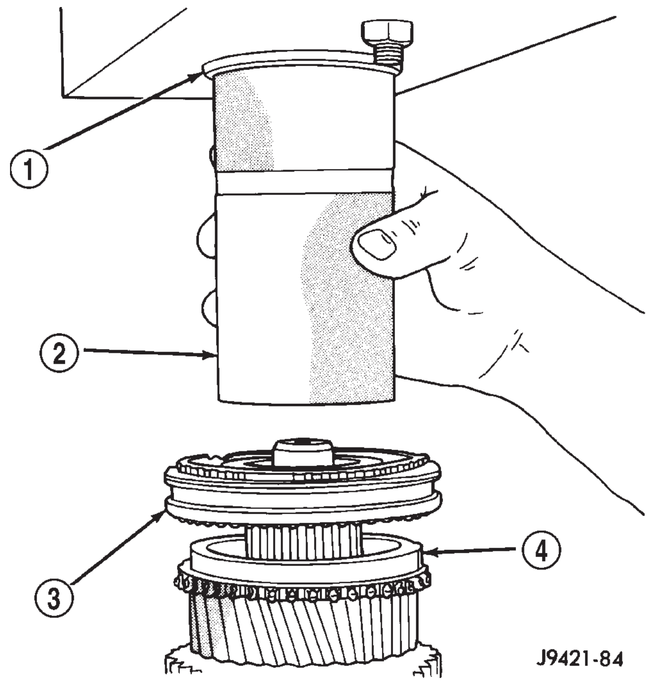


Fig. 83 Pressing 3-4 Synchro Assembly On Output Shaft

1 – PRESS RAM
2 – PIPE TOOL
3 – 3–4 SYNCHRO
4 – THIRD SPEED SYNCHRO RING

(35) Install 3-4 synchro hub snap ring (Fig. 84) as follows:

(a) Snap rings are available in thicknesses from 2.00 mm to 2.30 mm (0.078 to 0.090 in.).

(b) Install thickest snap ring that will fit in shaft groove. Use heavy duty snap ring pliers to install new ring.

(c) Verify that snap ring is completely seated in groove before proceeding.

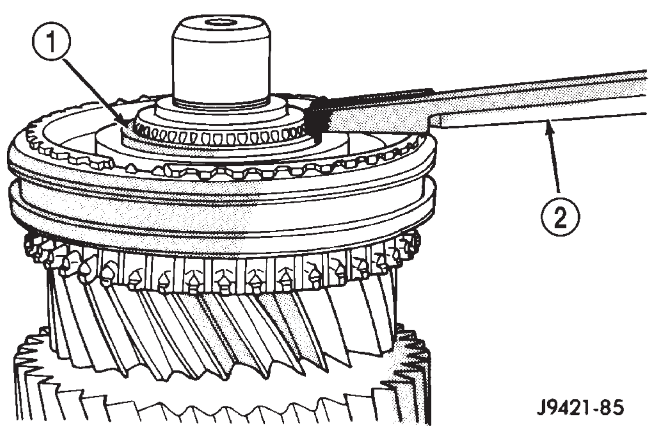


Fig. 84 Installing 3-4 Synchro Hub Snap Ring

1 – 3–4 SYNCHRO HUB SNAP RING
2 – HEAVY DUTY SNAP RING PLIERS

(36) Install output shaft bearing.

(37) Install output shaft bearing snap ring (Fig. 85). Use heavy duty snap ring pliers and spread snap ring only enough to install it. Be sure snap ring is completely seated in shaft groove before proceeding.

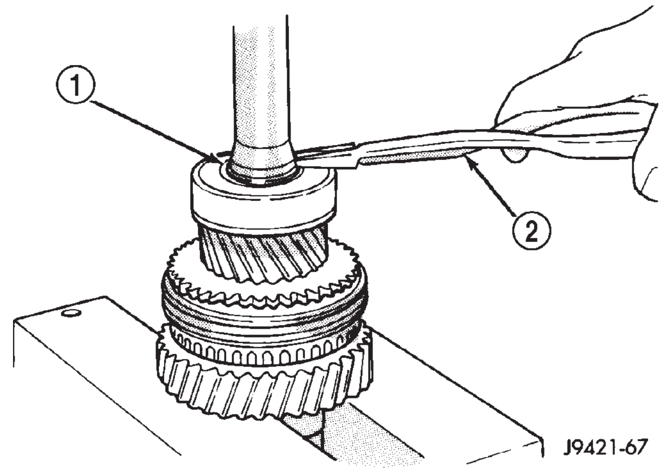


Fig. 85 Installing Output Shaft Bearing Snap Ring

1 – BEARING SNAP RING
2 – HEAVY DUTY SNAP RING PLIERS

(38) Verify correct position of synchro sleeves before proceeding with assembly operations (Fig. 86). Grooved side of 3-4 sleeve should be facing forward. First gear side of 1-2 sleeve should be facing first gear. Tapered side of fifth-reverse sleeve should be facing forward.

REVERSE IDLER ASSEMBLY

(1) Lubricate idler components with gear lube.

(2) Slide idler gear bearing on shaft (Fig. 87). Bearing fits either way on shaft.

(3) Slide gear onto shaft. Side of gear with recess goes to rear (Fig. 87).

(4) Place first lock ball in dimple at rear end of idler shaft (Fig. 87). Petroleum jelly can be used to hold ball in place if desired.

(5) Slide thrust rear thrust washer onto shaft and over lock ball (Fig. 88).

(6) Install snap ring in groove at rear of shaft (Fig. 88).

(7) Install lock ball in dimple at front of shaft. Hold ball in place with petroleum jelly if desired.

DISASSEMBLY AND ASSEMBLY (Continued)

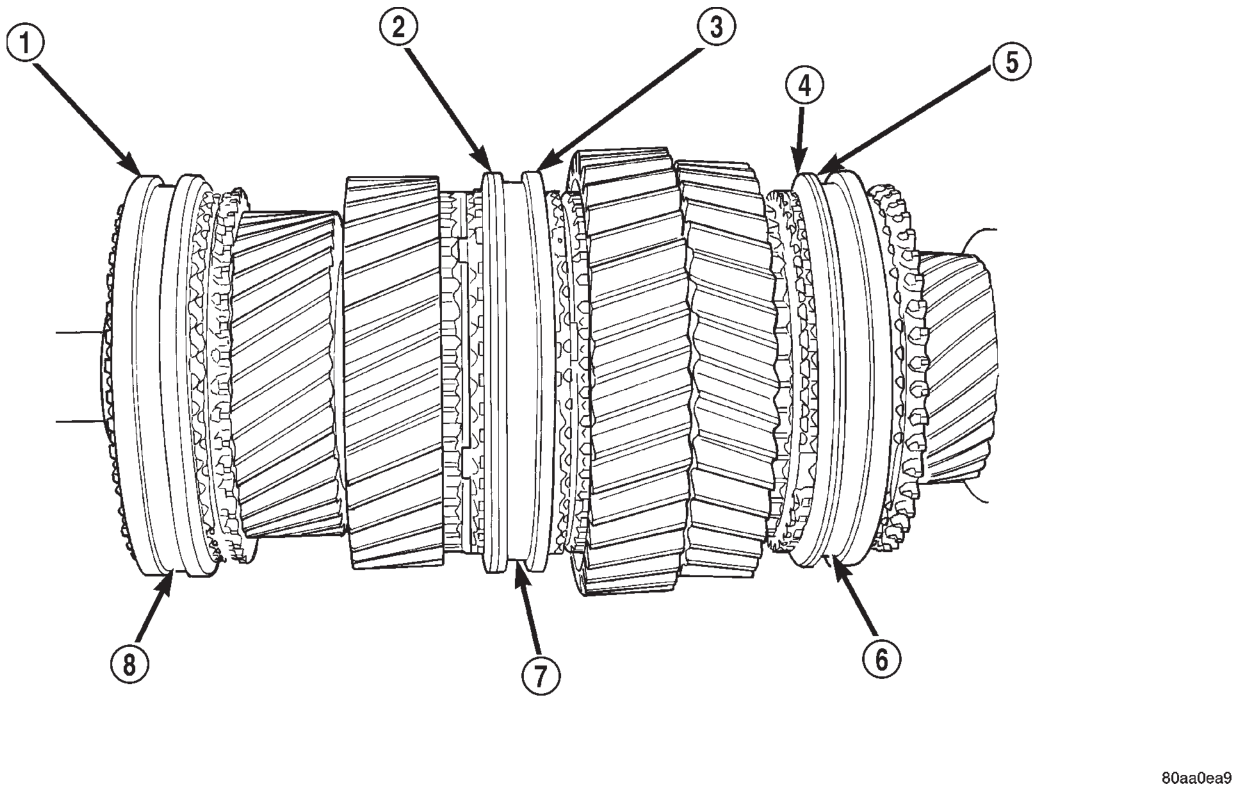


Fig. 86 Correct Synchro Sleeve Position

1 – DOUBLE GROOVE FORWARD
2 – GROOVE FORWARD
3 – FIRST GEAR SIDE MARKING TOWARD FIRST GEAR
4 – TAPER FORWARD
5 – GROOVE FORWARD
6 – 5TH-REV SYNCHRO SLEEVE
7 – 1–2 SYNCHRO SLEEVE
8 – 3–4 SYNCHRO SLEEVE

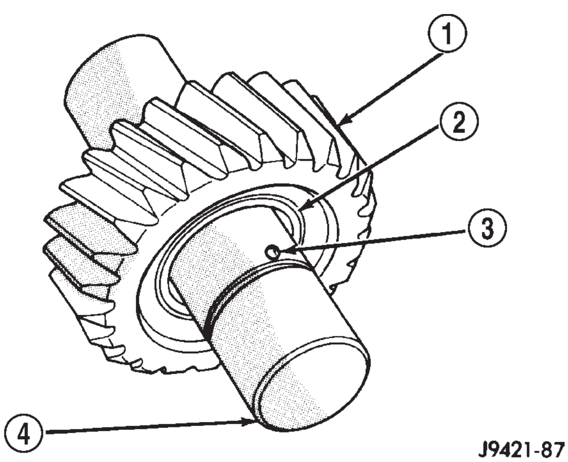


Fig. 87 Idler Gear And Bearing Installation

1 – IDLER GEAR
2 – BEARING
3 – LOCK BALL
4 – REAR OF SHAFT

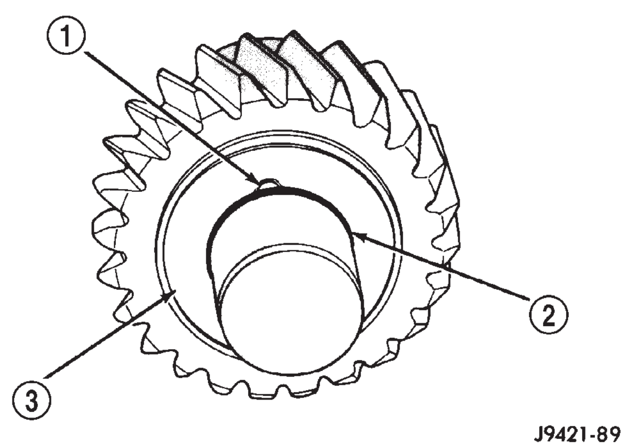


Fig. 88 Idler Gear Rear Thrust Washer Installation

1 – LOCK BALL
2 – SNAP RING GROOVE
3 – THRUST WASHER

(8) Install front thrust washer on shaft and slide washer up against gear and over lock ball (Fig. 89).

(9) Install wave washer, flat washer and remaining snap ring on idler shaft (Fig. 89). Be sure snap ring is fully seated.

DISASSEMBLY AND ASSEMBLY (Continued)

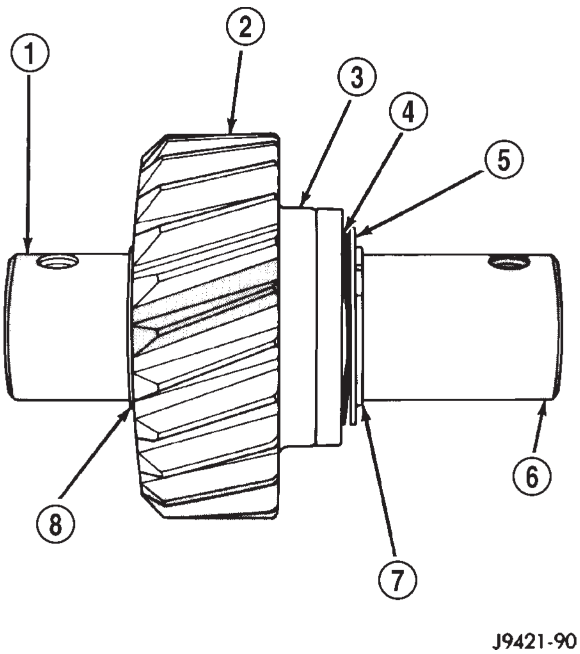


Fig. 89 Idler Gear And Shaft Assembly

1 – REAR OF SHAFT
2 – GEAR
3 – THRUST WASHER AND BALL
4 – WAVE WASHER
5 – FLAT WASHER
6 – FRONT OF SHAFT
7 – SNAP RING
8 – SNAP RING

SHIFT SHAFT AND DETENT PLUNGER BUSHINGS/BEARINGS

(1) Inspect shift shaft bushing and bearing for damage.

(2) If necessary, the shift shaft bushing can be replaced as follows:

(a) Locate a bolt that will thread into the bushing without great effort.

(b) Thread the bolt into the bushing, allowing the bolt to make its own threads in the bushing.

(c) Attach a slide hammer or suitable puller to the bolt and remove bushing.

(d) Use the short end of Installer 8119 to install the new bushing.

(e) The bushing is correctly installed if the bushing is flush with the transmission case.

(3) If necessary, the shift shaft bearing can be replaced as follows:

(a) Locate a bolt that will thread into the bearing without great effort.

(b) Thread the bolt into the bearing as much as possible.

(c) Attach a slide hammer or suitable puller to the bolt and remove the bearing.

(d) Use the short end of Installer 8119 to install the new bearing.

(e) The bearing is correctly installed if the bearing is flush with the transmission case.

(4) Inspect detent plunger bushings for damage.

NOTE: The detent plunger bushings are installed to a specific depth. The space between the two bushings when correctly installed contain an oil feed hole. Do not attempt to install the bushings with anything other than the specified tool or this oil hole may become restricted.

(5) If necessary, the detent plunger bushings can be replaced as follows:

(a) Using the long end of Installer 8119, drive the detent bushings through the outer case and into the shift shaft bore.

(b) Remove the bushings from the shift shaft bore.

(c) Install a new detent plunger bushing on the long end of Installer 8118.

(d) Start the bushing in the detent plunger bore in the case.

(e) Drive the bushing into the bore until the tool contacts the transmission case.

(f) Install a new detent plunger bushing on the short end of Installer 8118.

(g) Start the bushing in the detent plunger bore in the case.

(h) Drive the bushing into the bore until the tool contacts the transmission case.

GEARTRAIN ASSEMBLY

(1) Install Adapter 6747-1A on input shaft hub of fixture tool (Fig. 90). Then install Adapter 6747-2A on front bearing hub of countershaft. Adapter 6747-2A has a raised shoulder on one side. Be sure the shoulder is seated against the countershaft.

(2) Install input shaft in fixture tool. Make sure Adapter Tool 6747-1A is positioned under shaft as shown (Fig. 91).

(3) Install pilot bearing in input shaft (Fig. 91).

NOTE: There is a correct and an incorrect way to install the pilot bearing into the input shaft. The side of the pilot bearing with the small diameter goes toward the input shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

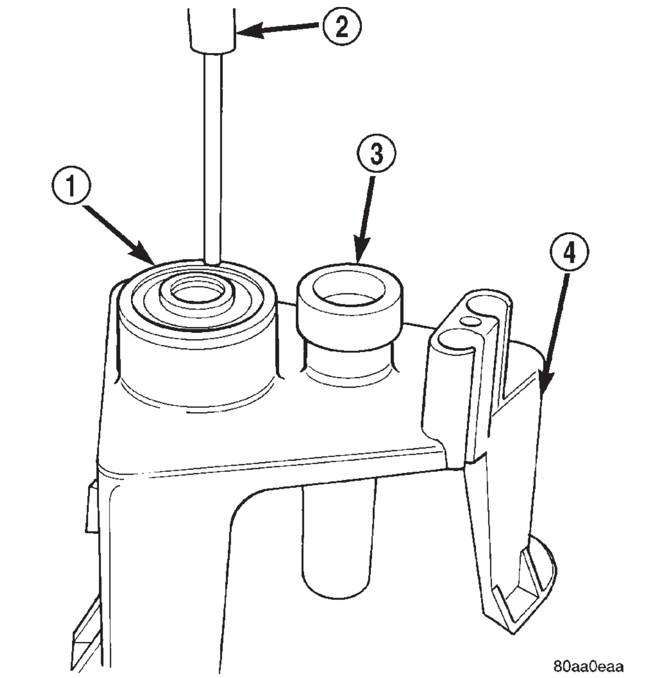


Fig. 90 Preparing Assembly Fixture For Geartrain Build-up

1 – SPECIAL TOOL 6747–2A (INSTALL ON COUNTERSHAFT FRONT HUB)
2 – SPECIAL TOOL 8115
3 – SPECIAL TOOL 6747–1A
4 – SPECIAL TOOL 6747

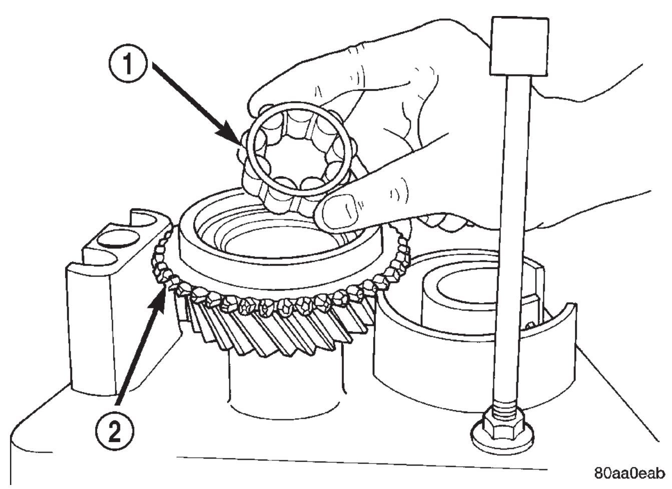


Fig. 91 Installing Pilot Bearing In Input Shaft

1 – PILOT BEARING
2 – INPUT SHAFT

(4) Install fourth gear synchro ring on input shaft (Fig. 92).

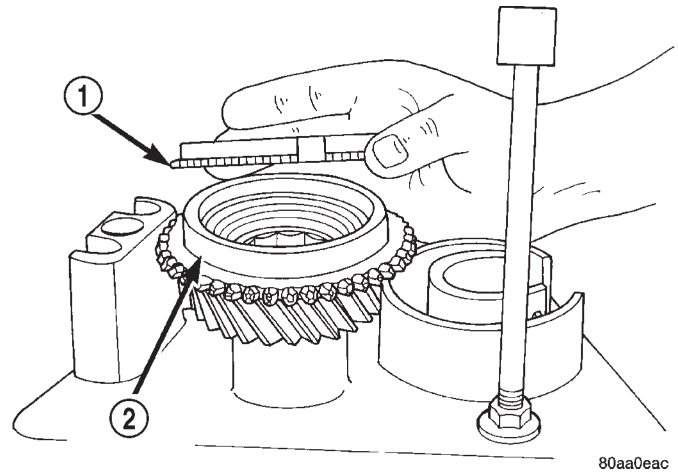


Fig. 92 Installing Fourth Gear Synchro Ring On Input Shaft

1 – FOURTH GEAR SYNCHRO RING
2 – INPUT SHAFT

(5) Adjust height of idler gear pedestal on assembly fixture (Fig. 93). Start with a basic height of 18.4 cm (7-1/4 in.). Final adjustment can be made after gear is positioned on pedestal.

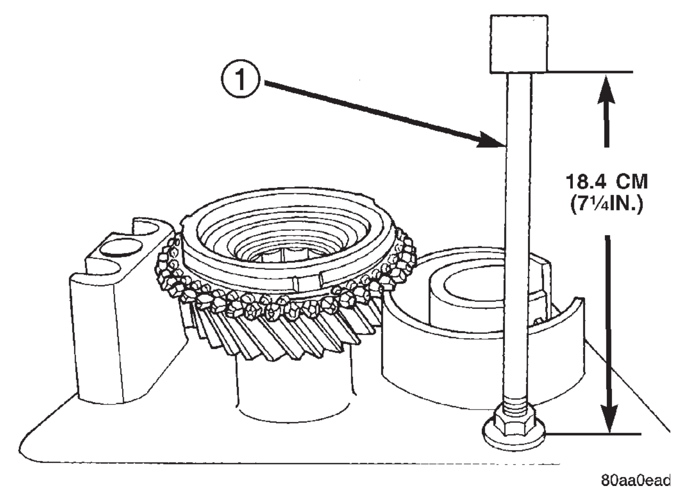


Fig. 93 Idler Pedestal Basic Height Adjustment

1 – REVERSE IDLER PEDESTAL

(6) Install assembled output shaft and geartrain in input shaft (Fig. 94). Carefully rotate output shaft until the 3–4 synchro ring seats in synchro hub and sleeve.

DISASSEMBLY AND ASSEMBLY (Continued)

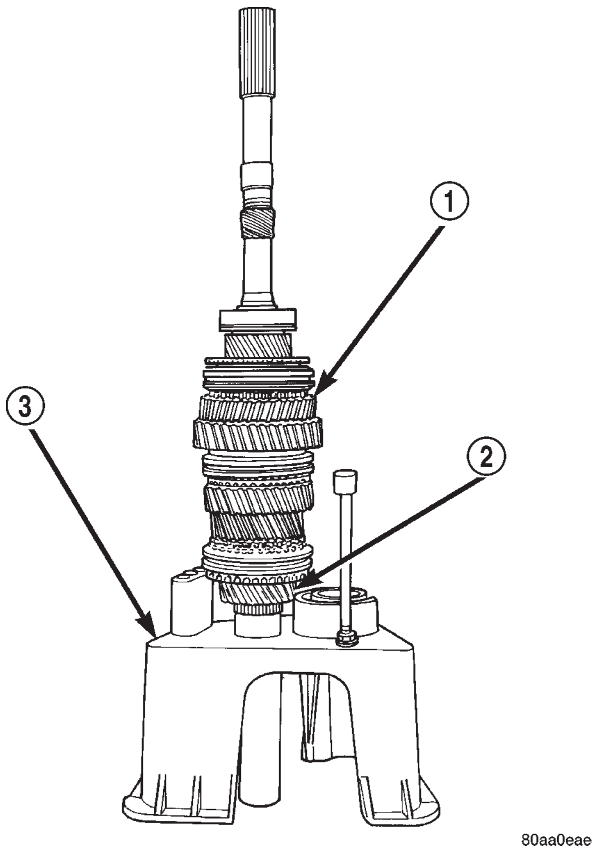


Fig. 94 Output Shaft And Geartrain Installed In Input Shaft

1 – OUTPUT SHAFT AND GEARTRAIN
2 – INPUT SHAFT
3 – SPECIAL TOOL 6747

(7) Install Adapter 6747-2A on front bearing hub of countershaft, if not previously done. The adapter has a shoulder on one side. The shoulder goes toward the countershaft.

(8) Slide countershaft (and adapter) into fixture slot. Verify that countershaft and output shaft gears are fully meshed with the mainshaft gears before proceeding (Fig. 95).

(9) Check alignment of countershaft and output shaft gear teeth. Note that gears may not align perfectly. A difference in height of 1.57 to 3.18 mm (1/16 to 1/8 in.) will probably exist. This difference will not interfere with assembly. However, if the difference is greater than this, the countershaft adapter tool is probably upside down. Remove countershaft, reverse adapter tool, reinstall countershaft and check alignment again.

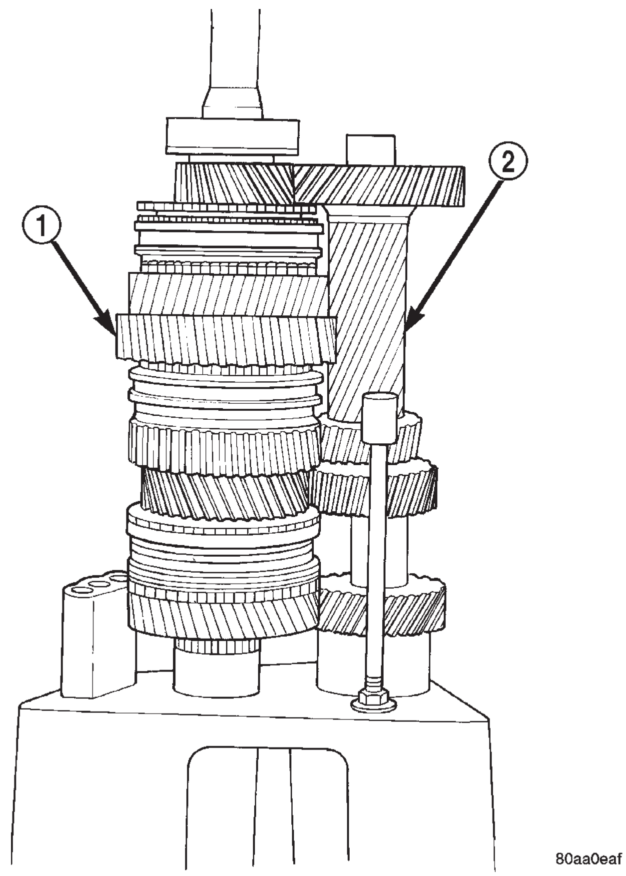


Fig. 95 Countershaft Installed On Fixture Tool

1 – OUTPUT SHAFT AND GEARTRAIN
2 – COUNTERSHAFT (SLIDE INTO PLACE ON FIXTURE TOOL)

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Position reverse idler in support cup of assembly fixture (Fig. 96). Be sure idler gear is properly meshed and aligned with shaft gear teeth and that bolt holes are facing out and not toward geartrain. Adjust pedestal up or down if necessary. Also be sure that short end of idler shaft is facing up as shown.

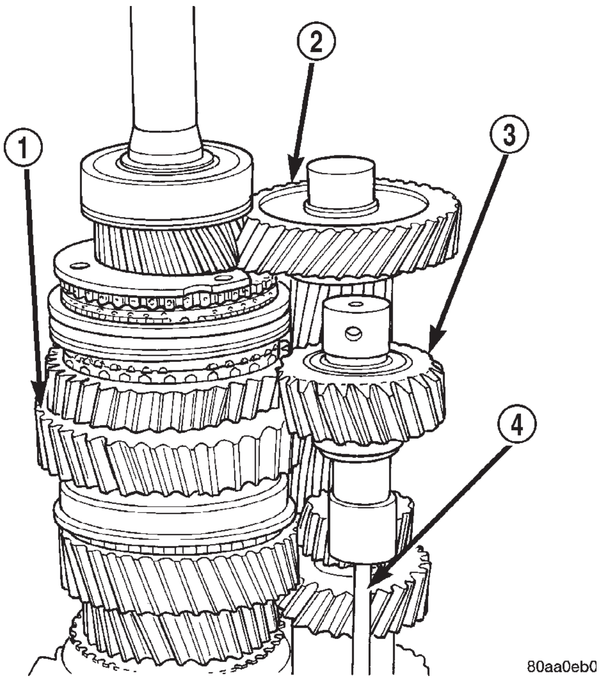


Fig. 96 Reverse Idler Assembly Positioned On Assembly Fixture Pedestal

1 – OUTPUT SHAFT AND GEARTRAIN
2 – COUNTERSHAFT
3 – REVERSE IDLER ASSEMBLY
4 – TOOL PEDESTAL

(11) On 2-wheel drive transmission, thread one Pilot Stud 8120 in center or passenger side hole of output shaft bearing retainer. Then position retainer on fifth gear as shown (Fig. 97).

(12) Assemble 1-2 and fifth reverse-shift forks (Fig. 98). Arm of fifth-reverse fork goes through slot in 1-2 fork.

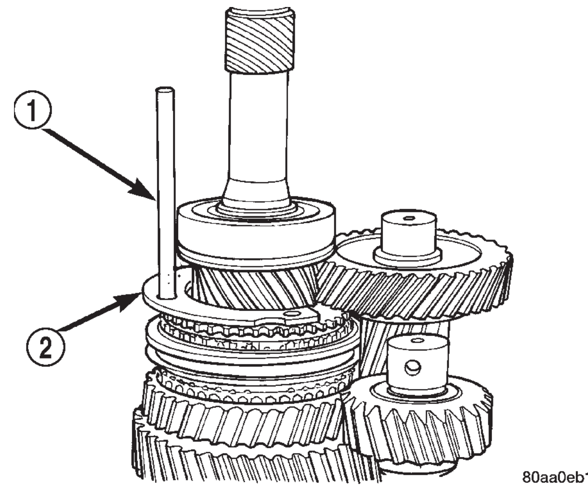


Fig. 97 Positioning Output Shaft Bearing Retainer For Rear Housing Installation

1 – SPECIAL TOOL 8120
2 – OUTPUT SHAFT BEARING RETAINER

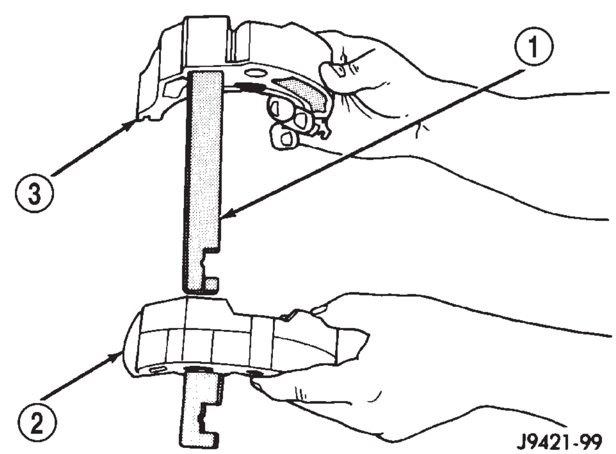


Fig. 98 Assembling 1-2 And Fifth-Reverse Shift Forks

1 – INSERT ARM THROUGH 1–2 FORK
2 – 1–2 FORK
3 – FIFTH-REVERSE FORK

DISASSEMBLY AND ASSEMBLY (Continued)

(13) Install assembled shift forks in synchro sleeves (Fig. 99). Be sure forks are properly seated in sleeves.

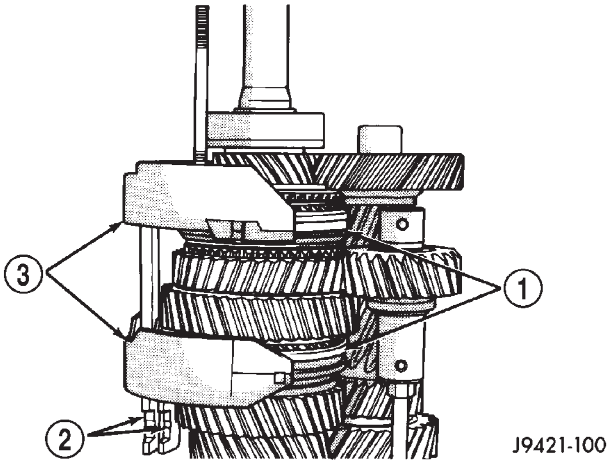


Fig. 99 Shift Forks Installed In Synchro Sleeves

1 – SYNCHRO SLEEVES
2 – FORK ARMS
3 – SHIFT FORKS

REAR HOUSING—2WD

(1) Drive adapter housing alignment dowels back into housing until dowels are flush with mounting surface (Fig. 100).

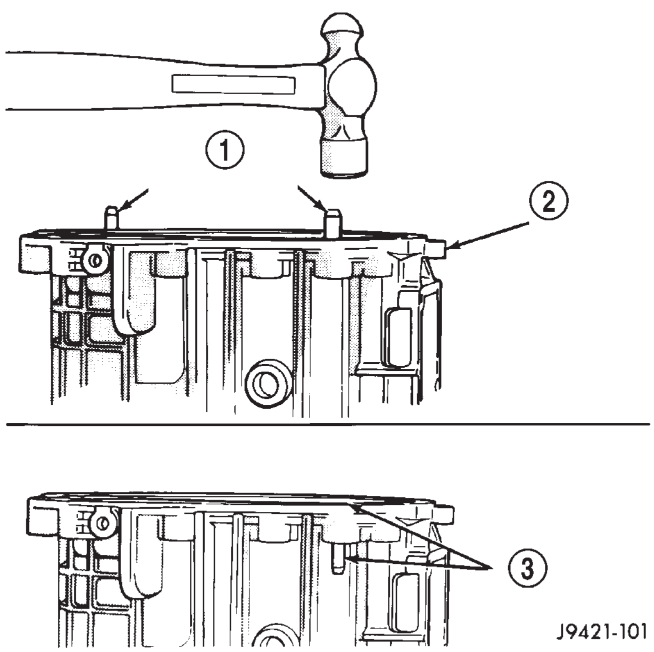


Fig. 100 Preparing Rear Housing Dowels For Installation

1 – HOUSING ALIGNMENT DOWELS
2 – REAR HOUSING
3 – DOWEL FLUSH WITH SURFACE

(2) Apply liberal quantity of petroleum jelly to countershaft rear bearing and bearing race.

(3) Install countershaft rear bearing in bearing race (Fig. 101).

CAUTION: The countershaft bearings can be installed backwards if care is not exercised. Be sure the large diameter side of the roller retainer faces the countershaft and the small diameter side faces the race and housing (Fig. 102).

(4) Apply extra petroleum jelly to hold countershaft rear bearing in place when housing is installed.

(5) Apply light coat of petroleum jelly to shift shaft bushing/bearing in rear housing (Fig. 102).

(6) Reach into countershaft rear bearing with finger, and push each bearing roller outward against race. Then apply extra petroleum jelly to hold rollers in place. This avoids having rollers becoming displaced during housing installation. This will result in misalignment between bearing and countershaft bearing hub.

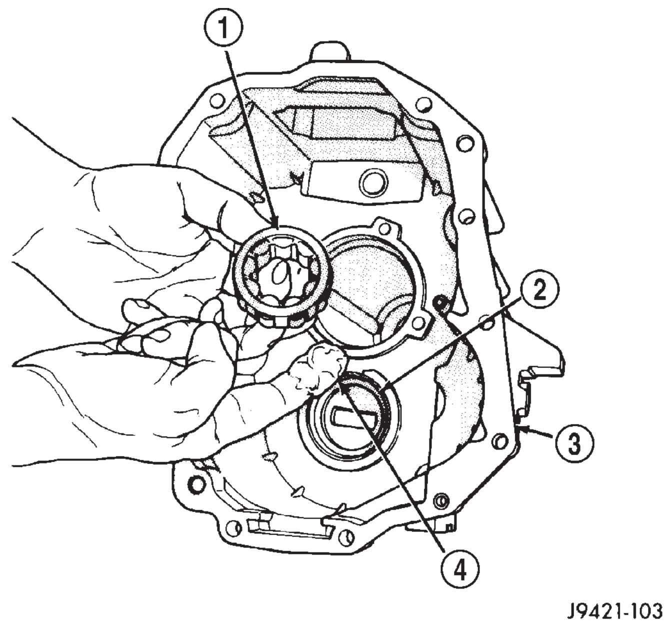


Fig. 101 Lubricating Countershaft Rear Bearing

1 – COUNTERSHAFT REAR BEARING
2 – REAR BEARING RACE
3 – REAR HOUSING
4 – PETROLEUM JELLY (APPLY TO BEARING AND RACE)

DISASSEMBLY AND ASSEMBLY (Continued)

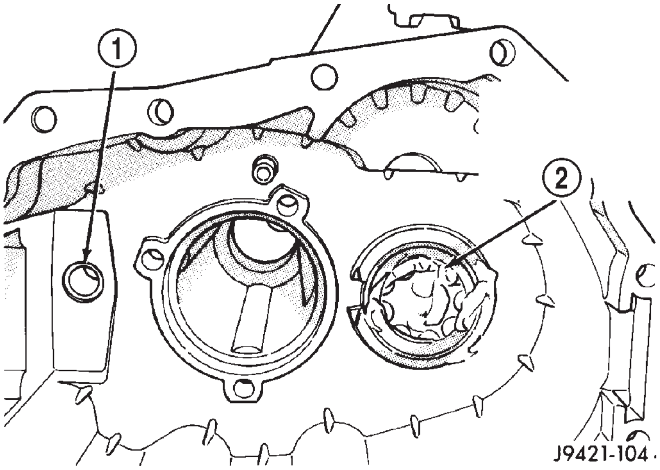


Fig. 102 Countershaft Rear Bearing Seated In Seated in Race

1 – SHIFT SHAFT BUSHING/BEARING
2 – COUNTERSHAFT REAR BEARING (SEATED IN RACE)

(7) Install rear housing onto geartrain (Fig. 103). Be sure bearing retainer pilot stud is in correct bolt hole in housing. Also be sure countershaft and output shaft bearings are aligned in housing and on countershaft. It may be necessary to lift upward on countershaft slightly to ensure that the countershaft rear bearing engages to the countershaft before the rear output shaft bearing engages the housing.

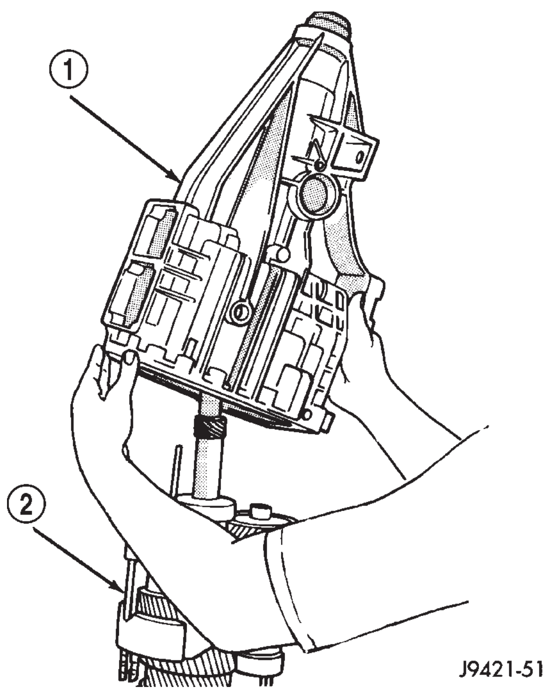


Fig. 103 Rear Housing Installation—2WD

1 – REAR HOUSING
2 – SHIFT FORKS AND GEARTRAIN

(8) Seat rear housing on output shaft rear bearing and countershaft. Use plastic or rawhide mallet to tap housing into place.

(9) Install the three bolts that secure rear bearing retainer to rear housing as follows:

(a) Apply Mopar® Gasket Maker, or equivalent, to bolt threads, bolt shanks and under bolt heads (Fig. 104).

(b) Start first two bolts in retainer (Fig. 105). It may be necessary to move retainer rearward (with pilot stud) in order to start bolts in retainer.

(c) Remove Pilot Stud 8120 and install last retainer bolt (Fig. 105).

(d) Tighten all three retainer bolts to 30-35 N·m (22-26 ft. lbs.) torque.

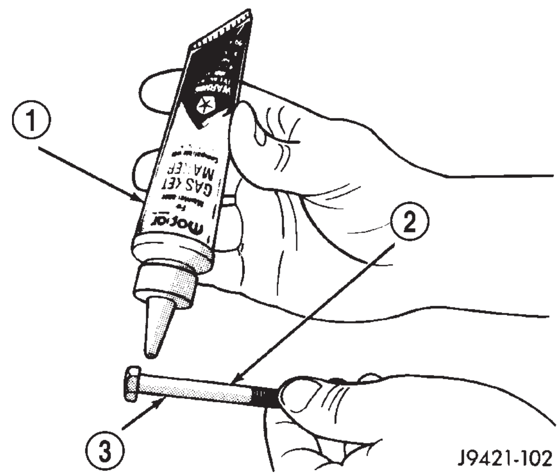


Fig. 104 Applying Sealer To Retainer And Housing Bolts

1 – MOPAR GASKET MAKER (OR LOCTITE 518)
2 – RETAINER AND HOUSING BOLTS
3 – APPLY SEALER TO UNDERSIDE OF BOLT HEAD, SHANK AND THREADS

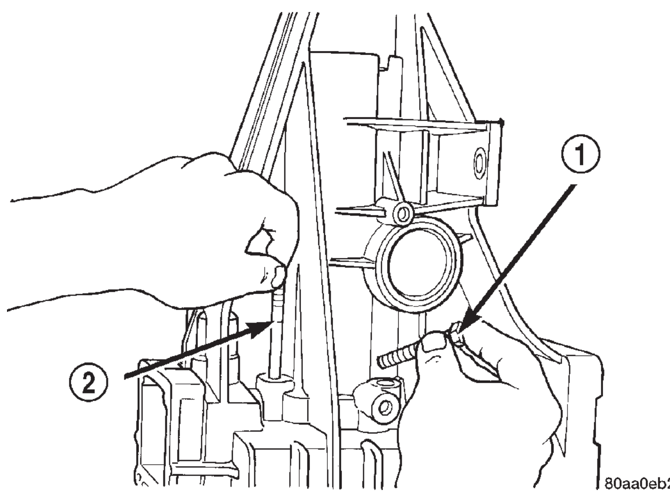


Fig. 105 Removing Pilot Stud Tool And Installing Retainer Bolts—2WD

1 – BEARING RETAINER BOLT
2 – SPECIAL TOOL 8120

DISASSEMBLY AND ASSEMBLY (Continued)

ADAPTER HOUSING—4WD

(1) Install rear bearing in adapter housing. Use wood hammer handle or wood dowel to tap bearing into place.

(2) Position rear bearing retainer in adapter housing (Fig. 106).

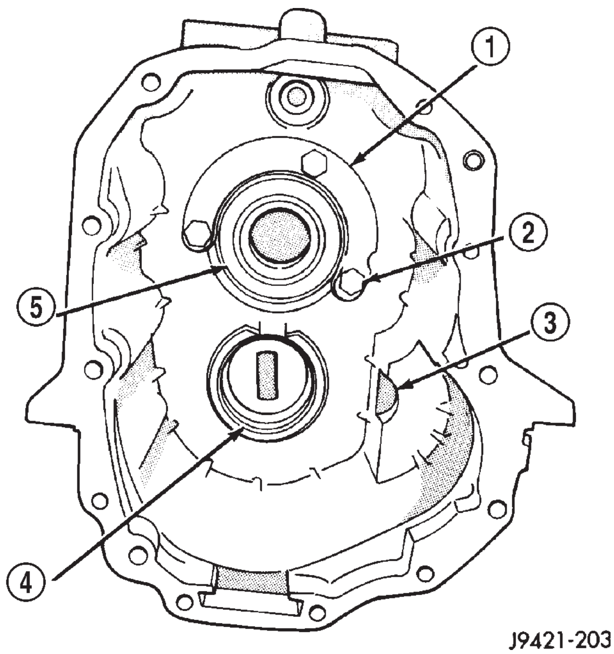


Fig. 106 Preparing Adapter Housing For Installation—4WD

1 – BEARING RETAINER
2 – RETAINER BOLTS (3)
3 – IDLER SHAFT NOTCH
4 – COUNTERSHAFT REAR BEARING RACE
5 – REAR BEARING

(3) Apply Mopar® Gasket Maker, or equivalent, to threads, bolt shanks and under hex heads of bearing retainer bolts (Fig. 107).

(4) Apply liberal quantity of petroleum jelly to countershaft rear bearing and bearing race.

(5) Install countershaft rear bearing in bearing race (Fig. 102).

CAUTION: The countershaft bearings can be installed backwards if care is not exercised. Be sure the large diameter side of the roller retainer faces the countershaft and the small diameter side faces the race and housing (Fig. 102).

(6) Apply extra petroleum jelly to hold countershaft rear bearing in place when housing is installed.

(7) Apply light coat of petroleum jelly to shift shaft bushing/bearing in adapter housing (Fig. 102).

(8) Install adapter housing on geartrain.

(9) Install rear bearing snap ring on output shaft (Fig. 107).

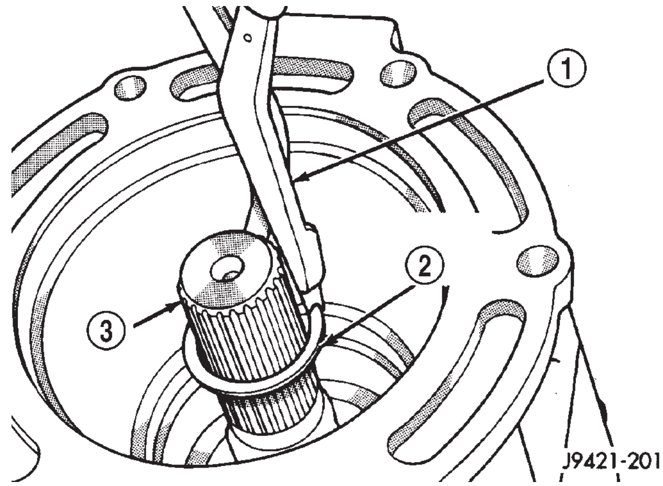


Fig. 107 Installing Rear Bearing Snap Ring—4WD

1 – HEAVY DUTY SNAP RING PLIERS
2 – REAR BEARING SNAP RING
3 – OUTPUT SHAFT

(10) Lubricate lip of new rear seal (Fig. 108) with Mopar® Door Ease, or transmission fluid.

(11) Install new rear seal in adapter housing bore with Installer C-3860-A. Be sure seal is fully seated in housing bore (Fig. 108).

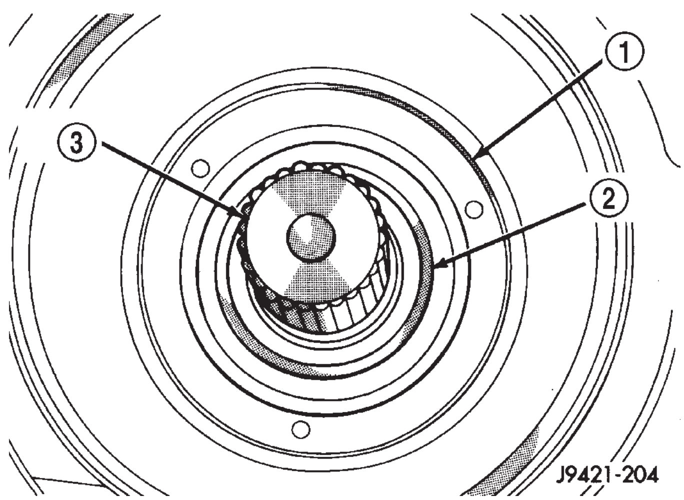


Fig. 108 Rear Seal Installation—4WD

1 – REAR SEAL
2 – SEAL LIP
3 – OUTPUT SHAFT

SHIFT SHAFT, SHAFT LEVER AND BUSHING AND SHIFT SOCKET

(1) Before proceeding, verify that all synchro sleeves are in Neutral position (centered on hub). Move sleeves into neutral if necessary.

DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: The transmission synchros must all be in Neutral position for proper reassembly. Otherwise, the housings, shift forks and gears can be damaged during installation of the two housings.

(2) Install 3-4 shift fork in synchro sleeve (Fig. 109). Verify that groove in fork arm is aligned with grooves in 1-2 and fifth-reverse fork arms as shown.

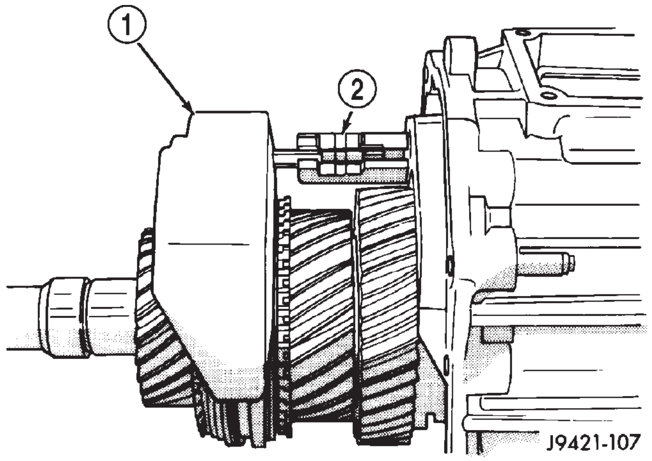


Fig. 109 Installing 3-4 Shift Fork

1 – 3–4 FORK
2 – ALIGN GROOVES IN FORK ARMS

(3) Slide shift shaft through 3-4 shift fork (Fig. 110). Be sure shaft detent notches are to front.

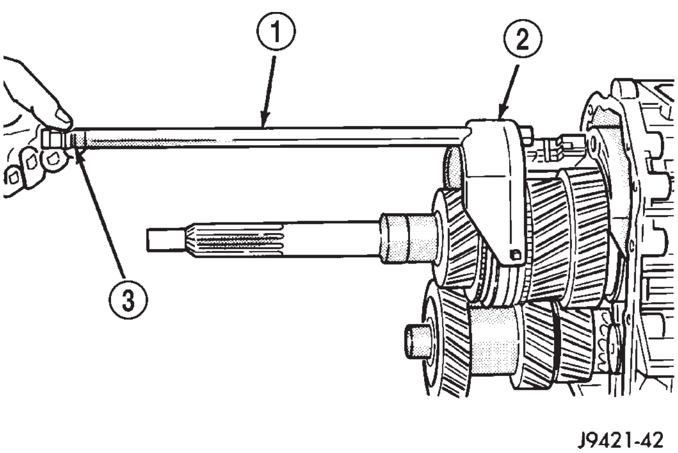


Fig. 110 Shift Shaft Installation

1 – SHIFT SHAFT
2 – 3–4 FORK
3 – SHAFT DETENT NOTCHES

(4) Assemble shift shaft shift lever and bushing (Fig. 111). Be sure slot in bushing is facing up and roll pin hole for lever is aligned with hole in shaft.

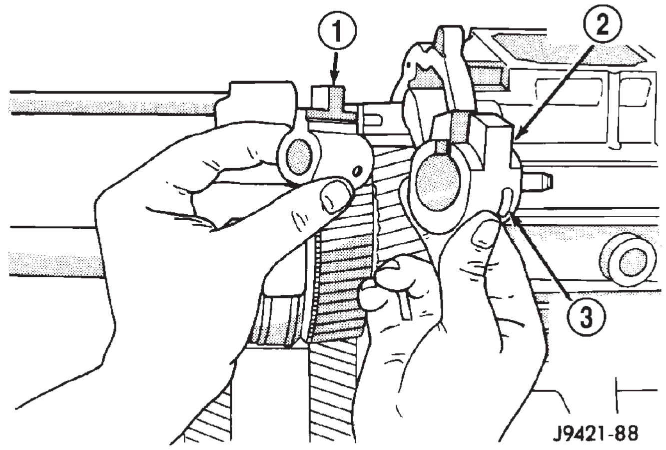


Fig. 111 Assembling Shift Shaft Lever And Bushing

1 – SHAFT LEVER
2 – LEVER BUSHING
3 – BUSHING LOCK PIN SLOT

(5) Install assembled lever and bushing on shift shaft (Fig. 112).

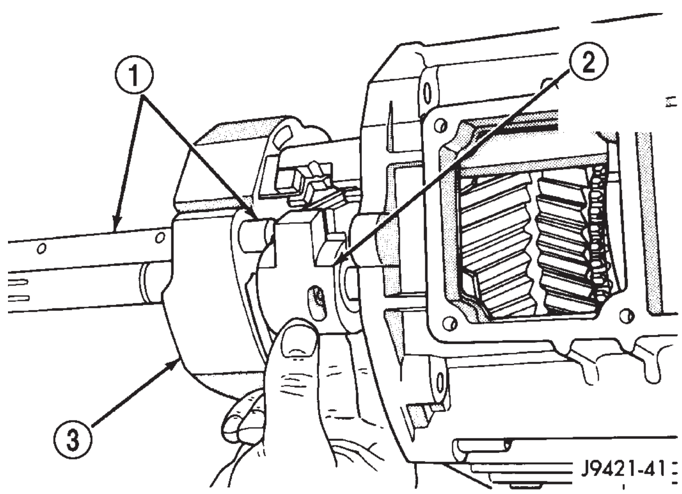


Fig. 112 Installing Shift Shaft Lever And Bushing

1 – SHIFT SHAFT
2 – SHAFT LEVER AND BUSHING
3 – 3–4 FORK

(6) Slide shift shaft through 1-2 and fifth-reverse fork and into shift lever opening in rear housing (Fig. 113).

(7) Align shift socket with shaft and slide shaft through socket and into shift shaft bearing in rear housing (Fig. 114).

(8) Rotate shift shaft so detent notches in shaft are facing the TOP of the transmission housing.

DISASSEMBLY AND ASSEMBLY (Continued)

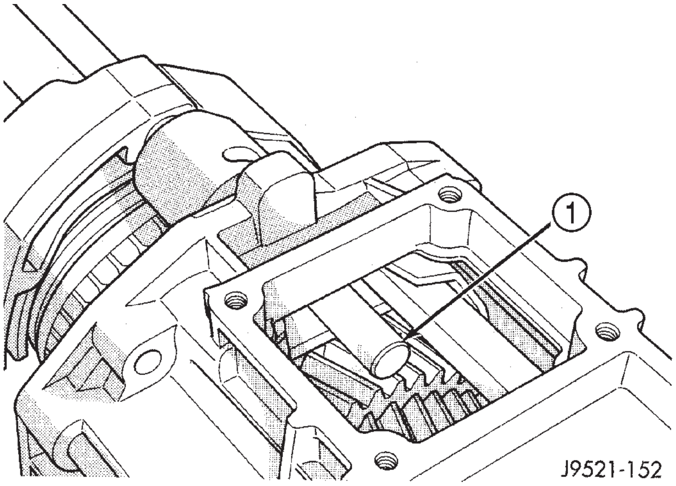


Fig. 113 Inserting Shaft Into Lever Opening In Housing

1 – SHIFT SHAFT

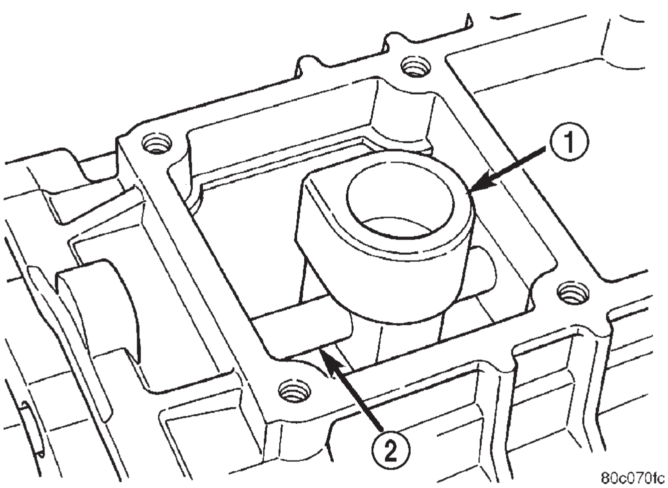


Fig. 114 Shift Socket Installation

1 – SHIFT SOCKET
2 – SHIFT SHAFT

CAUTION: Correct positioning of the shift shaft detent notch is important. Both of the shaft roll pins can be installed even when the shaft is 180° off. If this occurs, the transmission will have to be disassembled again to correct shaft alignment.

(9) Select correct new roll pin for shift shaft lever (Fig. 115). Shaft lever roll pin is approximately 22 mm (7/8 in.) long. Shift socket roll pin is approximately 33 mm (1-1/4 in.) long.

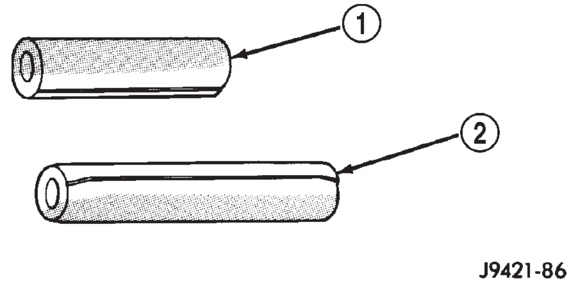


Fig. 115 Roll Pin Identification—Shaft Lever And Shift Socket

1 – SHAFT LEVER ROLL PIN
2 – SHIFT SOCKET ROLL PIN

(10) Align roll pin holes in shift shaft, lever and bushing. Then start roll pin into shaft lever by hand (Fig. 116).

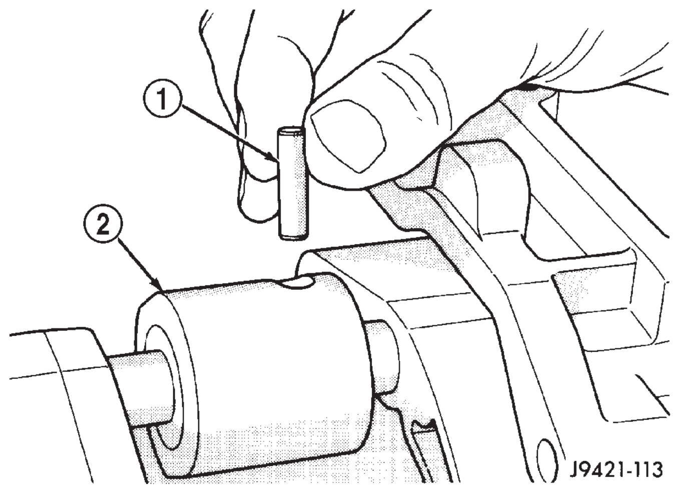


Fig. 116 Starting Roll Pin In Shift Shaft Lever

1 – SHAFT LEVER ROLL PIN (7⁄8" LONG)
2 – LEVER AND BUSHING

(11) Seat shaft lever roll pin with pin punch (Fig. 117).

CAUTION: The shaft lever roll pin must be flush with the surface of the lever. The lever bushing will bind on the roll pin if the pin is not seated flush.

(12) Before proceeding, verify that lock pin slot in lever bushing is positioned as shown (Fig. 117).

(13) Align roll pin holes in shift socket and shift shaft. Then start roll pin into shift shaft by hand (Fig. 118).

DISASSEMBLY AND ASSEMBLY (Continued)

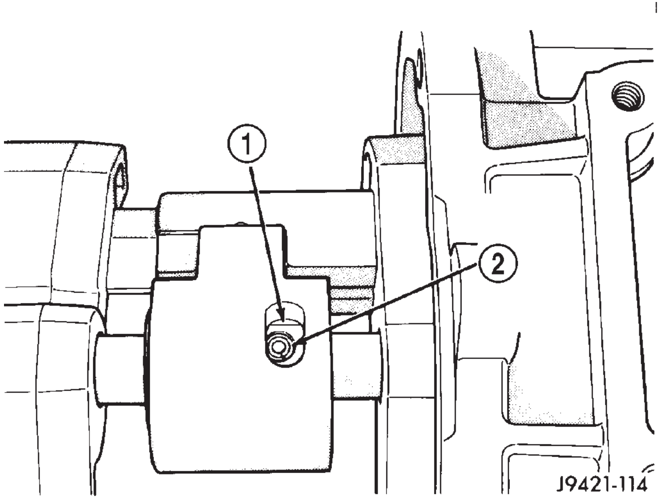


Fig. 117 Correct Seating Of Shift Shaft Lever Roll Pin

1 – BUSHING LOCK PIN SLOT
2 – SEAT ROLL PIN FLUSH WITH LEVER

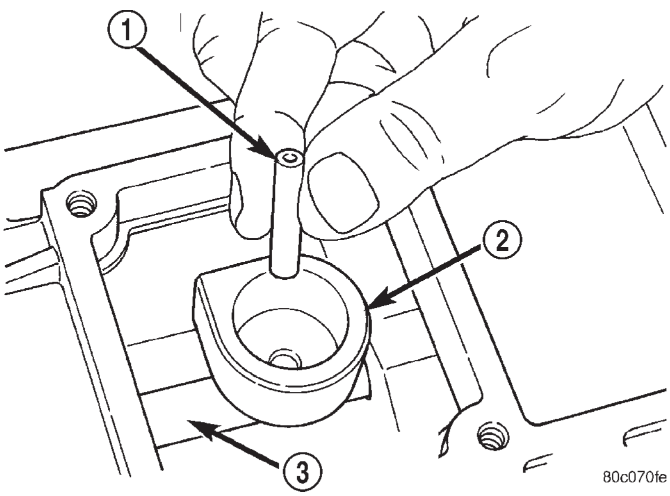


Fig. 118 Starting Roll Pin In Shift Socket

1 – ROLL PIN
2 – SHIFT SOCKET
3 – SHIFT SHAFT

(14) Seat roll pin in shift socket with pin punch. Roll pin must be flush with socket after installation (Fig. 119).

(15) Verify that notches in shift fork arms are aligned. Realign arms if necessary.

FRONT HOUSING AND INPUT SHAFT BEARING RETAINER

(1) If previously removed, install input shaft bearing in front housing bore (Fig. 120). Install snap ring and use plastic mallet to seat bearing. Bearing goes in from front side of housing only.

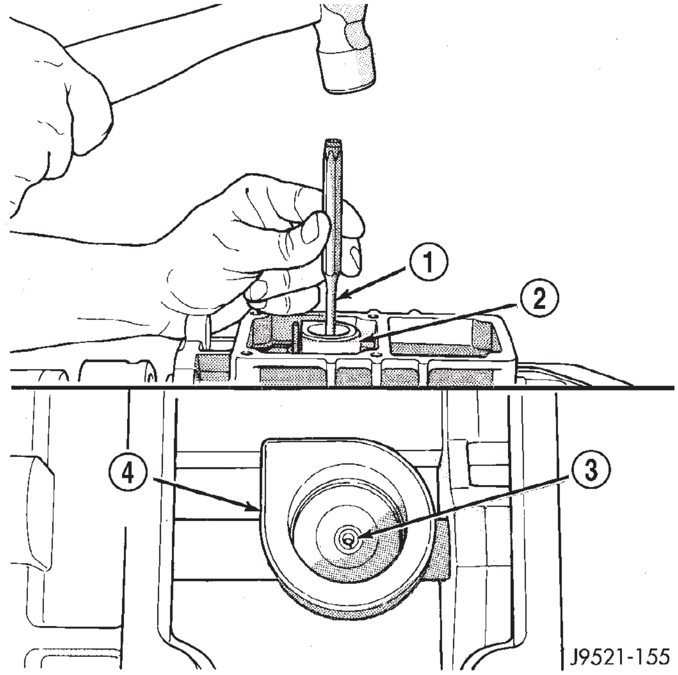


Fig. 119 Seating Shift Socket Roll Pin

1 – PIN PUNCH
2 – SHIFT SOCKET
3 – SEAT ROLL PIN FLUSH
4 – SHIFT SOCKET

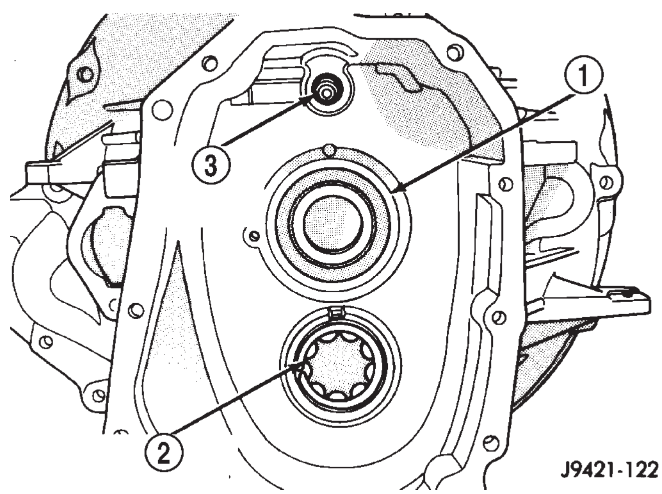


Fig. 120 Input Shaft Bearing And Countershaft Front Bearing

1 – INPUT SHAFT BEARING
2 – COUNTERSHAFT FRONT BEARING
3 – SHIFT SHAFT BUSHING

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Apply liberal quantity of petroleum jelly to countershaft front bearing. Then insert bearing in front housing race (Fig. 120). Large diameter side of bearing cage goes toward countershaft (Fig. 121). Small diameter side goes toward bearing race in housing.

(3) Reach into countershaft front bearing with finger, and push each bearing roller outward against race. Then apply extra petroleum jelly to hold rollers in place. This avoids having rollers becoming displaced during housing installation. This will result in misalignment between bearing and countershaft bearing hub.

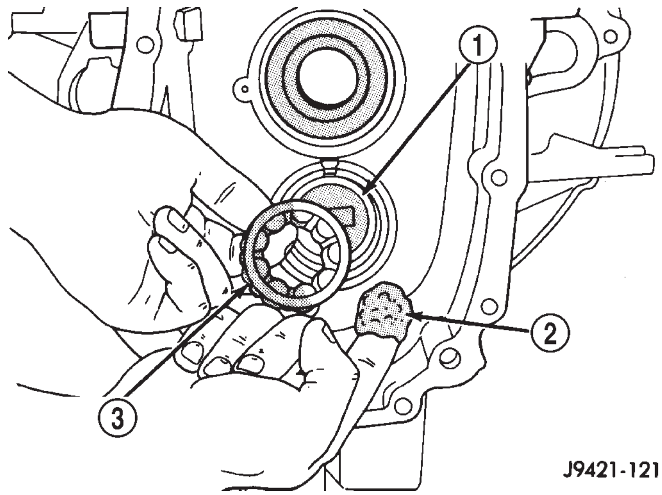


Fig. 121 Lubricating/Positioning Countershaft Front Bearing

1 – BEARING RACE
2 – PETROLEUM JELLY
3 – COUNTERSHAFT FRONT BEARING

(4) Apply small amount of petroleum jelly to shift shaft bushing in front housing.

(5) Apply 1/8 in. wide bead of Mopar® Gasket Maker, or equivalent, to mating surfaces of front and rear housings (Fig. 122).

(6) Have helper hold rear housing and geartrain in upright position. Then install front housing on rear housing and geartrain.

(7) Work front housing downward onto geartrain until seated on rear housing.

CAUTION: If the front housing will not seat on the rear housing, either the shift components are not in Neutral, or one or more components are misaligned. Do not force the front housing into place. This will only result in damaged components.

(8) Tap rear housing alignment dowels back into place with hammer and pin punch. Both dowels should be flush fit in each housing. Have helper hold transmission upright while dowels are tapped back into place.

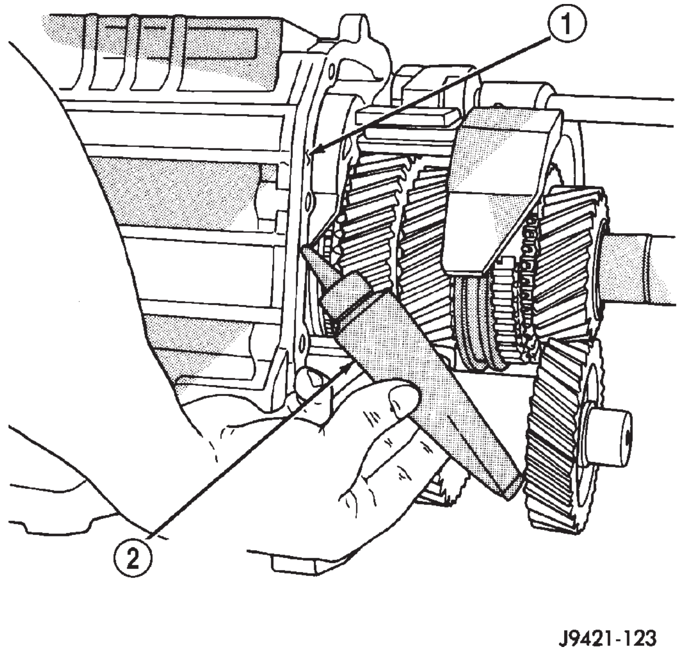


Fig. 122 Applying Sealer To Front/Rear Housings

1 – HOUSING FLANGE SURFACE
2 – MOPAR GASKET MAKER (OR LOCTITE 518)

(9) Place transmission in horizontal position.

(10) Apply Mopar® Gasket Maker, or equivalent, to housing attaching bolts. Apply sealer material sealer to underside of bolt heads and to bolt shanks and threads (Fig. 123).

(11) Install and start housing attaching bolts by hand (Fig. 123). Then tighten bolts to 34 N·m (25 ft. lbs.) torque.

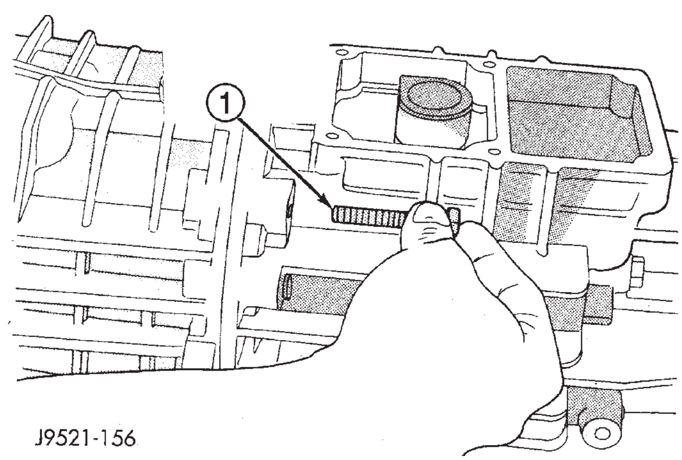


Fig. 123 Installing Housing Attaching Bolts

1 – HOUSING ATTACHING BOLTS (APPLY SEALER BEFOREHAND)

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Install shift shaft bushing lock bolt (Fig. 124). Apply Mopar® Gasket Maker, or equivalent, to bolt threads, shank and underside of bolt head before installation.

CAUTION: If the lock bolt cannot be fully installed, do not try to force it into place. Either the shift shaft is not in Neutral, or the shaft bushing (or lever) is misaligned.

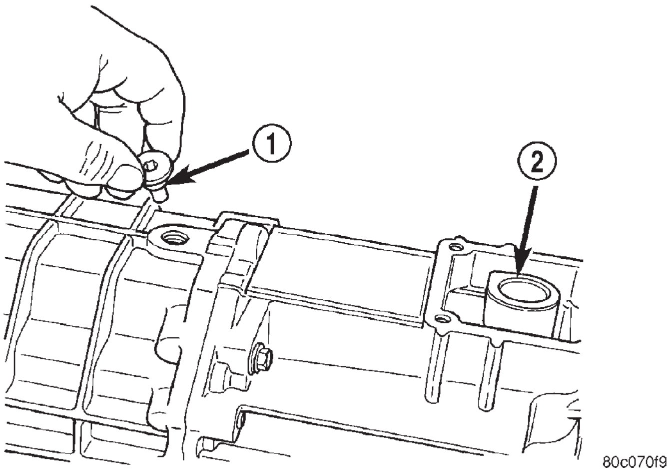


Fig. 124 Installing Shift Shaft Bushing Lock Bolt

1 – SHIFT SHAFT LOCK BOLT
2 – SHAFT SOCKET

(13) Lubricate then install shift shaft detent plunger in housing bore (Fig. 125). Lubricate plunger with petroleum jelly or gear lubricant. **Be sure plunger is fully seated in detent notch in shift shaft.**

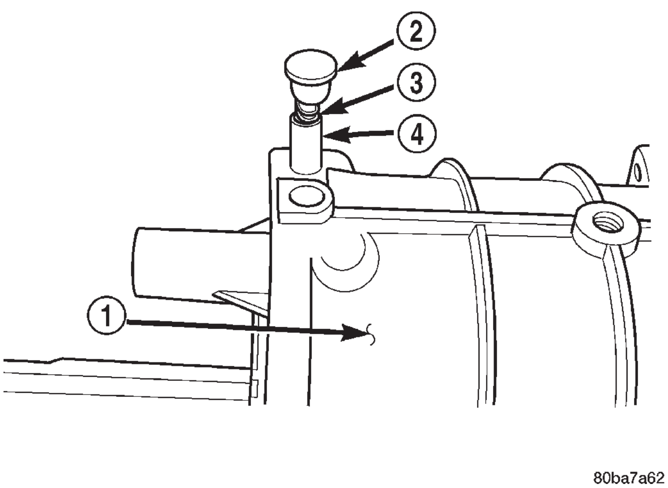


Fig. 125 Installing Shift Shaft Detent Plunger, Spring, and Plug

1 – FRONT HOUSING
2 – PLUG
3 – SPRING
4 – PLUNGER

(14) Install detent spring inside plunger (Fig. 125).

(15) Install detent plug as follows:

(a) Install detent plug in end of Installer 8123.

(b) Position plug on detent spring and compress spring until detent plug pilots in detent plunger bore.

(c) Drive detent plug into transmission case until plug seats.

(16) Install backup light switch (Fig. 126).

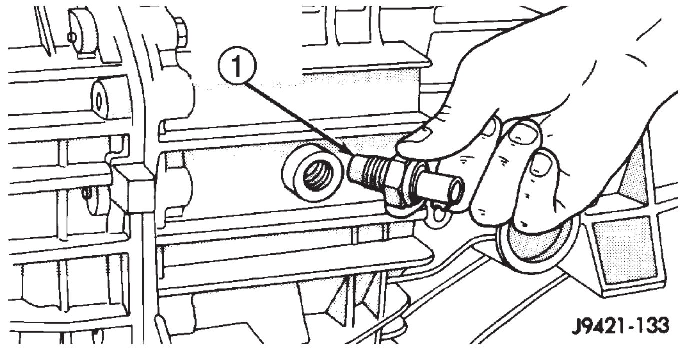


Fig. 126 Installing Backup Light Switch

1 – BACKUP LIGHT SWITCH

(17) Install input shaft snap ring (Fig. 127).

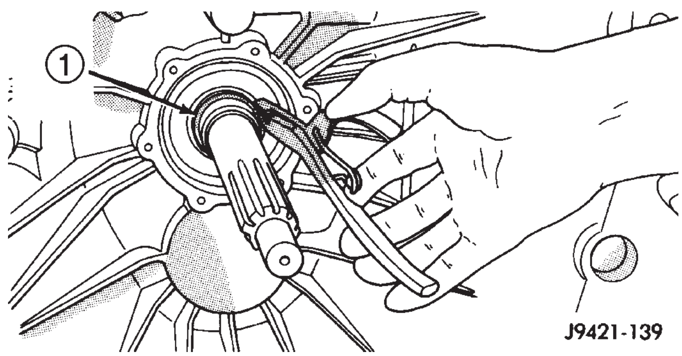


Fig. 127 Installing Input Shaft Snap Ring—Typical

1 – INPUT SHAFT SNAP RING

(18) Install new oil seal in front bearing retainer with Installer Tool 6448 (Fig. 128).

(19) Apply bead of Mopar® silicone sealer, or equivalent, to flange surface of front bearing retainer (Fig. 129).

DISASSEMBLY AND ASSEMBLY (Continued)

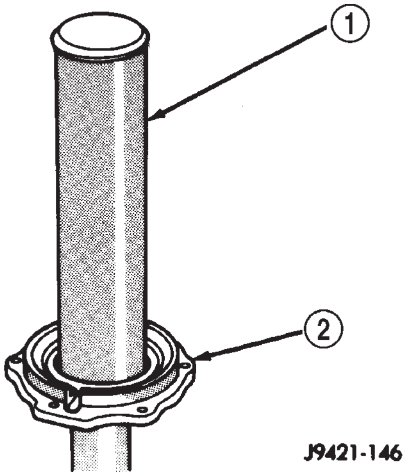


Fig. 128 Installing Oil Seal In Front Bearing Retainer

1 – SPECIAL TOOL 6448
2 – FRONT BEARING RETAINER

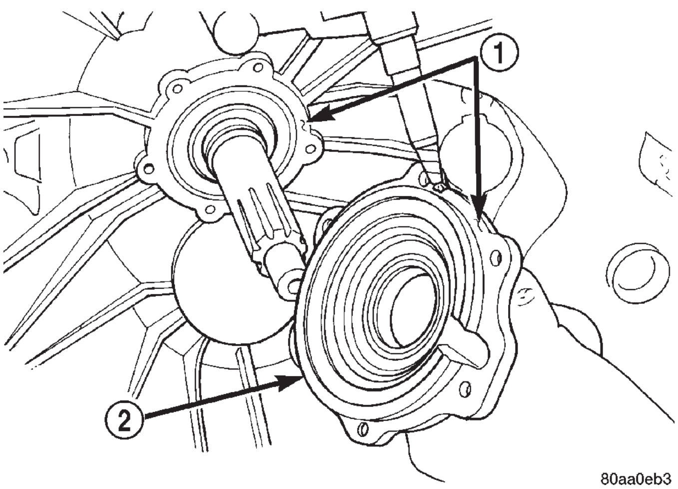


Fig. 129 Applying Sealer To Bearing Retainer And Housing—Typical

1 – APPLY SEALER BEAD
2 – INPUT SHAFT BEARING RETAINER

(20) Align and install front bearing retainer over input shaft and onto housing mounting surface (Fig. 130). Although retainer is one-way fit on housing, be sure bolt holes are aligned before seating retainer.

NOTE: Be sure that no sealer gets into the oil feed hole in the transmission case or bearing retainer.

(21) Install and tighten bearing retainer bolts to 7-10 N·m (5-7 ft. lbs.) torque (Fig. 131).

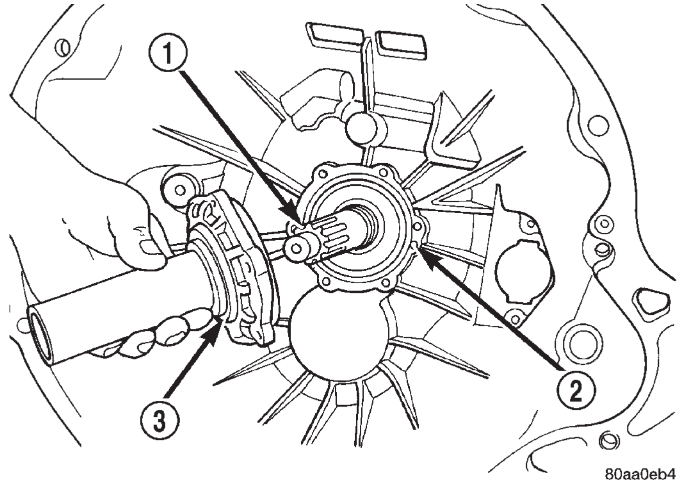


Fig. 130 Installing Input Shaft Bearing Retainer—Typical

1 – INPUT SHAFT
2 – OIL FEED
3 – BEARING RETAINER

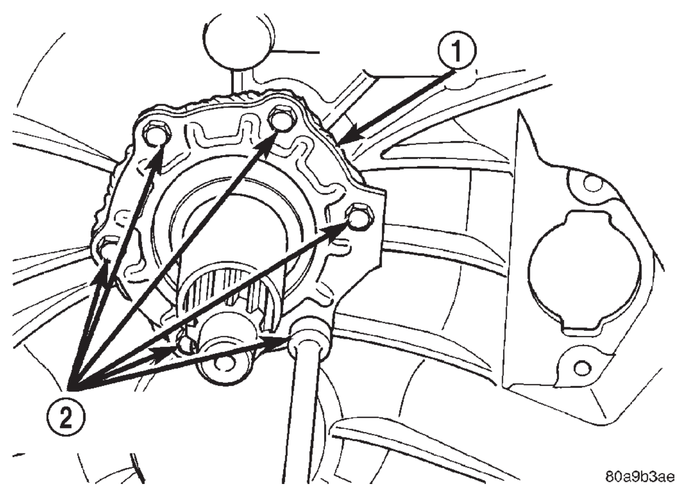


Fig. 131 Installing Input Shaft Bearing Retainer Bolts—Typical

1 – INPUT SHAFT BEARING RETAINER
2 – RETAINER BOLTS

SHIFT TOWER AND LEVER ASSEMBLY

(1) Apply petroleum jelly to ball end of shift lever and interior of shift socket.

(2) Shift the transmission into third gear.

(3) Align and install shift tower and lever assembly (Fig. 132). Be sure shift ball is seated in socket and the offset in the tower is toward the passenger side of the vehicle before installing tower bolts.

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Install shift tower bolts (Fig. 133). Tighten bolts to 8.5 N·m (75.2 in. lbs.) torque.

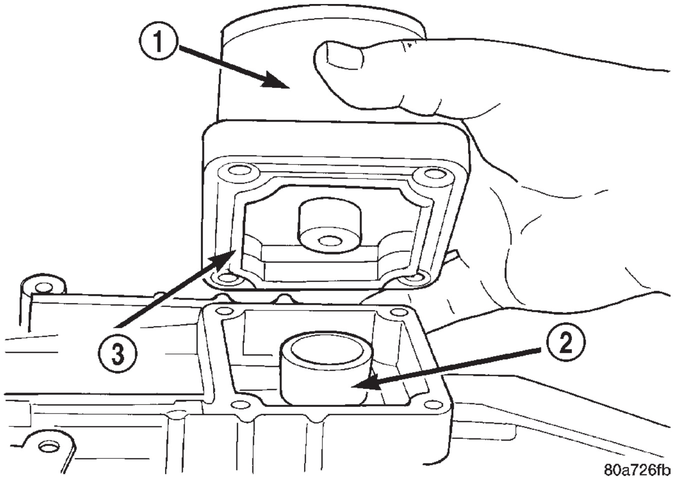


Fig. 132 Shift Tower Installation

1 – SHIFT TOWER AND LEVER ASSEMBLY
2 – SHIFT SOCKET
3 – SEAL

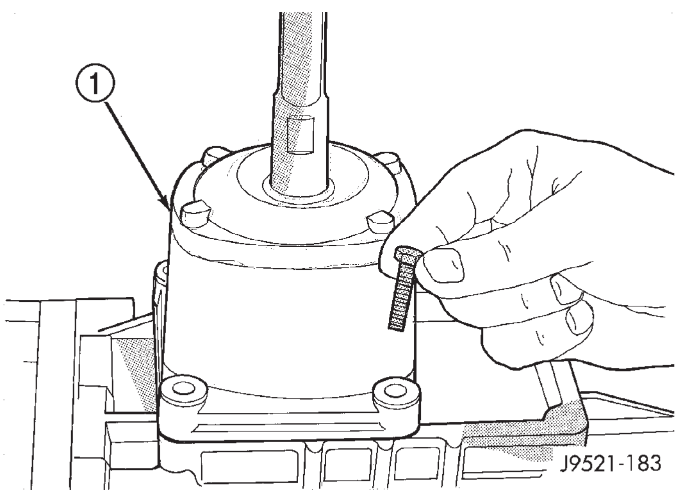


Fig. 133 Shift Tower Bolt Installation

1 – SHIFT TOWER AND LEVER ASSEMBLY

(5) Fill transmission to bottom edge of fill plug hole with Mopar® Transmission Lubricant, P/N 4761526.

(6) Install and tighten fill plug to 34 N·m (25 ft. lbs.) torque.

(7) Check transmission vent. Be sure vent is open and not restricted.

CLEANING AND INSPECTION

TRANSMISSION COMPONENTS

Clean the gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean the shaft bearings with a mild solvent such as Mopar® degreasing solvent, Gunk, or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry, or wipe them dry with clean shop towels.

SHIFT LEVER ASSEMBLY

The shift lever assembly is not serviceable. Replace the lever and shift tower as an assembly if the tower, lever, lever ball, or internal components are worn, or damaged.

SHIFT SHAFT AND FORKS

Inspect the shift fork interlock arms and synchro sleeve contact surfaces (Fig. 134). Replace any fork exhibiting wear or damage in these areas. Do not attempt to salvage shift forks.

Check condition of the shift shaft detent plunger and spring. The plunger should be smooth and free of nicks, or scores. The plunger spring should be straight and not collapsed, or distorted. Minor scratches, or nicks on the plunger can be smoothed with 320/400 grit emery soaked in oil. Replace the plunger and spring if in doubt about condition. Check condition of detent plunger bushings. Replace if damaged.

Inspect the shift shaft, shift shaft bushing and bearing, the shaft lever, and the lever bushing that fits over the lever. Replace the shaft if bent, cracked, or severely scored. Minor burrs, nicks, or scratches can be smoothed off with 320/400 grit emery cloth followed by polishing with crocus cloth. Replace the shift shaft bushing or bearing if damaged.

Replace the shaft lever and bushing if either part is deformed, or worn. Do not attempt to salvage these parts as shift fork binding will occur. Replace the roll pin that secures the lever to the shaft.

FRONT/REAR HOUSINGS AND BEARING RETAINERS

Inspect the housings carefully. Look for cracks, stripped threads, scored mating surfaces, damaged bearing bores, or worn dowel pin holes. Minor nicks on mating surfaces can be dressed off with a fine file, or emery cloth. Damaged threads can be renewed by either re-tapping or installing Helicoil inserts.

CLEANING AND INSPECTION (Continued)

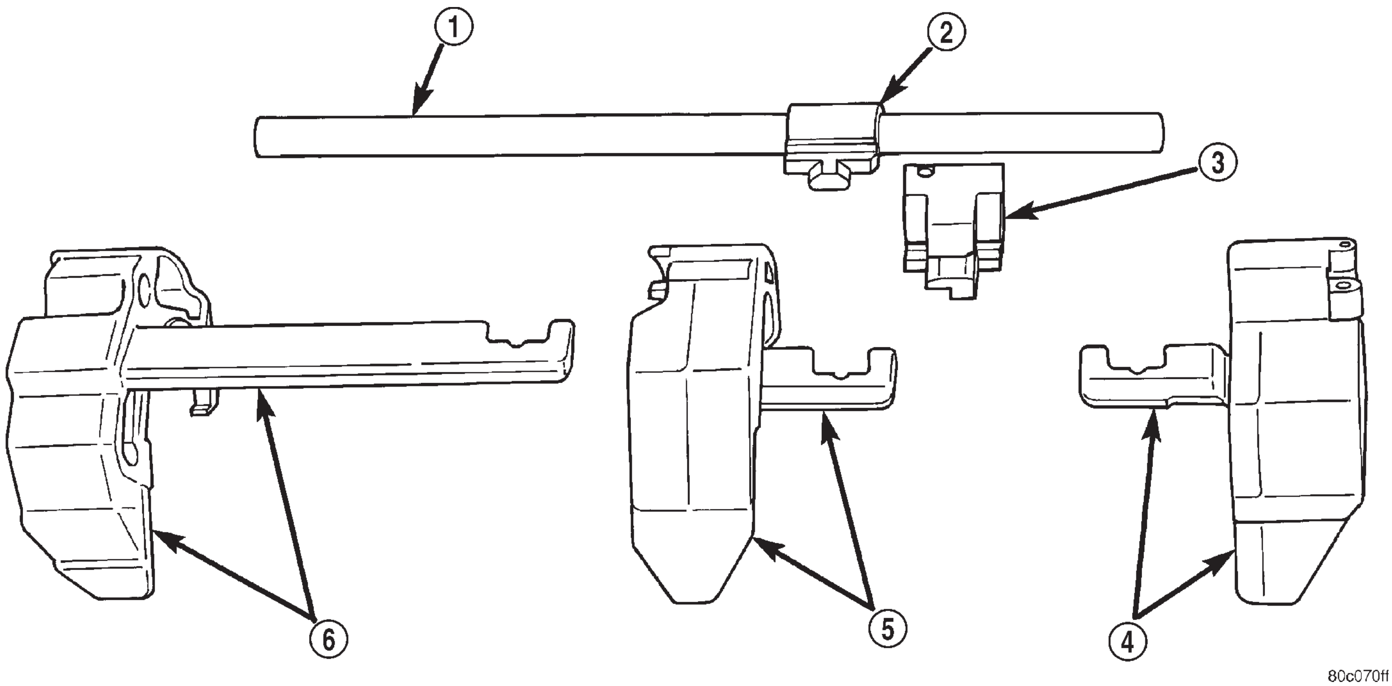


Fig. 134 Shift Forks And Shaft

1 – SHIFT SHAFT
2 – SHAFT LEVER
3 – SHAFT LEVER BUSHING
4 – 3-4 SHIFT FORK
5 – 1-2 SHIFT FORK
6 – FIFTH-REVERSE SHIFT FORK

NOTE: The front housing contains the countershaft front bearing race. The rear housing contains the countershaft rear bearing race. Be advised that these components are NOT serviceable items. The front housing will have to be replaced if the countershaft bearing race is loose, worn, or damaged. The rear housing will have to be replaced if the countershaft rear bearing race is loose, worn, or damaged.

Inspect the input shaft bearing retainer. Be sure the release bearing slide surface of the retainer is in good condition. Minor nicks on the surface can be smoothed off with 320/420 grit emery cloth and final polished with oil coated crocus cloth. Replace the retainer seal if necessary.

Inspect the output shaft bearing retainer. Be sure the U-shaped retainer is flat and free of distortion. Replace the retainer if the threads are damaged, or if the retainer is bent, or cracked.

COUNTERSHAFT BEARINGS AND RACES

The countershaft bearings and races are machine lapped during manufacture to form matched sets. The bearings and races should not be interchanged.

NOTE: The bearing races are a permanent press fit in the housings and are NOT serviceable. If a bearing race becomes damaged, it will be necessary to replace the front or rear housing as necessary. A new countershaft bearing will be supplied with each new housing for service use.

The countershaft bearings can be installed backwards if care is not exercised. The bearing roller cage is a different diameter on each side. Be sure the bearing is installed so the large diameter side of the cage is facing the countershaft gear (Fig. 135). The small diameter side goes in the bearing race.

REVERSE IDLER COMPONENTS

Inspect the idler gear, bearing, shaft, thrust washer, wave washer and thrust plate. Replace the bearing if any of the needle bearing rollers are worn, chipped, cracked, flat-spotted, or brinnelled. Also replace the bearing if the plastic bearing cage is damaged or distorted.

Replace the thrust washer, wave washer, or thrust plate if cracked, chipped, or worn. Replace the idler gear if the teeth are chipped, cracked or worn thin. Replace the shaft if worn, scored, or the bolt threads are damaged beyond repair. Replace the support segment if cracked, or chipped and replace the idler attaching bolts if the threads are damaged.

CLEANING AND INSPECTION (Continued)

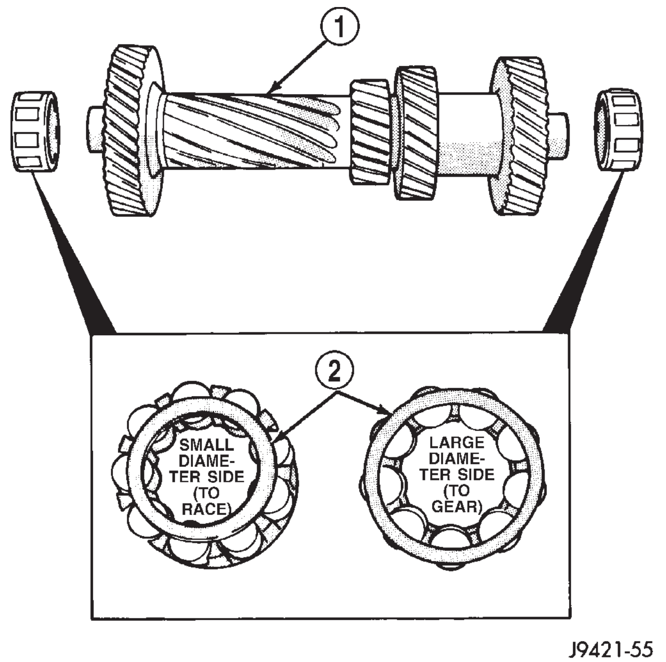


Fig. 135 Correct Countershaft Bearing Installation

1 – COUNTERSHAFT
2 – BEARING CAGE

Shift Socket

Inspect the shift socket for wear or damage. replace the socket if the roll pin, or shift shaft bores are damaged. Minor nicks in the shift lever ball seat in the socket can be smoothed down with 400 grit emery or wet/dry paper. Replace the socket if the ball seat is worn, or cracked. Do not reuse the original shift socket roll pin. Install a new pin during reassembly. The socket roll pin is approximately is approximately 33 mm (1-1/4 in.) long.

Output Shaft And Geartrain

Inspect all of the gears for worn, cracked, chipped, or broken teeth. Also check condition of the bearing bore in each gear. The bores should be smooth and free of surface damage. Discoloration of the gear bores is a normal occurrence and is not a reason for replacement. Replace gears only when tooth damage has occurred, or if the bores are brinnelled or severely scored.

Inspect the shaft splines and bearings surfaces. Minor nicks on the bearing surfaces can be smoothed with 320/420 grit emery and final polished with crocus cloth. Replace the shaft if the splines are damaged or bearing surfaces are deeply scored, worn, or brinnelled.

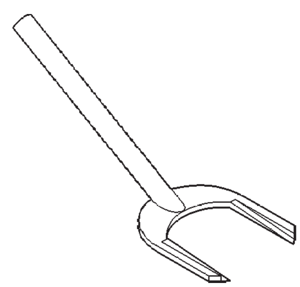
SPECIFICATIONS

TORQUE

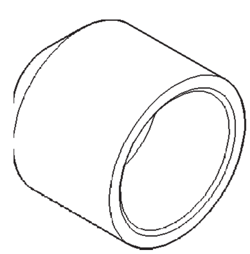
Description	Torque
Clutch Housing Bolts	54–61 N·m (40–45 ft. lbs.)
Crossmember-To-Frame Bolts	61–75 N·m (44–55 ft. lbs.)
Crossmember-To-Insulator Nuts	54–61 N·m (40–45 ft. lbs.)
Drain/Fill Plug	9–27 N·m (14–20 ft. lbs.)
Front-To-Rear Housing Bolts	30–35 N·m (22–26 ft. lbs.)
Front Bearing Retainer Bolts	7–10 N·m (5–7 ft. lbs.)
Idler Shaft Bolts	19–25 N·m (14–18 ft. lbs.)
Rear Bearing Retainer Bolts	30–35 N·m (22–26 ft. lbs.)
Shift Tower Bolts	7–10 N·m (5–7 ft. lbs.)
Slave Cylinder Attaching Nuts	23 N·m (200 in. lbs.)
Transfer Case Attaching Nuts	47 N·m (35 ft. lbs.)
U-Joint Clamp Bolts	19 N·m (170 in. lbs.)

SPECIAL TOOLS

NV3550 MANUAL TRANSMISSION

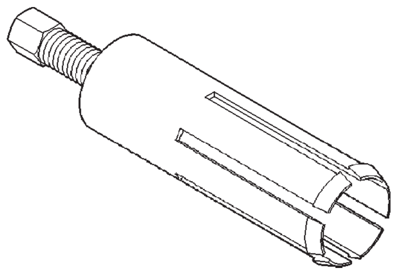


Remover, Seal—C-3985-B

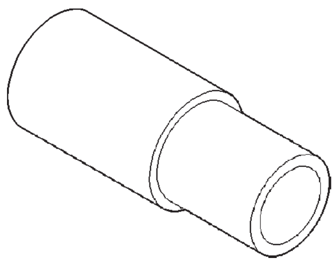


Installer, Seal—C-3972-A

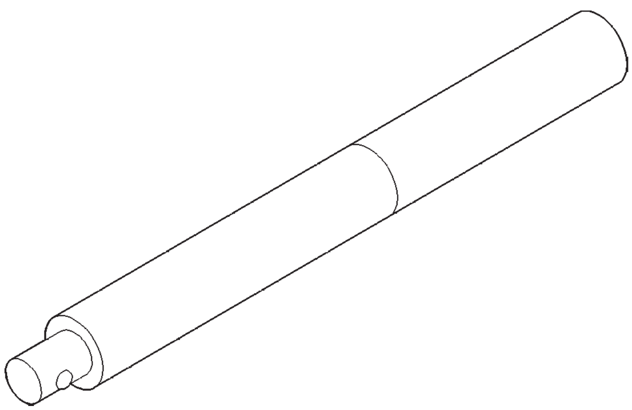
SPECIAL TOOLS (Continued)



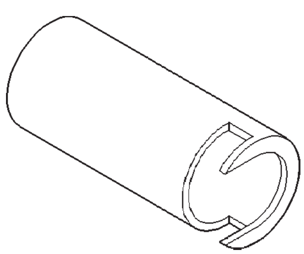
Remover, Bushing—6957



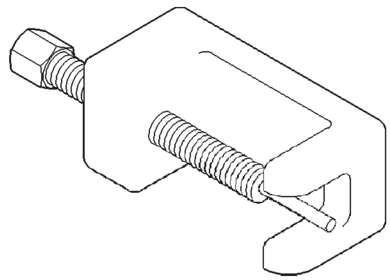
Installer, Bushing—6951



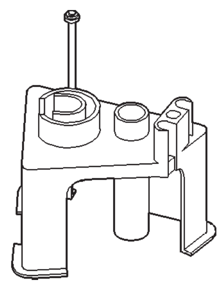
Handle—C-4171



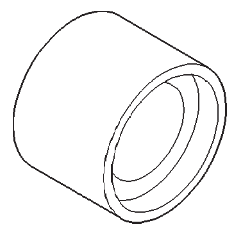
Remover—8117



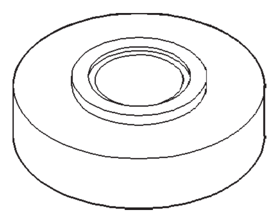
Remover/Installer, NV3550 Shift Rail Roll Pin—6858



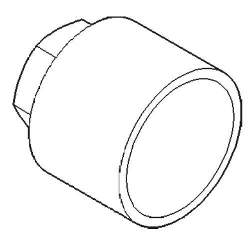
Fixture, NV3550—6747



Adapter, Fixture—6747-1A

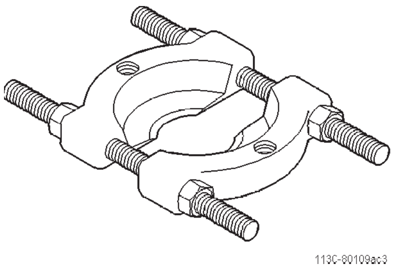


Adapter, Fixture—6747-2A

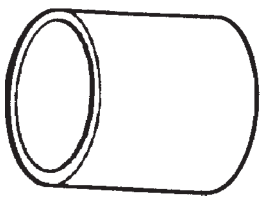


Cup, Fixture—8115

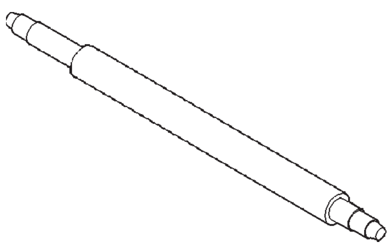
SPECIAL TOOLS (Continued)



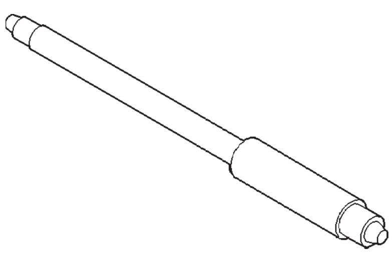
Splitter, Bearing—1130



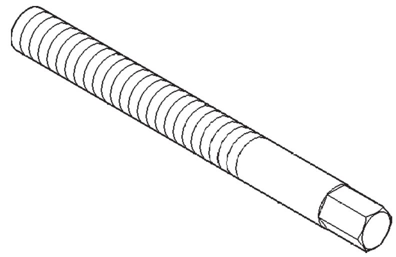
Tube—6310-1



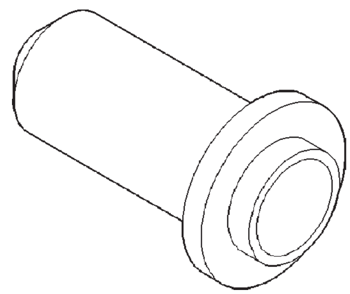
Installer—8118



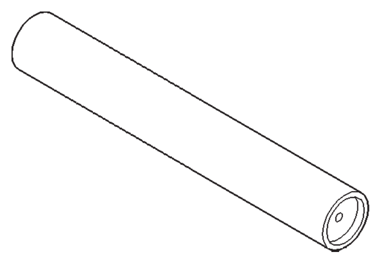
Remover/Installer—8119



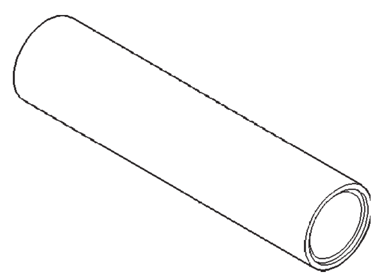
Stud, Alignment—8120



Installer, Seal—C-3860-A



Installer—8123



Installer, Bearing Cone—6448

AUTOMATIC TRANSMISSION—30RH

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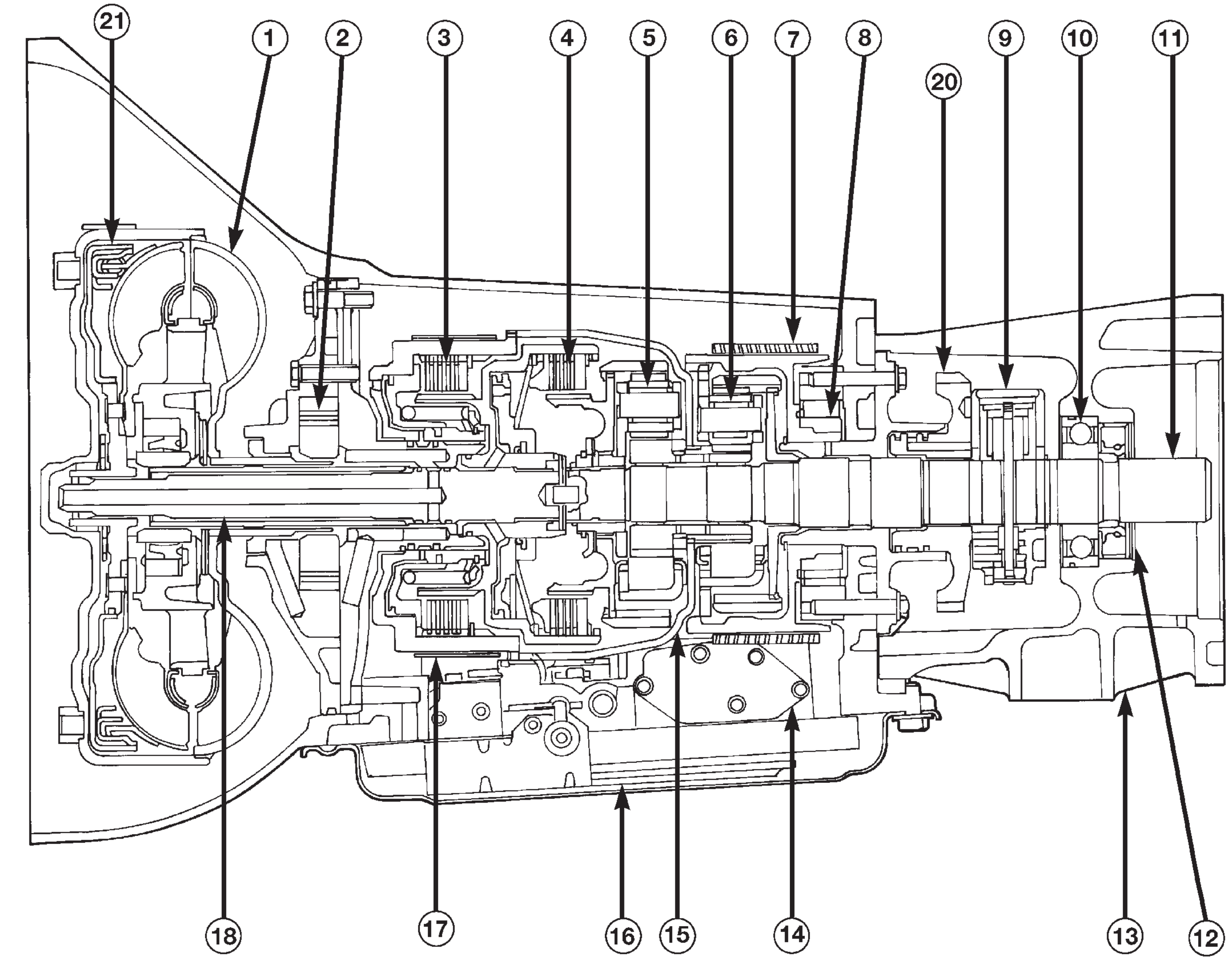
DESCRIPTION AND OPERATION

30RH AUTOMATIC TRANSMISSION

DESCRIPTION

The 30RH automatic transmission is used with the 2.5L engine (Fig. 1). The 30RH is three speed transmissions with a lock-up clutch in the torque converter. The transmissions contain a front and rear clutch which function as the input driving components. They also contain the kickdown (front) and the low/reverse (rear) bands which, along with the overrunning clutch, serve as the holding components. The driving and holding components combine to select the necessary planetary gear components, in the front and rear planetary gear set, transfer the engine power from the input shaft through to the output shaft. The transmissions contain a governor that is mounted on the output shaft and supplies pressure to the valve body based on the output shaft speed. The valve body is mounted to the lower side of the transmission and contains the valves to control pressure regulation, fluid flow control, and clutch/band application. The oil pump is mounted at the front of the transmission and is driven by the torque converter hub. The pump supplies the oil pressure necessary for clutch/band actuation and transmission lubrication. The 30RH transmission is cooled by an integral fluid cooler inside the radiator.

DESCRIPTION AND OPERATION (Continued)



1 CONVERTER
2 OIL PUMP
3 FRONT CLUTCH
4 REAR CLUTCH
5 FRONT PLANETARY GEAR SET
6 REAR PLANETARY GEAR SET
7 LOW AND REVERSE (REAR) BAND
8 OVERRUNNING CLUTCH
9 GOVERNOR
10 BEARING
11 OUTPUT SHAFT
12 SEAL
13 ADAPTER HOUSING
14 VALVE BODY
15 SUN GEAR DRIVING SHELL
16 OIL FILTER
17 KICK DOWN (FRONT) BAND
18 INPUT SHAFT
19 PARK GEAR
20 CONVERTER CLUTCH

80c070a2

Fig. 1 30RH Automatic Transmission

DESCRIPTION AND OPERATION (Continued)

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 2). Refer to this information when ordering replacement parts.

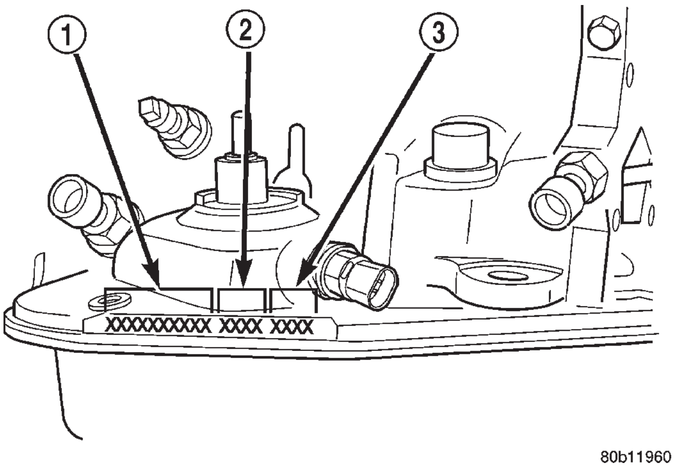


Fig. 2 Transmission Part Number And Serial Number Location

1 – PART NUMBER
2 – BUILD DATE
3 – SERIAL NUMBER

TRANSMISSION GEAR RATIOS

Forward gear ratios are:

- 2.74:1 (first gear)
- 1.54:1 (second gear)
- 1.00:1 (third gear)

OPERATION

The application of each driving or holding component is controlled by the valve body based upon the manual lever position and governor pressure. The governor pressure is a variable pressure input to the valve body and is one of the signals that a shift is necessary. First through third gear are obtained by selectively applying and releasing the different clutches and bands. Engine power is thereby routed to the various planetary gear assemblies which combine with the overrunning clutch assembly to generate the different gear ratios. The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in third gear when the vehicle is cruising on a level plane after the vehicle has warmed up. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased. The torque converter clutch feature increases fuel economy and reduces the transmission fluid temperature.

DESCRIPTION AND OPERATION (Continued)

PARK POWERFLOW

As the engine is running and the crankshaft is rotating, the flexplate and torque converter, which are also bolted to it, are all rotating in a clockwise direction as viewed from the front of the engine. The notched hub of the torque converter is connected to the oil pump's internal gear, supplying the transmission with oil pressure. As the converter turns, it turns the input shaft in a clockwise direction. As the input shaft is rotating, the front clutch hub–rear clutch retainer and all their associated parts are also rotating, all being directly connected to the input shaft. The power flow from the engine through the front–clutch–hub and rear–clutch–retainer stops at the rear–clutch–retainer. Therefore, no power flow to the output shaft, occurs because no clutches are applied. The only mechanism in use at this time is the parking sprag (Fig. 3), which locks the parking gear on the output shaft to the transmission case.

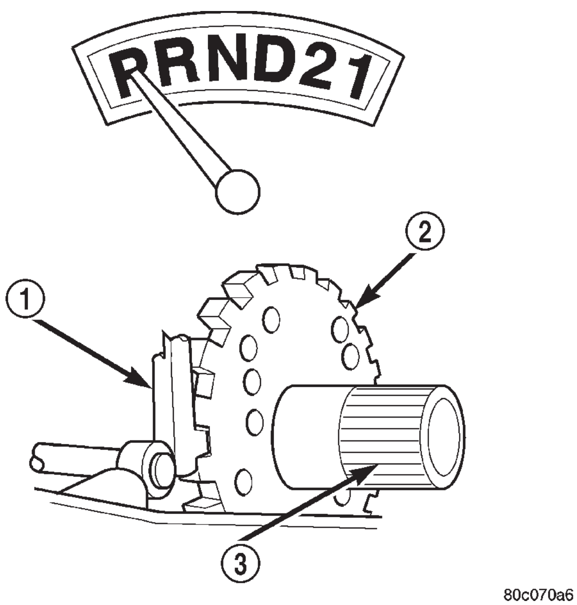


Fig. 3 Park Powerflow

1 – LEVER ENGAGED FOR PARK
2 – PARK SPRAG
3 – OUTPUT SHAFT

NEUTRAL POWERFLOW

With the gear selector in the neutral position (Fig. 4), the power flow of the transmission is essentially the same as in the park position. The only operational difference is that the parking sprag has been disengaged, unlocking the output shaft from the transmission case and allowing it to move freely.

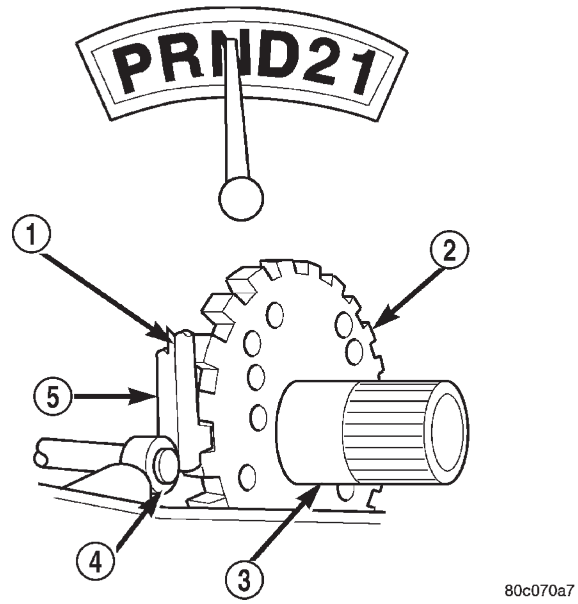


Fig. 4 Neutral Powerflow

1 – LEVER DISENGAGED FOR NEUTRAL
2 – PARK SPRAG
3 – OUTPUT SHAFT
4 – CAM
5 – LEVER

DESCRIPTION AND OPERATION (Continued)

REVERSE POWERFLOW

When the gear selector is moved into the reverse position (Fig. 5), the front clutch and the rear band are applied. With the application of the front clutch, engine torque is applied to the sun gear, turning it in a clockwise direction. The clockwise rotation of the sun gear causes the rear planet pinions to rotate against engine rotation in a counterclockwise direction. The rear band is holding the low reverse drum, which is splined to the rear carrier. Since the rear carrier is being held, the torque from the planet pinions is transferred to the rear annulus gear, which is splined to the output shaft. The output shaft in turn rotates with the annulus gear in a counterclockwise direction giving a reverse gear output. The entire transmission of torque is applied to the rear planetary gearset only. Although there is torque input to the front gearset through the sun gear, no other member of the gearset is being held. During the entire reverse stage of operation, the front planetary gears are in an idling condition.

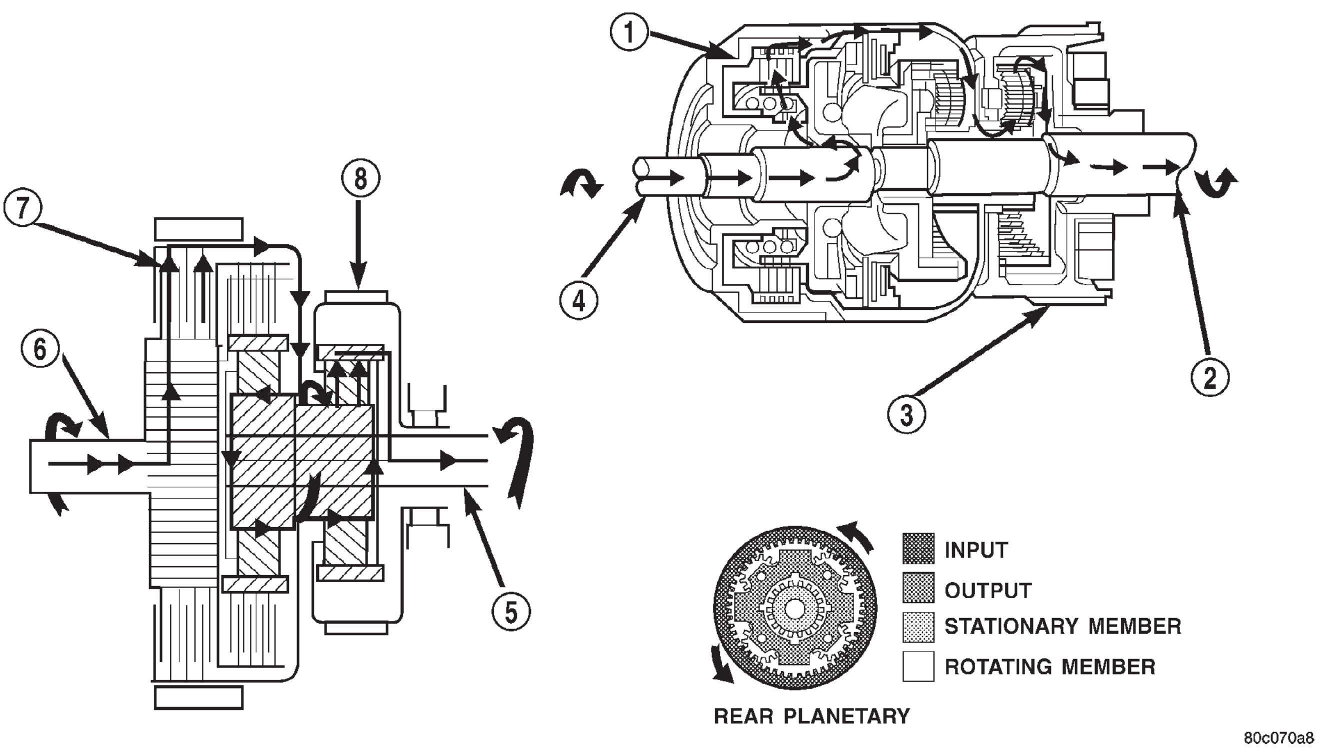


Fig. 5 Reverse Powerflow

1 – FRONT CLUTCH ENGAGED
2 – OUTPUT SHAFT
3 – LOW/REVERSE BAND APPLIED
4 – INPUT SHAFT
5 – OUTPUT SHAFT
6 – INPUT SHAFT
7 – FRONT CLUTCH ENGAGED
8 – LOW/REVERSE BAND APPLIED

DESCRIPTION AND OPERATION (Continued)

FIRST GEAR POWERFLOW

When the gearshift lever is moved into the drive position the transmission goes into first gear (Fig. 6). As soon as the transmission is shifted from park or neutral to drive, the rear clutch applies, applying the rear clutch pack to the front annulus gear. Engine torque is now applied to the front annulus gear turning it in a clockwise direction. With the front annulus gear turning in a clockwise direction, it causes the front planets to turn in a clockwise direction. The rotation of the front planets cause the sun to revolve in a counterclockwise direction. The sun gear now transfers its counterclockwise rotation to the rear planets which rotate back in a clockwise direction. With the rear annulus gear stationary, the rear planet rotation on the annulus gear causes the rear planet carrier to revolve in a counterclockwise direction. The rear planet carrier is splined into the low–reverse drum, and the low reverse drum is splined to the inner race of the over–running clutch. With the over–running clutch locked, the planet carrier is held, and the resulting torque provided by the planet pinions is transferred to the rear annulus gear. The rear annulus gear is splined to the output shaft and rotated along with it (clockwise) in an underdrive gear reduction mode.

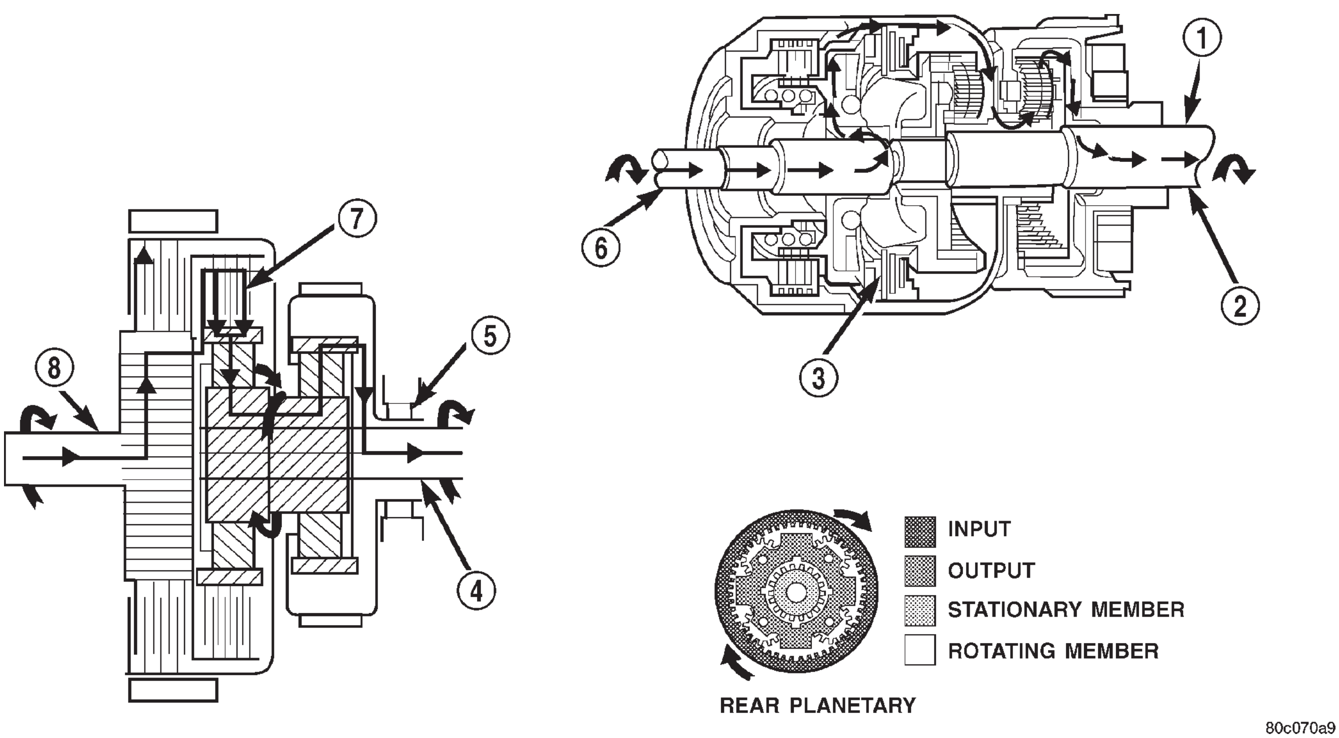


Fig. 6 First Gear Powerflow

1 – OUTPUT SHAFT
2 – OVER-RUNNING CLUTCH HOLDING
3 – REAR CLUTCH APPLIED
4 – OUTPUT SHAFT
5 – OVER-RUNNING CLUTCH HOLDING
6 – INPUT SHAFT
7 – REAR CLUTCH APPLIED
8 – INPUT SHAFT

DESCRIPTION AND OPERATION (Continued)

SECOND GEAR POWERFLOW

In drive–second (Fig. 7), the same elements are applied as in manual–second. Therefore, the power flow will be the same, and both gears will be discussed as one in the same. In drive–second, the transmission has proceeded from first gear to its shift point, and is shifting from first gear to second. The second gear shift is obtained by keeping the rear clutch applied and applying the front (kickdown) band. The front band holds the front clutch retainer that is locked to the sun gear driving shell. With the rear clutch still applied, the input is still on the front annulus gear turning it clockwise at engine speed. Now that the front band is holding the sun gear stationary, the annulus rotation causes the front planets to rotate in a clockwise direction. The front carrier is then also made to rotate in a clockwise direction but at a reduced speed. This will transmit the torque to the output shaft, which is directly connected to the front planet carrier. The rear planetary annulus gear will also be turning because it is directly splined to the output shaft. All power flow has occurred in the front planetary gear set during the drive–second stage of operation, and now the over–running clutch, in the rear of the transmission, is disengaged and freewheeling on its hub.

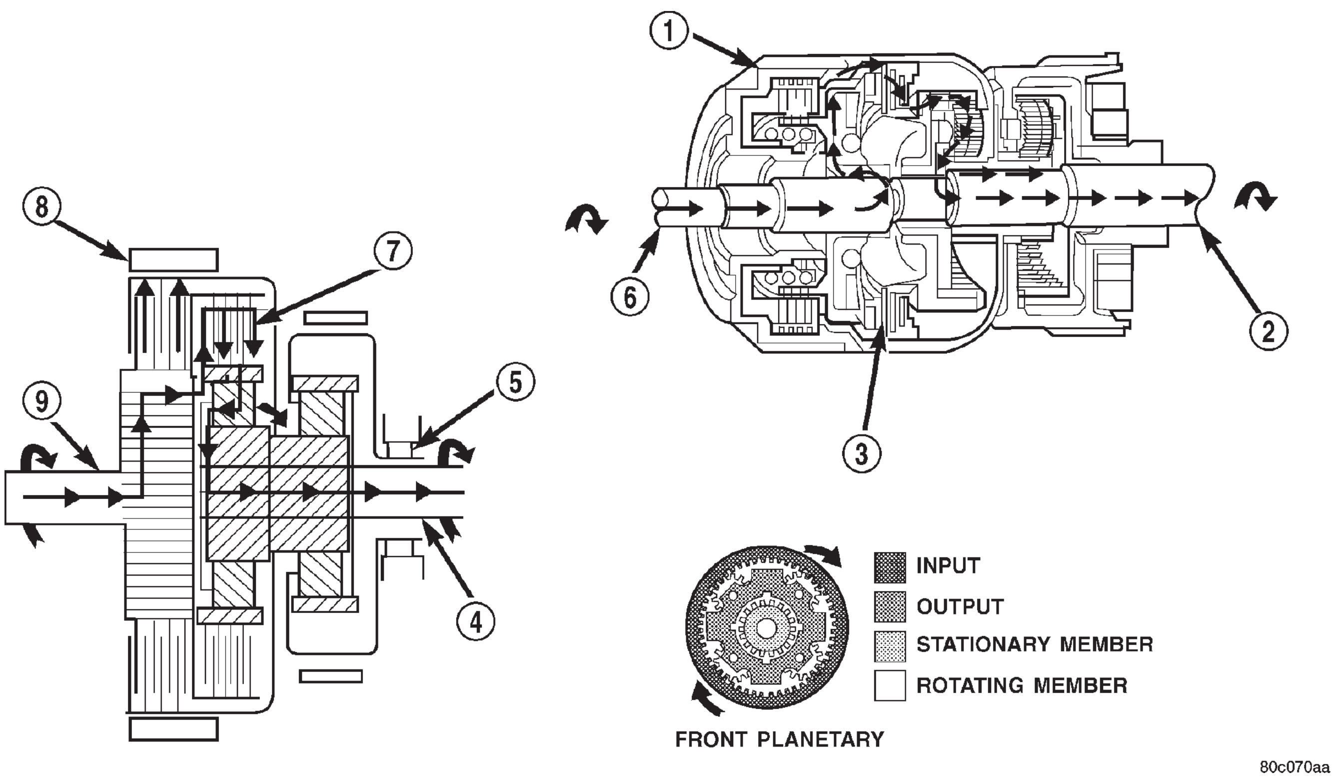


Fig. 7 Second Gear Powerflow

1 – KICKDOWN BAND APPLIED
2 – OUTPUT SHAFT
3 – REAR CLUTCH ENGAGED
4 – OUTPUT SHAFT
5 – OVER-RUNNING CLUTCH FREE-WHEELING
6 – INPUT SHAFT
7 – REAR CLUTCH APPLIED
8 – KICKDOWN BAND APPLIED
9 – INPUT SHAFT

DESCRIPTION AND OPERATION (Continued)

DIRECT DRIVE POWERFLOW

The vehicle has accelerated and reached the shift point for the 2–3 upshift into direct drive (Fig. 8). When the shift takes place, the front band is released, and the front clutch is applied. The rear clutch stays applied as it has been in all the forward gears. With the front clutch now applied, engine torque is now on the front clutch retainer, which is locked to the sun gear driving shell. This means that the sun gear is now turning in engine rotation (clockwise) and at engine speed. The rear clutch is still applied so engine torque is also still on the front annulus gear. If two members of the same planetary set are driven, direct drive results. Therefore, when two members are rotating at the same speed and in the same direction, it is the same as being locked up. The rear planetary set is also locked up, given the sun gear is still the input, and the rear annulus gear must turn with the output shaft. Both gears are turning in the same direction and at the same speed. The front and rear planet pinions do not turn at all in direct drive. The only rotation is the input from the engine to the connected parts, which are acting as one common unit, to the output shaft.

FLUID

NOTE: Refer to the maintenance schedules in Group 0, Lubrication and Maintenance for the recommended maintenance (fluid/filter change) intervals for this transmission.

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

DESCRIPTION

Mopar® ATF Plus 3, Type 7176, automatic transmission fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

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

Mopar® ATF Plus 3, Type 7176, 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

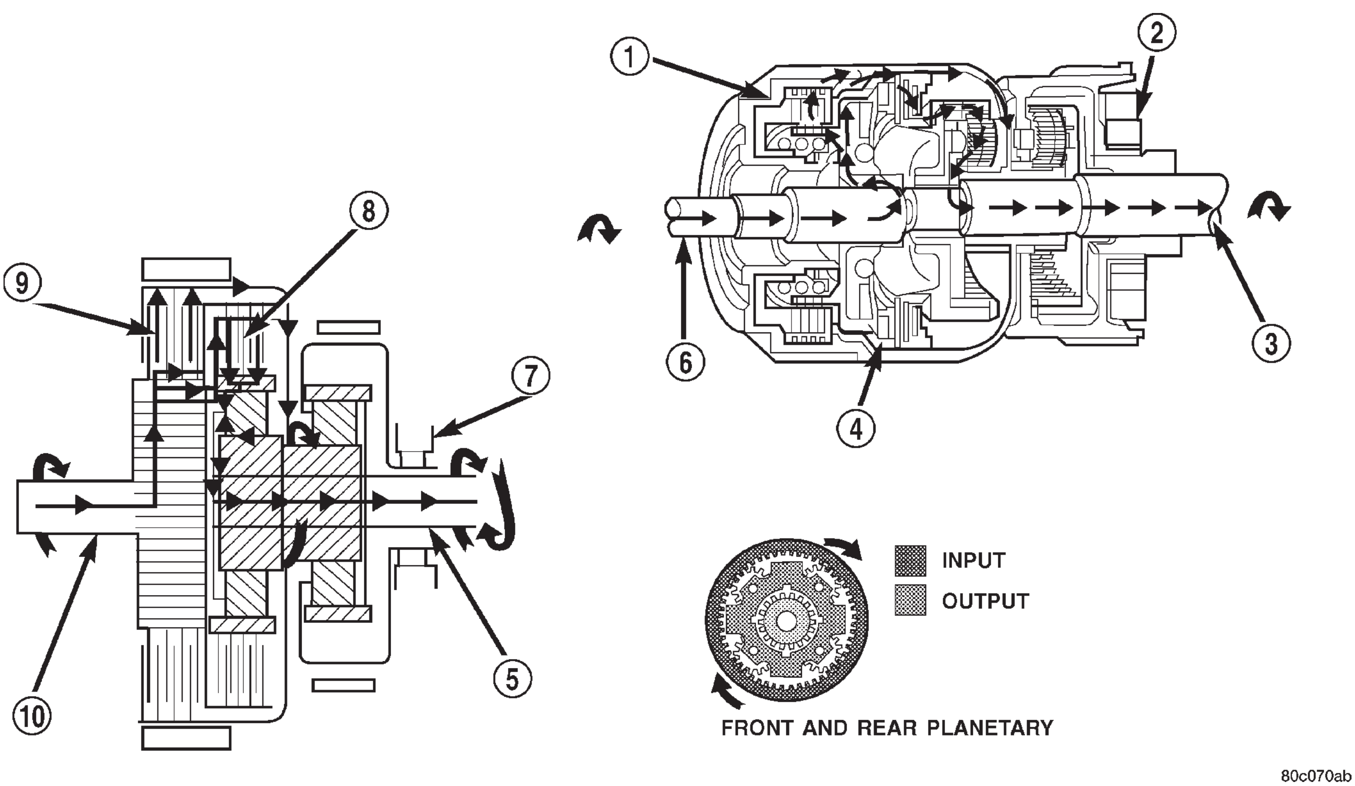


Fig. 8 Direct Drive Powerflow

1 – FRONT CLUTCH APPLIED
2 – OVER-RUNNING CLUTCH FREE-WHEELING
3 – OUTPUT SHAFT
4 – REAR CLUTCH APPLIED
5 – OUTPUT SHAFT
6 – INPUT SHAFT
7 – OVER-RUNNING CLUTCH FREE-WHEELING
8 – REAR CLUTCH APPLIED
9 – FRONT CLUTCH APPLIED
10 – INPUT SHAFT

DESCRIPTION AND OPERATION (Continued)

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.

OPERATION

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

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 9) 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.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the fluid cooler and lines.

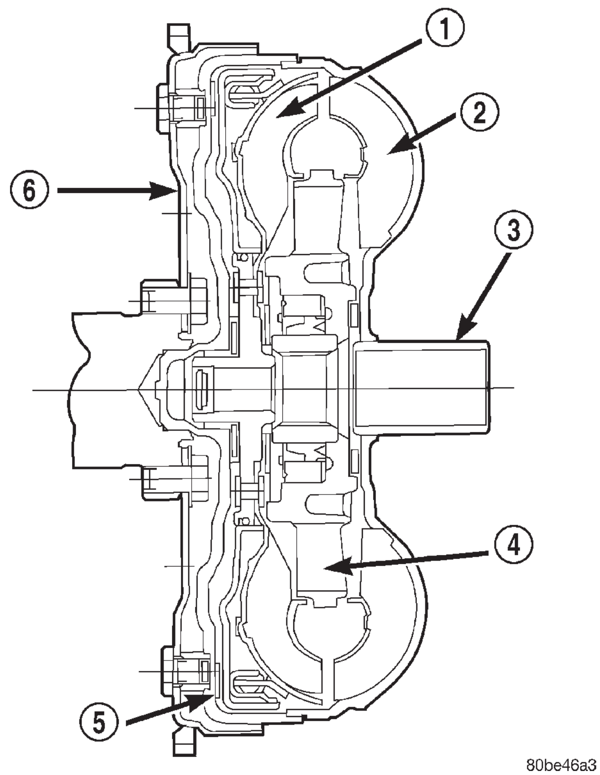


Fig. 9 Torque Converter Assembly

1 – TURBINE
2 – IMPELLER
3 – HUB
4 – STATOR
5 – CONVERTER CLUTCH DISC
6 – DRIVE PLATE

DESCRIPTION AND OPERATION (Continued)

IMPELLER

The impeller (Fig. 10) 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.

TURBINE

The turbine (Fig. 11) 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.

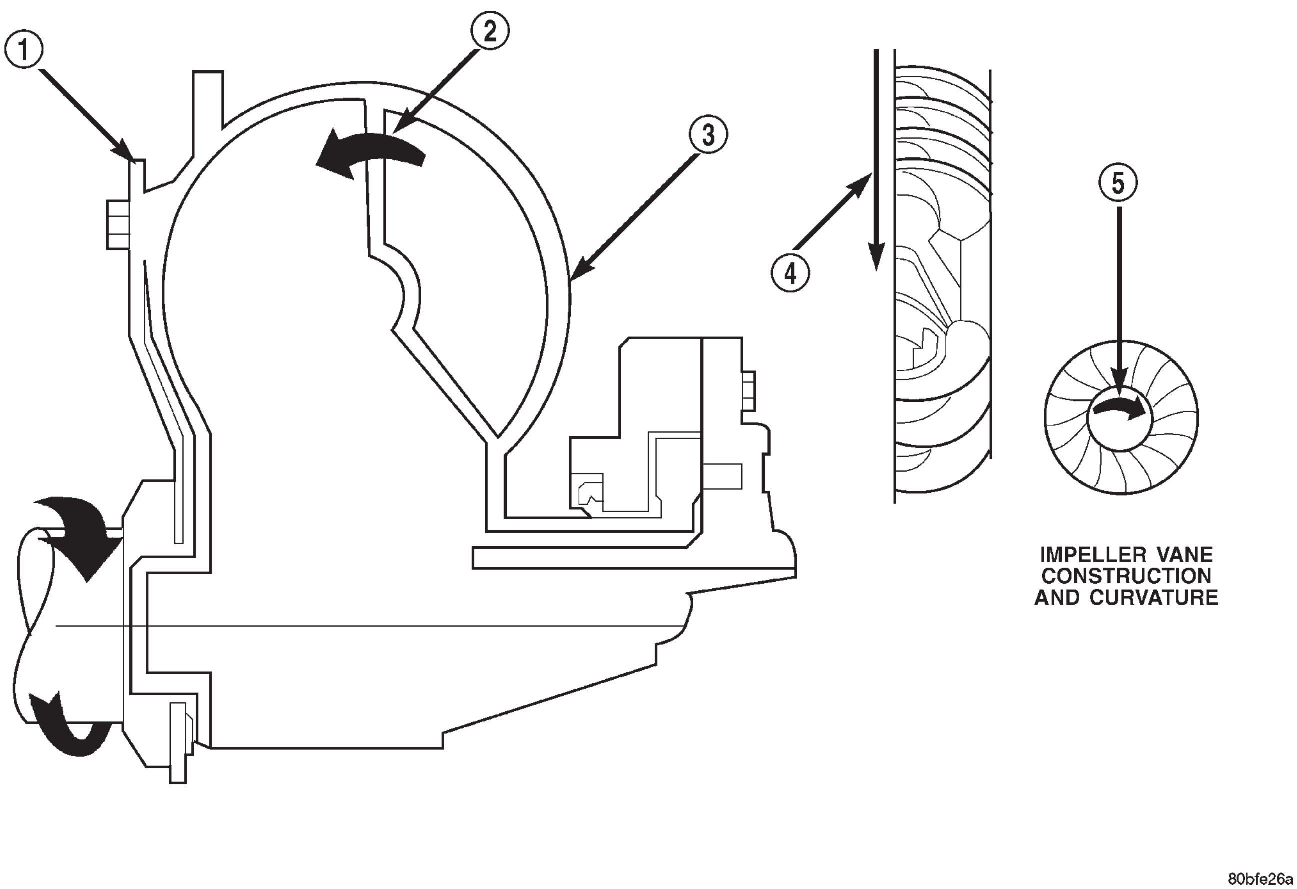


Fig. 10 Impeller

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

DESCRIPTION AND OPERATION (Continued)

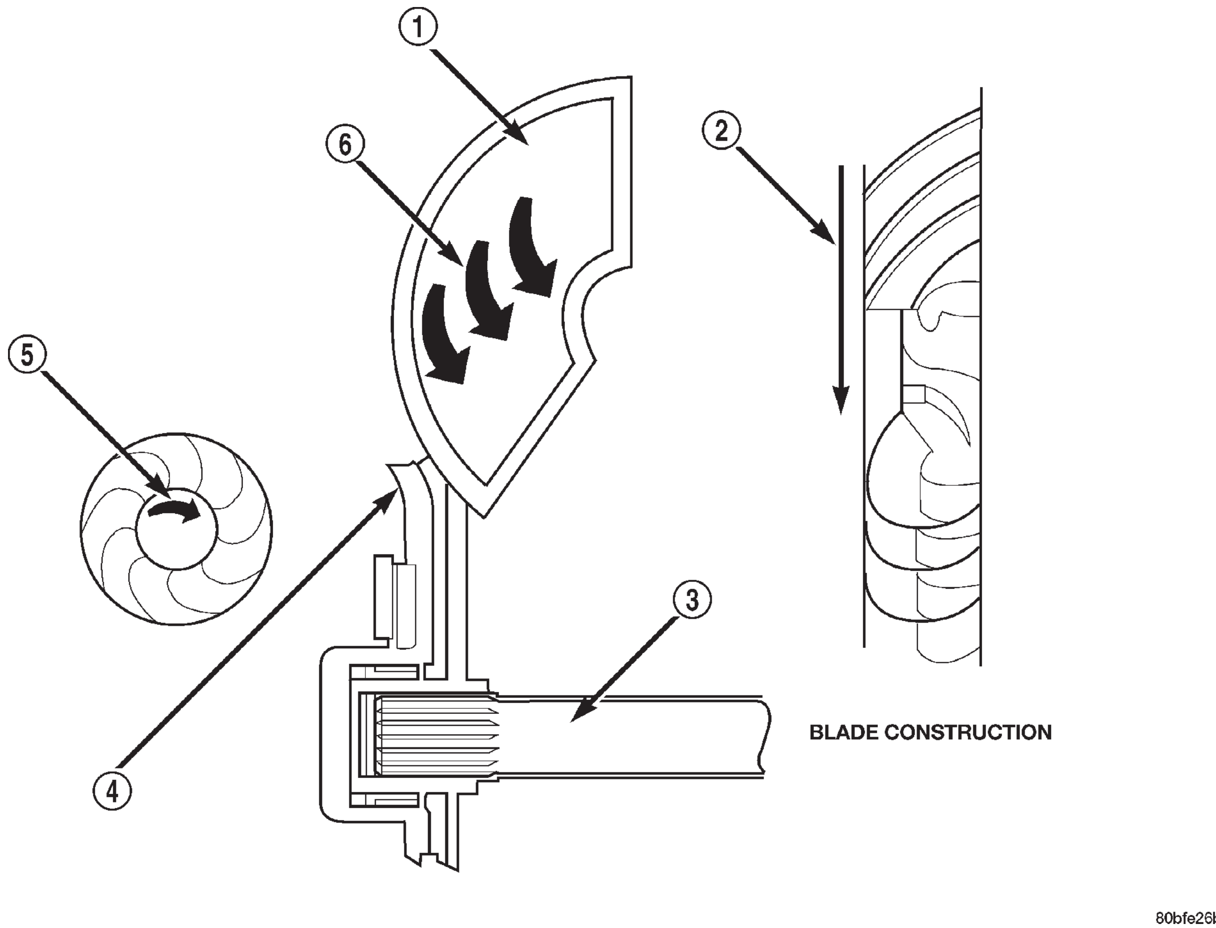


Fig. 11 Turbine

1 – TURBINE VANE
2 – ENGINE ROTATION
3 – INPUT SHAFT
4 – PORTION OF TORQUE CONVERTER COVER
5 – ENGINE ROTATION
6 – OIL FLOW WITHIN TURBINE SECTION

STATOR

The stator assembly (Fig. 12) 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. 13). 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.

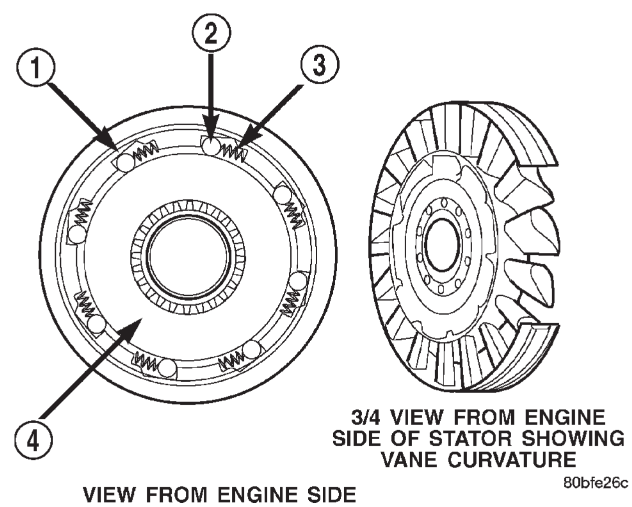


Fig. 12 Stator Components

1 – CAM (OUTER RACE)
2 – ROLLER
3 – SPRING
4 – INNER RACE

DESCRIPTION AND OPERATION (Continued)

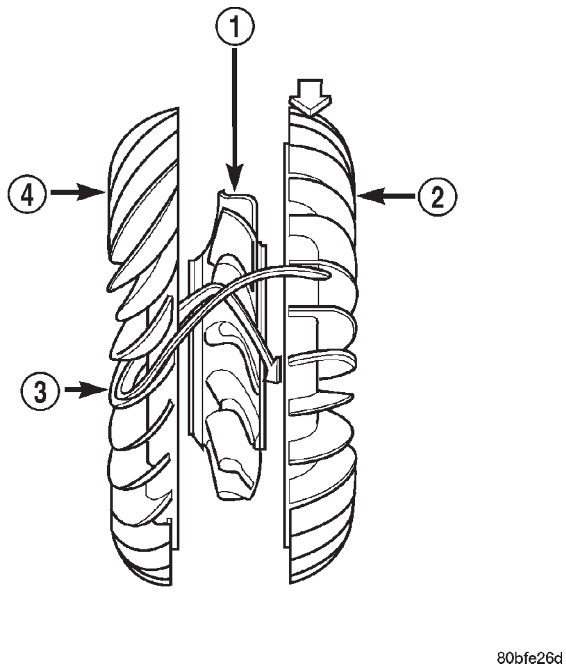


Fig. 13 Stator Location

1 – STATOR
2 – IMPELLER
3 – FLUID FLOW
4 – TURBINE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 14) 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.

OPERATION

The converter impeller (Fig. 15) (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.

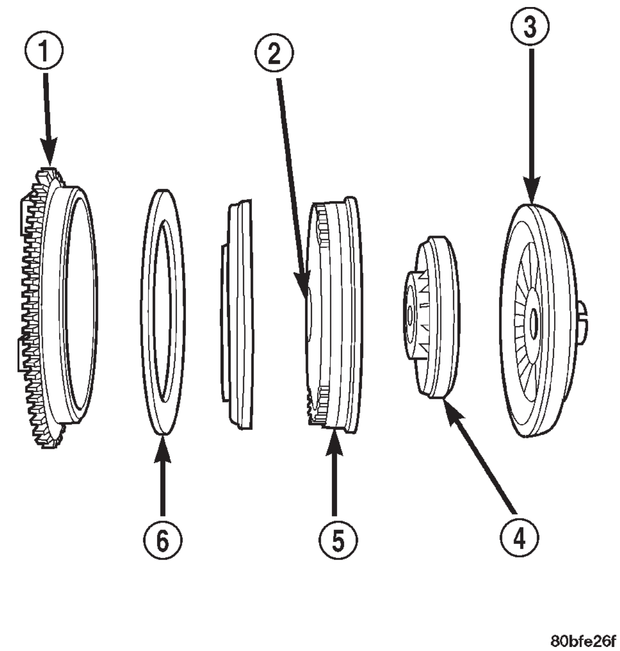


Fig. 14 Torque Converter Clutch (TCC)

1 – IMPELLER FRONT COVER
2 – THRUST WASHER ASSEMBLY
3 – IMPELLER
4 – STATOR
5 – TURBINE
6 – FRICTION DISC

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 16). 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

DESCRIPTION AND OPERATION (Continued)

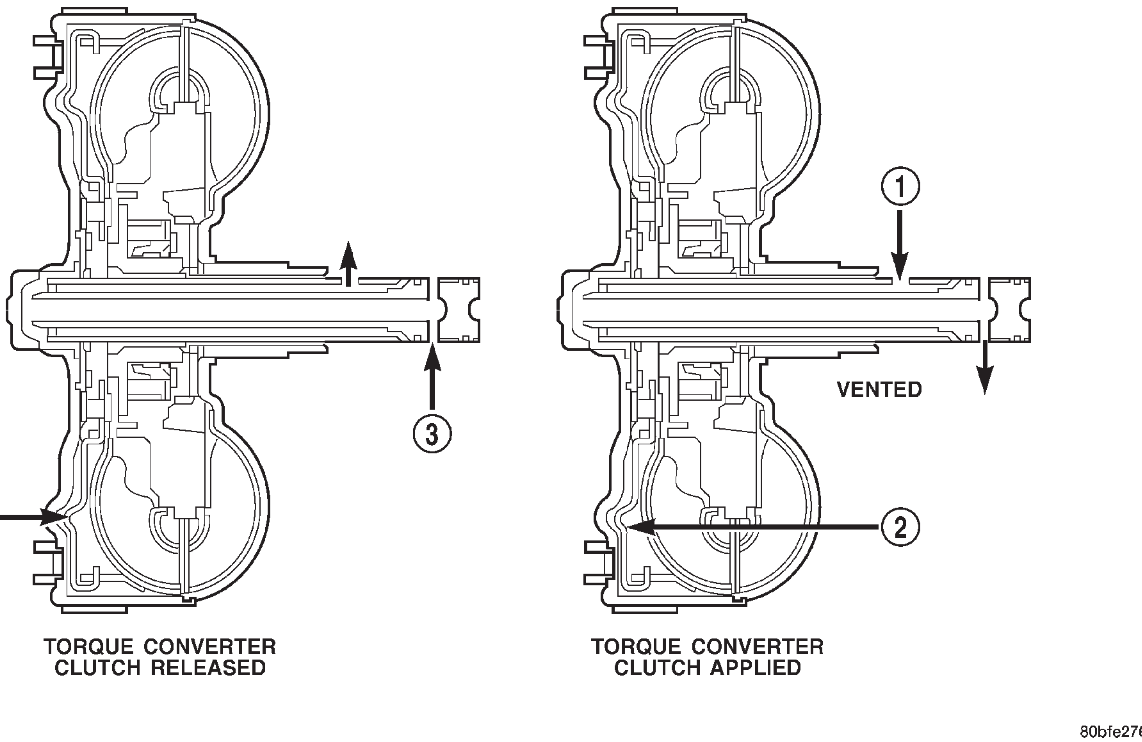


Fig. 15 Torque Converter Fluid Operation

1 – APPLY PRESSURE
2 – THE PISTON MOVES SLIGHTLY FORWARD
3 – RELEASE PRESSURE
4 – THE PISTON MOVES SLIGHTLY REARWARD

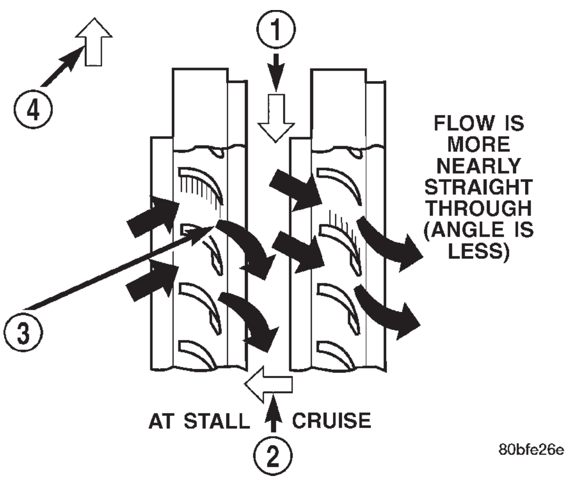


Fig. 16 Stator Operation

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

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 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.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 17) is located in the pump housing inside the bell housing of the transmission case. The oil pump consists of an inner and outer gear, a housing, and a cover that also serves as the reaction shaft support.

DESCRIPTION AND OPERATION (Continued)

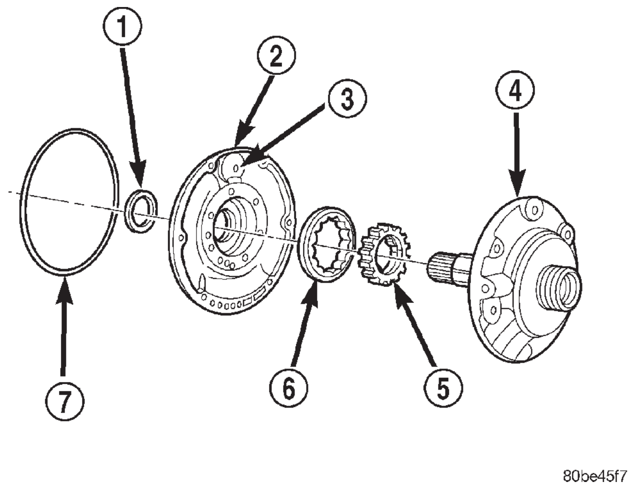


Fig. 17 Oil Pump Assembly

1 – OIL SEAL
2 – OIL PUMP BODY
3 – VENT
4 – REACTION SHAFT SUPPORT
5 – INNER ROTOR
6 – OUTER ROTOR
7 – “O” RING

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.

VALVE BODY

DESCRIPTION

The valve body 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, bands, and frictional clutches. The valve body contains the following components (Fig. 18) and (Fig. 19):

- Regulator valve
- Regulator valve throttle pressure plug
- Line pressure plug and sleeve
- Kickdown valve
- Kickdown limit valve
- 1–2 shift valve
- 1–2 control valve
- 2–3 shift valve
- 2–3 governor plug
- Throttle valve
- Throttle pressure plug
- Switch valve
- Manual valve
- Converter clutch control valve
- Fail-safe valve
- Shuttle valve
- Shuttle valve throttle plug
- 9 check balls

By adjusting the spring pressure acting on the regulator valve, transmission line pressure can be adjusted.

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

DESCRIPTION AND OPERATION (Continued)

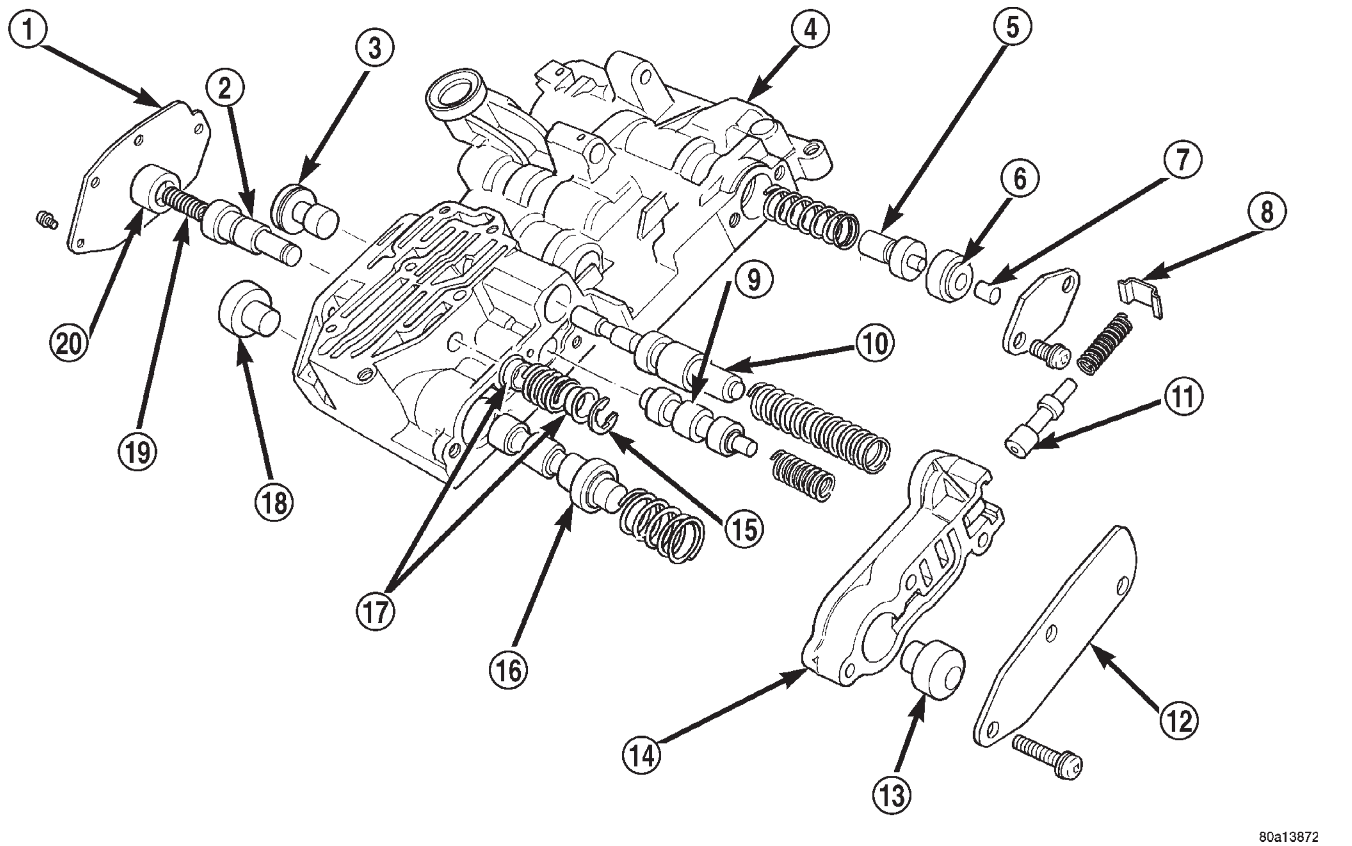


Fig. 18 Valve Body Assembly

1 – GOVERNOR PLUG END PLATE
2 – SHUTTLE VALVE
3 – 1–2 GOVERNOR PLUG
4 – VALVE BODY
5 – REGULATOR VALVE THROTTLE PRESSURE PLUG
6 – SLEEVE
7 – LINE PRESSURE PLUG
8 – RETAINER
9 – 1–2 SHIFT VALVE
10 – 1–2 SHIFT CONTROL VALVE
11 – KICKDOWN LIMIT VALVE
12 – END PLATE
13 – THROTTLE PRESSURE PLUG
14 – KICKDOWN LIMIT VALVE BODY
15 – E-RING
16 – 2–3 SHIFT VALVE
17 – GUIDES
18 – 2–3 GOVERNOR PLUG
19 – PRIMARY SPRING
20 – SHUTTLE VALVE THROTTLE PLUG

REGULATOR VALVE

The pressure regulator valve is needed to control the hydraulic pressure within the system and reduce the amount of heat produced in the fluid. The pressure regulator valve is located in the valve body near the manual valve. The pressure regulator valve train controls the maximum pressure in the lines by metering the dumping of fluid back into the sump. Regulated pressure is referred to as “line pressure.”

The regulator valve (Fig. 20) has a spring on one end that pushes the valve to the left. This closes a dump (vent) that is used to lower pressure. The closing of the dump will cause the oil pressure to increase. Oil pressure on the opposite end of the valve pushes the valve to the right, opening the dump and lowering oil pressure. The result is spring pressure working against oil pressure to maintain the oil at specific pressures. With the engine running, fluid flows from the pump to the pressure regulator valve, manual valve, and the interconnected circuits. As fluid is sent through passages to the regulator valve, the pressure pushes the valve to the right against the large spring. It is also sent to the reaction areas on the left side of the throttle pressure plug and the line pressure plug. With the gear selector in the park position, fluid recirculates through the regulator and manual valves back to the sump.

DESCRIPTION AND OPERATION (Continued)

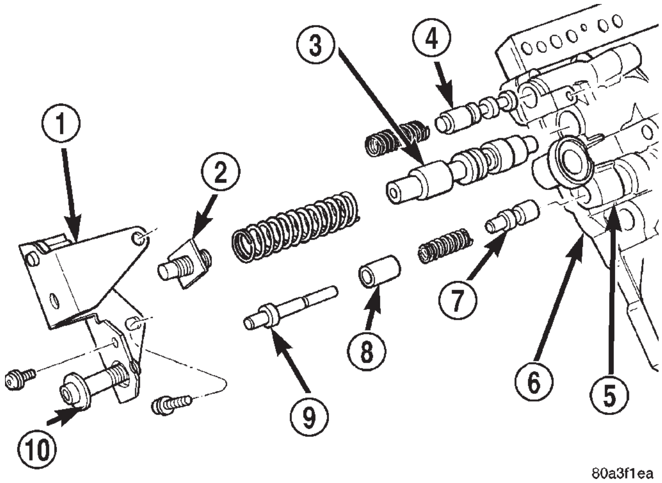


Fig. 19 Valve Body Assembly

1 – ADJUSTER BRACKET
2 – LINE PRESSURE ADJUSTER
3 – PRESSURE REGULATOR VALVE
4 – SWITCH VALVE
5 – VALVE BODY
6 – TRANSFER PLATE
7 – THROTTLE VALVE
8 – SLEEVE
9 – KICKDOWN VALVE
10 – THROTTLE PRESSURE ADJUSTER

Meanwhile, the torque converter is filled slowly. In all other gear positions (Fig. 21), fluid flows between two right side lands to the switch valve and torque converter. At low pump speeds, the flow is controlled by the pressure valve groove to reduce pressure to the torque converter. After the torque converter and switch valve fill with fluid, the switch valve becomes the controlling metering device for torque converter pressure. The regulator valve then begins to control the line pressure for the other transmission circuits. The balance of the fluid pressure pushing the valve to the right and the spring pressure pushing to the left determines the size of the metering passage at land #2 (land #1 being at the far right of the valve in the diagram). As fluid leaks past the land, it moves into a groove connected to the filter or sump. As the land meters the fluid to the sump, it causes the pressure to reduce and the spring decreases the size of the metering passage. When the size of the metering passage is reduced, the pressure rises again and the size of the land is increased again. Pressure is regulated by this constant balance of hydraulic and spring pressure.

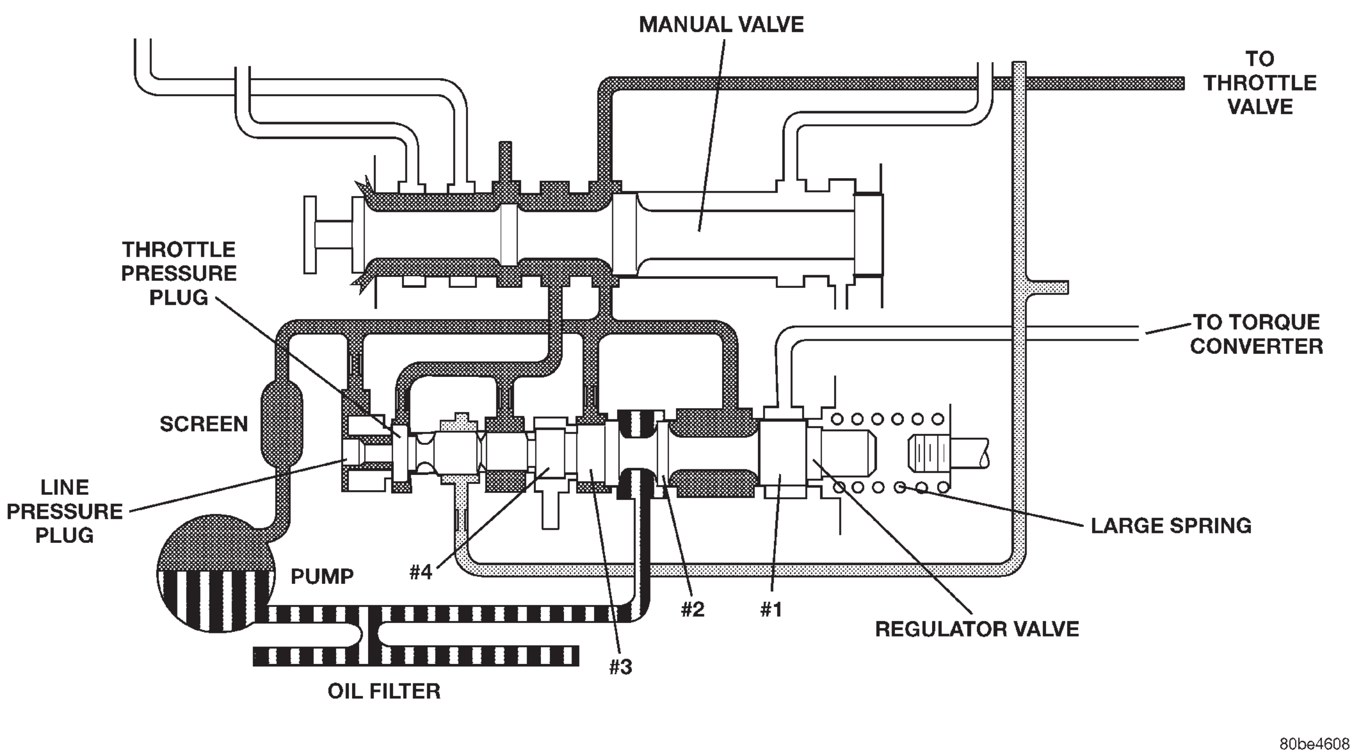


Fig. 20 Regulator Valve in Park Position

DESCRIPTION AND OPERATION (Continued)

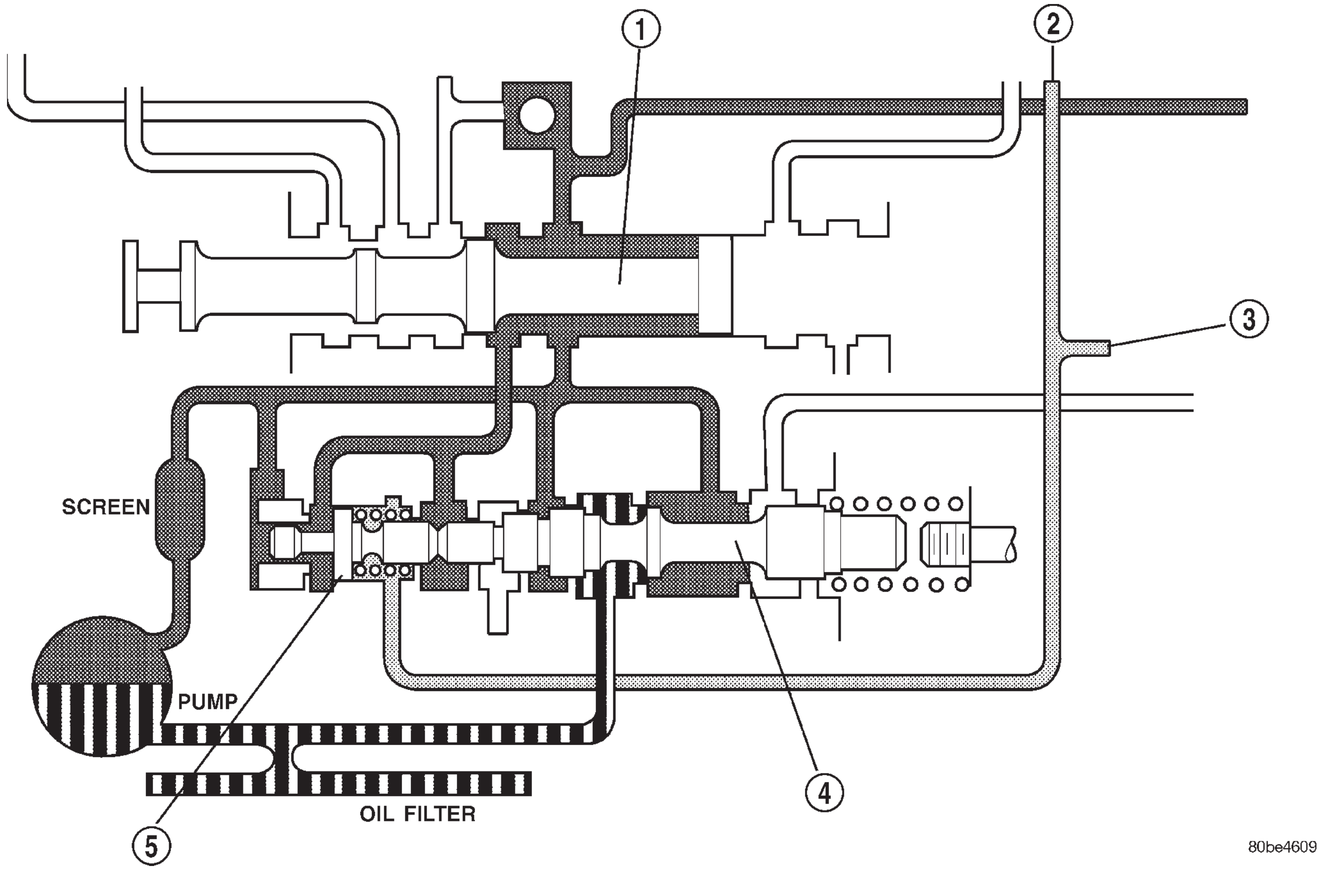


Fig. 21 Regulator Valve in Neutral Position

1 – MANUAL VALVE
2 – TO SHIFT VALVE
3 – FROM THROTTLE VALVE
4 – REGULATOR VALVE
5 – THROTTLE PRESSURE PLUG

The metering at land #2 establishes the line pressure throughout the transmission. It is varied according to changes in throttle position, engine speed, and transmission condition within a range of 57–94 psi (except in reverse) (Fig. 22). The regulated line pressure in reverse (Fig. 23) is held at much higher pressures than in the other gear positions: 145–280 psi. The higher pressure for reverse is achieved by the manual valve blocking the supply of line pressure to the reaction area left of land #4. With this pressure blocked, there is less area for pressure to act on to balance the force of the spring on the right. This allows line pressure to push the valve train to the right, reducing the amount of fluid returned to the pump's inlet, increasing line pressure.

DESCRIPTION AND OPERATION (Continued)

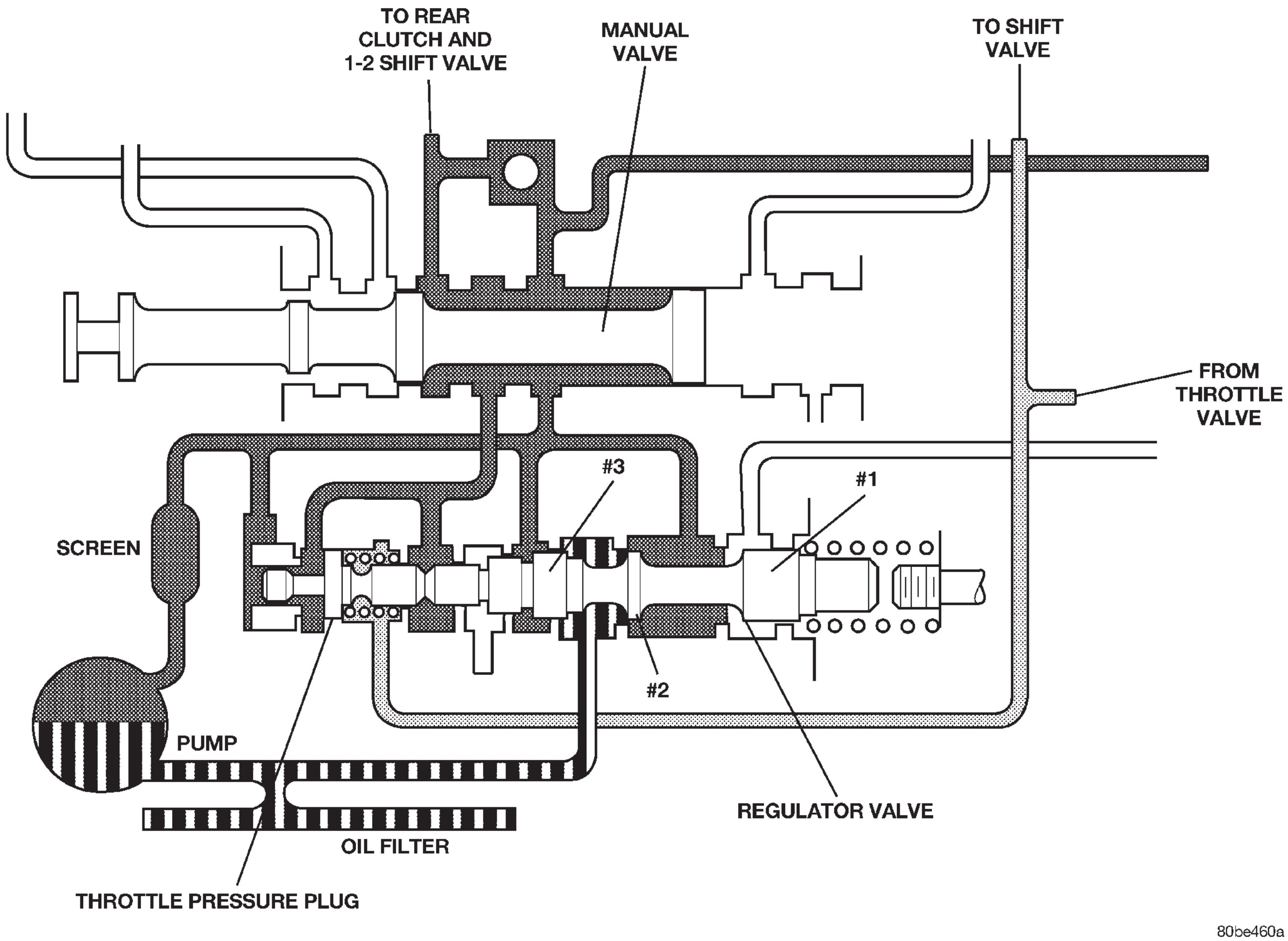


Fig. 22 Regulator Valve in Drive Position

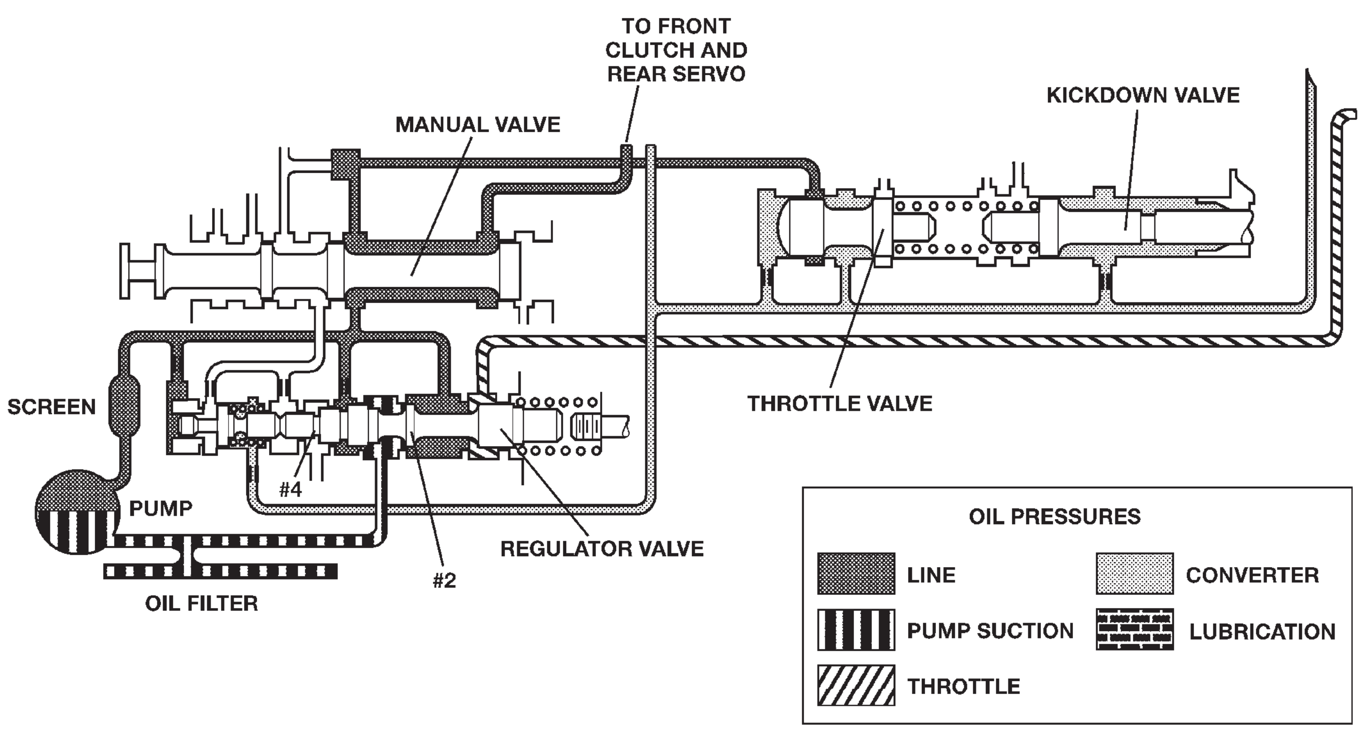


Fig. 23 Regulator Valve in Reverse Position

DESCRIPTION AND OPERATION (Continued)

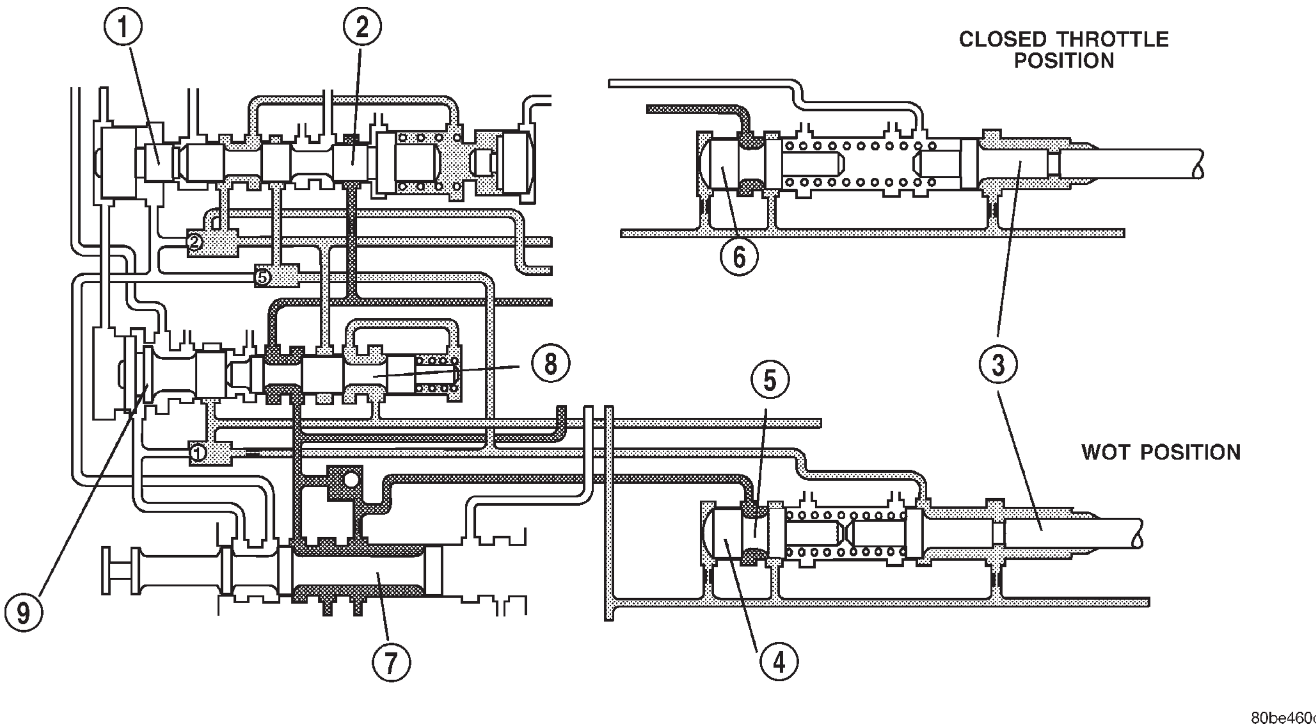


Fig. 24 Kickdown Valve

1 – GOVERNOR PLUG
2 – 2-3 SHIFT VALVE
3 – KICKDOWN VALVE
4 – THROTTLE VALVE
5 – MAXIMUM THROTTLE PRESSURE
6 – THROTTLE VALVE
7 – MANUAL VALVE
8 – 1-2 SHIFT VALVE
9 – GOVERNOR PLUG

KICKDOWN VALVE

When the throttle valve is as far over to the left as it can go, the maximum line pressure possible will enter the throttle pressure circuit. In this case, throttle pressure will equal line pressure. With the kickdown valve (Fig. 24) pushed into the bore as far as it will go, fluid initially flows through the annular groove of the 2–3 shift valve (which will be in the direct drive position to the right).

After passing the annular groove, the fluid is routed to the spring end of the 2–3 shift valve. Fluid pressure reacting on the area of land #1 overcomes governor pressure, downshifting the 2–3 shift valve into the kickdown, or second gear stage of operation. The valve is held in the kickdown position by throttle pressure routed from a seated check ball (#2). Again, if vehicle speed is low enough, throttle pressure will also push the 1–2 shift valve left to seat its governor plug, and downshift to drive breakaway.

KICKDOWN LIMIT VALVE

The purpose of the limit valve is to prevent a 3–2 downshift at higher speeds when a part–throttle downshift is not desirable. At these higher speeds only a full throttle 3–2 downshift will occur. At low road speeds (Fig. 25) the limit valve does not come into play and does not affect the downshifts. As the vehicle's speed increases (Fig. 26), the governor pressure also increases. The increased governor pressure acts on the reaction area of the bottom land of the limit valve overcoming the spring force trying to push the valve toward the bottom of its bore. This pushes the valve upward against the spring and bottoms the valve against the top of the housing. With the valve bottomed against the housing, the throttle pressure supplied to the valve will be closed off by the bottom land of the limit valve. When the supply of throttle pressure has been shut off, the 3–2 part throttle downshift plug becomes inoperative, because no pressure is acting on its reaction area.

DESCRIPTION AND OPERATION (Continued)

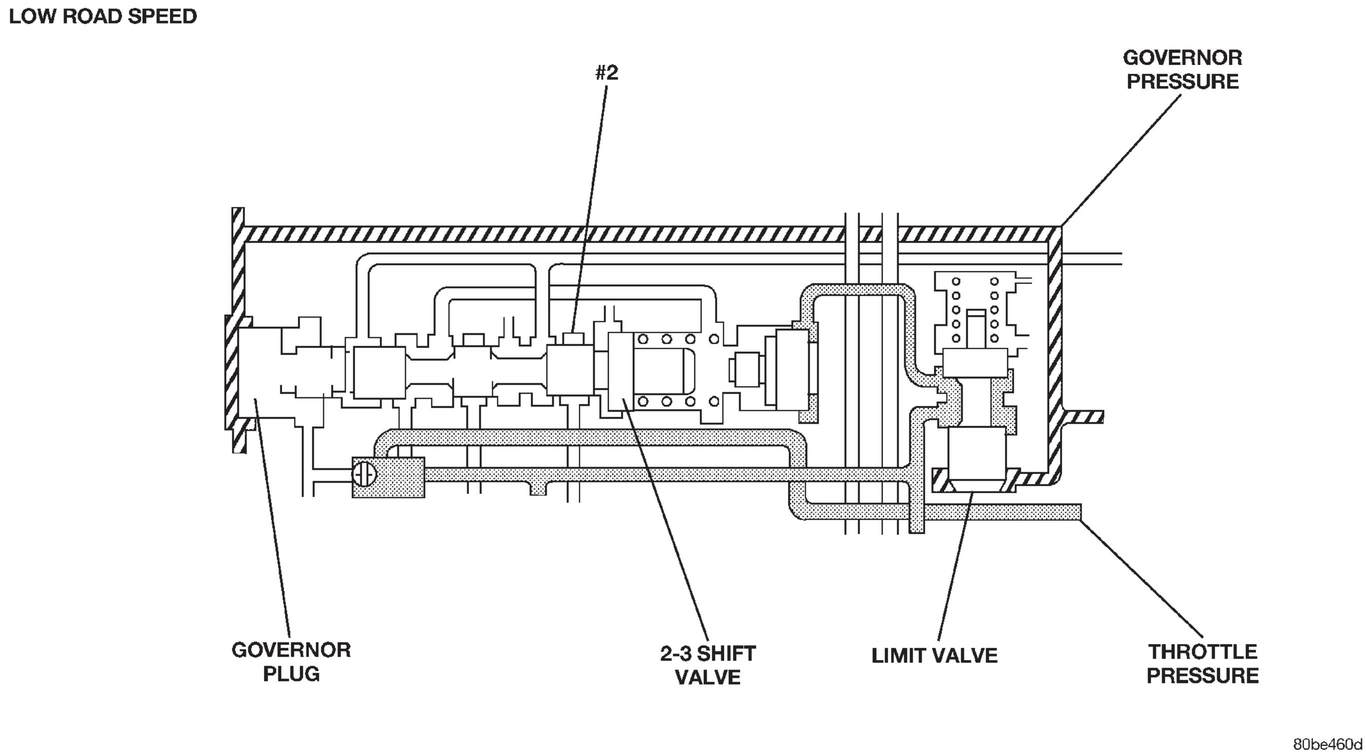


Fig. 25 Kickdown Limit Valve-Low Speeds

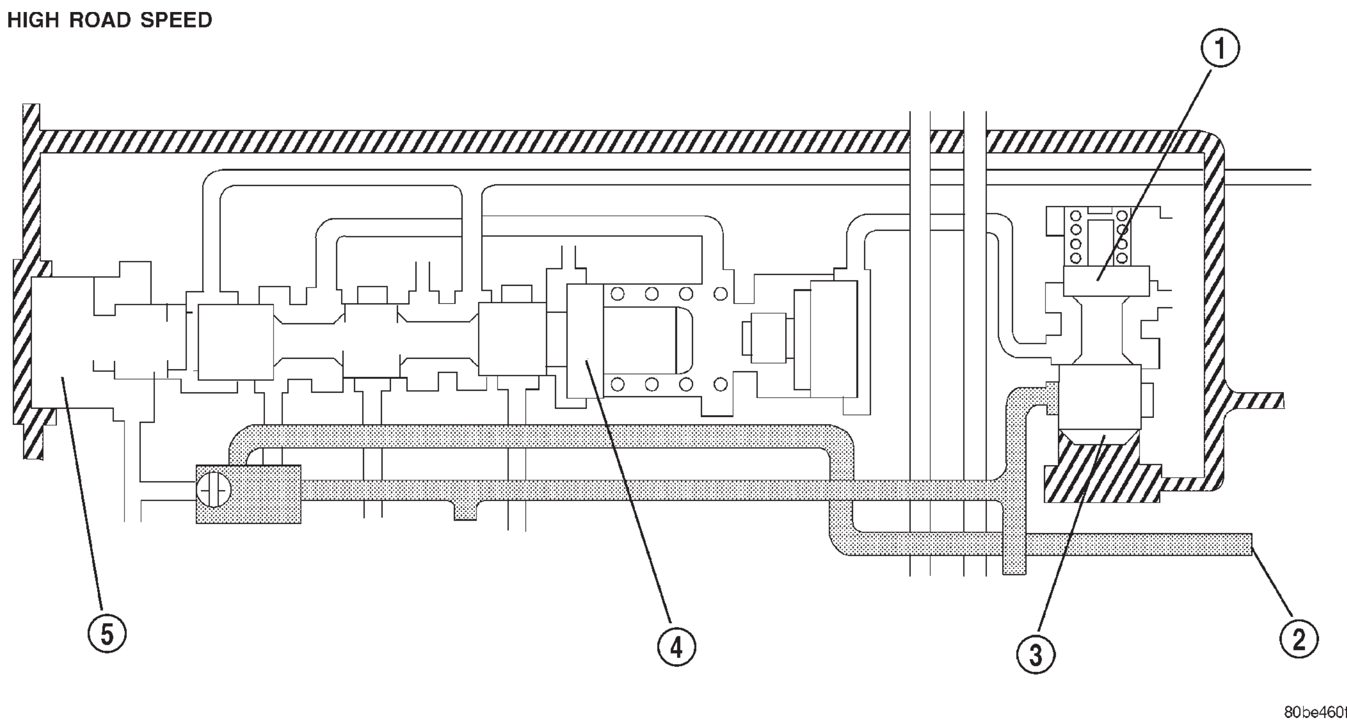


Fig. 26 Kickdown Limit Valve-High Speeds

1 – GOVERNOR PRESSURE CLOSES LIMIT VALVE
2 – THROTTLE PRESSURE
3 – LIMIT VALVE
4 – 2-3 SHIFT VALVE
5 – GOVERNOR PLUG

DESCRIPTION AND OPERATION (Continued)

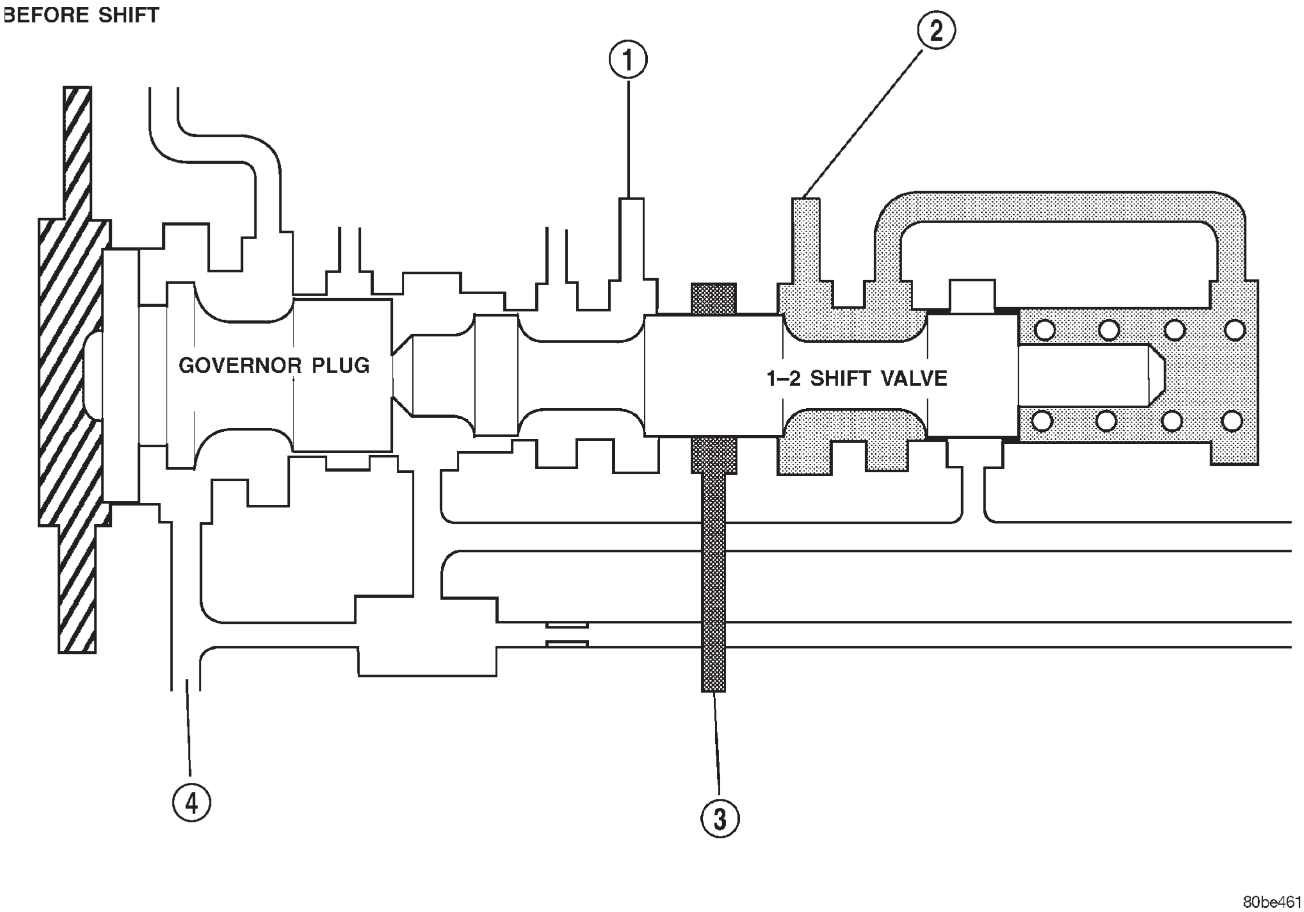


Fig. 27 1–2 Shift Valve-Before Shift

1 – TO FRONT SERVO AND 2-3 SHIFT VALVE
2 – THROTTLE PRESSURE
3 – LINE PRESSURE
4 – LINE PRESSURE PASSAGE FOR MANUAL LOW POSITION

1–2 SHIFT VALVE

The 1–2 shift valve assembly (Fig. 27), or mechanism, consists of: the 1–2 shift valve, governor plug, and a spring on the end of the valve. After the manual valve has been placed into a forward gear range, line pressure is directed to the 1–2 shift valve. As the throttle is depressed, throttle pressure is applied to the right side of the 1–2 shift valve assembly. With throttle pressure applied to the right side of the valve, there is now both spring pressure and throttle pressure acting on the valve, holding it against the governor plug. As the vehicle begins to move and build speed, governor pressure is created and is applied to the left of the valve at the governor plug.

DESCRIPTION AND OPERATION (Continued)

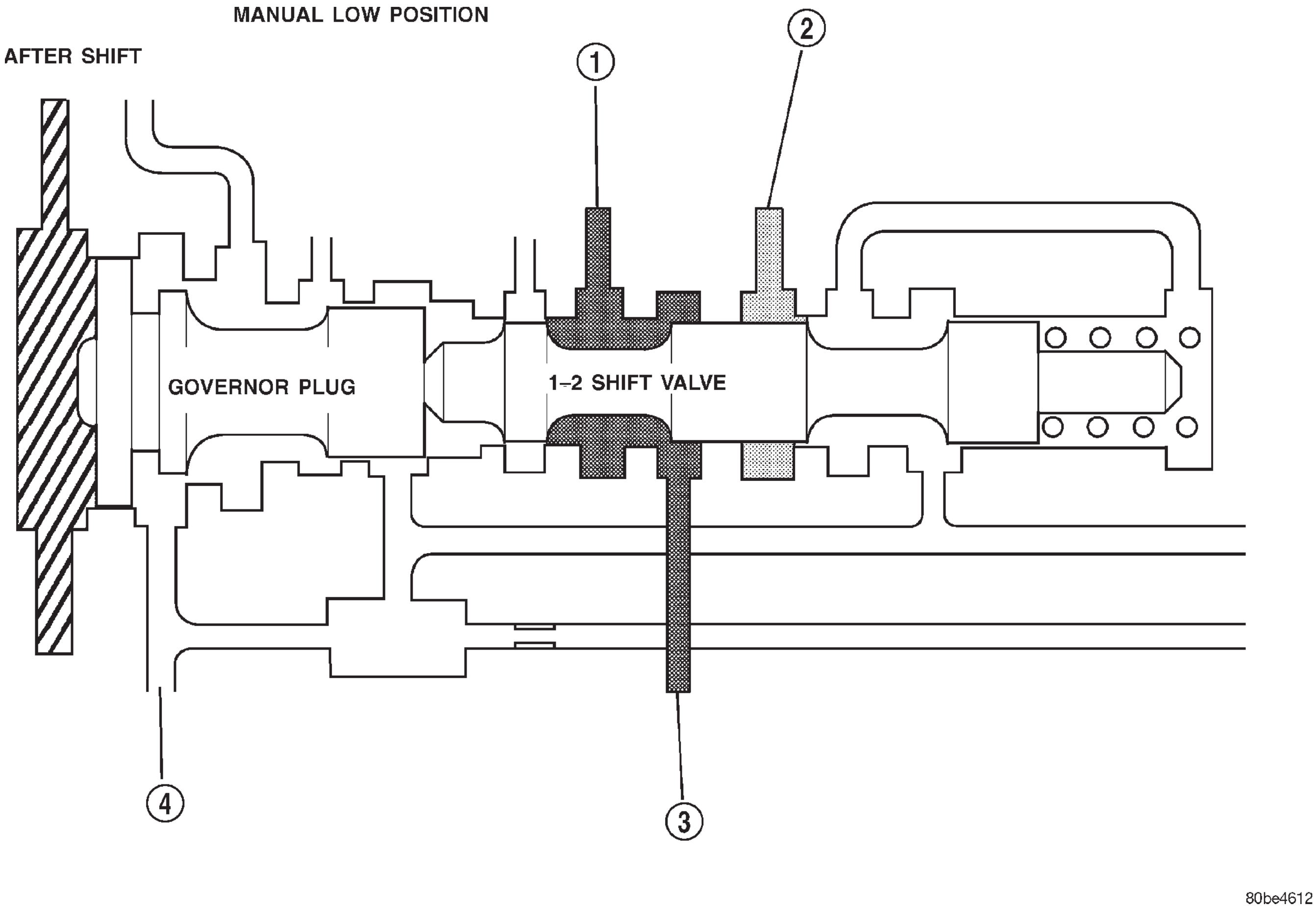


Fig. 28 1–2 Shift Valve-After Shift

1 – TO FRONT SERVO AND 2-3 SHIFT VALVE
2 – THROTTLE PRESSURE
3 – LINE PRESSURE
4 – LINE PRESSURE PASSAGE FOR MANUAL LOW POSITION

When governor pressure builds to a point where it can overcome the combined force of the spring and throttle pressure on the other side of the valve, the valve will begin to move over to the right. As the valve moves to the right, the middle land of the valve will close off the circuit supplying the throttle pressure to the right side of the valve. When the throttle pressure is closed off, the valve will move even farther to the right, allowing line pressure to enter another circuit and energize the front servo, applying the front band (Fig. 28).

The governor plug serves a dual purpose: [0001]

- It allows the shift valves to move either left or right, allowing both upshifts and downshifts.
- When in a manual selection position, it will be hydraulically "blocked" into position so no upshift can occur.

The physical blocking of the upshift while in the manual "1" position is accomplished by the directing of line pressure between both lands of the governor plug. The line pressure reacts against the larger land of the plug, pushing the plug back against the end plate overcoming governor pressure. With the combination of the line pressure and spring pressure, the valve cannot move, preventing any upshift.

1–2 SHIFT CONTROL VALVE

It contains a valve with four lands and a spring. It is used as both a "relay" and "balanced" valve.

The valve has two specific operations (Fig. 29):

- Aid in quality of the 1–2 upshift.
- Aid in the quality and timing of the 3–2 kickdown ranges.

When the manual valve is set to the Drive position and the transmission is in the first or second gear range, 1–2 shift control or "modulated throttle pressure" is supplied to the middle of the accumulator piston by the 1–2 shift control valve. During the 1–2 upshift, this pressure is used to control the kickdown servo apply pressure that is needed to apply the kickdown and accumulator pistons. Thus, the 1–2 shift point is "cushioned" and the quality is improved. During a WOT kickdown, kickdown pressure is applied between the kickdown valve and the 1–2

DESCRIPTION AND OPERATION (Continued)

shift control valve. This additional pressure is directed to the 1–2 shift control's spring cavity, adding to the spring load on the valve. The result of this increased "modulated" throttle pressure is a firmer WOT upshift.

SHUTTLE VALVE

The assembly is contained in a bore in the valve body above the shift valves. When the manual valve is positioned in the Drive range, throttle pressure acts on the throttle plug of the shuttle valve (Fig. 29) to move it against a spring, increasing the spring force on the shuttle valve. During a part or full throttle 1–2 upshift, the throttle plug is bottomed by throttle pressure, holding the shuttle valve to the right against governor pressure, and opening a by–pass circuit. The shuttle valve controls the quality of the kickdown shift by restricting the rate of fluid discharge from the front clutch and servo release circuits. During a 3–2 kickdown, fluid discharges through the shuttle by–pass circuit. When the shuttle valve closes the by–pass circuit, fluid discharge is restricted and controlled for the application of the front band. During a 2–3 "lift foot" upshift, the shuttle valve by–passes the restriction to allow full fluid flow through the by–pass groove for a faster release of the band.

2–3 SHIFT VALVE

The 2–3 shift valve mechanism (Fig. 30) consists of the 2–3 shift valve, governor plug and spring, and a throttle plug. After the 1–2 shift valve has completed its operation and applied the front band, line pressure is directed to the 2–3 shift valve through the connecting passages from the 1–2 shift valve. The line pressure will then dead–end at land #2 until the

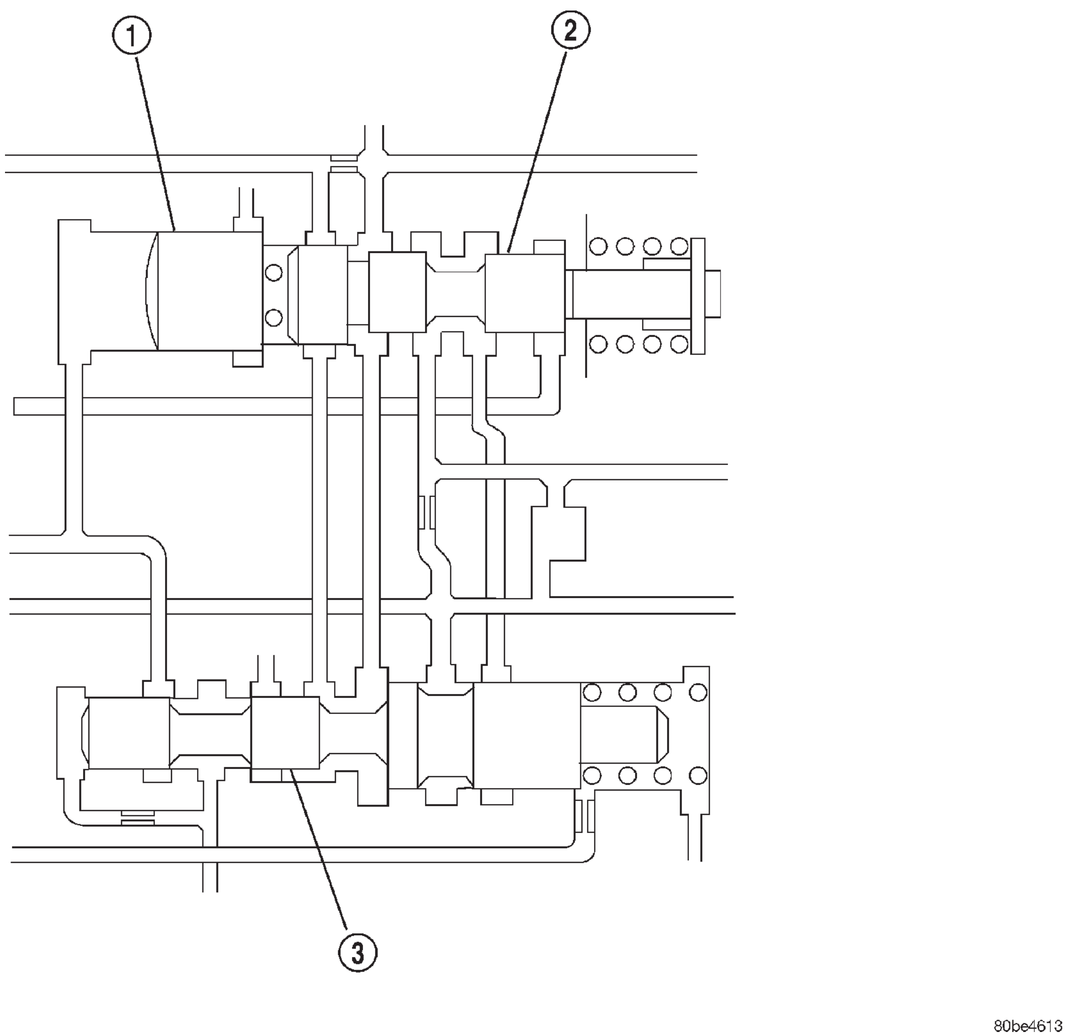


Fig. 29 1–2 Shift Control Valve

1 – THROTTLE PLUG
2 – SHUTTLE VALVE
3 – 1-2 SHIFT CONTROL VALVE

DESCRIPTION AND OPERATION (Continued)

2–3 valve is ready to make its shift. Now that the vehicle is in motion and under acceleration, there is throttle pressure being applied to the spring side of the valve and between lands #3 and #4.

As vehicle speed increases, governor pressure increases proportionately, until it becomes great enough to overcome the combined throttle and spring pressure on the right side of the valve. When this happens, the governor plug is forced against the shift valve moving it to the right. The shift valve causes land #4 to close the passage supplying throttle pressure to the 2–3 shift valve. Without throttle pressure present in the circuit now, the governor plug will push the valve over far enough to bottom the valve in its bore. This allows land #2 to direct line pressure to the front clutch.

After the shift (Fig. 31), line pressure is directed to the land between the shift valve and the governor plug, and to the release side of the kickdown servo. This releases the front band and applies the front clutch, shifting into third gear or direct drive. The rear clutch remains applied, as it has been in the other gears. During a manual“1” or manual “2” gear selection, line pressure is sent between the two lands of the 2–3 governor plug. This line pressure at the governor plug locks the shift valve into the second gear position, preventing an upshift into direct drive. The theory for the blocking of the valve is the same as that of the 1–2 shift valve.

THROTTLE VALVE

In all gear positions the throttle valve (Fig. 32) is being supplied with line pressure. The throttle valve meters and reduces the line pressure that now becomes throttle pressure. The throttle valve is moved by a spring and the kickdown valve, which is mechanically connected to the throttle. The larger the throttle opening, the higher the throttle pressure (to a maximum of line pressure). The smaller the throttle opening, the lower the throttle pressure (to a minimum of zero at idle). As engine speed increases, the increase in pump speed increases pump output. The increase in pressure and volume must be regulated to maintain the balance within the transmission. To do this, throttle pressure is routed to the reaction area on the right side of the throttle pressure plug (in the regulator valve).

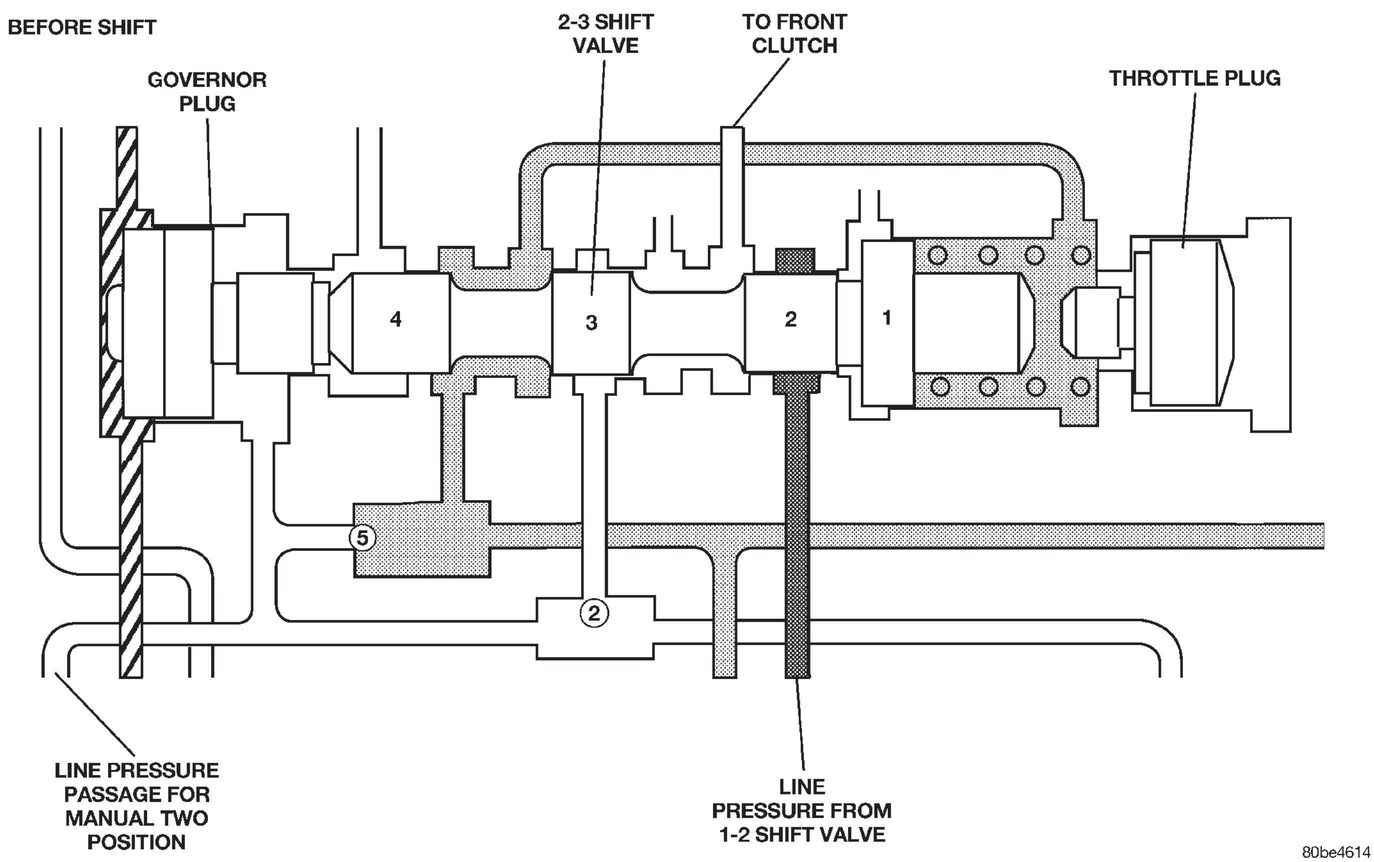


Fig. 30 2–3 Shift Valve-Before Shift

DESCRIPTION AND OPERATION (Continued)

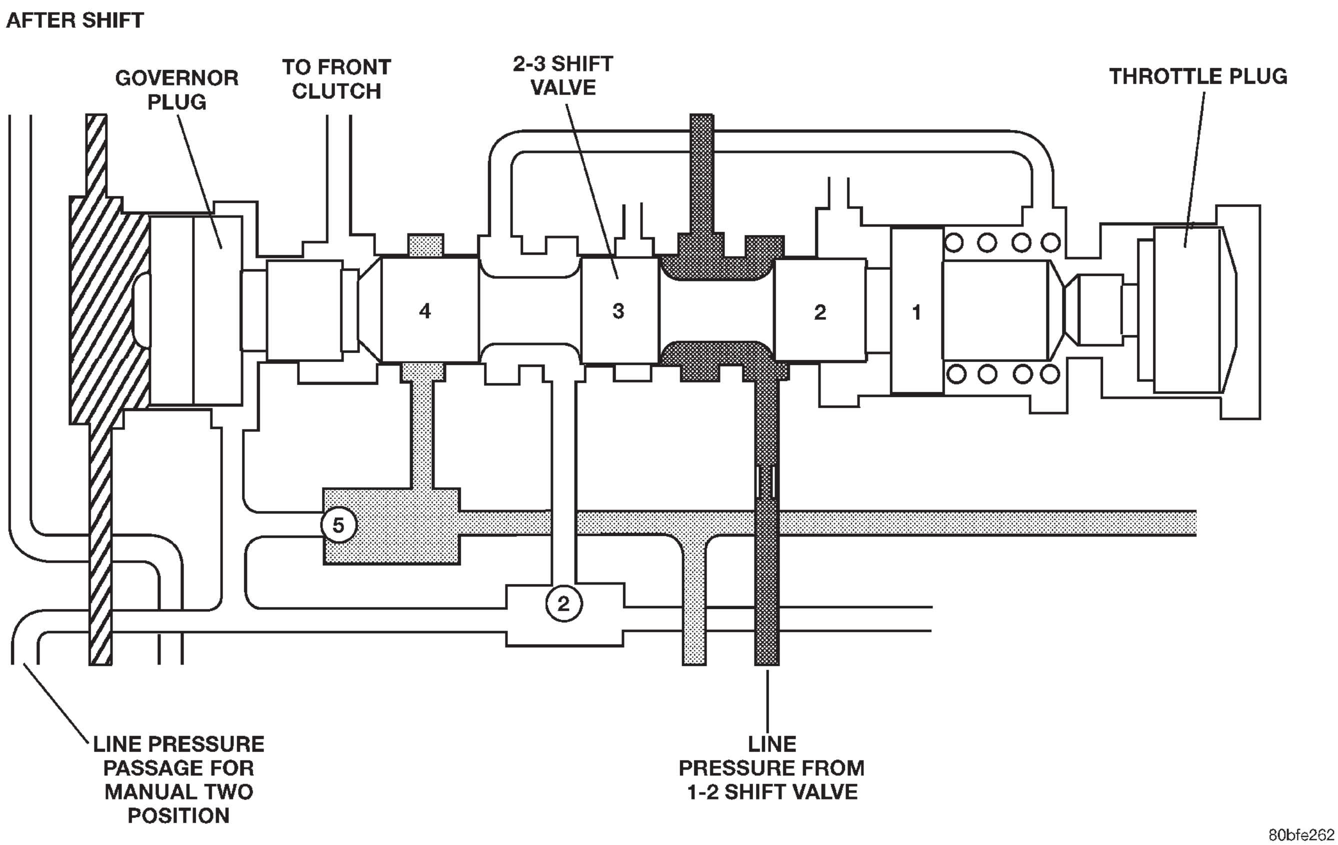


Fig. 31 2–3 Shift Valve-After Shift

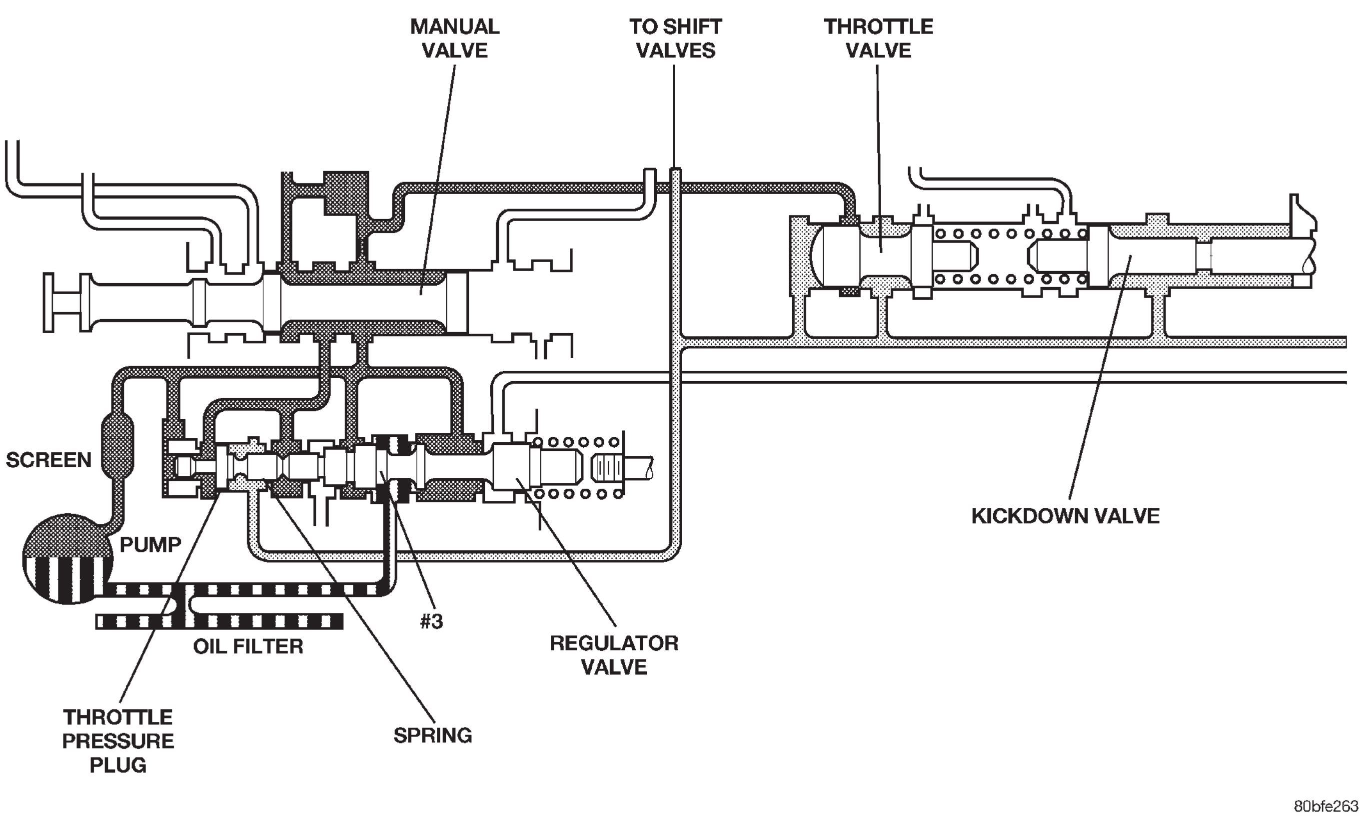


Fig. 32 Throttle Valve

DESCRIPTION AND OPERATION (Continued)

The higher engine speed and line pressure would open the vent too far and reduce line pressure too much. Throttle pressure, which increases with engine speed (throttle opening), is used to oppose the movement of the pressure valve to help control the metering passage at the vent. The throttle pressure is combined with spring pressure to reduce the force of the throttle pressure plug on the pressure valve. The larger spring at the right closes the regulator valve passage and maintains or increases line pressure. The increased line pressure works against the reaction area of the line pressure plug and the reaction area left of land #3 simultaneously moves the regulator valve train to the right and controls the metering passage.

The kickdown valve, along with the throttle valve, serve to delay upshifts until the correct vehicle and engine speed have been reached. It also controls downshifts upon driver demand, or increased engine load. If these valves were not in place, the shift points would be at the same speed for all throttle positions. The kickdown valve is actuated by a cam connected to the throttle. This is accomplished through either a linkage or a cable. The cam forces the kickdown valve toward the throttle valve compressing the spring between them and moving the throttle valve. As the throttle valve land starts to uncover its port, line pressure is “metered” out into the circuits and viewed as throttle pressure. This increased throttle pressure is metered out into the circuits it is applied to: the 1–2 and 2–3 shift valves. When the throttle pressure is high enough, a 3–2 downshift will occur. If the vehicle speed is low enough, a 2–1 downshift will occur.

SWITCH VALVE

When the transmission is in Drive Second just before the TCC application occurs (Fig. 33), the pressure regulator valve is supplying torque converter pressure to the switch valve. The switch valve directs this pressure through the transmission input shaft, into the converter, through the converter, back out between the input shaft and the reaction shaft, and back up to the switch valve. From the switch valve, the fluid pressure is directed to the transmission cooler, and lubrication pressure returns from the cooler to lubricate different portions of the transmission.

Once the TCC control valve has moved to the left (Fig. 34), line pressure is directed to the fail–safe valve, and then to the tip of the switch valve, forcing the valve downward. The switch valve now vents oil from the front of the piston in the torque converter, and supplies line pressure to the (rear) apply side of the torque converter piston. This pressure differential causes the piston to apply against the friction material, cutting off any further flow of line pressure oil. After the switch valve is shuttled downward allowing line pressure to engage the TCC, torque converter pressure is directed past the switch valve into the transmission cooler and lubrication circuits.

CONVERTER CLUTCH CONTROL VALVE

The torque converter clutch (TCC) control valve controls the back (ON) side of the torque converter clutch. When the PCM energizes the TCC solenoid to engage the converter clutch piston, pressure is applied to the TCC control valve which moves to the left and applies pressure to the fail–safe valve.

FAIL-SAFE VALVE

The pressure coming from the TCC control valve dead–ends at the fail–safe valve until governor pressure on the right side of the valve increases. The pressure must be high enough to overcome the throttle and spring pressure on the left side of the valve and push the valve to the left. The pressure will then flow to the switch valve.

DESCRIPTION AND OPERATION (Continued)

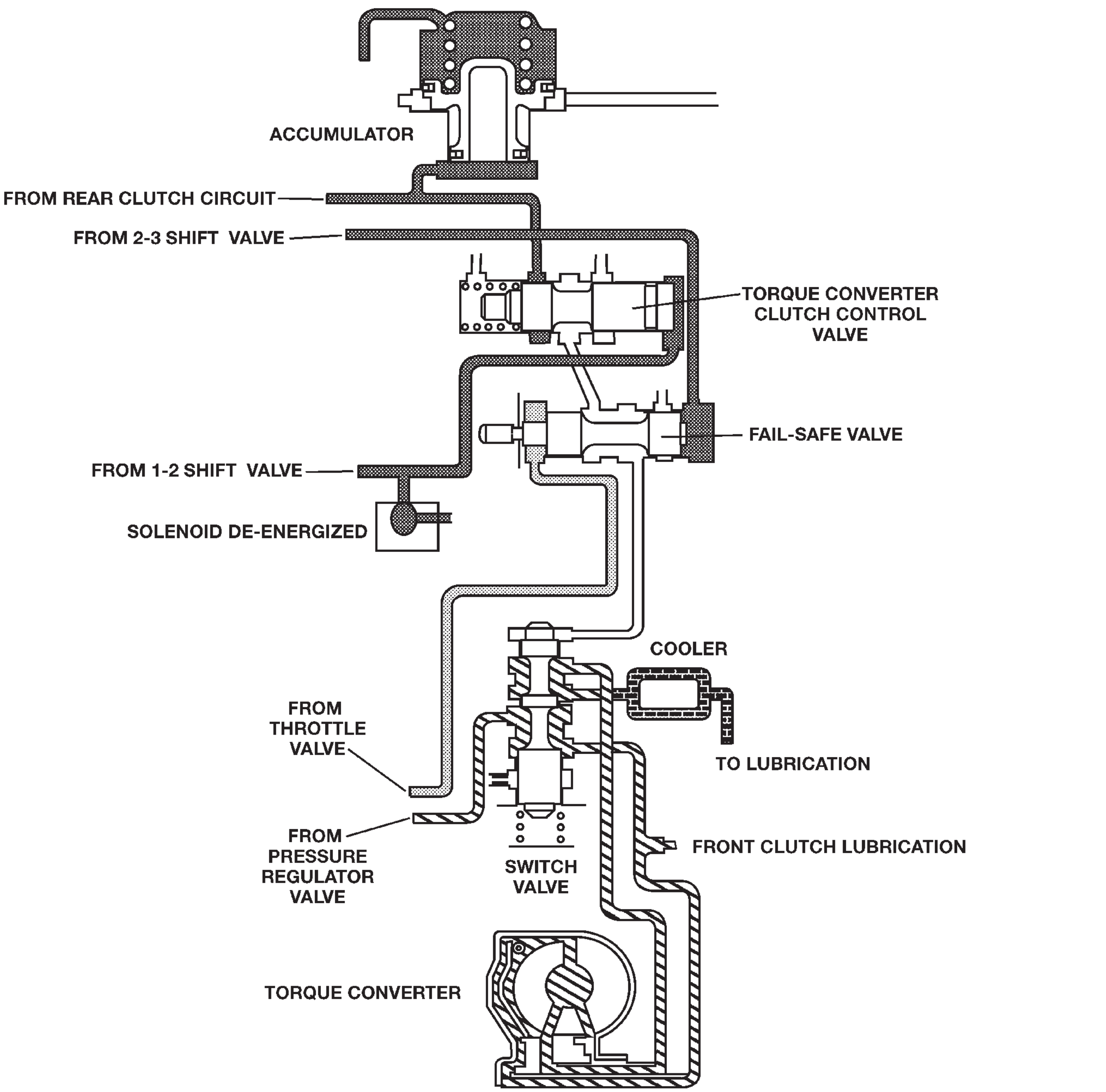


Fig. 33 Switch Valve-Torque Converter Unlocked

DESCRIPTION AND OPERATION (Continued)

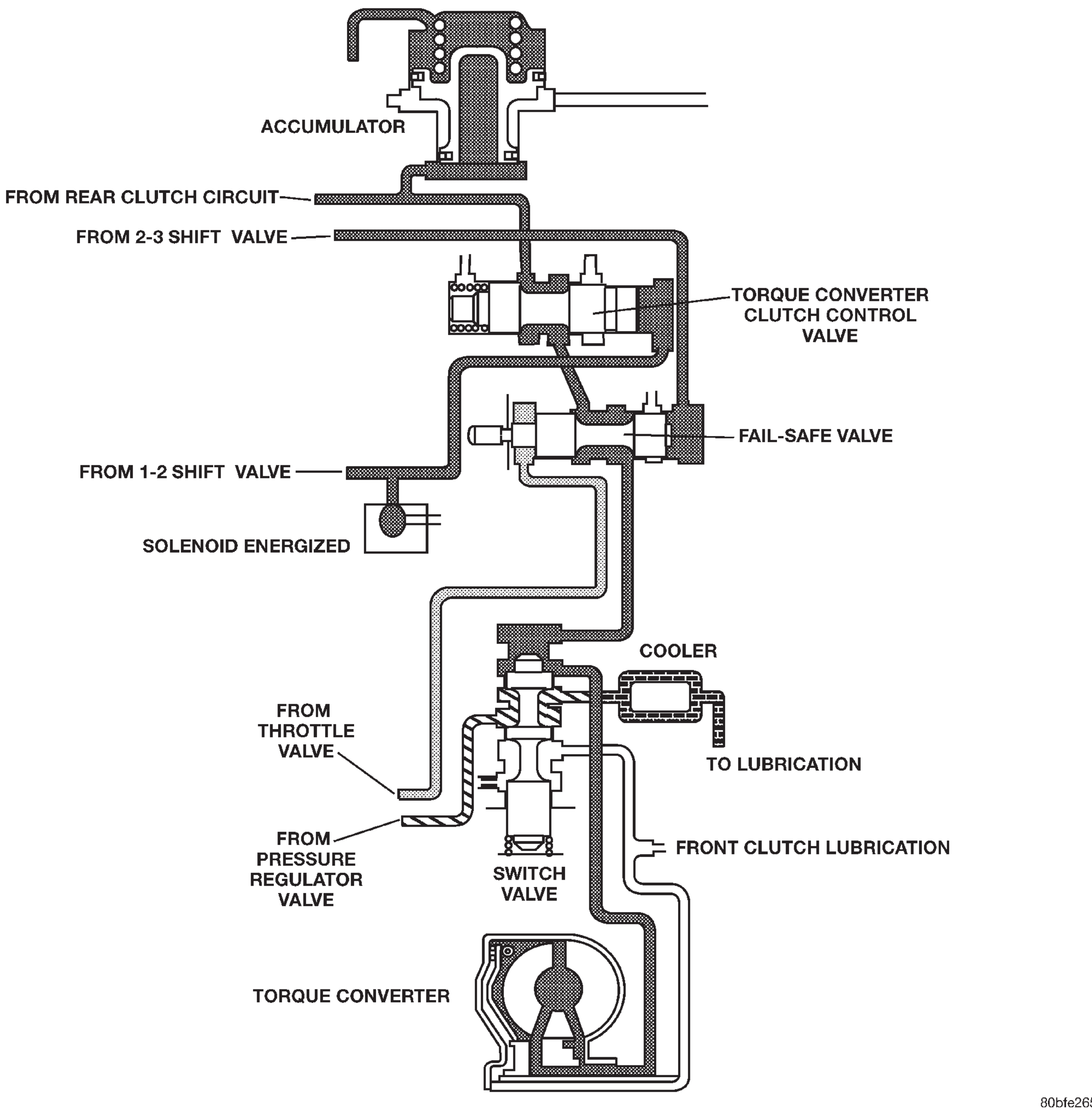


Fig. 34 Switch Valve-Torque Converter Locked

DESCRIPTION AND OPERATION (Continued)

MANUAL VALVE

The manual valve (Fig. 35) is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the side of the valve body. The valve is connected mechanically by either a cable or linkage to the gearshift mechanism. The valve is held in each of its positions by a spring–loaded roller or ball that engages the “roostercomb” of the manual valve.

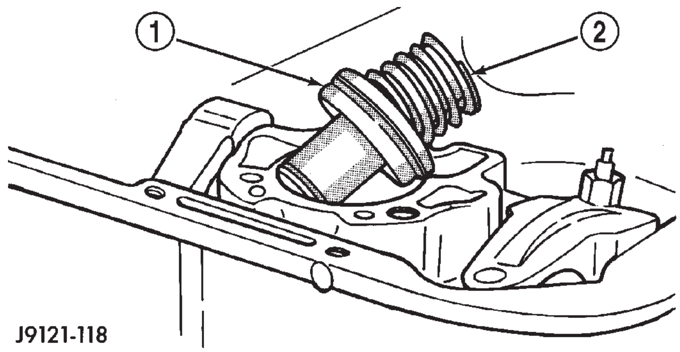


Fig. 36 Accumulator

1 – ACCUMULATOR PISTON
2 – PISTON SPRING

ACCUMULATOR

DESCRIPTION

The accumulator (Fig. 36) is a hydraulic device that has the sole purpose of cushioning the application of a band or clutch. The accumulator consists of a dual–land piston and a spring located in a bore in the transmission case.

OPERATION

Line pressure is directed between the lands of the piston (Fig. 37), bottoming it against the accumulator plate. The accumulator stays in this position after the transmission is placed into a Drive position. When the 1–2 upshift occurs (Fig. 38), line pressure is directed to the large end of the piston and then to the kickdown servo. As the line pressure reaches the accumulator, the combination of spring pressure and line pressure forces the piston away from the accumulator plate. This causes a balanced pressure situation, which results in a cushioned band application. After the kickdown servo has become immovable, line pressure will finish pushing the accumulator up into its bore. When the large end of the accumulator piston is seated in its bore, the band or clutch is fully applied.

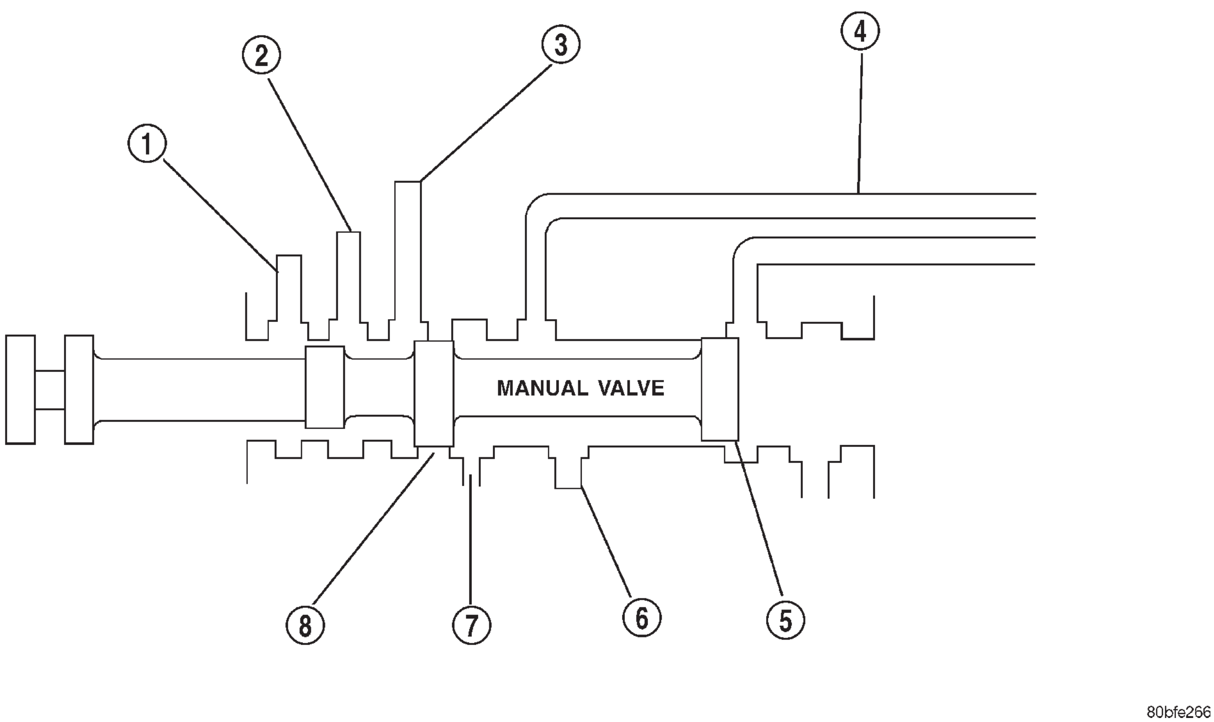


Fig. 35 Manual Valve

1 – 1-2 GOVERNOR PLUG
2 – 2-3 GOVERNOR PLUG
3 – GOVERNOR REAR CLUTCH ACCUMULATOR
4 – THROTTLE VALVE
5 – LAND #1
6 – PUMP
7 – PRESSURE REGULATOR
8 – LAND #2

DESCRIPTION AND OPERATION (Continued)

NOTE: The accumulator is shown in the inverted position for illustrative purposes.

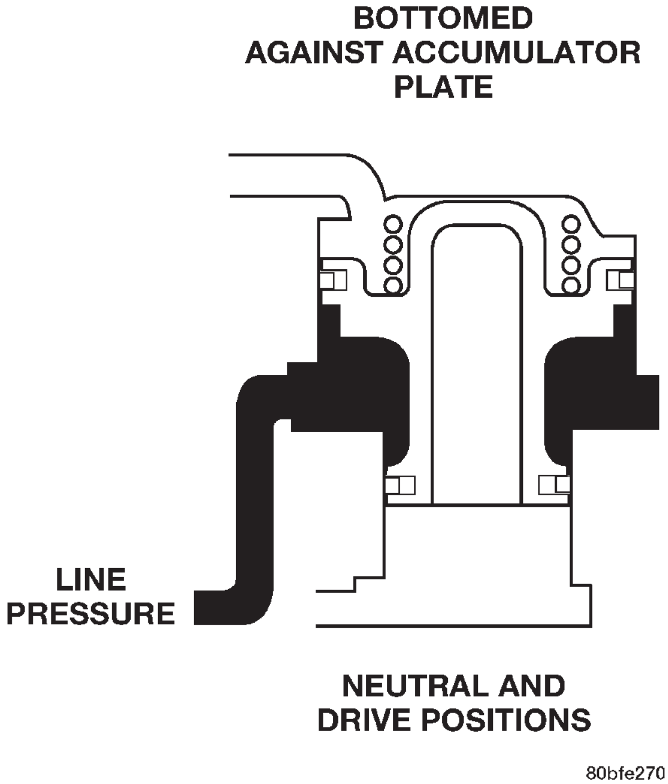


Fig. 37 Accumulator in Neutral and Drive Positions

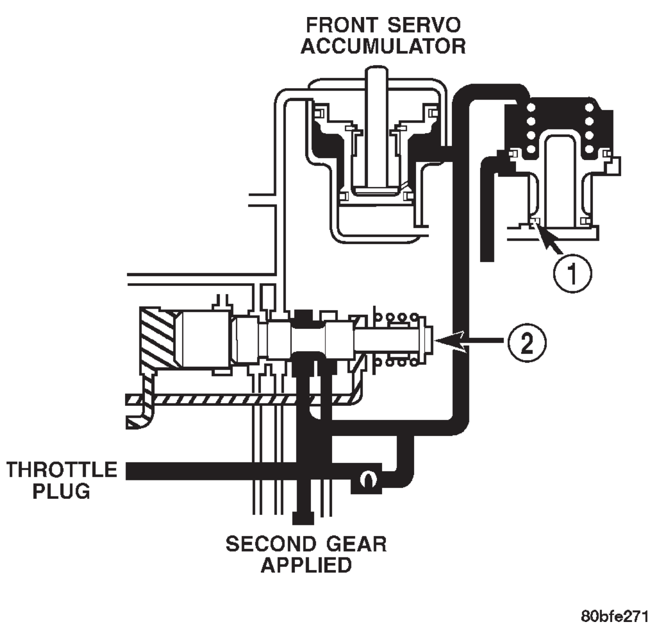


Fig. 38 Accumulator in Second Gear Position

1 – BOTTOM IN BORE
2 – SHUTTLE VALVE

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches, while others are used to apply bands. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

PRESSURE

Pressure (Fig. 39) is nothing more than force (lbs.) divided by area (in or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in or 1 pound per square inch, or PSI as it is commonly referred to.

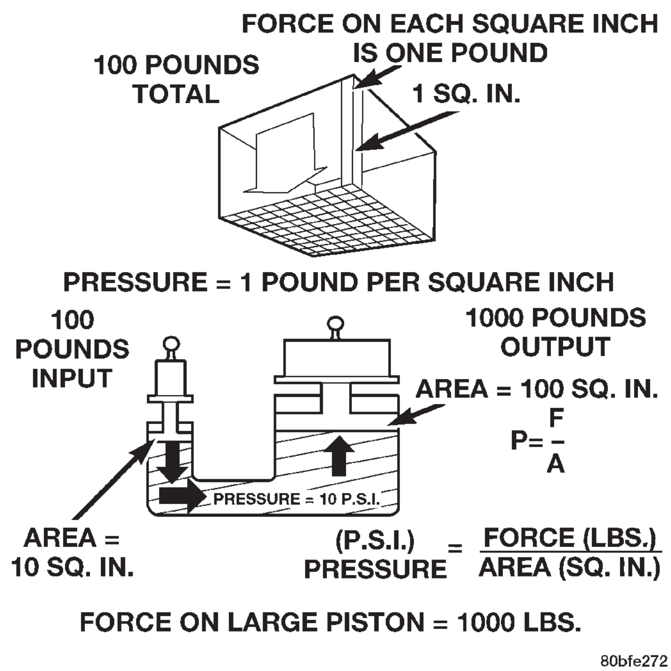


Fig. 39 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 40) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no

DESCRIPTION AND OPERATION (Continued)

pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O–rings, D–rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

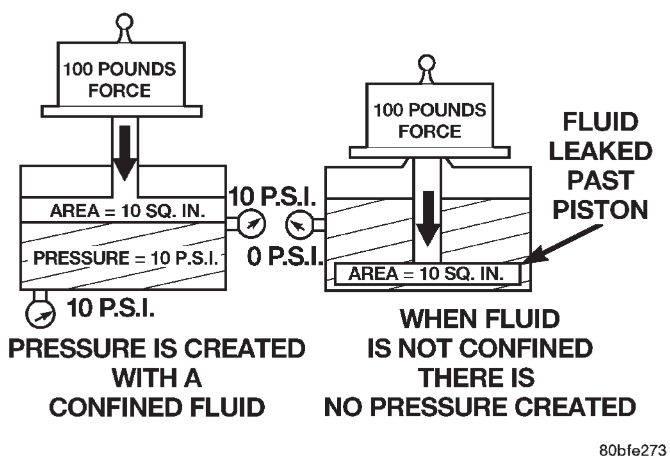


Fig. 40 Pressure on a Confined Fluid

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 41), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 41), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same everywhere" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

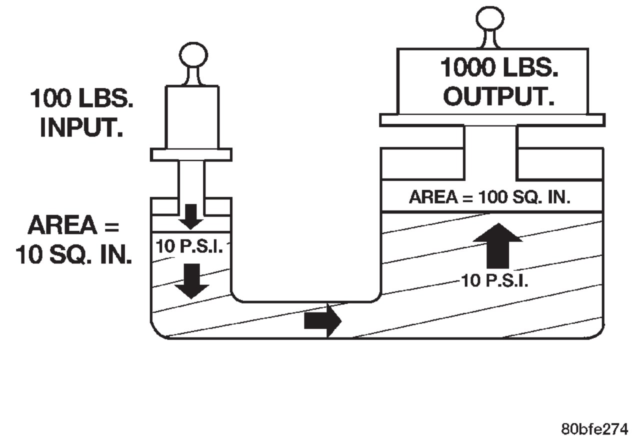


Fig. 41 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight–to–distance output rather than a pressure–to–area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 42) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

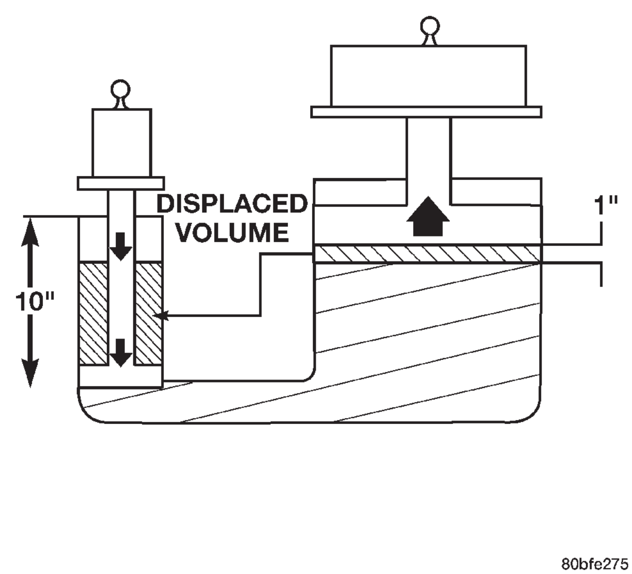


Fig. 42 Piston Travel

DESCRIPTION AND OPERATION (Continued)

FRONT CLUTCH

DESCRIPTION

The front clutch assembly (Fig. 43) is composed of the front clutch retainer, pressure plate, four clutch plates, four driving discs, piston, piston return spring, return spring retainer, and snap rings. The front clutch is the forwardmost component in the transmission geartrain and is directly behind the oil pump and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap ring is used to cushion the application of the clutch pack. In some transmissions, the snap ring is selective and used to adjust clutch pack clearance.

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one–way ball–check–valve located in the clutch retainer. The check–valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

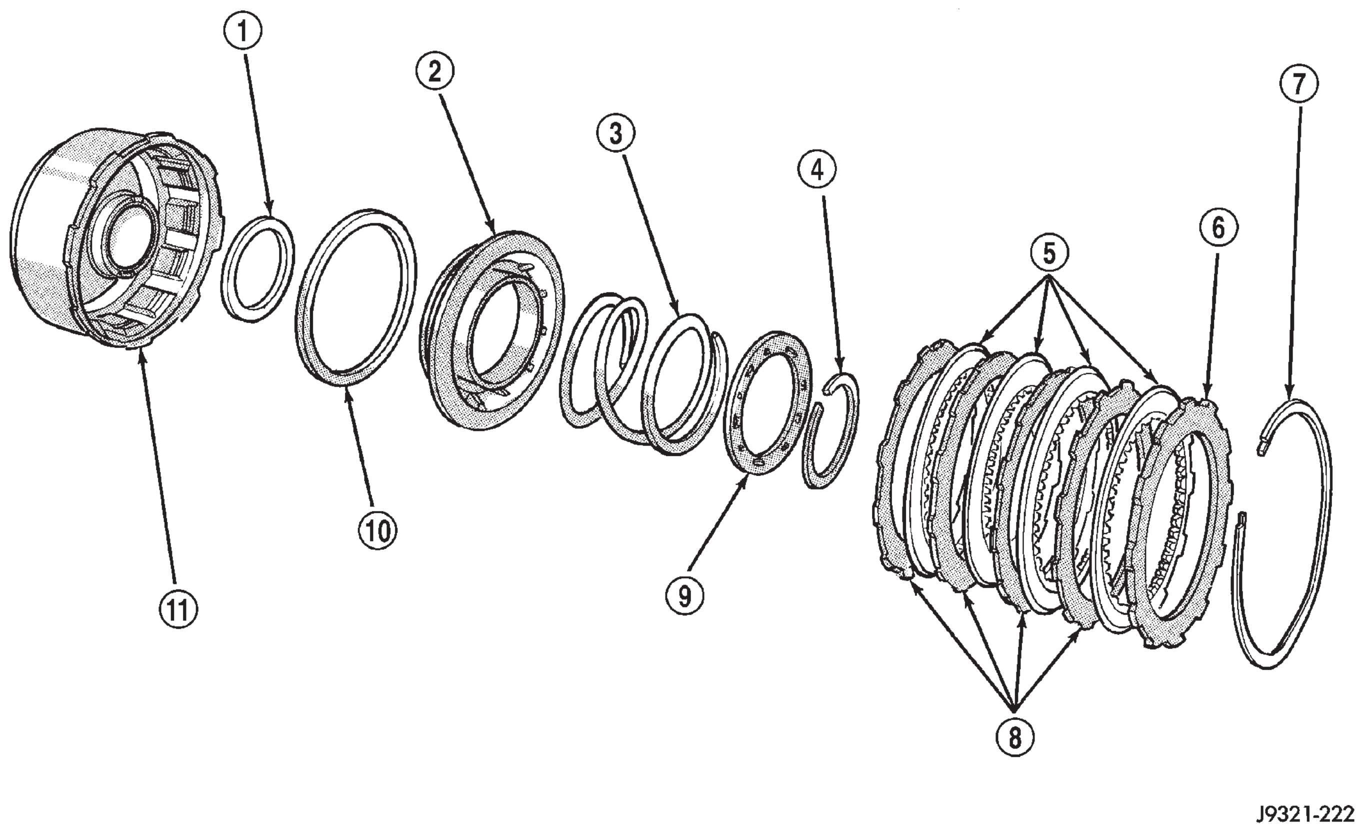


Fig. 43 Front Clutch

1 – RETAINER HUB SEAL
2 – CLUTCH PISTON
3 – PISTON SPRING
4 – SPRING RETAINER SNAP RING
5 – CLUTCH DISCS
6 – PRESSURE PLATE
7 – SNAP RING (WAVED)
8 – CLUTCH PLATES
9 – SPRING RETAINER
10 – PISTON SEAL
11 – FRONT CLUTCH RETAINER

DESCRIPTION AND OPERATION (Continued)

REAR CLUTCH

DESCRIPTION

The rear clutch assembly (Fig. 44) is composed of the rear clutch retainer, pressure plate, three clutch plates, four driving discs, piston, Belleville spring, and snap rings. The Belleville spring acts as a lever to multiply the force applied on to it by the apply piston. The increased apply force on the rear clutch pack, in comparison to the front clutch pack, is needed to hold against the greater torque load imposed onto the rear pack. The rear clutch is directly behind the front clutch and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap ring is used to cushion the application of the clutch pack. In some transmissions, the snap ring is selective and used to adjust clutch pack clearance.

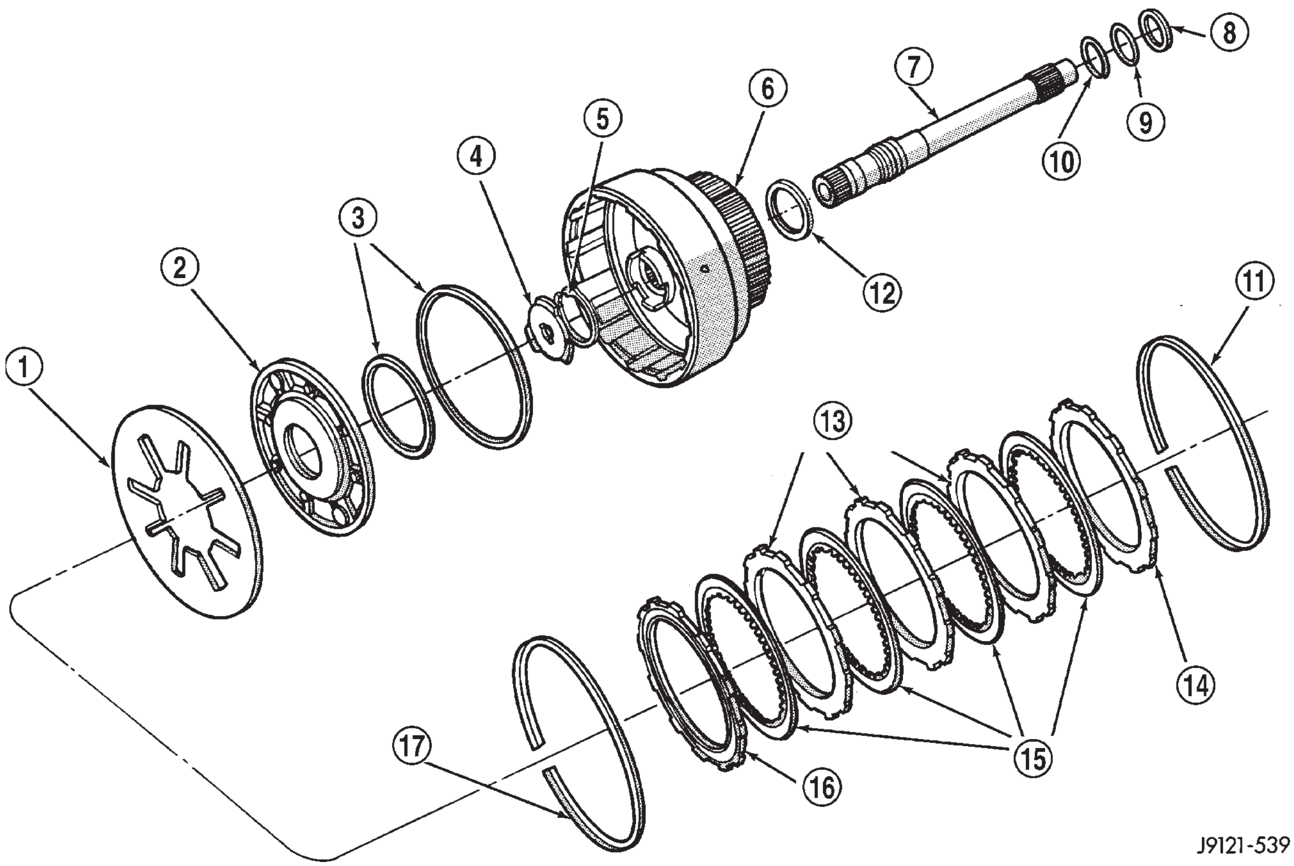


Fig. 44 Rear Clutch

1 – PISTON SPRING
2 – REAR CLUTCH PISTON
3 – CLUTCH PISTON SEALS
4 – OUTPUT SHAFT THRUST WASHER (METAL)
5 – INPUT SHAFT SNAP RING
6 – REAR CLUTCH RETAINER
7 – INPUT SHAFT
8 – REAR CLUTCH THRUST WASHER (FIBER)
9 – SHAFT FRONT SEAL RING (TEFLON)
10 – SHAFT REAR SEAL RING (METAL)
11 – CLUTCH PACK SNAP RING (SELECTIVE)
12 – RETAINER SEAL RING
13 – CLUTCH PLATES (3)
14 – TOP PRESSURE PLATE
15 – CLUTCH DISCS (4)
16 – BOTTOM PRESSURE PLATE
17 – WAVE SPRING

DESCRIPTION AND OPERATION (Continued)

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one–way ball–check–valve located in the clutch retainer. The check–valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

OVERRUNNING CLUTCH

DESCRIPTION

The overrunning clutch (Fig. 45) consists of an inner race, an outer race (or cam), rollers and springs, and the spring retainer. The number of rollers and springs depends on what transmission and which overrunning clutch is being dealt with.

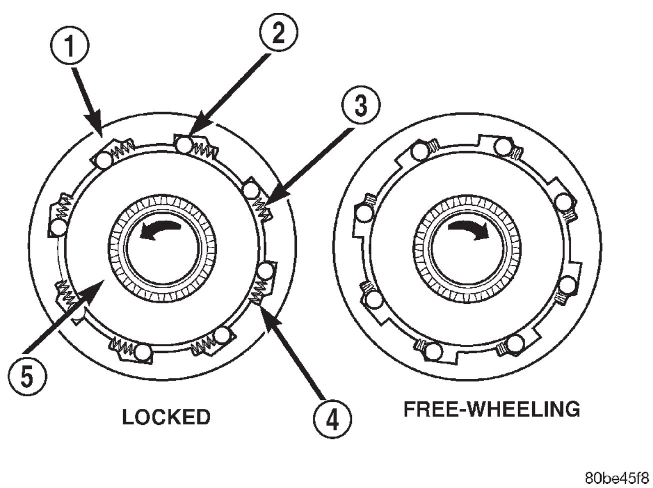


Fig. 45 Overrunning Clutch

1 – OUTER RACE (CAM)
2 – ROLLER
3 – SPRING
4 – SPRING RETAINER
5 – INNER RACE (HUB)

OPERATION

As the inner race is rotated in a clockwise direction (as viewed from the front of the transmission), the race causes the rollers to roll toward the springs, causing them to compress against their retainer. The compression of the springs increases the clearance between the rollers and cam. This increased clearance between the rollers and cam results in a free-wheeling condition. When the inner race attempts to rotate counterclockwise, the action causes the rollers to roll in the same direction as the race, aided by the pushing of the springs. As the rollers try to move in the same direction as the inner race, they are wedged between the inner and outer races due to the design of the cam. In this condition, the clutch is locked and acts as one unit.

PLANETARY GEARSET

DESCRIPTION

The planetary gearsets (Fig. 46) are designated as the front and rear planetary gear assemblies and located in such order. A simple planetary gearset consists of three main members:

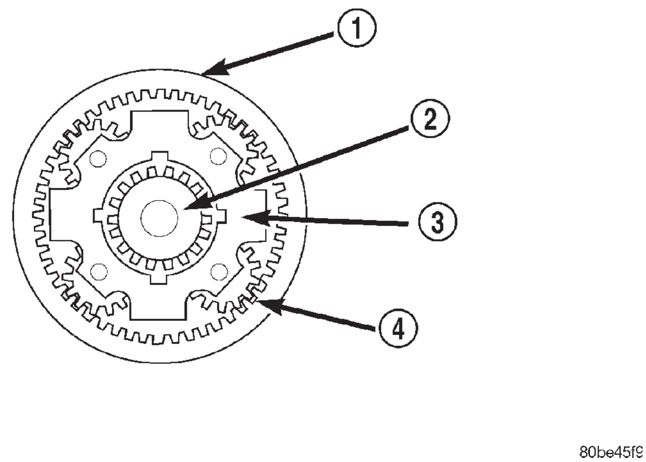


Fig. 46 Planetary Gearset

1 – ANNULUS GEAR
2 – SUN GEAR
3 – PLANET CARRIER
4 – PLANET PINIONS (4)

- The sun gear which is at the center of the system.
- The planet carrier with planet pinion gears which are free to rotate on their own shafts and are in mesh with the sun gear.
- The annulus gear, which rotates around and is in mesh with the planet pinion gears.

NOTE: The number of pinion gears does not affect the gear ratio, only the duty rating.

OPERATION

With any given planetary gearset, several conditions must be met for power to be able to flow:

- One member must be held.
- Another member must be driven or used as an input.
- The third member may be used as an output for power flow.
- For direct drive to occur, two gear members in the front planetary gearset must be driven.

NOTE: Gear ratios are dependent on the number of teeth on the annulus and sun gears.

DESCRIPTION AND OPERATION (Continued)

BANDS

DESCRIPTION

KICKDOWN (FRONT) BAND

The kickdown, or "front", band (Fig. 47) holds the common sun gear of the planetary gear sets. The front (kickdown) band is made of steel, and faced on its inner circumference with a friction–type lining. One end of the band is anchored to the transmission case, and the other is acted on with a pushing force by a servo piston. The front band is a single–wrap design (the band does not completely encompass/ wrap the drum that it holds).

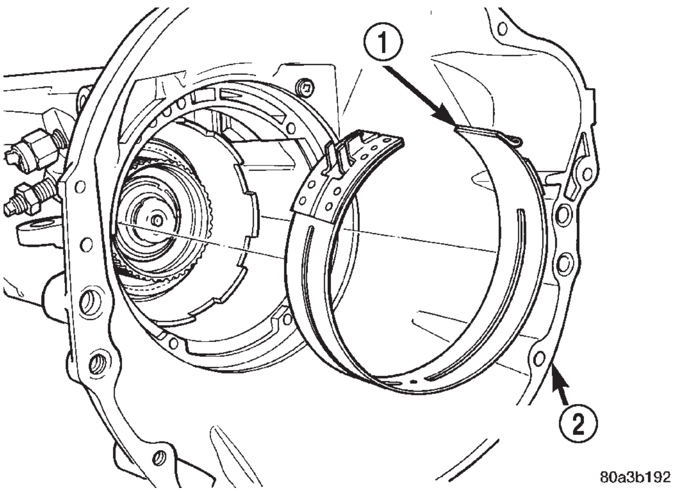


Fig. 47 Front Band

1 – FRONT BAND
2 – TRANSMISSION HOUSING

LOW/REVERSE (REAR) BAND

The low/reverse band, or "rear", band (Fig. 48) is similar in appearance and operation to the front band. The rear band of the 32RH is slightly different in that it does not use a link bar, but is acted directly on by the apply lever. This is referred to as a double–wrap band design (the drum is completely encompassed/wrapped by the band). The double–wrap band provides a greater holding power in comparison to the single–wrap design.

OPERATION

KICKDOWN (FRONT) BAND

The kickdown band holds the common sun gear of the planetary gear sets by applying and holding the front clutch retainer, which is splined to the sun gear driving shell, and in turn splined directly to the sun gear. The application of the band by the servo is typically done by an apply lever and link bar.

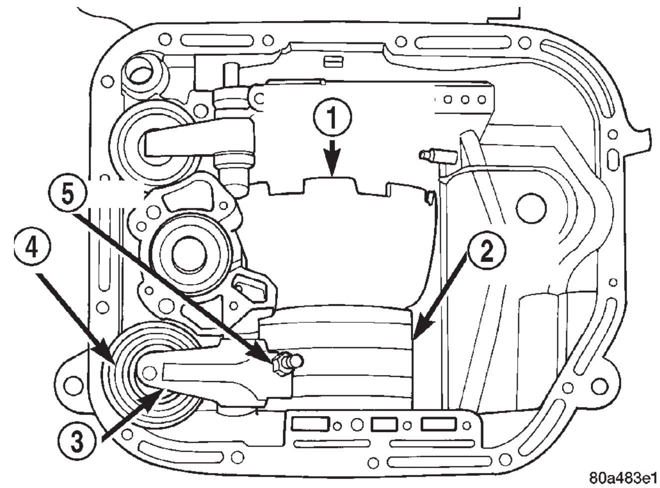


Fig. 48 Rear Band

1 – PLANETARY GEARTRAIN
2 – REAR BAND
3 – LEVER
4 – SERVO
5 – ADJUSTER

LOW/REVERSE (REAR) BAND

The rear band holds the rear planet carrier stationary by being mounted around and applied to the low/reverse drum.

SERVOS

DESCRIPTION

KICKDOWN (FRONT) SERVO

The kickdown servo (Fig. 49) consists of a two–land piston with an inner piston, a piston rod and guide, and a return spring. The dual–land piston uses seal rings on its outer diameters and an O–ring for the inner piston.

LOW/REVERSE (REAR) SERVO

The rear (low/reverse) servo consists of a single stage or diameter piston and a spring loaded plug. The spring is used to cushion the application of the rear (low/reverse) band.

OPERATION

KICKDOWN (FRONT) SERVO

The application of the piston is accomplished by applying pressure between the two lands of the piston. The pressure acts against the larger lower land to push the piston downward, allowing the piston rod to extend though its guide against the apply lever. Release of the servo at the 2–3 upshift is accomplished by a combination of spring and line pressure, acting on the bottom of the larger land of the piston.

DESCRIPTION AND OPERATION (Continued)

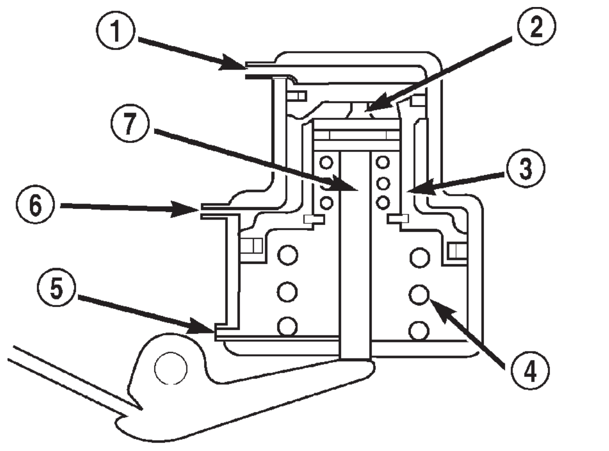


Fig. 49 Front Servo

1 – VENT
2 – INNER PISTON
3 – PISTON
4 – SPRING
5 – RELEASE PRESSURE
6 – APPLY PRESSURE
7 – PISTON ROD

The small piston is used to cushion the application of the band by bleeding oil through a small orifice in the larger piston. The release timing of the kickdown servo is very important to obtain a smooth but firm shift. The release has to be very quick, just as the front clutch application is taking place. Otherwise, engine runaway or a shift hesitation will occur. To accomplish this, the band retains its holding capacity until the front clutch is applied, giving a small amount of overlap between them.

LOW/REVERSE (REAR) SERVO

While in the de-energized state (no pressure applied), the piston is held up in its bore by the piston spring. The plug is held down in its bore, in the piston, by the plug spring. When pressure is applied to the top of the piston, the plug is forced down in its bore, taking up any clearance. As the piston moves, it causes the plug spring to compress, and the piston moves down over the plug. The piston continues to move down until it hits the shoulder of the plug and fully applies the band. The period of time from the initial application, until the piston is against the shoulder of the plug, represents a reduced shocking of the band that cushions the shift.

GOVERNOR

DESCRIPTION

The governor (Fig. 50) valve body is attached to the output shaft of the transmission.

OPERATION

The governor meters hydraulic pressure (Fig. 51), and this metered pressure is used to signal the transmission when it is time for a shift to occur. It does this by balancing governor pressure on one side of a shift valve, and throttle pressure on the other. When governor pressure increases far enough to overcome the throttle pressure on the valve, a shift occurs.

With the gearshift selector in a forward driving range, line pressure flows from the manual valve and down to the governor valve. When the output shaft starts to rotate with vehicle motion (Fig. 52), the governor weight assembly will start to move outward due to centrifugal force. As the weight is moved outward, it will pull the valve with it until the land of the valve uncovers the line pressure port. As the port begins to become uncovered, governor pressure is metered. As the vehicle's speed continues to increase (Fig. 53), the weight assembly will be at a point at which governor pressure is acting on the left side of the reaction area of the valve. This produces sufficient force to compress the spring and allow the outer weight to move out against the outer governor body retaining ring. At a very high speed, the governor valve will be opened as far as possible. In this condition, it is possible for governor pressure to meet, but not to exceed, line pressure. Generally governor pressure ranges from 0–100 psi from idle to maximum speed, and rises proportionally with the increase in output shaft speed. Governor pressure and throttle pressure are acting upon the shift valves to determine when a shift will occur. Governor pressure is a direct indication of road speed, and throttle pressure is an indication of engine load. When both parameters have been met by the throttle and governor pressures, an upshift or downshift will occur.

GEARSHIFT MECHANISM

DESCRIPTION

The shift mechanism is cable operated and provides six shift positions. The shift indicator is located on the console next to the gear shift. The shift positions are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual Second (2)
- Manual Low (1)

OPERATION

Manual low (1) range provides first gear only. Over run braking is also provided in this range. Manual second (2) range provides first and second gear only.

DESCRIPTION AND OPERATION (Continued)

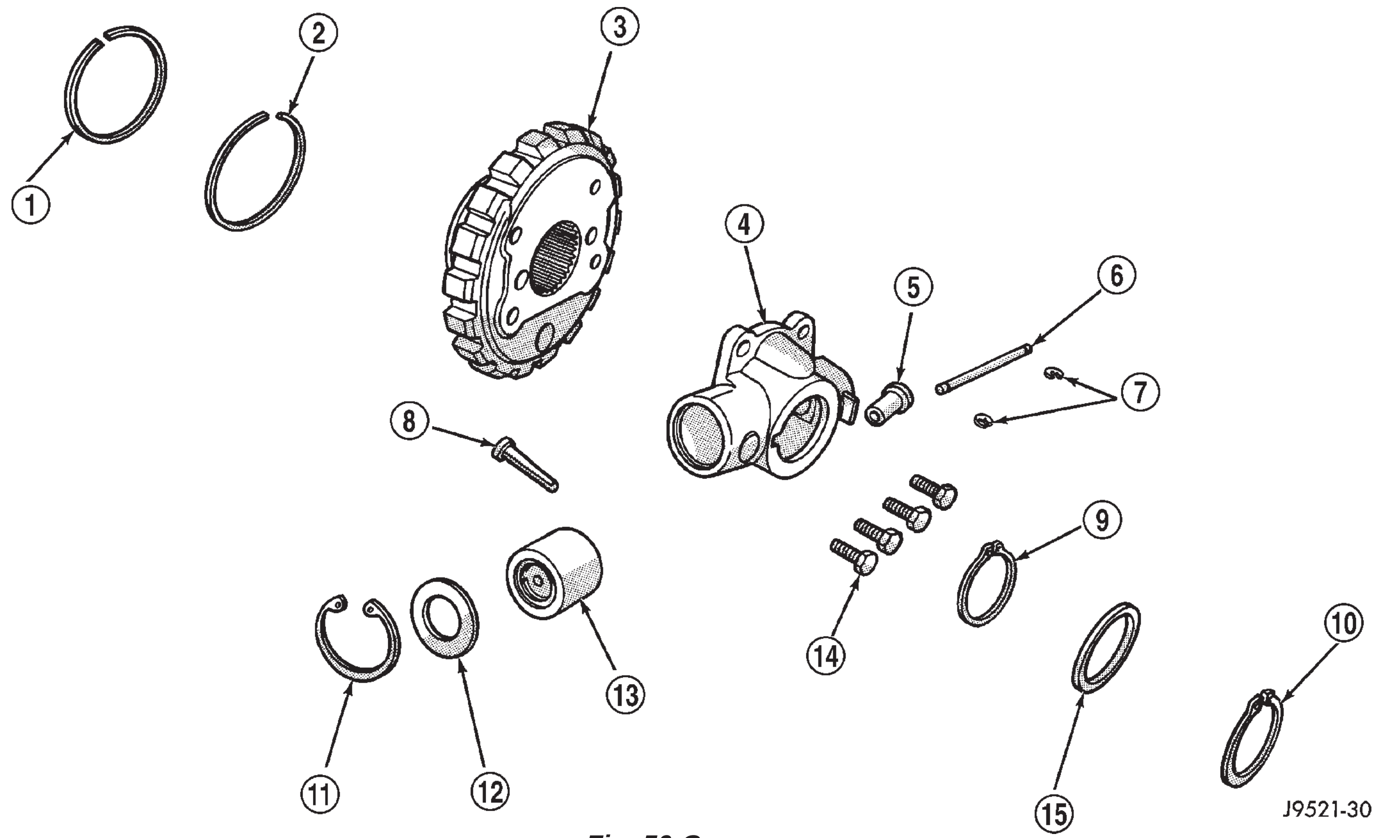


Fig. 50 Governor

1 – SEAL RING (PLAIN END)
2 – SEAL RING (HOOK END)
3 – PARK GEAR
4 – GOVERNOR BODY
5 – GOVERNOR VALVE
6 – VALVE SHAFT
7 – E-CLIPS (2)
8 – FILTER
9 – SNAP RING (THIN)
10 – SNAP RING (THICK)
11 – SNAP RING
12 – RETAINER WASHER
13 – GOVERNOR WEIGHT ASSEMBLY
14 – GOVERNOR BODY BOLTS (4)
15 – WASHER

Drive range provides first, second, and third gear ranges.

CONVERTER DRAINBACK VALVE

DESCRIPTION

The drainback valve is located in the transmission cooler outlet (pressure) line.

OPERATION

The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have a hose nipple at one end, while the opposite end is threaded for a flare fitting. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 54).

OPERATION

The system locks the shifter into the PARK position. The Interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half an inch. A magnetic holding device in line with the park/brake interlock cable is energized when the ignition is in

DESCRIPTION AND OPERATION (Continued)

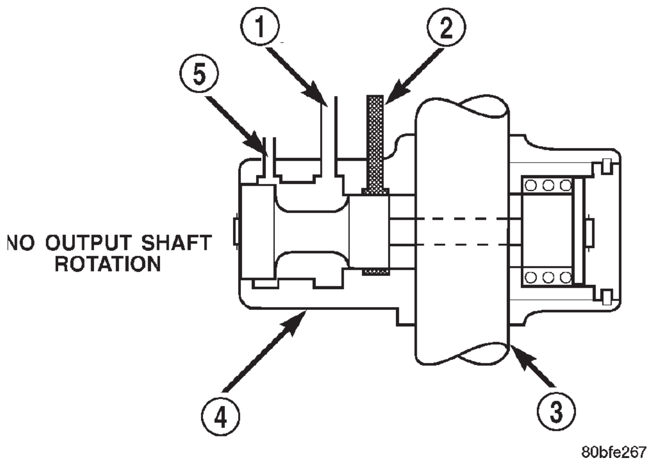


Fig. 51 Governor—No Output Shaft Rotation

1 – GOVERNOR PRESSURE
2 – LINE PRESSURE
3 – OUTPUT SHAFT
4 – GOVERNOR
5 – VENT

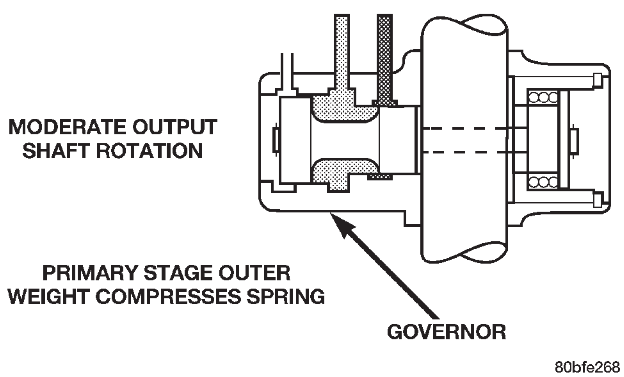


Fig. 52 Governor—Moderate Output Shaft Rotation

the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position (Fig. 55) unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION DIAGNOSIS

Automatic transmission problems can be a result of poor engine performance, incorrect fluid level, incorrect linkage or cable adjustment, band or hydraulic control pressure adjustments, hydraulic system malfunctions or electrical/mechanical component mal-

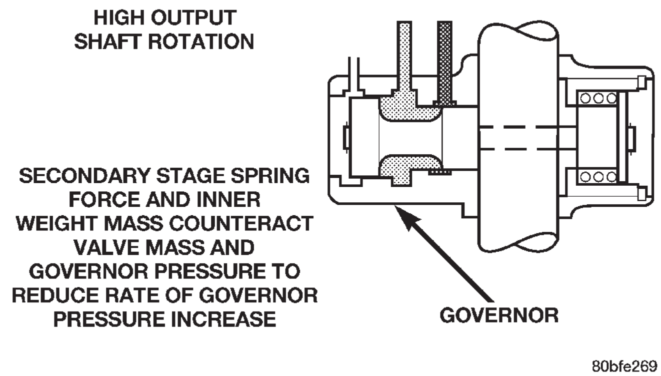


Fig. 53 Governor—High Output Shaft Rotation

functions. Begin diagnosis by checking the easily accessible items such as: fluid level and condition, linkage adjustments and electrical connections. A road test will determine if further diagnosis is necessary.

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve, clutch and servo operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

DIAGNOSIS AND TESTING (Continued)

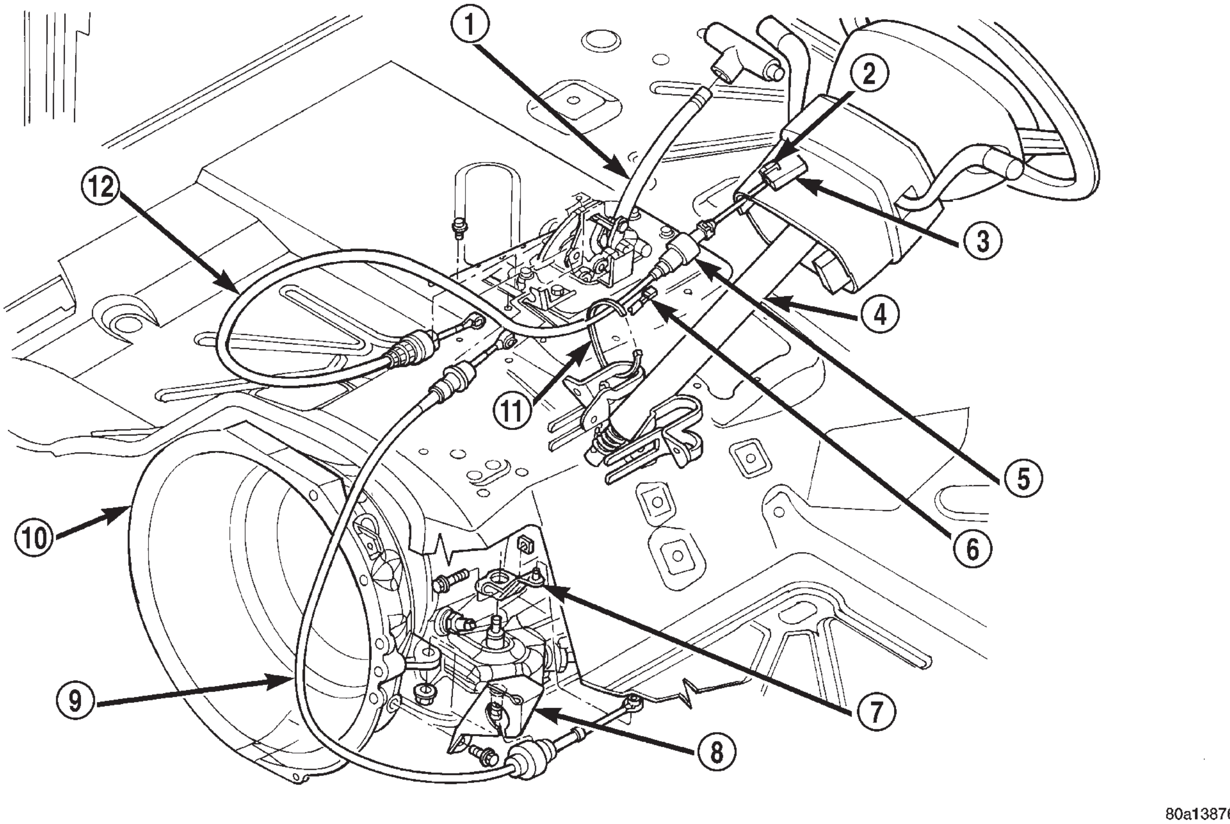


Fig. 54 Ignition Interlock Cable Routing

1 – SHIFT MECHANISM
2 – LOCK-TAB
3 – IGNITION LOCK INTERLOCK
4 – STEERING COLUMN
5 – SOLENOID
6 – WIRE CONNECTOR
7 – LEVER
8 – MOUNT BRACKET
9 – SHIFT CABLE
10 – AUTOMATIC TRANSMISSION
11 – TIE STRAP
12 – PARK/BRAKE INTERLOCK CABLE

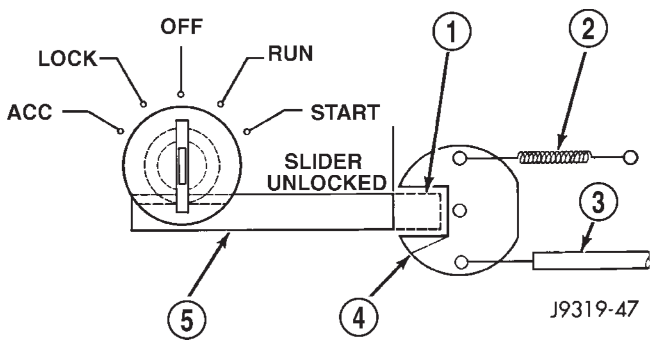


Fig. 55 Ignition Key Cylinder Actuation

1 – SLIDER LOCKED
2 – CAM RETURN SPRING
3 – INTERLOCK CABLE
4 – CAM
5 – SLIDER

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid break-down)
- failure to reverse flush cooler and lines after repair

DIAGNOSIS AND TESTING (Continued)

• failure to replace contaminated converter after repair

The use of non recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission for some time, an overhaul may also be necessary; especially if shift problems had developed.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

PRELIMINARY DIAGNOSIS

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVEABLE

(1) Check for transmission fault codes using DRB scan tool.

(2) Check fluid level and condition.

(3) Adjust throttle and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform stall test if complaint is based on sluggish acceleration. Or, if abnormal throttle opening is needed to maintain normal speeds with a properly tuned engine.

(6) Perform hydraulic pressure test if shift problems were noted during road test.

(7) Perform air-pressure test to check clutch-band operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift or throttle linkage.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged drive plate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

PARK/NEUTRAL POSITION SWITCH

The center terminal of the park/neutral position switch is the starter-circuit terminal. It provides the ground for the starter solenoid circuit through the selector lever in PARK and NEUTRAL positions only. The outer terminals on the switch are for the backup lamp circuit.

SWITCH TEST

To test the switch, remove the wiring connector. Test for continuity between the center terminal and the transmission case. Continuity should exist only when the transmission is in PARK or NEUTRAL.

Shift the transmission into REVERSE and test continuity at the switch outer terminals. Continuity should exist only when the transmission is in REVERSE. Continuity should not exist between the outer terminals and the case.

Check gearshift linkage adjustment before replacing a switch that tests faulty.

GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position—Apply forward force on center of handle and remove pressure. Engine starts must be possible.

DIAGNOSIS AND TESTING (Continued)

(b) PARK position—Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position—Normal position. Engine starts must be possible.

(d) NEUTRAL position—Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from neutral to reverse.

THROTTLE VALVE CABLE

Transmission throttle valve cable adjustment is extremely important to proper operation. This adjustment positions the throttle valve, which controls shift speed, quality, and part-throttle downshift sensitivity.

If cable setting is too loose, early shifts and slippage between shifts may occur. If the setting is too tight, shifts may be delayed and part throttle downshifts may be very sensitive. Refer to the Adjustments section for the proper adjustment procedure.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul will be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart provides a basis for analyzing road test results.

ANALYZING ROAD TEST

Refer to the Clutch and Band Application chart and note which elements are in use in the various gear ranges.

Verify that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Verify that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear. For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

	Gearshift Lever Position								
DRIVE ELEMENTS	P	R	N	D			2		1
				1	2	3	1	2	
FRONT CLUTCH		•				•			
FRONT BAND (KICKDOWN)					•			•	
REAR CLUTCH				•	•	•	•	•	•
REAR BAND (LOW-REV.)		•							•
OVER-RUNNING CLUTCH				•			•		•

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Fig. 56 Clutch And Band Application

Applying the same method of analysis, verify that the front and rear clutches are applied simultaneously only in D range third gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping.

If slippage occurs during the third gear and the direct clutch were to fail, the transmission would lose both reverse gear and overrun braking in 2 position (manual second gear). If the transmission slips in any other forward gears, the transmission rear clutch is probably slipping.

This process of elimination can be used to identify a slipping unit and check operation. Proper use of the Clutch and Band Application Chart is the key.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction usually cannot be determined until hydraulic and air pressure tests are performed. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Unless a malfunction is obvious, such as no drive in D range first gear, do not disassemble the transmission. Perform the hydraulic and air pressure tests to help determine the probable cause.

HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068 kPa) at the rear servo pressure port in reverse.

An accurate tachometer and two test gauges are required for the pressure test. Test Gauge C-3292 has a 100 psi range and is used at the accumulator,

DIAGNOSIS AND TESTING (Continued)

governor, and front servo pressure ports. Test Gauge C-3293-SP has a 300 psi range and is used at the rear servo port and overdrive test ports where pressures are higher. In cases where two test gauges are required, the 300 psi gauge can be used at any of the other test ports.

Pressure Test Port Locations

Pressure test ports locations are provided at the accumulator, front servo, and rear servo, governor passage, and overdrive clutch pressure passage (Fig. 57), (Fig. 58) and (Fig. 59).

Line pressure is checked at the accumulator port on the right side of the case. The front servo pressure port is at the right side of the case just behind the filler tube opening.

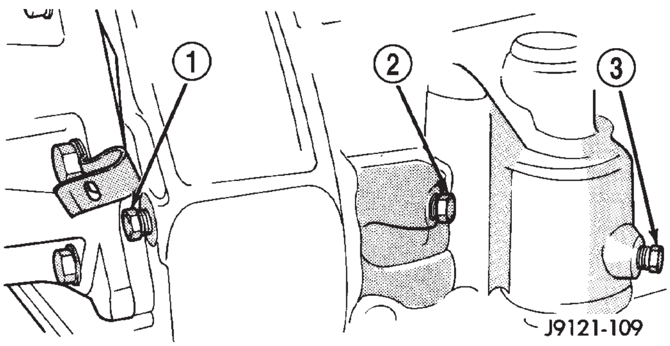


Fig. 57 Pressure Test Ports At Side Of Case

1 – REAR SERVO PORT
2 – LINE PRESSURE PORT
3 – FRONT SERVO PORT

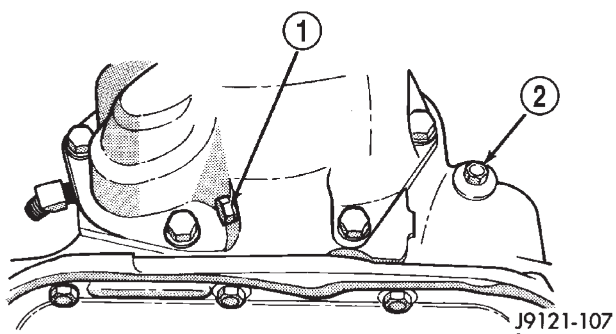


Fig. 58 Pressure Test Ports At Rear Of Case—2WD

1 – GOVERNOR PRESSURE PORT
2 – REAR SERVO PRESSURE PORT

Connect a tachometer to the engine. Position the tachometer so it can be observed from under the vehicle. Raise the vehicle on a hoist that will allow the wheels to rotate freely.

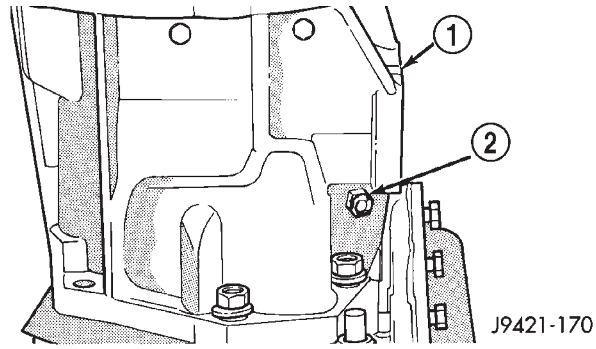


Fig. 59 Pressure Test Ports At Rear Of Case—4WD

1 – ADAPTER HOUSING
2 – GOVERNOR PRESSURE PORT PLUG

PRESSURE TEST PROCEDURE

Test One - Transmission In 1 Range

This test checks pump output, pressure regulation, and condition of the rear clutch and servo circuit. Test Gauges C-3292 and C-3293-SP are required for this test. Gauge C-3292 has a 100 psi range. Gauge C-3293-SP has a 300 psi range.

(1) Connect 100 psi Gauge C-3292 to accumulator port.

(2) Connect 300 psi Gauge C-3293-SP to rear servo port (Fig. 57) and (Fig. 58).

(3) Disconnect throttle and gearshift rods from manual and throttle levers.

(4) Start and run engine at 1000 rpm.

(5) Move shift lever (on manual lever shaft) all the way forward into 1 range.

(6) Move transmission throttle lever from full forward to full rearward position and note pressures on both gauges.

(7) Line pressure at accumulator port should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

(8) Rear servo pressure should be same as line pressure within 3 psi (20.68 kPa).

Test Two - Transmission In 2 Range

This test checks pump output and pressure regulation. Use 100 psi Test Gauge C-3292 for this test.

(1) Connect test gauge to accumulator pressure port (Fig. 57) and (Fig. 58).

(2) Start and run engine at 1000 rpm.

(3) Move shift lever on valve body manual lever shaft, one detent rearward from full forward position. This is 2 range.

(4) Move transmission throttle lever from full forward to full rearward position and read pressure at both gauges.

DIAGNOSIS AND TESTING (Continued)

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

Test Three - Transmission In D Range

This test checks pressure regulation and condition of the clutch circuits. Use both pressure Test Gauges C-3292 and C-3293-SP for this test.

(1) Connect test gauges to accumulator and front servo ports (Fig. 57) and (Fig. 58). Use either test gauge at the two ports.

(2) Start and run engine at 1600 rpm for this test.

(3) Move selector lever to D range. This is two detents rearward from full forward position.

(4) Read pressures on both gauges as transmission throttle lever is moved from full forward to full rearward position.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase as lever is moved rearward.

(6) Front servo is pressurized only in D range and should be same as line pressure within 3 psi (21 kPa) up to downshift point.

Test Four - Transmission In Reverse

This test checks pump output, pressure regulation and the front clutch and rear servo circuits. Use 300 psi Test Gauge C-3293-SP for this test.

(1) Connect 300 psi gauge to rear servo port (Fig. 57) and (Fig. 58).

(2) Start and run engine at 1600 rpm for test.

(3) Move valve body selector lever four detents rearward from the full forward position. This is Reverse range.

(4) Move throttle lever all way forward then all way rearward and note gauge readings.

(5) Pressure should be 145 - 175 psi (1000-1207 kPa) with lever forward and increase to 230 - 280 psi (1586-1931 kPa) as lever is moved rearward.

Test Five - Governor Pressure

This test checks governor operation by measuring governor pressure response to changes in engine speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not downshift.

(1) Connect 100 psi Test Gauge C-3292 to governor pressure port (Fig. 57) and (Fig. 58).

(2) Move shift lever to D range.

(3) Start and run engine at curb idle speed and note pressure. At idle and with vehicle stopped, pressure should be zero to 1.5 psi maximum. If pressure exceeds this figure, governor valve or weights are sticking open.

(4) Slowly increase engine speed and observe speedometer and pressure test gauge. Governor pressure should increase in proportion to vehicle speed.

(5) Pressure rise should be smooth and drop back to 0 to 1.5 psi when wheels stop rotating.

(6) Compare results of pressure tests with analysis charts (Fig. 60).

TEST CONDITION	INDICATION
Line pressure OK during any one test	Pump and regulator valve OK
Line pressure OK in R but low in D, 2, 1	Leakage in rear clutch area (servo, clutch seals, governor support seal rings on park gear)
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area (servo, clutch seals, retainer bore, pump seal rings)
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure in 2	Leakage in servo (broken servo ring or cracked servo piston)
Pressure low in all positions	Clogged filter, stuck pressure regulator valve, worn or defective pump
Governor pressure too high at idle speed	Governor valve sticking open
Governor pressure low at all mph figures	Governor valve sticking closed
Lubrication pressure low at all throttle positions	Clogged drainback valve, oil cooler or lines, seal rings leaking, output shaft plugged with devris, worn bushings in pump or clutch retainer

Fig. 60 Pressure Test Analysis

AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION

Air-pressure testing can be used to check transmission front/rear clutch and band operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check, after overhaul.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The servo and clutch apply passages are shown (Fig. 61).

DIAGNOSIS AND TESTING (Continued)

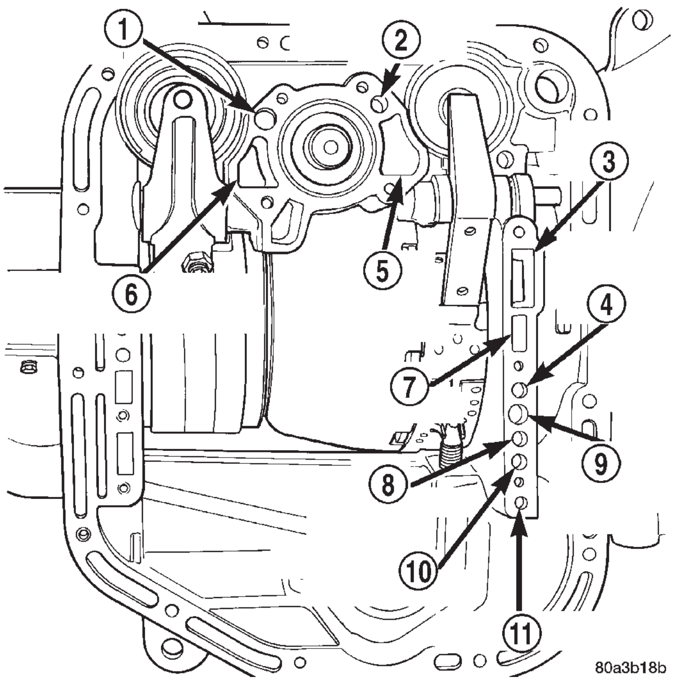


Fig. 61 Air Pressure Test Passages

1 – REAR SERVO APPLY
2 – FRONT SERVO APPLY
3 – PUMP SUCTION
4 – FRONT CLUTCH APPLY
5 – FRONT SERVO RELEASE
6 – LINE PRESSURE TO ACCUMULATOR
7 – PUMP PRESSURE
8 – TO CONVERTER
9 – REAR CLUTCH APPLY
10 – FROM CONVERTER
11 – TO COOLER

Front Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Rear Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Front Servo Apply Air Test

Apply air pressure to the front servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

Rear Servo Air Test

Apply air pressure to the rear servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

CONVERTER HOUSING FLUID LEAK DIAGNOSIS

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.

(2) Determined the true source of the leak.

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. 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. Pump O-ring or pump body leaks follow the same path as a seal leak (Fig. 62). Pump vent or pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself (Fig. 62). Pump seal or gasket leaks usually travel down the inside of the converter housing. Front band lever pin plug leaks are generally deposited on the housing and not on the converter.

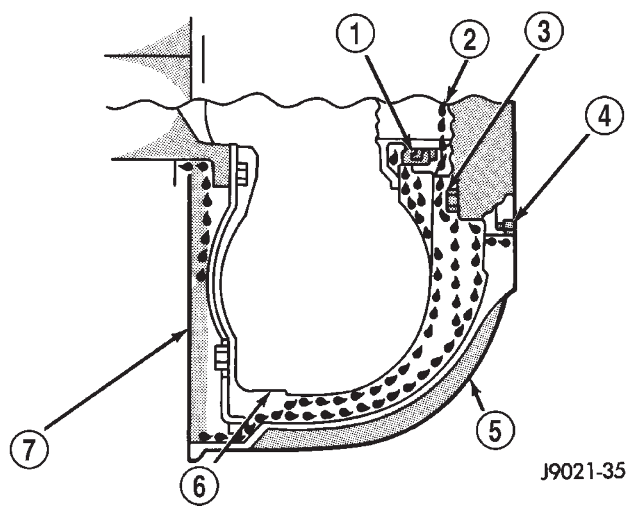


Fig. 62 Converter Housing Leak Paths

1 – PUMP SEAL
2 – PUMP VENT
3 – PUMP BOLT
4 – PUMP GASKET
5 – CONVERTER HOUSING
6 – CONVERTER
7 – REAR MAIN SEAL LEAK

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 63).

DIAGNOSIS AND TESTING (Continued)

(2) Leaks at the converter hub weld (Fig. 63).

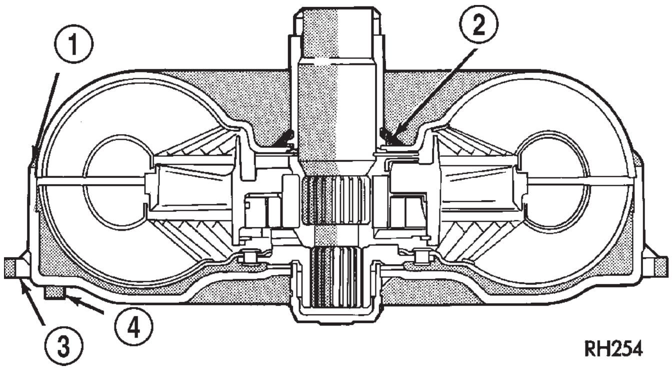


Fig. 63 Converter Leak Points—Typical

1 – OUTSIDE DIAMETER WELD
2 – TORQUE CONVERTER HUB WELD
3 – STARTER RING GEAR
4 – LUG

CONVERTER HOUSING AREA LEAK CORRECTION

(1) Remove converter.

(2) Tighten front band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out when oil pump is removed.

(3) Remove oil pump and remove pump seal. Inspect pump housing drainback and vent holes for obstructions. Clear holes with solvent and wire.

(4) Inspect pump bushing and converter hub. If bushing is scored, replace it. If converter hub is scored, either polish it with crocus cloth or replace converter.

(5) Install new pump seal, O-ring, and gasket. Replace oil pump if cracked, porous or damaged in any way. Be sure to loosen the front band before installing the oil pump, damage to the oil pump seal may occur if the band is still tightened to the front clutch retainer.

(6) Loosen kickdown lever pin access plug three turns. Apply Loctite 592, or Permatex No. 2 to plug threads and tighten plug to 17 N·m (150 in. lbs.) torque.

(7) Adjust front band.

(8) Lubricate pump seal and converter hub with transmission fluid or petroleum jelly and install converter.

(9) Install transmission and converter housing dust shield.

(10) Lower vehicle.

DIAGNOSIS CHARTS

The diagnosis charts provide additional reference when diagnosing a transmission fault. The charts provide general information on a variety of transmission, overdrive unit and converter clutch fault conditions.

The hydraulic flow charts, in the Schematics and Diagrams section of this group, outline fluid flow and hydraulic circuitry. Circuit operation is provided for neutral, third, fourth and reverse gear ranges. Normal working pressures are also supplied for each of the gear ranges.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
HARSH ENGAGEMENT FROM NEUTRAL TO DRIVE OR REVERSE	1. Fluid Level Low	1. Add Fluid
	2. Throttle Linkage Misadjusted	2. Adjust linkage - setting may be too long.
	3. Mount and Driveline Bolts Loose	3. Check engine mount, transmission mount, propeller shaft, rear spring to body bolts, rear control arms, crossmember and axle bolt torque. Tighten loose bolts and replace missing bolts.
	4. U-Joint Worn/Broken	4. Remove propeller shaft and replace U-Joint.
	5. Axle Backlash Incorrect	5. Check per Service Manual. Correct as needed.
	6. Hydraulic Pressure Incorrect	6. Check pressure. Remove, overhaul or adjust valve body as needed.
	7. Band Misadjusted.	7. Adjust rear band.
	8. Valve Body Check Balls Missing.	8. Inspect valve body for proper check ball installation.
	9. Axle Pinion Flange Loose.	9. Replace nut and check pinion threads before installing new nut. Replace pinion gear if threads are damaged.
	10. Clutch, band or planetary component Damaged.	10. Remove, disassemble and repair transmission as necessary.
	11. Converter Clutch (if equipped) Faulty.	11. Replace converter and flush cooler and line before installing new converter.
DELAYED ENGAGEMENT FROM NEUTRAL TO DRIVE OR REVERSE	1. Fluid Level Low.	1. Correct level and check for leaks.
	2. Filter Clogged.	2. Change filter.
	3. Gearshift Linkage Misadjusted.	3. Adjust linkage and repair linkage if worn or damaged.
	4. Rear Band Misadjusted.	4. Adjust band.
	5. Valve Body Filter Plugged.	5. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary.
	6. Oil Pump Gears Worn/Damaged.	6. Remove transmission and replace oil pump.
	7. Hydraulic Pressure Incorrect.	7. Perform pressure test, remove transmission and repair as needed.
	8. Reaction Shaft Seal Rings Worn/Broken.	8. Remove transmission, remove oil pump and replace seal rings.
	9. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged.	9. Remove and disassemble transmission and repair as necessary.
	10. Governor Valve Stuck.	10. Remove and inspect governor components. Replace worn or damaged parts.
	11. Regulator Valve Stuck.	11. Clean.
	12. Cooler Plugged.	12. Flush transmission cooler and inspect convertor drainback valve.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO DRIVE RANGE (REVERSE OK)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Repair or replace linkage components.
	3. Rear Clutch Burnt.	3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed.
	4. Valve Body Malfunction.	4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged.
	5. Transmission Overrunning Clutch Broken.	5. Remove and disassemble transmission. Replace overrunning clutch.
	6. Input Shaft Seal Rings Worn/ Damaged.	6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts.
	7. Front Planetary Failed Broken.	7. Remove and repair.
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Inspect, adjust and reassemble linkage as needed. Replace worn/damaged parts.
	3. U-Joint/Axle/Transfer Case Broken.	3. Perform preliminary inspection procedure for vehicle that will not move. Refer to procedure in diagnosis section.
	4. Filter Plugged.	4. Remove and disassemble transmission. Repair or replace failed components as needed. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test. Flush oil. Replace cooler as necessary.
	5. Oil Pump Damaged.	5. Perform pressure test to confirm low pressure. Replace pump body assembly if necessary.
	6. Valve Body Malfunctioned.	6. Check press and inspect valve body. Replace valve body (as assembly) if any valve or bore is damaged. Clean and reassemble correctly if all parts are in good condition.
	7. Transmission Internal Component Damaged.	7. Remove and disassemble transmission. Repair or replace failed components as needed. Remove and disassemble transmission. Repair or replace failed components as needed.
	8. Park Sprag not Releasing	8. Remove, disassemble, repair.
	9. Torque Converter Damage.	9. Check Stall Speed, Worn/Damaged/ Stuck. Inspect and replace as required.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	1. Fluid Level Low/High.	1. Correct fluid level and check for leaks if low.
	2. Throttle Linkage Misadjusted.	2. Adjust linkage as described in service section.
	3. Throttle Linkage Binding.	3. Check cable for binding. Check for return to closed throttle at transmission.
	4. Gearshift Linkage/Cable Misadjusted.	4. Adjust linkage/cable as described in service section.
	5. Fluid Filter Clogged.	5. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test.
	6. Governor Valve Sticking.	6. Inspect, clean or repair.
	7. Governor Seal Rings Worn/ Damaged.	7. Inspect/replace.
	8. Clutch or Servo Failure.	8. Remove valve body and air test clutch, and band servo operation. Disassemble and repair transmission as needed.
	9. Front Band Misadjusted.	9. Adjust band.
	10. Pump Suction Passage Leak.	10. Check for excessive foam on dipstick after normal driving. Check for loose pump bolts, defective gasket. Replace pump assembly if needed.
NO REVERSE (D RANGES OK)	1. Gearshift Linkage/Cable Misadjusted/Damaged.	1. Repair or replace linkage parts as needed.
	2. Park Sprag Sticking.	2. Inspect and replace as necessary.
	3. Rear Band Misadjusted/Worn.	3. Adjust band; replace.
	4. Valve Body Malfunction.	4. Remove and service valve body. Replace valve body if any valves or valve bores are worn or damaged.
	5. Rear Servo Malfunction.	5. Remove and disassemble transmission. Replace worn/damaged servo parts as necessary.
	6. Front Clutch Burnt.	6. Remove and disassemble transmission. Replace worn, damaged clutch parts as required.
HAS FIRST/REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	1. Governor Valve, Shaft, Weights or Body Damaged/Stuck.	1. Remove governor assembly and clean or repair as necessary.
	2. Valve Body Malfunction.	2. Stuck 1-2 shift valve or governor plug.
	3. Front Servo/Kickdown Band Damaged/Burned.	3. Repair/replace.
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Valve Body Malfunction.	1. Remove, clean and inspect. Look for stuck 1-2 valve or governor plug.
	2. Governor Valve Sticking.	2. Remove, clean and inspect. Replace faulty parts.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	1. Governor Valve Sticking.	1. Remove governor, clean, inspect and repair as required.
	2. Valve Body Malfunction.	2. Remove, clean and inspect. Look for sticking 1-2 shift valve, 2-3 shift valve, governor plug or broken springs.
	3. Front Servo Piston Cocked in Bore.	3. Inspect servo and repair as required.
	4. Front Band Linkage Malfunction	4. Inspect linkage and look for bind in linkage.
NO KICKDOWN OR NORMAL DOWNSHIFT	1. Throttle Linkage Misadjusted.	1. Adjust linkage.
	2. Accelerator Pedal Travel Restricted.	2. Floor mat under pedal, accelerator cable worn or brackets bent.
	3. Governor/Valve Body Hydraulic Pressures Too High or Too Low Due to Sticking Governor, Valve Body Malfunction or Incorrect Hydraulic Control Pressure Adjustments.	3. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	4. Valve Body Malfunction.	4. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	5. Valve Body Malfunction.	5. Sticking 1-2, 2-3 shift valves, or governor plugs.
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	1. Throttle Linkage Misadjusted/ Stuck.	1. Adjust linkage and repair linkage if worn or damaged. Check for binding cable or missing return spring.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage and repair linkage if worn or damaged.
	3. Governor/Valve Body, Governor Valve Stuck Closed; Loose Output Shaft Support or Governor Housing Bolts, Leaking Seal Rings or Valve Body Problem (i.e., Stuck 1- 2 Shift Valve/Gov. Plug).	3. Check line and governor pressures to determine cause. Correct as required.
	4. Front Band Out of Adjustment.	4. Adjust Band.
	5. Clutch or Servo Malfunction.	5. Air pressure check operation of clutches and bands. Repair faulty component.
CREEPS IN NEUTRAL	1. Gearshift Linkage Misadjusted.	1. Adjust linkage.
	2. Rear Clutch Dragging/Warped Welded.	2. Disassemble and repair.
	3. Valve Body Malfunction.	3. Perform hydraulic pressure test to determine cause and repair as required.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BUZZING NOISE	1. Fluid Level Low	1. Add fluid and check for leaks.
	2. Shift Cable Misassembled.	2. Route cable away from engine and bell housing.
	3. Valve Body Misassembled.	3. Remove, disassemble, inspect valve body. Reassemble correctly if necessary. Replace assembly if valves or springs are damaged. Check for loose bolts or screws.
	4. Pump Passages Leaking	4. Check pump for porous casting, scores on mating surfaces and excess rotor clearance. Repair as required. Loose pump bolts.
	5. Cooling System Cooler Plugged.	5. Flow check cooler circuit. Repair as needed.
	6. Overrunning Clutch Damaged.	6. Replace clutch.
SLIPS IN REVERSE ONLY	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage.
	3. Rear Band Misadjusted.	3. Adjust band.
	4. Rear Band Worn.	4. Replace as required.
	5. Hydraulic Pressure Too Low.	5. Perform hydraulic pressure tests to determine cause.
	6. Rear Servo Leaking.	6. Air pressure check clutch-servo operation and repair as required.
	7. Band Linkage Binding.	7. Inspect and repair as required.
SLIPS IN FORWARD DRIVE RANGES	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Fluid Foaming.	2. Check for high oil level, bad pump gasket or seals, dirt between pump halves and loose pump bolts. Replace pump if necessary.
	3. Throttle Linkage Misadjusted.	3. Adjust linkage.
	4. Gearshift Linkage Misadjusted.	4. Adjust linkage.
	5. Rear Clutch Worn.	5. Inspect and replace as needed.
	6. Low Hydraulic Pressure Due to Worn Pump, Incorrect Control Pressure Adjustments, Valve Body Warpage or Malfunction, Sticking Governor, Leaking Seal Rings, Clutch Seals Leaking, Servo Leaks, Clogged Filter or Cooler Lines	6. Perform hydraulic and air pressure tests to determine cause.
	7. Rear Clutch Malfunction, Leaking Seals or Worn Plates.	7. Air pressure check clutch-servo operation and repair as required.
	8. Overrunning Clutch Worn, Not Holding (Slips in 1 Only).	8. Replace Clutch.
SLIPS IN LOW GEAR “D” ONLY, BUT NOT IN 1 POSITION	Overrunning Clutch Faulty.	Replace overrunning clutch.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
GROWLING, GRATING OR SCRAPING NOISES	1. Drive Plate Broken.	1. Replace.
	2. Torque Converter Bolts Hitting Dust Shield.	2. Dust shield bent. Replace or repair.
	3. Planetary Gear Set Broken/ Seized.	3. Check for debris in oil pan and repair as required.
	4. Overrunning Clutch Worn/Broken.	4. Inspect and check for debris in oil pan. Repair as required.
	5. Oil Pump Components Scored/ Binding.	5. Remove, inspect and repair as required.
	6. Output Shaft Bearing or Bushing Damaged.	6. Remove, inspect and repair as required.
	7. Clutch Operation Faulty.	7. Perform air pressure check and repair as required.
	8. Front and Rear Bands Misadjusted.	8. Adjust bands.
DRAGS OR LOCKS UP	1. Fluid Level Low.	1. Check and adjust level.
	2. Clutch Dragging/Failed	2. Air pressure check clutch operation and repair as required.
	3. Front or Rear Band Misadjusted.	3. Adjust bands.
	4. Case Leaks Internally.	4. Check for leakage between passages in case.
	5. Servo Band or Linkage Malfunction.	5. Air pressure check servo operation and repair as required.
	6. Overrunning Clutch Worn.	6. Remove and inspect clutch. Repair as required.
	7. Planetary Gears Broken.	7. Remove, inspect and repair as required (look for debris in oil pan).
	8. Converter Clutch Dragging.	8. Check for plugged cooler. Perform flow check. Inspect pump for excessive side clearance. Replace pump as required.
WHINE/NOISE RELATED TO ENGINE SPEED	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Incorrect Routing.	2. Check shift cable for correct routing. Should not touch engine or bell housing.
TORQUE CONVERTER LOCKS UP IN SECOND AND/OR THIRD GEAR	Lockup Solenoid, Relay or Wiring Shorted/Open.	Test solenoid, relay and wiring for continuity, shorts or grounds. Replace solenoid and relay if faulty. Repair wiring and connectors as necessary.
HARSH 1-2 OR 2-3 SHIFTS	Lockup Solenoid Malfunction.	Remove valve body and replace solenoid assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO START IN PARK OR NEUTRAL	1. Gearshift Linkage/Cable Misadjusted.	1. Adjust linkage/cable.
	2. Neutral Switch Wire Open/Cut.	2. Check continuity with test lamp. Repair as required.
	3. Neutral Switch Faulty.	3. Refer to service section for test and replacement procedure.
	4. Neutral Switch Connect Faulty.	4. Connectors spread open. Repair.
	5. Valve Body Manual Lever Assembly Bent/Worn/Broken.	5. Inspect lever assembly and replace if damaged.
NO REVERSE (OR SLIPS IN REVERSE)	1. Direct Clutch Pack (front clutch) Worn.	1. Disassemble unit and rebuild clutch pack.
	2. Rear Band Misadjusted.	2. Adjust band.
	3. Front Clutch Malfunctioned/Burnt.	3. Air pressure test clutch operation. Remove and rebuild if necessary.
OIL LEAKS (ITEMS LISTED REPRESENT POSSIBLE LEAK POINTS AND SHOULD ALL BE CHECKED.	1. Speedometer Adapter Leaks.	1. Replace both adapter seals.
	2. Fluid Lines and Fittings Loose/ Leaks/Damaged.	2. Tighten fittings. If leaks persist, replace fittings and lines if necessary.
	3. Filler Tube (where tube enters case) Leaks/Damaged.	3. Replace O-ring seal. Inspect tube for cracks in tube.
	4. Pressure Port Plug Loose Loose/Damaged.	4. Tighten to correct torque. Replace plug or reseal if leak persists.
	5. Pan Gasket Leaks.	5. Tighten pan screws to 150 inch pounds. If leaks persist, replace gasket. Do no over tighten screws.
	6. Valve Body Manual Lever Shaft Seal Leaks/Worn.	6. Replace shaft seal.
	7. Rear Bearing Access Plate Leaks.	7. Replace gasket. Tighten screws.
	8. Gasket Damaged or Bolts are Loose.	8. Replace bolts or gasket or tighten both.
	9. Adapter/Extension Gasket Damaged Leaks/Damaged.	9. Replace gasket.
	10. Neutral Switch Leaks/Damaged.	10. Replace switch and gasket.
	11. Converter Housing Area Leaks.	11. Check for leaks at seal caused by worn seal or burr on converter hub (cutting seal), worn bushing, missing oil return, oil in front pump housing or hole plugged. Check for leaks past O-ring seal on pump or past pump-to-case bolts; pump housing porous, oil coming out vent due to overfill or leak past front band shaft access plug.
	12. Pump Seal Leaks/Worn/ Damaged.	12. Replace seal.
	13. Torque Converter Weld Leak/Cracked Hub.	13. Replace converter.
	14. Case Porosity Leaks.	14. Replace case.

SERVICE PROCEDURES

FLUID LEVEL CHECK

Transmission fluid level should be checked monthly under normal operation. If the vehicle is used for trailer towing or similar heavy load hauling, check fluid level and condition weekly. Fluid level is checked with the engine running at curb idle speed, the transmission in NEUTRAL and the transmission fluid at normal operating temperature.

FLUID LEVEL CHECK PROCEDURE

(1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).

(2) Position vehicle on level surface.

(3) Start and run engine at curb idle speed.

(4) Apply parking brakes.

(5) Shift transmission momentarily into all gear ranges. Then shift transmission back to Neutral.

(6) Clean top of filler tube and dipstick to keep dirt from entering tube.

(7) Remove dipstick (Fig. 64) and check fluid level as follows:

(a) Correct acceptable level is in crosshatch area.

(b) Correct maximum level is to MAX arrow mark.

(c) Incorrect level is at or below MIN line.

(d) If fluid is low, add only enough Mopar® ATF Plus 3 to restore correct level. Do not overfill.

CAUTION: Do not overfill the transmission. Overfilling may cause leakage out the pump vent which can be mistaken for a pump seal leak. Overfilling will also cause fluid aeration and foaming as the excess fluid is picked up and churned by the gear train. This will significantly reduce fluid life.

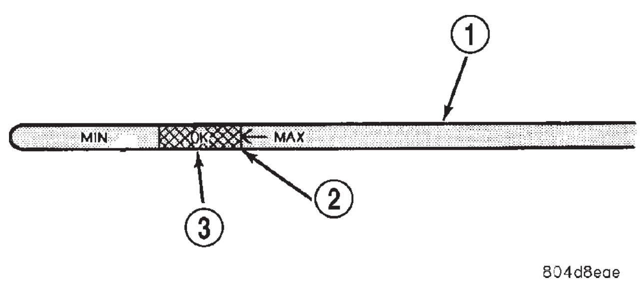


Fig. 64 Dipstick Fluid Level Marks—Typical

1 – DIPSTICK
2 – MAXIMUM CORRECT FLUID LEVEL
3 – ACCEPTABLE FLUID LEVEL

FLUID AND FILTER REPLACEMENT

Refer to the Maintenance Schedules in Group 0, Lubrication and Maintenance, for proper service intervals. The service fluid fill after a filter change is approximately 3.8 liters (4.0 quarts).

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Remove the transmission/skip plate as necessary to access the transmission oil pan.

(3) Place a large diameter shallow drain pan beneath the transmission pan.

(4) Remove bolts holding front and sides of pan to transmission (Fig. 65).

(5) Loosen bolts holding rear of pan to transmission.

(6) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.

(7) Hold up pan and remove remaining bolts holding pan to transmission.

(8) While holding pan level, lower pan away from transmission.

(9) Pour remaining fluid in pan into drain pan.

(10) Remove screws holding filter to valve body (Fig. 66).

(11) Separate filter from valve body and pour fluid in filter into drain pan.

(12) Dispose used trans fluid and filter properly.

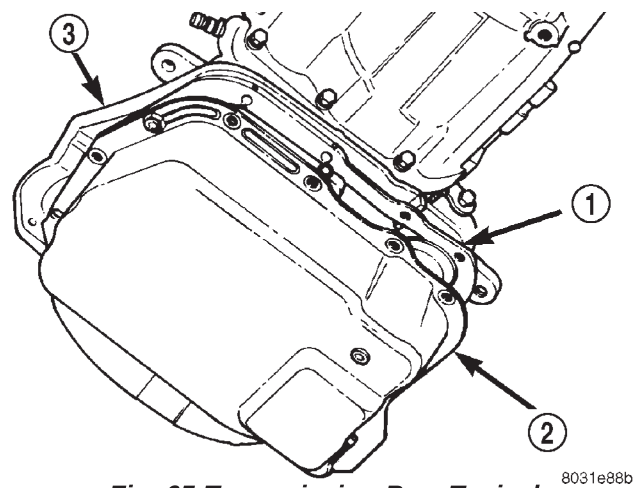


Fig. 65 Transmission Pan–Typical

1 – GASKET
2 – PAN
3 – TRANSMISSION

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal or fiber contamination. A light coating of clutch or band material on the bottom of the pan does not indicate a problem unless accompanied by slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts or debris, refer to the diagnosis section of this group.

Check the adjustment of the front and rear bands, adjust if necessary. Refer to Adjustment section of this group for proper procedure.

SERVICE PROCEDURES (Continued)

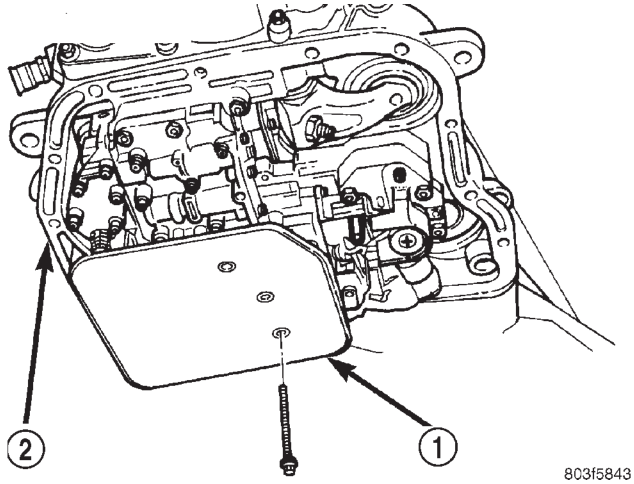


Fig. 66 Transmission Filter–Typical

1 – FILTER
2 – TRANSMISSION

CLEANING

(1) Using a suitable solvent, clean pan and magnet.

(2) Using a suitable gasket scraper, clean gasket material from gasket surface of transmission case and the gasket flange around the pan.

INSTALLATION

(1) Place replacement filter in position on valve body.

(2) Install screws to hold filter to valve body (Fig. 66). Tighten screws to 4 N·m (35 in. lbs.) torque.

(3) Place new gasket in position on pan. and install pan on transmission.

(4) Place pan in position on transmission.

(5) Install screws to hold pan to transmission (Fig. 65). Tighten bolts to 17 N·m (150 in. lbs.) torque.

(6) Install the transmission/skip plate.

(7) Lower vehicle and fill transmission with Mopar® ATF Plus 3, type 7176 fluid.

TRANSMISSION FILL PROCEDURE

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF Plus 3 to transmission:

(a) If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF Plus 3 to transmission.

(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **12 pints (6 quarts)** of ATF Plus 3 to transmission.

(3) Apply parking brakes.

(4) Start and run engine at normal curb idle speed.

(5) Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.

(6) Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.

(7) Drive vehicle until transmission fluid is at normal operating temperature.

(8) With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

(9) Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

CONVERTER DRAINBACK CHECK VALVE SERVICE

The converter drainback check valve is located in the cooler outlet (pressure) line near the radiator tank. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates significant amounts of sludge and/or clutch particles and metal shavings, the valve must be replaced.

The valve must be removed whenever the cooler and lines are reverse flushed. The valve can be flow tested when necessary. The procedure is exactly the same as for flow testing a cooler.

If the valve is restricted, installed backwards, or in the wrong line, it will cause an overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an overheating condition and eventual transmission failure.

OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil

SERVICE PROCEDURES (Continued)

cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF+3, type 7176, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed** , with the shift selector in neutral.

(3) If one quart of transmission fluid is collected in the container in 20 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 20 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

FLUSHING COOLERS AND TUBES

When a transmission failure has contaminated the fluid, the oil cooler(s) must be flushed. The torque converter must also be replaced. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transmission.

The only recommended procedure for flushing coolers and lines is to use Tool 6906A Cooler Flusher.

CAUTION: The transmission oil cooler requires a two stage flushing procedure due to an internally mounted thermostat. Failure to follow the procedure can result in severe transmission damage.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.

KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.

KEEP THE AREA WELL VENTILATED.

DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

COOLER FLUSH USING TOOL 6906A

(1) Remove cover plate filler plug on Tool 6906A. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.

(2) Reinstall filler plug on Tool 6906A.

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission.

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

NOTE: The converter drainback valve must be removed and an appropriate replacement hose installed to bridge the space between the transmission cooler line and the cooler fitting. Failure to remove the drainback valve will prevent reverse flushing the system. A suitable replacement hose can be found in the adapter kit supplied with the flushing tool.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Remove the transmission oil cooler from the vehicle. Refer to the Group 7, Cooling System, for the proper procedures.

(8) Remove the transmission oil cooler thermostat. Refer to the Group 7, Cooling System, for the proper procedures.

(9) Re-install the thermostat cover onto the oil cooler and install the snap ring.

(10) Re-connect the oil cooler to the transmission cooler lines.

(11) Turn pump ON for two to three minutes to flush cooler(s) and lines.

NOTE: This flushes the bypass circuit of the cooler only.

(12) Turn pump OFF.

(13) Remove the thermostat cover from the oil cooler.

(14) Install Special Tool Cooler Plug 8414 into the transmission oil cooler.

(15) Turn pump ON for two to three minutes to flush cooler(s) and lines.

SERVICE PROCEDURES (Continued)

NOTE: This flushes the main oil cooler core passages only.

(16) Turn pump OFF.

(17) Remove the thermostat cover from the oil cooler.

(18) Remove Special Tool Cooler Plug 8414 from the transmission oil cooler.

(19) Install a new thermostat spring, thermostat, cover, and snap-ring into the transmission oil cooler.

(20) Install the transmission oil cooler onto the vehicle.

(21) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(22) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(23) Place CLEAR suction line into a one quart container of Mopar® ATF Plus 3, type 7176 automatic transmission fluid.

(24) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(25) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL AND INSTALLATION

TRANSMISSION

CAUTION: The transmission and torque converter must be removed as an assembly to avoid component damage. The converter drive plate, pump bushing, or oil seal can be damaged if the converter is left attached to the driveplate during removal.

REMOVAL

(1) Disconnect battery negative cable.

(2) Disconnect and lower or remove necessary exhaust components.

(3) Remove engine-to-transmission bending braces.

(4) Disconnect fluid cooler lines at transmission.

(5) Remove starter motor.

(6) Disconnect and remove crankshaft position sensor (Fig. 67). Retain sensor attaching bolts.

CAUTION: The crankshaft position sensor can be damaged during transmission removal (or installation) if the sensor is left in place. To avoid damage, remove the sensor before removing the transmission.

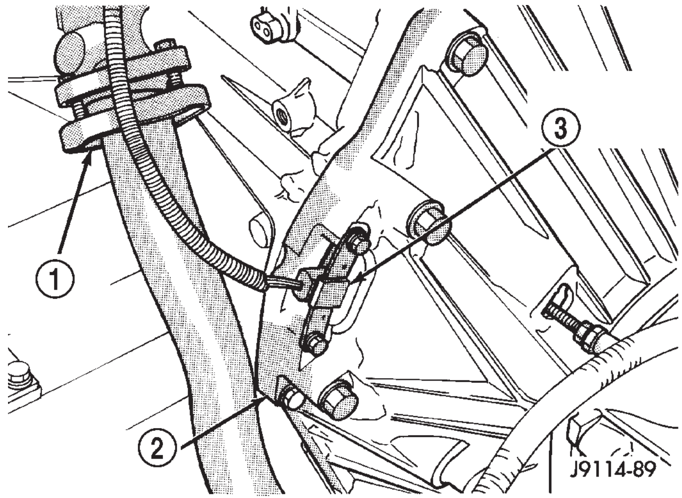


Fig. 67 Crankshaft Position Sensor—2.5L Engine

1 – EXHAUST DOWN PIPE
2 – TRANSMISSION HOUSING
3 – CRANKSHAFT POSITION SENSOR

(7) Remove torque converter access cover.

(8) If transmission is being removed for overhaul, remove transmission oil pan, drain fluid and reinstall pan.

(9) Remove skid plate for access.

(10) Remove the fill tube bracket bolts and pull tube out of transmission. Retain fill tube seal. On 4 x 4 models, it will also be necessary to remove bolt attaching transfer case vent tube to converter housing.

(11) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(12) Mark propeller shaft and axle yokes for assembly alignment. Then disconnect and remove propeller shafts.

(13) Disconnect wires from park/neutral position switch and vehicle speed sensor.

(14) Disconnect gearshift cable from transmission manual valve lever.

(15) Disconnect throttle valve cable from transmission bracket and throttle valve lever.

(16) Disconnect shift rod from transfer case shift lever or remove shift lever from transfer case.

REMOVAL AND INSTALLATION (Continued)

(17) Support rear of engine with safety stand or jack.

(18) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(19) Remove bolts securing rear support and cushion to transmission and crossmember. Raise transmission slightly, slide exhaust hanger arm from bracket and remove rear support.

(20) Remove bolts attaching crossmember to frame and remove crossmember.

(21) Disconnect transfer case vent hose. Then disconnect vacuum switch harness.

(22) Remove transfer case.

(23) Remove all converter housing bolts.

(24) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(25) Hold torque converter in place during transmission removal.

(26) Lower transmission and remove assembly from under the vehicle.

(27) To remove torque converter, carefully slide torque converter out of the transmission.

INSTALLATION

(1) Check torque converter hub and hub drive notches for sharp edges burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.

(2) Lubricate converter drive hub and oil pump seal lip with transmission fluid.

(3) Align converter and oil pump.

(4) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(5) Check converter seating with steel scale and straightedge (Fig. 68). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(6) Temporarily secure converter with C-clamp.

(7) Lubricate the pocket in the rear of the crankshaft, in which the converter pilot hub rides, with a light coating of Mopar® High-Temp Grease.

(8) Position transmission on jack and secure it with safety chains.

(9) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

(10) Raise transmission and align converter with drive plate and converter housing with engine block.

(11) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

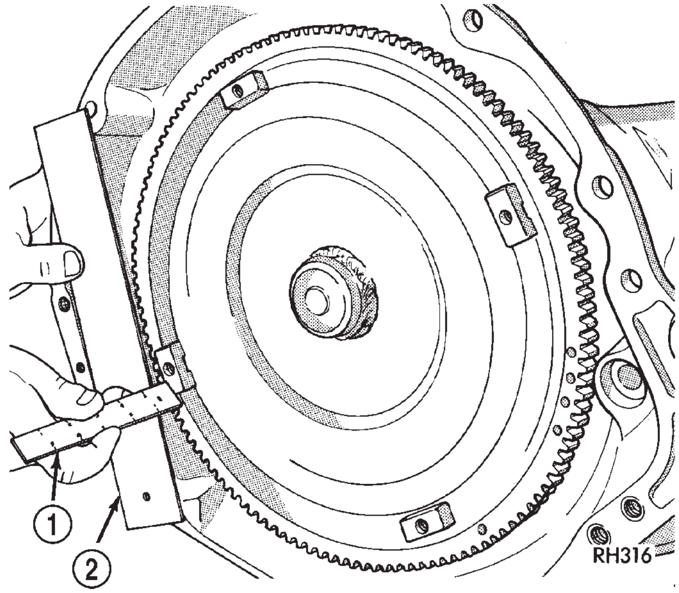


Fig. 68 Typical Method Of Checking Converter Seating

1 – SCALE

2 – STRAIGHTEDGE

(12) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.

(13) Install and tighten bolts that attach transmission converter housing to engine block (Fig. 69).

CAUTION: Be sure the converter housing is fully seated on the engine block dowels before tightening any bolts.

(14) Install torque converter attaching bolts. Tighten bolts to following torque.

- 54 N·m (40 ft. lbs.) with 9.5 in. 3-lug converter
- 74 N·m (55 ft. lbs.) with 9.5 in. 4-lug converter
- 74 N·m (55 ft. lbs.) with 10.0 in. 4-lug converter
- 31 N·m (270 in. lbs.) with 10.75 in. 4-lug converter

(15) Install crankshaft position sensor.

(16) Install transmission fill tube and seal. Install new fill tube seal in transmission before installation.

(17) Connect transmission cooler lines to transmission.

(18) Install transfer case onto transmission.

(19) Install rear crossmember and attach transmission rear support to crossmember.

(20) Remove engine support fixture.

(21) Remove transmission jack.

(22) Connect vehicle speed sensor wires.

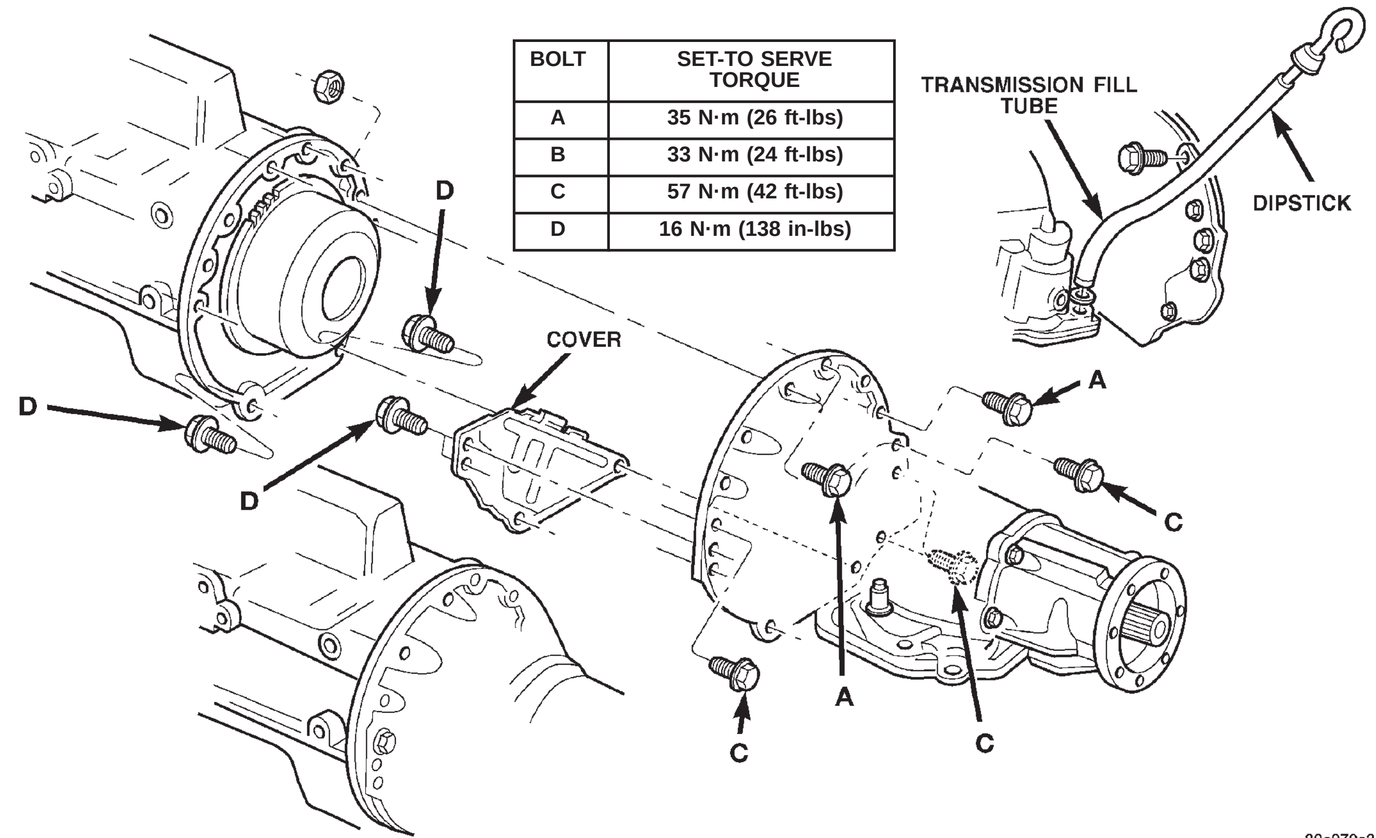
(23) Connect wires to park/neutral position switch.

(24) Install crankshaft position sensor.

(25) Install converter housing access cover.

(26) Install exhaust pipes and support brackets, if removed.

REMOVAL AND INSTALLATION (Continued)



BOLT	SET-TO SERVE TORQUE
A	35 N·m (26 ft-lbs)
B	33 N·m (24 ft-lbs)
C	57 N·m (42 ft-lbs)
D	16 N·m (138 in-lbs)

Fig. 69 Transmission Attachment

(27) Install starter motor and cooler line bracket.

(28) Install new plastic retainer grommet on any shift linkage rod or lever that was disconnected. Grommets should not be reused. Use pry tool to remove rod from grommet and cut away old grommet. Use pliers to snap new grommet into lever and to snap rod into grommet at assembly.

(29) Connect gearshift and linkage and throttle cable.

(30) Connect transfer case shift linkage.

(31) Adjust gearshift linkage and throttle valve cable if necessary.

(32) Align and connect propeller shaft(s).

(33) Install skid plate, rear cushion and bracket, if removed.

(34) Fill transfer case to bottom edge of fill plug hole.

(35) Lower vehicle and fill transmission to correct level with Mopar® ATF Plus 3, type 7176 fluid.

TORQUE CONVERTER

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(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.

REMOVAL AND INSTALLATION (Continued)

(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. 70). 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.

(9) Fill the transmission with the recommended fluid.

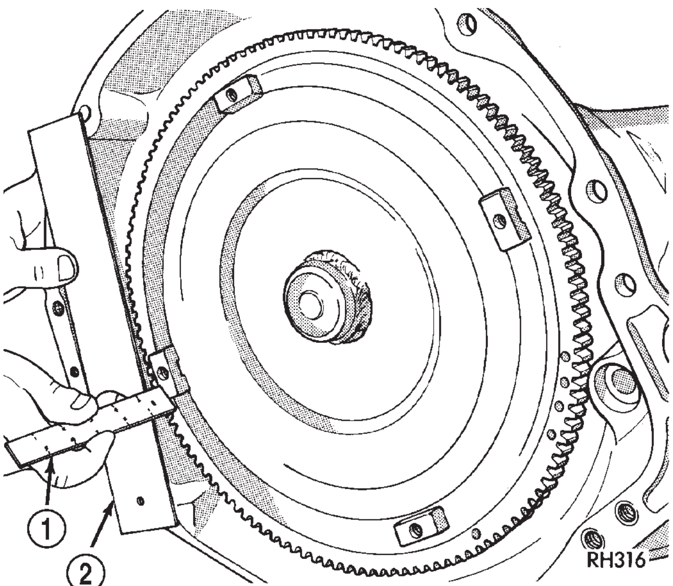


Fig. 70 Checking Torque Converter Seating

1 – SCALE
2 – STRAIGHTEDGE

YOKE SEAL REPLACEMENT

REMOVAL

(1) Raise vehicle.

(2) Mark propeller shaft and axle yoke for alignment reference.

(3) Disconnect and remove propeller shaft.

(4) Remove old seal with Seal Remover C-3985-B (Fig. 71) from extension housing.

INSTALLATION

(1) Place seal in position on extension housing.

(2) Drive seal into extension housing with Seal Installer C-3995-A or C-3972 (Fig. 72).

(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

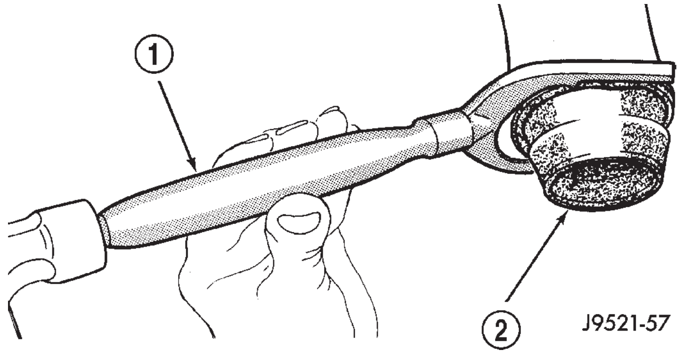


Fig. 71 Removing Extension Housing Yoke Seal

1 – SPECIAL TOOL C-3985–B
2 – SEAL

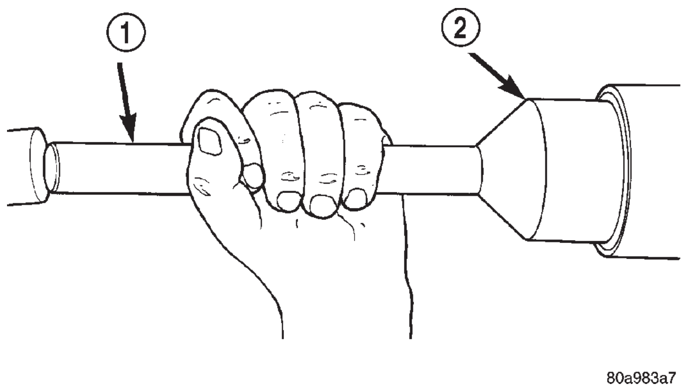


Fig. 72 Installing Extension Housing Yoke Seal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3995–A

EXTENSION HOUSING BUSHING

REMOVAL

(1) Remove housing yoke seal.

(2) Insert Remover 6957 into extension housing. Tighten tool to bushing and remove bushing (Fig. 73).

INSTALLATION

(1) Align bushing oil hole with oil slot in extension housing.

(2) Tap bushing into place with Installer 6951 and Handle C-4171.

(3) Install new oil seal in housing using Seal Installer C-3995–A (Fig. 74).

ADAPTER HOUSING

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Support transmission with a suitable lifting device.

(3) Remove transmission skid plate. Refer to Group 13, Frame and Bumpers, for proper procedure.

REMOVAL AND INSTALLATION (Continued)

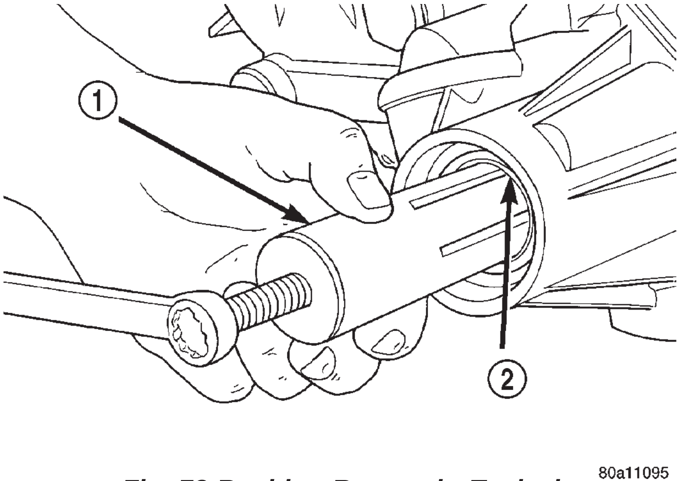


Fig. 73 Bushing Removal—Typical

1 – REMOVER 6957
2 – EXTENSION HOUSING BUSHING

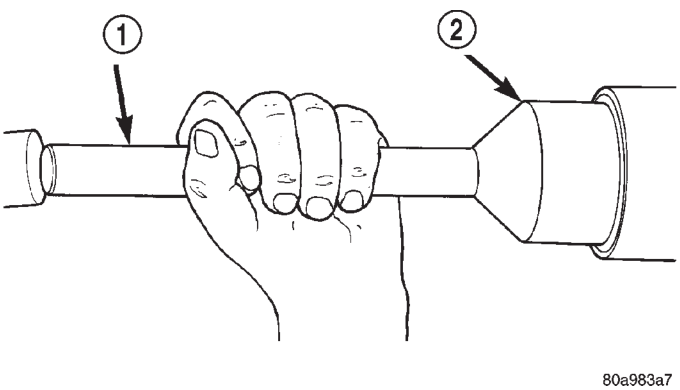


Fig. 74 Extension Housing Seal Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3995–A

(4) Remove propeller shafts. Refer to Group 3, Differential and Driveline, for proper procedure.

(5) Remove transfer case.

(6) Remove bolts holding adapter housing to transmission case (Fig. 75).

(7) Separate adapter housing from transmission.

(8) Slide adapter housing rearward and off output shaft (Fig. 75).

INSTALLATION

Clear gasket material from sealing surfaces on adapter housing and rear of transmission. Replace output shaft bearing, if necessary.

(1) Install new rear seal in adapter housing. Use Tool Handle C-4171 and Seal Installer C-3860-A to install seal.

(2) Place adapter housing gasket in position on rear of transmission.

(3) Slide adapter housing forward and over output shaft (Fig. 75).

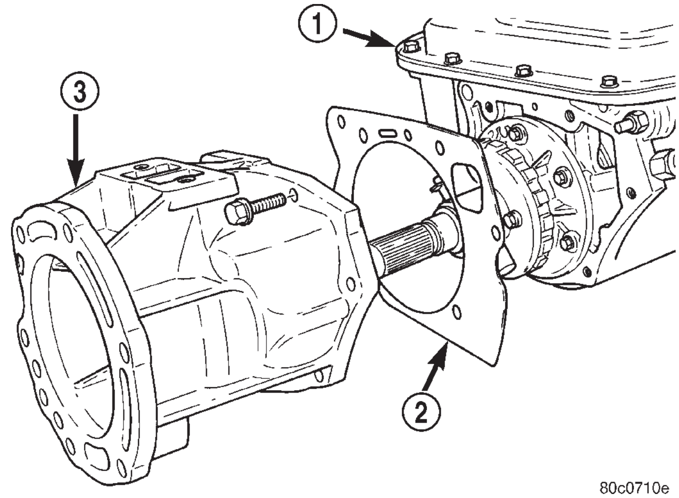


Fig. 75 Adapter Housing

1 – TRANSMISSION
2 – GASKET
3 – ADAPTER HOUSING

(4) Guide park shaft into park sprag and push adapter housing forward until rod passes through opening behind sprag. It may be necessary to use a wire to hold sprag to the side for rod to pass through.

(5) Install bolts to hold adapter housing to rear of transmission.

(6) Install transfer case.

(7) Install propeller shafts.

(8) Install rear transmission mount and skid plate.

(9) Lower vehicle and verify transmission fluid level. Add fluid as necessary.

SPEEDOMETER ADAPTER

Rear axle gear ratio and tire size determine speedometer pinion requirements.

REMOVAL

(1) Raise vehicle.

(2) Disconnect wires from vehicle speed sensor.

(3) Remove adapter clamp and screw (Fig. 76).

(4) Remove speed sensor and speedometer adapter as assembly.

(5) Remove speed sensor retaining screw and remove sensor from adapter.

(6) Remove speedometer pinion from adapter.

(7) Inspect sensor and adapter O-rings (Fig. 76). Remove and discard O-rings if worn or damaged.

(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or pins are loose, severely corroded, or damaged.

INSTALLATION

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean

REMOVAL AND INSTALLATION (Continued)

for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter if necessary (Fig. 76).

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 77). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o'clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level, if necessary.

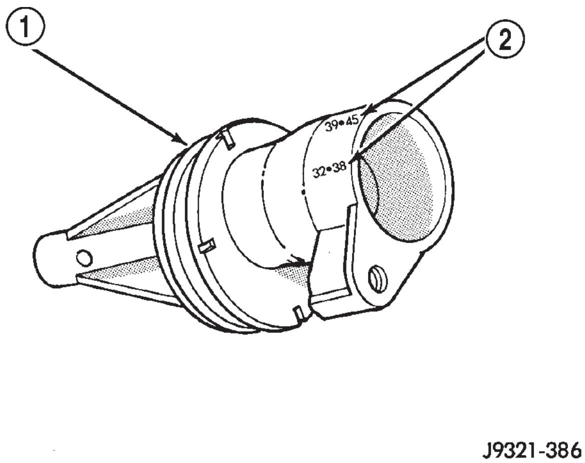


Fig. 77 Index Numbers On Speedometer Pinion Adapter

1 – SPEEDOMETER ADAPTER
2 – INDEX NUMBER LOCATION

PARK/NEUTRAL POSITION SWITCH

REMOVAL

(1) Raise vehicle and position drain pan under switch.

(2) Disconnect switch wires.

(3) Remove switch from case.

ITEM	TORQUE
A	2-3 N·m (15-27 in. lbs.)
B	10-12 N·m (90-110 in. lbs.)

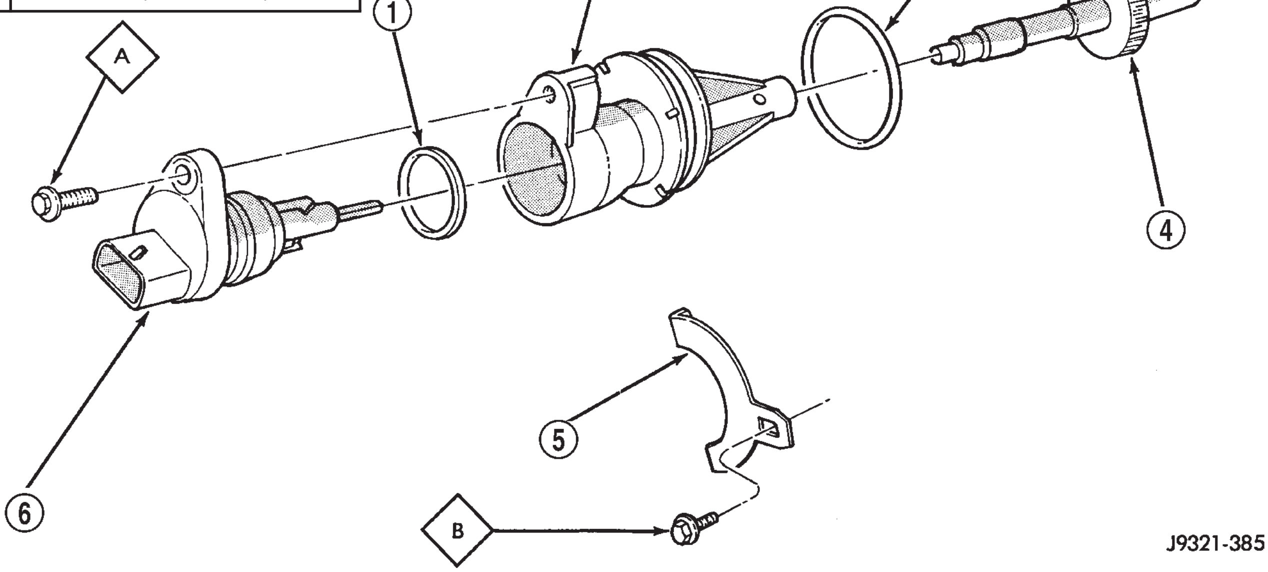


Fig. 76 Speedometer Pinion Adapter Components

1 – SENSOR O-RING
2 – SPEEDOMETER ADAPTER
3 – ADAPTER O-RING
4 – SPEEDOMETER PINION
5 – ADAPTER CLAMP
6 – VEHICLE SPEED SENSOR

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Move shift lever to Park and Neutral positions. Verify that switch operating lever fingers are centered in switch opening in case (Fig. 78).

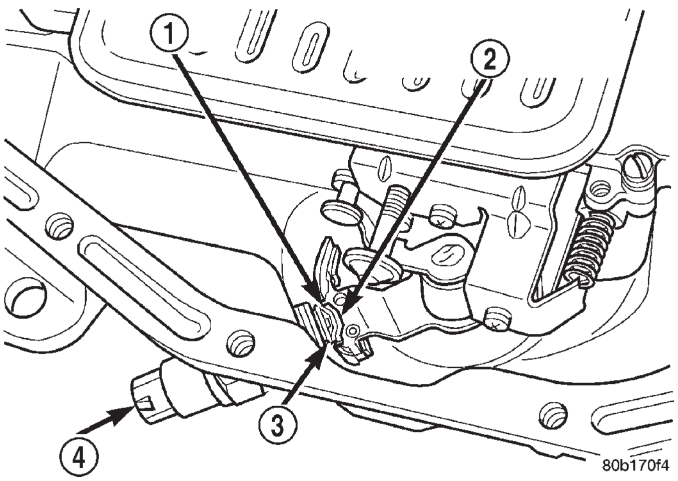


Fig. 78 Park/Neutral Position Switch

1 – NEUTRAL CONTACT
2 – MANUAL LEVER AND SWITCH PLUNGER IN REVERSE POSITION
3 – PARK CONTACT
4 – SWITCH

(2) Install new seal on switch and install switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(3) Test continuity of new switch with 12V test lamp.

(4) Connect switch wires and lower vehicle.

(5) Top off transmission fluid level.

GEARSHIFT CABLE

REMOVAL

(1) Shift transmission into Park.

(2) Remove shift lever bezel and necessary console parts for access to shift lever assembly.

(3) Disconnect cable at shift lever and feed cable through dash panel opening to underside of vehicle.

(4) Raise vehicle.

(5) Disengage cable eyelet at transmission shift lever and pull cable adjuster out of mounting bracket. Then remove old cable from vehicle.

INSTALLATION

(1) Route cable through hole in dash panel. Fully seat cable grommet into dash panel.

(2) Place the auto transmission manual shift control lever in "Park" detent (rearmost) position and rotate prop shaft to ensure transmission is in park.

(3) Connect shift cable to shifter mechanism by snapping cable retaining ears into shifter bracket and press cable end fitting onto lever ball stud.

(4) Place the floor shifter lever in park position. Ensure that the pawl is seated within the confines of the adjustment gauge clip.

(5) Snap the cable into the transmission bracket so the retaining ears are engaged and connect cable end fitting onto the manual control lever ball stud.

(6) Lock shift cable into position by pushing upward on the adjusting lock button.

(7) Remove and discard the shift cable adjustment gauge clip from the park gate of the shifter.

BRAKE TRANSMISSION SHIFT INTERLOCK

REMOVAL

(1) Remove lower steering column cover. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(2) Remove lower steering column shroud. Refer to Group 19, Steering, for proper procedure.

(3) Remove tie strap near the solenoid retaining the brake transmission interlock cable to the steering column.

(4) Disengage wire connector from solenoid.

(5) With the ignition removed or in the unlocked position, disengage lock tab holding cable end to steering column (Fig. 79).

(6) Pull cable end from steering column.

(7) Remove the floor console and related trim. Refer to Group 23, Body, for proper procedure.

(8) Disconnect the cable eyelet from the bellcrank (Fig. 80).

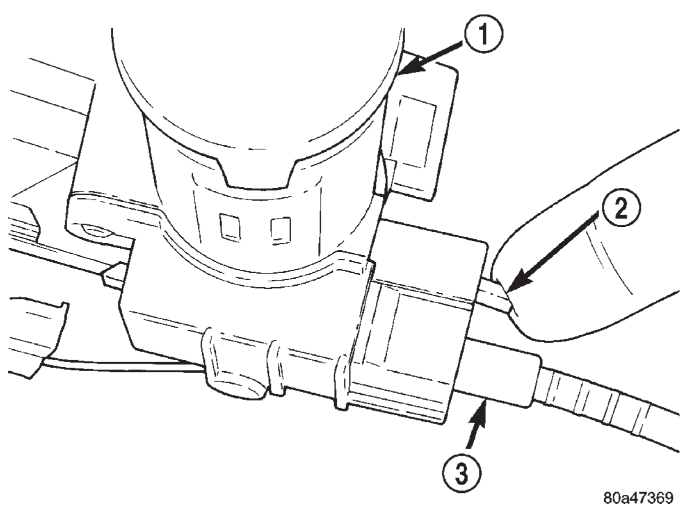


Fig. 79 Brake/Park Interlock Cable

1 – IGNITION LOCK
2 – LOCK TAB
3 – CABLE END

(9) Disconnect and remove the cable from the shift bracket.

REMOVAL AND INSTALLATION (Continued)

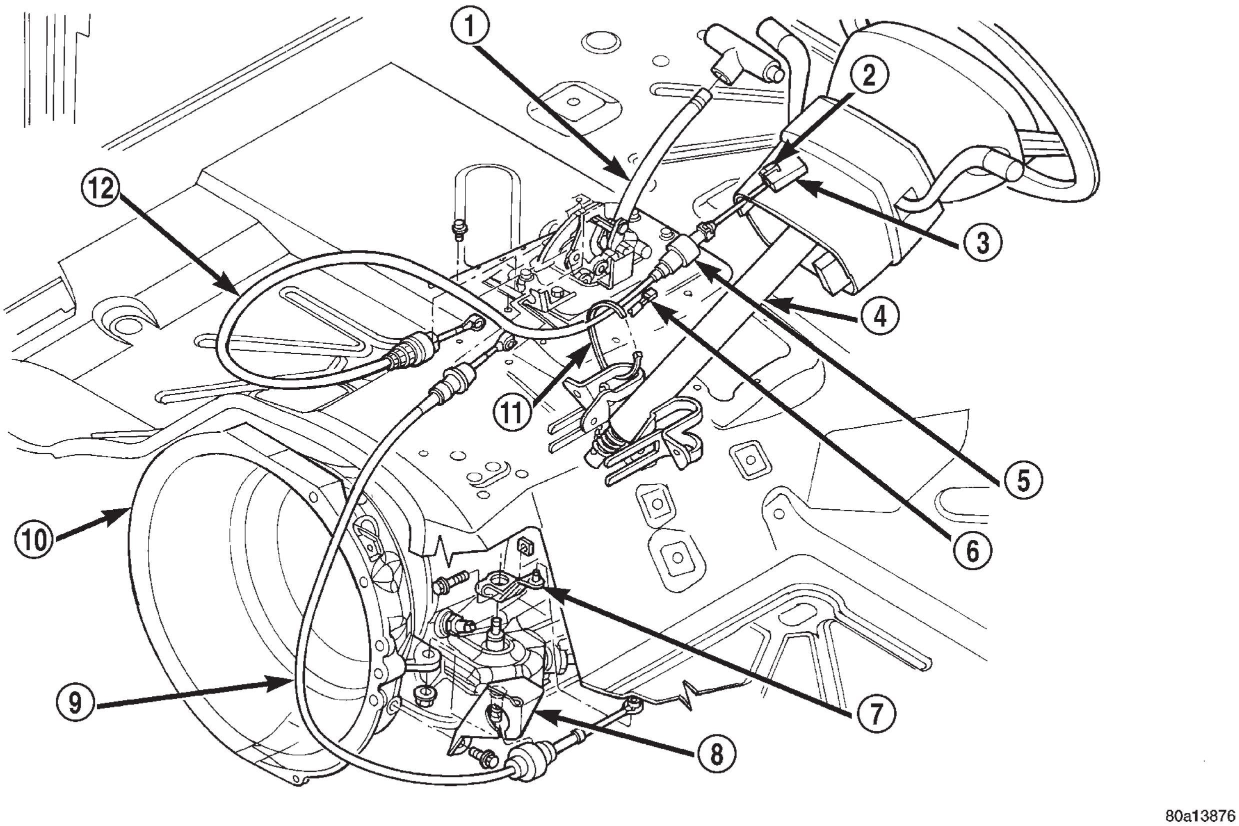


Fig. 80 Cable and Shifter

1 – SHIFT MECHANISM
2 – LOCK-TAB
3 – IGNITION LOCK INTERLOCK
4 – STEERING COLUMN
5 – SOLENOID
6 – WIRE CONNECTOR
7 – LEVER
8 – MOUNT BRACKET
9 – SHIFT CABLE
10 – AUTOMATIC TRANSMISSION
11 – TIE STRAP
12 – PARK/BRAKE INTERLOCK CABLE

INSTALLATION

(1) Route replacement cable behind instrument panel and under floor console area to shift mechanism (Fig. 80).

(2) Insert cable end into opening in steering column hub under ignition lock. Push cable inward until lock tab engages.

(3) Connect the cable end eyelet onto shifter bellcrank pin.

(4) Place gear selector in PARK.

(5) Push the spring-loaded cable adjuster forward and snap cable into bracket.

(6) Adjust the brake transmission shifter interlock cable. Refer to the Adjustment portion of this section for proper procedures.

(7) Verify that the cable adjuster lock clamp is pushed downward to the locked position.

(8) Test the park-lock cable operation.

(9) Install the floor console and related trim.

(10) Install tie strap to hold cable to base of steering column.

(11) Install lower steering column shroud and ignition lock.

(12) Install lower steering column cover.

VALVE BODY

REMOVAL

(1) Raise vehicle.

(2) Remove oil pan and drain fluid.

(3) Loosen clamp bolts and remove throttle and manual valve levers from manual lever shaft.

(4) Remove park/neutral position switch.

(5) Remove filter from valve body.

(6) Depress retaining clip and pull solenoid wire from case connector (Fig. 81).

(7) Remove valve body attaching screws.

(8) Lower valve body enough to remove accumulator piston and piston spring (Fig. 82).

REMOVAL AND INSTALLATION (Continued)

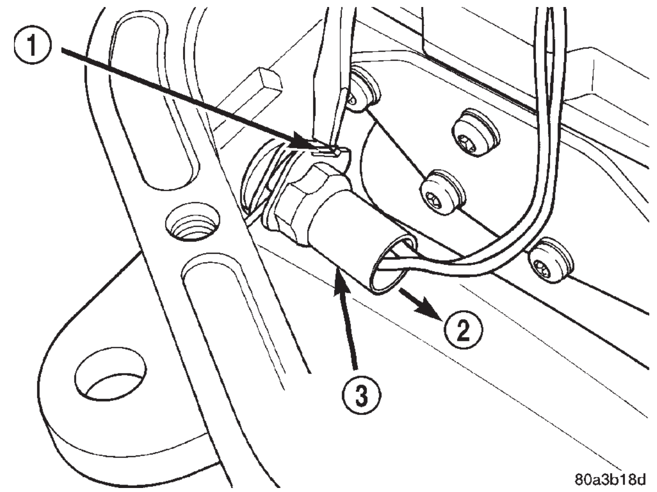


Fig. 81 Solenoid Wire Connector

1 – PUSH CLIP IN
2 – PULL
3 – CONVERTER CLUTCH SOLENOID CONNECTOR

(9) Pull valve body forward to disengage park rod.

(10) Push manual lever shaft and solenoid case connector out of transmission case.

(11) Lower valve body, rotate it away from case, pull park lock rod out of sprag, and remove valve body (Fig. 83).

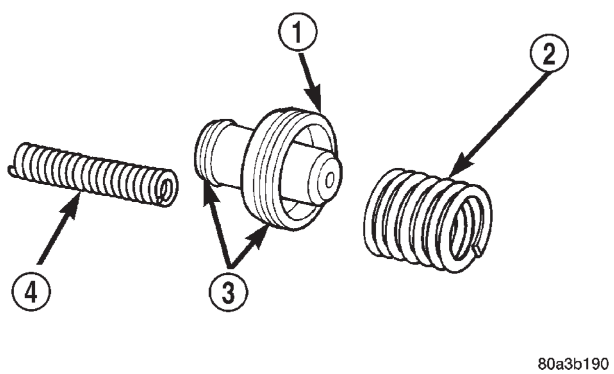


Fig. 82 Accumulator Piston And Springs

1 – ACCUMULATOR PISTON
2 – OUTER SPRING
3 – PISTON SEAL RINGS
4 – INNER SPRING (32RH)

INSTALLATION

(1) Verify that park/neutral position switch is **NOT** installed. Valve body cannot be installed with switch in place. Remove switch if necessary.

(2) Install new seals on accumulator piston if necessary, and install piston in case. Use small amount of petroleum jelly to hold piston in place.

(3) Place valve body manual lever in low (1 position) to ease inserting park rod into sprag.

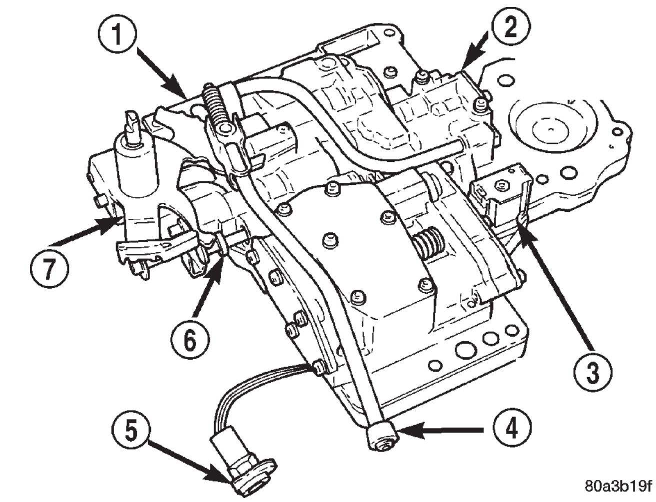


Fig. 83 Valve Body

1 – VALVE BODY
2 – CONVERTER CLUTCH MODULE
3 – SOLENOID
4 – PARK ROD
5 – CONVERTER CLUTCH SOLENOID CONNECTOR
6 – MANUAL VALVE
7 – MANUAL LEVER

(4) Use screwdriver to push park sprag into engagement with park gear. This makes clearance for knob on lock rod to move past sprag when valve body is installed. Rotate output shaft to verify sprag engagement.

(5) Position accumulator spring between accumulator piston and valve body.

(6) Position valve body on transmission and work knob on park lock rod past sprag. Be sure accumulator piston and spring remain in position.

(7) Hold valve body in position and install valve body screws finger tight.

(8) Install park/neutral position switch.

(9) Tighten valve body screws alternately and evenly to 11 N·m (100 in. lbs.) torque.

(10) Install new fluid filter on valve body. Install and tighten filter screws to 4 N·m (35 in. lbs.) torque.

(11) Connect solenoid wire to case connector.

(12) Install manual and throttle levers on throttle lever shaft. Tighten lever clamp screws and check for free operation. Shaft and levers must operate freely without any bind.

(13) Install oil pan and new gasket. Tighten pan bolts to 17 N·m (150 in. lbs.) torque. Install gasket dry; do not use sealer.

(14) Connect park/neutral position switch and converter clutch solenoid wires.

(15) Install speedometer pinion gear, adapter and speed sensor.

(16) Lower vehicle.

REMOVAL AND INSTALLATION (Continued)

(17) Fill transmission with Mopar® ATF Plus 3, Type 7176 fluid.

(18) Adjust gearshift and throttle cable if necessary.

OUTPUT SHAFT REAR BEARING

REMOVAL

(1) Remove extension housing.

(2) Remove snap ring that retains rear bearing on output shaft (Fig. 84).

(3) Remove bearing from output shaft.

INSTALLATION

(1) Install bearing on output shaft. Be sure retaining ring groove in outer circumference of bearing is toward the governor.

(2) Install rear bearing retaining snap ring (Fig. 84).

(3) Install extension housing.

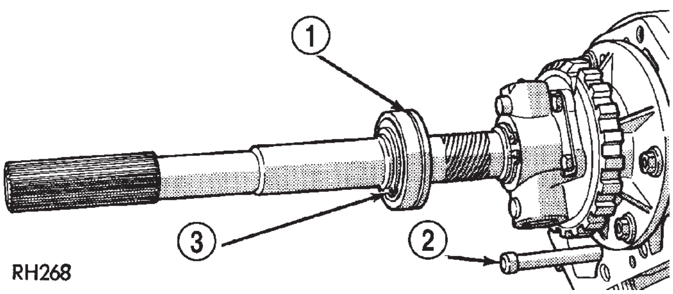


Fig. 84 Output Shaft Rear Bearing—Typical

1 – BEARING SNAP RING GROOVE
2 – PARK LOCK CONTROL ROD
3 – REAR SNAP RING

GOVERNOR AND PARK GEAR

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Mark propeller shaft and axle yoke for assembly reference. Then disconnect and remove shaft.

(3) Disconnect parking brake cable at equalizer and disconnect exhaust components as necessary.

(4) Support transmission on a suitable lifting device.

(5) Remove skid plate and rear transmission mount.

(6) Remove extension housing.

(7) Loosen but do not remove bolts that hold governor body to park gear.

(8) Rotate transmission output shaft until governor weight assembly is accessible.

(9) Remove E-clip at end of governor valve shaft (Fig. 85).

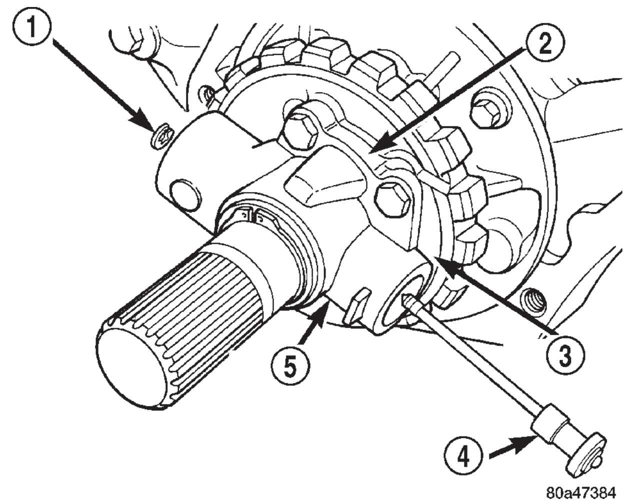


Fig. 85 Governor Valve

1 – E-CLIP
2 – PARK GEAR
3 – CURVER BOSS
4 – GOVERNOR VALVE
5 – GOVERNOR

(10) Remove governor valve and shaft from governor body (Fig. 85).

(11) Remove snap rings and spacer that retain governor body and park gear assembly on output shaft (Fig. 86).

(12) Remove bolts holding governor body to park gear (Fig. 87).

(13) Separate governor from park gear.

(14) Pull park gear from rear support.

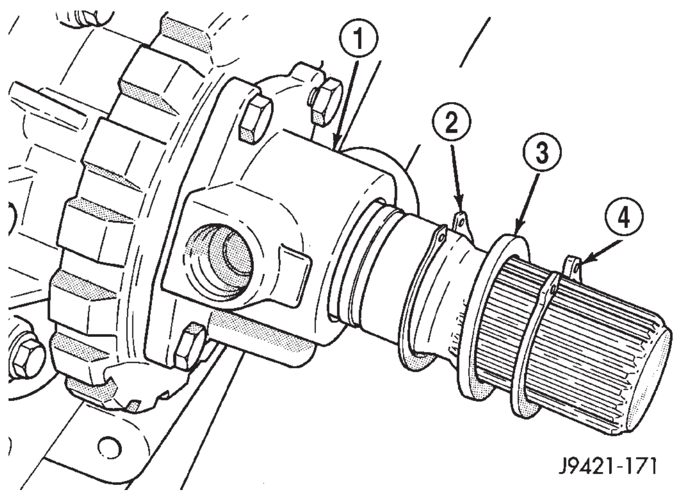


Fig. 86 Snap Rings And Spacer

1 – GOVERNOR BODY
2 – THIN SNAP RING
3 – THRUST WASHER
4 – THICK SNAP RING

REMOVAL AND INSTALLATION (Continued)

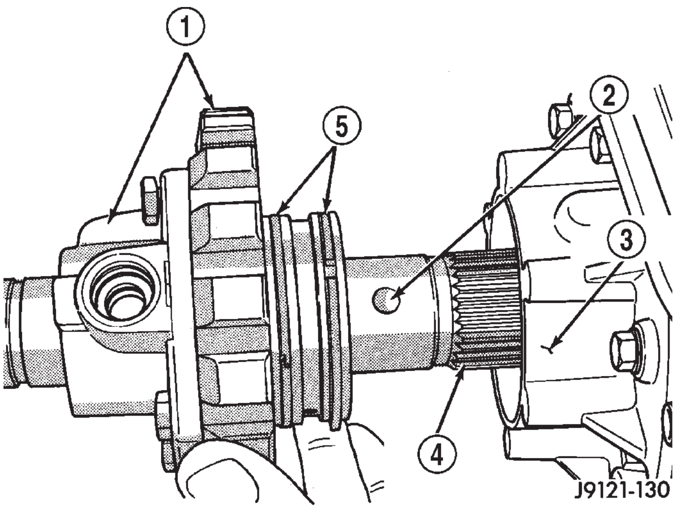


Fig. 87 Governor Body

1 – GOVERNOR/PARK ASSEMBLY
2 – GOVERNOR VALVE SHAFT BORE
3 – REAR SUPPORT
4 – OUTPUT SHAFT SPLINES
5 – SEAL RINGS

INSTALLATION

(1) Install park gear into rear support so crown on curved boss is in line with hole through output shaft.

(2) Install governor filter in park gear.

(3) Slip governor body over output shaft and align port to filter.

(4) Install bolts to hold governor body to park gear. Tighten bolts to 11 N·m (95 in. lbs.) torque (Fig. 87).

(5) Install governor body-park gear snap rings and washer on output shaft as follows:

(a) Install thin snap ring first. Then install thrust washer second, and thick snap ring last (Fig. 86).

(b) Verify correct position of snap rings. **Be sure flat side of each snap ring is toward governor body.**

(6) Insert governor valve and shaft through governor and install E-clip (Fig. 85).

(7) Install extension housing and gasket on transmission. Tighten housing bolts to 32 N·m (24 ft. lbs.).

(8) Install rear transmission mount and skid plate.

(9) Install speed sensor and speedometer components and connect speed sensor wires.

(10) Connect exhaust components and brake cable, if removed.

(11) Install propeller shaft.

(12) Remove supports and lower vehicle.

(13) Check transmission fluid level. Add fluid if necessary.

PARK LOCK

REMOVAL

(1) Raise vehicle and remove propeller shaft.

(2) Remove extension housing.

(3) Slide sprag shaft out of extension housing and remove sprag and spring (Fig. 88).

(4) Remove snap ring and slide reaction plug and pin assembly out of housing.

(5) If park rod requires service, it will be necessary to remove valve body.

INSTALLATION

(1) Inspect sprag shaft for scores and free movement in housing and sprag. Inspect sprag and control rod springs for distortion and loss of tension. replace worn, damaged parts as necessary.

(2) Inspect square lug on sprag for broken edges. Check lugs on park gear for damage. Inspect knob on end of control rod for wear grooves, or being seized on rod. Replace rod if bent, if knob is worn/grooved, or it has seized on rod. Replace park gear if lugs are damaged. Replace the park lock rod if it is suspected that the rod is not the correct length.

(3) Install reaction plug and pin assembly in housing and secure with new snap ring (Fig. 88).

(4) Position sprag and spring in housing and insert sprag shaft. Be sure square lug on sprag is toward park gear. Also be sure spring is positioned so it moves sprag away from gear.

(5) Install extension housing.

(6) Install propeller shaft and lower vehicle.

(7) Check transmission fluid level. Add fluid if necessary.

DISASSEMBLY AND ASSEMBLY

GOVERNOR AND PARK GEAR

DISASSEMBLY

(1) Remove governor body from transmission.

(2) Clean and inspect governor filter (Fig. 89).

(3) Remove snap ring and washer that secure governor weight assembly in body (Fig. 90).

(4) Remove governor weight assembly from governor body bore.

(5) Slide intermediate and inner weight from outer weight.

(6) Position intermediate weight on suitable size socket (Fig. 91).

(7) Push inner weight downward with nut driver. Then remove inner weight snap ring with Miller Plier Tool 6823 (Fig. 91).

(8) Remove inner weight and spring from intermediate weight.

DISASSEMBLY AND ASSEMBLY (Continued)

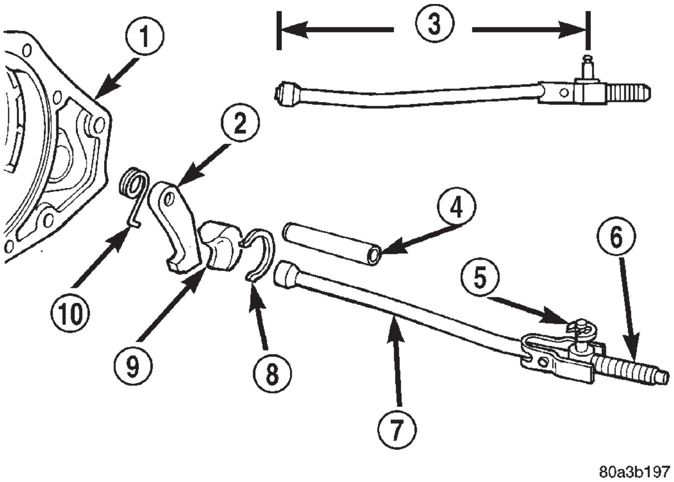


Fig. 88 Park Lock

1 – EXTENSION HOUSING
2 – SPRAG
3 – 8′′
4 – SHAFT
5 – E-CLIP
6 – SPRING
7 – CONTROL ROD
8 – SNAP RING
9 – PLUG AND PIN
10 – SPRING

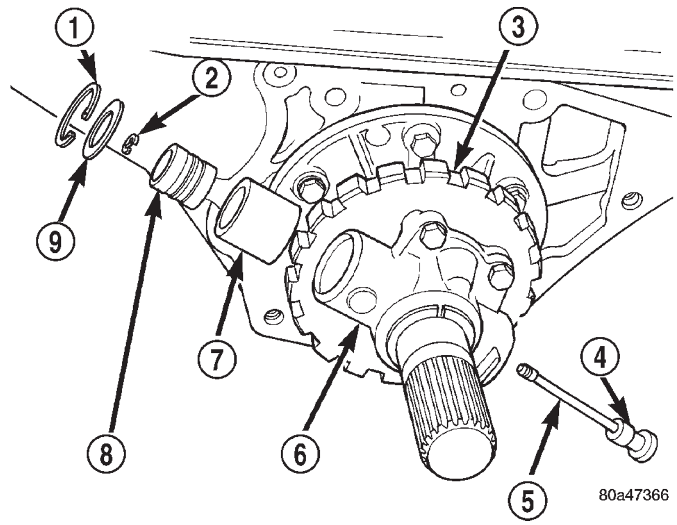


Fig. 90 Snap Ring, Washer, and Outer Weight

1 – SNAP-RING
2 – E-CLIP
3 – PARK GEAR
4 – GOVERNOR VALVE
5 – SHAFT
6 – GOVERNOR
7 – OUTER WEIGHT
8 – INTERMEDIATE WEIGHT
9 – WASHER

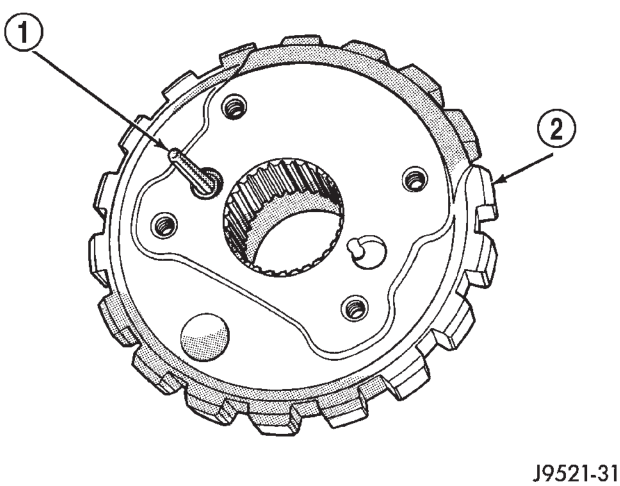


Fig. 89 Governor Filter

1 – GOVERNOR FILTER
2 – PARK GEAR

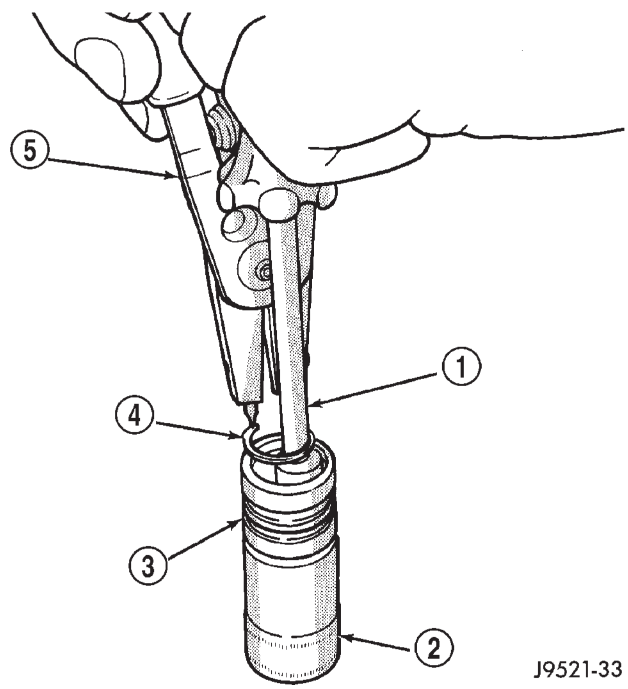


Fig. 91 Inner Weight Snap Ring

1 – NUT DRIVER
2 – SUITABLE SIZE SOCKET
3 – INTERMEDIATE WEIGHT
4 – INNER WEIGHT SNAP RING
5 – SPECIAL TOOL 6823

ASSEMBLY

CAUTION: Exercise care when installing the rings. They are easily broken if overspread or twisted during installation.

If it was necessary to remove the park gear, inspect the seal rings and bore in rear support.

DISASSEMBLY AND ASSEMBLY (Continued)

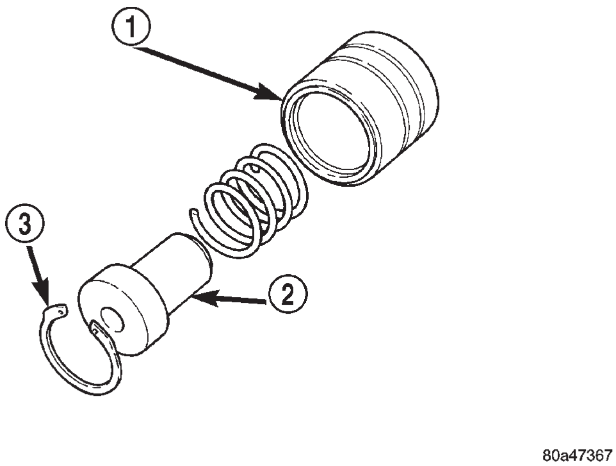


Fig. 92 Intermediate and Inner Governor Weights

1 – INTERMEDIATE WEIGHT
2 – INNER WEIGHT
3 – SNAP-RING

Install new seal rings on park gear hub only if original rings are damaged, or worn. Install ring with interlock ends first and ring with plain ends last. Slip each ring on hub and seat them in grooves. Verify that rear ring ends are securely interlocked before proceeding. If the bore in rear support is damaged, replace the rear support.

(1) Lubricate governor components with Mopar® ATF Plus 3, Type 7176 transmission fluid before assembly.

(2) Clean and inspect governor weights and bores for scoring or wear. Replace the governor body and weights if damaged. Refer to Cleaning and Inspection section of this group for proper procedure.

(3) Insert spring into intermediate weight.

(4) Insert inner weight into intermediate weight and install snap-ring (Fig. 92). Verify snap-ring is fully seated in groove in intermediate weight (Fig. 91).

(5) Assemble governor weights into governor body (Fig. 90).

(6) Install washer and snap ring to hold weights in governor body.

(7) Install governor body in transmission

VALVE BODY

DISASSEMBLY

Position the valve body on a clean work surface to avoid contamination.

CAUTION: Do not clamp any part of the valve body assembly (Fig. 93) in a vise. This practice will distort the valve body and transfer plate resulting in valve bind. Slide valves and plugs out carefully. Do not use force at any time. The valves and valve body will be damaged if force is used. Also tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

(1) Remove screws attaching adjusting screw bracket to valve body and transfer plate. Hold bracket firmly against spring force while removing last screw.

(2) Remove adjusting screw bracket, line pressure adjusting screw (Fig. 94).

(3) Remove switch valve and spring, pressure regulator valve and spring, kickdown valve and spring, and throttle valve from valve body (Fig. 94).

(4) Secure detent ball and spring in housing with Retainer Tool 6583 (Fig. 95).

(5) Remove manual shaft E-clip, washer, and seal (Fig. 96).

(6) Pull manual shaft and park rod assembly upward out of valve body and off throttle lever (Fig. 96).

(7) Remove manual valve from valve body (Fig. 97)

(8) Remove Retainer Tool 6583. Then remove and retain detent ball and spring (Fig. 96).

(9) Remove throttle lever (Fig. 96).

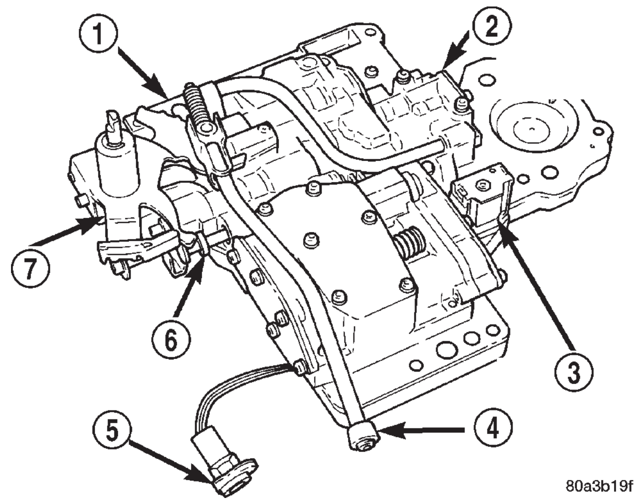


Fig. 93 Valve Body Assembly

1 – VALVE BODY
2 – CONVERTER CLUTCH MODULE
3 – SOLENOID
4 – PARK ROD
5 – CONVERTER CLUTCH SOLENOID CONNECTOR
6 – MANUAL VALVE
7 – MANUAL LEVER

(10) Remove park rod E-clip and separate rod from manual lever (Fig. 98).

DISSASSEMBLY AND ASSEMBLY (Continued)

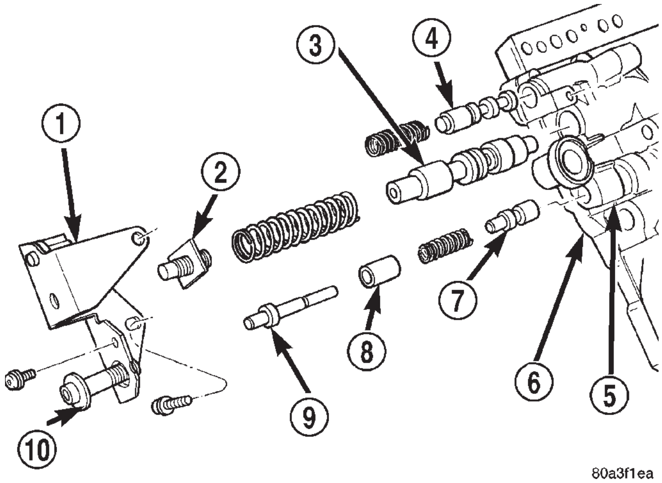


Fig. 94 Adjusting Screw Bracket, Springs, Valve Removal

1 – ADJUSTER BRACKET
2 – LINE PRESSURE ADJUSTER
3 – PRESSURE REGULATOR VALVE
4 – SWITCH VALVE
5 – VALVE BODY
6 – TRANSFER PLATE
7 – THROTTLE VALVE
8 – SLEEVE
9 – KICKDOWN VALVE
10 – THROTTLE PRESSURE ADJUSTER

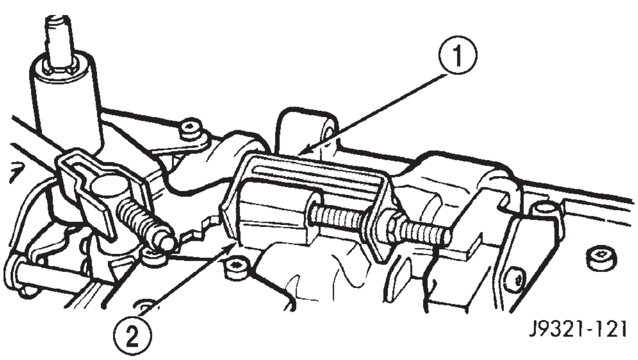


Fig. 95 Securing Detent Ball And Spring With Retainer Tool

1 – SPECIAL TOOL 6583
2 – DETENT BALL AND SPRING HOUSING

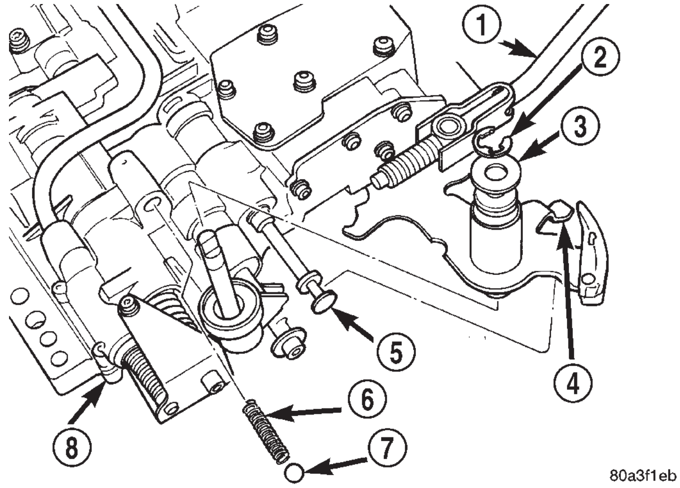


Fig. 96 Manual And Throttle Levers

1 – PARK ROD
2 – E-RING
3 – WASHER
4 – MANUAL LEVER
5 – MANUAL VALVE
6 – SPRING
7 – DETENT BALL
8 – VALVE BODY

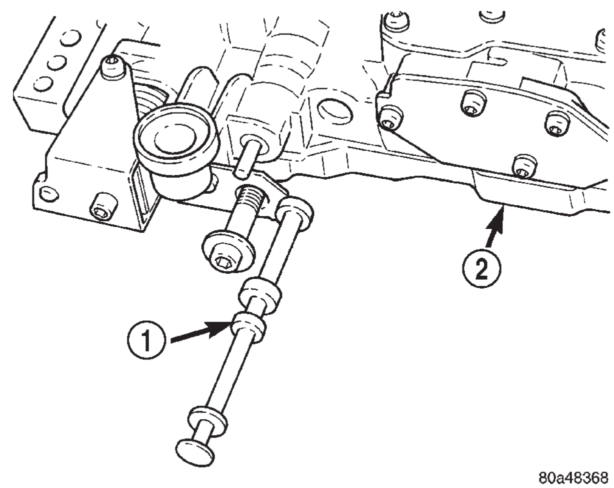


Fig. 97 Manual Valve

1 – MANUAL VALVE
2 – VALVE BODY

(11) Remove converter clutch solenoid from separator plate (Fig. 99). A T25 torx bit is required to remove solenoid attaching screw.

(12) Remove screws attaching converter clutch module to valve body and remove module and connecting tube (Fig. 100).

(13) Remove screws attaching end cover plate to torque converter module (Fig. 101).

(14) Remove converter clutch valve, fail safe valve, and springs (Fig. 101)

(15) Turn valve body over so transfer plate is facing upward (Fig. 102). With valve body in this position, valve body check balls will remain in place and not fall out when transfer plate is removed.

(16) Remove screws attaching transfer plate to valve body (Fig. 102).

(17) Remove transfer plate and separator plate from valve body (Fig. 102). Note position of filter and clutch solenoid for reference. Remove valve body check balls.

DISASSEMBLY AND ASSEMBLY (Continued)

(18) Position transfer plate on bench so separator plate, and filter are facing up. This will avoid having rear clutch and rear servo check balls fall out when plates are separated.

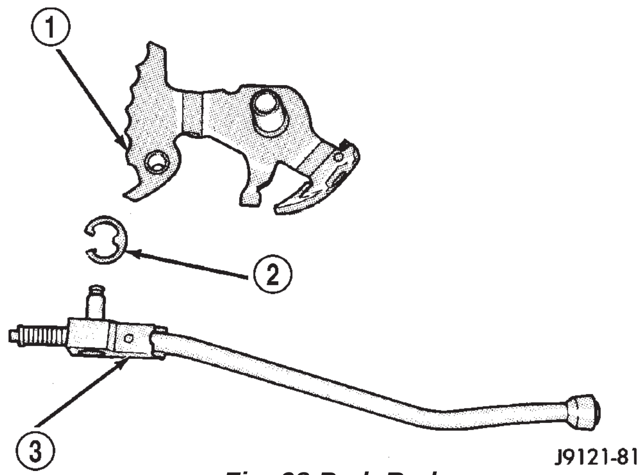


Fig. 98 Park Rod

1 – MANUAL LEVER
2 – E-CLIP
3 – PARK ROD

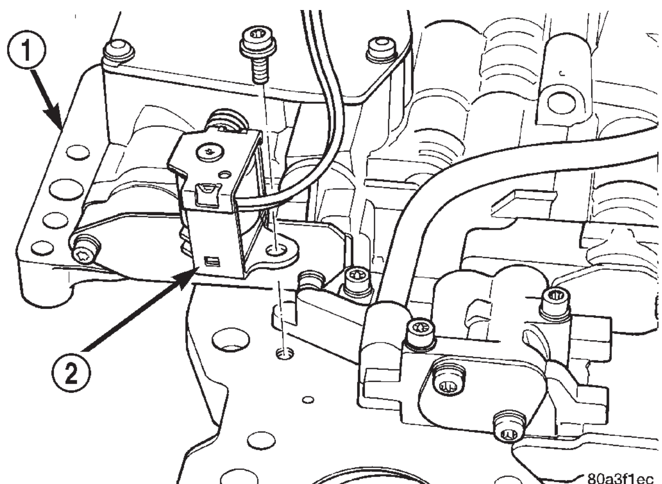


Fig. 99 Converter Clutch Solenoid

1 – VALVE BODY
2 – TORQUE CONVERTER CLUTCH SOLENOID

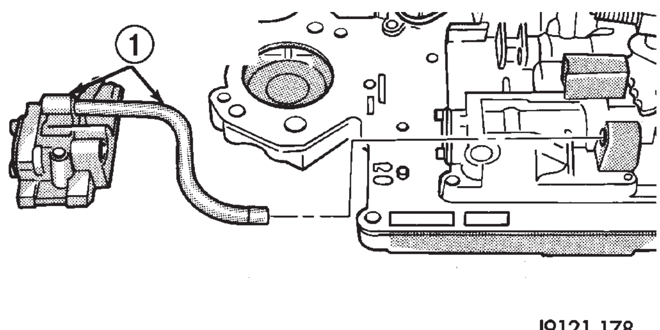


Fig. 100 Clutch Module And Connecting Tube

1 – MODULE AND CONNECTING TUBE

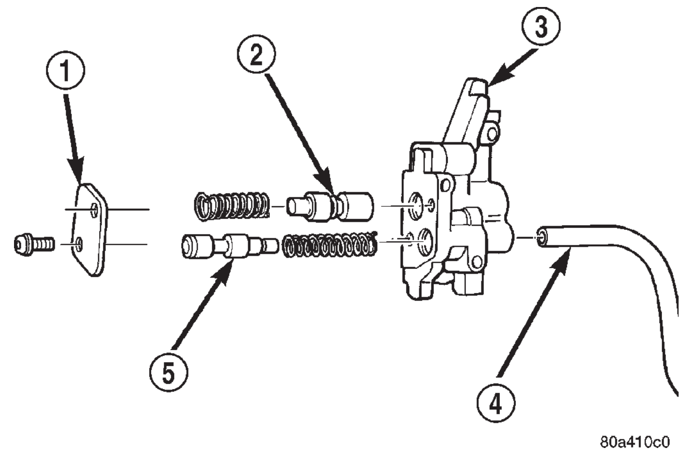


Fig. 101 Converter Clutch and Fail Safe Valves

1 – COVER PLATE
2 – CONVERTER CLUTCH VALVE
3 – TORQUE CONVERTER CLUTCH MODULE
4 – MODULE CONNECTING TUBE
5 – FAIL-SAFE VALVE

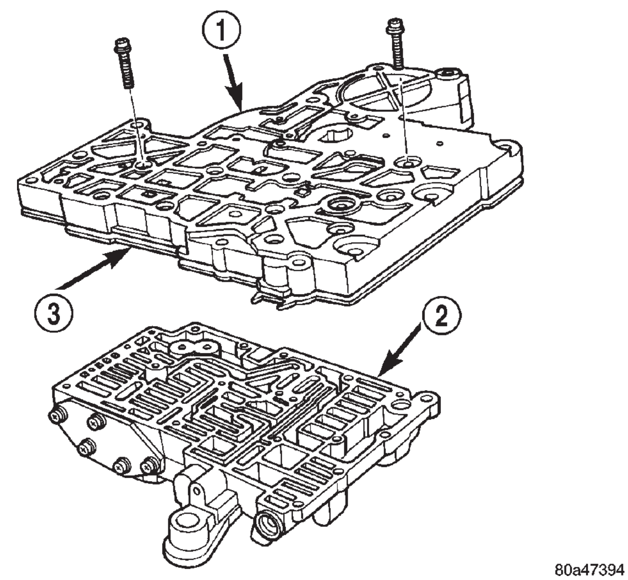


Fig. 102 Valve Body Transfer Plate Screws

1 – TRANSFER PLATE
2 – VALVE BODY
3 – SEPARATOR PLATE

(19) Remove screws attaching separator plate to transfer plate (Fig. 103).

(20) Note position of filter, rear clutch servo and rear servo check balls for assembly reference (Fig. 103) and (Fig. 104).

(21) Remove shuttle valve end plate (Fig. 105).

(22) Remove shuttle valve E-clip and remove secondary spring and spring guides from end of valve (Fig. 106).

DISASSEMBLY AND ASSEMBLY (Continued)

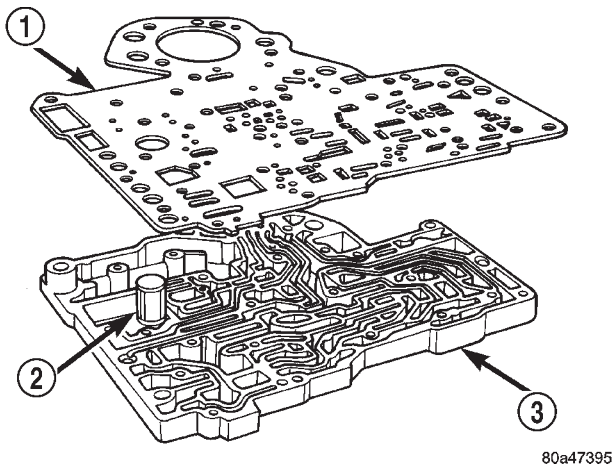


Fig. 103 Transfer And Separator Plates

1 – SEPARATOR PLATE
2 – FILTER
3 – TRANSFER PLATE

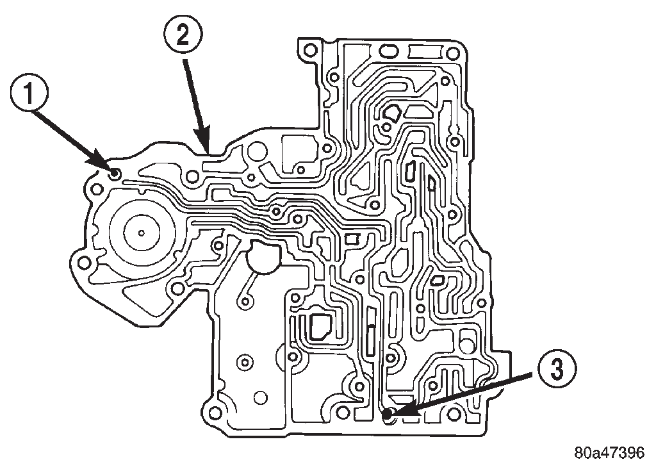


Fig. 104 Rear Servo and Rear Clutch Check Balls

1 – REAR SERVO CHECK BALL
2 – TRANSFER PLATE
3 – REAR CLUTCH CHECK BALL

(23) Remove governor plug end plate (Fig. 107).

(24) Remove 1-2 and 2-3 shift valve governor plugs from valve body (Fig. 107).

(25) Remove shuttle valve throttle plug, primary spring and shuttle valve from valve body (Fig. 107).

(26) Remove screws attaching kickdown limit valve body to valve body (Fig. 107).

(27) Remove 1-2 shift control valve and spring from valve body (Fig. 107).

(28) Remove 2-3 shift valve and spring from valve body (Fig. 107).

(29) Remove 1-2 shift valve and spring from valve body (Fig. 107).

(30) Remove throttle pressure plug from kickdown limit valve body (Fig. 107).

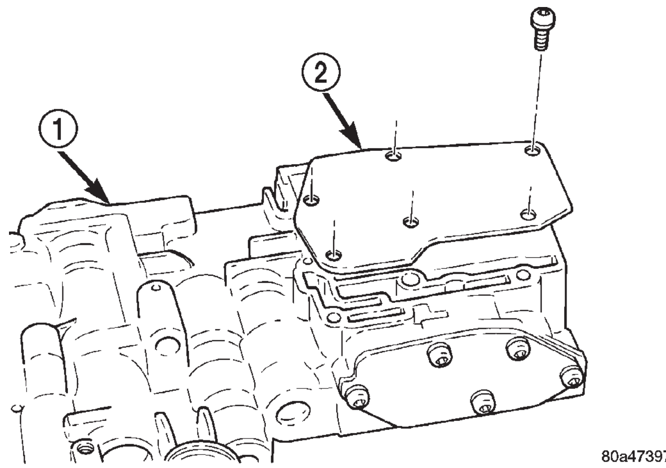


Fig. 105 Shuttle Valve End Plate

1 – VALVE BODY
2 – SHUTTLE VALVE END PLATE

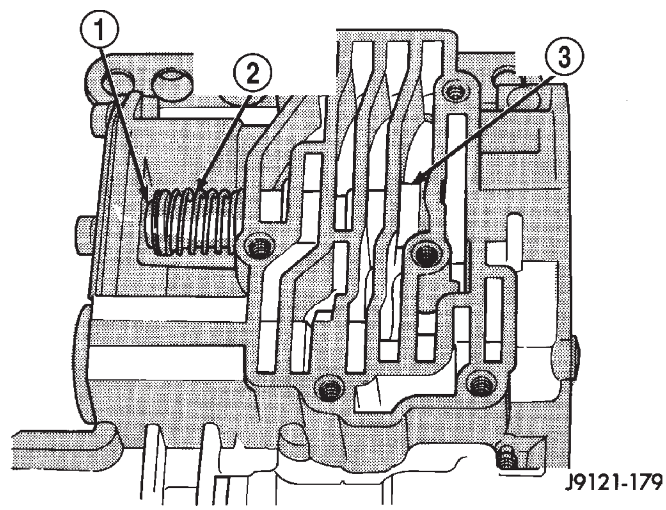


Fig. 106 Shuttle Valve E-Clip And Secondary Spring

1 – E-CLIP
2 – SECONDARY SPRING AND GUIDES
3 – SHUTTLE VALVE

(31) Remove retainer from end of kickdown limit valve body (Fig. 107).

(32) Remove kickdown limit valve and spring from kickdown limit valve body (Fig. 107).

(33) Remove regulator valve end plate from valve body (Fig. 107).

(34) Remove regulator valve line pressure plug, pressure plug sleeve, regulator valve throttle pressure plug and spring (Fig. 107).

ASSEMBLY

Clean and inspect all valve body components for damage or wear. Refer to the Cleaning and Inspection section of this group for proper procedure.

DISASSEMBLY AND ASSEMBLY (Continued)

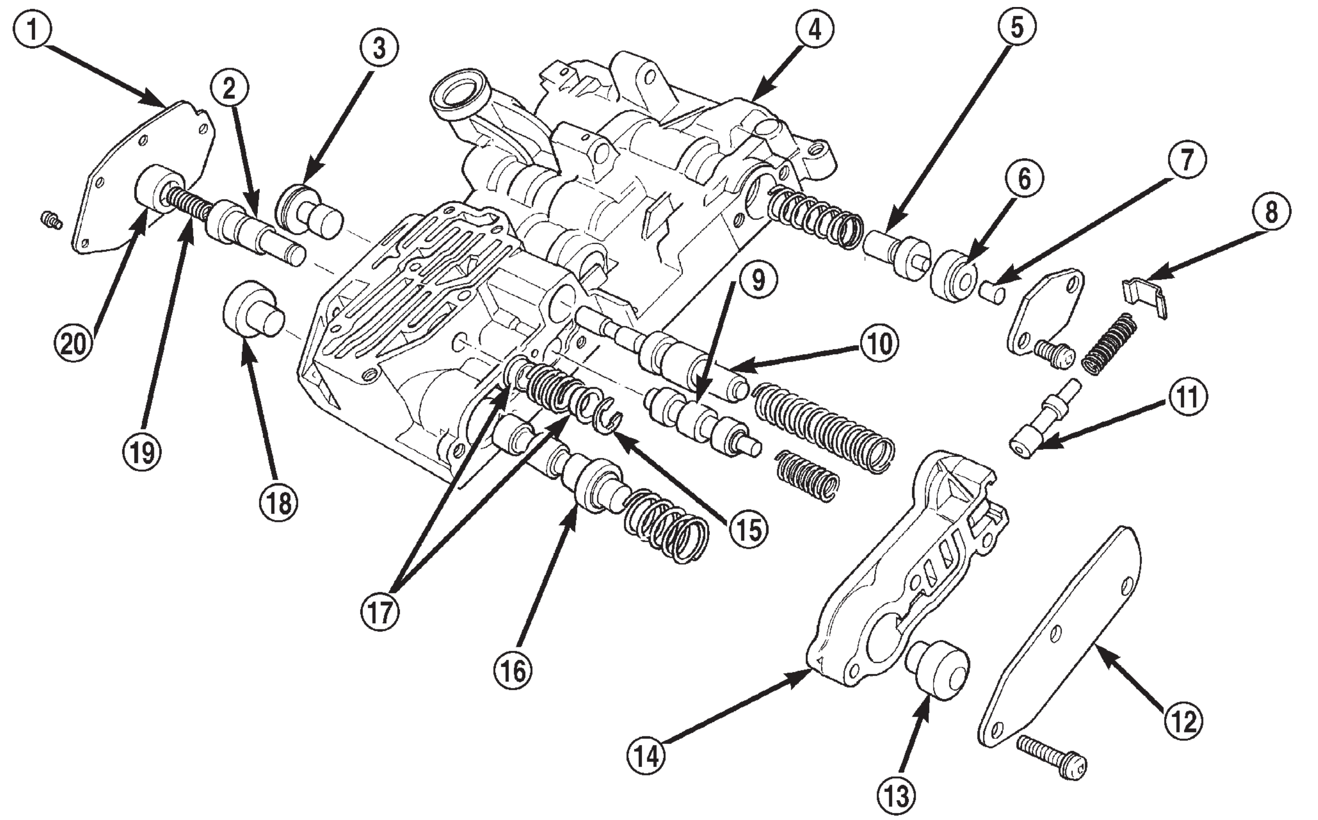


Fig. 107 Control Valves, Shift Valves, And Governor Plugs

1 – GOVERNOR PLUG END PLATE
2 – SHUTTLE VALVE
3 – 1–2 GOVERNOR PLUG
4 – VALVE BODY
5 – REGULATOR VALVE THROTTLE PRESSURE PLUG
6 – SLEEVE
7 – LINE PRESSURE PLUG
8 – RETAINER
9 – 1–2 SHIFT VALVE
10 – 1–2 SHIFT CONTROL VALVE
11 – KICKDOWN LIMIT VALVE
12 – END PLATE
13 – THROTTLE PRESSURE PLUG
14 – KICKDOWN LIMIT VALVE BODY
15 – E-RING
16 – 2–3 SHIFT VALVE
17 – GUIDES
18 – 2–3 GOVERNOR PLUG
19 – PRIMARY SPRING
20 – SHUTTLE VALVE THROTTLE PLUG

CAUTION: Do not force valves or plugs into place during reassembly. If the valve body bores, valves, and plugs are free of distortion or burrs, the valve body components should all slide into place easily. In addition, do not overtighten the transfer plate and valve body screws during reassembly. Overtightening can distort the valve body resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

(1) Lubricate valve body bores, valves and plugs with Mopar® ATF Plus 3, Type 7176, transmission fluid.

(2) Install regulator valve line pressure plug, pressure plug sleeve, regulator valve throttle pressure plug, and spring into valve body (Fig. 107). Verify valve components slide freely.

(3) Install regulator valve end plate on valve body (Fig. 107).

(4) Install kickdown limit valve and spring in kickdown limit valve body (Fig. 107). Verify valve components slide freely.

(5) Compress spring into kickdown limit valve body.

(6) Install retainer in grooves at end of kickdown limit valve body (Fig. 107).

(7) Install throttle pressure plug in kickdown limit valve body (Fig. 107).

(8) Install 1-2 shift valve and spring into valve body (Fig. 107).

(9) Install 2-3 shift valve and spring into valve body (Fig. 107).

(10) Install 1-2 shift control valve and spring into valve body (Fig. 107).

(11) Verify valve components slide freely.

DISASSEMBLY AND ASSEMBLY (Continued)

(12) Place kickdown limit valve body and end plate in position on valve body and compress springs (Fig. 107).

(13) Install screws to attach kickdown limit valve body to valve body (Fig. 107).

(14) Install shuttle valve throttle plug, primary spring and shuttle valve into valve body (Fig. 107). Verify valve components slide freely.

(15) Install 1-2 and 2-3 shift valve governor plugs into valve body (Fig. 107). Verify valve components slide freely.

(16) Place governor plug end plate in position on valve body and compress spring.

(17) Install screws to attach governor plug end plate to valve body (Fig. 107).

(18) Assemble shuttle valve spring and guides (Fig. 107). Place spring and guides in position on shuttle valve stem.

(19) Compress spring and install E-clip in groove on shuttle valve stem (Fig. 108).

(20) Place shuttle valve end plate in position on valve body (Fig. 109).

(21) Install screws to attach shuttle valve end plate to valve body (Fig. 109).

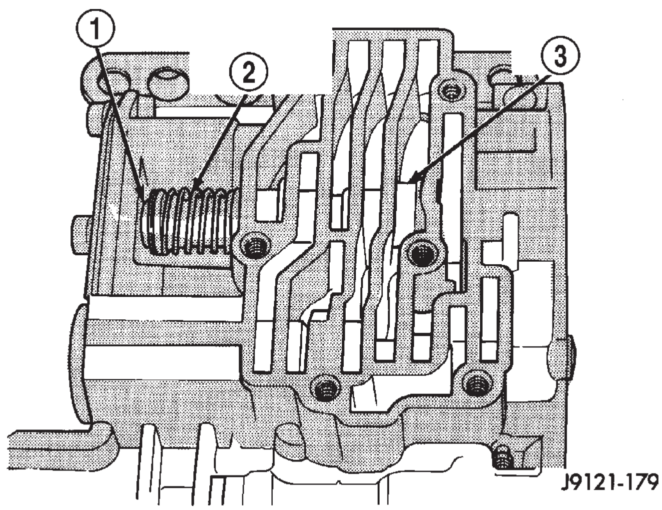


Fig. 108 Shuttle Valve E-Clip And Secondary Spring

1 – E-CLIP
2 – SECONDARY SPRING AND GUIDES
3 – SHUTTLE VALVE

(22) Install rear clutch servo and rear servo check balls in proper cavities in transfer plate (Fig. 110).

(23) Insert filter into opening in separator plate (Fig. 111).

(24) Place separator plate in position on transfer plate and install screws to attach separator plate to transfer plate (Fig. 111).

(25) Place one 11/32 in. check ball and six 1/4 in. check balls in the proper cavities in the valve body (Fig. 112).

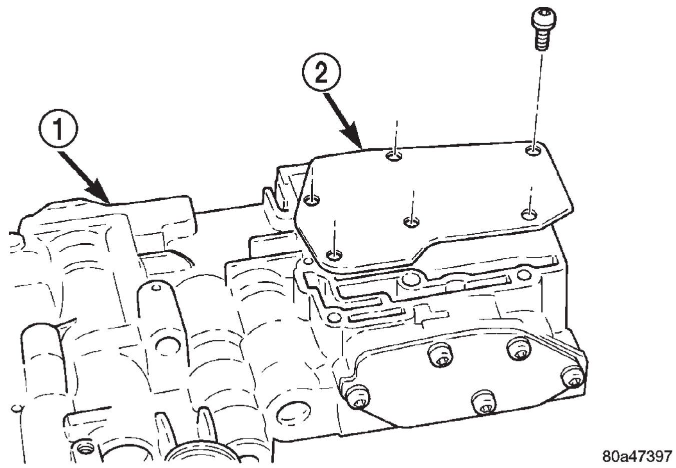


Fig. 109 Shuttle Valve End Plate

1 – VALVE BODY
2 – SHUTTLE VALVE END PLATE

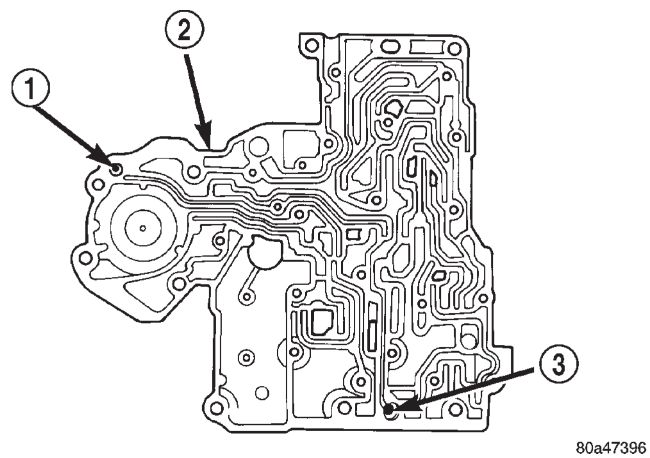


Fig. 110 Rear Servo and Rear Clutch Check Balls

1 – REAR SERVO CHECK BALL
2 – TRANSFER PLATE
3 – REAR CLUTCH CHECK BALL

(26) Place transfer plate in position on valve body (Fig. 113).

(27) Install screws to attach transfer plate to valve body (Fig. 113).

(28) Turn valve body over to expose the separator plate.

(29) Insert converter clutch valve and spring into converter clutch valve module (Fig. 114). Verify valve components slide freely.

(30) Insert spring and fail-safe valve into converter clutch valve module (Fig. 114). Verify valve components slide freely.

(31) Place cover plate in position on converter clutch valve module (Fig. 114).

(32) Install screws to attach cover to converter clutch valve module (Fig. 114).

DISASSEMBLY AND ASSEMBLY (Continued)

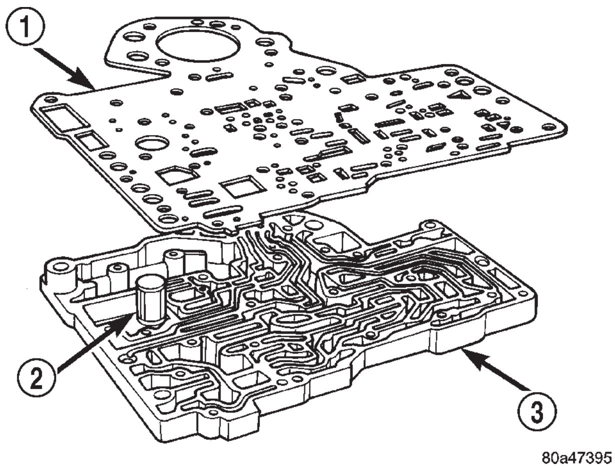


Fig. 111 Transfer And Separator Plates

1 – SEPARATOR PLATE
2 – FILTER
3 – TRANSFER PLATE

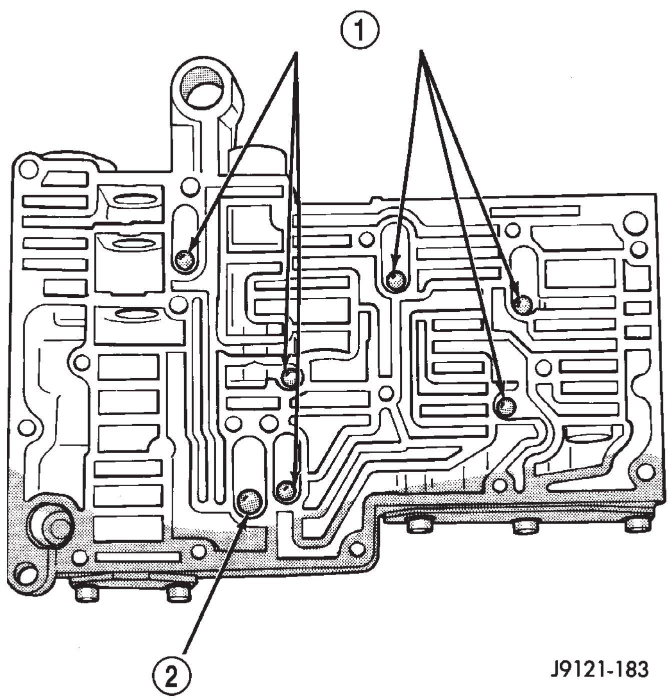


Fig. 112 Correct Position Of Valve Body Check Balls

1 – 1/4'' CHECK BALLS (6)
2 – 11/32'' CHECK BALL (1)

(33) Insert connecting tube into converter clutch valve module (Fig. 114).

(34) Insert connecting tube into valve body opening (Fig. 115).

(35) Place converter clutch valve module in position on separator plate. Install screws to attach converter clutch module to valve body (Fig. 115).

(36) If necessary, install a new O-ring on converter clutch solenoid (Fig. 116).

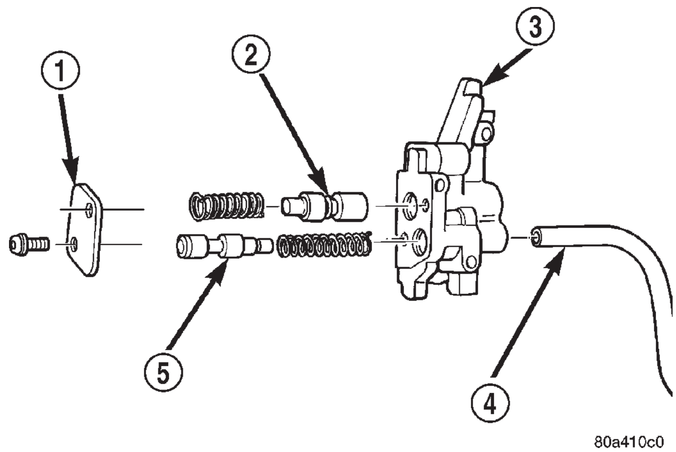


Fig. 114 Converter Clutch Valve Module

1 – COVER PLATE
2 – CONVERTER CLUTCH VALVE
3 – TORQUE CONVERTER CLUTCH MODULE
4 – MODULE CONNECTING TUBE
5 – FAIL-SAFE VALVE

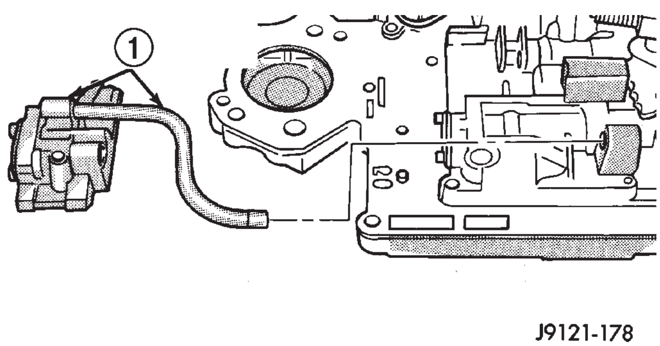


Fig. 115 Clutch Module And Connecting Tube

1 – MODULE AND CONNECTING TUBE

(37) Insert converter clutch solenoid into transfer plate (Fig. 116).

(38) Install screw to attach solenoid to transfer plate (Fig. 116).

(39) If necessary, insert park rod end into manual lever and install E-clip (Fig. 117).

(40) Insert detent spring and ball into opening in valve body and install Retainer Tool 6583 (Fig. 118).

(41) Install manual valve into valve body (Fig. 119).

(42) Insert throttle lever through transfer plate side of valve body and upward (Fig. 120).

(43) Insert throttle lever into groove in manual valve (Fig. 121).

(44) Install seal, washer, and E-clip to retain manual shaft to valve body (Fig. 120).

(45) Install switch valve and spring, pressure regulator valve and spring, kickdown valve and spring, and throttle valve into valve body (Fig. 122).

DISASSEMBLY AND ASSEMBLY (Continued)

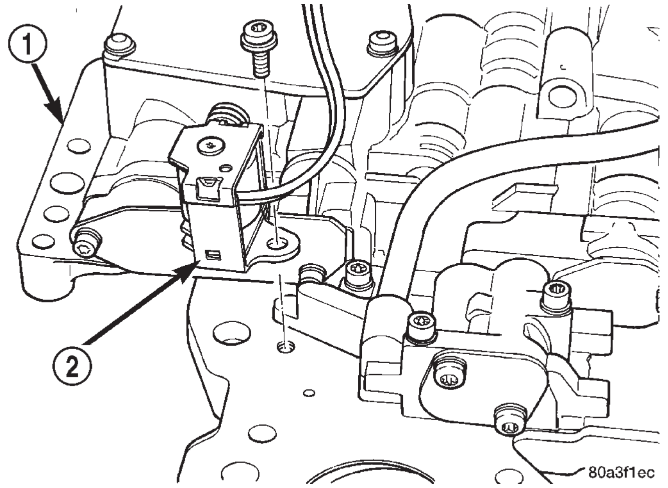


Fig. 116 Converter Clutch Solenoid

1 – VALVE BODY
2 – TORQUE CONVERTER CLUTCH SOLENOID

(46) Place adjusting screw bracket and line pressure adjusting screw in position on valve body and compress springs (Fig. 94).

(47) Install screws to attach adjuster bracket to valve body.

TRANSMISSION

DISASSEMBLY

(1) Remove transmission from vehicle.

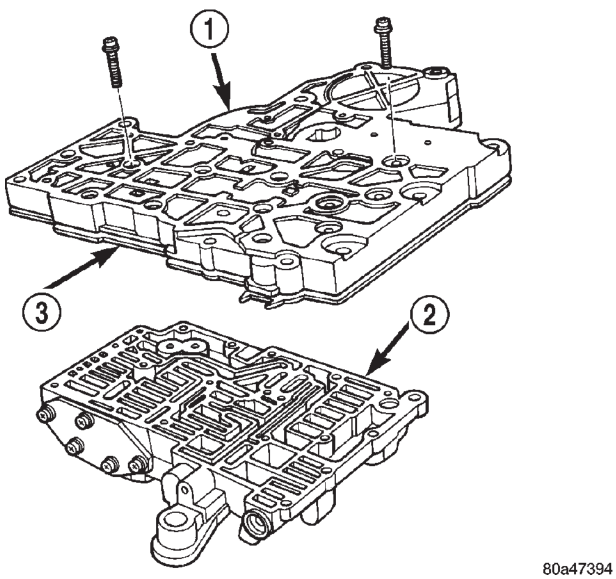


Fig. 113 Valve Body Transfer Plate Screws

1 – TRANSFER PLATE
2 – VALVE BODY
3 – SEPARATOR PLATE

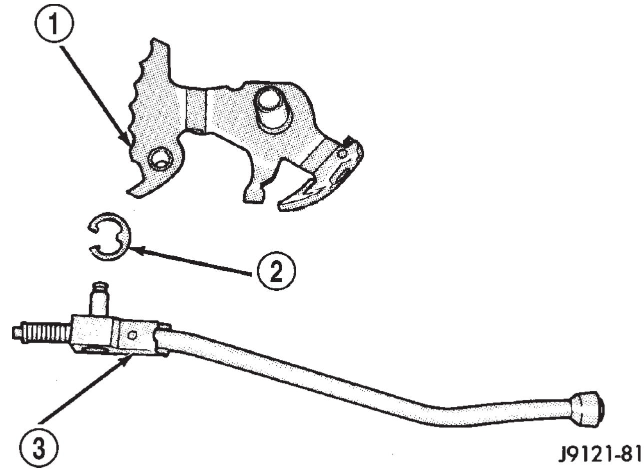


Fig. 117 Park Rod

1 – MANUAL LEVER
2 – E-CLIP
3 – PARK ROD

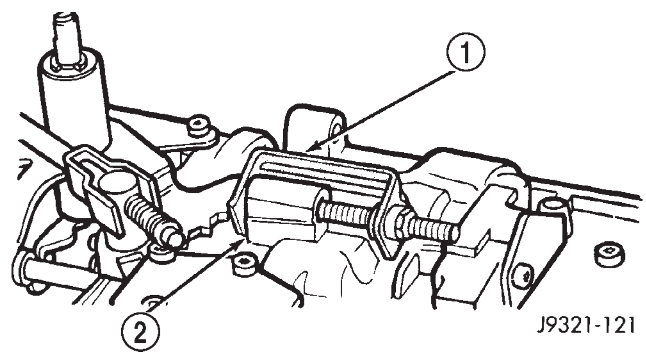


Fig. 118 Securing Detent Ball And Spring With Retainer Tool

1 – SPECIAL TOOL 6583
2 – DETENT BALL AND SPRING HOUSING

(2) Install a suitable tail shaft housing plug to avoid contaminating internal components with cleaning solvents.

(3) Clean exterior of transmission with suitable solvent or pressure washer.

(4) Remove torque converter from transmission.

(5) Remove throttle and shift levers from valve body manual shaft and throttle lever shaft.

(6) Mount transmission in repair stand C-3750-B or similar type stand (Fig. 123).

(7) Remove extension housing.

(8) Remove fluid pan.

(9) Remove park/neutral position switch and seal (Fig. 124).

(10) Remove valve body.

(11) Remove accumulator spring and piston (Fig. 125).

(12) Loosen front band adjusting screw lock nut (Fig. 126) 4-5 turns. Then tighten band adjusting

DISASSEMBLY AND ASSEMBLY (Continued)

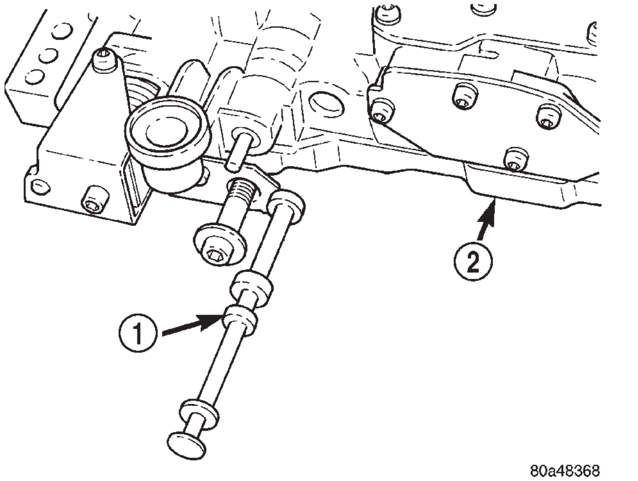


Fig. 119 Manual Valve

1 – MANUAL VALVE
2 – VALVE BODY

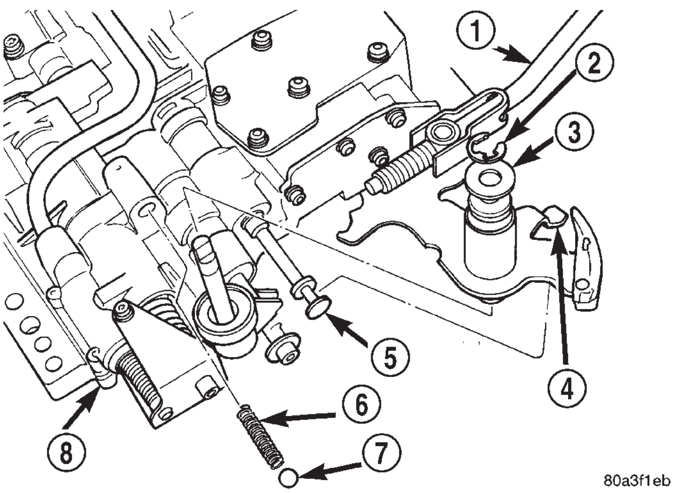


Fig. 120 Manual And Throttle Levers

1 – PARK ROD
2 – E-RING
3 – WASHER
4 – MANUAL LEVER
5 – MANUAL VALVE
6 – SPRING
7 – DETENT BALL
8 – VALVE BODY

screw until band is tight around front clutch. This prevents front/rear clutches from coming out with pump and possibly damaging clutch or pump components.

(13) Remove oil pump bolts.

(14) Thread bolts of Slide Hammer Tools C-3752 into threaded holes in pump body flange (Fig. 127).

(15) Bump slide hammer weights outward to remove pump and reaction shaft support assembly from case (Fig. 127).

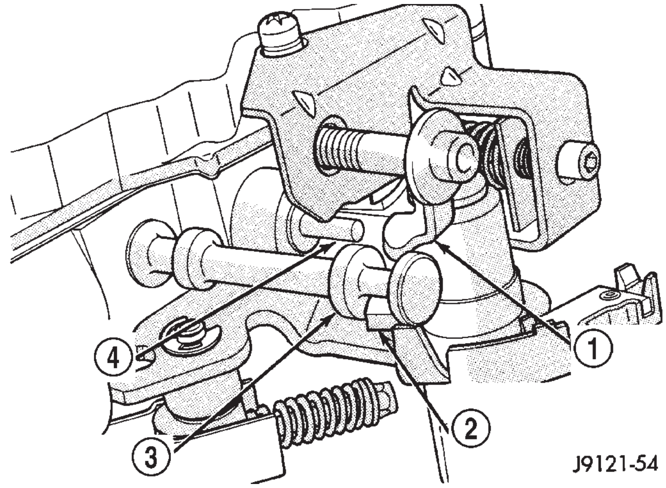


Fig. 121 Manual Valve And Throttle Lever Alignment

1 – THROTTLE LEVER
2 – MANUAL LEVER VALVE ARM
3 – MANUAL VALVE
4 – KICKDOWN VALVE

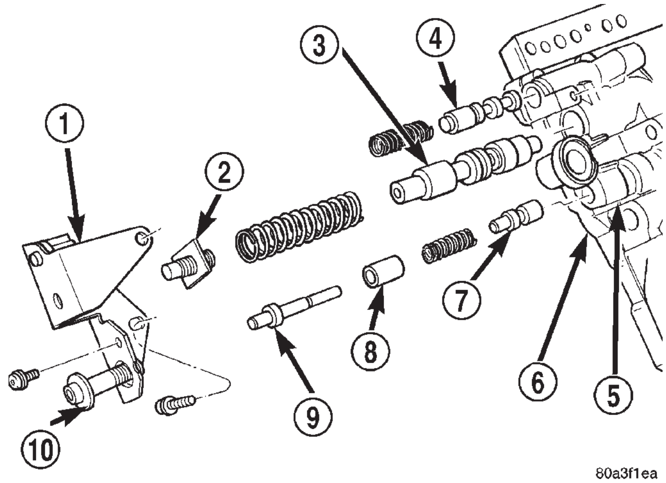


Fig. 122 Adjusting Screw Bracket, Springs, and Valves

1 – ADJUSTER BRACKET
2 – LINE PRESSURE ADJUSTER
3 – PRESSURE REGULATOR VALVE
4 – SWITCH VALVE
5 – VALVE BODY
6 – TRANSFER PLATE
7 – THROTTLE VALVE
8 – SLEEVE
9 – KICKDOWN VALVE
10 – THROTTLE PRESSURE ADJUSTER

(16) Loosen front band adjusting screw until band is completely loose (Fig. 126).

(17) Squeeze front band together and remove band strut (Fig. 128).

DISASSEMBLY AND ASSEMBLY (Continued)

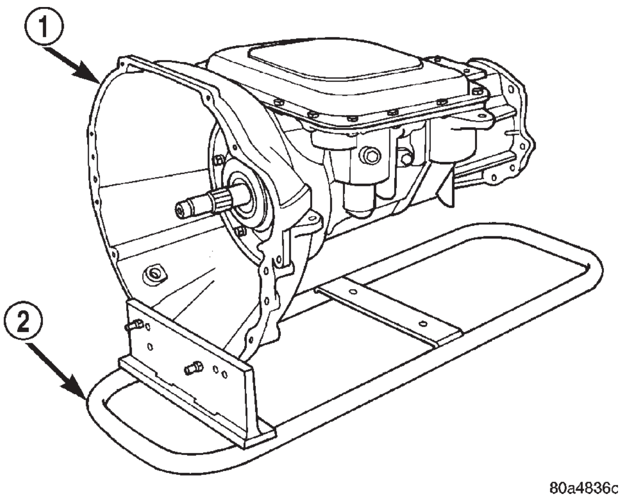


Fig. 123 Repair Stand

1 – TRANSMISSION
2 – STAND

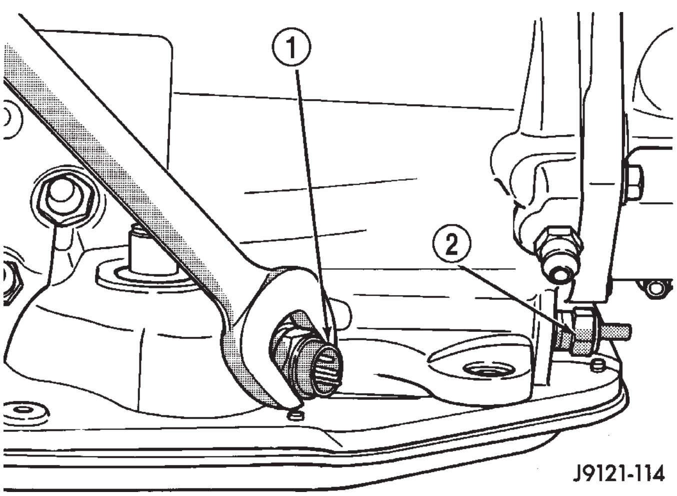


Fig. 124 Park/Neutral Position Switch

1 – NEUTRAL SWITCH
2 – SOLENOID CONNECTOR

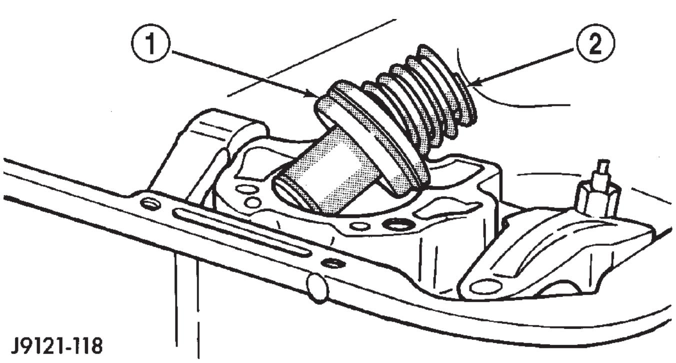


Fig. 125 Accumulator Piston And Spring

1 – ACCUMULATOR PISTON
2 – PISTON SPRING

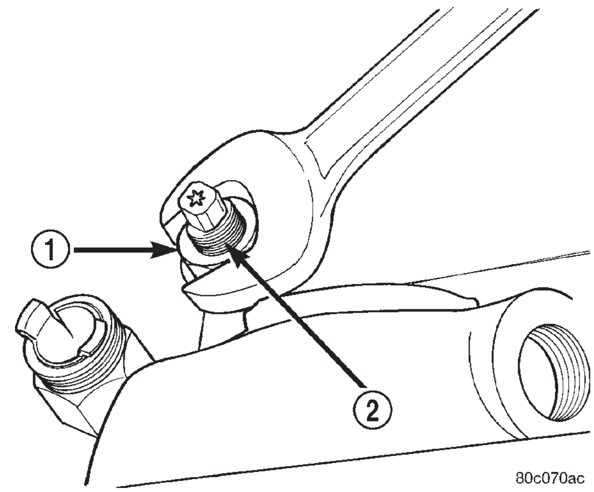


Fig. 126 Front Band Adjusting Screw Lock Nut

1 – LOCK-NUT
2 – FRONT BAND ADJUSTER

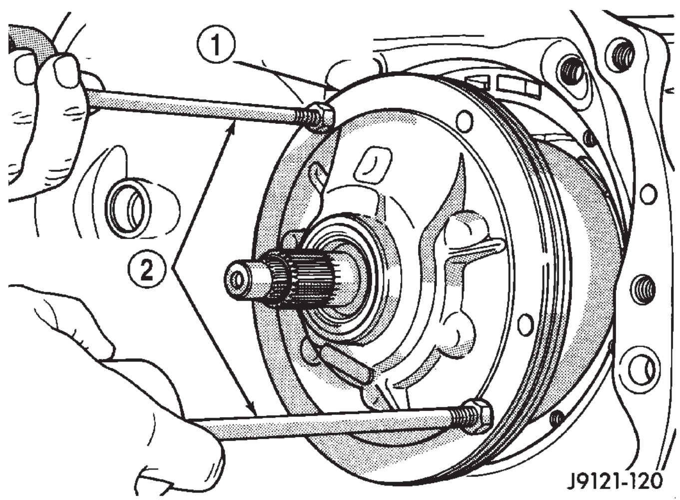


Fig. 127 Oil Pump/Reaction Shaft Support

1 – OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLY
2 – SLIDE HAMMER TOOLS C-3752

DISASSEMBLY AND ASSEMBLY (Continued)

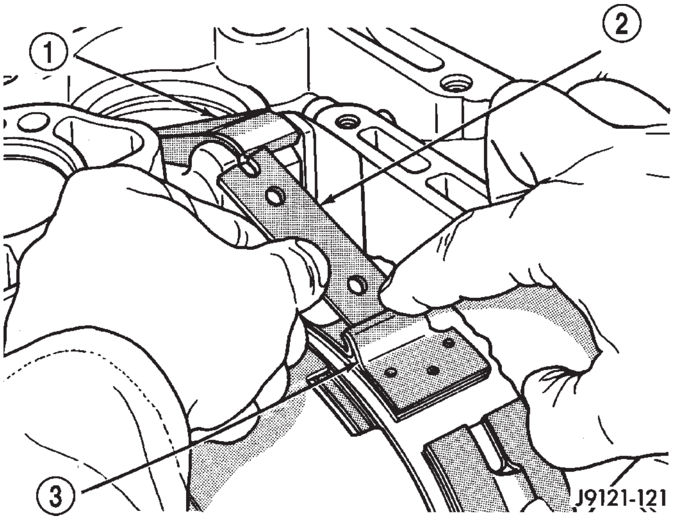


Fig. 128 Front Band Strut

1 – BAND LEVER
2 – BAND STRUT
3 – FRONT BAND

(18) Remove front and rear clutch units as an assembly. Grasp input shaft, hold clutch units together and remove them from case (Fig. 129).

(19) Lift front clutch off rear clutch (Fig. 130). Set clutch units aside for overhaul.

(20) Remove output shaft thrust washer from output shaft (or from rear clutch hub) (Fig. 131).

(21) Remove output shaft thrust plate and washer from output shaft hub (Fig. 131).

(22) Remove front band from case (Fig. 132).

(23) Remove extension housing from transmission case.

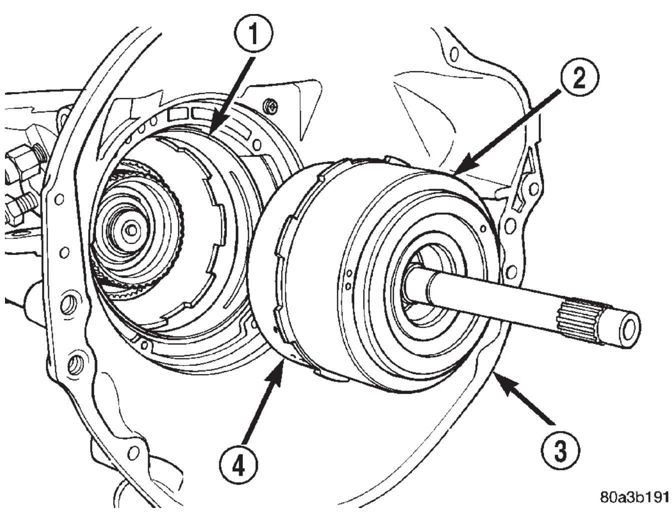


Fig. 129 Front/Rear Clutch Assemblies

1 – FRONT BAND
2 – FRONT CLUTCH AND DRUM
3 – TRANSMISSION HOUSING
4 – REAR CLUTCH

(24) Remove governor body and park gear from output shaft.

(25) Remove output shaft and planetary geartrain as assembly (Fig. 133). Support geartrain with both hands during removal. Do not allow machined surfaces on output shaft to become nicked or scratched.

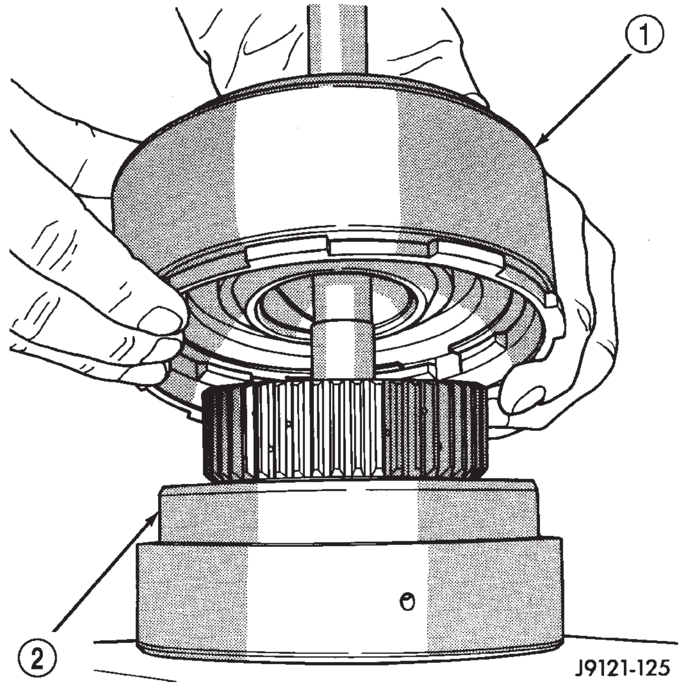


Fig. 130 Separating Front Clutch From Rear Clutch

1 – FRONT CLUTCH
2 – REAR CLUTCH

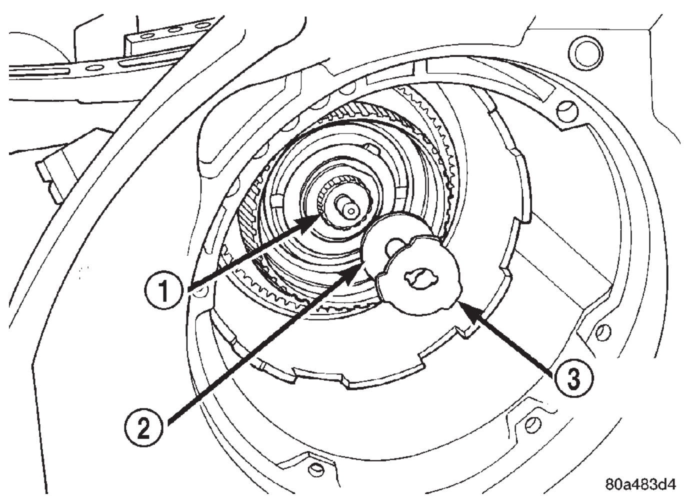


Fig. 131 Output Shaft Thrust Plate and Washer

1 – OUTPUT SHAFT
2 – THRUST PLATE
3 – THRUST WASHER

DISASSEMBLY AND ASSEMBLY (Continued)

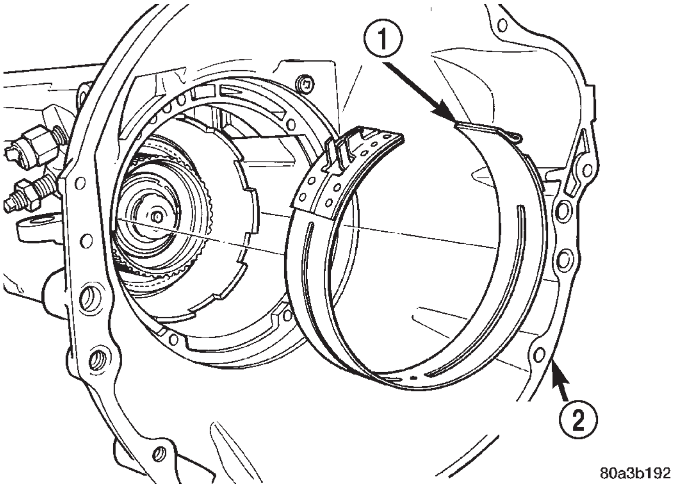


Fig. 132 Front Band

1 – FRONT BAND
2 – TRANSMISSION HOUSING

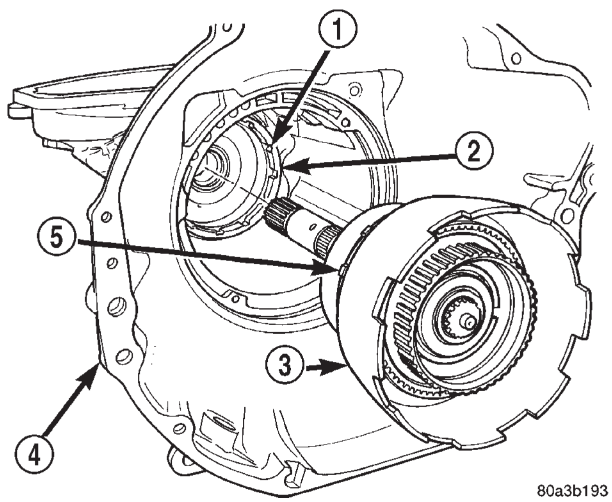


Fig. 133 Planetary Geartrain

1 – SLOTS
2 – LOW-REVERSE DRUM
3 – PLANETARY GEARTRAIN
4 – TRANSMISSION HOUSING
5 – LUGS

(26) Loosen rear band adjusting screw 4-5 turns (Fig. 134).

(27) Remove snap ring that secures low-reverse drum to rear support hub, however do not remove drum (Fig. 135).

(28) Remove bolts attaching rear support to transmission case and pull support from low-reverse drum (Fig. 136).

(29) Remove bolts attaching overrunning clutch cam and low-reverse drum to transmission case (Fig. 137).

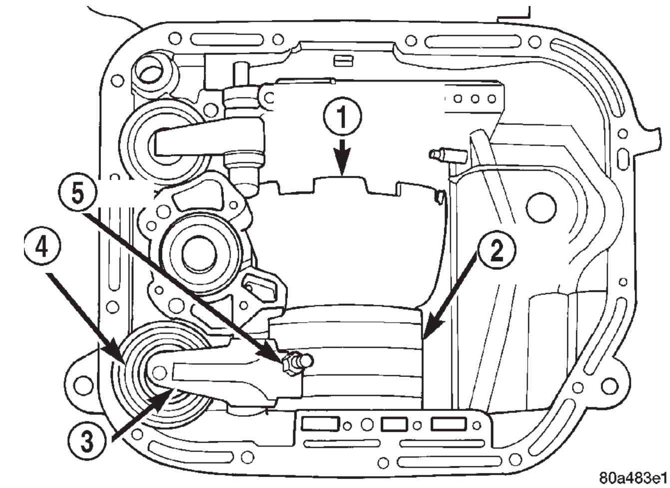


Fig. 134 Rear Band Adjuster Location

1 – PLANETARY GEARTRAIN
2 – REAR BAND
3 – LEVER
4 – SERVO
5 – ADJUSTER

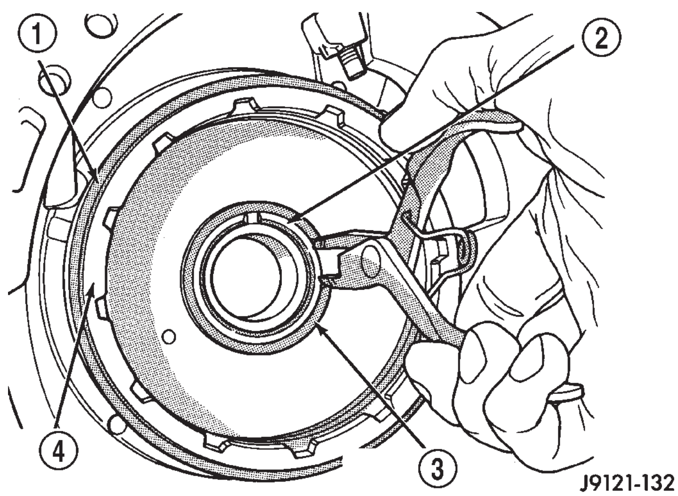


Fig. 135 Low-Reverse Drum Snap Ring

1 – REAR BAND
2 – REAR SUPPORT HUB
3 – LOW-REVERSE DRUM SNAP RING
4 – LOW-REVERSE DRUM

DISASSEMBLY AND ASSEMBLY (Continued)

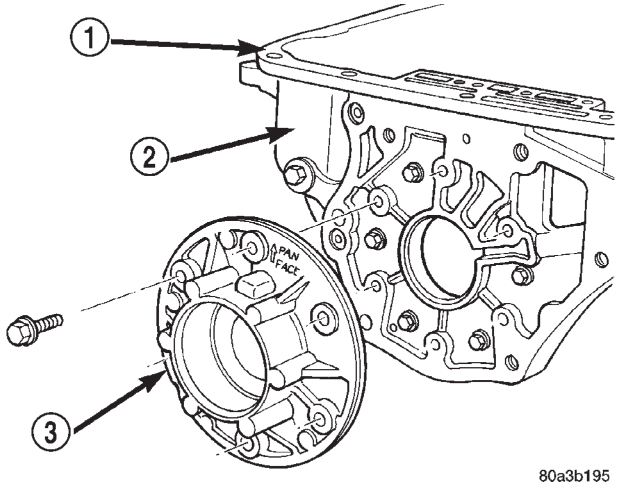


Fig. 136 Rear Support

1 – OIL PAN FACE
2 – TRANSMISSION HOUSING
3 – REAR SUPPORT

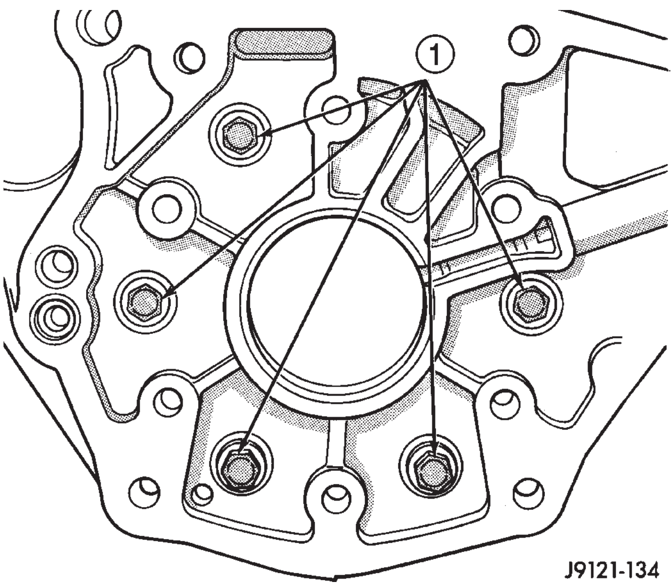


Fig. 137 Overrunning Clutch Cam Bolt Locations

1 – OVERRUNNING CLUTCH CAM BOLTS

(30) Using snap-ring plier, pull rear band anchor pin (located on the servo side of the rear support) from transmission case.

(31) Remove rear band and link from transmission (Fig. 138).

(32) Separate link from rear band (Fig. 139).

(33) If necessary remove front and rear band servo levers. All transmission components can be serviced without removing the levers.

(a) Using a 1/4 inch drive extension remove front band reaction pin access plug (Fig. 140).

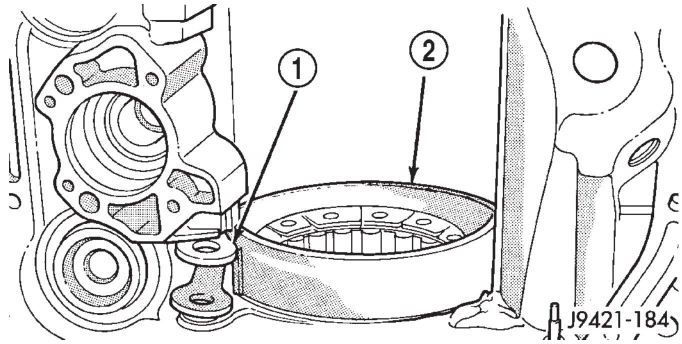


Fig. 138 Rear Band and Link

1 – LINK
2 – REAR BAND

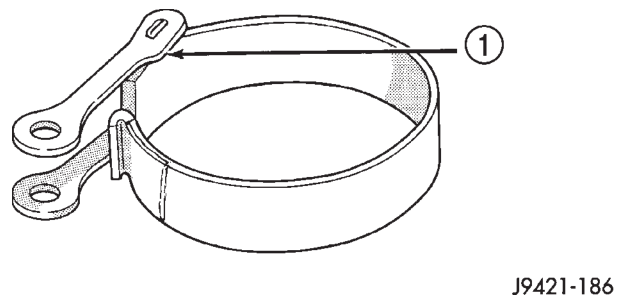


Fig. 139 Rear Band and Link

1 – NOTCHED SIDE OF LINK GOES TOWARD BAND

(b) Remove front band reaction pin with pencil magnet. Pin is accessible from converter housing side of case (Fig. 141).

(c) Remove front band lever (Fig. 142).

(d) Using snap-ring plier, pull rear band lever pivot from transmission case (Fig. 143).

(e) Separate rear band servo lever from transmission.

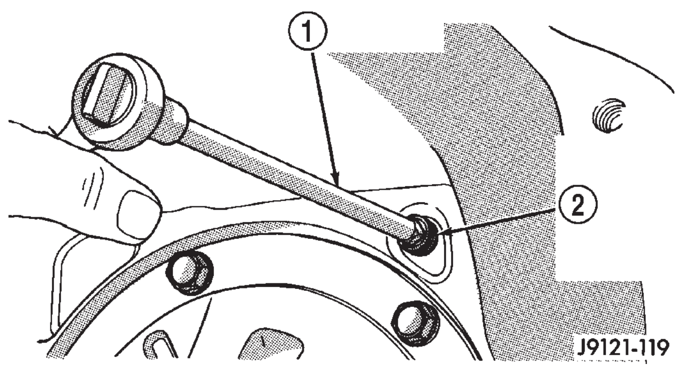


Fig. 140 Front Band Reaction Pin Access Plug

1 – 1/4′′ DRIVE EXTENSION
2 – FRONT BAND REACTION PIN ACCESS PLUG

DISASSEMBLY AND ASSEMBLY (Continued)

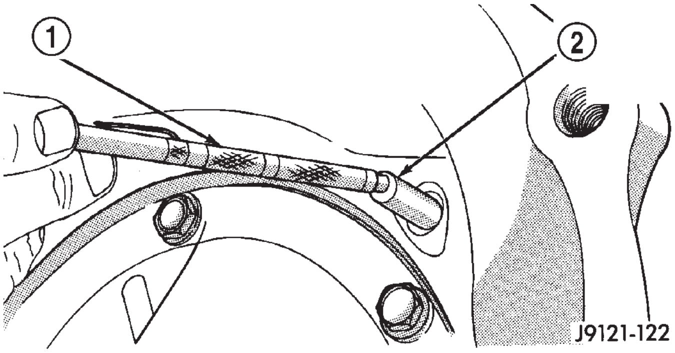


Fig. 141 Front Band Reaction Pin

1 – PENCIL MAGNET
2 – FRONT BAND REACTION PIN

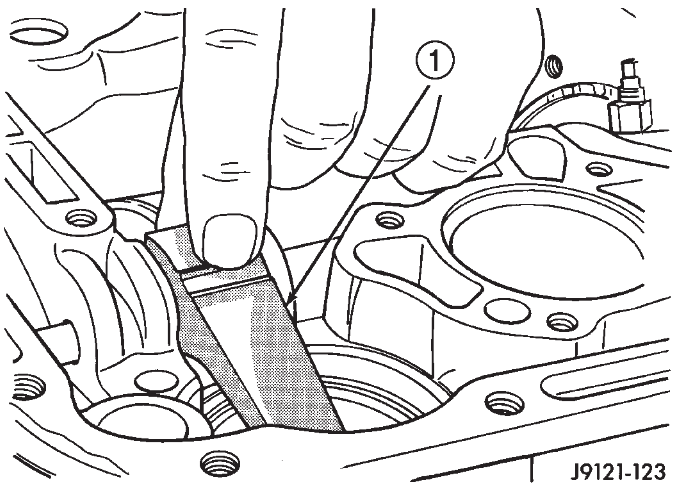


Fig. 142 Front Band Lever

1 – FRONT BAND LEVER

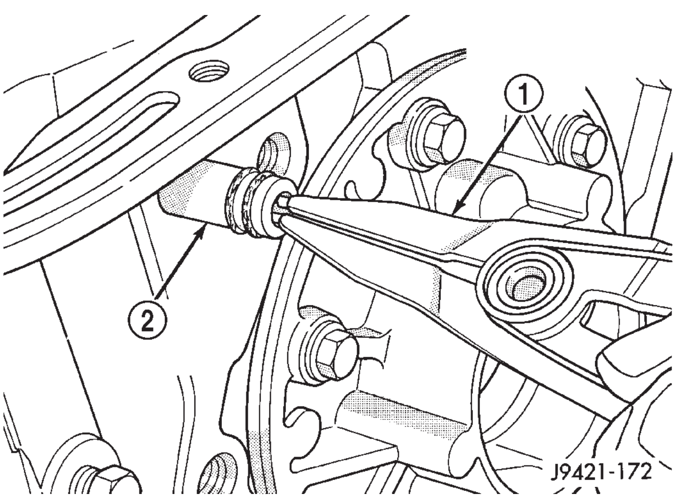


Fig. 143 Rear Band Servo Lever Pin

1 – PARALLEL JAW SNAP RING PLIERS
2 – REAR BAND LEVER PIVOT PIN

(34) Compress front servo rod guide about 1/8 in. with large C-clamp and Tool C-4470, or Spring Compressor Tool C-3422-B (Fig. 144).

(35) Remove front servo rod guide snap ring (Fig. 144). **Exercise caution when removing snap ring. Servo bore can be scratched or nicked if care is not exercised.**

(36) Remove compressor tools and remove front servo rod guide, spring and servo piston.

(37) Compress rear servo spring retainer about 1/16 in. with C-clamp and Tool C-4470 or SP-5560 (Fig. 145). Valve Spring Compressor C-3422-B can also be used to compress spring retainer.

(38) Remove rear servo spring retainer snap ring. Then remove compressor tools and remove rear servo spring and piston.

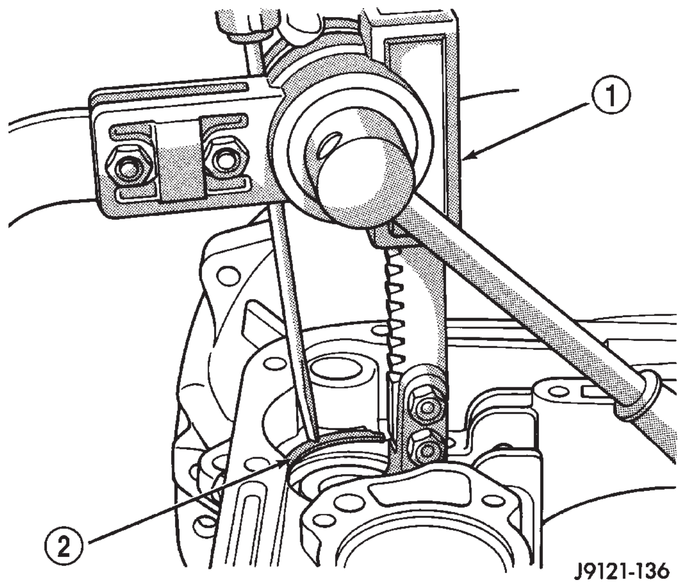


Fig. 144 Compressing Front Servo

1 – SPRING COMPRESSOR TOOL C-3422–B
2 – ROD GUIDE SNAP RING

ASSEMBLY

(1) Install rear servo piston, spring and spring retainer. Compress rear servo spring and retainer with Compressor Tool C-3422-B (Fig. 145) or a large C-clamp.

(2) Install front servo piston, spring, and rod guide. Compress front servo rod guide with Valve Spring Compressor C-3422-B and install servo snap ring (Fig. 144).

(3) Assemble link bar to band. Notched side of link toward band (Fig. 143).

(4) Insert rear band through pan opening in transmission case.

(5) Insert hook on band onto adjuster lever.

(6) Align holes in link bar with hole in transmission case outboard of rear support opening (Fig. 142).

(7) Insert anchor pin into case through link bar.

DISASSEMBLY AND ASSEMBLY (Continued)

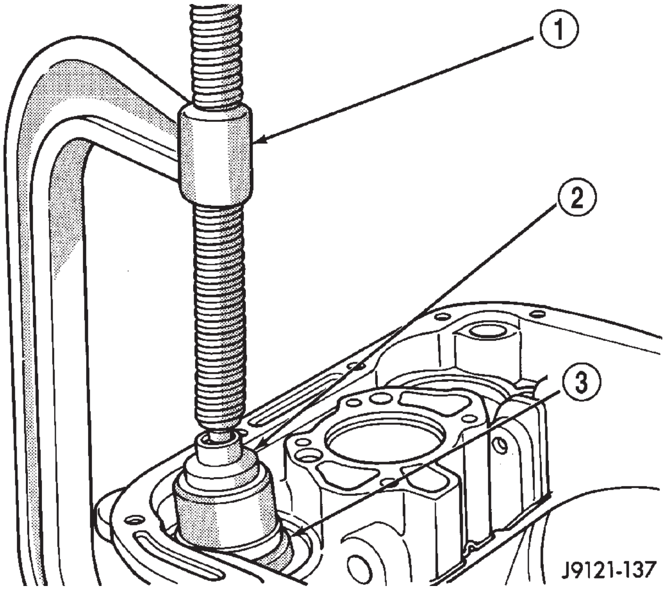


Fig. 145 Compressing Rear Servo Spring

1 – LARGE C-CLAMP
2 – TOOL C-4470 OR SP5560
3 – SERVO SPRING RETAINER

(8) Examine bolt holes in overrunning clutch cam. Note that one hole is **not threaded** (Fig. 146). This hole must align with blank area in clutch cam bolt circle.

NOTE: The bolt holes in cam are slightly countersunk on one side. This side of cam faces rearward (toward rear support).

(9) Lubricate overrunning clutch rollers, springs and cam with Mopar® ATF Plus 3, type 7176, transmission fluid.

(10) Position overrunning clutch on a clean, flat work surface with countersunk holes downward.

(11) Place rear of low-reverse drum over overrunning clutch and align clutch rollers to hub of drum.

(12) While slightly pivoting low-reverse drum, push hub of drum into overrunning clutch. Verify that countersunk holes are facing outward. **Cam should be able to rotate in the drum clockwise only.**

(13) Insert a suitable awl through the rear support mounting hole closest to the pan sealing face. The awl should be next to the wide space area at the back of transmission case.

(14) Insert low-reverse drum and overrunning clutch into front of transmission case and into rear band.

(15) Insert awl tip into the threaded hole next to the non-threaded hole in the overrunning clutch cam. Verify that non-threaded hole is aligned with wide space area on transmission case.

(16) Push low-reverse drum rearward to close gap between cam and case.

(17) Install overrunning clutch cam bolts. **Clutch cam bolts are shorter than rear support bolts.** Tighten cam bolts to 17 N·m (150 in. lbs. or 13 ft. lbs.) torque.

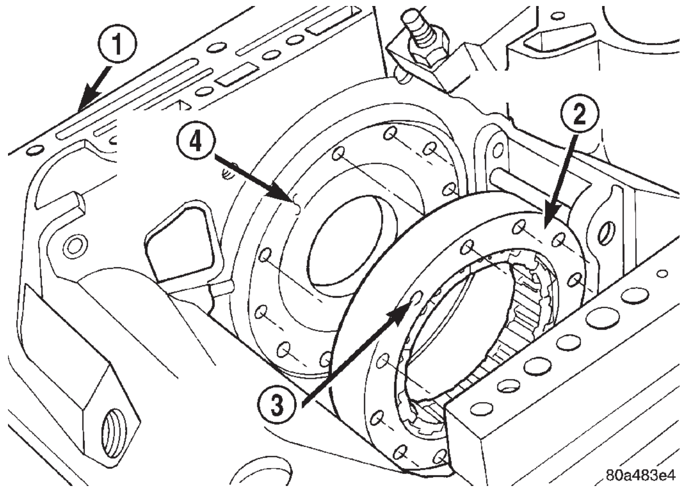


Fig. 146 Clutch Cam Alignment

1 – TRANSMISSION CASE
2 – OVERRUNNING CLUTCH
3 – NON-THREADER HOLE
4 – WIDE SPACE AREA

(18) Hold low-reverse drum in position so rear support will not push it out of overrunning clutch.

(19) Insert rear support into opening at rear of transmission case (Fig. 147).

(20) Align support with the embossed arrow in the direction of the pan face.

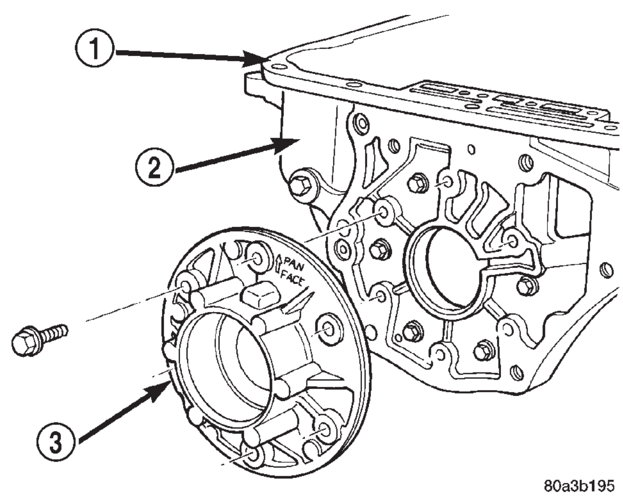


Fig. 147 Rear Support

1 – OIL PAN FACE
2 – TRANSMISSION HOUSING
3 – REAR SUPPORT

DISASSEMBLY AND ASSEMBLY (Continued)

(21) Install and tighten rear support bolts to 17 N·m (150 in. lbs.) torque.

(22) Install snap ring to retain low-reverse drum to hub of rear support (Fig. 148).

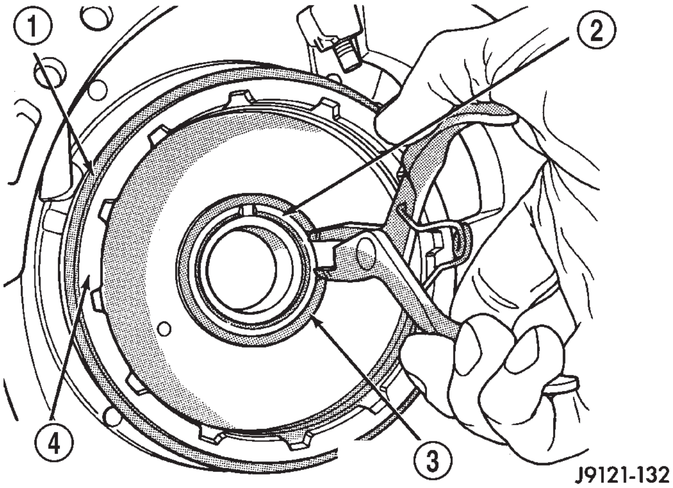


Fig. 148 Low-Reverse Drum Snap Ring

1 – REAR BAND
2 – REAR SUPPORT HUB
3 – LOW-REVERSE DRUM SNAP RING
4 – LOW-REVERSE DRUM

(23) Lubricate output shaft, rear support bore and low-reverse drum hub with transmission fluid.

(24) Install assembled output shaft and planetary geartrain in case (Fig. 149).

(25) Align drive lugs on rear planetary gear with slots in low-reverse drum (Fig. 149). Then seat planetary assembly in drum.

(26) Install governor on output shaft.

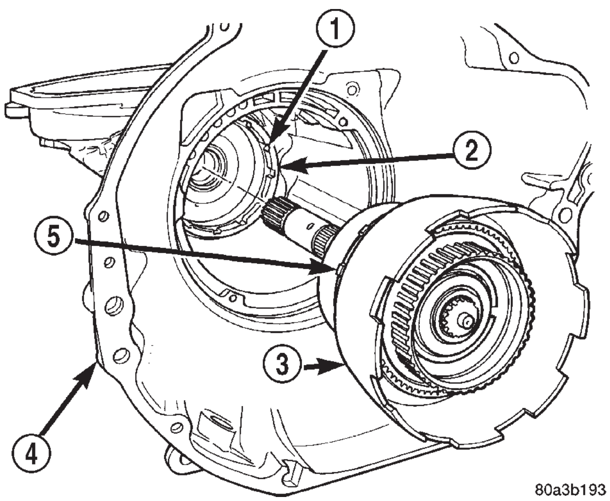


Fig. 149 Output Shaft And Planetary Geartrain

1 – SLOTS
2 – LOW-REVERSE DRUM
3 – PLANETARY GEARTRAIN
4 – TRANSMISSION HOUSING
5 – LUGS

(27) Turn and secure transmission so that front opening is upward.

(28) Assemble front and rear clutches together.

(a) Check input shaft seal rings (Fig. 150). Verify that diagonal-cut ends of Teflon™ seal ring are properly joined and ends of metal ring are correctly hooked together. Also be sure rings are installed in sequence shown.

(b) Align teeth on clutch discs in line.

(c) Insert input shaft on rear clutch into center of front clutch (Fig. 151).

(d) Engage teeth on rear clutch hub into teeth on clutch (Fig. 153). Rotate front clutch retainer back and forth until completely seated on rear clutch.

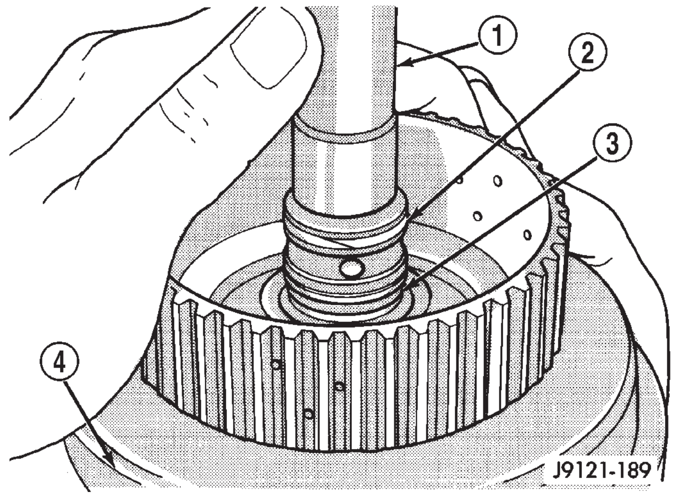


Fig. 150 Input Shaft Seal Ring Location

1 – INPUT SHAFT
2 – TEFLON SEAL RING
3 – METAL SEAL RING
4 – REAR CLUTCH RETAINER

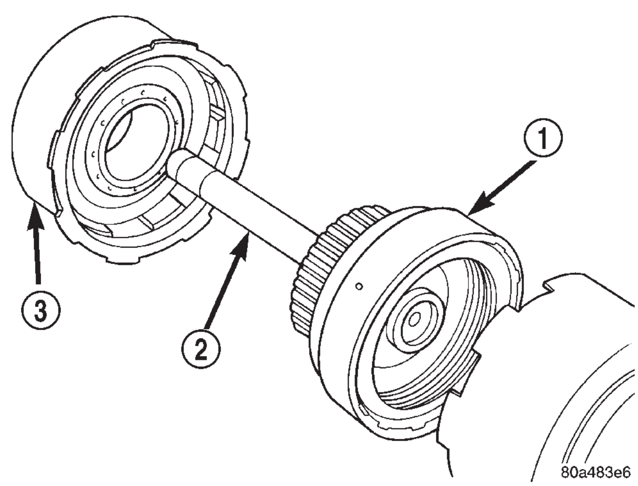


Fig. 151 Front and Rear Clutches

1 – REAR CLUTCH
2 – INPUT SHAFT
3 – FRONT CLUTCH

DISASSEMBLY AND ASSEMBLY (Continued)

(29) Install output shaft thrust plate on shaft hub in planetary geartrain driving shell (Fig. 152). Use petroleum jelly to hold thrust plate in place.

(30) Check rear clutch thrust washer. Use additional petroleum jelly to hold washer in place if necessary.

(31) Coat output shaft thrust washer with petroleum jelly. Install washer in rear clutch hub (Fig. 154). Use enough petroleum jelly to hold washer in place. **Be sure grooved side of washer faces rearward (toward output shaft) as shown. Also note that washer only fits one way in clutch hub.**

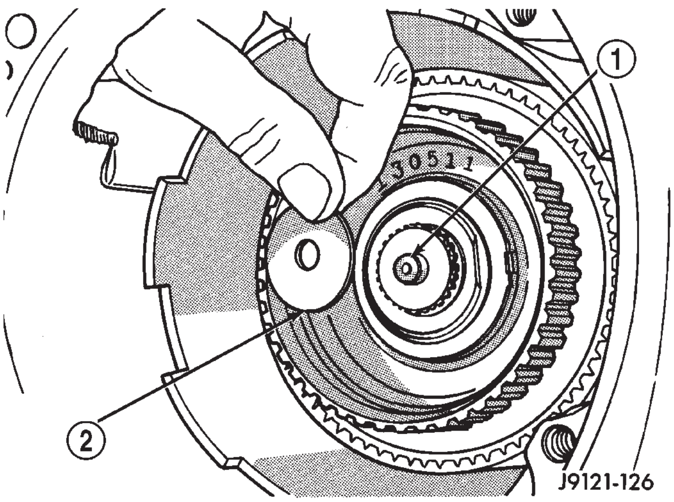


Fig. 152 Output Shaft Thrust Plate

1 – OUTPUT SHAFT HUB
2 – OUTPUT SHAFT THRUST PLATE

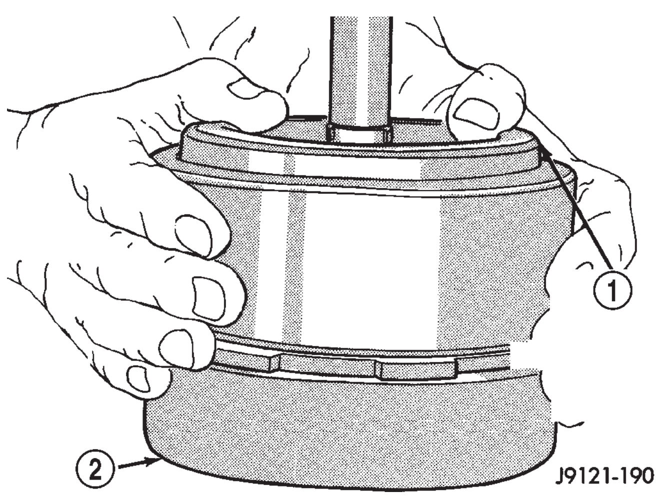


Fig. 153 Assembling Front And Rear Clutch Units

1 – TURN FRONT CLUTCH BACK & FORTH UNTIL SEATED
2 – REAR CLUTCH ASSEMBLY

(32) Align drive teeth on rear clutch discs with small screwdriver (Fig. 155). This will make installation into front of planetary geartrain easier.

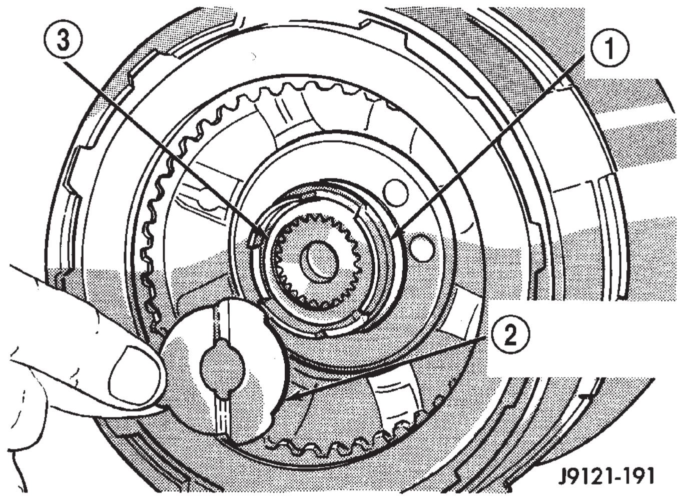


Fig. 154 Output Shaft Thrust Washer

1 – REAR CLUTCH HUB
2 – OUTPUT SHAFT THRUST WASHER
3 – OUTPUT SHAFT

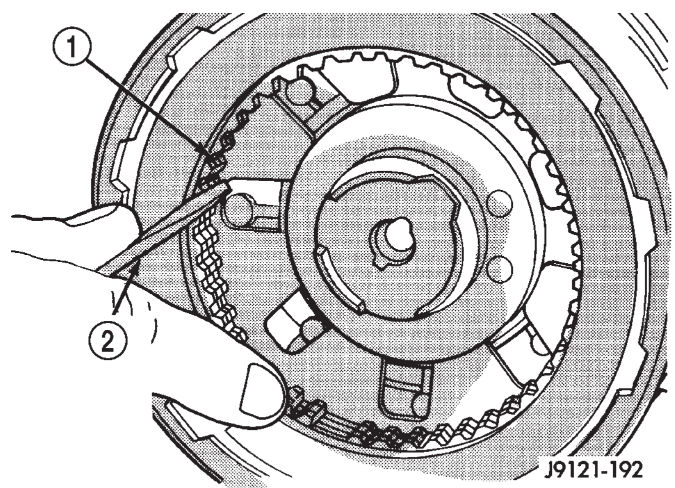


Fig. 155 Aligning Rear Clutch Disc Lugs

1 – REAR CLUTCH DISCS
2 – USE SMALL SCREWDRIVER TO ALIGN CLUTCH DISC TEETH

(33) Insert front band into opening at front of transmission case (Fig. 156).

(34) Install front and rear clutch units as assembly (Fig. 157). Align rear clutch with front annulus gear and install assembly in driving shell. **Be sure output shaft thrust washer and thrust plate are not displaced during installation.**

(35) Carefully work assembled clutches back and forth to engage and seat rear clutch discs on front annulus gear. Verify that front clutch drive lugs are

DISASSEMBLY AND ASSEMBLY (Continued)

fully engaged in slots of driving shell after installation.

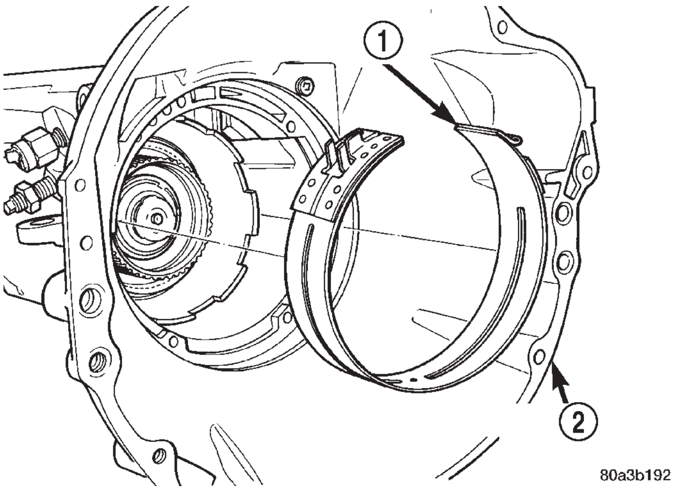


Fig. 156 Front Band

1 – FRONT BAND
2 – TRANSMISSION HOUSING

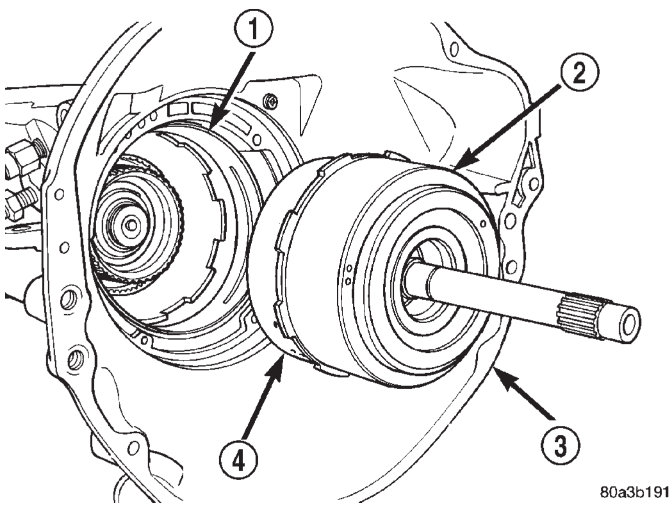


Fig. 157 Installing Front/Rear Clutch

1 – FRONT BAND
2 – FRONT CLUTCH AND DRUM
3 – TRANSMISSION HOUSING
4 – REAR CLUTCH

(36) Engage front band on adjusting screw and hold band in place.

(37) Install strut between band lever and front band (Fig. 158).

(38) Tighten front band adjusting screw until band just grips clutch retainer. Verify that front/rear clutches are still seated before continuing.

(39) Verify that reaction shaft support hub seal rings are hooked together (Fig. 159).

(40) Coat front clutch thrust washer with petroleum jelly to hold it in place. Then install washer over reaction shaft hub and seat it on pump (Fig. 160).

CAUTION: The thrust washer bore (I. D.), is chamfered on one side. Make sure the chamfered side is installed so it faces the pump.

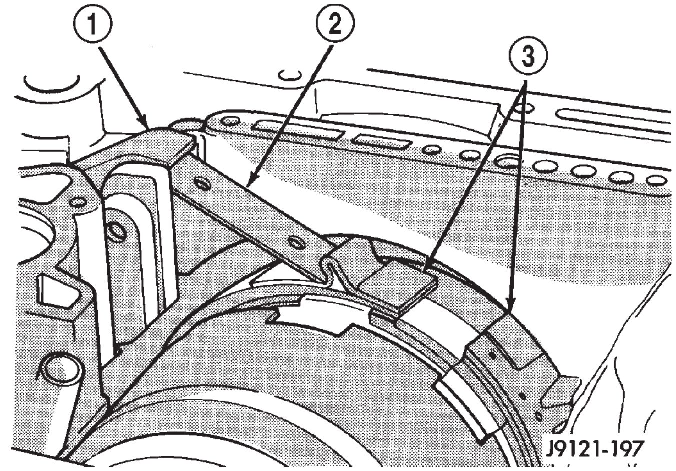


Fig. 158 Front Band Linkage Installation

1 – BAND LEVER
2 – BAND STRUT
3 – FRONT BAND

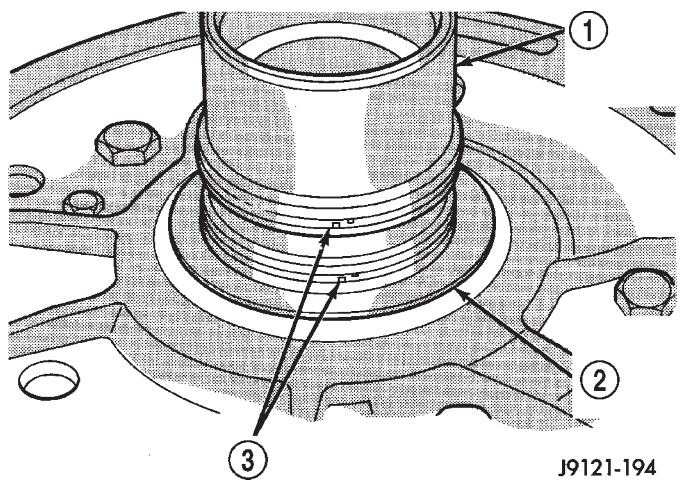


Fig. 159 Reaction Shaft Support Seal Rings

1 – REACTION SHAFT SUPPORT HUB
2 – FRONT CLUTCH THRUST WASHER
3 – SEAL RINGS

DISASSEMBLY AND ASSEMBLY (Continued)

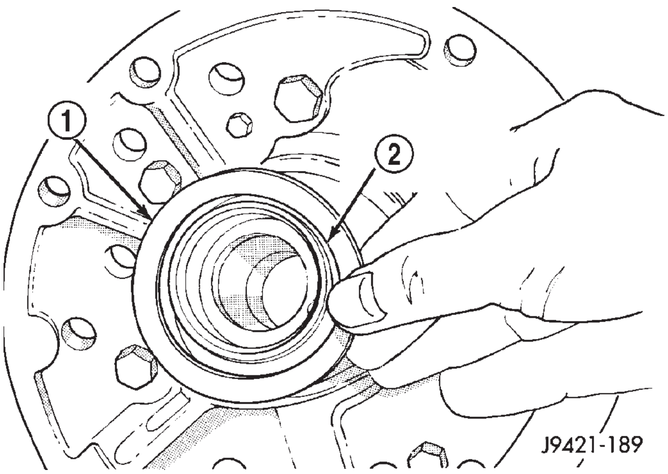


Fig. 160 Front Clutch Thrust Washer Installation

1 – THRUST WASHER
2 – CHAMFERED SIDE OF WASHER BORE GOES TOWARD PUMP

(41) Thread two Pilot Stud Tools C-3288-B into bolt holes in oil pump flange (Fig. 161).

(42) Align and install oil pump gasket (Fig. 161).

(43) Lubricate oil pump seals with Mopar® Door-Ease, or Ru-Glyde, Door Eze, or ATF Plus 3.

(44) Install oil pump (Fig. 162). Align and position pump on pilot studs. Slide pump down studs and work it into front clutch hub and case by hand. Then install two or three pump bolts to hold pump in place.

(45) Remove pilot stud tools and install remaining oil pump bolts. Tighten bolts alternately in diagonal pattern to 20 N·m (15 ft. lbs.).

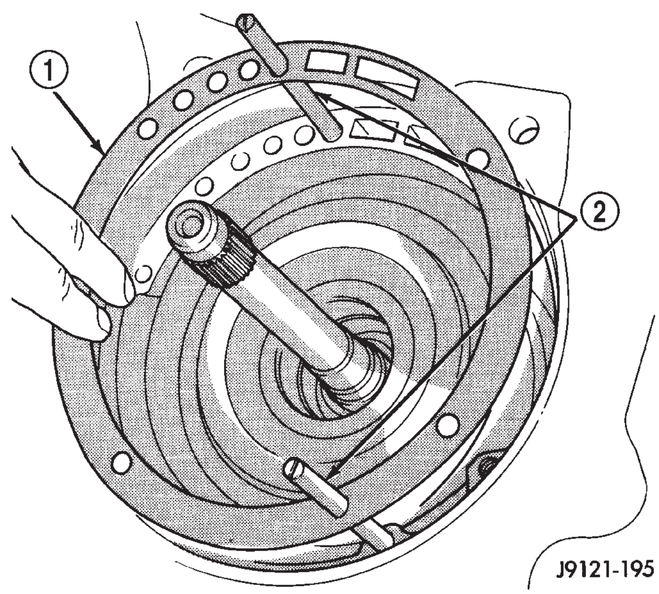


Fig. 161 Installing Pilot Studs And Oil Pump Gasket

1 – OIL PUMP GASKET
2 – PILOT STUD TOOLS C-3288–B

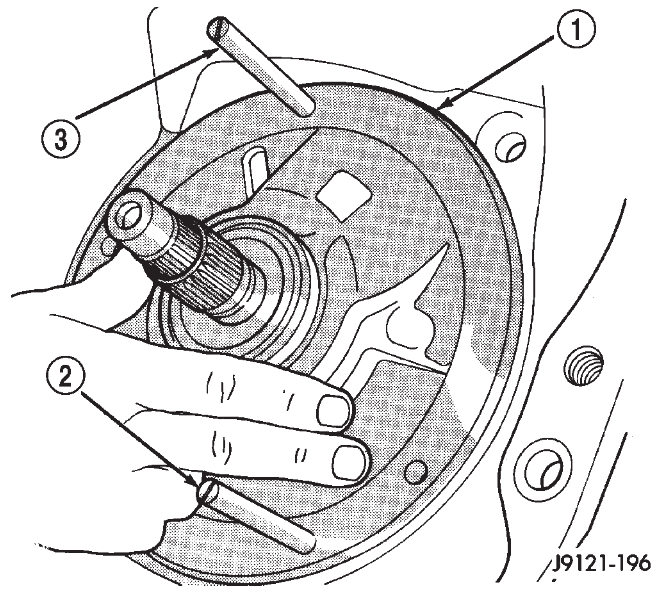


Fig. 162 Installing Oil Pump And Reaction Shaft Support

1 – OIL PUMP
2 – PILOT STUD TOOL
3 – PILOT STUD TOOL

(46) Measure input shaft end play (Fig. 163).

NOTE: If end play is incorrect, transmission is incorrectly assembled, or output shaft thrust washer and/or thrust plate are worn and need to be changed.

(a) Attach Adapter 8266–7 to Handle 8266–8.

(b) Attach dial indicator C-3339 to Handle 8266–8.

(c) Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266–7 to secure it to the input shaft.

(d) Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.

(e) Move input shaft in and out and record reading. End play should be 0.56 - 2.31 mm (0.022 - 0.091 in.).

(47) Position transmission on work surface with pan face upward.

(48) Install valve body.

(49) Adjust front and rear bands.

(50) Install fluid filter and pan.

(51) Install rear extension housing.

(52) Install torque converter.

DISASSEMBLY AND ASSEMBLY (Continued)

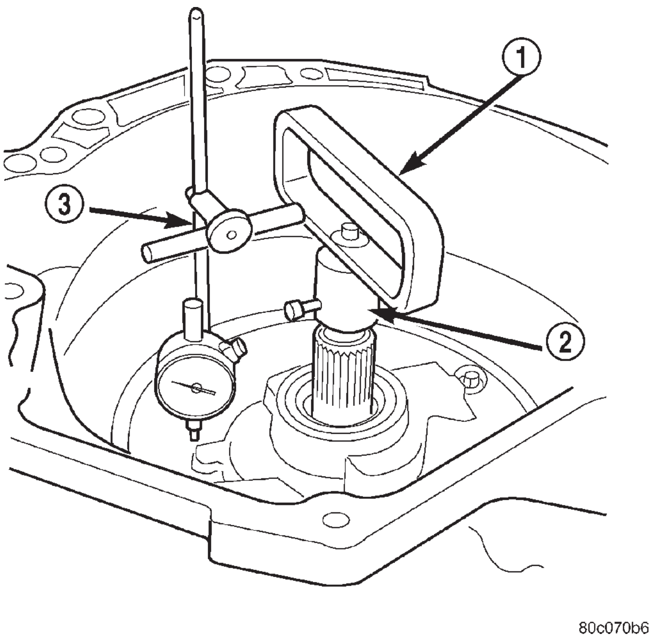


Fig. 163 Checking Input Shaft End Play

1 – TOOL 8266-8
2 – TOOL 8266-7
3 – TOOL C-3339

OVERRUNNING CLUTCH/LOW-REVERSE DRUM

DISASSEMBLY

(1) If the clutch assembly came out with the low-reverse drum, thread two clutch cam bolts into the cam. Then lift the cam out of the drum with the bolts (Fig. 164). Rotate the cam back and forth to ease removal if necessary.

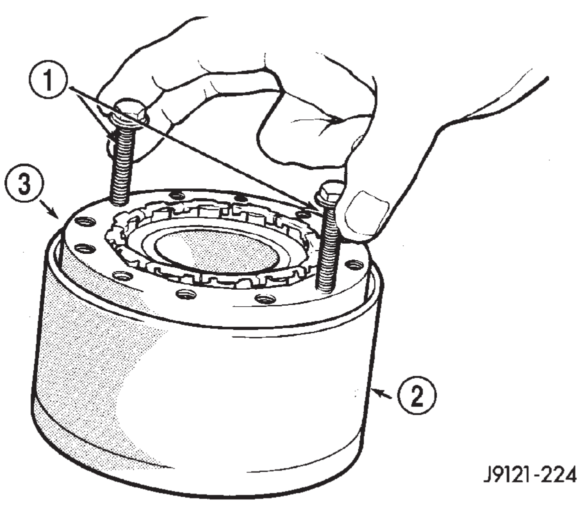


Fig. 164 Removing Overrunning Clutch From Low-Reverse Drum

1 – CAM BOLTS
2 – LOW-REVERSE DRUM
3 – OVERRUNNING CLUTCH AND CAM

(2) Remove the clutch roller and spring assembly from the overrunning clutch race.

ASSEMBLY

(1) Assemble clutch rollers and springs in retainer if necessary (Fig. 165).

(2) Install overrunning clutch roller, spring and retainer assembly in clutch cam (Fig. 166).

(3) Temporarily assemble and check overrunning clutch operation as follows:

(a) Assemble cam and clutch.

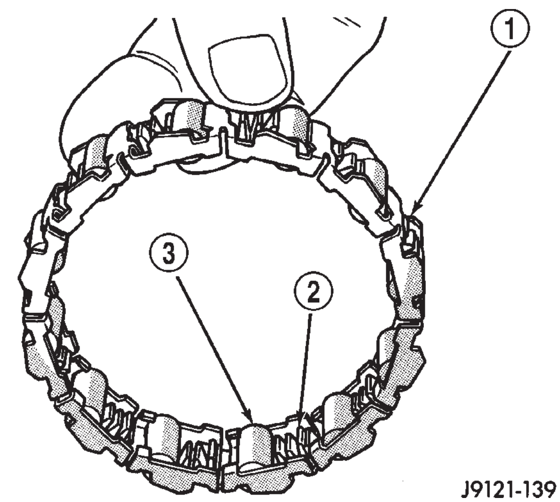


Fig. 165 Overrunning Clutch Rollers, Springs, Retainer

1 – RETAINER
2 – SPRING
3 – ROLLER

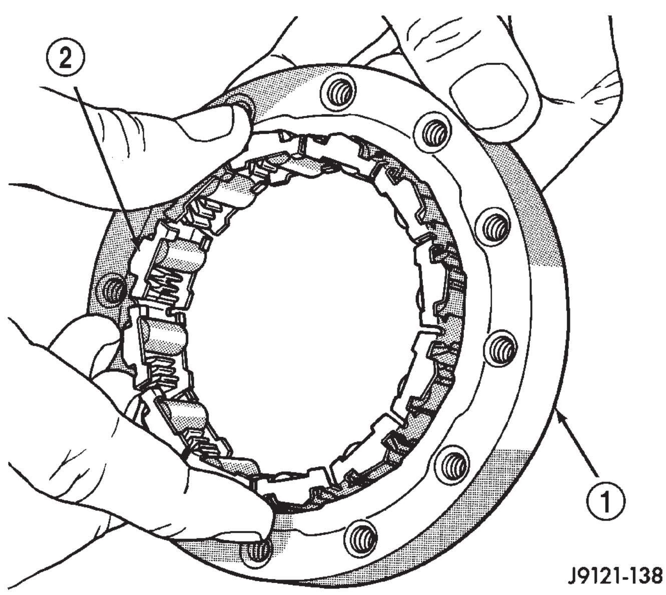


Fig. 166 Assembling Overrunning Clutch And Cam

1 – CLUTCH CAM
2 – CLUTCH ROLL ASSEMBLY

DISASSEMBLY AND ASSEMBLY (Continued)

(b) Install clutch assembly on low-reverse drum with twisting motion (Fig. 167).

(c) Install drum-clutch assembly in case and install clutch cam bolts.

(d) Install rear support and support attaching bolts.

(e) Check low-reverse drum rotation. **Drum should rotate freely in clockwise direction and lock when turned in counterclockwise direction (as viewed from front of case).**

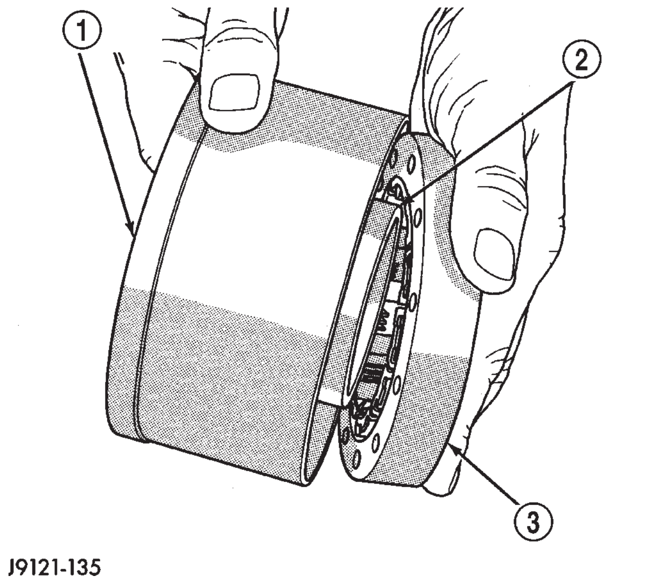


Fig. 167 Temporary Assembly Of Clutch And Drum To Check Operation

1 – LOW-REVERSE DRUM
2 – CLUTCH RACE (ON HUB OF DRUM)
3 – OVERRUNNING CLUTCH

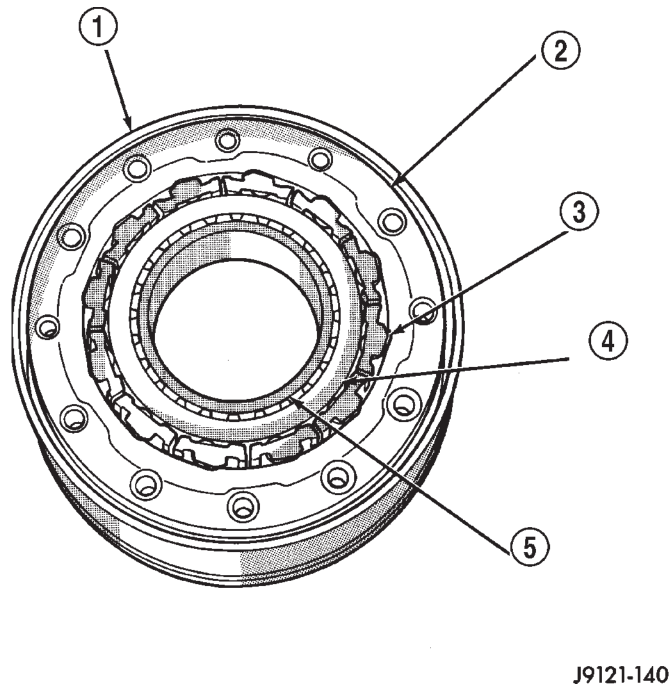


Fig. 168 Assembled Overrunning Clutch

1 – LOW-REVERSE DRUM
2 – OVERRUNNING CLUTCH CAM
3 – ROLLER AND SPRING ASSEMBLY
4 – CLUTCH RACE
5 – HUB OF LOW-REVERSE DRUM

FRONT SERVO PISTON

DISASSEMBLY

(1) Remove seal ring from rod guide (Fig. 169).

(2) Remove small snap ring from servo piston rod. Then remove piston rod, spring and washer from piston.

(3) Remove and discard servo component O-ring and seal rings.

ASSEMBLY

(1) Lubricate new O-ring and seal rings with petroleum jelly and install them on piston, guide and rod.

(2) Install rod in piston. Install spring and washer on rod. Compress spring and install snap ring (Fig. 169).

(3) Set servo components aside for installation during transmission reassembly.

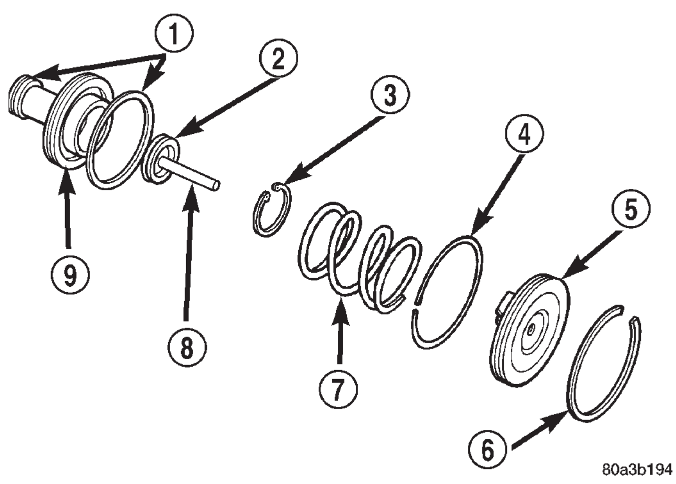


Fig. 169 Front Servo

1 – PISTON RINGS
2 – O-RING
3 – SNAP-RING
4 – SEAL RING
5 – PISTON ROD GUIDE
6 – SNAP-RING
7 – SERVO SPRING
8 – PISTON ROD
9 – SERVO PISTON

DISASSEMBLY AND ASSEMBLY (Continued)

REAR SERVO PISTON

DISASSEMBLY

(1) Remove small snap ring and remove plug and spring from servo piston (Fig. 170).

(2) Remove and discard servo piston seal ring.

ASSEMBLY

(1) Lubricate piston and guide seals with petroleum jelly. Lubricate other servo parts with Mopar® ATF Plus 3, Type 7176, transmission fluid.

(2) Install new seal ring on servo piston.

(3) Assemble piston, plug, spring and new snap ring.

(4) Lubricate piston seal lip with petroleum jelly.

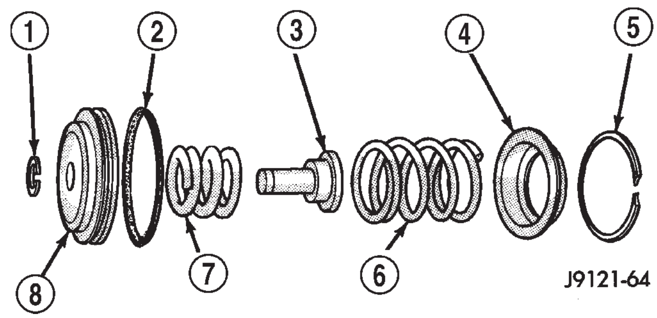


Fig. 170 Rear Servo Components

1 – SNAP RING
2 – PISTON SEAL
3 – PISTON PLUG
4 – SPRING RETAINER
5 – SNAP RING
6 – PISTON SPRING
7 – CUSHION SPRING
8 – PISTON

OIL PUMP AND REACTION SHAFT SUPPORT

DISASSEMBLY

(1) Remove seal ring from housing and reaction shaft support (Fig. 171).

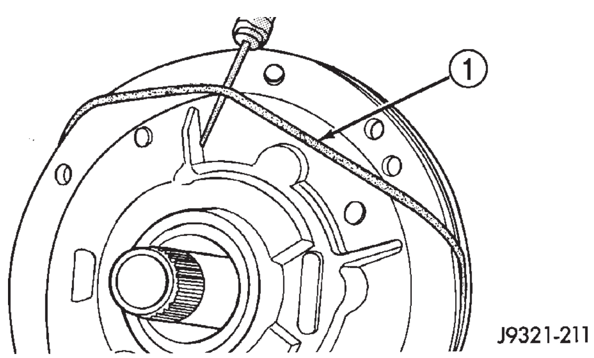


Fig. 171 Removing Pump Seal Ring

1 – PUMP HOUSING SEAL RING

(2) Mark pump housing and support assembly for alignment reference.

(3) Remove bolts attaching pump body to support (Fig. 172).

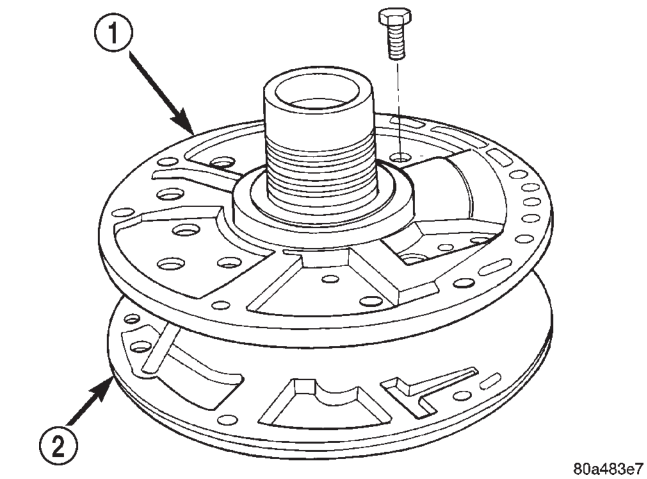


Fig. 172 Pump Support Bolts

1 – REACTION SHAFT SUPPORT
2 – PUMP

(4) Separate support from pump housing (Fig. 173).

(5) Remove inner and outer gears from reaction shaft support (Fig. 174).

(6) If pump seal was not removed during transmission disassembly, remove seal with punch and hammer.

(7) Remove front clutch thrust washer from support hub (Fig. 175).

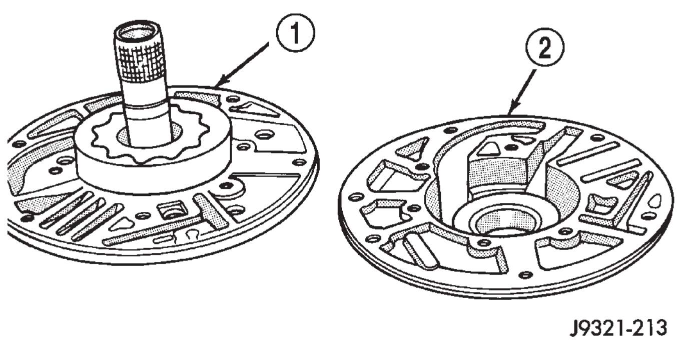


Fig. 173 Separating Pump Housing From Reaction Shaft Support

1 – REACTION SHAFT SUPPORT
2 – PUMP HOUSING

DISASSEMBLY AND ASSEMBLY (Continued)

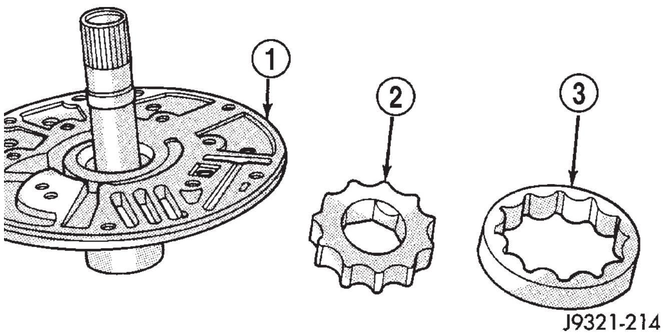


Fig. 174 Pump Gear Removal

1 – REACTION SHAFT SUPPORT
2 – INNER GEAR
3 – OUTER GEAR

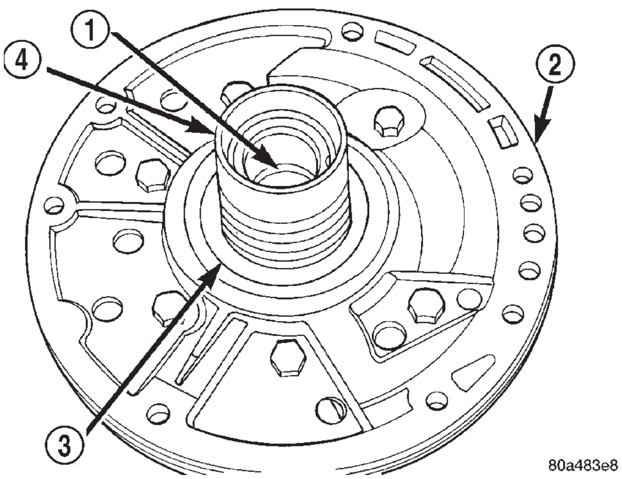


Fig. 175 Support Hub Thrust Washer

1 – BUSHING
2 – REACTION SHAFT SUPPORT
3 – THRUST WASHER
4 – HUB

OIL PUMP BUSHING REPLACEMENT

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 from Tool Set C-3887-J (Fig. 176).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 176). Bushing should be flush with pump housing bore.

(3) Stake new pump bushing in two places with blunt punch (Fig. 177). Remove burrs from stake points with knife blade afterward.

REACTION SHAFT SUPPORT BUSHING REMOVAL

(1) Assemble Bushing Remover Tools SP-1191, 3633 and 5324 (Fig. 178). **Do not clamp any part of reaction shaft or support in vise.**

(2) Hold Cup Tool SP-3633 firmly against reaction shaft and thread remover SP-5324 into bushing as far as possible by hand. Then thread remover tool 3-4 additional turns into bushing with a wrench.

(3) Turn remover tool hex nut down against remover cup to pull bushing from shaft. Clean all chips from shaft after bushing removal.

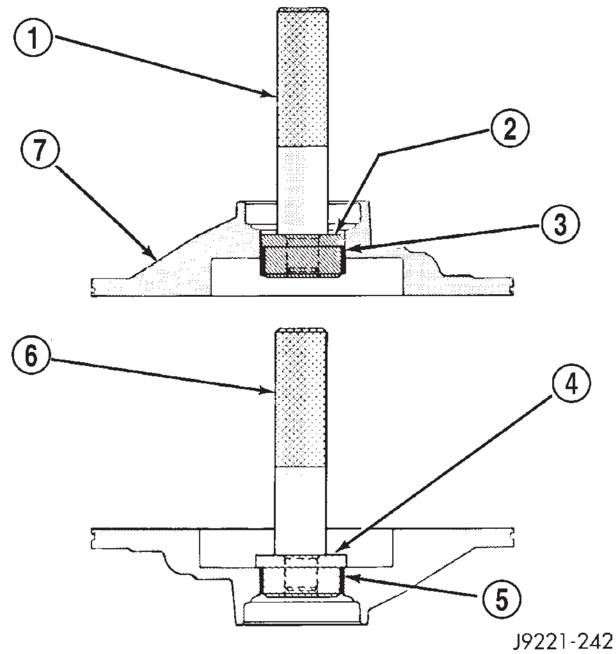


Fig. 176 Removing Oil Pump Bushing

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL SP-3551
3 – BUSHING
4 – SPECIAL TOOL SP-5117
5 – BUSHING
6 – SPECIAL TOOL C-4171
7 – PUMP HOUSING

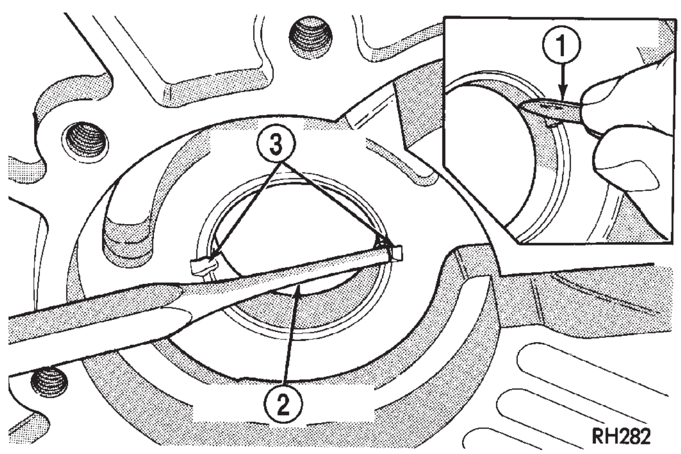


Fig. 177 Staking Oil Pump Bushing

1 – NARROW BLADE
2 – BLUNT PUNCH
3 – TWO STAKES

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Lightly grip old bushing in vise or with pliers and back remover tool out of bushing.

(5) Assemble Bushing Installer Tools C-4171 and SP-5325 (Fig. 178).

(6) Slide new bushing onto Installer Tool SP-5325.

(7) Position reaction shaft support upright on a clean smooth surface.

(8) Align bushing in bore. Then tap bushing into place until Bushing Installer SP-5325 bottoms.

(9) Clean reaction shaft support thoroughly after installing bushing.

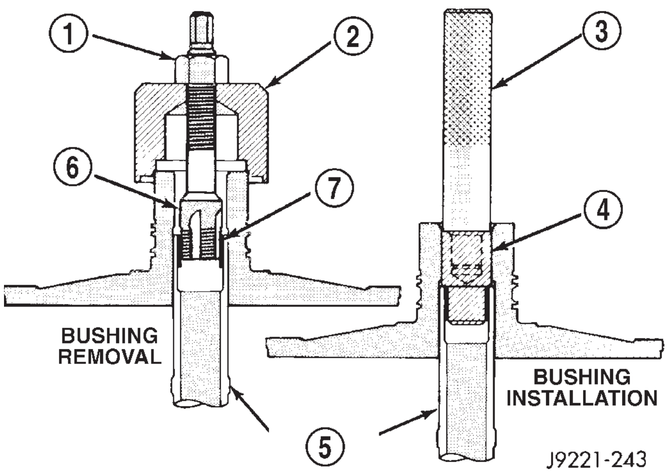


Fig. 178 Replacing Reaction Shaft Support Bushing

1 – SPECIAL TOOL SP-1191
2 – SPECIAL TOOL SP-3633
3 – SPECIAL TOOL C-4171
4 – SPECIAL TOOL SP-5325
5 – REACTION SHAFT
6 – SPECIAL TOOL SP-5324
7 – BUSHING

ASSEMBLY

(1) Lubricate gear bore in pump housing with transmission fluid.

(2) Lubricate pump gears with transmission fluid.

(3) Support pump housing on wood blocks (Fig. 179).

(4) Install outer gear in pump housing (Fig. 179). Gear can be installed either way (it is not a one-way fit).

(5) Install pump inner gear (Fig. 180).

CAUTION: The pump inner gear is a one way fit. The bore on one side of the gear inside diameter (I. D.) is chamfered. Be sure the chamfered side faces forward (to front of pump).

(6) Install new thrust washer on hub of reaction shaft support. Lubricate washer with transmission fluid or petroleum jelly.

(7) If reaction shaft seal rings are being replaced, install new seal rings on support hub (Fig. 181).

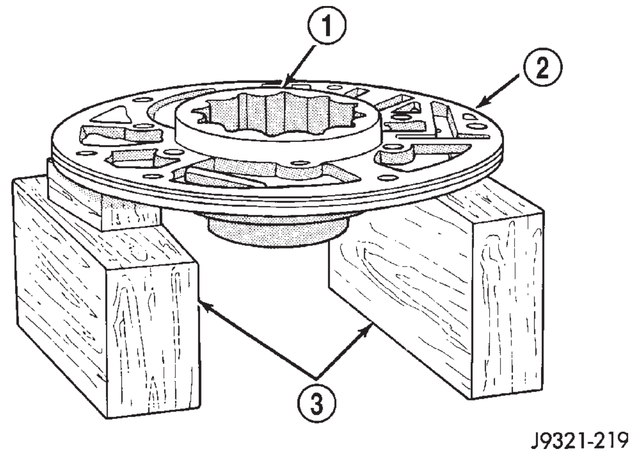


Fig. 179 Supporting Pump And Installing Outer Gear

1 – OUTER GEAR
2 – PUMP HOUSING
3 – WOOD BLOCKS

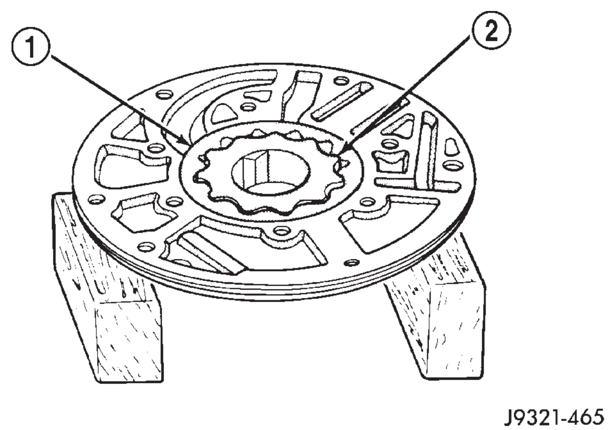


Fig. 180 Pump Inner Gear Installation

1 – OUTER GEAR
2 – INNER GEAR

Lubricate seal rings with transmission fluid or petroleum jelly after installation. Squeeze each ring until ring ends are securely hooked together.

CAUTION: The reaction shaft support seal rings will break if overspread, or twisted. If new rings are being installed, spread them only enough for installation. Also be very sure the ring ends are securely hooked together after installation. Otherwise, the rings will either prevent pump installation, or break during installation.

(8) Install reaction shaft support on pump housing (Fig. 182).

(9) Align reaction support on pump housing. Use alignment marks made at disassembly. Or, rotate support until bolt holes in support and pump housing are all aligned (holes are offset for one-way fit).

DISASSEMBLY AND ASSEMBLY (Continued)

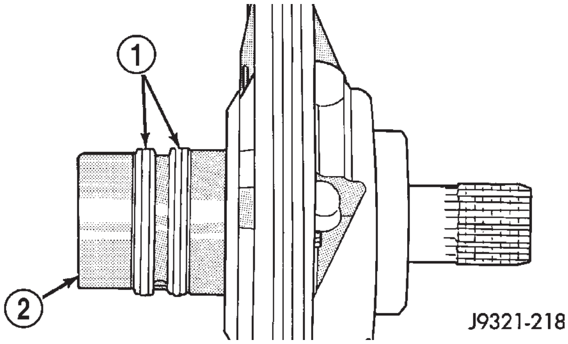


Fig. 181 Hub Seal Ring Position

1 – SEAL RINGS
2 – SUPPORT HUB

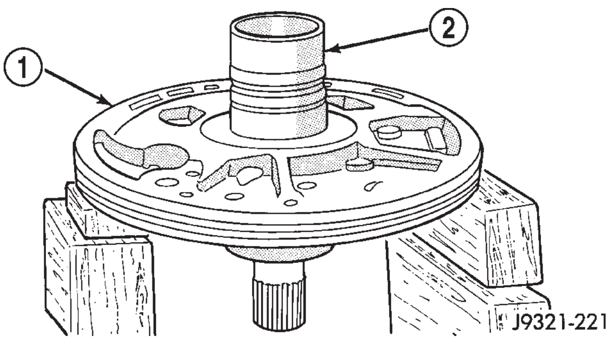


Fig. 182 Assembling Reaction Shaft Support And Pump Housing

1 – PUMP HOUSING
2 – REACTION SHAFT SUPPORT

(10) Install all bolts that attach support to pump housing. Then tighten bolts finger tight.

(11) Tighten support-to-pump bolts to required torque as follows:

(a) Reverse pump assembly and install it in transmission case. Position pump so bolts are facing out and are accessible.

(b) Secure pump assembly in case with 2 or 3 bolts, or with pilot studs.

(c) Tighten support-to-pump bolts to 20 N·m (15 ft. lbs.).

(d) Remove pump assembly from transmission case.

(12) Install new oil seal in pump with Special Tool C-4193 and Tool Handle C-4171 (Fig. 183). Be sure seal lip faces inward.

(13) Install new seal ring around pump housing. Be sure seal is properly seated in groove.

(14) Lubricate lip of pump oil seal and O-ring seal with transmission fluid.

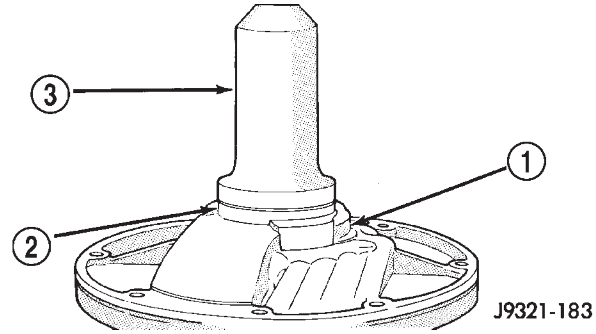


Fig. 183 Pump Oil Seal Installation

1 – PUMP BODY
2 – PUMP SEAL
3 – SPECIAL TOOL C-4193

FRONT CLUTCH

DISASSEMBLY

(1) Remove waved snap ring and remove pressure plate, clutch plates and clutch discs (Fig. 184).

(2) Compress clutch piston spring with Compressor Tool C-3575-A (Fig. 185). Be sure legs of tool are seated squarely on spring retainer before compressing spring.

(3) Remove retainer snap ring and remove compressor tool.

(4) Remove spring retainer and clutch spring. Note position of retainer on spring for assembly reference.

(5) Remove clutch piston from clutch retainer. Remove piston by rotating it up and out of retainer.

(6) Remove seals from clutch piston and clutch retainer hub. Discard both seals as they are not reusable.

ASSEMBLY

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seals on piston and in hub of retainer. Be sure lip of each seal faces interior of clutch retainer.

(3) Lubricate lips of piston and retainer seals with liberal quantity of Mopar® Door Ease, or Ru-Glyde. Then lubricate retainer hub, bore and piston with light coat of transmission fluid.

(4) Install clutch piston in retainer (Fig. 186). Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020” thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

DISASSEMBLY AND ASSEMBLY (Continued)

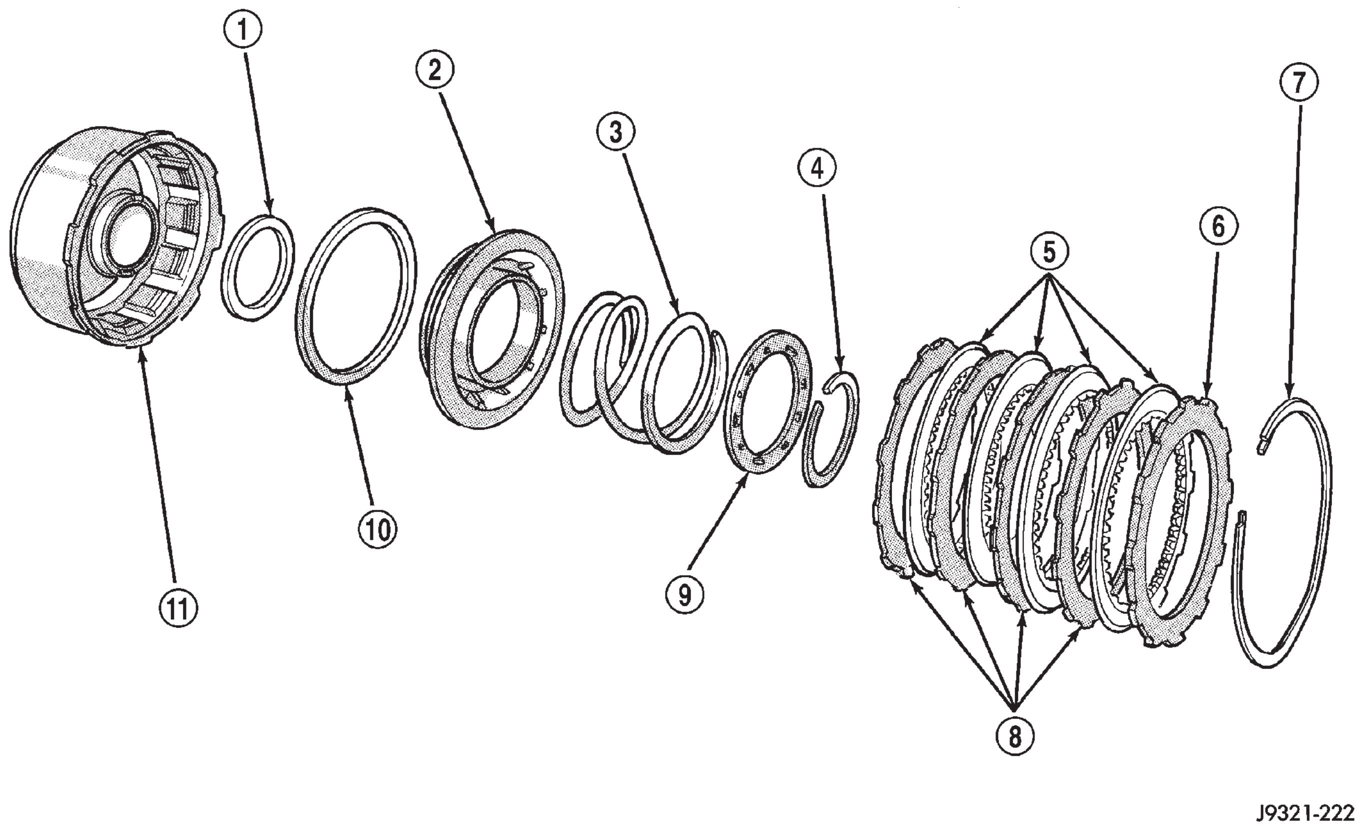


Fig. 184 Front Clutch Components

1 – RETAINER HUB SEAL
2 – CLUTCH PISTON
3 – PISTON SPRING
4 – SPRING RETAINER SNAP RING
5 – CLUTCH DISCS
6 – PRESSURE PLATE
7 – SNAP RING (WAVED)
8 – CLUTCH PLATES
9 – SPRING RETAINER
10 – PISTON SEAL
11 – FRONT CLUTCH RETAINER

(5) Position spring in clutch piston (Fig. 187).

(6) Position spring retainer on top of piston spring (Fig. 188). **Make sure retainer is properly installed. Small raised tabs should be facing upward. Semicircular lugs on underside of retainer are for positioning retainer in spring.**

(7) Compress piston spring and retainer with Compressor Tool C-3575-A (Fig. 185). Then install new snap ring to secure spring retainer and spring.

(8) Install clutch plates and discs (Fig. 184). Install steel plate then disc until all plates and discs are installed. The front clutch uses 4 clutch discs.

(9) Install pressure plate and waved snap ring (Fig. 184).

(10) Using a suitable gauge bar and dial indicator, measure clutch plate clearance (Fig. 189).

(a) Position gauge bar across the clutch drum with the dial indicator pointer on the pressure plate (Fig. 189).

(b) Using two small screw drivers, lift the pressure plate and compress the waved snap-ring. This will assure that the snap-ring is at the top of the groove.

(c) Release the pressure plate and zero the dial indicator.

(d) Lift the pressure plate until it contacts the waved snap-ring and record the dial indicator reading.

Clearance should be 1.70 to 3.40 mm (0.067 to 0.134 in.). If clearance is incorrect, clutch discs, plates pressure plates and snap ring may have to be changed.

REAR CLUTCH

DISASSEMBLY

(1) Remove thrust washer from forward side of clutch retainer.

(2) Remove input shaft front/rear seal rings.

(3) Remove selective clutch pack snap ring (Fig. 190).

DISASSEMBLY AND ASSEMBLY (Continued)

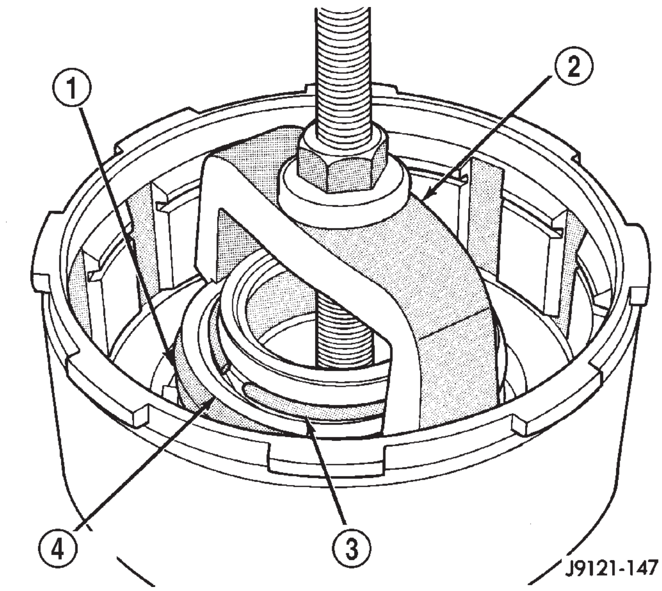


Fig. 185 Compressing Front Clutch Piston Spring

1 – FRONT CLUTCH SPRING
2 – COMPRESSOR TOOL C-3575–A
3 – RETAINER SNAP RING
4 – SPRING RETAINER

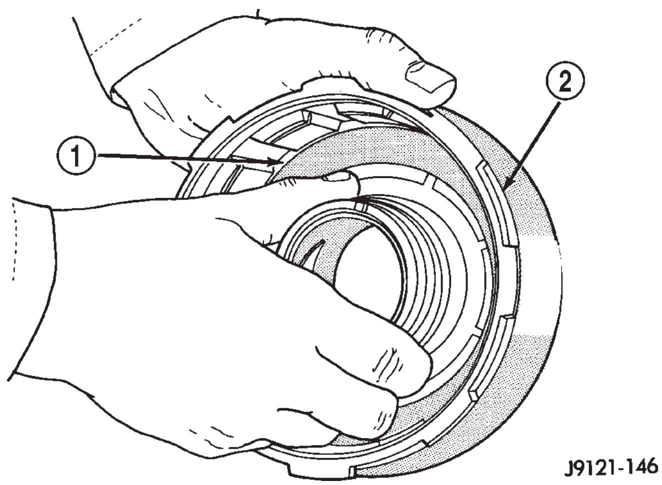


Fig. 186 Front Clutch Piston Installation

1 – CLUTCH PISTON
2 – FRONT CLUTCH RETAINER

(4) Remove top pressure plate, clutch discs, steel plates, bottom pressure plate and wave snap ring and wave spring (Fig. 190).

(5) Remove clutch piston with rotating motion.

(6) Remove and discard piston seals.

(7) Remove input shaft snap-ring (Fig. 191). It may be necessary to press the input shaft in slightly to relieve tension on the snap-ring

(8) Press input shaft out of retainer with shop press and suitable size press tool. Use a suitably

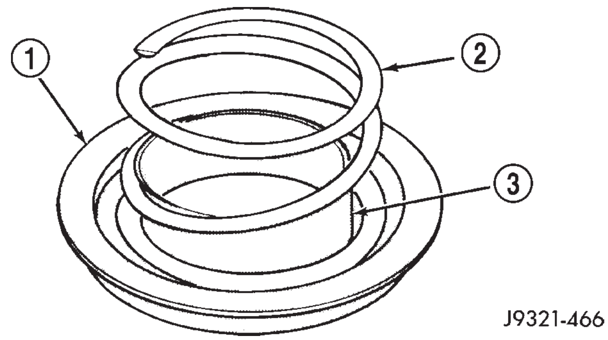


Fig. 187 Clutch Piston Spring Installation

1 – RETAINER
2 – CLUTCH SPRING
3 – PISTON

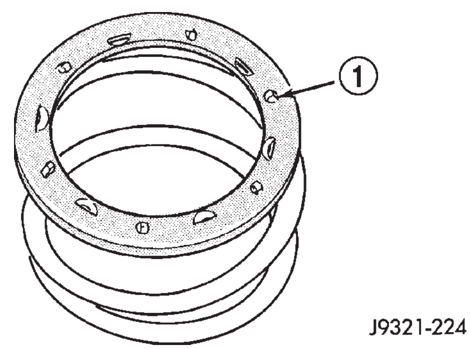


Fig. 188 Correct Spring Retainer Installed Position

1 – SMALL TABS ON RETAINER FACE UPWARD

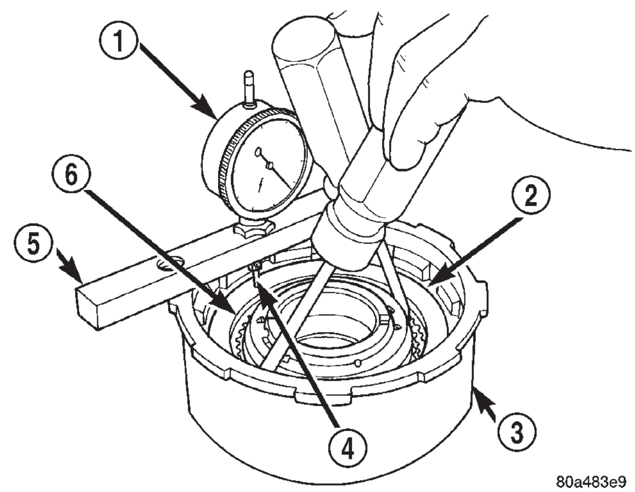


Fig. 189 Measuring Front Clutch Pack Clearance

1 – DIAL INDICATOR
2 – WAVED SNAP-RING
3 – FRONT CLUTCH
4 – POINTER
5 – GAUGE BAR
6 – PRESSURE PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

sized press tool to support the retainer as close to the input shaft as possible.

ASSEMBLY

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seal rings on clutch retainer hub and input shaft if necessary (Fig. 192).

(a) Be sure clutch hub seal ring is fully seated in groove and is not twisted.

(3) Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then press input shaft into retainer. Use a suitably sized press tool to support retainer as close to input shaft as possible.

(4) Install input shaft snap-ring (Fig. 191).

(5) Invert retainer and press input shaft in opposite direction until snap-ring is seated.

(6) Install new seals on clutch piston. Be sure lip of each seal faces interior of clutch retainer.

(7) Lubricate lip of piston seals with generous quantity of Mopar® Door Ease. Then lubricate retainer hub and bore with light coat of transmission fluid.

(8) Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020” thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

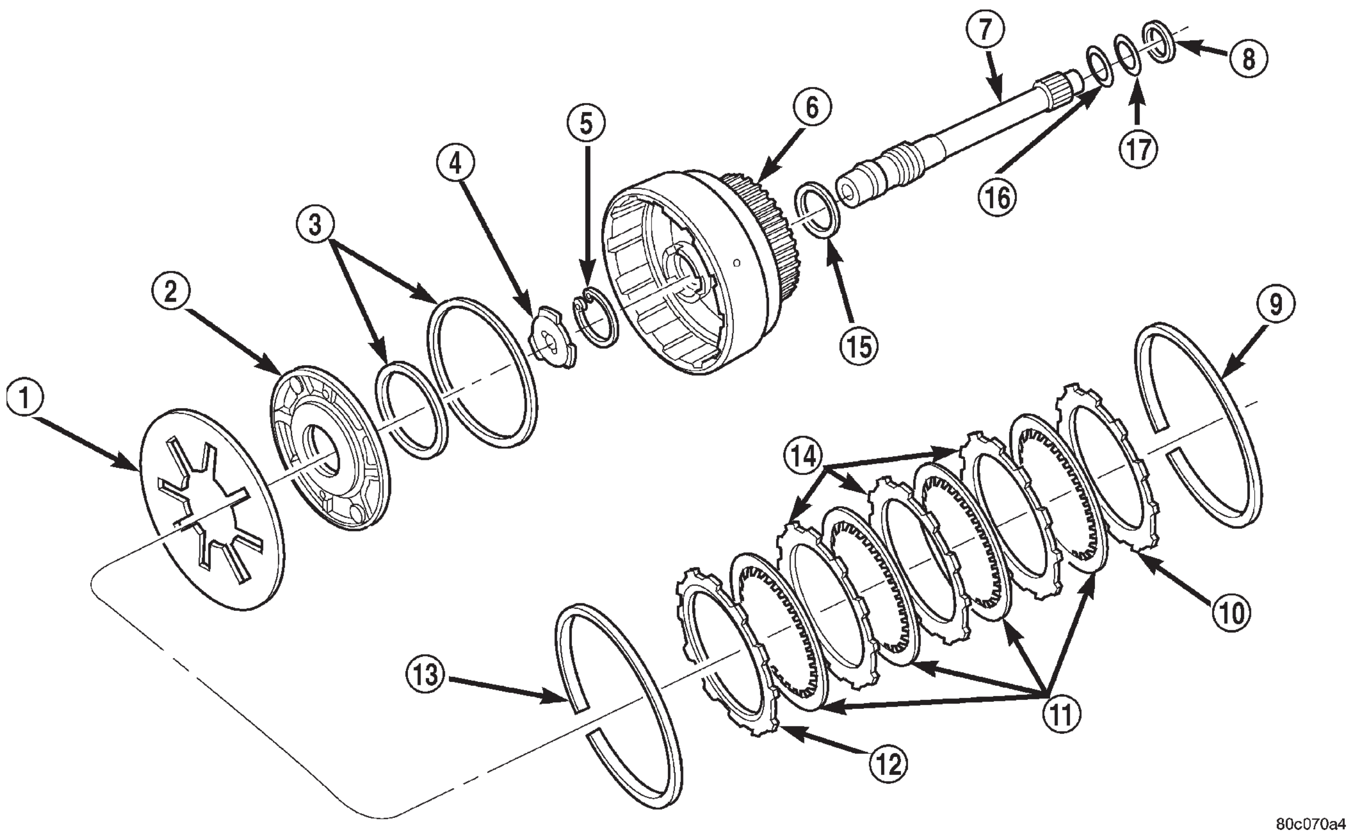


Fig. 190 Rear Clutch Components

1 – PISTON SPRING
2 – REAR CLUTCH PISTON
3 – CLUTCH PISTON SEALS
4 – OUTPUT SHAFT THRUST WASHER (METAL)
5 – INPUT SHAFT SNAP RING
6 – REAR CLUTCH RETAINER
7 – INPUT SHAFT
8 – REAR CLUTCH THRUST WASHER (FIBER)
9 – CLUTCH PACK SNAP RING (SELECTIVE)
10 – TOP PRESSURE PLATE
11 – CLUTCH DISCS (4)
12 – BOTTOM PRESSURE PLATE
13 – WAVE SPRING
14 – CLUTCH PLATES (3)
15 – RETAINER SEAL RING
16 – SHAFT REAR SEAL RING (PLASTIC)
17 – SHAFT FRONT SEAL RING (TEFLON)

DISASSEMBLY AND ASSEMBLY (Continued)

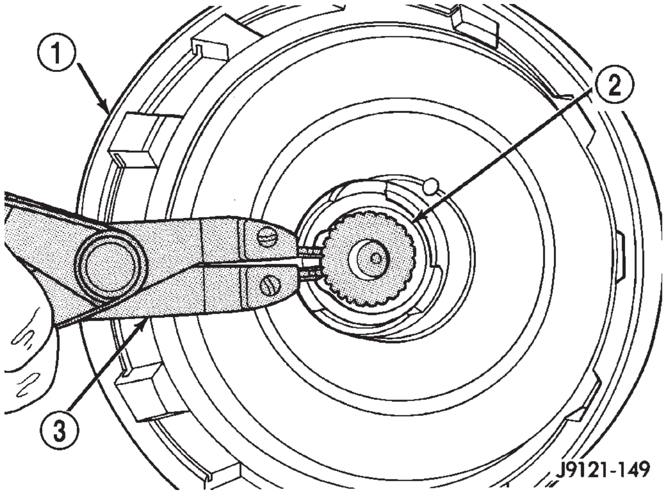


Fig. 191 Removing/Installing Input Shaft Snap-Ring

1 – REAR CLUTCH RETAINER
2 – INPUT SHAFT SNAP RING
3 – SNAP RING PLIERS

(9) Install piston spring in retainer and on top of piston (Fig. 195). Concave side of spring faces downward (toward piston).

(10) Install wave spring in retainer (Fig. 195). Be sure spring is completely seated in retainer groove.

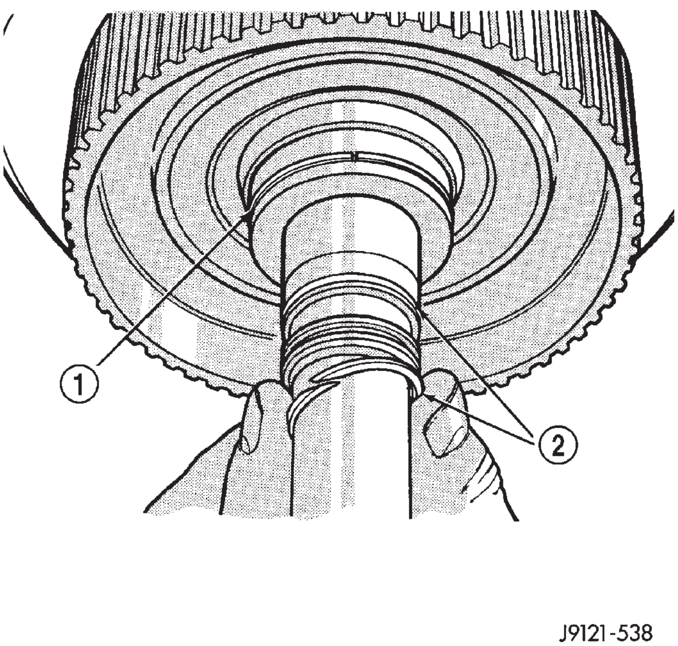


Fig. 192 Rear Clutch Retainer And Input Shaft Seal Ring Installation

1 – REAR CLUTCH RETAINER HUB SEAL RING
2 – INPUT SHAFT SEAL RINGS

(11) Install bottom pressure plate (Fig. 190). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

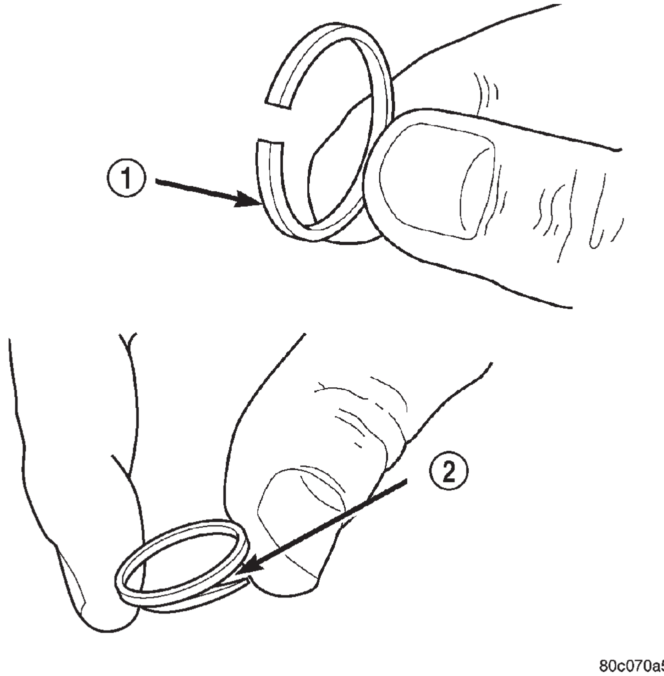


Fig. 193 Input Shaft Seal Ring Identification

1 – PLASTIC REAR SEAL RING
2 – TEFLON FRONT SEAL RING (SQUEEZE RING TOGETHER SLIGHTLY BEFORE INSTALLATION FOR BETTER FIT)

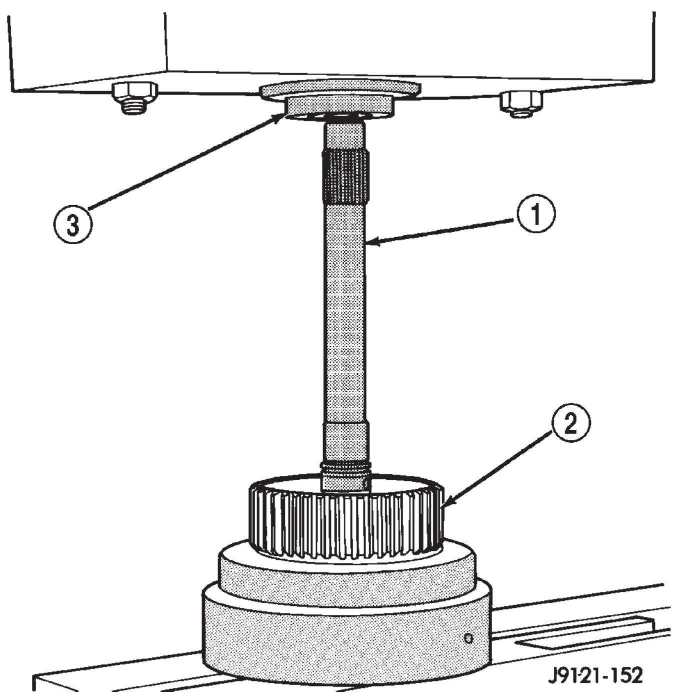


Fig. 194 Pressing Input Shaft Into Rear Clutch Retainer

1 – INPUT SHAFT
2 – REAR CLUTCH RETAINER
3 – PRESS RAM

DISASSEMBLY AND ASSEMBLY (Continued)

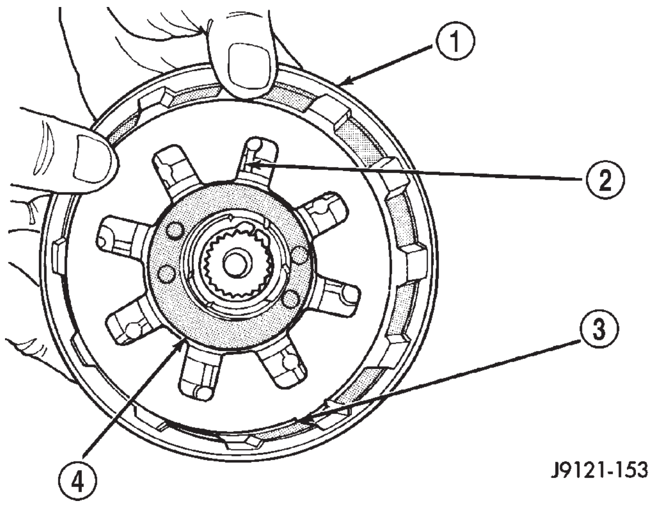


Fig. 195 Piston Spring/Wave Spring Position

1 – REAR CLUTCH RETAINER
2 – PISTON SPRING
3 – WAVE SPRING
4 – CLUTCH PISTON

(12) Install first clutch disc in retainer on top of bottom pressure plate. Then install a clutch plate followed by a clutch disc until entire clutch pack is installed (4 discs and 3 plates are required) (Fig. 190).

(13) Install top pressure plate.

(14) Install selective snap ring. Be sure snap ring is fully seated in retainer groove.

(15) Using a suitable gauge bar and dial indicator, measure clutch pack clearance (Fig. 196).

(a) Position gauge bar across the clutch drum with the dial indicator pointer on the pressure plate (Fig. 196).

(b) Using two small screw drivers, lift the pressure plate and release it.

(c) Zero the dial indicator.

(d) Lift the pressure plate until it contacts the snap-ring and record the dial indicator reading.

Clearance should be 0.64 - 1.14 mm (0.025 - 0.045 in.). If clearance is incorrect, steel plates, discs, selective snap ring and pressure plates may have to be changed.

The selective snap ring thicknesses are:

- .107–.109 in.
- .098–.100 in.
- .095–.097 in.
- .083–.085 in.
- .076–.078 in.
- .071–.073 in.
- .060–.062 in.

(16) Coat rear clutch thrust washer with petroleum jelly and install washer over input shaft and into clutch retainer (Fig. 197). Use enough petroleum jelly to hold washer in place.

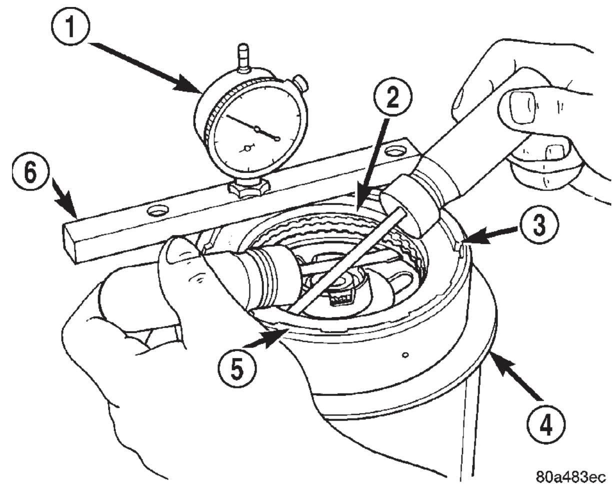


Fig. 196 Checking Rear Clutch Pack Clearance

1 – DIAL INDICATOR
2 – PRESSURE PLATE
3 – SNAP RING
4 – STAND
5 – REAR CLUTCH
6 – GAUGE BAR

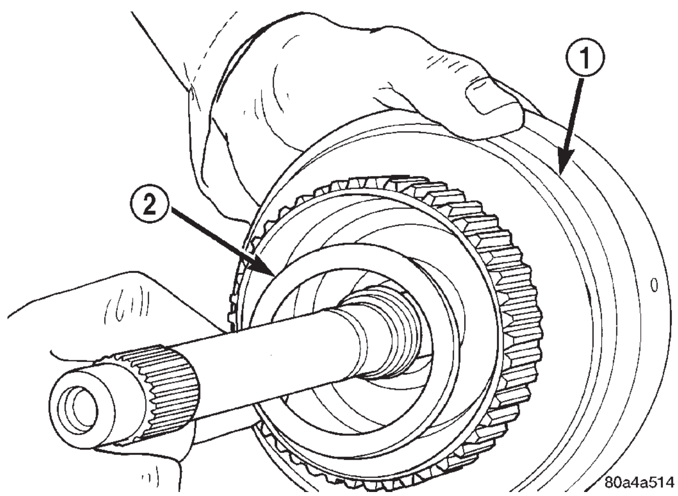


Fig. 197 Installing Rear Clutch Thrust Washer

1 – REAR CLUTCH RETAINER
2 – REAR CLUTCH THRUST WASHER

PLANETARY GEARTRAIN/OUTPUT SHAFT

DISASSEMBLY

(1) Remove planetary snap ring (Fig. 198).

(2) Remove front annulus and planetary assembly from driving shell (Fig. 198).

(3) Remove snap ring that retains front planetary gear in annulus gear (Fig. 199).

(4) Remove tabbed thrust washer and tabbed thrust plate from hub of front annulus (Fig. 200).

(5) Separate front annulus and planetary gears (Fig. 200).

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Remove front planetary gear front thrust washer from annulus gear hub.

(7) Separate and remove driving shell, rear planetary and rear annulus from output shaft (Fig. 201).

(8) Remove front planetary rear thrust washer from driving shell.

(9) Remove tabbed thrust washers from rear planetary gear.

(10) Remove lock ring that retains sun gear in driving shell. Then remove sun gear, spacer and thrust plates.

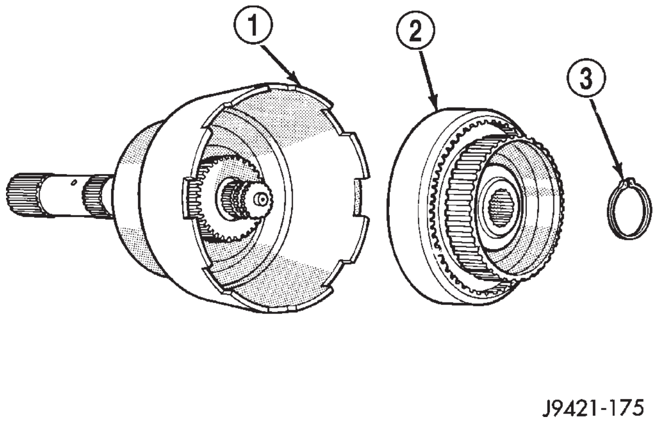


Fig. 198 Front Annulus And Planetary Assembly Removal

1 – DRIVING SHELL
2 – FRONT ANNULUS AND PLANETARY ASSEMBLY
3 – PLANETARY SNAP RING

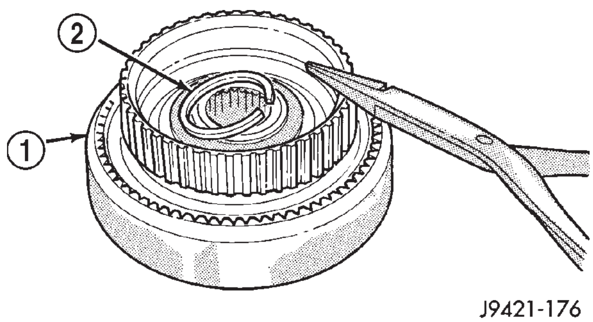


Fig. 199 Front Planetary Snap Ring Removal

1 – FRONT ANNULUS GEAR
2 – PLANETARY SNAP RING

ASSEMBLY

(1) Lubricate output shaft and planetary components with transmission fluid. Use petroleum jelly to lubricate and hold thrust washers and plates in position.

(2) Assemble rear annulus gear and support if disassembled. Be sure support snap ring is seated and that shoulder-side of support faces rearward (Fig. 202).

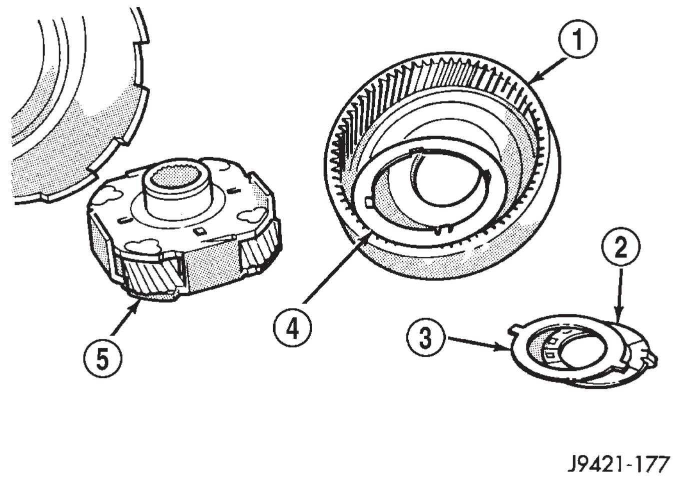


Fig. 200 Front Planetary And Annulus Gear Disassembly

1 – FRONT ANNULUS
2 – THRUST WASHER
3 – THRUST PLATE
4 – FRONT THRUST WASHER
5 – FRONT PLANETARY

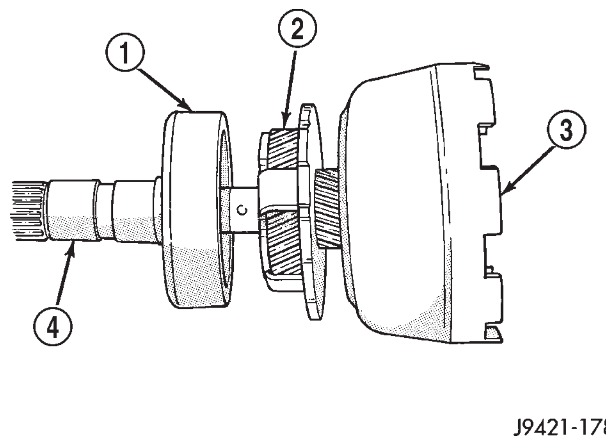


Fig. 201 Removing Driving Shell, Rear Planetary And Rear Annulus

1 – REAR ANNULUS
2 – REAR PLANETARY
3 – DRIVING SHELL
4 – OUTPUT SHAFT

(3) Install rear thrust washer on rear planetary gear. Use enough petroleum jelly to hold washer in place. Also be sure all four washer tabs are properly engaged in gear slots.

(4) Install rear annulus over and onto rear planetary gear (Fig. 202).

(5) Install assembled rear planetary and annulus gear on output shaft (Fig. 203). Verify that assembly is fully seated on shaft.

(6) Install front thrust washer on rear planetary gear (Fig. 204). Use enough petroleum jelly to hold

DISASSEMBLY AND ASSEMBLY (Continued)

washer on gear. Be sure all four washer tabs are seated in slots.

(7) Install spacer on sun gear (Fig. 205).

(8) Install thrust plate on sun gear (Fig. 206). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

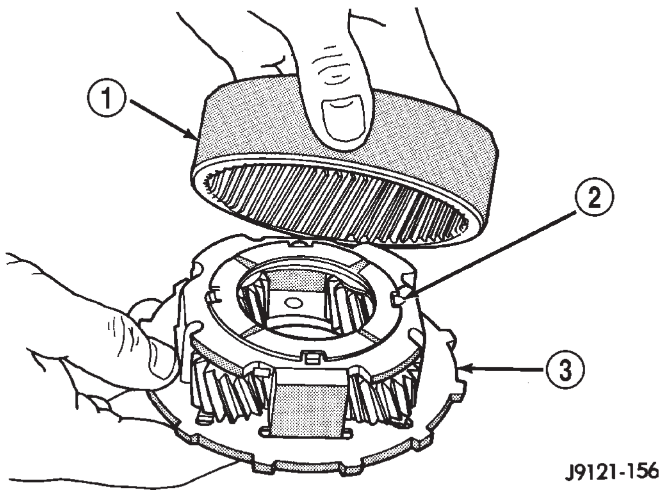


Fig. 202 Assembling Rear Annulus And Planetary Gear

1 – REAR ANNULUS GEAR
2 – TABBED THRUST WASHER
3 – REAR PLANETARY

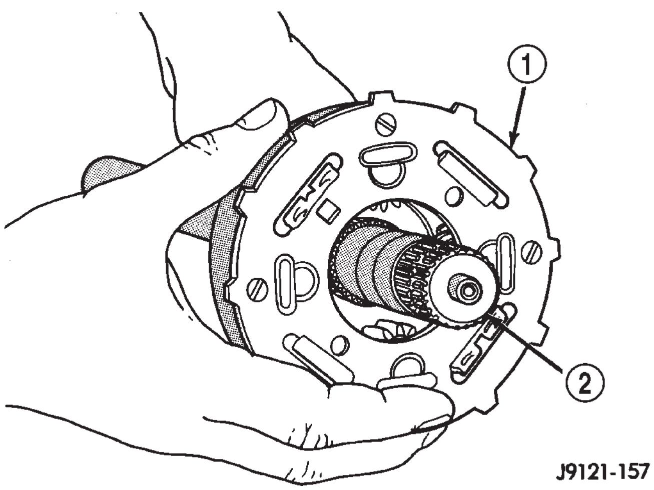


Fig. 203 Installing Rear Annulus And Planetary On Output Shaft

1 – REAR ANNULUS AND PLANETARY GEAR ASSEMBLY
2 – OUTPUT SHAFT

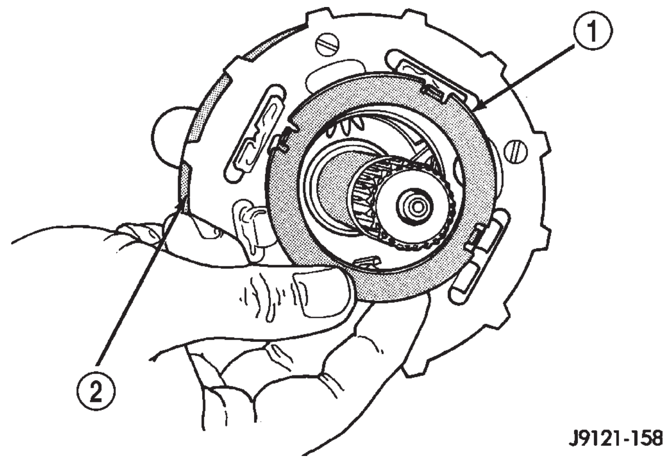


Fig. 204 Installing Rear Planetary Front Thrust Washer

1 – FRONT TABBED THRUST WASHER
2 – REAR PLANETARY GEAR

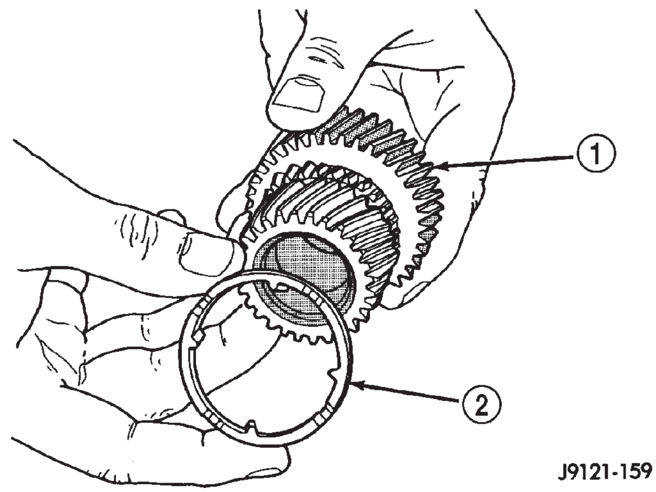


Fig. 205 Installing Spacer On Sun Gear

1 – SUN GEAR
2 – SUN GEAR SPACER

DISASSEMBLY AND ASSEMBLY (Continued)

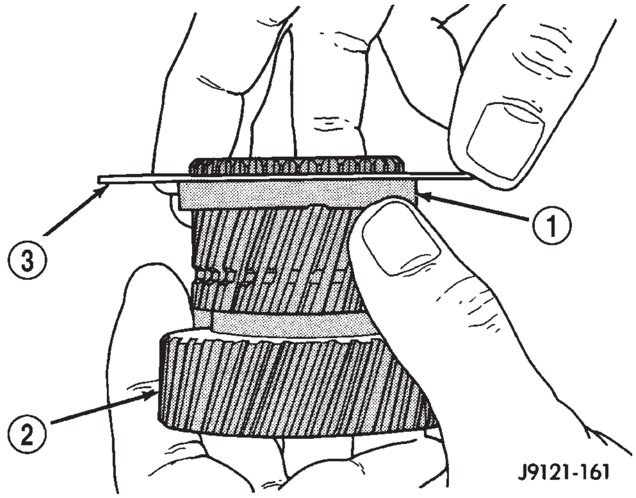


Fig. 206 Installing Driving Shell Front Thrust Plate On Sun Gear

1 – SPACER
2 – SUN GEAR
3 – THRUST PLATE

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 207).

(10) Position wood block on bench and support sun gear on block (Fig. 208). This makes it easier to align and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

(11) Align rear thrust plate on driving shell and install sun gear lock ring. Be sure ring is fully seated in sun gear ring groove (Fig. 209).

(12) Install assembled driving shell and sun gear on output shaft (Fig. 210).

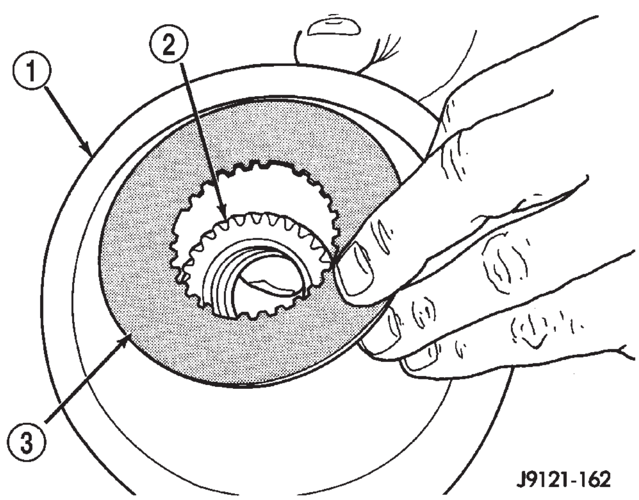


Fig. 207 Installing Driving Shell Rear Thrust Plate

1 – DRIVING SHELL
2 – SUN GEAR
3 – REAR THRUST PLATE

(13) Install rear thrust washer on front planetary gear (Fig. 211). Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

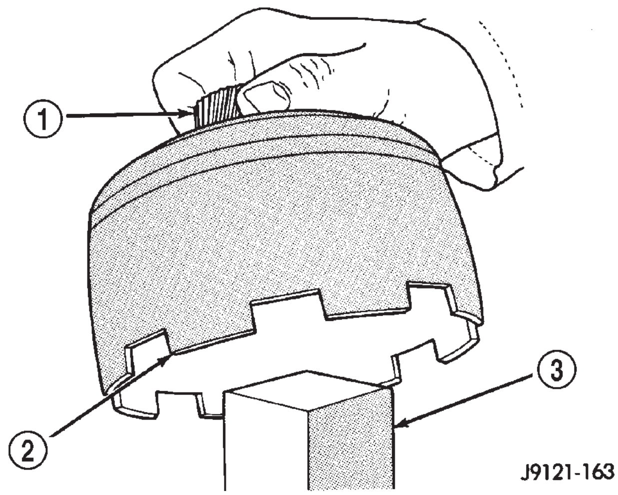


Fig. 208 Supporting Sun Gear On Wood Block

1 – SUN GEAR
2 – DRIVING SHELL
3 – WOOD BLOCK

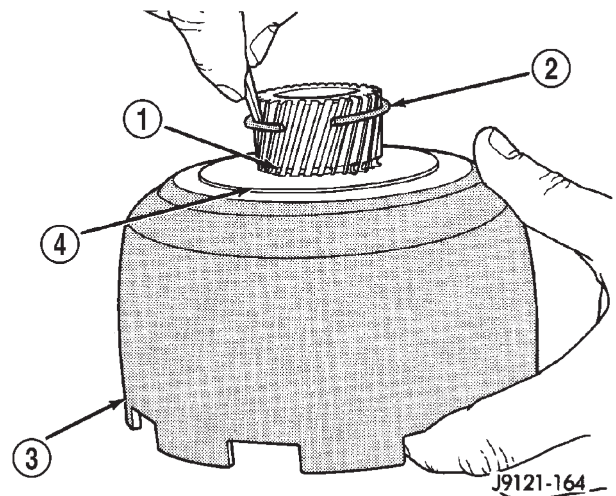


Fig. 209 Installing Sun Gear Lock Ring

1 – LOCK RING GROOVE
2 – SUN GEAR LOCK RING
3 – DRIVING SHELL
4 – REAR THRUST PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

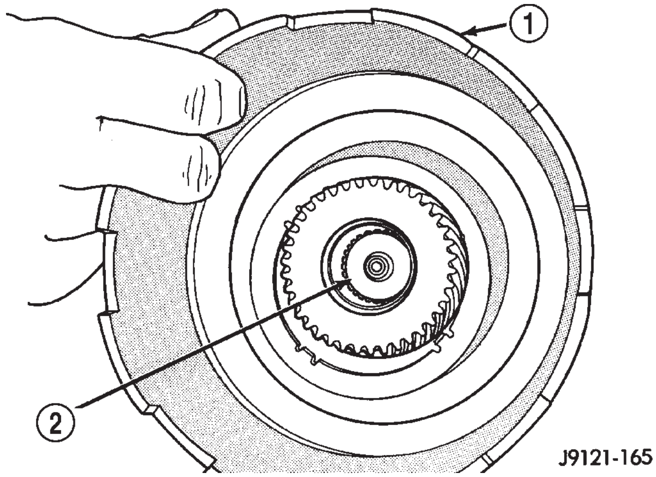


Fig. 210 Installing Assembled Sun Gear And Driving Shell On Output Shaft

1 – SUN GEAR/DRIVING SHELL ASSEMBLY
2 – OUTPUT SHAFT

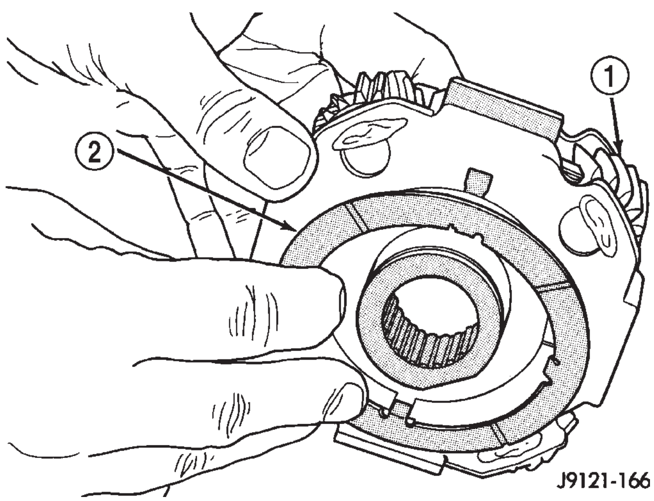


Fig. 211 Installing Rear Thrust Washer On Front Planetary Gear

1 – FRONT PLANETARY GEAR
2 – REAR TABBED THRUST WASHER

(14) Install front planetary gear on output shaft and in driving shell (Fig. 212).

(15) Install front thrust washer on front planetary gear. Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

(16) Assemble front annulus gear and support, if necessary. Be sure support snap ring is seated.

(17) Install front annulus on front planetary (Fig. 212).

(18) Position thrust plate on front annulus gear support (Fig. 213). **Note that plate has two tabs on it. These tabs fit in notches of annulus hub.**

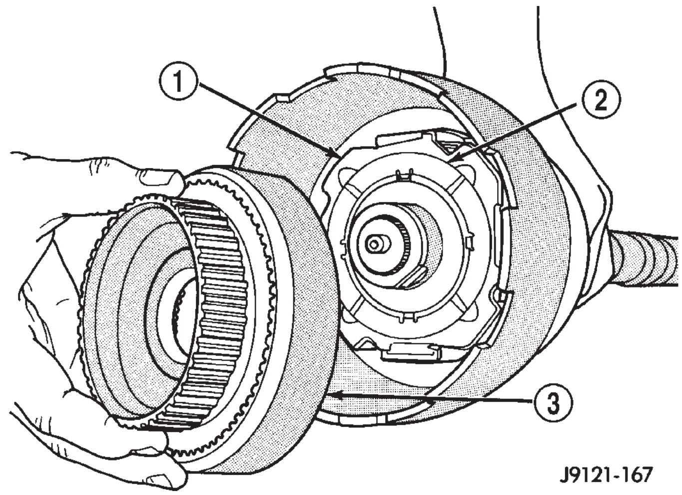


Fig. 212 Installing Front Planetary And Annulus Gears

1 – FRONT PLANETARY GEAR
2 – FRONT THRUST WASHER
3 – FRONT ANNULUS GEAR

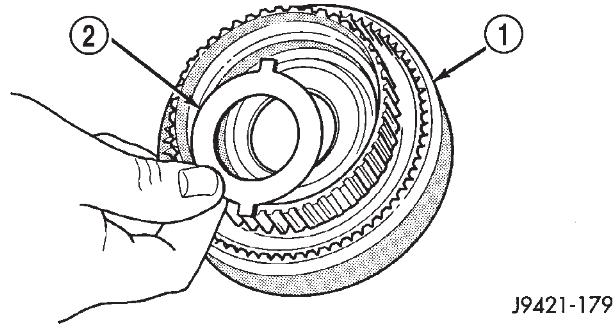


Fig. 213 Positioning Thrust Plate On Front Annulus Support

1 – FRONT ANNULUS
2 – THRUST PLATE

(19) Install thrust washer in front annulus (Fig. 214). **Align flat on washer with flat on planetary hub. Also be sure washer tab is facing up.**

(20) Install front annulus snap ring (Fig. 215). Use snap ring pliers to avoid distorting ring during installation. Also be sure ring is fully seated.

(21) Install planetary selective snap ring with snap ring pliers (Fig. 216). Be sure ring is fully seated.

(22) Turn planetary geartrain assembly over so driving shell is facing workbench. Then support geartrain on wood block positioned under forward end of output shaft. This allows geartrain components to move forward for accurate end play check.

(23) Check planetary geartrain end play with feeler gauge (Fig. 217). Gauge goes between shoulder on output shaft and end of rear annulus support.

DISASSEMBLY AND ASSEMBLY (Continued)

(24) Geartrain end play should be 0.12 to 1.22 mm (0.005 to 0.048 in.). If end play is incorrect, snap ring (or thrust washers) may have to be replaced. Snap ring is available in three different thicknesses for adjustment purposes.

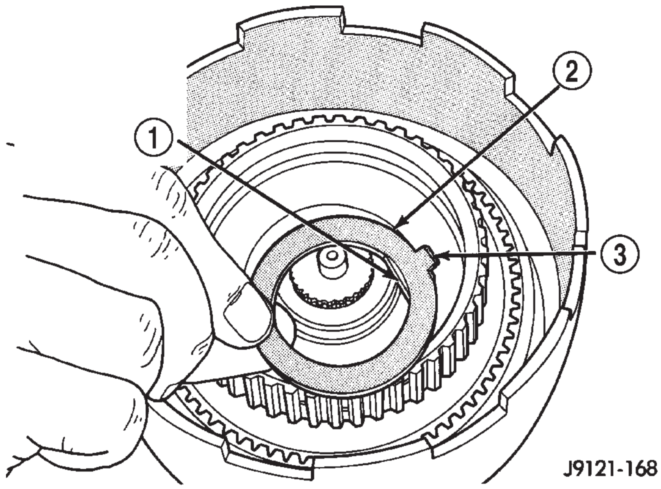


Fig. 214 Installing Front Annulus Thrust Washer

1 – WASHER FLAT ALIGNS WITH FLAT ON PLANETARY HUB
2 – FRONT ANNULUS THRUST WASHER
3 – TAB FACES FRONT

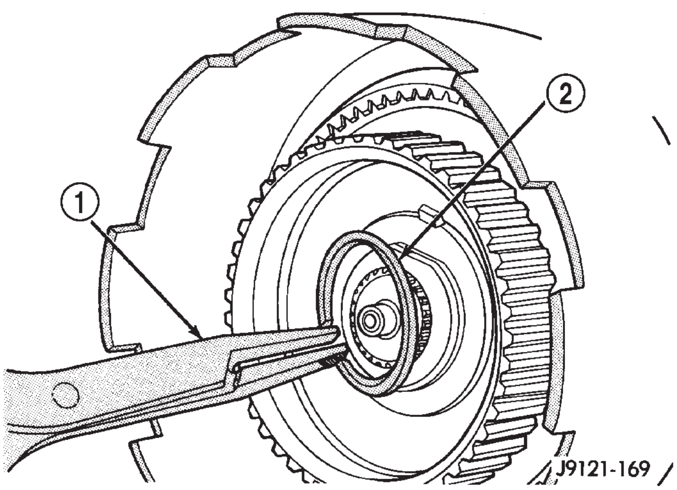


Fig. 215 Installing Front Annulus Snap Ring

1 – SNAP RING PLIERS
2 – FRONT ANNULUS SNAP RING

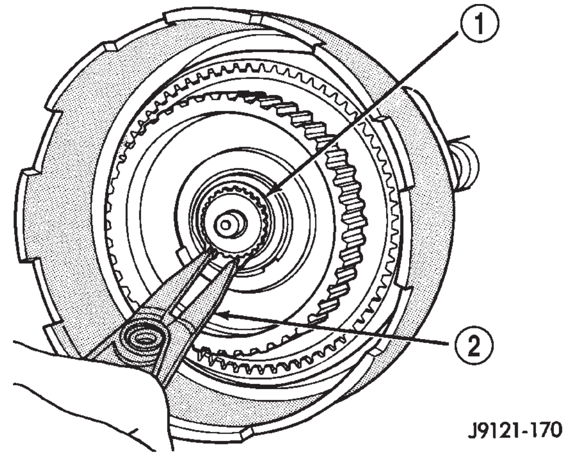


Fig. 216 Installing Planetary Selective Snap Ring

1 – SELECTIVE SNAP RING
2 – SNAP RING PLIERS

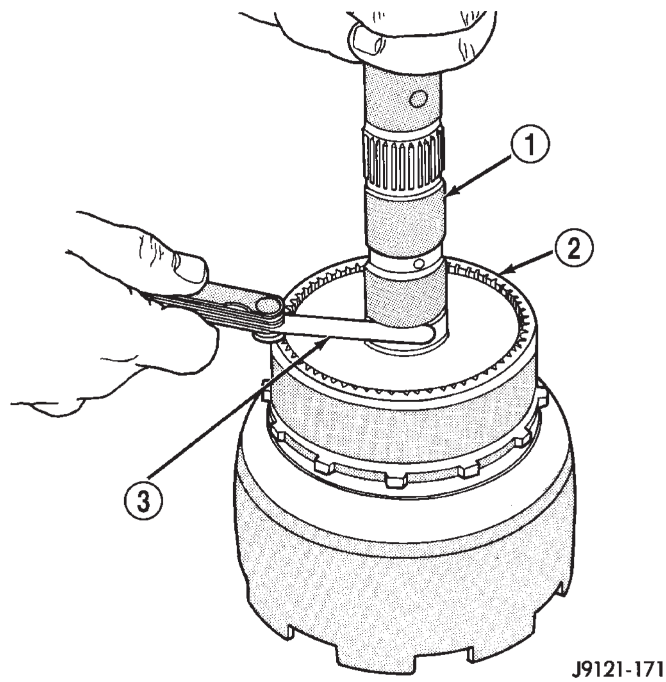


Fig. 217 Checking Planetary Geartrain End Play

1 – OUTPUT SHAFT
2 – REAR ANNULUS GEAR
3 – FEELER GAUGE

CLEANING AND INSPECTION

GOVERNOR AND PARK GEAR

Thoroughly clean all the governor parts in a suitable cleaning solution but do not use any type of caustic cleaning agents.

The governor weight components (Fig. 218) and the governor valve (Fig. 219), must slide freely in their bores when clean and dry. Minor surface scratches and burrs can be smoothed with crocus cloth.

The aluminum governor valve and outer weight have a hard coating on them. Check condition of this coating carefully. Do not reuse either part if the coating is damaged.

Inspect the governor weight spring for distortion. Replace the spring, if distorted, collapsed, or broken. Clean the filter in solvent and dry it with compressed air. Replace the filter, if damaged. Inspect the park gear for chipped or worn gear teeth or damaged ring grooves. Replace the gear, if damaged.

Check the teeth on the park gear for wear or damage. Replace the gear if necessary. Inspect the metal seal rings on the park gear hub. Replace the rings only if severely worn, or broken.

EXTENSION HOUSING AND PARK LOCK

Clean the housing and park lock components in solvent and dry them with compressed air.

Examine the park lock components in the housing. If replacement is necessary, remove the shaft with parallel jaw snap ring pliers (Fig. 220) and remove the sprag and spring. Then remove the spring clip and reaction plug (Fig. 221). **Compress the reaction plug spring clip only enough to remove and install it. Do not distort the clip during removal or installation.**

Be sure a replacement sprag is installed so the sprag locking lug will face the park gear (Fig. 222). Also be sure the spring is correctly positioned as shown (Fig. 222). The sprag may not retract if the spring is improperly installed.

VALVE BODY

Serviceable valve body components are:

- park lock rod and E-clip
- switch valve and spring
- pressure adjusting screw bracket
- throttle valve lever
- manual lever
- manual lever shaft seal, washer, E-clip and detent ball
- fluid filter
- converter clutch solenoid

The remaining valve body components are serviced only as part of a complete valve body assembly.

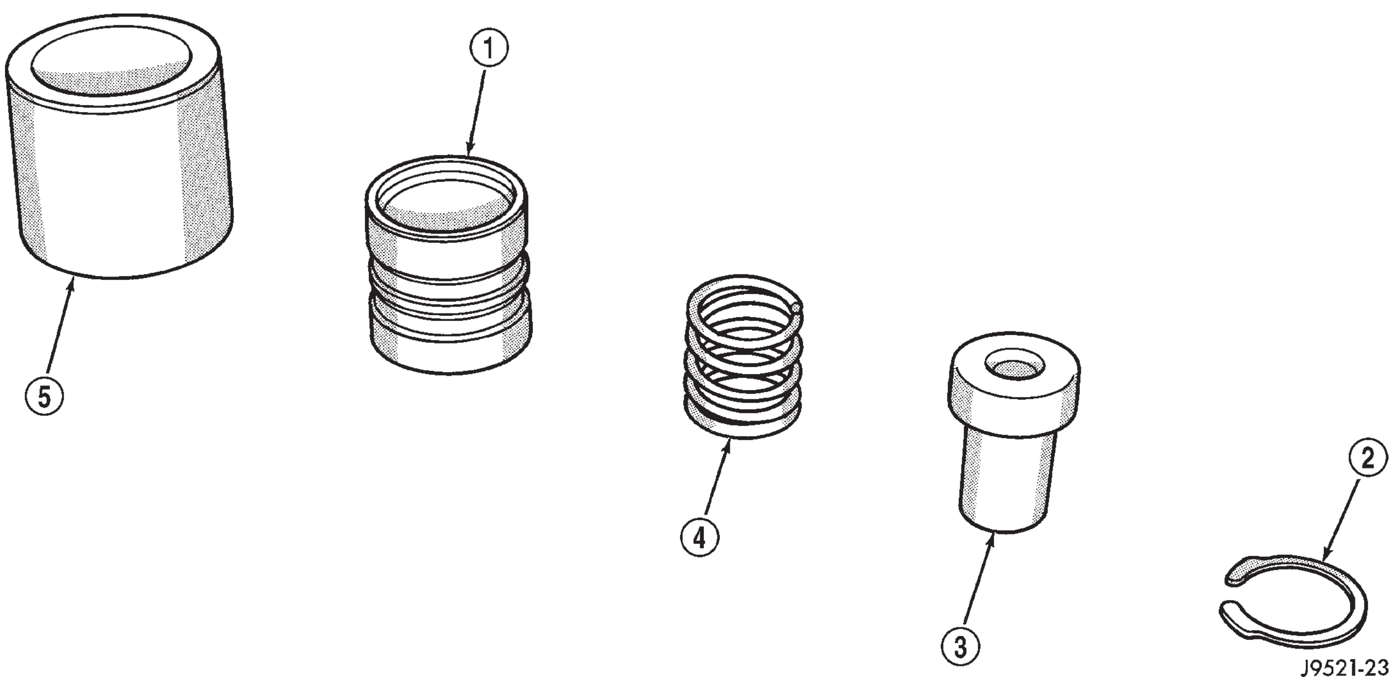


Fig. 218 Governor Weights

1 – INTERMEDIATE WEIGHT
2 – SNAP RING
3 – INNER WEIGHT
4 – INNER WEIGHT SPRING
5 – OUTER WEIGHT

CLEANING AND INSPECTION (Continued)

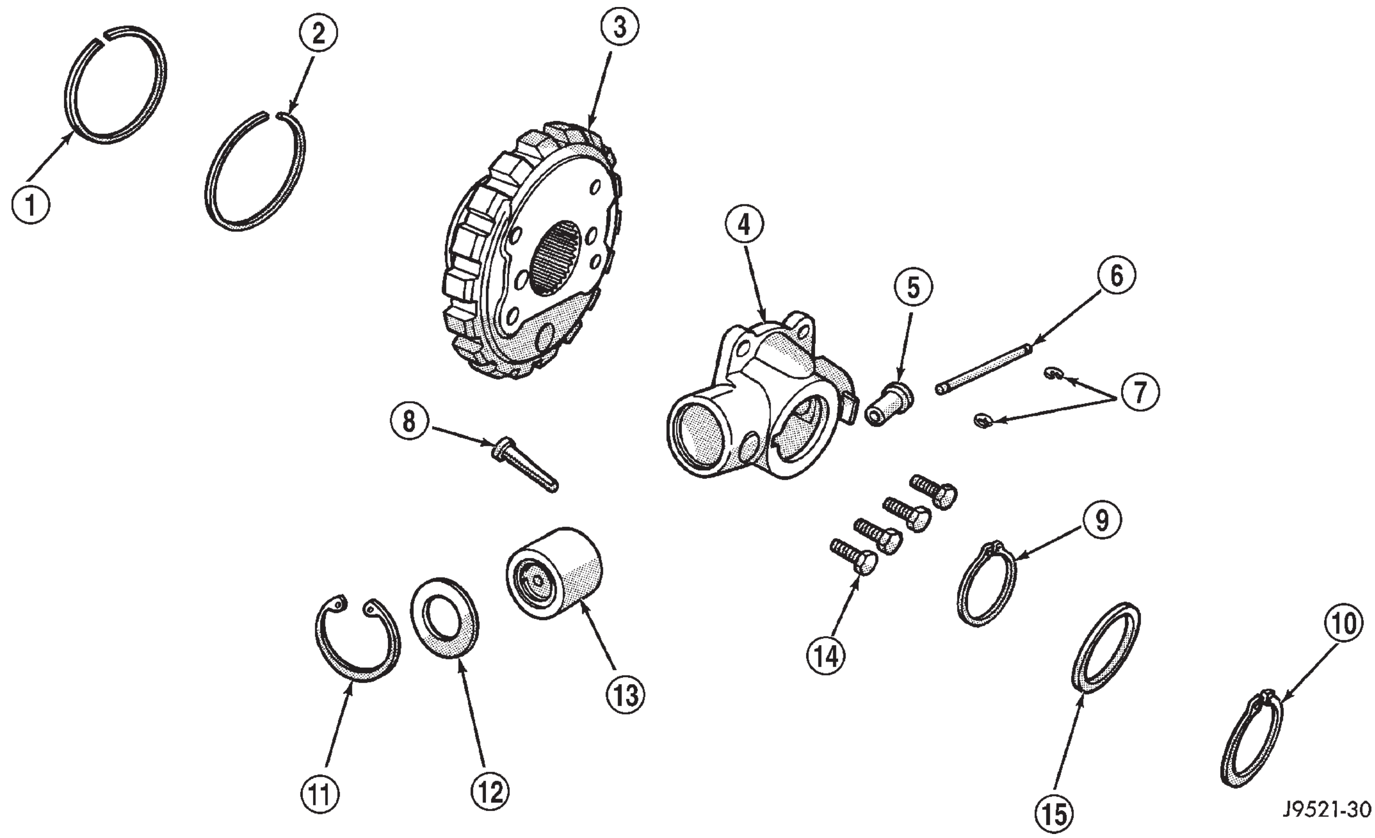


Fig. 219 Governor Components

1 – SEAL RING (PLAIN END)
2 – SEAL RING (HOOK END)
3 – PARK GEAR
4 – GOVERNOR BODY
5 – GOVERNOR VALVE
6 – VALVE SHAFT
7 – E-CLIPS (2)
8 – FILTER
9 – SNAP RING (THIN)
10 – SNAP RING (THICK)
11 – SNAP RING
12 – RETAINER WASHER
13 – GOVERNOR WEIGHT ASSEMBLY
14 – GOVERNOR BODY BOLTS (4)
15 – WASHER

Clean the valve body components in a parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution. Dry the parts with compressed air. Make sure all passages are clean and free from obstructions.

NOTE: Do not use rags or shop towels to wipe off valve body components. Lint from these materials will adhere to the valve body components. Lint will interfere with valve operation and may clog filters and fluid passages.

Inspect the throttle and manual valve levers and shafts. Do not attempt to straighten a bent shaft or correct a loose lever. Replace these components if worn, bent, loose or damaged in any way.

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straightedge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with crocus cloth. The cloth should be in sheet form and be positioned on a surface plate, sheet of plate glass, or equally flat surface. However, if distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: Many of the valve body valves and plugs are made of coated aluminum. Aluminum components can be identified by the dark color of the special coating applied to the surface (or by testing with a magnet). DO NOT polish or sand aluminum valves or plugs with any type of material, or under any circumstances. This practice might damage the special coating and cause the valves and plugs to stick and bind.

CLEANING AND INSPECTION (Continued)

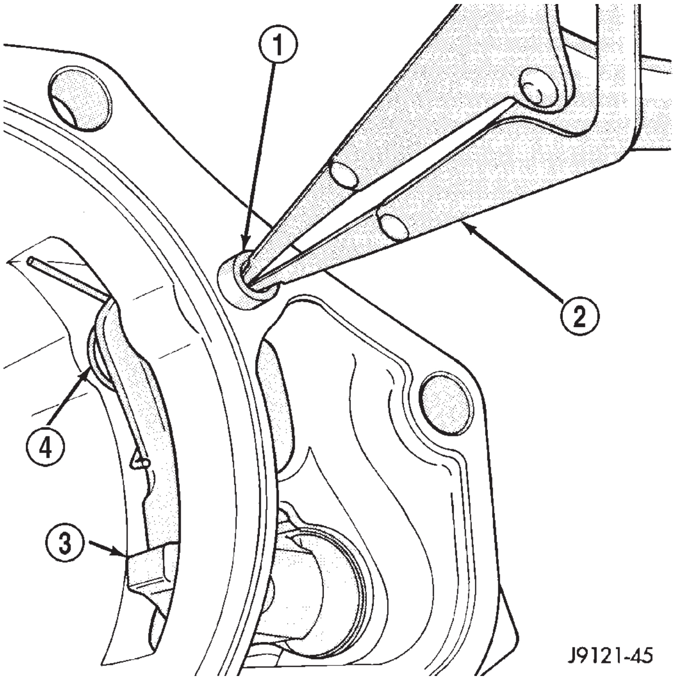


Fig. 220 Park Sprag, Shaft And Spring

1 – SPRAG SHAFT
2 – PARALLEL JAW SNAP RING PLIERS
3 – SPRAG
4 – SPRING

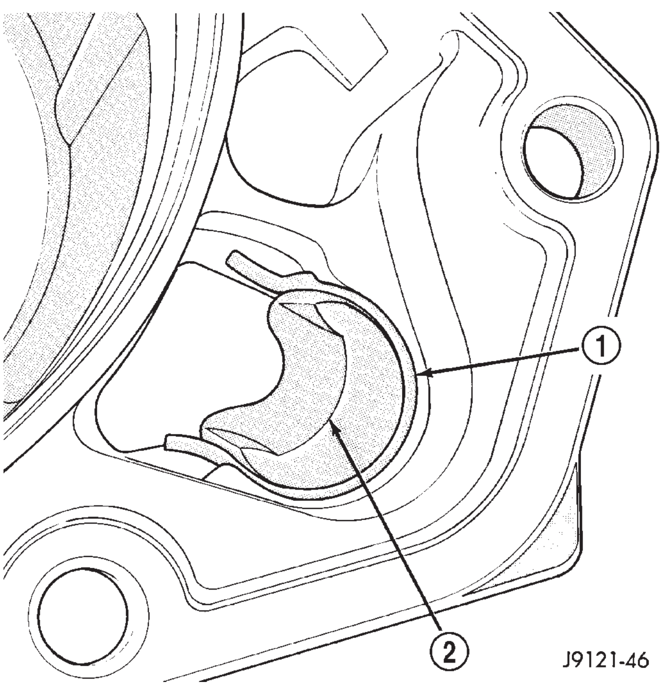


Fig. 221 Park Sprag Reaction Plug And Spring Location

1 – SPRING CLIP
2 – REACTION PLUG

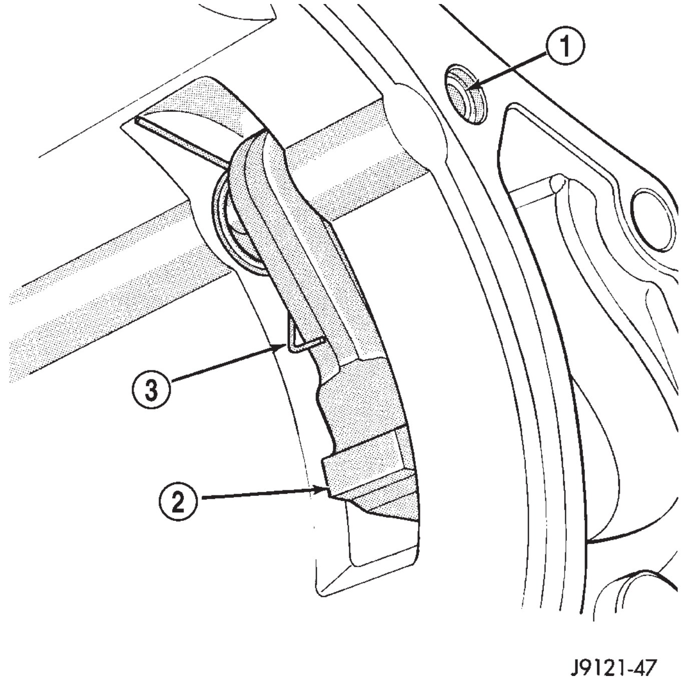


Fig. 222 Correct Position Of Sprag And Spring

1 – SPRAG SHAFT
2 – SPRAG LOCKING LUG
3 – SPRING

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Also inspect the coating on the aluminum valves and plugs (Fig. 223). If the coating is damaged or worn through, the valve (or valve body) should be replaced.

Aluminum valves and plugs should not be sanded or polished under any circumstances. However, minor burrs or scratches on steel valves and plugs can be removed with crocus cloth but do not round off the valve or plug edges. Squareness of these edges is vitally important. These edges prevent foreign matter from lodging between the valves, plugs and bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores. Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

CLEANING AND INSPECTION (Continued)

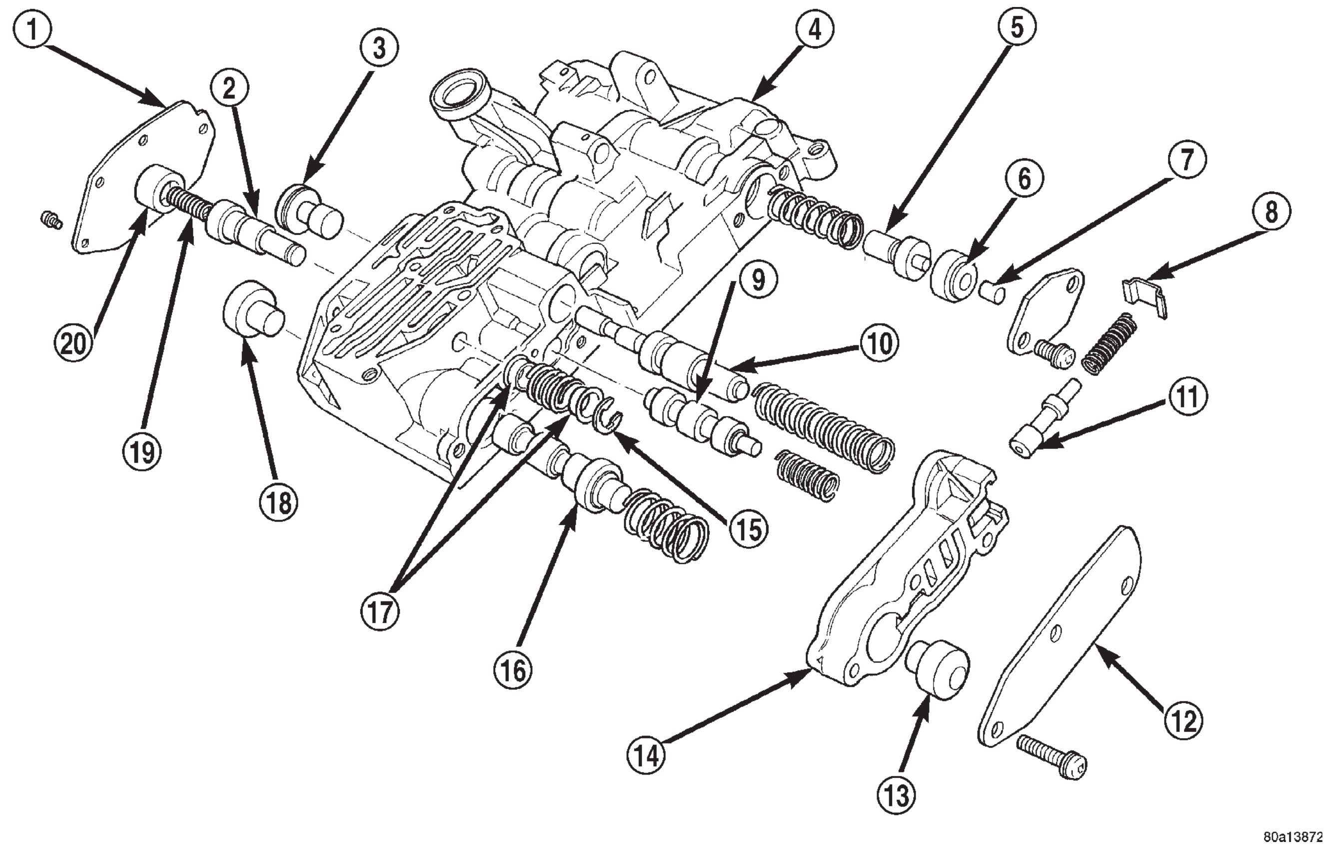


Fig. 223 Valve Body Components

1 – GOVERNOR PLUG END PLATE
2 – SHUTTLE VALVE
3 – 1–2 GOVERNOR PLUG
4 – VALVE BODY
5 – REGULATOR VALVE THROTTLE PRESSURE PLUG
6 – SLEEVE
7 – LINE PRESSURE PLUG
8 – RETAINER
9 – 1–2 SHIFT VALVE
10 – 1–2 SHIFT CONTROL VALVE
11 – KICKDOWN LIMIT VALVE
12 – END PLATE
13 – THROTTLE PRESSURE PLUG
14 – KICKDOWN LIMIT VALVE BODY
15 – E-RING
16 – 2–3 SHIFT VALVE
17 – GUIDES
18 – 2–3 GOVERNOR PLUG
19 – PRIMARY SPRING
20 – SHUTTLE VALVE THROTTLE PLUG

TRANSMISSION

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will readily adhere to case surfaces and transmission components and will circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Inspect the case for cracks, porous spots, worn servo bores, or damaged threads. However, the case will have to be replaced if it exhibits damage or wear.

Lubricate the front band adjusting screw and locknut with petroleum jelly and thread it part way into the case. Be sure the screw turns freely and does not bind. Install the locknut on the screw after checking screw thread operation.

Inspect all the transmission bushings during overhaul. Bushing condition is important as worn, scored bushings contribute to low pressures, clutch slip and accelerated wear of other components. Replace worn, or scored bushings, or if doubt exists about bushing condition.

Use recommended tools to replace bushings. The tools are sized and designed to remove, install and seat bushings correctly. The bushing replacement

CLEANING AND INSPECTION (Continued)

tools are included in Bushing Tool Sets C-3887-B, or C-3887-J.

Pre-sized service bushings are available for replacement purposes. Only the sun gear bushings are not serviced. Replace the gear as an assembly if the bushings are severely scored, or worn.

Heli-Coil inserts are recommended for repairing damaged, stripped or worn threads in aluminum parts. Stainless steel inserts are preferred.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF Plus 3, Type 7176 transmission fluid during assembly. Use Mopar® Door Ease, or Ru-Glyde to lubricate piston seals and O-rings. Use petroleum jelly on thrust washers and to hold parts in place during reassembly.

OVERRUNNING CLUTCH/LOW-REVERSE DRUM/OVERDRIVE PISTON RETAINER

Clean the overrunning clutch assembly, clutch cam, low-reverse drum, and overdrive piston retainer in solvent. Dry them with compressed air after cleaning.

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse drum if the clutch race, roller surface or inside diameter is scored, worn or damaged. **Do not remove the clutch race from the low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.**

Examine the overdrive piston retainer carefully for wear, cracks, scoring or other damage. Be sure the retainer hub is a snug fit in the case and drum. Replace the retainer if worn or damaged.

FRONT SERVO

Clean the servo piston components with solvent and dry them with compressed air. Wipe the band clean with lint free shop towels.

Replace the front band if distorted, lining is burned, flaking off, or worn to the point where the grooves in the lining material are no longer visible.

Inspect the servo components (Fig. 224). Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

Replace any servo component if doubt exists about condition. Do not reuse suspect parts.

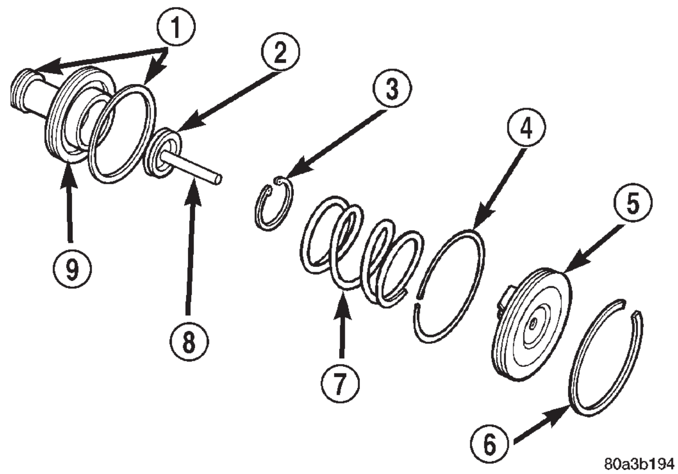


Fig. 224

1 – PISTON RINGS
2 – O-RING
3 – SNAP-RING
4 – SEAL RING
5 – PISTON ROD GUIDE
6 – SNAP-RING
7 – SERVO SPRING
8 – PISTON ROD
9 – SERVO PISTON

REAR SERVO

Remove and discard the servo piston seal ring (Fig. 225). Then clean the servo components with solvent and dry with compressed air. Replace either spring if collapsed, distorted or broken. Replace the plug and piston if cracked, bent, or worn. Discard the servo snap rings and use a new ones at assembly.

OIL PUMP AND REACTION SHAFT SUPPORT

(1) Clean pump and support components with solvent and dry them with compressed air.

(2) Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

(3) Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

CLEANING AND INSPECTION (Continued)

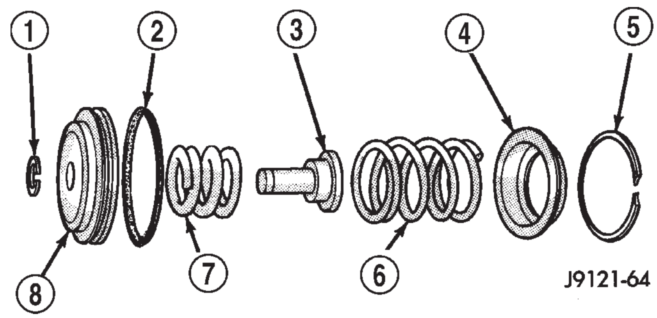


Fig. 225 Rear Servo Components

1 – SNAP RING
2 – PISTON SEAL
3 – PISTON PLUG
4 – SPRING RETAINER
5 – SNAP RING
6 – PISTON SPRING
7 – CUSHION SPRING
8 – PISTON

(4) Inspect the pump bushing. Then check the reaction shaft support bushing. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

(5) Install the gears in the pump body and measure pump component clearances as follows:

(a) Clearance between outer gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Clearance between inner gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Both clearances can be measured at the same time by:

(I) Installing the pump gears in the pump housing.

(II) Position an appropriate piece of Plastigage™ across both gears.

(III) Align the plastigage to a flat area on the reaction shaft housing.

(IV) Install the reaction shaft to the pump housing.

(V) Separate the reaction shaft housing from the pump housing and measure the Plastigage™ following the instructions supplied with it.

(b) Clearance between inner gear tooth and outer gear should be 0.08 to 0.19 mm (0.0035 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

(c) Clearance between outer gear and pump housing should also be 0.010 to 0.19 mm (0.0035 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

FRONT CLUTCH

Clean and inspect the front clutch components. Replace the clutch discs if warped, worn, scored, burned or charred, or if the facing is flaking off. Replace the steel plates if heavily scored, warped, or broken. Be sure the driving lugs on the plates are in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the clutch spring and spring retainer if either is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The steel plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged.

Check action of the check ball in the retainer (Fig. 226). The ball must move freely and not stick.

NOTE: Inspect the clutch retainer bushings carefully (Fig. 227). The retainer bushings are NOT serviceable. It will be necessary to replace the retainer if either bushing is scored, or worn.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

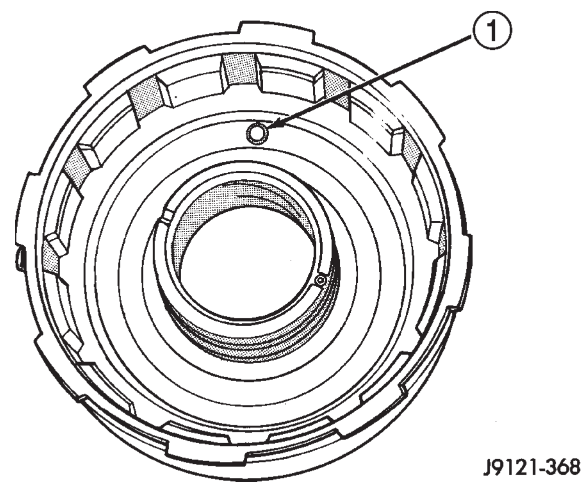


Fig. 226 Front Clutch Piston Retainer Check Ball Location

1 – RETAINER CHECK BALL

REAR CLUTCH

Clean the clutch components with solvent and dry them with compressed air.

Check condition of the input shaft seal rings. It is not necessary to remove or replace rings unless they are broken, cracked, or no longer securely hooked together.

Inspect the input shaft splines and machined surfaces. Very minor nicks or scratches can be smoothed off with crocus cloth. replace the shaft if the splines are damaged, or any of the machined surfaces are severely scored.

CLEANING AND INSPECTION (Continued)

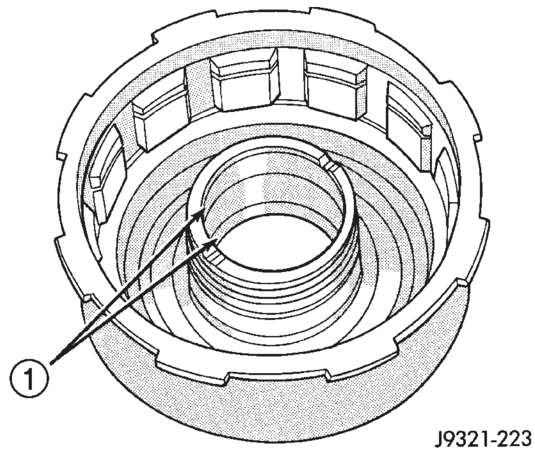


Fig. 227 Retainer Bushing Location/Inspection

1 – FRONT CLUTCH RETAINER BUSHINGS (NON-SERVICEABLE)

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off.

Replace the steel plates and the pressure plate if heavily scored, warped, or broken. Be sure the driving lugs on the discs and plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston spring and wave spring if either part is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The steel plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged. Also check action of the retainer check ball. The ball must move freely and not stick.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously damaged.

Check thrust washer condition. Washer thickness should be 1.55 to 1.60 mm (0.061 to 0.063 in.). Replace the washer if worn or damaged.

Check condition of the two seal rings on the input shaft and the single seal ring on the piston retainer hub. Replace the seal rings only if severely worn, cracked, or cannot be hooked together.

PLANETARY GEARTRAIN/OUTPUT SHAFT

Clean the intermediate shaft and planetary components in solvent and dry them with compressed air. Do not spin the planetary pinion gears with compressed air.

Inspect the planetary gear sets and annulus gears. The planetary pinions, shafts, washers, and retaining pins are serviceable. However, if a pinion carrier is damaged, the entire planetary gear set must be replaced as an assembly.

Replace the annulus gears if the teeth are chipped, broken, or worn, or the gear is cracked. Replace the planetary thrust plates and the tabbed thrust washers if cracked, scored or worn.

Inspect the machined surfaces of the output shaft. Be sure the oil passages are open and clear. Replace the shaft if scored, pitted, or damaged.

Inspect the sun gear and driving shell. If either component is worn or damaged, remove the sun gear rear retaining ring and separate the sun gear and thrust plate from the driving shell. Then replace the necessary component.

Replace the sun gear as an assembly if the gear teeth are chipped or worn. Also replace the gear as an assembly if the bushings are scored or worn. The sun gear bushings are not serviceable. Replace the thrust plate if worn, or severely scored. Replace the driving shell if distorted, cracked, or damaged in any way.

Replace all snap rings during geartrain assembly. Reusing snap rings is not recommended.

ADJUSTMENTS

GEARSHIFT CABLE

Check adjustment by starting the engine in Park and Neutral. Adjustment is OK if the engine starts only in these positions. Adjustment is incorrect if the engine starts in one but not both positions. If the engine starts in any position other than Park or Neutral, or if the engine will not start at all, the park/neutral position switch may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into Park.

(2) Raise vehicle.

(3) Release cable adjuster clamp (at transmission end of cable) to unlock cable.

(4) Unsnap cable from cable mounting bracket on transmission (Fig. 228).

(5) Slide cable eyelet off transmission shift lever.

(6) Verify transmission shift lever is in Park detent by moving lever fully rearward. Last rearward detent is Park position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Slide cable eyelt onto transmission shift lever.

(9) Snap shift cable adjuster into mounting bracket on transmission.

(10) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.

(11) Lower vehicle and check engine starting. Engine should start only in Park and Neutral.

ADJUSTMENTS (Continued)

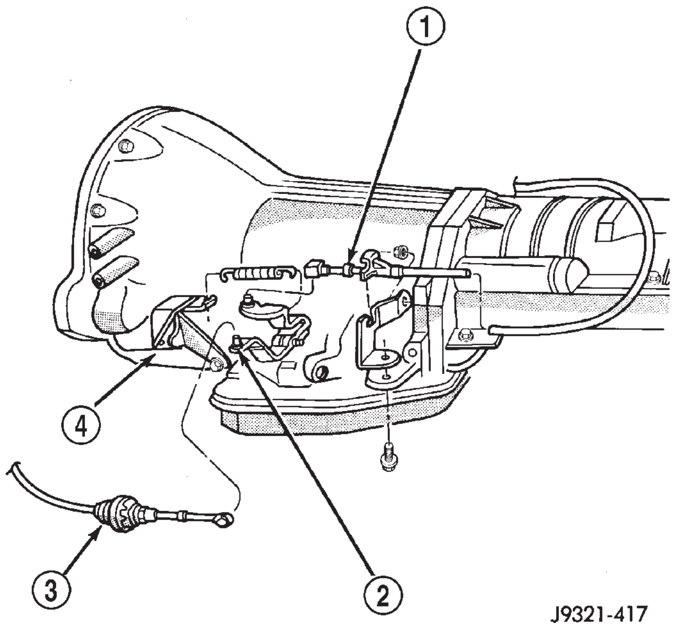


Fig. 228 Shift Cable Attachment At Transmission–Typical

1 – THROTTLE VALVE CABLE
2 – TRANSMISSION SHIFT LEVER
3 – SHIFT CABLE
4 – SHIFT CABLE BRACKET

BRAKE TRANSMISSION SHIFT INTERLOCK CABLE ADJUSTMENT

(1) Shift transmission into PARK.

(2) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.

(3) Pull cable lock button up to release cable (Fig. 229).

(4) Turn ignition switch to LOCK position.

(5) Use a spacer to create a one millimeter gap between the shifter pawl and top of the shift gate.

(6) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.

(7) Check adjustment as follows:

(a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.

(b) Turn ignition switch to RUN position.

(c) Shifting out of park should not be possible.

(d) Apply the brake and attempt to shift out of PARK. Shifting should be possible.

(e) While the transmission is shifted out of PARK, release the brake and attempt to shift through all gears. Release the shift button at least once during this procedure. The ignition key should not go to the LOCK position.

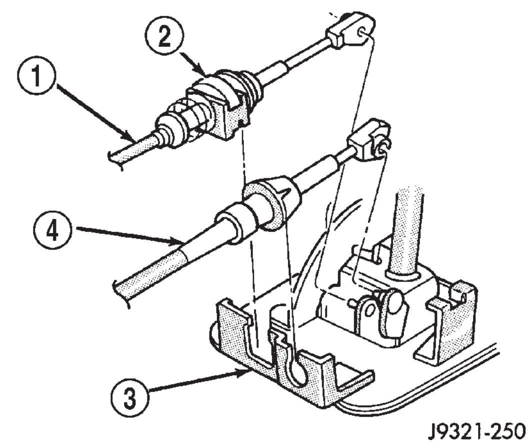


Fig. 229 Park Lock Cable Attachment

1 – PARK LOCK CABLE
2 – CABLE LOCK BUTTON
3 – SHIFT LEVER ASSEMBLY
4 – SHIFT CABLE

(f) Return transmission to the PARK position without applying the brake.

(8) Move shift lever back to PARK and check ignition switch operation. You should be able to turn switch to LOCK position and shift lever release button/lever should not move.

TRANSMISSION THROTTLE VALVE CABLE ADJUSTMENT

The transmission throttle valve is operated by a cam on the throttle lever. The throttle lever is operated by an adjustable cable (Fig. 230). The cable is attached to an arm mounted on the throttle lever shaft. A retaining clip at the engine-end of the cable is removed to provide for cable adjustment. The retaining clip is then installed back onto the throttle valve cable to lock in the adjustment.

A correctly adjusted throttle valve cable will cause the throttle lever on the transmission to move simultaneously with the throttle body lever from the idle position. Proper adjustment will allow simultaneous movement without causing the transmission throttle lever to either move ahead of, or lag behind the lever on the throttle body.

Checking Throttle Valve Cable Adjustment

(1) Turn ignition key to OFF position.

(2) Remove air cleaner.

(3) Verify that lever on throttle body is at curb idle position. Then verify that transmission throttle lever (Fig. 231) is also at idle (fully forward) position.

(4) Slide cable off attachment stud on throttle body lever.

(5) Compare position of cable end to attachment stud on throttle body lever:

ADJUSTMENTS (Continued)

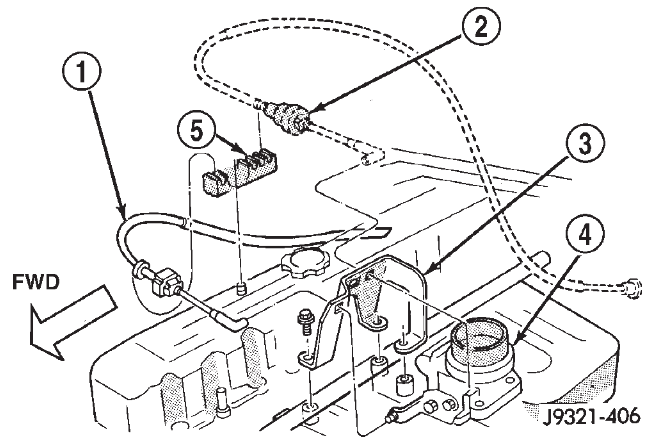


Fig. 230 Throttle Cable Attachment At Engine

1 – TRANSMISSION THROTTLE VALVE CABLE
2 – ACCELERATOR CABLE
3 – CABLE ENGINE BRACKET
4 – THROTTLE BODY
5 – CABLE GUIDE

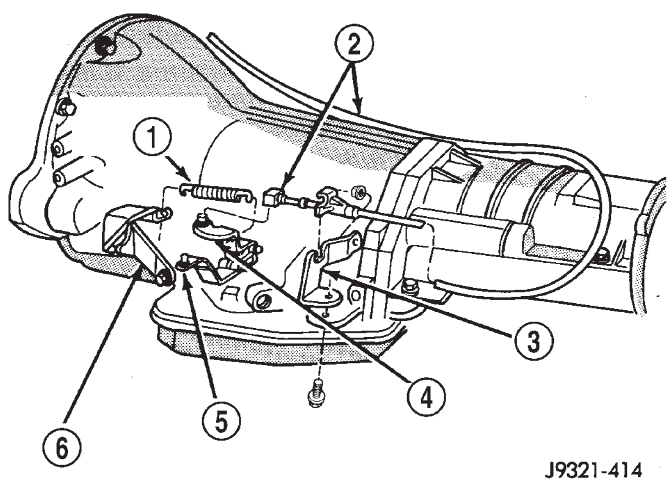


Fig. 231 Throttle Cable Attachment At Transmission

1 – RETURN SPRING
2 – THROTTLE VALVE CABLE
3 – THROTTLE VALVE CABLE BRACKET
4 – THROTTLE VALVE LEVER
5 – GEAR SELECTOR LEVER
6 – SHIFT CABLE BRACKET

• Cable end and attachment stud should be aligned (or centered on one another) to within 1 mm (0.039 in.) in either direction.

• If cable end and attachment stud are misaligned (off center), cable will have to be adjusted as described in Throttle Valve Cable Adjustment procedure.

(6) Reconnect cable end to attachment stud. Then with aid of a helper, observe movement of transmission throttle lever and lever on throttle body.

• If both levers move simultaneously from idle to half-throttle and back to idle position, adjustment is correct.

• If transmission throttle lever moves ahead of, or lags behind throttle body lever, cable adjustment will be necessary. Or, if throttle body lever prevents transmission lever from returning to closed position, cable adjustment will be necessary.

Throttle Valve Cable Adjustment Procedure

(1) Turn ignition switch to OFF position.

(2) Remove air cleaner if necessary.

(3) Disconnect cable end from attachment stud. **Carefully slide cable off stud. Do not pry or pull cable off.**

(4) Verify that transmission throttle lever is in fully closed position. Then be sure lever on throttle body is at curb idle position.

(5) Insert a small screwdriver under edge of retaining clip and remove retaining clip.

(6) Center cable end on attachment stud to within 1 mm (0.039 in.).

NOTE: Be sure that as the cable is pulled forward and centered on the throttle lever stud, the cable housing moves smoothly with the cable. Due to the angle at which the cable housing enters the spring housing, the cable housing may bind slightly and create an incorrect adjustment.

(7) Install retaining clip onto cable housing.

(8) Check cable adjustment. Verify transmission throttle lever and lever on throttle body move simultaneously.

FRONT BAND ADJUSTMENT

The front (kickdown) band adjusting screw is located on the left side of the transmission case above the manual valve and throttle valve levers.

(1) Raise vehicle.

(2) Loosen band adjusting screw locknut (Fig. 232). Then back locknut off 3-5 turns. Be sure adjusting screw turns freely in case. Apply lubricant to screw threads if necessary.

(3) Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with Inch Pound Torque Wrench C-3380-A, a 3-in. extension and appropriate Torx socket.

CAUTION: If Adapter C-3705 is needed to reach the adjusting screw, tighten the screw to only 5 N·m (47-50 in. lbs.) torque.

(4) Back off front band adjusting screw 2-1/2 turns.

(5) Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.

(6) Lower vehicle.

ADJUSTMENTS (Continued)

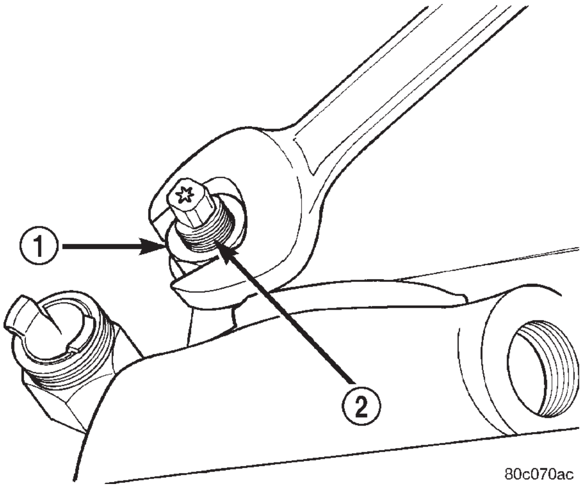


Fig. 232 Front Band Adjustment Screw Location

1 – LOCK-NUT
2 – FRONT BAND ADJUSTER

REAR BAND ADJUSTMENT

The transmission oil pan must be removed for access to the rear band adjusting screw.

(1) Raise vehicle.

(2) Remove transmission oil pan and drain fluid.

(3) Loosen band adjusting screw locknut 5-6 turns. Be sure adjusting screw turns freely in lever.

(4) Tighten adjusting screw to 5 N·m (41 in. lbs.) (Fig. 233).

(5) Back off adjusting screw 7 turns.

(6) Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.

(7) Position new gasket on oil pan and install pan on transmission. Tighten pan bolts to 17 N·m (13 ft. lbs.) torque.

(8) Lower vehicle and refill transmission with Mopar® ATF Plus 3, Type 7176, fluid.

VALVE BODY

CONTROL PRESSURE ADJUSTMENTS

There are two control pressure adjustments on the valve body;

- Line Pressure
- Throttle Pressure

Line and throttle pressures are interdependent because each affects shift quality and timing. As a result, both adjustments must be performed properly and in the correct sequence. Adjust line pressure first and throttle pressure last.

LINE PRESSURE ADJUSTMENT

Measure distance from the valve body to the inner edge of the adjusting screw with an accurate steel scale (Fig. 234).

Distance should be 33.4 mm (1-5/16 in.).

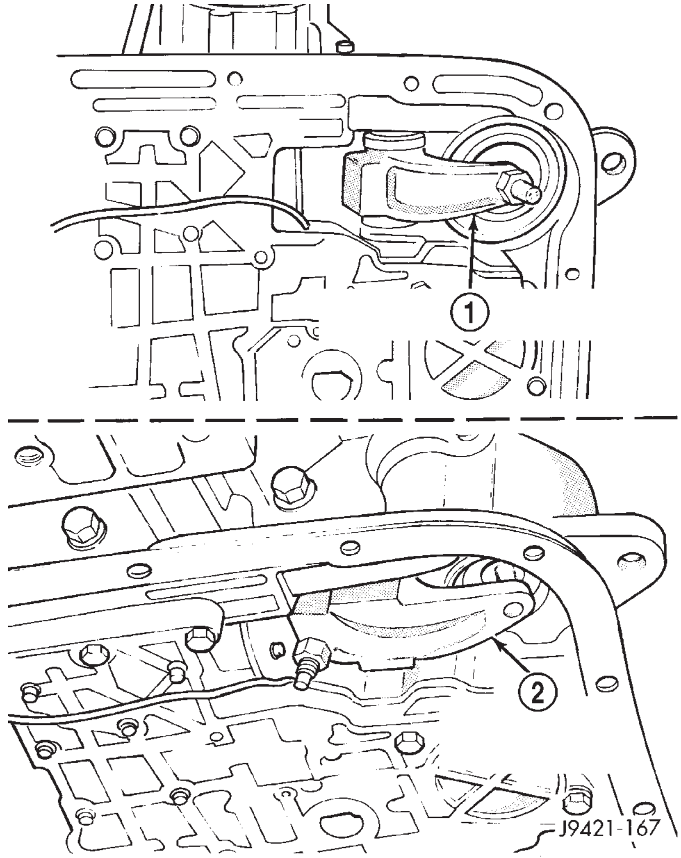


Fig. 233 Rear Band Adjustment Screw Location

1 – 30RH REAR BAND LEVER AND ADJUSTING SCREW
2 – 32RH REAR BAND LEVER AND ADJUSTING SCREW

If adjustment is required, turn the adjusting screw in, or out, to obtain required distance setting.

NOTE: The 33.4 mm (1-5/16 in.) setting is an approximate setting. Manufacturing tolerances may make it necessary to vary from this dimension to obtain desired pressure.

One complete turn of the adjusting screw changes line pressure approximately 1-2/3 psi (9 kPa).

Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

THROTTLE PRESSURE ADJUSTMENT

Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (Fig. 235).

Push the gauge tool inward to compress the kickdown valve against the spring and bottom the throttle valve.

Maintain pressure against kickdown valve spring. Turn throttle lever stop screw until the screw head touches throttle lever tang and the throttle lever cam touches gauge tool.

ADJUSTMENTS (Continued)

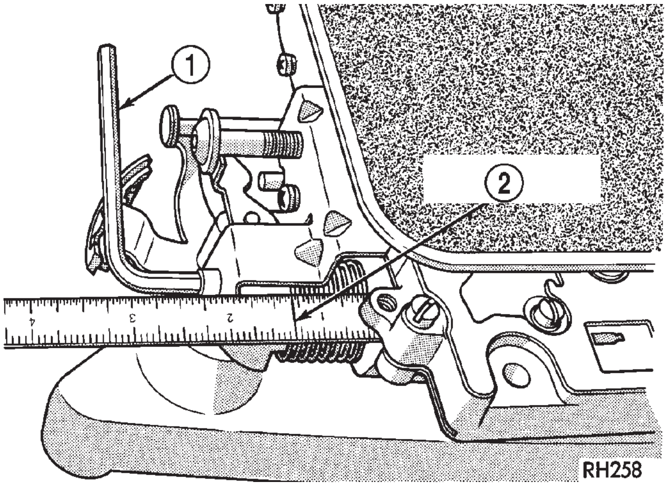


Fig. 234 Line Pressure Adjustment

1 – WRENCH
2 – 1–5/16 INCH

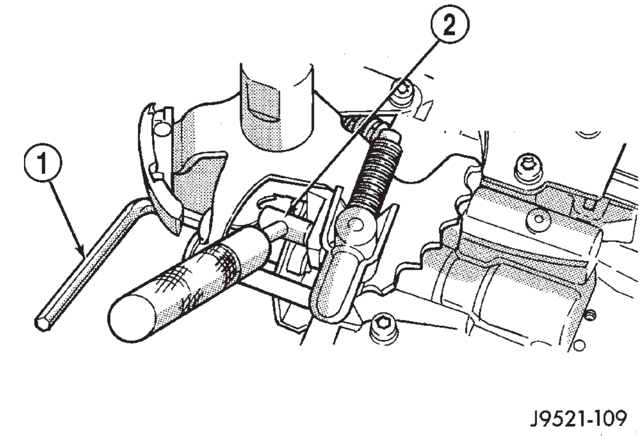


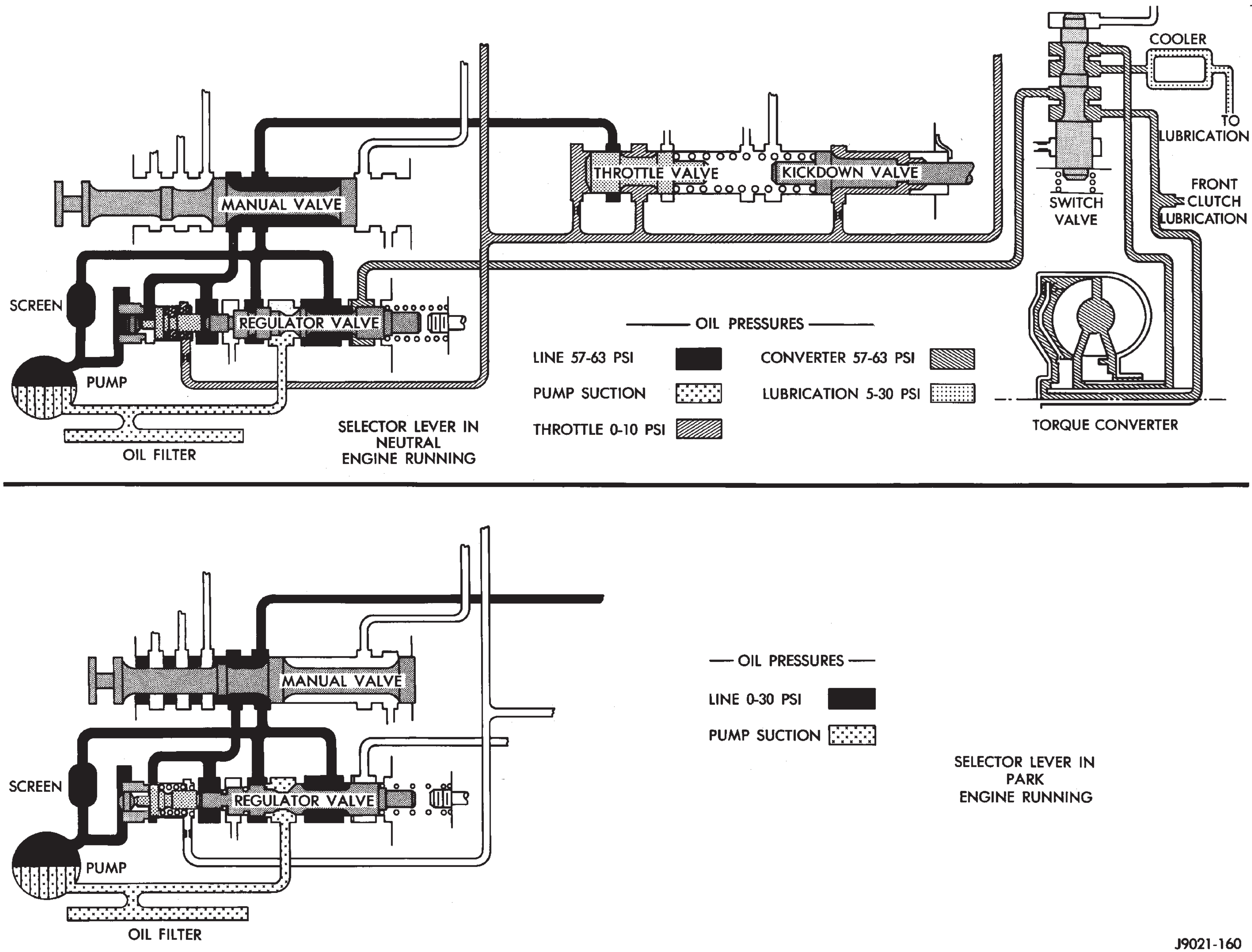
Fig. 235 Throttle Pressure Adjustment

1 – HEX WRENCH (IN THROTTLE LEVER ADJUSTING SCREW)
2 – SPECIAL TOOL C-3763 (POSITIONED BETWEEN THROTTLE LEVER AND KICKDOWN VALVE)

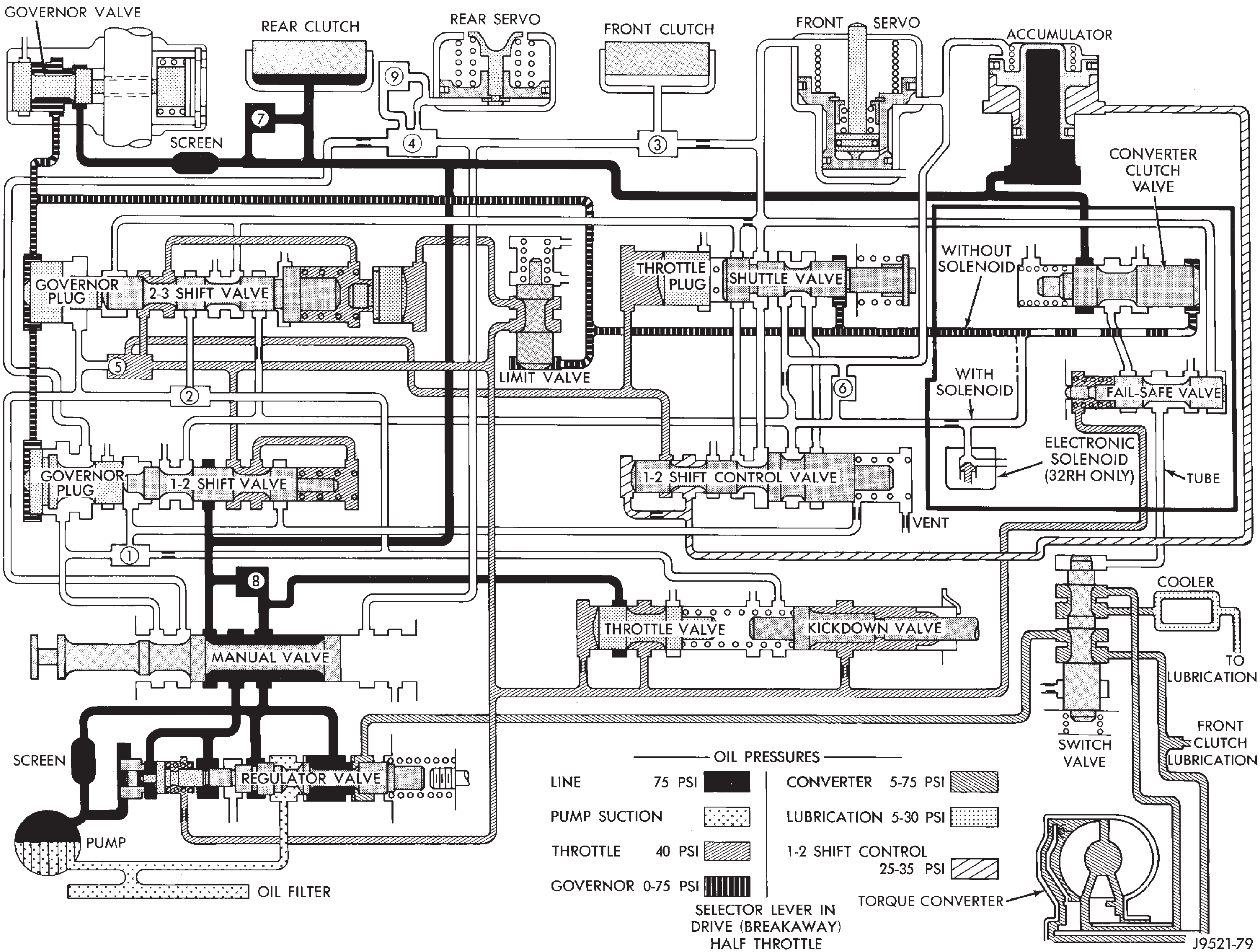
NOTE: The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.

SCHEMATICS AND DIAGRAMS

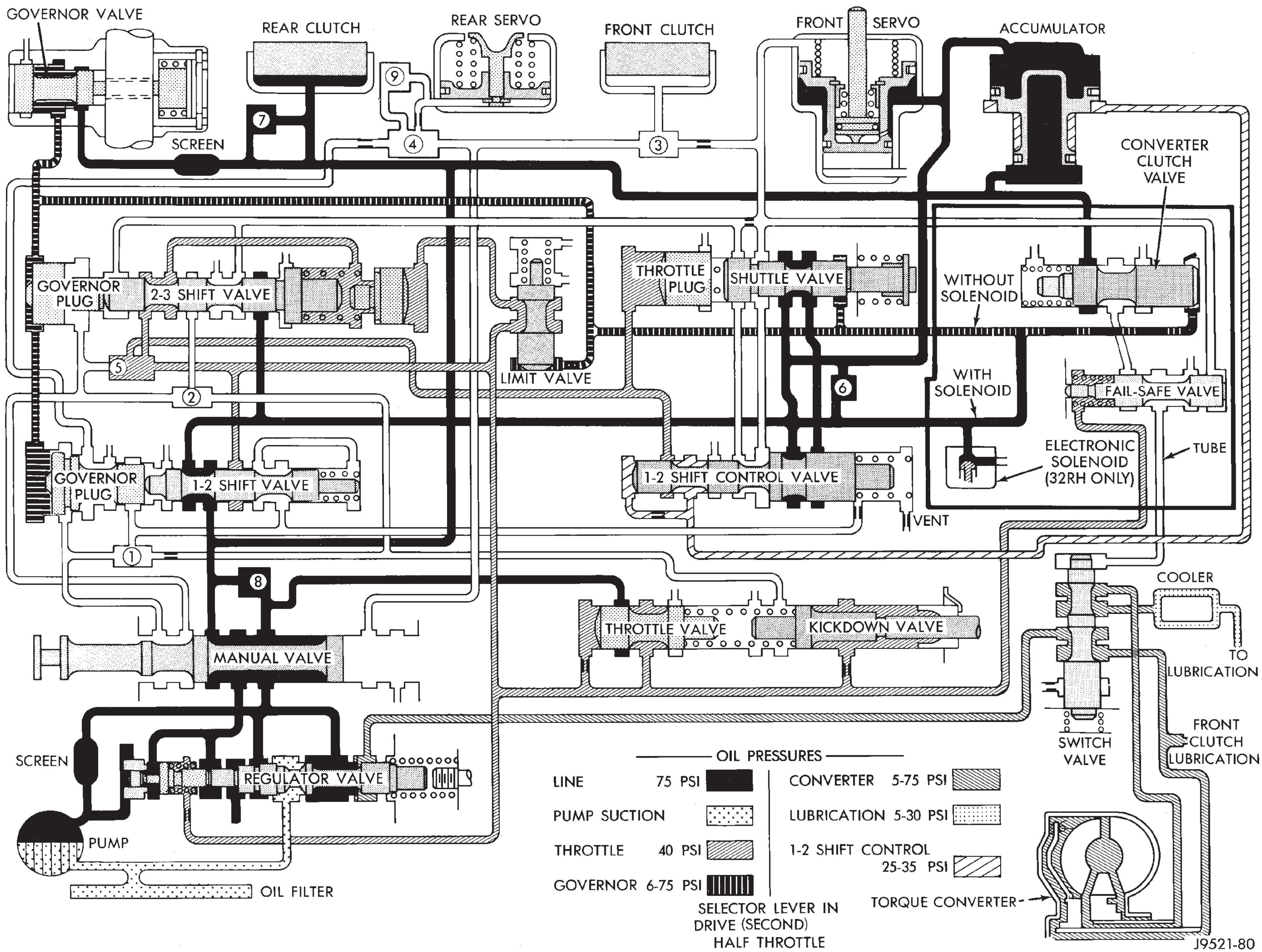
HYDRAULIC SCHEMATICS



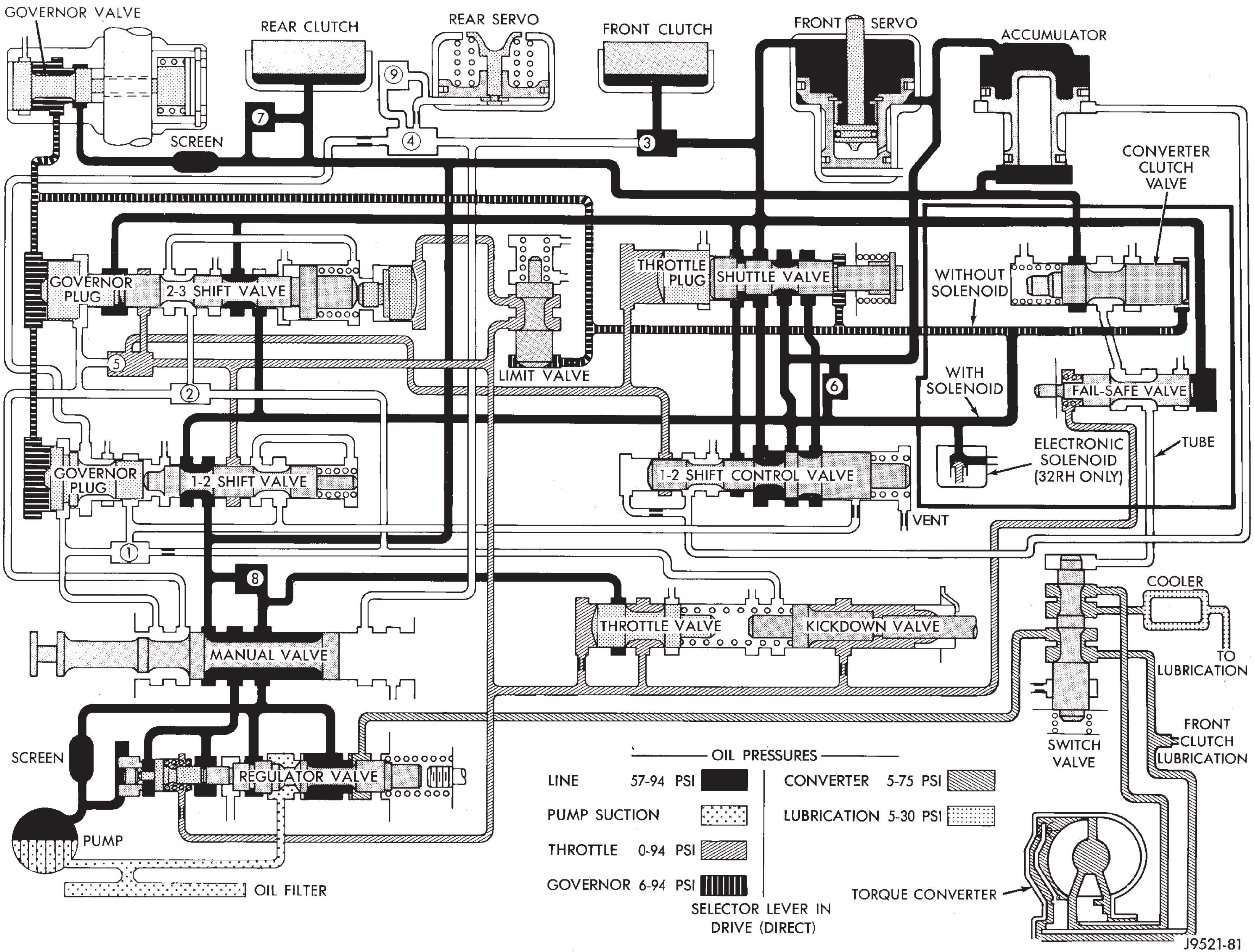
HYDRAULIC FLOW IN PARK/NEUTRAL



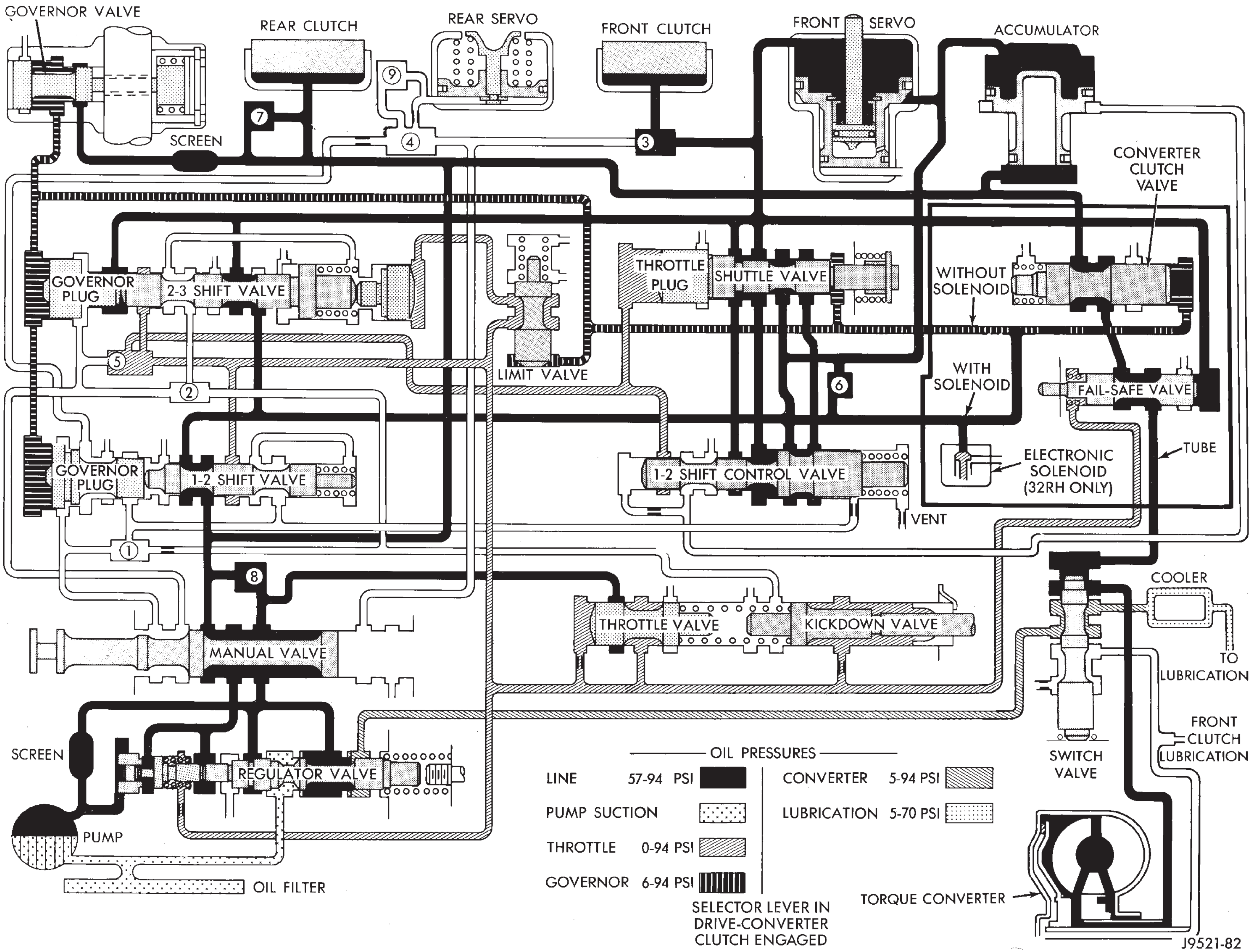
HYDRAULIC FLOW IN D-FIRST GEAR



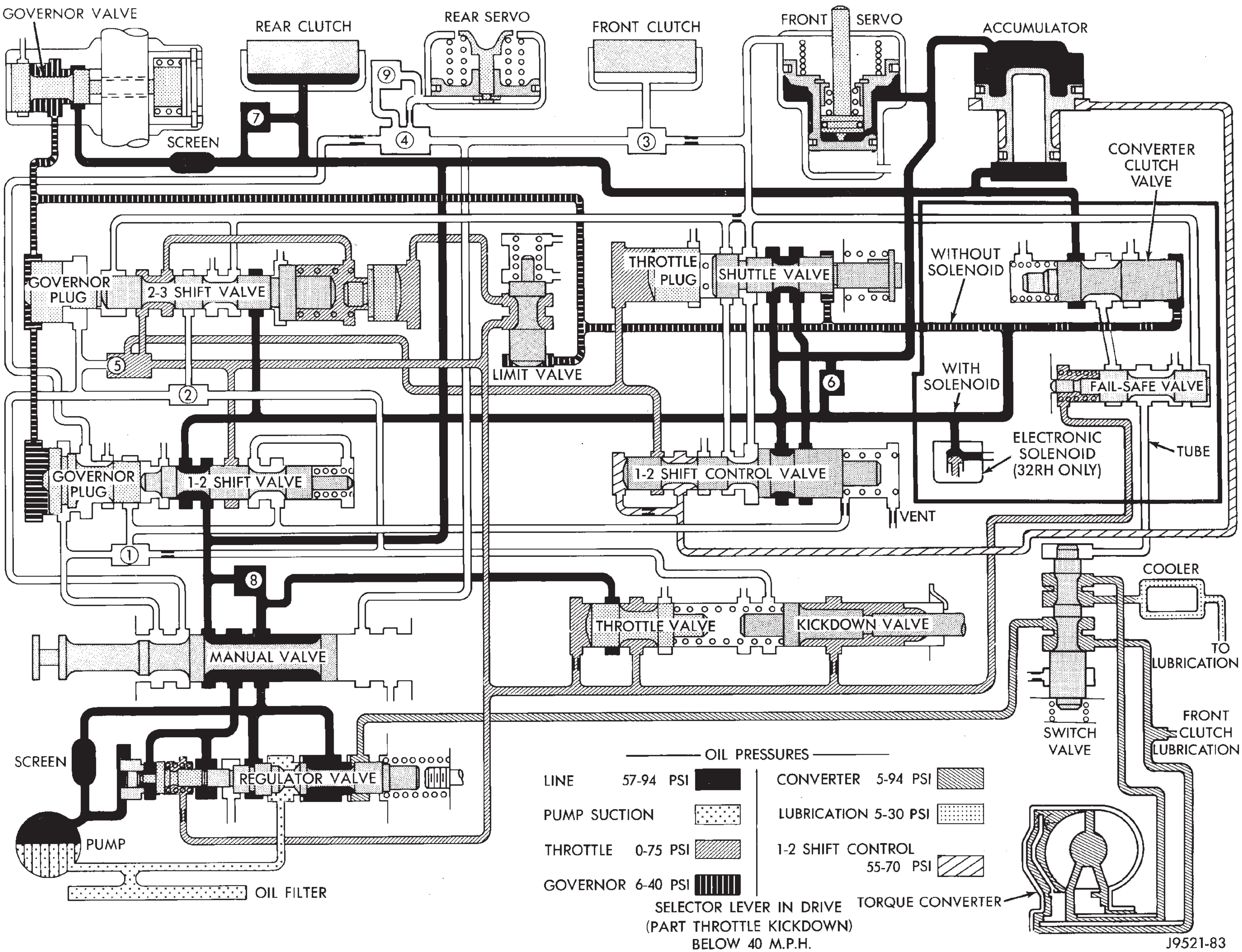
HYDRAULIC FLOW IN D-SECOND GEAR



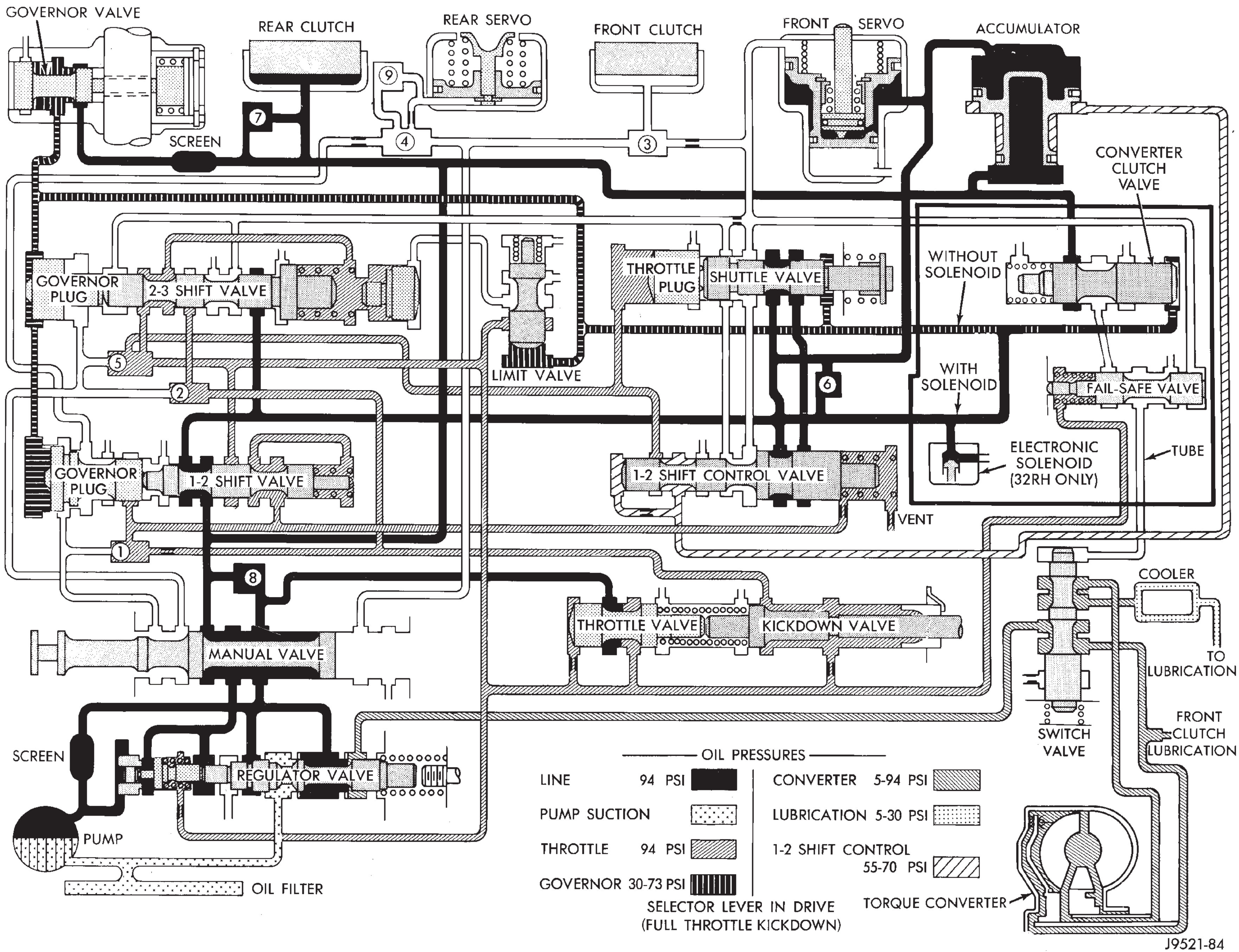
HYDRAULIC FLOW IN D-THIRD GEAR



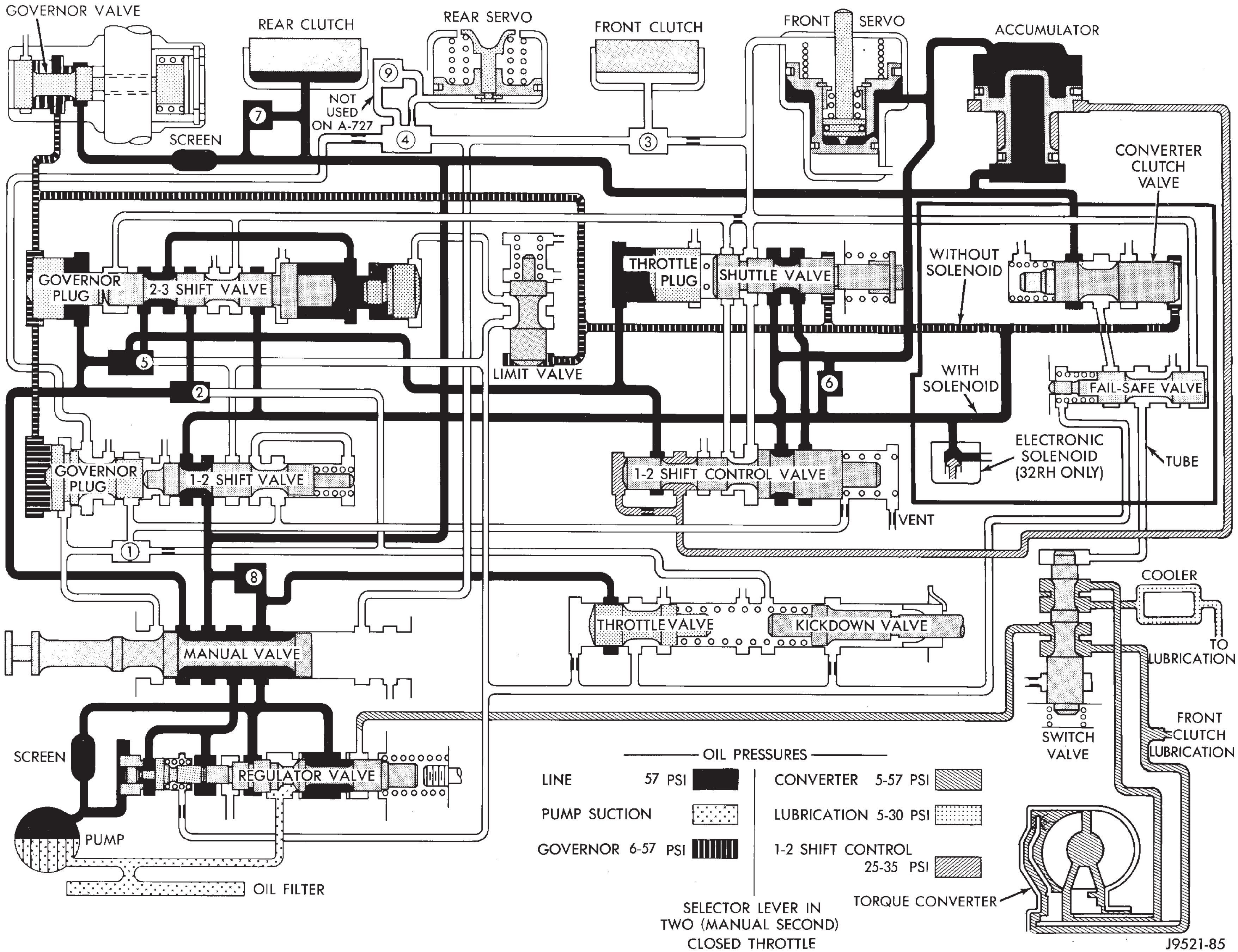
HYDRAULIC FLOW IN D-THIRD GEAR (CONVERTER CLUTCH APPLIED)



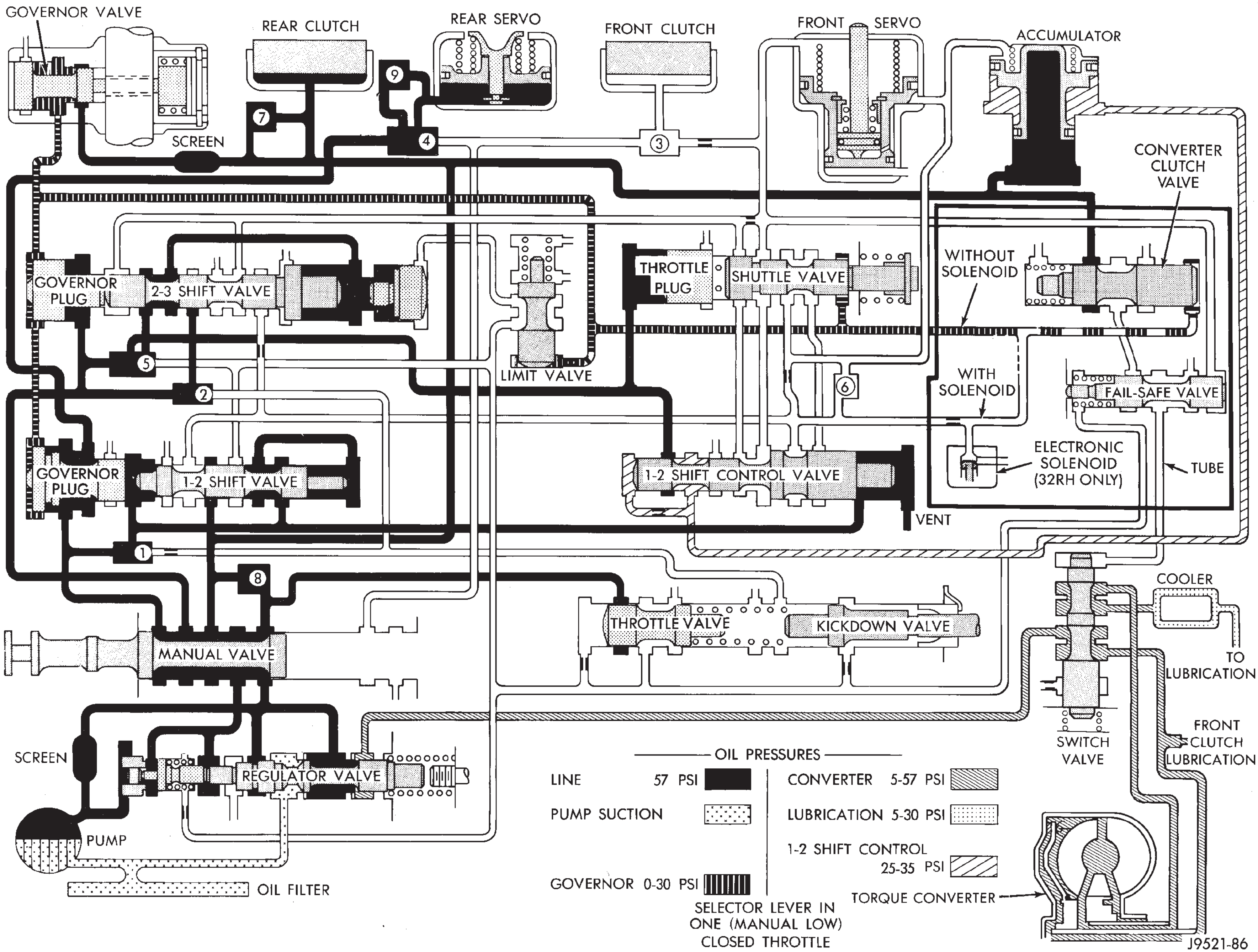
HYDRAULIC FLOW AT PART THROTTLE 3-2 KICKDOWN



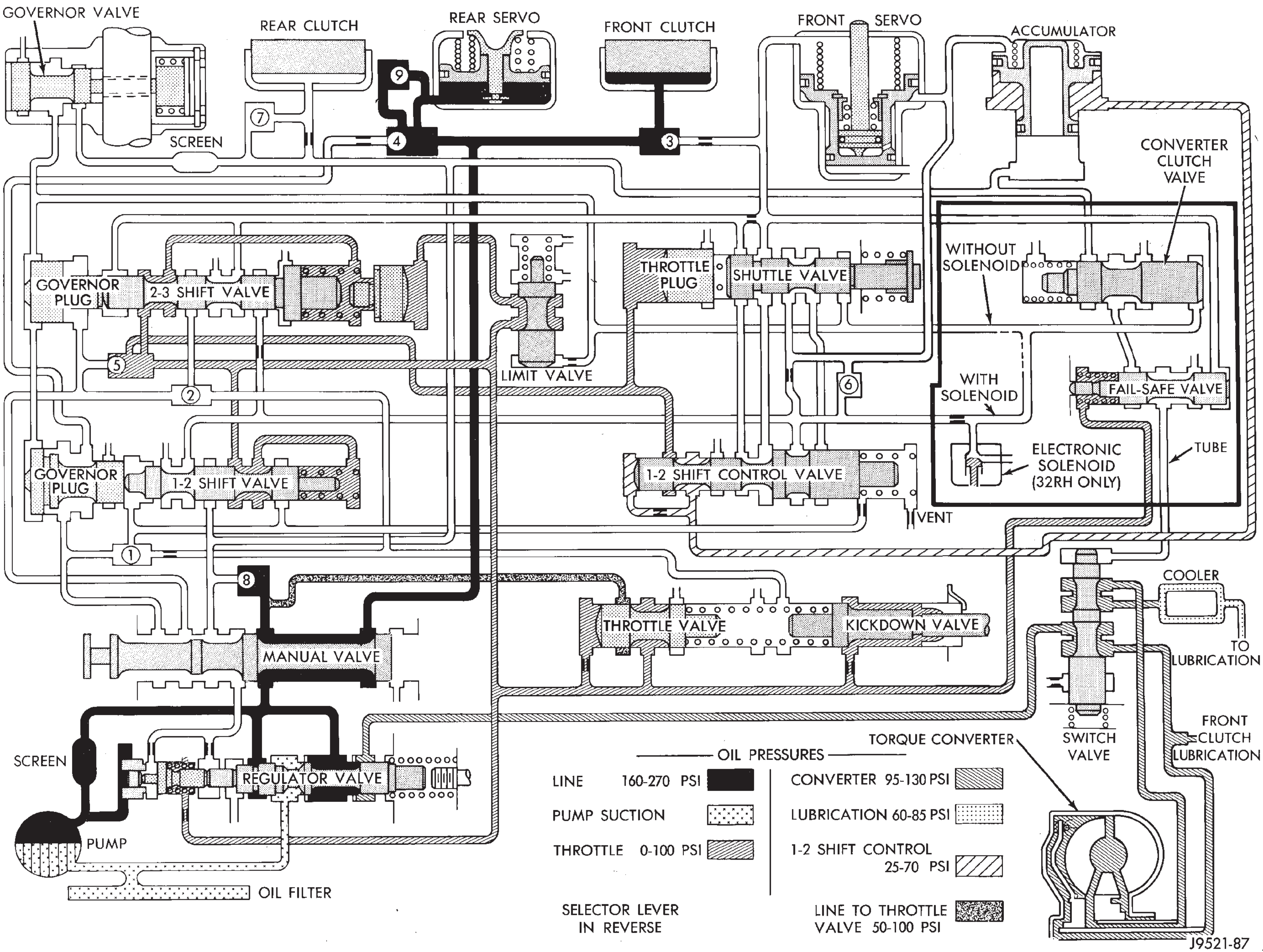
HYDRAULIC FLOW AT FULL THROTTLE 3-2 KICKDOWN



HYDRAULIC FLOW IN MANUAL SECOND



HYDRAULIC FLOW IN MANUAL LOW



HYDRAULIC FLOW IN REVERSE

SPECIFICATIONS

30RH AUTOMATIC TRANSMISSION

GENERAL

COMPONENT	METRIC	INCH
Oil pump gear tip clearance	0.089-0.190 mm	0.0035-0.0075 in.
Planetary end play	0.125-1.19 mm	0.001-0.047 in.
Input shaft end play	0.56-2.31 mm	0.022-0.091 in.
Clutch pack clearance/Front 4-disc.	1.70-3.40 mm	0.067-0.134 in.
Clutch pack clearance/Rear 4-disc.	0.559-0.940 mm	0.022-0.037 in.
Front clutch spring usage	1 spring	
30RH-Front Band adjustment from 72 in. lbs.	Back off 2.5 turns	
30RH-Rear Band adjustment from 41 in. lbs.	Back off 7 turns	
Recommended fluid	Mopar®, ATF Plus 3, Type 7176	

THRUST WASHER/SPACER/SNAP RING DIMENSIONS

COMPONENT	METRIC	INCH
Front clutch thrust washer (reaction shaft support hub)	1.55 mm	0.061 in.
Rear clutch thrust washer (clutch retainer)	1.55 mm	0.061 in.
Output shaft thrust plate (output shaft pilot hub)	1.5-1.6mm	0.060-0.063 in.
Output shaft thrust washer (rear clutch hub)	1.3-1.4 mm 1.7-1.8 mm 2.1-2.2 mm	0.052-0.054 in. 0.068-0.070 in. 0.083-0.086 in.
Rear clutch pack snap ring	1.5-1.6 mm 1.7-1.8 mm 1.9-2.0 mm	0.06-0.062 in. 0.068-0.070 in. 0.076-0.078 in.
Planetary geartrain snap ring (at front of output shaft)	1.0-1.1 mm 1.6-1.7 mm 2.1-2.2 mm	0.040-0.044 in. 0.062-0.066 in. 0.082-0.086 in.

PRESSURE TEST—ALL

ITEM	RANGE	PRESSURE
Line pressure (at accumulator)	Closed throttle	372-414 kPa (54-60 psi).
Front servo	Third gear only	No more than 21 kPa (3 psi) lower than line pressure.
Rear servo	1 range R range	No more than 21 kPa (3 psi) lower than line pressure. 1103 kPa (160 psi) at idle, builds to 1862 kPa (270 psi) at 1600 rpm.

SPECIFICATIONS (Continued)

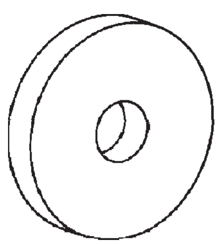
ITEM	RANGE	PRESSURE
Governor	D range closed throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1.5 psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1.5 psi) at stand still will prevent transmission from downshifting.

TORQUE

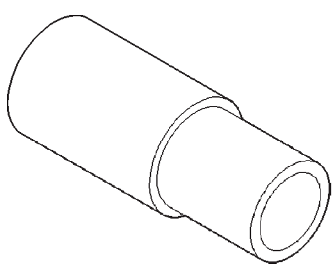
DESCRIPTION	TORQUE
Bolt/nut, crossmember	68 N·m (50 ft. lbs.)
Bolt, driveplate to crankshaft	75 N·m (55 ft. lbs.)
Plug, front band reaction	17 N·m (13 ft. lbs.)
Locknut, front band adj.	34 N·m (25 ft. lbs.)
Switch, park/neutral	34 N·m (25 ft. lbs.)
Bolt, fluid pan	17 N·m (13 ft. lbs.)
Bolt, oil pump	20 N·m (15 ft. lbs.)
Bolt, overrunning clutch cam	17 N·m (13 ft. lbs.)
Plug, pressure test port	14 N·m (10 ft. lbs.)
Bolt, reaction shaft support	20 N·m (15 ft. lbs.)
Locknut, rear band	41 N·m (30 ft. lbs.)
Bolt. speedometer adapter	11 N·m (8 ft. lbs.)
Screw, fluid filter	4 N·m (35 in. lbs.)
Bolt, valve body to case	12 N·m (100 in. lbs.)

SPECIAL TOOLS

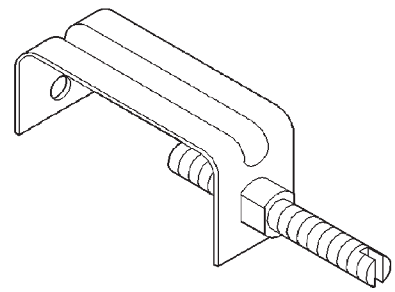
30RH TRANSMISSIONS



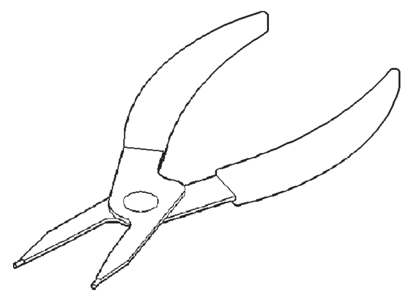
Remover—6957



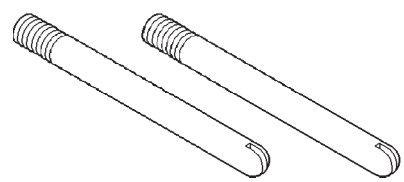
Installer—6951



Retainer, Detent Ball and Spring—6583



Snap-ring Plier—6823



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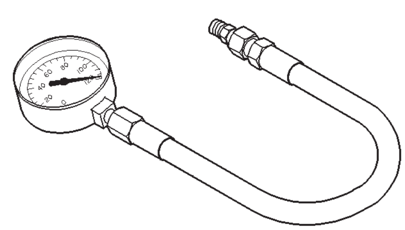
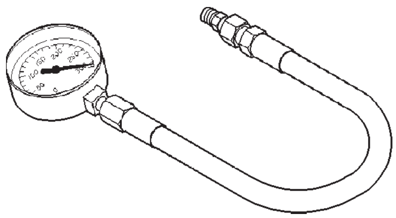


Pressure Gauge—C-3292

SPECIAL TOOLS (Continued)



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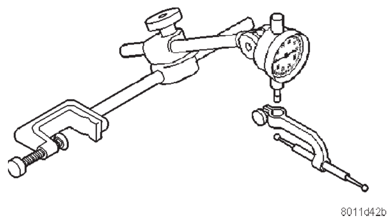
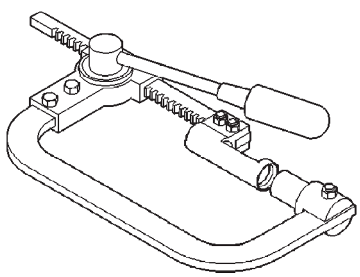


Dial Indicator—C-3339



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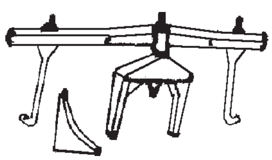

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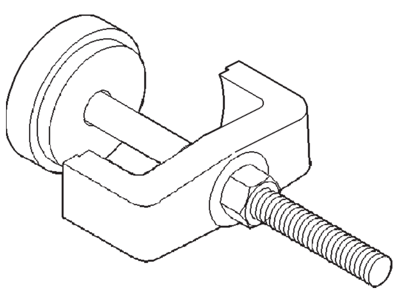

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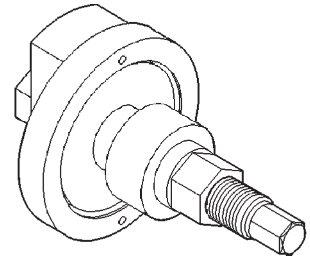

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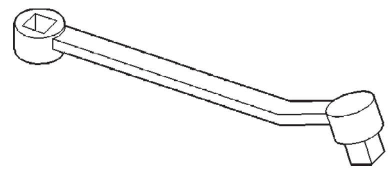

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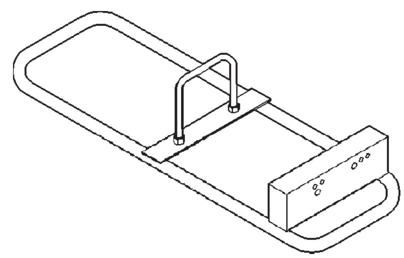
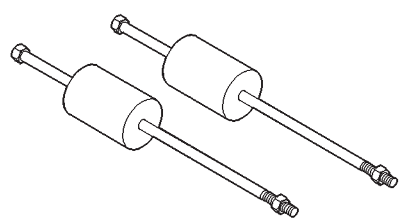


Transmission Repair Stand—C-3750-B



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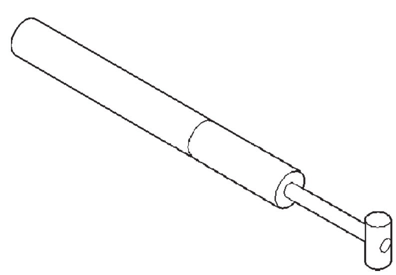

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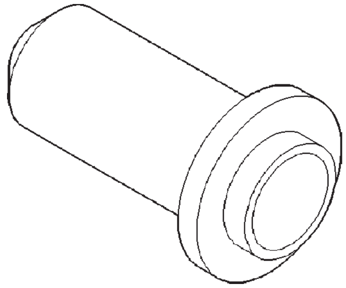

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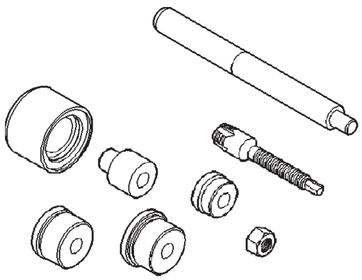

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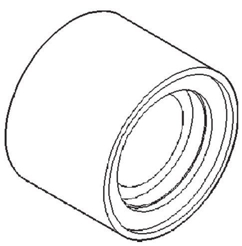

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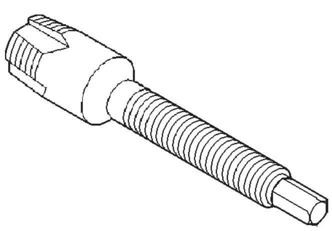

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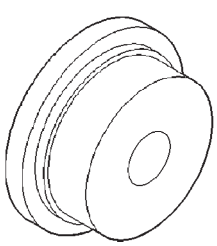

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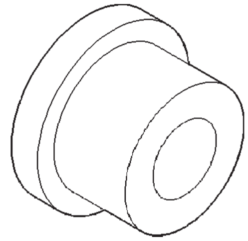

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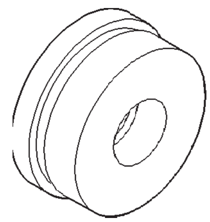

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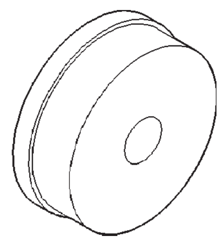

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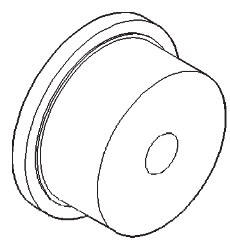

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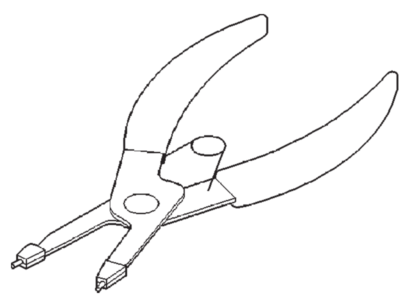

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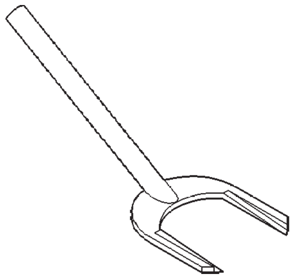

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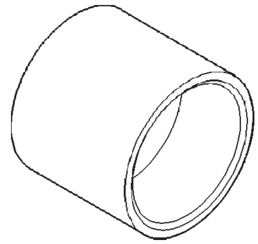

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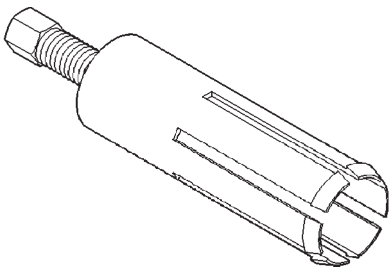

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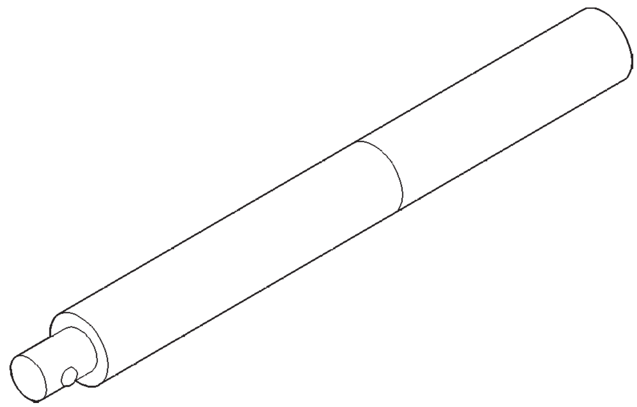

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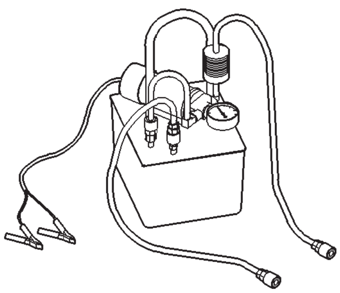

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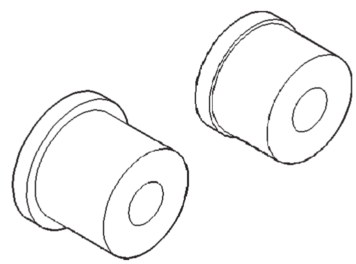

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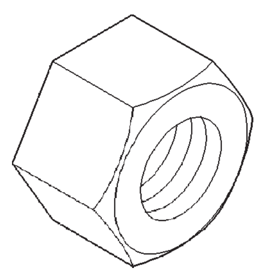

Nut, Bushing Remover—SP-1191

AW–4 AUTOMATIC TRANSMISSION

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

AW–4 AUTOMATIC TRANSMISSION

DESCRIPTION

The AW–4 is a 4–speed, electronically controlled automatic transmission (Fig. 1).

The running gear consists of an oil pump, planetary gear sets, clutch and brake units, hydraulic accumulators, a valve body with electrical solenoids, and a transmission control module (TCM). Cables are used to provide shift and throttle pressure control information. A park/neutral position switch permits engine starting in the Park and Neutral ranges only.

TRANSMISSION IDENTIFICATION

The transmission I. D. plate is attached to the case (Fig. 2). The plate contains the transmission serial and model numbers. Refer to the information on this plate when ordering service parts.

ELECTRONIC CONTROLS

The AW–4 is electronically controlled in 1, 2, 3 and D ranges. Controls consist of the transmission control module (TCM), valve body solenoids and various sensors. The sensors monitor vehicle speed, throttle opening, shift lever position and brake pedal application.

TRANSMISSION GEAR RATIOS

Fourth gear is an 0.75:1 ratio overdrive range. First, second, third and reverse gear are conventional ranges. Third gear ratio is 1:1. A separate planetary gear set provides overdrive operation in fourth gear.

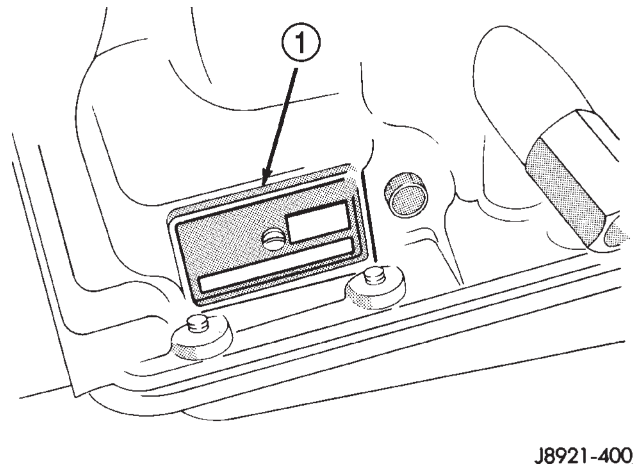

Fig. 2 Transmission Identification

1 – TRANSMISSION I. D. PLATE

OPERATION

GEARTRAIN OPERATION AND APPLICATION CHARTS

Operation and application of the first through fourth and reverse gear elements are outlined in the function and application charts.

The Component Function Chart describes basic function of various geartrain elements. The Component Application Chart indicates which elements (including valve body solenoids), are applied in the various gear ranges.

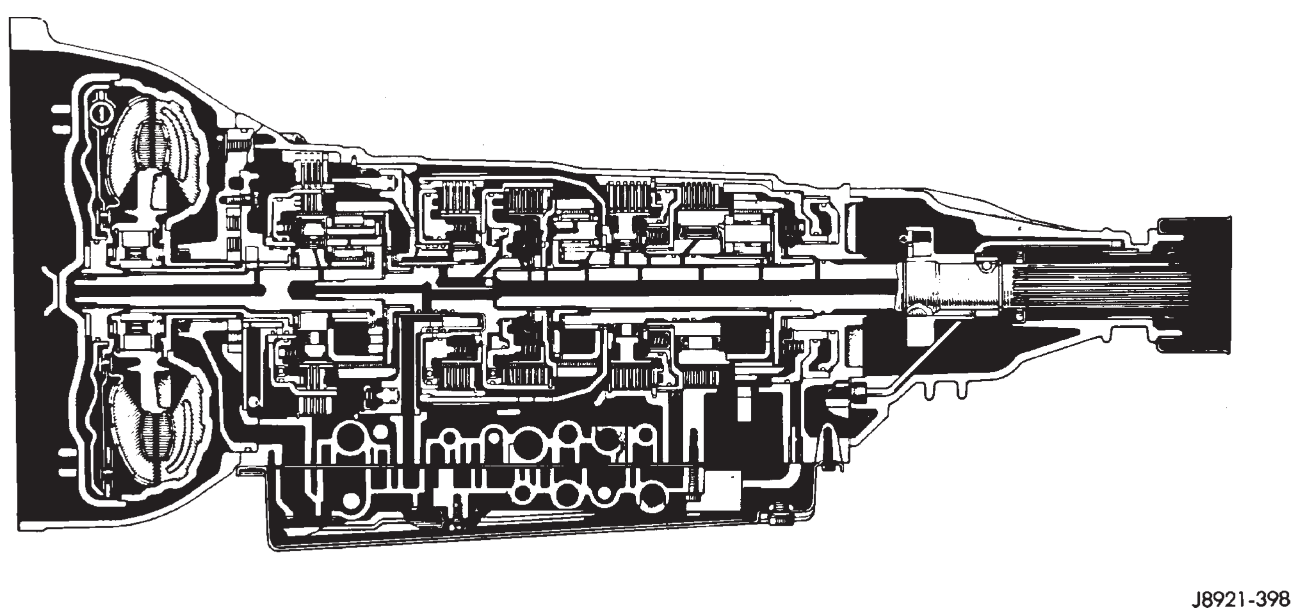

Fig. 1 AW–4 Automatic Transmission

DESCRIPTION AND OPERATION (Continued)

COMPONENT FUNCTION CHART

COMPONENT NAME	COMPONENT FUNCTION
Overdrive Direct Clutch	Connects overdrive sun gear and overdrive carrier.
Overdrive Brake	Prevents overdrive sun gear from turning either clockwise or counter-clockwise.
Overdrive One-Way Clutch	When transmission is driven by engine, connects overdrive sun gear and overdrive carrier.
Forward Clutch	Connects input shaft and front ring gear.
Direct Clutch	Connects input shaft to the front and rear ring gears.
Second Coast Brake	Prevents front and rear sun gear from turning either clockwise or counter-clockwise.
Second Brake	Prevents outer race of number 1 one-way clutch from turning either clockwise or counter-clockwise, thus preventing the front and rear sun gears from turning counter-clockwise.
First/Reverse Brake	Prevents the rear planetary carrier from turning either clockwise or counter-clockwise.
Number 1 One-way Clutch	When second brake is operating, prevents the front and rear sun gears from turning counter-clockwise.
Number 2 One-Way Clutch	Prevents the rear planetary carrier from turning counter-clockwise.

COMPONENT APPLICATION CHART

Shift Lever Position	Gear	Valve Body Solenoid No. 1	Valve Body Solenoid No. 2	OVERDRIVE CLUTCH	FORWARD CLUTCH	DIRECT CLUTCH	OVERDRIVE BRAKE	SECOND COAST BRAKE	SECOND BRAKE	FIRST/ REVERSE BRAKE	OVERDRIVE ONE-WAY CLUTCH	NO.1 ONE-WAY CLUTCH	NO.2 ONE-WAY CLUTCH
P	Park	ON	OFF	•									
R	Reverse	ON	OFF	•		•				•	•		
N	Neutral	ON	OFF	•									
D	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•				•		•	•	
	Third	OFF	ON	•	•	•			•		•		
	OD	OFF	OFF		•	•	•		•				
3	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•			•	•		•	•	
	Third	OFF	ON	•	•	•			•		•		
1-2	First	ON	OFF	•	•					•	•		•
	Second	ON	ON	•	•			•	•		•	•	

• = Applied

J8921-405

DESCRIPTION AND OPERATION (Continued)

FIRST/SECOND/THIRD/REVERSE GEAR COMPONENTS

First through third and reverse gear components are outlined in (Fig. 3).

The input shaft is meshed with the direct clutch hub and the forward clutch drum. These elements rotate as a unit. The forward clutch hub rotates as a unit with the front planetary ring gear. The direct clutch drum is meshed with the forward end of the planetary sun gear.

The second brake hub serves as the outer race of one–way clutch No. 1. The clutch inner race is locked with the front/rear sun gear. The inner race of one–way clutch No. 2 is splined to the transmission case and is locked. The outer race rotates as a unit with the rear planetary carrier.

The rear planetary ring gear is splined to the output shaft. The front planetary carrier and rear carrier ring gear are meshed and rotate as a unit with the output shaft.

FOURTH GEAR OVERDRIVE COMPONENTS

The overdrive system consists of the input shaft, one–way clutch, planetary sun gear, ring gear, planetary carrier, overdrive clutch and overdrive brake (Fig. 4). The overdrive elements are controlled and applied through transmission valve body solenoid number two.

In fourth gear, the overdrive brake prevents the overdrive sun gear from turning. The overdrive input shaft and planetary carrier rotate as a unit. The sun gear and overdrive direct clutch drum are in mesh and operate as a single unit. The direct clutch splines function as the hub for the overdrive brake. The one–way clutch outer race is in mesh with the planetary carrier. The inner race is fixed to the sun gear shaft.

FLUID

NOTE: Refer to the maintenance schedules in Group 0, Lubrication and Maintenance for the recommended maintenance (fluid/filter change) intervals for this transmission.

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

DESCRIPTION

Mopar® Dexron IIE/Mercon is the recommended fluid for the AW-4 automatic transmissions.

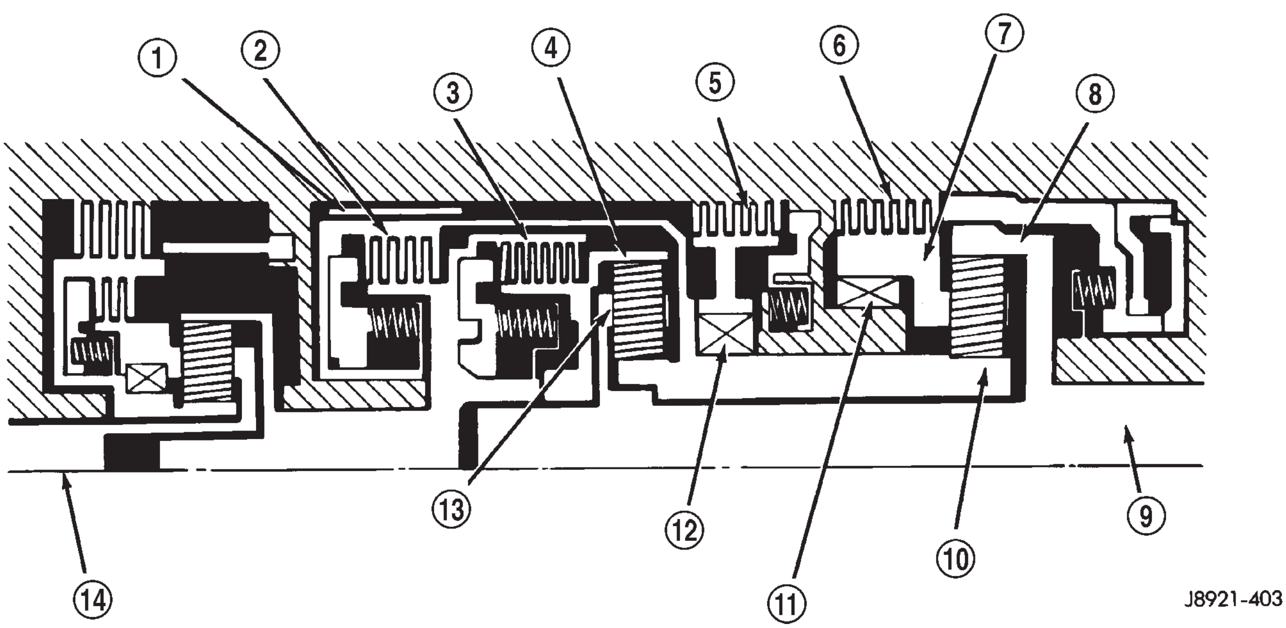

Fig. 3 First/Second/Third/Reverse Gear Components

1 – 2ND COAST BRAKE
2 – DIRECT CLUTCH
3 – FORWARD CLUTCH
4 – FRONT PLANETARY RING GEAR
5 – SECOND BRAKE
6 – FIRST/REVERSE BRAKE
7 – REAR PLANETARY CARRIER
8 – REAR PLANETARY RING GEAR
9 – OUTPUT SHAFT
10 – FRONT & REAR PLANETARY SUN GEAR
11 – ONE-WAY CLUTCH NO. 2
12 – ONE-WAY CLUTCH NO. 1
13 – FRONT PLANETARY CARRIER
14 – INPUT SHAFT

DESCRIPTION AND OPERATION (Continued)

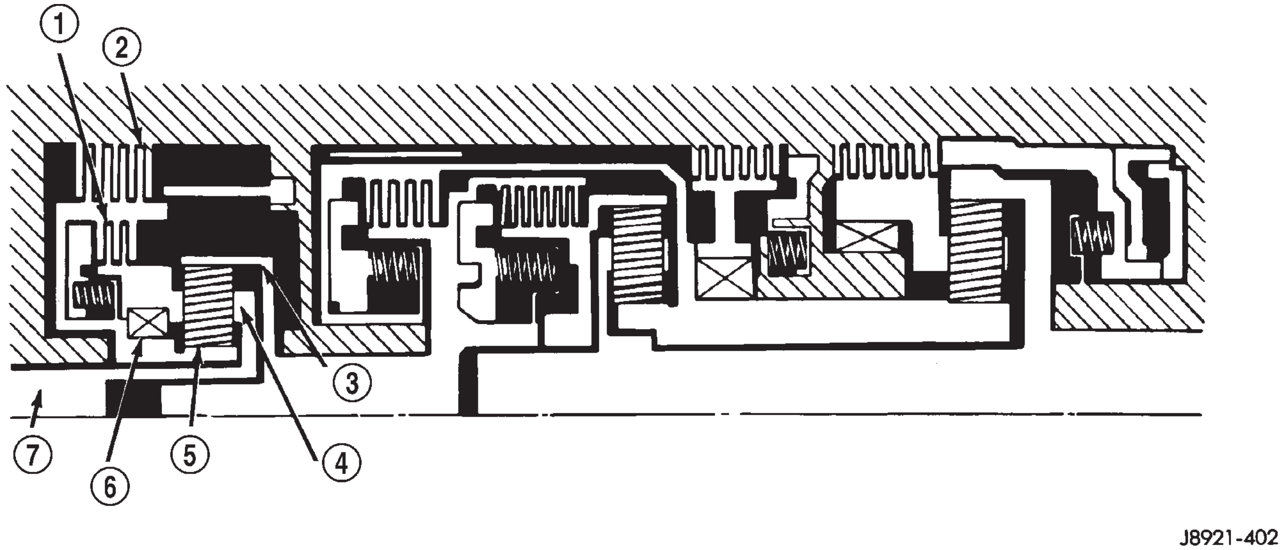

Fig. 4 Fourth Gear Overdrive Components

1 – CLUTCH
2 – BRAKE
3 – RING GEAR
4 – PLANETARY CARRIER
5 – SUN GEAR
6 – ONE-WAY CLUTCH
7 – INPUT SHAFT

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

Mopar® Dexron IIE/Mercon 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.

OPERATION

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

DESCRIPTION AND OPERATION (Continued)

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 5) 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. Torque converter clutch engagement occurs in second gear in 1–2 position; third gear in 3 position and third and fourth gear in D position. 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.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the fluid cooler and lines.

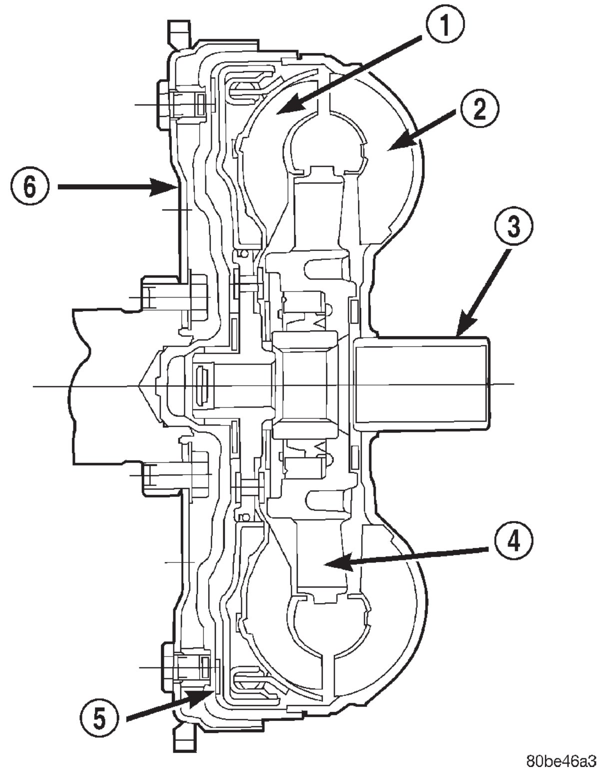

Fig. 5 Torque Converter Assembly

1 – TURBINE
2 – IMPELLER
3 – HUB
4 – STATOR
5 – CONVERTER CLUTCH DISC
6 – DRIVE PLATE

DESCRIPTION AND OPERATION (Continued)

IMPELLER

The impeller (Fig. 6) is an integral part of the converter housing. The impeller consists of curved vanes 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 in the same and are the driving member of the system.

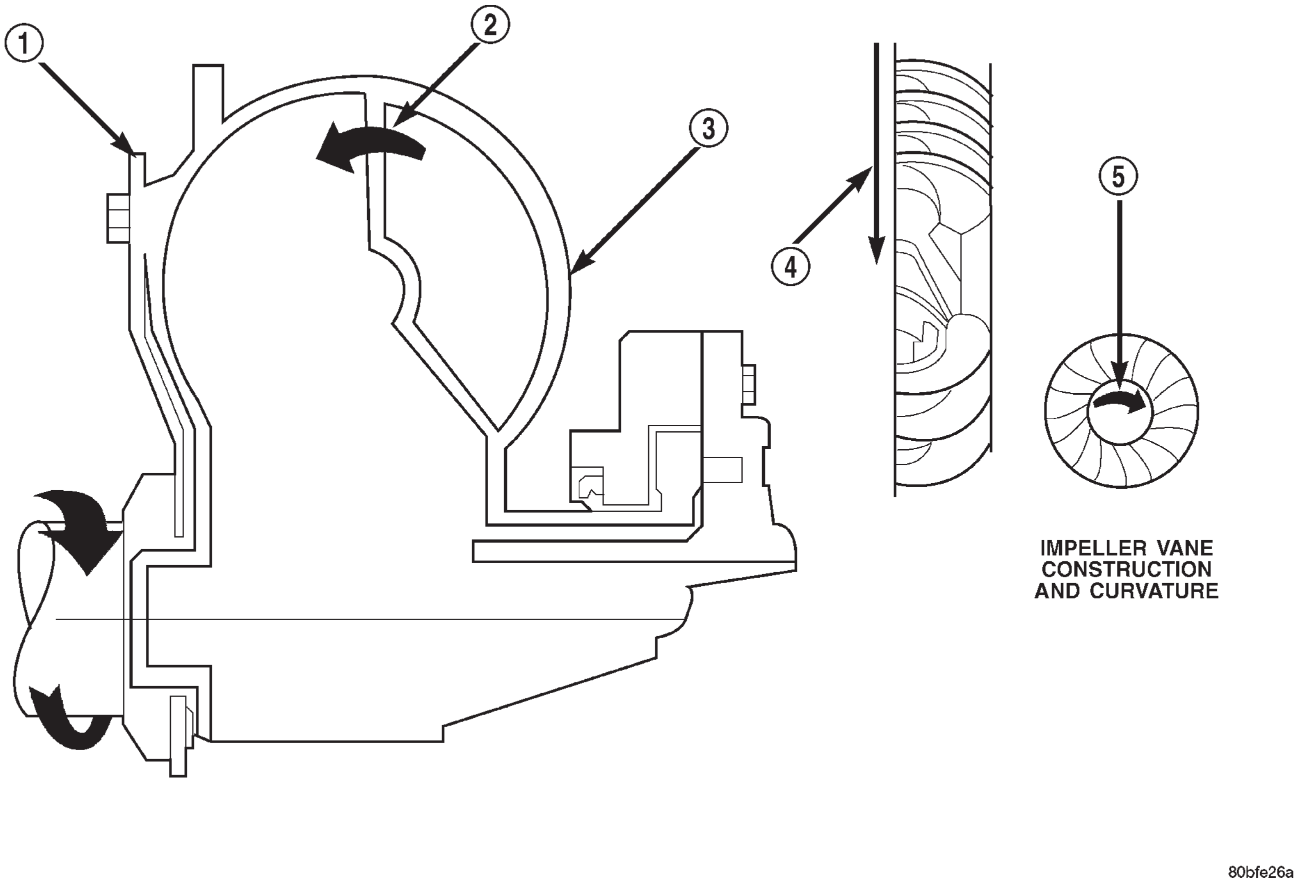

Fig. 6 Impeller

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

DESCRIPTION AND OPERATION (Continued)

TURBINE

The turbine (Fig. 7) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not mounted 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.

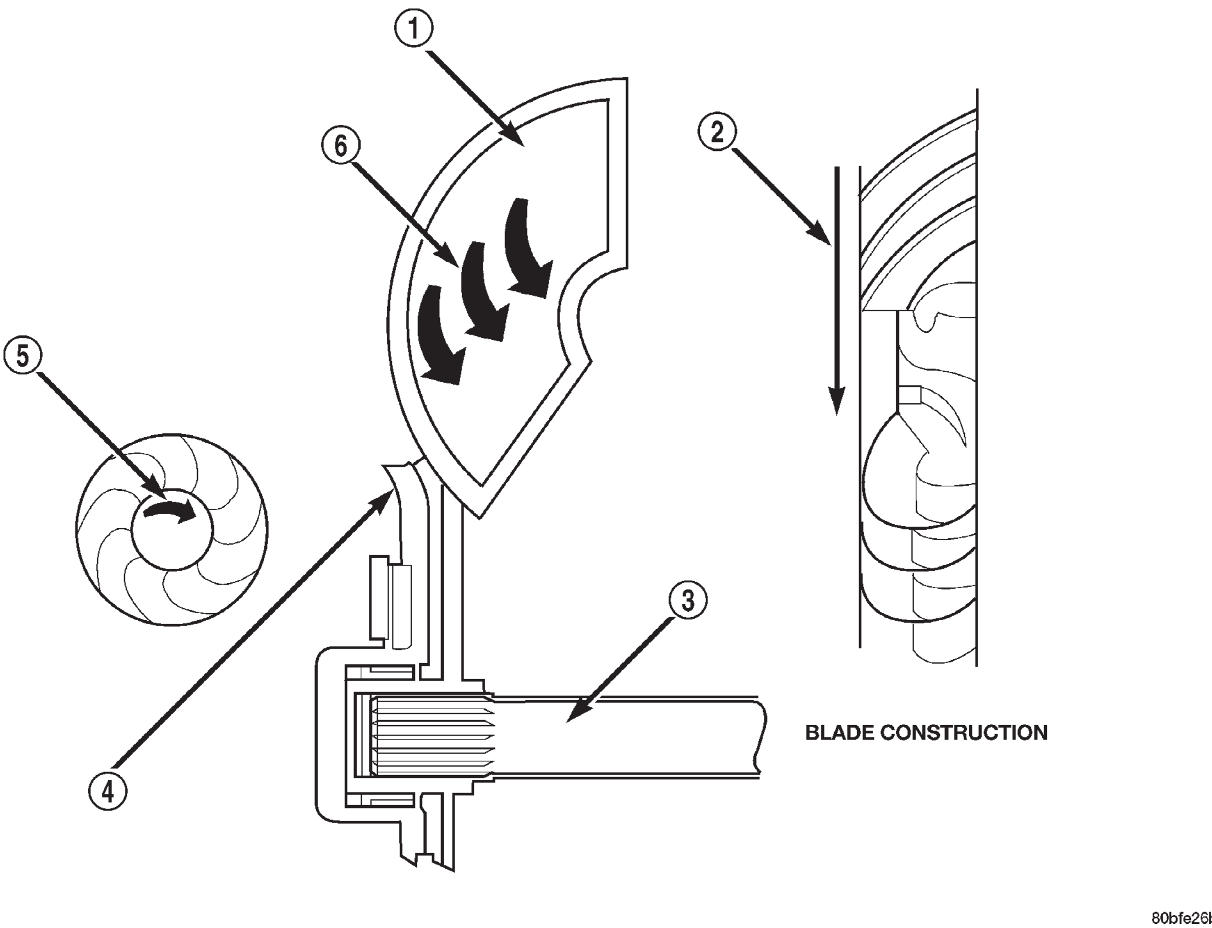

Fig. 7 Turbine

1 – TURBINE VANE
2 – ENGINE ROTATION
3 – INPUT SHAFT
4 – PORTION OF TORQUE CONVERTER COVER
5 – ENGINE ROTATION
6 – OIL FLOW WITHIN TURBINE SECTION

DESCRIPTION AND OPERATION (Continued)

STATOR

The stator assembly (Fig. 8) is mounted on a stationary shaft which is an integral part of the oil pump. The stator also contains an over–running clutch. The stator is located between the impeller and turbine within the torque converter case (Fig. 9). The over–running clutch of the stator allows the stator to rotate only in a clockwise direction.

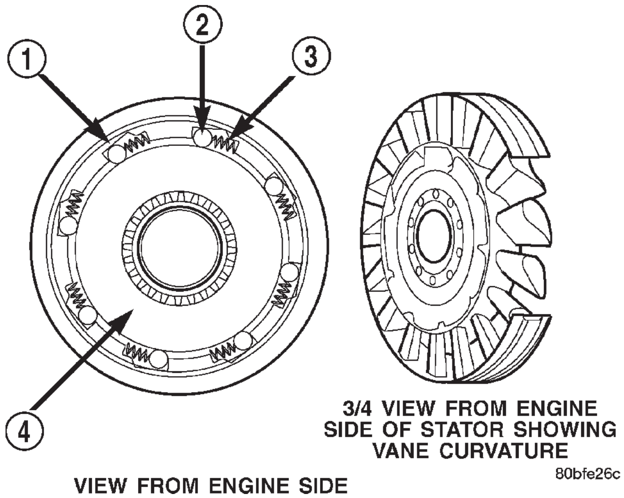

Fig. 8 Stator Components

1 – CAM (OUTER RACE)
2 – ROLLER
3 – SPRING
4 – INNER RACE

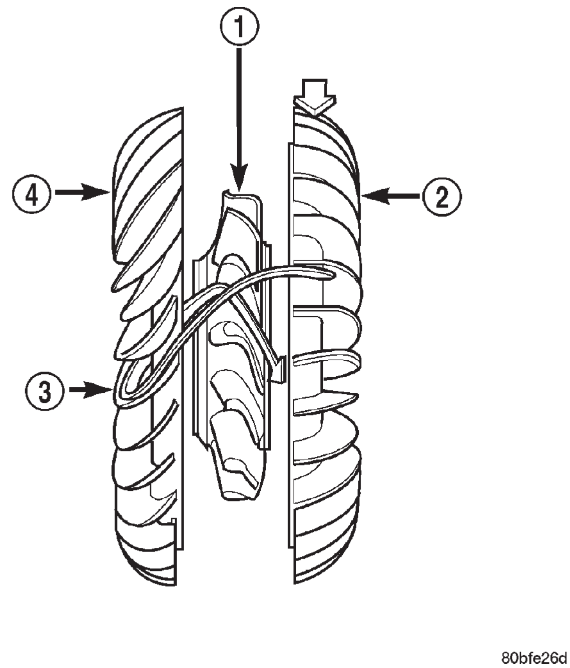

Fig. 9 Stator Location

1 – STATOR
2 – IMPELLER
3 – FLUID FLOW
4 – TURBINE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 10) 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 impeller housing to provide this mechanical lock-up.

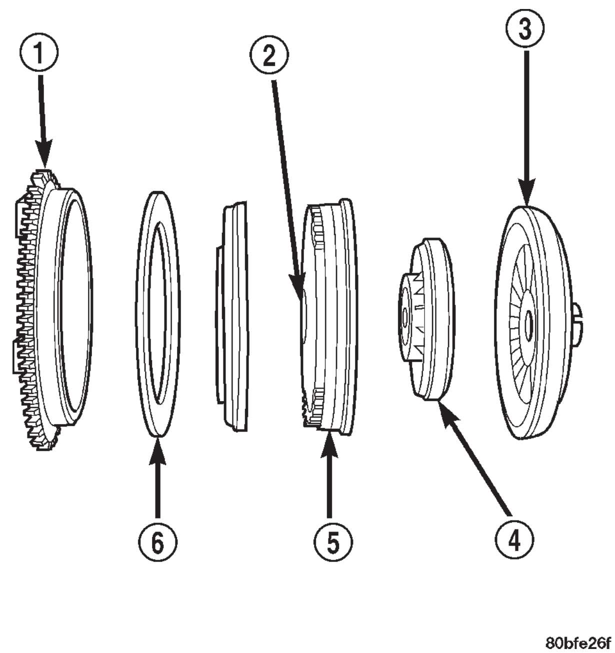

Fig. 10 Torque Converter Clutch (TCC)

1 – IMPELLER FRONT COVER
2 – THRUST WASHER ASSEMBLY
3 – IMPELLER
4 – STATOR
5 – TURBINE
6 – FRICTION DISC

OPERATION

The converter impeller (Fig. 11) (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

DESCRIPTION AND OPERATION (Continued)

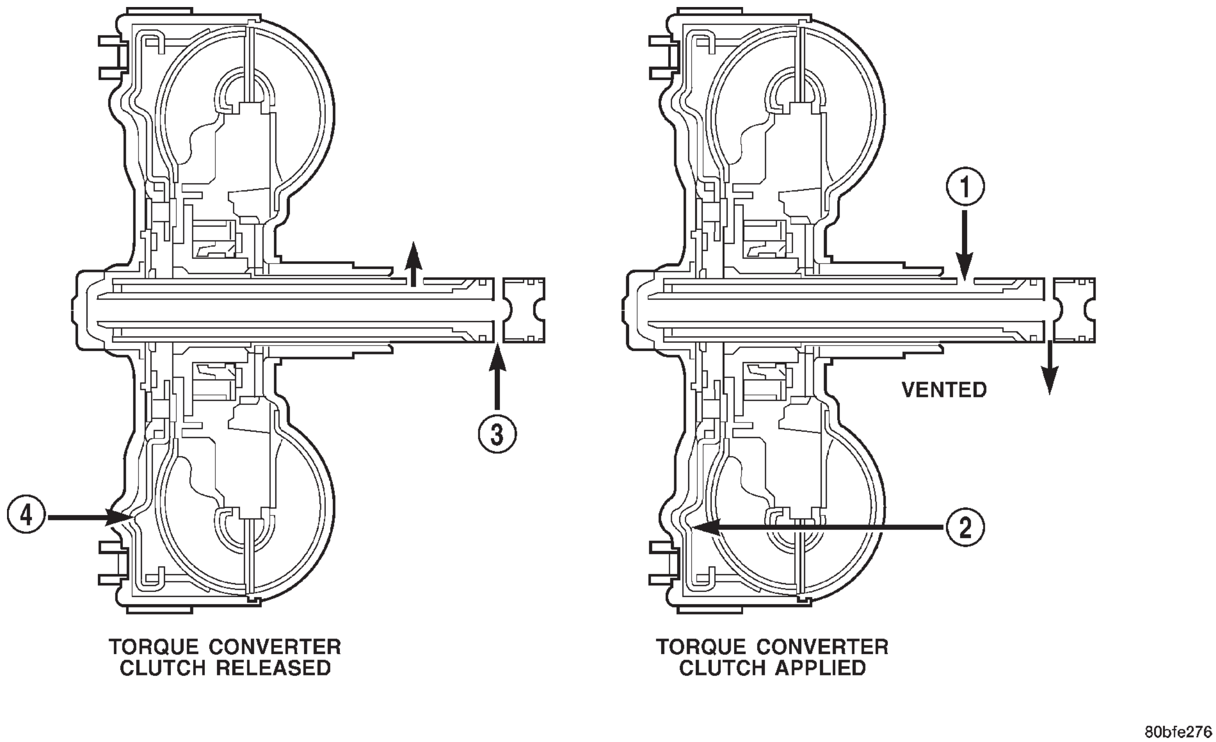

Fig. 11 Torque Converter Fluid Operation

1 – APPLY PRESSURE
2 – THE PISTON MOVES SLIGHTLY FORWARD
3 – RELEASE PRESSURE
4 – THE PISTON MOVES SLIGHTLY REARWARD

(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 vanes 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 clutch to its shaft (Fig. 12). Under stall conditions (the turbine is stationary), the oil leaving the turbine vanes strikes the face of the stator vanes 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 vanes 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 2.2:1. 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.

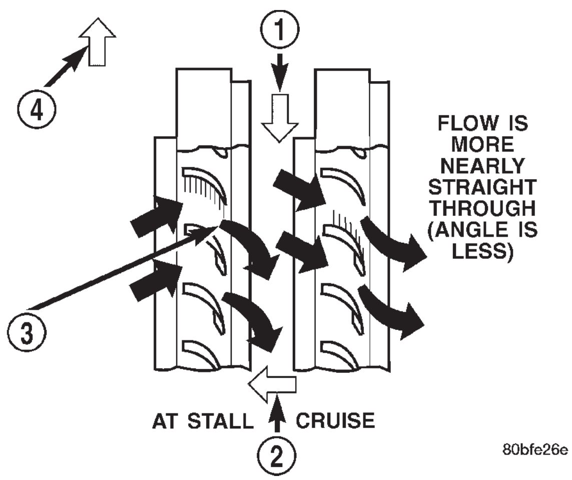

Fig. 12 Stator Operation

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

DESCRIPTION AND OPERATION (Continued)

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 impeller'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 Transmission Control Module (TCM). Inputs that determine clutch engagement are: coolant temperature, vehicle speed and throttle position. Clutch engagement is controlled by transmission valve body solenoid number three and by the converter clutch relay valve. The solenoid channels line pressure to the clutch through the relay valve at clutch engagement speeds.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 13) is located in the pump housing inside the bell housing of the transmission case. The oil pump consists of an inner and outer gear, a housing, and a cover that also serves as the reaction shaft support.

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.

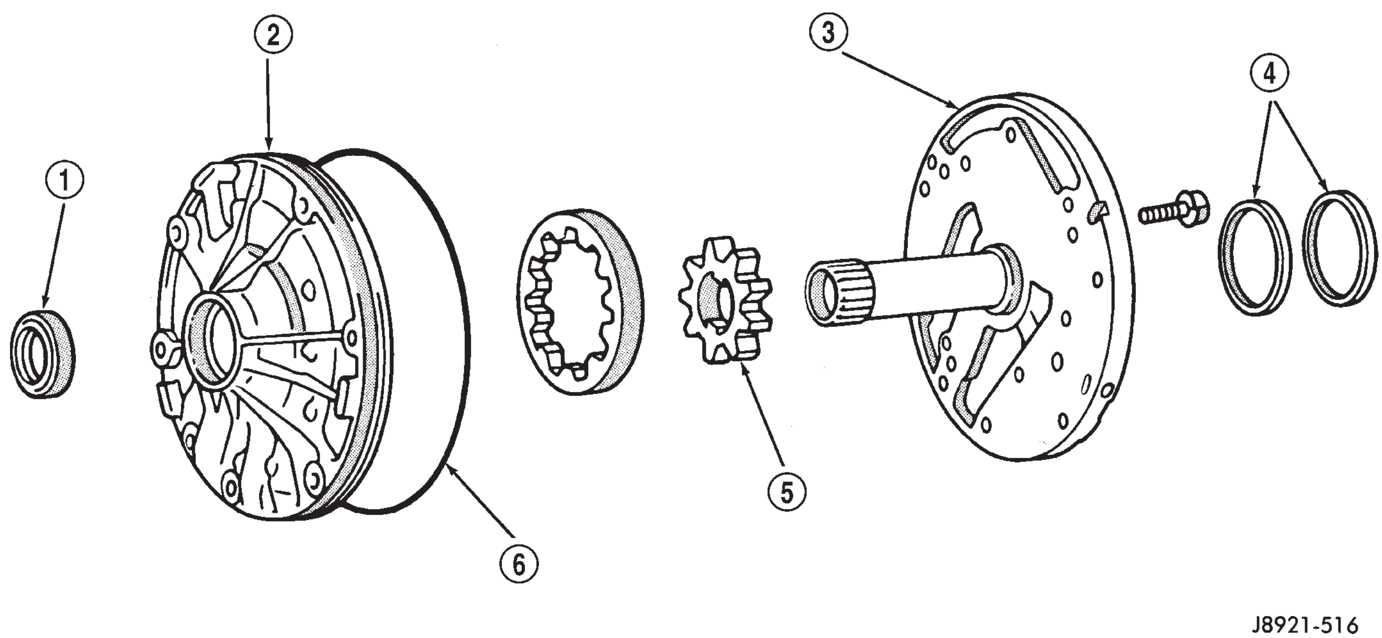

Fig. 13 Oil Pump Assembly

1 – PUMP SEAL
2 – PUMP BODY
3 – STATOR SHAFT
4 – SEAL RINGS
5 – GEAR
6 – O-RING

DESCRIPTION AND OPERATION (Continued)

TRANSMISSION VALVE BODY COMPONENTS

DESCRIPTION

Transmission operating pressure is supplied to the clutch and brake apply circuits through the transmission valve body. The valve body consists of an upper body, lower body, separator plate and upper and lower gaskets (Fig. 14). The various spool valves, sleeves, plugs and springs are located within the two body sections.

The manual valve, 1–2 shift valve, primary regulator valve, accumulator control valve, check balls, and oil strainers are located in the lower body section (Fig. 15). The remaining control and shift valves plus check balls and one additional oil strainer are located in the upper body section (Fig. 16).

TRANSMISSION VALVE BODY SOLENOIDS

The solenoids are mounted on the valve body and operated by the TCM. The solenoids control operation of the converter clutch and shift valves in response to input signals from the module.

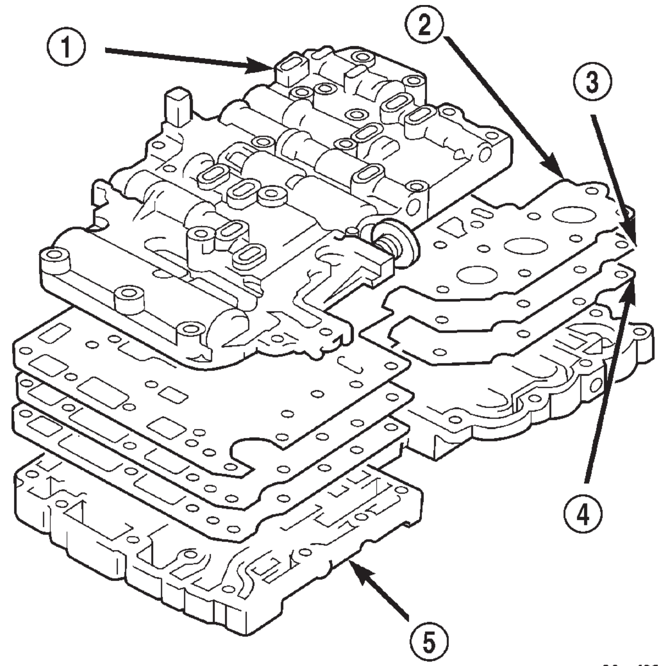

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Fig. 14 Two–Section Transmission Valve Body

1 – UPPPER BODY
2 – UPPER GASKET
3 – SEPARATOR PLATE
4 – LOWER GASKET
5 – LOWER BODY

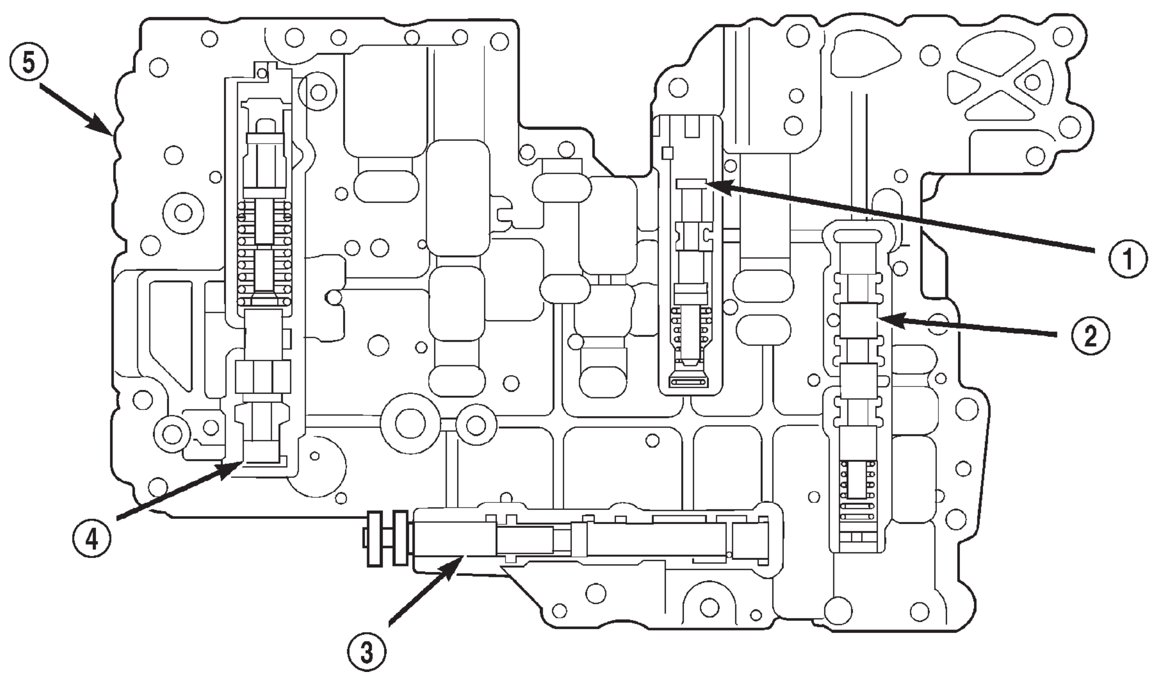

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Fig. 15 Upper Body Components

1 – ACCUMULATOR CONTROL VALVE
2 – 1–2 SHIFT VALVE
3 – MANUAL VALVE
4 – PRIMARY REGULATOR VALVE
5 – LOWER BODY

DESCRIPTION AND OPERATION (Continued)

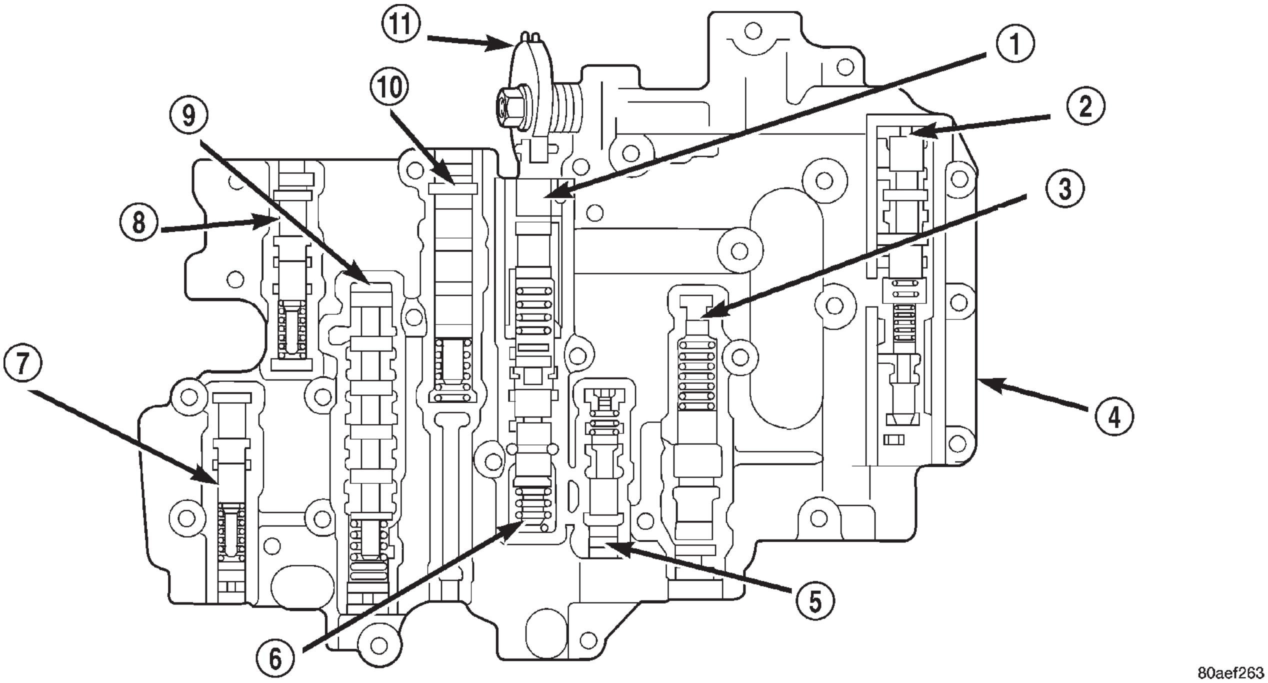


Fig. 16 Lower Body Components

1 – DOWNSHIFT PLUG
2 – LOCK-UP RELAY VALVE
3 – SECONDARY REGULATOR VALVE
4 – UPPER BODY
5 – CUT-BACK VALVE
6 – THROTTLE VALVE
7 – LOW COAST MODULATOR VALVE
8 – SECONDARY COAST MODULATOR VALVE
9 – 2–3 SHIFT VALVE
10 – 3–4 SHIFT VALVE
11 – THROTTLE CAM

OPERATION

MANUAL VALVE

The manual valve is operated by the gearshift linkage. The valve diverts fluid to the apply circuits according to shift lever position (Fig. 17).

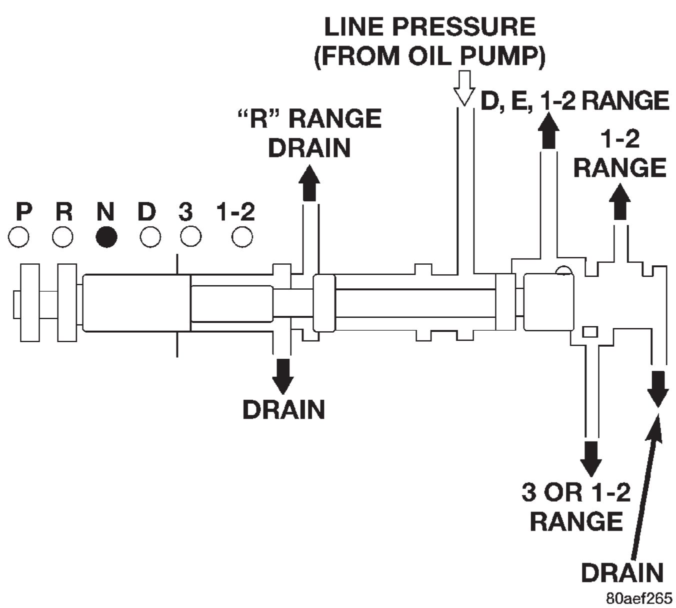


Fig. 17 Manual Valve

DESCRIPTION AND OPERATION (Continued)

PRIMARY REGULATOR VALVE

The primary regulator valve (Fig. 18) modulates line pressure to the clutches and brakes according to engine load. The valve is actuated by throttle valve pressure.

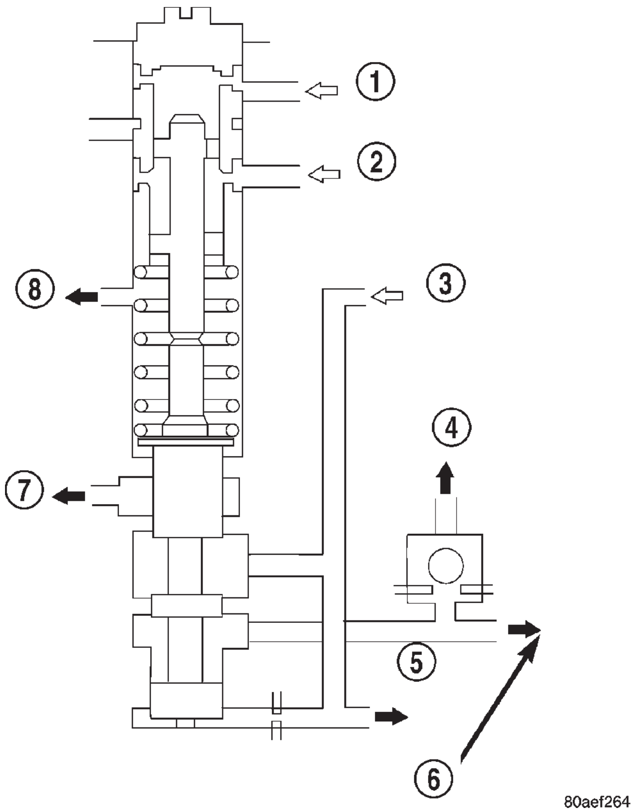


Fig. 18 Primary Regulator Valve

1 – THROTTLE PRESSURE
2 – LINE PRESSURE (FROM MANUAL VALVE “R” RANGE)
3 – LINE PRESSURE (FROM PUMP)
4 – CONVERTER PRESSURE TO CONVERTER CLUTCH RELAY VALVE
5 – LINE PRESSURE
6 – CONVERTER PRESSURE (TO SECONDARY REGULATOR VALVE)
7 – DRAIN
8 – DRAIN

During high load operation, the valve increases line pressure to maintain positive clutch and brake engagement. At light load, the valve decreases line pressure just enough to maintain smooth engagement.

THROTTLE VALVE AND DOWNSHIFT PLUG

The throttle valve and downshift plug (Fig. 19) control throttle pressure to the primary regulator valve.

The downshift plug and throttle valve are operated by the throttle valve cam and throttle cable in response to engine throttle position. Throttle valve

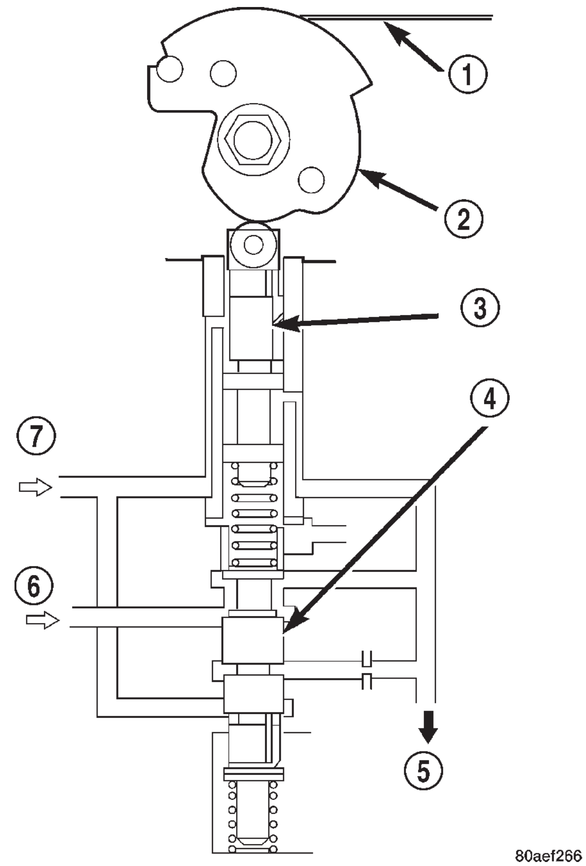


Fig. 19 Throttle Valve And Downshift Plug

1 – LINE PRESSURE CABLE
2 – THROTTLE VALVE CAM
3 – DOWNSHIFT PLUG
4 – THROTTLE VALVE
5 – THROTTLE PRESSURE (TO PRIMARY REGULATOR VALVE)
6 – LINE PRESSURE
7 – CUT-BACK PRESSURE (FROM CUT-BACK VALVE)

pressure is also modulated by the cut–back valve in second, third and fourth gear ranges.

CUT–BACK VALVE

The cut–back valve (Fig. 20) helps prevent excessive pump pressure buildup in second, third and fourth gear. The valve is actuated by throttle pressure and by line pressure from the second brake. The valve also helps regulate line pressure by controlling the amount of cut–back pressure to the throttle valve.

SECONDARY REGULATOR VALVE

The secondary regulator valve (Fig. 21) regulates converter clutch and transmission lubrication pressure. When primary regulator valve pressure exceeds requirements for clutch engagement or transmission lubrication, the secondary regulator valve is moved upward exposing the drain port. Excess pressure then bleeds off as needed. As pressure drops, spring

DESCRIPTION AND OPERATION (Continued)

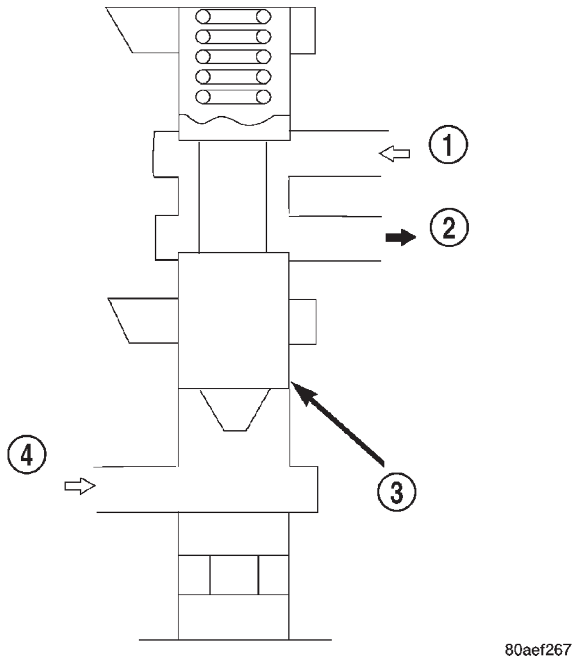


Fig. 20 Cut–Back Valve

1 – THROTTLE PRESSURE
2 – CUT-BACK PRESSURE TO THROTTLE VALVE
3 – CUT-BACK VALVE
4 – SECOND BRAKE LINE PRESSURE

tension moves the valve downward closing the drain port.

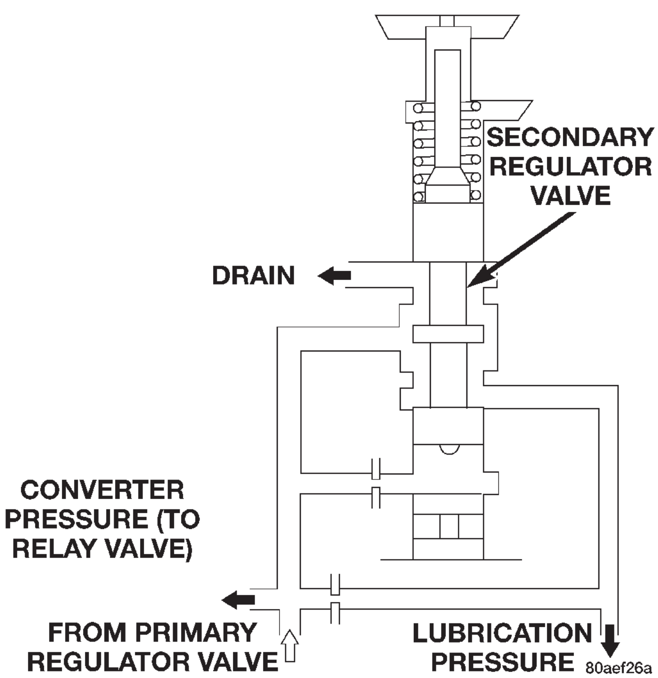


Fig. 21 Secondary Regulator Valve

CONVERTER CLUTCH RELAY VALVE

The converter clutch relay valve (Fig. 22) controls fluid flow to the converter clutch. The valve is operated by line pressure from the 1–2 shift valve and is controlled by solenoid valve number three.

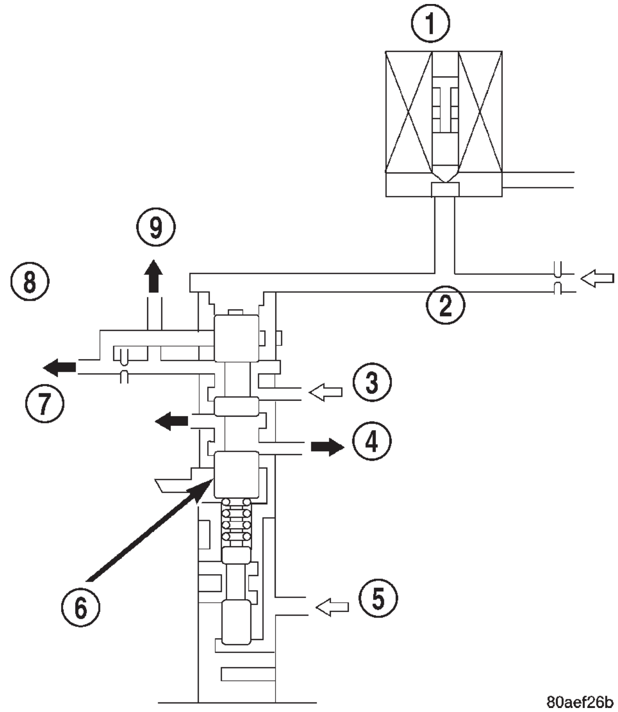


Fig. 22 Converter Clutch Relay Valve

1 – SOLENOID VALVE NO. 3
2 – LINE PRESSURE (FROM 1–2 SHIFT VALVE)
3 – CONVERTER PRESSURE
4 – DRAIN
5 – LINE PRESSURE (FROM PUMP)
6 – CONVERTER CLUTCH RELAY VALVE
7 – TO CONVERTER CLUTCH (DISENGAGED)
8 – TO OIL COOLER
9 – TO CONVERTER CLUTCH (ENGAGED)

1–2 SHIFT VALVE

The 1–2 shift valve (Fig. 23) controls the 1–2 upshifts and downshifts. The valve is operated by the No. 2 valve body solenoid and line pressure from the manual valve, second coast modulator valve and the 2–3 shift valve.

When the transmission control module deactivates the solenoid, line pressure at the top of the valve moves the valve down closing the second brake accumulator feed port. As the solenoid is activated and the drain port opens, spring force moves the valve up exposing the second brake feed port for the shift to second gear.

2–3 SHIFT VALVE

The 2–3 shift valve (Fig. 24) controls the 2–3 upshifts and downshifts. The valve is actuated by the No. 1 valve body solenoid and by line pressure from the manual valve and primary regulator valve.

DESCRIPTION AND OPERATION (Continued)

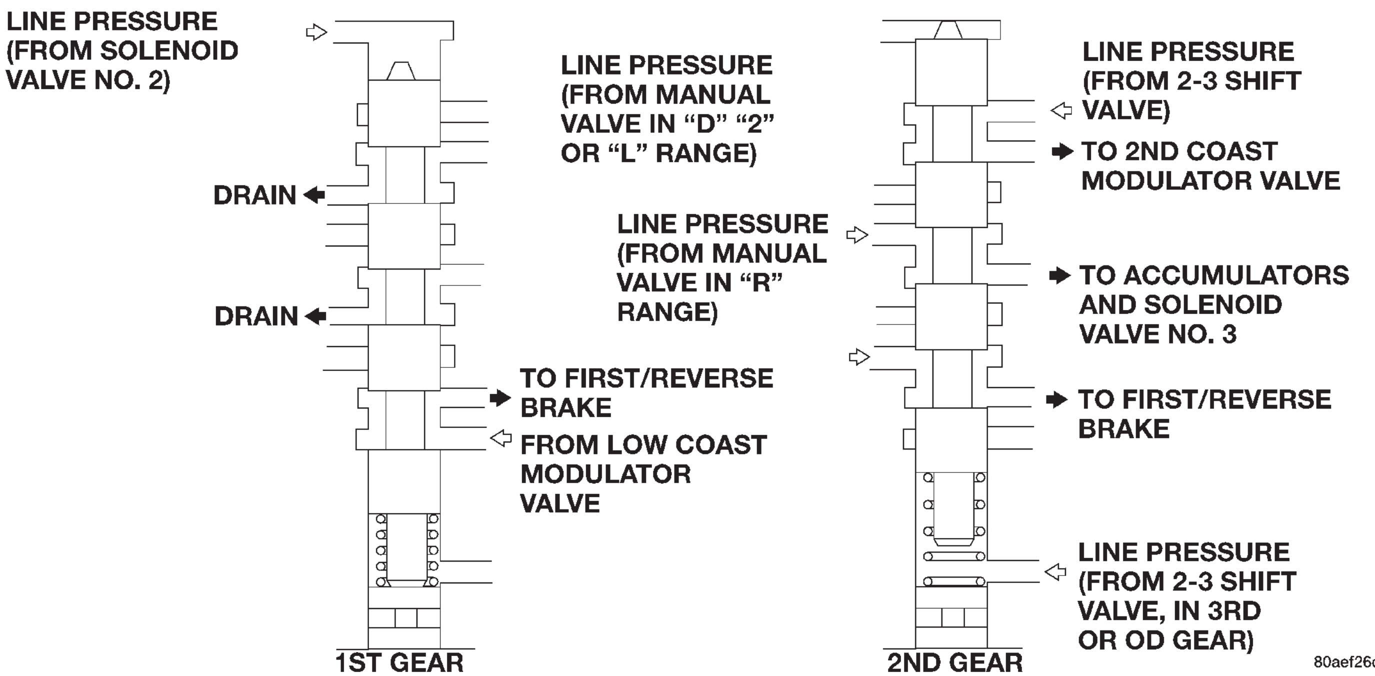


Fig. 23 1–2 Shift Valve

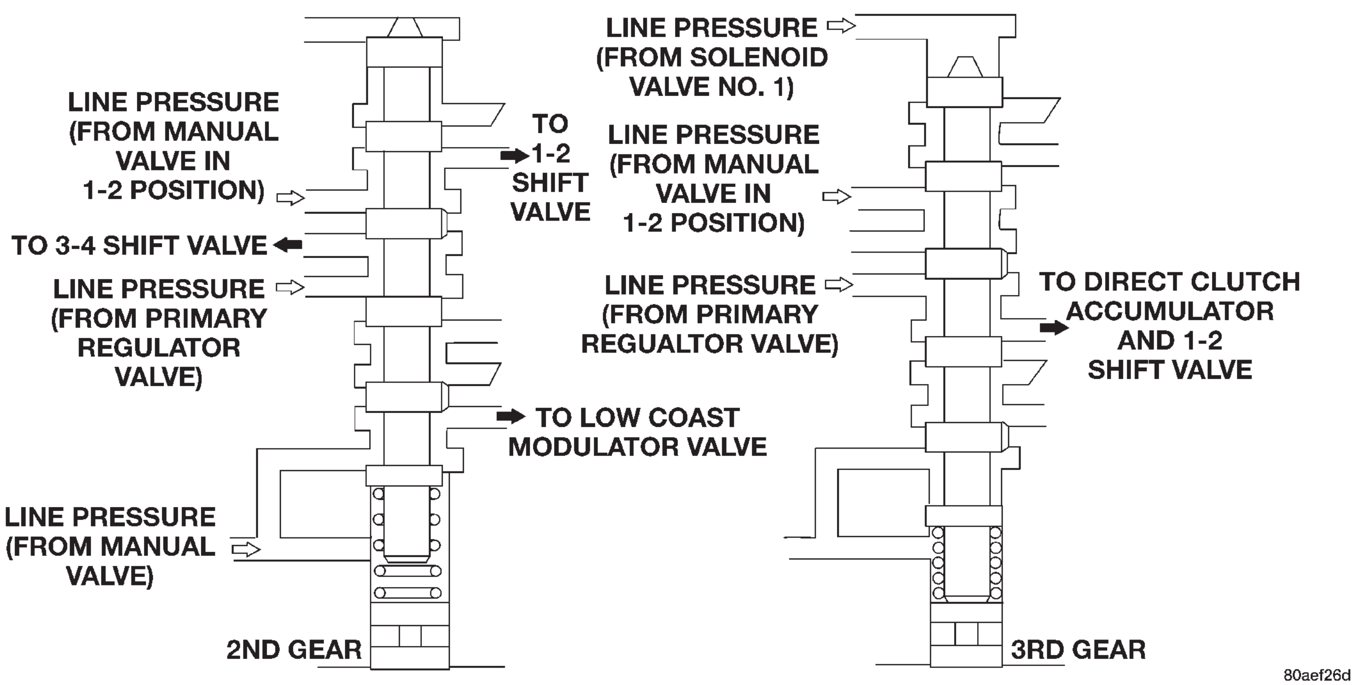


Fig. 24 2–3 Shift Valve

When the TCM activates solenoid No. 1, line pressure at the top of the 2–3 valve is released through the solenoid drain port. Spring tension moves the valve up to hold the valve in second gear position. As the solenoid is deactivated, line pressure then moves the valve down exposing the direct clutch feed port for the shift to third gear.

DESCRIPTION AND OPERATION (Continued)

3–4 SHIFT VALVE

The 3–4 shift valve (Fig. 25) is operated by the No. 2 solenoid and by line pressure from the manual valve, 2–3 valve and primary regulator valve.

Energizing the No. 2 solenoid causes line pressure at the top of the 3–4 valve to be released through the solenoid valve drain port. Spring tension moves the valve up exposing the overdrive clutch accumulator feed port to apply the clutch.

De–energizing the solenoid causes the drain port to close. Line pressure then moves the valve down exposing the overdrive brake accumulator feed port for the shift to fourth gear.

In the 1–2 or 3 gearshift lever positions, line pressure from the 2–3 shift valve is applied to the lower end of the 3–4 valve. This holds the valve upward, closing off the overdrive brake feed port preventing a shift into fourth gear.

SECOND COAST MODULATOR VALVE

The second coast modulator valve (Fig. 26) momentarily reduces line pressure from the 1–2 shift valve. This cushions application of the second coast brake. The valve is operative when the shift lever and manual valve are in the 3 position.

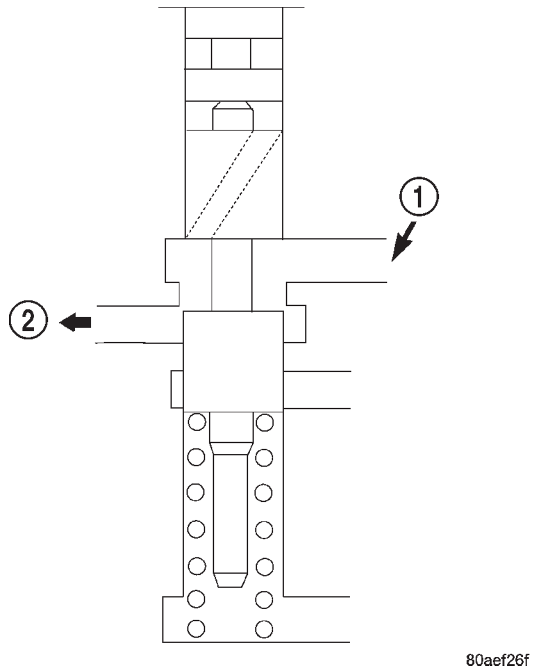


Fig. 26 Second Coast Modulator Valve

1 – LINE PRESSURE (FROM 1–2 SHIFT VALVE)
2 – LOW COAST MODULATOR PRESSURE SECOND COAST BRAKE

LOW COAST MODULATOR VALVE

The low coast modulator valve (Fig. 27) momentarily reduces line pressure from the 2–3 shift valve; this action cushions application of the first/reverse

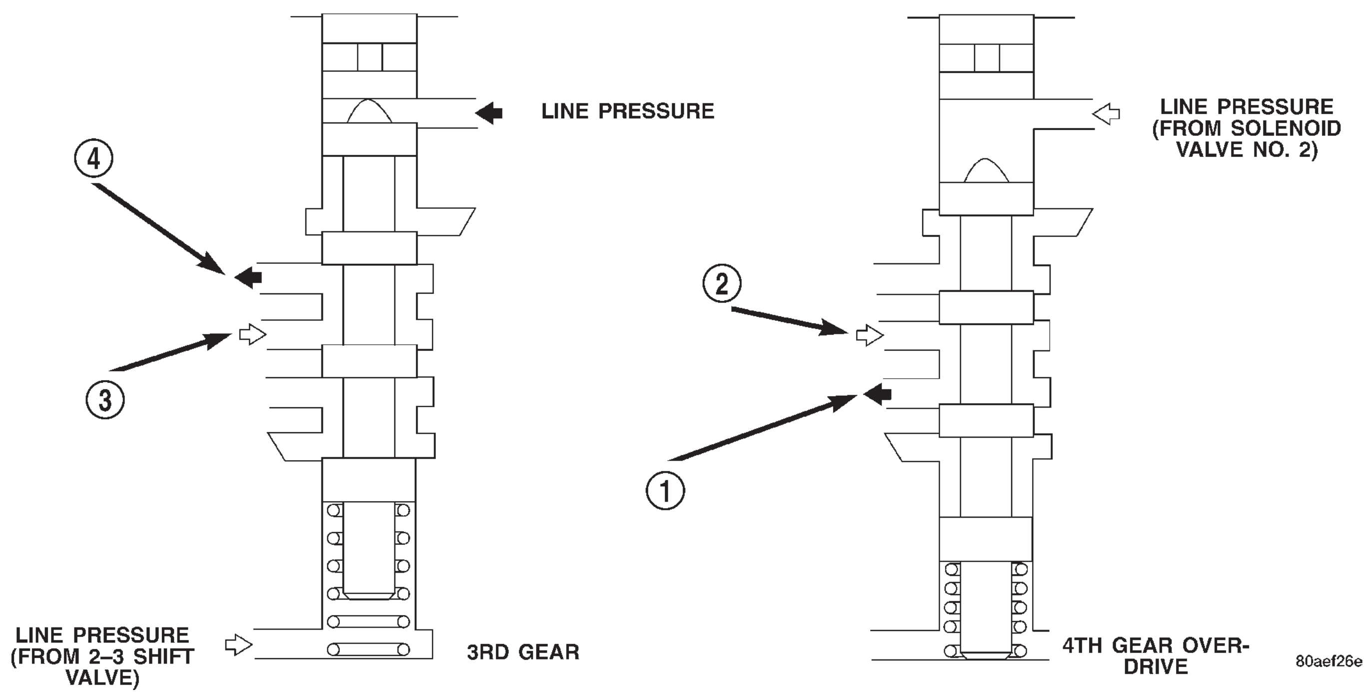


Fig. 25 3–4 Shift Valve

1 – TO OVER DRIVE BRAKE ACCUMULATOR
2 – LINE PRESSURE (FROM PRIMARY REGULATOR VALVE)
3 – LINE PRESSURE (FROM PRIMARY REGULATOR VALVE)
4 – TO OVERDRIVE CLUTCH ACCUMULATOR

DESCRIPTION AND OPERATION (Continued)

brake. The modulator valve operates when the shift lever and manual valve are in the 1–2 position.

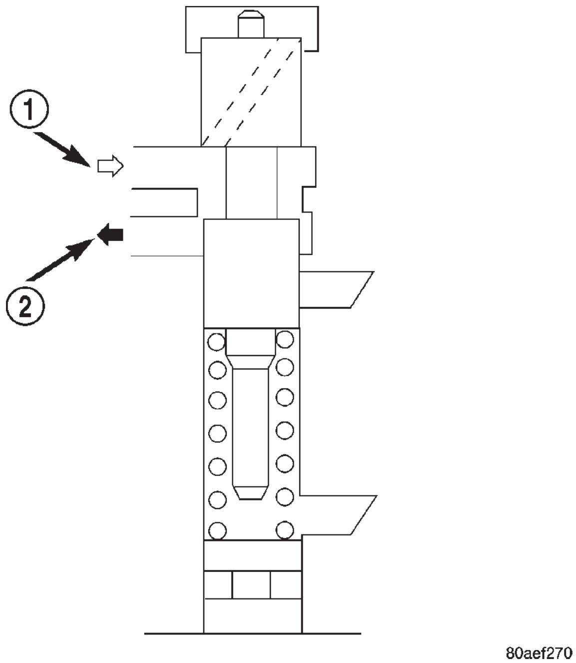


Fig. 27 Low Coast Modulator Valve

1 – LINE PRESSURE (FROM 2–3 SHIFT VALVE)
2 – LOW COAST MODULATOR PRESSURE TO FIRST/REVERSE BRAKE

ACCUMULATOR CONTROL VALVE

The accumulator control valve (Fig. 28) cushions the transmission clutch and brake applications. This is achieved by reducing back pressure to the accumulators when throttle opening is small. The valve is operated by line and throttle pressure.

ACCUMULATORS

Four accumulators are used to cushion clutch and brake application. The accumulators (Fig. 29), consist of spring loaded pistons. The pistons dampen the initial surge of apply pressure to provide smooth engagement during shifts.

Control pressure from the accumulator control valve is continuously applied to the back pressure side of the accumulator pistons. This pressure plus spring tension holds the pistons down. As line pressure from the shift valves enters the opposite end of the piston bore, control pressure and spring tension momentarily delay application of full line pressure to cushion engagement. The accumulators are all located in the transmission case (Fig. 29).

TRANSMISSION VALVE BODY SOLENOIDS

Three solenoids are used (Fig. 30). The No. 1 and 2 solenoids control shift valve operation by applying or releasing line pressure. The signal to apply or release

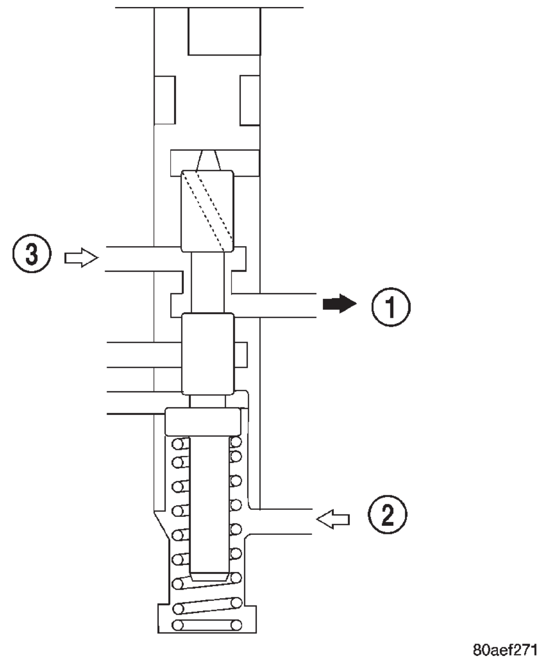


Fig. 28 Accumulator Control Valve

1 – ACCUMULATOR CONTROL PRESSURE (TO ACCUMULATORS)
2 – THROTTLE PRESSURE
3 – LINE PRESSURE (FROM PUMP)

pressure is provided by the transmission control module.

The No. 3 solenoid controls operation of the torque converter clutch. The solenoid operates in response to signals from the transmission control module.

When the No. 1 and 2 solenoids are activated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When either solenoid is deactivated, the plunger closes the drain port.

The No. 3 solenoid operates in reverse. When the solenoid is deactivated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When the solenoid is activated, the plunger closes the drain port.

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches, while others are used to apply bands. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

DESCRIPTION AND OPERATION (Continued)

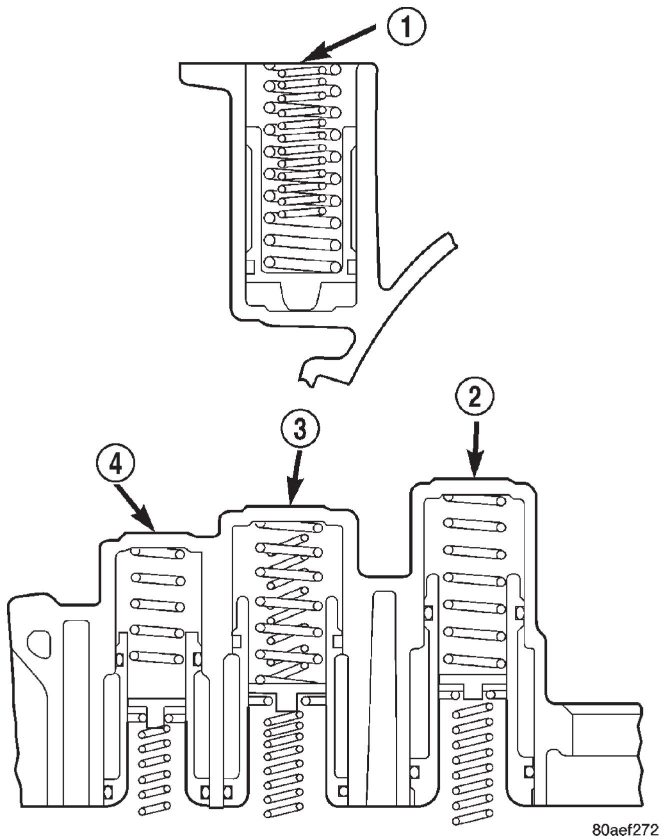


Fig. 29 Accumulators

1 – OVERDRIVE CLUTCH
2 – SECOND BRAKE
3 – DIRECT CLUTCH
4 – OVERDRIVE BRAKE

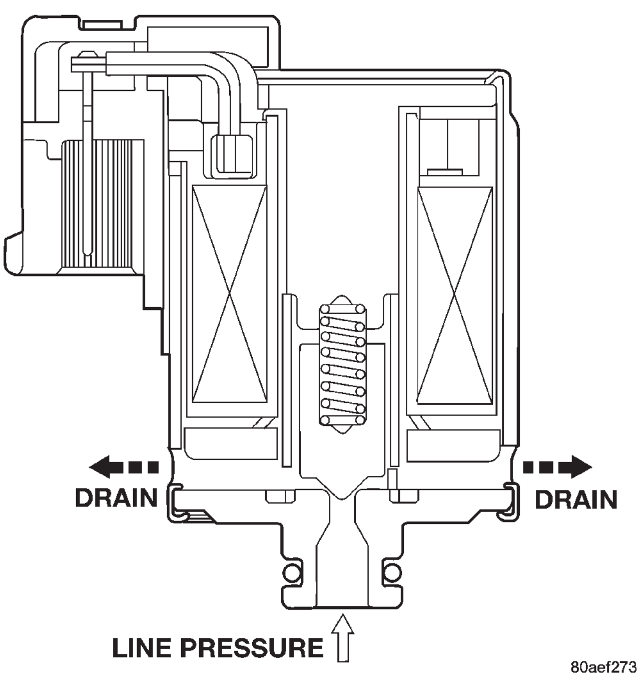


Fig. 30 Transmission Valve Body Solenoids

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

PRESSURE

Pressure (Fig. 31) is nothing more than force (lbs.) divided by area (in or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in or 1 pound per square inch, or PSI as it is commonly referred to.

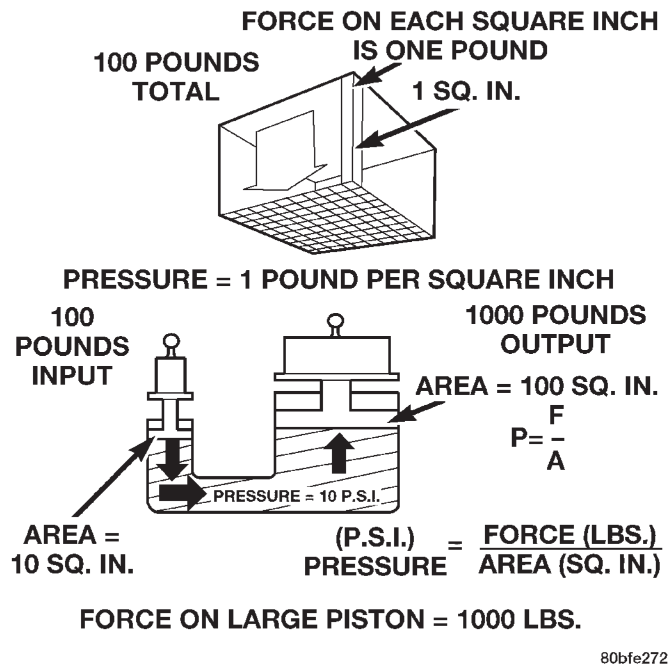


Fig. 31 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 32) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O–rings, D–rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken.

DESCRIPTION AND OPERATION (Continued)

The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

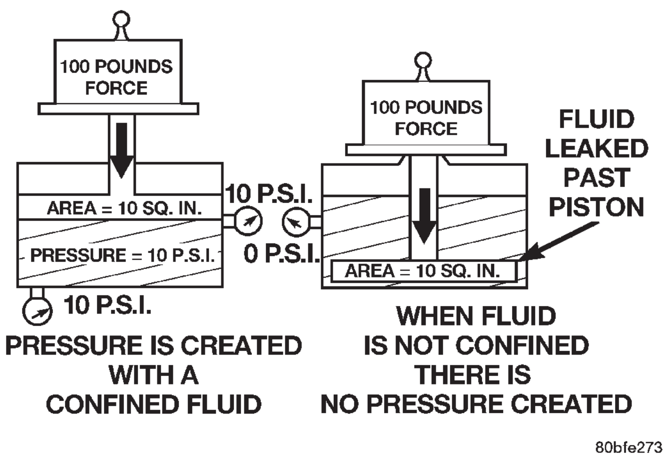


Fig. 32 Pressure on a Confined Fluid

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 33), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 33), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same everywhere" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight–to–distance output rather than a pressure–to–area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 34) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

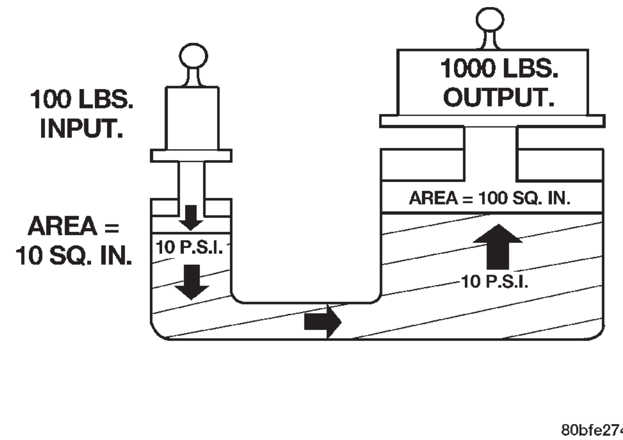


Fig. 33 Force Multiplication

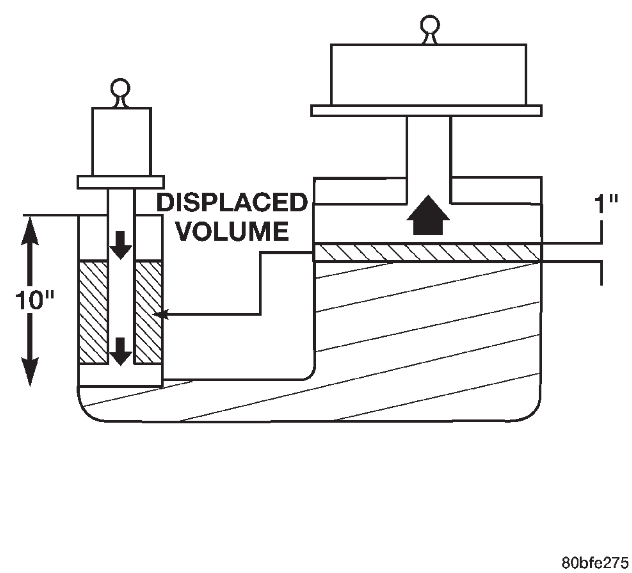


Fig. 34 Piston Travel

TRANSMISSION RANGES AND SHIFT LEVER POSITIONS

The AW–4 transmission has six ranges and shift lever positions. Park, Reverse and Neutral are conventional and mechanically operated. The 1–2, 3 and D ranges provide electronically controlled shifting.

The 1–2 position provides first and second gear only. The 3 position provides first, second and third gear.

DESCRIPTION AND OPERATION (Continued)

The D range provides first through fourth gear. Overdrive fourth gear range is available only when the shift lever is in D position (Fig. 35).

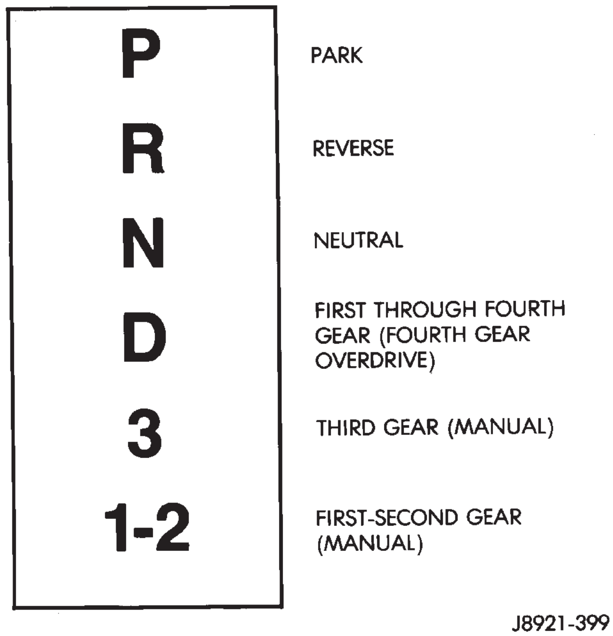


Fig. 35 AW–4 Shift Lever Positions And Transmission Ranges

TRANSMISSION CONTROL MODULE (TCM)

DESCRIPTION

The module determines shift and converter clutch engagement timing based on signals from sensors. The valve body solenoids are activated, or deactivated accordingly.

The TCM has a self diagnostic program. Component and circuitry malfunctions can be diagnosed with the DRB scan tool. Once a malfunction is noted and stored in control module memory, it is retained even after the problem has been corrected. To cancel a stored malfunction, disconnect and reconnect the “Trans.” fuse in the module harness.

SENSORS

Sensors include:

- throttle position sensor (TPS)
- transmission speed sensor
- vehicle speed sensor
- park/neutral position switch
- brake switch

OPERATION

The throttle position sensor is mounted on the throttle body. It electronically determines throttle position and relays this information to the transmission control module to determine shift points and converter clutch engagement.

The transmission speed sensor consists of a rotor and magnet on the transmission output shaft and a switch in the extension housing or adapter. The sensor switch is activated each time the rotor and magnet complete one revolution. Sensor signals are sent to the transmission control module.

The park/neutral position switch is mounted on the valve body manual shaft. The switch signals shift linkage and manual valve position to the transmission control module through an interconnecting harness. The switch prevents engine starting in all gears other than Park or Neutral.

The brake switch is in circuit with the torque converter clutch solenoid. The switch disengages the converter clutch whenever the brakes are applied. The switch is mounted on the brake pedal bracket and signals the transmission control module when the pedal is pressed or released.

HYDRAULIC SYSTEM

DESCRIPTION

The hydraulic system consists of the pump, valve body and solenoids, and four hydraulic accumulators. The oil pump provides lubrication and operating pressure.

The valve body controls application of the clutches, brakes, second coast band, and the converter clutch. The valve body solenoids control sequencing of the 1–2, 2–3 and 3–4 shift valves. The solenoids are activated by signals from the transmission control module.

The accumulators are used in the clutch and brake feed circuits to control initial apply pressure. Spring loaded accumulator pistons modulate the initial surge of apply pressure for smooth engagement.

TRANSMISSION COOLER

DESCRIPTION

MAIN COOLER

The transmission main cooler is located in the radiator. The main cooler can be flushed when necessary, however, the cooler is not a repairable component. If the cooler is damaged, plugged, or leaking, the radiator will have to be replaced.

AUXILIARY COOLER

The auxiliary cooler is mounted in front of the radiator at the driver side of the vehicle (Fig. 36). The cooler can be flushed when necessary, while mounted in the vehicle. The cooler can also be removed for access, repair, or replacement as needed.

The main and auxiliary coolers should both be flushed whenever a transmission or converter clutch

DESCRIPTION AND OPERATION (Continued)

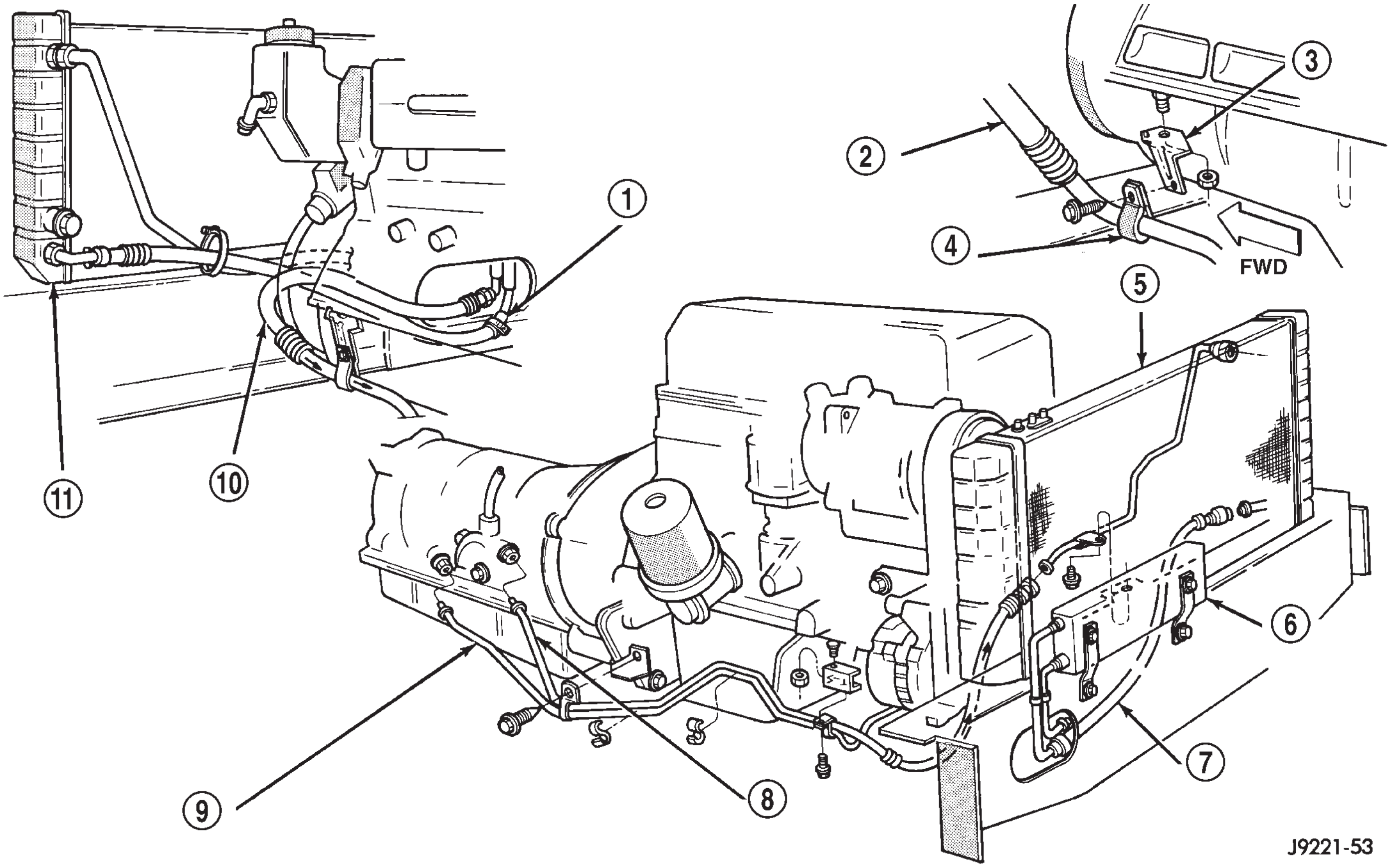


Fig. 36 Auxiliary Cooler Mounting (Left Hand Drive)

1 – COOLER INLET LINE
2 – COOLER RETURN LINE
3 – COOLER LINE BRACKET
4 – CLIP
5 – RADIATOR
6 – AUXILIARY COOLER
7 – COOLER RETURN LINE
8 – OUTLET LINE (FROM TRANSMISSION)
9 – RETURN LINE (TO TRANSMISSION)
10 – COOLER RETURN LINE
11 – RADIATOR

malfunction generates sludge, debris, or particles of clutch friction material.

COOLER SERVICE

The main cooler (and radiator) and the auxiliary cooler can be removed for service or access to other components. Auxiliary cooler removal requires that the front bumper and radiator support be removed for access to the cooler lines and attaching bracket.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 37).

OPERATION

The system locks the shifter into the PARK position. The Interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half an inch. A magnetic holding device in line with the park/brake interlock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position (Fig. 38) unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING (Continued)

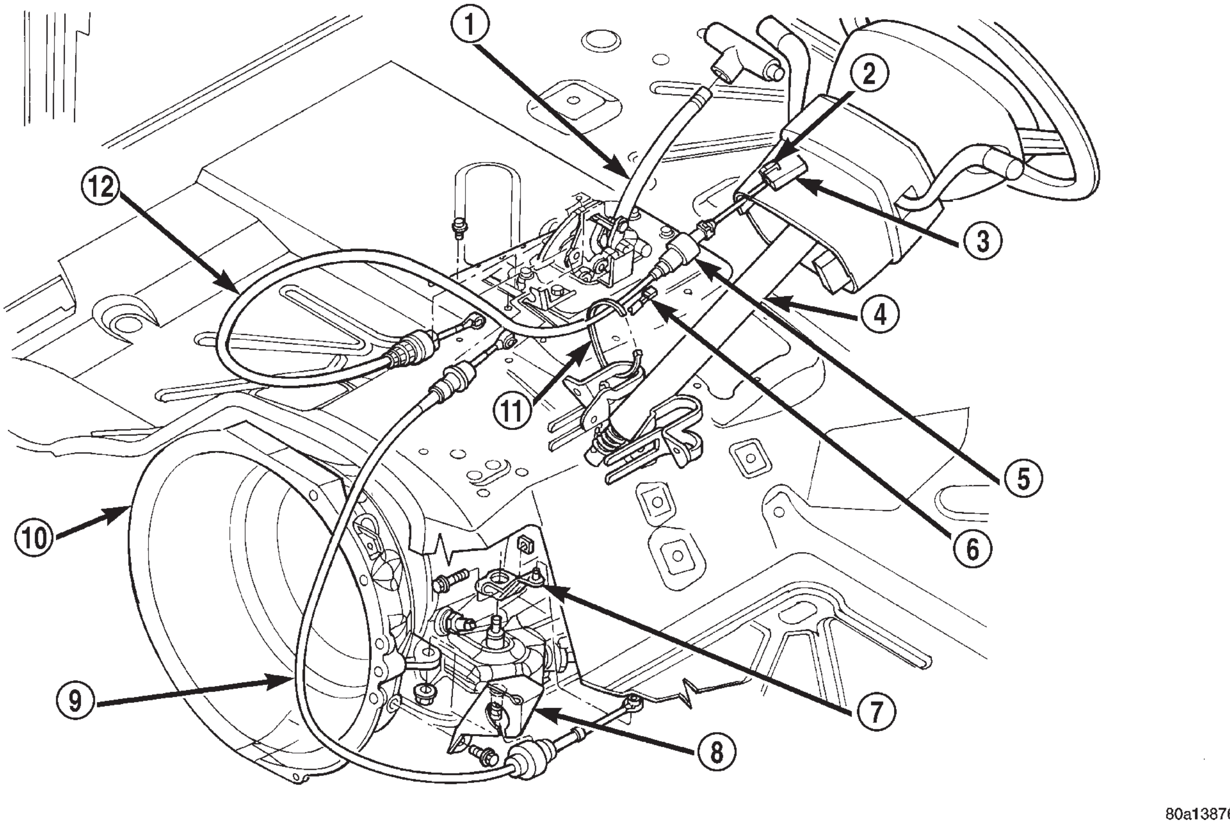


Fig. 37 Ignition Interlock Cable Routing

1 – SHIFT MECHANISM
2 – LOCK-TAB
3 – IGNITION LOCK INTERLOCK
4 – STEERING COLUMN
5 – SOLENOID
6 – WIRE CONNECTOR
7 – LEVER
8 – MOUNT BRACKET
9 – SHIFT CABLE
10 – AUTOMATIC TRANSMISSION
11 – TIE STRAP
12 – PARK/BRAKE INTERLOCK CABLE

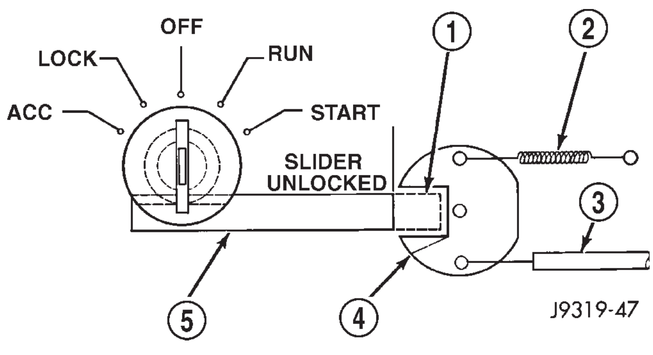


Fig. 38 Ignition Key Cylinder Actuation

1 – SLIDER LOCKED
2 – CAM RETURN SPRING
3 – INTERLOCK CABLE
4 – CAM
5 – SLIDER

DIAGNOSIS AND TESTING

GENERAL DIAGNOSIS INFORMATION

Shift points are controlled by the transmission control module (TCM). Before attempting repair, determine if a malfunction is electrical or mechanical.

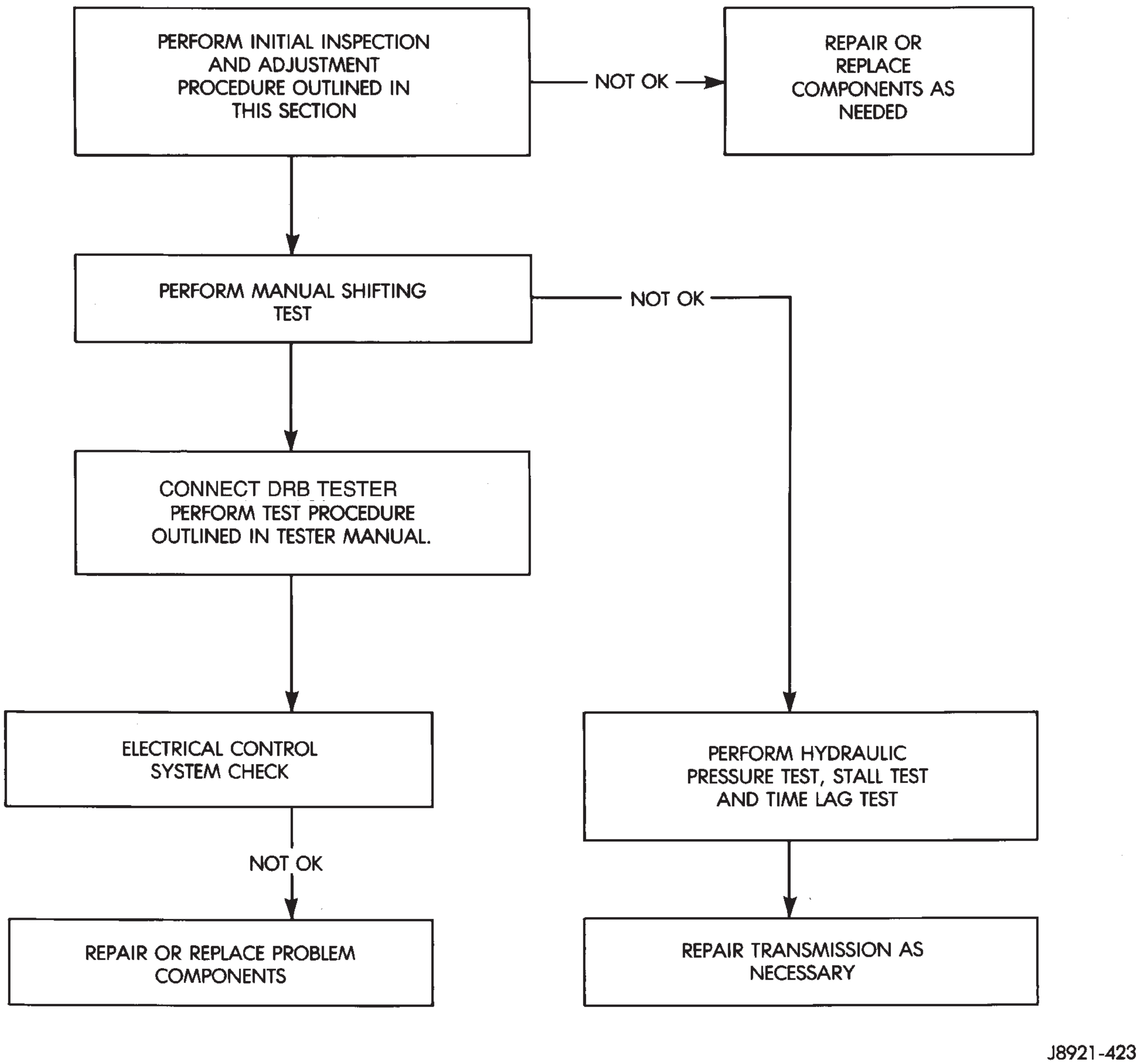
The TCM used with the AW–4 transmission has a self–diagnostic program compatible with the DRBIII scan tool. The tester will identify faults in the electrical control system.

Diagnosis should begin with the Preliminary Inspection And Adjustment procedure. It is will help determine if a problem is mechanical or electrical. The first procedure step is Initial Inspection and Adjustment.

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal.

DIAGNOSIS AND TESTING (Continued)



Preliminary Diagnosis Check Procedure

If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve, clutch and servo operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid

DIAGNOSIS AND TESTING (Continued)

- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission for some time, an overhaul may also be necessary; especially if shift problems had developed.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

PRELIMINARY INSPECTION AND ADJUSTMENT

(1) Check and adjust transmission shift cable if necessary.

(2) Verify transmission throttle cable operation. Repair or replace cable if necessary.

(3) Check engine throttle operation. Operate accelerator pedal and observe injector throttle plate movement. Adjust linkage if throttle plate does not reach wide open position.

(4) Check transmission fluid level when fluid is at normal operating temperature. Start engine. Shift transmission through all gear ranges then back to Neutral. Correct level is to Full or Add mark on dipstick with engine at curb idle speed.

(5) Check and adjust park/neutral position switch if necessary.

(6) Check throttle position sensor adjustment and operation. Adjust the sensor if necessary.

MANUAL SHIFTING TEST

(1) This test determines if problem is related to mechanical or electrical component.

(2) Stop engine and disconnect transmission control module or module fuse.

(3) Road test vehicle. Shift transmission into each gear range. Transmission should operate as follows:

- lock in Park
- back up in Reverse
- not move in Neutral
- provide first gear only with shift lever in 1–2 position
- operate in third gear only with shift lever in 3 position
- operate in overdrive fourth gear in D position

(4) If transmission operates as described, proceed to next step. However, if forward gear ranges were difficult to distinguish (all feel the same), or vehicle would not back up, refer to diagnosis charts. Do not perform stall or time lag tests.

CAUTION: Do not over speed the engine during the next test step. Ease off the throttle and allow the vehicle to slow before downshifting.

(5) Continue road test. Manually downshift transmission from D to 3, and from 3 to 1–2 position. Then manually upshift transmission through forward ranges again.

(6) If transmission operation is OK, perform stall, time lag and pressure tests. If transmission shifting problem is encountered, refer to diagnosis charts.

(7) If a problem still exists, continue testing with DRB scan tool.

HYDRAULIC PRESSURE TEST

Pressure Test Procedure

(1) Connect pressure test gauge to test port on passenger side of transmission (Fig. 39). Use Adapter 7554 to connect gauge. Be sure test gauge has minimum capacity of 300 psi (2100 kPa).

(2) Be sure transmission fluid is at normal operating temperature.

(3) Apply parking brakes and block wheels.

WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE WHILE PERFORMING THE FOLLOWING STEPS IN THE PRESSURE TEST.

(4) Check and adjust engine curb idle speed.

(5) Apply (and hold) service brakes.

DIAGNOSIS AND TESTING (Continued)

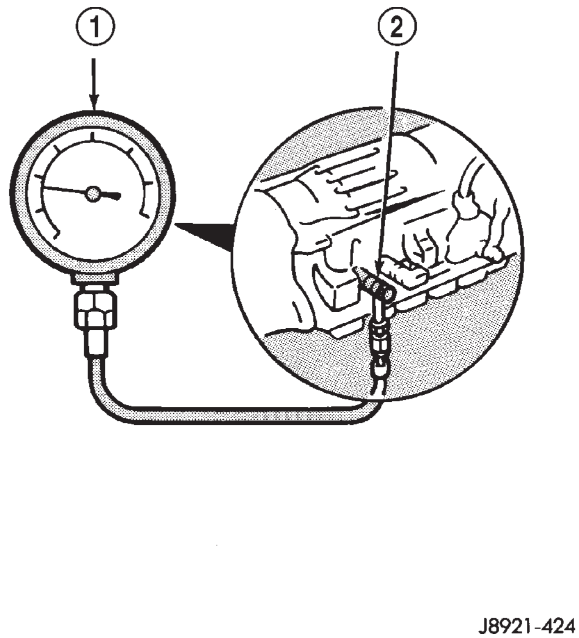


Fig. 39 Pressure Test Gauge Connection

1 – PRESSURE GAUGE
2 – TEST PORT

(6) Shift transmission into D range and note line pressure with engine at curb idle speed. Pressure should be 61–to–70 psi (421–to–481 kPa).

(7) Press accelerator pedal to wide open throttle position and note line pressure. Pressure should be 173–to–209 psi (1196–to–1442 kPa).

CAUTION: Do not hold wide open throttle for more than 3–4 seconds at a time.

(8) Shift transmission into Reverse and note line pressure with engine at curb idle speed. Pressure should be 75–to–90 psi (519–to–618 kPa).

(9) Press accelerator to wide open throttle position and note line pressure in Reverse. Pressure should be 213–to–263 psi (1471–to–1814 kPa).

CAUTION: Do not hold wide open throttle for more than 4 seconds.

(10) If line pressure is not within specifications, adjust transmission throttle cable and repeat pressure test.

PRESSURE TEST ANALYSIS

If pressures in D and Reverse are higher than specified in test, check for the following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, throttle cam, or primary regulator valve are sticking, worn or damaged

If pressures in D and Reverse are lower than specified in test, check for following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, or throttle cam sticking, worn or damaged
- primary regulator valve sticking, worn, or damaged
- oil pump gears or housing worn, or damaged
- overdrive clutch worn, or damaged

If pressures are low in D range only, check for following:

- forward clutch worn or damaged
- fluid leakage in D range circuit (component seal and O–rings)

If pressures are low in Reverse only, check for following:

- shift cable and manual valve out of adjustment
- fluid leakage in reverse circuit (component seal and O–rings)
- direct clutch worn or damaged
- first/reverse brake worn or damaged

TIME LAG TEST

This test checks general condition of the overdrive clutch, forward clutch, rear clutch and first/reverse brake. Condition is indicated by the amount of time required for clutch/brake engagement with the engine at curb idle speed. Engagement time is measured for D and Reverse positions. A stop watch is recommended for test accuracy.

TEST PROCEDURE

(1) Check and adjust transmission fluid level if necessary.

(2) Bring transmission to normal operating temperature.

(3) Apply parking brakes and turn off air conditioning unit.

(4) Shift transfer case into 2H range.

(5) Start engine and check curb idle speed. Adjust speed if necessary. Curb idle must be correct to ensure accurate test results.

(6) Shift transmission into Neutral and set stop watch.

(7) During following test steps, start stop watch as soon as shift lever reaches D and Reverse ranges.

(8) Shift transmission into D range and record time it takes for engagement. Repeat test two more times.

(9) Reset stop watch and shift transmission back to Neutral.

(10) Shift transmission into Reverse and record time it takes for engagement. Repeat test two more times.

DIAGNOSIS AND TESTING (Continued)

(11) Engagement time in D range should be a maximum of 1.2 seconds. Engagement time for Reverse should be a maximum of 1.5 seconds.

TIME LAG TEST ANALYSIS

If engagement time is longer than specified for D range, check for the following:

- shift cable misadjusted
- line pressure low
- forward clutch worn
- overdrive clutch worn or damaged

If engagement time is longer than specified for Reverse, check for the following:

- shift cable misadjusted
- line pressure low
- direct clutch worn
- first/reverse brake worn
- overdrive clutch worn or damaged

SERVICE DIAGNOSIS

DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSE	CORRECTION
VEHICLE WILL NOT BACK UP OR MOVE FORWARD	Shift cable out of adjustment or damaged	Adjust cable or replace cable
	Valve body or primary regulator faulty	Inspect/repair valve body
	Park lock pawl faulty	Repair park pawl
	Torque converter faulty	Replace torque converter
	Converter drive plate broken	Replace drive plate
	Oil pump intake screen blocked	Clean screen
	Transmission faulty	Disassemble and repair transmission
SHIFT LEVER POSITION INCORRECT	Shift cable out of adjustment	Adjust cable
	Manual valve and lever faulty	Repair valve body
HARSH ENGAGEMENT	Throttle cable out of adjustment	Adjust throttle cable
	Valve body or primary regulator faulty	Repair valve body
	Accumulator pistons faulty	Repair pistons
	Transmission faulty	Disassemble and repair transmission
DELAYED 1-2, 2-3 OR 3-4 UP-SHIFT, OR DOWN-SHIFTS FROM 4-3 OR 3-2 AND SHIFTS BACK TO 4 OR 3	Electronic control problem	Locate problem with DRB Tester
	Valve body faulty	Repair valve body
	Solenoid faulty	Repair solenoid
SLIPS ON 1-2, 2-3 OR 3-4 UP-SHIFT, OR SLIPS OR SHUDDERS DURING ACCELERATION	Shift cable out of adjustment	Adjust cable
	Throttle cable out of adjustment	Adjust cable
	Valve body faulty	Repair valve body
	Solenoid faulty	Replace solenoid
	Transmission faulty	Disassemble and repair transmission

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
DRAG OR BIND ON 1-2, 2-3 OR 3-4 UP-SHIFT	Shift cable out of adjustment	Adjust cable
	Valve body faulty	Repair valve body
	Transimssion faulty	Disassemble and repair transmission
CONVERTER CLUTCH DOES NOT ENGAGE IN 2ND, 3RD OR 4TH	Electronic control problem	Check with DRB Tester
	Valve body faulty	Repair valve body
	Solenoid faulty	Replace solenoid
	Transmission faulty	Disassemble and repair transmission
HARSH DOWN-SHIFT	Throttle cable out of adjustment	Adjust cable
	Throttle cable and cam faulty	Replace cable and cam
	Accumulator pistons faulty	Repair pistons
	Valve body faulty	Repair valve body
	Transmission faulty	Disassemble and repair transmission
NO DOWN-SHIFT WHEN COASTING	Valve body faulty	Repair valve body
	Solenoid faulty	Replace solenoid
	Electronic control problem	Locate problem with DRB Tester
DOWN-SHIFT LATE OR EARLY DURING COAST	Throttle cable faulty	Replace cable
	Valve body faulty	Repair valve body
	Transmission faulty	Disassembly and repair transmission
	Solenoid faulty	Replace solenoid
	Electronic control problem	Locate problem with DRB Tester
NO 4-3, 3-2 OR 2-1 KICKDOWN	Solenoid faulty	Replace solenoid
	Electronic control problem	Locate problem with DRB Tester
	Valve body faulty	Repair valve body
NO ENGINE BRAKING IN 1-2 POSITION	Solenoid faulty	Replace solenoid
	Electronic control problem	Locate problem with DRB Tester
	Valve body faulty	Repair valve body
	Transmission faulty	Disassemble and repair transmission
VEHICLE DOES NOT HOLD IN PARK	Shift cable out of adjustment	Adjust cable
	Parking lock pawl cam and spring faulty	Replace cam and spring
OVERHEAT DURING NORMAL OPERATION (FLUID DISCOLORED, SMELLS BURNED)	Low fluid level	Add fluid and check for leaks
	Fluid cooler, lines blocked, or cooler cracked (oil in engine coolant)	Flush cooler and lines and replace radiator if transmission fluid has entered coolant

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
OVERHEAT DURING COMMERCIAL OPERATION OR WHILE TRAILE TOWING (FLUID DARK AND BURNED WITH SOME SLUDGE FORMATION)	Vehicle not properly equipped for trailer towing or commercial use	Be sure vehicle is equipped with recommended optional components (i.e. HD springs, transmission, axle, larger CID engine, auxiliary cooler, correct axle ratio, etc.). If vehicle is not so equipped, it should not be used for severe service operation
	Vehicle not equipped with auxiliary fluid cooler	Drain fluid, change filter, and install auxiliary cooler
	Extensive idling time or operation in heavy traffic in hot weather	Cut down on idling time; shift into neutral every so often and run engine at 1000 rpm to help circulate fluid through cooler
	Tow vehicle overloaded (exceeding vehicle tow capacity	Be sure vehicle is properly equipped to handle load; do not tow Class III-type loads with a vehicle that is only rated for Class I or II operation
	Air flow to auxiliary cooler blocked by snow plow, front mounted spare tire, bug screen, or similar item	Remove or reposition item causing air flow blockage
OIL COMES OUT FILLER TUBE	Transmission overfilled	Drain fluid to correct level; remove neutral switch and drain through switch hole with suction gun
	Breather vent in oil pump blocked	Inspect and clear blockage
	Fluid cooler or cooler lines plugged	Flush cooler and lines

TRANSMISSION SOLENOID TESTING

Test solenoid resistance with an ohmmeter. Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 40).

Solenoid resistance should be 11–15 ohms. Replace the solenoid if resistance is above or below the specified range.

PARK/NEUTRAL POSITION SWITCH

SWITCH TESTING

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:

- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 41).
- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 41).
- Continuity should exist between terminals A and G with the transmission in third gear (Fig. 41).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 41).

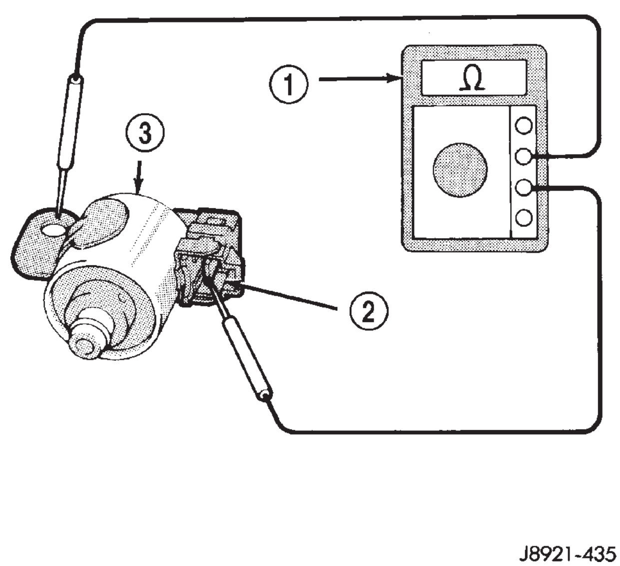


Fig. 40 Testing Transmission Valve Body Solenoid

1 – OHMMETER
2 – WIRE TERMINAL
3 – SOLENOID

- Continuity should not exist in D position.

DIAGNOSIS AND TESTING (Continued)

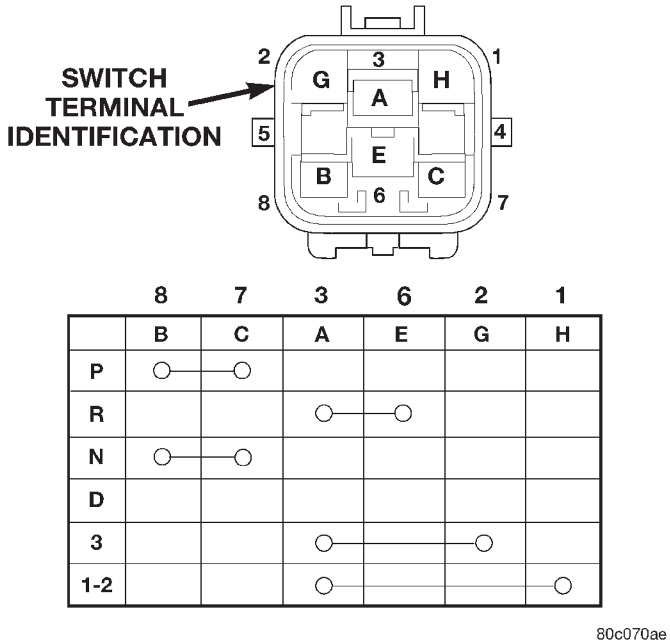


Fig. 41 Park/Neutral Position Switch Terminals And Testing

GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position—Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position—Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position—Normal position. Engine starts must be possible.

(d) NEUTRAL position—Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from neutral to reverse.

THROTTLE VALVE CABLE

Transmission throttle valve cable adjustment is extremely important to proper operation. This adjustment positions the throttle valve, which controls shift speed, quality, and part-throttle downshift sensitivity.

If cable setting is too loose, early shifts and slippage between shifts may occur. If the setting is too tight, shifts may be delayed and part throttle downshifts may be very sensitive. Refer to the Adjustments section for the proper adjustment procedure.

SPEED SENSOR TESTING

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the terminals in the sensor connector (Fig. 42).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the rotor moves past the sensor (Fig. 42). Replace the sensor if the ohmmeter does not display any kind of reading.

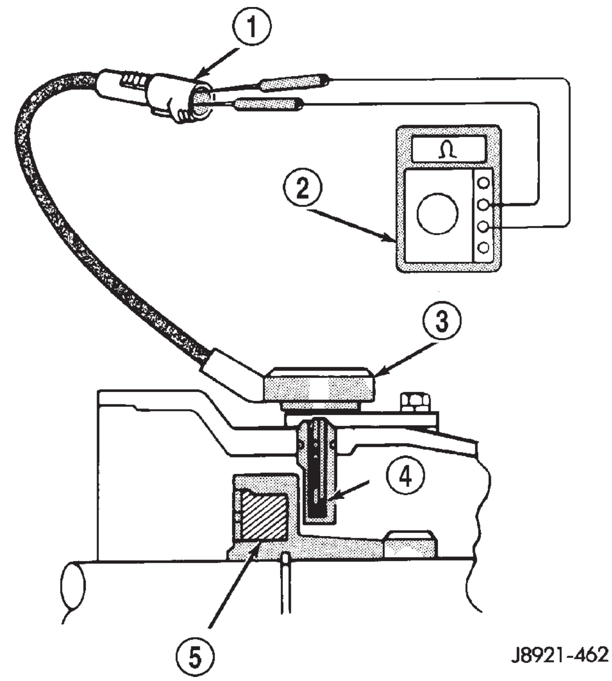


Fig. 42 Speed Sensor Testing

1 – CONNECTOR
2 – OHMMETER
3 – SENSOR
4 – SENSOR SWITCH
5 – ROTOR

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

FLOW TESTING TRANSMISSION MAIN COOLER

Cooler flow is checked by measuring the amount of fluid flow through the cooler in a 20 second time period. The test is performed with the engine running and transmission in neutral. Fluid is then pumped through the cooler by the transmission oil pump.

(1) Disconnect cooler inlet line at transmission fitting.

DIAGNOSIS AND TESTING (Continued)

(2) Securely attach hose to end of inlet line and position line in a one quart test container.

(3) Add extra quart of fluid to transmission.

(4) Use stopwatch to check flow test time.

(5) Shift transmission into neutral and set parking brake.

(6) Start and run engine at curb idle speed and immediately note cooler flow. Approximately one quart of fluid should flow into test container in 20 second period.

(7) If cooler flow is intermittent, flows less than one quart in 20 seconds, or does not flow at all, cooler is faulty and must be replaced.

TORQUE CONVERTER STATOR CLUTCH INSPECTION

(1) Insert Rotating Tool 7547 into converter hub and seat tool in one–way clutch (Fig. 43).

(2) Insert Stopper Tool 7548 in one converter hub notch and into outer race of rotating tool.

(3) Turn rotating tool clockwise. Converter clutch should rotate freely and smoothly. Less than 2.5 N·m (22 in. lbs.) of torque should be required to rotate clutch in clockwise direction.

(4) Turn rotating tool in counterclockwise direction. Converter clutch should lock.

(5) Replace converter if clutch binds or will not lock.

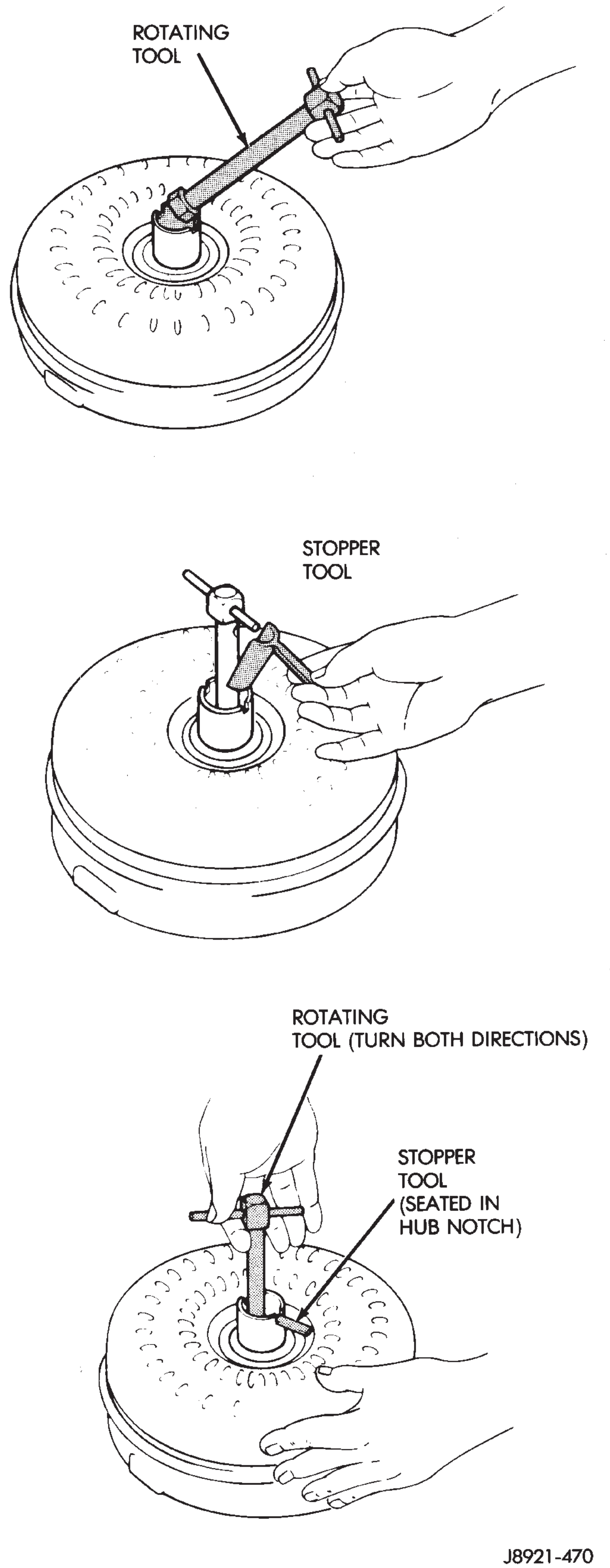


Fig. 43 Checking Operation Of Torque Converter Stator One–Way Clutch

SERVICE PROCEDURES

CHECKING FLUID LEVEL

(1) Be sure transmission fluid is at normal operating temperature. Normal operating temperature is reached after approximately 15 miles (25 km) of operation.

(2) Position vehicle on level surface. This is important for an accurate fluid level check.

(3) Shift transmission through all gear ranges and back to Park.

(4) Apply parking brakes.

(5) Verify that transmission is in Park.

(6) Wipe off dipstick handle to prevent dirt from entering fill tube. Then remove dipstick and check fluid level and condition.

(7) Correct fluid level is **to FULL mark on dipstick when fluid is at normal operating temperature** (Fig. 44).

(8) If fluid level is low, top off level with Mopar Dexron IIE/Mercon. Mopar Dexron II can be used but only if Mercon is not available. **Do not overfill transmission. Add only enough fluid to bring level to Full mark.**

(9) If too much fluid was added, excess amount can be removed with suction gun and appropriate diame-

SERVICE PROCEDURES (Continued)

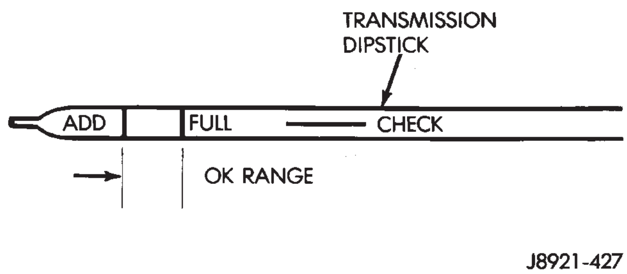


Fig. 44 Transmission Fluid Level

ter plastic tubing. Tubing only has to be long enough to extend into oil pan.

CHECKING FLUID CONDITION

Inspect the appearance of the fluid during the fluid level check. Fluid color should range from dark red to pink and be free of foreign material, or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and must be changed.

Transmission operation should also be checked if the fluid is severely discolored and contains quantities of foreign material, metal particles, or clutch disc friction material.

A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break–in period and indicate normal seating of the various transmission components.

REFILLING AFTER OVERHAUL OR FLUID/ FILTER CHANGE

The best way to refill the transmission after a fluid change or overhaul is as follows:

(1) If transmission has been overhauled, install transmission in vehicle.

(2) Remove dipstick and insert clean funnel in transmission fill tube.

(3) Add following initial quantity of Mopar Dexron IIE/Mercon to transmission:

(4) If fluid/filter change was performed, add **4 pints (2 quarts)** of fluid to transmission.

(a) If transmission was completely overhauled and torque converter was replaced or drained, add **10 pints (5 quarts)** of fluid to transmission.

(b) Remove funnel and install dipstick.

(5) Operate vehicle until fluid reaches normal operating temperature.

(6) Apply parking brakes.

(7) Let engine run at normal curb idle speed, apply service brakes. Then shift transmission through all gear ranges and back to PARK (leave engine running).

(8) Remove dipstick and check fluid level. Add only enough fluid to bring level to Full mark on dipstick. Do not overfill. **If too much fluid is added, excess amount can be removed with suction gun and plastic tubing. Tubing only has to be long enough to extend into oil pan.**

(9) When fluid level is correct, shut engine off, release park brake, remove funnel, and reseat dipstick in fill tube.

TRANSMISSION CONTROL MODULE (TCM) SERVICE

Use the DRB scan tool to diagnose transmission control module function whenever a fault is suspected. Replace the module only when the scan tool indicates the module is actually faulty.

OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF+3, type 7176, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed** , with the shift selector in neutral.

(3) If one quart of transmission fluid is collected in the container in 20 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 20 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

FLUSHING COOLERS AND TUBES

When a transmission failure has contaminated the fluid, the oil cooler(s) must be flushed. The torque converter must also be replaced. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transmission.

The only recommended procedure for flushing coolers and lines is to use Tool 6906A Cooler Flusher.

SERVICE PROCEDURES (Continued)

CAUTION: The transmission oil cooler requires a two stage flushing procedure due to an internally mounted thermostat. Failure to follow the procedure can result in severe transmission damage.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.

KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.

KEEP THE AREA WELL VENTILATED.

DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

COOLER FLUSH USING TOOL 6906A

(1) Remove cover plate filler plug on Tool 6906A. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.

(2) Reinstall filler plug on Tool 6906A.

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission.

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

NOTE: The converter drainback valve must be removed and an appropriate replacement hose installed to bridge the space between the transmission cooler line and the cooler fitting. Failure to remove the drainback valve will prevent reverse flushing the system. A suitable replacement hose can be found in the adapter kit supplied with the flushing tool.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Remove the transmission oil cooler from the vehicle. Refer to the Group 7, Cooling System, for the proper procedures.

(8) Remove the transmission oil cooler thermostat. Refer to the Group 7, Cooling System, for the proper procedures.

(9) Re-install the thermostat cover onto the oil cooler and install the snap ring.

(10) Re-connect the oil cooler to the transmission cooler lines.

(11) Turn pump ON for two to three minutes to flush cooler(s) and lines.

NOTE: This flushes the bypass circuit of the cooler only.

(12) Turn pump OFF.

(13) Remove the thermostat cover from the oil cooler.

(14) Install Special Tool Cooler Plug 8414 into the transmission oil cooler.

(15) Turn pump ON for two to three minutes to flush cooler(s) and lines.

NOTE: This flushes the main oil cooler core passages only.

(16) Turn pump OFF.

(17) Remove the thermostat cover from the oil cooler.

(18) Remove Special Tool Cooler Plug 8414 from the transmission oil cooler.

(19) Install a new thermostat spring, thermostat, cover, and snap-ring into the transmission oil cooler.

(20) Install the transmission oil cooler onto the vehicle.

(21) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(22) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(23) Place CLEAR suction line into a one quart container of Mopar® ATF Plus 3, type 7176 automatic transmission fluid.

(24) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(25) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL AND INSTALLATION

TRANSMISSION AND TORQUE CONVERTER

REMOVAL

(1) Raise vehicle.

(2) Drain transmission fluid and reinstall oil pan drain plug.

(3) On models with 2–piece fill tube, remove upper half of tube (Fig. 45).

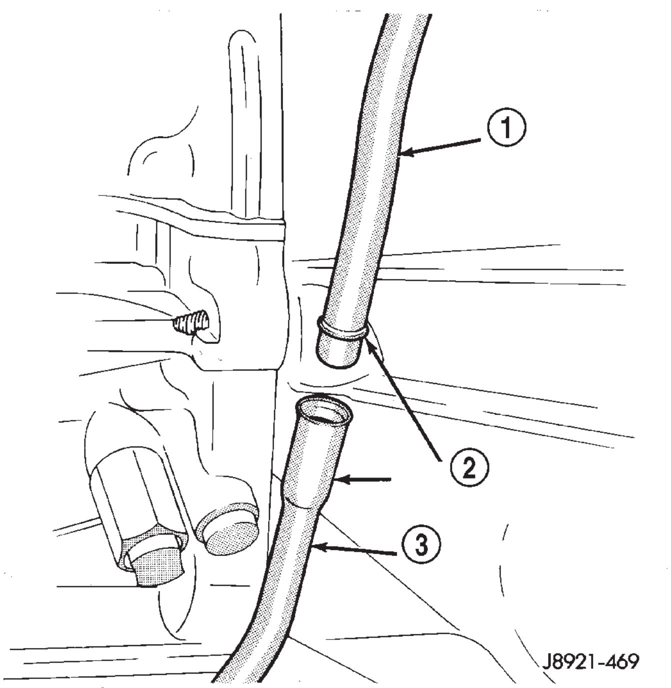


Fig. 45 Transmission Fill Tube (Two–Piece)

1 – UPPER HALF
2 – TRANSMISSION FILL TUBE
3 – LOWER HALF

(4) Disconnect cooler lines at transmission.

(5) Support engine with safety stand and support transmission with jack.

(6) Disconnect transmission and transfer case shift linkage.

(7) Remove necessary exhaust components.

(8) Disconnect vehicle speed sensor wires

(9) Mark position of front and rear propeller shafts for alignment reference. Then remove shafts from vehicle.

(10) Remove rear crossmember.

(11) Disconnect transmission shift cable at transmission. Then disconnect transmission throttle valve cable at engine.

(12) Disconnect necessary vacuum and fluid hoses.

(13) Remove transfer case from transmission.

(14) Disconnect and remove crankshaft position sensor (Fig. 46).

CAUTION: The crankshaft position sensor can be damaged during transmission removal (or installation) if the sensor is still bolted to the engine block. To avoid damage, remove the sensor before removing the transmission.

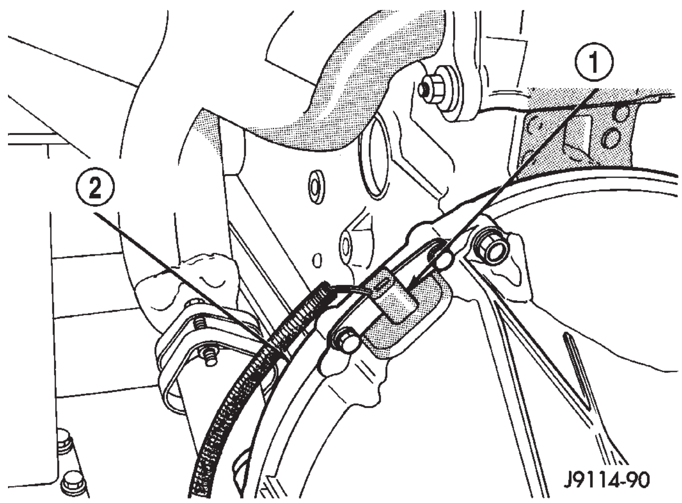


Fig. 46 Crankshaft Position Sensor

1 – CRANKSHAFT POSITION SENSOR
2 – TRANSMISSION HOUSING

(15) Remove starter motor.

(16) Remove bolts attaching converter to drive plate.

(17) Remove bolts attaching converter housing to engine.

REMOVAL AND INSTALLATION (Continued)

(18) Secure transmission to jack with safety chains.

(19) Pull transmission rearward for access to converter. Then secure converter in pump with C–clamp or strap bolted to converter housing.

(20) Remove transmission from under vehicle.

(21) Remove torque converter if converter or oil pump seal are to be serviced.

INSTALLATION

(1) Mount transmission on transmission jack. Then secure transmission to jack with safety chains.

(2) Lubricate converter drive hub and oil pump seal lip with transmission fluid. Then install converter. Be sure converter is fully seated in oil pump gears before proceeding. Hold converter in place with C–clamp or strap attached to converter housing.

(3) Lubricate the pocket in the rear of the crankshaft, in which the converter pilot hub rides, with a light coating of Mopar® High-Temp Grease.

(4) Align and position transmission and converter on engine.

(5) Remove clamp or strap used to hold torque converter in place.

(6) Move transmission forward seat and it on engine. Be sure torque converter hub is fully seated.

(7) Install converter housing–to–engine bolts (Fig. 47).

(8) Install converter-to-drive plate bolts.

(9) Install and connect starter motor.

(10) Install and connect crankshaft position sensor.

(11) Install transfer case on transmission.

(12) Connect transfer case shift linkage and vacuum hoses.

(13) Connect exhaust components.

(14) Install rear crossmember and remove jack used to support transmission assembly.

(15) Connect speed sensor wire harness to sensor.

(16) Connect wire harness to park/neutral position switch.

(17) Align and connect front and rear propeller shafts.

(18) Connect transmission wire harnesses and transfer case vacuum and wire harnesses.

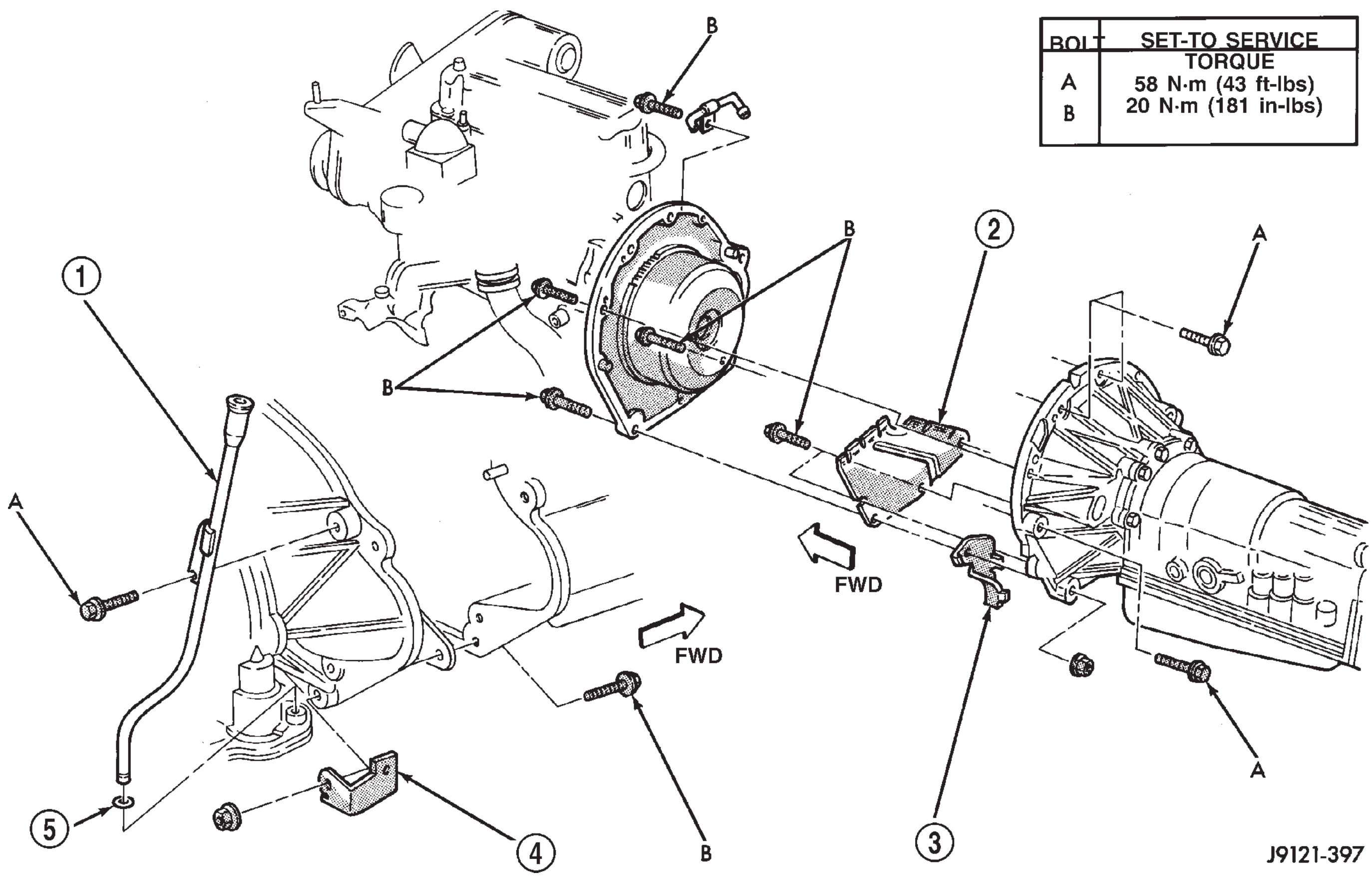


Fig. 47 Transmission Mounting

1 – TRANSMISSION FILL TUBE
2 – COVER
3 – BRACKET
4 – BRACKET
5 – FILL TUBE O-RING

REMOVAL AND INSTALLATION (Continued)

(19) Connect transmission cooler lines.

(20) Connect transmission throttle cable at engine.

(21) Install new O–ring seal on upper half of transmission fill tube. Then connect upper and lower tube halves.

(22) Lower vehicle.

(23) Fill transmission with Mopar® Dexron IIE/ Mercon automatic transmission fluid.

TORQUE CONVERTER

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(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. 48). 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.

(9) Fill the transmission with the recommended fluid.

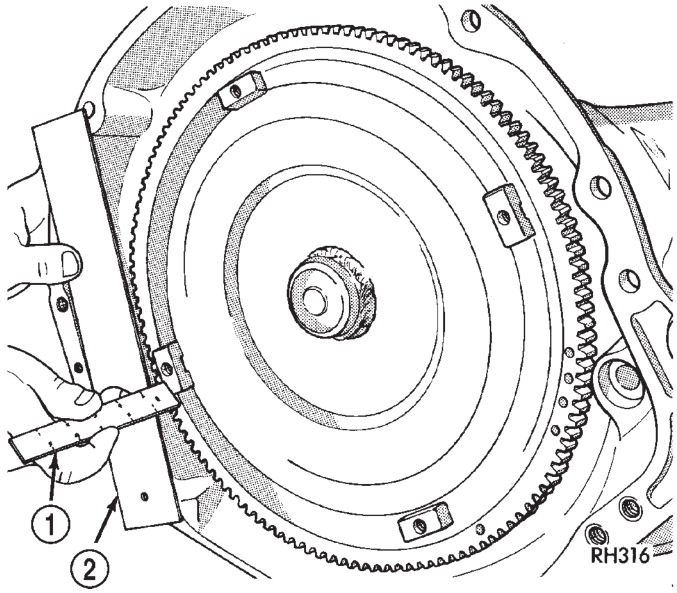


Fig. 48 Checking Torque Converter Seating

1 – SCALE
2 – STRAIGHTEDGE

ADAPTER HOUSING SEAL

REMOVAL

(1) Raise vehicle.

(2) Disconnect or remove components necessary to gain access to seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).

(3) On 4X2 vehicles, remove dust shield from the adapter housing by tapping gently with a brass drift and hammer (Fig. 49).

(4) On 4X2 vehicles, remove the adapter housing seal with Seal Puller 7550.

(5) On 4X4 vehicles, remove the adapter housing seal using a slide hammer mounted screw.

INSTALLATION

(1) Install new adapter housing seal with Seal Installer 7888.

(2) On 4X2 vehicles, install dust shield using Special Tool D-187-B.

(3) Reinstall components removed to gain access to seal.

(4) Top off transmission fluid if necessary.

SPEED SENSOR

REMOVAL

(1) Disconnect sensor wire harness connector.

REMOVAL AND INSTALLATION (Continued)

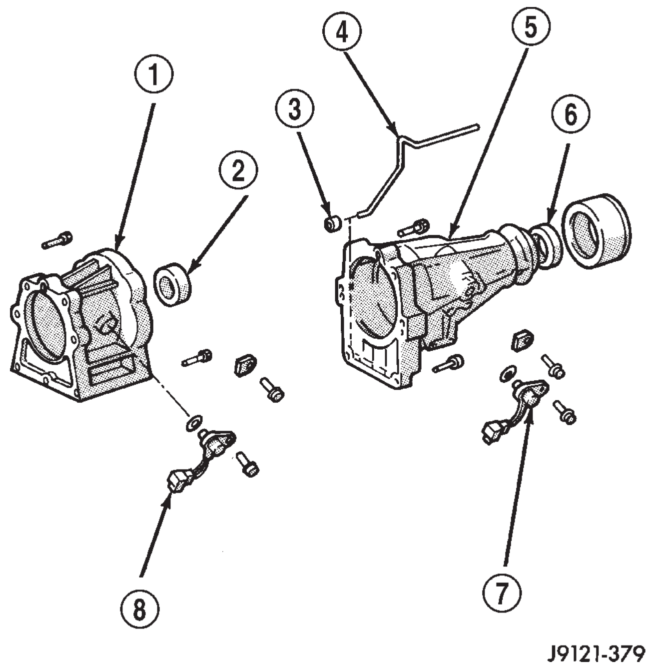


Fig. 49 Adapter Housing Seals

1 – 4WD ADAPTER HOUSING
2 – SEAL
3 – BUSHING
4 – OIL TUBE
5 – 2WD EXTENSION HOUSING
6 – SEAL
7 – SPEED SENSOR
8 – SPEED SENSOR

(2) Remove sensor retainer bolt and remove sensor (Fig. 50).

(3) Remove and discard speed sensor O–ring.

INSTALLATION

(1) Install new O–ring on speed sensor and install sensor in transmission case.

(2) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N·m (65 in. lbs.) torque.

(3) Connect sensor wire harness connector.

SPEEDOMETER ADAPTER

Rear axle gear ratio and tire size determine speedometer pinion requirements.

REMOVAL

(1) Raise vehicle.

(2) Disconnect wires from vehicle speed sensor.

(3) Remove adapter clamp and screw (Fig. 51).

(4) Remove speed sensor and speedometer adapter as assembly.

(5) Remove speed sensor retaining screw and remove sensor from adapter.

(6) Remove speedometer pinion from adapter.

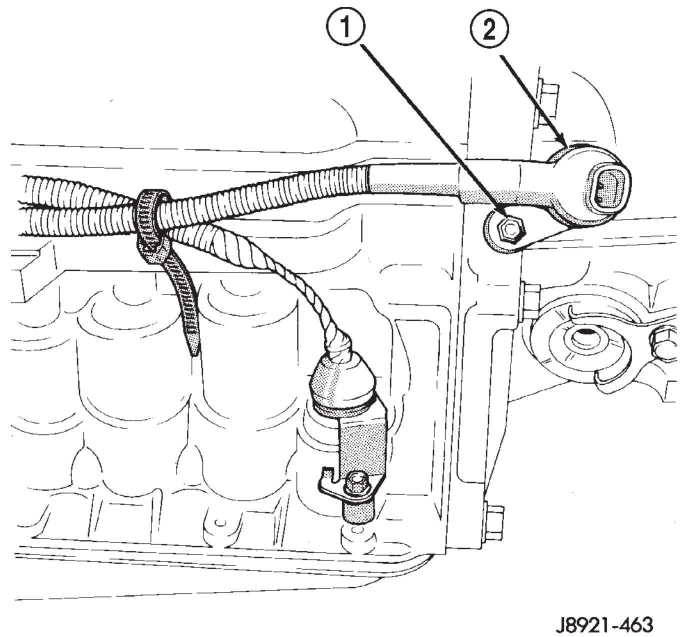


Fig. 50 Transmission Speed Sensor Removal/ Installation

1 – RETAINER BOLT
2 – SPEED SENSOR

(7) Inspect sensor and adapter O-rings (Fig. 51). Remove and discard O-rings if worn or damaged.

(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or pins are loose, severely corroded, or damaged.

INSTALLATION

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter if necessary (Fig. 51).

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 52). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o'clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

REMOVAL AND INSTALLATION (Continued)

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level, if necessary.

SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR

REMOVAL

(1) Raise vehicle.

(2) Remove components necessary to gain access to rotor and drive gear such as propeller shaft, transfer case, crossmember, and shift linkage.

(3) Disengage wire connector from the output speed sensor.

(4) Remove the bolt holding the output speed sensor to the adapter housing.

(5) Remove the output speed sensor from the adapter housing.

(6) Remove the bolts holding the adapter housing to the transmission case.

(7) Tap the adapter housing at the joint line gently with a rubber mallet to separate the adapter housing from the transmission case.

(8) Remove the adapter housing from the transmission case.

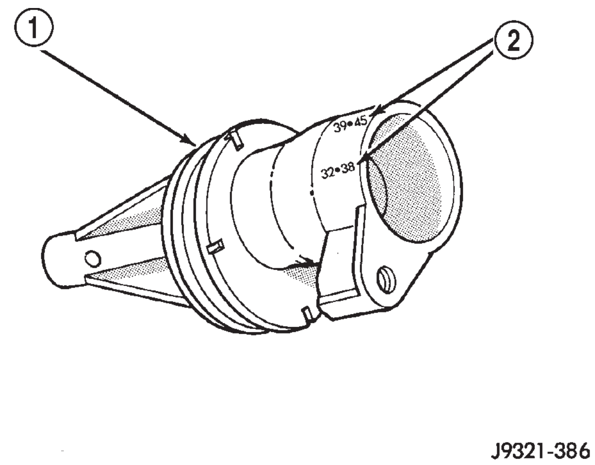


Fig. 52 Index Numbers On Speedometer Pinion Adapter

1 – SPEEDOMETER ADAPTER
2 – INDEX NUMBER LOCATION

(9) Remove speedometer drive gear snap ring (Fig. 53).

(10) Remove the speedometer drive gear and spacer, if equipped.

(11) Remove rotor from the output shaft. It may be necessary to use a wood dowel or hammer handle (Fig. 54) to gently pry the rotor from the output

ITEM	TORQUE
A	2-3 N·m (15-27 in. lbs.)
B	10-12 N·m (90-110 in. lbs.)

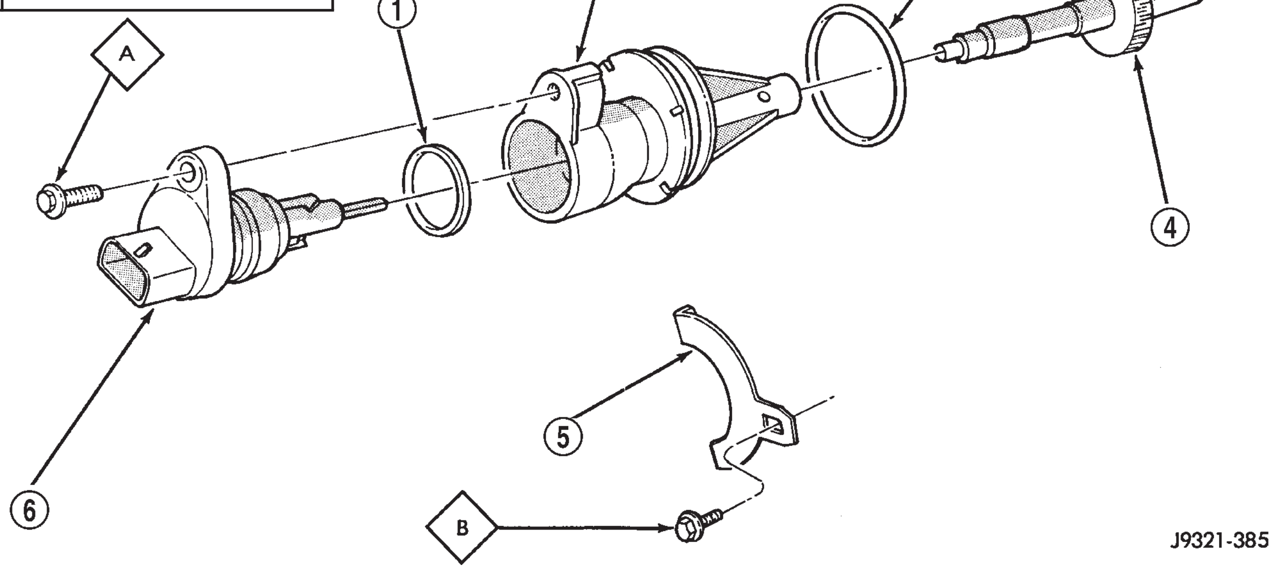


Fig. 51 Speedometer Pinion Adapter Components

1 – SENSOR O-RING
2 – SPEEDOMETER ADAPTER
3 – ADAPTER O-RING
4 – SPEEDOMETER PINION
5 – ADAPTER CLAMP
6 – VEHICLE SPEED SENSOR

REMOVAL AND INSTALLATION (Continued)

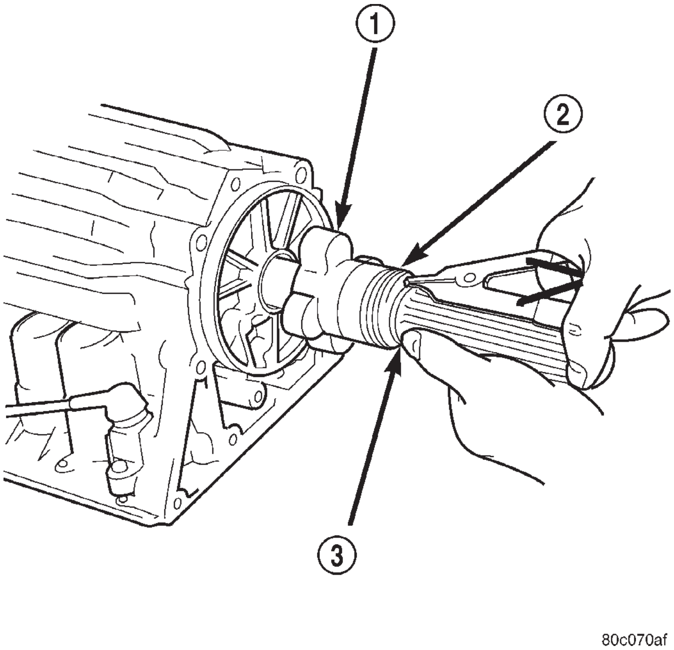


Fig. 53 Removing/Installation Speedometer Drive Gear

1 – ROTOR
2 – SPEEDOMETER DRIVE GEAR
3 – SNAP RING

shaft. Be sure to retrieve the rotor locating key from the output shaft or rotor.

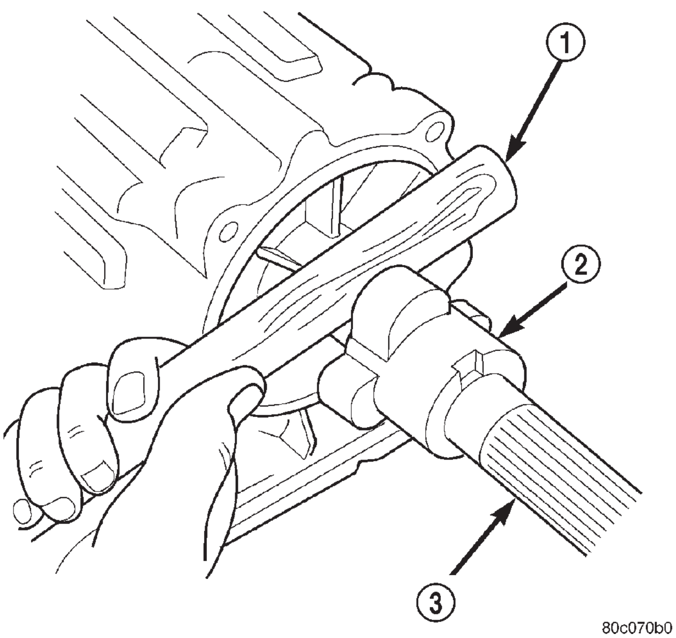


Fig. 54 Removing Speed Sensor Rotor

1 – WOOD DOWEL OR HAMMER HANDLE
2 – ROTOR
3 – OUTPUT SHAFT

INSTALLATION

(1) Clean sealing surfaces of transmission case and extension/adaptor housing.

(2) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 53).

(3) Apply 1/8 3/16 inch wide bead of Threebond® Liquid Gasket TB1281, P/N 83504038, to transmission case sealing surface and install extension/adapter housing on case.

(4) Tighten adaptor housing bolts to 34 N·m (25 ft. lbs.) torque.

(5) Install components removed to gain access to rotor and drive gear.

PARK/NEUTRAL POSITION SWITCH

REMOVAL

(1) Raise vehicle.

(2) Disconnect switch wire harness connector.

(3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 55).

(4) Remove switch adjusting bolt (Fig. 55).

(5) Slide switch off manual valve shaft.

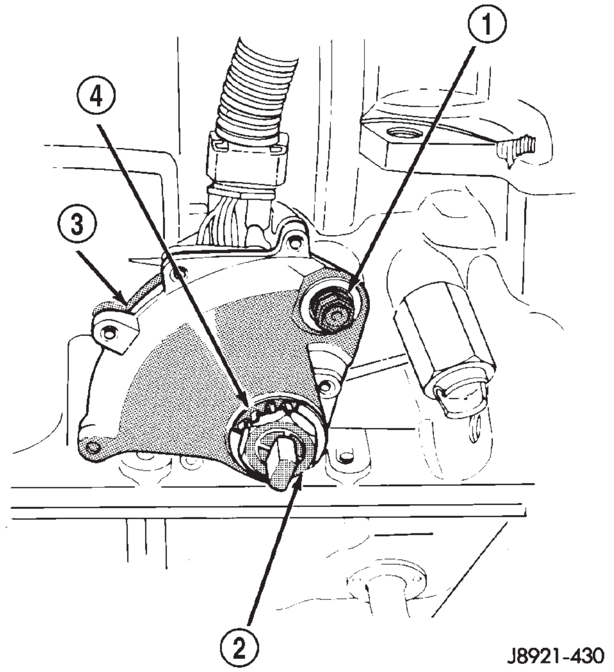


Fig. 55 Park/Neutral Position Switch Removal/ Installation

1 – ADJUSTING BOLT
2 – ATTACHING NUT
3 – NEUTRAL SWITCH
4 – TABBED WASHER

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Disconnect shift linkage rod from shift lever on left side of transmission.

(2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.

(3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.

(4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N·m (61 in. lbs.) torque but do not bend washer lock tabs over nut at this time.

(5) Verify that transmission is in Neutral.

(6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 56).

(7) Align switch standard line with groove or flat on manual valve shaft.

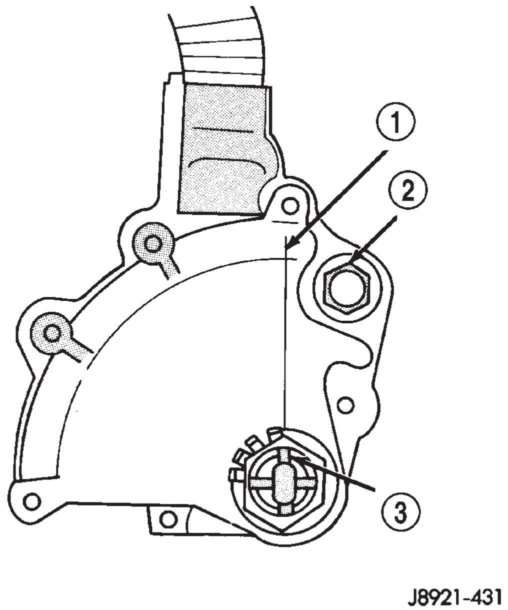


Fig. 56 Park/Neutral Position Switch Adjustment

1 – NEUTRAL STANDARD LINE
2 – ADJUSTING BOLT
3 – VERTICAL GROOVE ON MANUAL VALVE SHAFT

(8) Tighten switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.

(9) Bend at least two washer lock tabs over switch attaching nut to secure it.

(10) Connect shift linkage rod to shift lever on left side of case.

(11) Connect switch wires to harness and lower vehicle.

(12) Check switch operation. Engine should start in Park and Neutral only.

GEARSHIFT CABLE

REMOVAL

(1) Shift transmission into Park.

(2) Remove shift lever bezel and necessary console parts for access to shift lever assembly.

(3) Disconnect cable at shift lever and feed cable through dash panel opening to underside of vehicle.

(4) Raise vehicle.

(5) Disengage cable eyelet at transmission shift lever and pull cable adjuster out of mounting bracket. Then remove old cable from vehicle.

INSTALLATION

(1) Route cable through hole in dash panel. Fully seat cable grommet into dash panel.

(2) Place the auto transmission manual shift control lever in “Park” detent (rearmost) position and rotate prop shaft to ensure transmission is in park.

(3) Connect shift cable to shifter mechanism by snapping cable retaining ears into shifter bracket and press cable end fitting onto lever ball stud.

(4) Place the floor shifter lever in park position. Ensure that the pawl is seated within the confines of the adjustment gauge clip.

(5) Snap the cable into the transmission bracket so the retaining ears are engaged and connect cable end fitting onto the manual control lever ball stud.

(6) Lock shift cable into position by pushing upward on the adjusting lock button.

(7) Remove and discard the shift cable adjustment gauge clip from the park gate of the shifter.

BRAKE TRANSMISSION SHIFT INTERLOCK

REMOVAL

(1) Remove lower steering column cover. Refer to Group 8E, Instrument Panel and Gauges, for proper procedure.

(2) Remove lower steering column shroud. Refer to Group 19, Steering, for proper procedure.

(3) Remove tie strap near the solenoid retaining the brake transmission interlock cable to the steering column.

(4) Disengage wire connector from solenoid.

(5) With the ignition removed or in the unlocked position, disengage lock tab holding cable end to steering column (Fig. 57).

(6) Pull cable end from steering column.

(7) Remove the floor console and related trim. Refer to Group 23, Body, for proper procedure.

(8) Disconnect the cable eyelet from the bellcrank (Fig. 58).

(9) Disconnect and remove the cable from the shift bracket.

REMOVAL AND INSTALLATION (Continued)

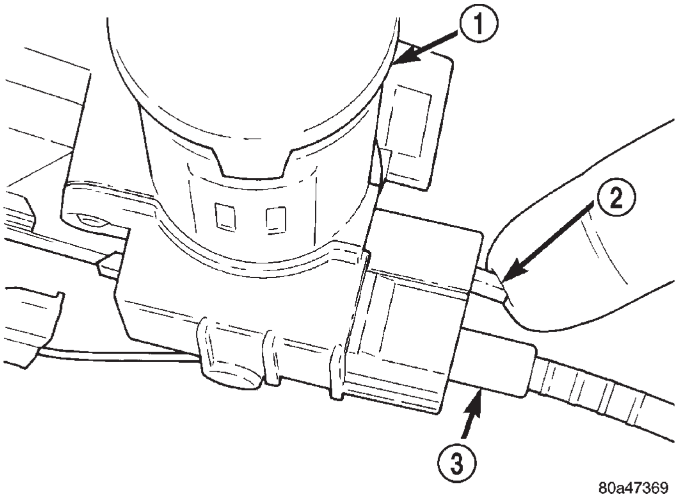


Fig. 57 Brake/Park Interlock Cable

1 – IGNITION LOCK
2 – LOCK TAB
3 – CABLE END

INSTALLATION

(1) Route replacement cable behind instrument panel and under floor console area to shift mechanism (Fig. 58).

(2) Insert cable end into opening in steering column hub under ignition lock. Push cable inward until lock tab engages.

(3) Connect the cable end eyelet onto shifter bellcrank pin.

(4) Place gear selector in PARK.

(5) Push the spring-loaded cable adjuster forward and snap cable into bracket.

(6) Adjust the brake transmission shifter interlock cable. Refer to the Adjustment portion of this section for proper procedures.

(7) Verify that the cable adjuster lock clamp is pushed downward to the locked position.

(8) Test the park-lock cable operation.

(9) Install the floor console and related trim.

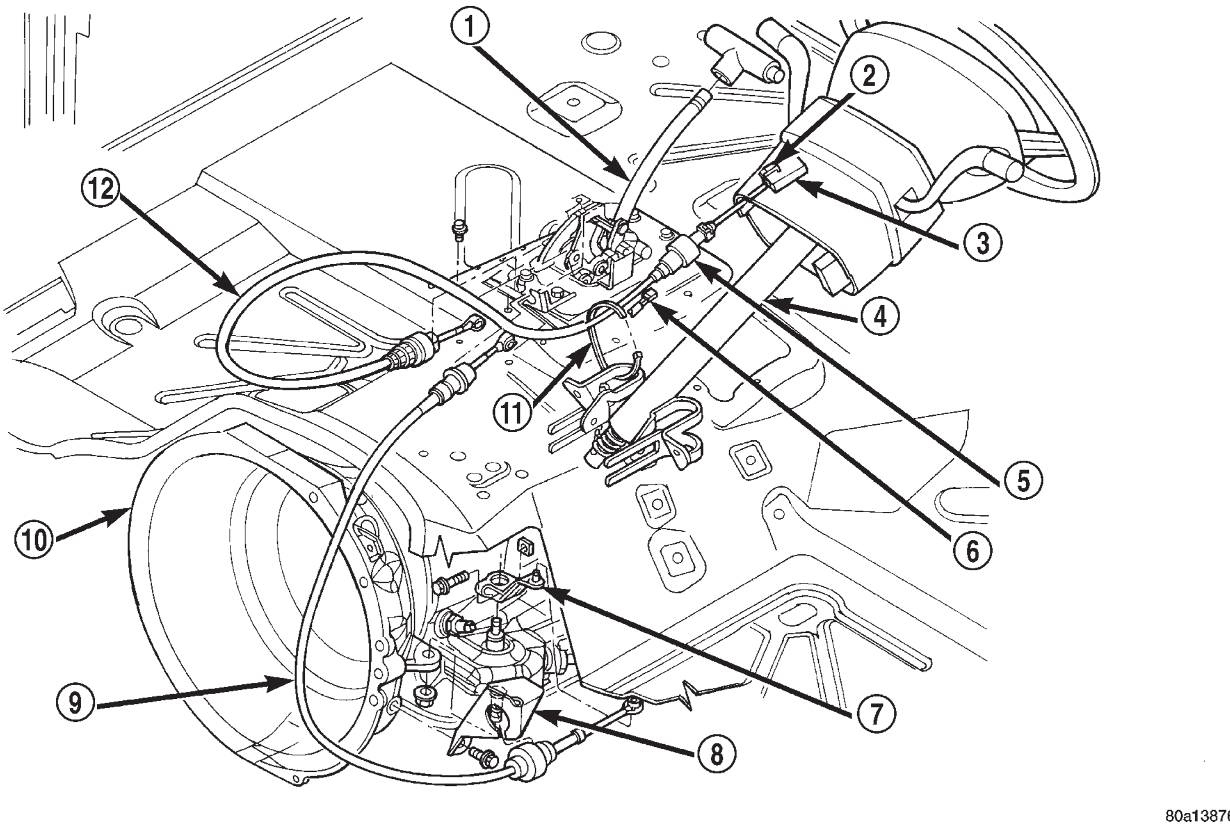


Fig. 58 Cable and Shifter

1 – SHIFT MECHANISM
2 – LOCK-TAB
3 – IGNITION LOCK INTERLOCK
4 – STEERING COLUMN
5 – SOLENOID
6 – WIRE CONNECTOR
7 – LEVER
8 – MOUNT BRACKET
9 – SHIFT CABLE
10 – AUTOMATIC TRANSMISSION
11 – TIE STRAP
12 – PARK/BRAKE INTERLOCK CABLE

REMOVAL AND INSTALLATION (Continued)

(10) Install tie strap to hold cable to base of steering column.

(11) Install lower steering column shroud and ignition lock.

(12) Install lower steering column cover.

TRANSMISSION VALVE BODY SOLENOIDS

REMOVAL

(1) Remove transmission oil pan drain plug and drain fluid.

(2) Remove pan bolts and remove oil pan.

(3) Remove oil screen bolts and remove screen (Fig. 59) and gasket. Discard the gasket.

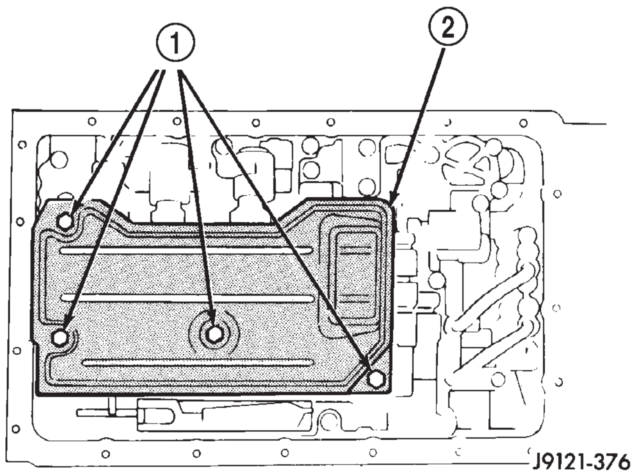


Fig. 59 Oil Screen Removal/Installation

1 – OIL SCREEN BOLTS
2 – OIL SCREEN

(4) Disconnect solenoid wire connector (Fig. 60).

(5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.

(6) Remove bolt attaching solenoids to valve body and remove solenoids (Fig. 61). Do not allow any valve body components to fall out when solenoids are removed.

(7) Clean oil filter and pan with solvent and dry with compressed air.

(8) Remove old sealer material from oil pan and transmission case.

INSTALLATION

(1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N·m (7 ft. lbs.) torque.

(2) Connect feed wires to solenoids.

(3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.

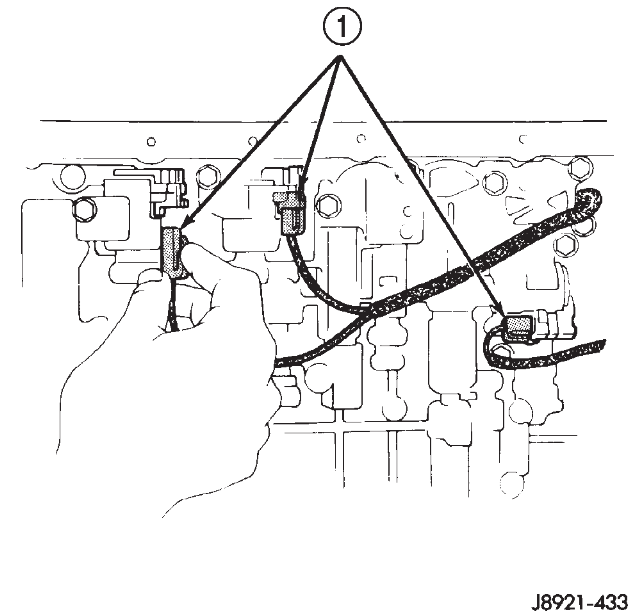


Fig. 60 Solenoid Wire Connectors

1 – SOLENOID WIRE CONNECTORS

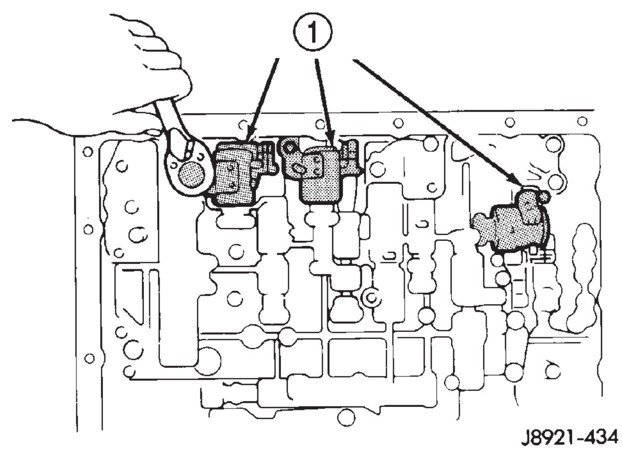


Fig. 61 Transmission Valve Body Solenoids

1 – VALVE BODY SOLENOIDS

(4) Apply bead of Threeebond® Liquid Gasket TB1281, P/N 83504038, sealer to oil pan sealing surface. Sealer bead should be at least 3.0 mm (1/8 in.) wide.

(5) Install oil pan on transmission. Tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(6) Install and tighten oil pan drain plug to 20 N·m (15 ft. lbs.) torque.

(7) Fill transmission with Mopar® Dexron IIE/Mercon.

REMOVAL AND INSTALLATION (Continued)

TRANSMISSION VALVE BODY

REMOVAL

(1) Remove oil pan plug and drain transmission fluid.

(2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.

(3) Disconnect solenoid wire connectors (Fig. 62). Mark wires for assembly reference.

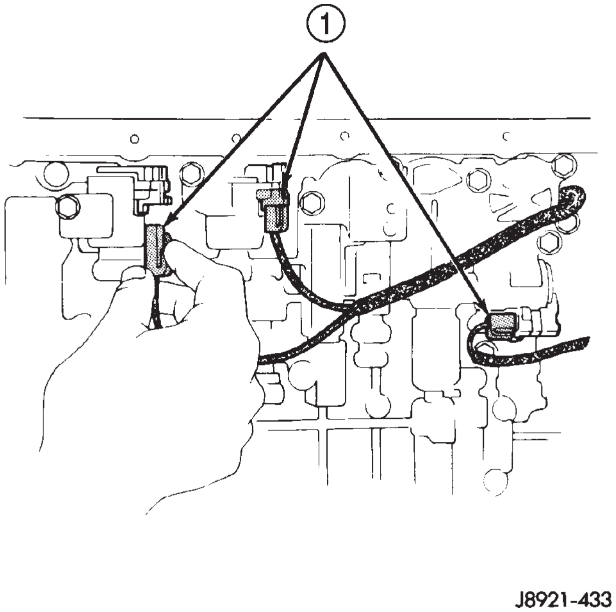


Fig. 62 Solenoid Wire Connectors

1 – SOLENOID WIRE CONNECTORS

(4) Remove valve body oil tubes (Fig. 63). Carefully pry tubes out of valve body with screwdriver.

(5) Disconnect throttle cable from throttle cam (Fig. 64).

(6) Remove valve body bolts. Bolt locations are outlined in (Fig. 65).

(7) Lower valve body and remove overdrive clutch accumulator springs, direct clutch accumulator springs and second brake accumulator spring (Fig. 66).

(8) Remove valve body and check ball and spring (Fig. 67).

INSTALLATION

(1) Connect cable to throttle cam (Fig. 64).

(2) Install check ball and spring (Fig. 67).

(3) Position accumulator springs and spacers on valve body.

(4) Align valve body manual valve with shift sector (Fig. 68) and carefully position valve body on case.

(5) Install valve body bolts (Fig. 65). Tighten bolts evenly to 10 N·m (7 ft. lbs.) torque.

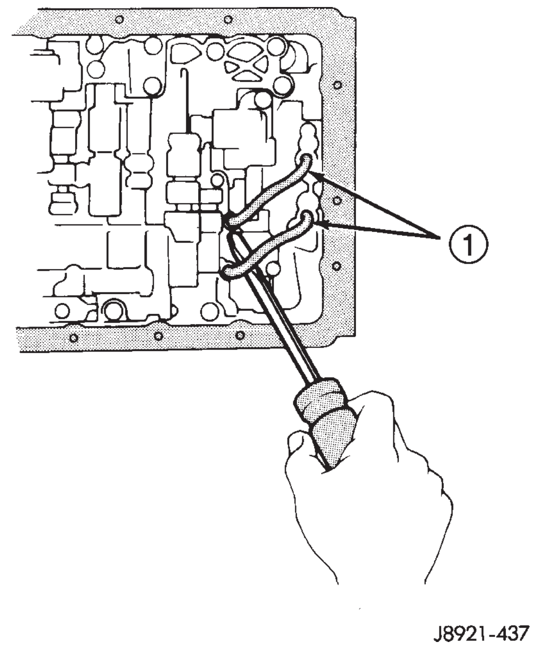


Fig. 63 Removing Transmission Valve Body Oil Tubes

1 – OIL TUBES

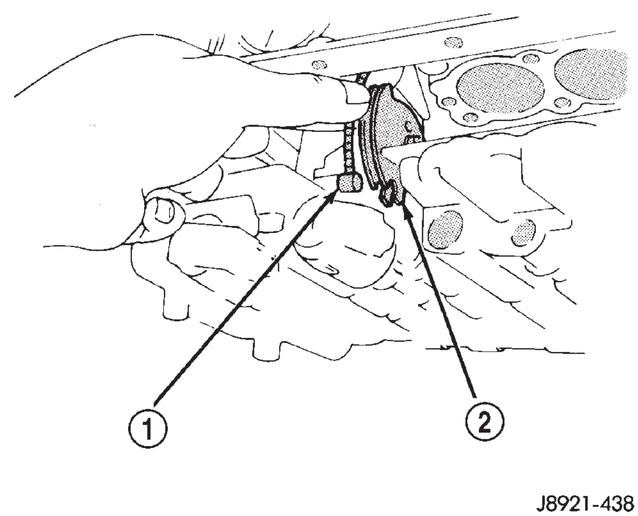


Fig. 64 Removing/Installing Throttle Cable

1 – THROTTLE CABLE
2 – CABLE BRACKET

(6) Install valve body oil tubes. Be sure tube ends (L) and (M) are installed as shown in (Fig. 69).

(7) Remove old sealer material from oil pan and transmission case.

(8) Clean oil screen and oil pan with solvent (if not done previously). Dry both components with compressed air only. Do not use shop towels.

(9) Install new gaskets on oil screen and install screen on case. Tighten screen attaching bolts to 10 N·m (7 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

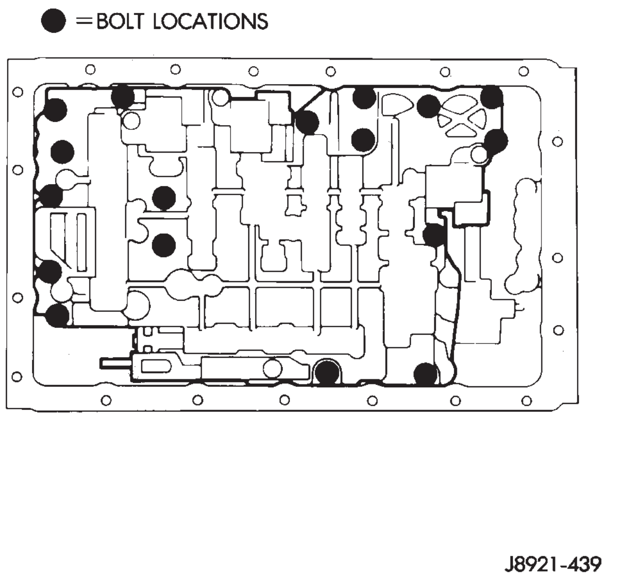


Fig. 65 Transmission Valve Body Bolt Locations

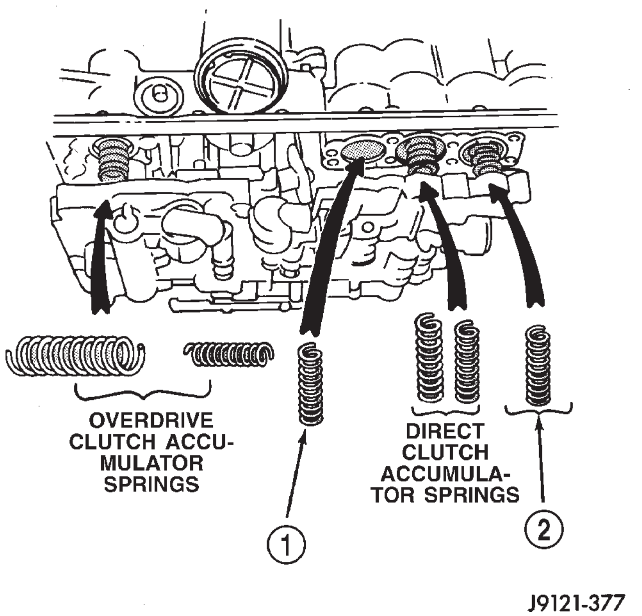


Fig. 66 Accumulator Springs

1 – OVERDRIVE BRAKE ACCUMULATOR SPRING
2 – SECOND BRAKE ACCUMULATOR SPRING

(10) Apply bead of Threebond® Liquid Gasket TB1281, P/N 83504038 to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install oil pan and tighten pan bolts to 7.4 N·m (65 in. lbs.) torque.

(11) Install new gasket on oil pan drain plug and install plug in pan. Tighten plug to 20 N·m (15 ft. lbs.) torque.

(12) Fill transmission with Mopar® Dexron IIE/ Mercon.

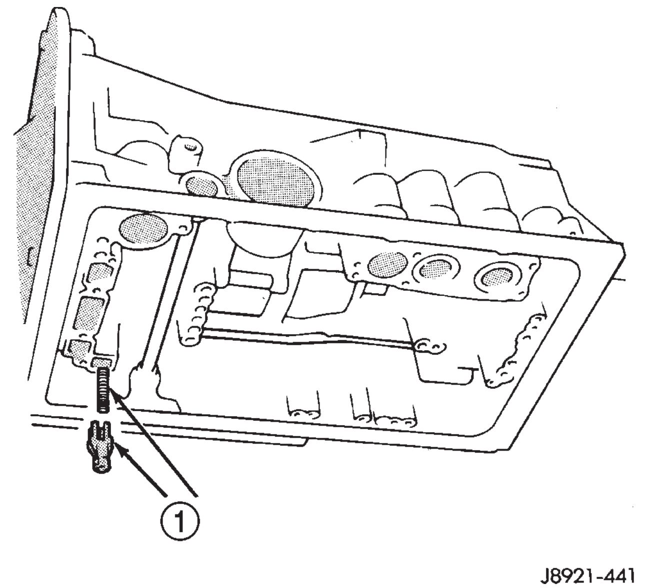


Fig. 67 Removing/Installing Check Ball And Spring

1 – CHECK BALL AND SPRING

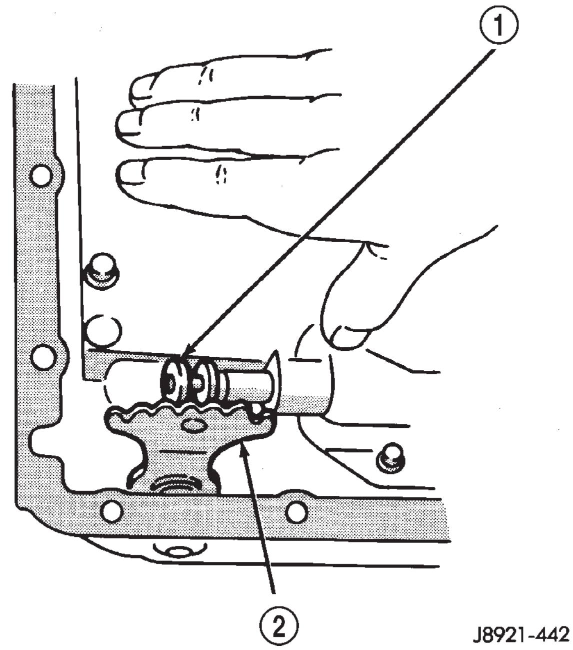


Fig. 68 Shift Sector And Manual Valve Alignment

1 – MANUAL VALVE
2 – SHIFT SECTOR

TRANSMISSION CONTROL MODULE

The transmission control module is mounted under the instrument panel. On left hand drive models, it is at the driver side of the lower finish panel (Fig. 70). On right hand drive models, it is at the passenger side of the lower finish panel (Fig. 71).

To remove the module, disconnect the wire harness, remove the mounting screws and remove the

REMOVAL AND INSTALLATION (Continued)

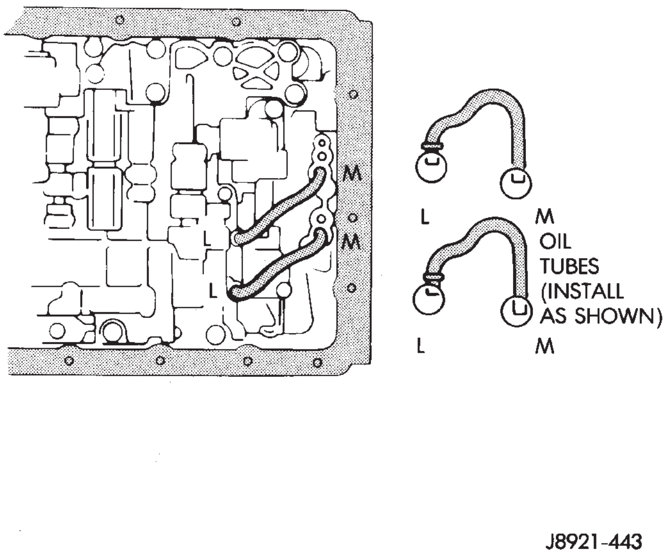


Fig. 69 Installing Transmission Valve Body Oil Tubes

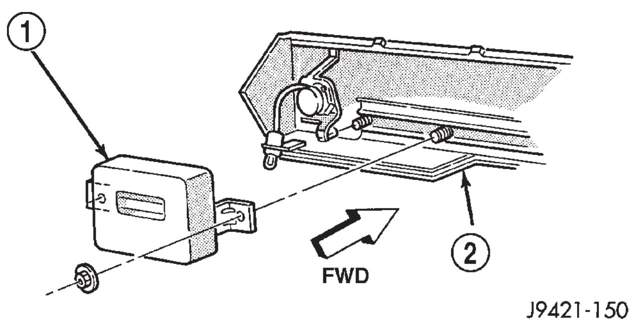


Fig. 70 TCM Location (Left Hand Drive)

1 – TCM
2 – LOWER FINISH PANEL

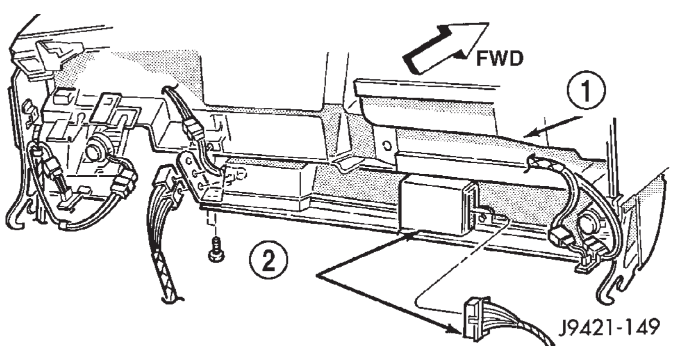


Fig. 71 TCM Location (Right Hand Drive)

1 – REAR SIDE OF INSTRUMENT PANEL
2 – TCM AND HARNESS

module from the finish panel. Tighten the module mounting screws securely after installation. Also be sure the wire harness is not twisted, kinked or touching any body panels.

SOLENOID HARNESS ADAPTER SEAL

REMOVAL

(1) Remove oil pan and oil screen.
(2) Disconnect solenoid wire connectors (Fig. 72).

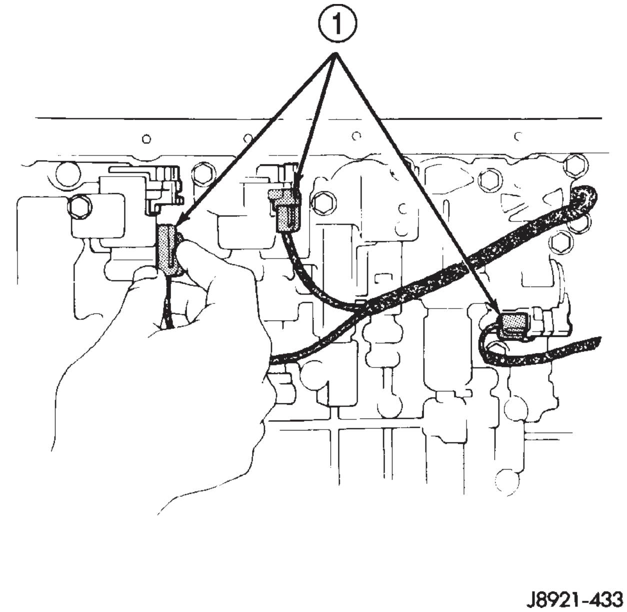


Fig. 72 Solenoid Wire Connectors

1 – SOLENOID WIRE CONNECTORS

(3) Remove bracket securing solenoid harness adaptor (Fig. 73) to case.

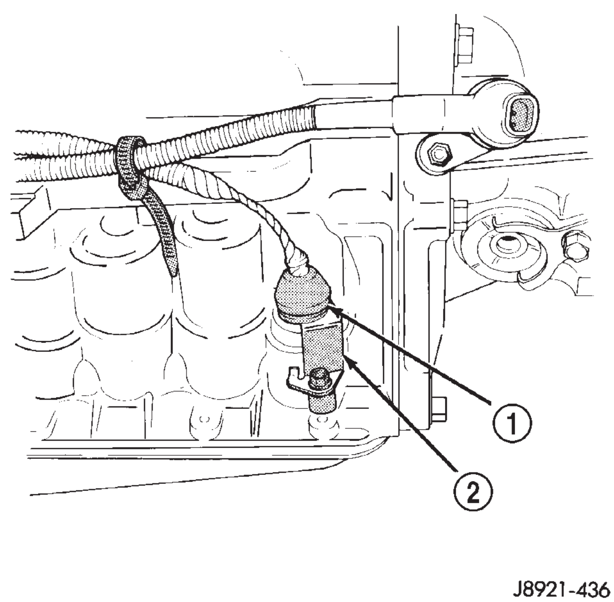


Fig. 73 Harness Adapter Removal/Installation

1 – HARNESS ADAPTER
2 – BRACKET

(4) Pull harness adapter and wires out of case.

REMOVAL AND INSTALLATION (Continued)

(5) Remove and discard adapter O–ring.

INSTALLATION

(1) Lubricate new O–ring and install it on adapter.
(2) Install solenoid wire harness and adapter in case.
(3) Install adapter bracket and bracket bolt.
(4) Connect wires to solenoids.
(5) Install oil screen.
(6) Apply bead of Threeebond® Liquid Gasket TB1281, P/N 83504038, to oil pan seal surface. Sealer bead should be at least 3 mm (1/8 in.) wide.
(7) Install oil pan on transmission. Tighten pan bolts to 7 N·m (65 in. lbs.) torque.
(8) Install and tighten oil pan drain plug to 20 N·m (15 ft. lbs.) torque.
(9) Fill transmission with Mopar Dexron IIE/Mercon.

MANUAL VALVE SHAFT SEAL

REMOVAL

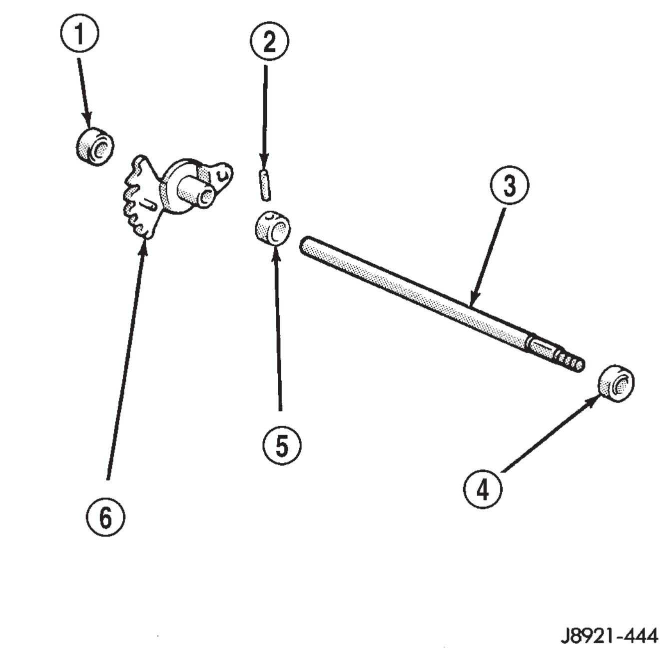


Fig. 74 Manual Valve Shaft And Seals
1 – SHAFT SEAL
2 – PIN
3 – MANUAL VALVE SHAFT
4 – SHAFT SEAL
5 – SPACER SLEEVE
6 – SHIFT SECTOR

(1) Remove park/neutral position switch and disconnect transmission shift lever (Fig. 74).
(2) Remove oil pan and valve body.
(3) Remove bolts attaching park rod bracket to case (Fig. 75).

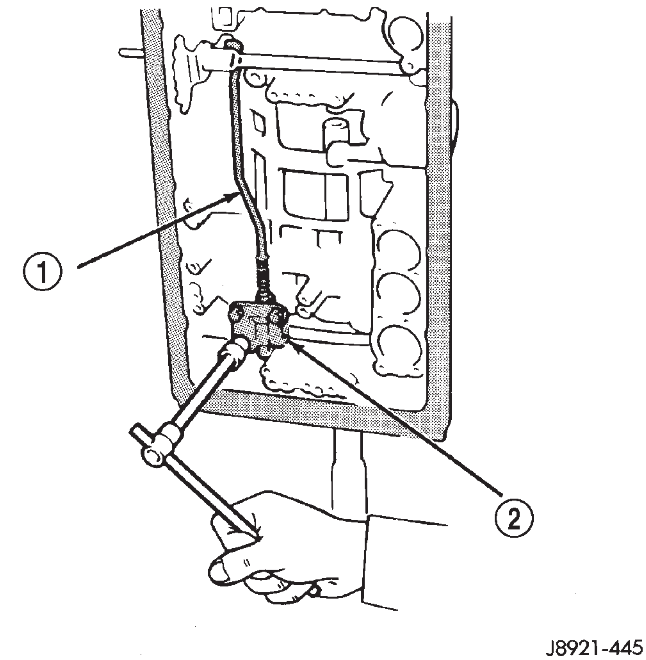


Fig. 75 Removing/Installing Park Rod Bracket
1 – PARK ROD
2 – PARK ROD BRACKET

(4) Remove park rod from shift sector (Fig. 76).

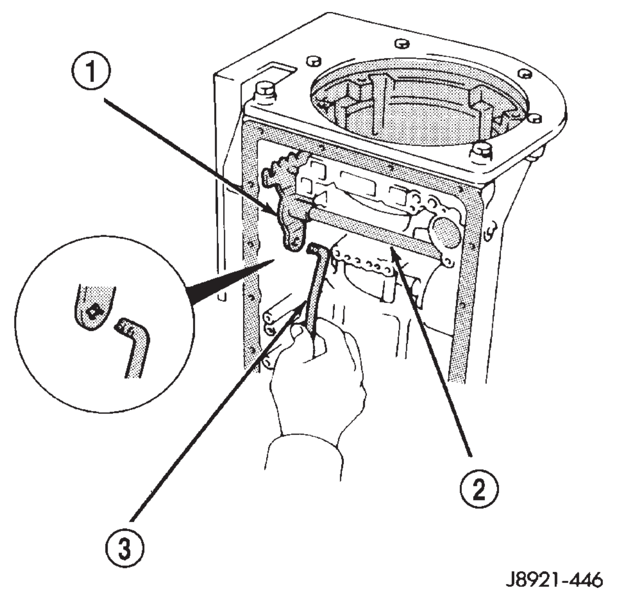


Fig. 76 Removing/Installing Park Rod
1 – SHIFT SECTOR
2 – MANUAL VALVE SHAFT
3 – PARK ROD

(5) Cut spacer sleeve with chisel and remove it from manual valve shaft (Fig. 77).
(6) Remove pin from shaft and sector with pin punch.
(7) Remove shaft and sector from case.

REMOVAL AND INSTALLATION (Continued)

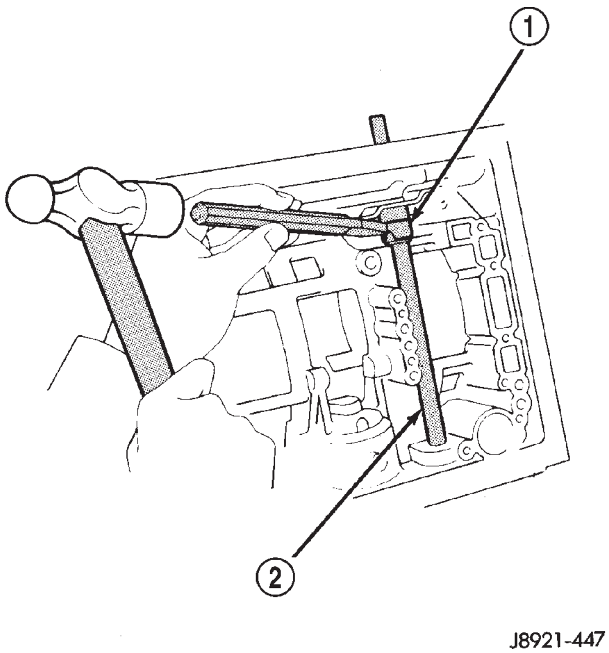


Fig. 77 Cutting Spacer Sleeve

1 – SPACER
2 – MANUAL VALVE SHAFT

(8) Pry shaft seals out of case (Fig. 78).

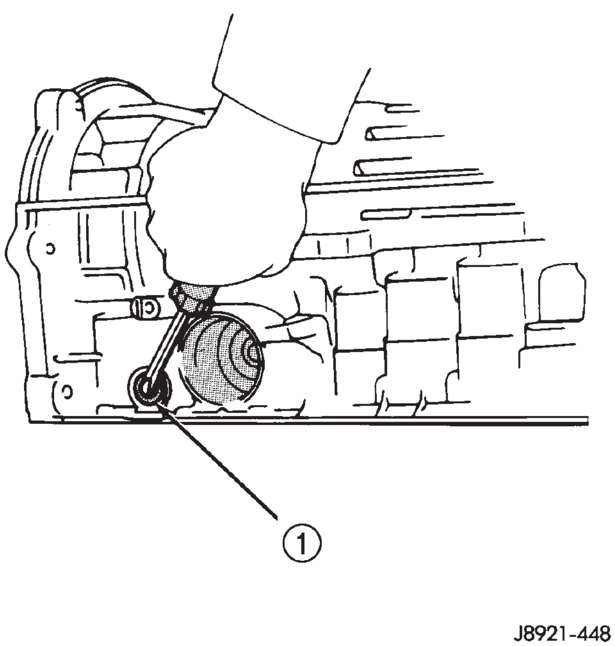


Fig. 78 Removing Manual Valve Shaft Seals

1 – MANUAL VALVE SHAFT SEAL

INSTALLATION

(1) Inspect the manual valve shaft and sector. Replace either component if worn or damaged.

(2) Coat replacement shaft seals with petroleum jelly and seat them in the case using an appropriately sized driver/socket (Fig. 79).

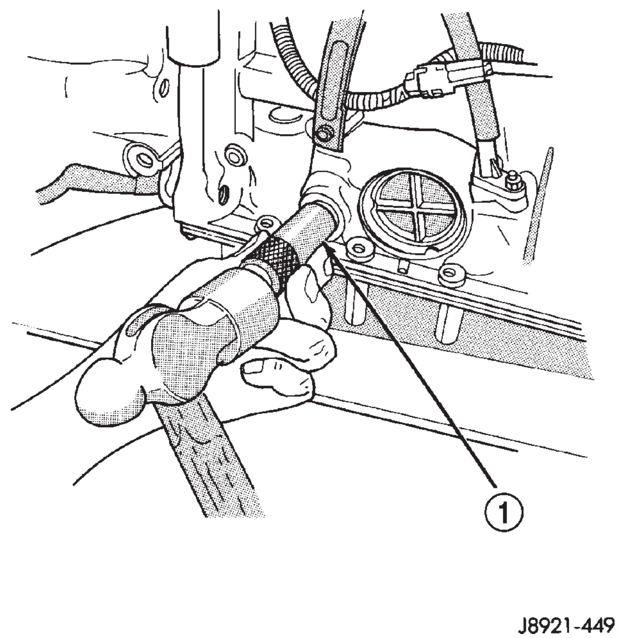


Fig. 79 Installing Manual Valve Shaft Seals

1 – SHAFT SEAL INSTALLER

(3) Install new spacer sleeve on sector (Fig. 80).

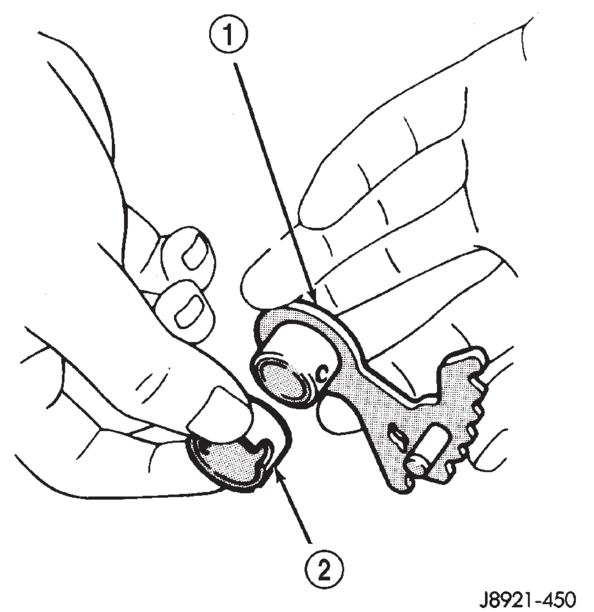


Fig. 80 Installing Spacer Sleeve On Sector

1 – SHIFT SECTOR
2 – SPACER SLEEVE

(4) Lubricate manual valve shaft with petroleum jelly and install it through the left side of the transmission case.

REMOVAL AND INSTALLATION (Continued)

(5) Lubricate sector and sleeve with petroleum jelly and install them on shaft.

(6) Install the manual valve shaft through the remainder of the transmission case.

(7) Align hole in spacer sleeve with notch in sector. Then install shift sector roll pin. Tap pin into sector and shaft and securely stake sleeve to sector and shaft.

(8) Connect park rod to sector (Fig. 76).

(9) Install park rod bracket (Fig. 81). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

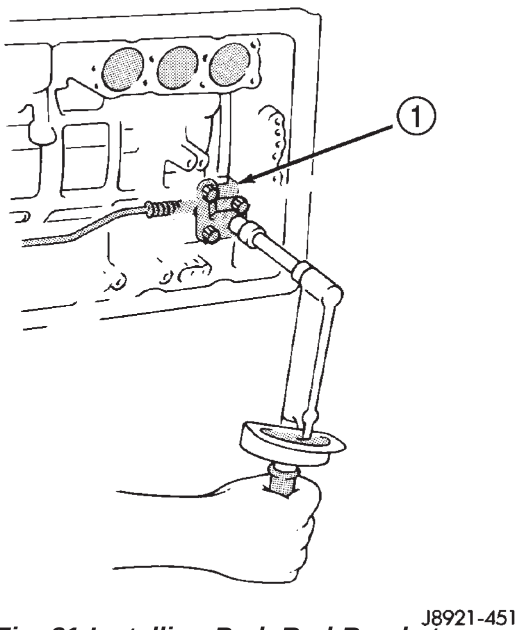


Fig. 81 Installing Park Rod Bracket

1 – PARK ROD BRACKET

(10) Install valve body, oil screen and oil pan.

(11) Install park/neutral position switch.

ACCUMULATOR PISTONS AND SPRINGS

REMOVAL

(1) Remove valve body.

(2) Remove accumulator pistons with compressed air (Fig. 82). Apply air through small feed hole next to each piston bore. Catch each piston in a shop towel as it exits bore.

CAUTION: Use only enough air pressure to ease each piston out of the bore. In addition, remove the pistons one at a time and tag the pistons and springs for assembly reference. Do not intermix them.

(3) Remove and discard piston O–ring seals. Then clean pistons and springs with solvent.

INSTALLATION

(1) Inspect pistons, springs and piston bores. Replace worn damaged pistons. Replace broken, collapsed or distorted springs. Replace case if piston bores are damaged.

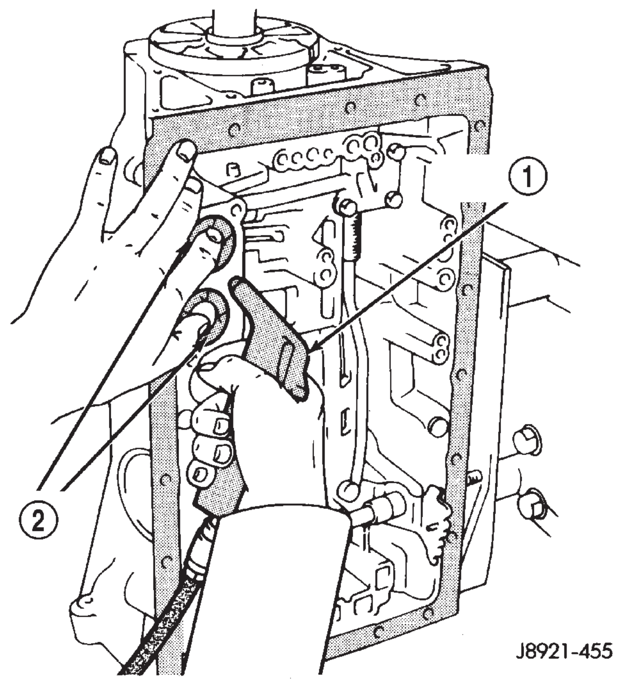


Fig. 82 Accumulator Piston Removal

1 – AIR GUN NOZZEL IN FEED HOLE

2 – PISTONS

(2) If small cushion spring in any piston must be replaced, remove spring retainer clip and remove spring from piston (Fig. 83). A small hooked tool or small thin blade screwdriver can be used to remove clip. A thin wall, deep socket, or pin punch can be used to seat clip after spring replacement.

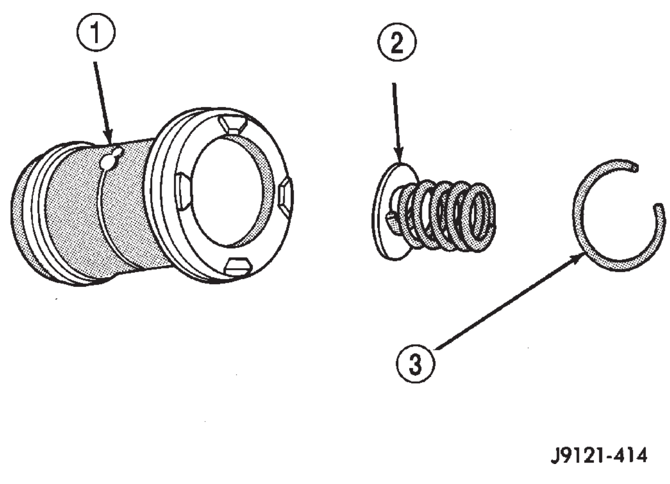


Fig. 83 Small Cushion Spring Retention

1 – ACCUMULATOR PISTON (TYPICAL)

2 – SMALL CUSHION SPRING

3 – RETAINER CLIP

REMOVAL AND INSTALLATION (Continued)

(3) Install new O–ring seals on pistons. Lubricate seals and pistons and piston bores with transmission fluid.

(4) Install pistons and springs (Fig. 84).

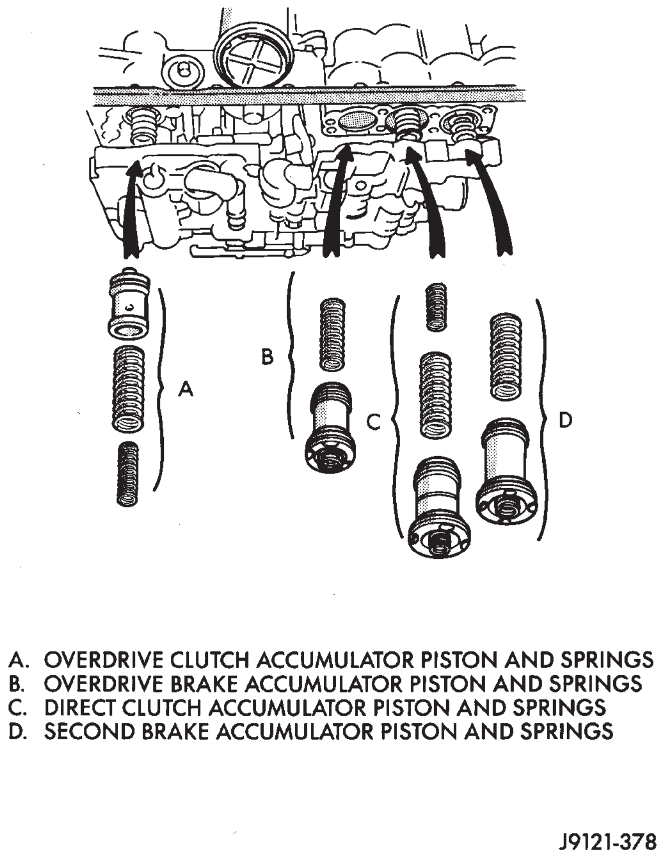


Fig. 84 Accumulator Pistons, Springs And Spacers

(5) Install valve body, oil screen and oil pan.

SECOND COAST BRAKE SERVO

REMOVAL

(1) Remove valve body.

(2) Remove servo piston cover snap ring with snap ring pliers (Fig. 85).

(3) Remove servo piston and cover with compressed air. Apply compressed air through oil hole in servo boss to ease piston out of bore (Fig. 86).

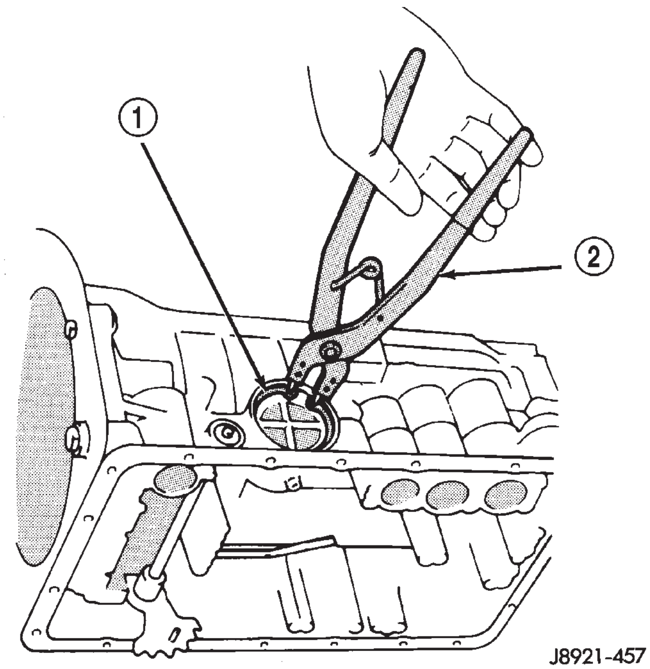


Fig. 85 Removing/Installing Servo Piston Cover Snap Ring

1 – SERVO PISTON COVER SNAP RING
2 – SNAP RING PLIERS

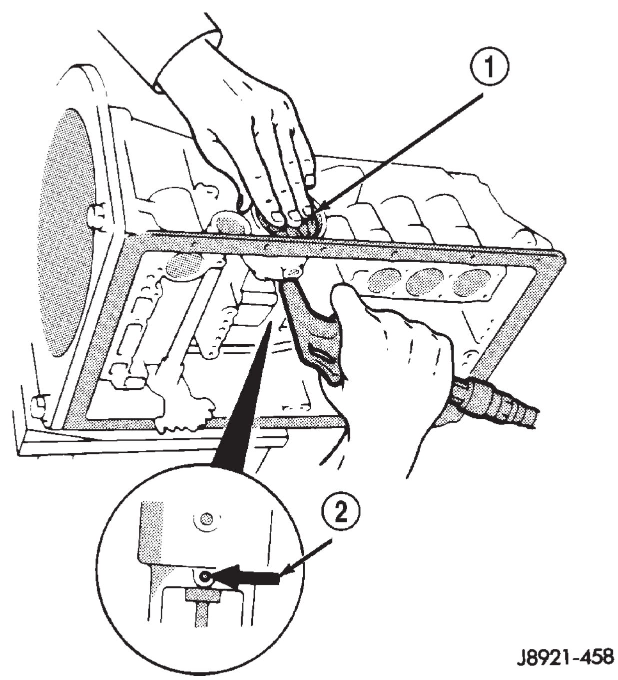


Fig. 86 Removing Servo Cover And Piston

1 – PISTON AND COVER
2 – OIL HOLE

REMOVAL AND INSTALLATION (Continued)

(4) Remove and discard seal and O–rings from cover and piston (Fig. 87). Inspect E–ring, piston, spring and retainer, piston rod and piston spring. Replace worn or damaged parts.

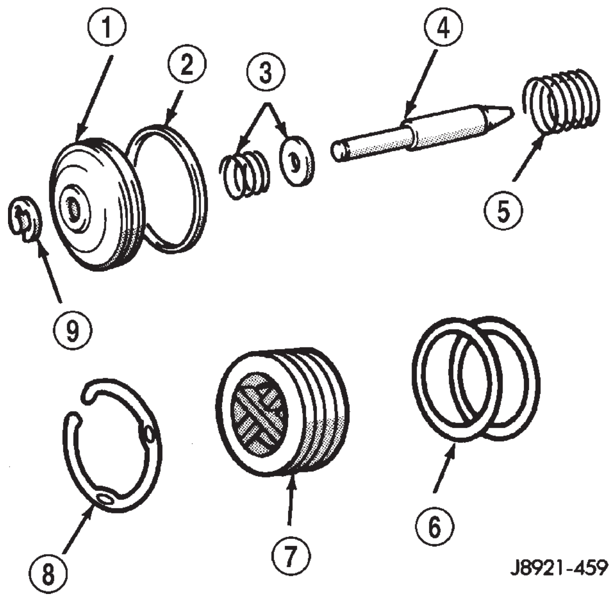


Fig. 87 Second Coast Brake Servo Components

1 – SERVO PISTON
2 – SEAL RING
3 – SPRING AND RETAINER
4 – PISTON ROD
5 – PISTON SPRING
6 – SERVO COVER O-RINGS
7 – SERVO COVER
8 – SNAP RING
9 – E-RING

INSTALLATION

(1) Install new seals on cover and piston.
(2) Lubricate servo components with transmission fluid.
(3) Assemble and install servo components in case. Be sure servo piston rod is properly engaged in the second coast brake band.
(4) Compress cover and piston and install cover snap ring.
(5) Install valve body, oil screen and oil pan.

PARK ROD AND PAWL

REMOVAL

(1) Remove valve body as outlined in this section.
(2) Remove bolts attaching park rod bracket to case (Fig. 88).
(3) Remove park rod from manual valve shaft sector (Fig. 89).
(4) Remove park rod.

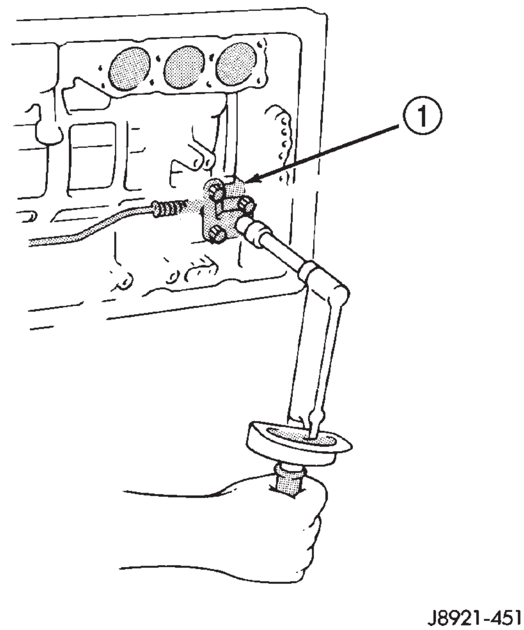


Fig. 88 Removing/Installing Park Rod Bracket

1 – PARK ROD BRACKET

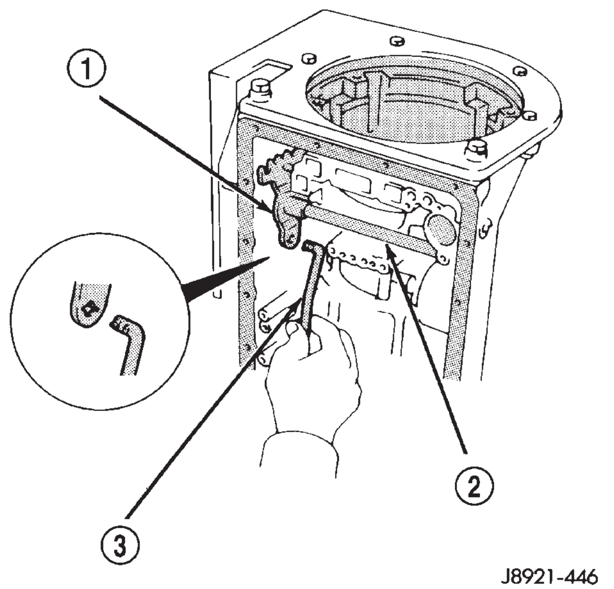


Fig. 89 Removing/Installing Park Rod

1 – SHIFT SECTOR
2 – MANUAL VALVE SHAFT
3 – PARK ROD

REMOVAL AND INSTALLATION (Continued)

(5) Remove park pawl, pin and spring (Fig. 90).

INSTALLATION

(1) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.

(2) Install pawl in case. Insert pin and install spring. Be sure spring is positioned as shown in Figure 35.

(3) Install park rod and bracket (Fig. 88). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

(4) Install valve body, oil screen and oil pan.

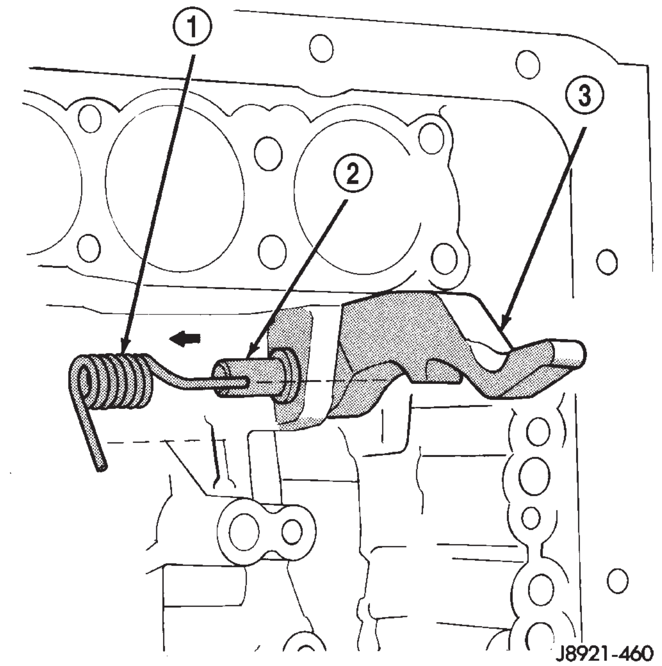


Fig. 90 Removing/Installing Park Pawl, Pin And Spring

1 – SPRING
2 – PIN
3 – PARK PAWL

TRANSMISSION THROTTLE CABLE

REMOVAL

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from engine bracket (Fig. 91).

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 92).

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 93).

(6) Remove and discard cable seal.

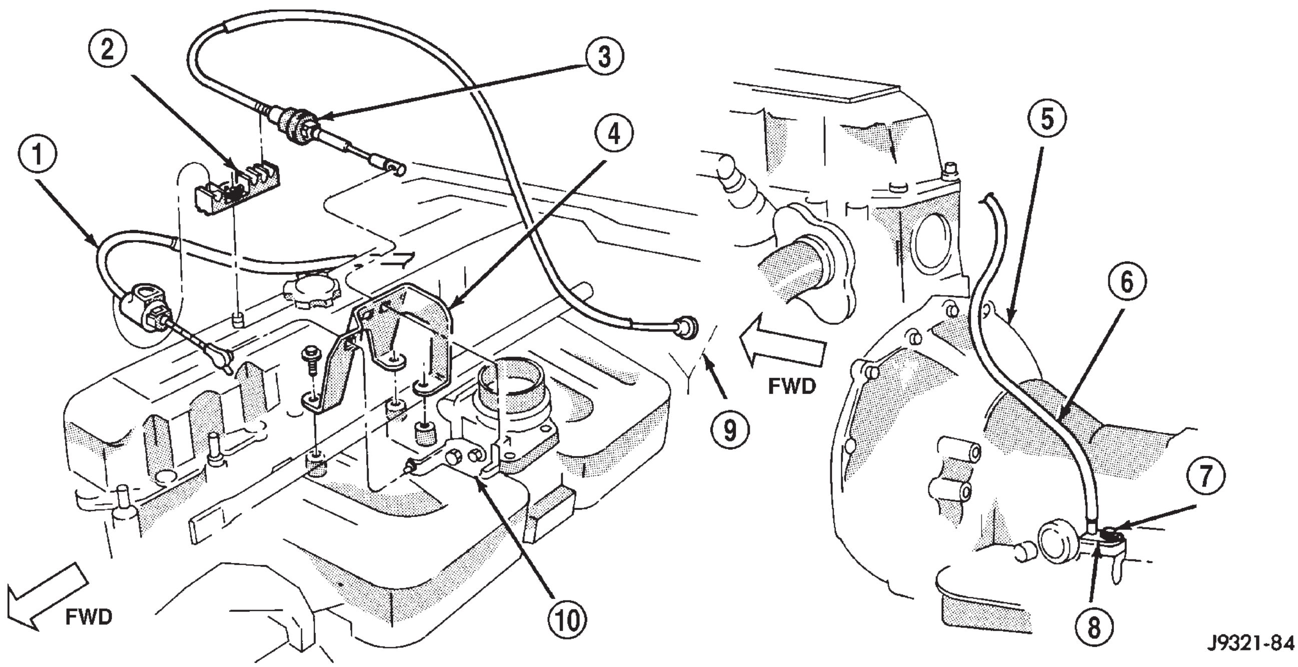


Fig. 91 Transmission Throttle Cable Attachment

1 – THROTTLE CABLE
2 – CABLE GUIDE
3 – ACCELERATOR CABLE
4 – CABLE ENGINE BRACKET
5 – CONVERTER HOUSING
6 – THROTTLE CABLE
7 – CABLE RETAINER SCREW
8 – CABLE BRACKET
9 – DASH PANEL
10 – THROTTLE BODY

REMOVAL AND INSTALLATION (Continued)

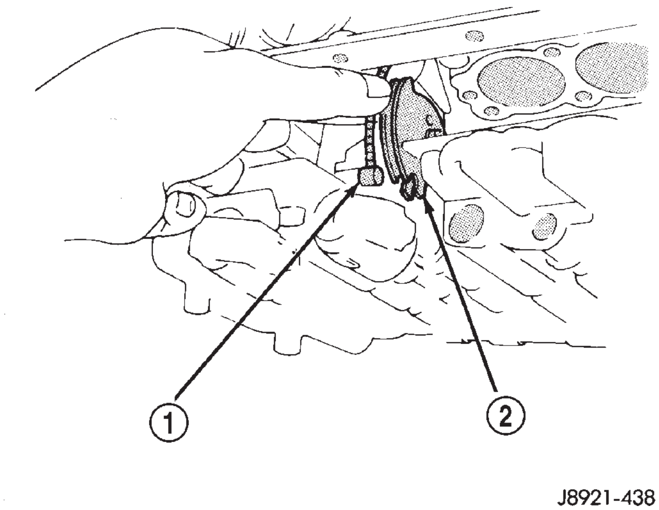


Fig. 92 Removing/Installing Transmission Throttle Cable

1 – THROTTLE CABLE
2 – CABLE BRACKET

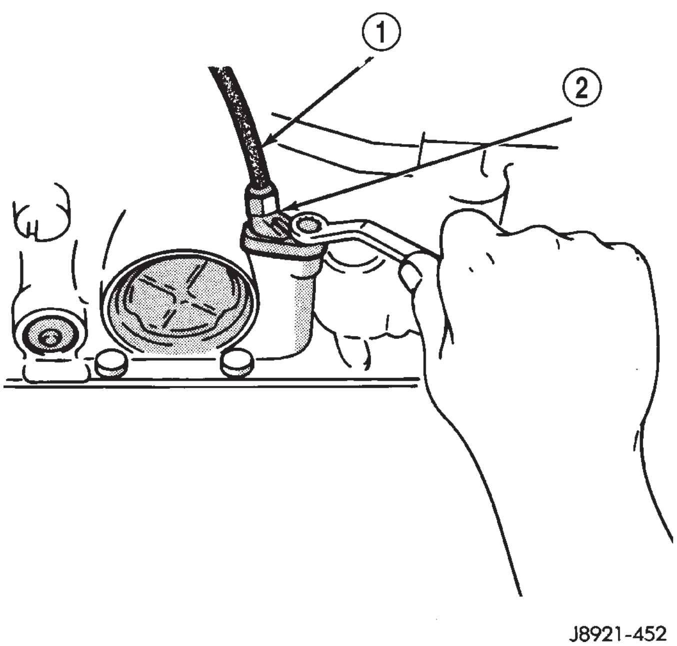


Fig. 93 Removing/Installing Transmission Throttle Cable And Bracket

1 – THROTTLE CABLE
2 – CABLE BRACKET

INSTALLATION

(1) Lubricate and install new seal on cable.

(2) Insert cable in transmission case.

(3) Attach cable to throttle cam (Fig. 92).

(4) Install cable bracket on case and tighten attaching bolt to 10 N·m (7 ft. lbs.) torque (Fig. 93).

(5) Install pan and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(6) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N·m (15 ft. lbs.) torque.

(7) Connect cable to engine bracket and throttle linkage.

(8) Fill transmission with Mopar® Dexron/Mercon IIE.

(9) Adjust the cable as described in cable adjustment procedure.

OIL PUMP SEAL

REMOVAL

(1) Remove converter.

(2) Remove old seal. Use blunt punch to collapse seal and pry seal out of pump housing. Do not scratch or damage seal bore.

INSTALLATION

(1) Lubricate lip of new seal with transmission fluid and install seal in pump with tool 7549 (Fig. 94).

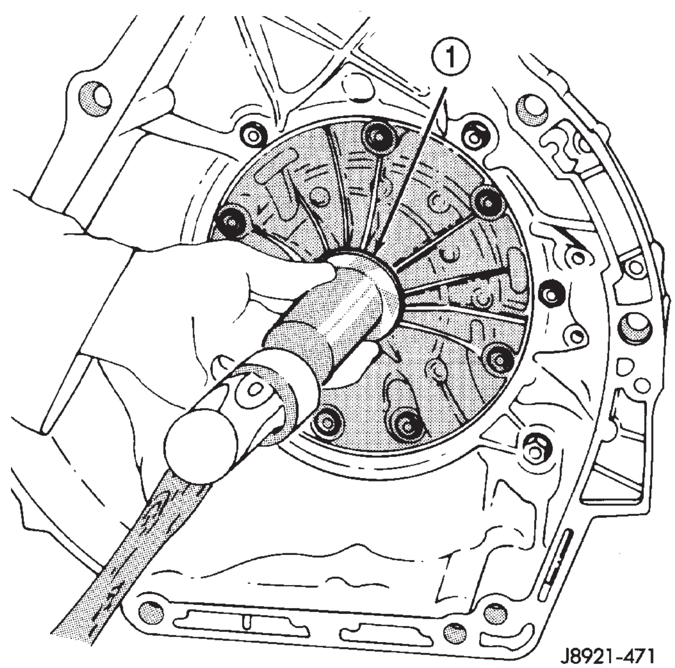


Fig. 94 Installing Oil Pump Seal

1 – PUMP SEALER INSTALLER

(2) Lubricate converter drive hub with transmission fluid.

(3) Align and install converter in oil pump.

DISASSEMBLY AND ASSEMBLY

TRANSMISSION

DISASSEMBLY

(1) Remove torque converter.

(2) Remove clamps attaching wire harness and throttle cable (Fig. 95) to transmission.

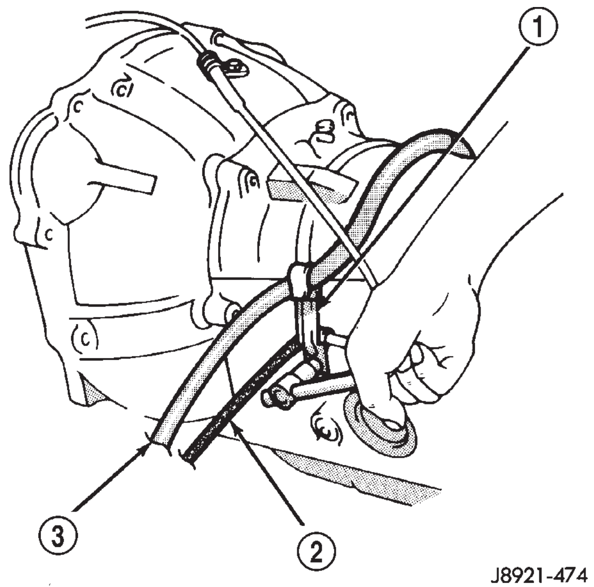


Fig. 95 Typical Harness And Cable Clamp Attachment

1 – CLAMP
2 – THROTTLE CABLE
3 – TRANSMISSION HARNESS

(3) Remove shift lever from manual valve shaft at left side of transmission.

(4) Remove park/neutral position switch.

(5) Remove speed sensor.

(6) Remove converter housing bolts and remove housing (Fig. 96) from case.

(7) Remove adapter housing, speedometer drive gear, and speed sensor rotor.

(8) Remove transmission oil pan, oil screen and screen gaskets (Fig. 97).

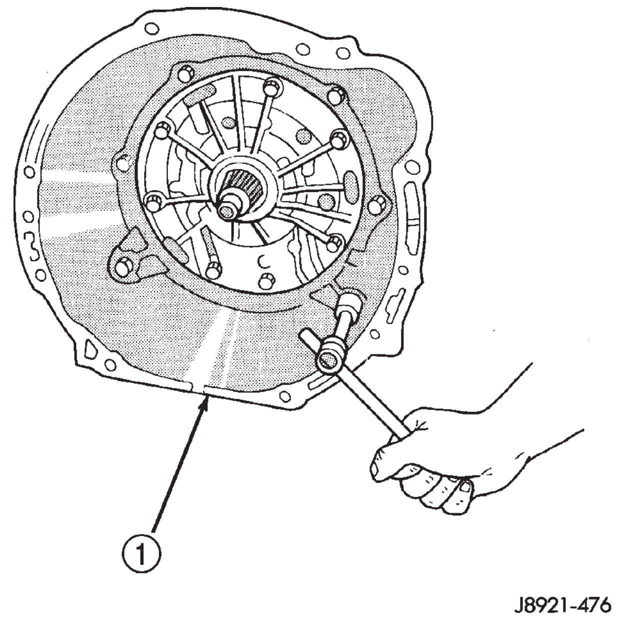


Fig. 96 Converter Housing Removal

1 – CONVERTER HOUSING

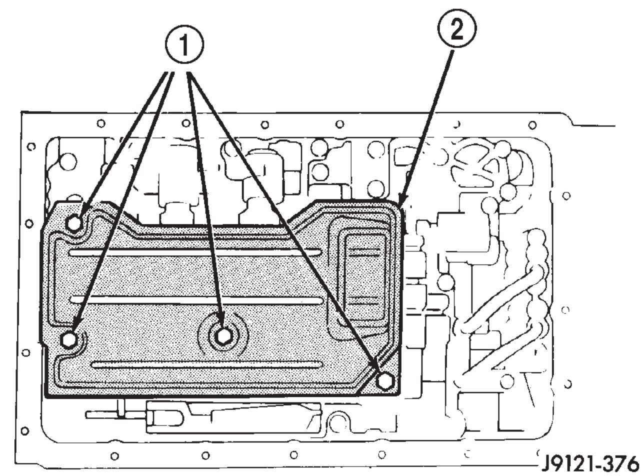


Fig. 97 Removing Oil Screen

1 – OIL SCREEN BOLTS
2 – OIL SCREEN

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Remove valve body oil feed tubes (Fig. 98).

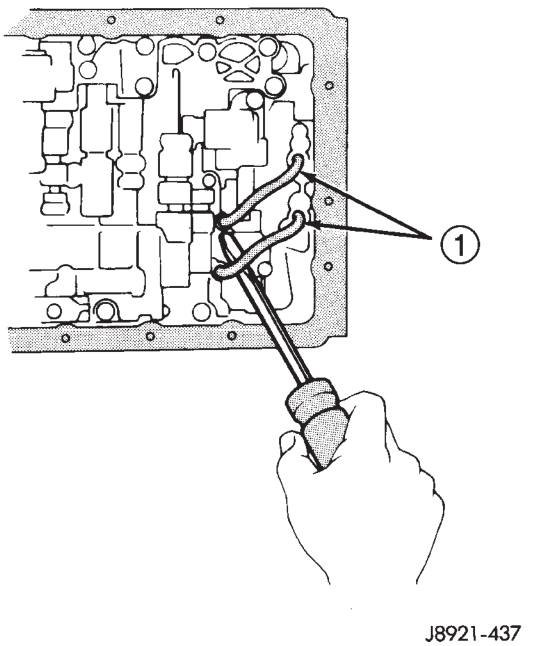


Fig. 98 Valve Body Oil Tube Removal

1 – OIL TUBES

(10) Disconnect valve body solenoid wires (Fig. 99).

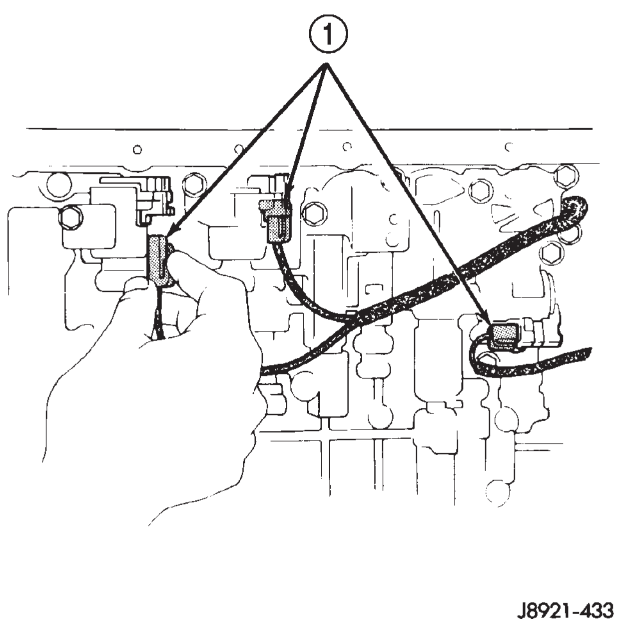


Fig. 99 Solenoid Wire Location

1 – SOLENOID WIRE CONNECTORS

(11) Remove harness bracket bolt and remove harness and bracket (Fig. 100).

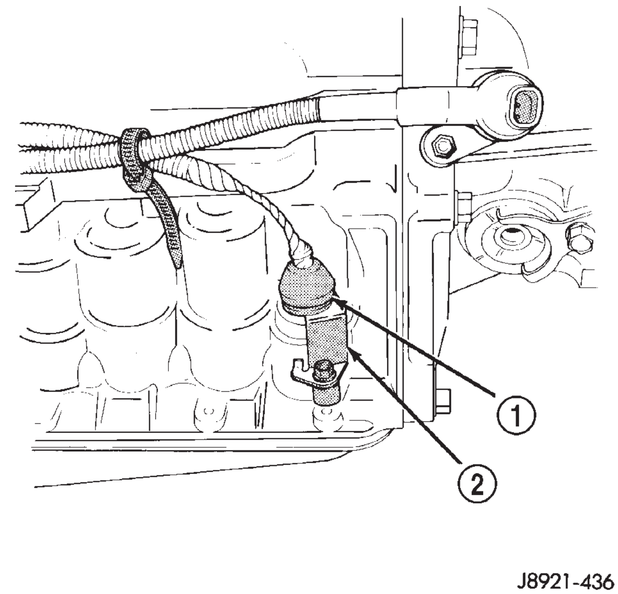


Fig. 100 Removing Bracket And Harness

1 – HARNESS ADAPTER

2 – BRACKET

(12) Remove valve body bolts (Fig. 101).

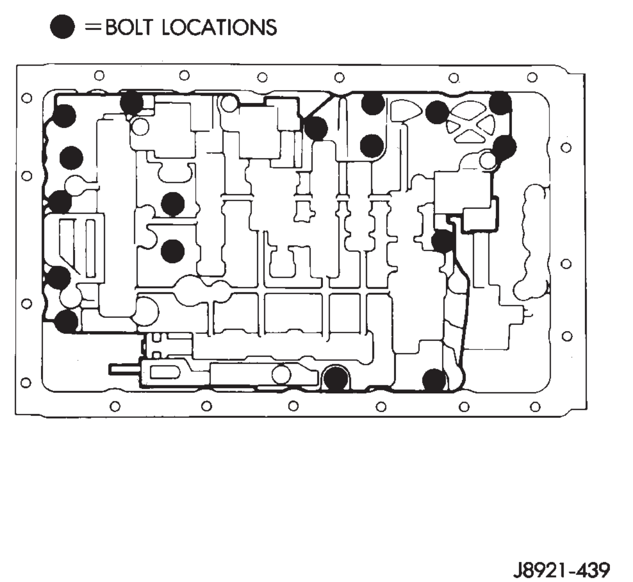


Fig. 101 Valve Body Bolt Locations

(13) Disconnect throttle cable from throttle cam (Fig. 102).

(14) Remove valve body from case. Then remove accumulator springs, check ball, and spring (Fig. 103).

DISASSEMBLY AND ASSEMBLY (Continued)

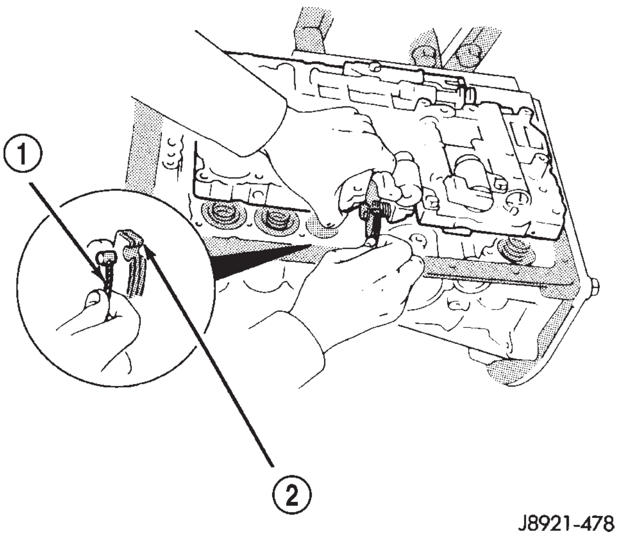


Fig. 102 Disconnecting Throttle Cable

1 – THROTTLE CABLE
2 – THROTTLE CAM

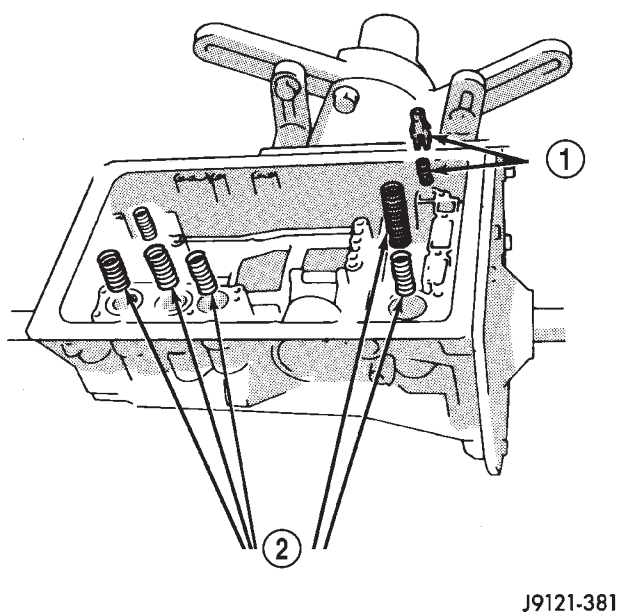


Fig. 103 Removing Accumulator Springs, Spacers And Check Ball

1 – CHECK BALL AND SPRING
2 – ACCUMULATOR SPRINGS

(15) Remove second brake and clutch accumulator pistons with compressed air (Fig. 104). Apply air pressure through feed port and ease the pistons and springs out of the bore. Note and identify the original location of all springs.

(16) Remove overdrive brake accumulator piston with compressed air (Fig. 104). Note and identify the original location of all springs.

(17) Remove overdrive clutch accumulator piston with compressed air (Fig. 104).

(18) Remove throttle cable.

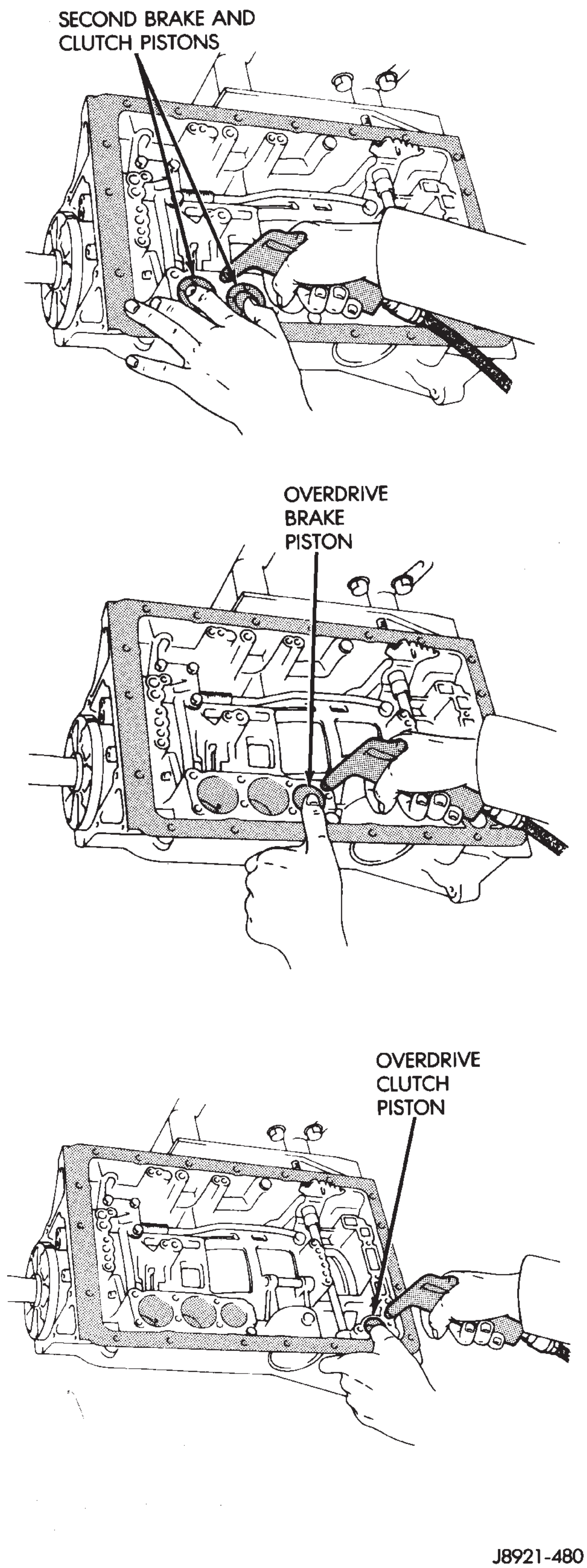


Fig. 104 Accumulator Piston Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(19) Remove oil pump bolts and remove pump with bridge–type Puller 7536 (Fig. 105).

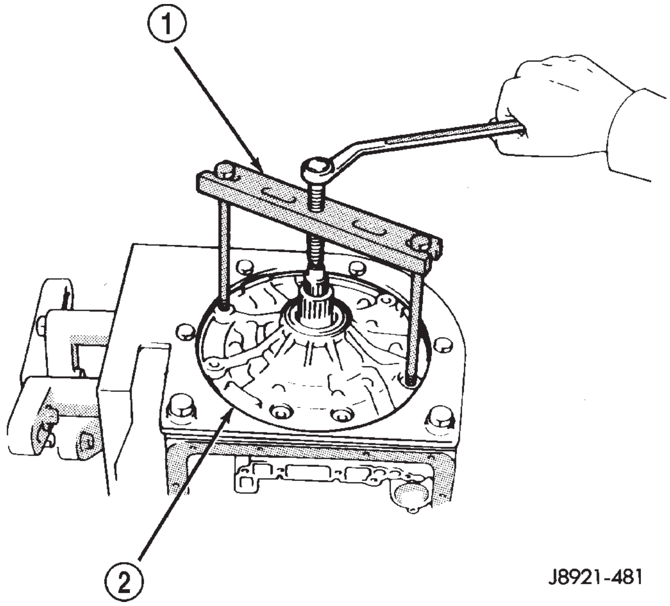


Fig. 105 Oil Pump Removal

1 – PULLER TOOL
2 – OIL PUMP

(20) Remove race from oil pump (Fig. 106).

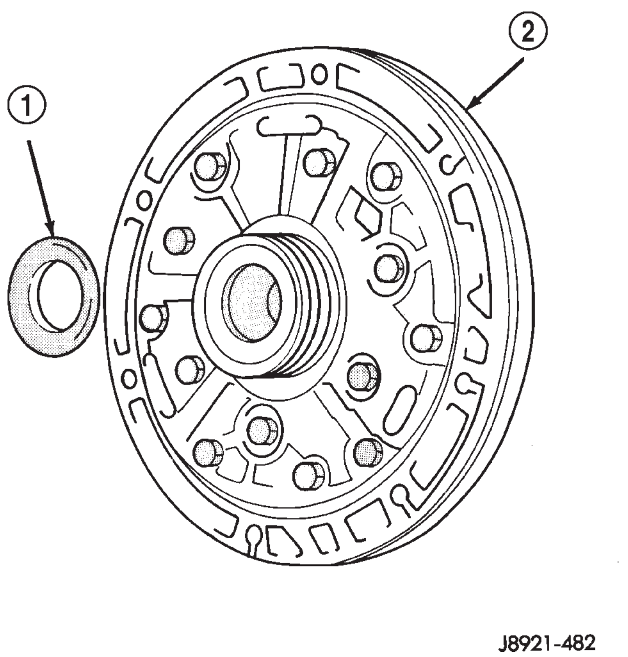


Fig. 106 Oil Pump Race Removal

1 – OIL PUMP RACE
2 – OIL PUMP

(21) Remove overdrive planetary gear and clutch assembly (Fig. 107).

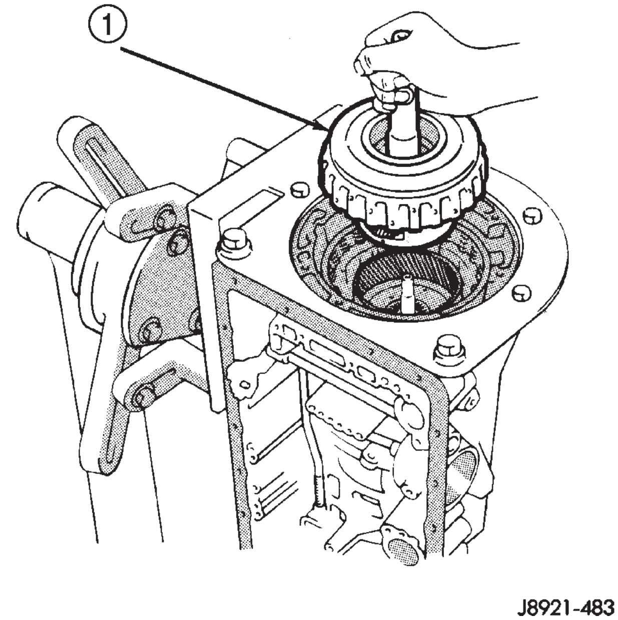


Fig. 107 Removing Overdrive Planetary And Clutch Assembly

1 – PLANETARY AND CLUTCH ASSEMBLY

(22) Remove race from overdrive planetary (Fig. 108).

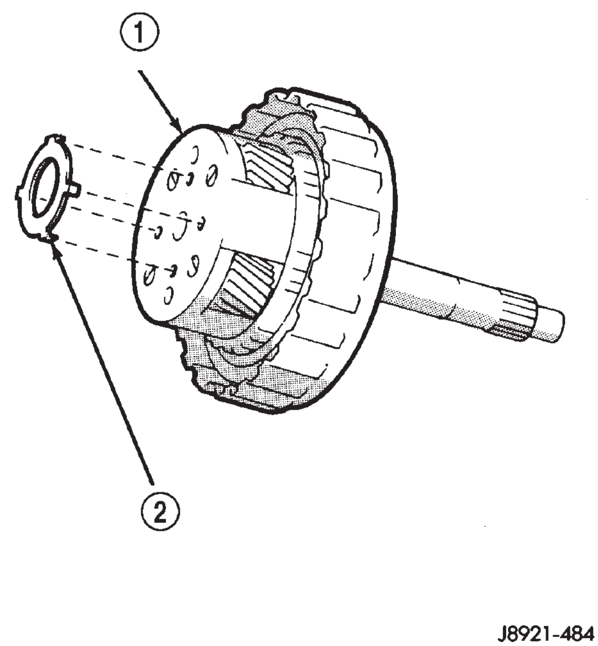


Fig. 108 Fourth Gear Planetary Race Removal

1 – PLANETARY (OVERDRIVE)
2 – RACE

(23) Remove thrust bearing, race and overdrive planetary ring gear (Fig. 109).

(24) Measure stroke length of overdrive brake piston as follows:

DISASSEMBLY AND ASSEMBLY (Continued)

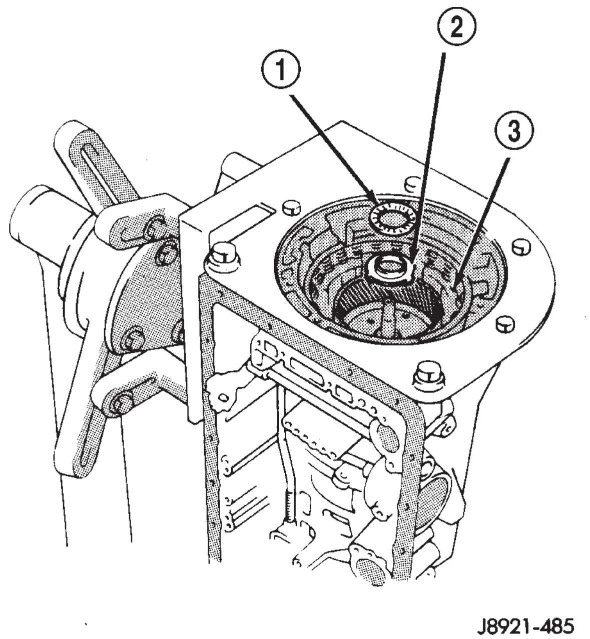


Fig. 109 Removing Bearing, Race And Planetary Ring Gear

1 – THRUST BEARING
2 – RACE
3 – OVERDRIVE PLANETARY RING GEAR

(a) Mount dial indicator on case using Miller Tool C-3339 and a suitable bolt threaded into the transmission case.

(b) Verify that the dial indicator is mounted solidly and square to the direction of the piston travel.

(c) Apply 57–114 psi air pressure through piston apply port and note piston stroke on dial indicator. Stroke length should be: 1.40 – 1.70 mm (0.055 – 0.0699 in.).

(d) Record the reading for use during re-assembly.

(e) Remove the dial indicator set-up from the transmission.

(25) Measure stroke length of second coast brake piston rod as follows:

(a) Install a small wire tie strap around the second coast brake piston rod tight against the transmission case.

(b) Apply 57–114 psi air pressure through piston feed hole and check stroke length with Gauge Tool 7552.

(c) Stroke length should be 1.5 – 3.0 mm (0.059 – 0.118 in.).

(d) Record the reading for use during re-assembly.

(26) Remove the bolt holding the input speed sensor to the transmission case.

(27) Remove the input speed sensor from the transmission case.

(28) Remove overdrive brake pack snap ring (Fig. 110).

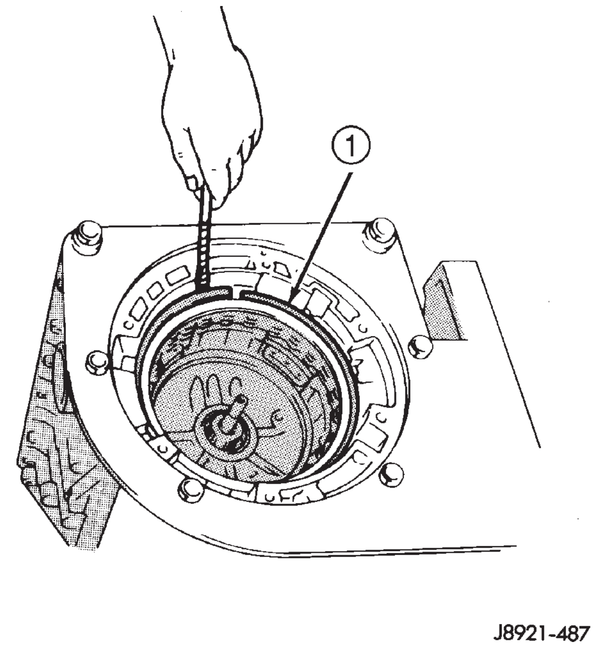


Fig. 110 Removing Overdrive Brake Pack Snap Ring

1 – OVERDRIVE BRAKE SNAP RING

(29) Remove overdrive brake pack discs and plates. Inspect and replace as necessary.

(30) Remove overdrive support lower race and upper bearing and race assembly (Fig. 111).

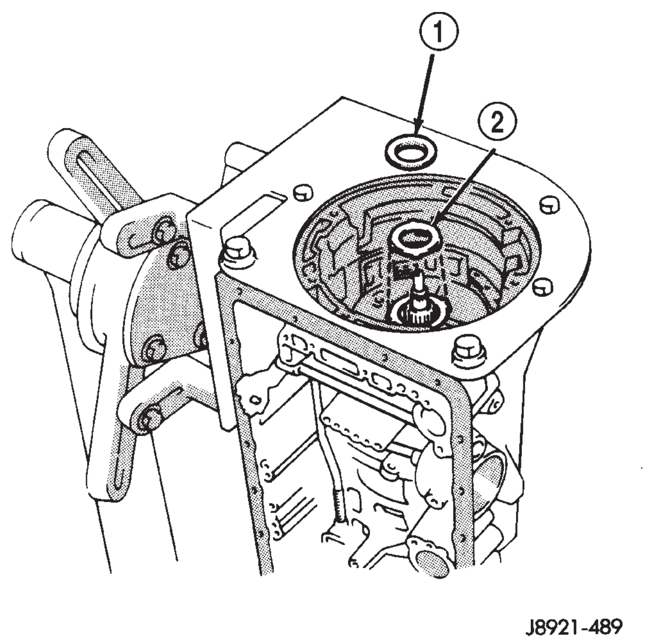


Fig. 111 Overdrive Support Bearing/Race Removal

1 – UPPER BEARING AND RACE
2 – LOWER RACE

DISASSEMBLY AND ASSEMBLY (Continued)

(31) Remove overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 112).

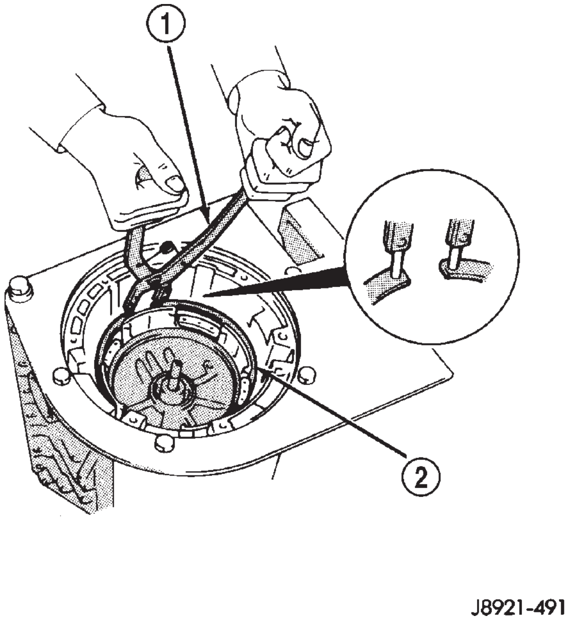


Fig. 112 Overdrive Support Snap Ring Removal/ Installation

1 – SNAP RING PLIERS
2 – SUPPORT SNAP RING

(32) Remove overdrive support bolts (Fig. 113).

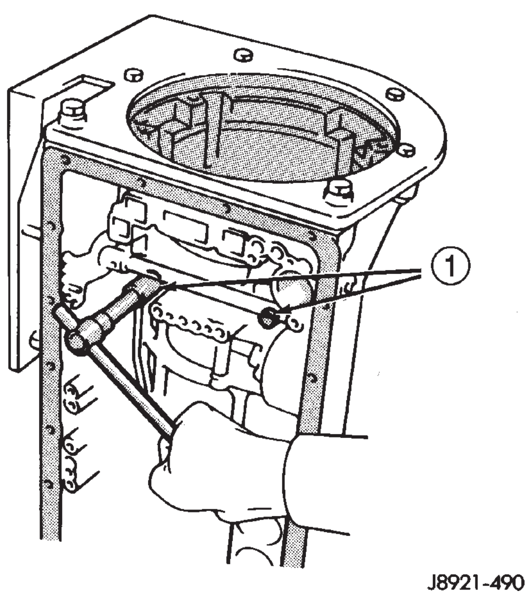


Fig. 113 Overdrive Support Bolt Removal

1 – SUPPORT BOLTS

(33) Remove overdrive support (Fig. 114) with bridge–type Puller 7536.

(34) Remove race from hub of overdrive support (Fig. 115).

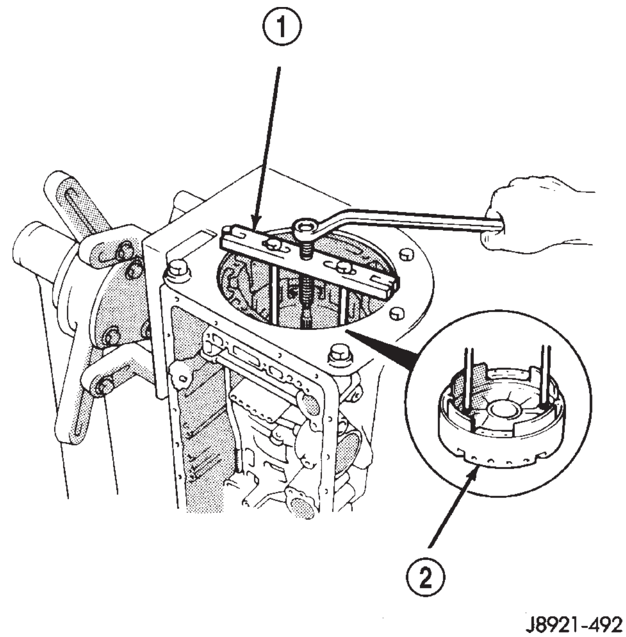


Fig. 114 Removing Overdrive Support

1 – BRIDGE-TYPE PULLER TOOL
2 – OVERDRIVE SUPPORT

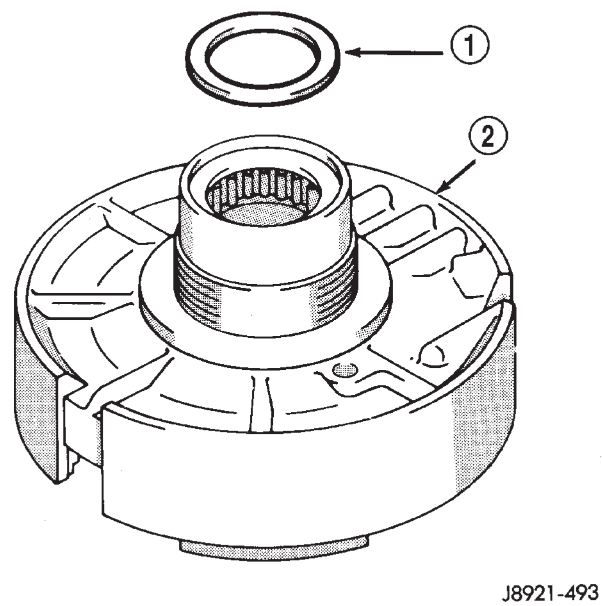


Fig. 115 Remove Overdrive Support Race

1 – RACE
2 – OVERDRIVE SUPPORT

(35) Remove second coast brake piston snap ring with Snap Ring Plier Tool 7540. Then remove piston cover and piston assembly.

(36) Disassemble second coast brake piston (Fig. 116), if necessary.

(37) Remove direct and forward clutch assembly (Fig. 117).

DISASSEMBLY AND ASSEMBLY (Continued)

(38) Remove thrust bearing and race from clutch hub (Fig. 118).

(39) Remove second coast brake band E–ring from band pin and remove pin and brake band (Fig. 119).

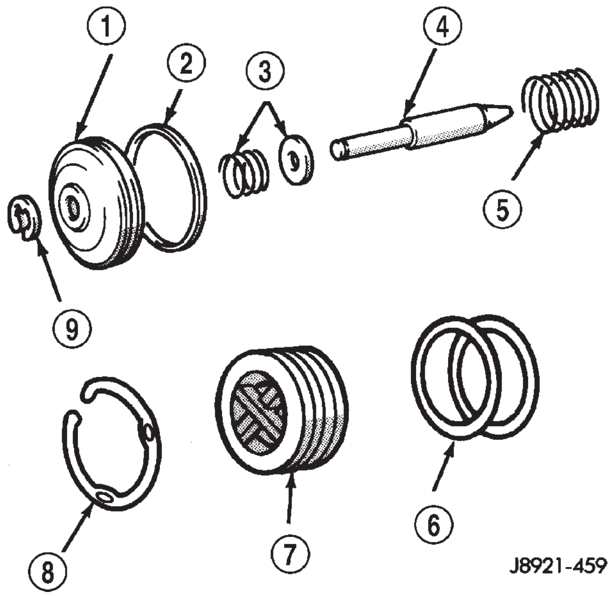


Fig. 116 Second Coast Brake Piston Components

1 – SERVO PISTON
2 – SEAL RING
3 – SPRING AND RETAINER
4 – PISTON ROD
5 – PISTON SPRING
6 – SERVO COVER O-RINGS
7 – SERVO COVER
8 – SNAP RING
9 – E-RING

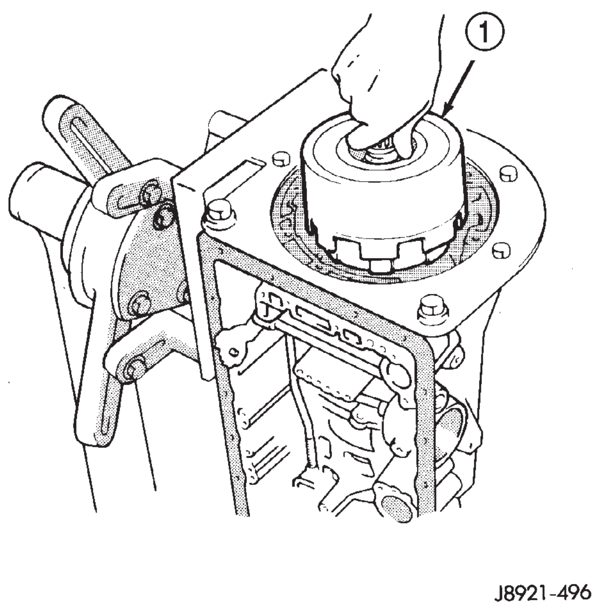


Fig. 117 Removing Direct And Forward Clutch Assembly

1 – DIRECT AND FORWARD CLUTCH ASSEMBLY

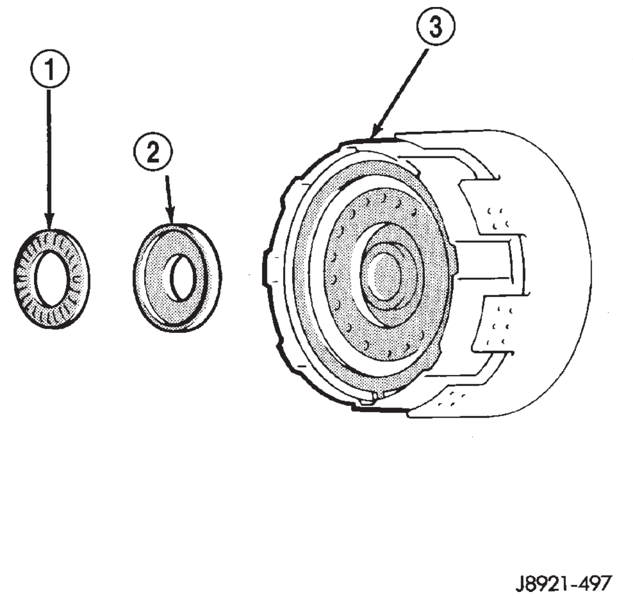


Fig. 118 Bearing And Race Removal From Clutch Hub

1 – BEARING
2 – RACE
3 – DIRECT CLUTCH

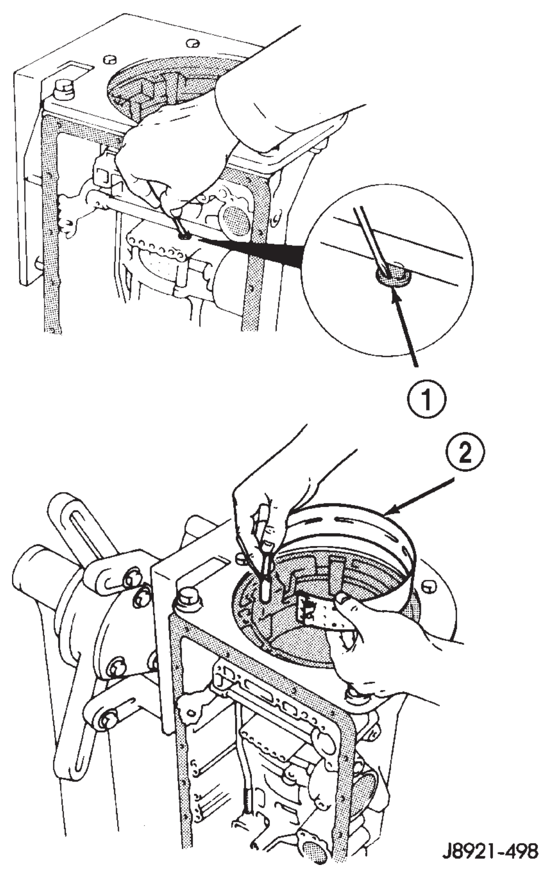


Fig. 119 Second Coast Brake Band Removal

1 – BRAKE BAND E-RING
2 – SECOND COAST BRAKE BAND

DISASSEMBLY AND ASSEMBLY (Continued)

(40) Remove front planetary bearing race and remove front planetary ring gear (Fig. 120).

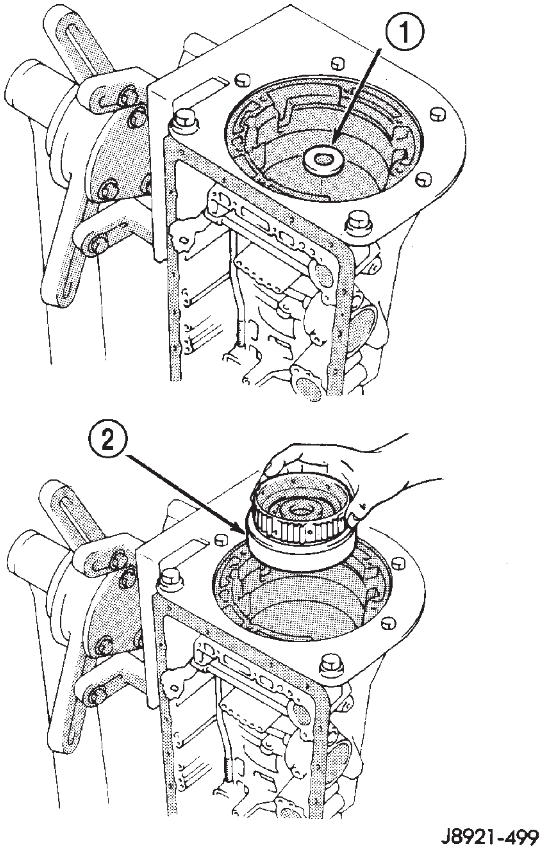


Fig. 120 Front Planetary Ring Gear Removal

1 – RING GEAR BEARING RACE (FRONT)
2 – FRONT PLANETARY RING GEAR

(41) Remove thrust bearing and rear race from ring gear (Fig. 121).

(42) Remove planetary thrust race.

(43) Push forward on output shaft to relieve the load on the planetary snap ring.

(44) Remove planetary snap ring and remove planetary gear (Fig. 122).

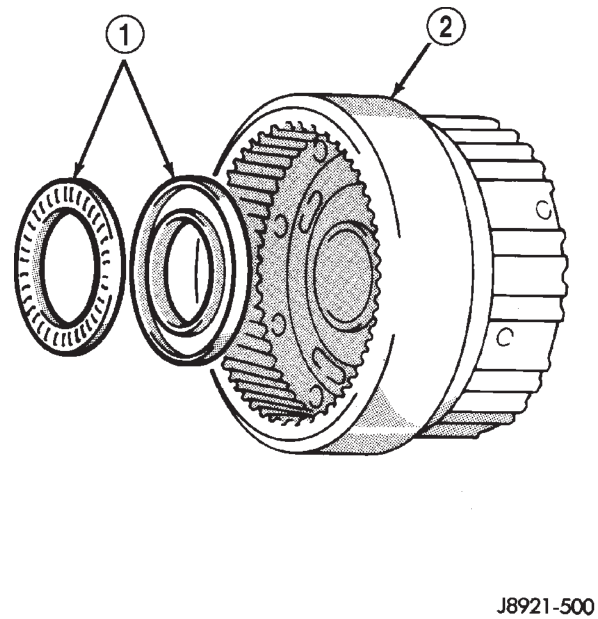


Fig. 121 Removing Ring Gear Bearing And Rear Race

1 – BEARING AND REAR RACE
2 – FRONT PLANETARY RING GEAR

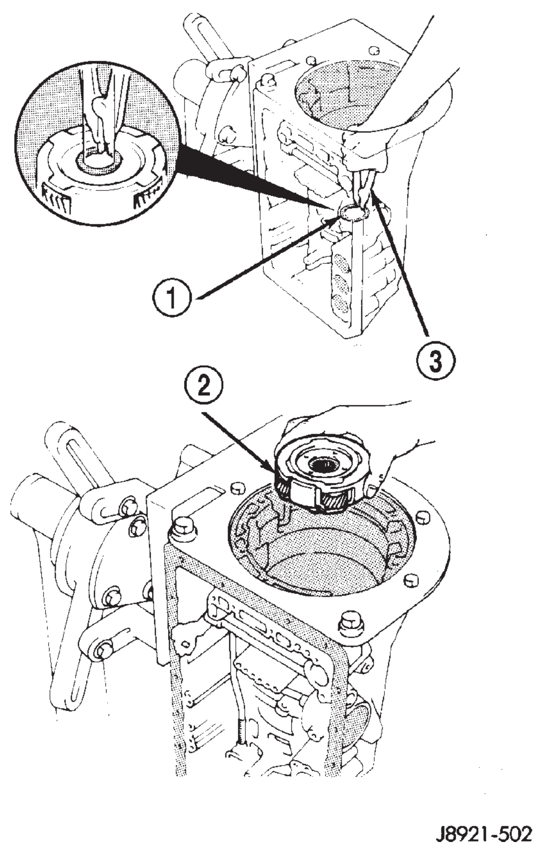


Fig. 122 Removing Planetary Snap Ring And Gear

1 – PLANETARY SNAP RING
2 – PLANETARY GEAR
3 – SNAP RING PLIERS

DISASSEMBLY AND ASSEMBLY (Continued)

(45) Remove sun gear, input drum, one–way clutch, and thrust washer as assembly (Fig. 123).

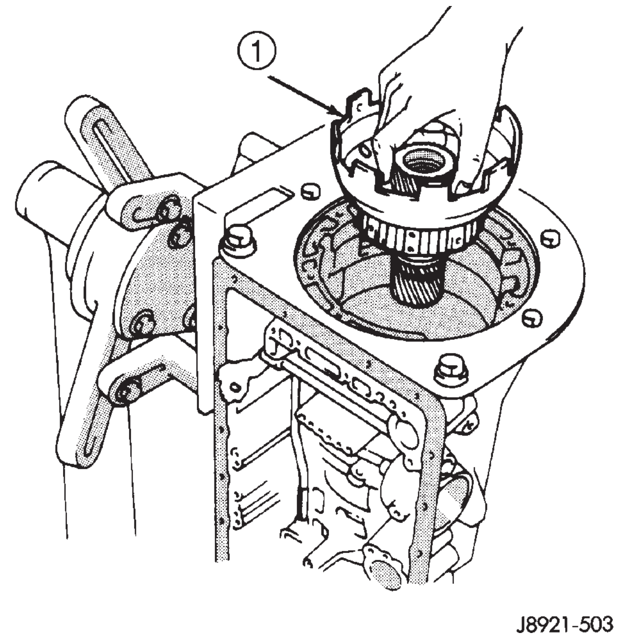


Fig. 123 Removing Sun Gear, Input Drum And One–Way Clutch

1 – SUN GEAR INPUT DRUM, ONE-WAY CLUTCH ASSEMBLY

(46) Measure second brake clutch pack clearance (Fig. 124). Clearance should be 0.62 – 1.98 mm (0.0244 – 0.0780 in.). Record measurement for use during re-assembly.

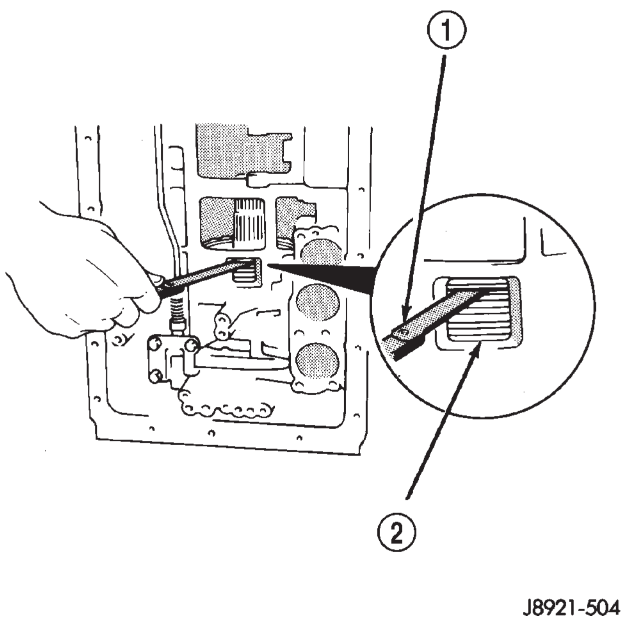


Fig. 124 Checking Second Brake Clutch Pack Clearance

1 – FEELER GAUGE
2 – SECOND BRAKE CLUTCH PACK

(47) Remove second brake clutch pack snap ring (Fig. 125).

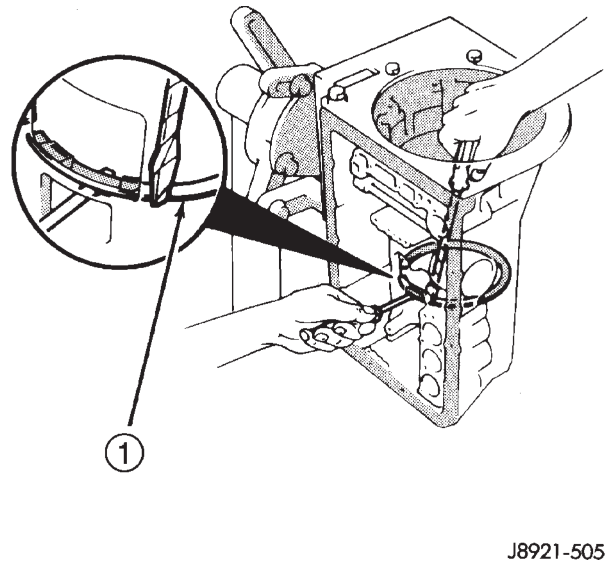


Fig. 125 Removing Second Brake Clutch Pack Snap Ring

1 – CLUTCH PACK SNAP RING

(48) Remove second brake clutch pack (Fig. 126). Inspect and replace as necessary.

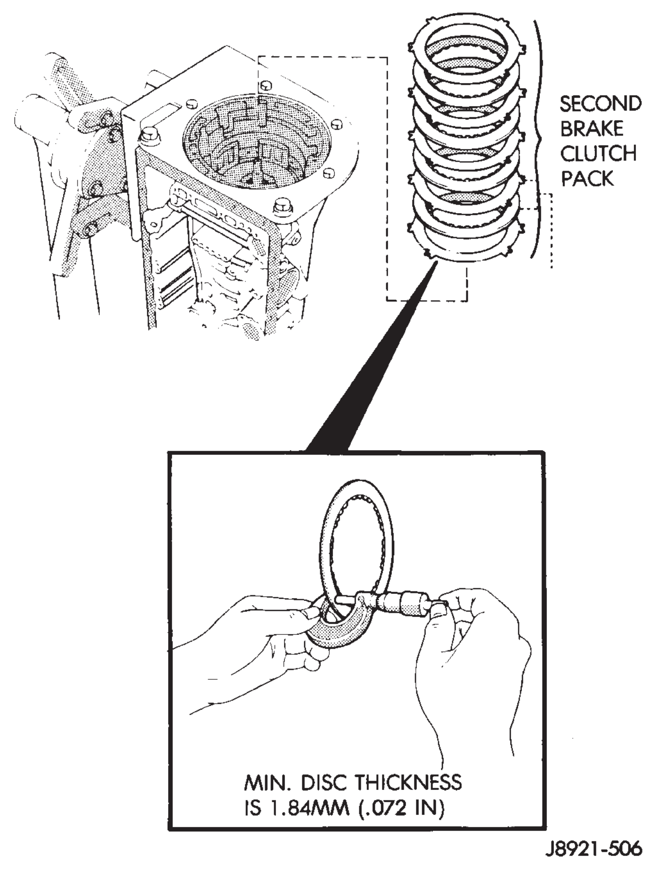


Fig. 126 Removing/Measuring Second Brake Clutch Disc Thickness

DISASSEMBLY AND ASSEMBLY (Continued)

(49) Remove bolts attaching park rod bracket to case. Then disconnect park rod from manual shaft lever and remove rod and bracket (Fig. 127).

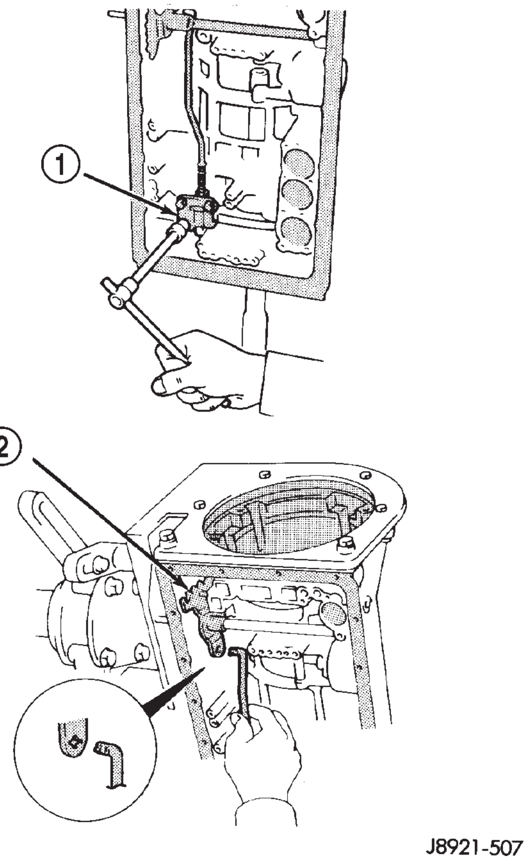


Fig. 127 Removing Park Rod And Bracket

1 – PARK ROD BRACKET
2 – SHIFT SETOR

(50) Remove park pawl spring, pin and pawl (Fig. 128).

(51) Measure clearance of first–reverse brake clutch pack (Fig. 129). Clearance should be: 0.70 – 1.2 mm (0.028 – 0.047 in.). record measurement for use during re-assembly.

(52) Remove second brake piston sleeve (Fig. 130).

(53) Remove second brake snap-ring.

(54) Remove rear planetary gear, second brake drum and output shaft as an assembly (Fig. 131).

(55) Remove planetary and brake drum thrust bearing and race assembly (Fig. 132).

(56) Remove second brake drum gasket from case with screwdriver.

(57) Measure inside diameter of transmission case rear bushing with bore gauge or inside micrometer (Fig. 133). Maximum allowable diameter is 38.18 mm (1.5031 in.). **Replace transmission case if bushing I. D. is greater than specified. Bushing is not serviceable.**

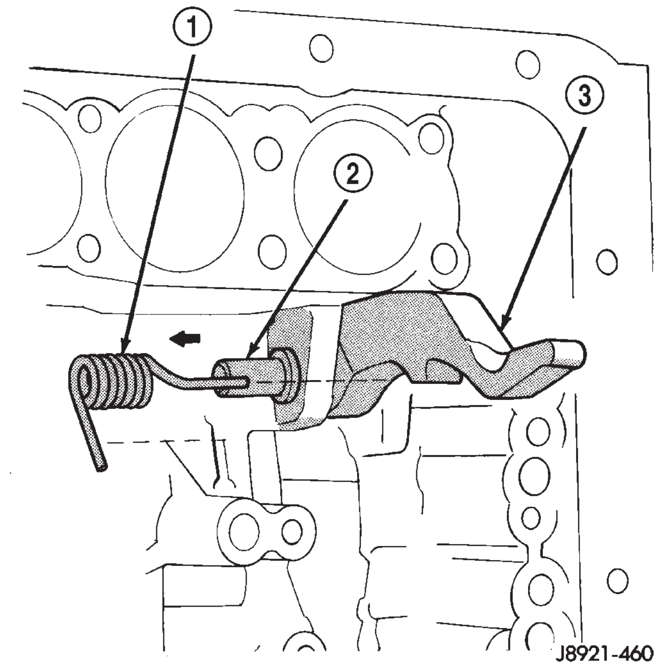


Fig. 128 Removing Park Pawl, Pin And Spring

1 – SPRING
2 – PIN
3 – PARK PAWL

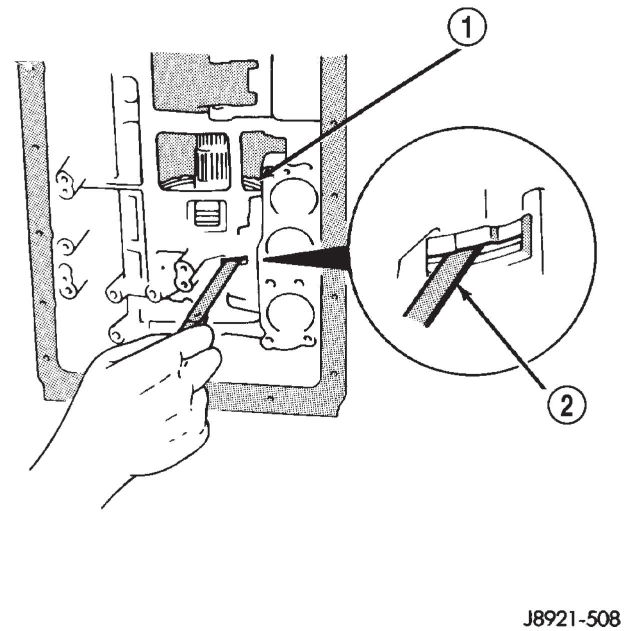


Fig. 129 Checking First–Reverse Brake Clutch Pack Clearance

1 – FIRST-REVERSE CLUTCH PACK
2 – FEELER GAUGE

DISASSEMBLY AND ASSEMBLY (Continued)

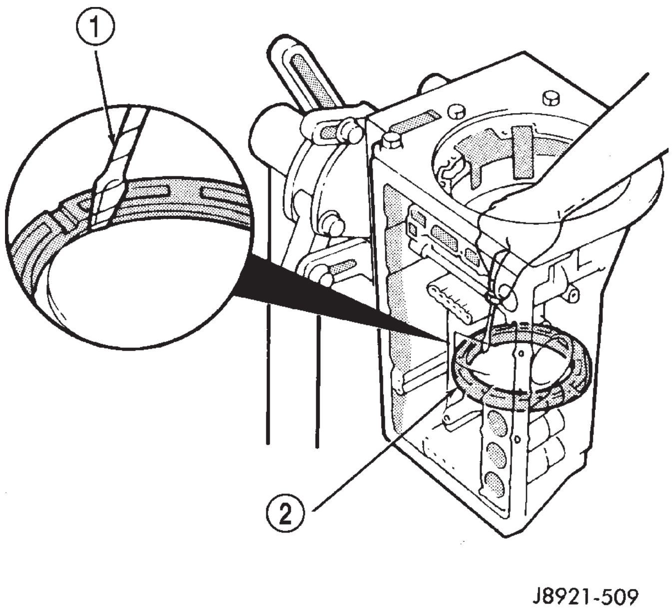


Fig. 130 Removing Second Brake Piston Sleeve

1 – REMOVER TOOL
2 – PISTON SLEEVE

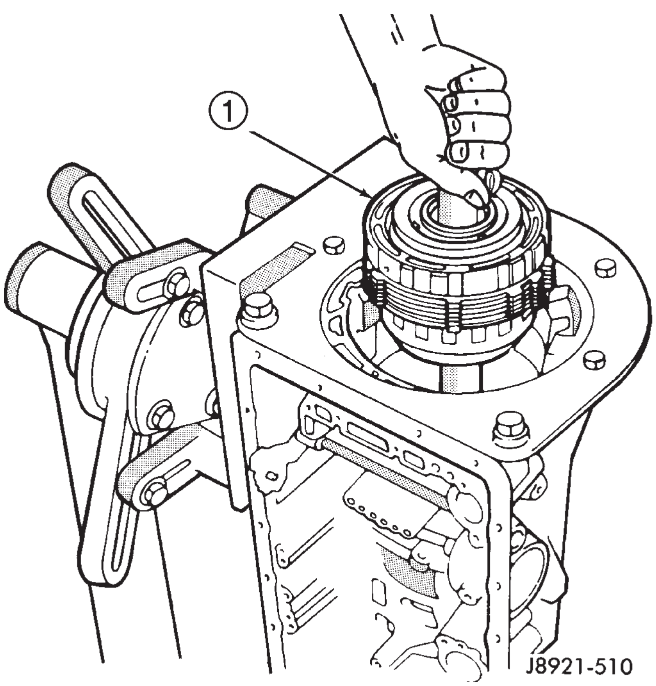


Fig. 131 Removing Rear Planetary, Second Brake Drum And Output Shaft

1 – PLANETARY, BRAKE DRUM AND OUTPUT SHAFT ASSEMBLY

(58) Check first/reverse brake piston operation with compressed air (Fig. 134). Piston should move smoothly and not bind or stick. If piston operation is incorrect, case or piston may require replacement.

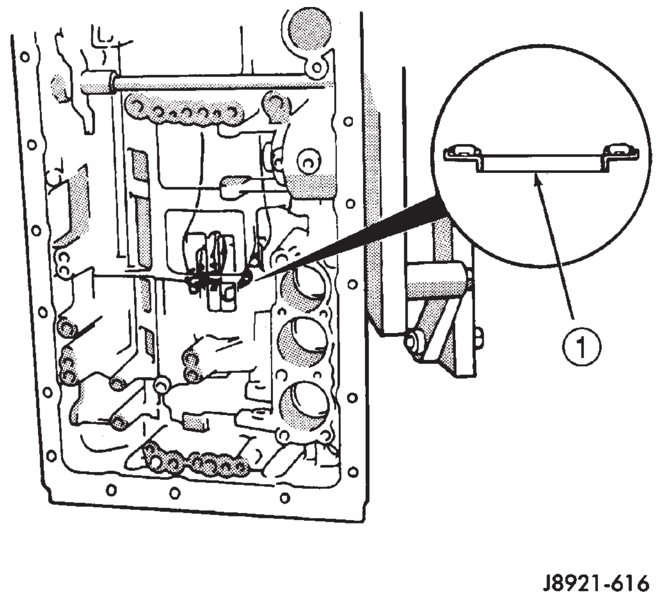


Fig. 132 Removing/Installing Bearing And Race Assembly

1 – BEARING AND RACE ASSEMBLY

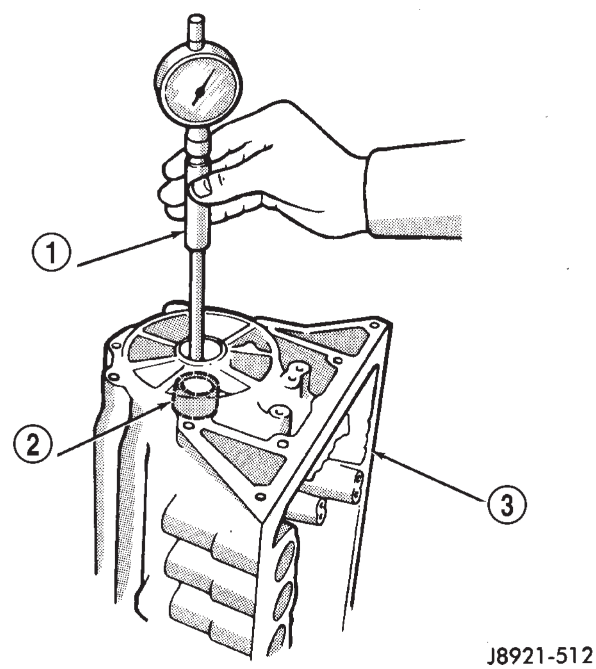


Fig. 133 Checking Rear Bushing Inside Diameter

1 – BORE GAUGE
2 – REAR BUSHING
3 – TRANSMISSION CASE

(59) Compress piston return springs with Tool 7539 and remove piston snap ring (Fig. 135).

(60) Remove Tool 7539 and remove piston return springs.

DISASSEMBLY AND ASSEMBLY (Continued)

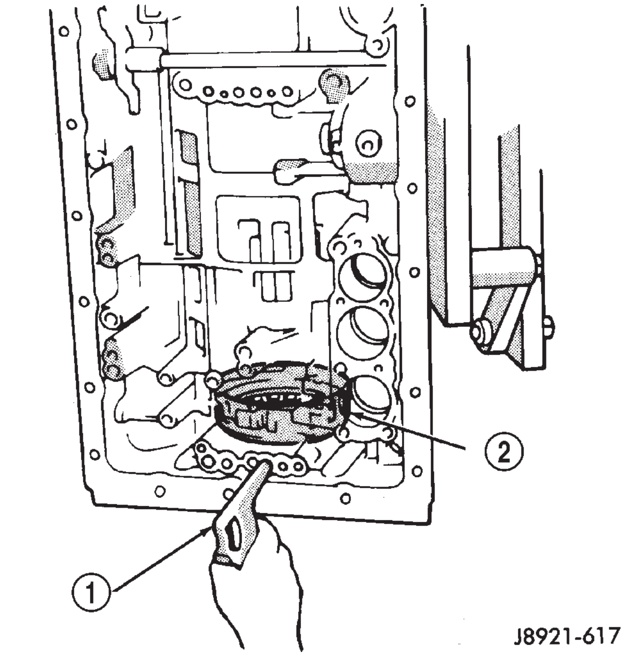


Fig. 134 Checking First–Reverse Brake Piston Operation

1 – LOW-PRESSURE AIR
2 – FIRST-REVERSE BRAKE (IN CASE)

(61) Remove No. 2 first–reverse brake piston with compressed air. Apply air through same transmission feed hole used for checking piston operation.

(62) Remove reaction sleeve with Sleeve Remover Tool 7542 (Fig. 136). Insert tool flanges under sleeve and lift tool and sleeve out of case.

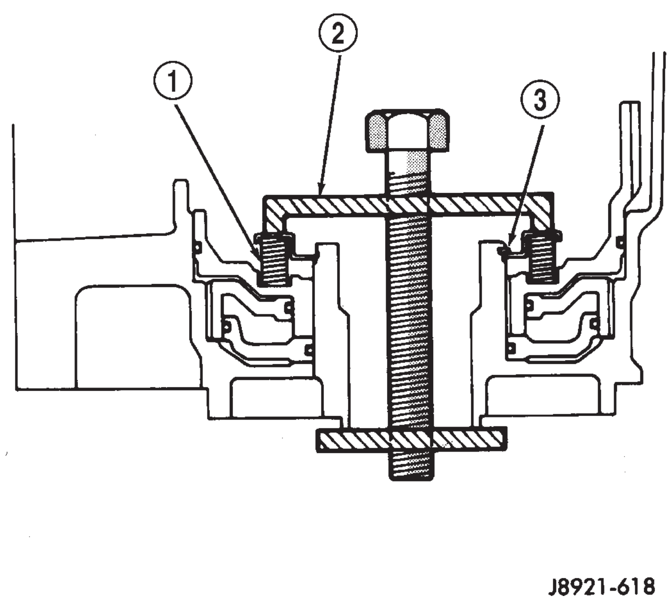


Fig. 135 Removing/Installing Piston Snap Ring

1 – RETURN SPRINGS
2 – COMPRESSOR TOOL
3 – PISTON SNAP RING

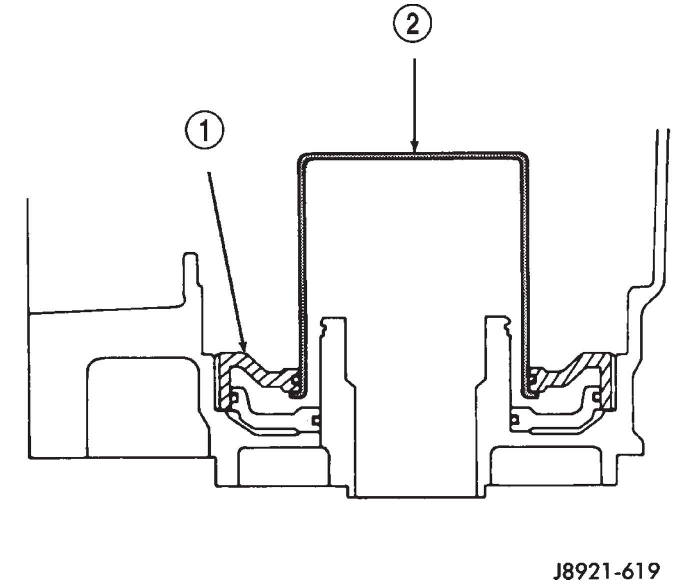


Fig. 136 Removing/Installing Reaction Sleeve

1 – REACTION SLEEVE
2 – TOOL

(63) Remove No. 1 first/reverse brake piston with Piston Puller 7543 (Fig. 137). Slip tool under piston and lift tool and piston out of case.

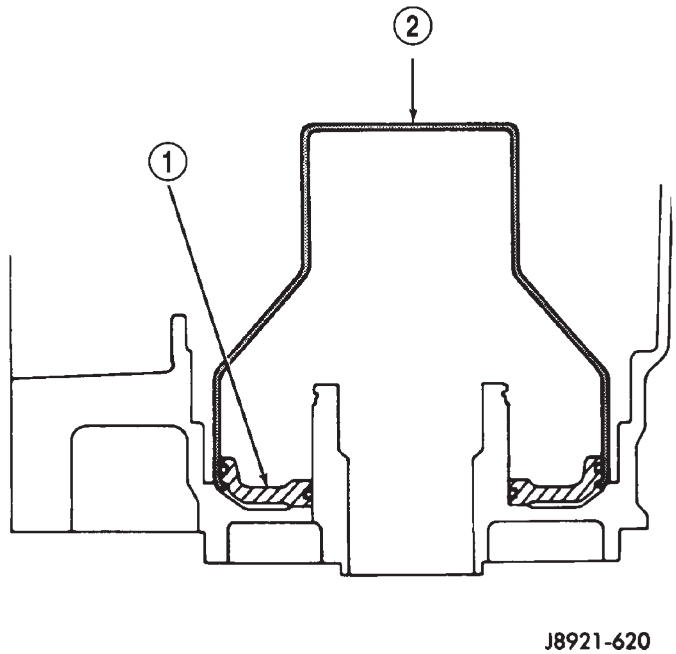


Fig. 137 Removing/Installing First–Reverse Brake No.1 Piston

1 – NO. 1 PISTON
2 – TOOL

ASSEMBLY

(1) During assembly, lubricate components with transmission fluid or petroleum jelly as indicated.

(2) Verify thrust bearing and race installation during assembly. Refer to the Thrust Bearing Chart (Fig.

DISASSEMBLY AND ASSEMBLY (Continued)

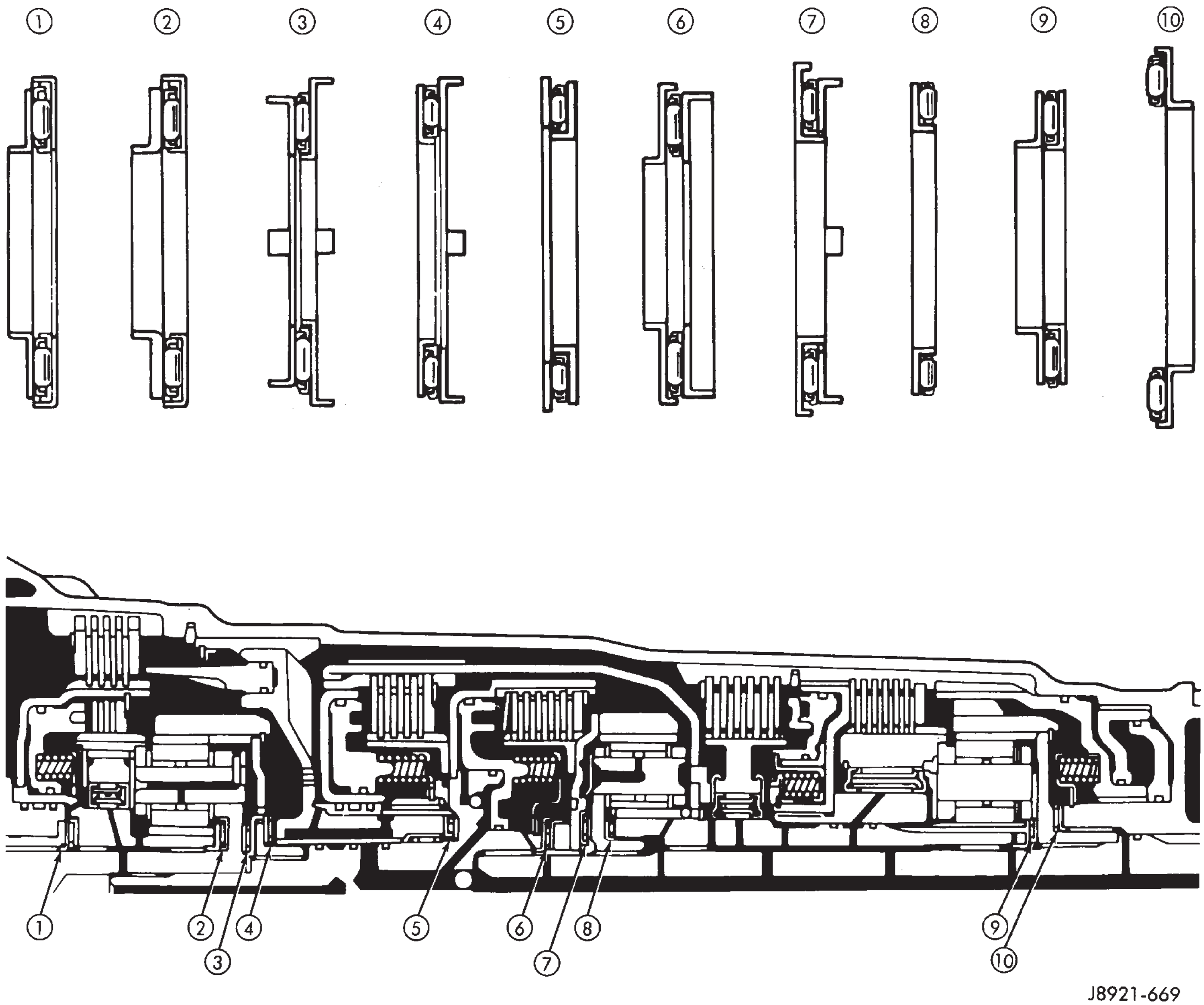


Fig. 138 Thrust Bearing Chart

138) for bearing and race location and correct positioning.

(3) Install new seals onto the No.1 first-reverse brake piston. Lubricate seals with transmission fluid.

(4) Install the No.1 first-reverse brake piston into the transmission case.

(5) Install new seal onto the first-reverse brake piston reaction sleeve. Lubricate seals with transmission fluid.

(6) Install the first-reverse brake piston reaction sleeve into the transmission case.

(7) Install new seal onto the No.2 first-reverse brake piston. Lubricate seals with transmission fluid.

(8) Install the No.2 first-reverse brake piston into the transmission case.

(9) Install the spring plate into the No.2 first-reverse brake piston.

(10) Install Spring Compressor 7539 onto the first-reverse brake piston.

(11) Compress the first-reverse brake piston spring and install the first-reverse brake piston snap-ring.

(12) Remove Spring Compressor 7539.

(13) Install rear planetary gear, second brake drum and output shaft as outlined in following steps:

(14) Verify No. 10 thrust bearing and race (Fig. 138). Bearing and race outer diameter is 57.7 mm (2.272 in.) and inside diameter is 39.2 mm (1.543 in.).

(15) Coat thrust bearing and race assembly with petroleum jelly and install in case (Fig. 139). Race faces down. Bearing rollers face up.

(16) Align teeth of second brake drum and clutch pack (Fig. 140).

DISASSEMBLY AND ASSEMBLY (Continued)

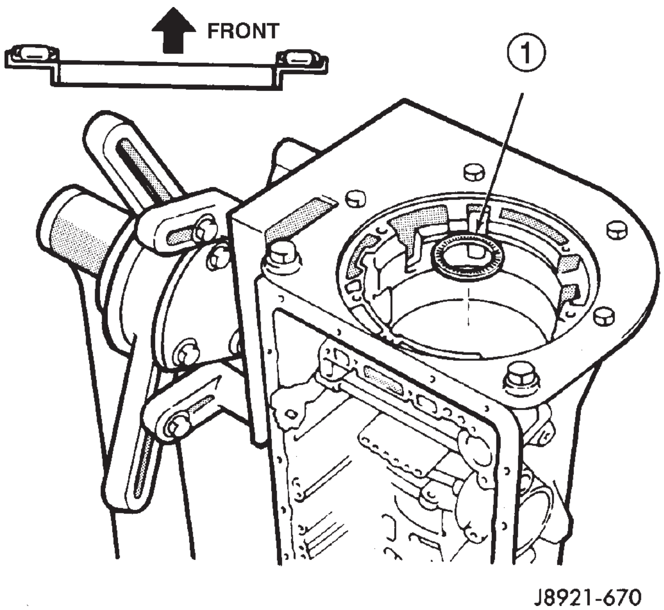


Fig. 139 Installing Thrust Bearing And No. 10 Race

1 – THRUST BEARING AND RACE

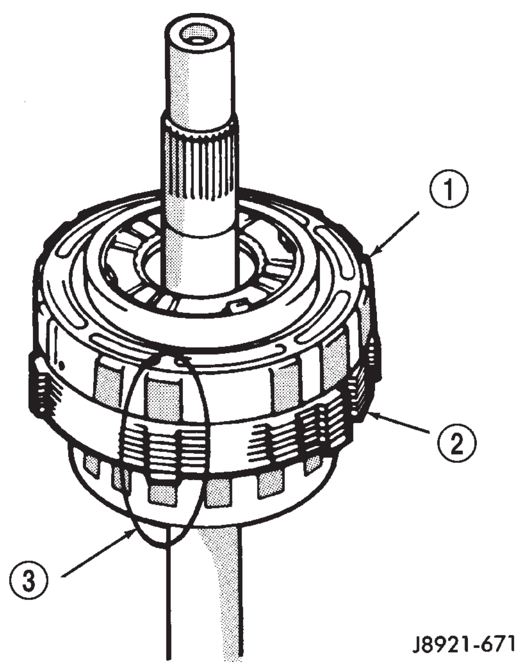


Fig. 140 Aligning Second Brake Drum And Clutch Pack Teeth

1 – SECOND BRAKE DRUM
2 – CLUTCH PACK
3 – ALIGN DRUM AND CLUTCH PACK TEETH

(17) Align rear planetary-output shaft assembly teeth with case slots and install assembly in case (Fig. 141).

(18) Install rear planetary snap ring with snap ring pliers. Chamfered side of snap ring faces up and toward case front (Fig. 142).

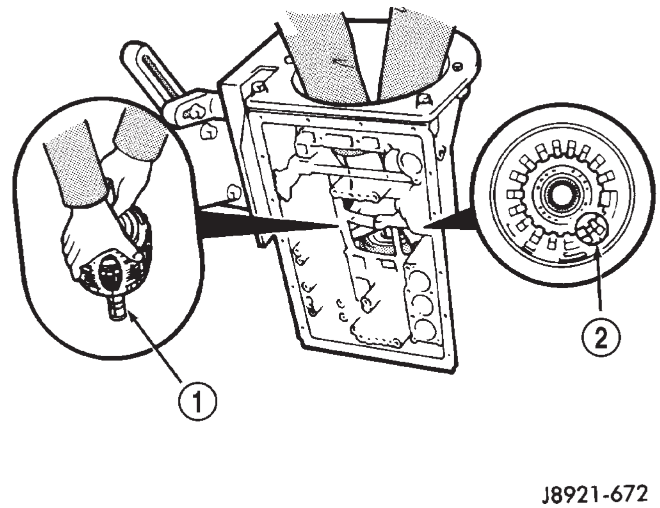


Fig. 141 Output Shaft/Rear Planetary Assembly Installation

1 – ALIGN CLUTCH/DRUM TEETH WITH CASE SLOTS
2 – CASE SLOTS

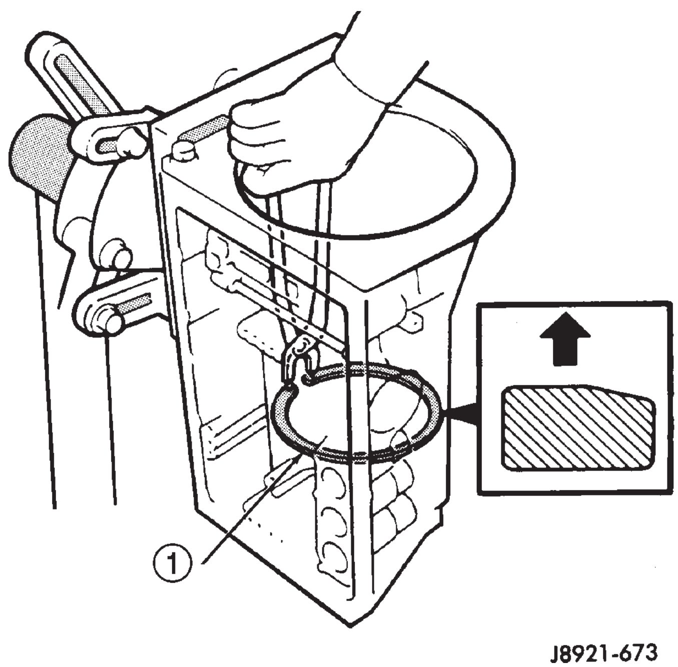


Fig. 142 Planetary Snap Ring Installation

1 – REAR PLANETARY SNAP RING

(19) Check first–reverse brake pack clearance with feeler gauge (Fig. 143). Clearance should be 0.70 – 1.20 mm (0.028 – 0.047 in.). If clearance is incorrect, planetary assembly, thrust bearing or snap ring is not properly seated in case. Remove and reinstall components if necessary.

(20) Install second brake piston sleeve (Fig. 144). Sleeve lip faces up and toward case front as shown.

(21) Install second brake drum gasket.

DISASSEMBLY AND ASSEMBLY (Continued)

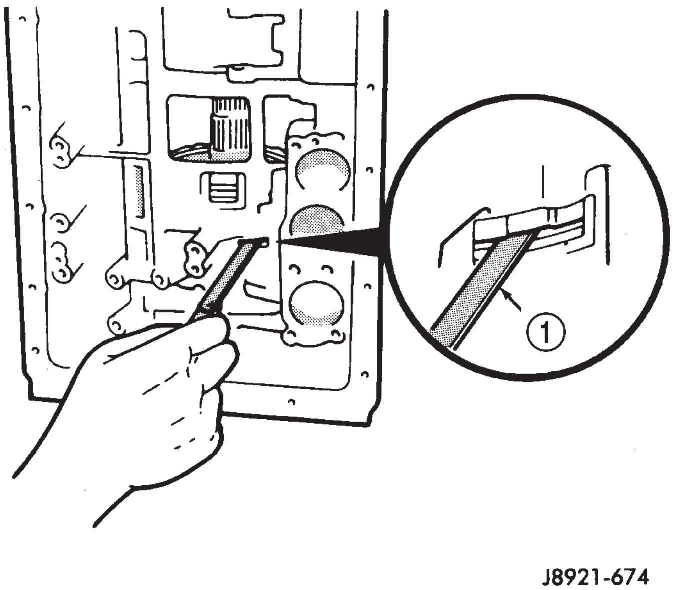


Fig. 143 Checking First–Reverse Brake Pack Clearance

1 – FEELER GAUGE

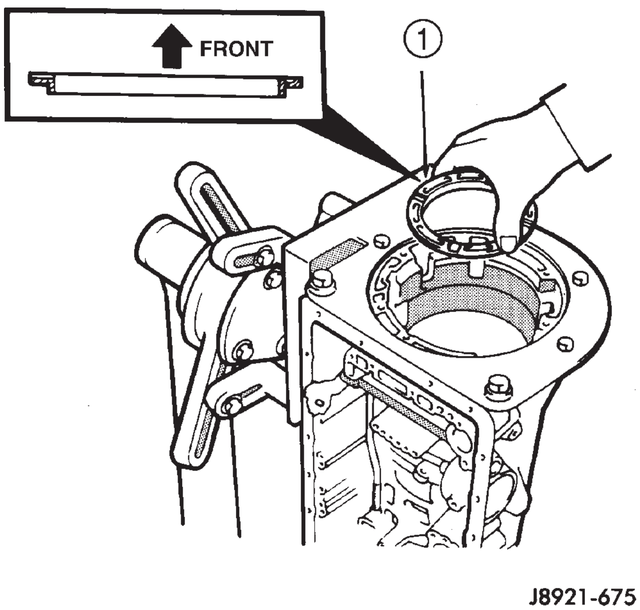


Fig. 144 Second Brake Piston Sleeve Installation

1 – PISTON SLEEVE

(22) Install park lock pawl, spring and pin (Fig. 145).

(23) Install the manual valve shift assembly.

(24) Connect park lock rod to manual valve shift sector (Fig. 146).

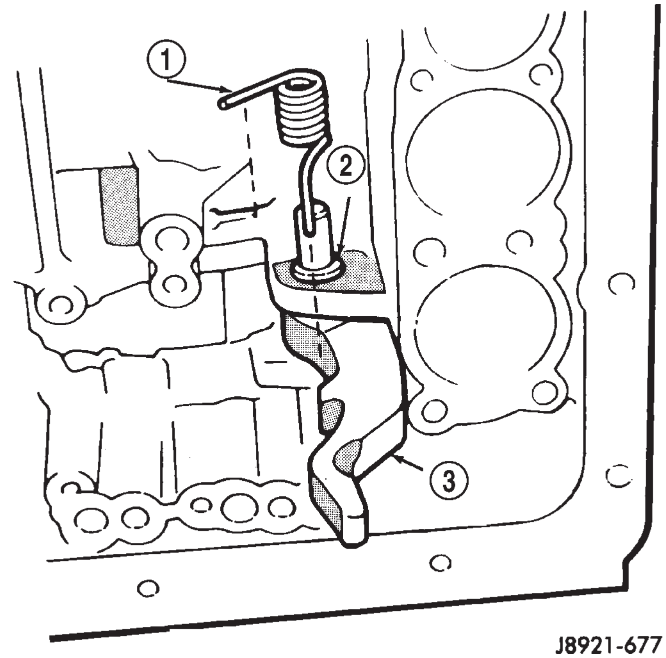


Fig. 145 Park Lock Pin, Spring And Pawl Installation

1 – SPRING
2 – PIN
3 – PAWL

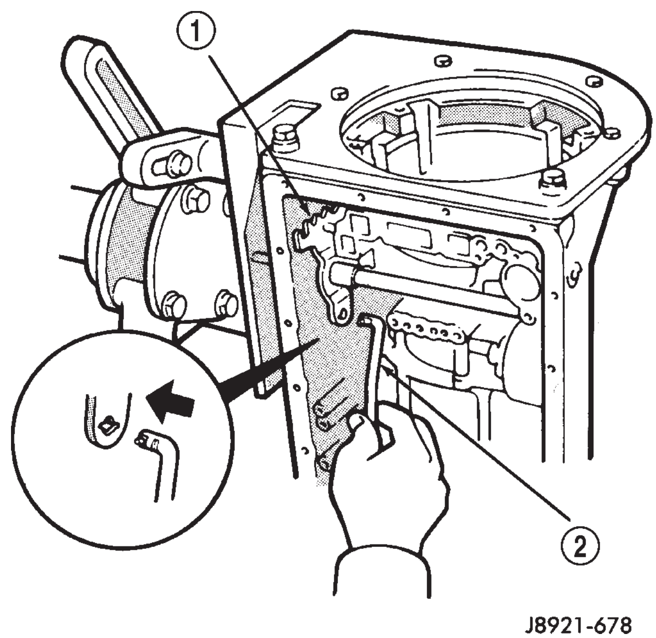


Fig. 146 Park Lock Rod Installation

1 – SHIFT SECTOR
2 – PARK LOCK ROD

DISASSEMBLY AND ASSEMBLY (Continued)

(25) Position park lock rod bracket on case and tighten bracket attaching bolts to 10 N·m (7 ft. lbs.) torque (Fig. 147).

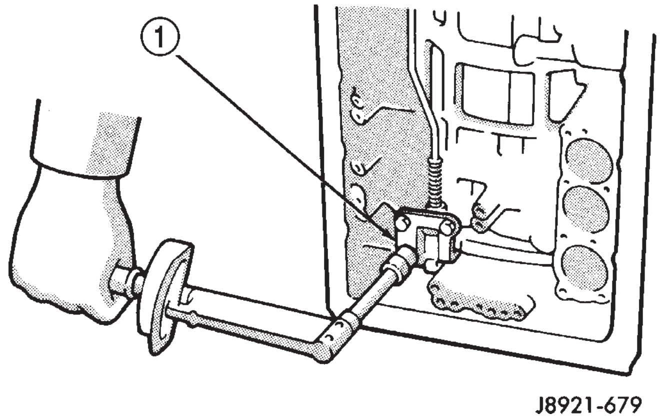


Fig. 147 Park Rod Bracket Installation

1 – PARK ROD BRACKET

(26) Verify park lock operation. Move shift sector to Park position. Park pawl should be firmly engaged (locked) in planetary ring gear (Fig. 148).

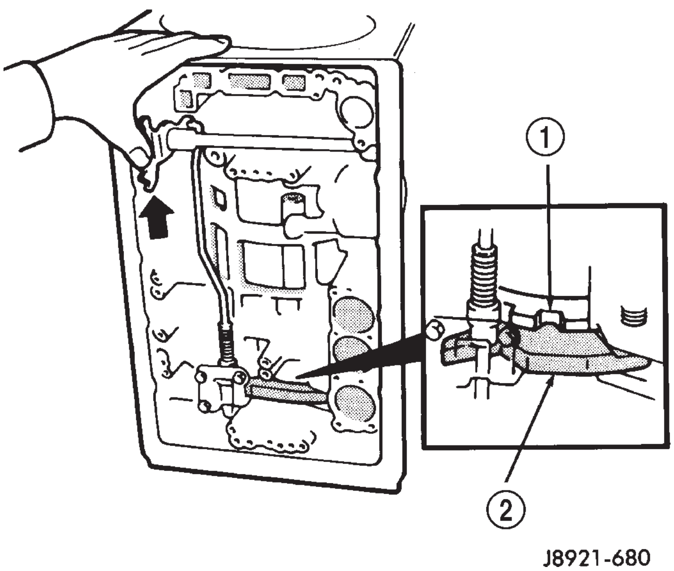


Fig. 148 Checking Park Pawl Engagement

1 – REAR PLANETARY RING GEAR
2 – PARK PAWL

(27) Install No. 1 one–way clutch (Fig. 149). Short flanged side of clutch faces up and toward case front.

(28) Install second brake pack (Fig. 150). Install disc then plate. Continue installation sequence until five discs and five plates are installed.

(29) Install second brake pack retainer with rounded edge of retainer facing disc.

(30) Install second brake pack snap ring.

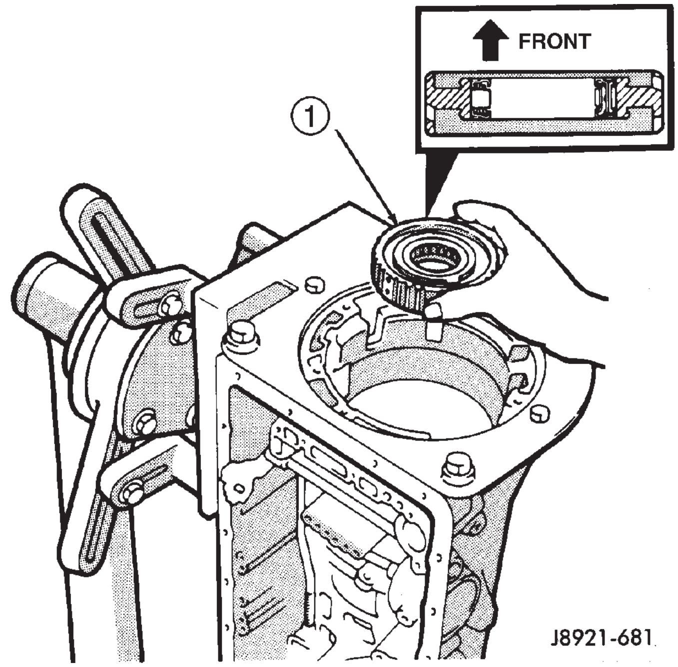


Fig. 149 Installing No. 1 One–Way Clutch

1 – NO. 1 ONE-WAY CLUTCH

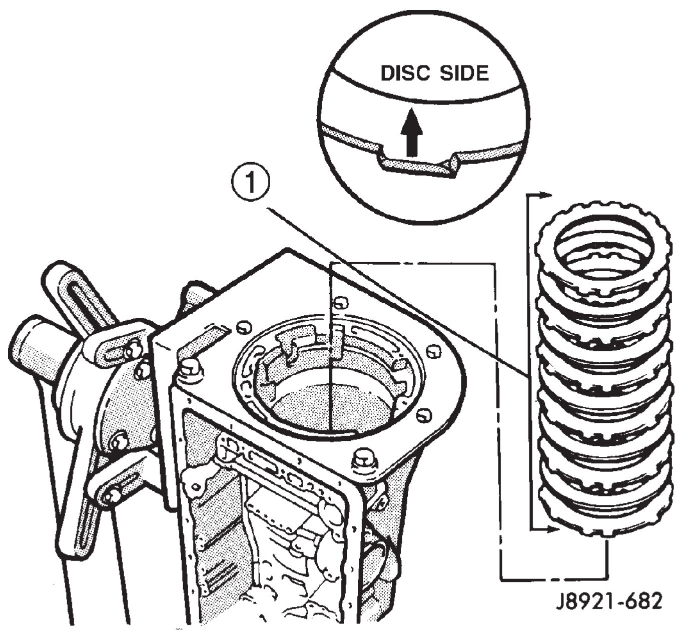


Fig. 150 Second Brake Pack Installation

1 – SECOND BRAKE PACK

DISASSEMBLY AND ASSEMBLY (Continued)

(31) Check brake pack clearance with feeler gauge (Fig. 151). Clearance should be 0.062 – 1.98 mm (0.024 – 0.078 in.). If brake pack clearance is not correct, brake pack components are not seated. Reassemble brake pack if necessary.

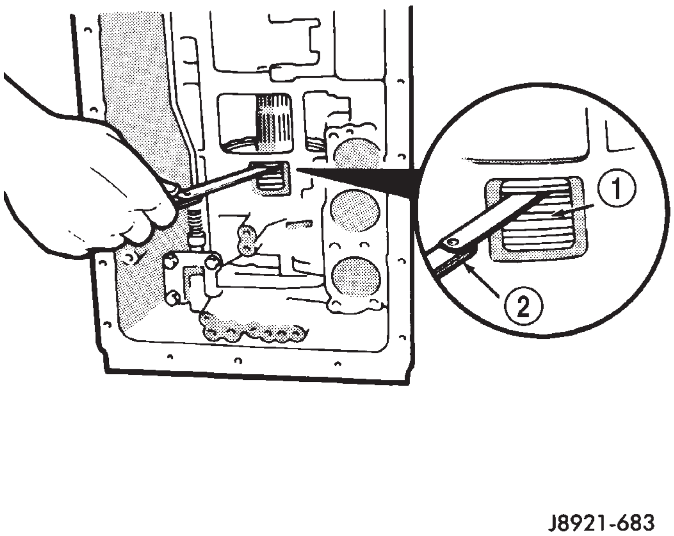


Fig. 151 Checking Second Brake Pack Clearance

1 – BRAKE PACK
2 – FEELER GAUGE

(32) Install planetary sun gear and input drum (Fig. 152). Be sure drum thrust washer tabs are seated in drum. Use petroleum jelly to hold thrust washer in position if necessary.

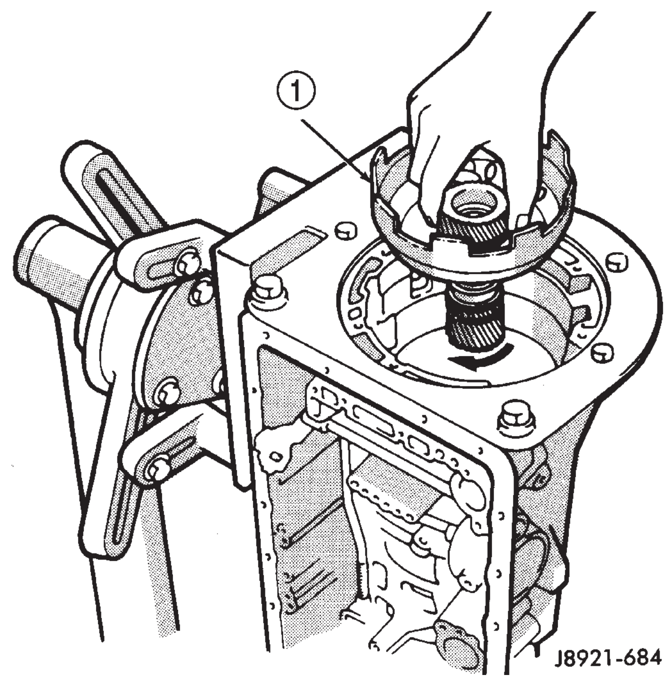


Fig. 152 Installing Sun Gear And Input Drum

1 – SUN GEAR AND INPUT DRUM

(33) Install front planetary gear on sun gear (Fig. 153).

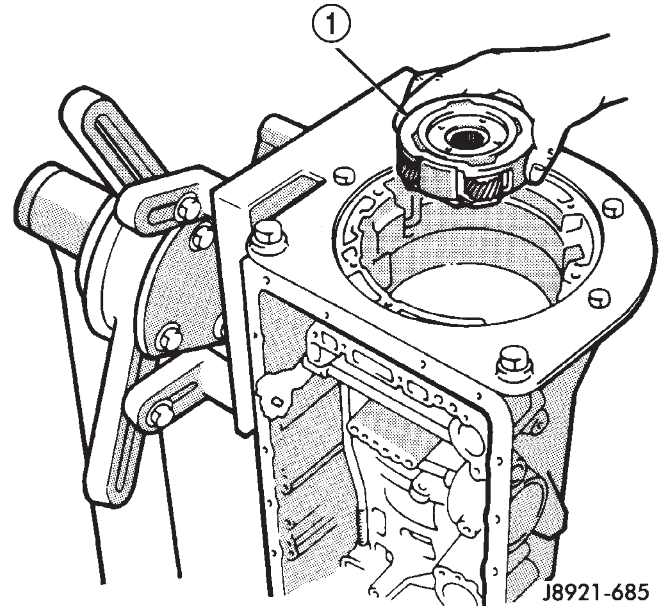


Fig. 153 Installing Front Planetary Gear

1 – FRONT PLANETARY GEAR

(34) Support output shaft with wood blocks (Fig. 154).

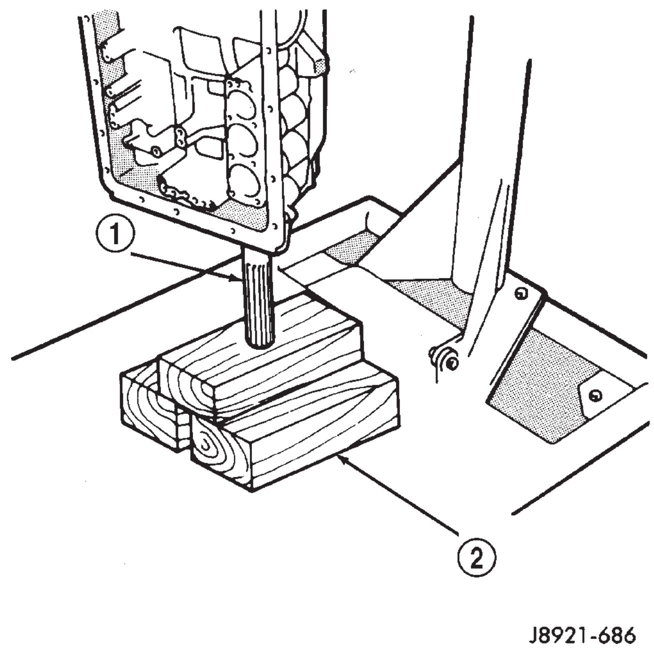


Fig. 154 Supporting Output Shaft

1 – OUTPUT SHAFT
2 – WOOD BLOCKS

DISASSEMBLY AND ASSEMBLY (Continued)

(35) Install planetary snap ring on sun gear with snap ring plier tool 7541 (Fig. 155).

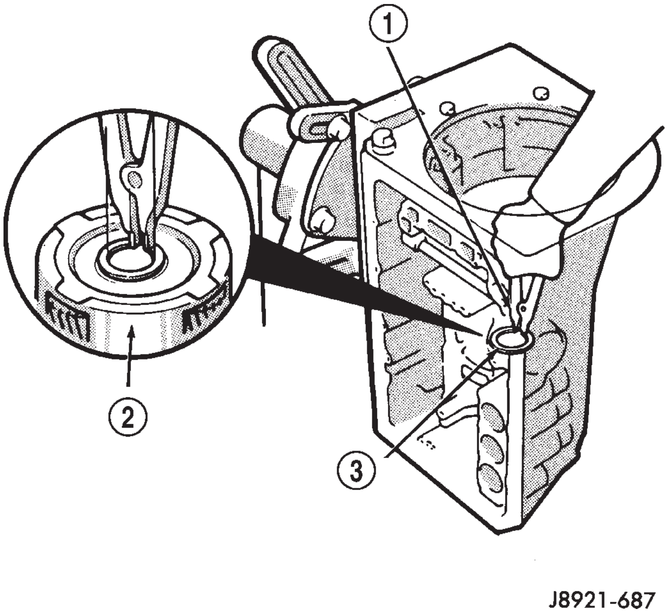


Fig. 155 Installing Front Planetary Snap Ring

1 – SNAP RING PLIER TOOL
2 – FRONT PLANETARY
3 – SNAP RING

(36) Install tabbed thrust race on front planetary gear. Washer tabs face down and toward gear. Race outer diameter is 47.8 mm (1.882 in.). Inside diameter is 34.3 mm (1.350 in.).

(37) Install second coast brake band (Fig. 156).

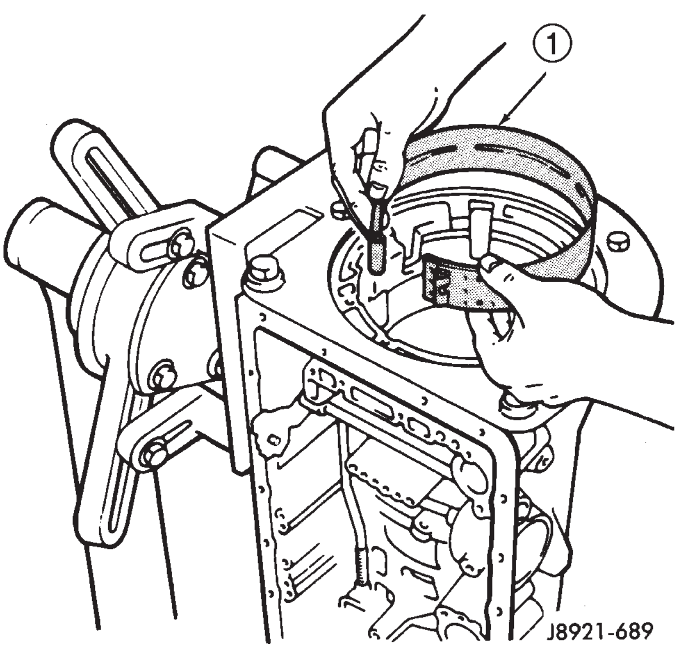


Fig. 156 Installing Second Coast Brake Band

1 – SECOND COAST BRAKE BAND

(38) Install pin in second coast brake band. Then install retaining ring on pin (Fig. 157).

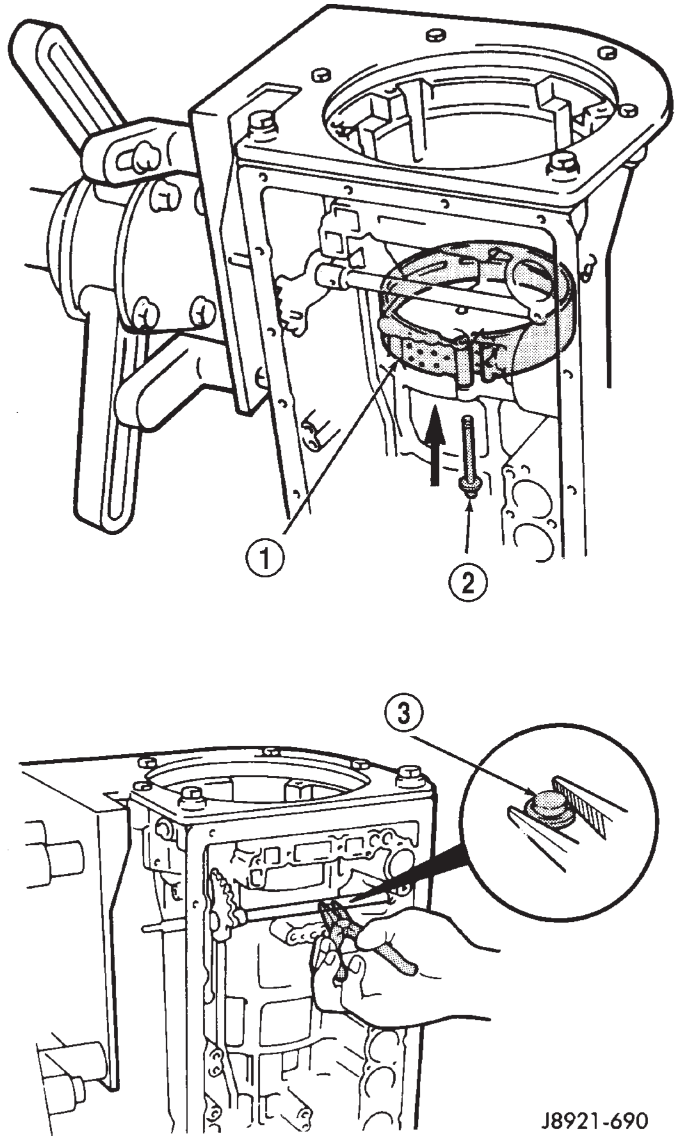


Fig. 157 Installing Second Coast Brake Band Retaining Pin

1 – SECOND COAST BRAKE BAND
2 – BAND RETAINING PIN
3 – RETAINING RING (INSTALL ON PIN)

(39) Install thrust bearing and race in forward–direct clutch (Fig. 158). Coat bearing/race with petroleum jelly to hold them in place.

(40) Verify forward–direct clutch thrust bearing size.

- Race outer diameter is 48.9 mm (1.925 in.) and inside diameter is 26.0 mm (1.024 in.).
- Bearing outer diameter is 46.7 mm (1.839 in.) and inside diameter is 26.0 mm (1.024 in.).

(41) Coat front planetary ring gear race with petroleum jelly and install it in ring gear (Fig. 159).

DISASSEMBLY AND ASSEMBLY (Continued)

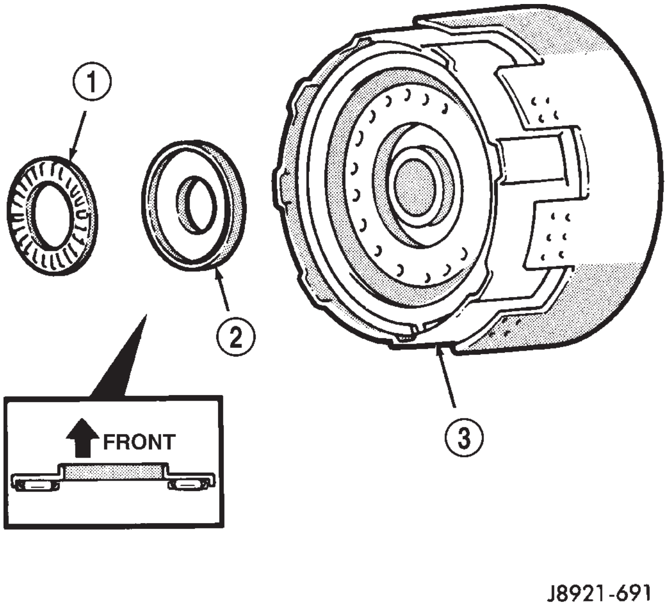


Fig. 158 Installing Forward–Direct Clutch Thrust Bearing And Race

1 – THRUST BEARING
2 – RACE
3 – FORWARD-DIRECT CLUTCH ASSEMBLY

(42) Verify ring gear race size. Outer diameter is 47.0 mm (1.850 in.) and inside diameter is 26.5 mm (1.045 in.).

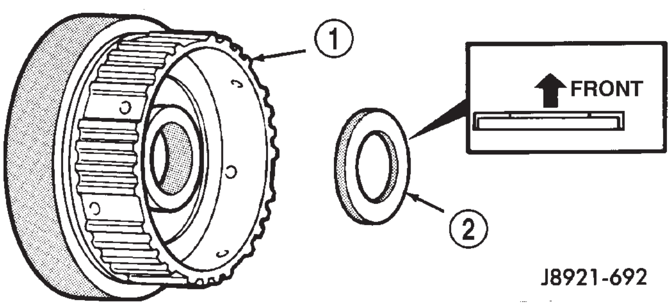


Fig. 159 Installing Planetary Ring Gear Race

1 – PLANETARY RING GEAR
2 – THRUST RACE

(43) Align forward–direct clutch disc splines with screwdriver (Fig. 160).

(44) Align and install front planetary ring gear in forward–direct clutch (Fig. 161).

(45) Coat bearing and race with petroleum jelly and install them in ring gear (Fig. 162). Verify bearing/race size.

• Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.6 mm (1.283 in.).
• Race outer diameter is 53.6 mm (2.110 in.) and inside diameter is 30.6 mm (1.205 in.).

(46) Install assembled planetary gear/forward–direct clutch (Fig. 163).

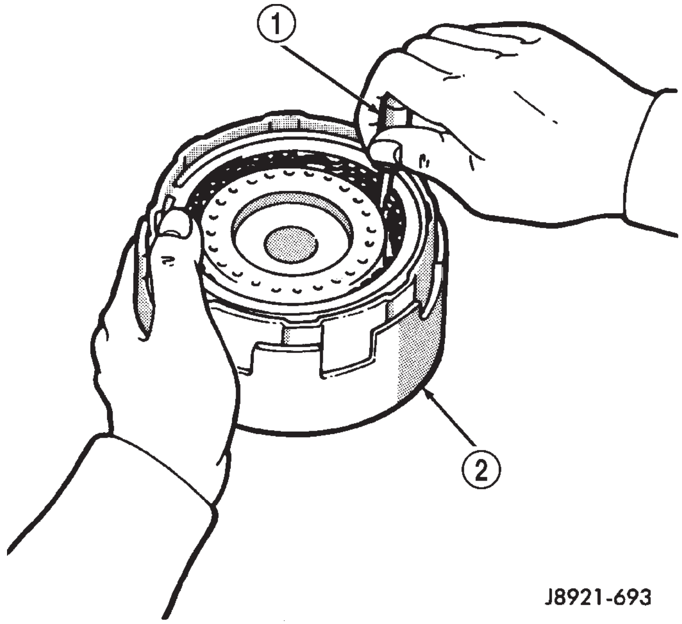


Fig. 160 Aligning Forward–Direct Clutch Splines

1 – CLUTCH SPLINE ALIGNING TOOL
2 – FORWARD-DIRECT CLUTCH

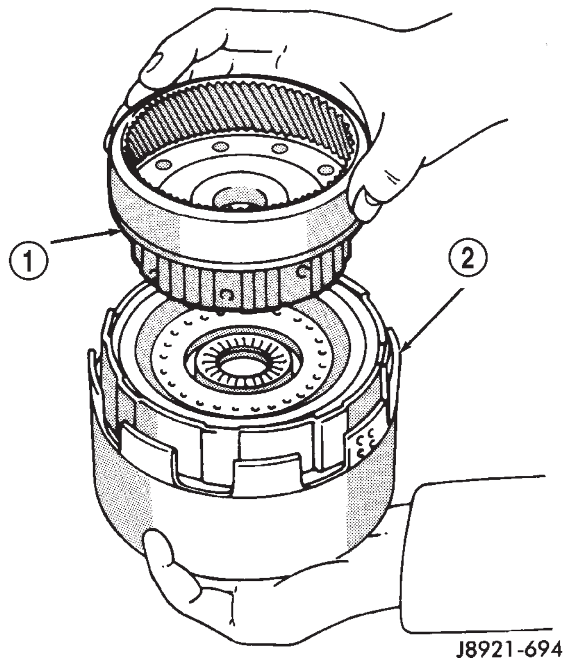


Fig. 161 Installing Front Planetary Ring Gear

1 – RING GEAR
2 – FORWARD-DIRECT CLUTCH

(47) Check clearance between sun gear input drum and direct clutch drum (Fig. 164). Clearance should be 9.8 – 11.8 mm (0.386 – 0.465 in.). If clearance is incorrect, planetary gear/forward–direct clutch assembly is not seated or is improperly assembled. Remove, and correct if necessary.

DISASSEMBLY AND ASSEMBLY (Continued)

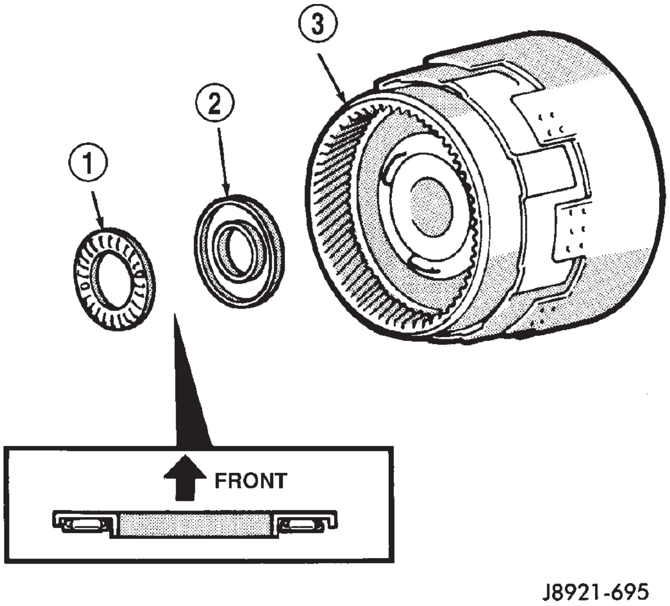


Fig. 162 Installing Ring Gear Bearing And Race

1 – THRUST BEARING
2 – RACE
3 – PLANETARY RING GEAR

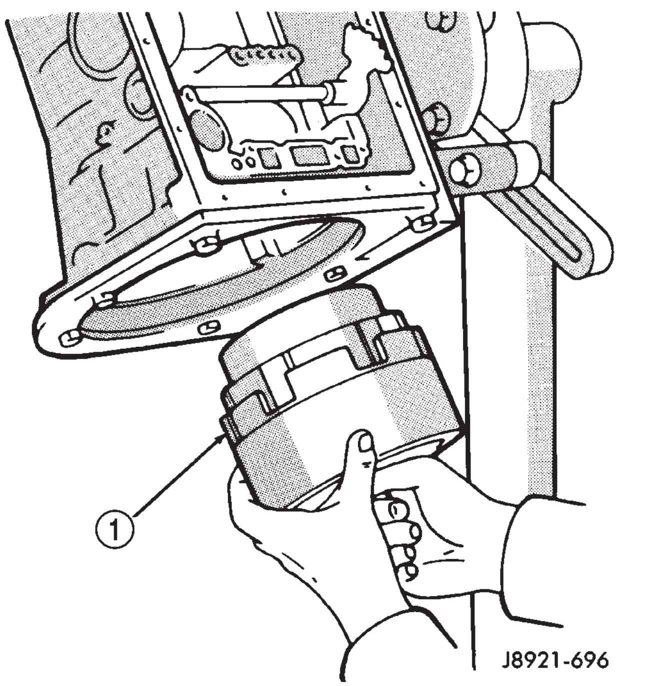


Fig. 163 Installing Front Planetary And Forward–Direct Clutch Assembly

1 – FRONT PLANETARY AND FOWARD-DIRECT CLUTCH ASSEMBLY

(48) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch shaft. Bearing faces up and toward case front as shown. Verify bearing/race size. Bearing and race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 33.6 mm (1.301 in.).

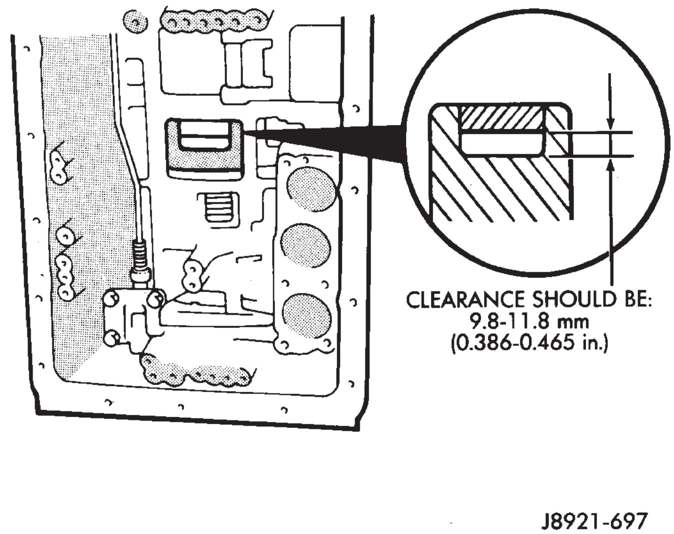


Fig. 164 Checking Input Drum–To–Direct Clutch Drum Clearance

(49) Assemble second coast brake piston components (Fig. 165).

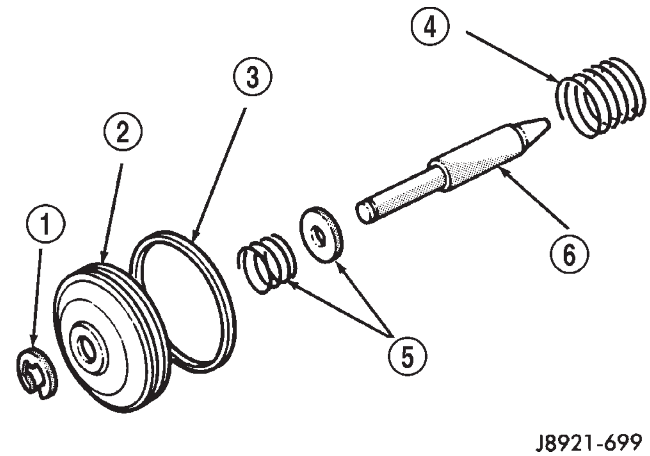


Fig. 165 Assembling Second Coast Brake Piston

1 – E-CLIP
2 – PISTON
3 – O-RING
4 – PISTON SPRING
5 – SPRING AND RETAINER
6 – PISTON ROD

(50) Install assembled second coast brake piston in case. Verify that the piston rod contacts the second coast brake band.

(51) Install replacement seals on second coast brake piston cover and install cover in case.

(52) Install second coast brake piston snap ring with snap ring plier tool (Fig. 166).

(53) Check second coast brake piston stroke as follows:

DISASSEMBLY AND ASSEMBLY (Continued)

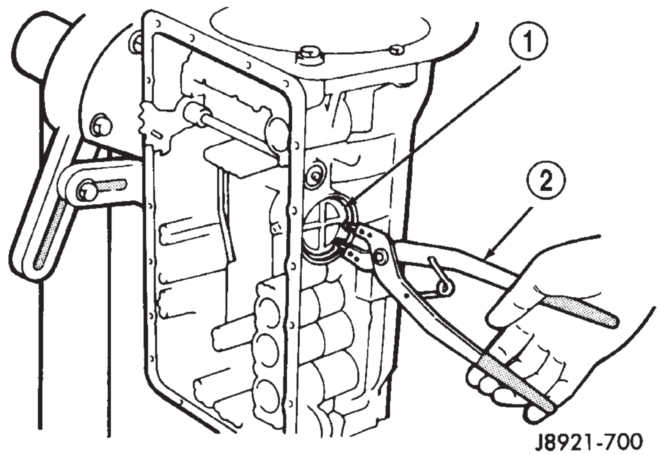


Fig. 166 Installing Second Coast Brake Piston Snap Ring

1 – PISTON SNAP RING
2 – SNAP RING TOOL

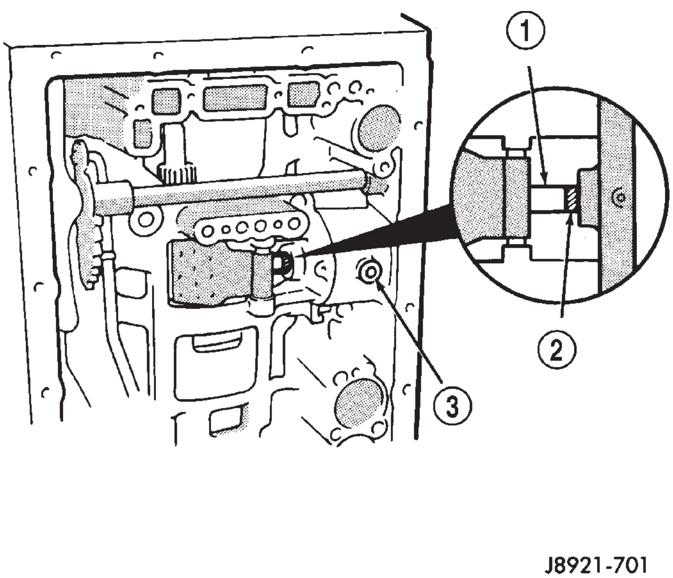


Fig. 167 Marking Brake Piston Rod

1 – BRAKE PISTON ROD
2 – REFERENCE MARK
3 – PISTON FEED HOLE

(a) Install a small wire tie strap around the second coast brake piston rod tight against the transmission case.

(b) Apply 57–114 psi air pressure through piston feed hole and check stroke length with Gauge Tool 7552.

(c) Stroke length should be 1.5 – 3.0 mm (0.059 – 0.118 in.).

(d) If stroke length is incorrect, piston, cover or snap ring is not seated. Reassemble and check stroke again if necessary.

(54) Coat thrust race and tabbed washer with petroleum jelly and install them on overdrive support (Fig. 169). Verify race size. Race outer diameter is 50.9 mm (2.004 in.) and inside diameter is 36.2 mm (1.426 in.).

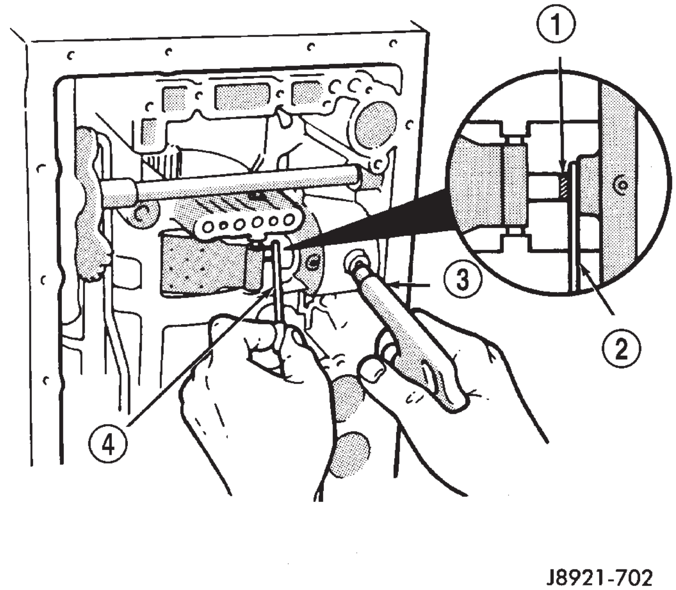


Fig. 168 Checking Second Coast Brake Piston Stroke

1 – PISTON ROD REFERENCE MARK
2 – GAUGE TOOL
3 – AIR GUN
4 – GAUGE TOOL

(55) Install overdrive support in case. Use two long bolts to help align and guide support into position (Fig. 170).

(56) Install overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 171). Chamfered side of snap ring faces up and toward case front. **Snap ring ends must be aligned with case opening with ring ends approximately 24 mm (0.94 in.) from center line of case opening.**

(57) Install and tighten overdrive support bolts to 25 N·m (19 ft. lbs.) torque (Fig. 172).

DISASSEMBLY AND ASSEMBLY (Continued)

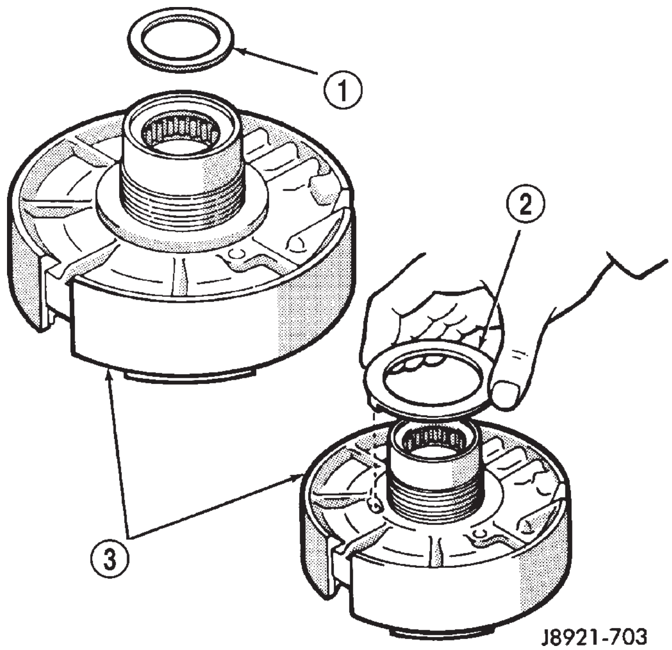


Fig. 169 Installing Overdrive Support Thrust Race And Washer

1 – THRUST RACE
2 – TABBED THRUST WASHER
3 – OVERDRIVE SUPPORT

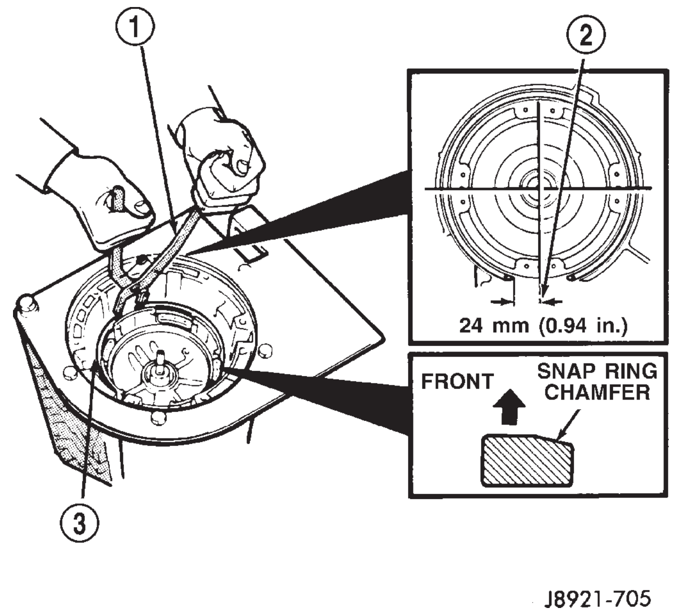


Fig. 171 Installing Overdrive Support Snap Ring

1 – SNAP RING TOOL
2 – SNAP RING ENDS CENTERED IN CASE OPENING
3 – SNAP RING

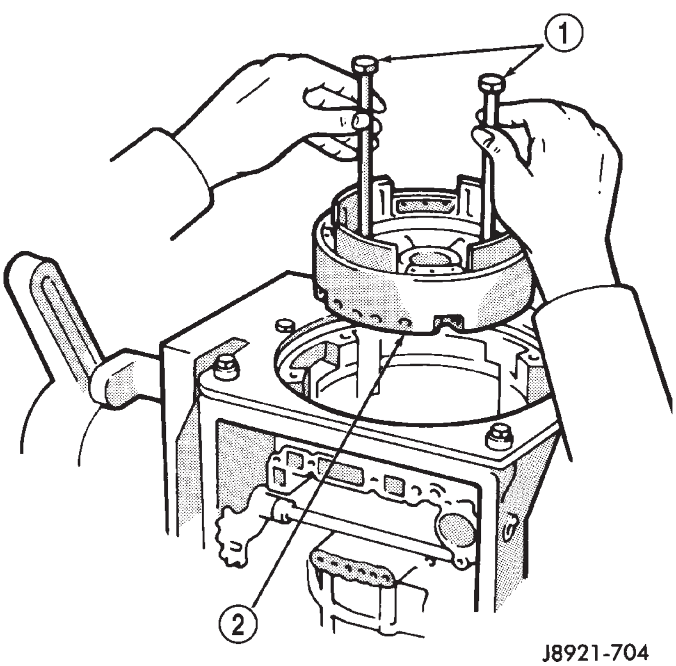


Fig. 170 Installing Overdrive Support

1 – USE LONG BOLTS TO INSTALL SUPPORT
2 – OVERDRIVE SUPPORT

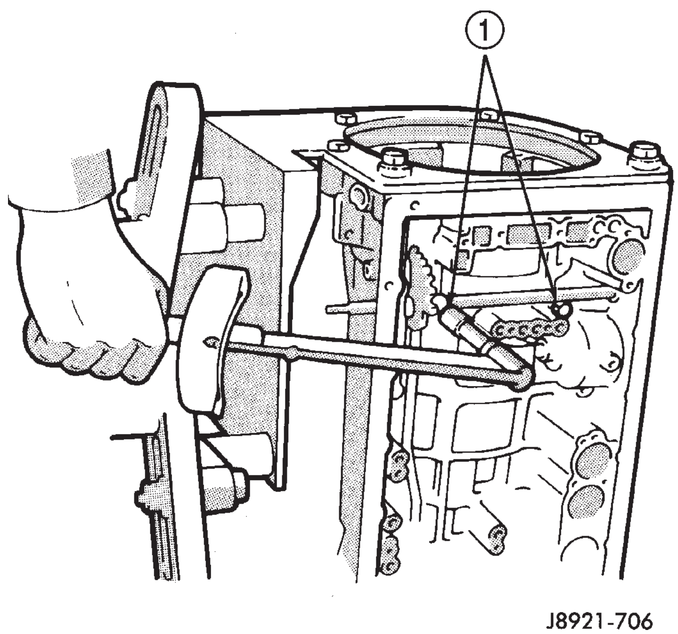


Fig. 172 Installing Overdrive Support Bolts

1 – OVERDRIVE SUPPORT BOLTS

DISASSEMBLY AND ASSEMBLY (Continued)

(58) Check output shaft end play with dial indicator (Fig. 173). End play should be 0.27 – 0.86 mm (0.0106 – 0.0339 in.).

(59) If output shaft end play is incorrect, one or more of installed components is not seated. Reassemble as necessary and check end play again.

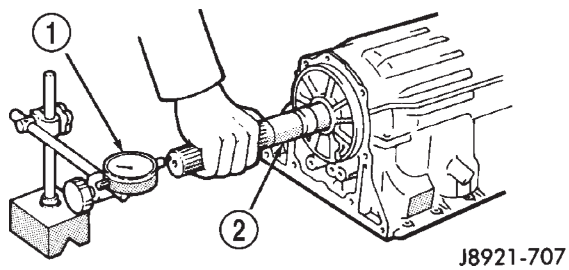


Fig. 173 Checking Output Shaft End Play

1 – DIAL INDICATOR
2 – OUTPUT SHAFT

(60) Install overdrive brake clutch pack (Fig. 174). Install thickest clutch plate first. Rounded edge of plate faces up. Install first disc followed by another plate until four discs and three plates are installed.

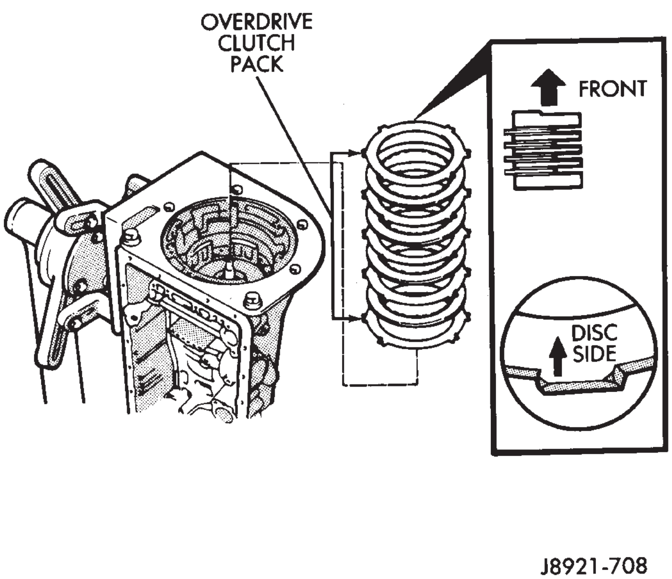


Fig. 174 Installing Overdrive Brake Clutch Pack

(61) Install stepped ring retainer plate with flat side facing disc. Then install brake pack snap ring (Fig. 175).

(62) Check overdrive brake piston stroke as follows:

(a) Mount dial indicator on case using Miller Tool C-3339 and a suitable bolt threaded into the transmission case.

(b) Verify that the dial indicator is mounted solidly and square to the direction of the piston travel.

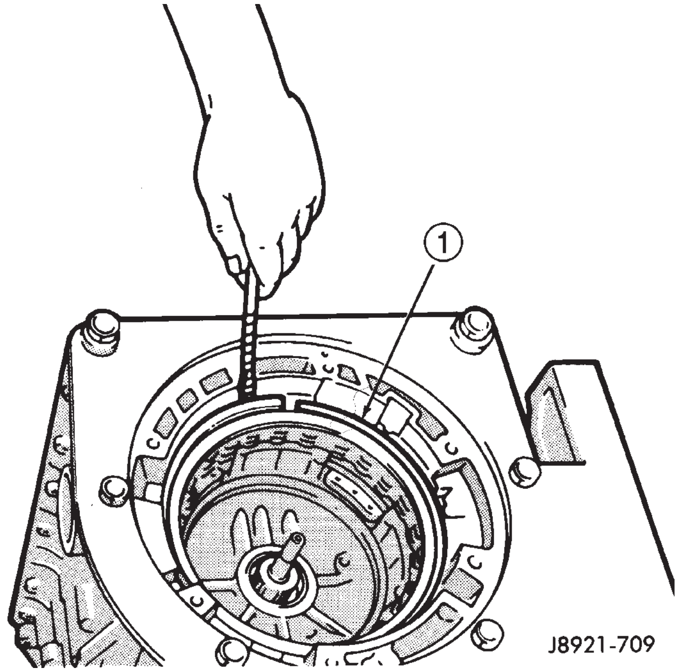


Fig. 175 Installing Overdrive Brake Snap Ring

1 – CLUTCH PACK SNAP RING

(c) Apply 57–114 psi air pressure through piston apply port and note piston stroke on dial indicator. Stroke length should be: 1.40 – 1.70 mm (0.055 – 0.0699 in.).

(d) If stroke is incorrect, brake pack or piston is installed incorrectly. Check and correct as necessary and measure piston stroke again.

(e) Remove the dial indicator set-up from the transmission.

(63) Coat overdrive lower race, thrust bearing and upper race with petroleum jelly and install them in overdrive support (Fig. 176). Be sure races and bearing are assembled and installed as shown.

(64) Verify bearing/race sizes before proceeding. Bearing race sizes are:

- Outer diameter of lower race is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Outer diameter of bearing is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).
- Outer diameter of upper race is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).

(65) Install overdrive planetary ring gear in support (Fig. 177).

(66) Coat ring gear thrust race and thrust bearing assembly with petroleum jelly and install them in gear (Fig. 178).

(67) Verify bearing/race size before proceeding.

- Outer diameter of ring gear race–bearing is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

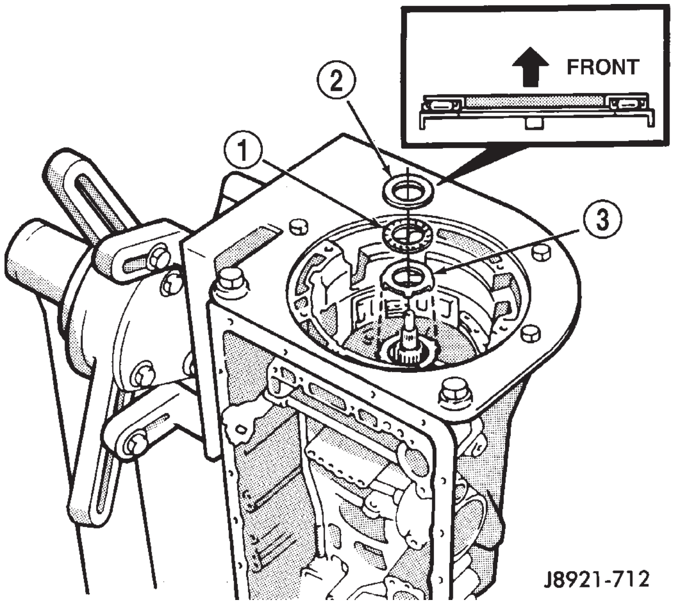


Fig. 176 Installing Overdrive Support Thrust Bearing And Races

1 – THRUST BEARING
2 – UPPER RACE
3 – LOWER RACE

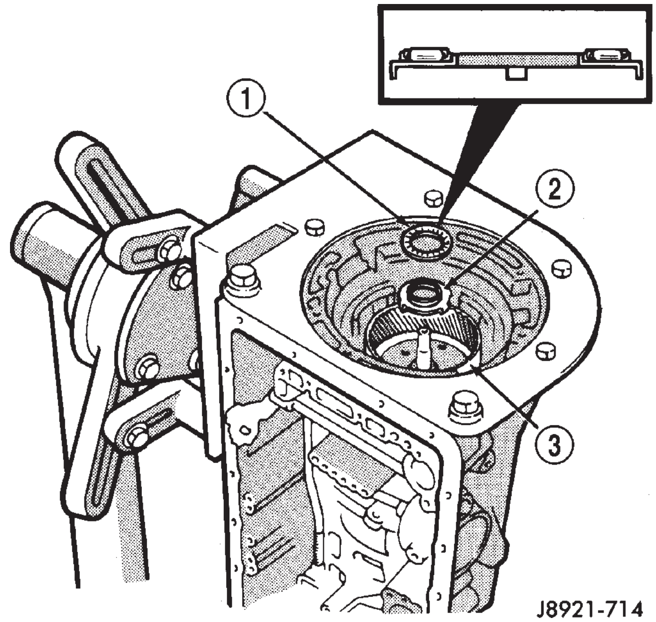


Fig. 178 Installing Ring Gear Thrust Bearing And Race

1 – THRUST BEARING-RACE ASSEMBLY
2 – THRUST RACE (TABBED)
3 – OVERDRIVE PLANETARY RING GEAR

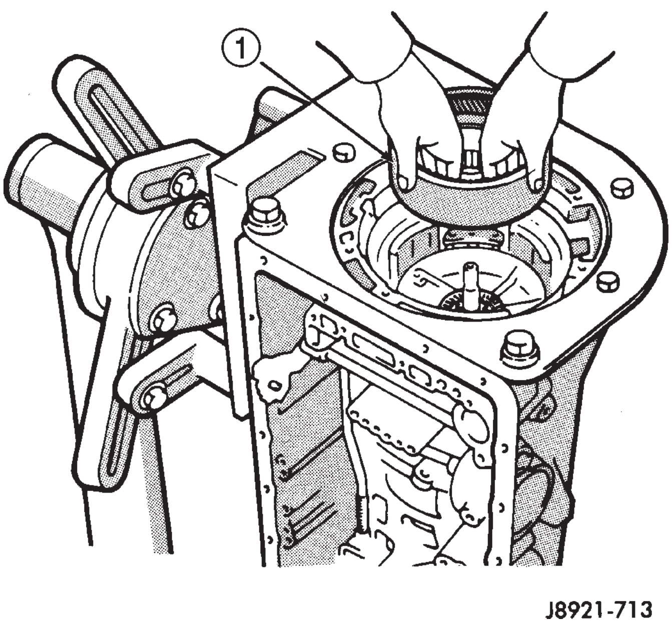


Fig. 177 Installing Overdrive Planetary Ring Gear

1 – OVERDRIVE PLANETARY RING GEAR

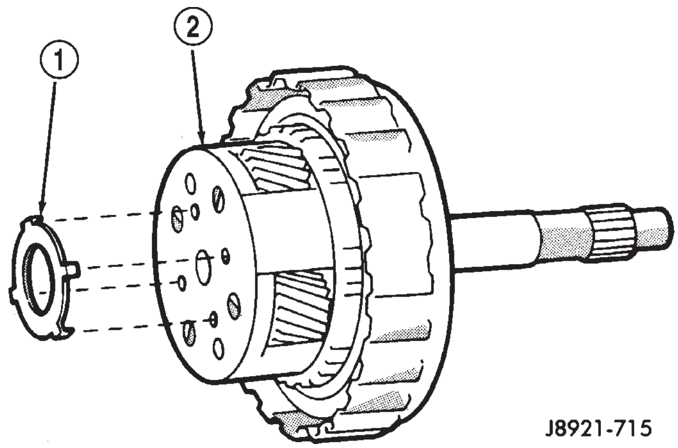


Fig. 179 Installing Planetary Thrust Race

1 – THRUST RACE (TABBED)
2 – OVERDRIVE PLANETARY

- Outer diameter of bearing is 46.8 mm (1.844 in.) and inside diameter is 26.0 mm (1.024 in.).

(68) Coat tabbed thrust race with petroleum jelly and install it on planetary gear (Fig. 179). Race outer diameter is 41.8 mm (1.646 in.) and inside diameter is 27.1 mm (1.067 in.).

(69) Install assembled overdrive planetary gear and clutch (Fig. 180).

(70) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch input shaft (Fig. 181). Bearing and race outer diameter is 50.2 mm (1.976 in.) and inside diameter is 28.9 mm (1.138 in.).

(71) Coat thrust bearing race with petroleum jelly and install it in oil pump (Fig. 182). Bearing race outer diameter is 47.2 mm (1.858 in.) and inside diameter is 28.1 mm (1.106 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

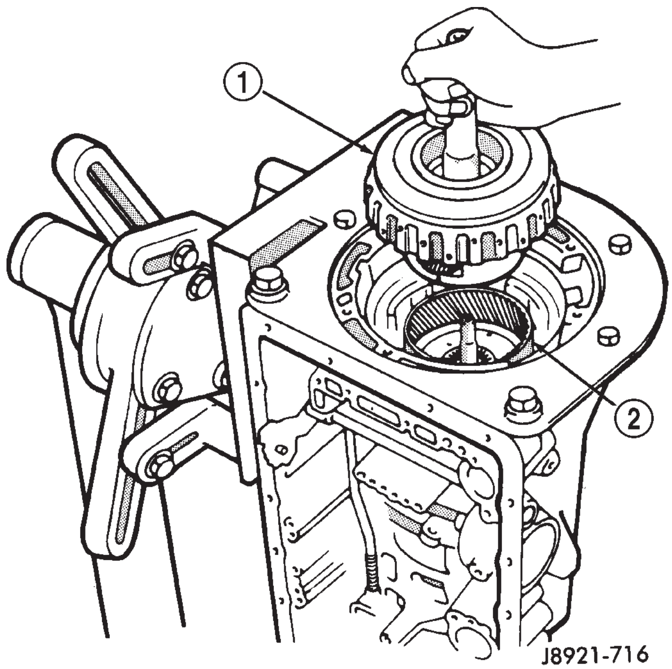


Fig. 180 Installing Overdrive Planetary And Clutch Assembly

1 – OVERDRIVE PLANETARY AND CLUTCH ASSEMBLY
2 – RING GEAR

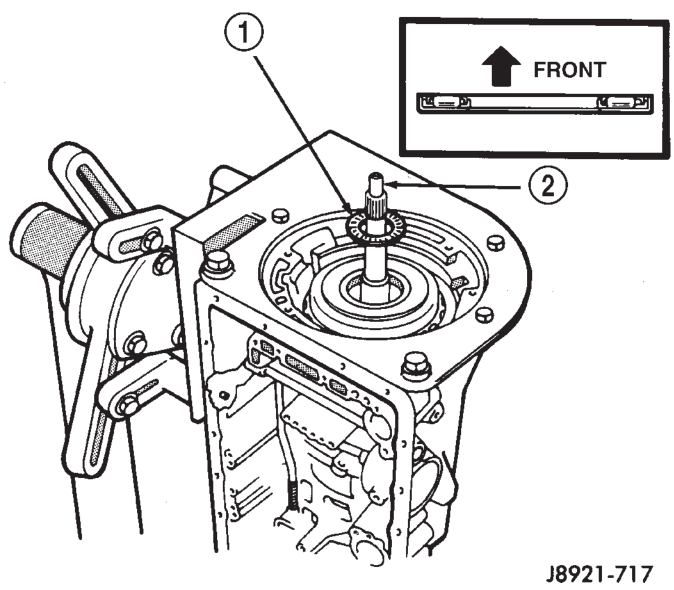


Fig. 181 Installing Input Shaft Thrust Bearing And Race Assembly

1 – THRUST BEARING AND RACE ASSEMBLY
2 – CLUTCH INPUT SHAFT

(72) Lubricate and install replacement O–ring on oil pump body.

(73) Install oil pump in case. Align pump and case bolt holes and carefully ease pump into place.

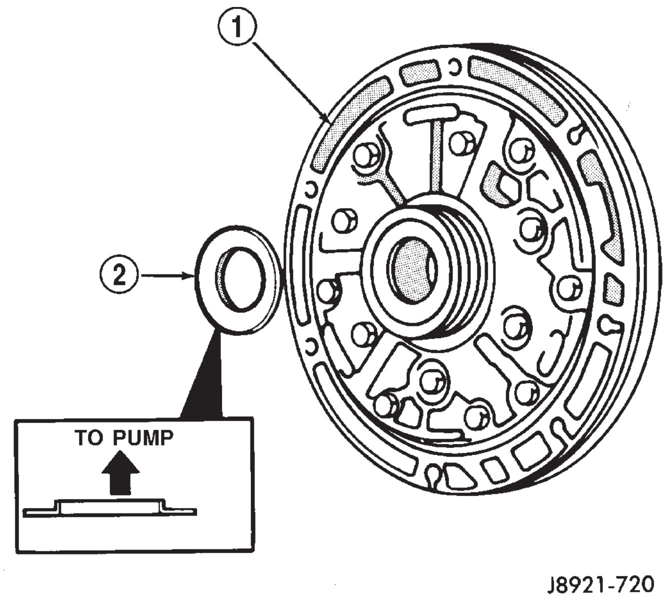


Fig. 182 Installing Oil Pump Thrust Race

1 – OIL PUMP
2 – PUMP THRUST RACE

CAUTION: Do not use force to seat the pump. The seal rings on the stator shaft could be damaged if they bind or stick to the direct clutch drum.

(74) Tighten oil pump bolts to 22 N·m (16 ft. lbs.) torque.

(75) Verify input shaft rotation. Shaft should rotate smoothly and not bind.

(76) Lubricate and install new O–ring on transmission throttle cable adapter and install cable in case (Fig. 183).

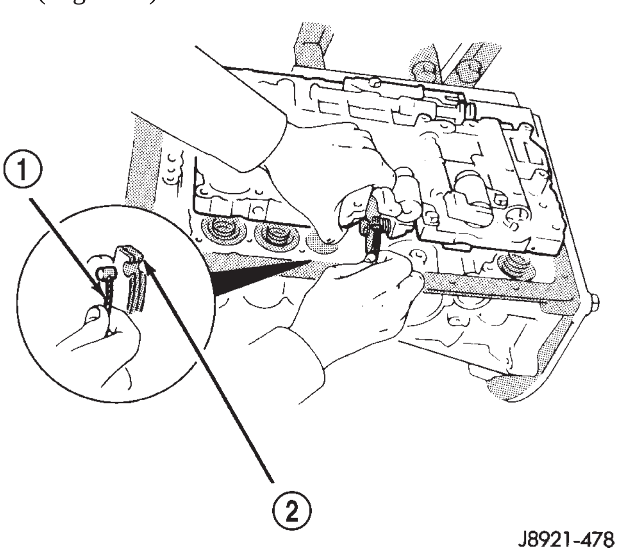


Fig. 183 Installing Transmission Throttle Cable

1 – THROTTLE CABLE
2 – THROTTLE CAM

DISASSEMBLY AND ASSEMBLY (Continued)

(77) Check clutch and brake operation. Operate clutches and brakes with compressed air applied through feed holes in case (Fig. 184). Listen for clutch and brake application. If you do not hear a clutch or brake apply, disassemble transmission and repair fault before proceeding. **It is necessary to block the overdrive clutch accumulator feed hole No. 8 (Fig. 184) in order to check direct clutch operation.**

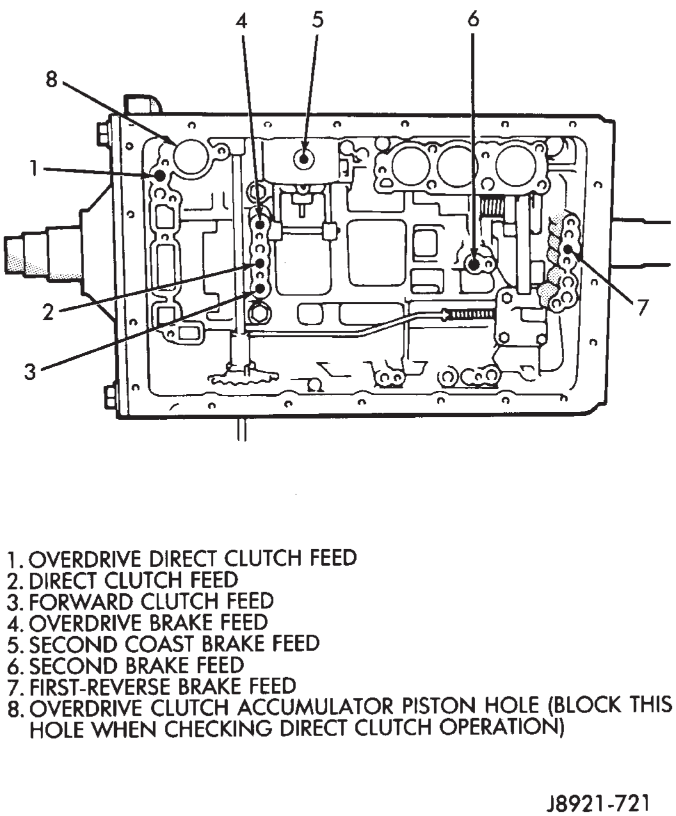


Fig. 184 Clutch And Brake Feed Hole Locations

(78) Lubricate and install new O–rings on accumulator pistons (Fig. 185).

(79) Assemble and install accumulator pistons and springs (Fig. 185).

(80) Install new check ball body and spring (Fig. 186).

(81) Position valve body on case (Fig. 187).

(82) Install detent spring (Fig. 187).

(83) Align manual valve, detent spring and shift sector (Fig. 187).

(84) Connect transmission throttle cable to throttle valve cam (Fig. 188).

(85) Install and tighten valve body–to–case bolts to 10 N·m (7 ft. lbs.) torque.

(86) Connect valve body solenoid wires to solenoids (Fig. 189).

(87) Install new O–ring on solenoid harness adapter and secure adapter to case.

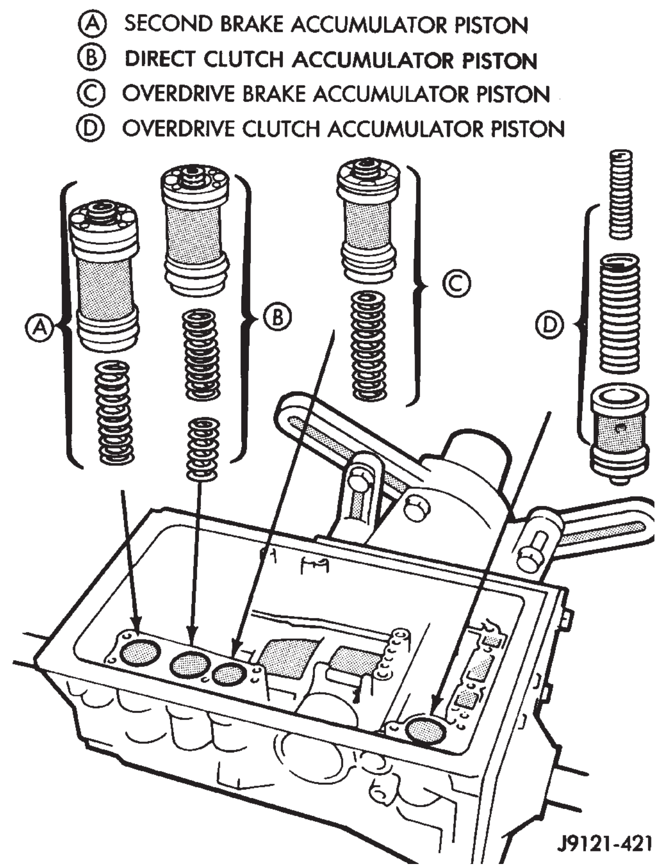


Fig. 185 Accumulator Piston And Spring Installation

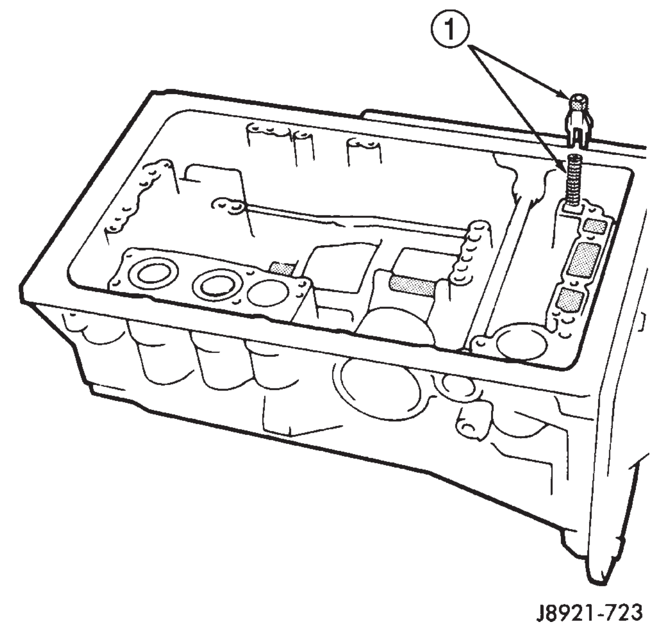


Fig. 186 Installing Check Ball Body And Spring

1 – CHECK BALL BODY AND SPRING

(88) Install valve body oil tubes (Fig. 190). Tap tubes into place with a plastic mallet. Be sure the

DISASSEMBLY AND ASSEMBLY (Continued)

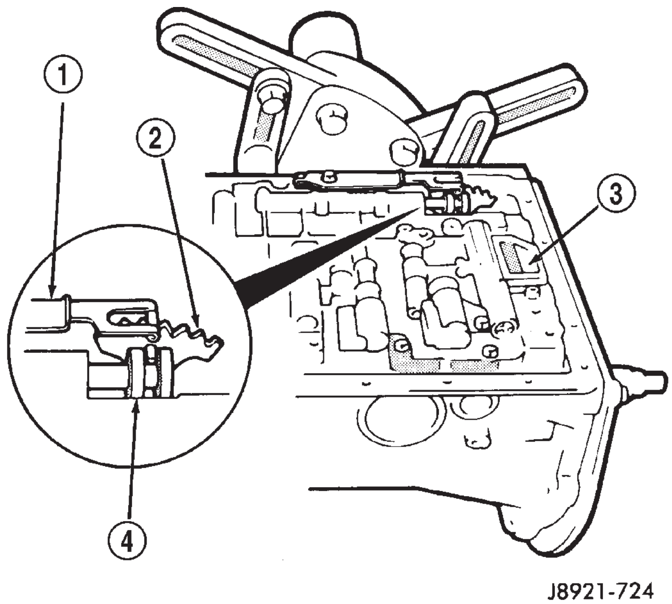


Fig. 187 Aligning Manual Valve, Shift Sector And Detent Spring

1 – DETENT SPRING
2 – SHIFT SECTOR
3 – VALVE BODY
4 – MANUAL VALVE

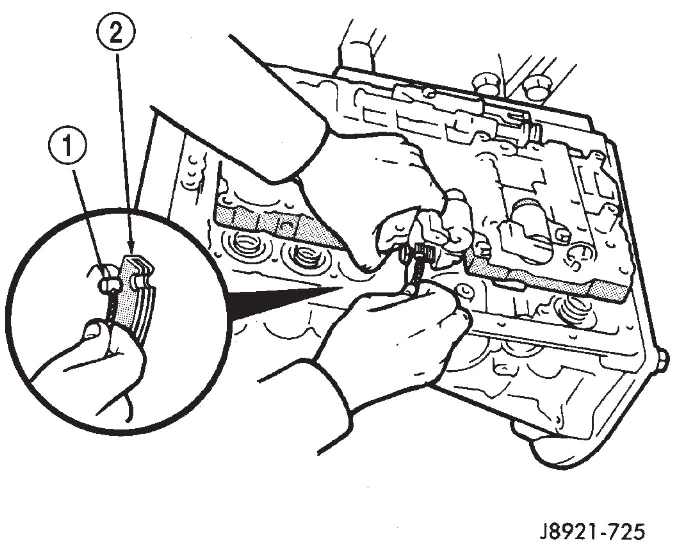


Fig. 188 Connecting Transmission Throttle Cable

1 – THROTTLE CABLE
2 – THROTTLE CAM

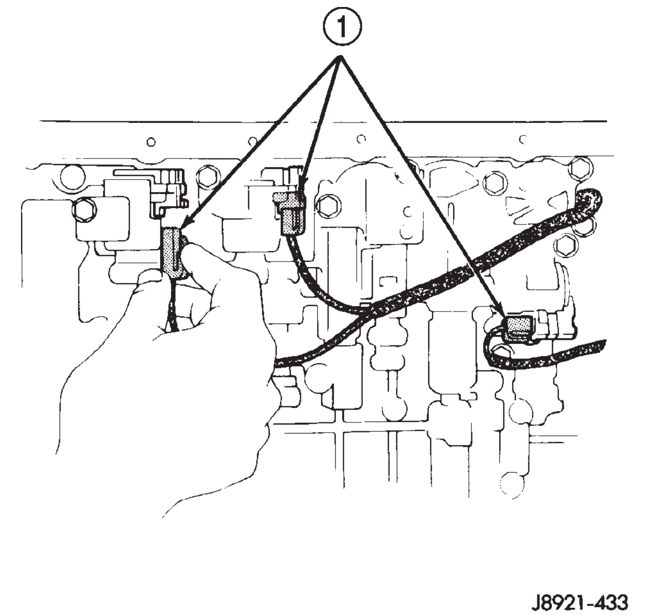


Fig. 189 Connecting Valve Body Solenoid Wires

1 – SOLENOID WIRE CONNECTORS

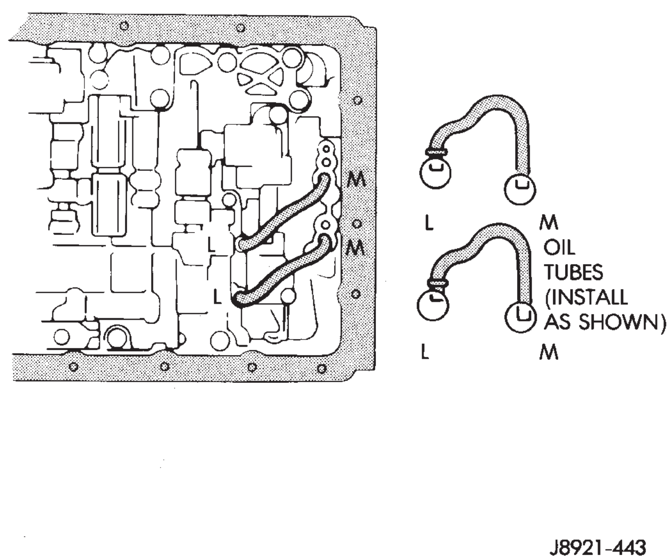


Fig. 190 Installing Valve Body Oil Tubes

flanged tube ends and straight tube ends are installed as shown.

(89) Install new gaskets on oil screen and install screen on valve body. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.

(90) Install magnet in oil pan. Be sure magnet does not interfere with valve body oil tubes.

(91) Apply Threebond® Liquid Gasket TB1281, P/N 83504038, to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Install pan on case and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(92) Install transmission speed sensor rotor and key on output shaft (Fig. 191).

(93) Install spacer and speedometer drive gear on output shaft. Then install retaining snap ring (Fig. 192).

(94) Apply bead of Threebond® Liquid Gasket TB1281, P/N 83504038, to sealing surface at rear of case (Fig. 193).

DISASSEMBLY AND ASSEMBLY (Continued)

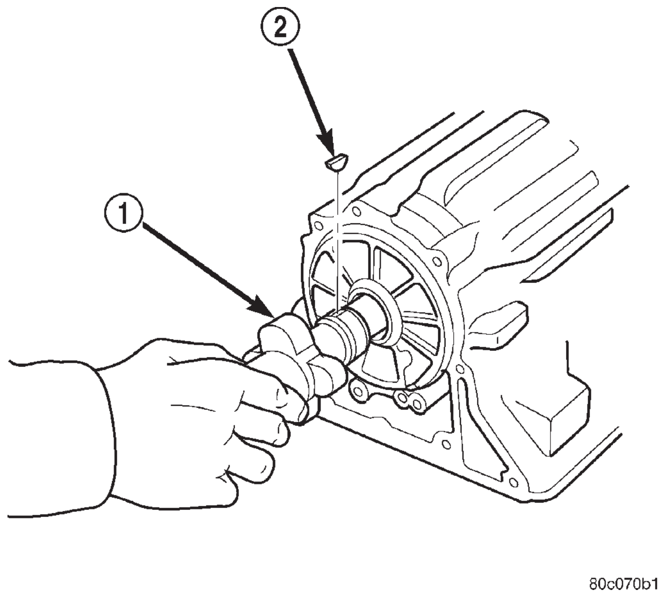


Fig. 191 Installing Transmission Speed Sensor Rotor And Key

1 – SPEED SENSOR ROTOR
2 – ROTOR KEY

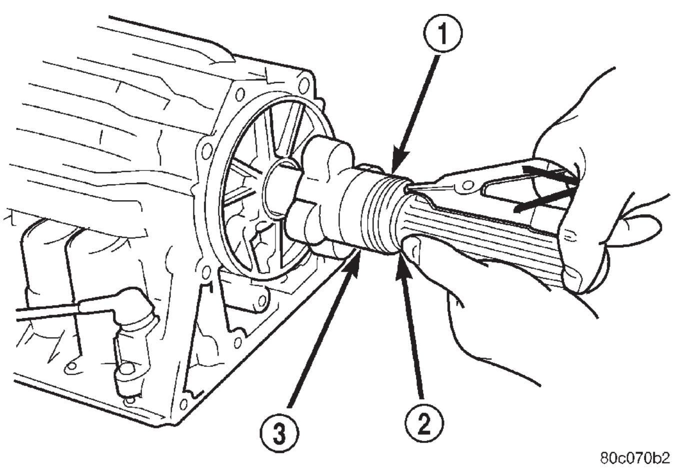


Fig. 192 Installing Spacer And Speedometer Drive Gear

1 – SPEEDOMETER DRIVE GEAR
2 – SNAP RING
3 – SPACER

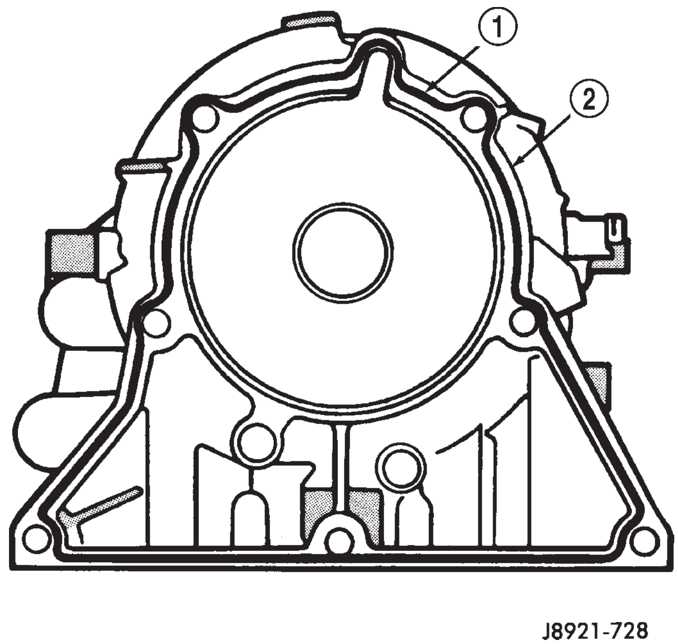


Fig. 193 Applying Sealer To Case Rear Flange

1 – SEALER BEAD
2 – CASE REAR FLANGE

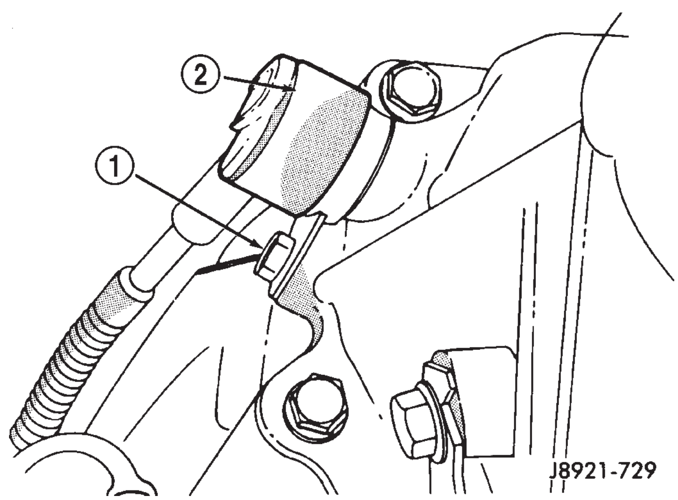


Fig. 194 Installing Transmission Speed Sensor

1 – SENSOR BOLT
2 – SPEED SENSOR

(95) Install adapter housing on transmission. Tighten adapter bolts to 34 N·m (25 ft. lbs.) torque.

(96) Install transmission speed sensor (Fig. 194). Tighten sensor bolt to 7.4 N·m (65 in. lbs.) torque and connect sensor wire harness connector.

(97) Install converter housing (Fig. 195). Tighten 12 mm diameter housing bolts to 57 N·m (42 ft. lbs.) torque. Tighten 10 mm diameter housing bolts to 34 N·m (25 ft. lbs.) torque.

(98) Install transmission shift lever on manual valve shaft. Do not install lever attaching nut at this time.

(99) Move transmission shift lever fully rearward. Then move lever two detent positions forward.

(100) Mount park/neutral position switch on manual valve shaft and tighten switch adjusting bolt just enough to keep switch from moving (Fig. 196).

(101) Install park/neutral position switch tabbed washer and retaining nut (Fig. 196). Tighten nut to

DISASSEMBLY AND ASSEMBLY (Continued)

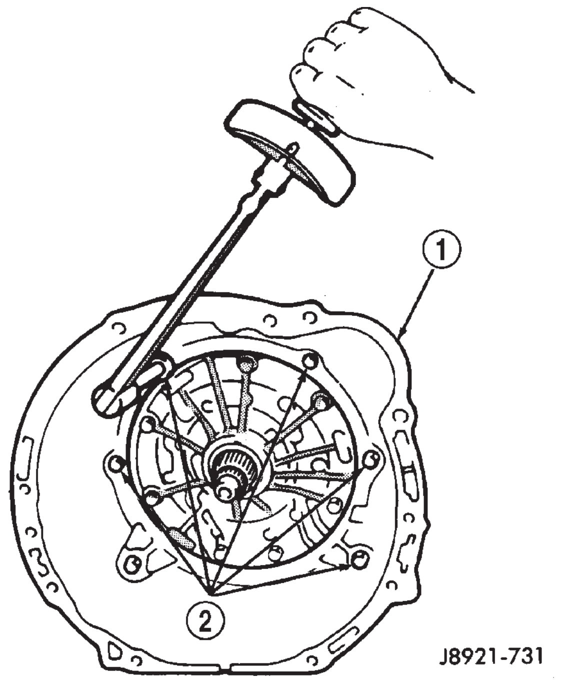


Fig. 195 Installing Converter Housing

1 – CONVERTER HOUSING
2 – HOUSING BOLTS

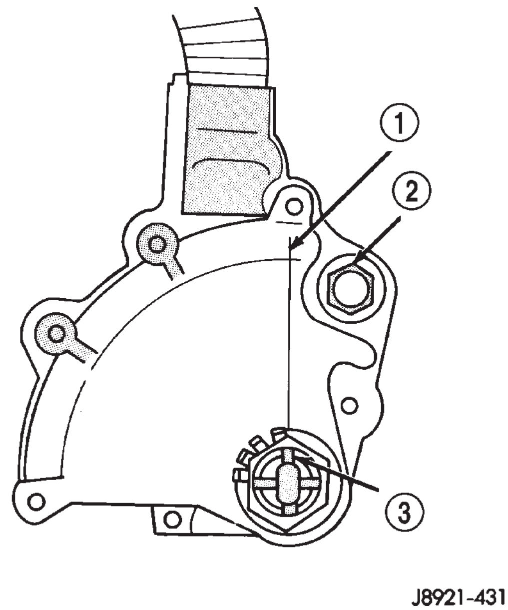


Fig. 196 Park/Neutral Position Switch Installation/ Adjustment

1 – NEUTRAL STANDARD LINE
2 – ADJUSTING BOLT
3 – VERTICAL GROOVE ON MANUAL VALVE SHAFT

6.9 N·m (61 in. lbs.) torque, but do not bend any of the washer tabs against the nut at this time.

(102) Align park/neutral position switch standard line with groove or flat on manual shaft (Fig. 196).

(103) Tighten park/neutral position switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.

(104) Install transmission shift lever on manual valve shaft. Tighten lever attaching nut to 16 N·m (12 ft. lbs.) torque.

(105) Install retaining clamp for wire harness and throttle cable (Fig. 197).

(106) Install torque converter.

(107) Verify that converter is seated by measuring distance between converter housing flange and one of the converter mounting pads (Fig. 198). Use straightedge and vernier calipers to measure distance. On 6–cyl. transmissions, distance should be 16.5 mm (0.650 in.).

(108) Secure converter in transmission with C–clamp or metal strapping. Do this before mounting transmission on jack or moving transmission under vehicle.

(109) Install lower half of transmission fill tube (install upper half after transmission is in vehicle).

CAUTION: The transmission cooler and lines must be reverse flushed if overhaul corrected a malfunction that generated sludge, metal particles, or clutch friction material. The torque converter should also be replaced if contaminated by the same malfunction. Debris and residue not flushed from the cooler and lines will flow back into the transmission and converter. The result will be a repeat failure and shop comeback.

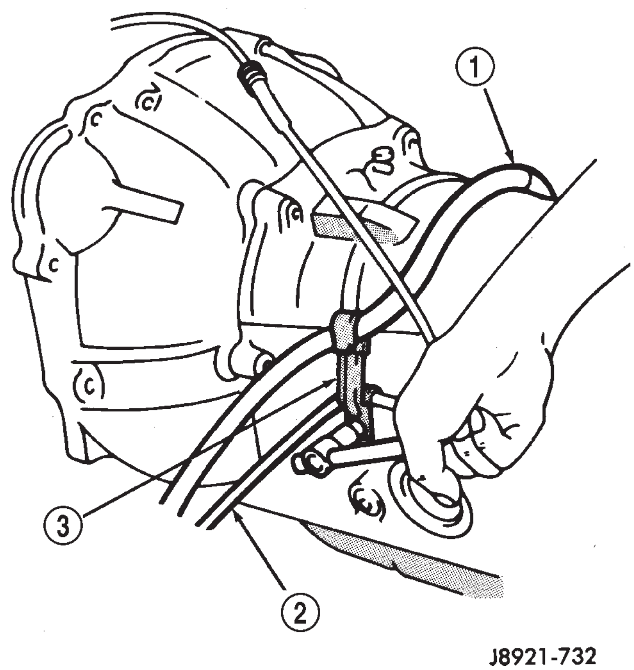


Fig. 197 Installing Cable/Harness Clamps

1 – TRANSMISSION HARNESS
2 – THROTTLE CABLE
3 – RETAINING CLAMPS

DISASSEMBLY AND ASSEMBLY (Continued)

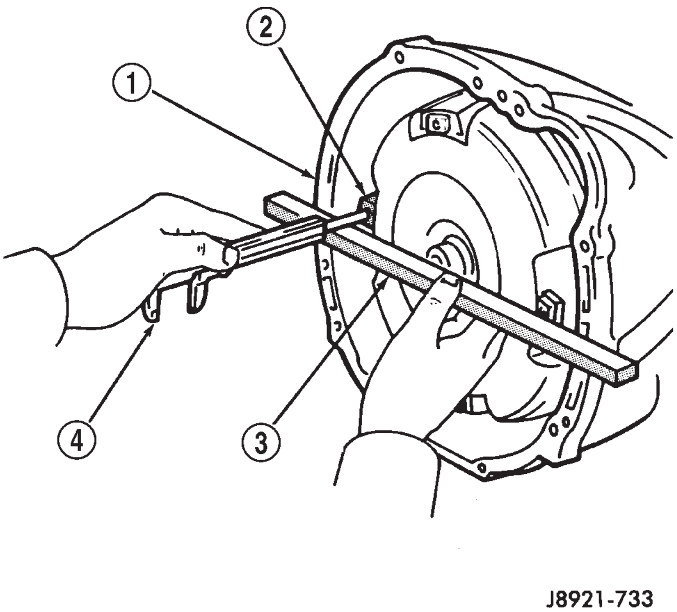


Fig. 198 Checking Converter Installation

1 – HOUSING FLANGE
2 – CONVERTER MOUNTING PAD
3 – STRAIGHTEDGE
4 – VERNIER CALIPERS

OIL PUMP

DISASSEMBLY

(1) Remove pump body O–ring (Fig. 199).

(2) Remove pump seal.

(3) Remove pump seal rings (Fig. 199).

(4) Remove bolts attaching stator shaft to pump body and separate components.

(5) Remove drive gear and driven gear from pump body (Fig. 199).

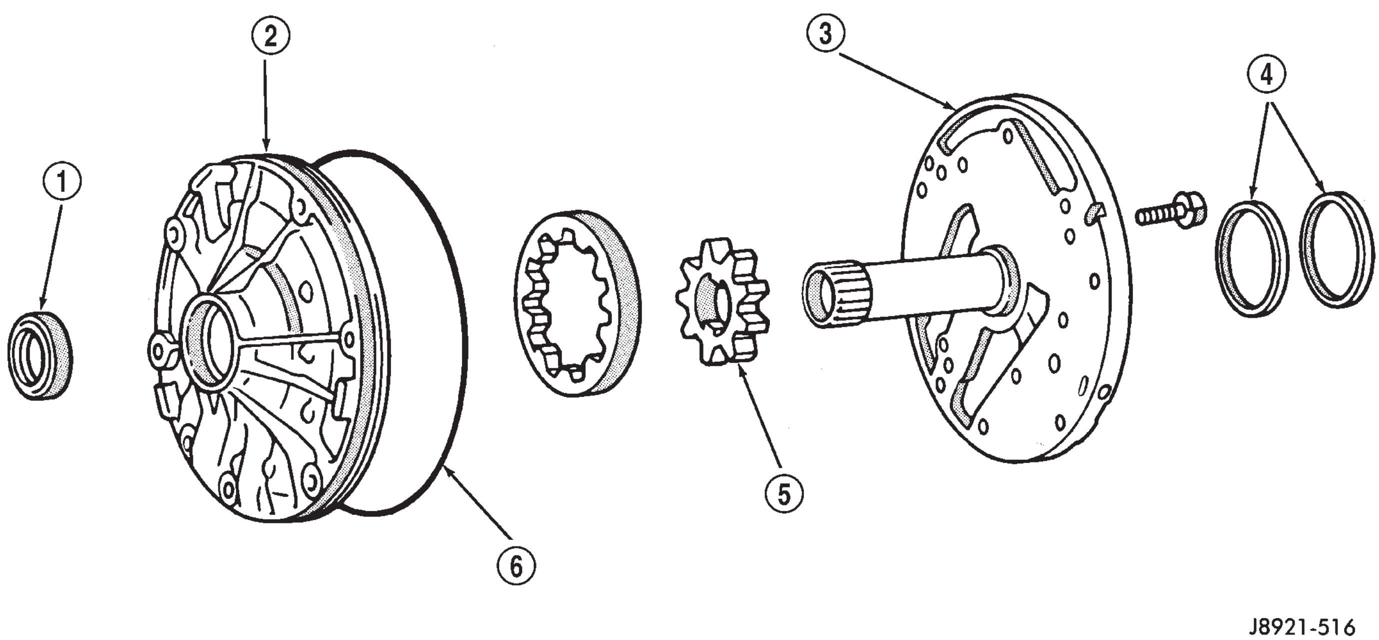


Fig. 199 Oil Pump Components

1 – PUMP SEAL
2 – PUMP BODY
3 – STATOR SHAFT
4 – SEAL RINGS
5 – GEAR
6 – O-RING

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

(1) Measure inside diameter of pump body bushing with bore gauge or inside micrometer (Fig. 200). Diameter should be maximum of 38.19 mm (1.5035 in.). Replace pump body if bushing I. D. is greater than specified.

(2) Measure inside diameter of stator shaft bushing (Fig. 200). Take measurements at front and rear of bushing. Diameter should be maximum of 21.58 mm (0.08496 in.) at front and 27.08 mm (1.0661 in.) at rear. Replace stator shaft if bushing diameter is greater than specified.

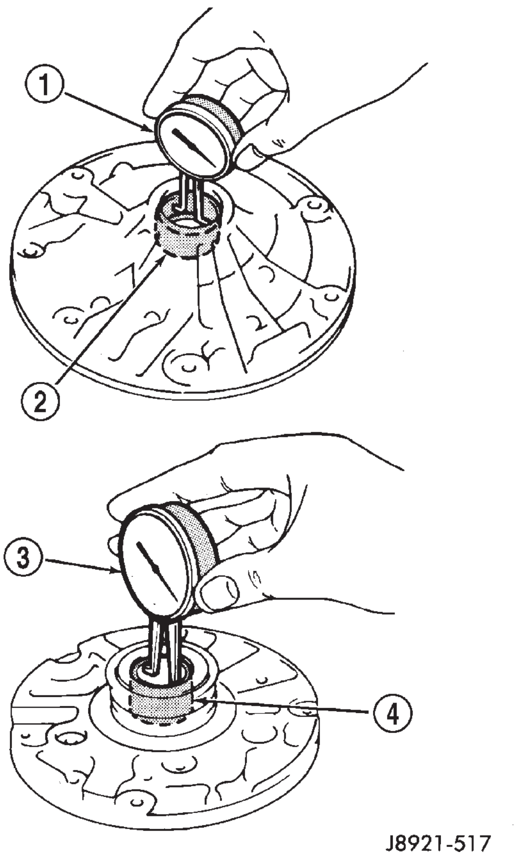


Fig. 200 Checking Pump/Stator Shaft Bushings

1 – BORE GAUGE
2 – PUMP BODY BUSHING
3 – BORE GAUGE
4 – STATOR SHAFT BUSHING

(3) Measure oil pump clearances (Fig. 201).

• Clearance between pump driven gear and pump body should be maximum of 0.3 mm (0.012 in).

• Clearance between tips of pump gear teeth should be maximum of 0.3 mm (0.012 in).

• Clearance between rear surface of pump housing and pump gears should be maximum of 0.1 mm (0.004 in.).

(4) Replace pump body and gears if any clearance is greater than specified.

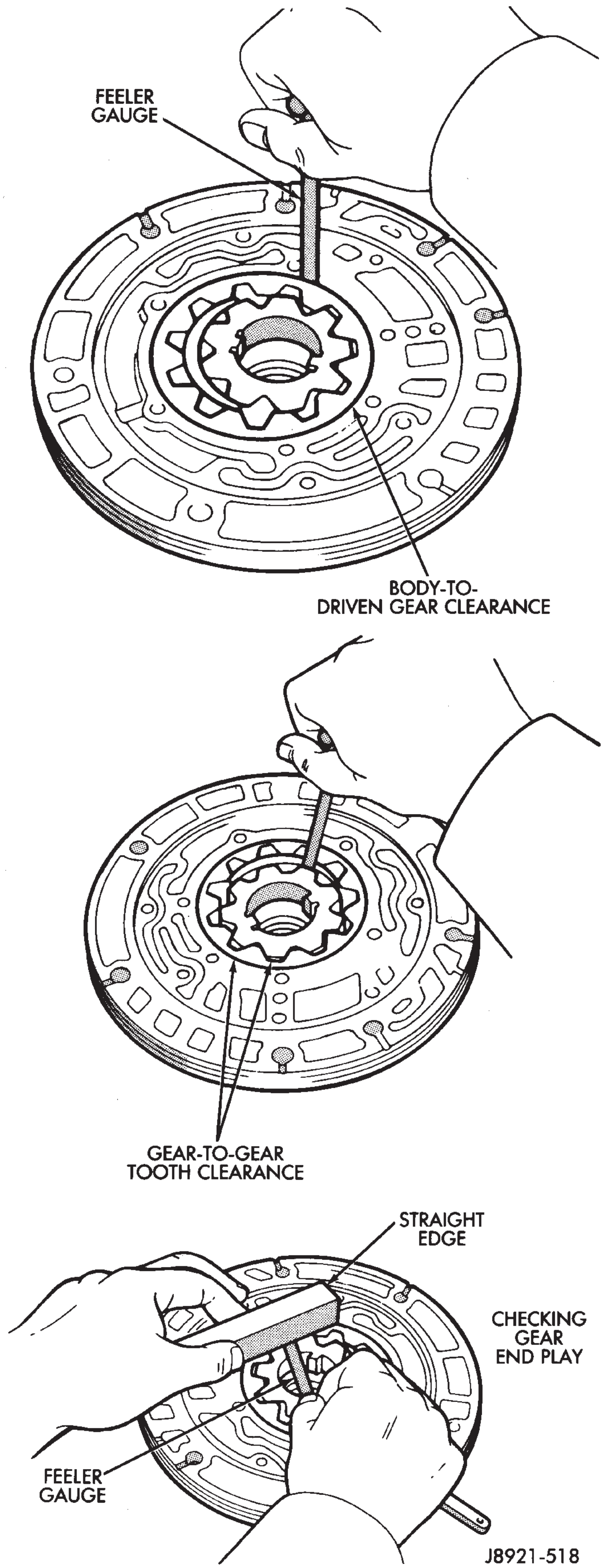


Fig. 201 Checking Pump Gear Clearances

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install new seal with Seal Installer 7549 (Fig. 202).

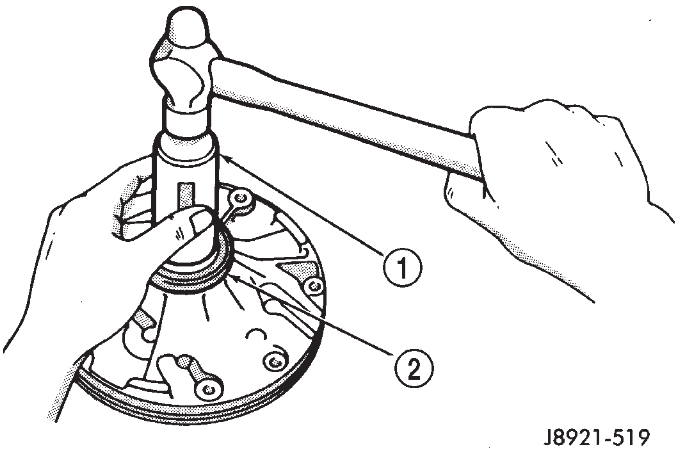


Fig. 202 Installing Pump Seal

1 – SEAL INSTALLER TOOL
2 – PUMP SEAL

(6) Lubricate and install gears in pump body.

(7) Assemble stator shaft and pump body. Tighten shaft–to–body bolts to 10 N·m (7 ft. lbs.) torque.

(8) Install new O–ring on pump body and new seal rings on stator shaft.

(9) Install pump in torque converter and check pump gear rotation (Fig. 203). Gears must rotate smoothly when turned clockwise and counterclockwise.

(10) Lubricate pump O–ring and seal rings with petroleum jelly.

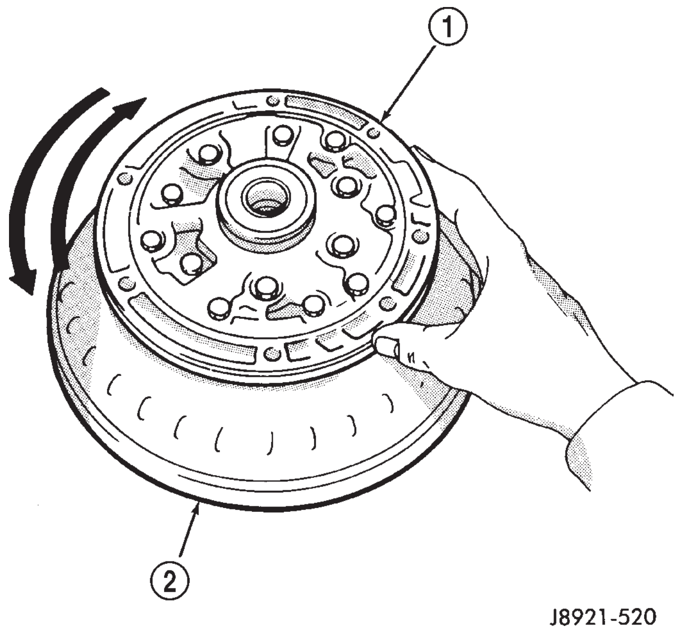


Fig. 203 Checking Pump Gear Rotation

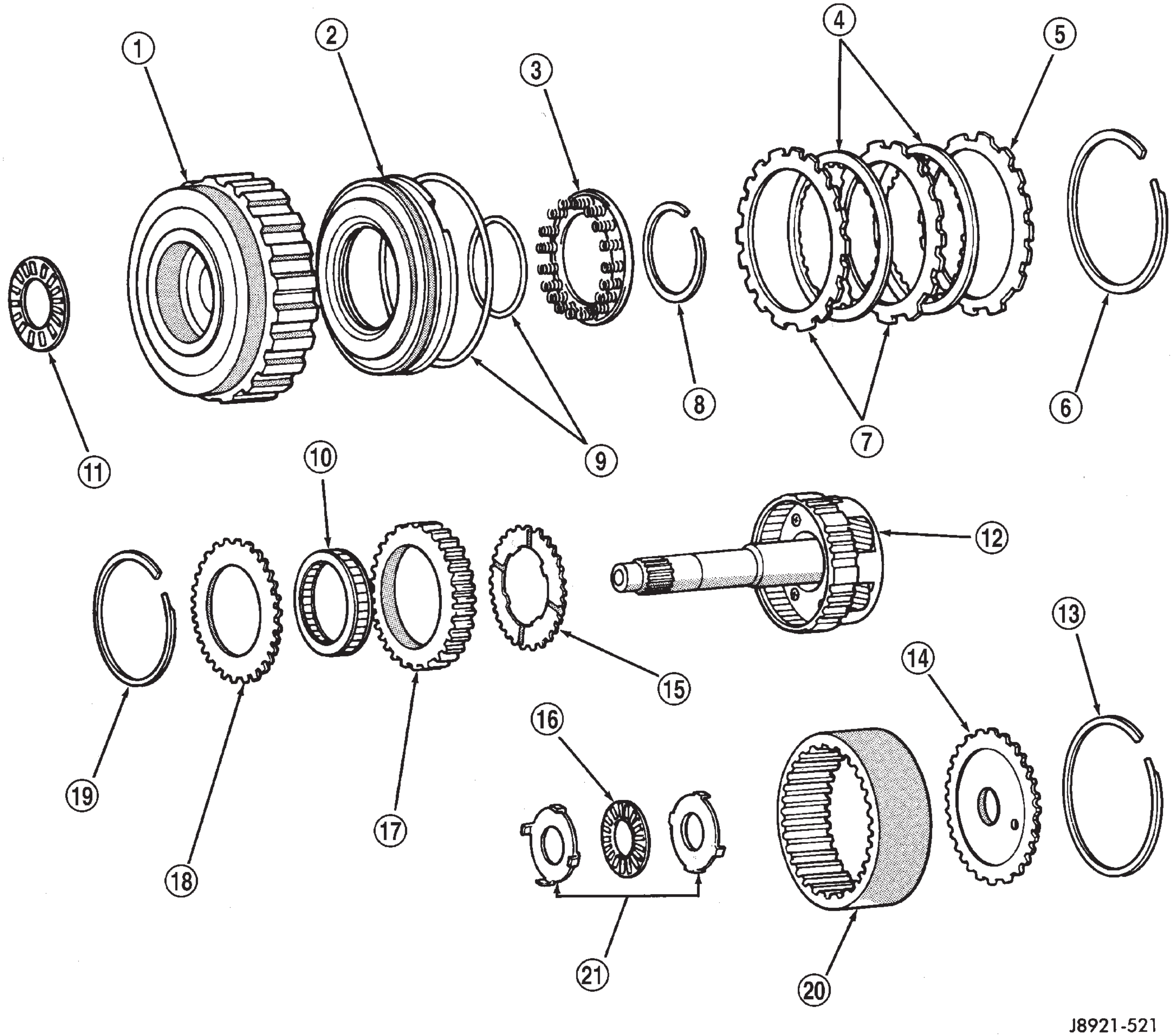
1 – OIL PUMP
2 – TORQUE CONVERTER

DISASSEMBLY AND ASSEMBLY (Continued)

OVERDRIVE PLANETARY GEAR AND CLUTCH

DISASSEMBLY

(1) Check operation of one–way clutch in clutch drum (Fig. 204). Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn



Overdrive Planetary Gear And Clutch Components

1 – CLUTCH DRUM
2 – CLUTCH PISTON
3 – PISTON RETURN SPRING
4 – CLUTCH DISCS
5 – RETAINER PLATE
6 – CLUTCH PACK SNAP RING
7 – CLUTCH PLATES
8 – PISTON SNAP RING
9 – O-RINGS
10 – ONE-WAY CLUTCH
11 – CLUTCH DRUM BEARING AND RACE ASSEMBLY
12 – PLANETARY GEAR
13 – SNAP RING
14 – RING GEAR HUB
15 – THRUST WASHER
16 – BEARING
17 – ONE-WAY CLUTCH OUTER RACE
18 – RETAINING PLATE
19 – SNAP RING
20 – PLANETARY RING GEAR
21 – RACE

DISASSEMBLY AND ASSEMBLY (Continued)

clockwise freely but lock when turned counterclockwise. Replace one–way clutch if necessary.

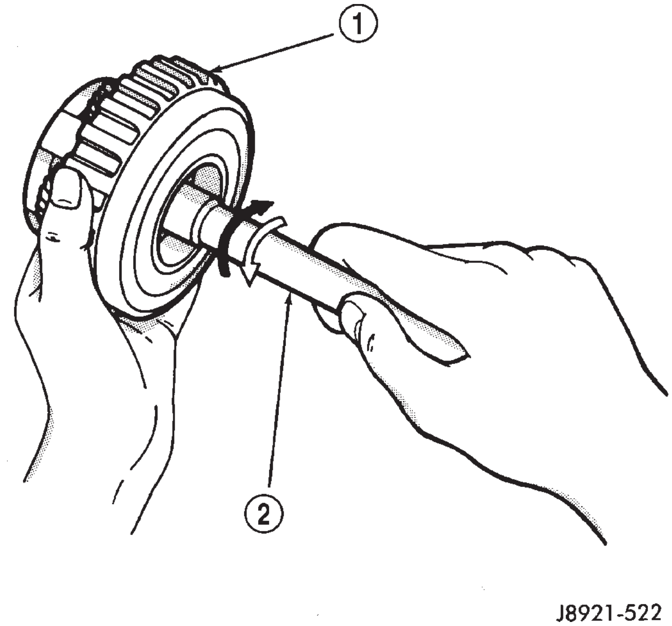


Fig. 204 Checking One–Way Clutch

1 – CLUTCH DRUM
2 – PLANETARY SHAFT

(2) Remove overdrive clutch from planetary gear (Fig. 205).

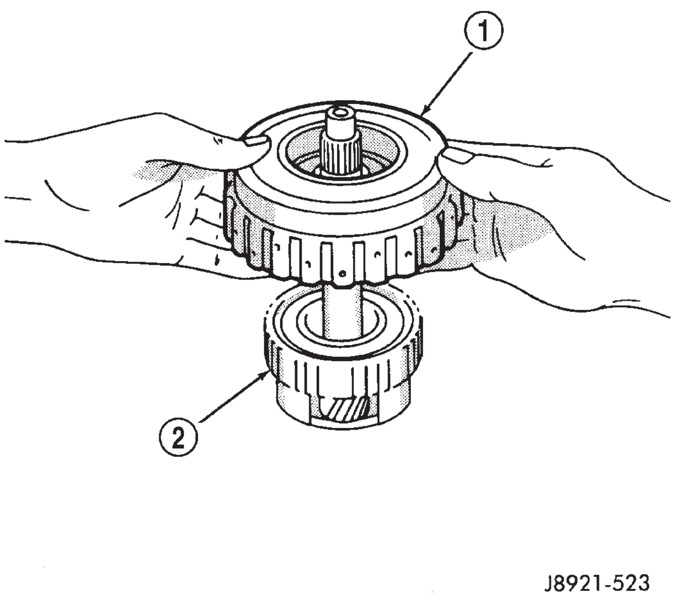


Fig. 205 Removing Overdrive Clutch From Gear

1 – OVERDRIVE CLUTCH
2 – PLANETARY GEAR

(3) Measure stroke length of overdrive clutch piston as follows:

(a) Mount oil pump on torque converter. Then mount clutch on oil pump (Fig. 206).

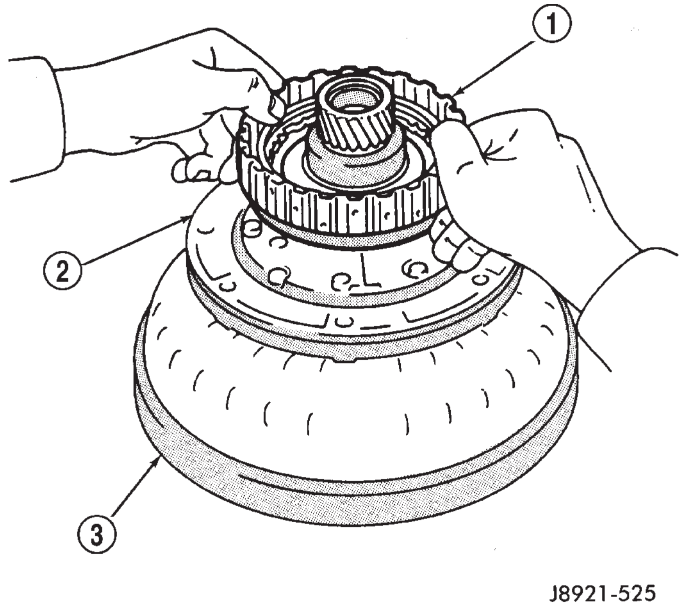


Fig. 206 Assembling Converter, Pump And Clutch For Test

1 – OVERDRIVE CLUTCH
2 – OIL PUMP
3 – TORQUE CONVERTER

(b) Install a suitable threaded bolt/rod into oil pump for use in mounting Miller Tool C-3339 dial indicator components securely.

(c) Mount dial indicator on the bolt/rod and position the dial indicator squarely on the clutch piston.

(d) Apply compressed air through clutch feed hole in oil pump and note piston stroke length. Stroke length should be 1.85 – 2.15 mm (0.0728 – 0.0846 in.).

(4) Remove thrust bearing and race assembly from clutch drum (Fig. 207).

(5) Remove clutch pack snap ring and remove the clutch pack (Fig. 208).

(6) Measure overdrive clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in.).

(7) If the clutch pack stroke length is out of specification or any clutch disc fails to meet the minimum thickness, new discs will need to be installed during assembly.

(8) Compress piston return spring with Tool 7538 (Fig. 209). Remove snap ring and remove compressor tool.

(9) Remove the piston return springs.

(10) Mount oil pump on converter. Then mount clutch on oil pump (Fig. 210).

(11) Hold clutch piston by hand and apply compressed air through oil pump feed hole to ease piston

DISASSEMBLY AND ASSEMBLY (Continued)

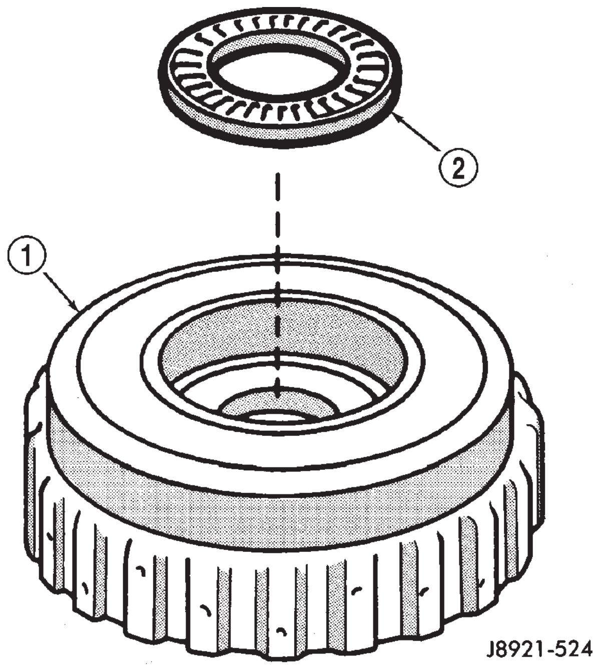


Fig. 207 Removing Clutch Drum Bearing And Race

1 – CLUTCH DRUM
2 – THRUST BEARING AND RACE

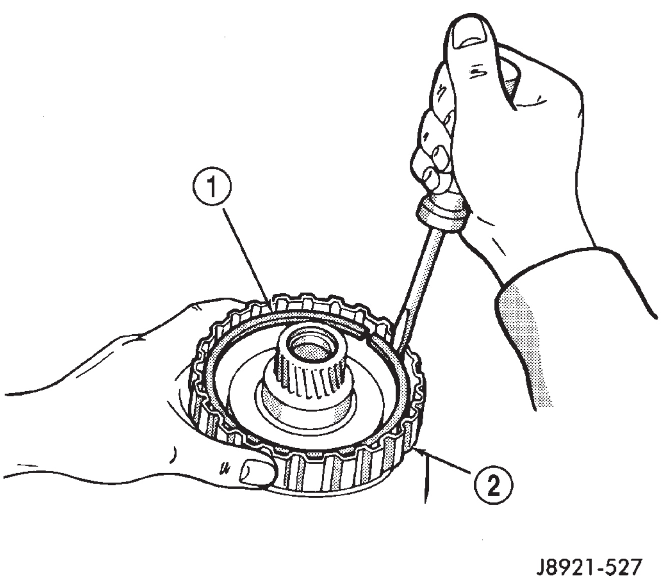


Fig. 208 Removing Clutch Pack Snap Ring

1 – SNAP RING
2 – CLUTCH RETAINER

out (Fig. 210). Apply only enough air pressure to remove piston.

(12) Measure free length of piston return springs with springs in retainer (Fig. 211). Length should be 16.8 mm (0.661 in.). Replace spring and retainer assembly if necessary.

(13) Check clutch piston check ball (Fig. 212). Shake piston to see if ball moves freely. Then check ball sealing by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

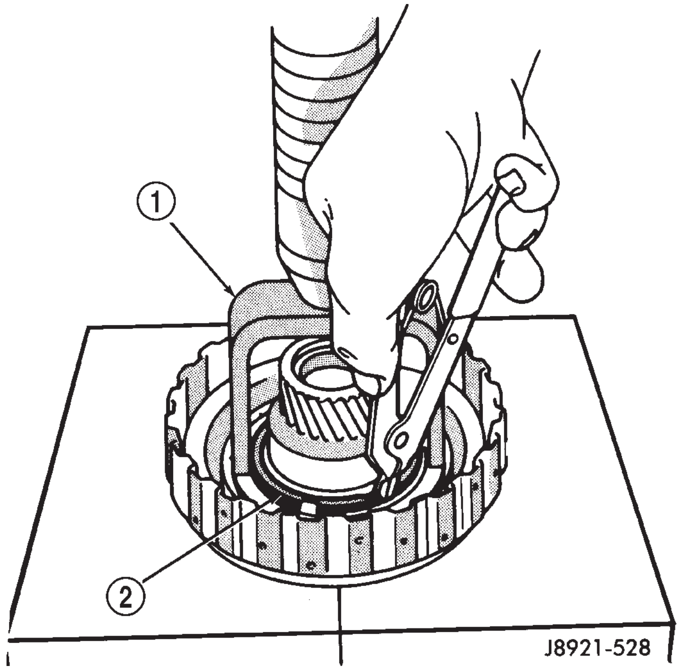


Fig. 209 Removing Clutch Piston Snap Ring

1 – COMPRESSOR TOOL
2 – CLUTCH PISTON SNAP RING

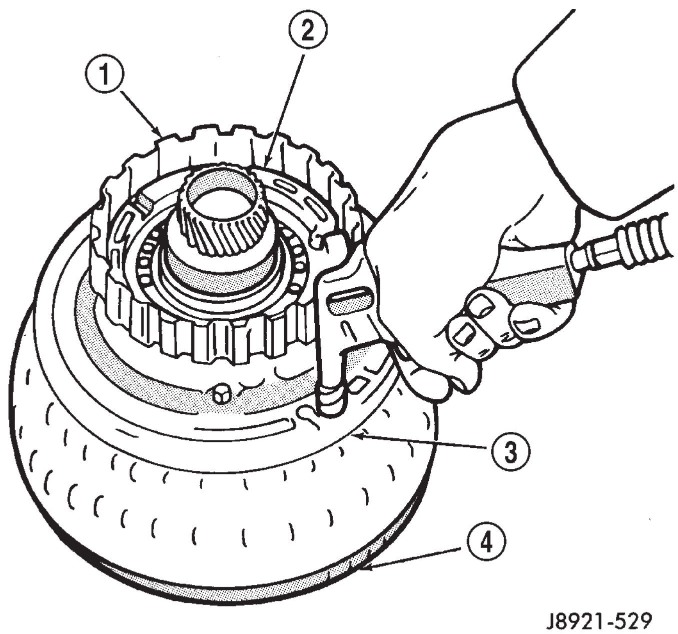


Fig. 210 Removing Overdrive Clutch Piston

1 – CLUTCH RETAINER
2 – CLUTCH PISTON
3 – OIL PUMP
4 – CONVERTER

DISASSEMBLY AND ASSEMBLY (Continued)

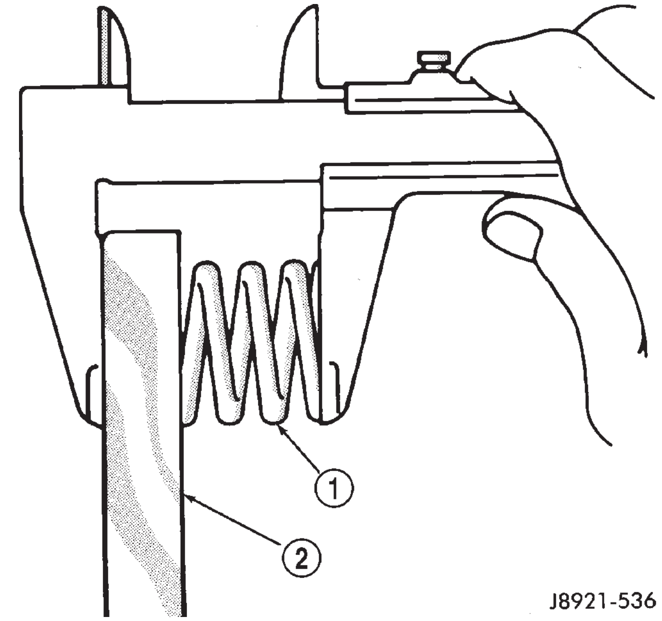


Fig. 211 Checking Piston Return Spring Length

1 – PISTON RETURN SPRINGS
2 – SPRING RETAINER

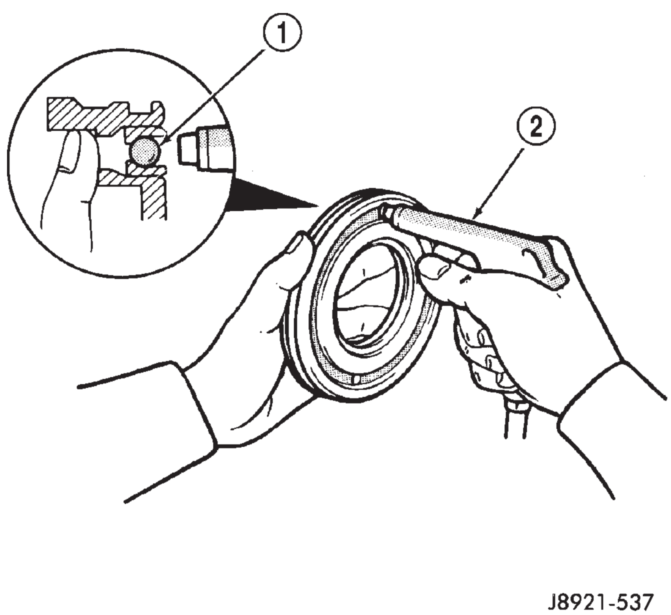


Fig. 212 Testing Clutch Piston Check Ball

1 – CLUTCH PISTON CHECK BALL
2 – USE LOW-PRESSURE COMPRESSED AIR TO TEST BALL SEATING

(14) Check inside diameter of clutch drum bushings with bore gauge or inside micrometer (Fig. 213). Maximum inside diameter is 27.11 mm (1.0673 in.). Replace drum if bushing inside diameter is greater than specified.

(15) Remove bearing and race from ring gear (Fig. 214).

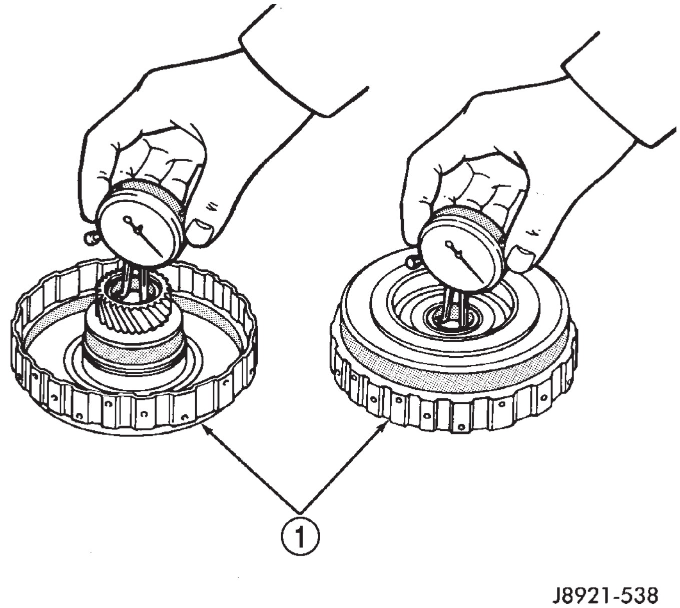


Fig. 213 Checking Clutch Drum Bushings

1 – CLUTCH DRUM

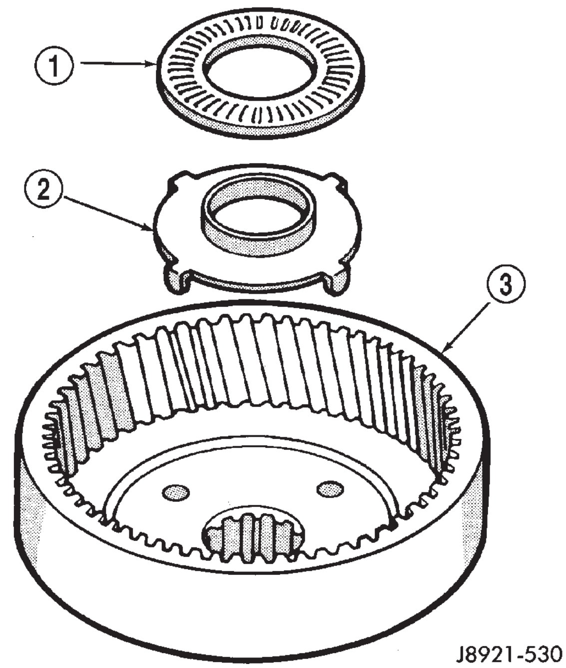


Fig. 214 Removing Ring Gear Bearing And Race

1 – BEARING
2 – RACE
3 – RING GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Remove snap ring from ring gear and remove ring gear hub (Fig. 215).

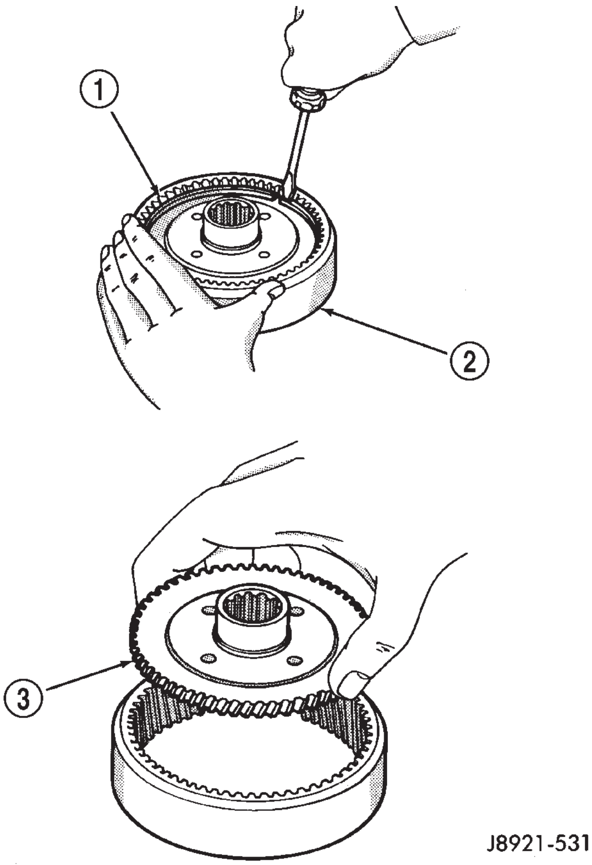


Fig. 215 Removing Ring Gear Hub

1 – SNAP RING
2 – RING GEAR
3 – RING GEAR HUB

(17) Remove race from planetary gear (Fig. 216).

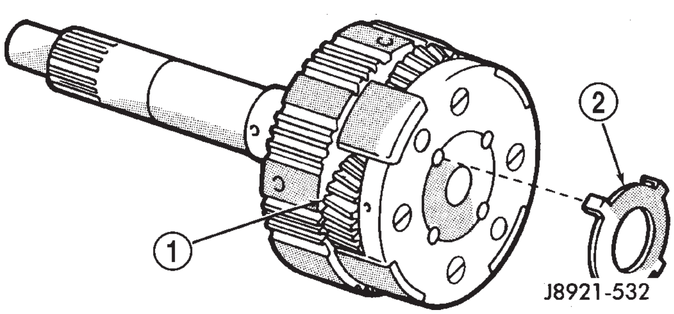


Fig. 216 Remove Planetary Gear Race

1 – PLANETARY GEAR
2 – RACE

(18) Remove snap ring and remove retaining plate (Fig. 217).

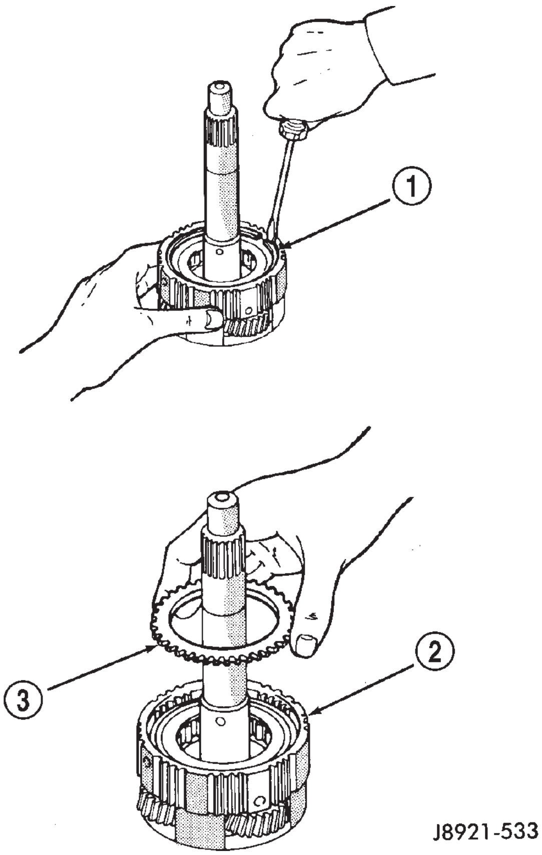


Fig. 217 Removing Snap Ring And Retaining Plate

1 – SNAP RING
2 – PLANETARY GEAR
3 – RETAINING PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

(19) Remove one–way clutch and outer race as assembly. Then separate race from clutch (Fig. 218).

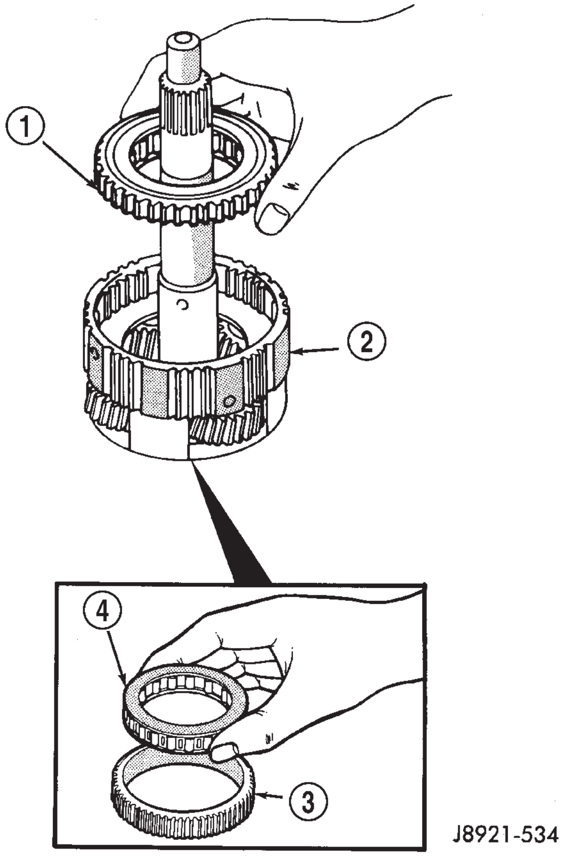


Fig. 218 Removing One–Way Clutch

1 – ONE-WAY CLUTCH AND OUTER RACE ASSEMBLY
2 – PLANETARY GEAR
3 – RACE
4 – CLUTCH

(20) Remove thrust washer (Fig. 219).

(21) Check inside diameter of planetary gear bushing (Fig. 220). Maximum inside diameter is 11.27 mm (0.4437 in.). Replace planetary gear if bushing inside diameter is greater then specified.

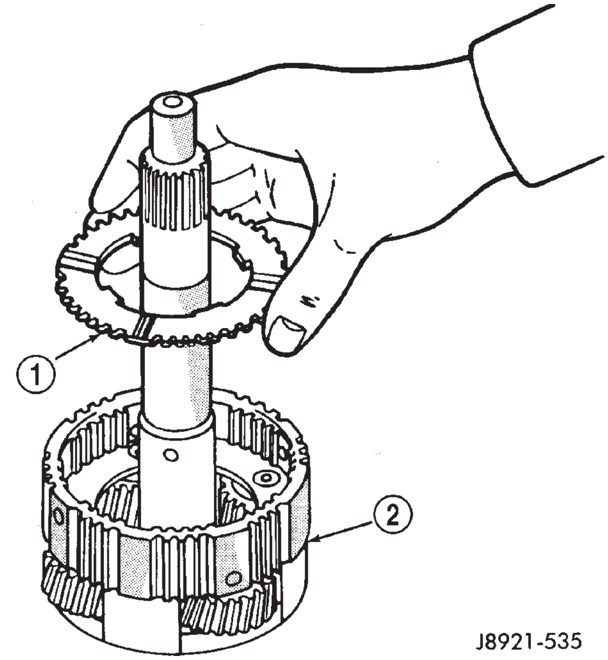


Fig. 219 Removing Planetary Thrust Washer

1 – THRUST WASHER
2 – PLANETARY GEAR

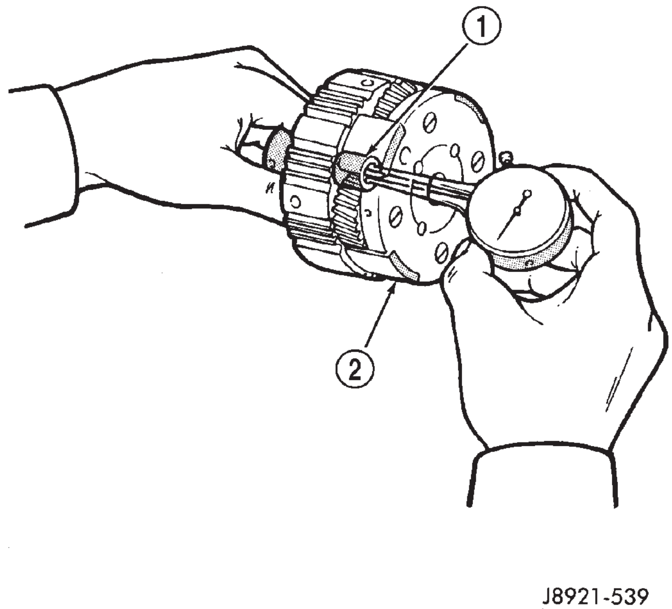


Fig. 220 Checking Planetary Bushing

1 – PLANETARY BUSHING
2 – PLANETARY GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

(1) Install thrust washer in planetary gear (Fig. 221). **Grooved side of washer faces up and toward front.**

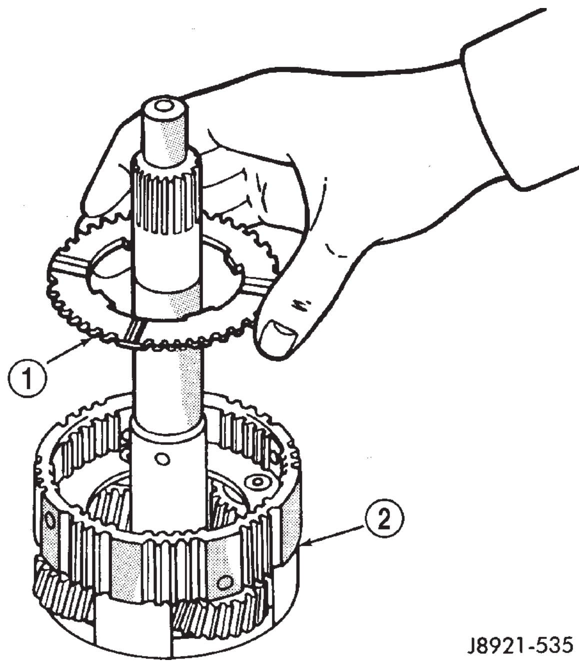


Fig. 221 Install Planetary Thrust Washer

1 – THRUST WASHER
2 – PLANETARY GEAR

(2) Install clutch race into planetary gear.

(3) Install one–way clutch into the outer race (Fig. 222). Be sure flanged side of clutch is facing upward.

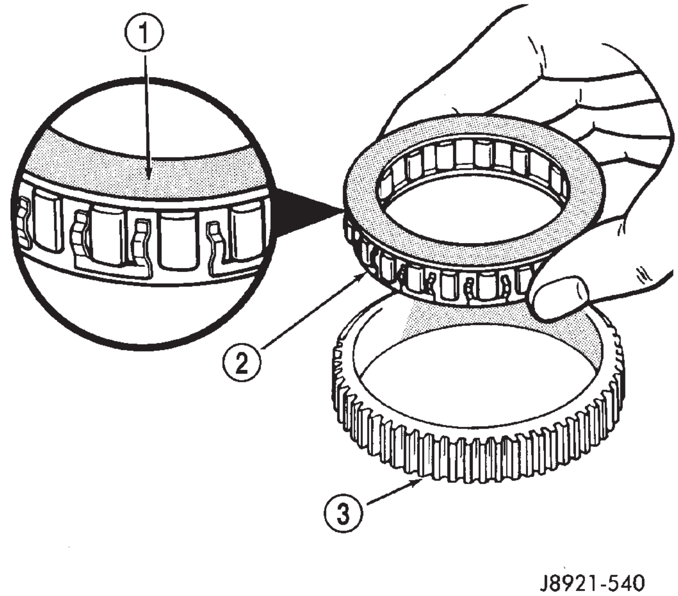


Fig. 222 Assembling One–Way Clutch And Race

1 – FLANGED SIDE OF CLUTCH FACES UP
2 – ONE-WAY CLUTCH
3 – CLUTCH RACE

(4) Install clutch retaining plate and snap ring in planetary gear.

(5) Coat planetary race with petroleum jelly and install it on planetary gear. Outside diameter of race should be 41.8 mm (1.646 in.); inside diameter is 27.1 mm (1.067 in.).

(6) Install hub in planetary ring gear and install snap ring.

(7) Coat race and bearing with petroleum jelly and install in planetary ring gear (Fig. 223).

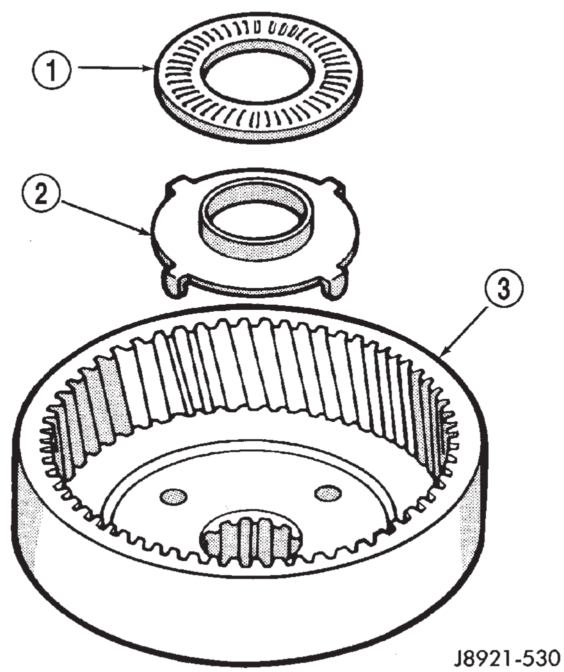


Fig. 223 Install Ring Gear Bearing And Race

1 – BEARING
2 – RACE
3 – RING GEAR

(8) Verify bearing/race size. Outside diameter of race is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.). Outside diameter of bearing is 46.8 mm (1.843 in.) and inside diameter is 26 mm (1.024 in.).

(9) Lubricate new clutch piston O–rings with Mopar® Door Ease, or Ru–Glyde. Then install rings on clutch piston and install piston in clutch drum.

(10) Install piston return springs in clutch piston (Fig. 224).

(11) Install piston snap ring. Compress piston return springs with Tool 7538 and shop press (Fig. 225).

(12) Install overdrive clutch pack in drum. Install steel plate first, then a disc (Fig. 226). Continue

DISASSEMBLY AND ASSEMBLY (Continued)

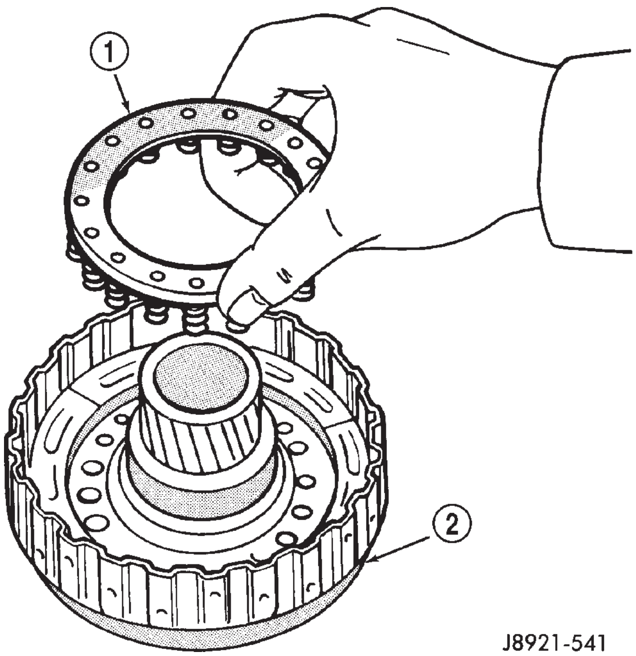


Fig. 224 Installing Piston Return Springs

1 – RETURN SPRINGS
2 – CLUTCH PISTON

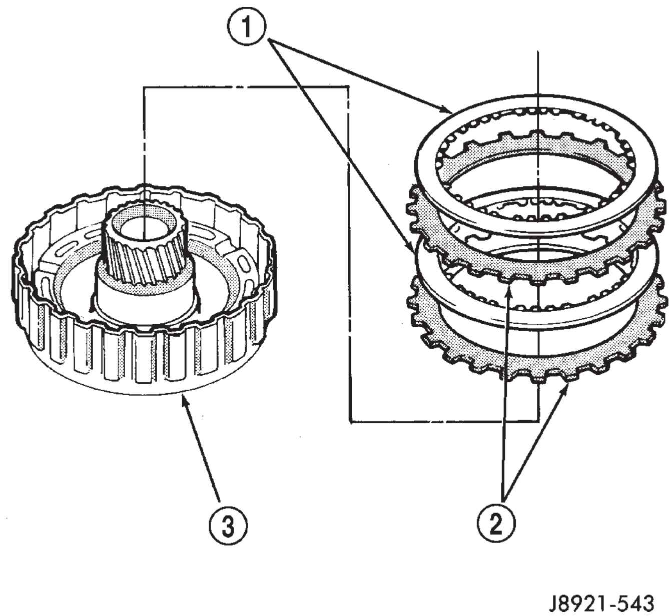


Fig. 226 Installing Overdrive Clutch Discs And Plates

1 – CLUTCH DISC
2 – STEEL PLATE
3 – CLUTCH DRUM

installation sequence until required number of discs and plates have been installed.

(13) Install clutch pack retainer with flat side facing downward. Then install retainer snap ring (Fig. 227). Compress springs with suitable tool.

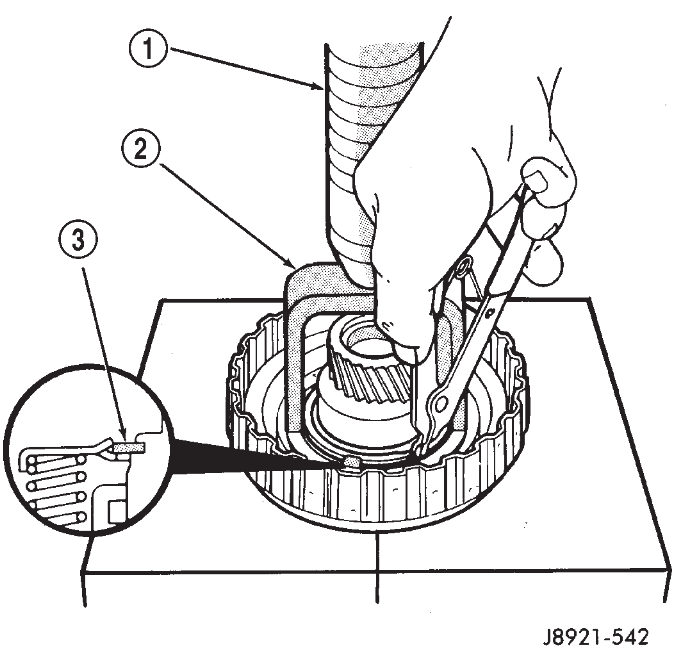


Fig. 225 Installing Clutch Piston Snap Ring

1 – PRESS RAM
2 – COMPRESSOR TOOL
3 – SNAP RING

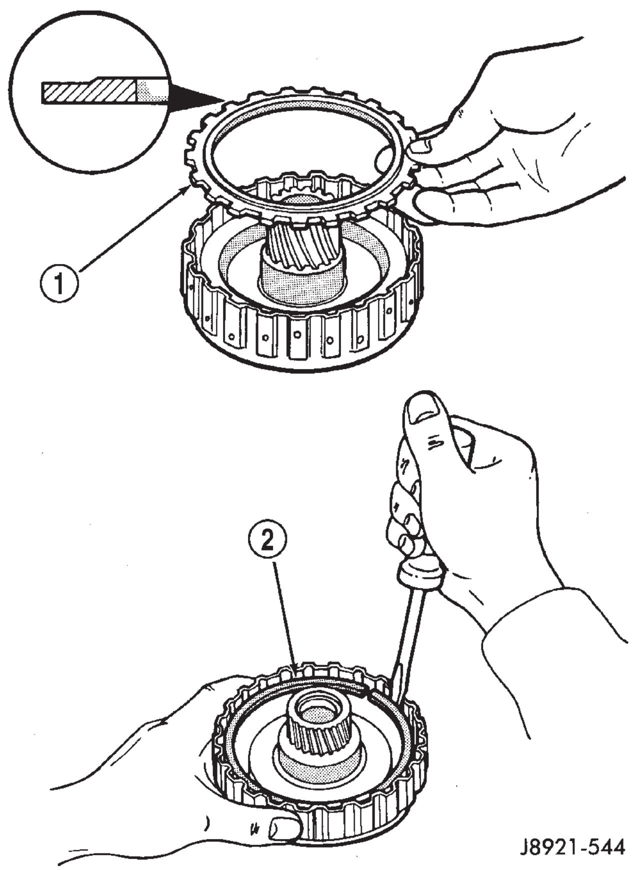


Fig. 227 Installing Retainer And Snap Ring

1 – CLUTCH PACK RETAINER
2 – RETAINER SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Install clutch drum bearing and race assembly (Fig. 228). Be sure bearing rollers face upward as shown. Outside diameter of assembled bearing and race is 50.2 mm (1.976 in.). Inside diameter is 28.9 mm (1.138 in.).

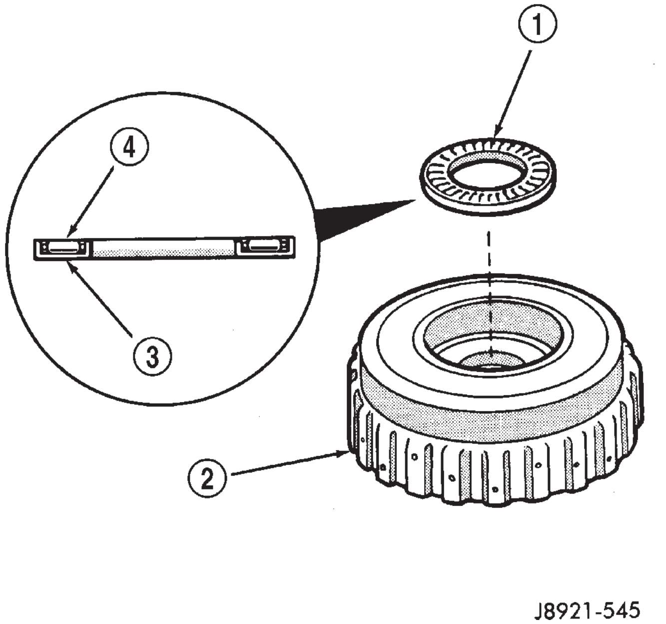


Fig. 228 Installing Clutch Drum Bearing And Race Assembly

1 – BEARING AND RACE ASSEMBLY
2 – CLUTCH DRUM
3 – RACE
4 – ROLLERS

(15) Install clutch on planetary gear.

(16) Verify one–way clutch operation. Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise.

OVERDRIVE SUPPORT

DISASSEMBLY

(1) Check brake piston operation. Mount support on clutch (Fig. 229).

(2) Apply compressed air through support feed hole and observe brake piston movement (Fig. 229). Piston should move smoothly and not bind or stick. If operation is incorrect, replace piston and support.

(3) Remove thrust bearing front race, thrust bearing and rear race (Fig. 230).

(4) Turn overdrive support over and remove bearing race and clutch drum thrust washer (Fig. 231).

(5) Compress piston return spring with Spring Compressor 7537 and remove piston snap ring (Fig. 232).

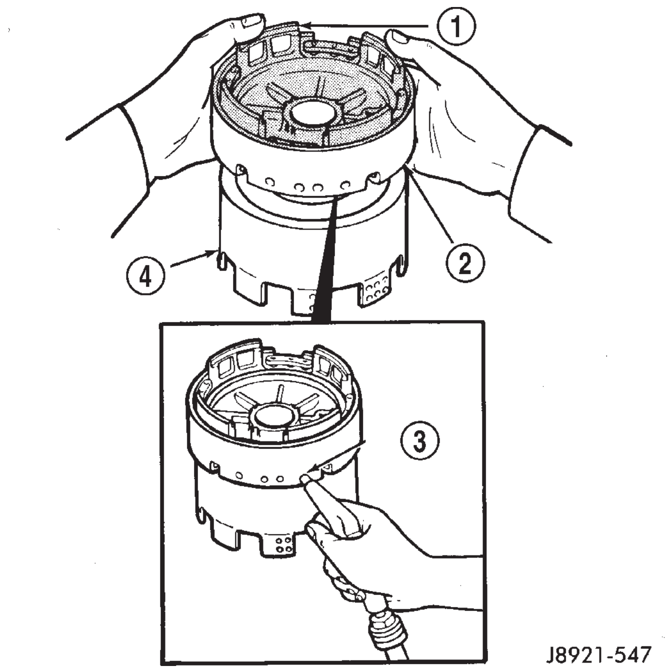


Fig. 229 Checking Brake Piston Movement

1 – BRAKE PISTON
2 – OVERDRIVE SUPPORT
3 – SUPPORT FEED HOLE
4 – CLUTCH

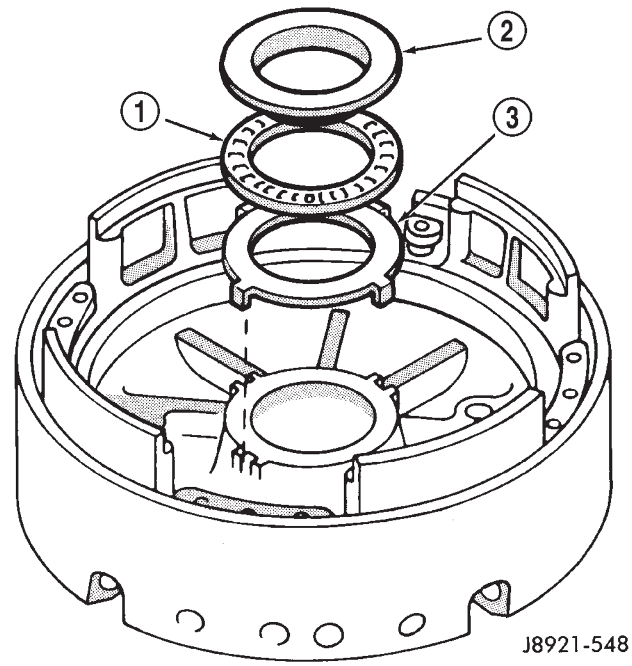


Fig. 230 Removing Support Thrust Bearing And Races

1 – THRUST BEARING
2 – FRONT RACE
3 – REAR RACE

DISASSEMBLY AND ASSEMBLY (Continued)

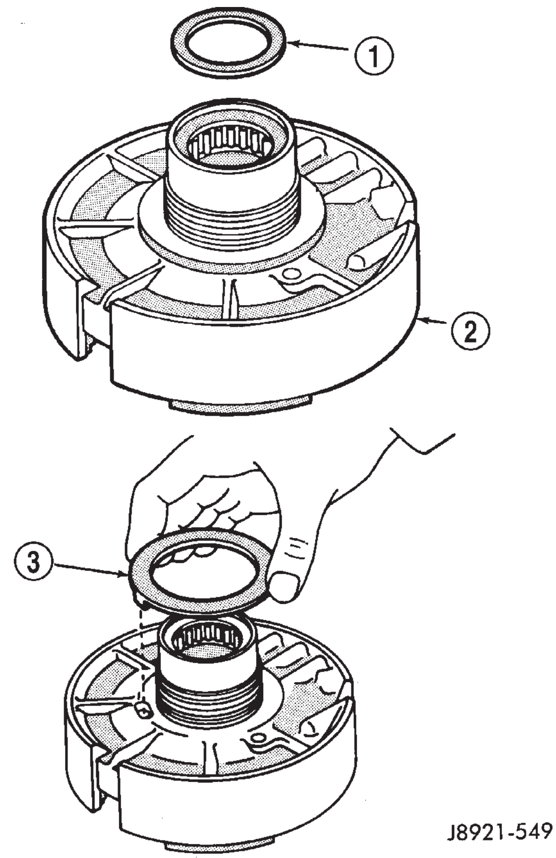


Fig. 231 Removing Clutch Drum Thrust Washer And Race

1 – BEARING RACE
2 – OVERDRIVE SUPPORT
3 – THRUST WASHER

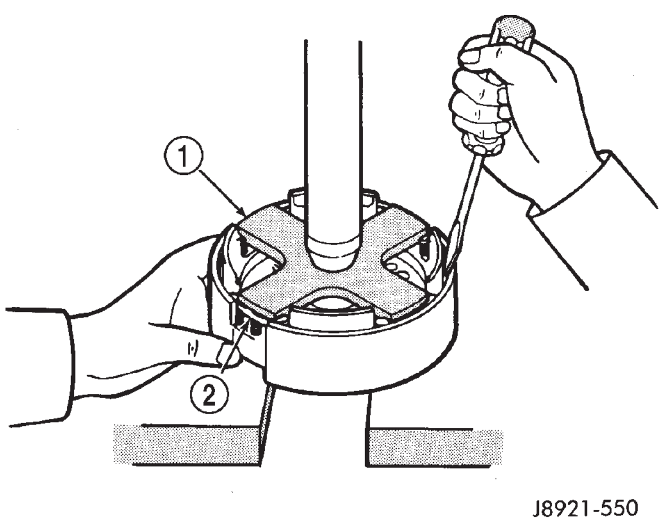


Fig. 232 Removing/Installing Piston Snap Ring

1 – COMPRESSOR TOOL
2 – SNAP RING

(6) Mount support in direct clutch and remove brake piston with compressed air. Apply air to same feed hole used when checking piston operation.

(7) Remove and discard support O–rings (Fig. 233).

(8) Remove support seal rings (Fig. 234).

(9) Measure free length of piston return springs with springs mounted in retainer (Fig. 235). Length should be 17.23 mm (0.678 in.).

(10) Clean support components and dry them with compressed air.

(11) Inspect overdrive support and brake piston. Replace support and piston if either part is worn or damaged.

ASSEMBLY

(1) Lubricate new support seal rings. Then compress rings and install them on support (Fig. 236).

(2) Lubricate and install new O–rings on brake piston. Then carefully seat piston in support.

(3) Install return springs on brake piston.

(4) Compress return springs with Spring Compressor 7537 (Fig. 232) and install piston snap ring.

(5) Install support bearing race and clutch drum thrust washer (Fig. 231).

(6) Install thrust bearing and front and rear bearing races. Thrust bearing rollers should face upward as shown (Fig. 236).

(7) Verify thrust bearing/race sizes (Fig. 237).

- Front race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).
- Rear race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).

(8) Verify brake piston operation. Use same procedure described at beginning of disassembly. Piston should operate smoothly and not bind or stick.

DISASSEMBLY AND ASSEMBLY (Continued)

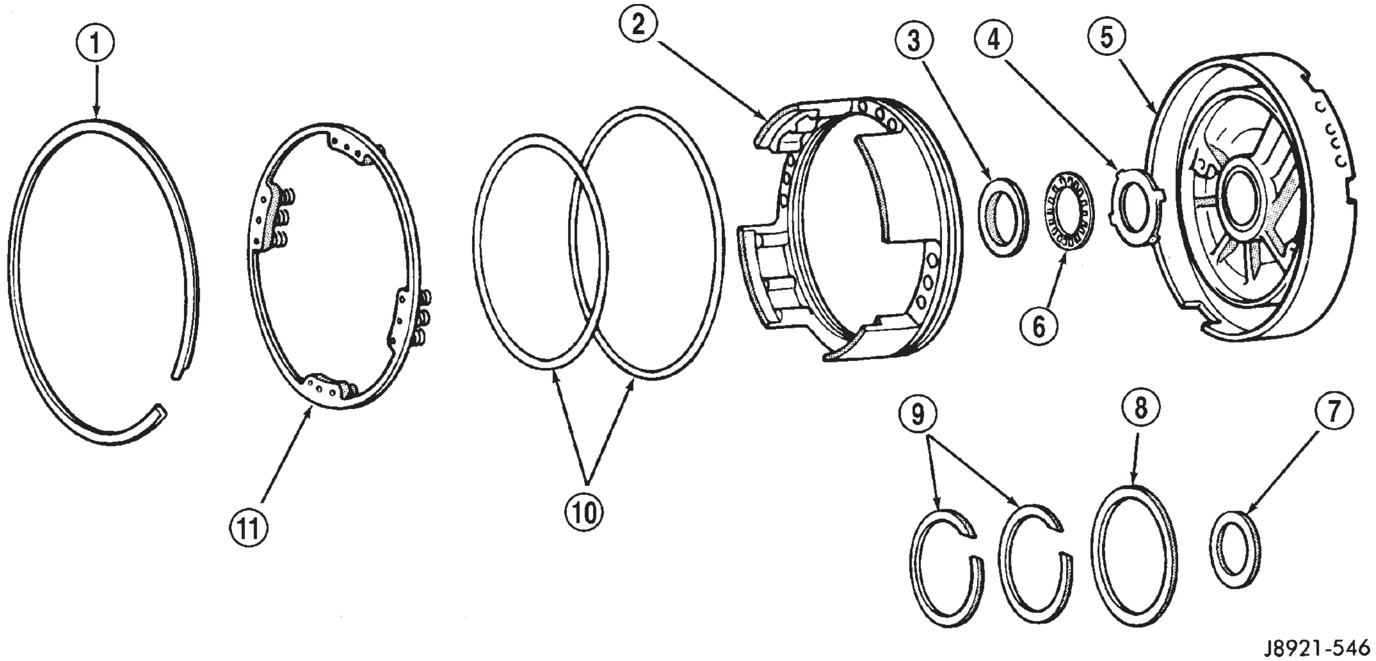


Fig. 233 Overdrive Support Components

1 – PISTON SNAP RING
2 – BRAKE PISTON
3 – FRONT RACE
4 – REAR RACE
5 – OVERDRIVE SUPPORT
6 – THRUST BEARING
7 – BEARING RACE
8 – CLUTCH DRUM THRUST WASHER
9 – SUPPORT SEAL RINGS
10 – BRAKE PISTON O-RINGS
11 – PISTON RETURN SPRING

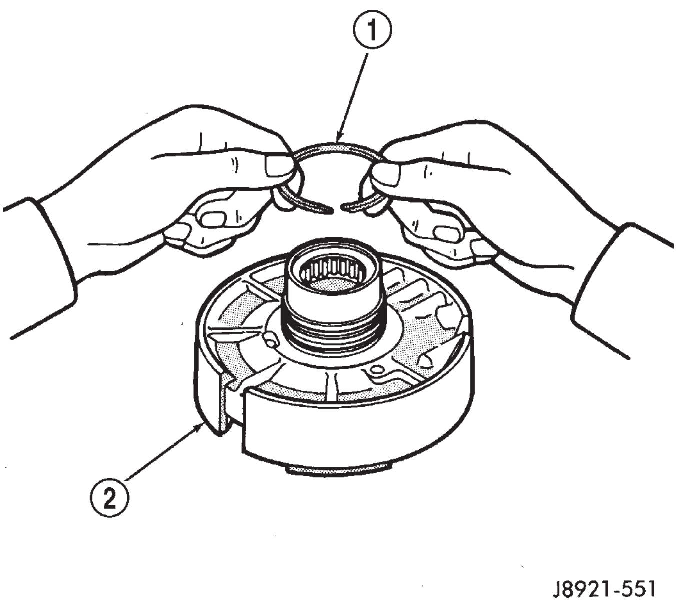


Fig. 234 Removing Support Seal Rings

1 – SEAL RINGS (2)
2 – SUPPORT

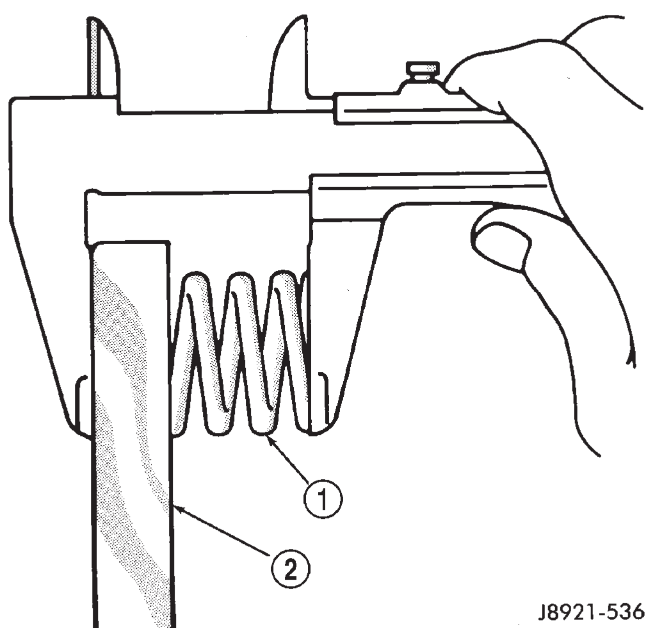


Fig. 235 Checking Piston Return Spring Length

1 – PISTON RETURN SPRINGS
2 – SPRING RETAINER

DISASSEMBLY AND ASSEMBLY (Continued)

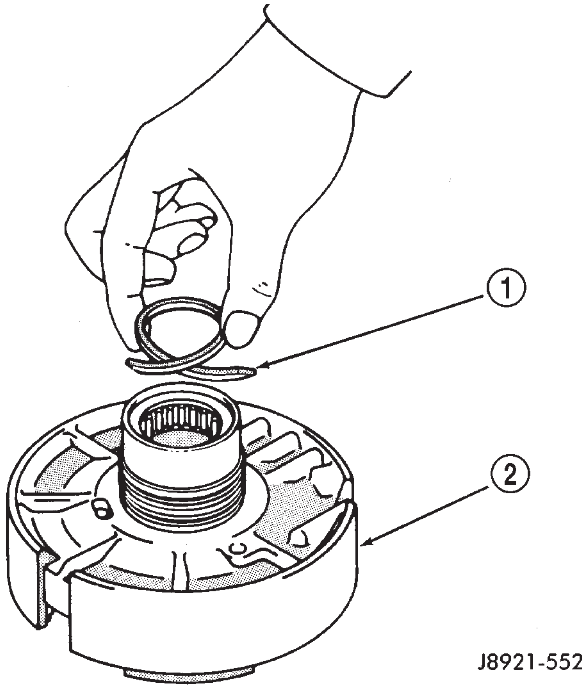


Fig. 236 Installing Support Seal Rings

1 – COMPRESS SEAL RINGS BEFORE INSTALLATION
2 – OVERDRIVE SUPPORT

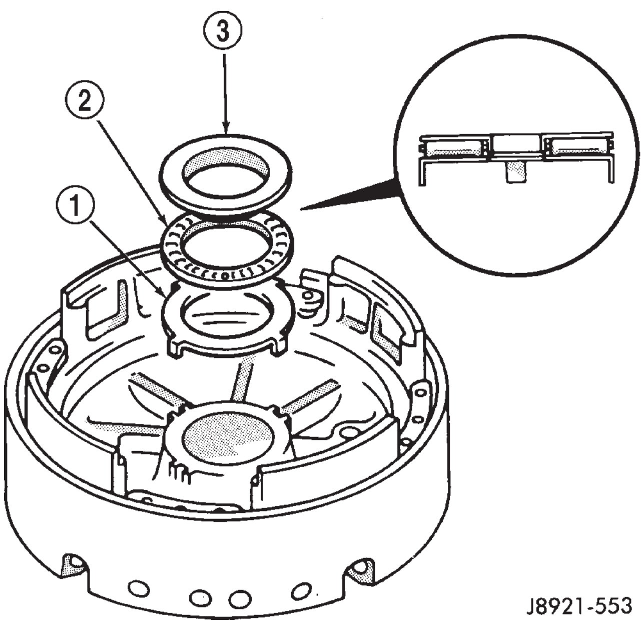


Fig. 237 Installing Support Thrust Bearing And Races

1 – REAR RACE
2 – THRUST BEARING
3 – FRONT RACE

DIRECT CLUTCH

DISASSEMBLY

(1) Remove direct clutch from forward clutch (Fig. 238).

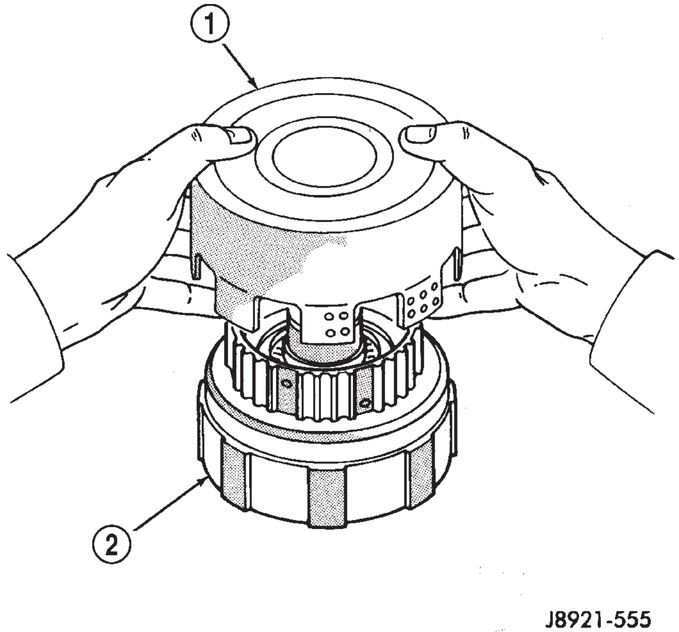


Fig. 238 Separate Direct Clutch From Forward Clutch

1 – DIRECT CLUTCH
2 – FORWARD CLUTCH

(2) Remove clutch drum thrust washer (Fig. 239).

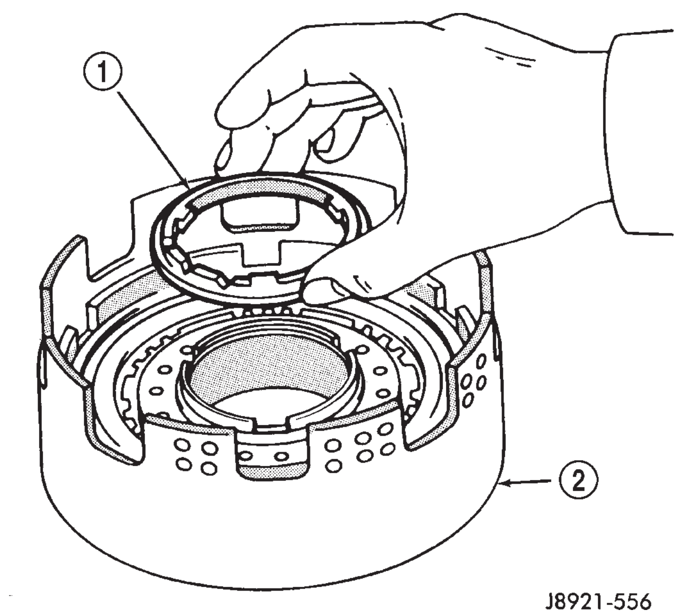


Fig. 239 Removing Clutch Drum Thrust Washer

1 – THRUST WASHER
2 – CLUTCH DRUM

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Check clutch piston stroke length as outlined in following steps.

(4) Mount direct clutch on overdrive support assembly (Fig. 240).

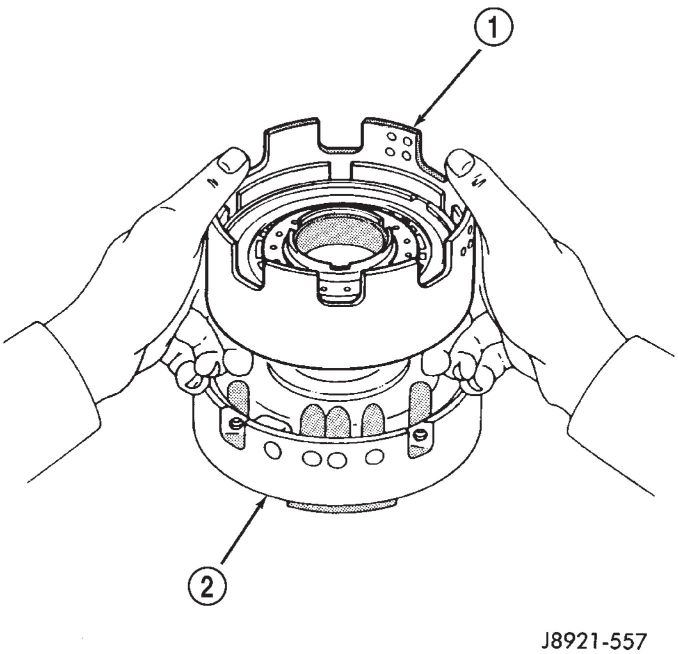


Fig. 240 Mount Direct Clutch On Overdrive Support

1 – DIRECT CLUTCH
2 – OVERDRIVE SUPPORT

(5) Mount dial indicator on clutch and position indicator plunger on clutch piston (Fig. 241).

(6) Apply 57–114 psi air pressure through feed hole in overdrive support and note piston stroke length (Fig. 241). Check stroke at least twice.

(7) Piston stroke length should be 1.37 mm – 1.67 mm (0.054 – 0.065 in.). If stroke length is incorrect, either the clutch pack retainer or clutch discs will have to be replaced.

(8) Remove clutch pack snap ring and remove retainer and clutch pack from drum (Fig. 242).

(9) Compress clutch piston return springs with tool 7538 and remove clutch piston snap ring (Fig. 243).

(10) Remove compressor tool and return spring.

(11) Remove clutch piston. Remount clutch on overdrive support (Fig. 244). Apply compressed air through piston feed hole in support to remove piston. Use only enough air to ease piston out.

(12) Remove and discard clutch piston O–rings.

(13) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in). Replace clutch pack if any disc is below minimum thickness.

(14) Measure free length of piston return springs with springs in retainer (Fig. 245). Length should be 21.32 mm (0.839 in.). Replace return springs if not within specification.

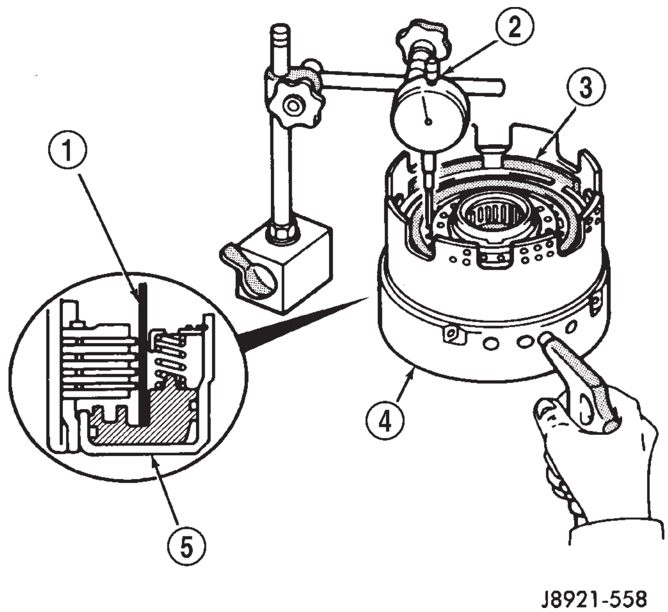


Fig. 241 Checking Direct Clutch Piston Stroke Length

1 – INDICATOR PLUNGER
2 – DIAL INDICATOR
3 – CLUTCH PISTON
4 – OVERDRIVE SUPPORT
5 – CLUTCH PISTON

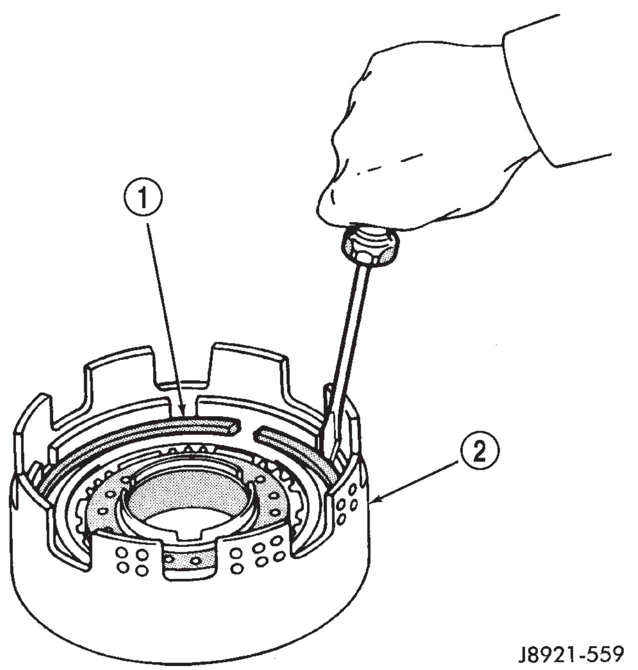


Fig. 242 Removing Clutch Pack Snap Ring

1 – CLUTCH PACK SNAP RING
2 – DIRECT CLUTCH DRUM

(15) Check clutch piston check ball (Fig. 246). Shake piston to see if ball moves freely. Then check ball seating by applying low pressure compressed air

DISASSEMBLY AND ASSEMBLY (Continued)

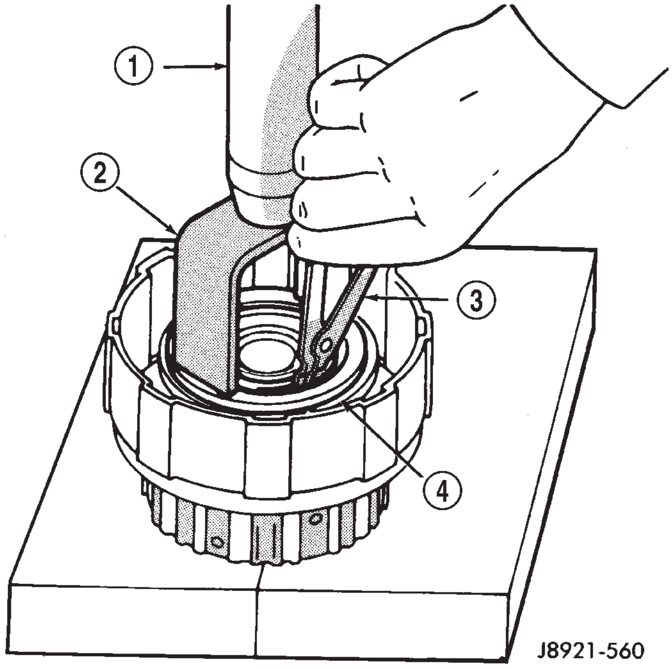


Fig. 243 Removing Piston Return Spring

1 – PRESS RAM
2 – COMPRESSOR TOOL
3 – SNAP RING PLIERS
4 – RETURN SPRING

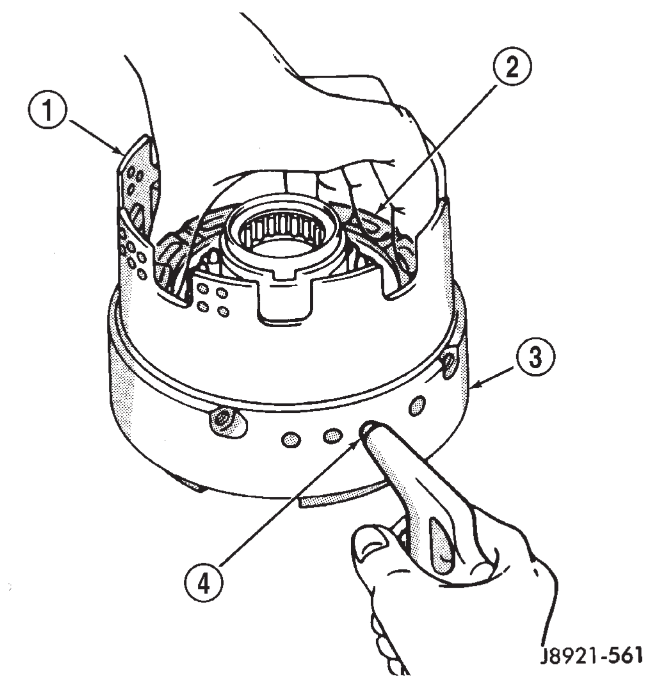


Fig. 244 Removing Direct Clutch Piston

1 – DIRECT CLUTCH DRUM
2 – CLUTCH PISTON
3 – OVERDRIVE SUPPORT
4 – SUPPORT FEED HOLE

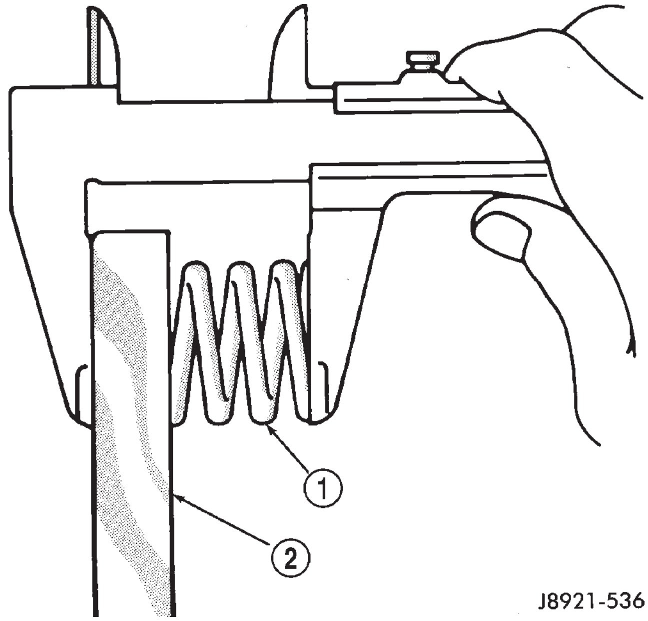


Fig. 245 Checking Piston Return Spring Length

1 – PISTON RETURN SPRINGS
2 – SPRING RETAINER

to ball inlet as shown. Air should not leak past check ball.

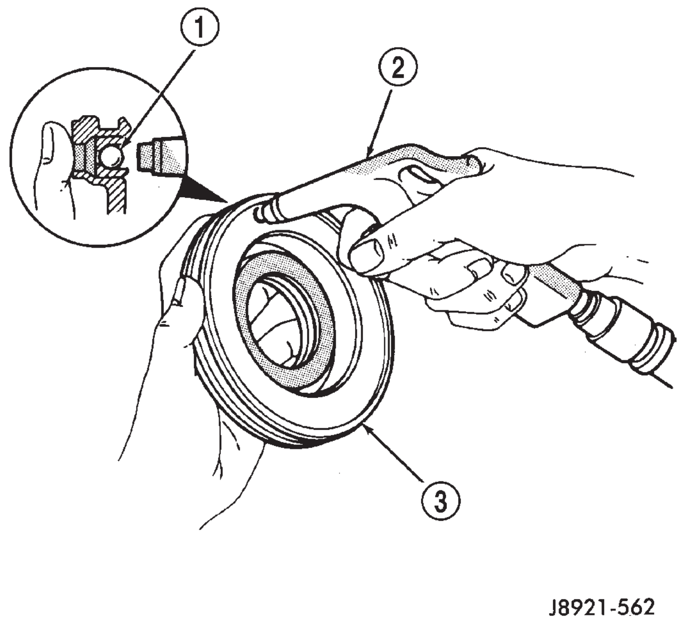


Fig. 246 Testing Piston Check Ball Seating

1 – PISTON CHECK BALL
2 – USE LOW-PRESSURE AIR TO CHECK SEATING
3 – DIRECT CLUTCH PISTON

(16) Measure inside diameter of clutch drum bushing. Inside diameter should be no more than 53.97 mm (2.1248 in.). Replace drum if bushing inside diameter is greater than specified.

DISASSEMBLY AND ASSEMBLY (Continued)

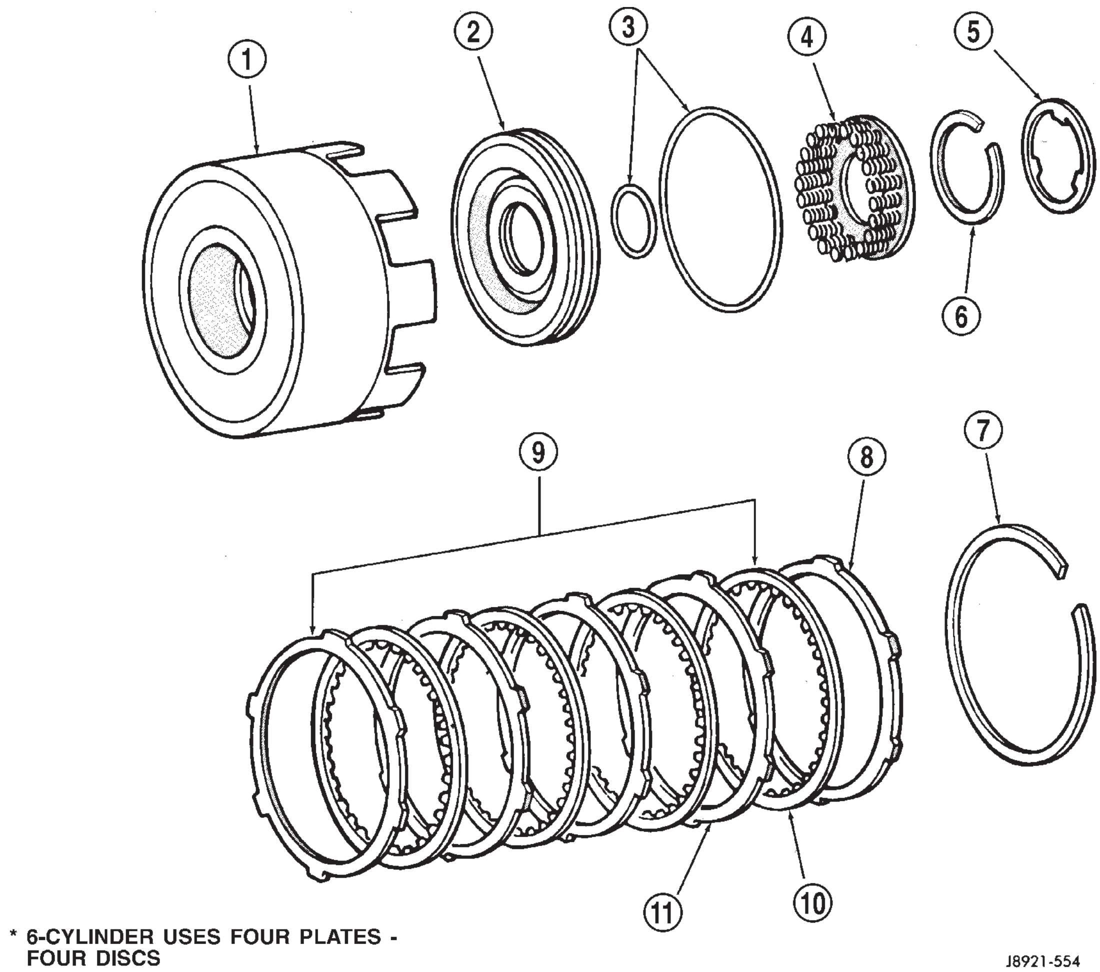


Fig. 247 Direct Clutch Components

1 – DIRECT CLUTCH DRUM
2 – DIRECT CLUTCH PISTON
3 – O-RINGS
4 – PISTON RETURN SPRINGS
5 – CLUTCH DRUM THRUST WASHER
6 – CLUTCH PISTON SNAP RING
7 – CLUTCH PACK SNAP RING
8 – RETAINER
9 – CLUTCH PACK
10 – CLUTCH DISC*
11 – CLUTCH PLATE*

ASSEMBLY

(1) Lubricate and install replacement O–rings on clutch piston (Fig. 247).

(2) Install clutch piston in drum and install return springs on piston.

(3) Compress piston return springs with Tool 7538 and install snap ring (Fig. 243). Be sure snap ring end gap is not aligned with spring retainer tab.

(4) Install clutch discs and plates (Fig. 248). Install plate then disc until all plates and discs are installed. Four plates and discs are required.

(5) Install clutch pack retainer in drum (Fig. 249).

(6) Install clutch pack snap ring (Fig. 249).

(7) Check snap ring position. If necessary, shift snap ring until end gap is **not** aligned with any notches in clutch drum (Fig. 250).

(8) Lubricate clutch drum thrust washer with petroleum jelly and install it in drum (Fig. 240).

(9) Mount direct clutch assembly on forward clutch assembly and check assembled height (Fig. 251). Height should be 70.3 to 71.5 mm (2.767 to 2.815 in.).

(10) If assembled height is incorrect, clutches are not seated.

DISASSEMBLY AND ASSEMBLY (Continued)

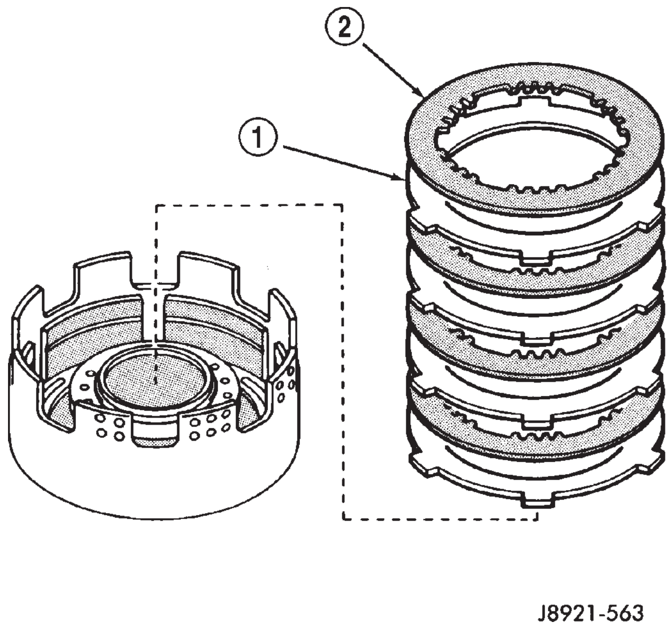


Fig. 248 Installing Direct Clutch Discs And Plates

1 – CLUTCH PLATES
2 – CLUTCH DISCS

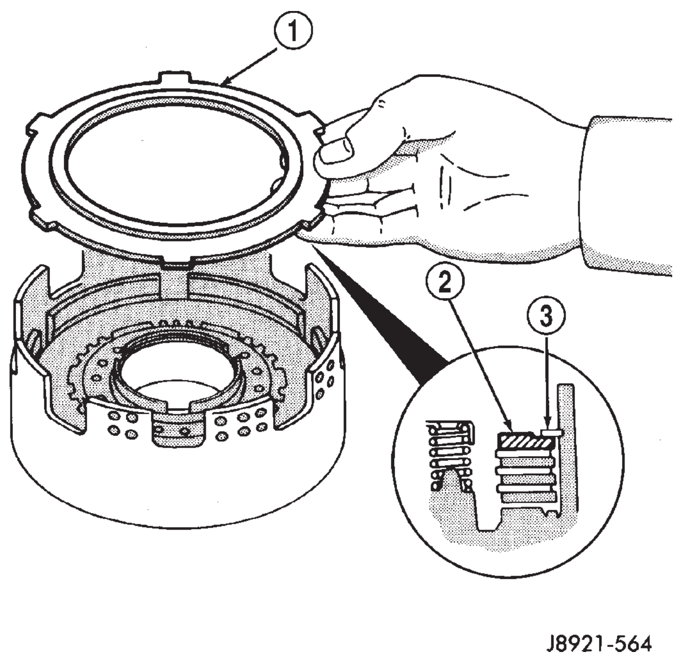


Fig. 249 Install Clutch Pack Retainer

1 – CLUTCH PACK RETAINER
2 – RETAINER
3 – SNAP RING

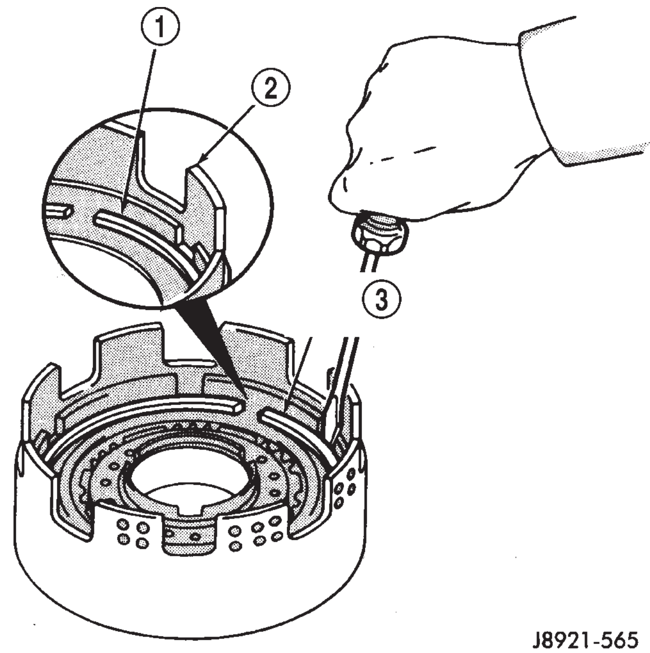


Fig. 250 Adjusting Clutch Pack Snap Ring Position

1 – CLUTCH PACK SNAP RING
2 – DRUM NOTCH
3 – SHIFT SNAP RING END GAP AWAY FROM DRUM NOTCHES

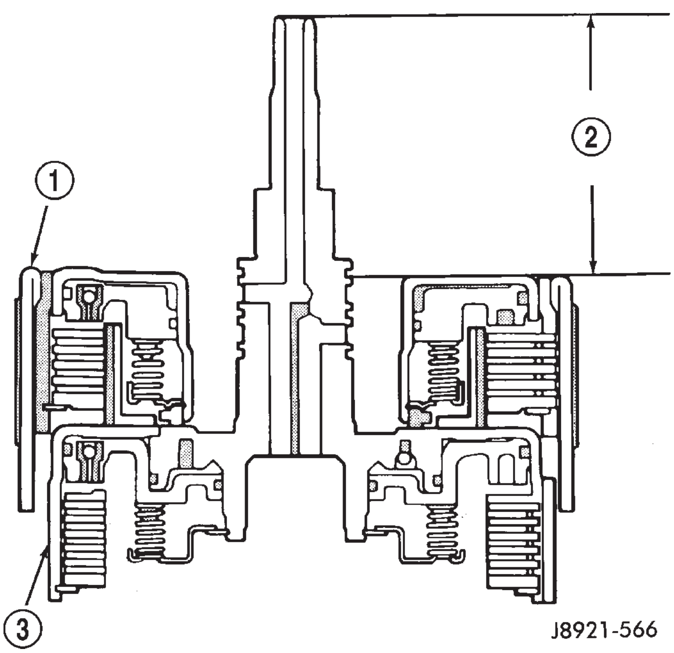


Fig. 251 Checking Direct Clutch Assembled Height

1 – DIRECT CLUTCH
2 – HEIGHT SHOULD BE 70.3-71.5 mm (2.767-2.815 in.)
3 – FORWARD CLUTCH

DISASSEMBLY AND ASSEMBLY (Continued)

FORWARD CLUTCH

DISASSEMBLY

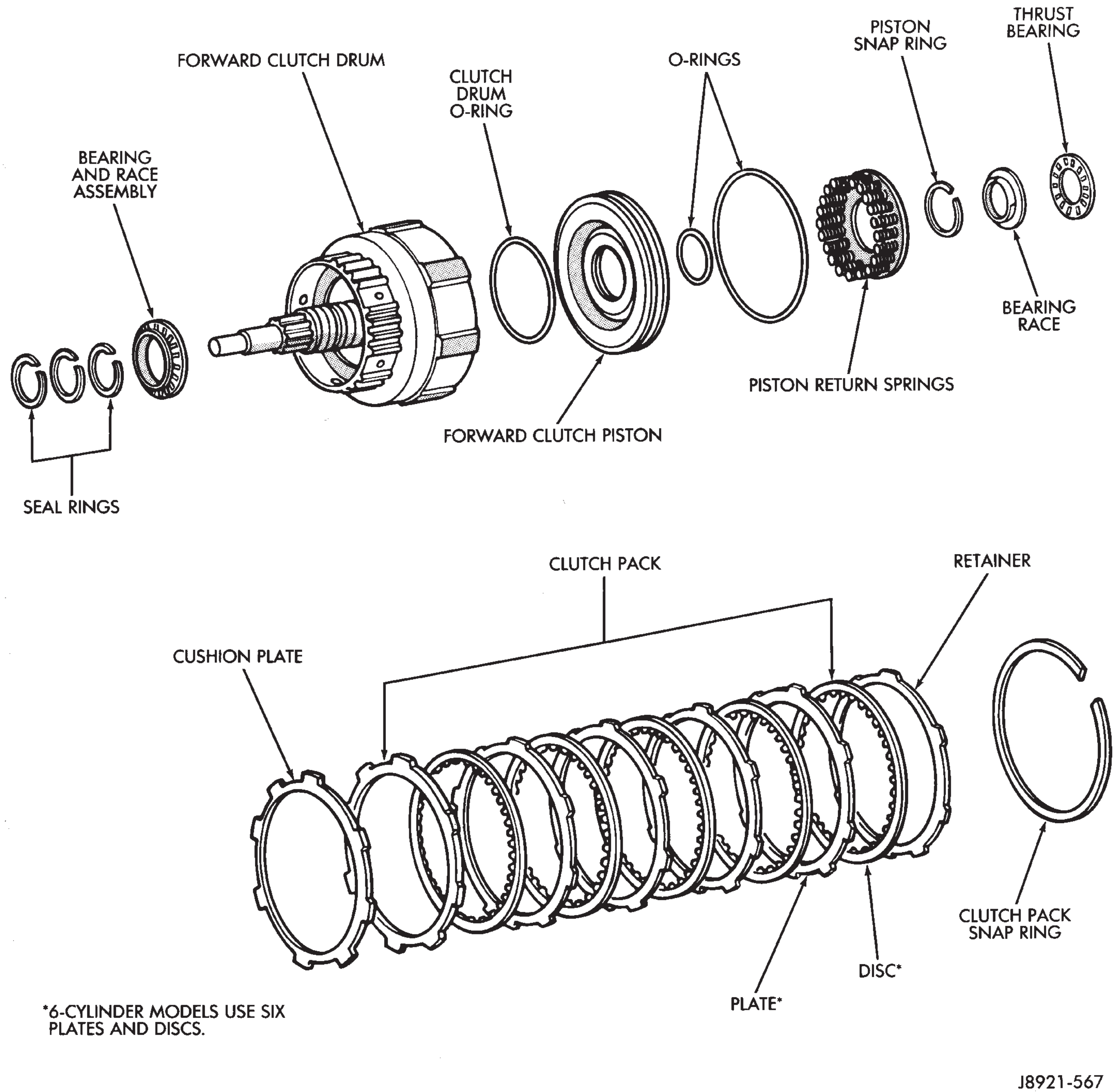


Fig. 252 Forward Clutch Components

(1) Check clutch piston stroke as outlined in following steps.

(2) Position overdrive support on wood blocks and mount forward clutch drum on support (Fig. 253).

(3) Remove bearing and race from forward clutch drum (Fig. 253).

(4) Install a suitable threaded bolt/rod into the side of the overdrive support.

(5) Mount Miller Tool C-3339 dial indicator components onto the threaded rod as necessary.

(6) Position dial indicator plunger squarely against clutch piston.

DISASSEMBLY AND ASSEMBLY (Continued)

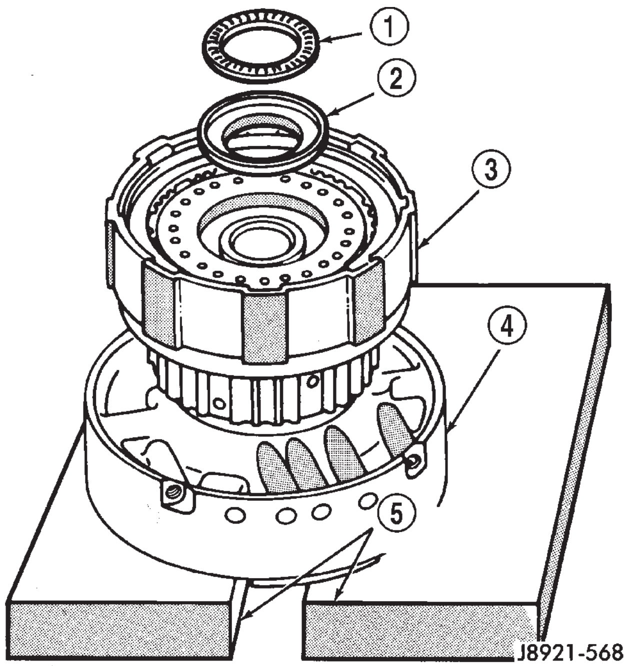


Fig. 253 Positioning Drum And Support On Wood Blocks

1 – THRUST BEARING
2 – BEARING RACE
3 – FORWARD CLUTCH DRUM
4 – OVERDRIVE SUPPORT
5 – WOOD BLOCKS

(7) Apply compressed air through right side feed hole in support and note piston stroke length on dial indicator.

(8) Stroke length should be 3.55 – 3.73 mm (0.1348 – 0.1469 in.).

(9) Replace clutch discs if stroke length is incorrect.

(10) Remove clutch pack snap ring and remove retainer and clutch pack (Fig. 254).

(11) Remove clutch pack cushion plate (Fig. 255).

(12) Compress clutch springs with Tool 7538 and remove piston snap ring.

(13) Remove spring compressor tool and piston return springs.

(14) Remount forward clutch drum on overdrive support (Fig. 256).

(15) Apply compressed air through feed hole in support to remove piston (Fig. 256). Use only enough air pressure to ease piston out of drum.

(16) Remove and discard clutch piston O–rings (Fig. 257).

(17) Remove clutch drum O–ring from rear hub of drum.

(18) Remove three seal rings from clutch drum shaft (Fig. 258).

(19) Remove thrust bearing and race assembly from clutch drum (Fig. 259).

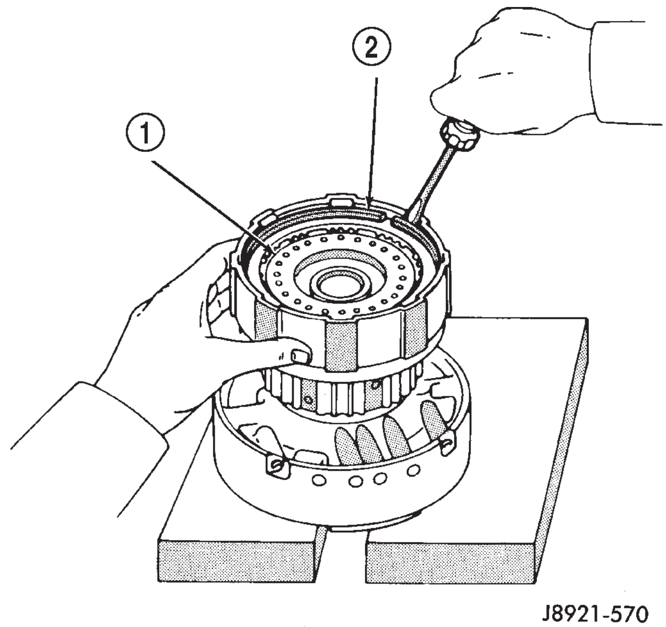


Fig. 254 Removing Retainer And Clutch Pack

1 – RETAINER AND CLUTCH PACK
2 – SNAP RING

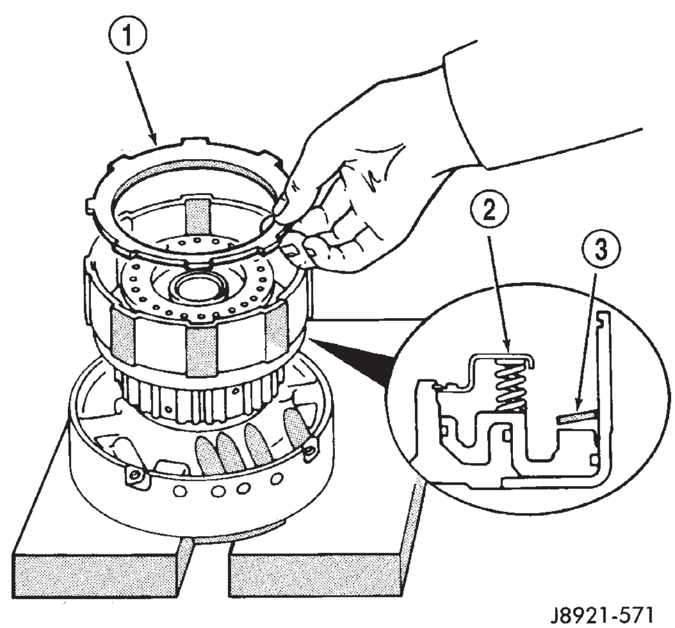


Fig. 255 Removing Cushion Plate

1 – CUSHION PLATE
2 – RETURN SPRINGS
3 – CUSHION PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

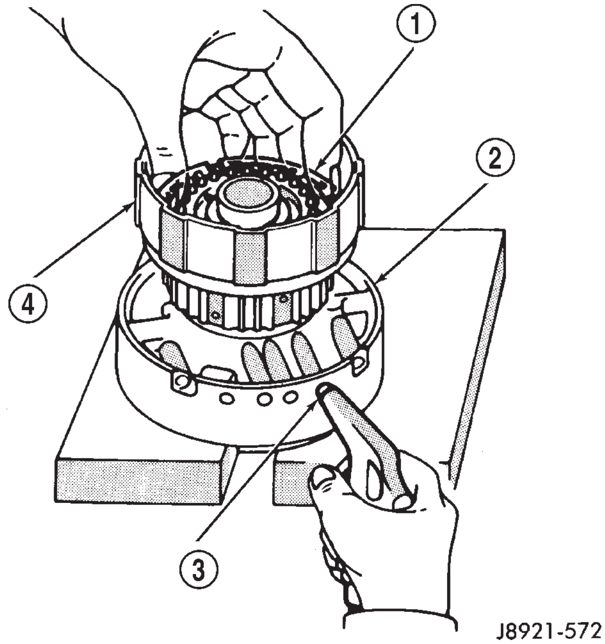


Fig. 256 Removing Forward Clutch Piston

1 – CLUTCH PISTON
2 – OVERDRIVE SUPPORT
3 – FEED HOLE
4 – CLUTCH DRUM

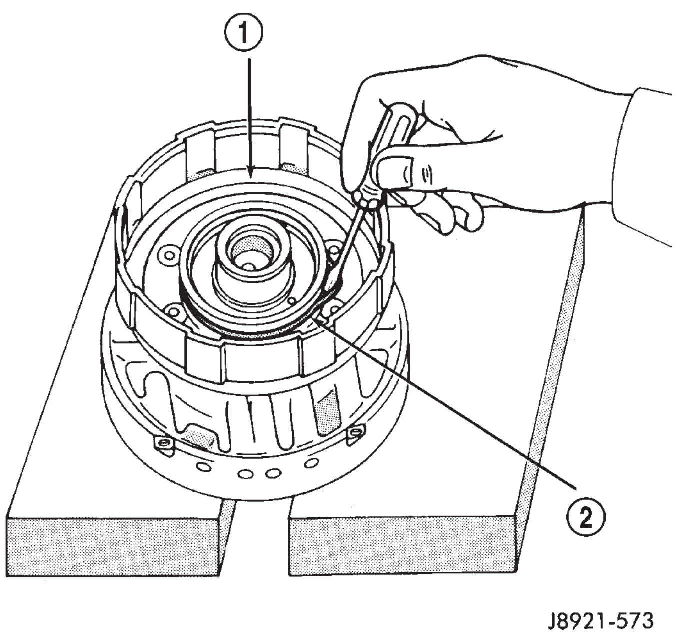


Fig. 257 Removing/Installing Clutch Drum O–Ring

1 – CLUTCH DRUM HUB
2 – O-RING

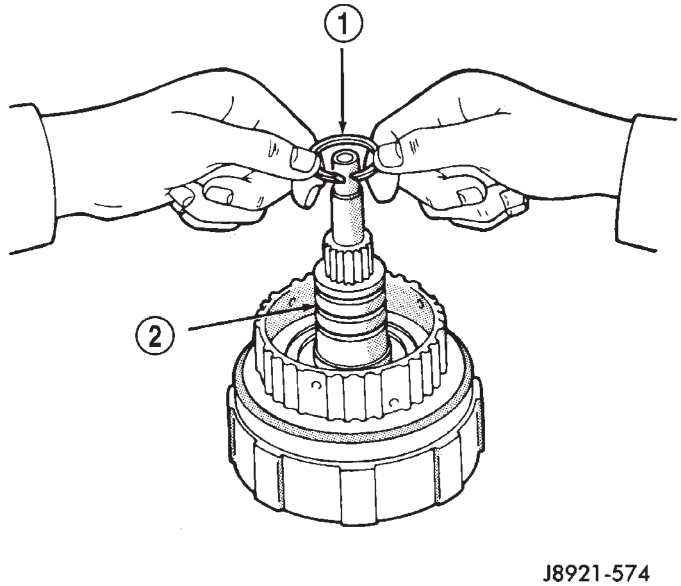


Fig. 258 Removing Clutch Drum Seal Rings

1 – SEAL RINGS
2 – CLUTCH DRUM SHAFT

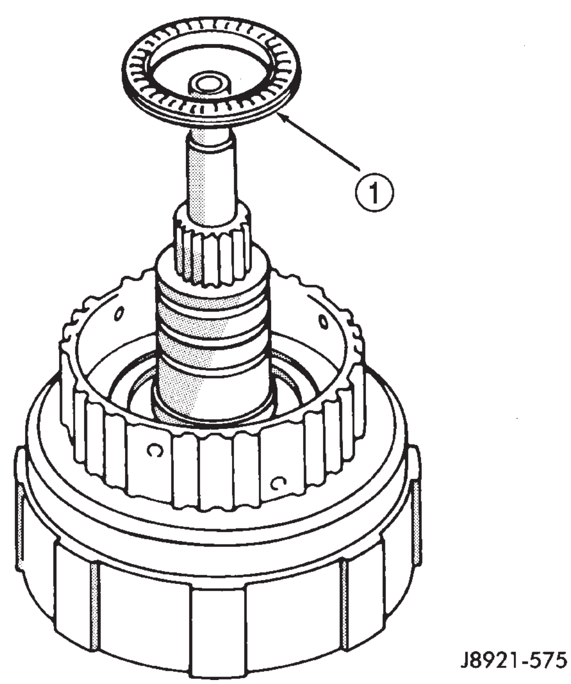


Fig. 259 Removing Clutch Drum Thrust Bearing Assembly

1 – THRUST BEARING AND RACE ASSEMBLY

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Measure clutch disc thickness (Fig. 260). Minimum allowable thickness is 1.51 mm (0.0595 in.). Replace clutch pack if any disc falls below specified minimum thickness.

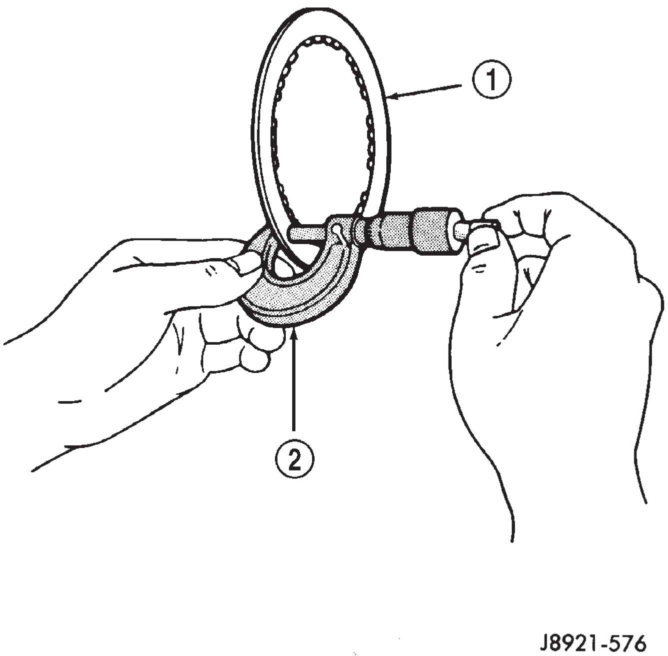


Fig. 260 Measuring Clutch Disc Thickness

1 – CLUTCH DISC
2 – MICROMETER

(21) Measure free length of piston return springs with springs mounted in retainer (Fig. 261). Length should be 19.47 mm (0.767 in.). Replace springs and retainer if length is incorrect.

(22) Inspect clutch piston check ball (Fig. 262). Ball should move freely within piston. Check ball seating by applying low pressure compressed air to ball feed hole. Ball should seat firmly and not leak air.

(23) Measure inside diameter of bushing in clutch drum hub. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace clutch drum if bushing inside diameter is greater than specified.

ASSEMBLY

(1) Lubricate bearing and race assembly with petroleum jelly and install it in clutch drum (Fig. 263). Race side of assembly faces downward and toward drum. Bearing rollers face up (Fig. 263)

(2) Coat new clutch drum shaft seal rings with petroleum jelly. Before installing drum shaft seal rings, squeeze each ring so ring ends overlap (Fig. 264). This tightens ring making clutch installation easier.

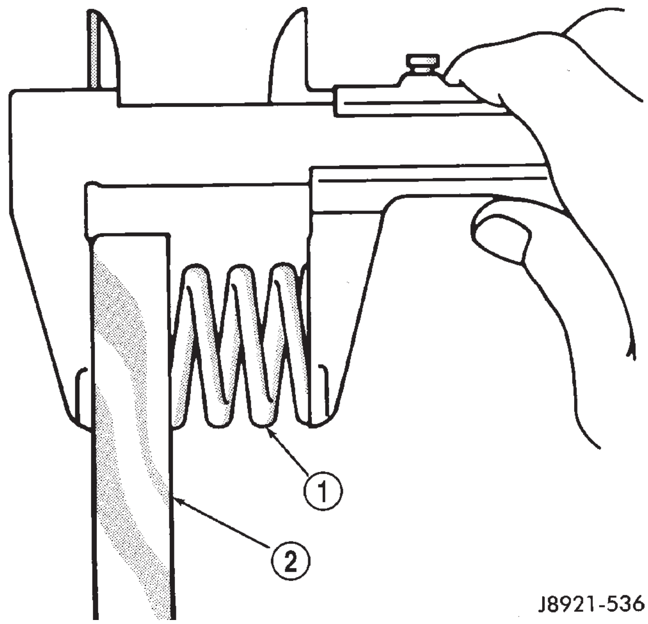


Fig. 261 Checking Return Spring Length

1 – PISTON RETURN SPRINGS
2 – SPRING RETAINER

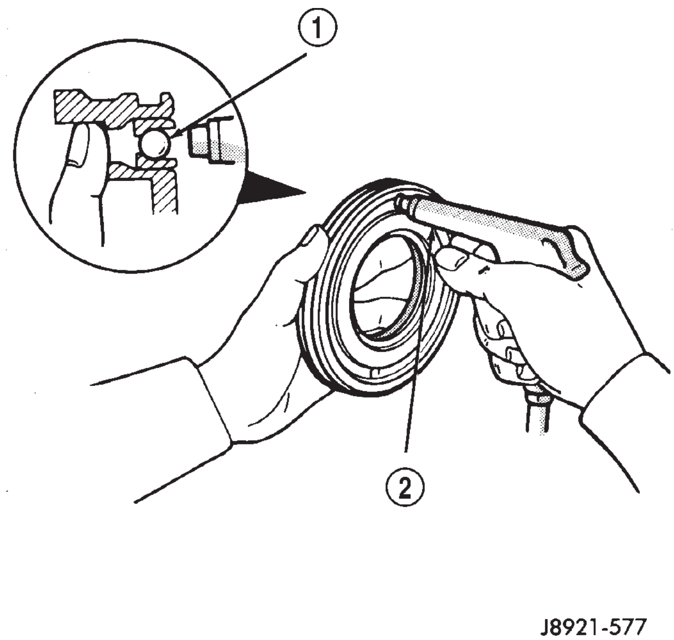


Fig. 262 Testing Piston Check Ball

1 – PISTON CHECK BALL
2 – USE LOW AIR PRESSURE FOR TEST

(3) Install seal rings on shaft. Keep rings closed as tightly as possible during installation. Avoid overspreading them.

(4) Mount clutch drum on overdrive support.

(5) Lubricate and install new O–ring on clutch drum hub (Fig. 257).

DISASSEMBLY AND ASSEMBLY (Continued)

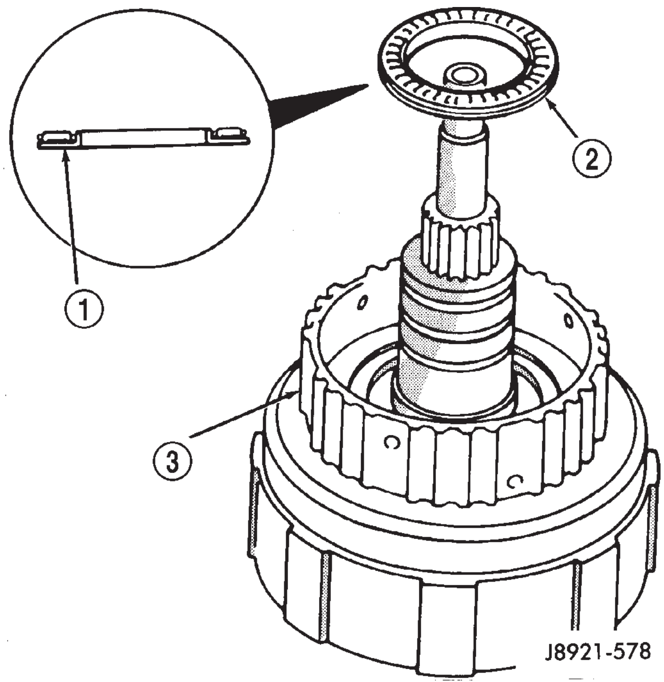


Fig. 263 Installing Thrust Bearing And Race

1 – BEARING ROLLERS FACE UP
2 – THRUST BEARING AND RACE
3 – FORWARD CLUTCH

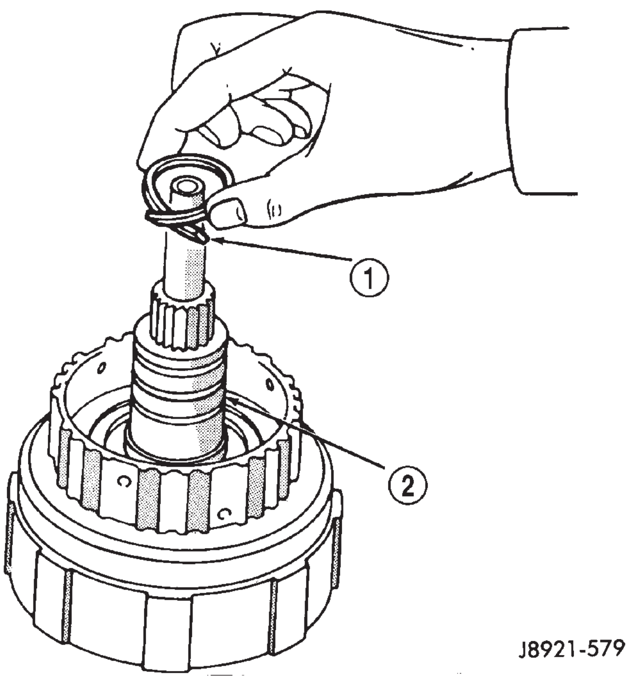


Fig. 264 Installing Clutch Drum Shaft Seal Rings

1 – SEAL RINGS (COMPRESS BEFORE INSTALLATION)
2 – CLUTCH DRUM SHAFT

(6) Lubricate new clutch piston O–rings with Mopar Door Ease, or Ru–Glyde. Install rings on clutch piston and install piston in drum.

(7) Install piston return springs.

(8) Compress piston return springs with Tool 7538 and shop press and install piston snap ring. Be sure snap ring end gap is not aligned with any notches in drum.

(9) Install cushion plate in drum. Concave side of plate faces downward (Fig. 255).

(10) Install clutch discs, plates and retainer (Fig. 265). Install tabbed plate followed by disc until required number of plates and discs are installed. Use six plates and discs.

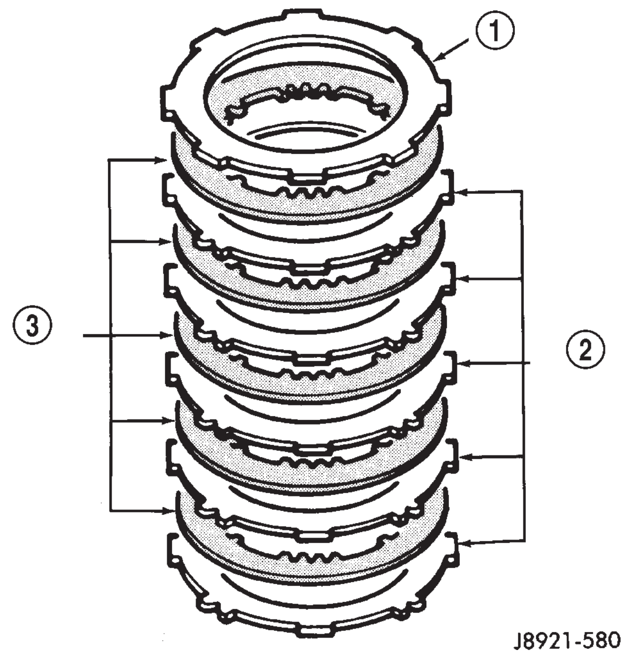


Fig. 265 Installing Forward Clutch Discs And Plates

1 – RETAINER
2 – CLUTCH PLATES
3 – CLUTCH DISCS

(11) Install clutch pack snap ring.

(12) Recheck clutch piston stroke length using same method outlined at beginning of disassembly procedure. If stroke length is not within specified limits, replace clutch discs.

(13) Lubricate race and bearing with petroleum jelly and install them in clutch drum (Fig. 266). Be sure bearing rollers face up and race lip seats in drum as shown.

(14) Verify bearing and race size.

- Outer diameter of bearing is 46.7 mm (1.839 in).
- Outer diameter of race is 48.9 mm (1.925 in.).
- Inner diameter of bearing and race is 26.0 mm (1.024 in.).

(15) Mount forward clutch on direct clutch and check assembled height (Fig. 267). Height should be 70.3 – 71.5 mm (2.767 – 2.815 in.).

DISASSEMBLY AND ASSEMBLY (Continued)

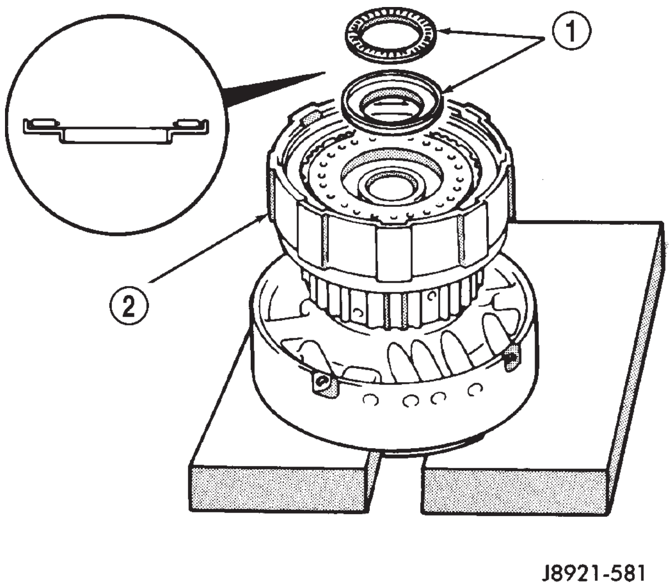


Fig. 266 Installing Thrust Bearing And Race

1 – THRUST BEARING AND RACE
2 – CLUTCH DRUM

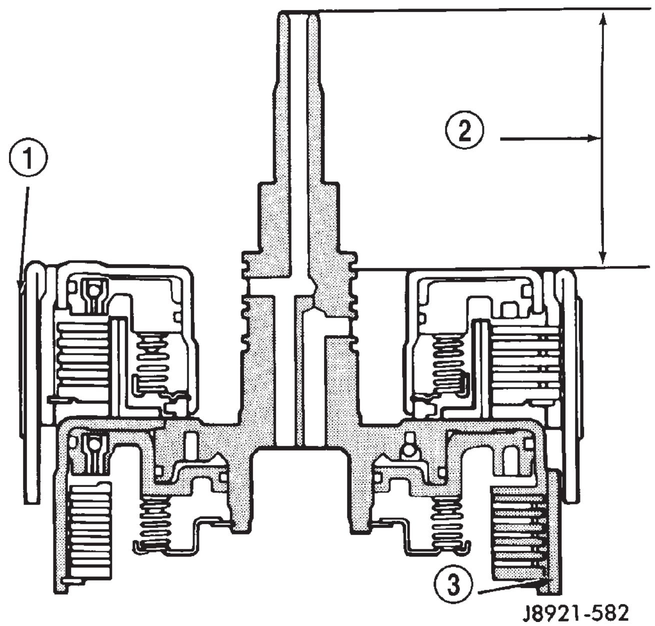


Fig. 267 Checking Forward Clutch Assembled Height

1 – DIRECT CLUTCH
2 – APPROXIMATELY 71.2 mm (2.80 in.)
3 – FORWARD CLUTCH

FRONT PLANETARY GEAR

DISASSEMBLY

(1) Remove ring gear from planetary gear (Fig. 268).

(2) Remove front bearing and the two races from ring gear (Fig. 268).

(3) Remove tabbed thrust race from planetary gear (Fig. 268).

(4) Remove snap ring attaching planetary gear to shaft and remove gear.

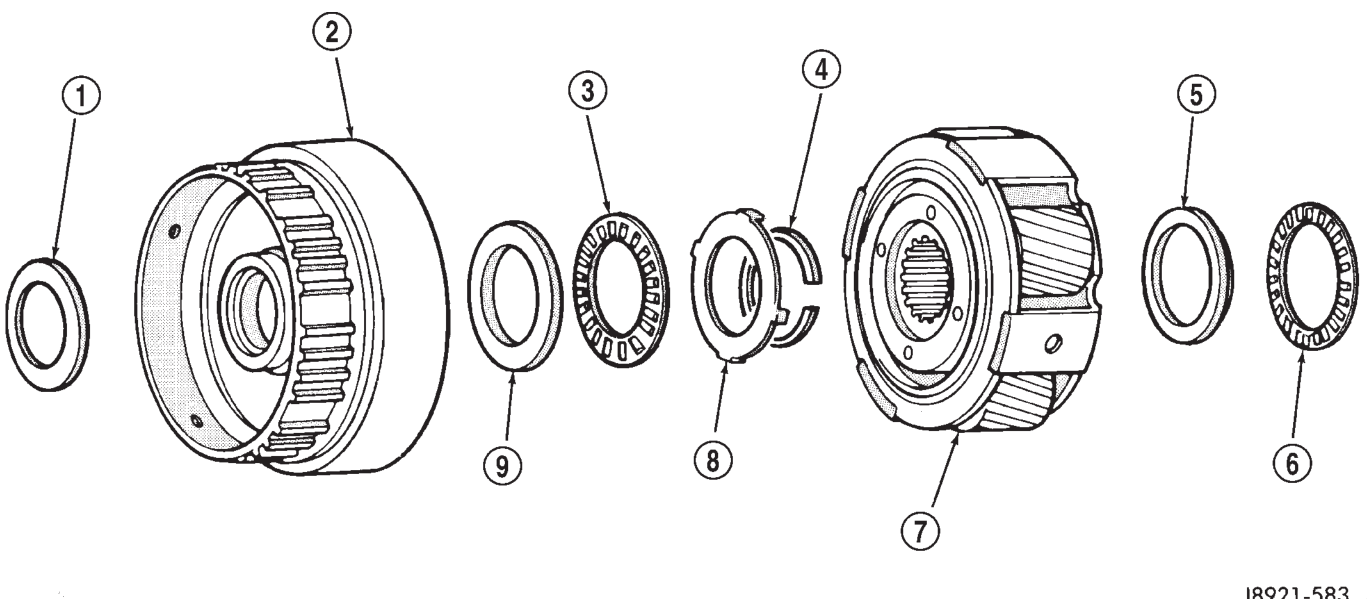


Fig. 268 Front Planetary Gear Components

1 – FORWARD RACE
2 – FRONT PLANETARY RING GEAR
3 – FRONT BEARING
4 – SNAP RING
5 – REAR RACE
6 – REAR BEARING
7 – FRONT PLANETARY GEAR
8 – THRUST RACE
9 – FRONT RACE

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Remove rear bearing and race from planetary gear.

(6) Measure inside diameter of ring gear bushing. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace ring gear if bushing inside diameter is greater than specified.

(7) Check condition of planetary gear. Replace gear if teeth are worn, pins are loose, or carrier is cracked, distorted, or worn.

ASSEMBLY

(1) Lubricate planetary and ring gear bearings and races with petroleum jelly.

(2) Identify planetary bearings and races before installation. (Fig. 268). Bearings and races can be identified by following dimensions:

- Outer diameter of rear bearing is 47.7 mm (1.878 in.). Inner diameter is 35.5 mm (1.398 in.).
- Outer diameter of rear race 47.6 mm (1.874 in.). Inner diameter is 33.7 mm (1.327 in.).
- Outer diameter of front race is 53.6 mm (2.110 in.). Inner diameter is 30.5 mm (1.201 in.).
- Outer diameter of front bearing is 47.7 mm (1.878 in.). Inner diameter is 32.6 (1.283 in.).
- Outer diameter of forward race is 47.0 mm (1.850 in.). Inner diameter is 26.5 mm 1.043 in.).

(3) Install rear race and bearing in gear (Fig. 269).

(4) Turn planetary over and install thrust race (Fig. 270).

(5) Install front race and bearing and forward race in ring gear (Fig. 271).

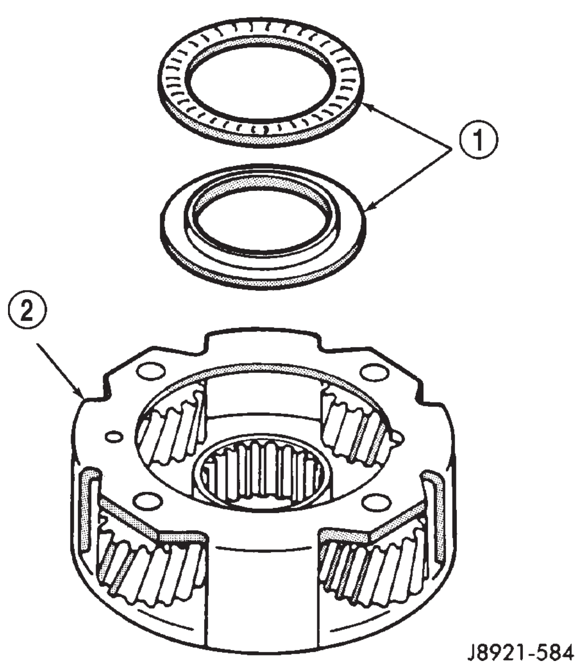


Fig. 269 Front Planetary Rear Bearing and Race Installation

1 – REAR BEARING AND RACE
2 – PLANETARY GEAR

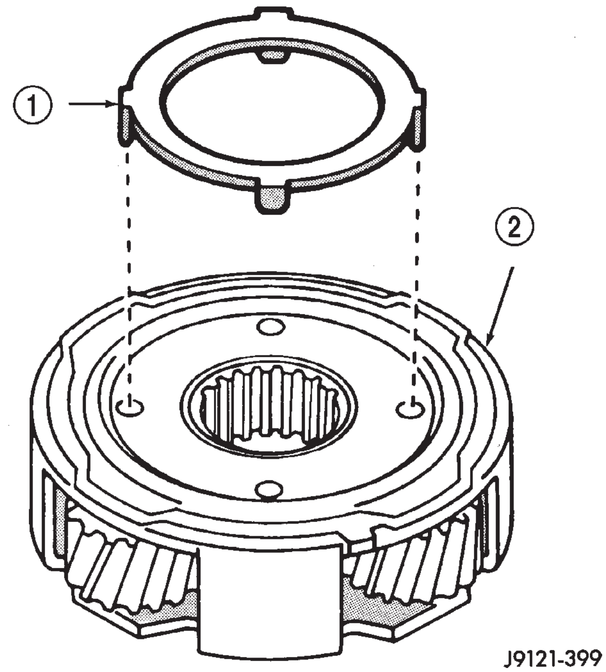


Fig. 270 Front Planetary Thrust Race Installation

1 – TABBED THRUST RACE
2 – PLANETARY GEAR

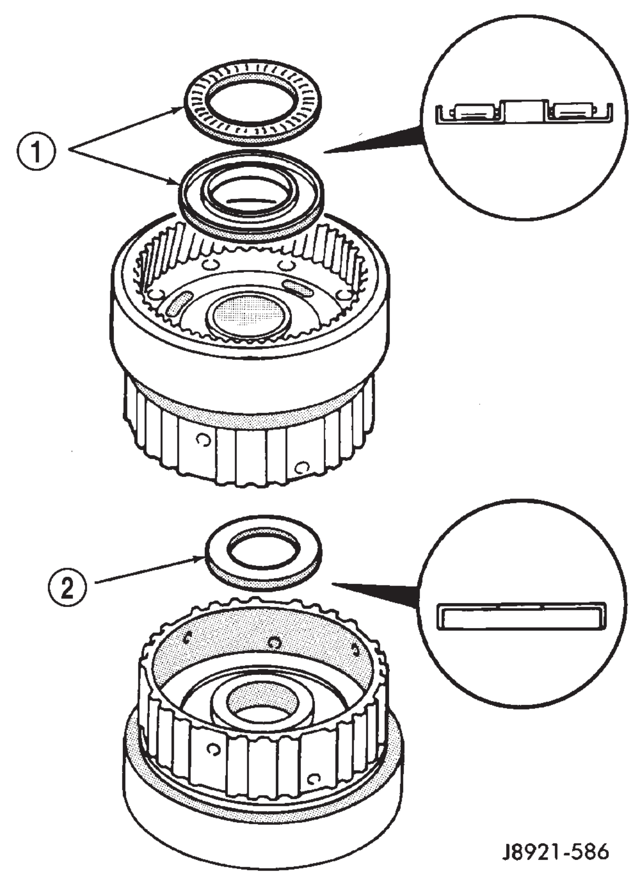
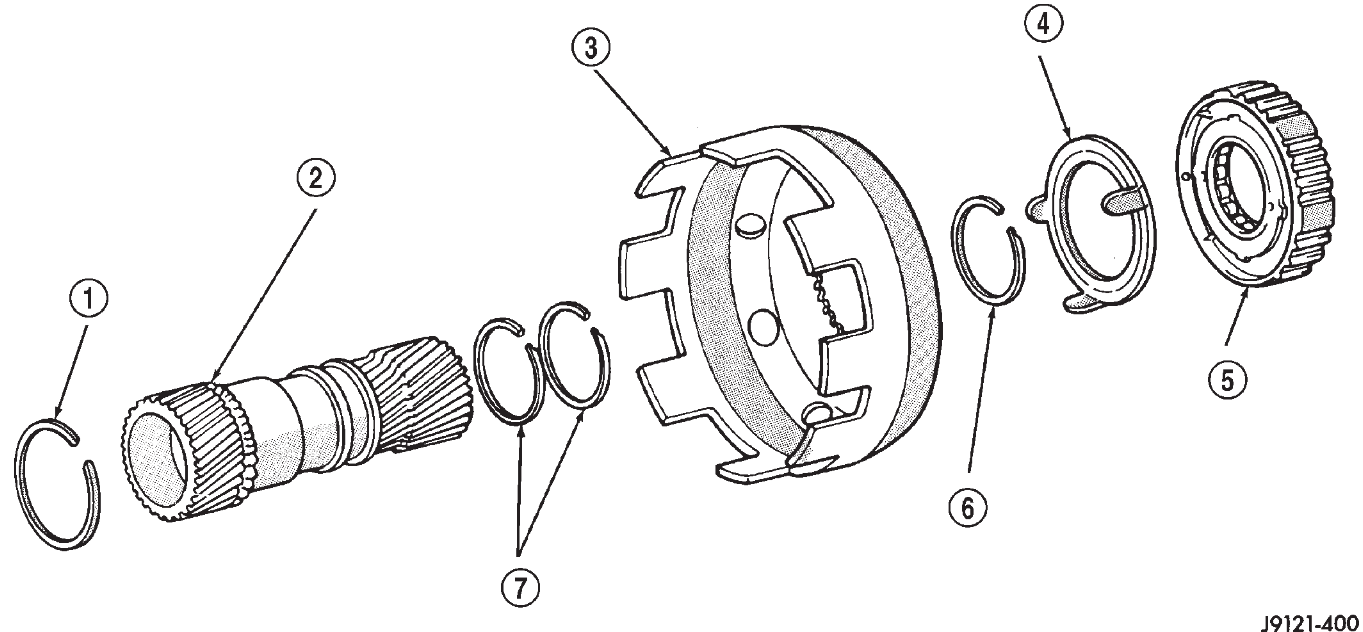


Fig. 271 Front Planetary Front Bearing And Races Installation

1 – FRONT BEARING AND RACE
2 – FORWARD RACE

DISASSEMBLY AND ASSEMBLY (Continued)

SUN GEAR AND NO. 1 ONE–WAY CLUTCH



Sun Gear And One–Way Clutch Components

1 – SNAP RING
2 – SUN GEAR
3 – SUN GEAR INPUT DRUM
4 – THRUST WASHER
5 – ONE-WAY CLUTCH AND SECOND BRAKE HUB ASSEMBLY
6 – SNAP RING
7 – SEAL RINGS

DISASSEMBLY

(1) Hold sun gear and turn second brake hub clockwise and counterclockwise (Fig. 272). Hub should rotate freely clockwise but lock when turned counterclockwise. Replace one–way clutch and hub if they do not operate properly.

(2) Remove one–way clutch/second brake hub assembly from drum (Fig. 273).

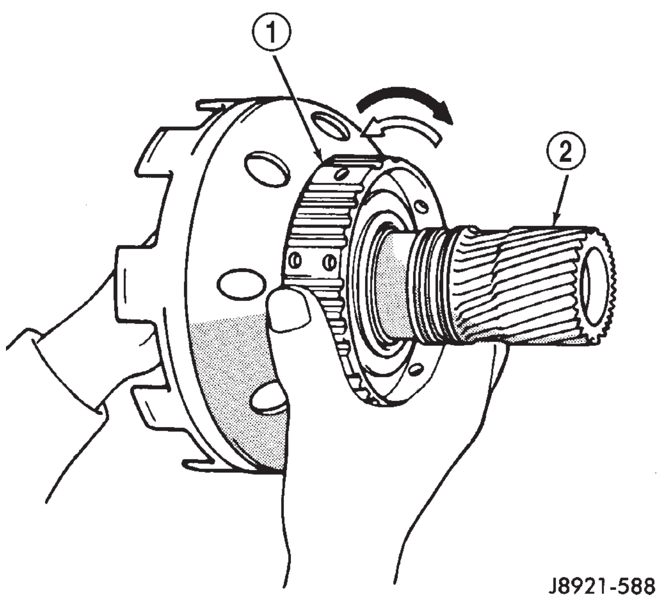


Fig. 272 Checking One–Way Clutch Operation

1 – SECOND BRAKE HUB
2 – SUN GEAR

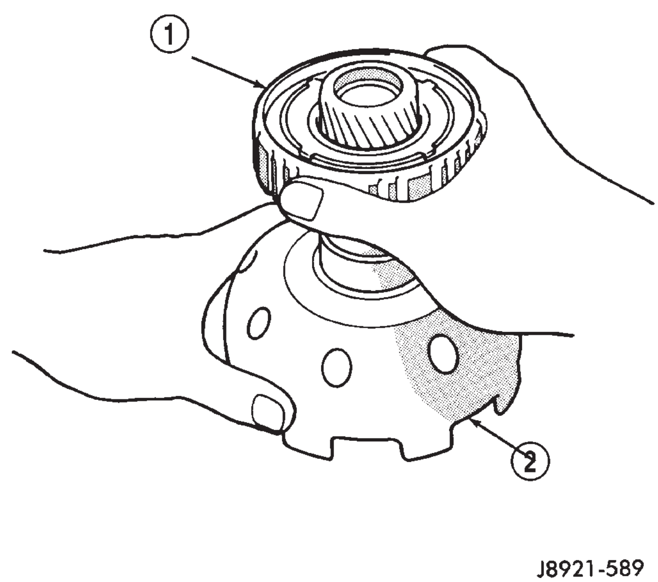


Fig. 273 Removing/Installing Brake Hub And Clutch Assembly

1 – HUB AND CLUTCH ASSEMBLY
2 – DRUM

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove thrust washer from drum (Fig. 274).

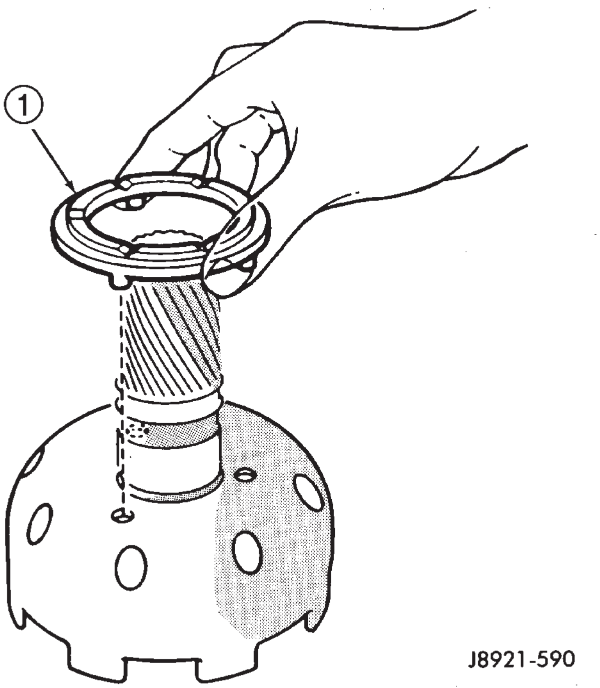


Fig. 274 Removing/Installing Thrust Washer

1 – THRUST WASHER

(4) Remove two seal rings from sun gear (Fig. 275).

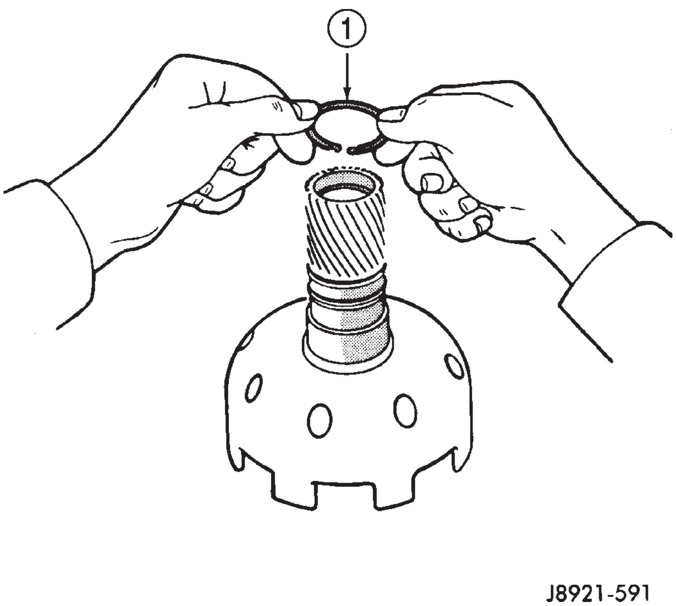


Fig. 275 Removing/Installing Sun Gear Seal Rings

1 – SEALS RINGS (2)

(5) Support sun gear on wood block (Fig. 276). Then remove first sun gear snap ring and separate drum from gear.

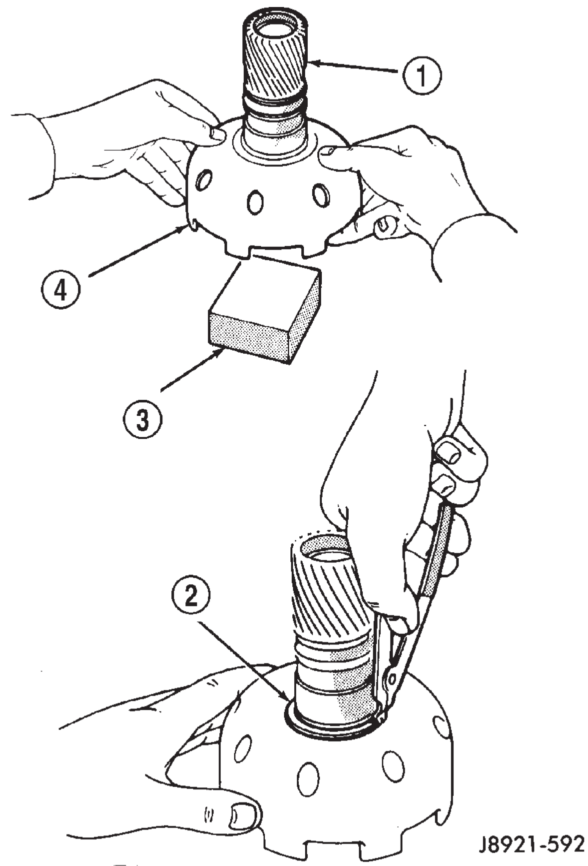


Fig. 276 Removing/Installing Sun Gear

1 – SUN GEAR
2 – SNAP RING
3 – WOOD BLOCK
4 – INPUT DRUM

(6) Remove remaining snap ring from sun gear (Fig. 277).

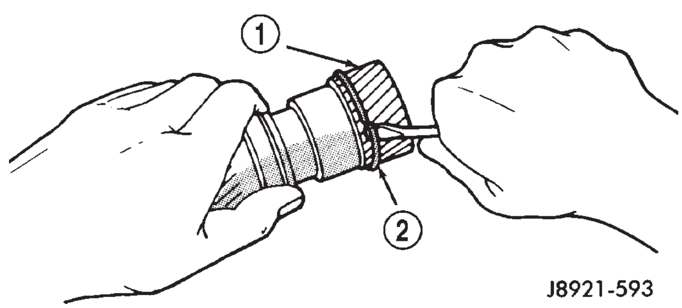


Fig. 277 Removing/Installing Second Snap Ring

1 – SUN GEAR
2 – SECOND SNAP RING

(7) Measure inside diameter of sun gear bushings with bore gauge or inside micrometer (Fig. 278). Maximum allowable diameter is 27.08 mm (1.0661 in.). Replace sun gear if bushing inside diameter is greater than specified.

DISASSEMBLY AND ASSEMBLY (Continued)

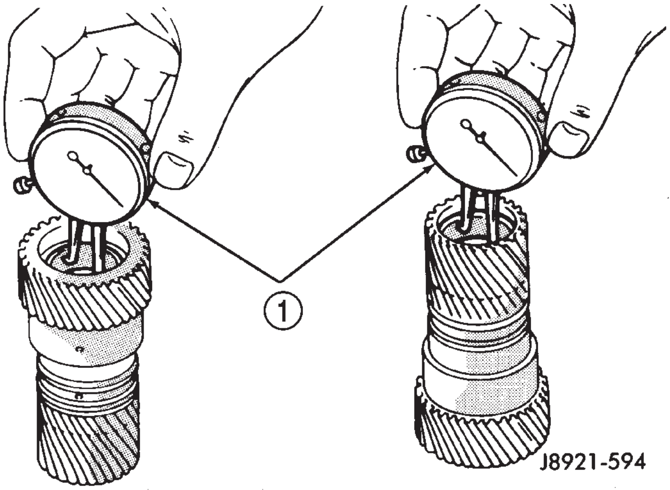


Fig. 278 Checking Sun Gear Bushings

1 – BORE GAUGE

ASSEMBLY

(1) Install first snap ring on sun gear.

(2) Install sun gear in drum and install remaining snap ring.

(3) Coat replacement seal rings with petroleum jelly and install them on sun gear. **Be sure seal ring ends are interlocked.**

(4) Install thrust washer. Be sure washer tabs are seated in drum slots.

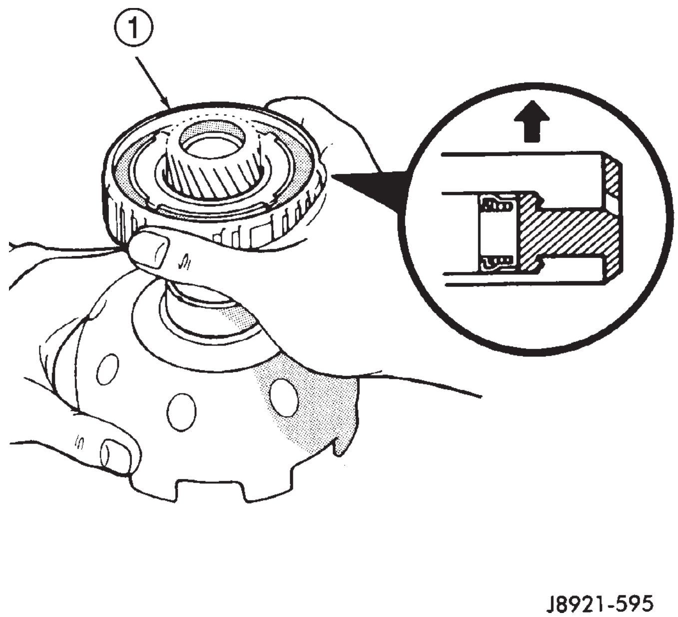
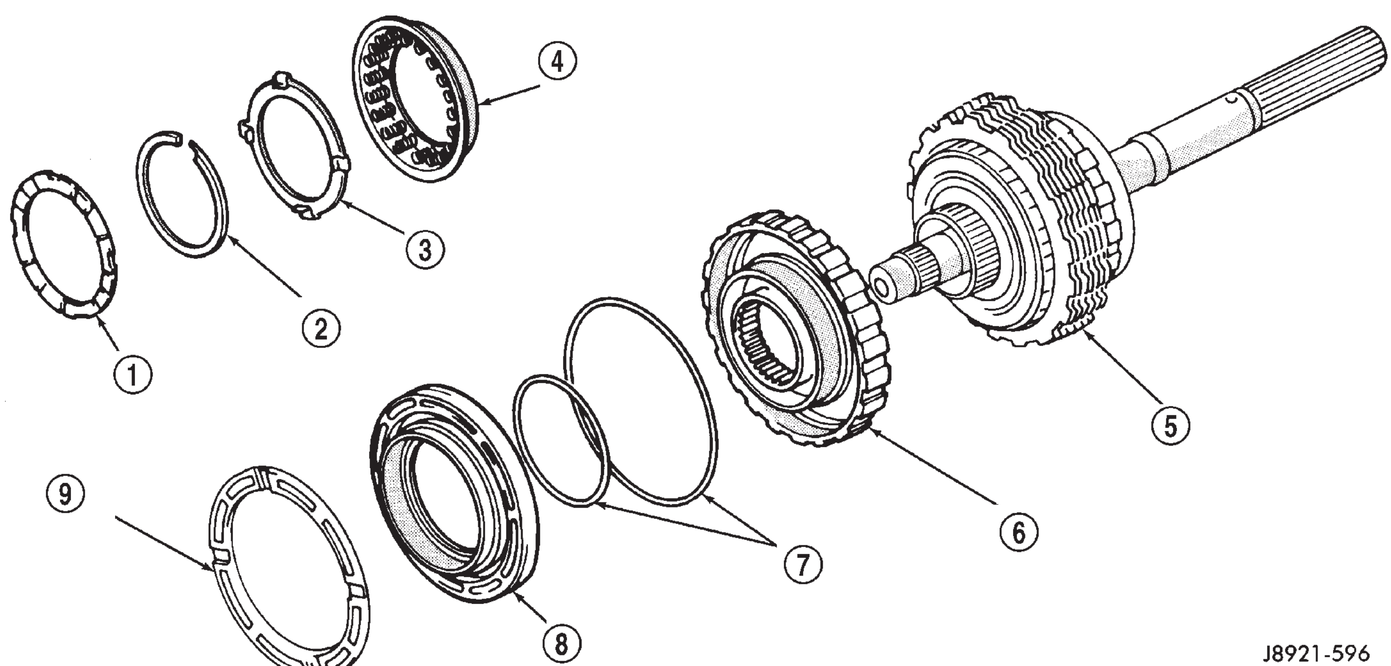


Fig. 279 Installing Clutch And Hub Assembly On Sun Gear

1 – CLUTCH AND HUB ASSEMBLY

(5) Install one–way clutch/second brake hub assembly on sun gear. Deep side of hub flange faces upward (Fig. 279).



Second Brake Components

1 – THRUST WASHER
2 – SNAP RING
3 – SPRING RETAINER
4 – PISTON RETURN SPRINGS
5 – REAR PLANETARY/OUTPUT SHAFT/FIRST-REVERSE BRAKE
6 – SECOND BRAKE DRUM
7 – O-RINGS
8 – SECOND BRAKE PISTON
9 – PISTON SLEEVE

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Check one–way clutch operation again (Fig. 272). Hold sun gear and turn second brake hub clockwise and counterclockwise. Hub should turn clockwise freely, but lock when turned counterclockwise.

SECOND BRAKE

DISASSEMBLY

(1) Remove second brake drum from output shaft (Fig. 280).

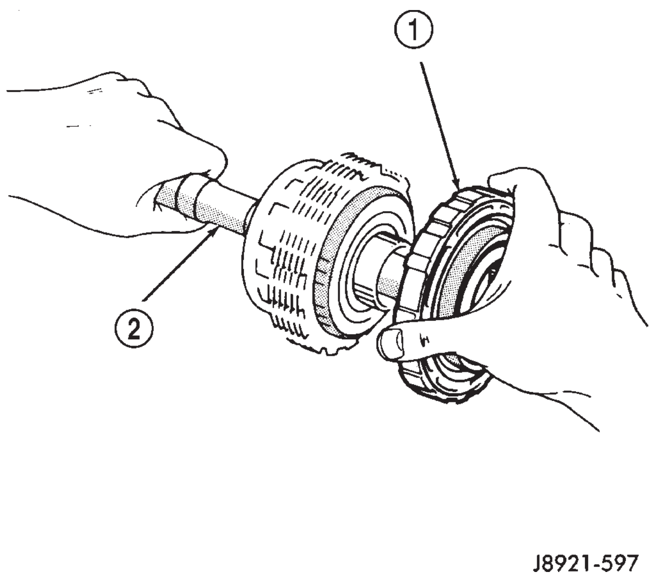


Fig. 280 Removing/Installing Second Brake Assembly

1 – SECOND BRAKE ASSEMBLY
2 – OUTPUT SHAFT

(2) Remove thrust washer from second brake drum (Fig. 281).

(3) Compress piston return springs with shop press and tool 7538. Then remove piston snap ring (Fig. 282).

(4) Remove compressor tool and remove spring retainer and return springs.

(5) Remove second brake piston and sleeve from drum with compressed air (Fig. 283). Use only enough air pressure to ease piston out of drum.

(6) Remove and discard brake piston O–rings.

(7) Measure free length of piston return springs with springs mounted in retainer (Fig. 284). Length should be approximately 16.05 mm (0.632 in.). Replace return springs if length is less than specified.

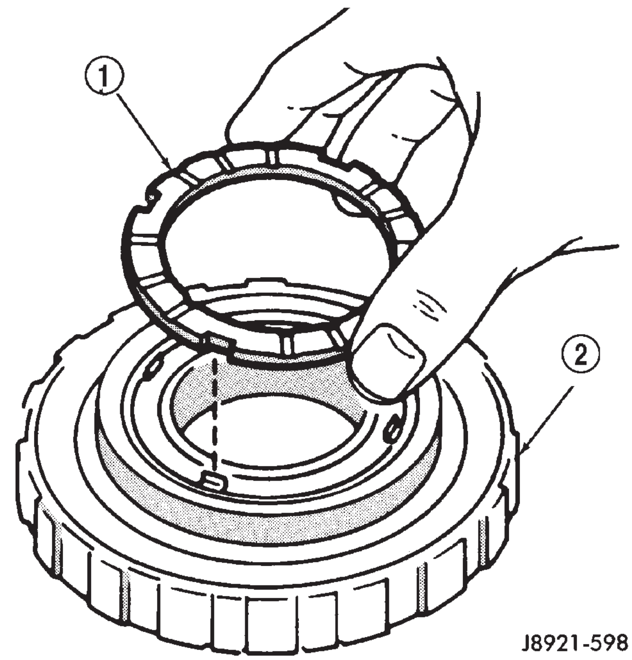


Fig. 281 Removing/Installing Second Brake Drum Thrust Washer

1 – THRUST WASHER
2 – SECOND BRAKE DRUM

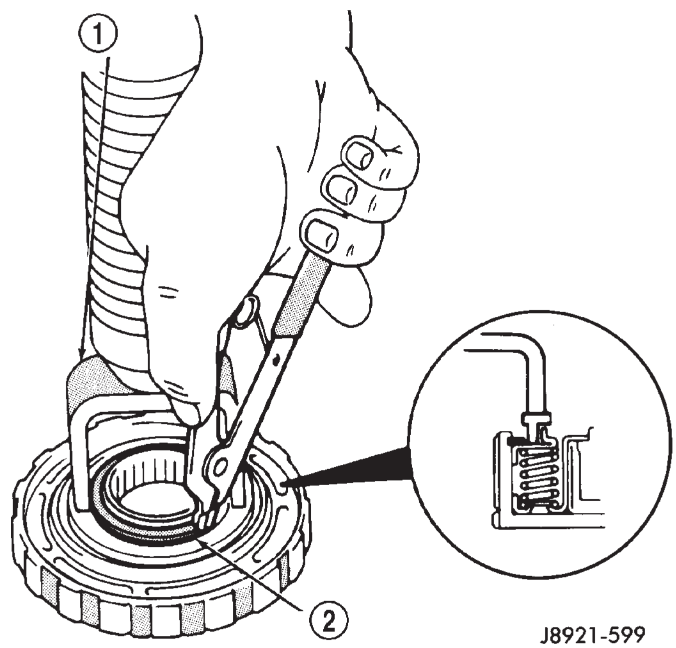


Fig. 282 Removing/Installing Second Brake Piston Snap Ring

1 – COMPRESSOR TOOL
2 – PISTON SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

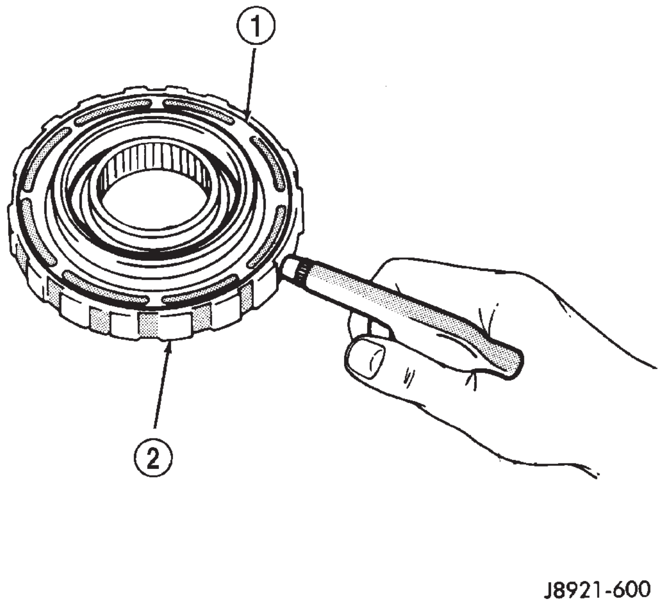


Fig. 283 Removing/Installing Piston And Sleeve

1 – PISTON AND SLEEVE
2 – DRUM

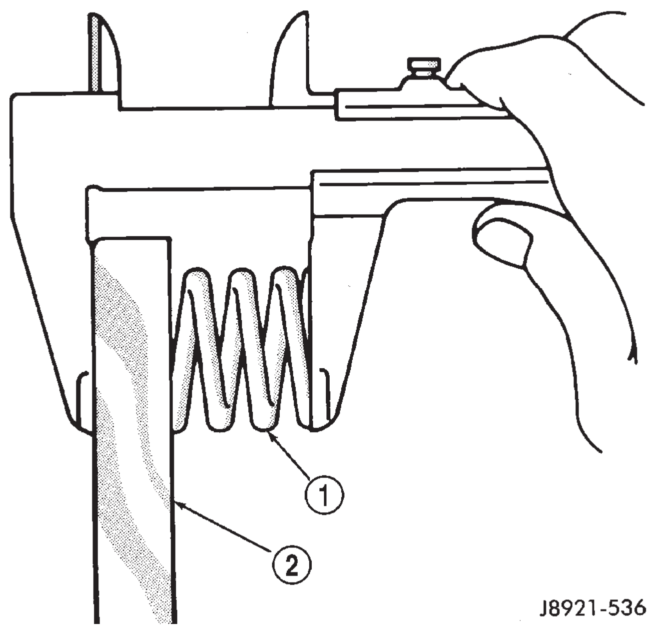


Fig. 284 Measuring Second Brake Piston Return Springs

1 – PISTON RETURN SPRINGS
2 – SPRING RETAINER

ASSEMBLY

(1) Lubricate and install new O–rings on brake piston. Then install brake piston in drum.

(2) Install return springs and retainer on brake piston.

(3) Compress return springs with shop press and Compressor Tool 7538. Install piston snap ring and remove brake assembly from press.

(4) Check brake piston operation with low pressure compressed air (Fig. 285). Apply air pressure through feed hole in drum. Piston should move smoothly when applying–releasing air pressure.

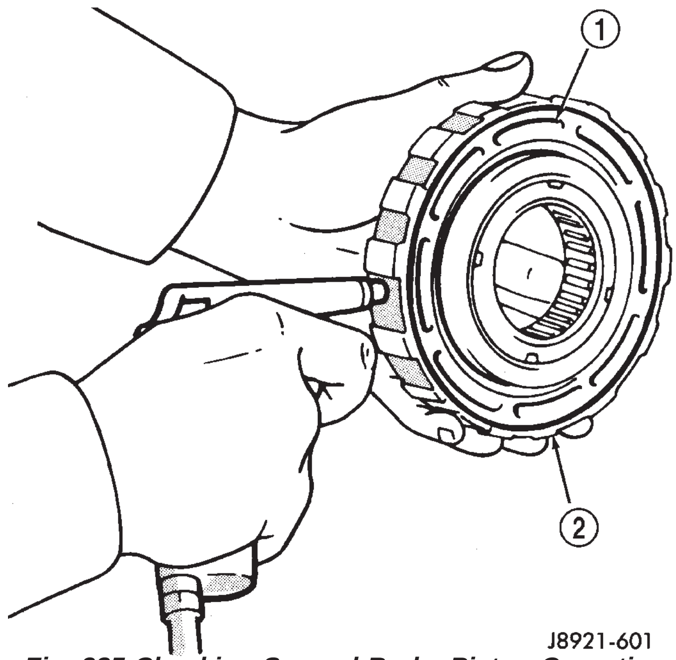


Fig. 285 Checking Second Brake Piston Operation

1 – PISTON
2 – DRUM

(5) Coat thrust washer with petroleum jelly and install it in drum. Be sure washer notches are aligned with tabs on spring retainer (Fig. 286).

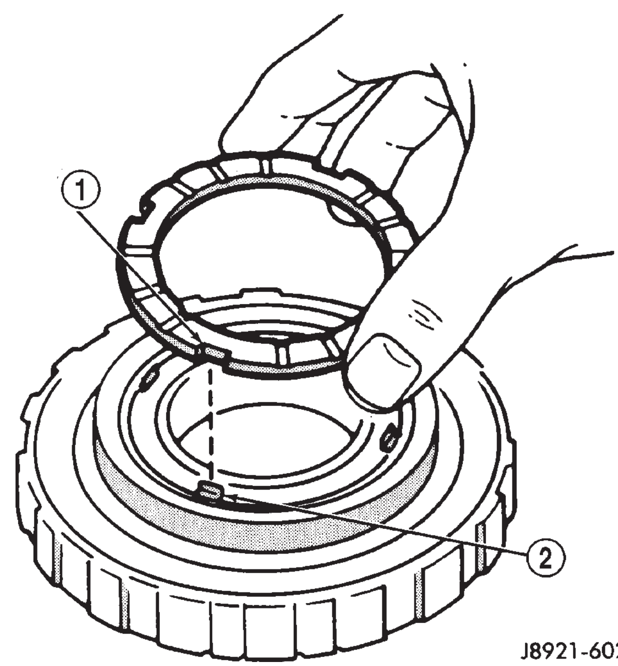
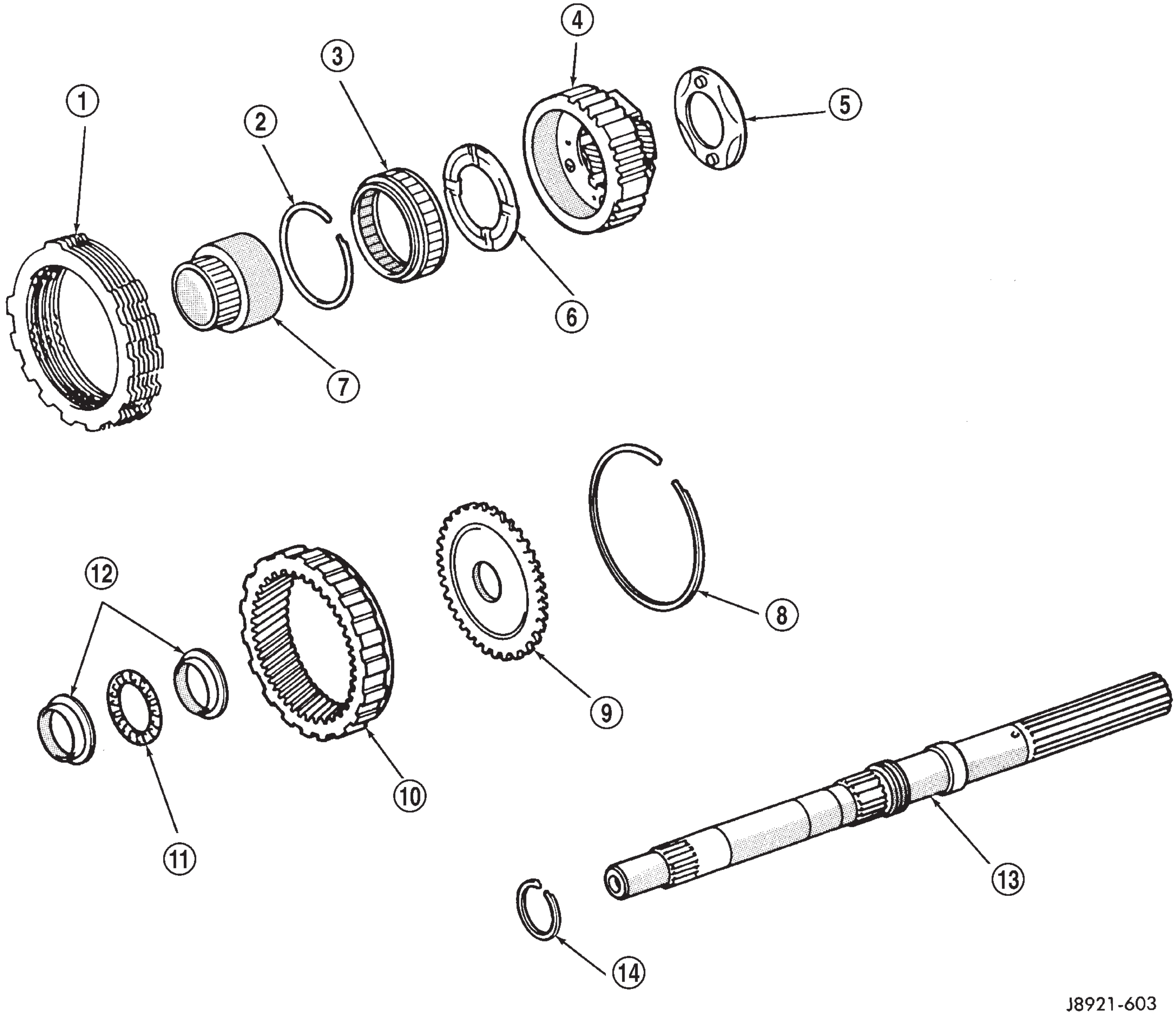


Fig. 286 Installing Second Brake Thrust Washer

1 – THRUST WASHER NOTCHES
2 – SPRING RETAINER TABS

DISASSEMBLY AND ASSEMBLY (Continued)

PLANETARY/BRAKE PACK/OUTPUT SHAFT



Rear Planetary, Brake Pack, Output Shaft Components

1 – FIRST-REVERSE BRAKE PACK
2 – SNAP RING
3 – NO. 2 ONE-WAY CLUTCH
4 – REAR PLANETARY GEAR
5 – REAR THRUST WASHER
6 – FRONT THRUST WASHER
7 – ONE-WAY CLUTCH INNER RACE
8 – SNAP RING
9 – RING GEAR HUB
10 – REAR PLANETARY RING GEAR
11 – THRUST BEARING
12 – RACES
13 – OUTPUT SHAFT
14 – SEAL RING

DISASSEMBLY AND ASSEMBLY (Continued)

DISASSEMBLY

(1) Remove output shaft from gear assembly (Fig. 287).

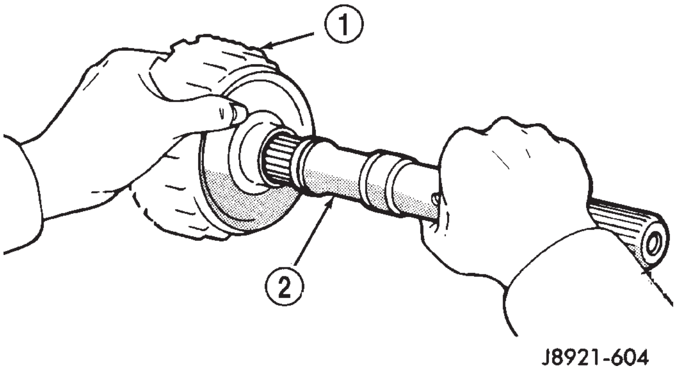


Fig. 287 Removing/Installing Output Shaft

1 – GEAR ASSEMBLY
2 – OUTPUT SHAFT

(2) Remove and discard shaft seal ring (Fig. 288).

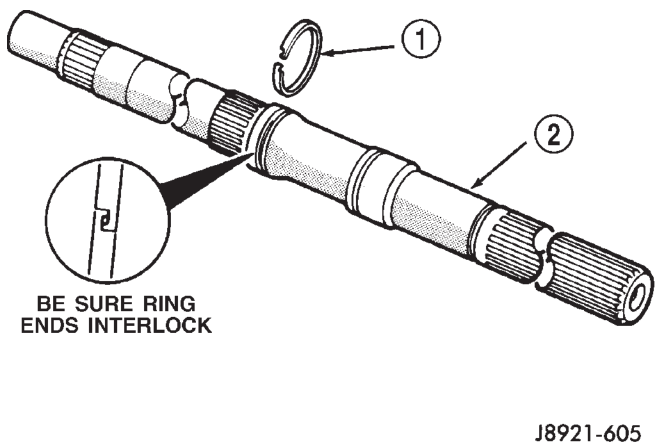


Fig. 288 Removing/Installing Shaft Seal Ring

1 – SEAL RING
2 – OUTPUT SHAFT

(3) Remove brake pack from planetary gear (Fig. 289).

(4) Remove planetary gear from ring gear (Fig. 290).

(5) Check No. 2 one–way clutch (Fig. 291). Hold planetary gear and turn clutch inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise. Replace one–way clutch if necessary.

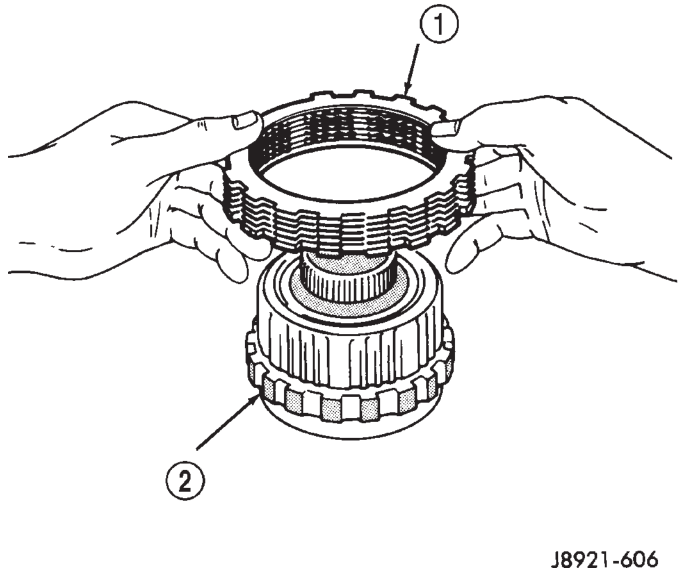


Fig. 289 Removing/Installing First–Reverse Brake Pack

1 – FIRST-REVERSE BRAKE PACK
2 – REAR PLANETARY GEAR

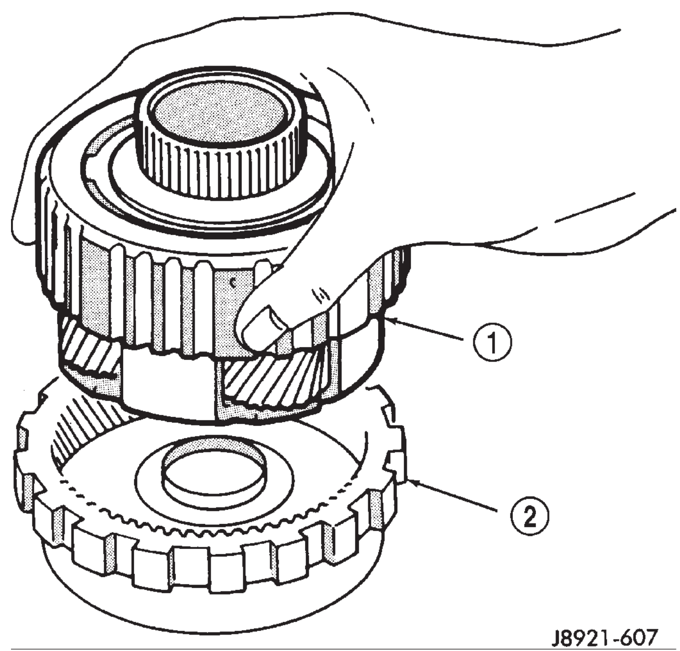


Fig. 290 Removing/Installing Rear Planetary

1 – REAR PLANETARY GEAR
2 – RING GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

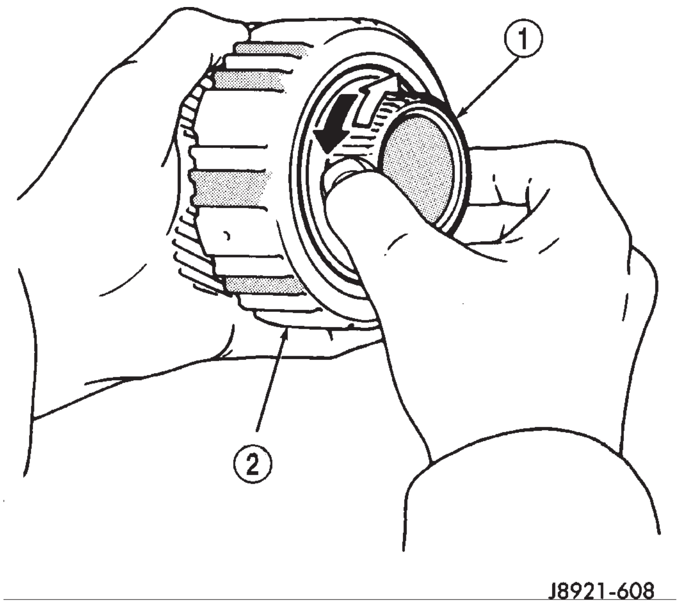


Fig. 291 Checking No. 2 One–Way Clutch Operation

1 – CLUTCH INNER RACE
2 – PLANETARY GEAR

(6) Remove clutch inner race from planetary gear (Fig. 292).

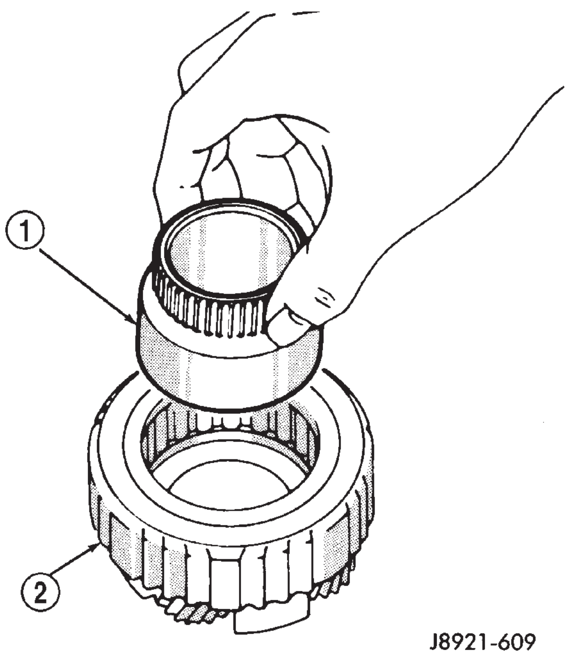


Fig. 292 Removing/Installing Clutch Inner Race

1 – CLUTCH INNER RACE
2 – REAR PLANETARY

(7) Remove clutch snap ring and remove No. 2 one–way clutch top end cap from planetary.

(8) Remove No. 2 one–way clutch from planetary (Fig. 293).

(9) Remove No. 2 one–way clutch bottom end cap from planetary.

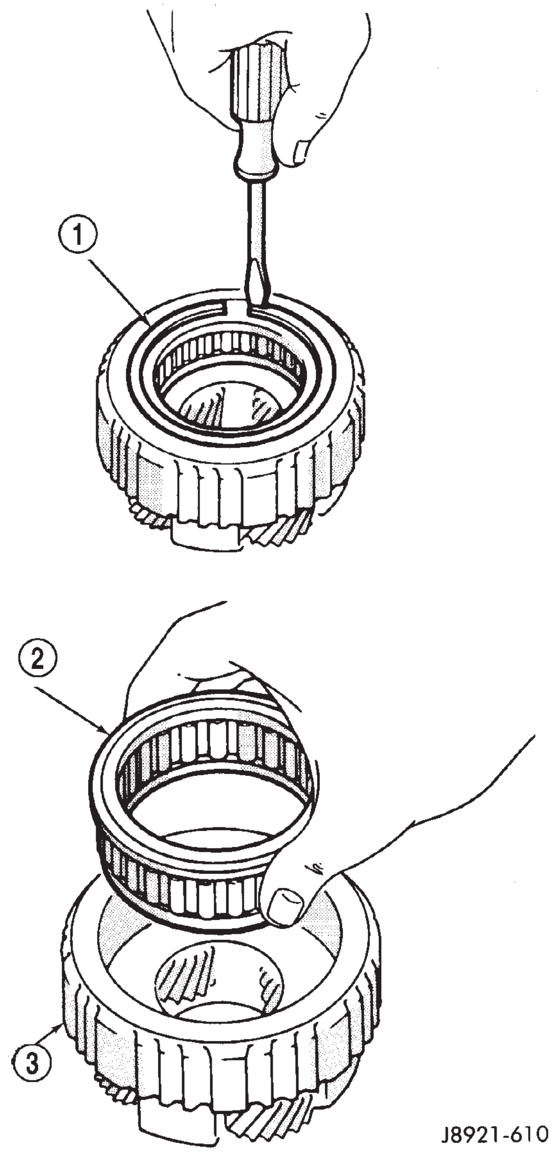


Fig. 293 Removing/Installing One–Way Clutch

1 – CLUTCH SNAP RING
2 – NO. 2 ONE-WAY CLUTCH
3 – PLANETARY GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Remove front and rear thrust washers from planetary gear (Fig. 294).

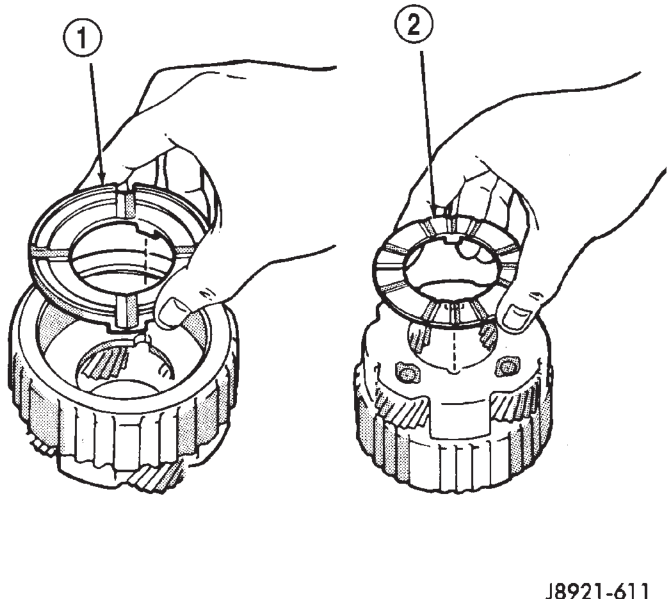


Fig. 294 Removing/Installing Rear Planetary Thrust Washers

1 – FRONT THRUST WASHER
2 – REAR THRUST WASHER

(11) Remove thrust bearing and washers from ring gear (Fig. 295).

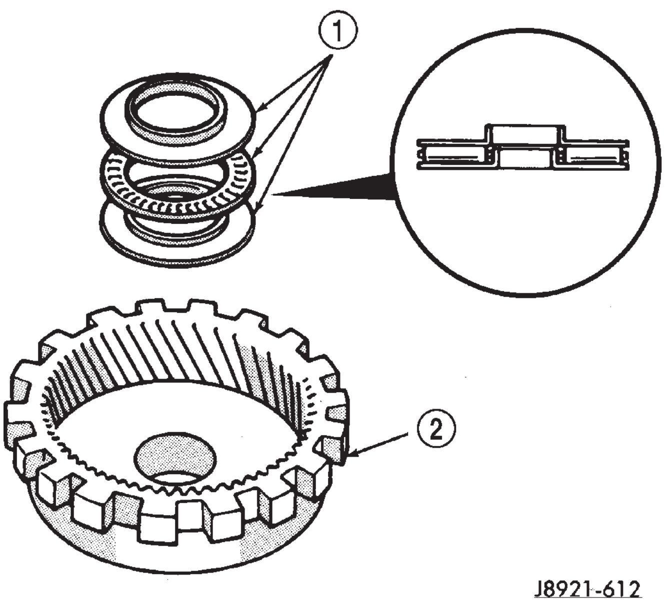


Fig. 295 Removing/Installing Ring Gear Thrust Bearing And Races

1 – THRUST BEARING AND RACES
2 – RING GEAR

(12) Remove ring gear snap ring and remove ring gear hub (Fig. 296).

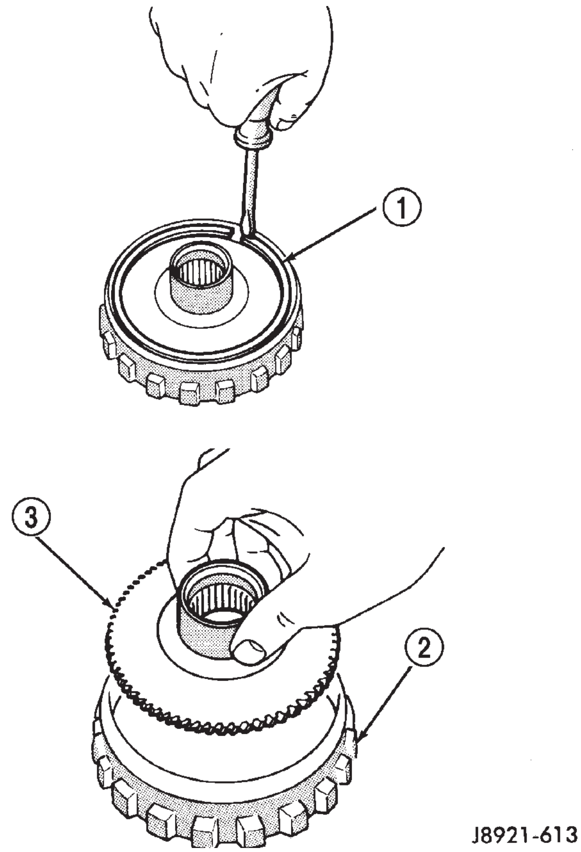


Fig. 296 Removing/Installing Ring Gear Hub

1 – SNAP RING
2 – RING GEAR
3 – HUB

(13) Inspect and replace any worn or damaged planetary gear components.

ASSEMBLY

(1) Measure thickness of each brake pack disc. Minimum thickness is 1.51 mm (0.0594 in.). Replace all discs if any disc is thinner than specified.

(2) Install hub and snap ring in ring gear (Fig. 296)

(3) Identify ring gear thrust bearing and races by following dimensions (Fig. 295) :

• Outer diameter of bottom race is 44.8 mm (1.764 in.) and inner diameter is 27.6 mm (1.087 in.).

• Outer diameter of bearing is 44.7 mm (1.760 in.) and inner diameter is 30.1 mm (1.185 in.).

• Outer diameter of upper race is 44.8 mm (1.764 in.) and inner diameter is 28.8 mm (1.134 in.).

(4) Lubricate ring gear thrust bearing and races with petroleum jelly and install them in ring gear (Fig. 295).

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Coat planetary thrust washers with petroleum jelly and install them in gear (Fig. 294).

(6) Install No. 2 one–way clutch bottom end cap into the planetary gear.

(7) Install No. 2 one–way clutch in planetary gear. Be sure flanged side of clutch faces upward (Fig. 297).

(8) Install No. 2 one–way clutch top end cap into the planetary gear.

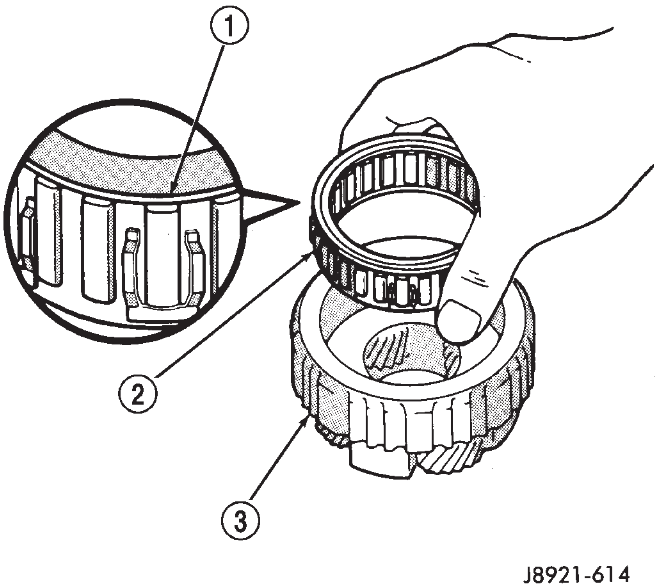


Fig. 297 Installing No. 2 One–Way Clutch

1 – FLANGED SIDE OF CLUTCH
2 – NO. 2 ONE-WAY CLUTCH
3 – REAR PLANETARY

(9) Install clutch retaining snap ring and install clutch inner race (Fig. 292). Turn race counterclockwise to ease installation.

(10) Verify one–way clutch operation. Hold gear and turn inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise.

(11) Install planetary gear in ring gear.

(12) Install thrust bearing and washers onto the ring gear (Fig. 295).

(13) Assemble clutch discs and clutch plates (Fig. 289). Sequence is disc first, then a plate. Use seven discs and plates.

(14) Install brake pack on planetary gear (Fig. 289).

(15) Install new seal ring on output shaft (Fig. 288). Be sure ring ends are interlocked as shown.

TRANSMISSION VALVE BODY

The valve body assembly consists of two sections which are the upper body and lower body (Fig. 298) and (Fig. 299). Disassembly, inspection and overhaul procedures for each section are outlined separately. Refer to the appropriate procedure as needed.

DISASSEMBLY AND ASSEMBLY (Continued)

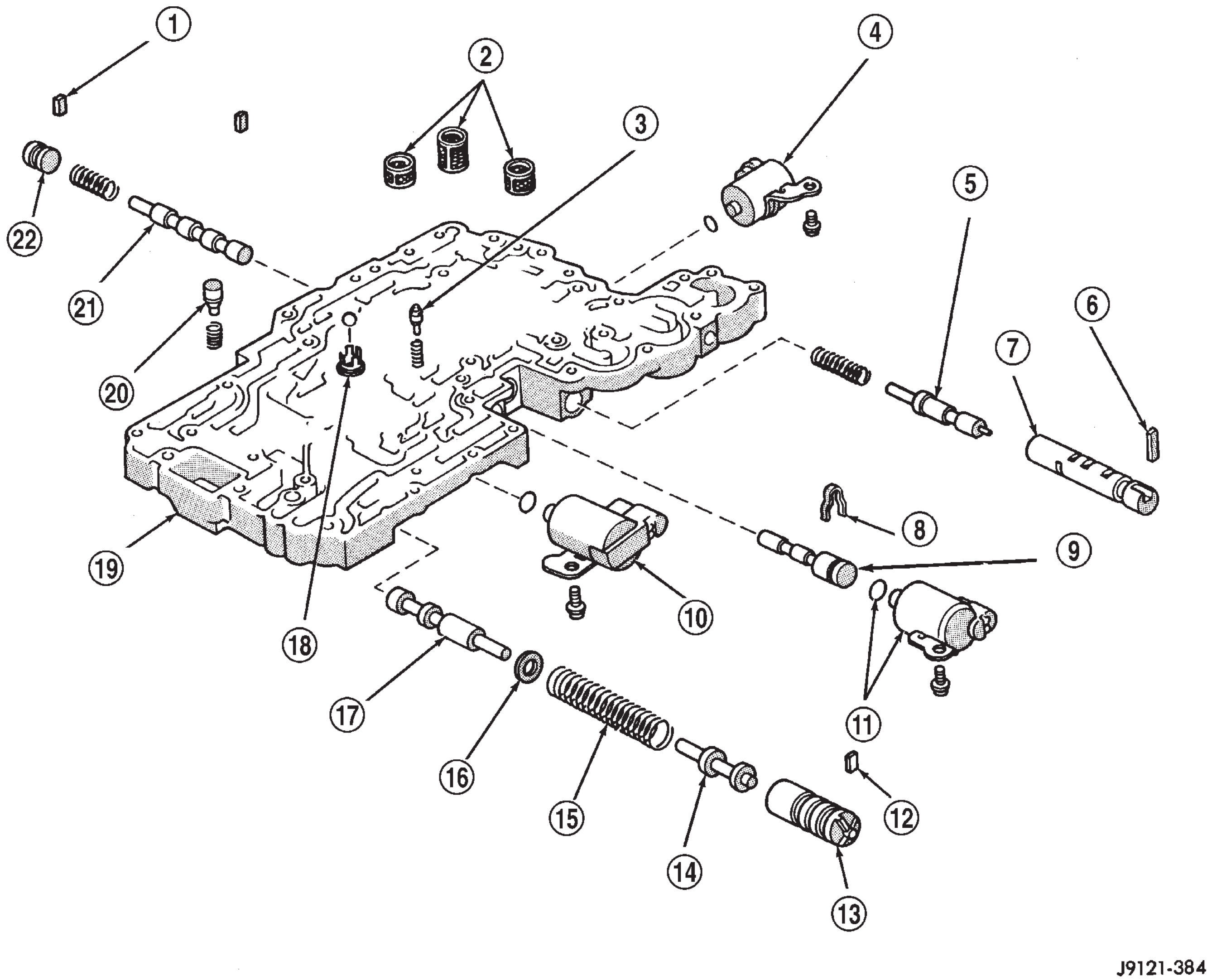


Fig. 298 Lower Body Components

1 – RETAINER
2 – STRAINERS
3 – PRESSURE RELIEF VALVE
4 – NO. 2 SOLENOID AND O-RING
5 – ACCUMULATOR CONTROL VALVE
6 – RETAINER
7 – SLEEVE
8 – CLIP
9 – PRESSURE REDUCING PLUG
10 – NO. 3 SOLENOID AND O-RING
11 – NO. 1 SOLENOID AND O-RING
12 – RETAINER
13 – SLEEVE
14 – PLUNGER
15 – VALVE SPRING
16 – WASHER
17 – PRIMARY REGULATOR VALVE
18 – CHECK VALVE AND BALL
19 – LOWER BODY
20 – CHECK VALVE
21 – 1-2 SHIFT VALVE
22 – PLUG

DISASSEMBLY AND ASSEMBLY (Continued)

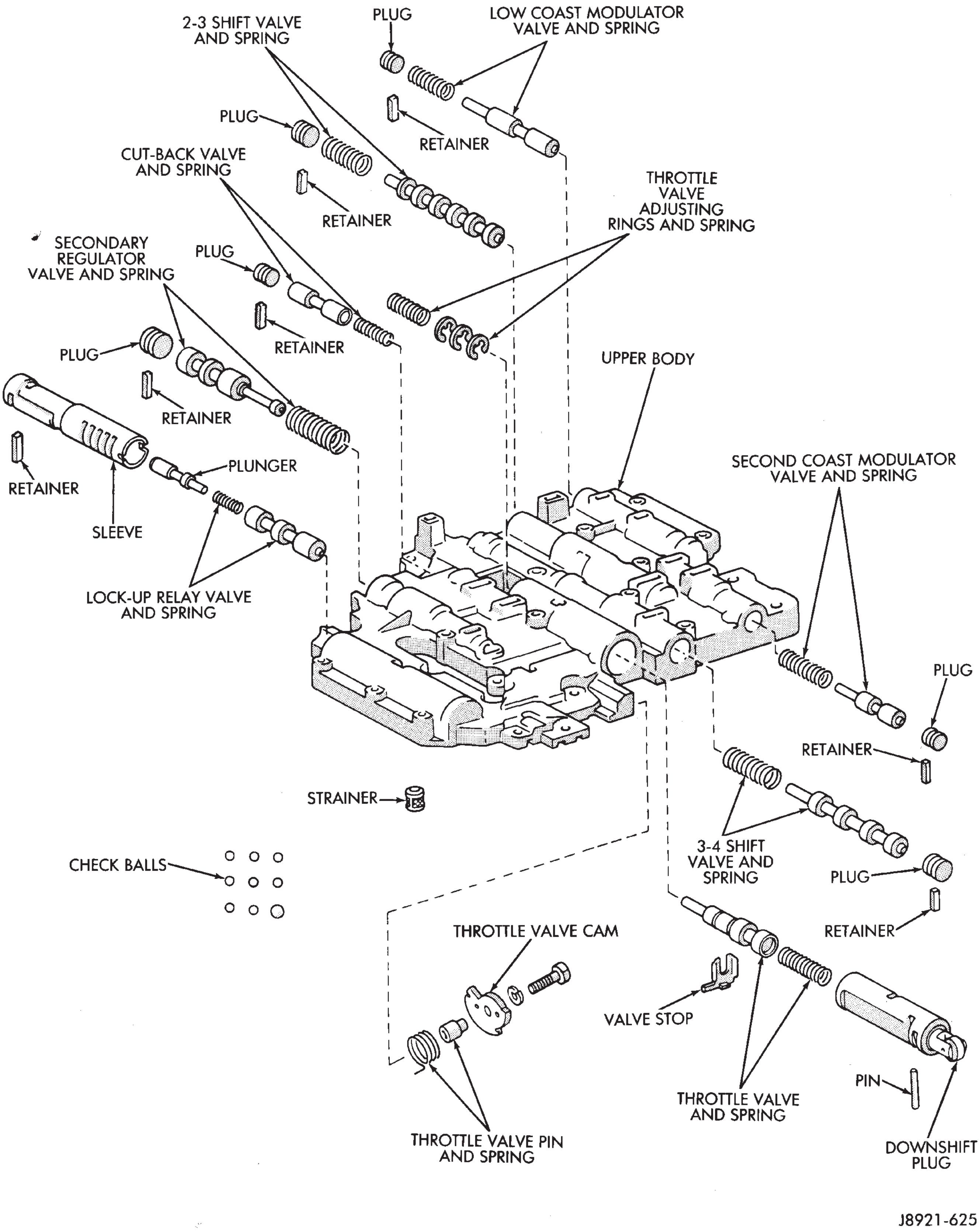


Fig. 299 Upper Body Components

CLEANING AND INSPECTION

TRANSMISSION PARTS CLEANING AND INSPECTION

Clean the transmission components with solvent and dry them with compressed air only. Do not use shop towels or rags.

Blow compressed air through all oil feed passages and channels to be sure they are clear. Inspect the transmission components for wear and damage. Replace components that are damaged or worn beyond the limits specified in the individual overhaul procedures.

Replace all O–rings, gaskets and seals. These components are not reusable. Also replace any snap ring that is distorted or damaged.

During overhaul assembly operations, lubricate the transmission components with Mopar Mercon™ automatic transmission fluid or petroleum jelly as indicated. Petroleum jelly should be used to prelubricate thrust bearings, washers and races. It can also be used to hold parts in position during assembly.

Soak replacement clutch and brake pack components in transmission fluid for at least 30 minutes before installation.

ADJUSTMENTS

GEARSHIFT CABLE

Check adjustment by starting the engine in Park and Neutral. Adjustment is OK if the engine starts only in these positions. Adjustment is incorrect if the engine starts in one but not both positions. If the engine starts in any position other than Park or Neutral, or if the engine will not start at all, the park/neutral position switch may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into Park.

(2) Raise vehicle.

(3) Release cable adjuster clamp (at transmission end of cable) to unlock cable.

(4) Unsnap cable from cable mounting bracket on transmission (Fig. 300).

(5) Slide cable eyelet off transmission shift lever.

(6) Verify transmission shift lever is in Park detent by moving lever fully rearward. Last rearward detent is Park position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Slide cable eyelt onto transmission shift lever.

(9) Snap shift cable adjuster into mounting bracket on transmission.

(10) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.

(11) Lower vehicle and check engine starting. Engine should start only in Park and Neutral.

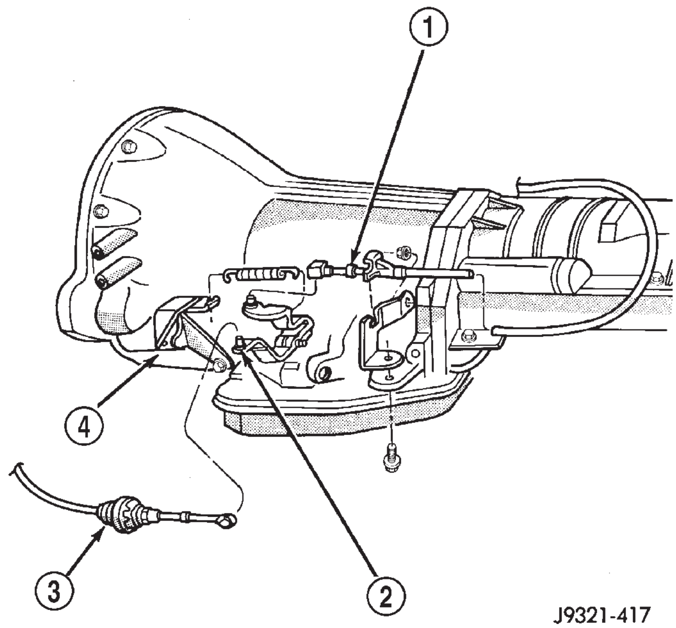


Fig. 300 Shift Cable Attachment At Transmission–Typical

1 – THROTTLE VALVE CABLE
2 – TRANSMISSION SHIFT LEVER
3 – SHIFT CABLE
4 – SHIFT CABLE BRACKET

BRAKE TRANSMISSION SHIFT INTERLOCK CABLE ADJUSTMENT

(1) Shift transmission into PARK.

(2) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.

(3) Pull cable lock button up to release cable (Fig. 301).

(4) Turn ignition switch to LOCK position.

(5) Use a spacer to create a one millimeter gap between the shifter pawl and top of the shift gate.

(6) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.

(7) Check adjustment as follows:

(a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.

(b) Turn ignition switch to RUN position.

(c) Shifting out of park should not be possible.

(d) Apply the brake and attempt to shift out of PARK. Shifting should be possible.

(e) While the transmission is shifted out of PARK, release the brake and attempt to shift

ADJUSTMENTS (Continued)

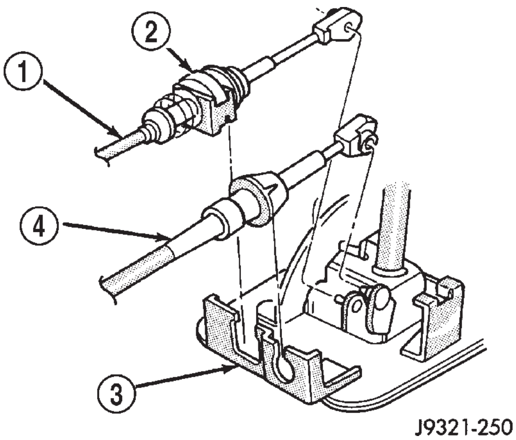


Fig. 301 Park Lock Cable Attachment

1 – PARK LOCK CABLE
2 – CABLE LOCK BUTTON
3 – SHIFT LEVER ASSEMBLY
4 – SHIFT CABLE

through all gears. Release the shift button at least once during this procedure. The ignition key should not go to the LOCK position.

(f) Return transmission to the PARK position without applying the brake.

(8) Move shift lever back to PARK and check ignition switch operation. You should be able to turn switch to LOCK position and shift lever release button/lever should not move.

TRANSMISSION THROTTLE VALVE CABLE ADJUSTMENT

(1) Shift transmission into Park, shut engine off and raise hood.

(2) Press cable release button (Fig. 302).

(3) Push cable conduit back into cable sheath as far as possible (Fig. 303).

(4) Rotate lever on throttle body to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 303).

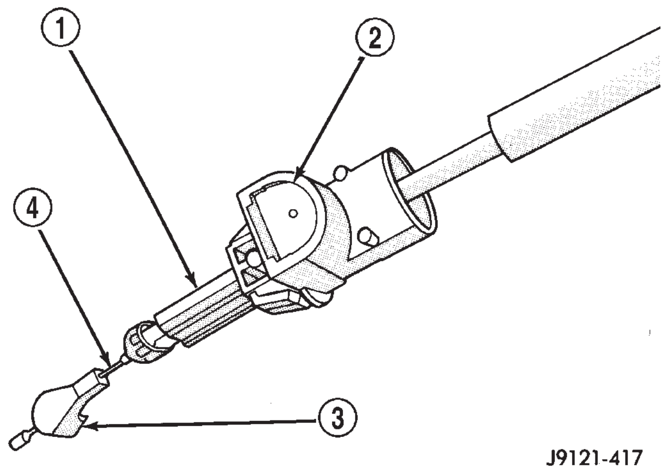


Fig. 302 Throttle Cable Components

1 – CONDUIT
2 – RELEASE BUTTON
3 – CABLE CONNECTOR
4 – CABLE

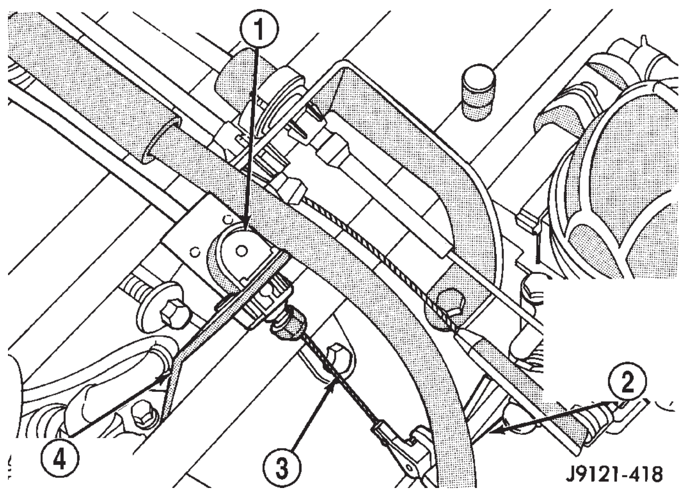


Fig. 303 Throttle Cable Adjustment

1 – RELEASE BUTTON
2 – ROTATE THROTTLE BODY LEVER TO W. O. T. POSITION
3 – CABLE
4 – CABLE BRACKET

SPECIFICATIONS

AW-4 AUTOMATIC TRANSMISSION

AW-4 GENERAL SPECIFICATIONS

Gear Ratios:
- First 2.804:1
- Second 1.531:1
- Third 1.000:1
- Fourth (Overdrive) 0.753:1
- Reverse 2.393:1

Transmission Fluid . . Jeep automatic transmission fluid or DEXRON® II

Fluid Level . To “Full” mark with fluid hot (normal operating temperature)

Fluid Capacity (all models) . . . 8.0 Liters (8.45 qts.)

Test Specifications

Stall Speed:
- In D Range and Reverse . . . . 2100-2400 rpm

Line Pressure . . . . .
- In D at Curb Idle . . . . . 61–70 psi (421–481 kPa)
- In D at WOT . . . . . . 173-209 psi (1196-1442 kPa)
- In Reverse at Curb Idle . 75-90 psi (519-618 kPa)
- In Reverse at WOT . 213-263 psi (1471-1814 kPa)

Time Lag Test:
- Engagement in D Range . . . . 1.2 seconds
- Engagement in Reverse . . . . 1.5 seconds

Valve Body Solenoid Resistance . . . . . . 11-15 ohms

Transmission Fluid Normal Operating Temperature . . . . 50-80°C (122-176°F)

TPS Input Voltage (AU) . . . . 5.0 Volts (approx.)

TPS Output Voltage . . . . .
- 4–Cylinder . . . . 0.2 Volts (approx.)
- 6–Cylinder . . . . 4.2 Volts (approx.)

AW-4 OIL PUMP WEAR LIMITS

Drive Gear Tip Clearance: . . . . .
- Standard . . . 0.11–0.14 mm (0.0043 —0.0055 in.)
- Maximum Allowance . . . . 0.3 mm (0.012 in.)

Gear-to-Pump Body End Clearance:
- Standard . . . . . 0.02–0.05 mm (0.0008–0.0020 in.)
- Maximum Allowance . . . . 0.1 mm (0.004 in.)

Driven Gear-to-Pump Body Clearance:
- Standard . . . . . 0.07–0.15 mm (0.0028–0.0059 in.)
- Maximum Allowance . . . . 0.3 mm (0.012 in.)

AW-4 CLUTCH DISC AND PLATE THICKNESS

Component	Minimum Allowable Thickness
Clutch Disc (all except first-reverse and forward clutch discs)	1.84 mm (0.0724 in.)
6-Cylinder Forward Clutch Disc	1.51 mm (0.0594 in.)
6-Cylinder Direct Clutch Plates:	
Thin Plate (1)	2.3 mm (0.905 in.)
Thick Plates (3)	3.0 mm (0.118 in.)
6-Cylinder Forward Clutch Plate	1.8 mm (0.070 in.)
First-Reverse Brake Disc (All)	1.51 mm (0.0594 in.)

SPECIFICATIONS (Continued)

AW-4 BUSHING AND PISTON CLEARANCE

BUSHING INSIDE DIAMETER (MAXIMUM)

Bushing Location	Maximum Allowance Inside Diameter
Extension Housing	38.09 mm (1.4996 in.)
Direct Clutch Drum	53.97 mm (2.1248 in.)
Overdrive Planetary Gear	11.27 mm (.4437 in.)
Overdrive Direct Clutch Drum	27.11 mm (1.0673 in.)
Stator Shaft (Front)	21.58 mm (.8496 in.)
Stator Shaft (Rear)	27.08 mm (1.0661 in.)
Oil Pump Body	38.19 mm (1.5035 in.)
Transmission Case	38.18 mm (1.5031 in.)

PISTON STROKE LENGTH

Piston Location	Specification
Direct Clutch (all)	1.37–1.67 mm (.0539–.0657 in.)
6-Cylinder Overdrive Brake	1.40–1.70 mm (.0551–.0669 in.)
Second Coast Brake (all)	1.5–3.0 mm (.059–.118 in.)
6-Cylinder Forward Clutch	3.55–3.73 (.1397–.1468 in.)
Overdrive Direct Clutch (all)	1.85–2.15 mm (.0728–.0846 in.)

END PLAY AND CLEARANCE

Component	Specification
Output Shaft End Play	.27–.86 mm (.0106–.0339 in.)
6-Cylinder First-Reverse Brake Pack Clearance	.70–1.20 mm (.028–.047 in.)
6-Cylinder Second Brake Pack Clearance	.62–1.98 mm (.024–.078 in.)

J9121-403

SPECIFICATIONS (Continued)

AW-4 RETAINER AND PISTON SPECIFICATIONS

OVERDRIVE BRAKE RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
26	3.3 mm (.130 in.)	11	3.8 mm (.150 in.)
25	3.5 mm (.138 in.)	23	3.9 mm (.154 in.)
12	3.6 mm (.142 in.)	Not Marked	4.0 mm (.157 in.)
24	3.7 mm (.146 in.)	—	—

DIRECT CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
33	3.0 mm (.118 in.)	29	3.4 mm (.134 in.)
32	3.1 mm (.122 in.)	28	3.5 mm (.138 in.)
31	3.2 mm (.126 in.)	27	3.6 mm (.142 in.)
30	3.3 mm (.130 in.)	34	3.7 mm (.146 in.)

OVERDRIVE CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
16	3.6 mm (.142 in.)	19	3.3 mm (.130 in.)
17	3.5 mm (.138 in.)	20	3.2 mm (.126 in.)
18	3.4 mm (.134 in.)	21	3.1 mm (.122 in.)

SECOND COAST BRAKE PISTON ROD SELECTION

Rod	Rod Length
No. 1	71.4 mm (2.811 in.)
No. 2	72.9 mm (2.870 in.)

FORWARD CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
42	4.0 mm (.157 in.)	61	3.0 mm (.118 in.)
44	3.8 mm (.149 in.)	62	3.6 mm (.142 in.)
45	3.4 mm (.134 in.)	63	4.2 mm (.165 in.)
60	3.2 mm (.126 in.)	64	4.4 mm (.173 in.)

FIRST-REVERSE BRAKE CLEARANCE SELECTION

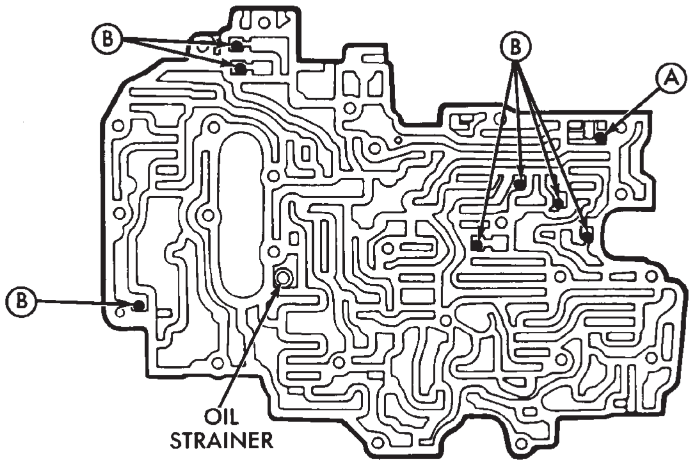
Retainer No.	Thickness	Retainer No.	Thickness
50	5.0 mm (.197 in.)	53	4.4 mm (.173 in.)
51	4.8 mm (.189 in.)	54	4.2 mm (.165 in.)
52	4.6 mm (.181 in.)	55	4.0 mm (.157 in.)

J9121-404

SPECIFICATIONS (Continued)

AW-4 VALVE BODY BALL DIMENSIONS

Check Ball	Diameter
(A) Rubber Ball	6.35 mm (0.250 in.)
(B) Rubber Ball	5.535 mm (.218 in.)



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AW-4 CLUTCH AND BRAKE PACK REQUIREMENTS

Component	Discs Required	Plates Required	Retainers Required
6-Cylinder Overdrive Brake	4	3	2
6-Cylinder Second Brake	5	5	1
6-Cylinder Overdrive Direct Clutch	2	2	1
6-Cylinder Direct Clutch	4	4	1
6-Cylinder Forward Clutch	6	6	1
6-Cylinder First-Reverse Brake	7	7	1

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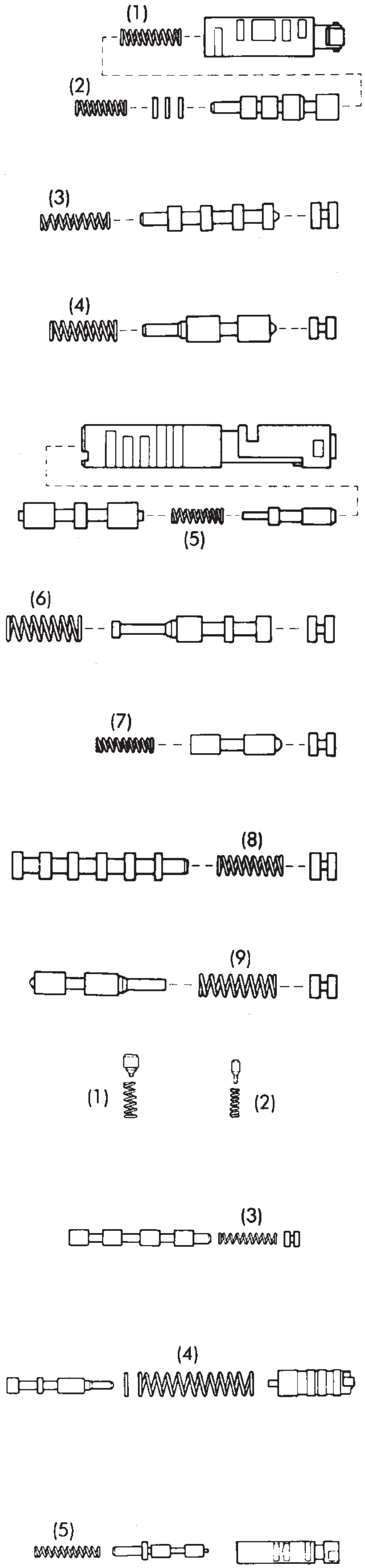
SPECIFICATIONS (Continued)

AW-4 VALVE AND SPRING IDENTIFICATION



Spring	Free Length
(1) Downshift Plug	27.3 mm (1.074 in.)
(2) Throttle Valve	20.6 mm (.811 in.)
(3) 3-4 Shift Valve	30.8 mm (1.212 in.)
(4) Second Coast Modulator Valve	25.3 mm (.996 in.)
(5) Lockup Relay Valve	21.4 mm (.843 in.)
(6)Secondary Regulator Valve	30.9 mm (1.217 in.)
(7) Cut-Back Valve	21.8 mm (.858 in.)
(8) 2-3 Shift Valve	30.8 mm (1.212 in.)
(9) Low Coast Modulator Valve	27.8 mm (1.094)

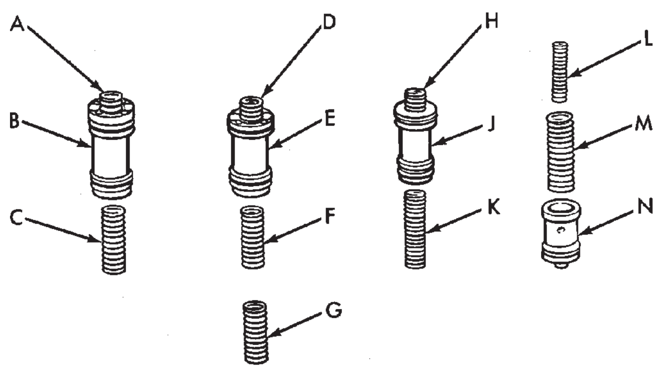
Spring	Spring Length
(1) Check Valve	20.2 mm (.797 in.)
(2) Pressure Relief Valve	11.2 mm (.441 in.)
(3) 1-2 Shift Valve	30.8 mm (1.213 in.)
(4) Primary Regulator Valve	62.3 mm (2.453 in.)
(5) Accumulator Control Valve	29.8 mm (1.173 in.)

J9121-408

SPECIFICATIONS (Continued)

AW-4 ACCUMULATOR COMPONENT IDENTIFICATION

	Component	Approximate Outside Diameter
SECOND BRAKE ACCUMULATOR	SPRING A PISTONB SPRING C	14.17 mm (.558 in.) 36.9 mm (1.453 in.) 19.91 mm (.784 in.)
DIRECT CLUTCH ACCUMULATOR	SPRING D PISTON E SPRING F SPRING G	12.07 mm (.475 in.) 36.9 mm (1.453 in.) 20.19 mm (.795 in.) 14.81 mm (.583 in.)
OVERDRIVE BRAKE ACCUMULATOR	SPRING H PISTON J SPRING K	14.10 mm (.555 in.) 31.9 mm (1.256 in.) 19.99 mm (.785 in.)
OVERDRIVE CLUTCH ACCUMULATOR	SPRING L SPRING M PISTON N	14.0 mm (0.551 in.) 20.3 mm (0.799 in.) 29.9 mm (1.177 in.)



J9121-407

AW-4 TORQUE SPECIFICATIONS

Description **Torque**

Converter Housing Bolts . . . .
10 mm . . . . 32–36 N·m (23–27 ft. lbs.)
12 mm . . . . 55–59 N·m (40–43 ft. lbs.)
Cooler Line Retaining Clip Nuts . . . . 2–4 N·m (18–35 in. lbs.)
Cooler Line Bracket Nuts . . . . 5–11 N·m (48–96 in. lbs.)
Cooler Line Fitting Nuts (at auto. trans. fittings) . . . . 18–23 N·m (160–200 in. lbs.)
Detent Spring Bolt . . . . . 9–11 N·m (80–96 in. lbs.)
Dust Cover Nuts/Bolts . . . . 18–23 N·m (159–203 in. lbs.)
Extension Housing Bolts . . . . 32–36 N·m (23–27 ft. lbs.)
Fill Tube Bracket Bolt . . 50–64 N·m (37–47 ft. lbs.)
Neutral Switch Bolt . . . . . 12–14 N·m (8–10 ft. lbs.)
Nut . . . . 6–8 N·m (53–70 ft. lbs.)
OD Support Bolt (to case) . . . . 23–27 N·m (18–20 ft. lbs.)

Description **Torque**

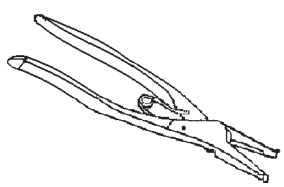
Oil Pan Bolts . . . . 6–8 N·m (53–70 in. lbs.)
Oil Pan Drain Plug . . . . 19–21 N·m (14–16 ft. lbs.)
Oil Pump Bolt (to case) . 21–23 N·m (16–18 ft. lbs.)
Oil Pump Bolt (to stator shaft) . . . . 9–11N·m (80–96 in. lbs.)
Oil Screen Bolt . . . . 9–11 N·m (80–96 in. lbs.)
Park Pawl Bracket . . . . . 9–11 N·m (80–96 in. lbs.)
Propeller Shaft Clamp Screws . . . . 16–23N·m (140–200 in. lbs.)
Rear Mount-To-Transmission Bolts . . . . . 60–81N·m (44 ft. lbs.)
Rear Mount-To-Clevis Bracket Bolt/Nut . . . . 54–75 N·m (40–55 ft. lbs.)
Rear Mount Clevis Bracket-To-Crossmember Nuts . . . . 33–49 N·m (24–36 ft. lbs.)
Shift Cable Bracket Screws At Transmission . . . . . 25–39 N·m (221–345 in. lbs.)
Shift Lever Mounting Cover Screws . . . . . 1–2 N·m (9–20 in. lbs.)
Shift Lever Housing Nuts . . . . 16–26 N·m (141–230 in. lbs.)

SPECIFICATIONS (Continued)

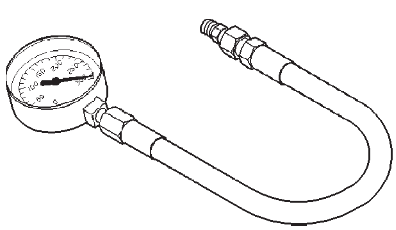
Description	Torque
Solenoid Harness Bolt	6–8 N·m (57–75 in. lbs.)
Speedometer Adapter Clamp Screw	10–12 N·m (90–110 in. lbs.)
Speed Sensor Coupling Nut	14–20 N·m (125–175 in. lbs.)
Throttle Cable Engine Bracket Screws	7–11 N·m (63–94 in. lbs.)
Throttle Cable Retaining Screw (at transmission)	8–10 N·m (70–98 in. lbs.)
Transfer Case Mounting Nuts	30–41 N·m (22–30 ft. lbs.)
Transmission Shift Lever Nut	15–17 N·m (134–154 in. lbs.)
Transmission-To-Engine Block Bolts	50–64 N·m (37–47 ft. lbs.)
Valve Body Bolts (to case)	9–11 N·m (80–96 in. lbs.)
Valve Body Bolts (to valve body)	6–7 N·m (54–58 in. lbs.)

SPECIAL TOOLS

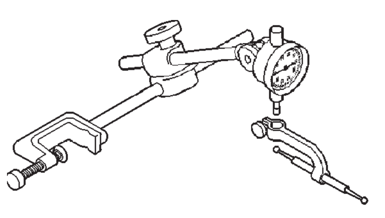
AW-4



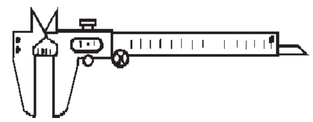
C-484 Snap Ring Plier



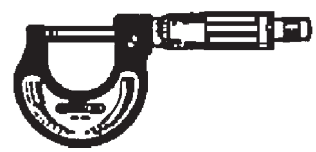
C-3293-SP Gauge



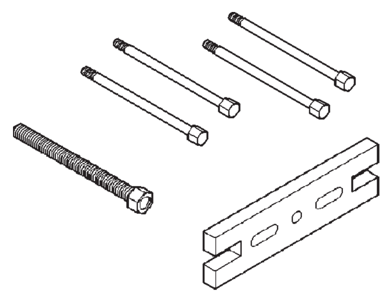
C-3339 Dial Indicator Set



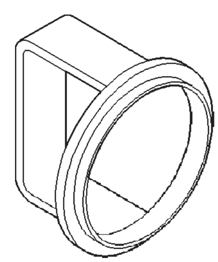
C-4959 Caliper, Metric Vernier



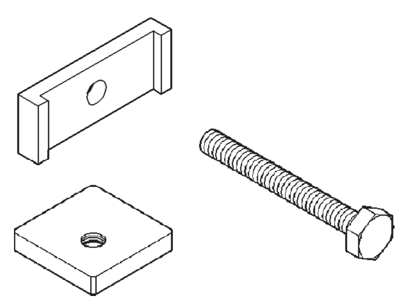
C-4960 Micrometer



7536 Puller, Oil Pump

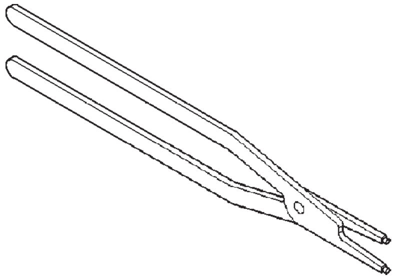


7538 Compressor, Piston #2 Spring

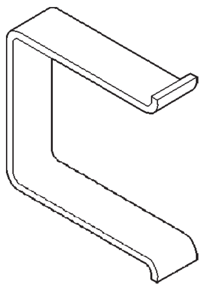


7539 Compressor, Piston #3 Spring

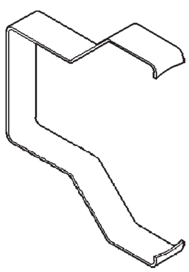
SPECIAL TOOLS (Continued)



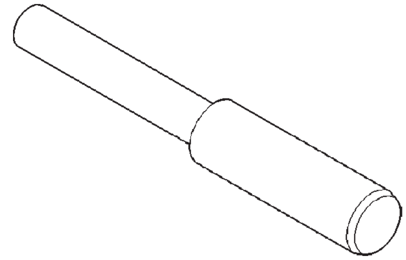
7540 Pliers, Large Snap Ring



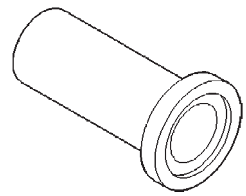
7542 Puller, Reaction Sleeve



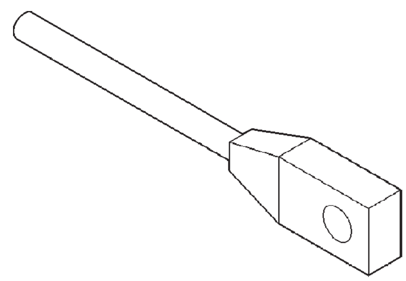
7543 Puller, Piston #1



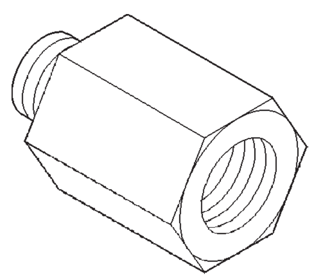
7544 Installer, Brake Drum Seal



7549 Installer, Seal



7552 Gauge, 3.0 mm Wire



7554 Adapter, Pressure Port

NV231 TRANSFER CASE

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

NV231 TRANSFER CASE

DESCRIPTION

The NV231 is a part-time transfer case with a low range reduction gear system. The NV231 has three operating ranges plus a Neutral position. A low range system provides a reduction ratio for increased low speed torque capability.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4x4 (4-wheel drive)
- 4 Lo (4-wheel drive low range

The 2WD range is for use on any road surface at any time.

The 4x4 and 4 Lo ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

The low range reduction gear system is operative in 4 Lo range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate.

IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

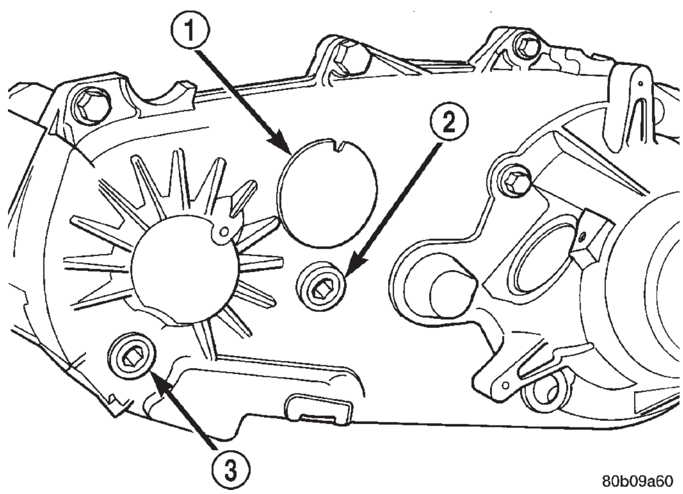


Fig. 1 Fill/Drain Plug And I. D. Tag Locations

1 – I. D. TAG
2 – FILL PLUG
3 – DRAIN PLUG

OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and

DESCRIPTION AND OPERATION (Continued)

hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

LUBRICANT AND FILL LEVEL

DESCRIPTION

Recommended lubricant for the NV231 transfer case is Mopar® Dexron II, or ATF Plus 3, type 7176. Approximate lubricant fill capacity is 1.2 liters (2.5 pints).

The fill and drain plugs are both in the rear case (Fig. 2). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

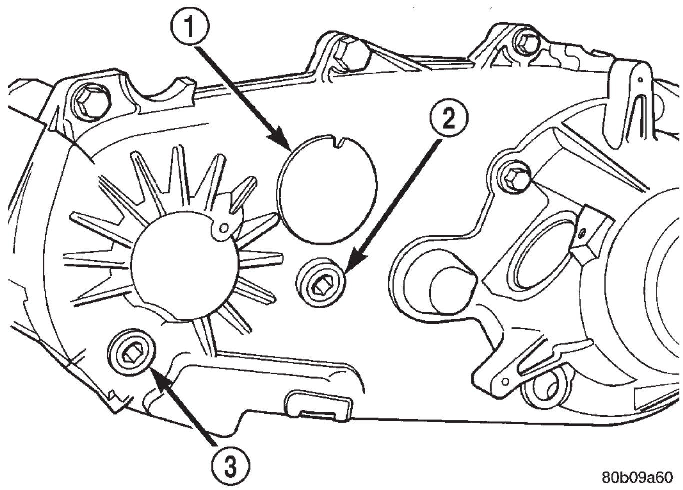


Fig. 2 Fill/Drain Plug Locations

1 – I. D. TAG
2 – FILL PLUG
3 – DRAIN PLUG

DIAGNOSIS AND TESTING

NV231 DIAGNOSIS

DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer case difficult to shift or will not shift into desired range.	1) Vehicle speed to great to permit shifting.	1) Slow vehicle and shift into desired range.
	2) If vehicle was operated for an extended period in 4H mode on dry surface, driveline torque load may cause difficulty.	2) Stop vehicle and shift transfer case to Neutral position. Transfer case can then be shifted to the desired mode.
	3) Transfer case shift linkage binding.	3) Repair or replace linkage as necessary.
	4) Insufficient or incorrect lubricant.	4) Drain and refill transfer case with the correct type and quantity of lubricant.
	5) Internal transfer case components binding, worn, or damaged.	5) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.

DIAGNOSIS AND TESTING (Continued)

Condition	Possible Cause	Correction
Transfer case noisy while in, or jumps out of, 4L mode.	1) Transfer case not completely engaged in 4L position.	1) Slow vehicle, shift transfer case to the Neutral position, and then shift into the 4L mode.
	2) Transfer case shift linkage out of adjustment.	2) Adjust linkage as necessary.
	3) Transfer case shift linkage loose or binding.	3) Repair, replace, or tighten linkage components as necessary.
	4) Range fork damaged, inserts worn, or fork is binding on the shift rail.	4) Repair or replace components as necessary.
	5) Low range gear worn or damaged.	5) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Abnormal tire wear.	1) Extended operation in 4H mode on dry surfaces,	1) Operate vehicle in 2H mode on dry surfaces.

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember, or skid plate.
(7) Disconnect front/rear propeller shafts at transfer case.
(8) Disconnect vehicle speed sensor wires.
(9) Disconnect transfer case linkage rod from range lever.
(10) Disconnect transfer case vent hose (Fig. 3) and indicator switch harness, if necessary.
(11) Support transfer case with transmission jack.
(12) Secure transfer case to jack with chains.
(13) Remove nuts attaching transfer case to transmission.
(14) Pull transfer case and jack rearward to disengage transfer case.
(15) Remove transfer case from under vehicle.

INSTALLATION

(1) Mount transfer case on a transmission jack.
(2) Secure transfer case to jack with chains.

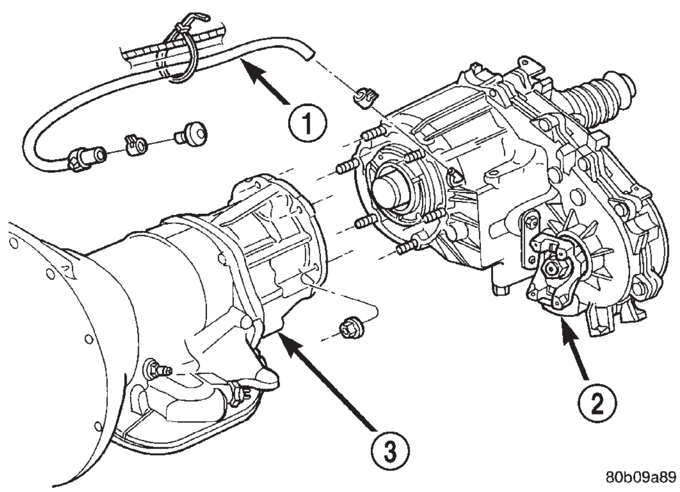


Fig. 3 Transfer Case Mounting

1 – VENT TUBE
2 – TRANSFER CASE
3 – TRANSMISSION

(3) Position transfer case under vehicle.
(4) Align transfer case and transmission shafts and install transfer case on transmission.
(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 3).
(6) Connect vehicle speed sensor wires, and vent hose.
(7) Connect indicator switch harness to transfer case switch, if necessary. Secure wire harness to clips on transfer case.

REMOVAL AND INSTALLATION (Continued)

(8) Align and connect propeller shafts. Refer to Group 3, Differential and Driveline, for proper procedures and specifications.

(9) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(11) Remove transmission jack and support stand.

(12) Connect shift rod to transfer case range lever.

(13) Adjust transfer case shift linkage.

(14) Lower vehicle and verify transfer case shift operation.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.

(2) Raise vehicle.

(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 4). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.

(4) Lower vehicle.

(5) Remove console. Refer to Group 23, Body, for proper procedures.

(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.

(2) Install console. Refer to Group 23, Body, for proper procedures.

(3) Raise vehicle.

(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.

(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.

TORQUE	
A	3-4 N•m (27-35 in. lbs.)
B	11-14 N•m (97-123 in. lbs.)
C	8-14 N•m (72-120 in. lbs.)

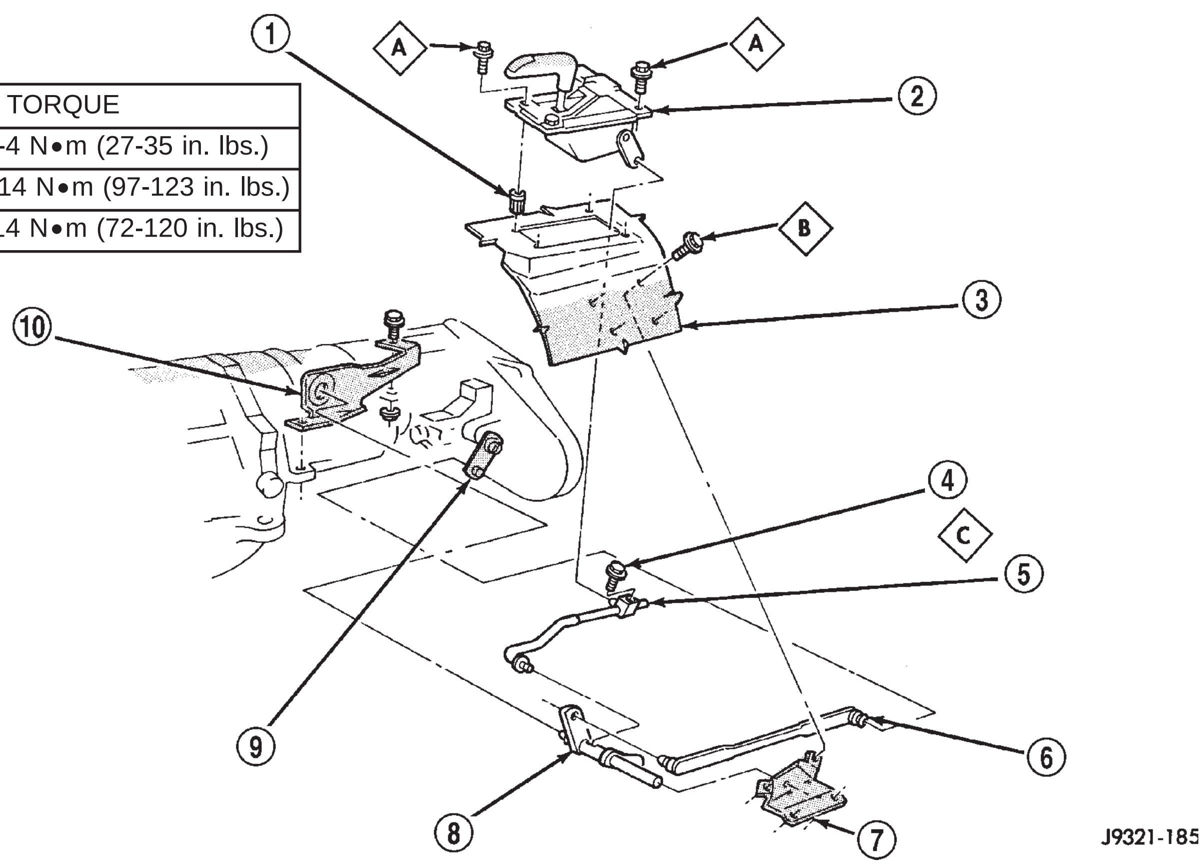


Fig. 4 Shift Linkage

1 – RIVNUT (4)
2 – SHIFT LEVER ASSEMBLY
3 – FLOORPAN
4 – TRUNNION LOCK BOLT
5 – SELECTOR ROD AND TRUNNION
6 – SHIFT LEVER ROD
7 – TORQUE SHAFT FRAME BRACKET
8 – TORQUE SHAFT
9 – TRANSFER CASE SHIFT LEVER
10 – TORQUE SHAFT TRANSFER CASE BRACKET

REMOVAL AND INSTALLATION (Continued)

(6) Lower vehicle and check transfer case shift operation.

SPEEDOMETER

REMOVAL

(1) Raise vehicle.

(2) Disconnect wires from vehicle speed sensor.

(3) Remove adapter clamp and screw (Fig. 5).

(4) Remove speed sensor and speedometer adapter as an assembly.

(5) Remove speed sensor retaining screw and remove sensor from adapter.

(6) Remove speedometer pinion from adapter. Replace pinion if chipped, cracked, or worn.

(7) Inspect sensor and adapter O-rings (Fig. 5). Remove and discard O-rings if worn or damaged.

(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or if pins are loose, severely corroded, or damaged.

INSTALLATION AND INDEXING

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter (Fig. 5), if necessary.

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 6). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o-clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

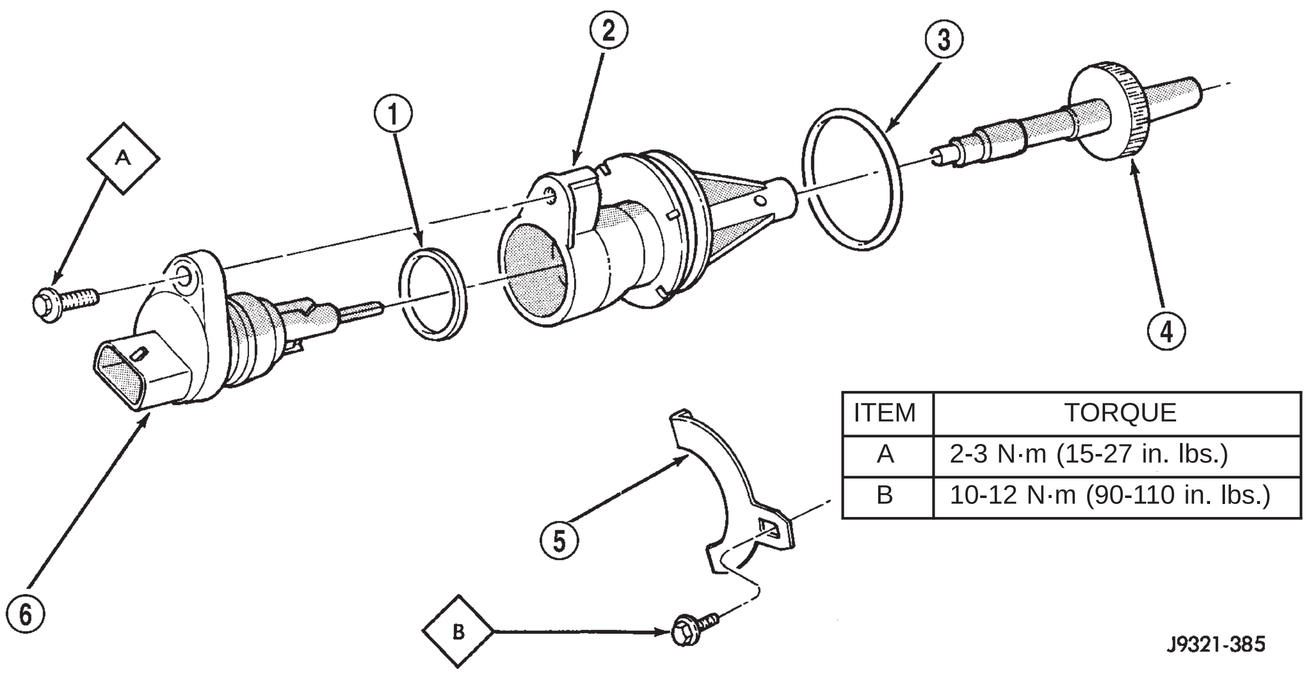
(12) Lower vehicle and top off transmission fluid level if necessary.

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.



ITEM	TORQUE
A	2-3 N·m (15-27 in. lbs.)
B	10-12 N·m (90-110 in. lbs.)

Fig. 5 Speedometer Components

1 – SENSOR O-RING
2 – SPEEDOMETER ADAPTER
3 – ADAPTER O-RING
4 – SPEEDOMETER PINION
5 – ADAPTER CLAMP
6 – VEHICLE SPEED SENSOR

REMOVAL AND INSTALLATION (Continued)

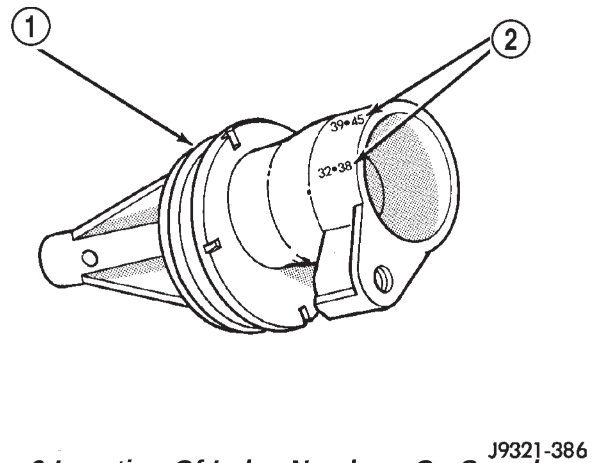


Fig. 6 Location Of Index Numbers On Speedometer Adapter

1 – SPEEDOMETER ADAPTER
2 – INDEX NUMBER LOCATION

(3) Remove front output shaft yoke.

(4) Remove seal from front case with pry tool (Fig. 7).

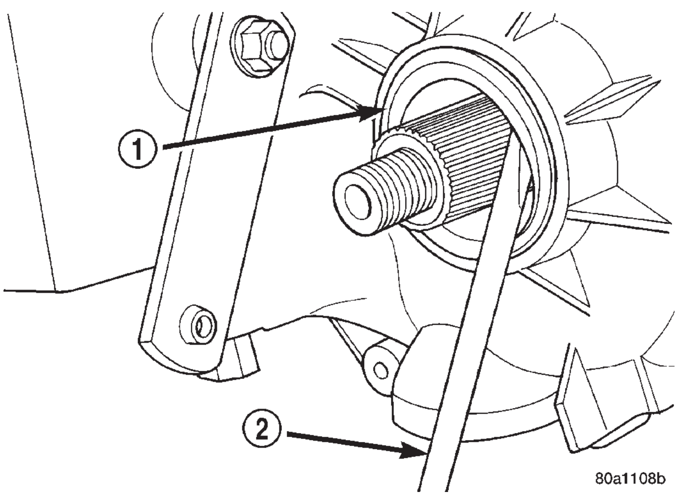


Fig. 7 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 8143 as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 8). Once seal is started, continue tapping seal into bore until installer tool seats against case.

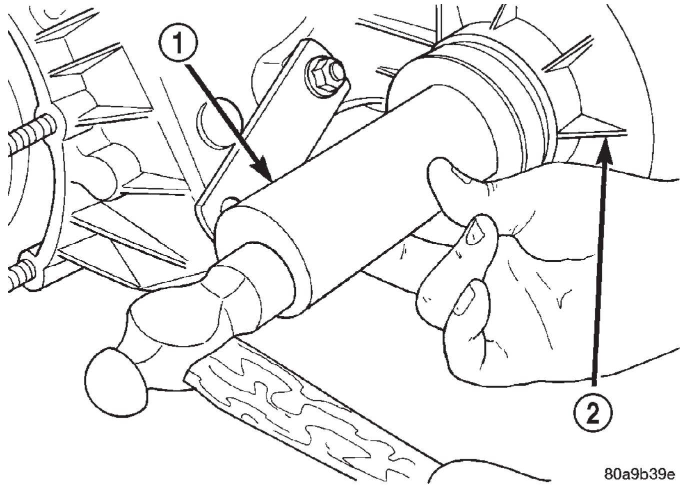


Fig. 8 Front Output Seal Installation

1 – INSTALLER 8143
2 – TRANSFER CASE

DISASSEMBLY AND ASSEMBLY

NV231 TRANSFER CASE

DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug and drain lubricant remaining in case.

REAR RETAINER AND OIL PUMP REMOVAL

(1) Remove the speedometer adapter.

(2) Spread band clamp which holds output shaft boot to slinger with a suitable awl, or equivalent.

(3) Remove output shaft boot from slinger and output shaft.

(4) Using Puller MD-998056-A, remove rear slinger (Fig. 9).

(5) Use a suitable pry tool, or a slide hammer mounted screw, to remove the seal from the rear retainer (Fig. 10).

(6) Remove the rear output bearing I. D. retaining ring (Fig. 11).

(7) Remove the bolts holding the rear retainer to the rear case half.

(8) Tap rear retainer with rawhide or rubber mallet to loosen sealer bead.

DISASSEMBLY AND ASSEMBLY (Continued)

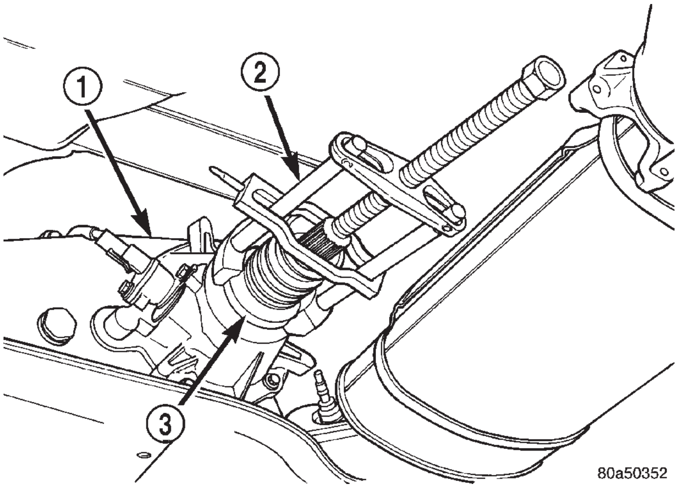


Fig. 9 Rear Slinger Removal

1 – TRANSFER CASE
2 – SPECIAL TOOL MD998056–A
3 – SLINGER

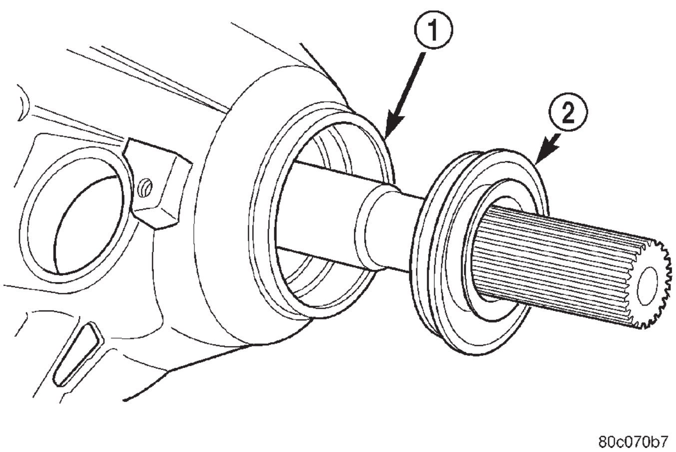


Fig. 10 Rear Retainer Seal

1 – REAR RETAINER
2 – OUTPUT SHAFT SEAL

(9) Remove rear retainer from rear case half (Fig. 12).

(10) Remove snap-ring holding oil pump in position on output shaft.

(11) Disengage oil pickup tube from oil pump and remove oil pump assembly. Remove oil pump by tilting the edge of the oil pump from under the edge of the rear case half and sliding the pump (Fig. 13).

(12) Remove pick-up tube o-ring from oil pump (Fig. 14), if necessary. Do not disassemble the oil pump, it is not serviceable.

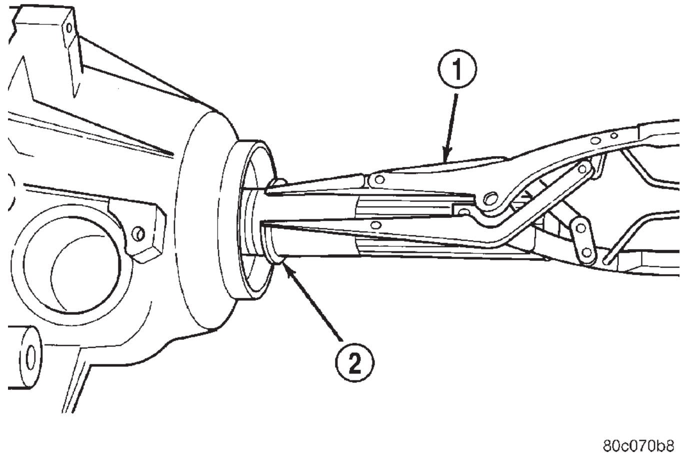


Fig. 11 Output Shaft Rear Bearing Retaining Ring

1 – REAR RETAINER
2 – OUTPUT SHAFT SEAL

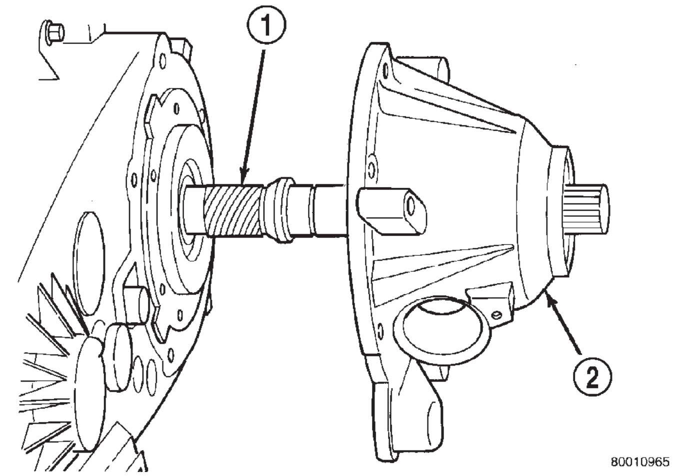


Fig. 12 Rear Retainer Removal

1 – MAINSHAFT
2 – REAR RETAINER

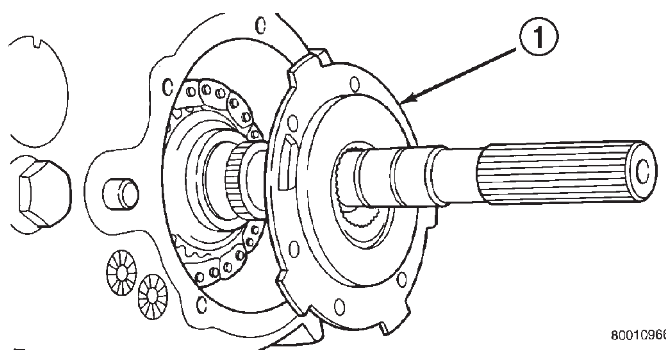


Fig. 13 Oil Pump Removal

1 – OIL PUMP

DISASSEMBLY AND ASSEMBLY (Continued)

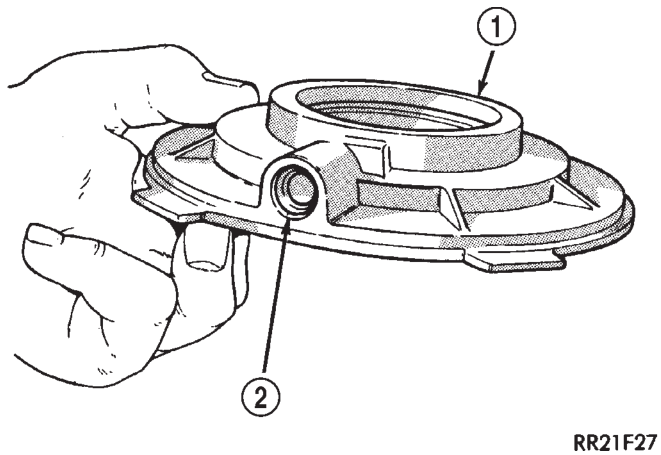


Fig. 14 Pick-up Tube O-ring Location

1 – OIL PUMP
2 – O-RING

YOKE AND RANGE LEVER REMOVAL

(1) Remove transfer case indicator switch.

(2) Remove front yoke nut as follows:

(a) Move range lever to 4L position.

(b) Then remove nut with socket and impact wrench (Fig. 15).

(3) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 16). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

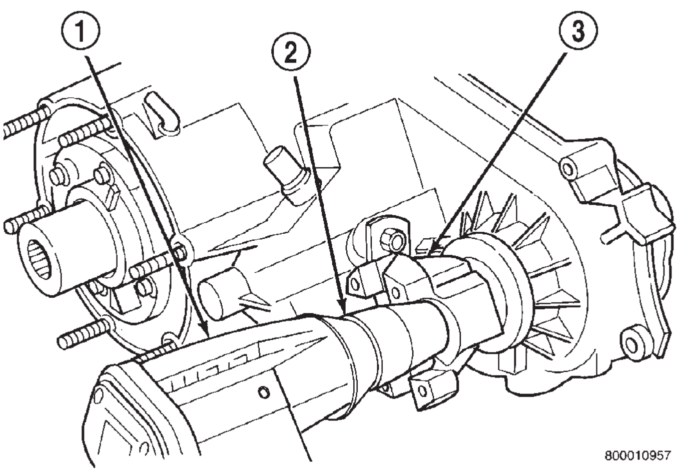


Fig. 15 Yoke Nut Removal

1 – IMPACT WRENCH
2 – SOCKET
3 – YOKE

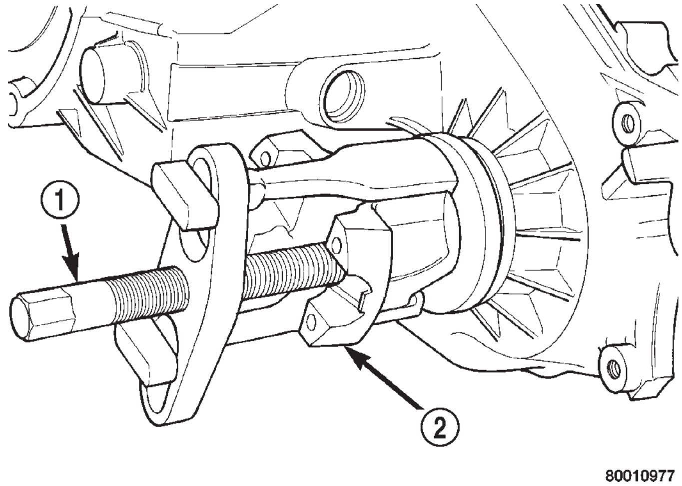


Fig. 16 Yoke Removal

1 – PULLER TOOL
2 – YOKE

(4) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(5) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft (Fig. 17).

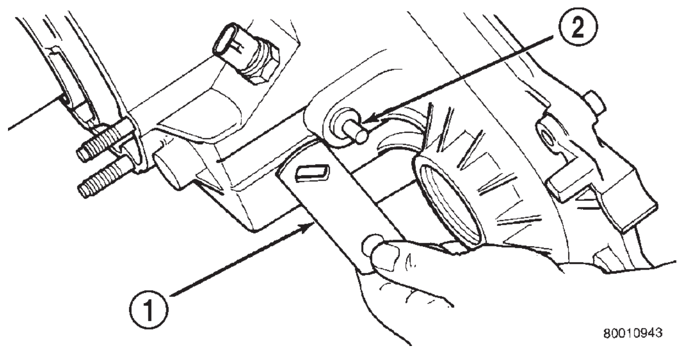


Fig. 17 Range Lever Removal

1 – RANGE LEVER
2 – SECTOR SHAFT

DISASSEMBLY AND ASSEMBLY (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN REMOVAL

(1) Support transfer case so rear case is facing upward.

(2) Remove bolts holding front case to rear case. The case alignment bolts require flat washers (Fig. 18).

(3) Loosen rear case with flat blade screwdriver to break sealer bead. Insert pry tool blade only into notches provided at each end of case (Fig. 19).

(4) Remove rear case from front case.

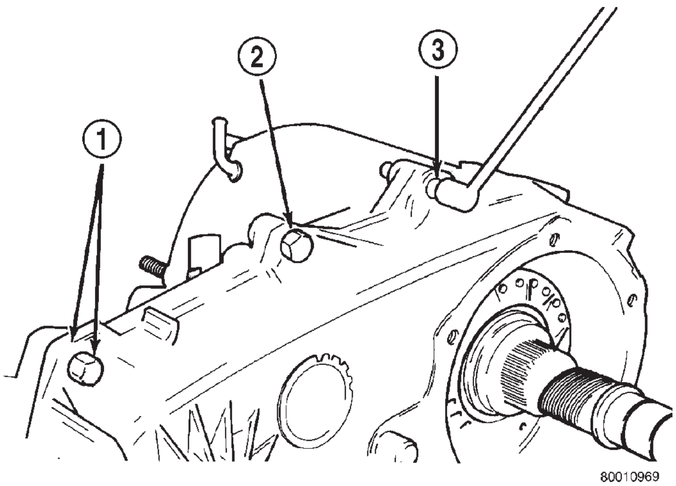


Fig. 18 Rear Case Alignment Bolt Locations

1 – DOWEL BOLT AND WASHER (2)
2 – CASE BOLT (5)
3 – SPLINE HEAD BOLT (1)

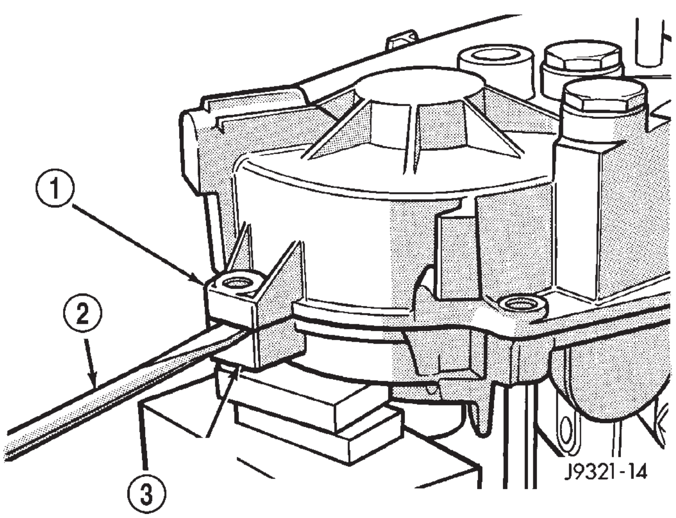


Fig. 19 Loosening Rear Case

1 – REAR CASE
2 – PRY TOOL (IN CASE SLOT)
3 – FRONT CASE

(5) Remove oil pickup tube from rear case (Fig. 20).

(6) Remove mode fork spring (Fig. 21).

(7) Pull front output shaft upward and out of front output shaft bearing (Fig. 22).

(8) Remove front output shaft and chain.

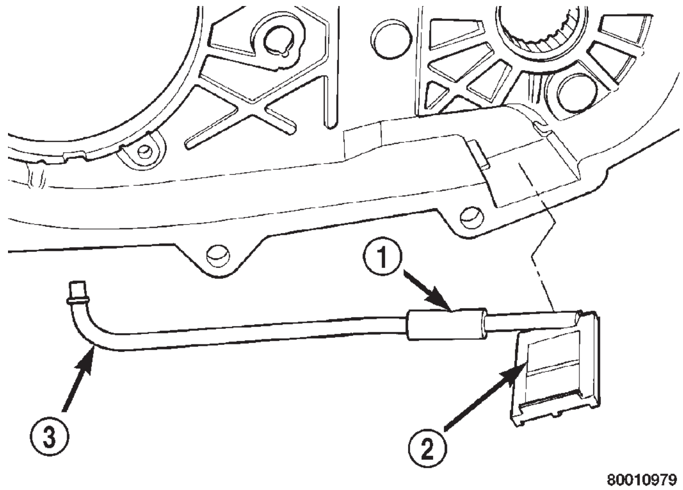


Fig. 20 Oil Pickup Tube Removal

1 – CONNECTING HOSE
2 – PICKUP SCREEN
3 – PICKUP TUBE

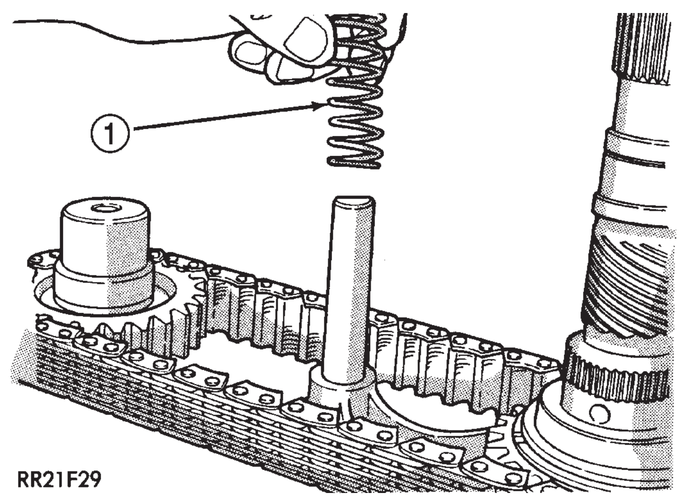


Fig. 21 Mode Fork Spring Removal

1 – MODE SPRING

DISASSEMBLY AND ASSEMBLY (Continued)

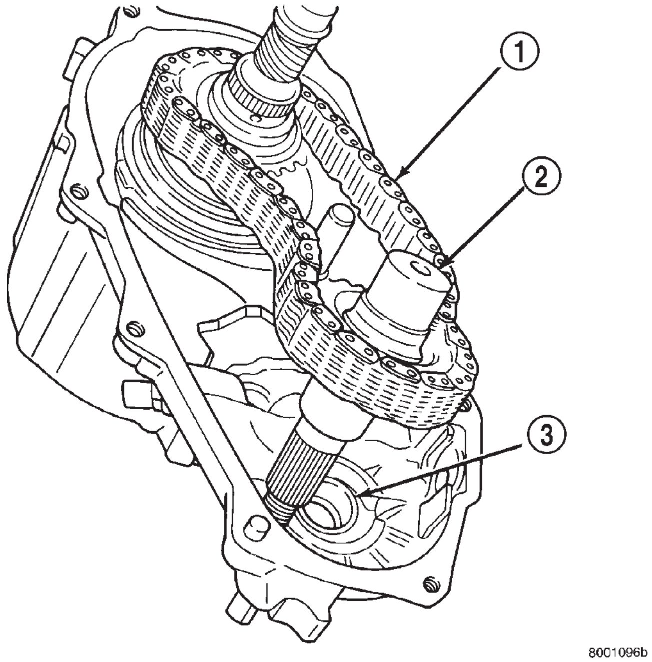


Fig. 22 Remove Front Output Shaft And Chain

1 – DRIVE CHAIN
2 – FRONT OUTPUT SHAFT
3 – SHAFT FRONT BEARING

SHIFT FORKS AND MAINSHAFT REMOVAL

(1) Remove detent plug, O-ring, detent spring and detent plunger (Fig. 23).

(2) Remove mainshaft from mode sleeve and input gear pilot bearing.

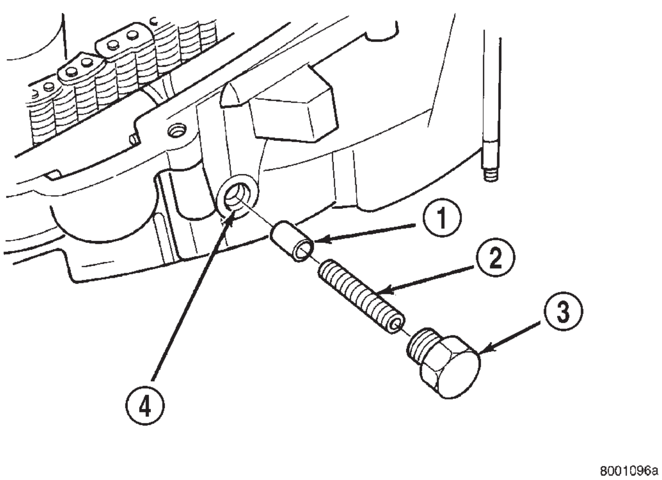


Fig. 23 Detent Plug, Spring And Plunger Removal

1 – POPPET
2 – SPRING
3 – SCREW
4 – POPPET BORE (IN CASE)

(3) Remove mode fork and sleeve as an assembly (Fig. 24). Note position of sleeve for assembly reference. The short side of the sleeve faces upward.

(4) Remove range fork and hub as an assembly (Fig. 25). Note fork position for installation reference.

(5) Remove shift sector from front case (Fig. 26).

(6) Remove shift sector bushing and O-ring (Fig. 27).

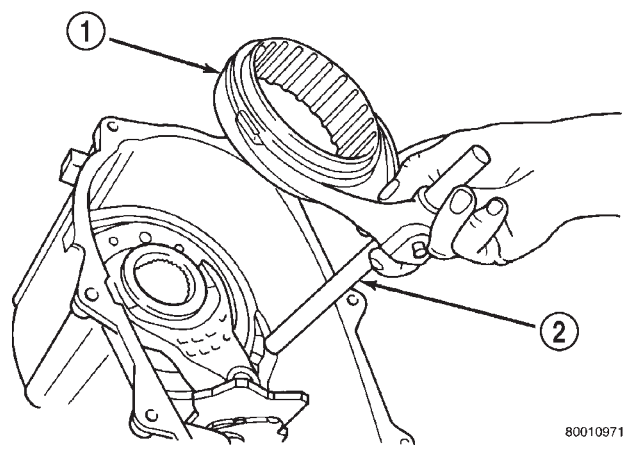


Fig. 24 Mode Fork And Sleeve Removal

1 – MODE SLEEVE
2 – MODE FORK AND RAIL

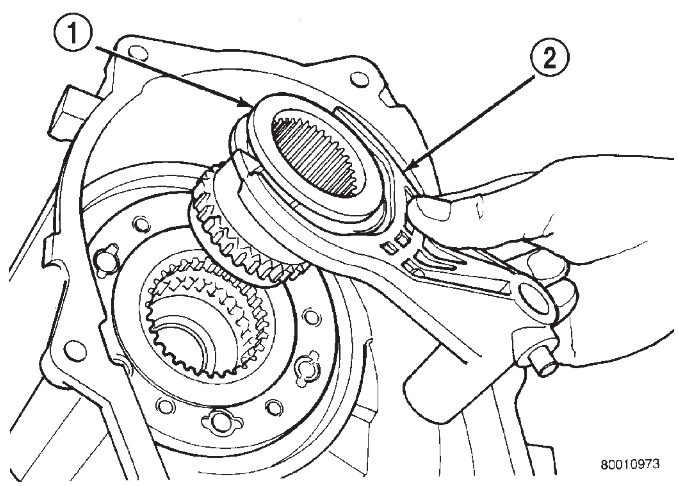


Fig. 25 Range Fork And Hub Removal

1 – RANGE HUB
2 – RANGE FORK

DISASSEMBLY AND ASSEMBLY (Continued)

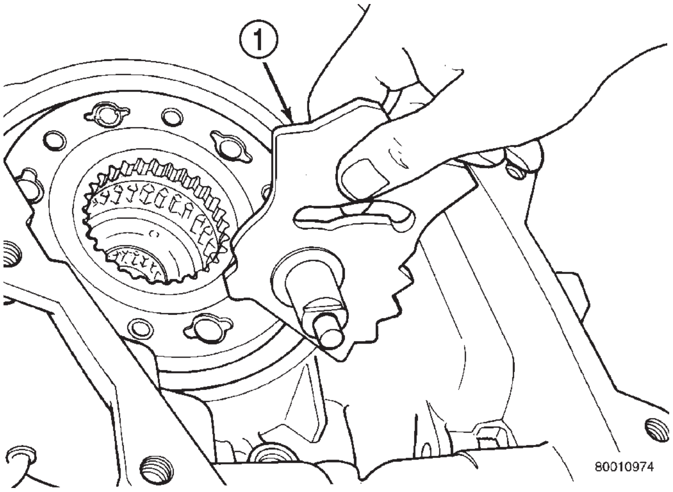


Fig. 26 Shift Sector Removal

1 – SHIFT SECTOR

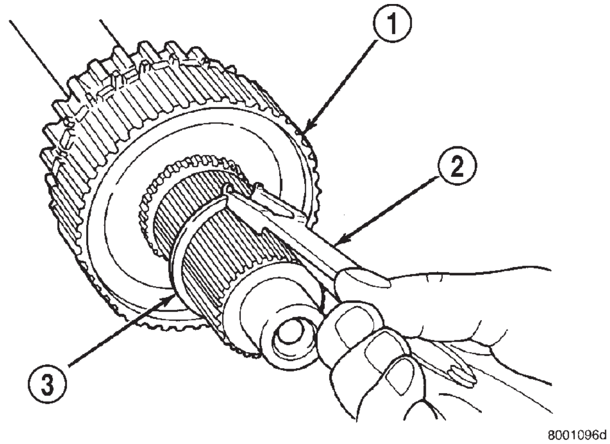


Fig. 28 Mode Hub Retaining Ring Removal

1 – MODE HUB
2 – SNAP RING PLIERS (HEAVY DUTY)
3 – MODE HUB RETAINING RING

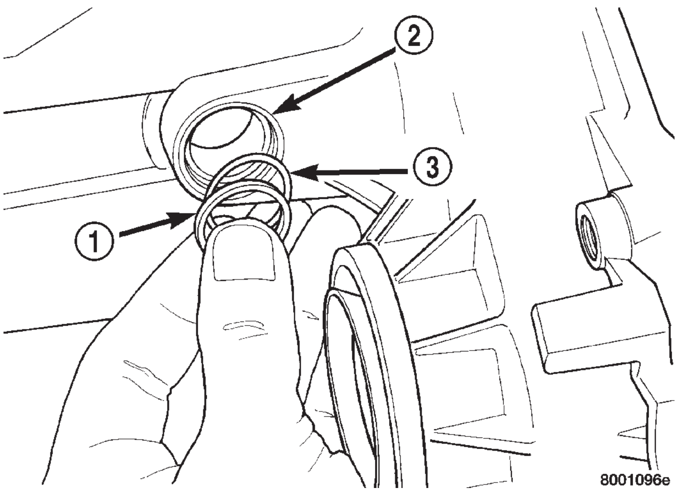


Fig. 27 Sector Bushing And O-Ring Removal

1 – SEAL RETAINER
2 – SECTOR SHAFT BORE
3 – O-RING SEAL

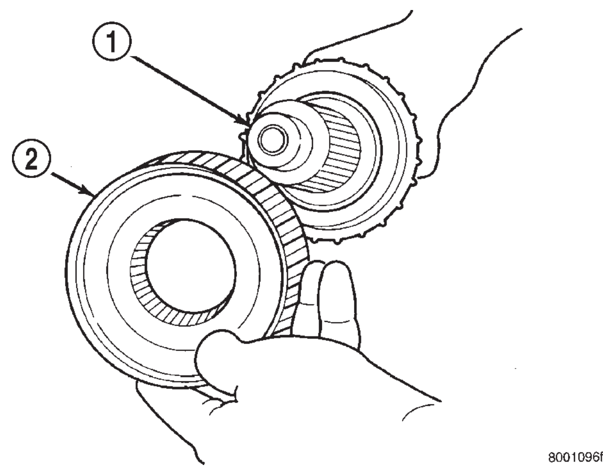


Fig. 29 Mode Hub Removal

1 – MAINSHAFT
2 – MODE HUB

MAINSHAFT DISASSEMBLY

(1) Remove mode hub retaining ring with heavy duty snap-ring pliers (Fig. 28).

(2) Slide mode hub off mainshaft (Fig. 29).

(3) Slide drive sprocket off mainshaft (Fig. 30).

DISASSEMBLY AND ASSEMBLY (Continued)

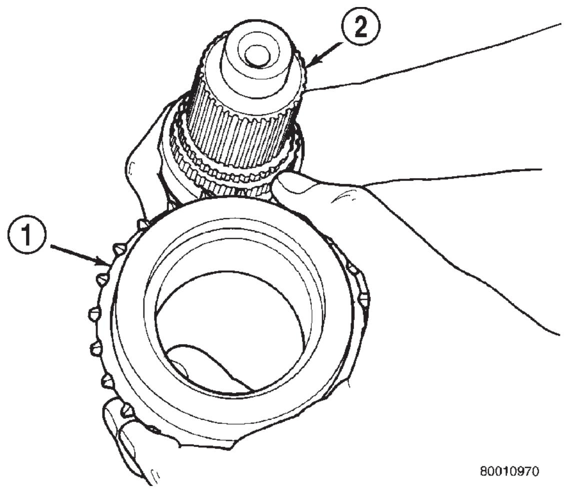


Fig. 30 Drive Sprocket Removal

1 – DRIVE SPROCKET
2 – MAINSHAFT

INPUT GEAR AND LOW RANGE GEAR REMOVAL

(1) Remove front bearing retainer attaching bolts (Fig. 31).

(2) Remove front bearing retainer. Pry retainer loose with pry tool positioned in slots at each end of retainer (Fig. 32).

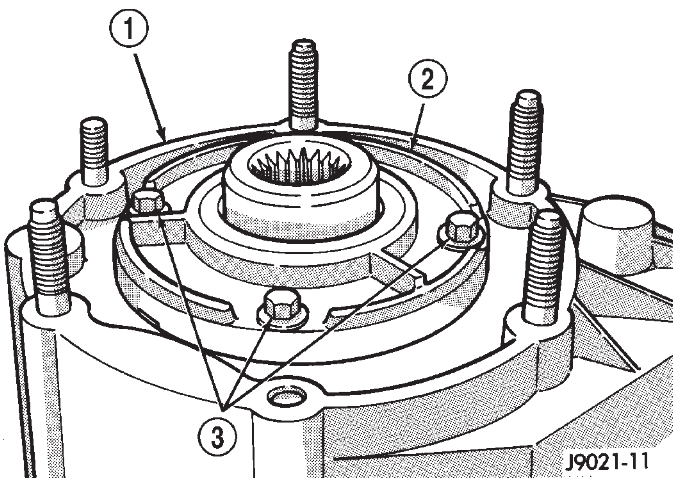


Fig. 31 Front Bearing Retainer Bolts

1 – FRONT CASE
2 – FRONT BEARING RETAINER
3 – RETAINER BOLTS

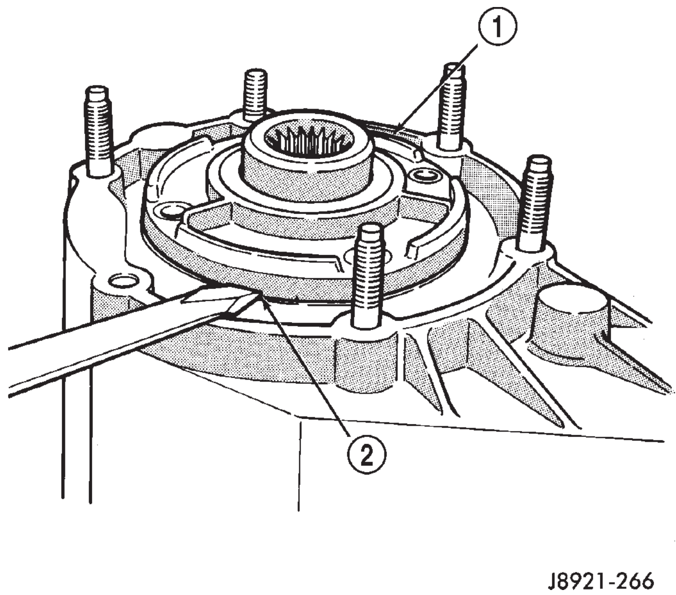


Fig. 32 Front Bearing Retainer Removal

1 – FRONT BEARING RETAINER
2 – RETAINER SLOT

(3) Remove front bearing retainer seal. Tap seal out with drift and hammer.

(4) Remove input gear retaining ring with heavy duty snap-ring pliers (Fig. 33)

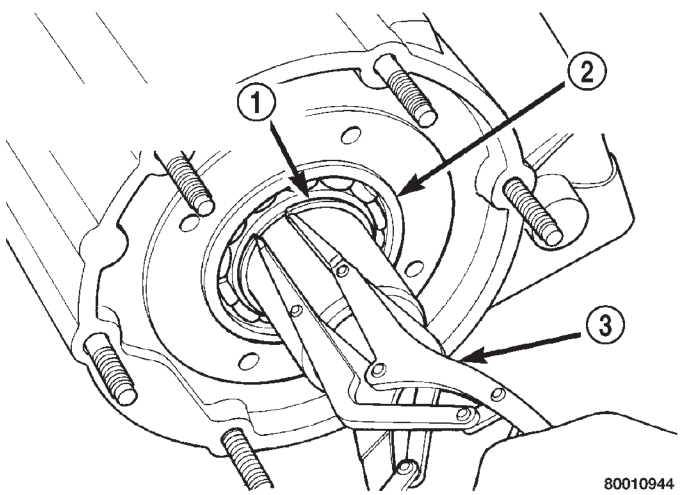


Fig. 33 Removing Input Gear Retaining Ring

1 – INPUT GEAR BEARING RETAINING RING
2 – INPUT GEAR BEARING
3 – SNAP RING PLIERS

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Place front case in horizontal position. Then remove input gear and low range gear as an assembly (Fig. 34). Tap gear out of bearing with plastic mallet if necessary.

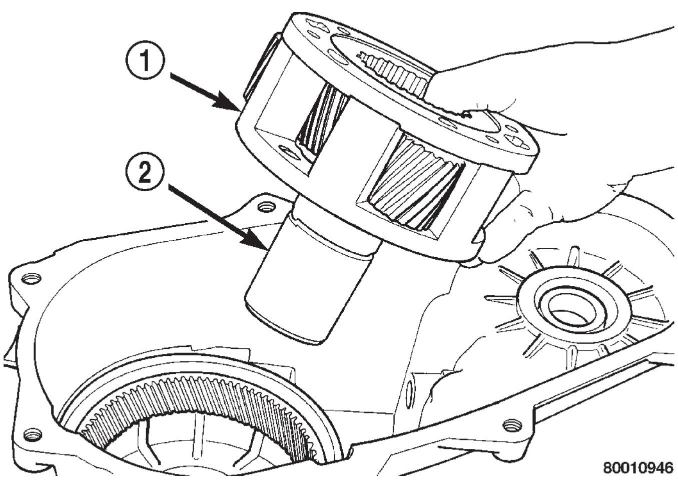


Fig. 34 Input Gear And Planetary Carrier Removal

1 – PLANETARY ASSEMBLY
2 – INPUT GEAR

INPUT AND LOW RANGE GEAR DISASSEMBLY

(1) Remove snap-ring that retains input gear in low range gear (Fig. 35).
(2) Remove retainer (Fig. 36).
(3) Remove front tabbed thrust washer (Fig. 37).
(4) Remove input gear (Fig. 38).
(5) Remove rear tabbed thrust washer from low range gear (Fig. 39).

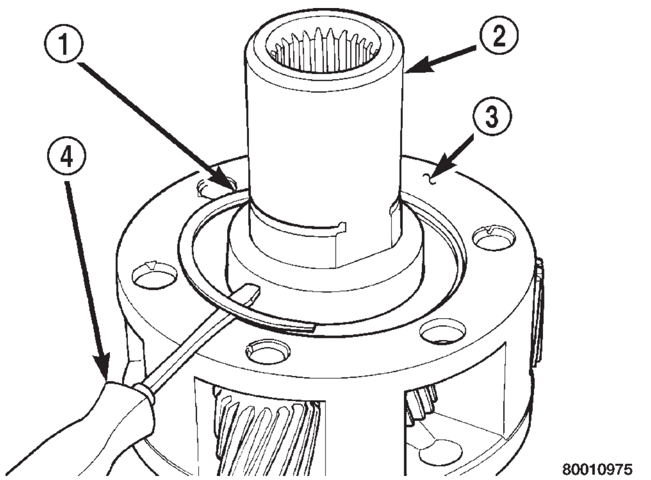


Fig. 35 Input Gear Snap-Ring Removal

1 – CARRIER LOCK RETAINING RING
2 – INPUT GEAR
3 – PLANETARY CARRIER
4 – SCREWDRIVER

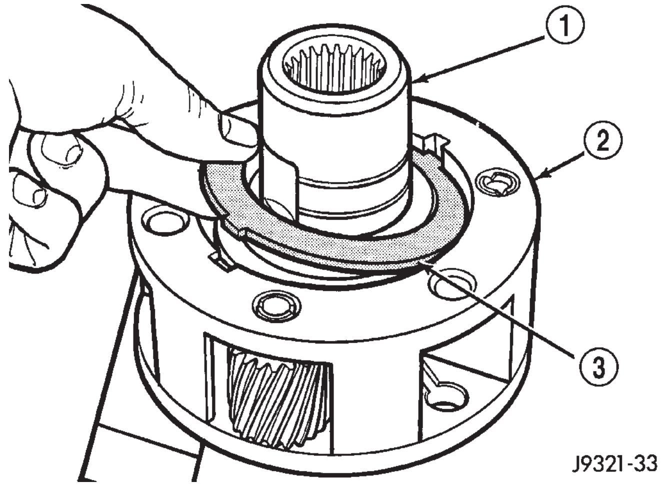


Fig. 36 Input Gear Retainer Removal

1 – INPUT GEAR
2 – LOW RANGE GEAR
3 – RETAINER

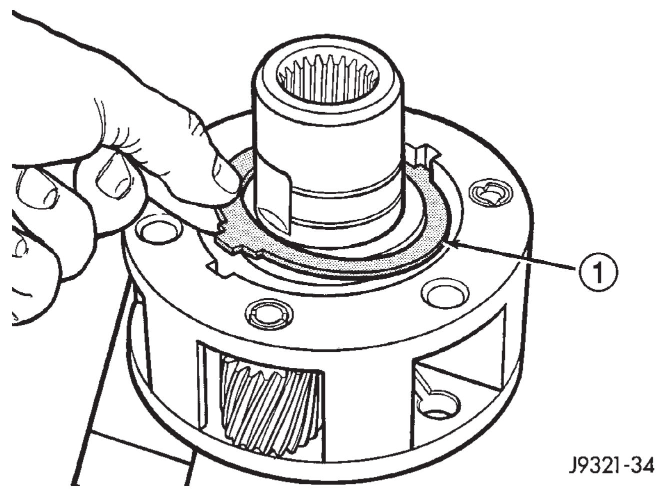


Fig. 37 Front Tabbed Thrust Washer Removal

1 – FRONT TABBED THRUST WASHER

DISASSEMBLY AND ASSEMBLY (Continued)

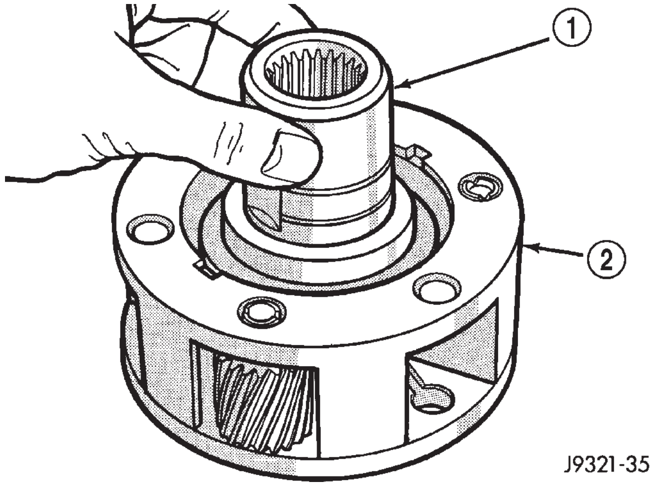


Fig. 38 Input Gear Removal

1 – INPUT GEAR
2 – LOW RANGE GEAR

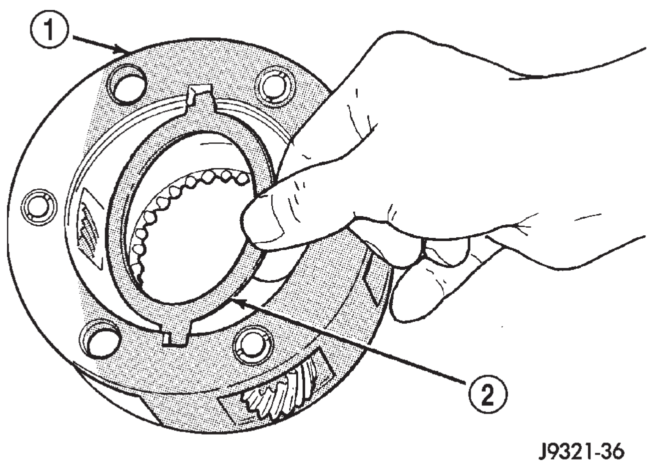


Fig. 39 Rear Tabbed Thrust Washer Removal

1 – LOW RANGE GEAR
2 – REAR TABBED THRUST WASHER

ASSEMBLY

Lubricate transfer case components with Mopar® Dexron II automatic transmission fluid or petroleum jelly (where indicated) during assembly.

BEARING AND SEAL INSTALLATION

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

(1) Remove the front output shaft seal from case with pry tool (Fig. 40).

(2) Remove the front output shaft bearing retaining ring with screwdriver (Fig. 41).

(3) Remove bearing with Tool Handle C-4171 and Tool 5065 (Fig. 42).

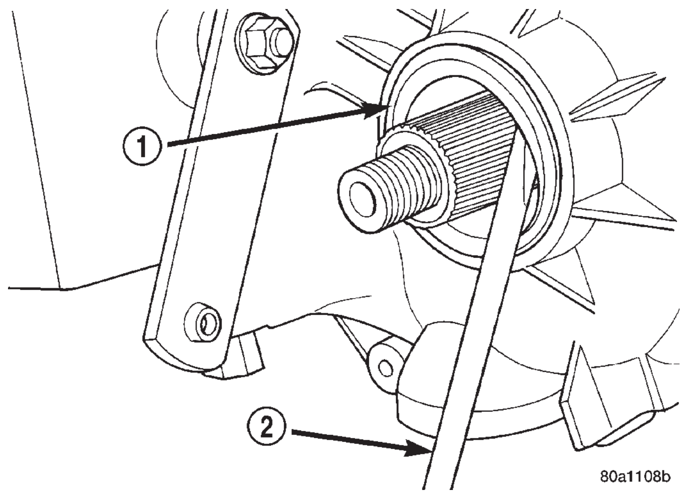


Fig. 40 Front Output Seal Removal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

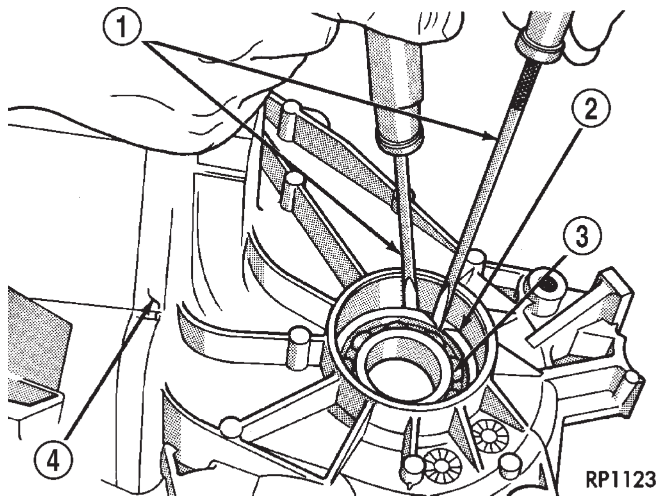


Fig. 41 Front Output Shaft Bearing Retaining Ring Removal

1 – SCREWDRIVERS
2 – SNAP RING
3 – FRONT OUTPUT SHAFT BEARING
4 – FRONT CASE

DISASSEMBLY AND ASSEMBLY (Continued)

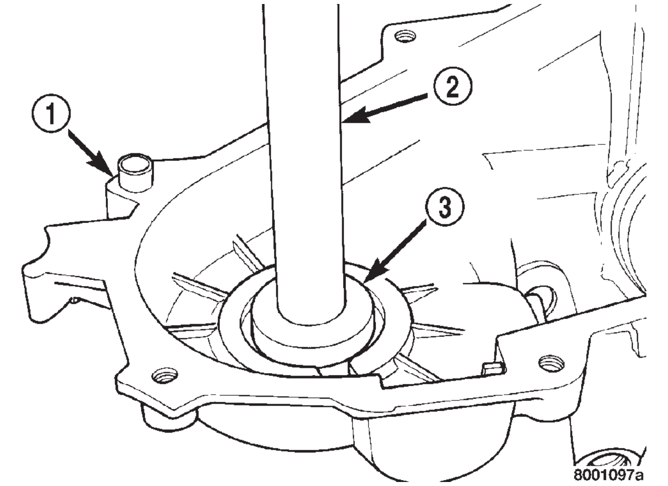


Fig. 42 Front Output Shaft Bearing Removal

1 – FRONT CASE
2 – SPECIAL TOOL C-4171
3 – SPECIAL TOOL 5065

(4) Install front output shaft front bearing in case with Tool Handle C-4171 and Installer 5064 (Fig. 43).

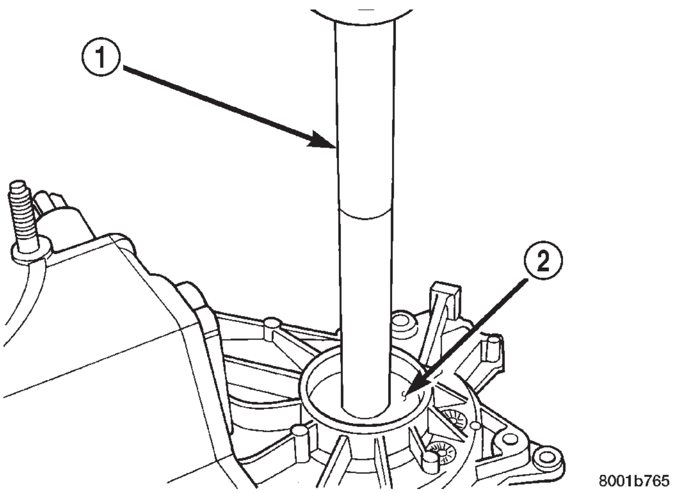


Fig. 43 Front Output Shaft Bearing Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5064

(5) Install output shaft front bearing retaining ring (Fig. 44). Start ring into place by hand. Then use small screwdriver to work ring into case groove. Be sure ring is fully seated before proceeding.

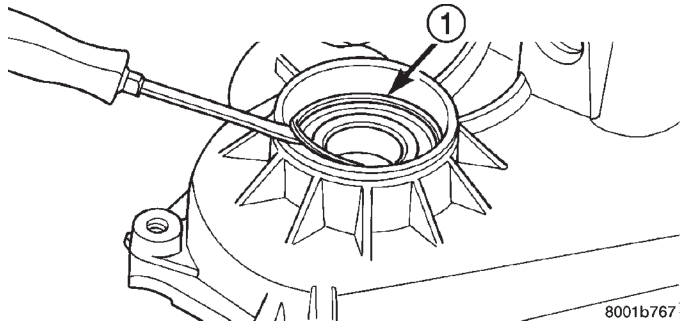


Fig. 44 Installing Output Shaft Front Bearing Retaining Ring

1 – WORK RETAINING RING INTO BORE GROOVE WITH SMALL SCREWDRIVER

(6) Install new front output seal in front case with Installer Tool 8143 as follows:

(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**

(b) Start seal in bore with light taps from hammer (Fig. 45). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

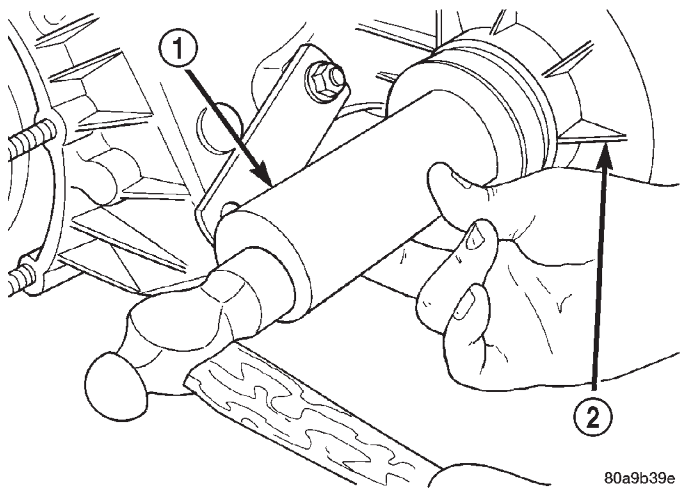


Fig. 45 Front Output Seal Installation

1 – INSTALLER 8143
2 – TRANSFER CASE

(7) Remove the output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 46).

(8) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 47). The bearing bore is chamfered at the top. Install the bearing so it is flush with the lower edge of this chamfer (Fig. 48).

DISASSEMBLY AND ASSEMBLY (Continued)

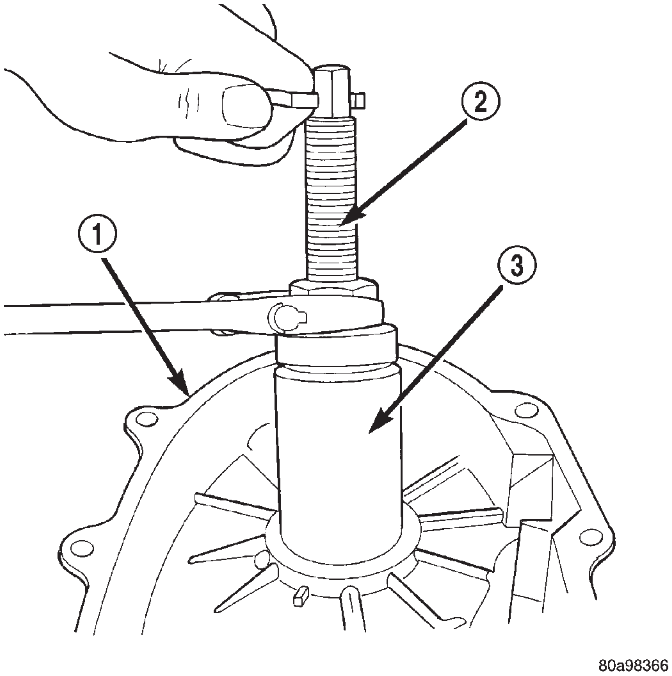


Fig. 46 Output Shaft Rear Bearing Removal

1 – REAR CASE
2 – SPECIAL TOOL L-4454–1 AND L-4454–3
3 – SPECIAL TOOL 8148

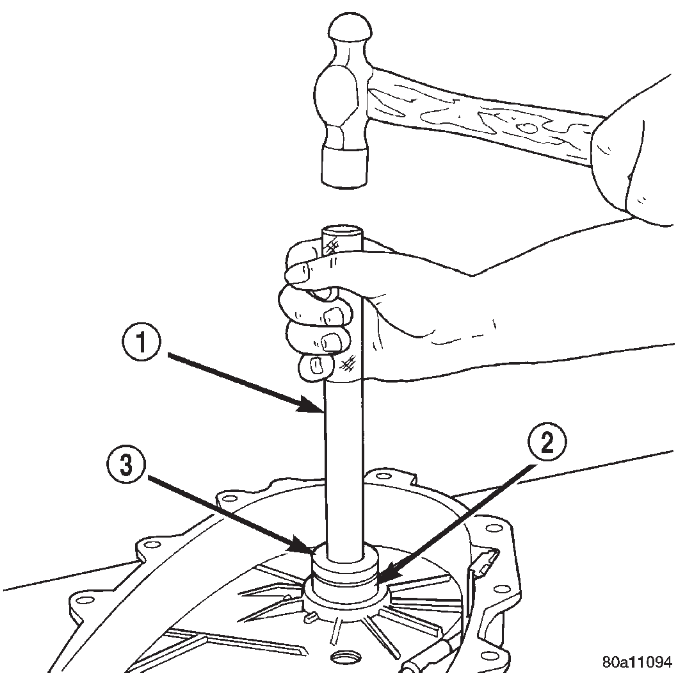


Fig. 47 Output Shaft Rear Bearing Installation

1 – HANDLE C-4171
2 – OUTPUT SHAFT INNER BEARING
3 – INSTALLER 5066

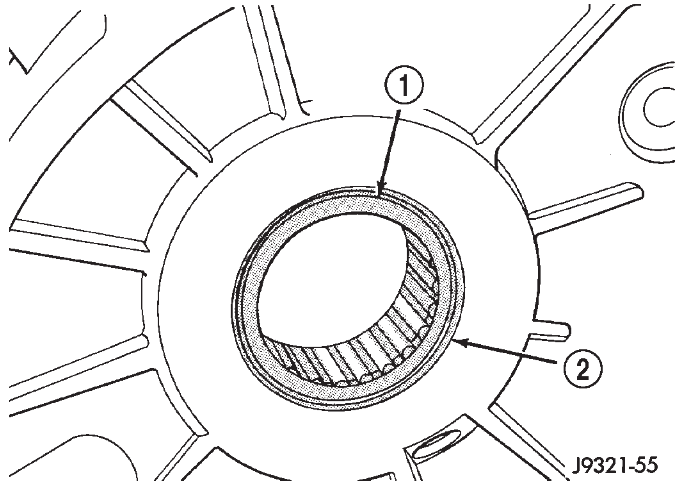


Fig. 48 Output Shaft Rear Bearing Installation Depth

1 – BEARING (SEATED) AT LOWER EDGE OF CHAMFER
2 – CHAMFER

(9) Using Remover C-4210 and Handle C-4171, drive input shaft bearing from inside the annulus gear opening in the case. (Fig. 49).

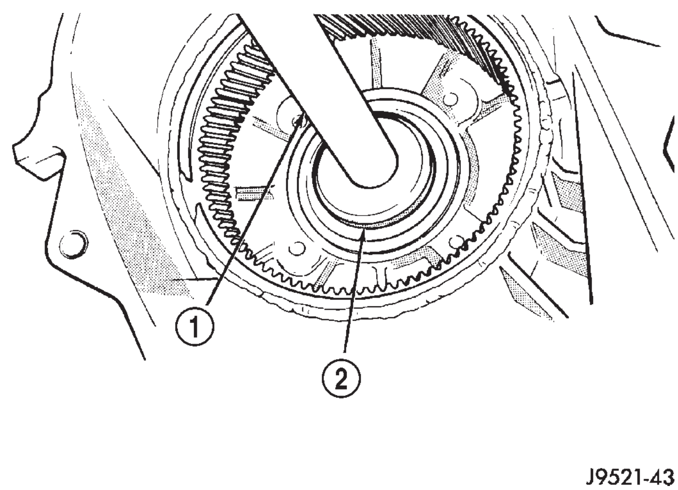


Fig. 49 Input Shaft Bearing Removal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-4210

(10) Install locating ring on new bearing.

(11) Position case so forward end is facing upward.

(12) Using Remover C-4210 and Handle C-4171, drive input shaft bearing into case. The bearing locating ring must be fully seated against case surface (Fig. 50).

(13) Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 51).

(14) Install new pilot bearing with Installer 5065 and Handle C-4171 (Fig. 52).

DISASSEMBLY AND ASSEMBLY (Continued)

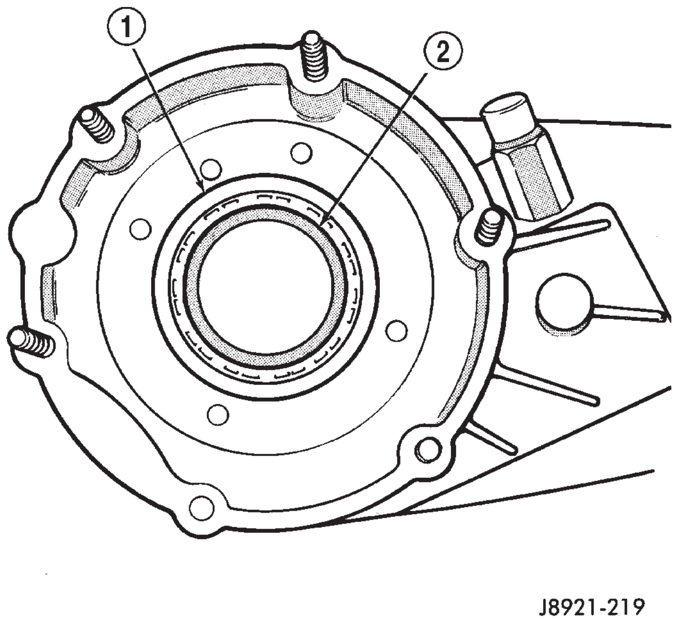


Fig. 50 Seating Input Shaft Bearing

1 – SNAP RING
2 – INPUT SHAFT BEARING

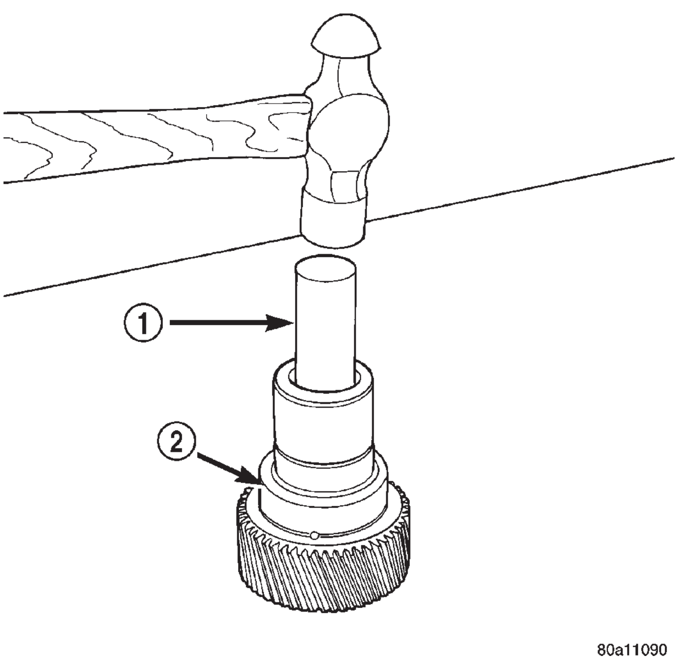


Fig. 51 Remove Input Gear Pilot Bearing

1 – DRIFT
2 – INPUT GEAR

(15) Remove front bearing retainer seal with suitable pry tool.

(16) Install new front bearing retainer seal with Installer 7884 (Fig. 53).

(17) Remove seal from oil pump housing with a suitable pry tool

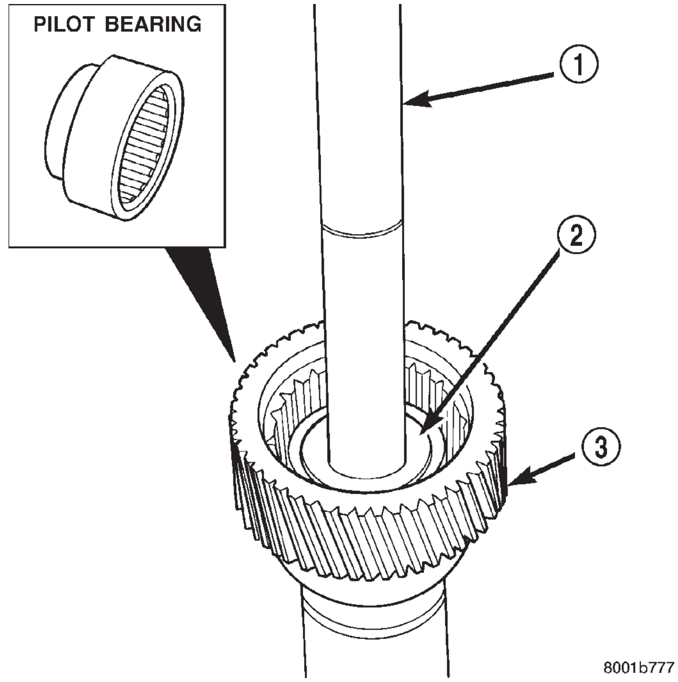


Fig. 52 Install Input Gear Pilot Bearing

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5065
3 – INPUT GEAR

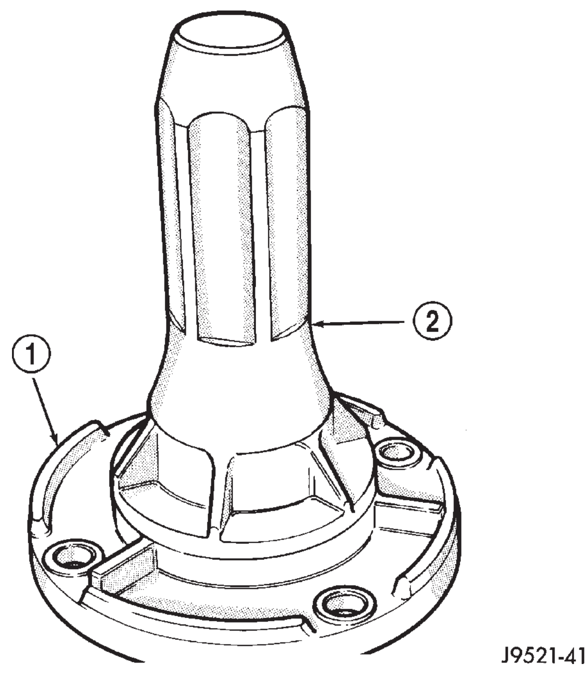


Fig. 53 Install Front Bearing Retainer Seal

1 – FRONT BEARING RETAINER
2 – SPECIAL TOOL 7884

DISASSEMBLY AND ASSEMBLY (Continued)

(18) Install new seal in oil pump housing with Installer 7888 (Fig. 54).

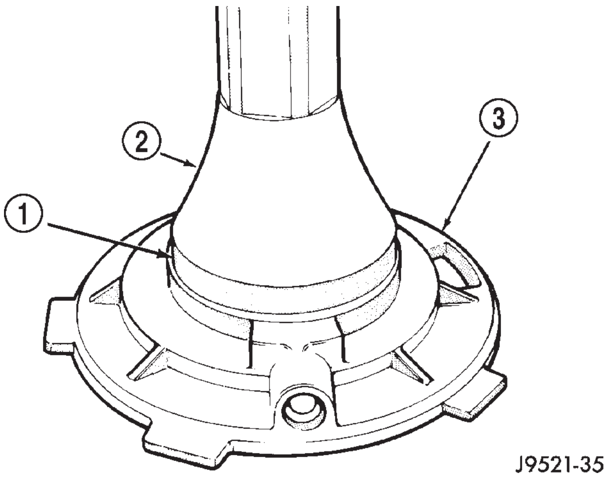


Fig. 54 Oil Pump Seal Installation

1 – HOUSING SEAL
2 – SPECIAL TOOL 7888
3 – OIL PUMP FEED HOUSING

(19) Remove rear retainer bearing with Installer 8128 and Handle C-4171.

(20) Install rear bearing in retainer with Handle C-4171 and Installer 5064 (Fig. 55).

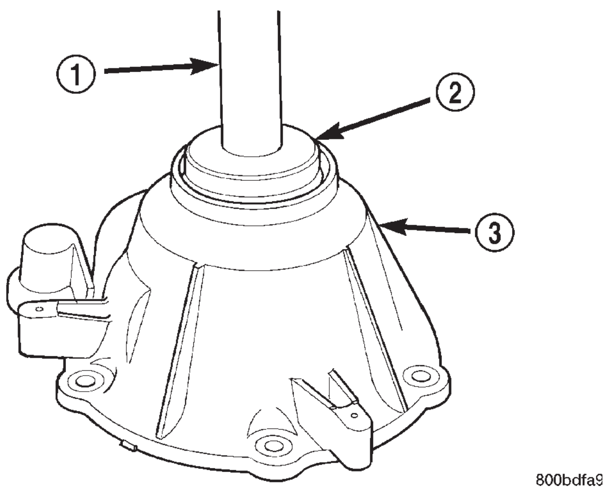


Fig. 55 Installing Rear Bearing In Retainer

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5064
3 – REAR RETAINER

INPUT AND LOW RANGE GEAR ASSEMBLY

(1) Lubricate gears and thrust washers (Fig. 56) with recommended transmission fluid.

(2) Install first thrust washer in low range gear (Fig. 56). Be sure washer tabs are properly aligned in gear notches.

(3) Install input gear in low range gear. Be sure input gear is fully seated.

(4) Install remaining thrust washer in low range gear and on top of input gear. Be sure washer tabs are properly aligned in gear notches.

(5) Install retainer on input gear and install snap-ring.

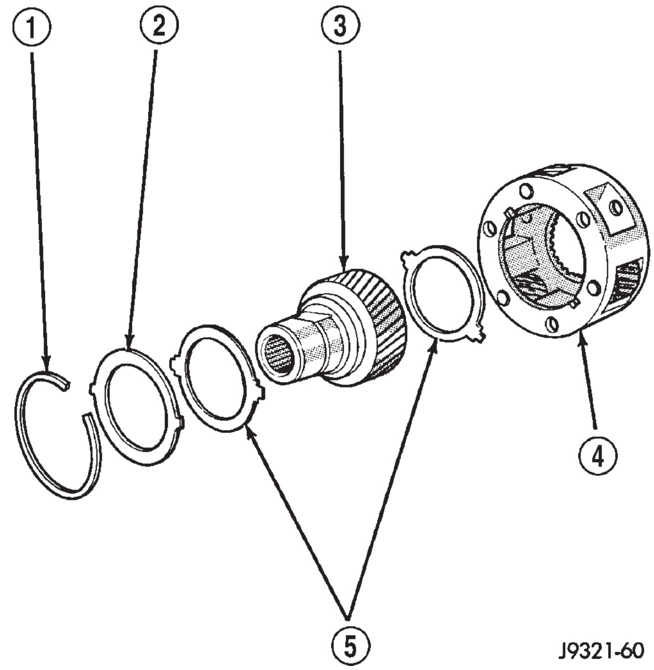


Fig. 56 Input/Low Range Gear Components

1 – SNAP RING
2 – RETAINER PLATE
3 – INPUT GEAR
4 – LOW RANGE GEAR
5 – THRUST WASHERS

INPUT GEAR AND LOW RANGE GEAR INSTALLATION

(1) Align and install low range/input gear assembly in front case (Fig. 57). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

(2) Install snap-ring to hold input/low range gear into front bearing (Fig. 58).

(3) Clean gasket sealer residue from retainer and inspect retainer for cracks or other damage.

(4) Apply a 3 mm (1/8 in.) bead of Mopar® gasket maker or silicone adhesive to sealing surface of retainer.

(5) Align cavity in seal retainer with fluid return hole in front of case.

CAUTION: Do not block fluid return cavity on sealing surface of retainer when applying Mopar® gasket maker or silicone adhesive sealer. Seal failure and fluid leak can result.

(6) Install bolts to hold retainer to transfer case (Fig. 59). Tighten to 21 N·m (16 ft. lbs.) of torque.

DISASSEMBLY AND ASSEMBLY (Continued)

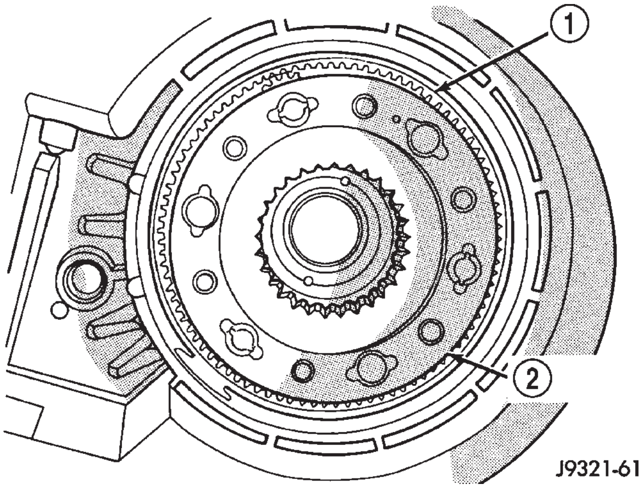


Fig. 57 Input/Low Range Gear Installation

1 – ANNULUS GEAR
2 – INPUT/LOW RANGE GEAR

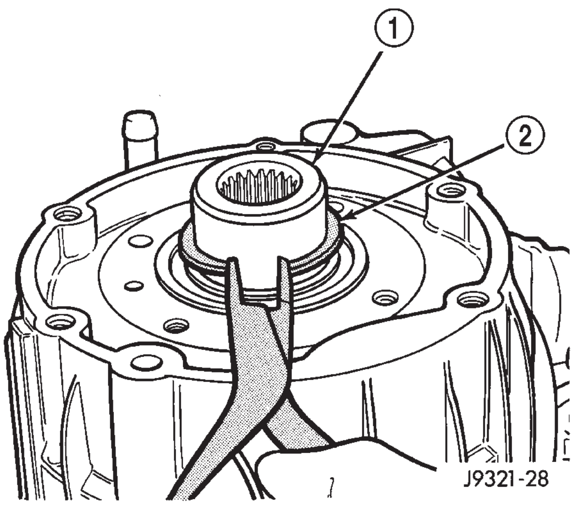


Fig. 58 Install Snap-Ring

1 – INPUT GEAR
2 – SNAP RING

MAINSHAFT ASSEMBLY

(1) Lubricate mainshaft splines with recommended transmission fluid.
(2) Slide drive sprocket onto mainshaft.
(3) Slide mode hub onto mainshaft.
(4) Install mode hub retaining ring. Verify that the retaining ring is fully seated in mainshaft groove.

SHIFT FORKS AND MAINSHAFT INSTALLATION

(1) Install new sector shaft O-ring and bushing (Fig. 60).
(2) Install shift sector in case (Fig. 61). Lubricate sector shaft with transmission fluid before installation.

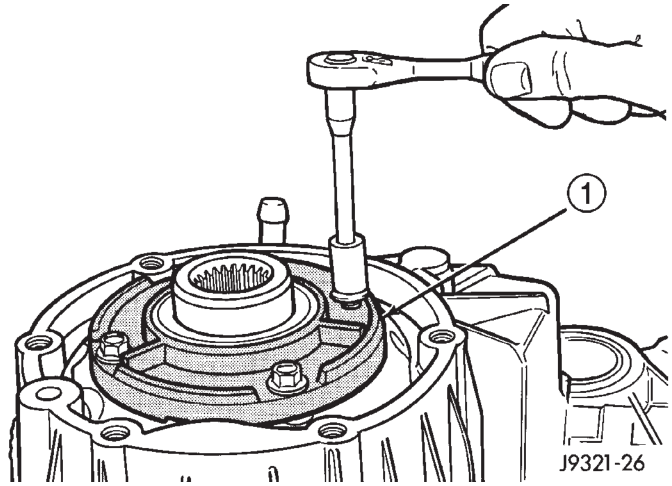


Fig. 59 Install Front Bearing Retainer

1 – FRONT BEARING RETAINER

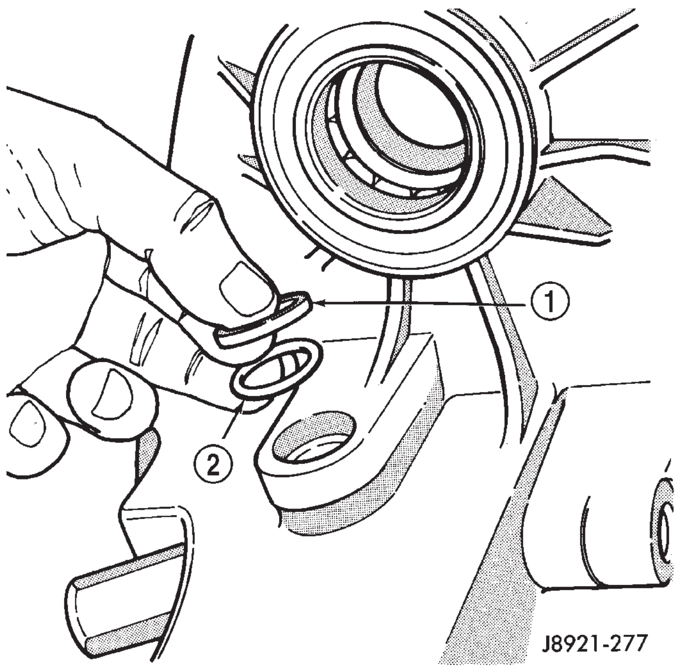


Fig. 60 Sector O-Ring And Bushing Installation

1 – SECTOR BUSHING
2 – O-RING

(3) Install range lever, washer, and nut on sector shaft (Fig. 62). Tighten range lever nut to 27–34 N.m (20–25 ft. lbs.) torque.
(4) Assemble and install range fork and hub (Fig. 63). Be sure hub is properly seated in low range gear and engaged to the input gear.
(5) Align and insert range fork pin in shift sector slot.
(6) Install assembled mainshaft (Fig. 64). Be sure shaft is seated in pilot bearing and input gear.
(7) Install new pads on mode fork if necessary.

DISASSEMBLY AND ASSEMBLY (Continued)

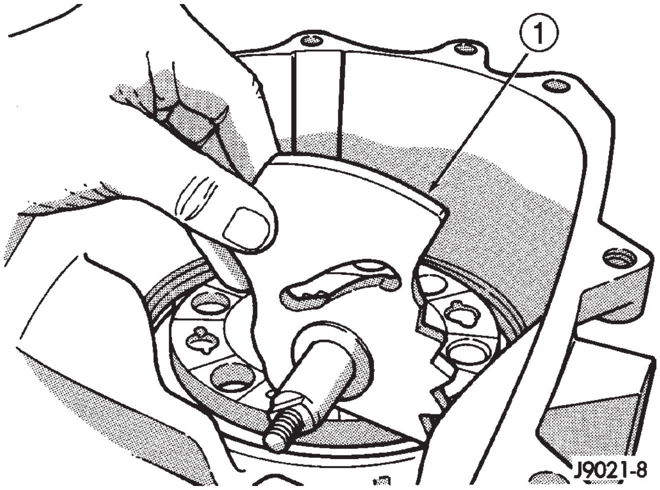


Fig. 61 Shift Sector Installation

1 – SHIFT SECTOR

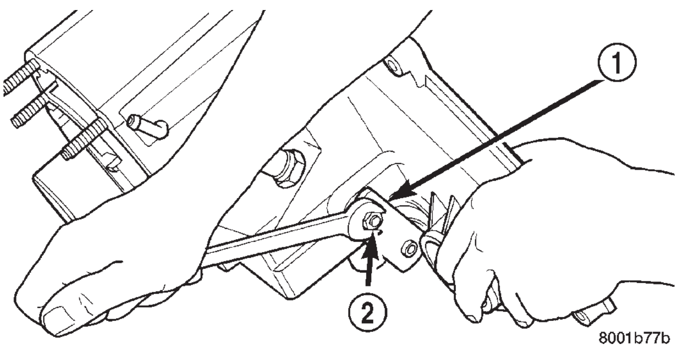


Fig. 62 Range Lever Installation

1 – RANGE LEVER
2 – LEVER NUT

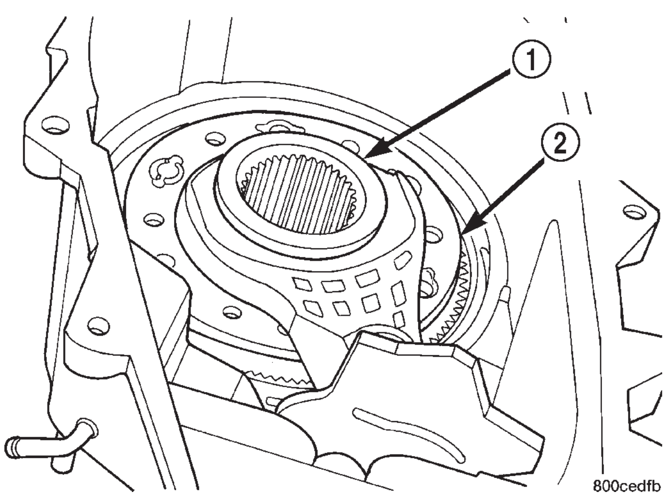


Fig. 63 Install Range Fork And Hub Assembly

1 – RANGE HUB
2 – RANGE FORK

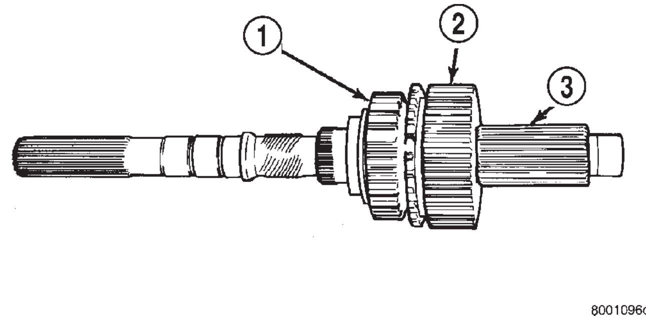


Fig. 64 Mainshaft Assembly Installation

1 – DRIVE SPROCKET
2 – MODE HUB
3 – MAINSHAFT

(8) Insert mode sleeve in mode fork mode fork. Be sure long side of sleeve is toward long end of shift rail (Fig. 65).

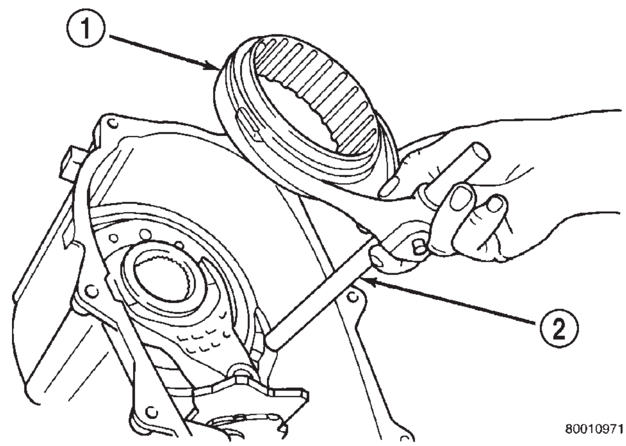


Fig. 65 Assembling Mode Fork And Sleeve

1 – MODE SLEEVE
2 – MODE FORK AND RAIL

(9) Install assembled mode fork and sleeve (Fig. 66). Be sure fork rail goes through range fork and into case bore. Also be sure sleeve is aligned and seated on mainshaft hub.

(10) Rotate sector to Neutral position.

(11) Install new O-ring on detent plug (Fig. 67).

(12) Lubricate detent plunger with transmission fluid or light coat of petroleum jelly.

(13) Install detent plunger, spring and plug (Fig. 67).

(14) Verify that plunger is properly engaged in sector.

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Lubricate front output shaft-sprocket assembly, drive chain, and drive sprocket with transmission fluid.

DISASSEMBLY AND ASSEMBLY (Continued)

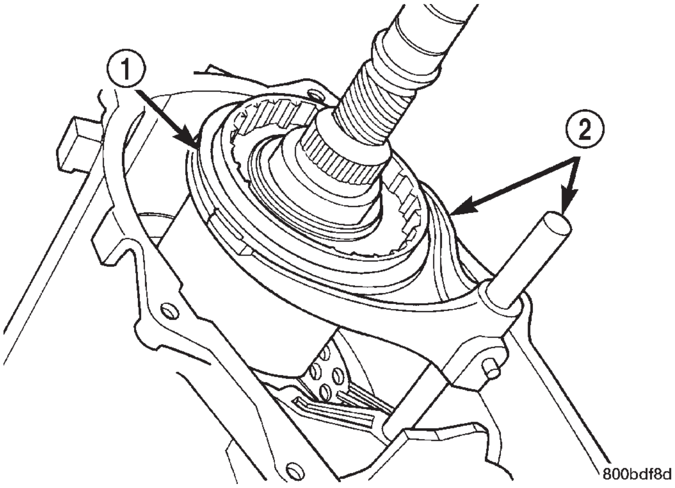


Fig. 66 Mode Fork And Sleeve Installation

1 – MODE SLEEVE
2 – MODE FORK AND RAIL

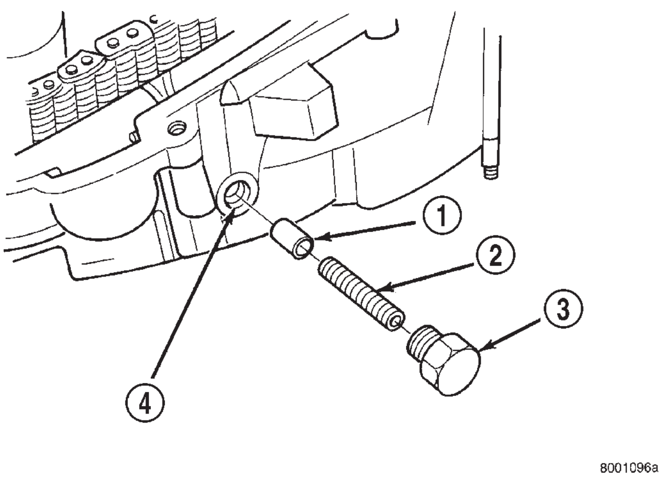


Fig. 67 Shift Detent Components

1 – POPPET
2 – SPRING
3 – SCREW
4 – POPPET BORE (IN CASE)

(2) Assemble drive chain and front output shaft (Fig. 68).

(3) Start chain on mainshaft drive sprocket.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 68).

(5) Install mode spring on upper end of mode fork shift rail (Fig. 69).

OIL PUMP AND REAR CASE ASSEMBLY/INSTALLATION

(1) Install magnet in front case pocket (Fig. 70).

(2) Assemble oil pickup screen, connecting hose, and tube.

(3) Install new pickup tube O-ring in oil pump (Fig. 71).

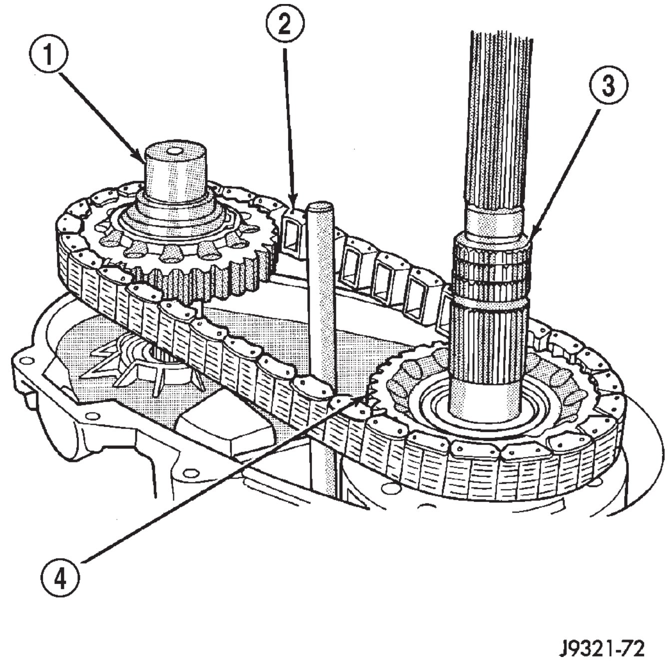


Fig. 68 Installing Drive Chain And Front Output Shaft

1 – FRONT OUTPUT SHAFT
2 – DRIVE CHAIN
3 – MAINSHAFT
4 – DRIVE SPROCKET

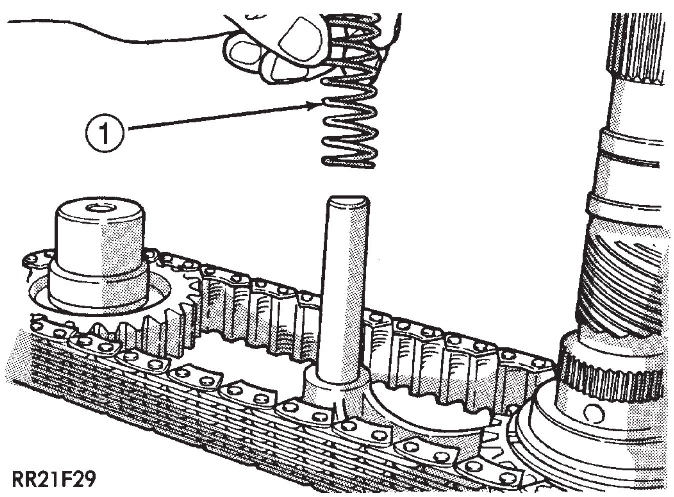


Fig. 69 Install Mode Fork Spring

1 – MODE SPRING

(4) Insert oil pickup tube in oil pump inlet.

(5) Position assembled oil pump and pickup tube in rear case. Be sure pickup screen is securely seated in case slot. Also be sure oil pump locating tabs are outside rear case (Fig. 72).

(6) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting

DISASSEMBLY AND ASSEMBLY (Continued)

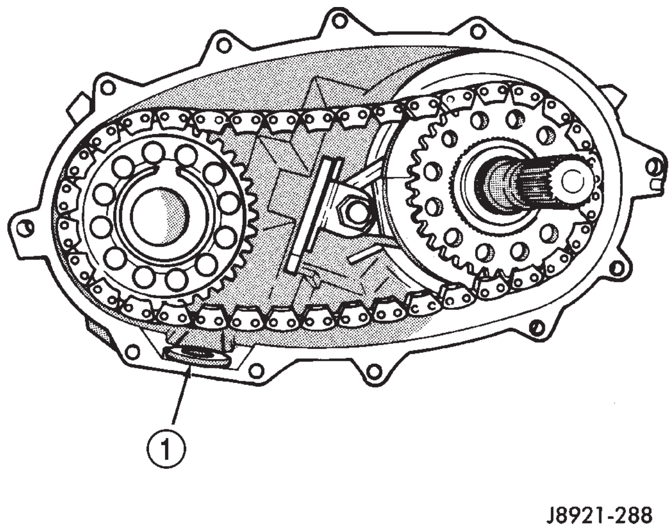


Fig. 70 Installing Case Magnet

1 – MAGNET

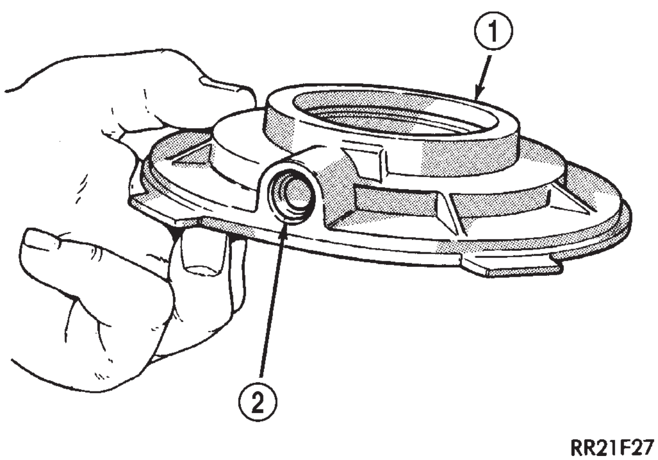


Fig. 71 Pickup Tube O-Ring Position

1 – OIL PUMP
2 – O-RING

flange of front case. Work sealer bead around bolt holes.

(7) Lift rear case and oil pump and carefully position assembly on front case. Be sure case dowels are aligned and that mode fork rail extends through rear case before seating rear case on front case.

(8) Install case attaching bolts. Alignment bolts at each end of case are only ones requiring washers (Fig. 73).

(9) Tighten case bolts to 27-34 N·m (20-25 ft. lbs.) torque.

YOKE AND RANGE LEVER INSTALLATION

(1) Install indicator switch in front case. Tighten switch to 20–34 N·m (15–25 ft. lbs.) torque.

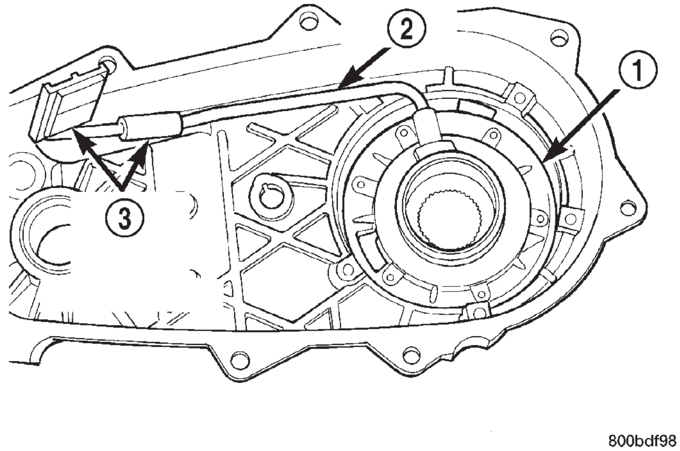


Fig. 72 Oil Pump And Pickup Tube Installation

1 – OIL PUMP
2 – PICKUP TUBE
3 – PICKUP SCREEN AND CONNECTOR

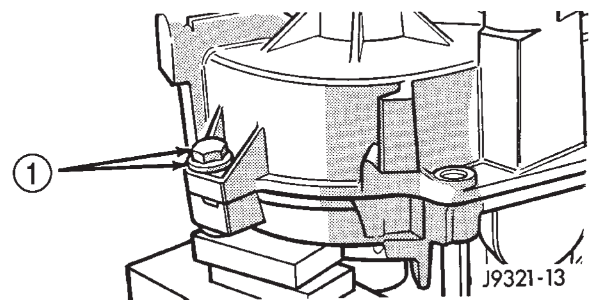


Fig. 73 Alignment Bolt Location

1 – ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

(2) Install range lever, washer and locknut on sector shaft (Fig. 74). Tighten locknut to 27-34 N·m (20-25 ft. lbs.) torque.

(3) Install new seal washer on front output shaft (Fig. 76).

(4) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(5) Install new seal washer on front shaft.

(6) Install yoke and new yoke nut on front output shaft (Fig. 75).

(7) Tighten yoke nut to 122-176 N·m (90-130 ft. lbs.) torque. Use Tool C-3281, or similar tool to hold yoke while tightening yoke nut.

REAR RETAINER INSTALLATION

(1) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 inch.

(2) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N·m (15–20 ft. lbs.) torque.

(3) Install rear bearing I. D. retaining ring and spacer on output shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

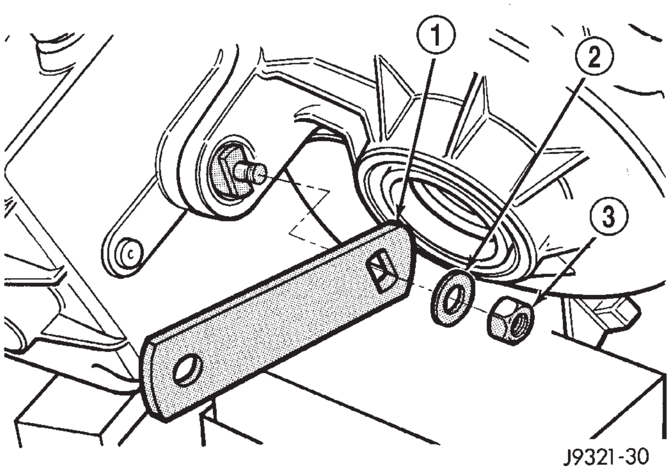


Fig. 74 Range Lever Installation

1 – RANGE LEVER
2 – WASHER
3 – LOCKNUT

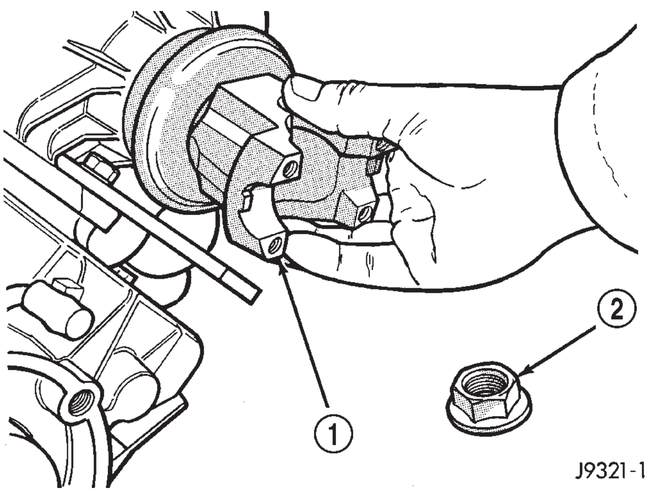


Fig. 75 Output Shaft Yoke Installation

1 – OUTPUT SHAFT YOKE
2 – YOKE NUT

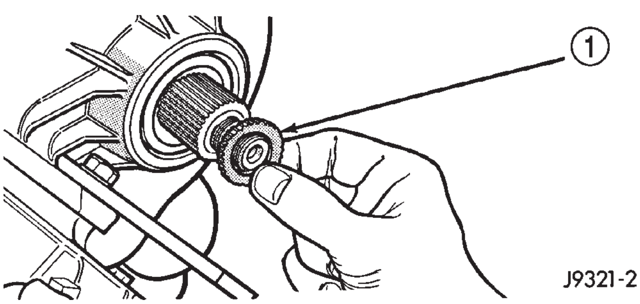


Fig. 76 Yoke Seal Washer Installation

1 – YOKE SEAL WASHER

(4) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(5) Slide seal onto Seal Protector 6992 (Fig. 77). Slide seal protector and seal onto output shaft.

(6) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with Installer C-4076-B and Handle MD-998323 (Fig. 78).

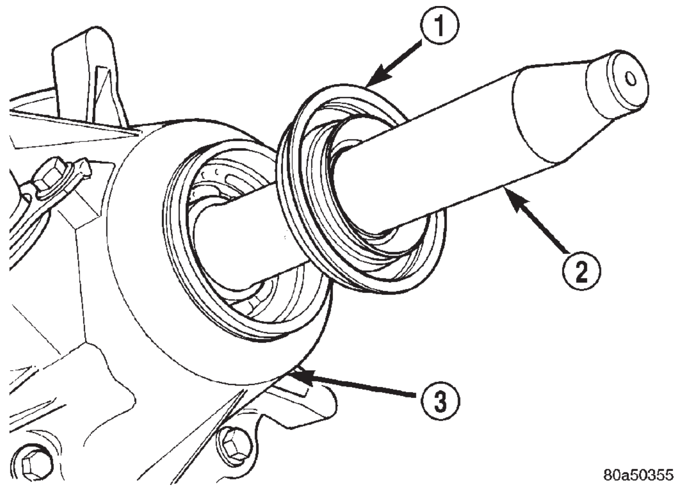


Fig. 77 Output Shaft Seal and Protector

1 – OUTPUT SHAFT SEAL
2 – SPECIAL TOOL 6992
3 – TRANSFER CASE

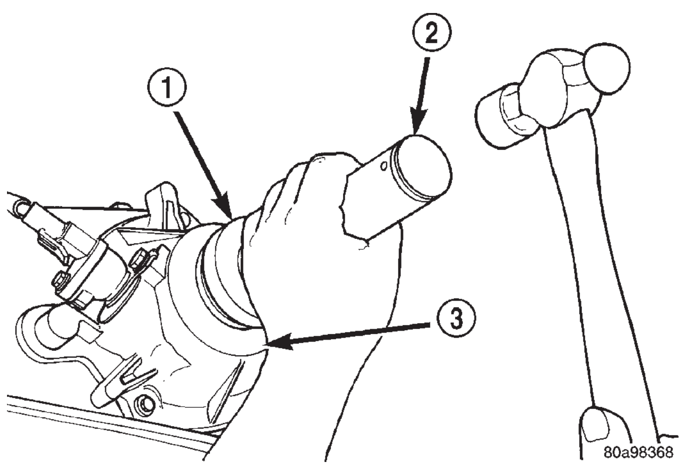


Fig. 78 Rear Seal Installation

1 – SPECIAL TOOL C-4076–B
2 – SPECIAL TOOL MD998323
3 – TRANSFER CASE

(7) Install rear slinger with Installer 8408.

(8) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 79).

CLEANING AND INSPECTION (Continued)

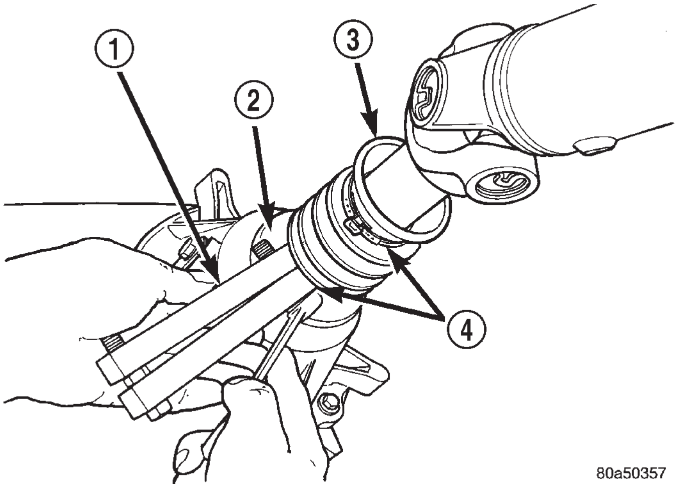


Fig. 79 Slinger Boot Installation

1 – SPECIAL TOOL C-4975–A
2 – SLINGER
3 – BOOT
4 – CLAMP

CLEANING AND INSPECTION

NV231 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket (Fig. 80). Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 81). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

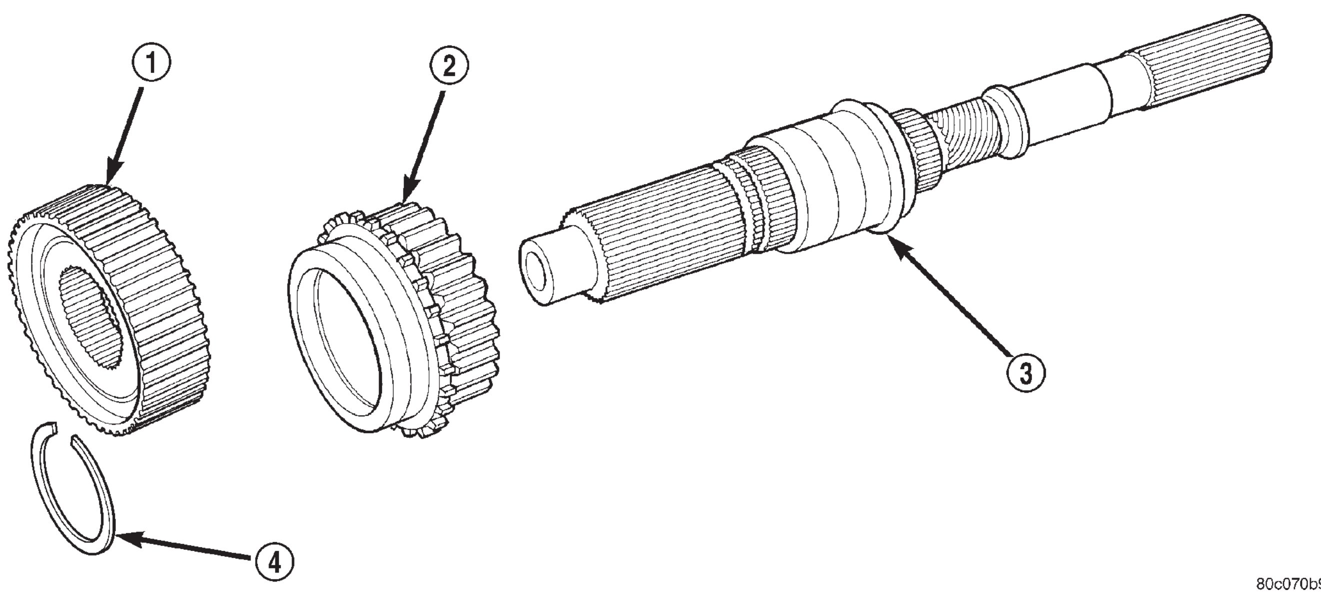


Fig. 80 Mainshaft, Mode Hub, And Drive Sprocket

1 – MODE HUB
2 – DRIVE SPROCKET
3 – MAINSHAFT
4 – MODE HUB RETAINING RING

CLEANING AND INSPECTION (Continued)

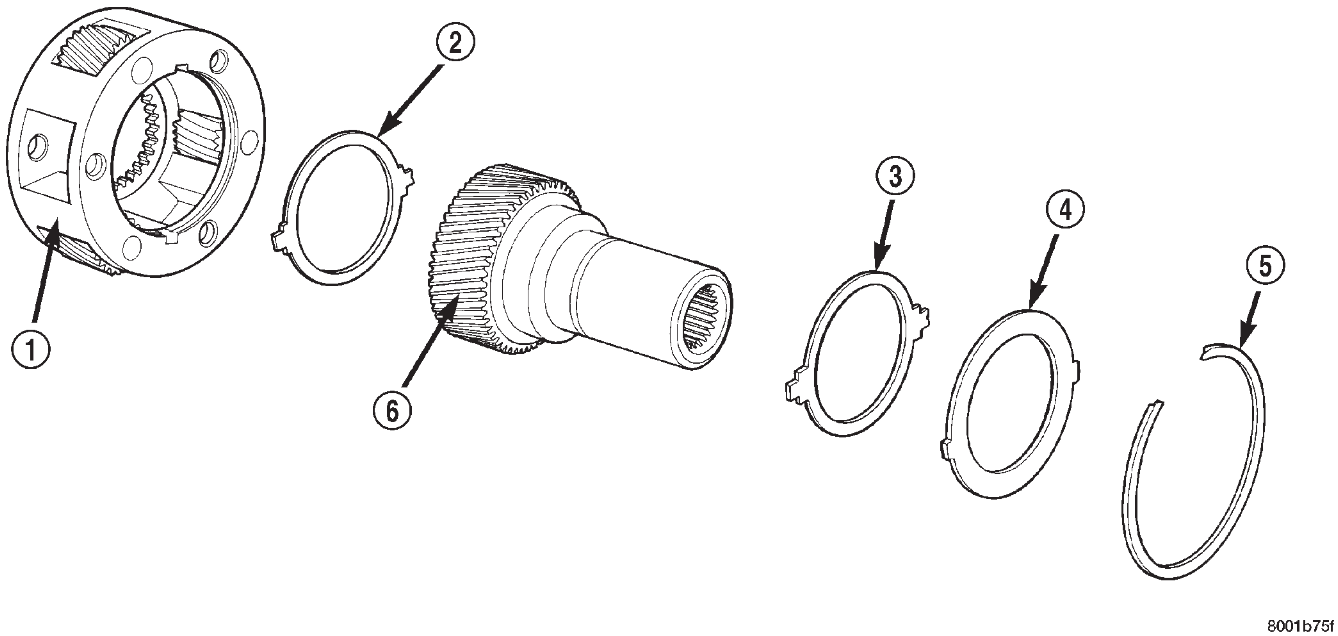


Fig. 81 Input Gear And Carrier Components

1 – PLANETARY CARRIER
2 – REAR THRUST WASHER
3 – FRONT THRUST WASHER
4 – CARRIER LOCK RING
5 – CARRIER LOCK RETAINING RING
6 – INPUT GEAR

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 82). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

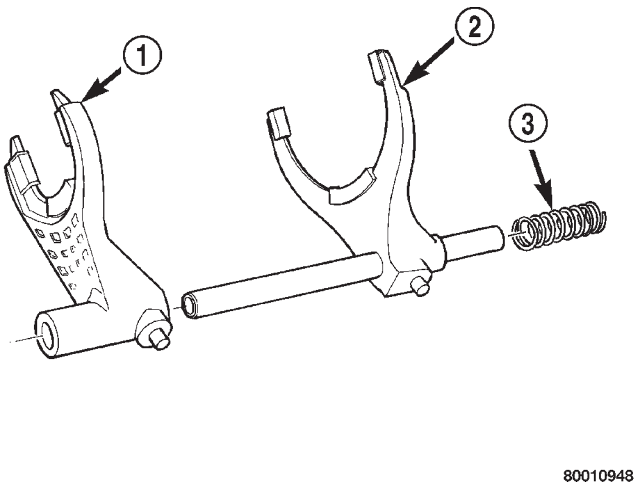


Fig. 82 Shift forks

1 – RANGE FORK
2 – MODE FORK AND RAIL
3 – MODE SPRING

Inspect the shift fork wear pads (Fig. 83). The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are not serviceable. The fork must be replaced as an assembly if the pads are worn or damaged.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 84). Replace the bearing if rough or noisy. Check the retainer for

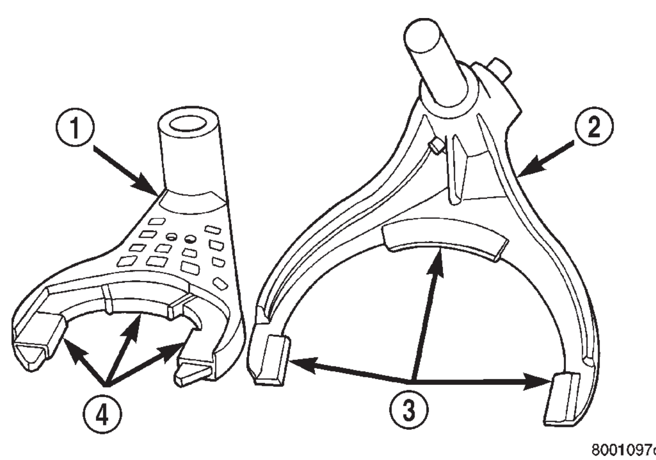


Fig. 83 Shift Fork And Wear Pad Locations

1 – RANGE FORK
2 – MODE FORK
3 – WEAR PADS (SERVICEABLE)
4 – WEAR PADS (NON-SERVICEABLE)

CLEANING AND INSPECTION (Continued)

cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Replace any part if distorted, bent, or broken. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 85). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 86)

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

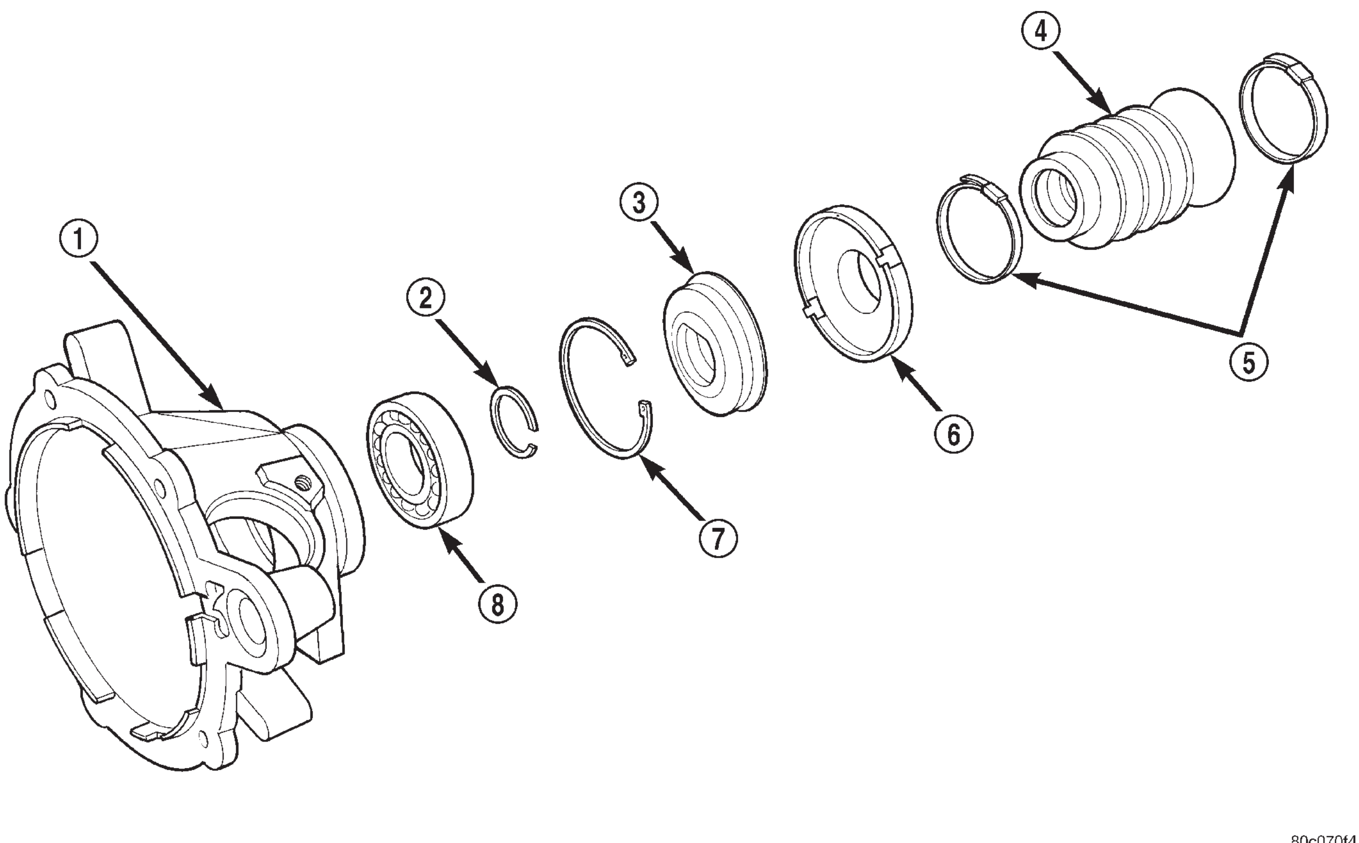


Fig. 84 Rear Retainer Components

1 – REAR RETAINER
2 – REAR BEARING I. D. RETAINING RING
3 – REAR SEAL
4 – BOOT
5 – BAND CLAMPS
6 – REAR SLINGER
7 – REAR BEARING O. D. RETAINING RING
8 – REAR BEARING

CLEANING AND INSPECTION (Continued)

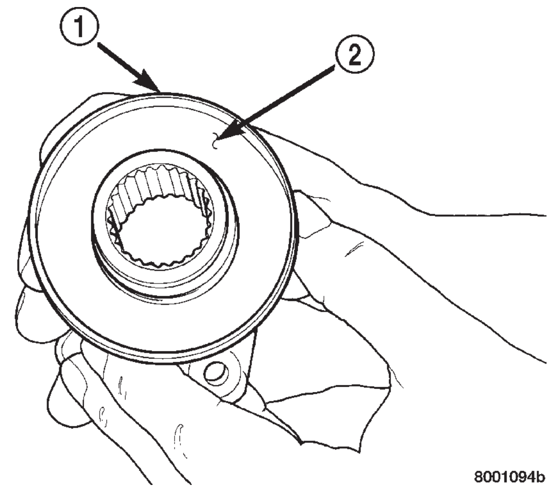


Fig. 85 Seal Contact Surface Of Yoke Slinger

1 – FRONT SLINGER (PART OF YOKE)
2 – SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

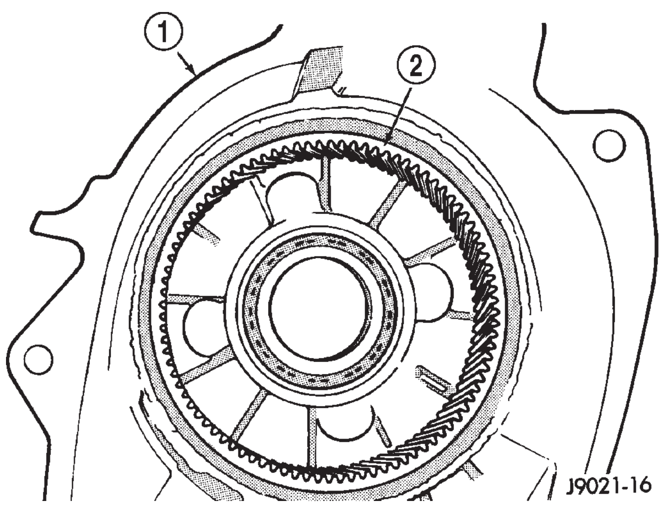


Fig. 86 Low Range Annulus Gear

1 – FRONT CASE
2 – LOW RANGE ANNULUS GEAR

Check the front case mounting studs and vent tube. The tube can be secured with Loctite 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 87).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

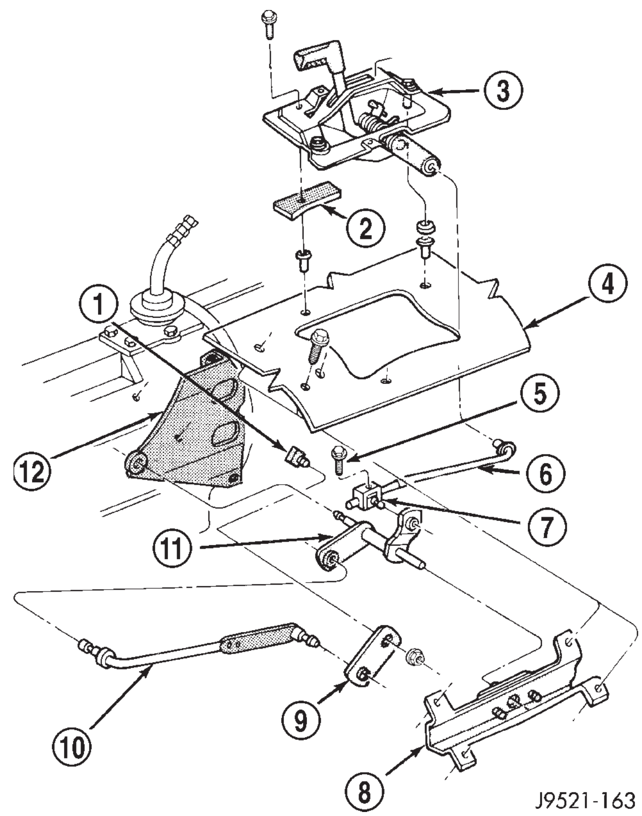


Fig. 87 Shift Linkage

1 – TRANSFER CASE SHIFT LEVER SHAFT
2 – SEAL
3 – TRANSFER CASE SHIFT LEVER ASSEMBLY
4 – FLOORPAN
5 – TRUNNION LOCK BOLT
6 – SHIFT ROD
7 – ADJUSTING TRUNNION
8 – TORQUE SHAFT BRACKET
9 – RANGE LEVER
10 – TORQUE SHAFT ROD
11 – TORQUE SHAFT
12 – LINKAGE BRACKET

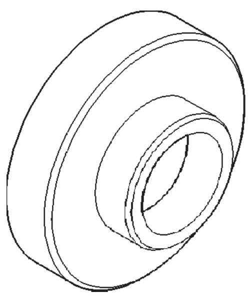
SPECIFICATIONS

TORQUE

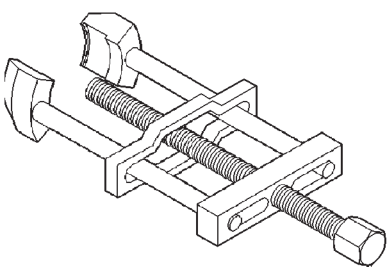
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Plug, Drain/Fill	20–34 N·m (15–25 ft. lbs.)
Bolt, Front Brg. Retainer	21 N·m (16 ft. lbs.)
Bolt, Front Brg. Retainer	21 N·m (16 ft. lbs.)
Bolt, Case Half	27–34 N·m (20–25 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35–47 N·m (26–35 ft. lbs.)
Switch, Indicator	20–34 N·m (15–25 ft. lbs.)

SPECIAL TOOLS

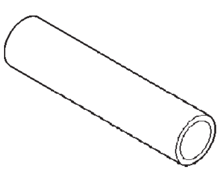
NV231



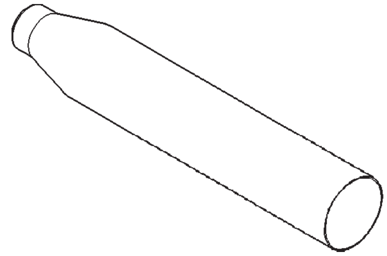
Installer—C-4076-B



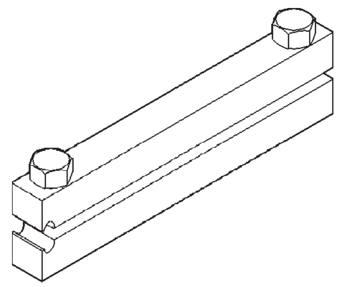
Puller, Slinger—MD-998056–A



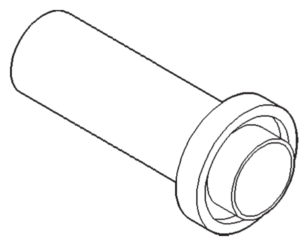
Installer—MD-998323



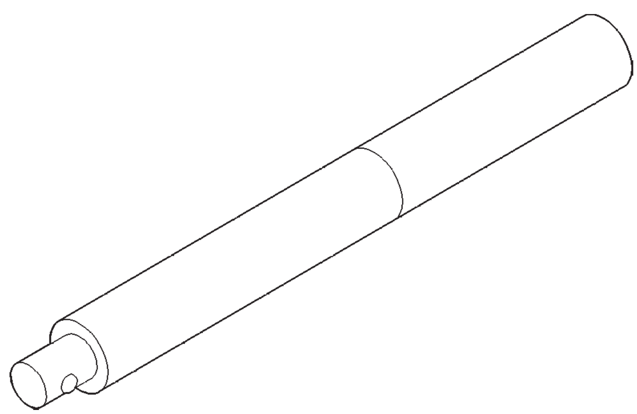
Seal Protector—6992



Installer, Boot Clamp—C-4975-A

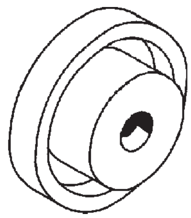


Installer, Seal—8143

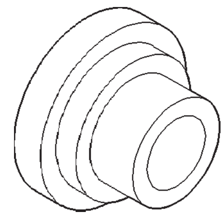


Handle, Universal—C-4171

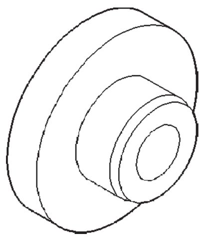
SPECIAL TOOLS (Continued)



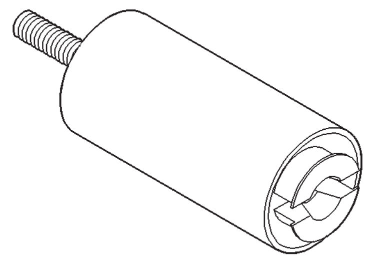
Installer, Seal—C-4210



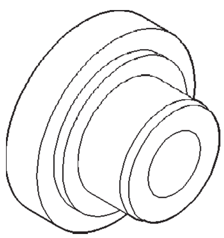
Installer, Bearing—8128



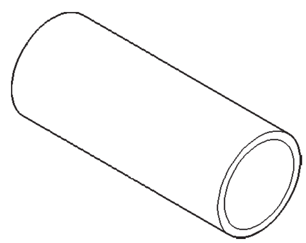
Installer, Bearing—5064



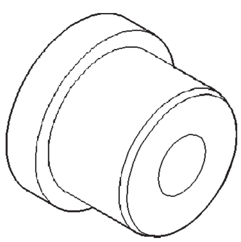
Remover—L-4454



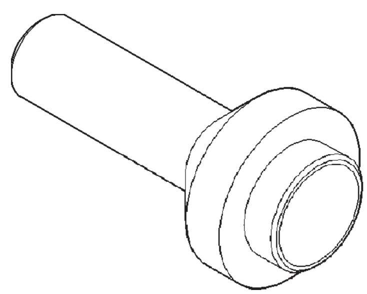
Installer, Bearing—5065



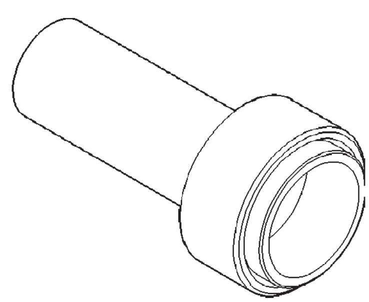
Cup—8148



Installer, Bushing—5066



Installer, Seal—7884



Installer, Pump Housing Seal—7888

NV242 TRANSFER CASE

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DESCRIPTION AND OPERATION

NV242 TRANSFER CASE

DESCRIPTION

The NV242 is a full-time transfer case (Fig. 1). It provides full time 2-wheel, or 4-wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

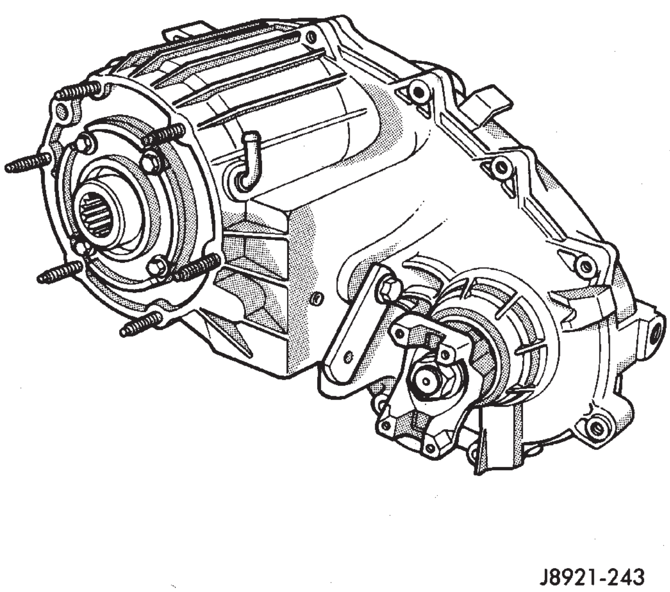


Fig. 1 NV242 Transfer Case

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 2). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

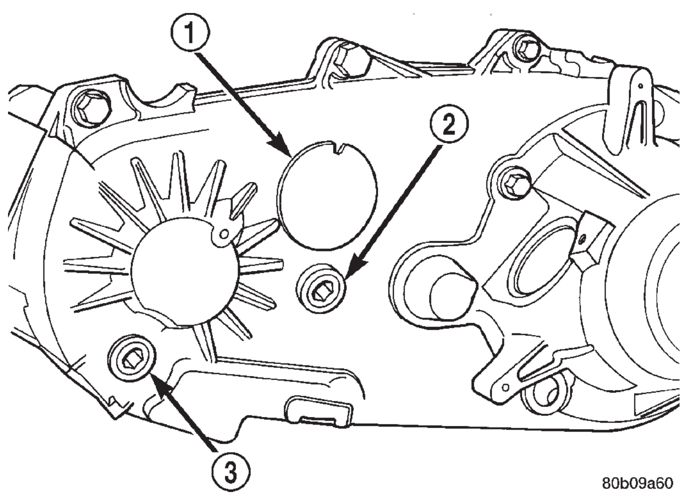


Fig. 2 Fill/Drain Plug And I. D. Tag Locations

1 – I. D. TAG
2 – FILL PLUG
3 – DRAIN PLUG

DESCRIPTION AND OPERATION (Continued)

OPERATING RANGES

NV242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, and 4 Lo.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate, or on the shift knob.

LUBRICANT AND FILL LEVEL

DESCRIPTION

Recommended lubricant for the NV242 transfer case is Mopar® Dexron II, or ATF Plus, type 7176. Approximate lubricant fill capacity is 1.35 liters (2.85 pints).

The fill and drain plugs are both in the rear case (Fig. 3). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

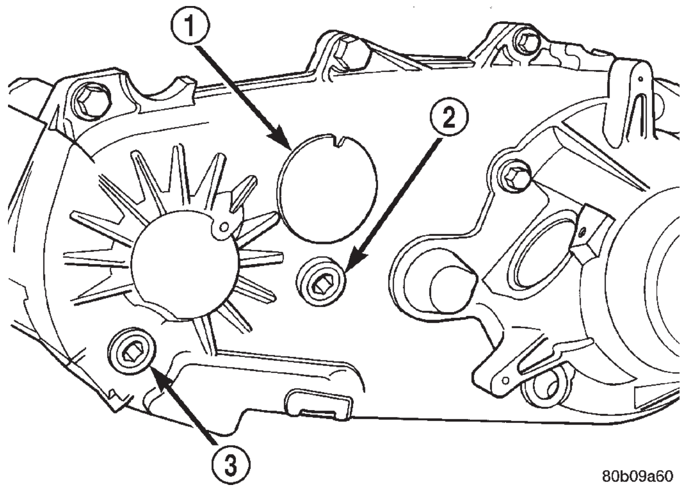


Fig. 3 Fill/Drain Plug Locations

1 – I. D. TAG
2 – FILL PLUG
3 – DRAIN PLUG

DIAGNOSIS AND TESTING

NV242 DIAGNOSIS

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case shift linkage binding.	1) Repair or replace linkage as necessary.
	2) Insufficient or incorrect lubricant.	2) Drain and refill transfer case with the correct type and quantity of lubricant.
	3) Internal transfer case components binding, worn, or damaged.	3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case will not shift through 4X4 part time range (light remains on)	1) Incomplete shift due to drivetrain torque load.	1) Momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive Tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.

(2) Raise vehicle.

(3) Drain transfer case lubricant.

(4) Mark front and rear propeller shaft yokes for alignment reference.

(5) Support transmission with jack stand.

(6) Remove rear crossmember, or skid plate.

(7) Disconnect front/rear propeller shafts at transfer case.

(8) Disconnect vehicle speed sensor wires.

(9) Disconnect transfer case linkage rod from range lever.

(10) Disconnect transfer case vent hose (Fig. 4) and indicator switch harness, if necessary.

(11) Support transfer case with transmission jack.

(12) Secure transfer case to jack with chains.

(13) Remove nuts attaching transfer case to transmission.

(14) Pull transfer case and jack rearward to disengage transfer case.

(15) Remove transfer case from under vehicle.

INSTALLATION

(1) Mount transfer case on a transmission jack.

(2) Secure transfer case to jack with chains.

(3) Position transfer case under vehicle.

(4) Align transfer case and transmission shafts and install transfer case on transmission.

(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 4).

(6) Connect vehicle speed sensor wires, and vent hose.

(7) Connect indicator switch harness to transfer case switch, if necessary. Secure wire harness to clips on transfer case.

(8) Align and connect propeller shafts. Refer to Group 3, Differential and Driveline, for proper procedures and specifications.

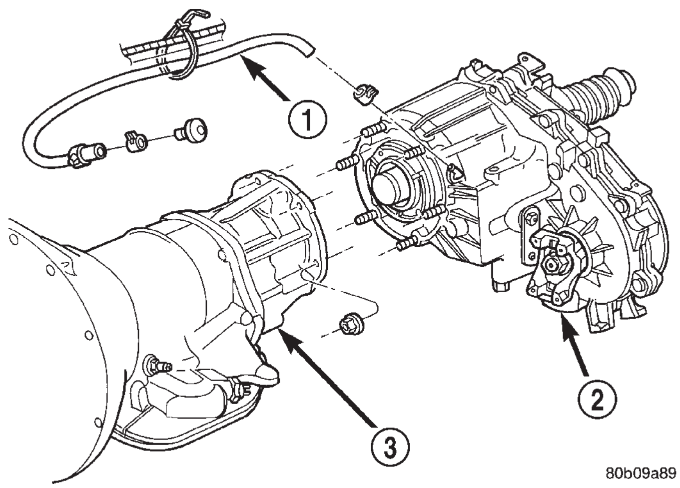


Fig. 4 Transfer Case Mounting

1 – VENT TUBE
2 – TRANSFER CASE
3 – TRANSMISSION

(9) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(11) Remove transmission jack and support stand.

(12) Connect shift rod to transfer case range lever.

(13) Adjust transfer case shift linkage.

(14) Lower vehicle and verify transfer case shift operation.

SHIFT LEVER

REMOVAL

(1) Shift transfer case into 4L.

(2) Raise vehicle.

(3) Loosen adjusting trunnion locknut and slide shift rod out of trunnion (Fig. 5). If rod lacks enough travel to come out of trunnion, push trunnion out of torque shaft.

(4) Lower vehicle.

(5) Remove console. Refer to Group 23, Body, for proper procedures.

REMOVAL AND INSTALLATION (Continued)

(6) Remove screws attaching lever assembly to floorpan and remove assembly and shift rod (if left attached).

INSTALLATION

(1) If shift rod was not removed from lever assembly, work rod down through floorpan opening. Then position lever assembly on floorpan and install assembly attaching screws.

(2) Install console. Refer to Group 23, Body, for proper procedures.

(3) Raise vehicle.

(4) Connect trunnion to torque shaft arm. Or, slide shift rod into trunnion on range lever. Be sure shift rod slides freely in trunnion.

(5) Verify that range lever is in 4L position. Then tighten trunnion lock bolt.

(6) Lower vehicle and check transfer case shift operation.

SPEEDOMETER

REMOVAL

(1) Raise vehicle.

(2) Disconnect wires from vehicle speed sensor.

(3) Remove adapter clamp and screw (Fig. 6).

(4) Remove speed sensor and speedometer adapter as an assembly.

(5) Remove speed sensor retaining screw and remove sensor from adapter.

(6) Remove speedometer pinion from adapter. Replace pinion if chipped, cracked, or worn.

(7) Inspect sensor and adapter O-rings (Fig. 6). Remove and discard O-rings if worn or damaged.

(8) Inspect terminal pins in speed sensor. Clean pins with Mopar® electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or if pins are loose, severely corroded, or damaged.

TORQUE	
A	3-4 N•m (27-35 in. lbs.)
B	11-14 N•m (97-123 in. lbs.)
C	8-14 N•m (72-120 in. lbs.)

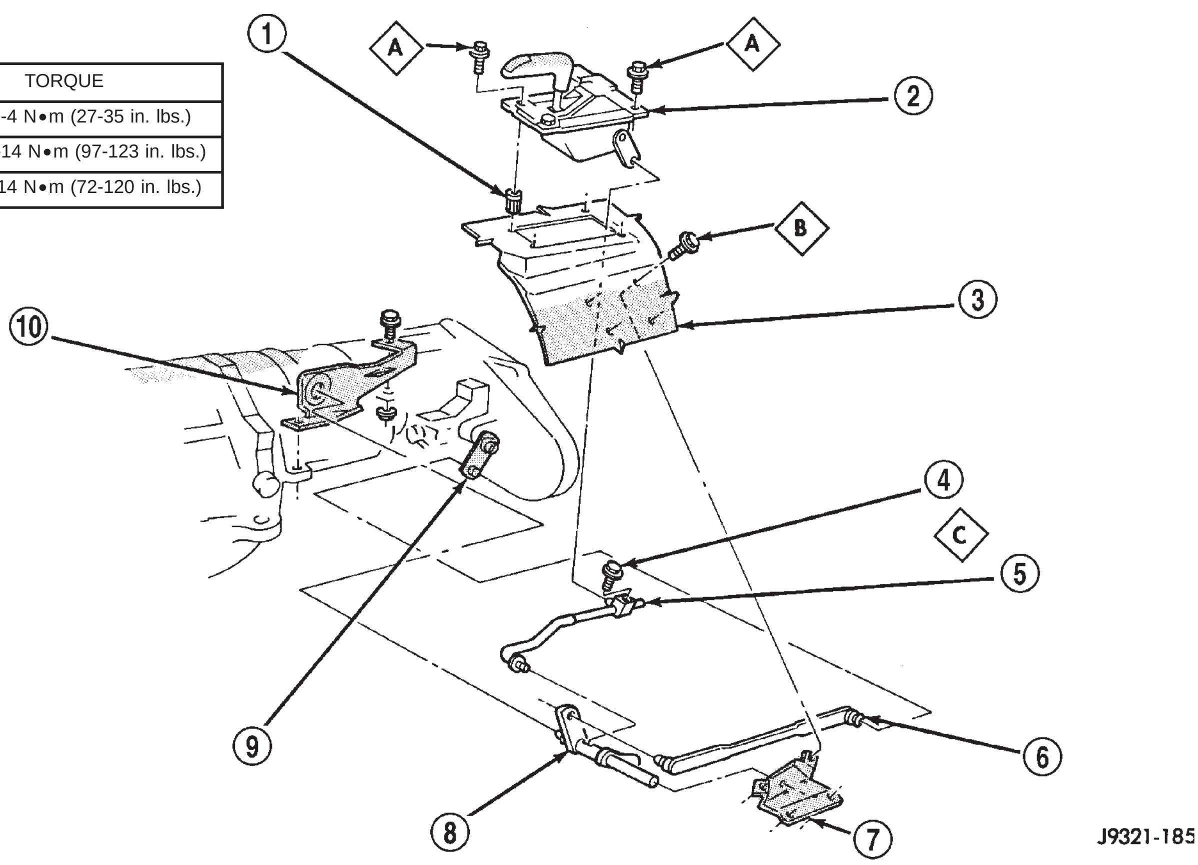


Fig. 5 Shift Linkage

1 – RIVNUT (4)
2 – SHIFT LEVER ASSEMBLY
3 – FLOORPAN
4 – TRUNNION LOCK BOLT
5 – SELECTOR ROD AND TRUNNION
6 – SHIFT LEVER ROD
7 – TORQUE SHAFT FRAME BRACKET
8 – TORQUE SHAFT
9 – TRANSFER CASE SHIFT LEVER
10 – TORQUE SHAFT TRANSFER CASE BRACKET

REMOVAL AND INSTALLATION (Continued)

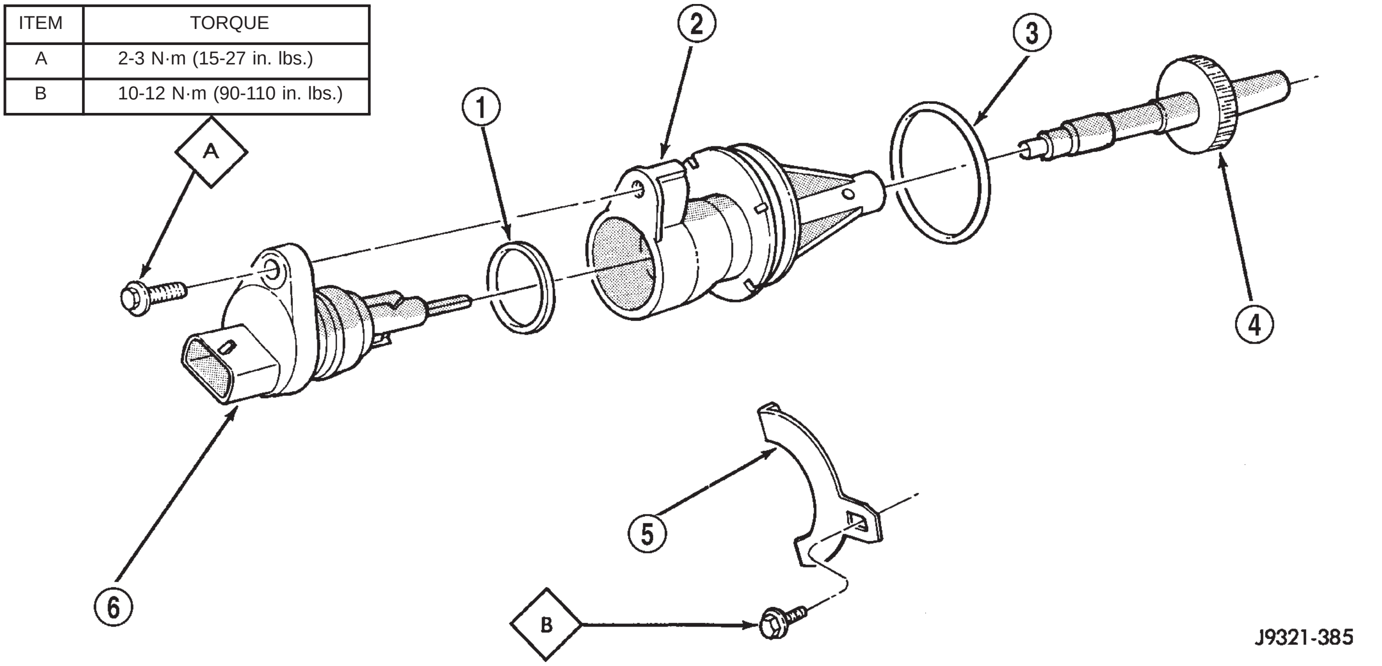


Fig. 6 Speedometer Components

1 – SENSOR O-RING
2 – SPEEDOMETER ADAPTER
3 – ADAPTER O-RING
4 – SPEEDOMETER PINION
5 – ADAPTER CLAMP
6 – VEHICLE SPEED SENSOR

INSTALLATION AND INDEXING

(1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.

(2) Install new O-rings on speed sensor and speedometer adapter (Fig. 6), if necessary.

(3) Lubricate sensor and adapter O-rings with transmission fluid.

(4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N·m (15-27 in. lbs.) torque.

(5) Install speedometer pinion in adapter.

(6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

(7) Note index numbers on adapter body (Fig. 7). These numbers will correspond to number of teeth on pinion.

(8) Install speedometer assembly in housing.

(9) Rotate adapter until required range numbers are at 6 o-clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level if necessary.

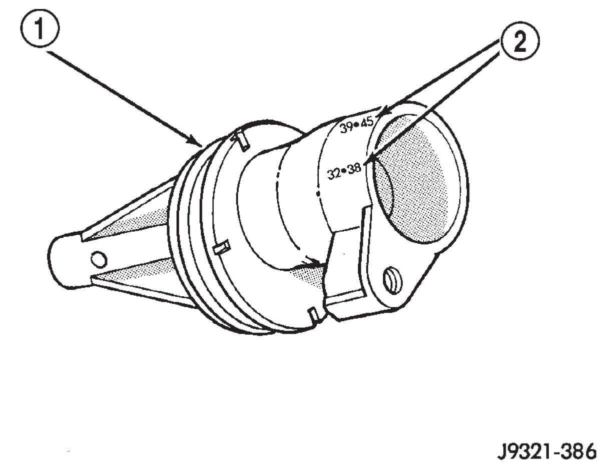


Fig. 7 Location Of Index Numbers On Speedometer Adapter

1 – SPEEDOMETER ADAPTER
2 – INDEX NUMBER LOCATION

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

REMOVAL AND INSTALLATION (Continued)

(3) Remove front output shaft yoke.

(4) Remove seal from front case with pry tool (Fig. 8).

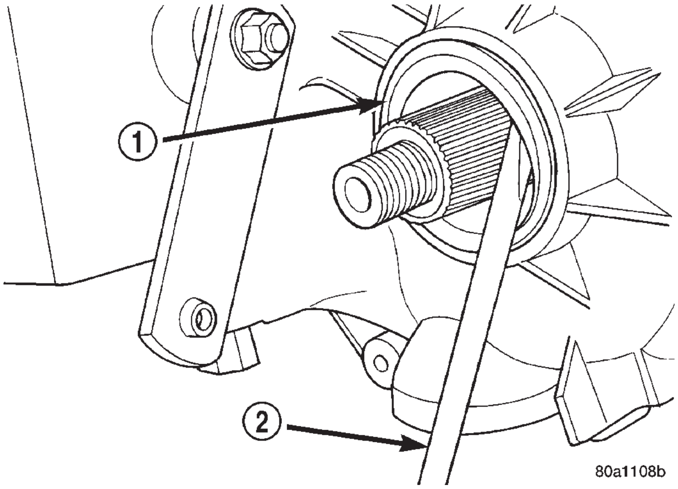


Fig. 8 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 9). Once seal is started, continue tapping seal into bore until installer tool seats against case.

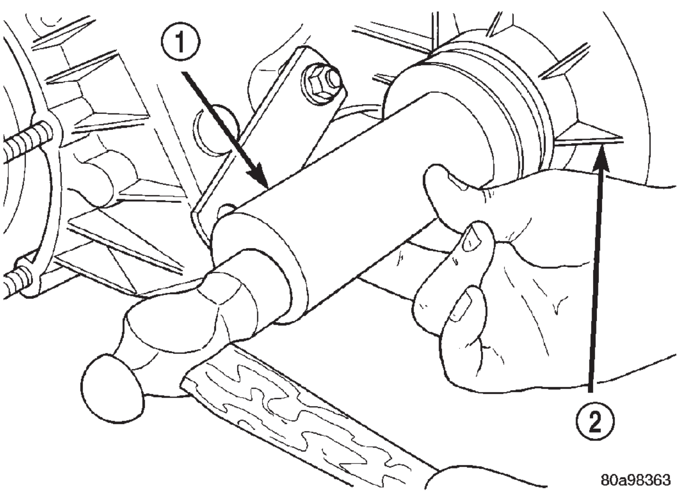


Fig. 9 Front Output Seal Installation

1 – INSTALLER 6952–A
2 – TRANSFER CASE

DISASSEMBLY AND ASSEMBLY

NV242 TRANSFER CASE

DISASSEMBLY

REAR RETAINER REMOVAL

(1) Remove output shaft boot. Spread band clamp that secures boot on slinger with a suitable awl. Then slide boot off shaft (Fig. 10).

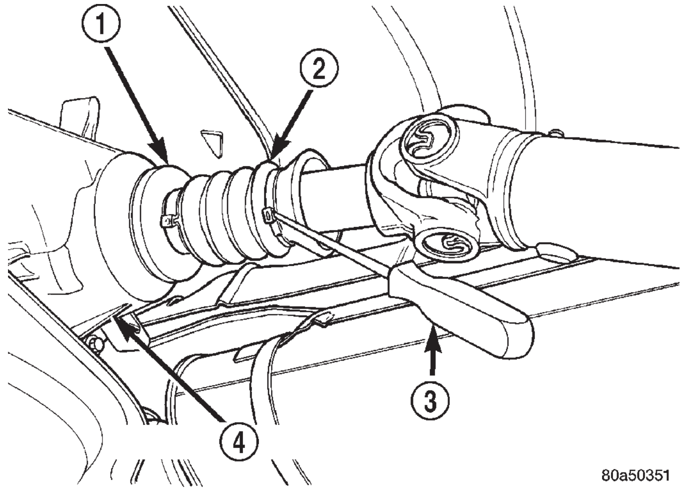


Fig. 10 Output Boot—Typical

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

(2) Using puller MD-998056-A, remove rear slinger (Fig. 11).

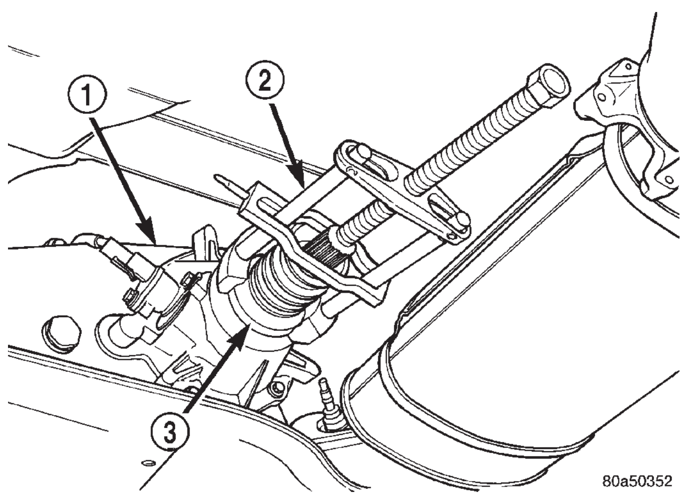


Fig. 11 Rear Slinger Removal

1 – TRANSFER CASE
2 – SPECIAL TOOL MD998056–A
3 – SLINGER

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove rear seal from retainer (Fig. 12). Use pry tool, or collapse seal with punch to remove it.

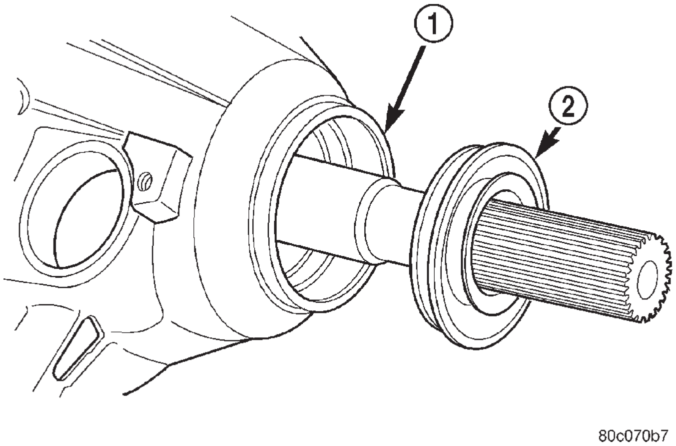


Fig. 12 Rear Seal Removal

1 – REAR RETAINER
2 – OUTPUT SHAFT SEAL

(4) Remove rear output bearing I. D. retaining ring (Fig. 13).

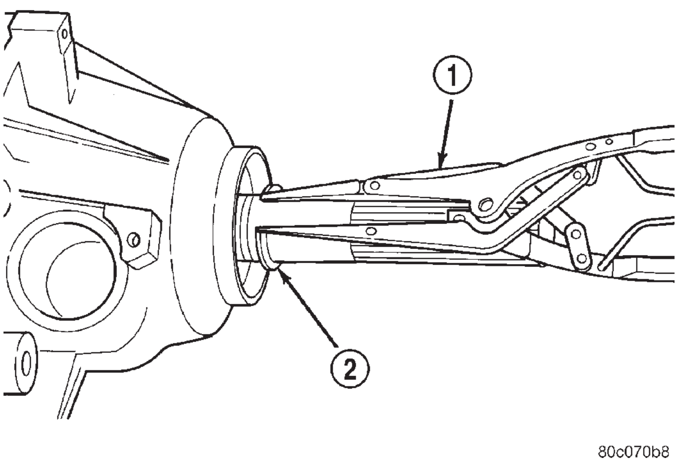


Fig. 13 Rear Bearing I. D. Retaining Ring Removal

1 – SNAP RING PLIERS
2 – REAR BEARING I. D. RETAINING RING

(5) Remove speedometer adapter.
(6) Remove rear retainer bolts.
(7) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and output shaft (Fig. 14).
(8) Remove rear bearing O. D. retaining ring with snap ring pliers. Then tilt pump and slide it off output shaft (Fig. 15)
(9) Remove pickup tube O-ring from pump (Fig. 16) but do not disassemble pump; it is not a repairable part.
(10) Remove seal from oil pump with pry tool.

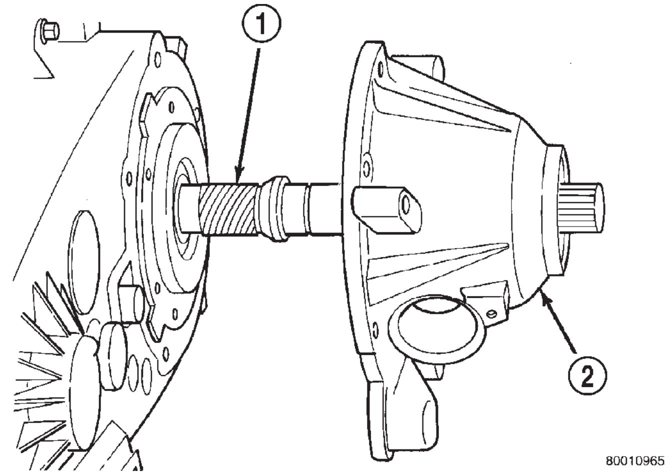


Fig. 14 Rear Retainer Removal

1 – MAINSHAFT
2 – REAR RETAINER

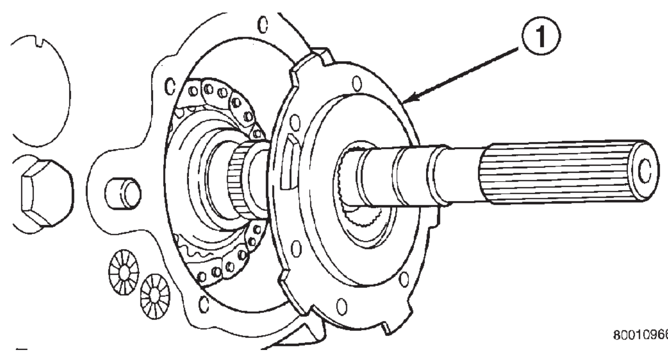


Fig. 15 Oil Pump Removal

1 – OIL PUMP

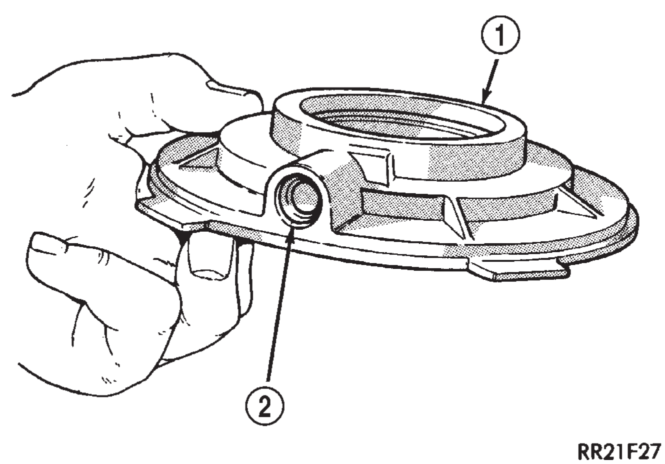


Fig. 16 Pickup Tube O-Ring Location

1 – OIL PUMP
2 – O-RING

(11) Remove bolts attaching rear case to front case (Fig. 17). Note position of the two black finish bolts

DISASSEMBLY AND ASSEMBLY (Continued)

at each end of the case. These bolts go through the case dowels and require a washer under the bolt head.

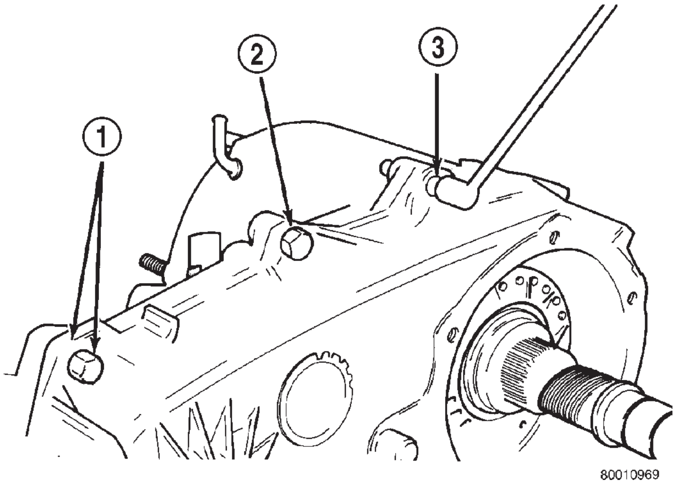


Fig. 17 Spline And Dowel Bolt Locations

1 – DOWEL BOLT AND WASHER (2)
2 – CASE BOLT (5)
3 – SPLINE HEAD BOLT (1)

(12) Remove rear case from front case (Fig. 18). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

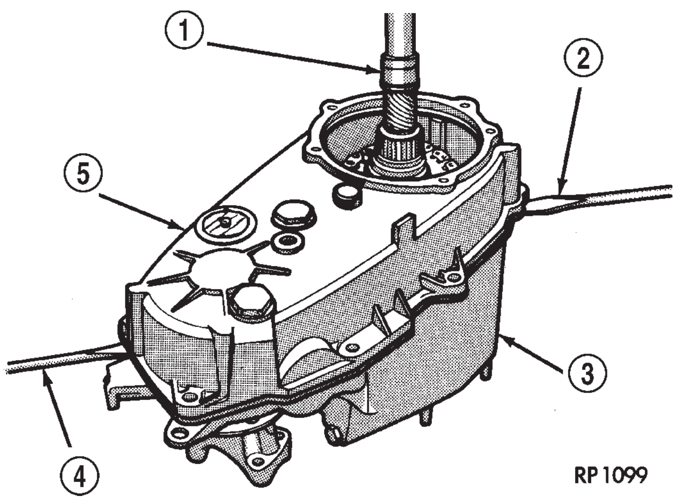


Fig. 18 Loosening/Removing Rear case

1 – MAINSHAFT
2 – SCREWDRIVER
3 – FRONT CASE
4 – SCREWDRIVER
5 – REAR CASE

(13) Remove oil pickup tube and screen from rear case (Fig. 19).

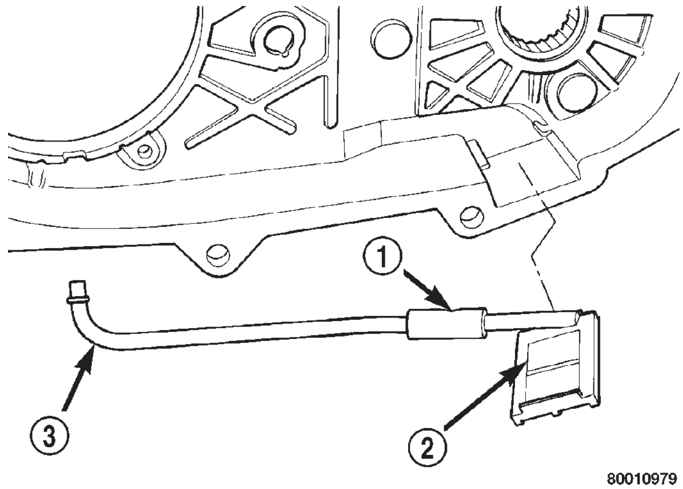


Fig. 19 Oil Pickup Screen, Hose And Tube Removal

1 – CONNECTING HOSE
2 – PICKUP SCREEN
3 – PICKUP TUBE

YOKE AND RANGE LEVER REMOVAL

(1) Remove front yoke nut:

(a) Move range lever to 4L position.

(b) Remove nut with socket and impact wrench (Fig. 20).

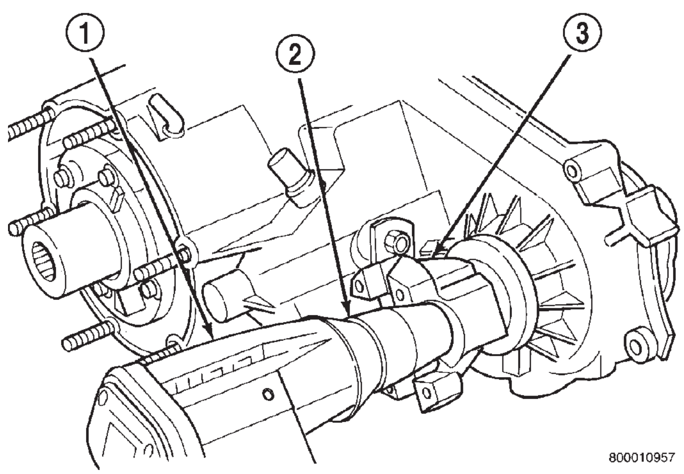


Fig. 20 Yoke Nut Removal

1 – IMPACT WRENCH
2 – SOCKET
3 – YOKE

(2) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 21). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

DISASSEMBLY AND ASSEMBLY (Continued)

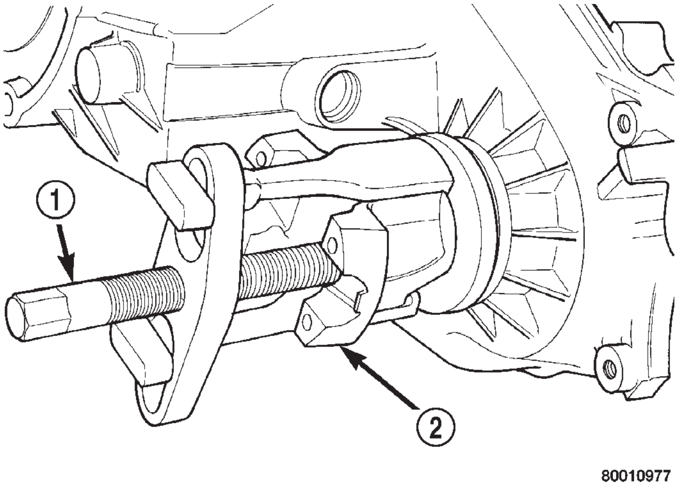


Fig. 21 Yoke Removal

1 – PULLER TOOL
2 – YOKE

(3) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(4) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft (Fig. 22).

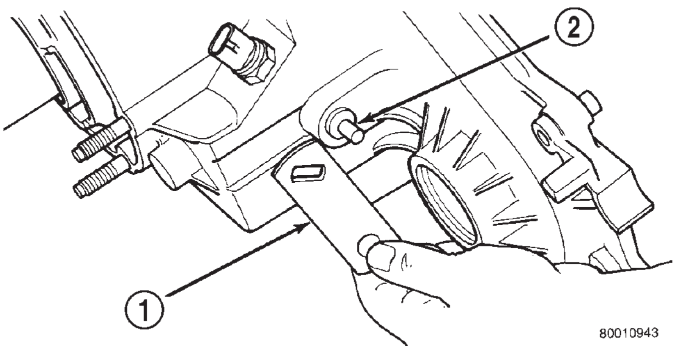


Fig. 22 Range Lever Removal

1 – RANGE LEVER
2 – SECTOR SHAFT

FRONT OUTPUT SHAFT AND DRIVE CHAIN REMOVAL

(1) Remove drive sprocket snap-ring (Fig. 23).
(2) Remove drive sprocket and chain (Fig. 24).
(3) Remove front output shaft (Fig. 25).

SHIFT FORKS AND MAINSHAFT REMOVAL AND DISASSEMBLY

(1) Remove shift detent plug, spring and pin (Fig. 26).

(2) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole.

(3) Remove range fork lockpin with size number one easy-out tool as follows:

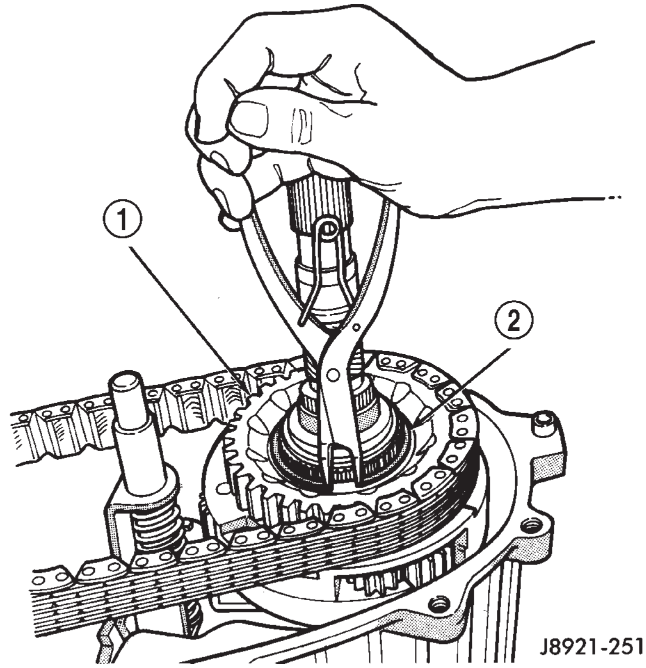


Fig. 23 Drive Sprocket Snap-Ring Removal

1 – DRIVE SPROCKET
2 – DRIVE SPROCKET SNAP RING

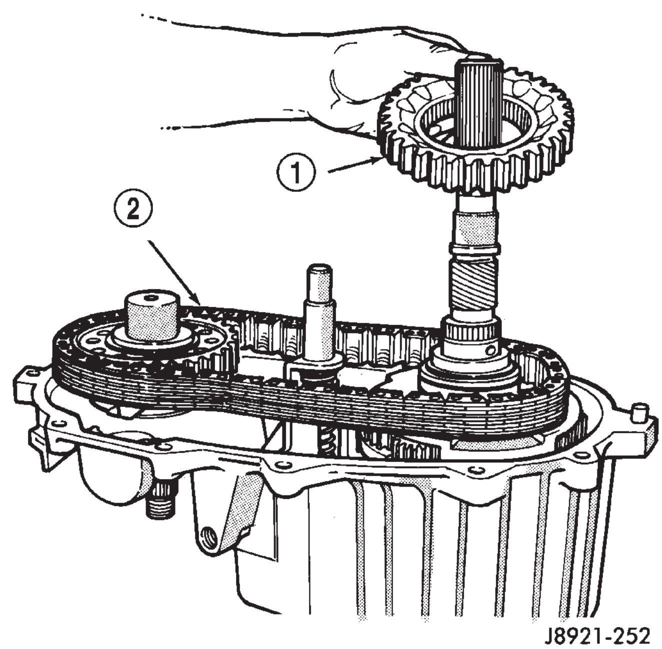


Fig. 24 Drive Sprocket And Chain Removal

1 – DRIVE SPROCKET
2 – DRIVE CHAIN

(a) Insert easy-out tool through access hole in side of transfer case and into lock-pin.

(b) Tap easy-out tool into lock-pin with hammer until tool is securely engaged into the lock-pin.

DISASSEMBLY AND ASSEMBLY (Continued)

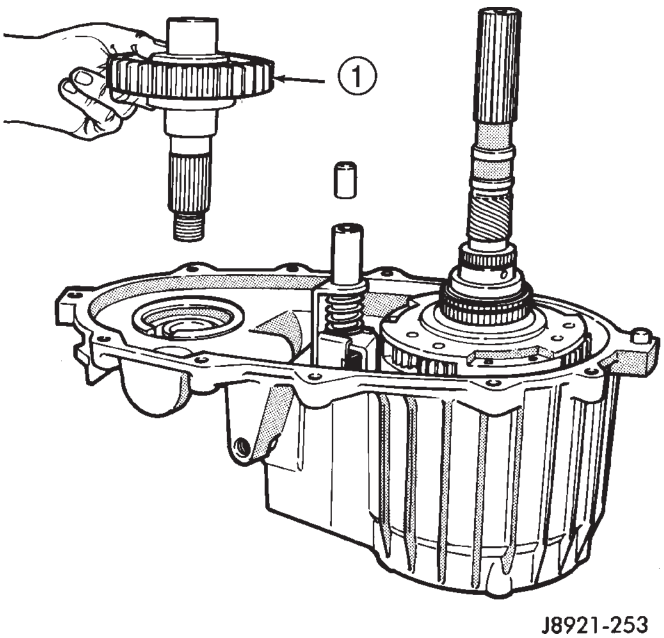


Fig. 25 Removing Front Output Shaft

1 – FRONT OUTPUT SHAFT

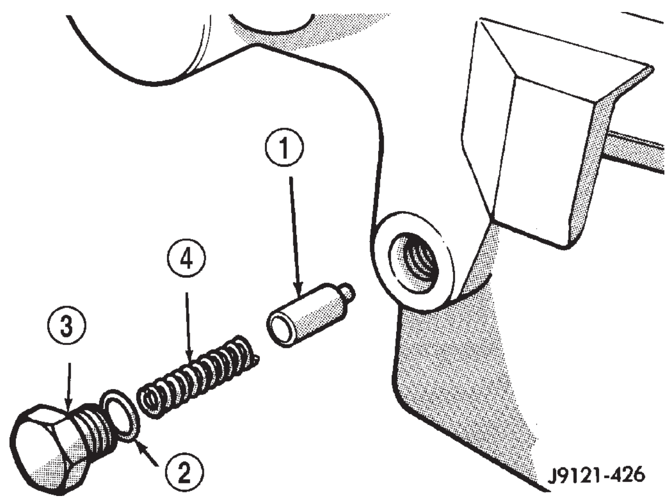


Fig. 26 Detent Component Removal

1 – PLUNGER
2 – O-RING
3 – PLUG
4 – SPRING

(c) Install a t-handle, such as from a tap and die set, onto the easy-out tool.

(d) Securely tighten the t-handle onto the tool.

(e) In one motion, pull upward and turn the t-handle counter-clockwise to remove the lock-pin.

(4) Remove shift rail by pulling it straight up and out of fork (Fig. 27).

(5) Remove mode fork and mainshaft as assembly (Fig. 28).

(6) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 29). Note position of mode sleeve in fork and remove sleeve.

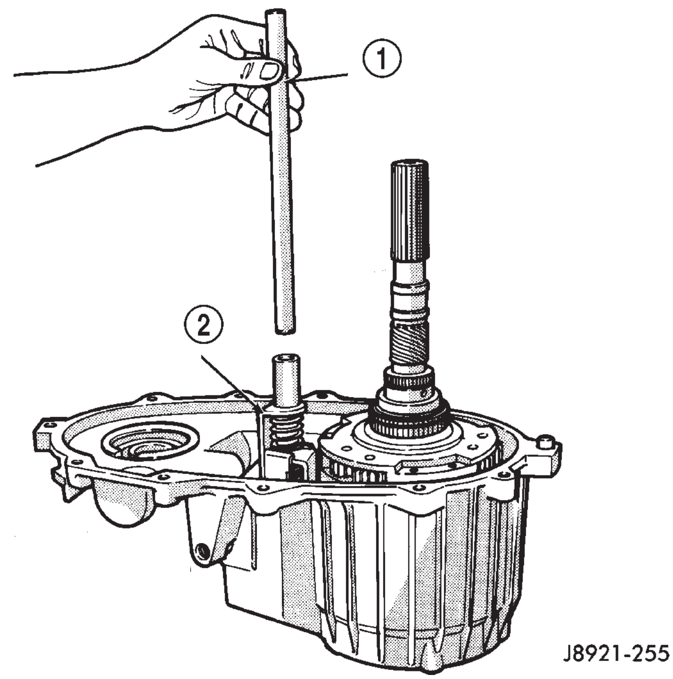


Fig. 27 Shift Rail Removal

1 – SHIFT RAIL
2 – MODE FORK

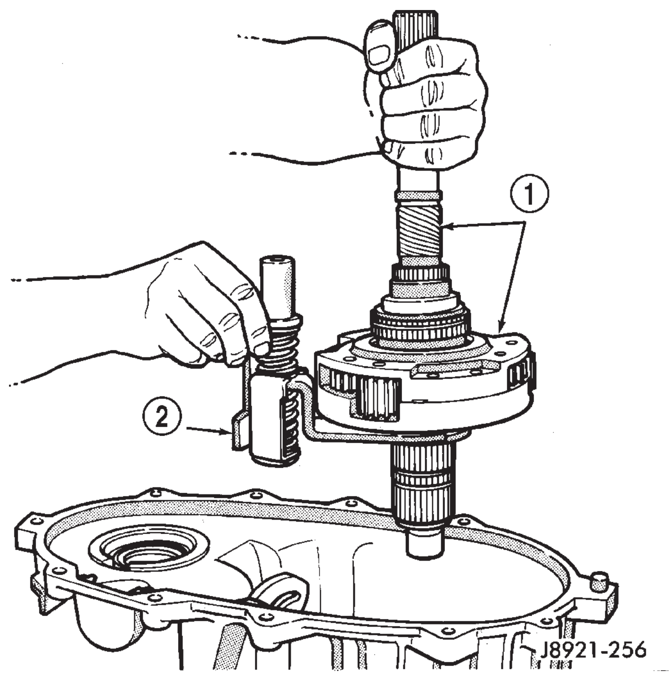


Fig. 28 Mode Fork And Mainshaft Removal

1 – MAINSHAFT ASSEMBLY
2 – MODE FORK

DISASSEMBLY AND ASSEMBLY (Continued)

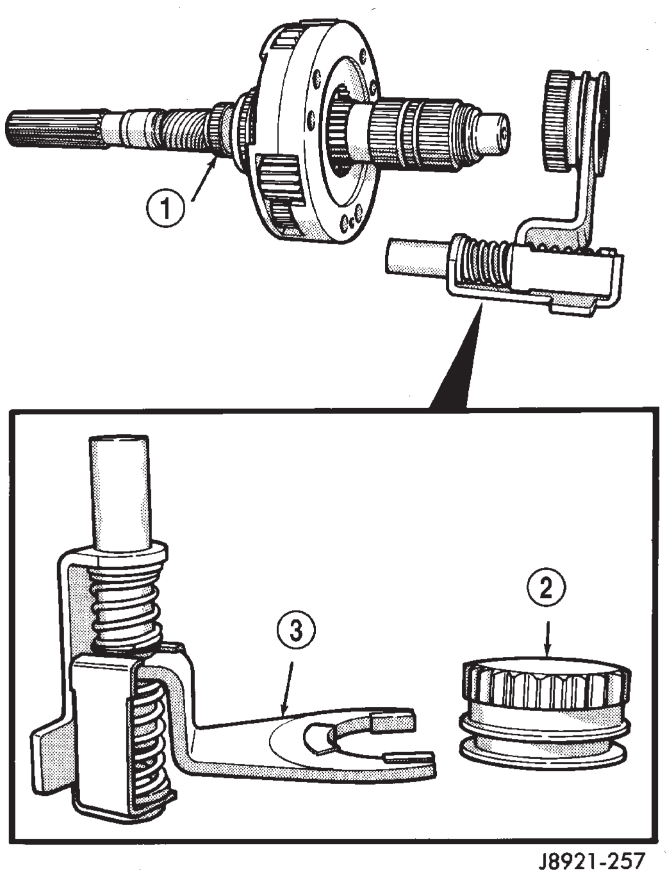


Fig. 29 Mode Fork And Sleeve Removal

1 – MAINSHAFT
2 – SLEEVE
3 – MODE FORK ASSEMBLY

(7) Remove intermediate clutch shaft snap-ring (Fig. 30).

(8) Remove clutch shaft thrust ring (Fig. 31).

(9) Remove intermediate clutch shaft (Fig. 32).

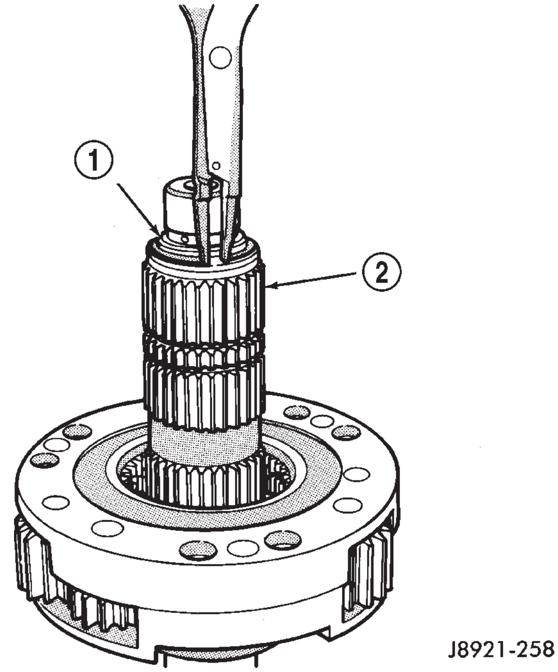


Fig. 30 Intermediate Clutch Shaft Snap-Ring Removal

1 – SNAP RING
2 – INTERMEDIATE CLUTCH SHAFT

Fig. 31 Clutch Shaft Thrust Ring Removal

1 – CLUTCH SHAFT THRUST RING

DISASSEMBLY AND ASSEMBLY (Continued)

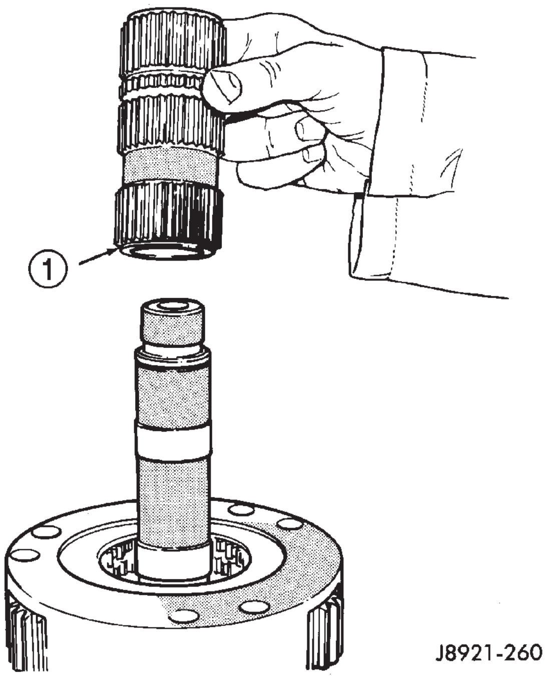


Fig. 32 Intermediate Clutch Shaft Removal

1 – INTERMEDIATE CLUTCH SHAFT

(10) Remove differential snap-ring (Fig. 33).

(11) Remove differential (Fig. 34).

(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

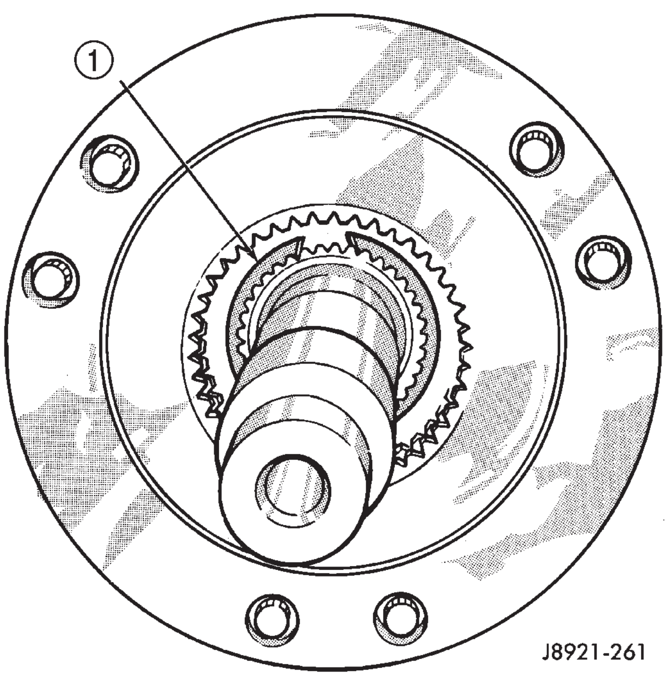


Fig. 33 Differential Snap-Ring Removal

1 – DIFFERENTIAL SNAP RING

(13) Slide low range fork pin out of shift sector slot (Fig. 35).

(14) Remove low range fork and hub (Fig. 36).

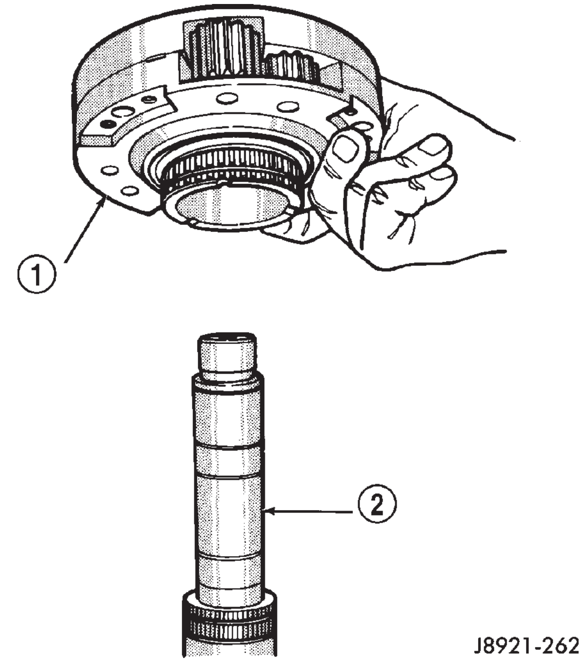


Fig. 34 Differential Removal

1 – DIFFERENTIAL

2 – MAINSHAFT

(15) Remove shift sector (Fig. 37).

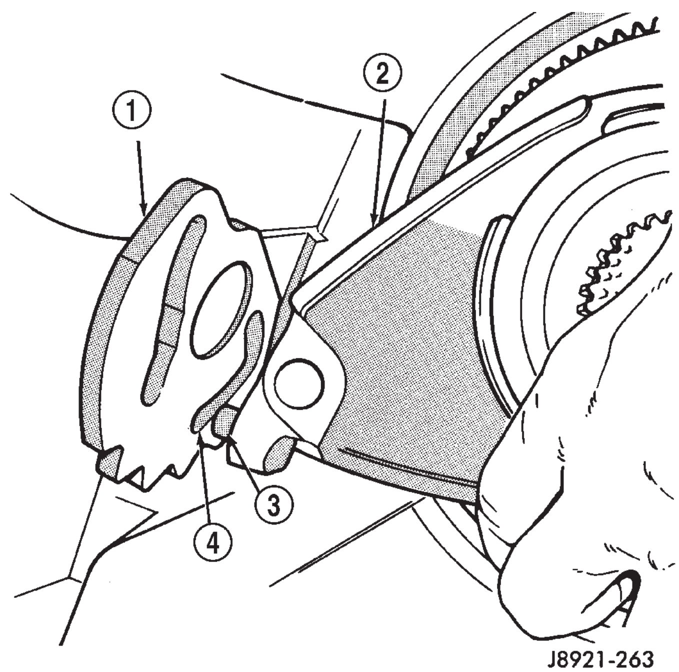


Fig. 35 Disengaging Low Range Fork

1 – SHIFT SECTOR

2 – LOW RANGE FORK

3 – PIN

4 – SLOT

DISASSEMBLY AND ASSEMBLY (Continued)

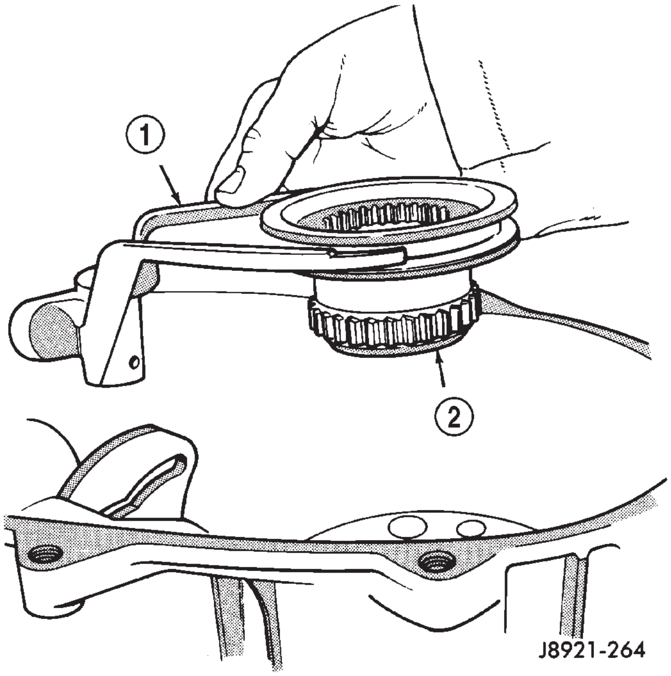


Fig. 36 Low Range Fork And Hub Removal

1 – LOW RANGE FORK
2 – FORK HUB

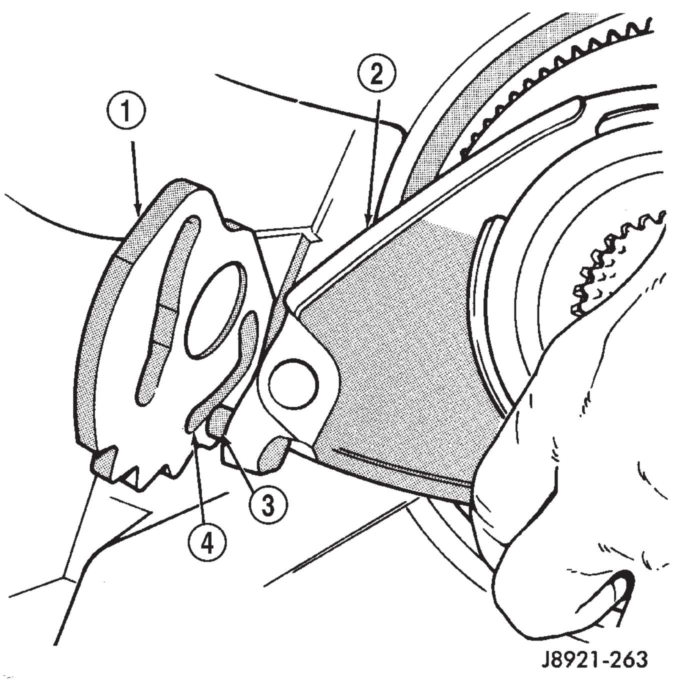


Fig. 37 Shift Sector Position

1 – SHIFT SECTOR
2 – LOW RANGE FORK
3 – PIN
4 – SLOT

(16) Remove shift sector bushing and O-ring (Fig. 38).

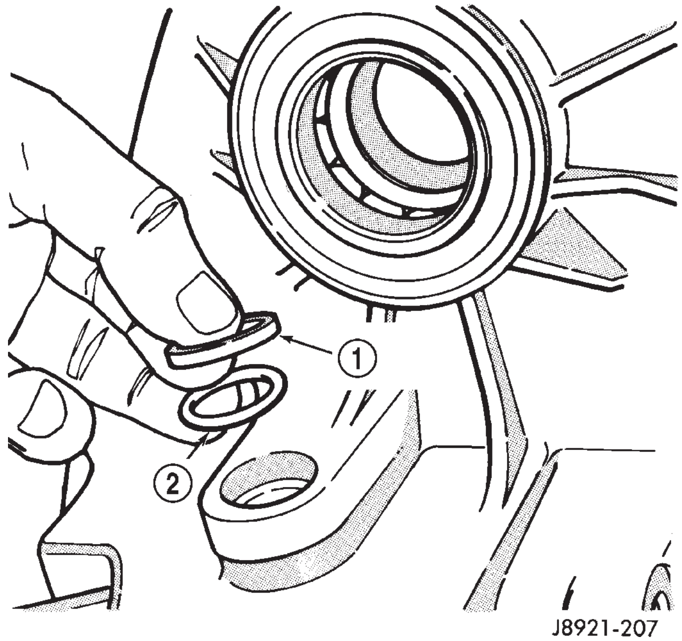


Fig. 38 Sector Bushing And O-Ring Removal

1 – SHIFT SECTOR BUSHING
2 – O-RING

INPUT GEAR/LOW RANGE ASSEMBLY REMOVAL AND DISASSEMBLY

(1) Remove front bearing retainer bolts.

(2) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 39). Position screwdriver in slots cast into retainer.

(3) Remove input gear snap-ring (Fig. 40).

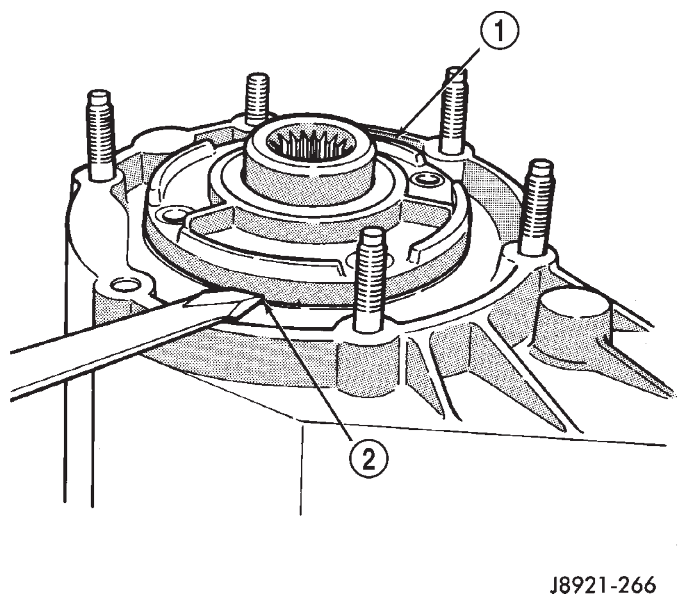


Fig. 39 Front Bearing Retainer Removal

1 – FRONT BEARING RETAINER
2 – RETAINER SLOT

DISASSEMBLY AND ASSEMBLY (Continued)

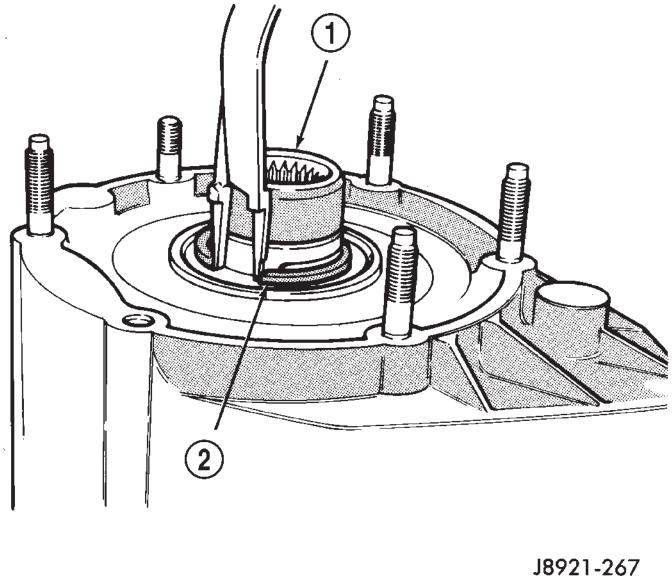


Fig. 40 Input Gear Snap-Ring Removal

1 – INPUT GEAR
2 – SNAP RING

(4) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829A (Fig. 41).

(5) Remove low range gear snap-ring (Fig. 42).

(6) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 43).

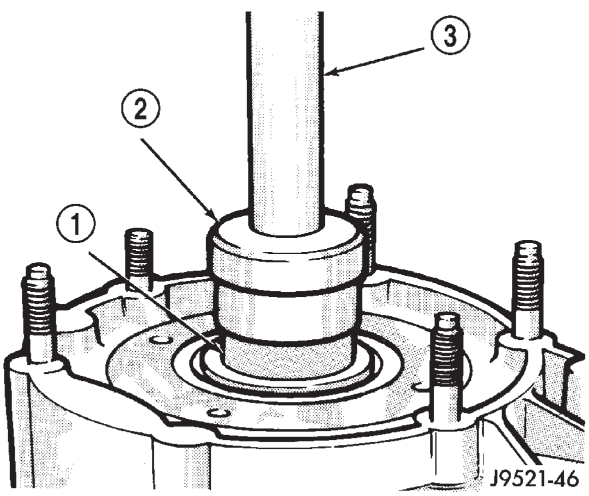


Fig. 41 Input And Low Range Gear Assembly Removal

1 – INPUT-LOW RANGE GEARS
2 – SPECIAL TOOL 7829A
3 – SPECIAL TOOL C-4171

(7) Inspect low range annulus gear (Fig. 44). **Gear is not a serviceable component. If damaged, replace gear and front case as assembly.**

(8) Remove oil seals from following components:

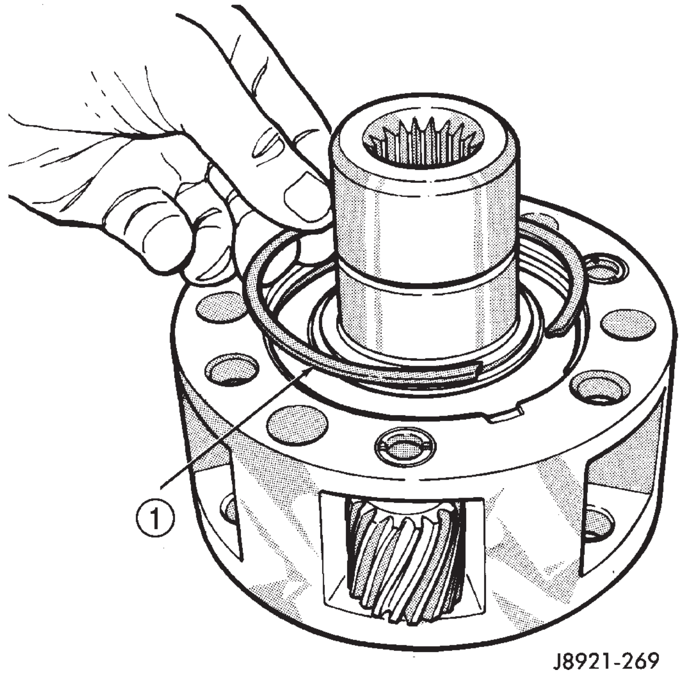


Fig. 42 Low Range Gear Snap-Ring Removal/ Installation

1 – LOW RANGE GEAR SNAP RING

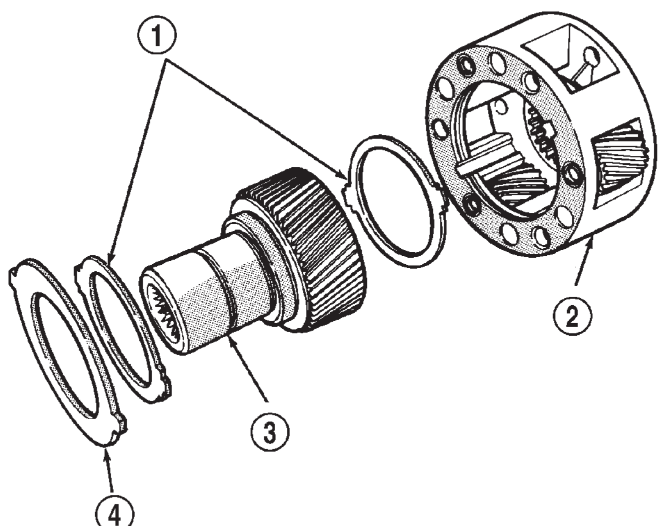


Fig. 43 Low Range Gear Disassembly

1 – THRUST WASHERS
2 – LOW RANGE GEAR
3 – INPUT GEAR
4 – RETAINER

- front bearing retainer.
- rear retainer.
- oil pump.
- case halves.

DISASSEMBLY AND ASSEMBLY (Continued)

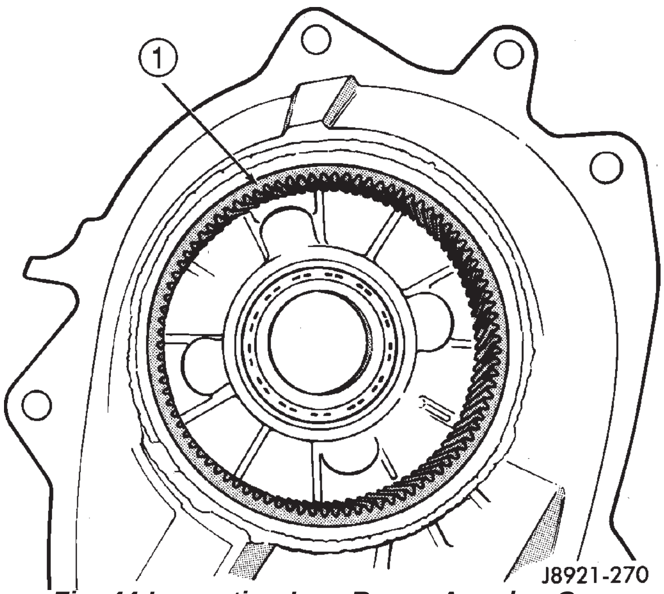


Fig. 44 Inspecting Low Range Annulus Gear

1 – LOW RANGE ANNULUS GEAR

DIFFERENTIAL DISASSEMBLY

(1) Mark differential case halves for reference.

(2) Remove differential case bolts.

(3) Invert differential on workbench.

(4) Separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 45).

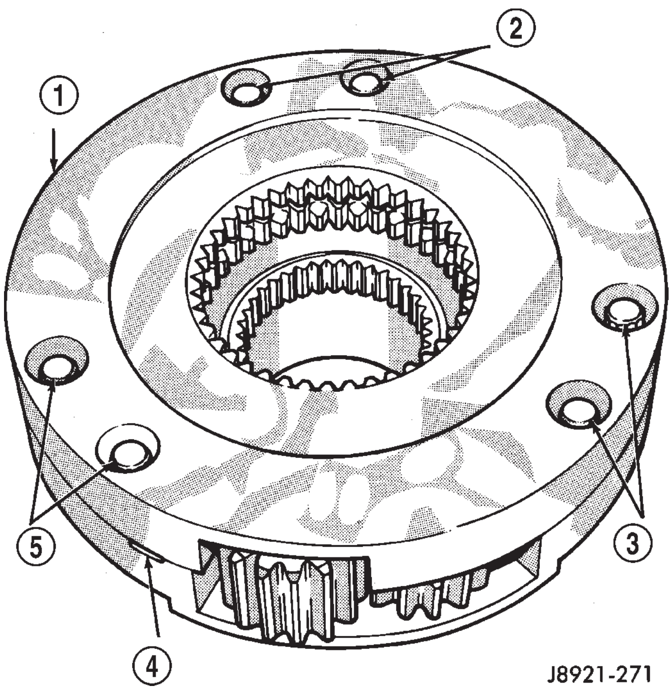


Fig. 45 Separating Differential Case Halves

1 – TOP CASE
2 – CASE BOLTS
3 – CASE BOLTS
4 – CASE SLOTS
5 – CASE BOLTS

(5) Remove thrust washers and planet gears from case pins (Fig. 46).

(6) Remove mainshaft and sprocket gears from bottom case (Fig. 47). Note gear position for reference before separating them.

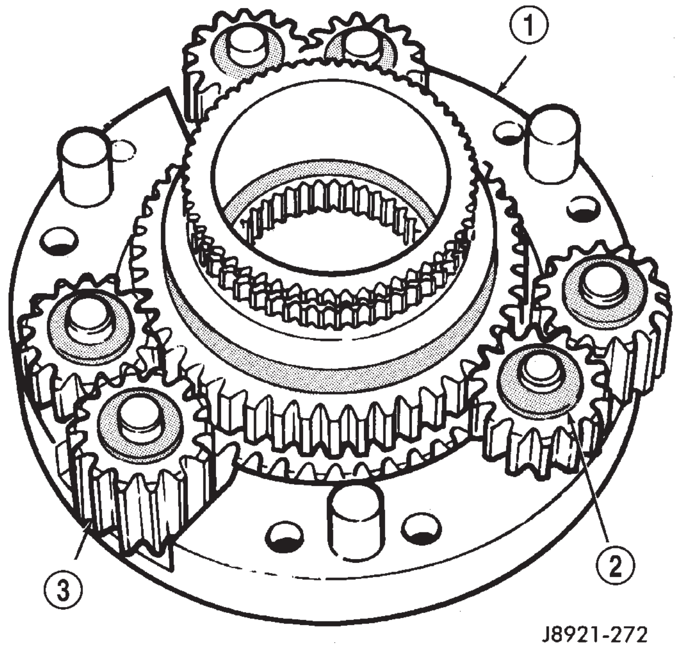


Fig. 46 Planet Gears And Thrust Washer Removal

1 – BOTTOM CASE
2 – THRUST WASHERS (12)
3 – PLANET GEARS (6)

ASSEMBLY

Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

DISASSEMBLY AND ASSEMBLY (Continued)

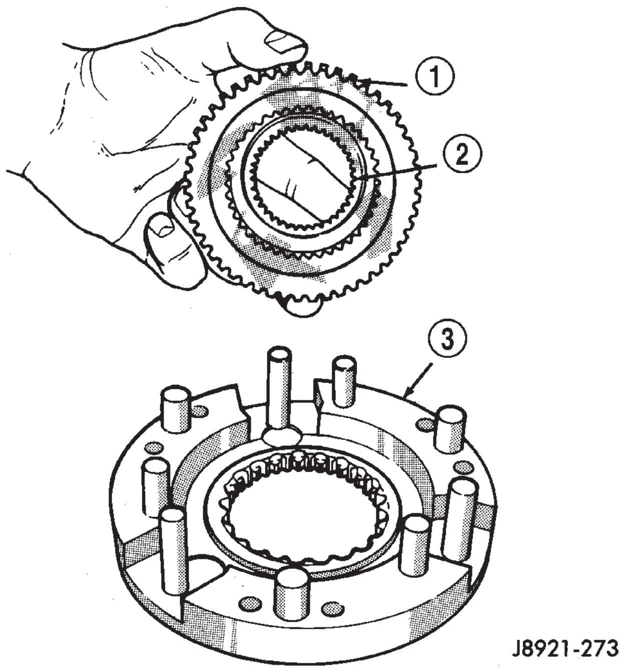


Fig. 47 Mainshaft And Sprocket Gear Removal

1 – MAINSHAFT GEAR
2 – SPROCKET GEAR
3 – BOTTOM CASE

BEARING AND SEAL INSTALLATION

(1) Remove snap-ring that retains front output shaft front bearing in case (Fig. 48). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.

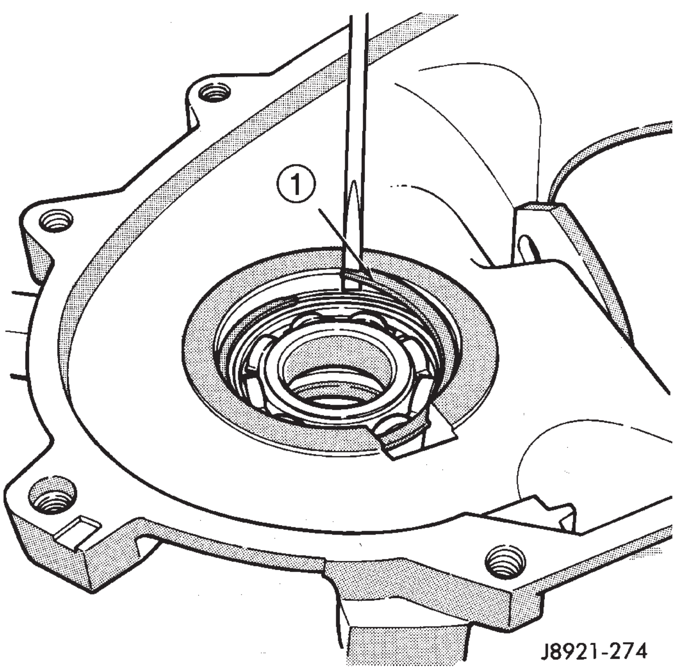


Fig. 48 Front Output Shaft Front Bearing Snap-Ring Removal

1 – FRONT BEARING SNAP RING

(2) Install new front output shaft front bearing with Tool Handle C-4171 and Installer 8033A with the tapered cone upward (Fig. 49).

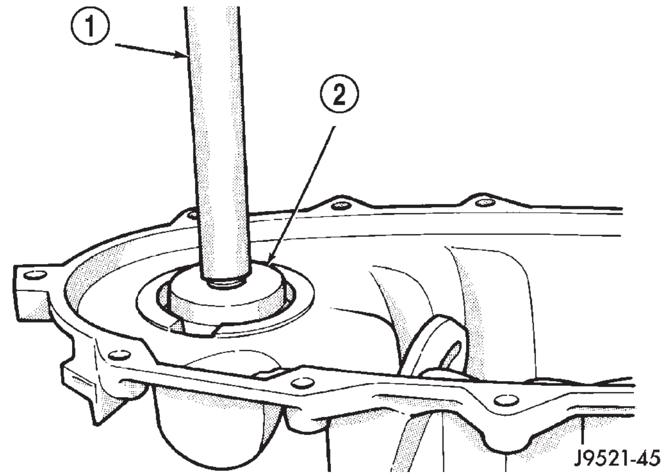


Fig. 49 Front Output Shaft Front Bearing Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 8033A

(3) Install front bearing snap-ring (Fig. 48).

(4) Remove front output shaft seal using an appropriate pry tool (Fig. 50) or slide-hammer mounted screw.

(5) Install new front output shaft oil seal with Installer 6952-A (Fig. 51).

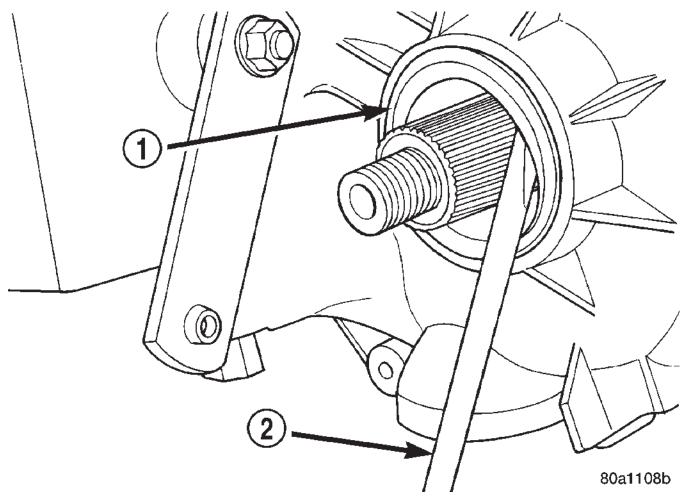


Fig. 50 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

DISASSEMBLY AND ASSEMBLY (Continued)

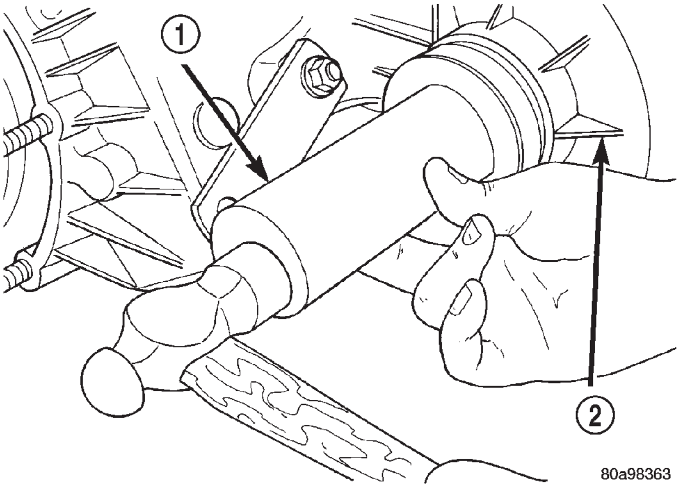


Fig. 51 Install Front Output Shaft Seal

1 – INSTALLER 6952–A
2 – TRANSFER CASE

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 52).

(7) Install snap-ring on new input gear bearing.

(8) Install new input gear bearing with Tool Handle C-4171 and Remover C-4210. Install bearing far enough to seat snap-ring against case (Fig. 53).

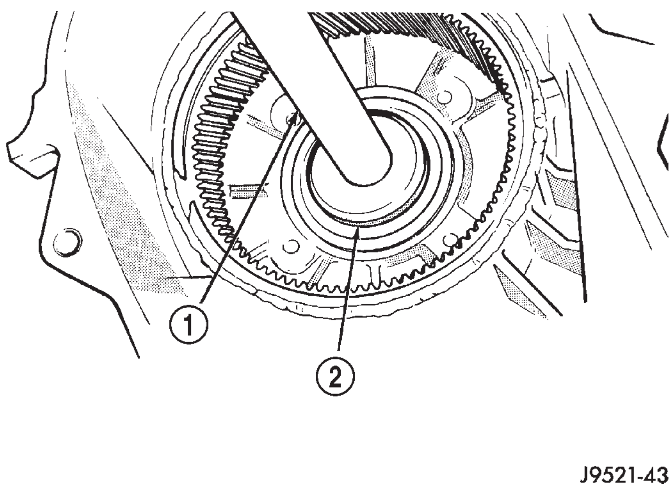


Fig. 52 Input Gear Bearing Removal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-4210

(9) Remove the input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 54).

(10) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 55).

(11) Install new seal in front bearing retainer with Installer 7884 (Fig. 56).

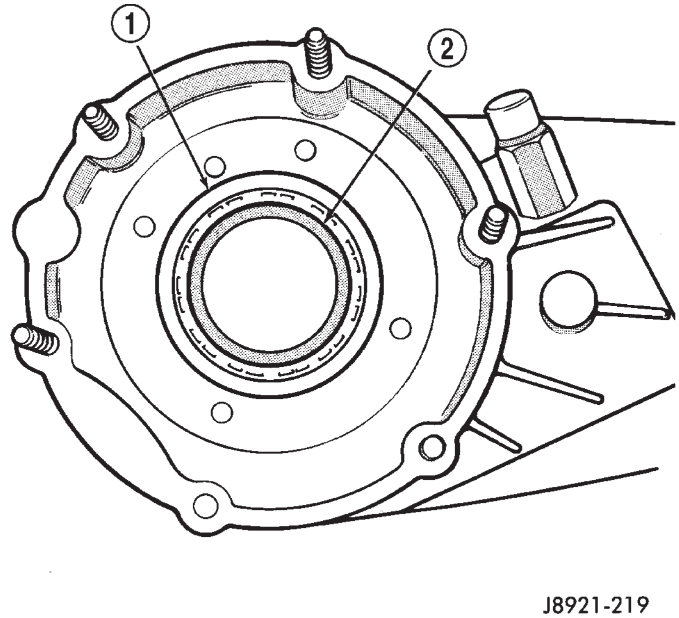


Fig. 53 Seating Input Gear Bearing

1 – SNAP RING
2 – INPUT SHAFT BEARING

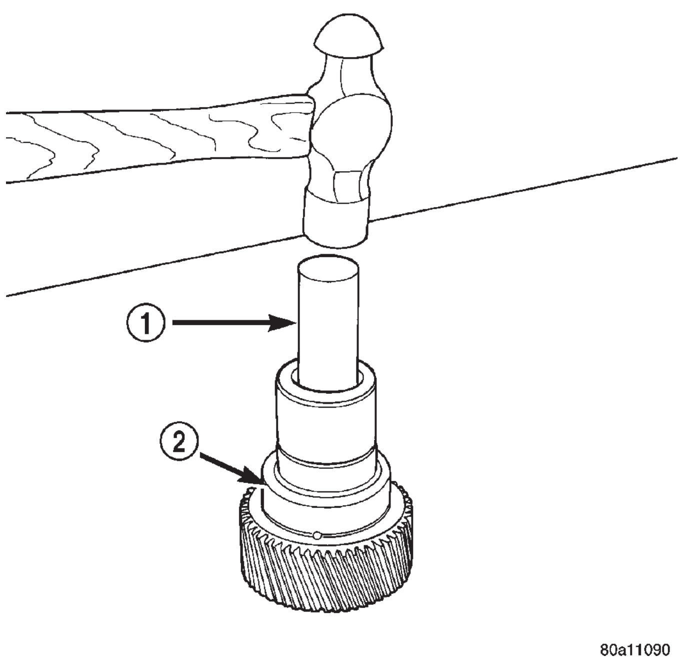


Fig. 54 Remove Input Gear Pilot Bearing

1 – DRIFT
2 – INPUT GEAR

(12) Remove output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 57).

DISASSEMBLY AND ASSEMBLY (Continued)

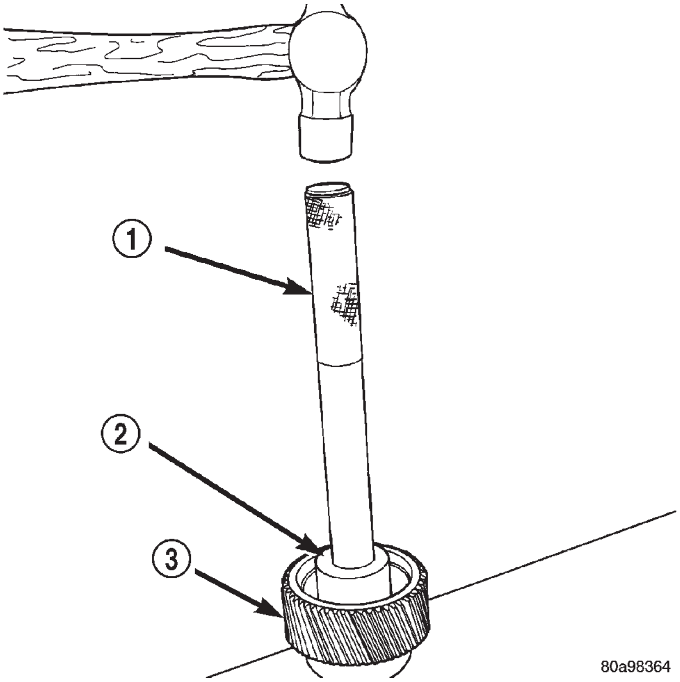


Fig. 55 Install Input Gear Pilot Bearing

1 – HANDLE C-4171
2 – INSTALLER 8128
3 – INPUT GEAR

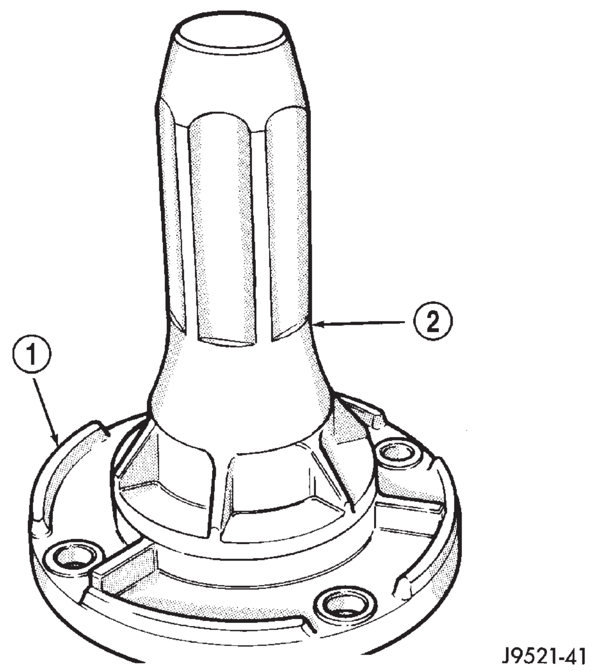


Fig. 56 Front Bearing Retainer Seal Installation

1 – FRONT BEARING RETAINER
2 – SPECIAL TOOL 7884

(13) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 58). Lubricate bearing after installation.

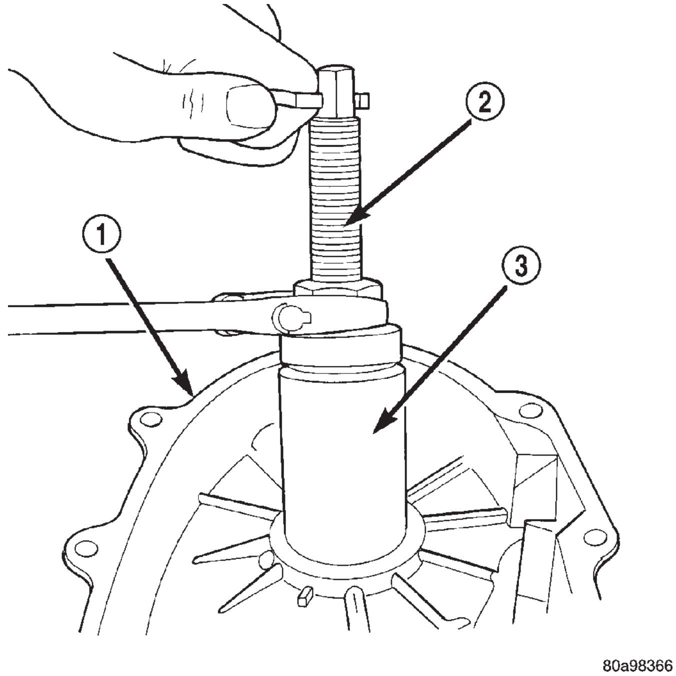


Fig. 57 Remove Front Output Shaft Rear Bearing

1 – REAR CASE
2 – SPECIAL TOOL L-4454–1 AND L-4454–3
3 – SPECIAL TOOL 8148

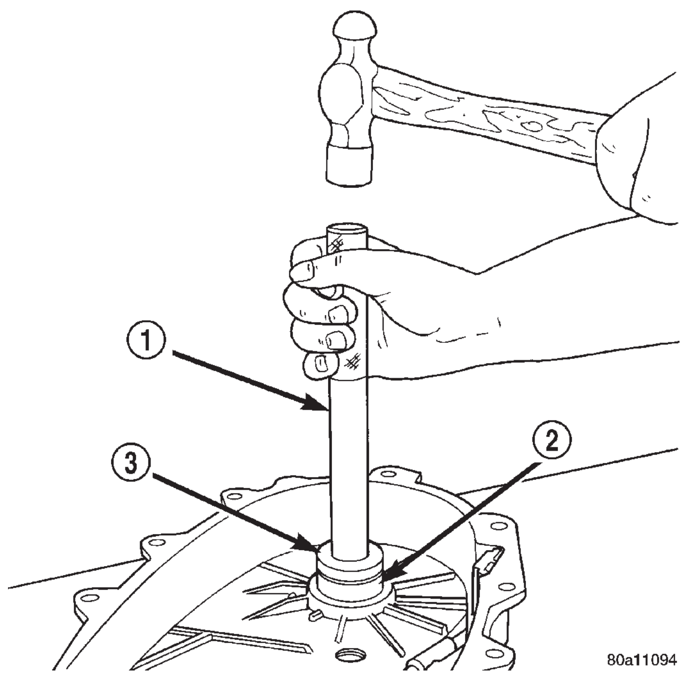


Fig. 58 Install Front Output Shaft Rear Bearing

1 – HANDLE C-4171
2 – OUTPUT SHAFT INNER BEARING
3 – INSTALLER 5066

(14) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 59).

DISASSEMBLY AND ASSEMBLY (Continued)

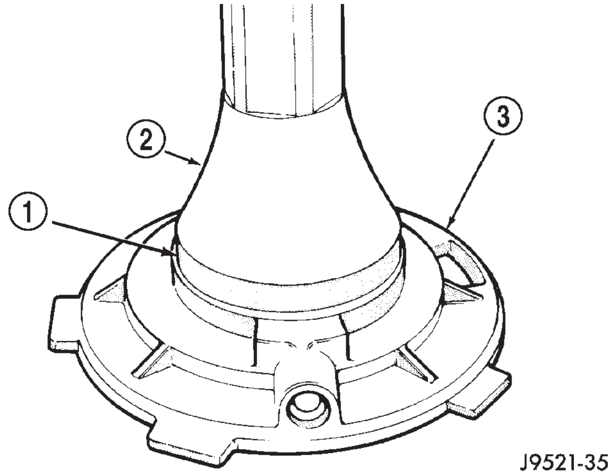


Fig. 59 Oil Pump Seal Installation

1 – HOUSING SEAL
2 – SPECIAL TOOL 7888
3 – OIL PUMP FEED HOUSING

(15) Install new pickup tube O-ring in oil pump (Fig. 60).

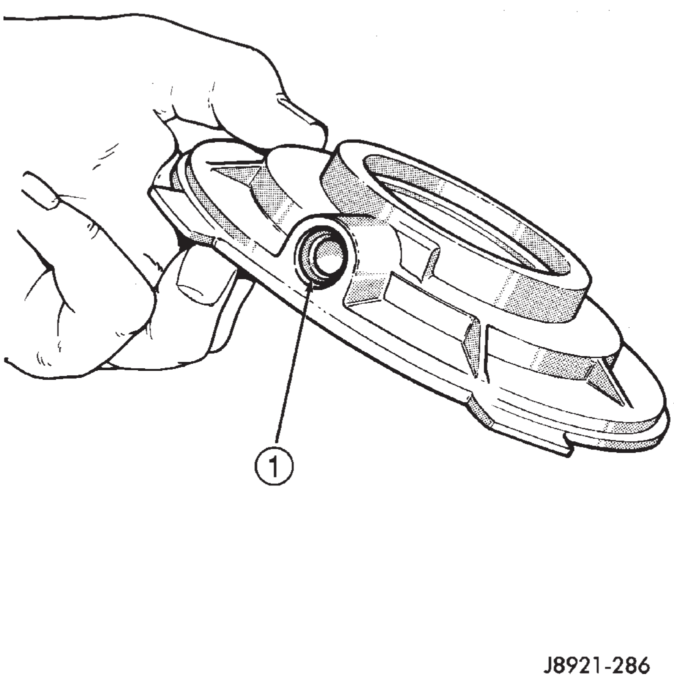


Fig. 60 Pickup Tube O-Ring Installation

1 – PICKUP TUBE O-RING

DIFFERENTIAL ASSEMBLY

(1) Lubricate differential components with automatic transmission fluid.

(2) Install sprocket gear in differential bottom case (Fig. 61).

(3) Install differential planet gears and new thrust washers (Fig. 62). **Be sure thrust washers are installed at top and bottom of each planet gear.**

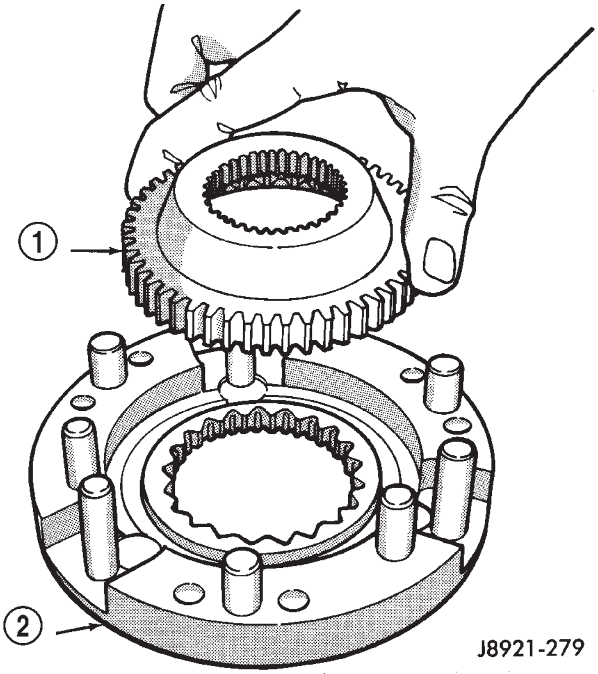


Fig. 61 Installing Differential Sprocket Gear

1 – SPROCKET GEAR
2 – BOTTOM CASE

(4) Install differential mainshaft gear (Fig. 62).

(5) Align and position differential top case on bottom case (Fig. 63). Align using scribe marks made at disassembly.

(6) While holding differential case halves together, invert the differential and start the differential case bolts.

(7) Tighten differential case bolts to specified torque.

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 64).

(2) Install low range gear snap ring (Fig. 65).

DISASSEMBLY AND ASSEMBLY (Continued)

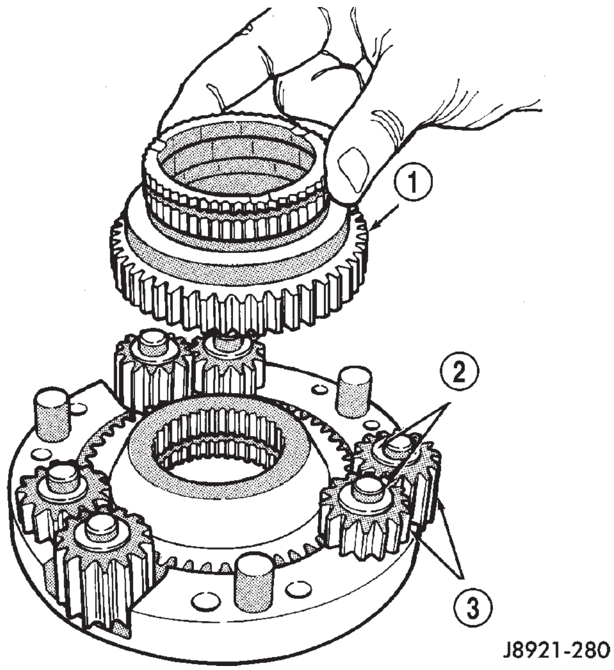


Fig. 62 Installing Mainshaft And Planet Gears

1 – MAINSHAFT GEAR
2 – THRUST WASHERS (12)
3 – PLANET GEARS (6)

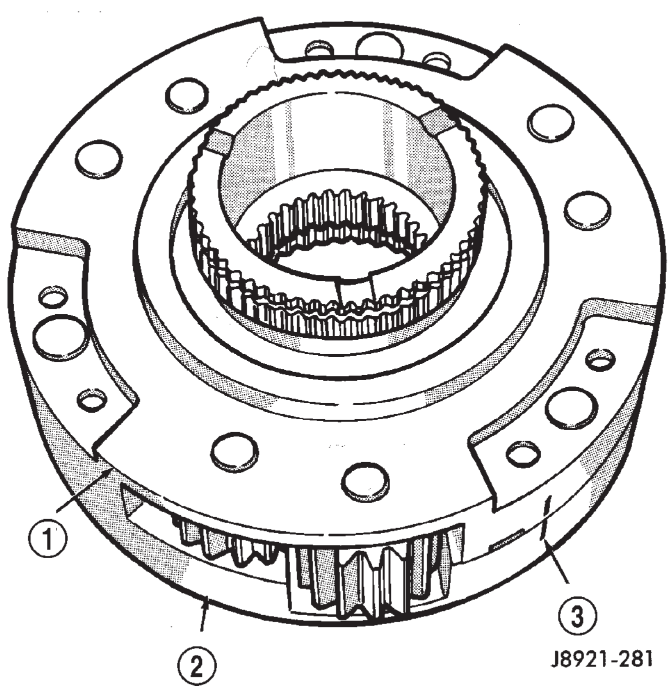


Fig. 63 Differential Case Assembly

1 – TOP CASE
2 – BOTTOM CASE
3 – CASE ALIGNMENT MARKS

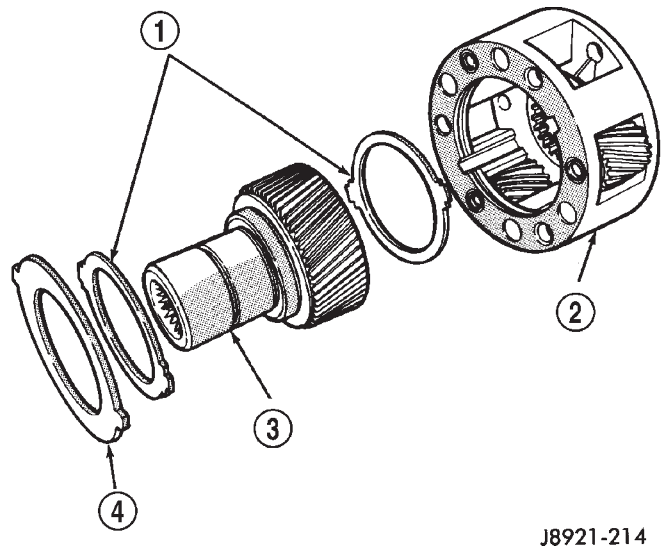


Fig. 64 Low Range And Input Gear Assembly

1 – THRUST WASHERS
2 – LOW RANGE GEAR
3 – INPUT GEAR
4 – RETAINER

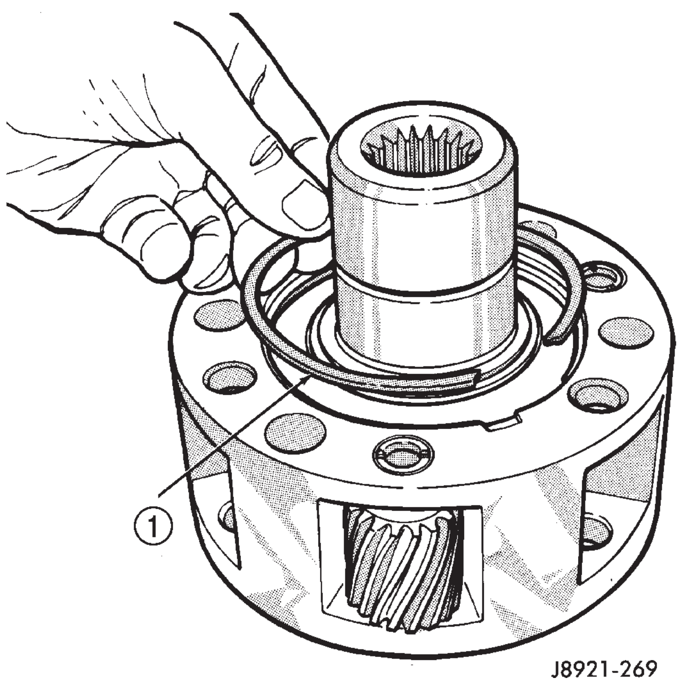


Fig. 65 Install Low Range Gear Snap Ring

1 – LOW RANGE GEAR SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Lubricate input gear and low range gears with automatic transmission fluid.

(4) Start input gear shaft into front case bearing.

(5) Press input gear shaft into front bearing.

(6) Install new input gear snap ring (Fig. 66).

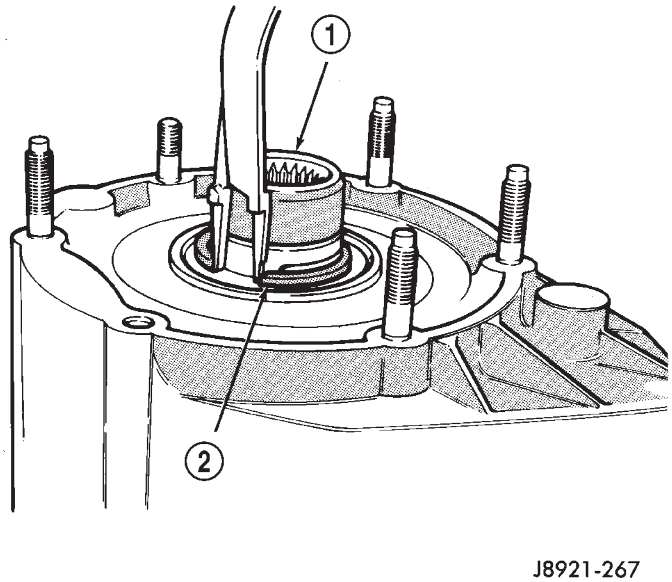


Fig. 66 Input Gear Snap Ring Installation

1 – INPUT GEAR
2 – SNAP RING

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front bearing retainer.

(8) Install front bearing retainer (Fig. 67). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

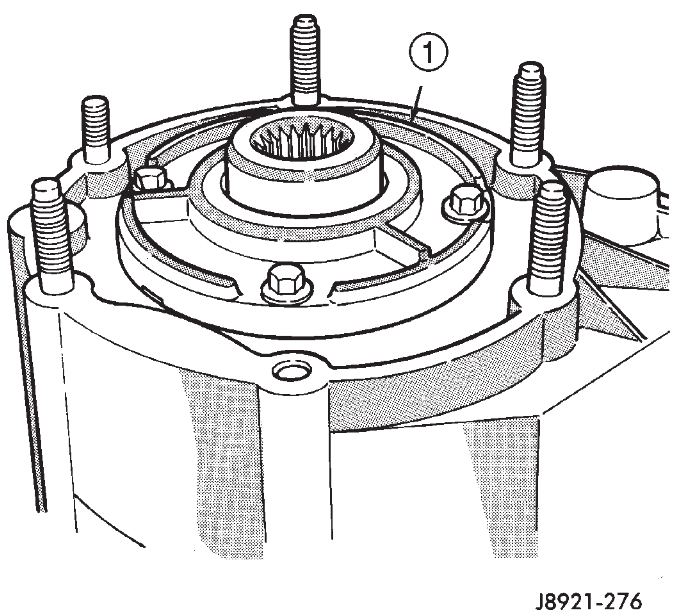


Fig. 67 Installing Front Bearing Retainer

1 – FRONT BEARING RETAINER

SHIFT FORKS AND MAINSHAFT INSTALLATION

(1) Install new sector shaft O-ring and bushing (Fig. 68).

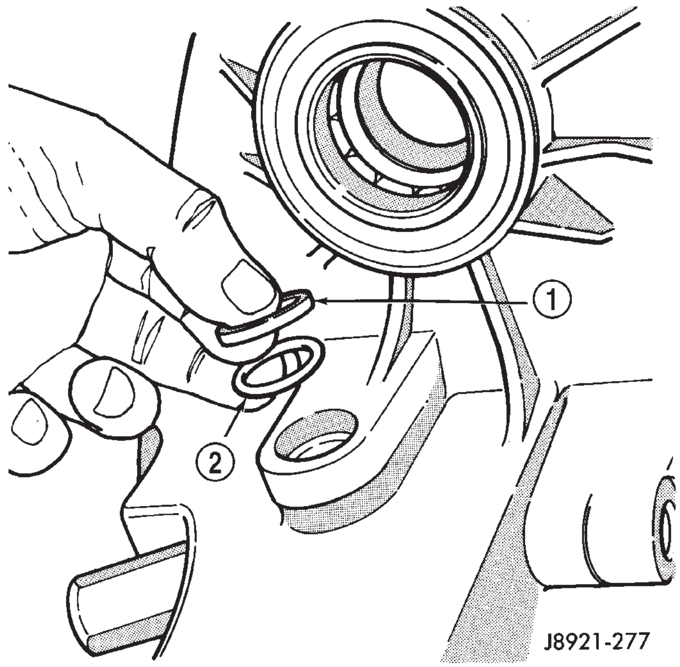


Fig. 68 Sector O-Ring And Bushing Installation

1 – SECTOR BUSHING
2 – O-RING

(2) Install shift sector.

(3) Install new pads on low range fork, if necessary, (Fig. 69).

(4) Assemble low range fork and hub (Fig. 69).

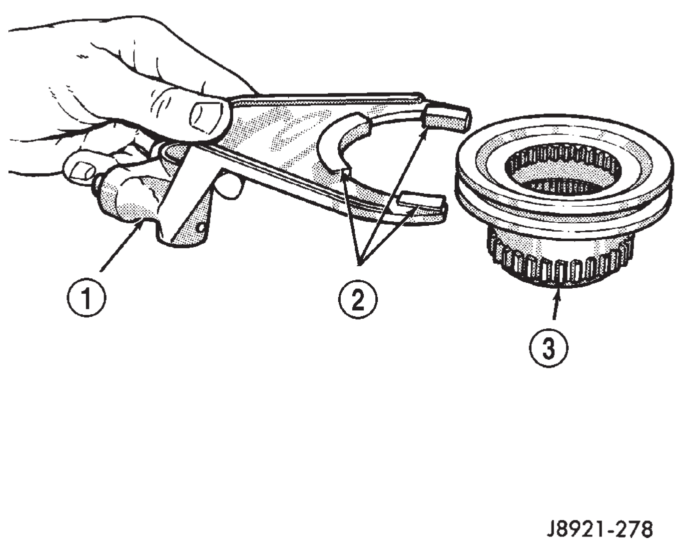


Fig. 69 Assembling Low Range Fork And Hub

1 – LOW RANGE FORK
2 – PADS
3 – HUB

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Position low range fork and hub in case. Be sure low range fork pin is engaged in shift sector slot (Fig. 70).

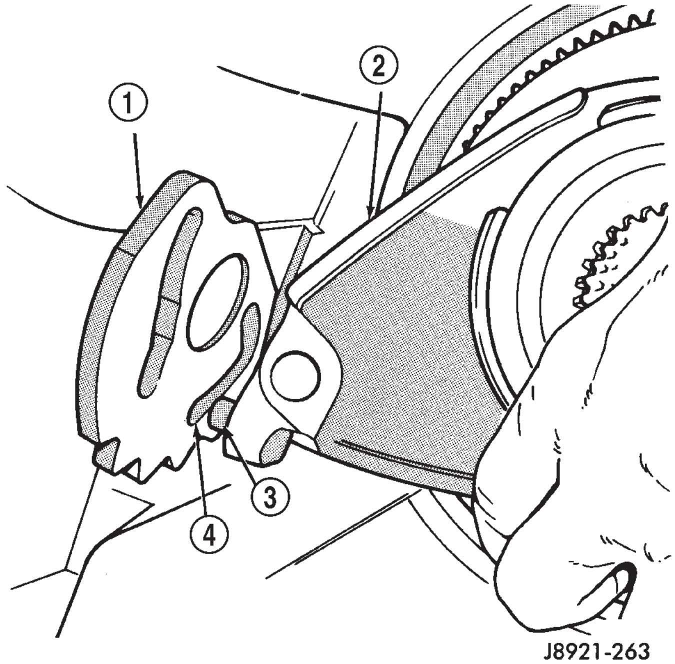


Fig. 70 Positioning Low Range Fork

1 – SHIFT SECTOR
2 – LOW RANGE FORK
3 – PIN
4 – SLOT

(6) Install first mainshaft bearing spacer on mainshaft (Fig. 71).

(7) Install bearing rollers on mainshaft (Fig. 71). **Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.**

(8) Install remaining bearing spacer on mainshaft (Fig. 71). Do not displace any bearings while installing spacer.

(9) Install differential (Fig. 72). **Do not displace mainshaft bearings when installing differential.**

(10) Install differential snap-ring (Fig. 73).

(11) Install intermediate clutch shaft (Fig. 74).

(12) Install clutch shaft thrust washer (Fig. 75).

(13) Install clutch shaft snap-ring (Fig. 76).

(14) Inspect mode fork assembly (Fig. 77). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 77). Replace worn, damaged components.

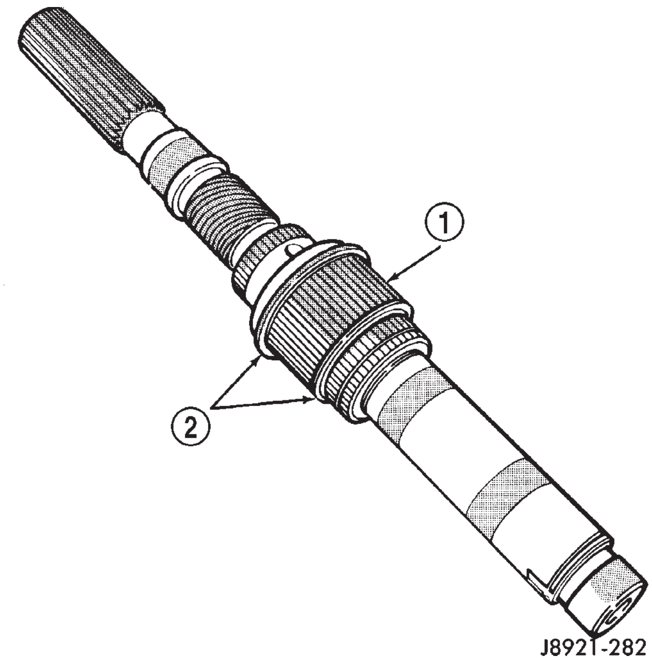


Fig. 71 Installing Mainshaft Bearing Rollers and Spacers

1 – MAINSHAFT BEARING ROLLERS
2 – BEARING SPACERS

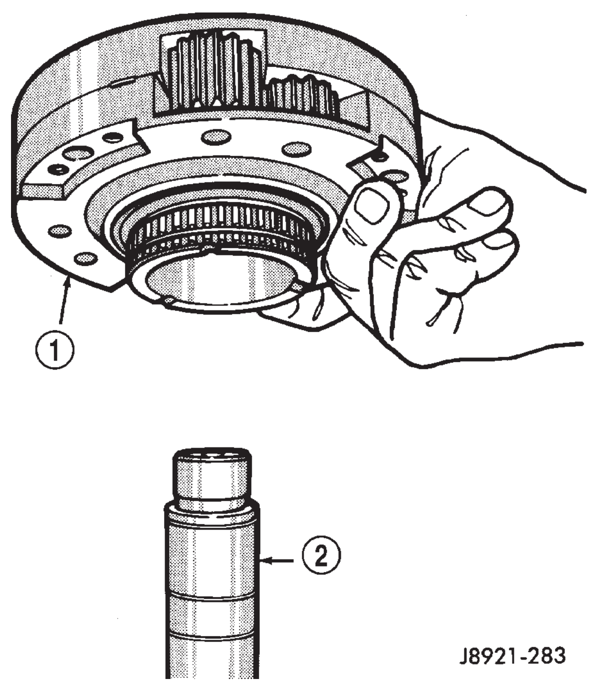


Fig. 72 Differential Installation

1 – DIFFERENTIAL
2 – MAINSHAFT

DISASSEMBLY AND ASSEMBLY (Continued)

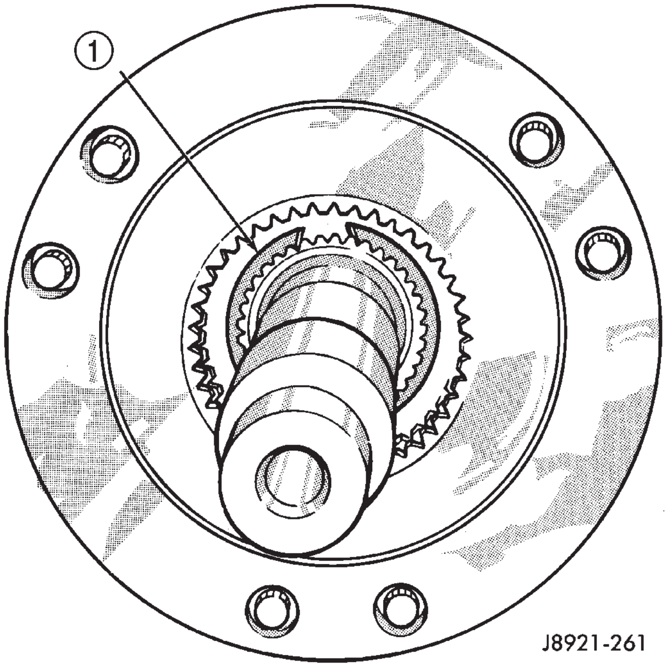


Fig. 73 Installing Differential Snap-Ring

1 – DIFFERENTIAL SNAP RING

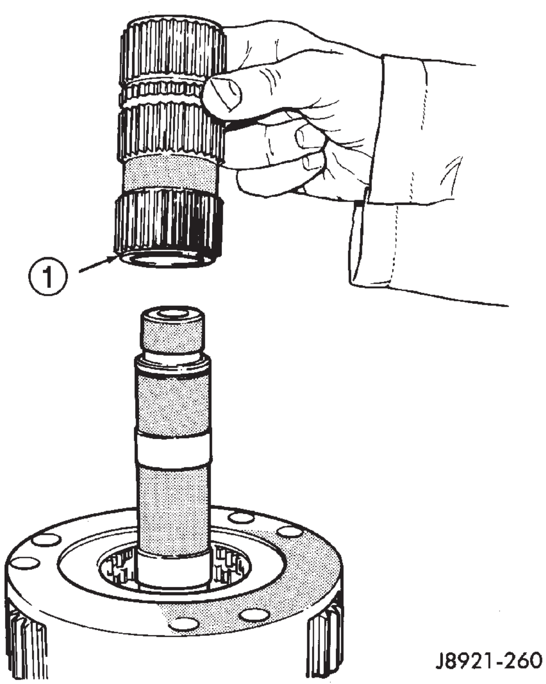


Fig. 74 Installing Intermediate Clutch Shaft

1 – INTERMEDIATE CLUTCH SHAFT

Fig. 75 Installing Clutch Shaft Thrust Washer

1 – CLUTCH SHAFT THRUST RING

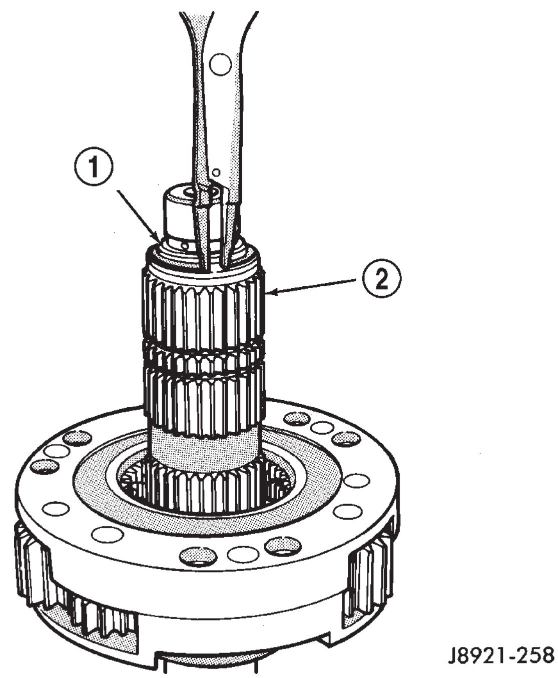


Fig. 76 Installing Clutch Shaft Snap-Ring

1 – SNAP RING

2 – INTERMEDIATE CLUTCH SHAFT

DISASSEMBLY AND ASSEMBLY (Continued)

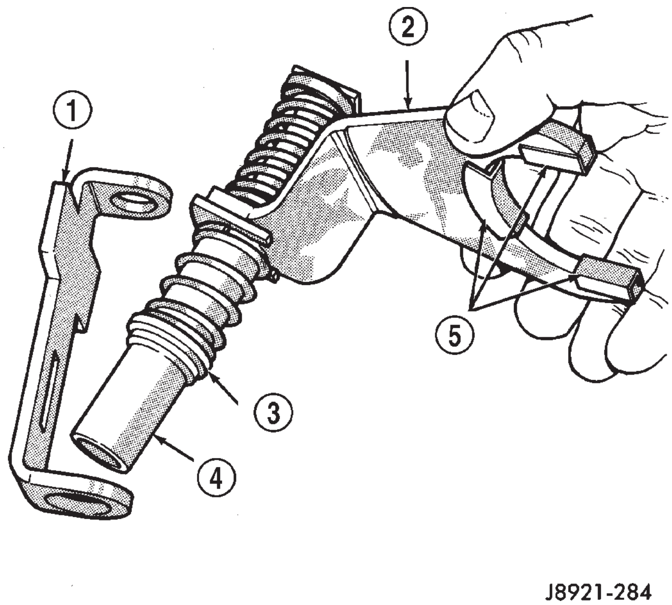


Fig. 77 Mode Fork Assembly Inspection

1 – SLIDER
2 – MODE FORK
3 – BUSHING/SPRING
4 – TUBE
5 – PADS

(15) Install mode sleeve in mode fork (Fig. 78). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

(16) Install mode fork and mainshaft assembly in case (Fig. 79). Rotate mainshaft slightly to engage shaft with low range gears.

(17) Rotate mode fork pin into shift sector slot.

(18) Install shift rail (Fig. 80). **Be sure rail is seated in both shift forks.**

(19) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(20) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 81). **Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.**

(21) Insert lockpin through access hole and into shift fork (Fig. 81). Then remove easy-out and seat the pin with pin punch.

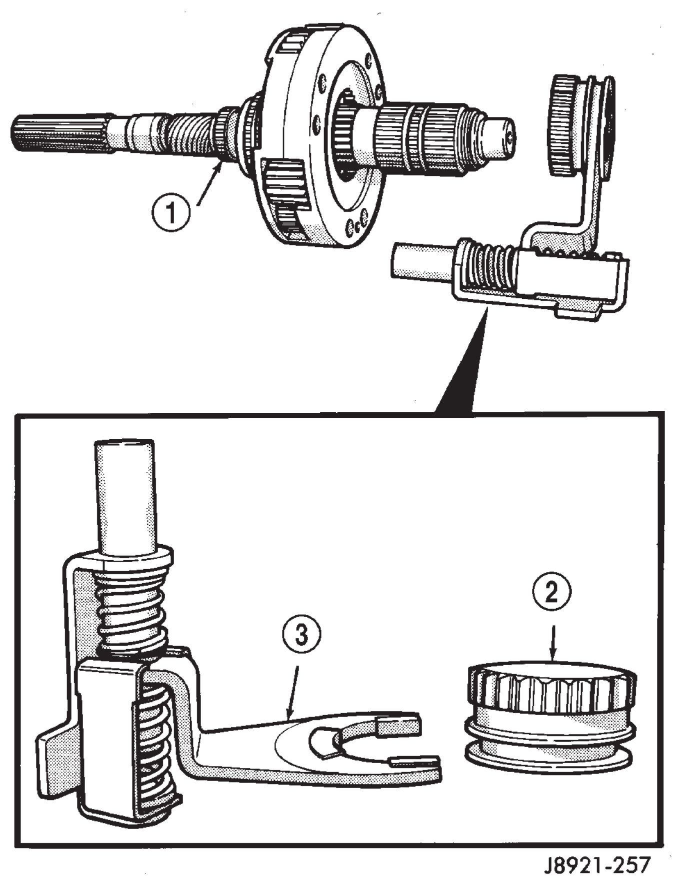


Fig. 78 Installing Mode Fork And Sleeve

1 – MAINSHAFT
2 – SLEEVE
3 – MODE FORK ASSEMBLY

(22) Install plug in lockpin access hole.

(23) Install detent plunger, detent spring and detent plug in case (Fig. 82).

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Install front output shaft (Fig. 83).

(2) Install drive chain (Fig. 83). Engage chain with front output shaft sprocket teeth.

(3) Install drive sprocket (Fig. 83). Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

DISASSEMBLY AND ASSEMBLY (Continued)

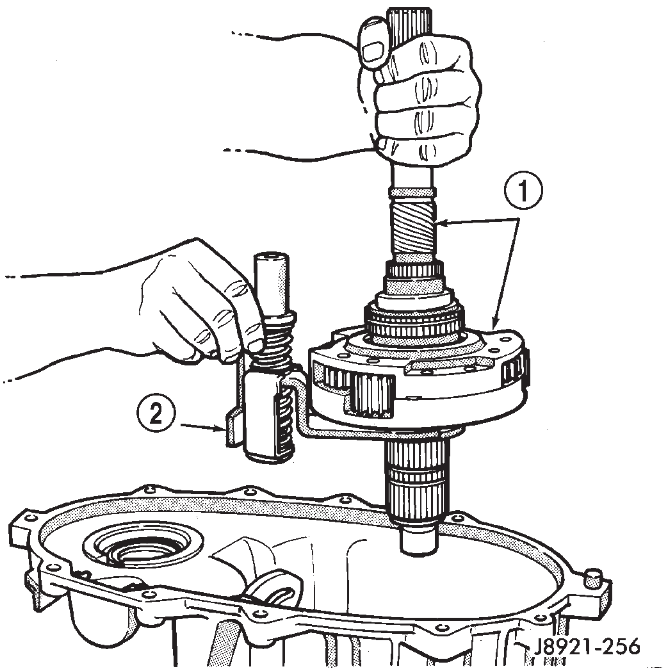


Fig. 79 Assembled Mainshaft And Mode Fork Installation

1 – MAINSHAFT ASSEMBLY
2 – MODE FORK

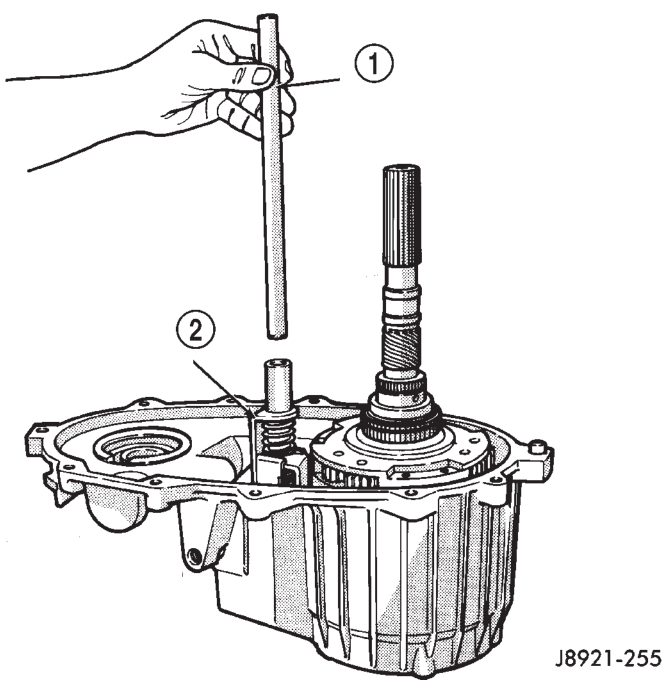


Fig. 80 Shift Rail Installation

1 – SHIFT RAIL
2 – MODE FORK

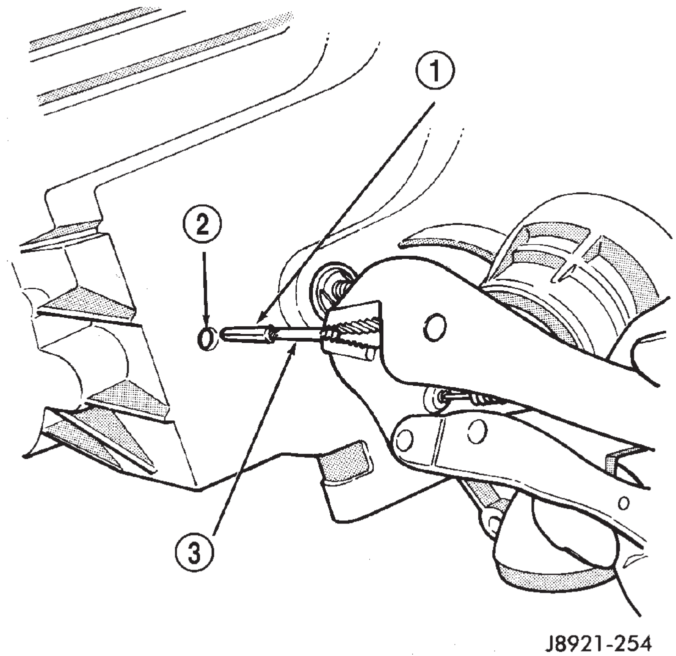


Fig. 81 Installing Low Range Fork Lockpin

1 – LOW RANGE FORK LOCK PIN
2 – ACCESS HOLE
3 – EASY-OUT

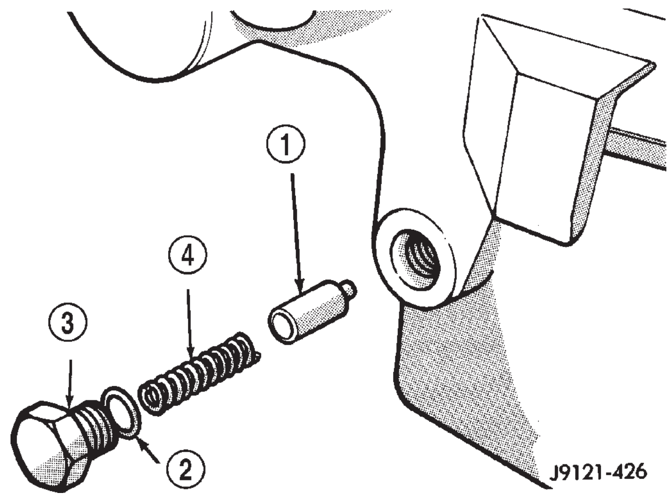


Fig. 82 Detent Pin, Spring And Plug Installation

1 – PLUNGER
2 – O-RING
3 – PLUG
4 – SPRING

DISASSEMBLY AND ASSEMBLY (Continued)

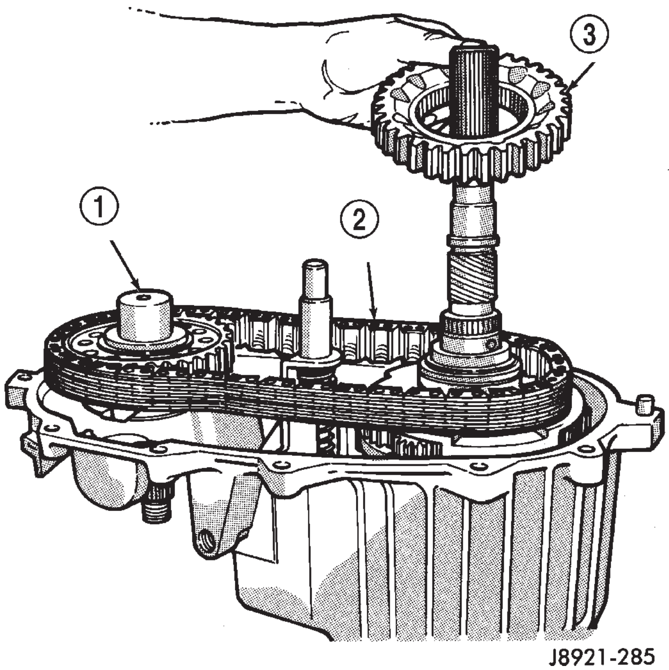


Fig. 83 Drive Chain And Sprocket Installation

1 – FRONT OUTPUT SHAFT
2 – DRIVE CHAIN
3 – DRIVE SPROCKET

(4) Install drive sprocket snap-ring (Fig. 84).

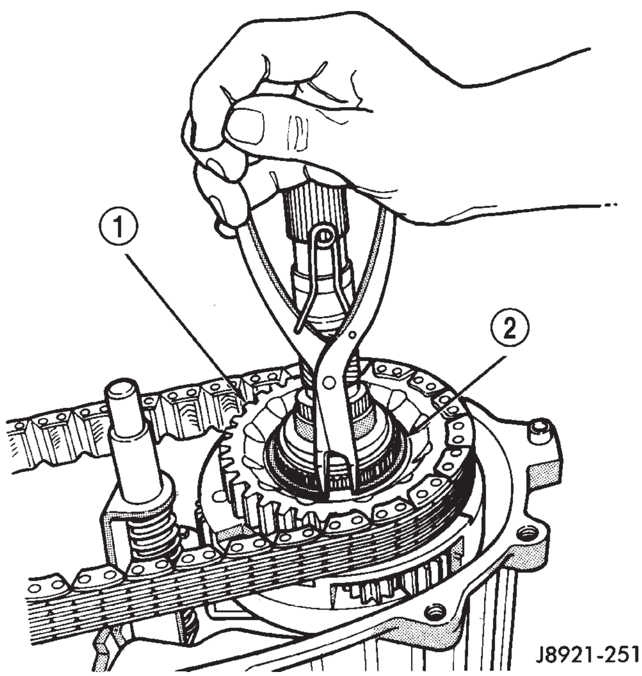


Fig. 84 Drive Sprocket Snap-Ring Installation

1 – DRIVE SPROCKET
2 – DRIVE SPROCKET SNAP RING

OIL PUMP AND REAR CASE INSTALLATION

(1) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 85). Be sure screen is seated in case slot as shown.

(2) Install magnet in front case pocket (Fig. 86).

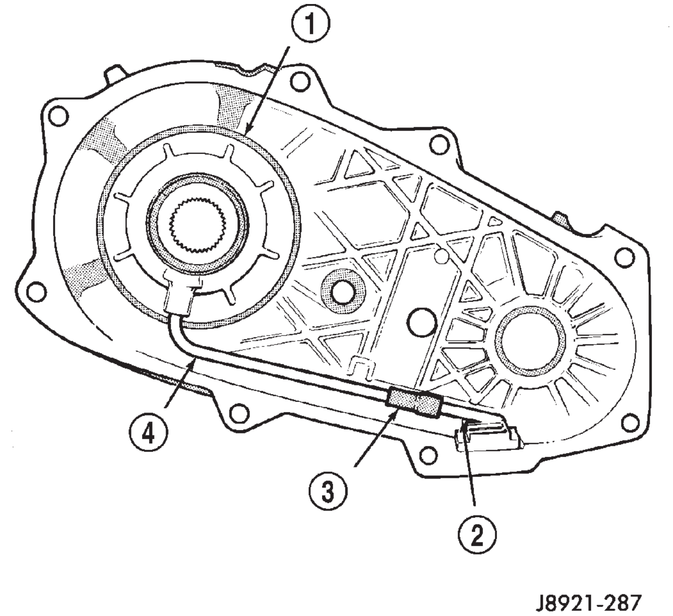


Fig. 85 Oil Screen And Pickup Tube Installation

1 – OIL PUMP
2 – OIL SCREEN
3 – CONNECTOR
4 – PICKUP TUBE

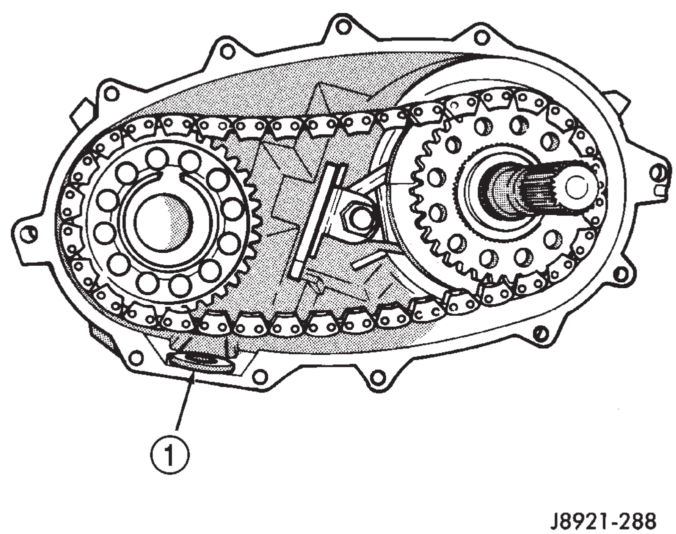


Fig. 86 Installing Case Magnet

1 – MAGNET

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker or silicone adhesive sealer to seal surface of front case.

(4) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(5) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

REAR RETAINER INSTALLATION

(1) Remove rear bearing in retainer using Installer 8128 and Handle C-4171.

(2) Install rear bearing in retainer with Tools C-4171 and 5064 (Fig. 87).

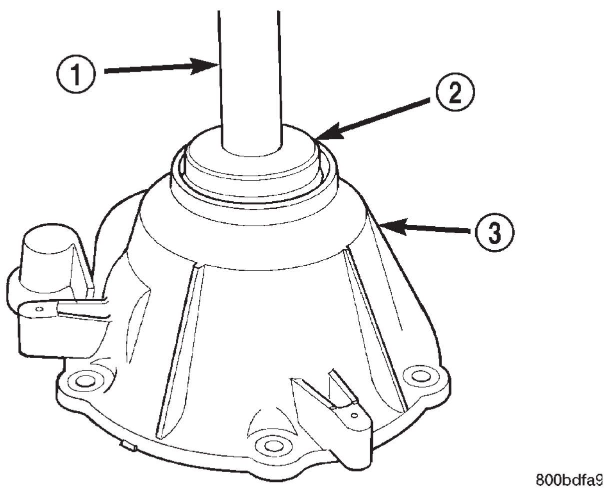


Fig. 87 Installing Rear Bearing In Retainer

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5064
3 – REAR RETAINER

(3) Install rear bearing O. D. retaining ring with snap-ring pliers (Fig. 88). Be sure retaining ring is fully seated in retainer groove.

(4) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

(5) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N·m (15–20 ft. lbs.) torque.

(6) Install rear bearing I. D. retaining ring and spacer on output shaft.

(7) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(8) Slide seal onto Seal Protector 6992 (Fig. 89). Slide seal protector and seal onto output shaft.

(9) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal.

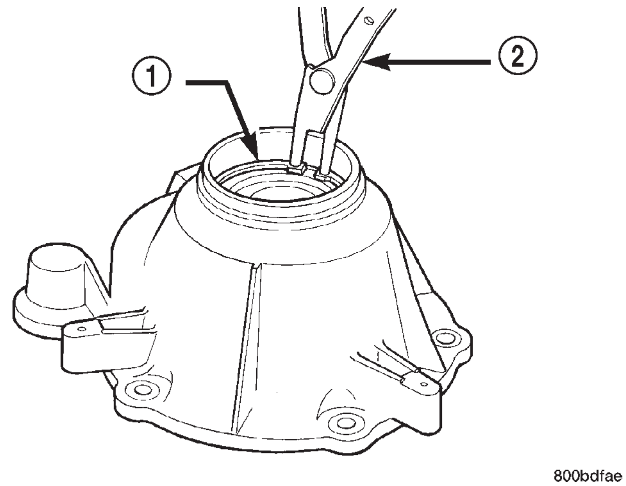


Fig. 88 Rear Bearing Retaining Ring Installation

1 – REAR BEARING O. D. RETAINING RING
2 – SNAP RING PLIERS

Drive seal into rear bearing retainer with Installer C-4076-B and Handle MD-998323 (Fig. 90).

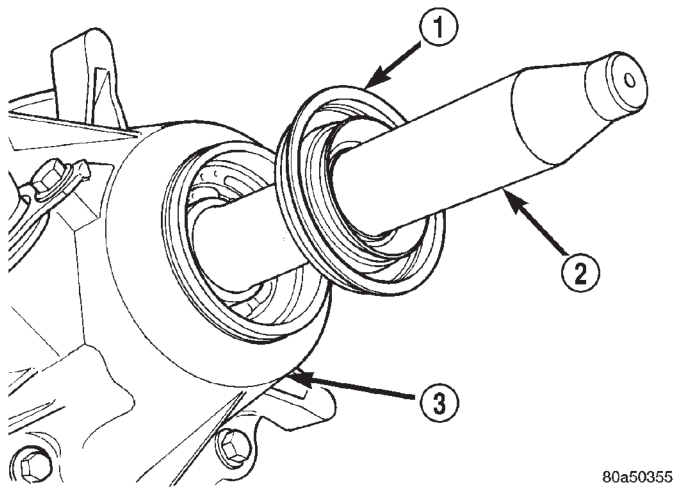


Fig. 89 Output Shaft Seal and Protector

1 – OUTPUT SHAFT SEAL
2 – SPECIAL TOOL 6992
3 – TRANSFER CASE

(10) Install rear slinger with Installer 8408.

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 91).

FRONT YOKE AND SWITCH INSTALLATION

(1) Install indicator switch in front case. Tighten switch to 20–34 N·m (15–25 ft. lbs.) torque.

(2) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(3) Install new seal washer on front shaft.

(4) Install yoke on front shaft. Secure yoke with new nut.

DISASSEMBLY AND ASSEMBLY (Continued)

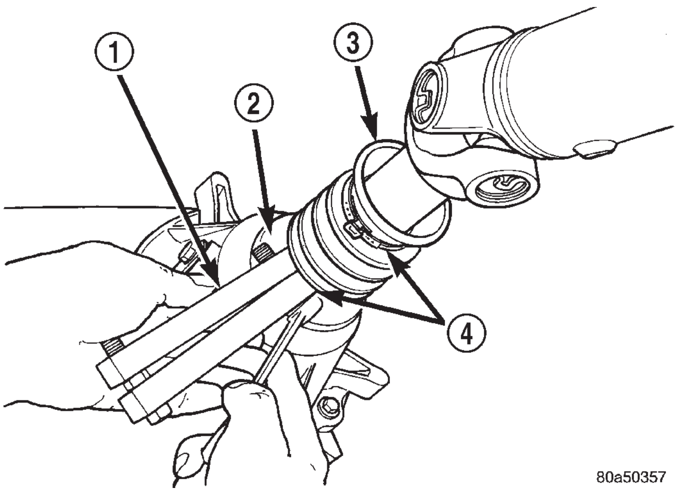


Fig. 91 Slinger Boot Installation

1 – SPECIAL TOOL C-4975–A
2 – SLINGER
3 – BOOT
4 – CLAMP

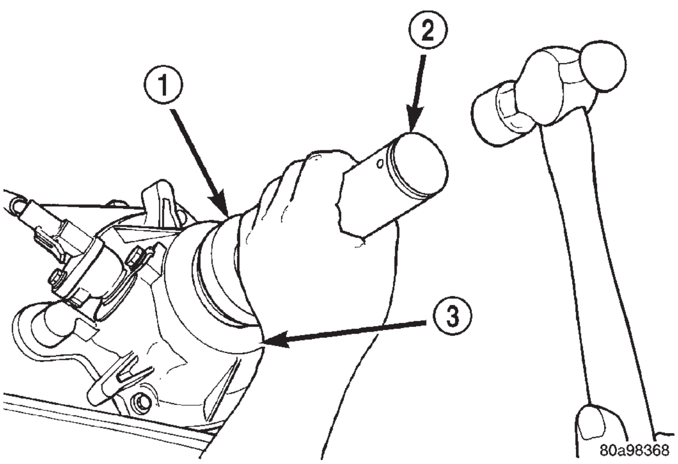


Fig. 90 Rear Seal Installation

1 – SPECIAL TOOL C-4076–B
2 – SPECIAL TOOL MD998323
3 – TRANSFER CASE

CLEANING AND INSPECTION

NV242 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 92). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 93). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

Inspect the shift fork wear pads. The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are also serviceable.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 94). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not recommended. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 95). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

CLEANING AND INSPECTION (Continued)

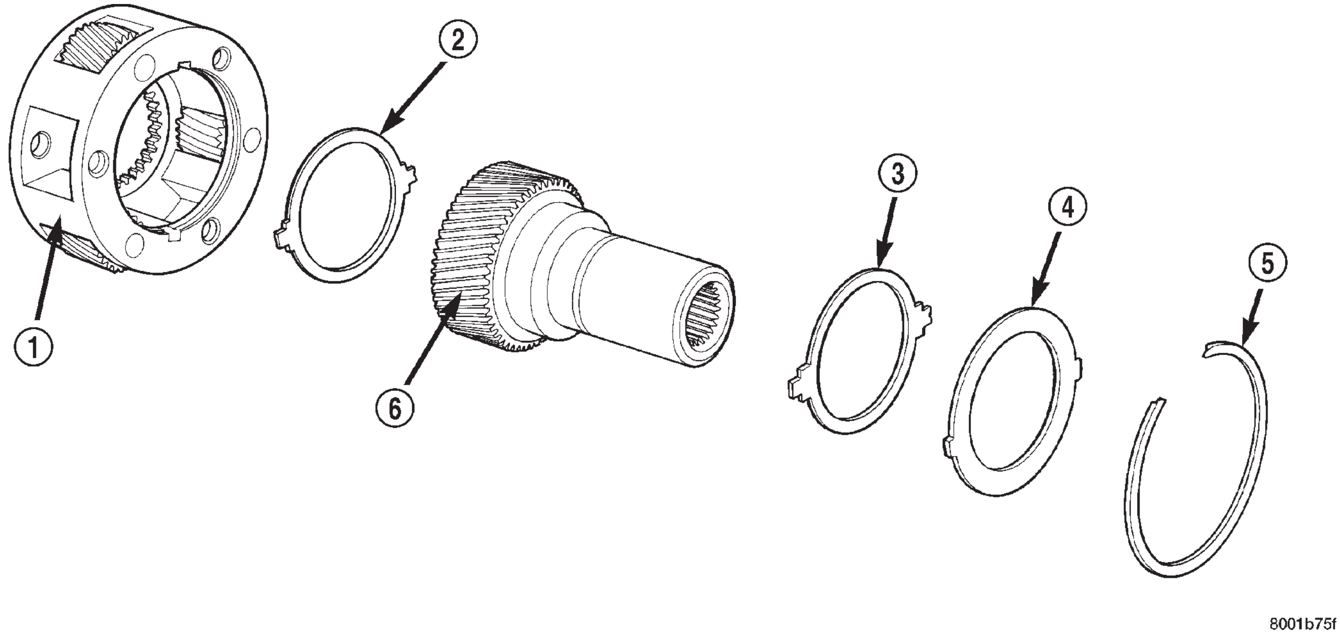


Fig. 92 Input Gear And Carrier Components

1 – PLANETARY CARRIER
2 – REAR THRUST WASHER
3 – FRONT THRUST WASHER
4 – CARRIER LOCK RING
5 – CARRIER LOCK RETAINING RING
6 – INPUT GEAR

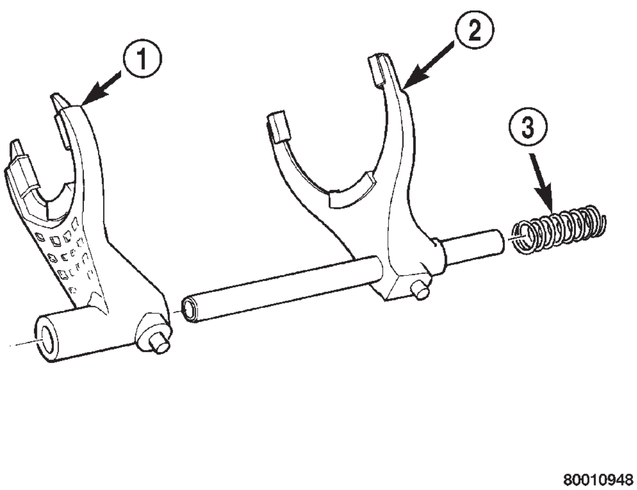


Fig. 93 Shift forks

1 – RANGE FORK
2 – MODE FORK AND RAIL
3 – MODE SPRING

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 96).

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

CLEANING AND INSPECTION (Continued)

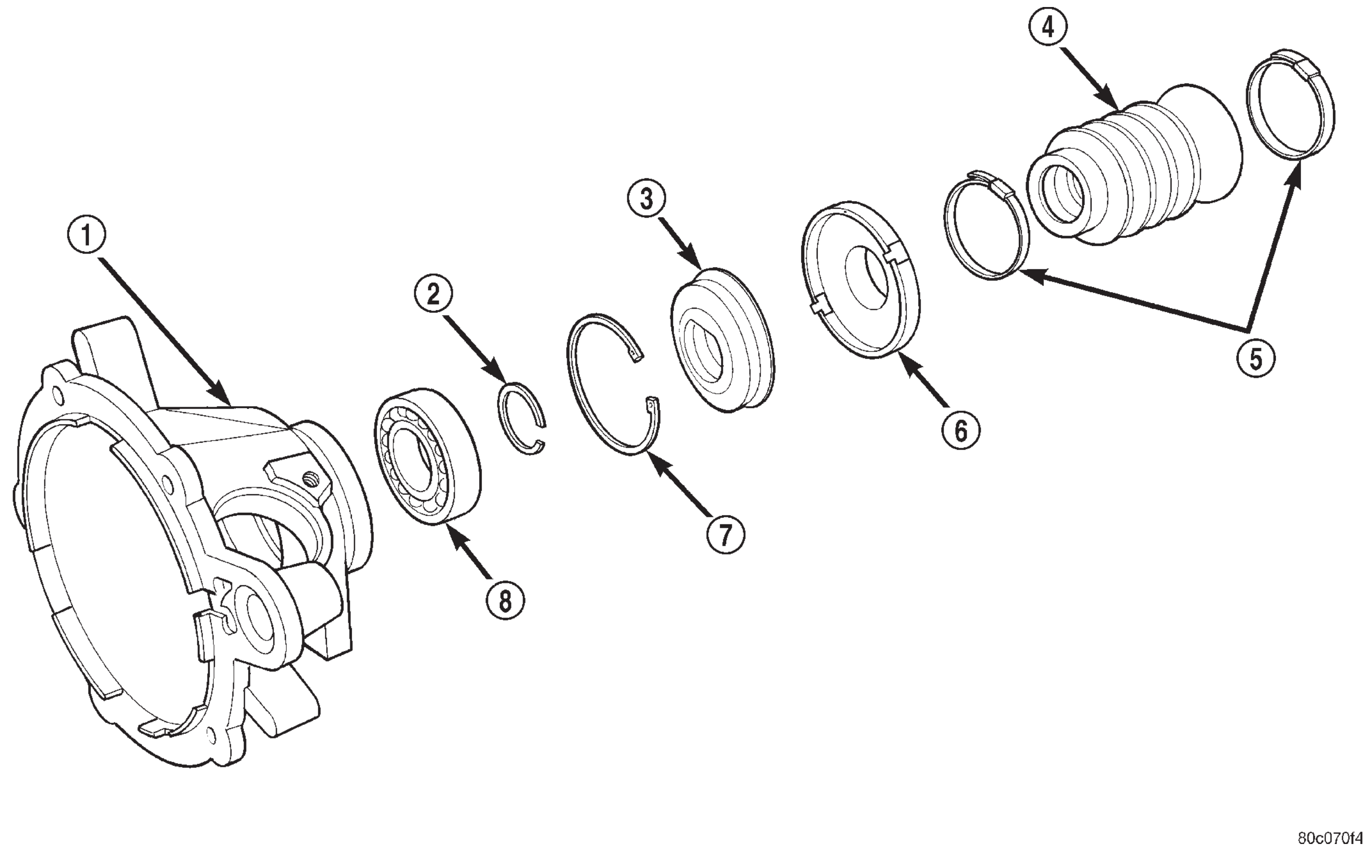


Fig. 94 Rear Retainer Components

1 – REAR RETAINER
2 – REAR BEARING I. D. RETAINING RING
3 – REAR SEAL
4 – BOOT
5 – BAND CLAMPS
6 – REAR SLINGER
7 – REAR BEARING O. D. RETAINING RING
8 – REAR BEARING

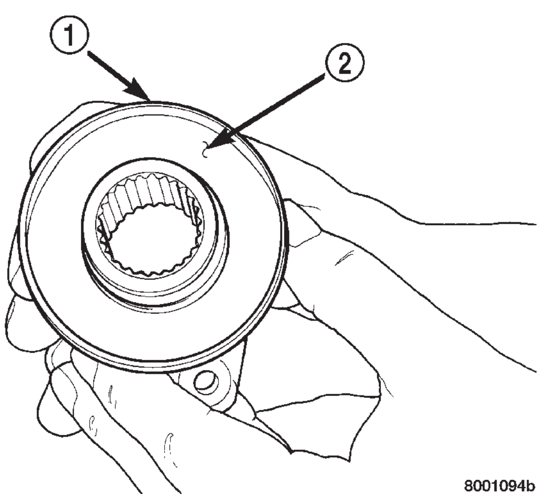


Fig. 95 Seal Contact Surface Of Yoke Slinger

1 – FRONT SLINGER (PART OF YOKE)
2 – SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

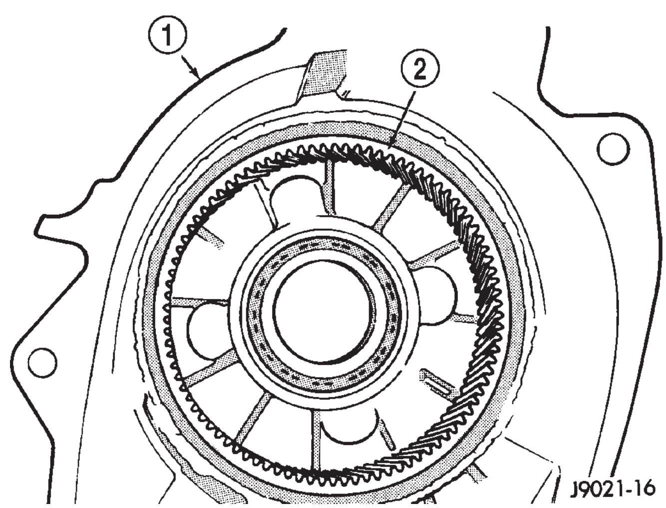


Fig. 96 Low Range Annulus Gear

1 – FRONT CASE
2 – LOW RANGE ANNULUS GEAR

CLEANING AND INSPECTION (Continued)

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT

(1) Shift transfer case into 4L position.
(2) Raise vehicle.
(3) Loosen lock bolt on adjusting trunnion (Fig. 97).
(4) Be sure linkage rod slides freely in trunnion. Clean rod and apply spray lube if necessary.
(5) Verify that transfer case range lever is fully engaged in 4L position.
(6) Tighten adjusting trunnion lock bolt.
(7) Lower vehicle.

SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Bolt, Diff. Case	17–27 N·m (15–24 ft. lbs.)
Plug, Drain/Fill	20–25 N·m (15–25 ft. lbs.)
Bolt, Front Brg. Retainer	16–27 N·m (12–20 ft. lbs.)
Bolt, Case Half	35–46 N·m (26–34 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Screw, Oil Pump	1.2–1.8 N·m (12–15 in. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35 N·m (26 ft. lbs.)
Bolts, U-Joint	19 N·m (17 ft. lbs.)

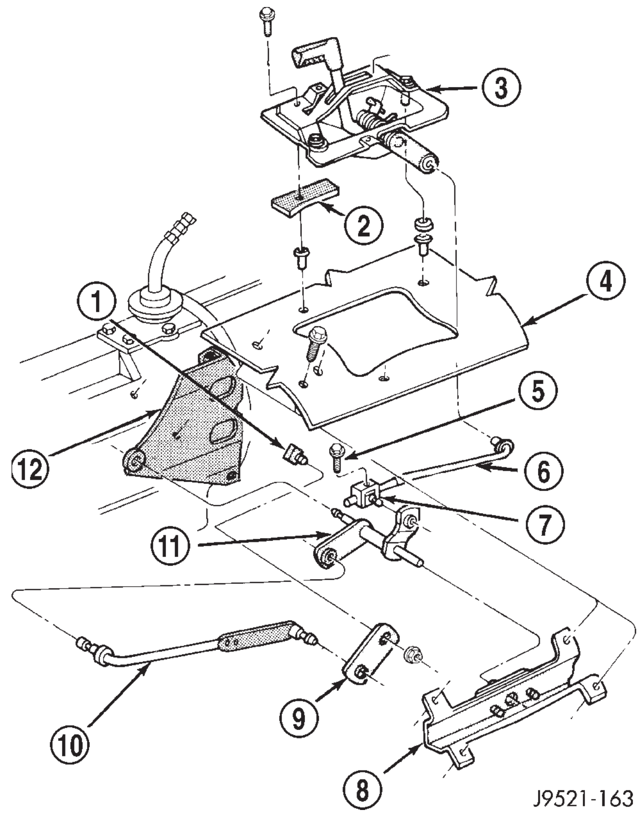
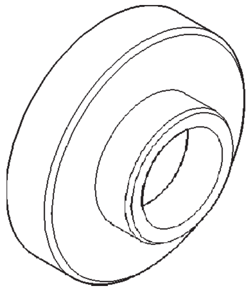


Fig. 97 Shift Linkage

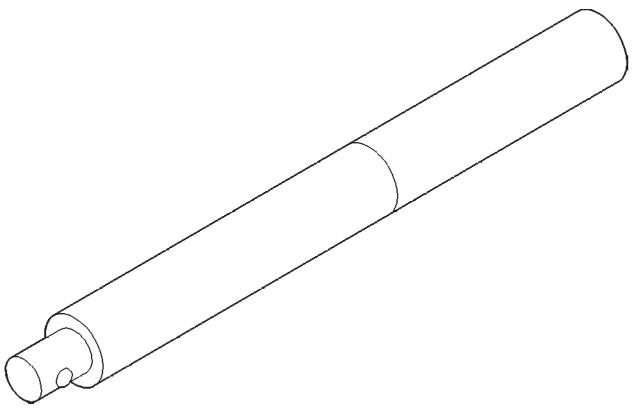
1 – TRANSFER CASE SHIFT LEVER SHAFT
2 – SEAL
3 – TRANSFER CASE SHIFT LEVER ASSEMBLY
4 – FLOORPAN
5 – TRUNNION LOCK BOLT
6 – SHIFT ROD
7 – ADJUSTING TRUNNION
8 – TORQUE SHAFT BRACKET
9 – RANGE LEVER
10 – TORQUE SHAFT ROD
11 – TORQUE SHAFT
12 – LINKAGE BRACKET

SPECIAL TOOLS

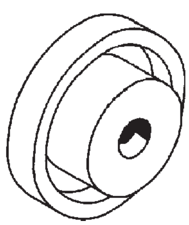
NV242



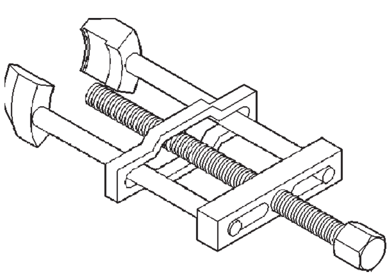
Installer—C-4076-B



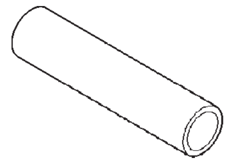
Handle, Universal—C-4171



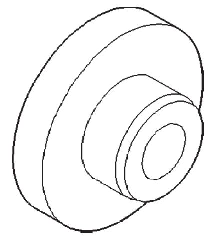
Remover—C-4210



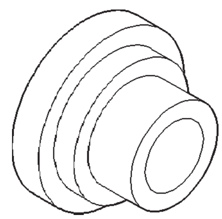
Puller, Slinger—MD-998056–A



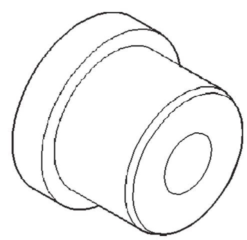
Installer—MD-998323



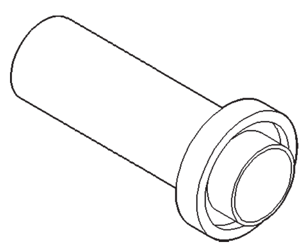
Installer, Bearing—5064



Installer—8128

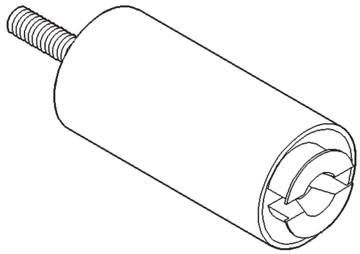


Installer—5066

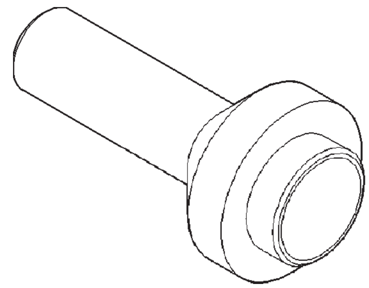


Installer—6952-A

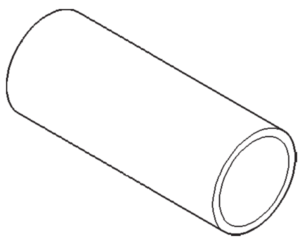
SPECIAL TOOLS (Continued)



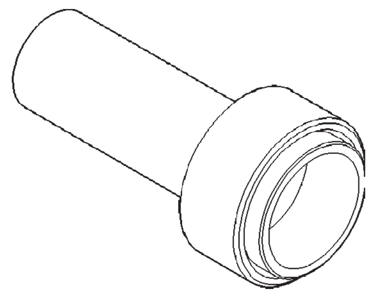
Remover—L-4454



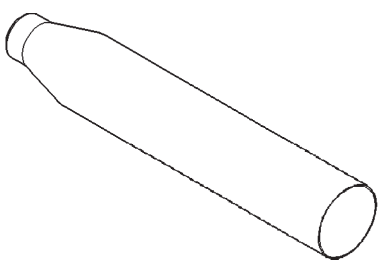
Installer, Seal—7884



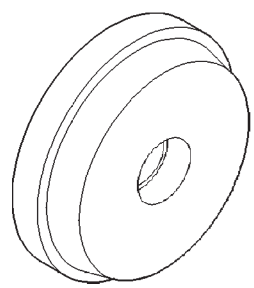
Cup—8148



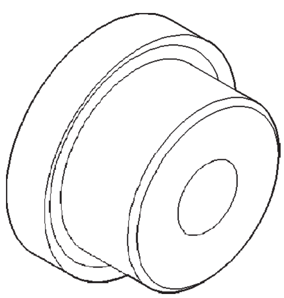
Installer, Pump Housing Seal—7888



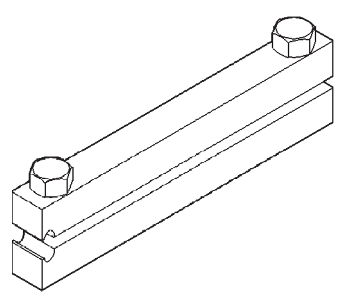
Seal Protector—6992



Installer, Bearing—8033-A



Installer, Input Gear Bearing—7829-A



Installer, Boot Clamp—C-4975-A

TIRES AND WHEELS

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TIRES

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DESCRIPTION AND OPERATION

TIRES

DESCRIPTION

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 brake applications
- High speed driving
- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation. This will help to achieve a greater tread life.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 1).

Performance tires have a speed rating letter after the aspect ratio number.

LETTER	SPEED RATING
S	180 km/h (112 mph)
T	190 km/h (118 mph)
U	200 km/h (124 mph)
H	210 km/h (130 mph)
V	240 km/h (149 mph)
W	270 km/h (168 mph)
Y	300 km/h (186 mph)

The speed rating is not always printed on the tire sidewall.

DESCRIPTION AND OPERATION (Continued)

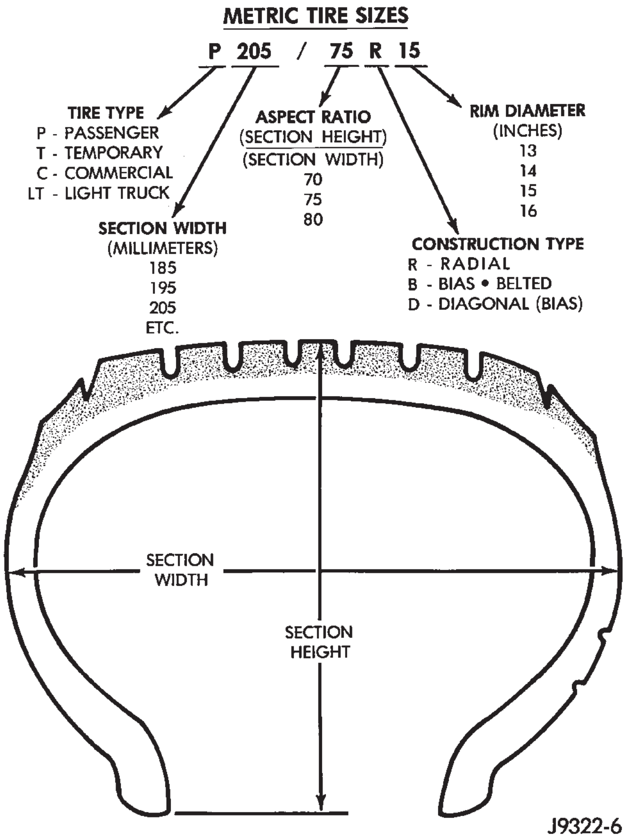

Fig. 1 Tire Identification

TIRE CHAINS

Tire snow chains may be used on **certain** models. Refer to the Owner's Manual for more information.

RADIAL-PLY TIRES

DESCRIPTION

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 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

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.

SPARE TIRE–TEMPORARY

DESCRIPTION

The 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 50 M. P. H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

TIRE INFLATION PRESSURES

Under inflation will cause rapid shoulder wear, tire flexing, and possible tire failure (Fig. 2).

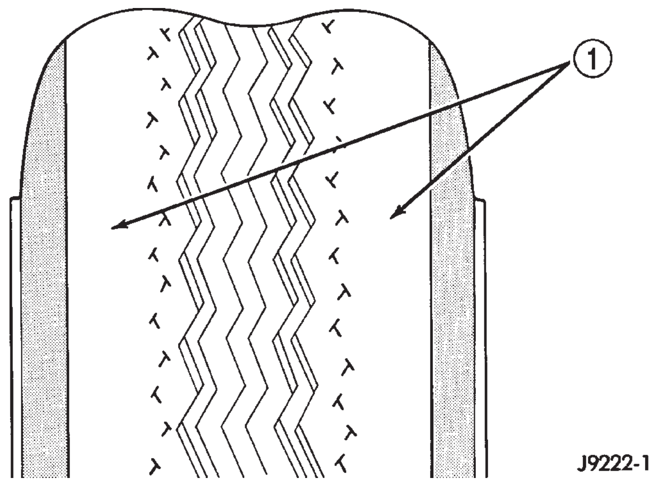

Fig. 2 Under Inflation Wear

1 – THIN TIRE THREAD AREAS

Over inflation will cause rapid center wear and loss of the tire's ability to cushion shocks (Fig. 3).

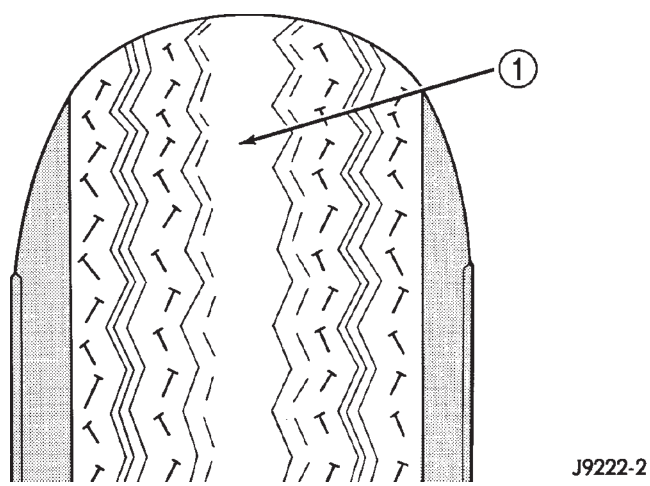

Fig. 3 Over Inflation Wear

1 – THIN TIRE THREAD AREA

Improper inflation can cause:
- Uneven wear patterns

DESCRIPTION AND OPERATION (Continued)

- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- Vehicle drift

For proper tire pressure specification refer to the Tire Inflation Pressure Chart provided with the vehicle.

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once a month. The spare tire pressure should be check at least twice annually. Tire pressure decreases as the ambient temperature drops. Check tire pressure frequently when ambient temperature varies widely.

Inflation pressures specified on the placards are cold inflation pressure. The vehicle must sit for at least 3 hours to obtain the correct cold inflation pressure reading. Or driven less than one mile after sitting for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation, due to increased tire temperature.

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND TREAD WEAR. THIS MAY CAUSE THE TIRE TO FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

TIRE PRESSURE FOR HIGH SPEED

DESCRIPTION

Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. For speeds up to and including 120 km/h (75 mph), tires must be inflated to the pressures shown on the tire placard. For continuous speeds in excess of 120 km/h (75 mph), tires must be inflated to the maximum pressure specified on the tire sidewall.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

For emergency vehicles that are driven at speeds over 90 mph (144 km/h), special high speed tires must be used. Consult tire manufacturer for correct inflation pressure recommendations.

REPLACEMENT TIRES

DESCRIPTION

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is 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 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.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

DIAGNOSIS AND TESTING

PRESSURE GAUGES

A quality air pressure gauge is recommended to check tire pressure. After checking the air pressure, replace valve cap finger tight.

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. 4).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.

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. 5).

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread (Fig. 5).

TIRE NOISE OR VIBRATION

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying

DIAGNOSIS AND TESTING (Continued)

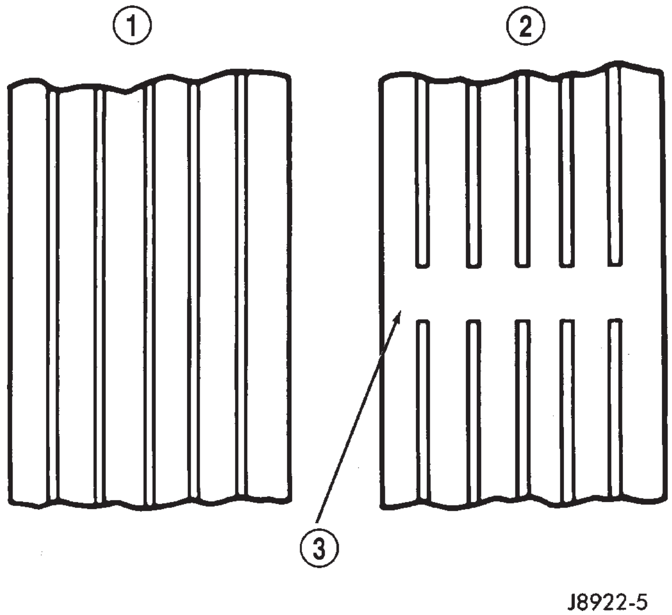

Fig. 4 Tread Wear Indicators

1 – THREAD ACCEPTABLE
2 – THREAD UNACCEPTABLE
3 – WEAR INDICATOR

speeds. Note the noise level during acceleration, deceleration and slight left and right steering inputs.

SERVICE PROCEDURES

ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is (Fig. 6). Other rotation methods can be used, but they will not provide all the tire longevity benefits.

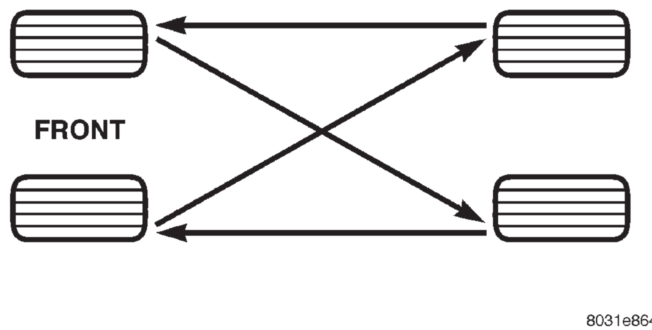

Fig. 6 Tire Rotation Pattern

MATCH MOUNTING

Tires and wheels are currently match mounted at the factory. Match mounting is a technique used to reduce runout in the wheel/tire assembly. This means that the high spot of the tire is aligned with the low spot on the wheel rim. 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 on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot on the inside of the rim.

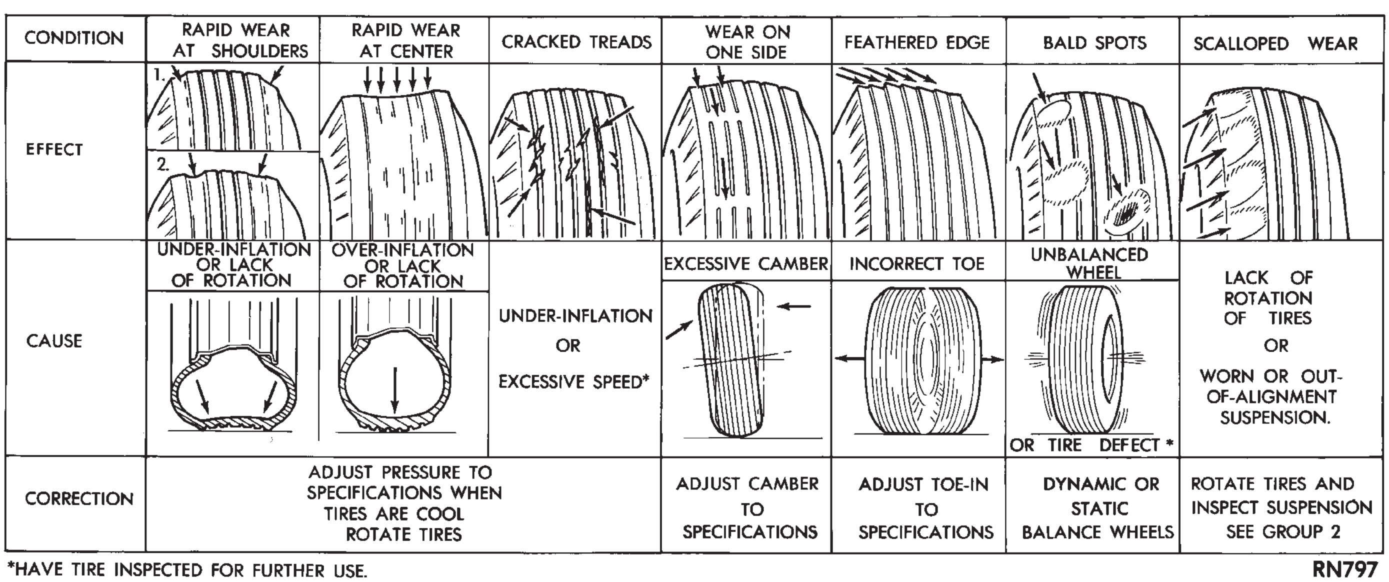

Fig. 5 Tire Wear Patterns

SERVICE PROCEDURES (Continued)

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) Use a dial indicator to locate the high spot of the tire on the center tread rib (Fig. 7). Record the indicator reading and mark the high spot on the tire. Place a mark on the tire at the valve stem location (Fig. 8).

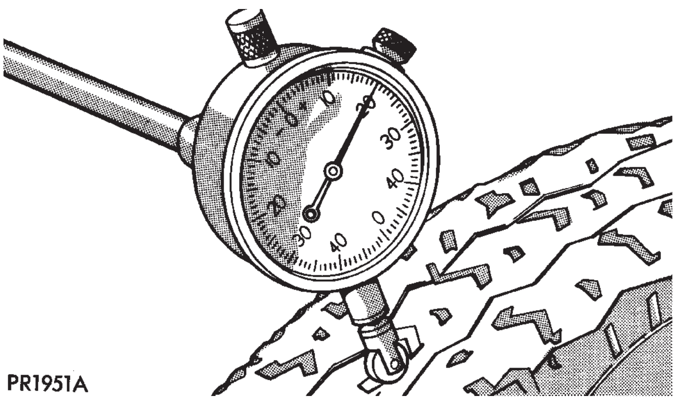

Fig. 7 Dial Indicator

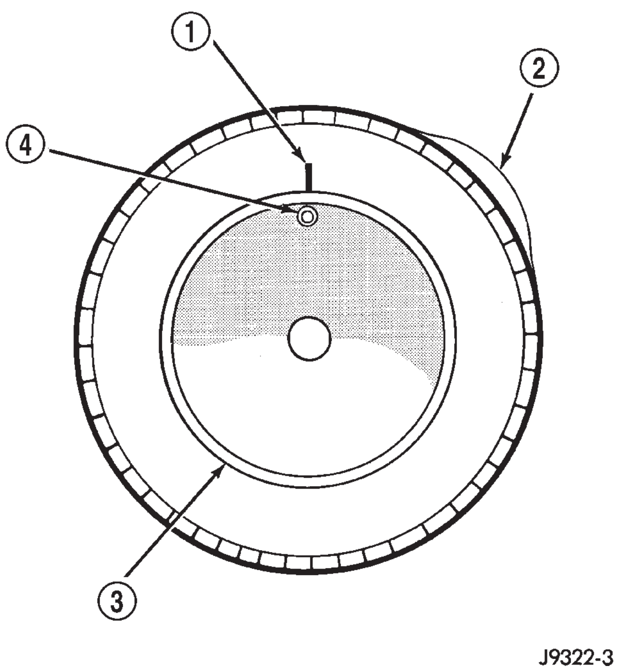

Fig. 8 First Measurement On Tire

1 – REFERENCE MARK
2 – 1ST MEASUREMENT
HIGH SPOT MARK TIRE AND RIM
3 – WHEEL
4 – VALVE STEM

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 9).

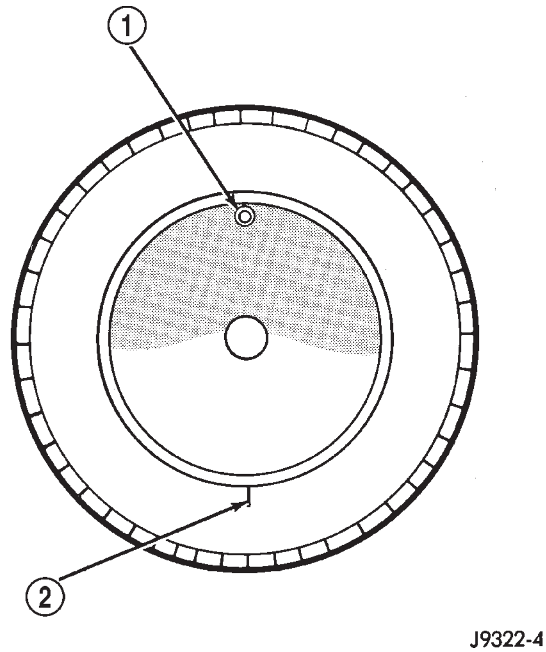

Fig. 9 Remount Tire 180 Degrees

1 – VALVE STEM
2 – REFERENCE MARK

(3) Measure the total runout again and mark the tire to indicate the high spot.

(4) If runout is still excessive use the following procedures.

(a) If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.

(b) If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications. Refer to Wheel and Tire Runout.

(c) If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 10). This procedure will normally reduce the runout to an acceptable amount.

REPAIRING LEAKS

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 11). The tire should be replaced if the puncture is located in the sidewall.

SERVICE PROCEDURES (Continued)

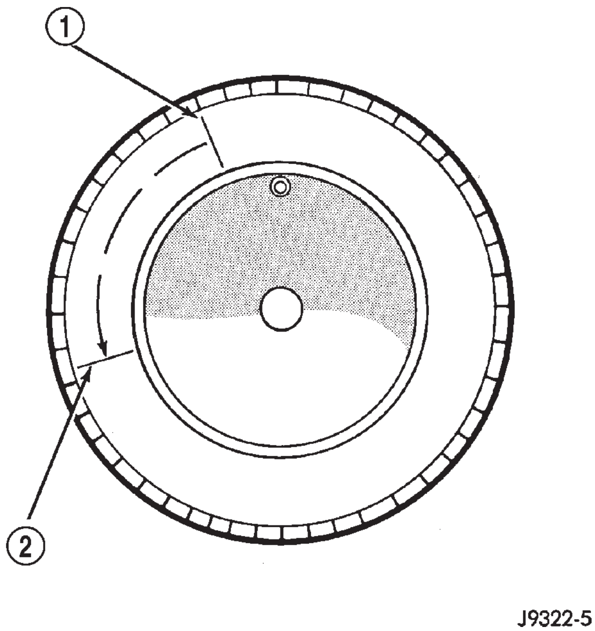

Fig. 10 Remount Tire 90 Degrees In Direction of Arrow

1 – 2ND HIGH SPOT ON TIRE
2 – 1ST HIGH SPOT ON TIRE

Deflate tire completely before removing the tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification.

CLEANING AND INSPECTION

CLEANING TIRES

Remove the protective coating on the tires before delivery of a vehicle. This coating may cause deterioration of the tires.

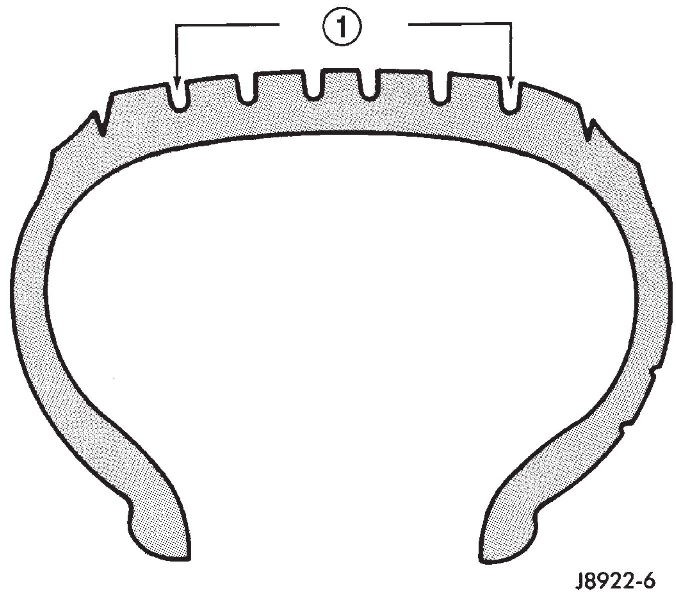

Fig. 11 Tire Repair Area

1 – REPAIRABLE AREA

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.

NOTE: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

SPECIFICATIONS

TIRE SIZE

TIRE SIZE	SUPPLIER
P215/75R15	Goodyear
P225/75R15	Goodyear
P225/70R15	Goodyear
P225/70R16	Goodyear

WHEELS

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DESCRIPTION AND OPERATION

WHEEL

DESCRIPTION

The rim size is on the vehicle safety certification label located on the drivers door shut face. The size of the rim is determined by the drivetrain package. Original equipment wheels/rims are designed for operation up to the specified maximum vehicle capacity.

All models use stamped steel, cast aluminum or forged aluminum wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 1).

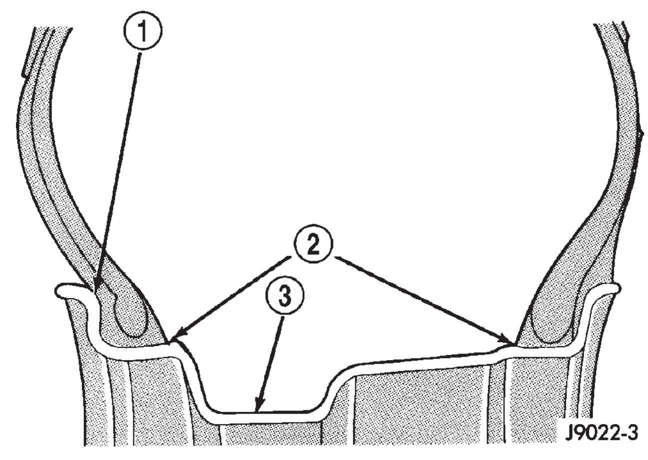

Fig. 1 Safety Rim

1 – FLANGE
2 – RIDGE
3 – WELL

Initial inflation of the tire forces the bead over these raised sections. In case of rapid loss of air pressure, the raised sections help hold the tire on the wheel.

The wheel studs and nuts are designed for specific applications. All aluminum and some steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels. Do not use replacement studs or nuts with a different design or lesser quality.

DIAGNOSIS AND TESTING

WHEEL INSPECTION

Inspect wheels for:
- Excessive run out
- Dents or cracks
- Damaged wheel lug nut holes
- Air Leaks from any area or surface of the rim

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 should 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. USED WHEELS ARE NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 2).

Lateral runout is the **wobble** of the tire or wheel.

DIAGNOSIS AND TESTING (Continued)

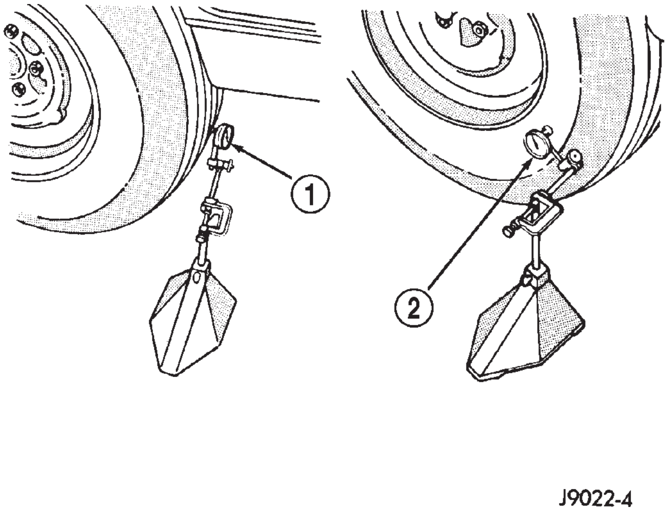

Fig. 2 Checking Tire/Wheel/Hub Runout

1 – RADIAL RUNOUT
2 – LATERAL RUNOUT

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting 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).

METHOD 1 (RELOCATE WHEEL ON HUB)

(1) Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

(2) Check wheel bearings and adjust if adjustable or replace if necessary.

(3) Check the wheel mounting surface.

(4) Relocate wheel on the mounting, two studs over from the original position.

(5) Tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

(6) Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

METHOD 2 (RELOCATE TIRE ON WHEEL)

NOTE: Rotating the tire on wheel is particularly effective when there is runout in both tire and wheel.

(1) Remove tire from wheel and mount wheel on service dynamic balance machine.

(2) Check wheel radial runout (Fig. 3) and lateral runout (Fig. 4).

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in. (maximum)
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in. (maximum)

(3) If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout, Refer to match mounting procedure.

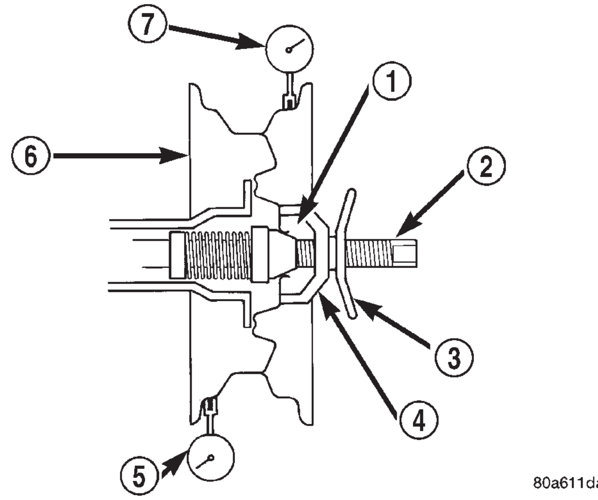

Fig. 3 Radial Runout

1 – MOUNTING CONE
2 – SPINDLE SHAFT
3 – WING NUT
4 – PLASTIC CUP
5 – DIAL INDICATOR
6 – WHEEL
7 – DIAL INDICATOR

SERVICE PROCEDURES

WHEEL INSTALLATION

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

NOTE: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in

SERVICE PROCEDURES (Continued)

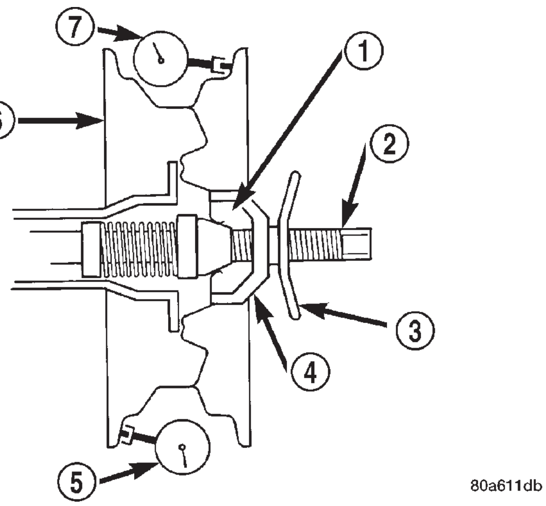

Fig. 4 Lateral Runout

1 – MOUNTING CONE
2 – SPINDLE SHAFT
3 – WING NUT
4 – PLASTIC CUP
5 – DIAL INDICATOR
6 – WHEEL
7 – DIAL INDICATOR

sequence to the proper torque specification (Fig. 5). **Never use oil or grease on studs or nuts.**

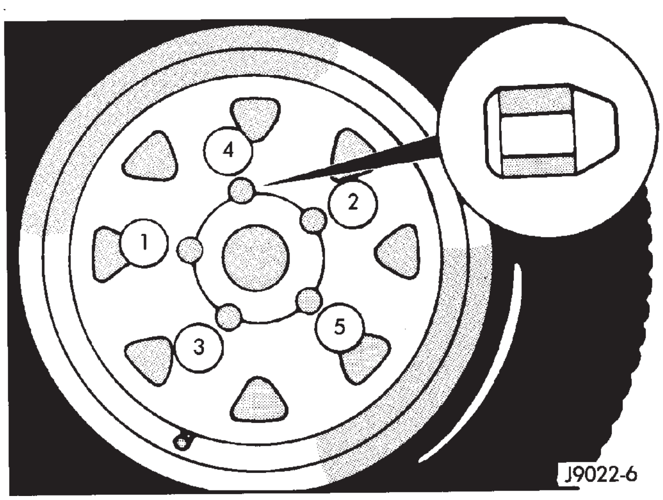

Fig. 5 Lug Nut Tightening Pattern

WHEEL REPLACEMENT

Wheels must be replaced if they have:
- Excessive runout
- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:
- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

TIRE AND WHEEL BALANCE

It is recommended that a two plane service dynamic balancer be used when a tire and wheel assembly require balancing. Refer to balancer operation instructions for proper cone mounting procedures. Typically use front cone mounting method for steel wheels. For aluminum wheel use back cone mounting method without cone spring.

NOTE: Static should be used only when a two plane balancer is not available.

NOTE: Cast aluminum and forged aluminum wheels require coated balance weights and special alignment equipment.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire. Off-vehicle balancing is recommended.

For static balancing, find location of heavy spot causing the imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight required to counter balance 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).

For dynamic balancing, the balancing equipment is designed to locate the amount of weight to be applied to both the inner and outer rim flange (Fig. 7).

SERVICE PROCEDURES (Continued)

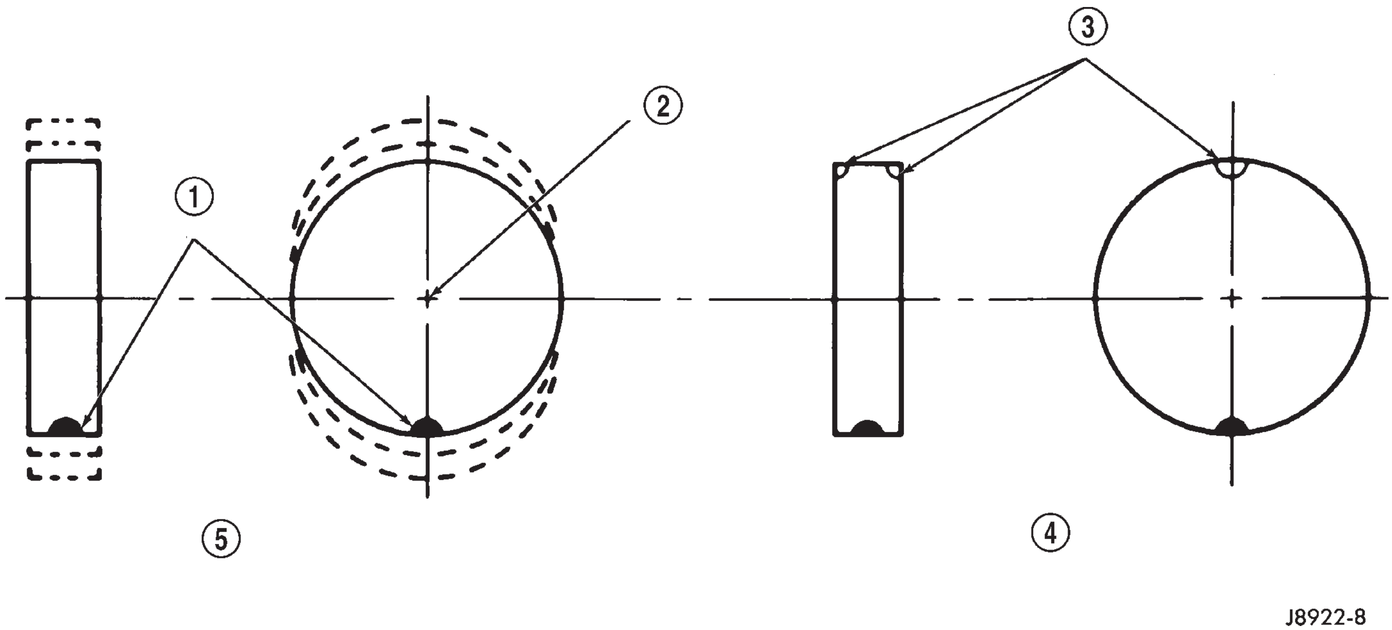

Fig. 6 Static Unbalance & Balance

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

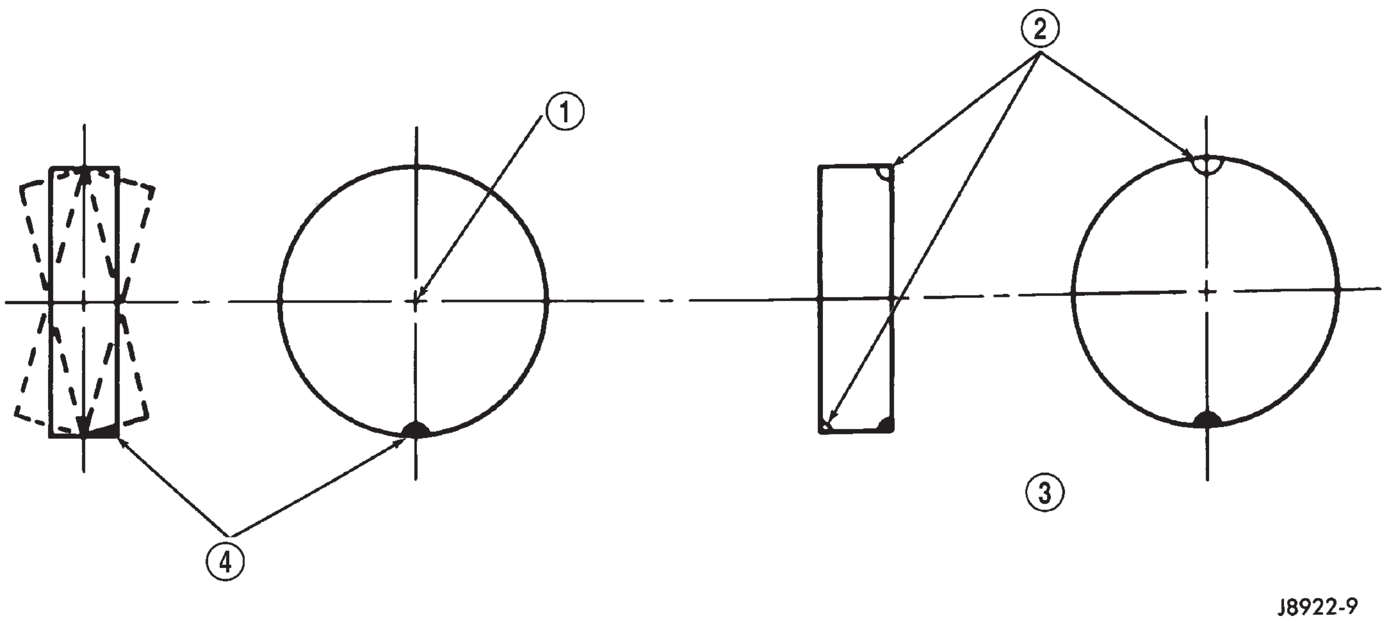

Fig. 7 Dynamic Unbalance & Balance

1 – CENTER LINE OF SPINDLE
2 – ADD BALANCE WEIGHTS HERE
3 – CORRECTIVE WEIGHT LOCATION
4 – HEAVY SPOT WHEEL SHIMMY AND VIBRATION

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Lug Nut	
1/2 X 20 with 60° Cone	115-150 N·m (85-115 ft. lbs.)

BODY

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DESCRIPTION AND OPERATION

BODY COMPONENTS

PAINT

DESCRIPTION

The original equipment finish is a multi-step process that involves cleaning, electrodeposition (e-coat), base coat, and clear coat steps. Additionally, selected areas of the vehicle may be coated with an anti-chip finish.

OPERATION

On most vehicles a two-stage paint application (base coat/clear coat) is used. Color that is applied to primer is called base coat. The clear coat protects the base coat from ultraviolet light and provides a durable high-gloss finish.

STATIONARY GLASS

DESCRIPTION

Windshields and selected stationary glass are structural members of the vehicle. The windshield glass is bonded to the windshield frame with urethane adhesive.

OPERATION

Windshields are made of two pieces of glass with a plastic inner layer. Windshields and other stationary glass protect the occupants from the effects of the elements. Windshields are also used to retain some airbags in position during deployment. Urethane bonded glass is difficult to salvage during removal. The urethane bonding is difficult to cut or clean from any surface. Before removing the glass, check the availability of replacement components.

SEATS

DESCRIPTION

Seat modules are made up of a seat frame, seat cushion, seat back cushion, a covering material, and the electrical components used for power operation, if equipped. Some seat systems also contain seat belt components and supplemental restraint systems.

OPERATION

Seat assemblies transport the occupants in comfort and safety. Seat assemblies also help position occupants correctly in the event of airbag deployment. Seat cushions, coverings, and electrical components are serviceable. Refer to the appropriate group in this manual.

EXTERIOR COMPONENTS

DESCRIPTION

Exterior sheet metal components make up the exterior of the vehicle. Some exterior metal systems are welded assemblies, such as doors and hoods. Some exterior trim items are made of composite.

DESCRIPTION AND OPERATION (Continued)

OPERATION

The exterior is finished in various metal stampings and composite moldings. These assemblies give the vehicle a finished appearance and protect the occupants from the elements. Some components are part of the energy absorbing system used to protect the occupants in collisions. The exterior sheet metal is repairable and adjustable for fit and finish. Welded component systems are adjustable as a system. Trim components made of composite are stamped with the type of material used. DaimlerChrysler uses various fasteners to retain trim items. At times, it is not possible to remove trim items without damaging the fastener. If it is not possible to remove an item without damaging a component, cut or break the fasteners and use new ones when installing the component.

SAFETY PRECAUTIONS

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SERVICE PROCEDURES

SAFETY PRECAUTIONS AND WARNINGS

DESCRIPTION

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.

DaimlerChrysler Corporation uses many different types of push-in fasteners to secure the interior and exterior trim to the body. Most of these fasteners can be reused to assemble the trim during various repair procedures. At times, a push-in fastener cannot be removed without damaging the fastener or the component it is holding. If it is not possible to remove a fastener without damaging a component or body, cut or break the fastener and use a new one when installing the component. Never pry or pound on a plastic or pressed-board trim component. Using a suitable fork-type prying device, pry the fastener from the retaining hole behind the component being removed. When installing, verify fastener alignment with the retaining hole by hand. Push directly on or over the fastener until it seats. Apply a low-force pull to the panel to verify that it is secure.

When it is necessary to remove components to service another, it should not be necessary to apply excessive force or bend a component to remove it. Before damaging a trim component, verify hidden fasteners or captured edges holding the component in place.

PAINT

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DESCRIPTION AND OPERATION

PAINT CODE

The paint code is identified on the Vehicle Safety Certification Label which is located on the drivers door shut face. The color names provided in the Paint and Trim Code Description chart are the color names used on most repair product containers.

BASE COAT/CLEAR COAT FINISH

DESCRIPTION

On most vehicles a two-part paint application (base coat/clear coat) is used. Color paint that is applied to primer is called base coat. The clear coat protects the base coat from ultraviolet light and provides a durable high-gloss finish.

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.

FINESSE SANDING, BUFFING, AND POLISHING

DESCRIPTION

Minor acid etching, orange peel, or smudging in clear coat 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 clear coat finish, if equipped. Base coat paint must retain clear coat for durability.

PAINTED 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 Introduction group of this manual for Body Code Plate information.

WARNING: USE A OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

OPERATION

(1) Scrape loose paint and corrosion from inside scratch or chip.

(2) Clean affected area with Mopar® Tar/Road Oil Remover, and allow to dry.

(3) Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the defect without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.

(4) Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.

(5) On vehicles without clear coat, the touch-up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.

(6) On vehicles with clear coat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

DESCRIPTION AND OPERATION (Continued)

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

SPECIFICATIONS

AFTERMARKET PAINT REPAIR PRODUCTS

EXTERIOR COLOR

EXTERIOR COLOR	DAIMLER CHRYSLER CODE	PPG	DuPONT	S-W** M-S**	AKZO NOBEL SIKKENS	SPIES HECKER	ICI**
Flame Red Clear Coat	PR4	4679	B9326	46916	CHA93:PR4	30116	2NN6B
Chili Pepper Red	VEA	5361	B9823	54470	CHA98:VEA	33688	HMT3B
Medium Fern Pearl Coat	RJP	4969	B9524	50270	CHA99:RJP	61088	7CD6B
Forest Green Pearl Coat	SG8	5065	B9609	51062	CHA95:SG8	61633	7MR8B
Intense Blue Pearl Coat	VB3	5357	B9822	54468	CHA98:VB3	55321	HMR9B
Desert Sand	WTD	5474	B9884	56153	CHA99:WTD	81764	KGC7B
Deep Amethyst Pearl Coat	TCN	5246	B9736	52026	CHA97:TCN	54755	FNE4B
Black Clear Coat	DX8	9700	99	34858	CHA85:DX8	73328	TC60B
Gunmetal Pearl Coat	TQ7	5248	B9735	52952	CHA97:TQ7	73320	ERA9B
Stone White Clear Coat	SW1	83542	B9622	51539	CHA96:SW1	15069	8KY5B

INTERIOR COLOR

INTERIOR COLOR	DIAMLER CHRYSLER CODE*	PPG	DuPONT	S-W** M-S**	AKZO NOBEL SIKKENS	SPIES HECKER	ICI**
Agate	AZ	9856 / 2-1461	C9208	45994	CHALAZI	75016	7WC8
Camel / Dark Green	KG	N/A	N/A	N/A	N/A	NA	K5/G8

NOTE: *Herberts Standox and BASF use the Chrysler paint code as listed on the Body Code Plate and the Vehicle Safety Certification label. ** S-W = Sherwin-Williams, M-S = Martin Senour, ICI = ICI Autocolor.

STATIONARY GLASS

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DESCRIPTION AND OPERATION

WINDSHIELD SAFETY PRECAUTIONS

DESCRIPTION

WARNING: DO NOT OPERATE THE VEHICLE WITHIN 24 HOURS OF WINDSHIELD INSTALLATION. IT TAKES AT LEAST 24 HOURS FOR URETHANE ADHESIVE TO CURE. IF IT IS NOT CURED, THE WINDSHIELD MAY NOT PERFORM PROPERLY IN AN ACCIDENT.

URETHANE ADHESIVES ARE APPLIED AS A SYSTEM. USE GLASS CLEANER, GLASS PREP SOLVENT, GLASS PRIMER, PVC (VINYL) PRIMER AND PINCH WELD (FENCE) PRIMER PROVIDED BY THE ADHESIVE MANUFACTURER. IF NOT, STRUCTURAL INTEGRITY COULD BE COMPROMISED.

DAIMLERCHRYSLER 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.

OPERATION

The windshield is attached to the window frame with urethane adhesive. The urethane adhesive is applied cold and seals the surface area between the window opening and the glass. The primer adheres the urethane adhesive to the windshield.

It is difficult to salvage a windshield during the removal operation. The windshield is part of the structural support for the roof. The urethane bonding used to secure the windshield to the fence is difficult to cut or clean from any surface. If the moldings are set in urethane, it would also be unlikely they could be salvaged. Before removing the windshield, check the availability of the windshield and moldings from the parts supplier.

REMOVAL AND INSTALLATION

WINDSHIELD

The windshield is positioned in the reveal molding and is bonded to the windshield frame with urethane adhesive.

Depending on the circumstances, either one of two windshield glass installation methods can be used:

- The short method.
- The extended method.

The short method is used when the windshield glass is removed intact, and the body opening and the pinchweld flanges do not require repair.

The extended method must be used when the body opening or a flange is damaged. The extended method must also be used when urethane no longer adheres to either the windshield glass or the pinchweld flanges.

REMOVAL

(1) Cover the interior and exterior body surface areas with a protective covering.

REMOVAL AND INSTALLATION (Continued)

(2) Remove the windshield wiper arms and the rearview mirror.

(3) Using a razor knife, slide the blade between the windshield glass and the inboard edge of the reveal molding.

(4) Cut around the interior perimeter of the reveal molding and sever the cap of the reveal molding.

(5) Using a cold knife, cut the urethane around the perimeter of the windshield (Fig. 1).

(6) Remove the windshield glass from the frame.

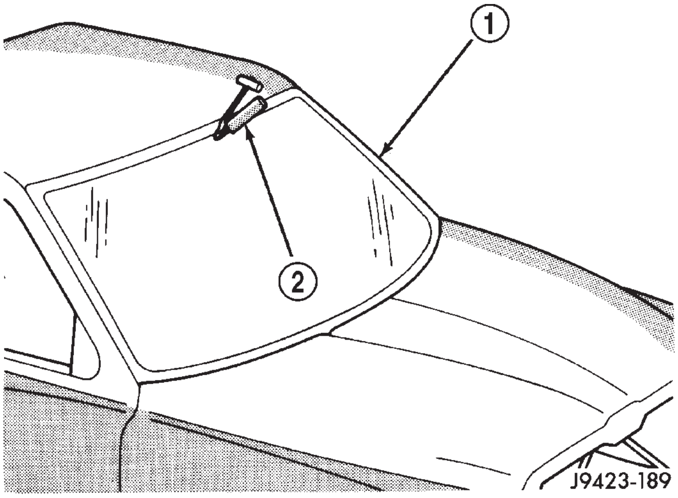


Fig. 1 Cutting Urethane Around Windshield—Typical

1 – WINDSHIELD
2 – COLD KNIFE

INSTALLATION—SHORT METHOD

WARNING: REVIEW ALL WARNINGS AND CAUTIONS IN THIS GROUP BEFORE PRECEDING WITH INSTALLATION.

(1) Trim the urethane from the pinchweld flanges. Leave a 3 mm (0.1 in.) level base of urethane on the pinchweld flanges.

WARNING: DO NOT USE SOLVENT BASED GLASS CLEANER TO CLEAN WINDSHIELD BEFORE APPLYING GLASS PREP AND PRIMER. POOR ADHESION CAN RESULT.

(2) Clean inside of windshield with ammonia based glass cleaner and lint-free cloth.

(3) Prime outer perimeter of interior side of glass 16 mm (5/8 inch) from edge. Use a wipe-off type urethane primer and wipe glass dry after primer application.

NOTE: The reveal molding has an adhesive applied to the windshield contact surface to help secure the molding to the windshield during the installation procedure.

(4) Apply the molding to the windshield:

• With the molding at room temperature, press the molding onto the windshield corners.

• From corner to corner, work the molding to the center of each side. (Some stretching of the molding may be required during this procedure.)

(5) Place the glass on the pinchweld flanges and inspect for gaps in the urethane. Gaps in excess of 3 mm (1/8 inch) must be filled with urethane.

(6) Adjust windshield glass position until it is aligned with the flanges and adhesive.

(7) Using a grease pencil or equivalent, make alignment marks on the glass and body.

(8) Remove replacement windshield from windshield opening.

(9) Position the windshield inside up on a suitable work surface with two padded, wood 10 cm by 10 cm by 50 cm (4 in. by 4 in. by 20 in.) blocks, placed parallel 75 cm (2.5 ft.) apart (Fig. 2).

CAUTION: Avoid spilling or dripping primer on painted surfaces. Clean spills or drips immediately. The primer will damage the paint if it remains on the surface for any length of time.

(10) If the replacement windshield glass does not have blackout primer:

• Attach a 25 mm (1 in) wide masking tape band around the interior side of the glass 16 mm (5/8 in) from the edge of the glass (Fig. 3).

• Do not attach tape along the bottom of the glass and **attach it only to the inside of the glass.**

• Clean the 16-mm (5/8-in) wide surface area around the glass with isopropyl alcohol.

• Thoroughly mix and apply glass blackout primer to the 16 mm (5/8 in) surface area around the interior side of the glass (Fig. 4).

• Allow the primer to dry for at least 10-12 minutes.

(11) Apply a small amount of adhesive to the bottom support spacers and attach the support spacers to the bottom of the windshield, 170 mm inboard from the outer windshield edge (Fig. 5).

(12) Cut the urethane adhesive applicator nozzle (Fig. 6).

CAUTION: Be prepared to install the glass immediately after applying the adhesive, as the adhesive will begin to cure in less than 10 minutes.

(13) Apply a continuous, 6-mm (1/4-in) diameter bead of urethane adhesive to the surface area.

(14) Align the glass with the reference marks and position the glass on the pinchweld flanges. Ensure that the windshield glass is correctly seated on the support spacers.

REMOVAL AND INSTALLATION (Continued)

(15) Force the windshield glass inward just enough to wet-out and set the urethane. Use care to avoid excessive squeeze-out of adhesive.

(16) Water test the windshield with a water spray after installation. Do not direct high pressure streams of water directly at urethane. If any leaks are detected, apply urethane as necessary.

(17) If used, remove the masking tape from the inner surface of the glass.

(18) Install all components and clean the vehicle.

(19) Open the vehicle windows to prevent interior pressure while the urethane is curing. **If not vented, pressure in the interior of the vehicle may interfere with proper glass bonding.**

(20) Install the rearview mirror.

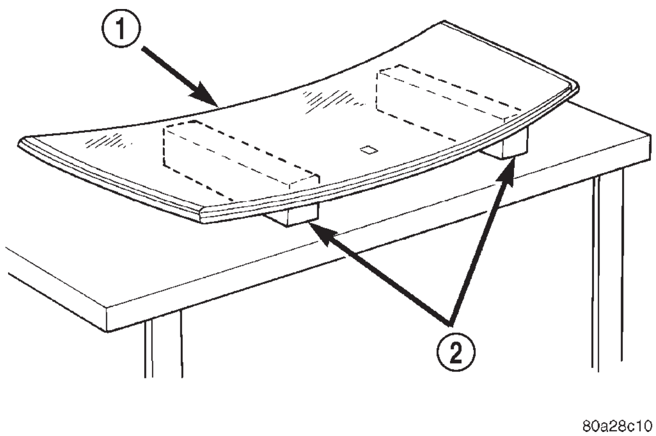


Fig. 2 Work Surface Set up

1 – WINDSHIELD AND MOLDINGS
2 – BLOCKS

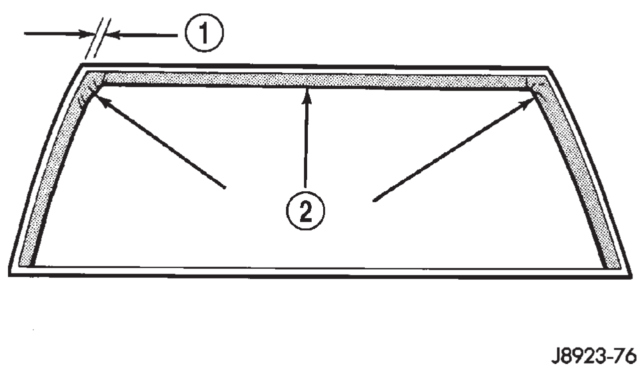


Fig. 3 Masking Tape Location For Blackout Primer

1 – POSITION TAPE 5/8 INCH FROM EDGE OF GLASS
2 – 1-INCH WIDE MASKING TAPE

INSTALLATION—EXTENDED METHOD

WARNING: REVIEW ALL WARNINGS AND CAUTIONS IN THIS GROUP BEFORE PRECEDING WITH INSTALLATION.

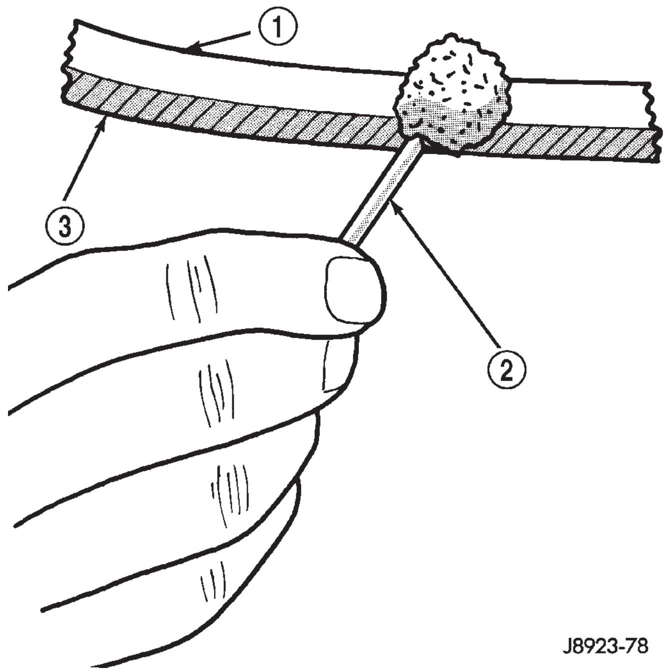


Fig. 4 Blackout Primer Application

1 – APPLY PRIMER TO THIS AREA OF GLASS
2 – BLACKOUT PRIMER APPLICATOR
3 – TAPE

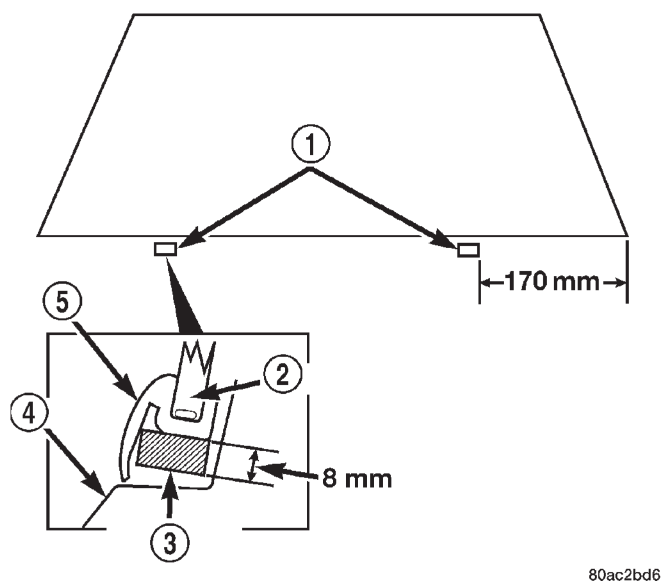


Fig. 5 Windshield Bottom Support Spacers

1 – SUPPORT SPACERS
2 – WINDSHIELD
3 – SUPPORT SPACER
4 – COWL
5 – MOLDING

(1) Remove the all of urethane from all pinchweld flanges.

REMOVAL AND INSTALLATION (Continued)

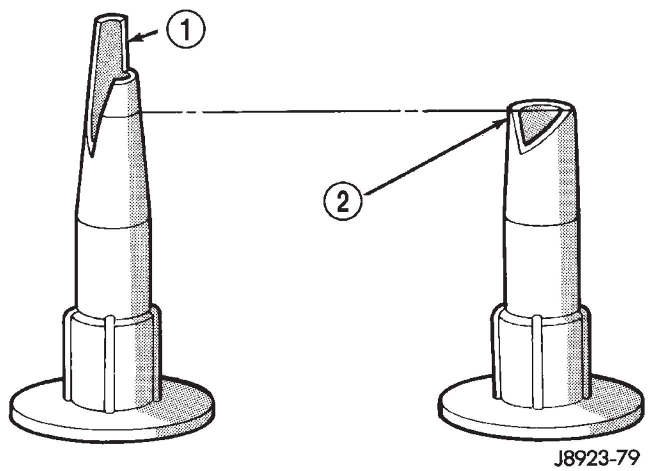


Fig. 6 Applicator Nozzle Preparation

1 – CUT NOZZLE THIS SHAPE FOR EXTENDED PROCEDURE
2 – CUT NOZZLE THIS SHAPE FOR SHORT PROCEDURE

(2) Inspect and repair the windshield opening and pinchweld flanges.

(3) Prime the pinchweld flanges with a urethane base primer. However, if the flange is color-coated with paint, prime the flanges with a paint finish primer. **This is important because urethane adhesive will not adhere to all color-coat paints.** Allow primer sufficient time to dry.

NOTE: The reveal molding has an adhesive applied to the windshield contact surface to help secure the molding to the windshield during the installation procedure.

(4) Apply the reveal molding to the windshield:

• With the molding at room temperature, press the molding onto the windshield corners.

• From corner to corner, work the molding to the center of each side. (Some stretching of the molding may be required during this procedure).

(5) Install and inspect the fit of the windshield on the pinchweld flanges as follows:

• Position windshield until it is aligned within windshield opening.

• Measure the gap between the pinchweld flanges and glass around perimeter of the glass and flange.

• The reveal molding should equally cover the A-Pillars on both sides.

• The flanges should also extend above the glass edge equally around the perimeter of the opening.

(6) If the pinchweld flanges require repair, remove the windshield glass and straighten, align, or repair the flange(s) as necessary.

(7) Position the windshield in the opening and inspect the windshield fit again. Mark the windshield final position on the glass and body with a wax pencil (or use masking tape). The marks (or masking tape) will be used for installation alignment reference.

(8) If the replacement windshield does not have blackout primer:

• Attach a 25-mm (1-in) wide masking tape band around the interior side of glass 16 mm (5/8 in) from edge of glass (Fig. 3).

• Do not attach tape along the bottom of the glass and **attach only to the inside of glass.**

• Thoroughly mix and apply blackout primer to the 16 mm (5/8 in) surface area around the interior side of the glass (Fig. 4).

• Allow the primer to dry for at least 10-12 minutes.

(9) Apply a small amount of adhesive to the bottom support spacers and attach the support spacers to the bottom of the windshield, 170 mm inboard from the outer windshield edge (Fig. 5).

(10) Cut the urethane applicator nozzle (Fig. 6).

(11) Apply a continuous bead of urethane to the surface area with blackout primer on the interior side of glass. The bead should be 9-mm (3/8-in) wide by 12.7-mm (1/2-in) deep for best results.

CAUTION: Be prepared to install the glass immediately after applying the adhesive, as the adhesive will begin to cure in less than 10 minutes.

(12) Align the windshield with the wax pencil installation alignment reference marks (or the tape strips). Position the windshield on pinchweld flanges and spacers.

(13) Force the windshield inward just enough to wet-out and set the urethane. Use care to avoid excessive squeeze-out of adhesive.

(14) Water test the windshield with a water spray after installation. Do not direct high pressure streams of water directly at the urethane. If any leaks are detected, apply urethane as necessary.

(15) If used, remove the masking tape from the inner surface of glass.

(16) Install all components and clean the vehicle. If necessary, refer to the installation procedures.

(17) Open the vehicle windows to prevent interior pressure while the urethane adhesive is curing. **If not vented, pressure in the interior of vehicle will interfere with glass bonding.**

(18) Install the rearview mirror on the bracket.

REAR DOOR STATIONARY WINDOW GLASS

REMOVAL

The rear door stationary window glass is bonded to the division bar and is serviced as an assembly.

(1) Lower the window glass.

(2) Remove the inner and outer beltline weatherstrip.

REMOVAL AND INSTALLATION (Continued)

(3) Remove the trim panel and waterdam from door inner panel.

(4) Remove the screws attaching the division bar/ glass to the door (Fig. 7).

(5) Tilt the division bar/glass forward and remove it from the door.

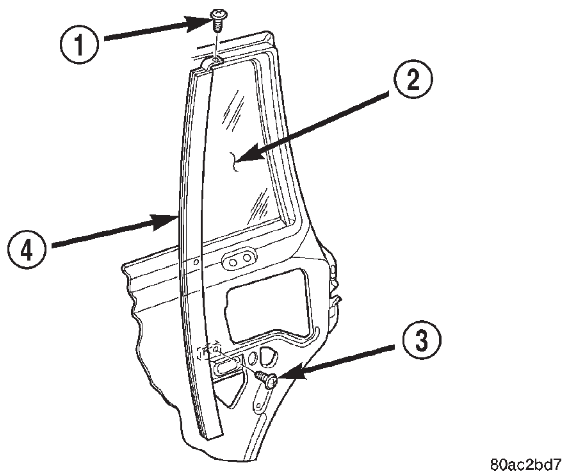


Fig. 7 Division Bar/Stationary Glass

1 – UPPER SCREW
2 – GLASS
3 – LOWER SCREW
4 – DIVISION BAR

INSTALLATION

(1) Position the division bar/glass in the door.

(2) Install the screws attaching the division bar/ glass to the door. Finger tighten the screws.

(3) Tighten the upper screw to 6 N·m (5 ft-lbs) torque.

(4) Tighten the lower screw to 6 N·m (5 ft-lbs) torque.

(5) Install the beltline weatherstrip.

(6) Install the door waterdam and trim panel.

REAR QUARTER WINDOW GLASS

REMOVAL

(1) If equipped, remove the quarter window reveal molding (Fig. 8).

(2) Remove the quarter window interior trim covers.

(3) Separate the weatherstrip seal lip from the window opening flanges. Use a pry tool and carefully push the window glass and seal outward.

(4) Remove the weatherstrip seal and window glass from window opening.

(5) Remove the weatherstrip seal from the window glass.

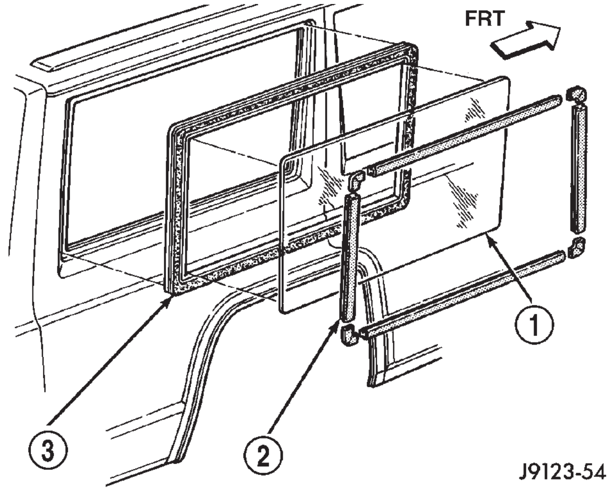


Fig. 8 Quarter Window Reveal Molding, Glass and Seal

1 – GLASS
2 – REVEAL MOULDING
3 – WEATHERSTRIP SEAL

INSTALLATION

(1) Clean the original sealant from the weatherstrip channels and window opening flanges.

(2) Apply a 4-mm (1/6-in) diameter bead of sealant to the window channel in the weatherstrip seal.

(3) Install the weatherstrip on the window glass. Install the seal installation cord in the window opening flange channel (Fig. 9) as follows:

• Moisten a length of 6-mm (1/4-in) diameter cord with a soap and water solution.

• Ensure that the cord is long enough to go all the way around the perimeter of the weatherstrip.

• Insert the cord into the window opening flange channel in the weatherstrip seal.

(4) Apply a 6-mm (1/4-in) diameter bead of sealant to the window opening flanges.

(5) For two-door vehicles, apply a 3-mm (1/8-in) diameter bead of sealant at the quarter panel applique and liftgate pillar seam.

(6) Position the quarter window glass and the weatherstrip seal in the window opening (Fig. 10) with the free ends of the cord inside the vehicle (Fig. 11).

(7) Pull on each end of the cord to pull the weatherstrip seal channel lip over the window opening flanges.

(8) Test the vent window for water leaks.

(9) Install the interior trim cover.

(10) If equipped, install the quarter window reveal molding.

REMOVAL AND INSTALLATION (Continued)

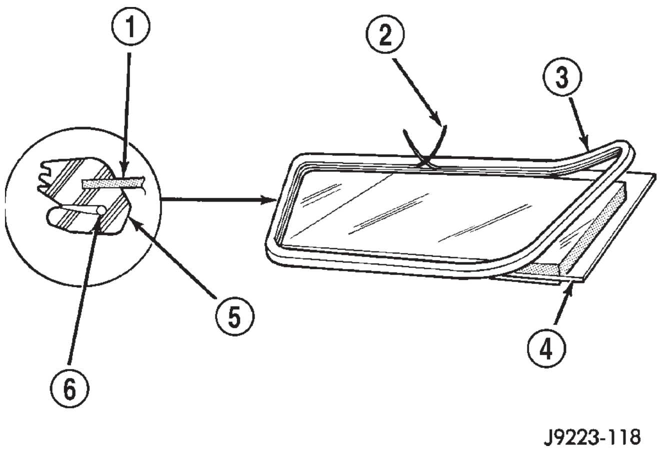


Fig. 9 Weatherstrip Seal and Cord Installation

1 – WINDOW GLASS
2 – INSTALLATION CORD END
3 – WEATHERSTRIP SEAL
4 – WINDOW GLASS
5 – WEATHERSTRIP SEAL
6 – INSTALLATION CORD

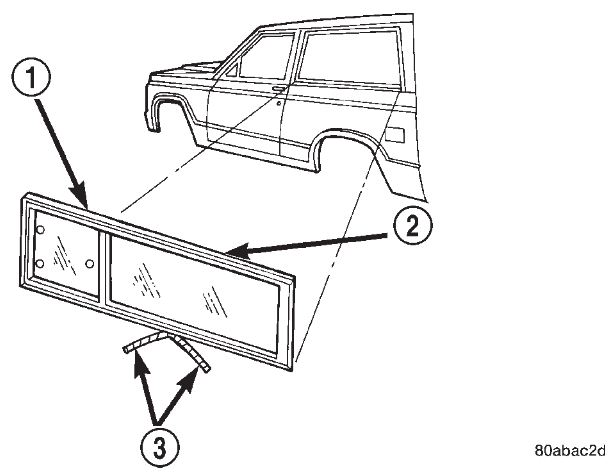


Fig. 10 Quarter Window With Vent

1 – QUARTER WINDOW W/VENT
2 – WEATHERSTRIP SEAL
3 – INSTALLATION CORD

LIFTGATE GLASS

REMOVAL

(1) Open liftgate.
(2) Remove liftgate trim panel.
(3) Disconnect heated backlite (HBL) connector.
(4) Remove wiper arm.
(5) Remove CHMSL lens.
(6) Using a razor knife, slide the blade between the liftgate glass and the inboard edge of the reveal molding.
(7) Cut around the interior perimeter of the reveal molding and severe the cap of the reveal molding.

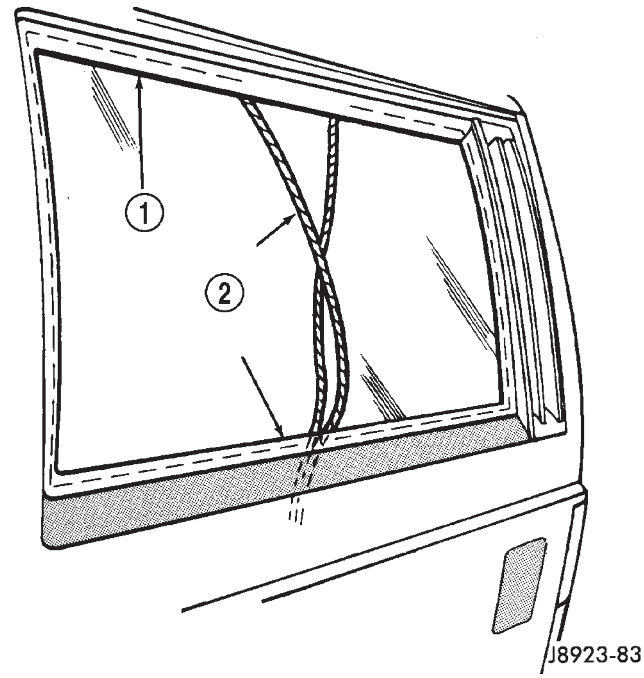


Fig. 11 Quarter Window Glass and Seal Installation

1 – WEATHERSTRIP
2 – 1/4-INCH DIAMETER CORD (POSITION IN WEATHERSTRIP GLASS CHANNEL)

(8) Using a cold knife, cut urethane bonding from around liftgate glass. A pneumatic cutting device can be used if available.
(9) Separate glass from Liftgate.

INSTALLATION

CAUTION: Open a window before installing glass. This will avoid pressurizing the passenger compartment. If a door or liftgate is slammed before urethane is cured, water leaks can result.

(1) Trim the urethane from the liftgate glass opening flanges. Leave a 3 mm (0.1 in.) level base of urethane on the flanges.
(2) Starting in the corners, press reveal molding onto glass.
(3) Place replacement glass into liftgate opening and position glass in the center of the opening against flange.
(4) Verify the glass lays evenly against the fence at the sides, top and bottom. If not, the flange must be formed to the shape of the new glass.
(5) Using a grease pencil or equivalent, make references marks on the glass and body.
(6) Remove replacement glass from liftgate opening.
(7) Position the glass inside up on a suitable work surface.

REMOVAL AND INSTALLATION (Continued)

WARNING: DO NOT USE SOLVENT BASED GLASS CLEANER TO CLEAN WINDSHIELD BEFORE APPLYING GLASS PREP AND PRIMER. POOR ADHESION CAN RESULT.

(8) Clean inside of glass with Mopar Glass Cleaner and lint-free cloth.

(9) Apply PVC (vinyl) primer 25 mm (1 in.) wide around edge of glass. Wipe with clean/dry lint-free cloth.

(10) If necessary, apply fence primer around edge of fence. Allow at least eighteen minutes drying time.

(11) Apply a 10 mm (0.4 in.) bead of urethane around glass border.

(12) Position glass into liftgate opening and reference marks.

(13) Push the glass inward until the reveal molding is seated onto the liftgate frame. Use care to avoid excessive squeeze-out of adhesive.

(14) Open windows to prevent pressure build-up while the urethane is curing.

(15) Apply 150 mm (6 in.) lengths of 50 mm (2 in.) masking tape spaced 250 mm (10 in.) apart to hold glass in place until urethane cures.

(16) Install the wiper arm.

(17) Install CHMSL lens.

(18) Connect heated backlite (HBL) connector.

(19) After urethane has cured, remove tape strips and water test to verify repair.

(20) Install liftgate trim panel.

SEATS

TABLE OF CONTENTS

REMOVAL AND INSTALLATION

HEAD RESTRAINT SLEEVE

REMOVAL

NOTE: When replacing a head restraint sleeve, the retaining tabs on the sleeve will be damaged during the removal process. Check the availability of replacement parts before servicing.

(1) Raise head restraint to the full up position.
(2) Turn head restraint lock thumbwheel to release head restraint and pull head restraint upward to remove from seat back.
(3) Insert head restraint sleeve extractor (special tool 6773) (Fig. 1) and (Fig. 2) into the seat back.
(4) The retaining tabs are positioned on each side of the sleeve, when inserting the extractor, ensure that the flat of the collar is facing the side of the seatback (Fig. 3).
(5) Using a small hammer, tap extractor downward to release sleeve retaining tab.
(6) Remove extractor tool from sleeve, rotate tool 180 degrees (Fig. 4) and repeat steps 3 and 4.
(7) Remove extractor tool from sleeve and remove sleeve from seat back.

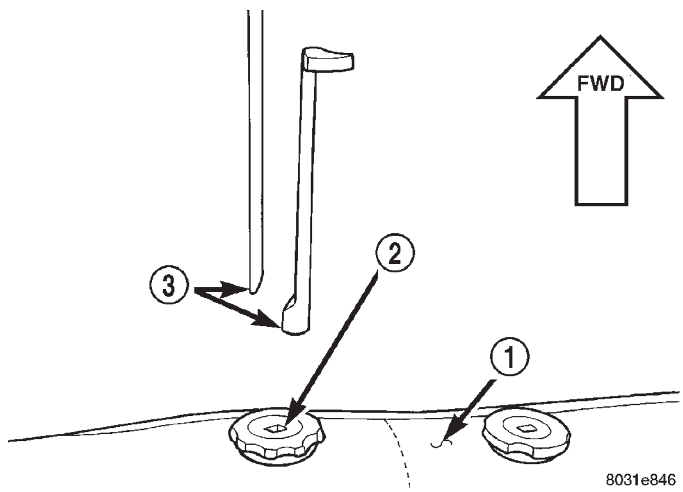


Fig. 1 Head Restraint Sleeve Extractor

1 – SEAT BACK
2 – HEAD RESTRAINT SLEEVE
3 – EXTRACTOR TOOL 6773

REMOVAL AND INSTALLATION (Continued)

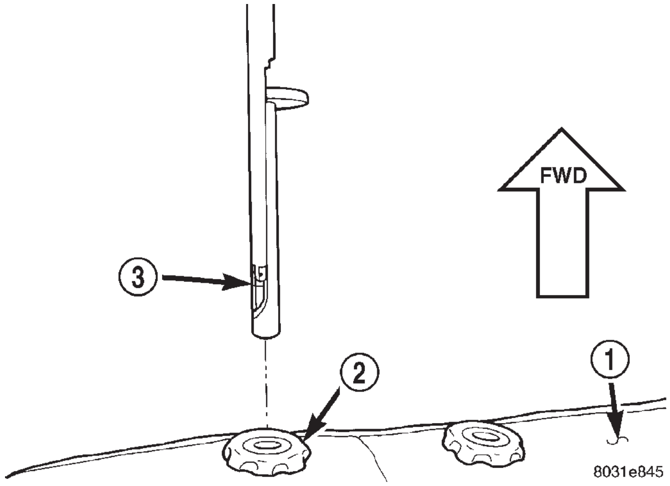


Fig. 2 Head Restraint Sleeve Extractor Installation

1 – SEAT BACK
2 – HEAD RESTRAINT SLEEVE
3 – EXTRACTOR TOOL 6773

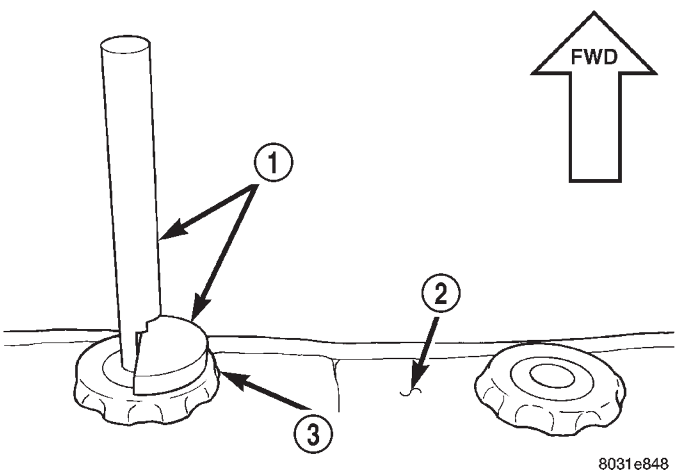


Fig. 3 Head Restraint Sleeve Extractor Positioning

1 – EXTRACTOR TOOL 6773
2 – SEAT BACK
3 – LOCK RELEASE THUMBWHEEL

INSTALLATION

(1) Position the sleeve in the seat back.
(2) Firmly, push sleeve down to snap into place.
(3) Install head restraint.

HEAD RESTRAINT COVER

REMOVAL

(1) Remove head restraint from the bucket seat.
(2) Remove the screws attaching the bezel and adjuster bar to the head restraint (Fig. 5).
(3) Pull the adjuster bar from the head restraint.
(4) Roll the cover upward and separate from the head restraint cushion (Fig. 6).

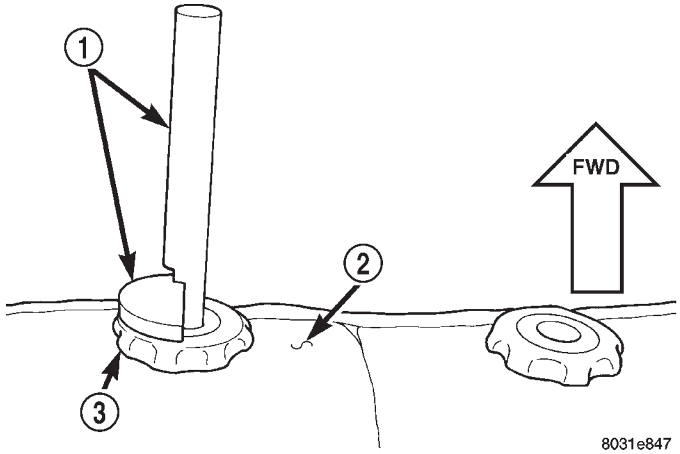


Fig. 4 Head Restraint Sleeve Extractor Positioning

1 – EXTRACTOR TOOL 6773
2 – SEAT BACK
3 – LOCK RELEASE THUMBWHEEL

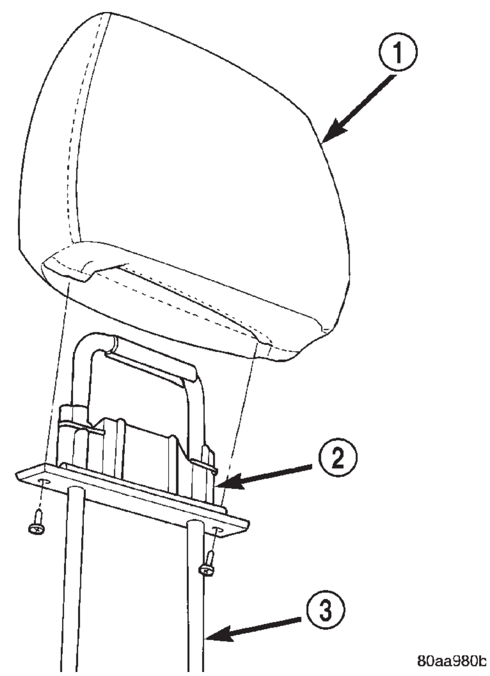


Fig. 5 Head Restraint

1 – HEAD RESTRAINT
2 – BEZEL
3 – ADJUSTER BAR

INSTALLATION

(1) Position the cover on the head restraint cushion and roll the cover downward.
(2) Position the adjuster bar in the head restraint.
(3) Install the screws attaching the bezel and adjuster bar to the head restraint.
(4) Install head restraint in the bucket seat.

REMOVAL AND INSTALLATION (Continued)

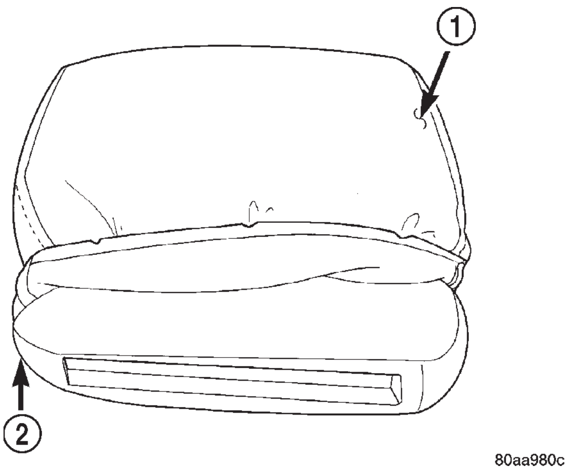


Fig. 6 Head Restraint Cover

1 – HEAD RESTRAINT COVER
2 – HEAD RESTRAINT CUSHION

BUCKET SEAT

REMOVAL

(1) Remove bolts attaching seat to floor pan (Fig. 7).

(2) Remove nut attaching seat to floor pan.

(3) For power seat, disconnect wire harness connector. If equipped, disconnect wire harness for heated seat.

(4) Disconnect seat belt buckle warning wire harness connector.

(5) Separate seat from floor panel.

INSTALLATION

(1) Position seat on floor pan.

(2) Connect seat belt buckle warning wire harness connector.

(3) For power seats, connect wire harness connector. If equipped, connect harness for heated seat.

(4) Install front fasteners attaching seat to floor pan. Tighten to 27 N·m (20 ft. lbs.) torque.

(5) Install rear fasteners attaching seat to floor pan. Tighten to 27 N·m (20 ft. lbs.) torque.

(6) Install nut attaching seat to floor pan. Tighten to 40 N·m (30 ft. lbs.) torque.

BUCKET SEAT TRACK

REMOVAL

NOTE: If the vehicle is equipped with manually adjusted bucket seats, the inboard or outboard seat track may be serviced separately.

(1) Remove bucket seat from vehicle.

(2) Remove screws attaching the side shield trim cover from the seat.

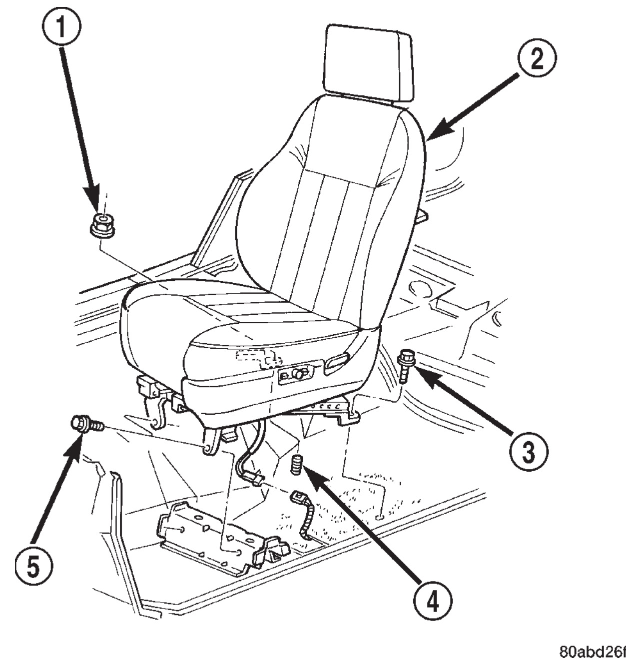


Fig. 7 Bucket Seat—Power Seat

1 – NUT
2 – DRIVER SIDE FRONT SEAT
3 – SCREW
4 – STUD
5 – SCREW

(3) If equipped, disengage the power seat connector from the power seat switch.

(4) Remove the nuts attaching the seat track to the bucket seat platform.

(5) When separating the seat track from the platform, route the power seat switch connector through the access hole in the seat cushion frame, if equipped.

INSTALLATION

(1) While positioning the seat track on the bucket seat platform, route the power seat switch connector through the access hole in the seat cushion frame, if equipped.

(2) Install the nuts attaching the seat track to the bucket seat platform.

(3) If equipped, engage the power seat connector to the power seat switch.

(4) Install screws attaching the side shield trim cover to the seat.

(5) Install bucket seat.

BUCKET SEAT PLATFORM

Bucket seat platforms are not repairable. If the seat platform is damaged, replace platform as a unit.

REMOVAL AND INSTALLATION (Continued)

BUCKET SEATBACK COVER

REMOVAL

(1) Remove seat.
(2) Remove head restraint, if equipped.
(3) Remove screws attaching side shield trim cover to bucket seat.
(4) If equipped, disengage power seat wire connector from power seat switch.
(5) Remove the inboard seatback pivot bolt and large plastic washer.
(6) Position the seatback in the full forward or full recline position.
(7) Remove the seatback cover J straps from the base of the seatback.
(8) Roll the seatback cover upward, disengage electrical connectors for heated seat grid, if equipped. (Fig. 8).
(9) Disengage the hogrings attaching the seatback cover to the seatback cushion support wires (Fig. 9).
(10) Roll the seatback cover upward and disengage the hook and loop fastener (Fig. 10).
(11) Roll seatback cover up and over the head restraint sleeves, if equipped and separate from the seatback.

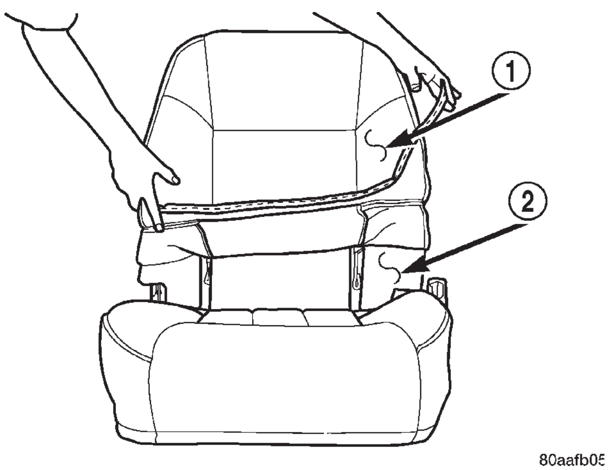


Fig. 8 Seatback Cover

1 – SEAT BACK COVER
2 – SEAT BACK CUSHION

INSTALLATION

(1) Position the seatback cover on the seatback cushion and roll seatback cover down over the head restraint sleeves. Route the sleeves through the access holes in the cover, if equipped.
(2) Roll the seatback cover downward and engage the hook and loop fastener. Engage electrical connectors for heated seat grid, if equipped.
(3) Continue rolling the cover downward and engage the hogrings attaching the seatback cover to the seatback cushion support wires.

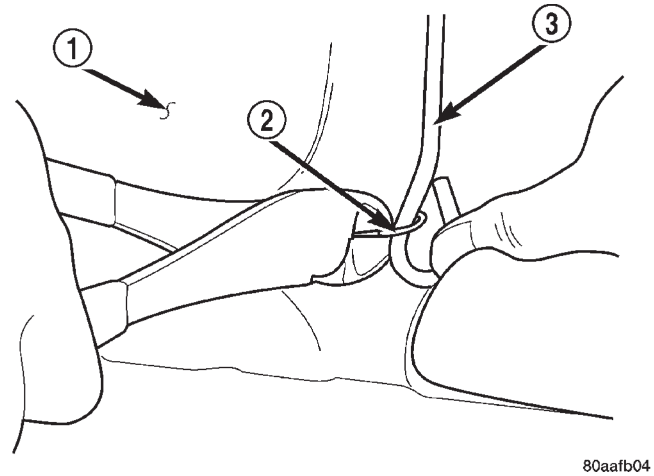


Fig. 9 Hog Ring

1 – SEAT BACK CUSHION
2 – HOG RING
3 – SUPPORT

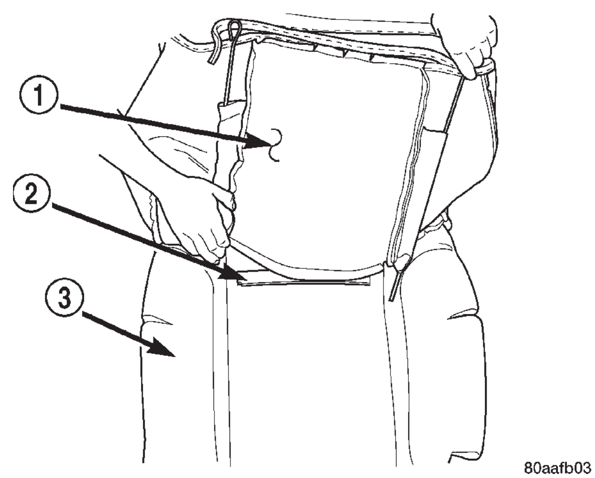


Fig. 10 Hook And Loop Fastener

1 – SEAT BACK COVER
2 – HOOK AND LOOP FASTENER
3 – SEAT BACK CUSHION

(4) Engage the seatback cover J straps to the base of the seatback.
(5) Install the inboard seatback pivot bolt and large plastic washer.
(6) Install the side shield trim cover.
(7) Install head restraint, if equipped.
(8) Install seat.

BUCKET SEATBACK

REMOVAL

(1) Remove seat.
(2) Remove side shield trim cover.
(3) Remove inboard seatback pivot bolt and washer.

REMOVAL AND INSTALLATION (Continued)

(4) Remove bolts attaching recliner to seat cushion frame (Fig. 11).

(5) Separate seatback from vehicle.

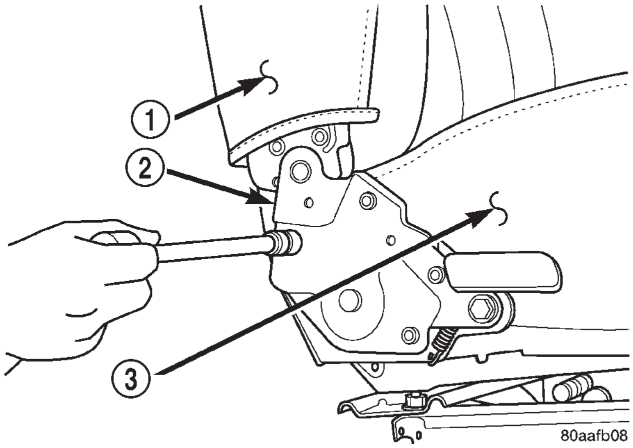


Fig. 11 Bucket Seatback

1 – SEAT BACK
2 – RECLINER
3 – SEAT CUSHION

INSTALLATION

(1) Position seatback on seat cushion frame.

(2) Install inboard seatback pivot bolt and washer.

(3) Install bolts attaching recliner to seat cushion frame.

(4) Install side shield trim cover.

(5) Install seat.

BUCKET SEAT CUSHION COVER

REMOVAL

(1) Remove seat from vehicle.

(2) Remove side shield trim cover.

(3) Remove seatback.

(4) With the cushion side down, disengage the forward, rearward and inboard J-straps.

(5) Disengage the clips attaching the outboard side of the cover to the cushion frame.

(6) Turn the cushion over and roll the cover off the cushion.

(7) Disengage the electrical connectors for the heated seat, if equipped.

(8) Remove the hog rings attaching the cover to the cushion support wires (Fig. 12).

(9) Separate the cover from the cushion.

INSTALLATION

(1) Position the cover on the cushion.

(2) Engage the electrical connectors for the heated seat, if equipped.

(3) Install the hog rings attaching the cover to the cushion support wires.

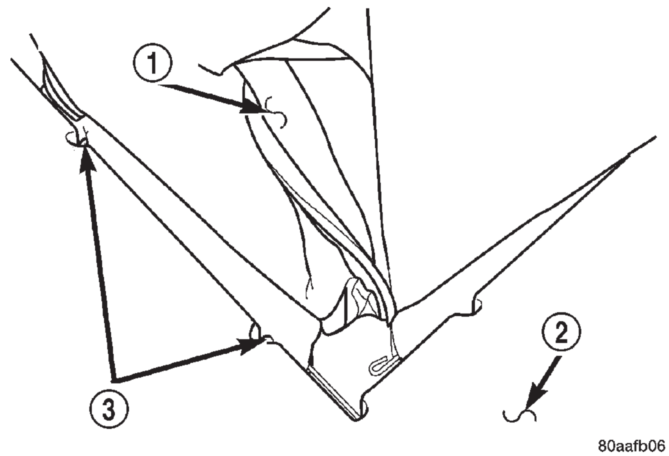


Fig. 12 Seat Cushion Cover Hog Rings

1 – SEAT CUSHION COVER
2 – SEAT CUSHION
3 – HOG RING

(4) With the cushion side down, engage the forward, rearward and inboard J-straps.

(5) Engage the clips attaching the outboard side of the cover to the cushion frame.

(6) Install seatback.

(7) Install side shield trim cover.

(8) Install seat.

BUCKET SEAT RECLINER

REMOVAL

(1) Remove side shield trim cover.

(2) Disengage seatback cover zipper.

(3) Roll outer seatback cover upward.

(4) Remove bolts attaching recliner to seatback and seat cushion frames (Fig. 13).

(5) Separate recliner from seat.

INSTALLATION

(1) Position recliner on seat.

(2) Install bolts attaching recliner to seatback and seat cushion frames (Fig. 13).

(3) Roll seatback cover downward.

(4) Engage seatback cover zipper.

(5) Install side shield trim cover.

REAR SEAT CUSHION

REMOVAL

(1) Disengage seat cushion at rear by pulling upward on release strap (Fig. 14).

(2) Tilt seat cushion forward.

(3) Disengage seat cushion latch with right side release lever. Separate right side latch and left side seat bracket from floor anchor bolts, and remove cushion from vehicle (Fig. 15).

REMOVAL AND INSTALLATION (Continued)

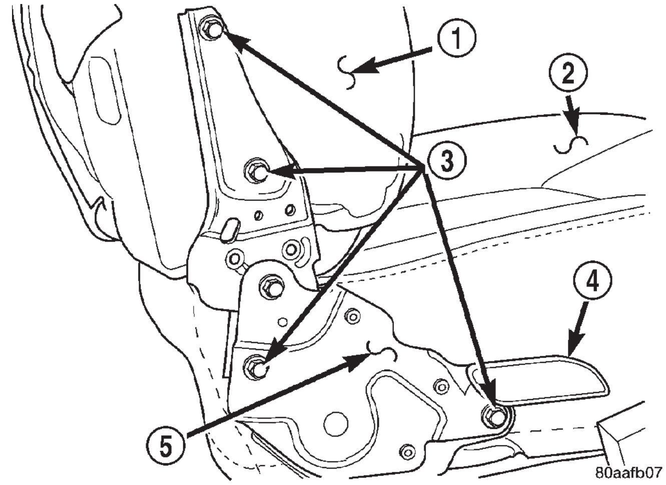


Fig. 13 Bucket Seat Recliner

1 – SEAT BACK CUSHION
2 – SEAT CUSHION
3 – REMOVE
4 – RECLINER HANDLE
5 – RECLINER

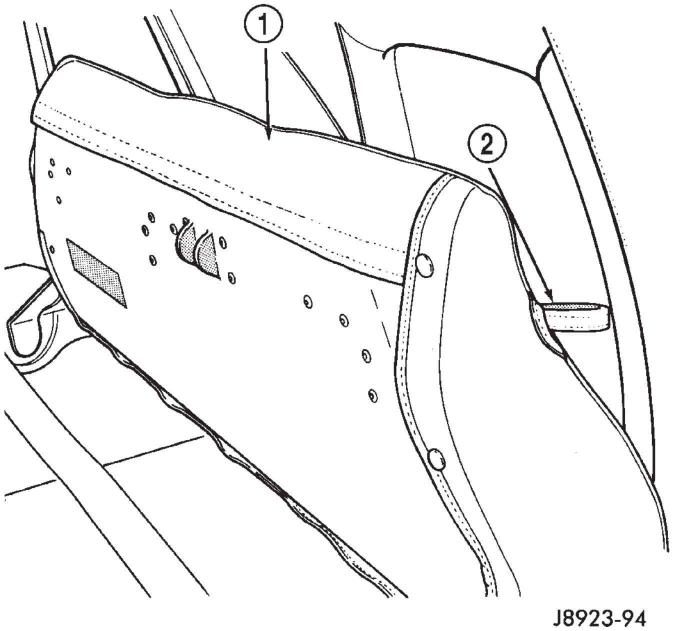


Fig. 14 Seat Cushion Release Strap

1 – REAR SEAT CUSHION
2 – RELEASE STRAP

INSTALLATION

(1) Position seat cushion in vehicle.
(2) Insert left pivot in anchor grommet.
(3) Force right side latch onto anchor bolt and pivot seat cushion to horizontal position.
(4) Lock seat cushion in-place by pressing firmly on center of cushion until latch engages.

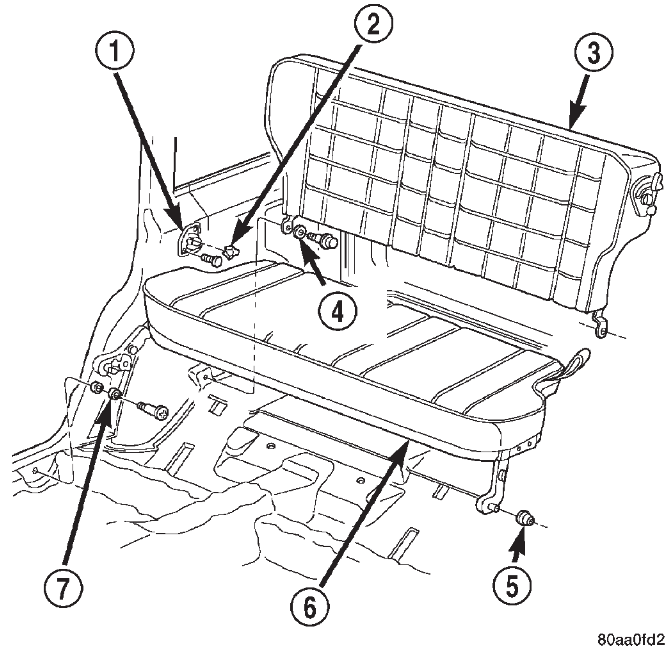


Fig. 15 Rear Seat Cushion/Seat Back

1 – SEAT BACK LATCH STRIKER BRACKET
2 – SEAT BACK LATCH STRIKER
3 – SEAT BACK
4 – PIVOT SPACER
5 – GROMMET
6 – SEAT CUSHION
7 – BUSHING

REAR SEATBACK

REMOVAL

(1) Disengage the seat cushion at the rear by pulling upward on the release strap.
(2) Tilt the seat cushion forward.
(3) Remove the shoulder/lap belt buckles from the elastic straps.
(4) Release the seatback latch from the striker.
(5) Remove the pivot bolts and the washers from the wheelhouse panel anchors (Fig. 15).
(6) Tilt the seatback forward, lift it upward and remove it from the vehicle.

INSTALLATION

(1) Position the seatback in the vehicle.
(2) Install the pivot bolts and the washer. Tighten the bolts with 33 N·m (25 ft. lbs.) torque.
(3) Engage the seatback latch with the striker.
(4) Insert the shoulder/lap belt buckles in the elastic straps.
(5) Pivot the seat cushion to the horizontal position and lock it in-place by pressing firmly on the center of the cushion until the latch engages.

REMOVAL AND INSTALLATION (Continued)

REAR SEAT CUSHION COVER

REMOVAL

(1) Remove the seat cushion from the vehicle.

(2) Remove the cover side, front and rear retaining clips from the wire retainers with an appropriate removal tool (Fig. 16).

(3) Remove the serrated retainers from the front ends of the cover with a trim panel removal tool (Fig. 17).

(4) Remove the seat cover from the cushion.

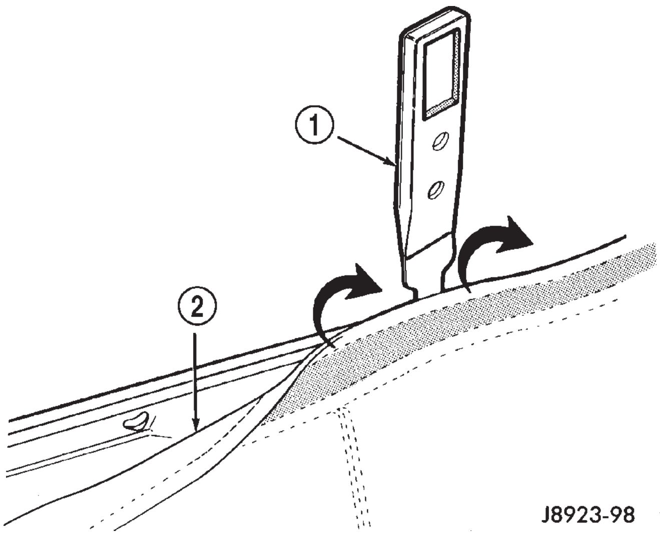


Fig. 16 Seat Cushion Cover Retaining Clip Removal

1 – REMOVER TOOL
2 – SEAT COVER

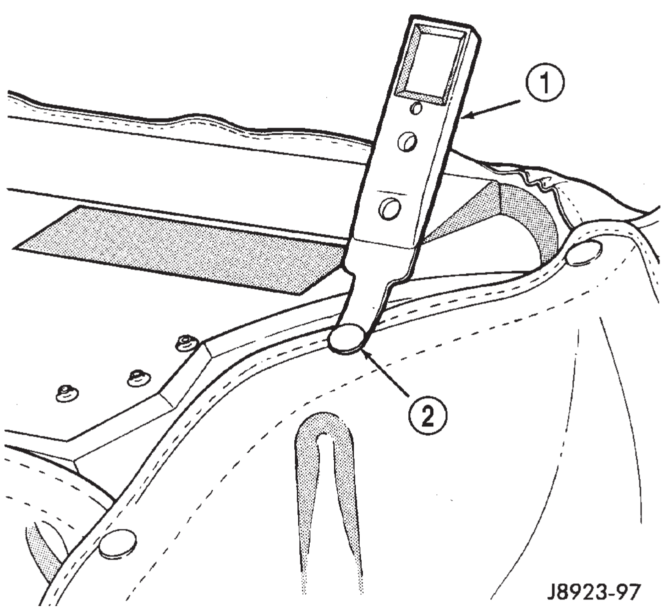


Fig. 17 Seat Cushion Cover Retaining Clip Removal

1 – CLIP REMOVER TOOL
2 – SEAT COVER CLIPS

INSTALLATION

(1) Position the replacement cover on the cushion.

(2) Compress the cover and attach the retaining clips to the front and rear wire retainers.

(3) Install the serrated retainers at the ends of the cover.

(4) Install the seat cushion in the vehicle. If necessary, refer to the installation procedure.

REAR SEATBACK LATCH STRIKER AND BUMPER

REMOVAL

(1) Disengage seat cushion at the rear by pulling upward on the release strap.

(2) Tilt seat cushion forward.

(3) Release seatback latch from striker.

(4) Tilt seatback forward for access to striker bracket.

(5) Remove screws (Fig. 18) attaching latch striker bracket and shims to trim panel.

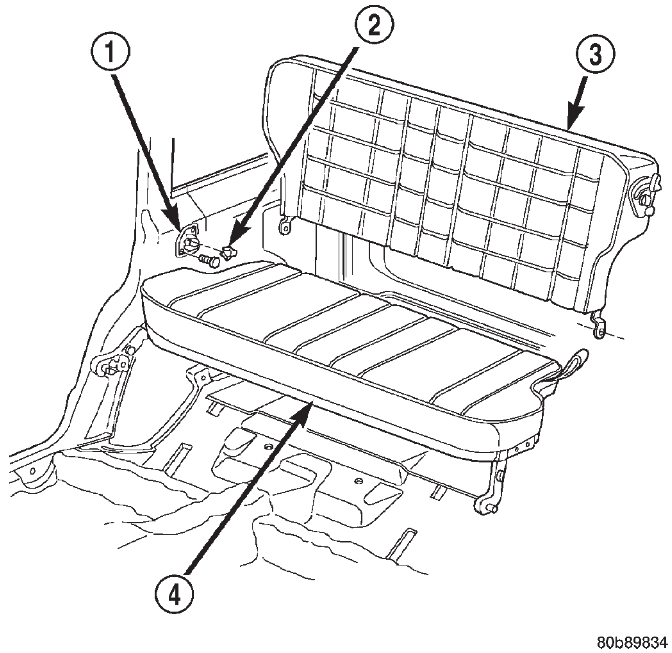


Fig. 18 Seatback Latch Striker Bracket

1 – SEAT BACK LATCH STRIKER BRACKET
2 – SEAT BACK LATCH STRIKER
3 – SEAT BACK
4 – SEAT CUSHION

INSTALLATION

(1) Position shims and latch striker bracket on trim panel.

(2) Install screws attaching latch striker bracket and shims to trim panel. Tighten screws to 6 N·m (50 in. lbs.) torque.

(3) Engage seatback latch with striker.

REMOVAL AND INSTALLATION (Continued)

(4) Pivot seat cushion to horizontal position and lock it in-place by pressing firmly on center of the cushion until latch engages.

REAR SEATBACK COVER

REMOVAL

(1) Remove the seatback from the vehicle.
(2) Remove the seatback latch release handle and bezel from the seatback.
(3) Disengage the cover zippers.
(4) Disengage the J-strap attaching the cover to the seat back frame (Fig. 19).
(5) Remove the cover from the seatback pad.

INSTALLATION

(1) Install the cover on the seatback.
(2) Attach the cover J-strap to the seatback frame.
(3) Engage the cover zippers.
(4) Install the seat latch release bezel and handle.
(5) Install the seatback in the vehicle.

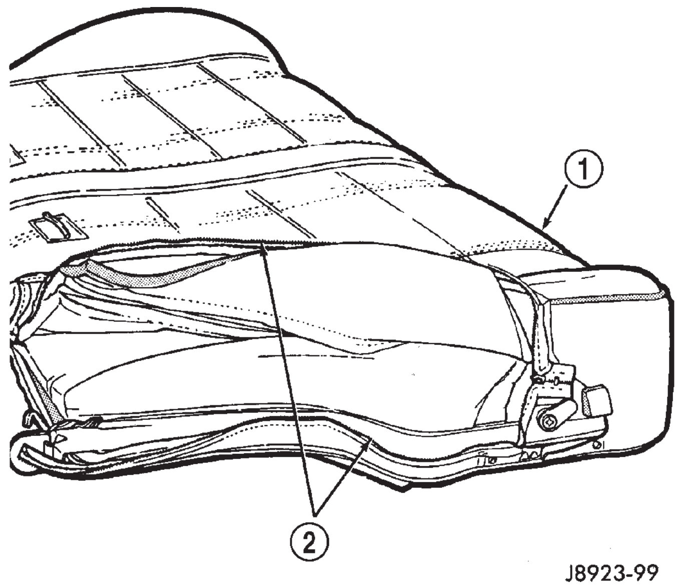
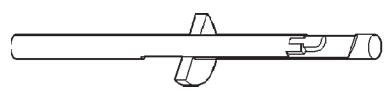


Fig. 19 Seatback Cover Removal

1 – SEAT BACK
2 – COVER ZIPPER

SPECIAL TOOLS

SPECIAL TOOLS—SEATS



Extractor Head Restraint Sleeve 6773

BODY COMPONENT SERVICE

TABLE OF CONTENTS

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations refer to Group 0, Lubrication and Maintenance, General Information section.

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

DIAGNOSIS AND TESTING (Continued)

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.

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.

Wind noise can also be caused by improperly fitted exterior moldings or body ornamentation. Loose moldings can flutter, creating a buzzing or chattering noise. An open cavity or protruding edge can create a whistling or howling noise. Inspect the exterior of the vehicle to verify that these conditions do not exist.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

(1) Drive the vehicle to verify the general location of the wind noise.

(2) Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

SERVICE PROCEDURES

BODY LUBRICATION

All mechanisms and linkages should be lubricated when necessary. This will maintain ease of operation and provide protection against rust and excessive wear. The weatherstrip seals should be lubricated to prolong their life as well as to improve door sealing.

All applicable exterior and interior vehicle operating mechanisms should be inspected and cleaned. Pivot/sliding contact areas on the mechanisms should then be lubricated.

(1) When necessary, lubricate the operating mechanisms with the specified lubricants.

(2) Apply silicone lubricant to a cloth and wipe it on door seals to avoid over-spray that can soil passenger's clothing.

(3) Before applying lubricant, the component should be wiped clean. After lubrication, any excess lubricant should be removed.

(4) The hood latch, latch release mechanism, latch striker, and safety latch should be lubricated periodically.

(5) The door lock cylinders should be lubricated twice each year (preferably autumn and spring).

- Spray a small amount of lock cylinder lubricant directly into the lock cylinder.
- Apply a small amount to the key and insert it into the lock cylinder.
- Rotate it to the locked position and then back to the unlocked position several times.
- Remove the key. Wipe the lubricant from it with a clean cloth to avoid soiling of clothing.

REMOVAL AND INSTALLATION

GRILLE

REMOVAL

(1) Remove the headlamp/park lamp bezels.

(2) Remove the screws attaching the grille to the grille opening panel (GOP) (Fig. 1).

(3) Separate the grille from the GOP.

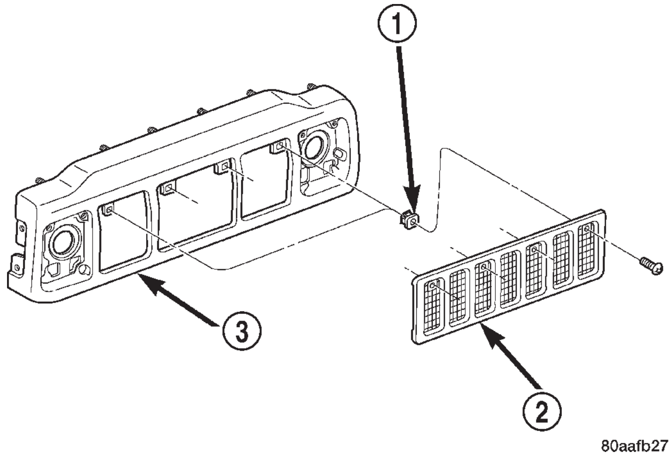


Fig. 1 Grille

1 – NUT
2 – GRILLE
3 – GRILLE OPENING PANEL

INSTALLATION

(1) Position the grille in the GOP.

(2) Install the screws.

(3) Install the headlamp/park lamp bezels.

GRILLE OPENING PANEL (GOP)

REMOVAL

(1) Remove headlamp bezels.

(2) Remove grille.

(3) Remove side marker lamps.

(4) Remove headlamps and park/turn signal lamps.

(5) Open hood.

(6) Remove nuts that attach GOP to front fenders (Fig. 2).

(7) Remove nuts attaching GOP to support bracket.

(8) Pull GOP forward and disconnect harness clips and front lamp harness connectors.

(9) Remove GOP from vehicle.

INSTALLATION

(1) Place GOP on bumper and secure all harness clips.

(2) Connect all lamp wire harness connectors.

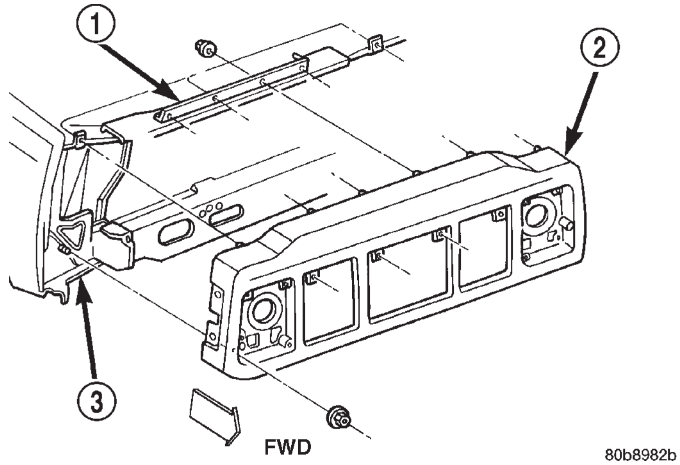


Fig. 2 Grille Opening Panel

1 – SUPPORT BRACKET
2 – GRILLE OPENING PANEL
3 – BODY

(3) Position GOP on vehicle.

(4) Install nuts attaching GOP to front fenders. Tighten nuts to 4 N·m (38 in-lbs) torque.

(5) Install nuts attaching GOP to support bracket. Tighten nuts to 4 N·m (38 in-lbs) torque.

(6) Install headlamps and park/turn signal lamps.

(7) Install grille.

(8) Install side marker lamps.

(9) Install headlamp bezels.

(10) Adjust headlamp aim, if necessary.

HOOD

REMOVAL

(1) Raise hood.

(2) Disconnect underhood lamp wire harness connector, if equipped.

(3) Disconnect release cable from latch release bellcrank.

(4) Remove latch release cable clips and remove cable from hood (Fig. 3).

(5) Mark location of hood, hinges and hinge shims for installation.

(6) Remove bolts that attach hinges to hood.

(7) Remove hood from vehicle with aid of a helper.

INSTALLATION

(1) Position hood on shims and hinges; finger-tighten hinge bolts.

(2) Align hinges and shims with reference marks and tighten hinge bolts.

(3) Connect latch release cable and latch connecting rod to bellcrank.

(4) Attach latch release cable to clips.

(5) Connect underhood lamp wire harness connector.

REMOVAL AND INSTALLATION (Continued)

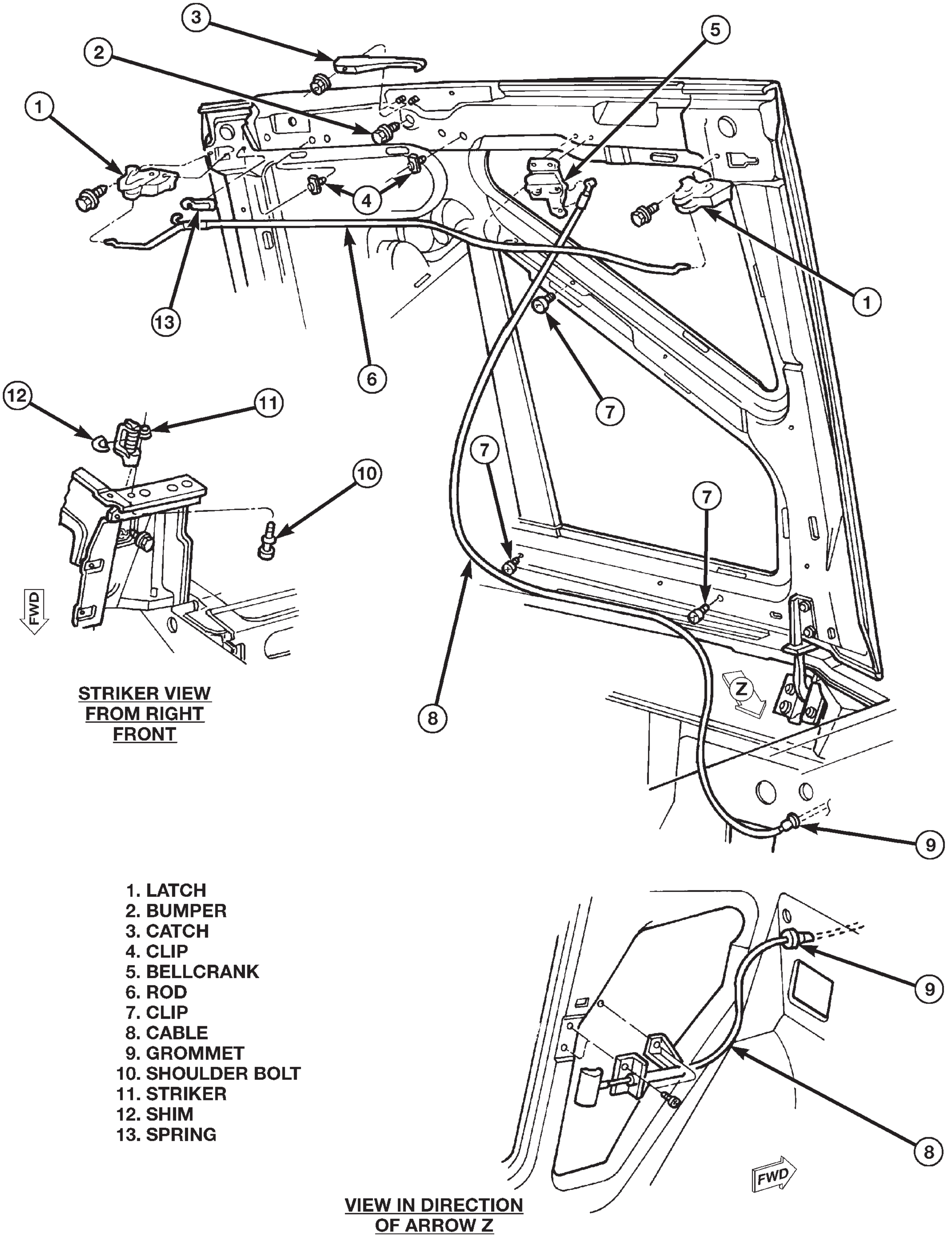


Fig. 3 Hood Components

REMOVAL AND INSTALLATION (Continued)

HOOD HINGE

REMOVAL

(1) Raise and support hood.
(2) Using a grease pencil or equivalent, mark position of hood.
(3) Remove seal from hinge base (Fig. 4).
(4) Remove hinge retaining nuts from studs.

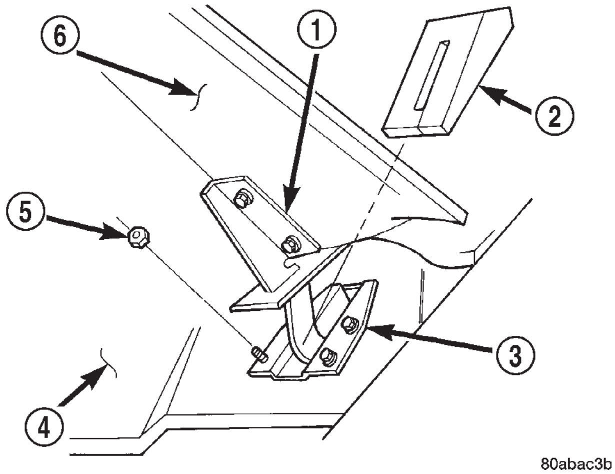


Fig. 4 Hood Hinge and Seal

1 – HINGE
2 – SEAL
3 – HINGE BASE
4 – DASH PANEL
5 – NUT
6 – HOOD

INSTALLATION

(1) Position hinge over studs and align with reference marks.
(2) Install nuts.

NOTE: If a replacement hinge seal is being installed, position it around hinge arm, force it against hinge base.

(3) Position hinge seal around hinge arm and on hinge base.
(4) Adjust hood as necessary.

HOOD LATCH

REMOVAL

(1) Remove the screw that attaches the latch to the hood inner panel (Fig. 5).
(2) Disconnect the latch connecting rod.
(3) Remove the latch from the hood.

INSTALLATION

(1) Connect the latch to the latch connecting rod and

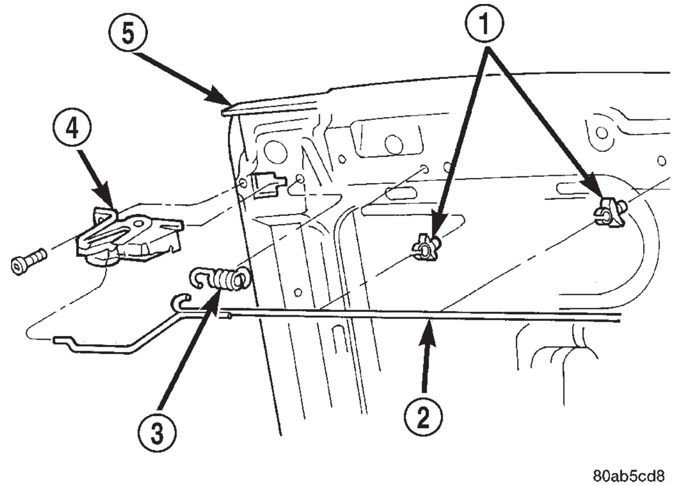


Fig. 5 Hood Latch

1 – RETAINER CLIP
2 – LATCH CONNECTING ROD
3 – ROD SPRING
4 – HOOD LATCH
5 – HOOD

(2) Position the latch on the hood inner panel.
(3) Install the screw that attaches the latch to the hood inner panel.

HOOD LATCH STRIKER

REMOVAL

(1) Remove headlamp bezel.
(2) Remove parklamp.
(3) Release the spring attaching the headlamp mounting bucket to the grille opening panel (GOP).
(4) Remove the headlamp with mounting bucket attached from the adjusting screws.
(5) Remove the upper bolt attaching the striker to the top of the (GOP).
(6) Remove the lower bolt attaching the striker to the (GOP).
(7) Remove the striker and shims.

INSTALLATION

(1) Position the shims and striker on the (GOP) and install the bolts.
(2) Install the headlamp and mounting bucket.
(3) Install parklamp.
(4) Install the headlamp bezel.
(5) Test the striker/hood alignment by opening and closing the hood several times. Adjust the striker, if necessary.

REMOVAL AND INSTALLATION (Continued)

HOOD RELEASE CABLE

REMOVAL

(1) Drill out bellcrank to hood rivet heads and remove rivets (Fig. 6).

(2) Disconnect bellcrank from latch rod and hood release cable. Remove bellcrank from hood.

(3) Disconnect hood release cable from clips on hood.

(4) Remove left cowl side trim panel.

(5) Remove cable bracket screws from cowl side panel.

(6) Route cable through dash panel and remove it from under instrument panel.

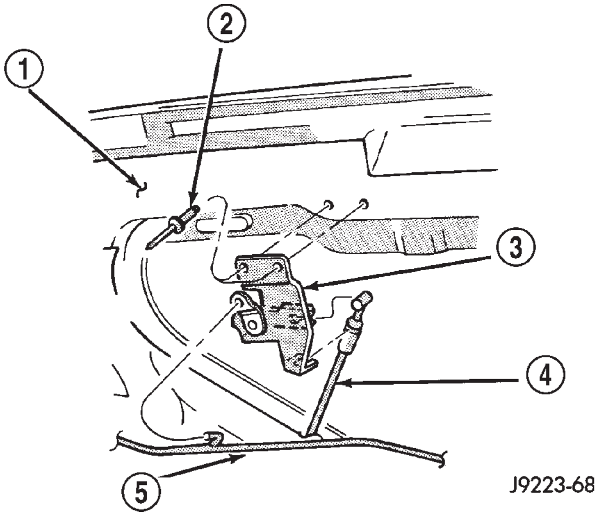


Fig. 6 Hood Release Cable Bellcrank

1 – HOOD INNER PANEL
2 – RIVET
3 – BELLCRANK
4 – LATCH RELEASE CABLE
5 – LATCH CONNECTING ROD

INSTALLATION

(1) Insert replacement cable end through hole in dash panel into engine compartment.

(2) Route cable forward and seat grommet in dash panel.

(3) Position cable bracket on cowl side panel and install screws.

(4) Install left cowl side trim panel.

(5) Connect cable and latch rod to bellcrank.

(6) Position bellcrank on hood and install rivets.

(7) Attach cable to clips.

(8) Test release cable for proper operation.

HOOD SAFETY LATCH

REMOVAL

(1) Open and support hood.

(2) Remove the nuts attaching the safety latch to the inner hood panel (Fig. 7).

(3) Separate the safety latch from the hood.

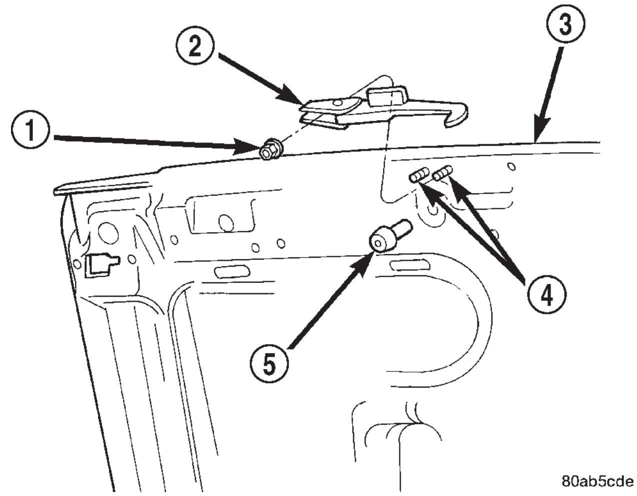


Fig. 7 Hood Safety Latch

1 – NUT
2 – HOOD SAFETY LATCH
3 – HOOD
4 – STUD
5 – HOOD BUMPER

INSTALLATION

(1) Position the safety latch on the hood.

(2) Install the nuts attaching the safety latch to the inner hood panel.

(3) Close hood.

SAFETY LATCH STRIKER

REMOVAL

(1) Remove striker screws from radiator support crossmember (Fig. 8).

(2) Remove striker from crossmember.

INSTALLATION

(1) Position striker on radiator support crossmember and install screws.

(2) Test safety latch operation.

HOOD SILENCER PAD

REMOVAL

(1) Open and support hood.

(2) Remove the hood latch release bellcrank.

(3) Remove the clips attaching the latch connecting rod to the hood inner panel.

(4) Remove the retainers attaching the hood silencer pad to the inner hood panel (Fig. 9).

(5) Separate the hood silencer pad from the hood.

REMOVAL AND INSTALLATION (Continued)

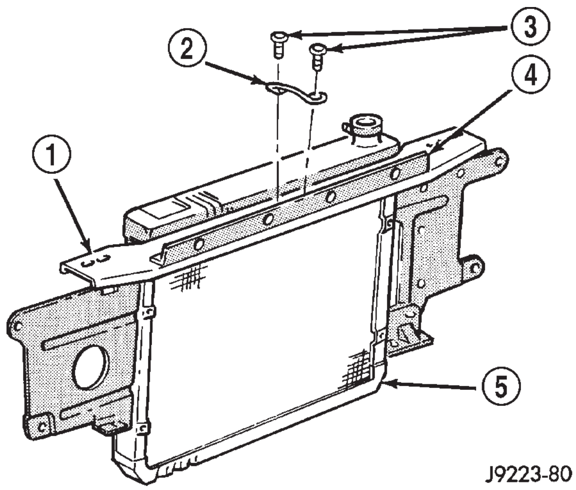


Fig. 8 Hood Safety Latch Striker

1 – RADIATOR SUPPORT CROSSMEMBER
2 – HOOD SAFETY LATCH STRIKER
3 – SCREW
4 – GOP BRACKET
5 – RADIATOR

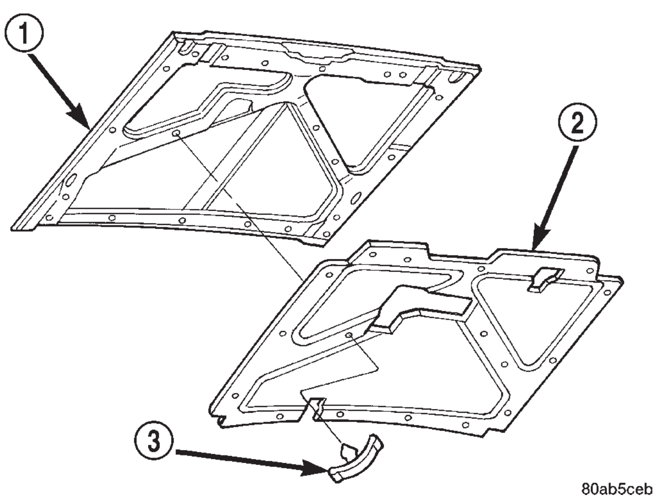


Fig. 9 Hood Silencer Pad

1 – HOOD
2 – SILENCER PAD
3 – RETAINER

INSTALLATION

(1) Position the hood silencer pad on the hood inner panel.
(2) Install the retainers attaching the hood silencer pad to the inner hood panel.
(3) Install the clips attaching the latch connecting rod to the hood inner panel.
(4) Install the hood latch release bellcrank.
(5) Close hood.

COWL WEATHERSTRIP

REMOVAL

The cowl weatherstrip is attached to the cowl with adhesive tape.
(1) Peel weatherstrip from cowl (Fig. 10).

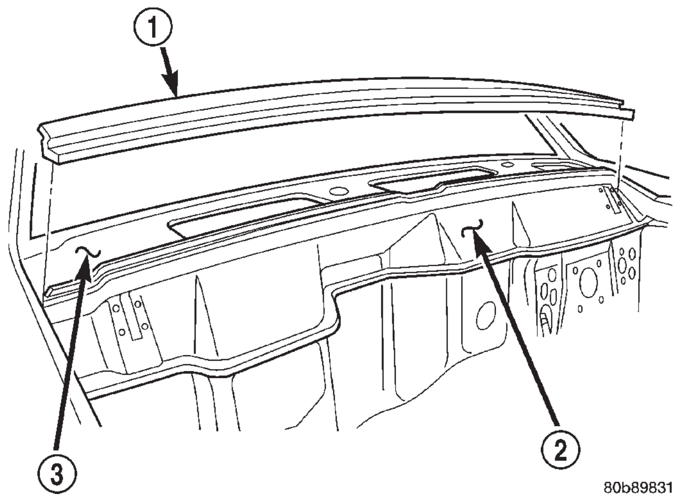


Fig. 10 Cowl Weatherstrip

1 – WEATHERSTRIP
2 – DASH PANEL
3 – COWL

INSTALLATION

(1) Clean contact surface with Mopar Super Kleen or equivalent.
(2) Position weatherstrip on cowl.
(3) Press weatherstrip into place.

COWL GRILLE

REMOVAL

(1) Remove the windshield wiper arms from the pivots.
(2) Remove the screws that attach the grille to the cowl.
(3) Remove the windshield washer tubes from the nozzles.
(4) Remove the cowl grille and screen from the cowl (Fig. 11).

INSTALLATION

CAUTION: The washer fluid tubes must be routed and installed so that they are not pinched.

(1) Position the cowl grille and screen on the cowl.
(2) Install the windshield washer tubes on the nozzles.
(3) Install the cowl screen and grille screws with new sealer. Tighten in sequence (Fig. 12).

REMOVAL AND INSTALLATION (Continued)

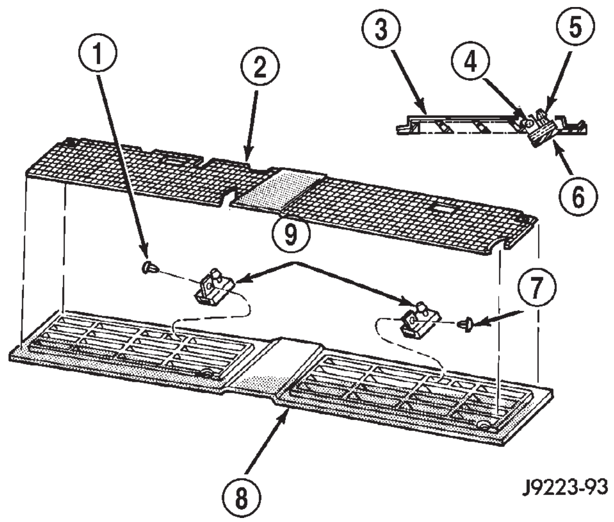


Fig. 11 Cowl Grille, Screen & Washer Nozzles

1 – PLASTIC PUSH-RIVET
2 – SCREEN
3 – SCREEN
4 – RIVET
5 – NOZZLE
6 – GRILLE
7 – PLASTIC PUSH-RIVET
8 – GRILLE
9 – NOZZLE

NOTE: Force the cowl grille rearward while tightening the screws.

(4) Install the windshield wiper arms on the pivots.

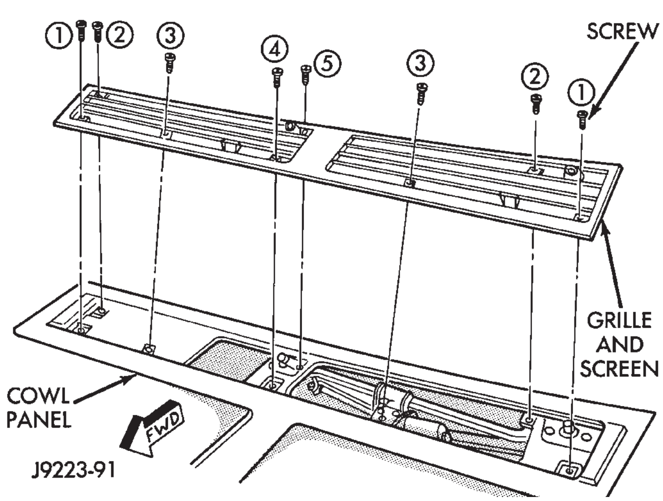


Fig. 12 Cowl Grille Screw Tightening Sequence

BODY DECALS

Small nicks, scratches and other surface marks in a decal can be touched-up with paint.

To eliminate blisters and air bubbles in a decal, pierce them with a needle or pin.

A heat gun can also be used to remove small wrinkles in a decal.

Decal replacement requires that the metal repair and paint refinish be completed first.

The work area temperature should be between 21°C (70°F) and 32°C (90°F). **A decal should not be replaced if the work area temperature is less than 21°C (70°F).**

The following equipment and material are necessary for removal and installation:

- Liquid dish detergent (for the wetting solution).
- Mixture of wetting solution.
- Commercial wax and silicone removal solution.
- Isopropyl (rubbing) alcohol.
- Small squeegee (plastic or hard rubber).
- Water bucket and sponge.
- Clean wiping rags or paper towels.
- Heat gun (or infra-red heat bulb).
- Wax pencil.
- Sharp knife, single edge razor blade or X-acto knife.
- Pair of scissors.
- Needle or pin.

WARNING: USE DECAL REMOVAL SOLUTION IN A WELL-VENTILATED AREA ONLY.

A decal removal solution can be used for removal at areas where a heat gun is ineffective. Follow the manufacturers instructions whenever this type of product is used.

REMOVAL

(1) Clean the repaired surface as necessary.

(2) Start at one end of the decal and apply heat with a heat gun. Slowly peel the decal from the panel by pulling it back. **Do not pull the decal outward from panel.**

INSTALLATION

(1) The area that will be covered by the decal must be cleaned with cleaning solution.

(2) Freshly painted surfaces must be thoroughly dry.

(3) Clean the painted surface with a commercial wax and silicone removal solution. Wipe the surface with a clean cloth and allow it to dry.

(4) Prepare a wetting solution by mixing two or three teaspoons of dish detergent with 1 gallon of water. Do not use soap.

NOTE: Too much detergent will reduce the effectiveness of the mixture.

(5) Use a clean sponge and apply the wetting solution to the adhesive side of the decal and to the painted panel surface. The wetting solution will permit ease of decal movement when positioning it.

REMOVAL AND INSTALLATION (Continued)

(6) Align a straight edge with the existing decal ends (Fig. 13).

NOTE: If applicable, the body panel character line can be used as the decal alignment reference.

(7) Position the decal and carrier on the body panel (Fig. 14) and the mark length with a wax pencil.

(8) Position the decal and carrier on the body panel and hold it in-place with masking tape.

(9) Lift the bottom edge of decal and carrier. Use the tape sections as hinges, and reverse the position of decal and carrier.

CAUTION: Always remove the carrier from the decal, never remove the decal from carrier

(10) Bend a corner of carrier outward and then, with a flick of the finger, separate the corner of carrier from the decal.

(11) Return the decal back to its original position. If a solution is being used, position adhesive side of the decal on panel. Apply the solution to the outside of the decal.

(12) Hold the decal against the panel surface while separating the carrier from the decal.

(13) If applicable, remove the cover from face of decal.

(14) Using a squeegee smooth out the decal to remove wrinkles and/or air bubbles.

(15) Inspect the decal with reflected light to find any damage. Remove all the air and/or moisture bubbles.

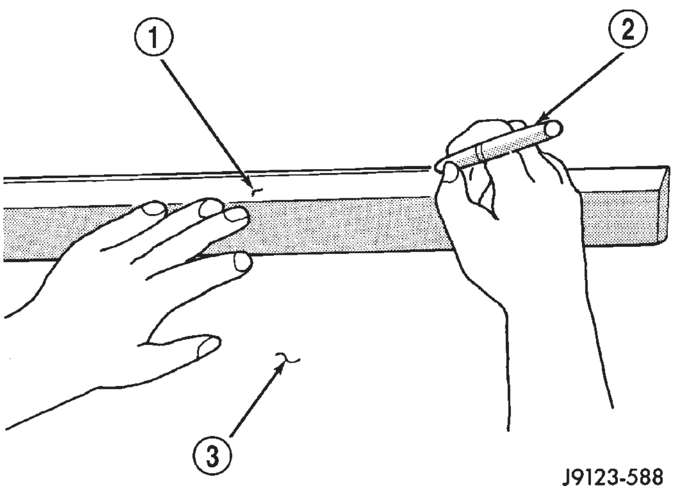


Fig. 13 Decal Alignment Reference Mark

1 – STRAIGHT EDGE
2 – GREASE PENCIL
3 – BODY PANEL

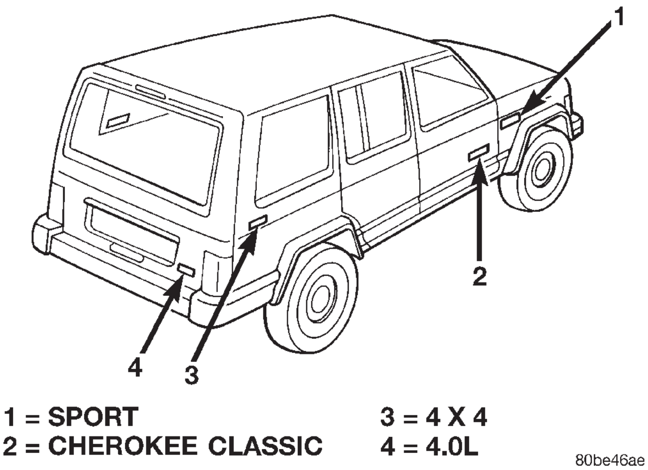


Fig. 14 Body Decals

EXTERIOR NAMEPLATES

REMOVAL

NOTE: Exterior nameplates are attached to body panels with adhesive tape.

(1) Apply a length of masking tape on the body, parallel to the top edge of the nameplate to use as a guide, if necessary.

(2) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun. Do not exceed 52°C (120°F) when heating emblem.

(3) Insert a plastic trim stick or a hard wood wedge behind the emblem to separate the adhesive backing from the body.

(4) Clean adhesive residue from body with MOPAR Super Clean solvent or equivalent.

INSTALLATION

(1) Remove protective cover from adhesive tape on back of emblem.

(2) Position emblem properly on body (Fig. 15).

(3) Press emblem firmly to body with palm of hand.

(4) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun to assure adhesion. Do not exceed 52°C (120°F) when heating emblem.

REMOVAL AND INSTALLATION (Continued)

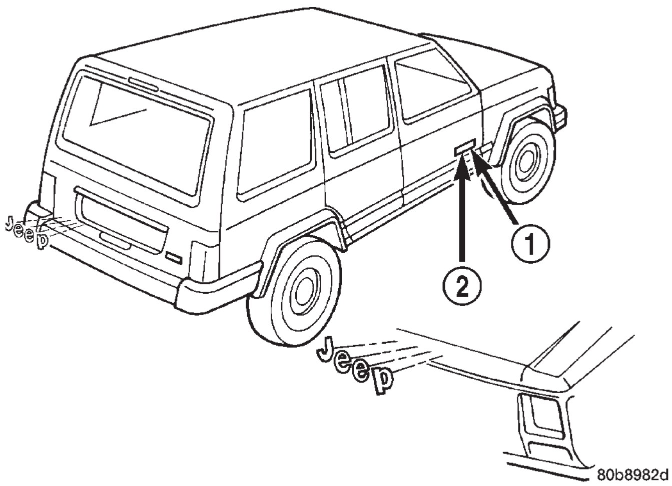


Fig. 15 Exterior Nameplates

1 – CHEROKEE
2 – LIMITED-SPORT-CLASSIC

SIDE VIEW MIRROR

REMOVAL

(1) Remove the door trim panel.
(2) Remove the screw attaching the mirror trim cover/speaker grille to the door inner panel.
(3) remove push-in fastener attaching trim cover to door inner panel (use special tool C-4829).
(4) Disconnect the power mirror wire connector, if equipped.
(5) Remove the screws attaching the mirror to the door (Fig. 16).
(6) Separate the mirror from the door.

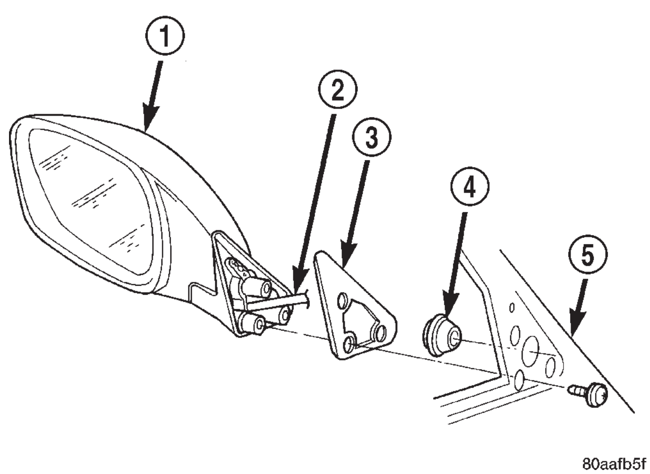


Fig. 16 Side View Mirror

1 – SIDE VIEW MIRROR
2 – WIRE HARNESS
3 – SEAL
4 – GROMMET
5 – DOOR

INSTALLATION

(1) Position the mirror on the door.
(2) Install the screws attaching the mirror to the door.
(3) Connect the power mirror wire connector, if equipped.
(4) Install new push-in fastener.
(5) Install the mirror trim cover/speaker grille.
(6) Install the door trim panel.

FRONT FENDER FLARE

REMOVAL

(1) Remove the screw attaching the lower part of flare to the bottom of the fender.
(2) Remove the nuts attaching the fender flare retainer to the wheelhouse splash shield (Fig. 17).
(3) Remove the liner from the fender.
(4) Remove the fasteners attaching the fender flare and retainer to the fender.
(5) Separate the fender flare and retainer from the fender.

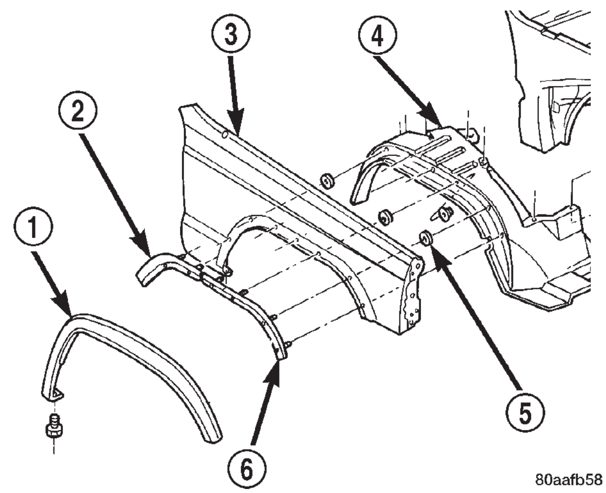


Fig. 17 Fender Flare

1 – FENDER FLARE
2 – RETAINER
3 – FENDER
4 – LINER
5 – PUSH NUT
6 – RETAINER

INSTALLATION

(1) Position the fender flare and retainer on the fender.
(2) Install the nuts attaching the fender flare and retainer to the wheelhouse fender.
(3) Install the screw attaching the lower part of flare to the bottom of the fender.

REMOVAL AND INSTALLATION (Continued)

FRONT WHEELHOUSE LINER

REMOVAL

(1) Hoist vehicle.
(2) Remove tire.
(3) Remove the push-in fasteners attaching the wheelhouse liner to the inner fender.
(4) Separate the wheelhouse liner from the fender (Fig. 18).

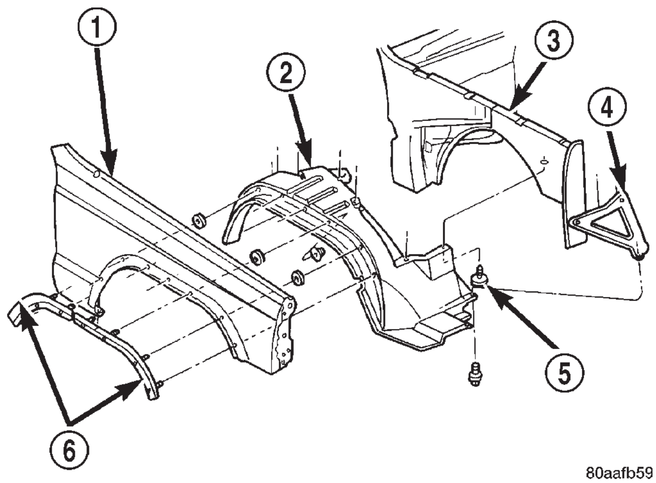


Fig. 18 Front Wheelhouse Liner

1 – FENDER
2 – WHEELHOUSE LINER
3 – INNER FENDER PANEL
4 – BRACE
5 – PUSH-IN FASTENER
6 – RETAINER

INSTALLATION

(1) Position the wheelhouse liner in the fender.
(2) Install new push-in fasteners attaching the wheelhouse liner to the inner fender.
(3) Install tire.
(4) Lower vehicle.

RIGHT FRONT FENDER

REMOVAL

(1) Raise and support the hood.
(2) Remove the grille opening panel (GOP).
(3) If equipped, remove the radio antenna mast, and components from the fender.
(4) Remove the coolant recovery bottle.
(5) Raise and support the vehicle.
(6) Remove the right front wheel.
(7) Remove the front bumper end cap.
(8) Remove the wheelhouse liner.
(9) Remove the fender flare and retainers.
(10) Disconnect all wire harness connectors.
(11) Remove the air deflector.
(12) Remove the fender lower screws (Fig. 19).
(13) Remove the fender top, front and the rear screws.
(14) Remove the screws attaching the fender to the inner support bracket (Fig. 20).
(15) Separate the fender from the inner fender panel.

INSTALLATION

(1) Position the fender on the inner fender panel.
(2) Install all fender screws finger-tight.
(3) Align the fender with the body panels and tighten the screws attaching the fender to the body panels.
(4) Install the air deflector.
(5) Install the fender flare and retainers.
(6) Install the wheelhouse liner.
(7) Install the front bumper end cap.
(8) Install the wheel, remove the support and lower the vehicle.
(9) Install the grille opening panel (GOP).
(10) Install the radio antenna.

LEFT FRONT FENDER

REMOVAL

(1) Raise and support the hood.
(2) Remove the grille opening panel (GOP).
(3) Raise and support the vehicle.
(4) Remove the left front wheel.
(5) Remove the front bumper end cap.
(6) Remove the fender flare and retainers.
(7) Remove the wheelhouse liner.
(8) Remove the air deflector.
(9) Remove the fender lower screws.
(10) Remove the fender top, front and the rear screws.
(11) Remove the screws attaching the fender to the inner support bracket.
(12) Separate the fender from the inner fender panel.

INSTALLATION

(1) Position the fender on the inner fender panel.
(2) Install all fender screws finger-tight.
(3) Align the fender with the body panels and tighten the screws attaching the fender to the body panels.
(4) Install the air deflector.
(5) Install the wheelhouse liner.
(6) Install the fender flare and retainers.
(7) Install the front bumper.
(8) Install the wheel, remove the support and lower the vehicle.
(9) Install the grille opening panel (GOP).

REMOVAL AND INSTALLATION (Continued)

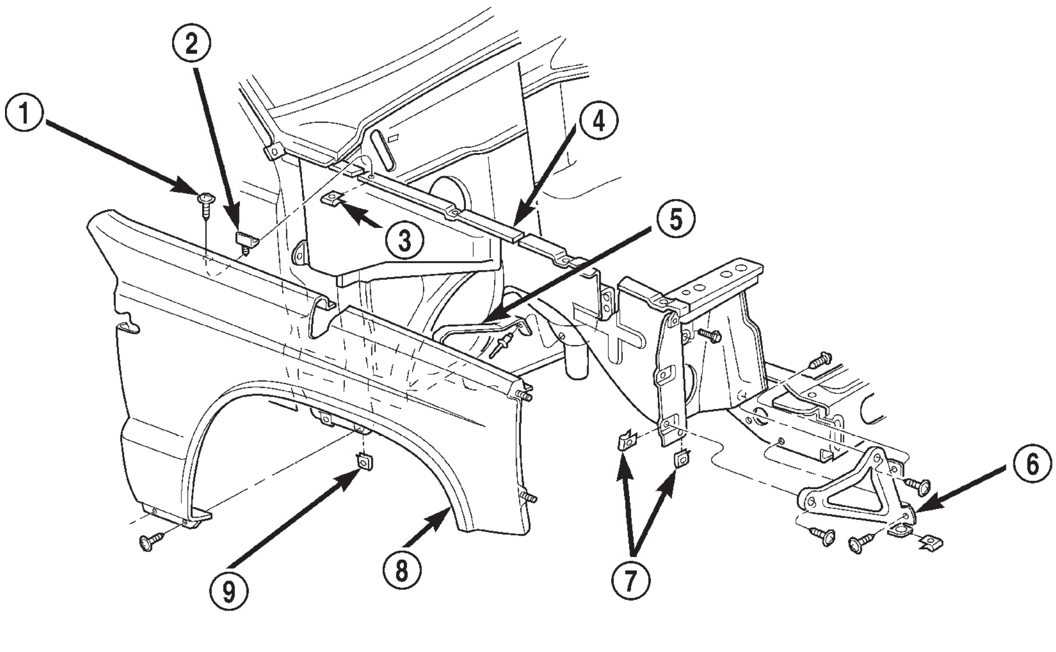


Fig. 19 Right Front Fender

1 – SCREW
2 – HOOD BUMPER
3 – U-NUT
4 – INNER FENDER PANEL
5 – FENDER BRACE
6 – FRAME SILL-TO-BAFFLE BRACE
7 – U-NUT
8 – OUTER FENDER PANEL
9 – U-NUT

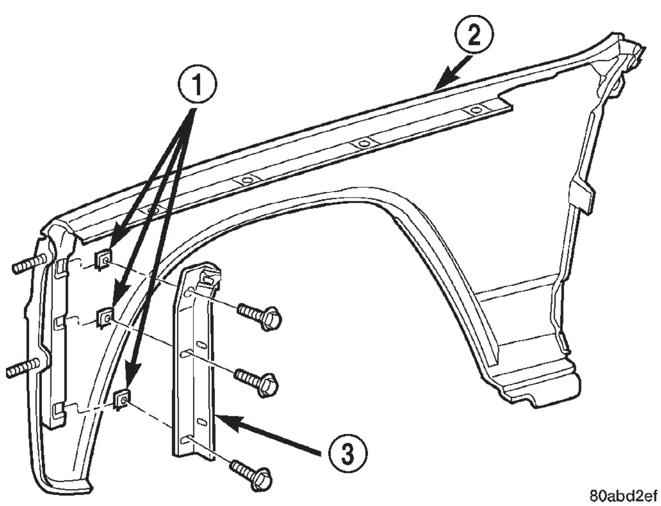


Fig. 20 Inner Support Bracket

1 – U-NUT
2 – FRONT FENDER
3 – SUPPORT BRACKET

FRONT DOOR TRIM PANEL

REMOVAL

(1) Roll window down.
(2) Remove window crank, if equipped (Fig. 21).
(3) Remove the screws attaching the trim panel to the door inner panel (Fig. 22) and (Fig. 23).
(4) Separate the trim panel fasteners from door inner panel with a pry tool (use special tool C-4829) (Fig. 24).
(5) Lift the trim panel up and outward to separate from the inner belt seal.
(6) Move the door trim panel outward and disconnect the handle-to-latch rods.
(7) Disconnect the power door locks/windows/mirrors wire harness connectors, if equipped.
(8) Remove the trim panel from door.

INSTALLATION

(1) Replace any broken or damaged push-in fasteners.
(2) Connect the power door locks/windows/mirrors wire harness connectors, if equipped.
(3) Move the door trim panel outward and connect the handle-to-latch rods.
(4) Position the trim panel on the inner belt seal and push down to seat.
(5) Align the locating pins and push- (Fig. 25) in fasteners. Press inward to secure.
(6) Install the screws attaching the trim panel to the door inner panel.
(7) Install the window crank, if equipped.

REMOVAL AND INSTALLATION (Continued)

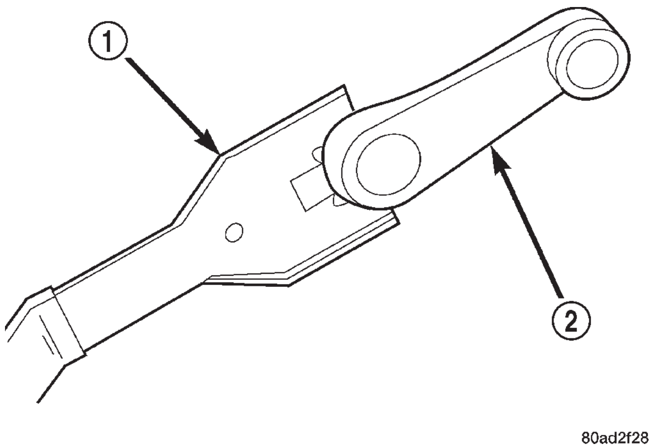


Fig. 21 Window Crank—Typical

1 – WINDOW CRANK REMOVAL TOOL
2 – WINDOW CRANK

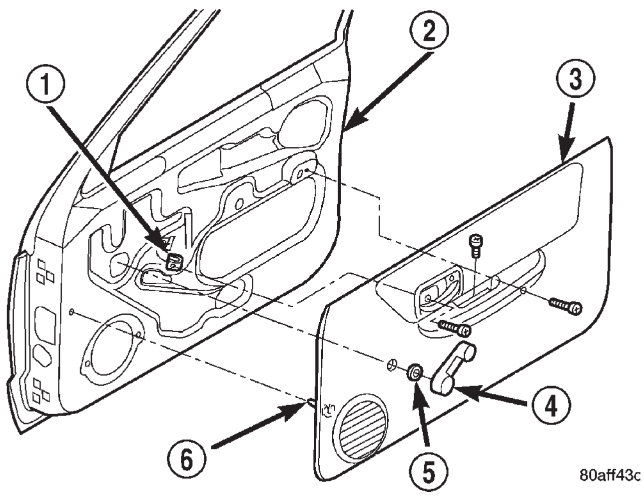


Fig. 22 Front Door Trim Panel-Manual Window

1 – U-NUT
2 – DOOR
3 – TRIM PANEL
4 – WINDOW CRANK
5 – SPACER
6 – PUSH-IN FASTENER

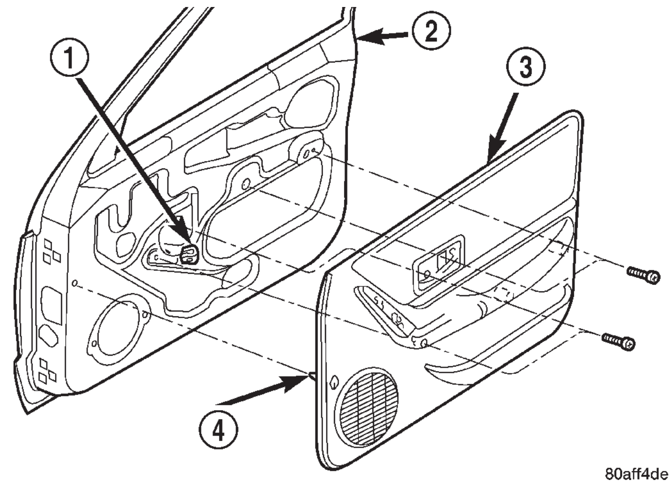


Fig. 23 Front Door Trim Panel-Power Window

1 – U-NUT
2 – DOOR
3 – TRIM PANEL
4 – PUSH-IN FASTENER

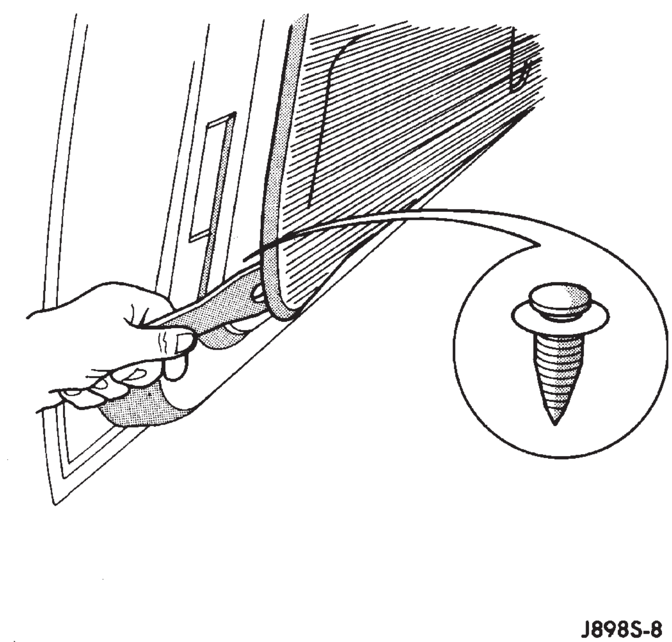


Fig. 24 Detaching Trim Panel Push-In Fasteners

FRONT DOOR WATERDAM

REMOVAL

The waterdam is attached to the door inner panel with a butly adhesive. If cohesive separation of the butly between the waterdam and door inner panel occurs during the removal process, cut the strands of butly with a razor knife or equivalent.

(1) Remove door trim panel.

(2) Disengage clips attaching wire harnesses to the door inner panel.

(3) Push the harnesses/connectors through the waterdam and into the door.

(4) Grasp the upper and lower rearward corners of the waterdam and rapidly peel back the waterdam from the door inner panel.

(5) Separate the waterdam from the door inner panel.

INSTALLATION

(1) Route the latch rods through the waterdam.

(2) Position the waterdam on the door, apply adhesive as necessary and press into place.

(3) Route the harnesses/connectors through the waterdam.

REMOVAL AND INSTALLATION (Continued)

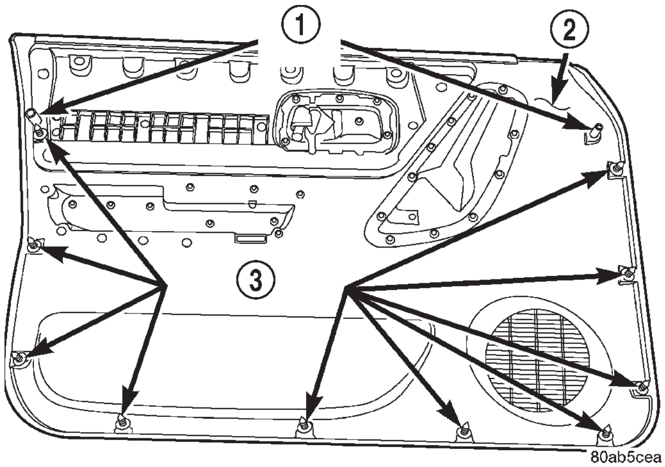


Fig. 25 Push-In Fasteners

1 – LOCATING PINS
2 – TRIM PANEL
3 – PUSH-IN FASTENERS

(4) Engage clips attaching wire harnesses to the door inner panel.
(5) Install door trim panel.

FRONT DOOR

REMOVAL

(1) Remove door restraint (check) retaining pin.
(2) For vehicles equipped with power windows, power mirrors and power door locks, remove trim panel and waterdam. Disconnect all components and route wire harness out of door.
(3) Remove bolts that attach hinge to door (Fig. 26).
(4) Remove door from vehicle.

INSTALLATION

(1) Position door in body opening.
(2) Align door hinges, plates and shims and install bolts. Tighten bolts to 3 N·m (2 ft. lbs.) torque.
(3) Install door restraint (check) pin.
(4) If applicable, route and connect wire harness connectors.
(5) Install door waterdam and trim panel.

FRONT DOOR HINGE

REMOVAL

(1) Remove door restraint (check) retaining pin.
(2) Remove door hinge bolts and shims (Fig. 26).
(3) Retain door hinge shims for correct installation.

INSTALLATION

(1) Position hinge plates and shims on door face.

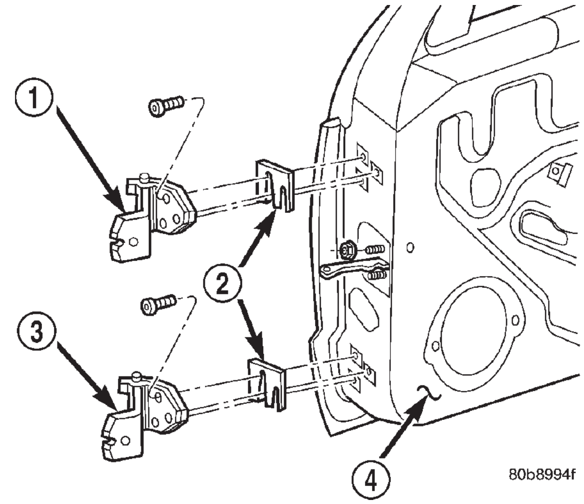


Fig. 26 Front Door Hinge

1 – UPPER HINGE
2 – SHIM
3 – LOWER HINGE
4 – FRONT DOOR

(2) Align door hinges and shims with bolt holes and install hinge bolts. Tighten bolts to 3 N·m (2 ft. lbs.) torque.
(3) Adjust/align latch striker and latch as necessary.
(4) Install door restraint (check) retaining pin.

FRONT DOOR RESTRAINT

REMOVAL

(1) Remove door trim panel.
(2) Remove door radio speaker from door inner panel.
(3) Remove door restraint (check) retaining pin from bracket with a punch.
(4) Remove nuts and remove restraint via speaker opening. (Fig. 27).

INSTALLATION

(1) Position door restraint in door by way of opening and install nuts.

NOTE: Ensure the spring on the door restraint is facing outward.

(2) Position door restraint in bracket with holes aligned and insert retaining pin.
(3) Install radio speaker and door trim panel.

FRONT DOOR OUTSIDE HANDLE

REMOVAL

(1) Remove the door trim panel and waterdam.

REMOVAL AND INSTALLATION (Continued)

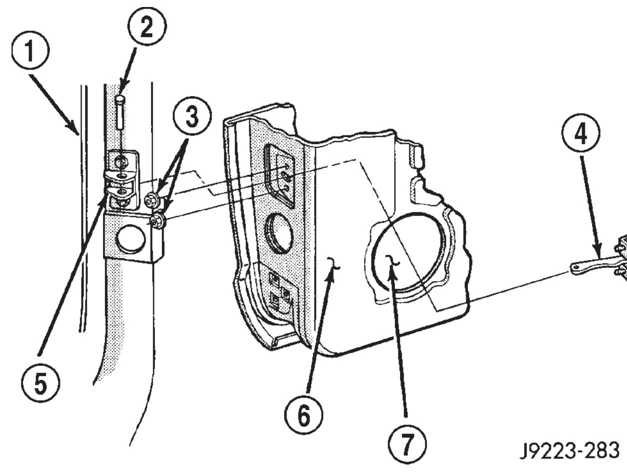


Fig. 27 Door Restraint (Check)

1 – A-PILLAR
2 – RETAINING PIN
3 – NUT
4 – DOOR RESTRAINT
5 – RESTRAINT BRACKET
6 – DOOR INNER PANEL
7 – SPEAKER OPENING

(2) Remove the access hole cover and remove the rearward nut attaching the door handle to the door. (Fig. 28).

(3) Disconnect the handle-to-latch rod from the handle latch release lever arm.

(4) Remove the forward nut attaching the handle to the door.

(5) Separate the handle from the door.

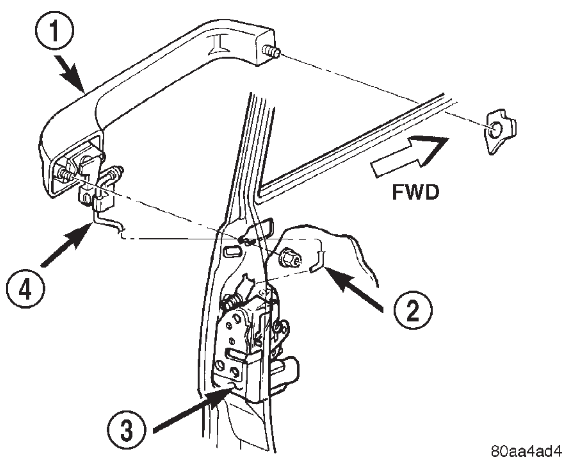


Fig. 28 Front Door Outside Handle

1 – OUTSIDE DOOR HANDLE
2 – OUTSIDE HANDLE TO LATCH ROD
3 – DOOR LATCH
4 – OUTSIDE HANDLE TO LATCH ROD

INSTALLATION

(1) Position the handle in the door.

(2) Install the forward nut attaching the handle to the door.

(3) Connect the latch to handle rod, to the handle latch release lever arm.

(4) Install the rearward nut attaching the door handle to the door.

(5) Install the access hole cover.

(6) Install the door waterdam and trim panel.

FRONT DOOR LOCK CYLINDER

REMOVAL

(1) Remove the door trim panel.

(2) Peel back waterdam to access lock cylinder.

(3) Disconnect the door latch-to-lock cylinder rod at the door latch (Fig. 29).

(4) Remove the lock cylinder retainer clip.

(5) Remove the lock cylinder.

(6) If applicable, remove the door latch-to-lock cylinder rod from the original lock cylinder. Connect it to the replacement lock cylinder.

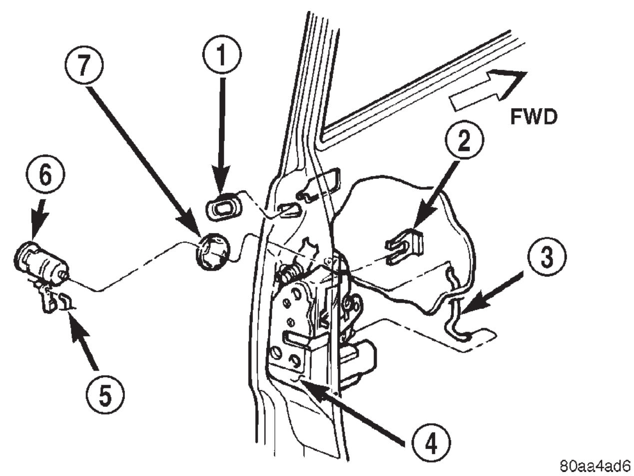


Fig. 29 Door Lock Cylinder

1 – ACCESS PLUG
2 – RETAINER
3 – LOCK CYLINDER TO LATCH ROD
4 – LATCH
5 – LOCK CYLINDER TO LATCH ROD
6 – LOCK CYLINDER
7 – GASKET

INSTALLATION

(1) Position the lock cylinder and in the door opening.

(2) Install the retainer clip.

(3) Connect the door latch-to-lock cylinder rod to the door latch.

(4) Press the waterdam into position.

(5) Install the door trim panel.

REMOVAL AND INSTALLATION (Continued)

LOCK CYLINDERS

Ignition, door, deck lid, and rear hatch lock cylinders are all codable to the key. Lock barrels, tumblers, and tumbler springs are available to allow the technician to change replacement locks cylinders to match the customer's original key set. See the appropriate section in this manual for lock cylinder removal. See the Mopar® catalogue for part numbers and lock coding procedures.

FRONT DOOR LATCH

REMOVAL

(1) Remove door trim panel and waterdam.
(2) Remove screws attaching latch to door.
(3) Disconnect all rods from latch (Fig. 30).
(4) Disconnect power lock motor wire connector, if equipped.
(5) Remove latch from door face.

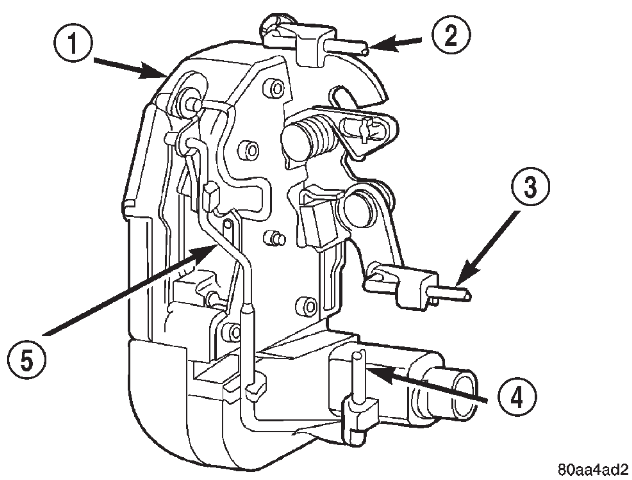


Fig. 30 Door Latch

1 – FRONT DOOR LATCH
2 – LOCK BUTTON TO LATCH ROD
3 – INSIDE HANDLE TO LATCH ROD
4 – OUTSIDE HANDLE TO LATCH ROD
5 – LOCK CYLINDER TO LATCH ROD

INSTALLATION

(1) Position latch on door face.
(2) Connect power lock motor wire connector, if equipped.
(3) Connect all rods to latch.
(4) Install screws attaching latch to door. Tighten screws to 11 N·m (8 ft. lbs.) torque.
(5) Install waterdam and door trim panel.

FRONT DOOR LATCH STRIKER

REMOVAL

(1) Using a grease pencil or equivalent, mark position of striker.
(2) Remove screws attaching striker to B-pillar (Fig. 31).
(3) Separate striker from B-pillar.

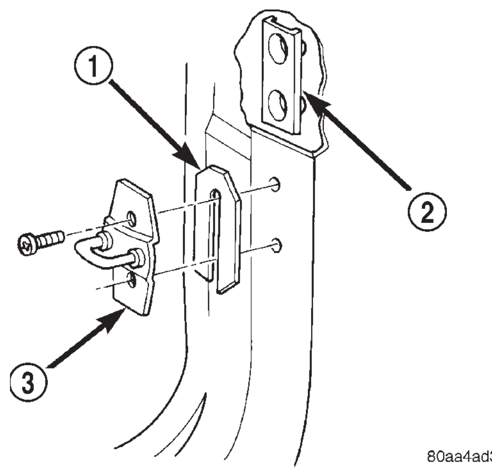


Fig. 31 Front Door Latch Striker

1 – SPACER
2 – TAPPING PLATE
3 – STRIKER

INSTALLATION

(1) Position and align striker on B-pillar.
(2) Install screws attaching striker to B-pillar. Tighten screws to 28 N·m (20 ft. lbs.) torque.

FRONT DOOR INSIDE HANDLE ACTUATOR

REMOVAL

The front door inside handle actuator is heat staked to the front door trim panel during the manufacturing process.
(1) Remove the door trim panel.
(2) Using an X-ACTO knife or equivalent, cut the melted tabs securing the inside handle to the door trim panel.
(3) Separate the inside handle from the trim panel.

INSTALLATION

(1) Position the inside handle in the trim panel.
(2) Heat stake the inside handle to the trim panel.
(3) Install the door trim panel.

FRONT DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Roll window down.
(2) Remove door trim panel.
(3) Pull up on the rear corner of the weatherstrip and lift from the door (Fig. 32).

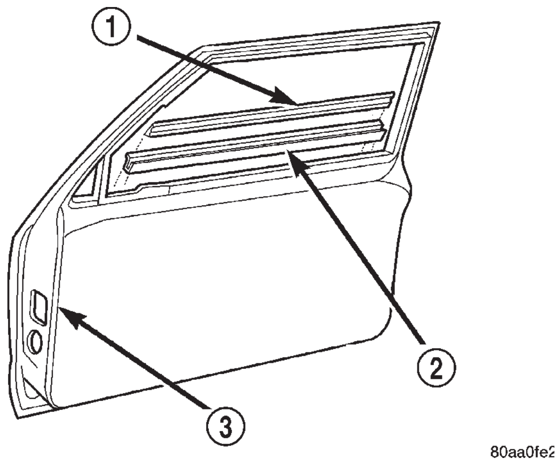


Fig. 32 Front Door Inner/Outer Belt Weatherstrip

1 – OUTER BELT WEATHERSTRIP
2 – INNER BELT WEATHERSTRIP
3 – DOOR INNER PANEL

INSTALLATION

(1) Position the weatherstrip on the door.
(2) Push weatherstrip down to seat onto door.
(3) Install door trim panel.

FRONT DOOR OUTER BELT WEATHERSTRIP

REMOVAL

(1) Roll window down.
(2) Using a trim stick, pry up the rear outer corner of the weatherstrip.
(3) Lift the weatherstrip up to separate from the door (Fig. 32).

INSTALLATION

(1) Position the weatherstrip on the door.
(2) Push weatherstrip down to seat onto door.

FRONT DOOR GLASS RUN CHANNEL WEATHERSTRIP

REMOVAL

(1) Remove door trim panel.
(2) Remove waterdam.
(3) Starting at rear corner, peel weatherstrip from around door frame.

INSTALLATION

(1) Install the weatherstrip in the following sequence:
- Press weatherstrip into upper rear corner.
- Press weatherstrip into lower front corner.
- Work/press the weatherstrip upward and to the upper front corner, seat the weatherstrip into the channel.
- Continue working/pressing the weatherstrip into the channel along the upper window frame.
- Press weatherstrip into lower rear corner.
- Work/press the weatherstrip upward and to the upper rear corner, seat the weatherstrip into the channel.
- Press the weatherstrip to seat into the front lower glass run channel.

(2) As applicable, move upward and forward evenly until the weatherstrip seal is fully seated in the channel.
(3) Install waterdam.
(4) Install door trim panel.

FRONT DOOR OPENING WEATHERSTRIP

REMOVAL

(1) Remove A-pillar trim panel.
(2) Remove B-pillar upper trim panel.
(3) Remove cowl side trim panel.
(4) Remove inner scuff plate.
(5) Remove B-pillar lower trim panel.
(6) Grasp seal and separate from door opening.

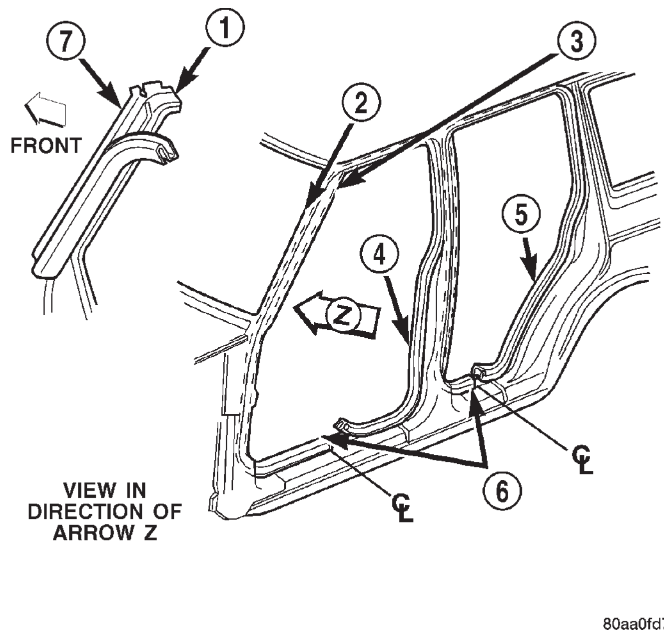


Fig. 33 Door Opening Weatherstrip

1 – FRONT DOOR SEAL
2 – A PILLAR
3 – SECONDARY DOOR SEAL
4 – FRONT DOOR SEAL
5 – REAR DOOR SEAL
6 – ENDS MEET AT CENTERLINE
7 – A PILLAR

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position weatherstrip at corners.

(2) Move upward and around edge of door opening. Seat seal on flange.

(3) When installing a door opening weatherstrip seal, start at the door sill center line.

(4) Move upward and around the perimeter of the door opening and seat the weatherstrip on the flange (Fig. 34).

(5) Install cowl side trim panel.

(6) Install inner scuff plate.

(7) Install B-pillar lower trim panel.

(8) Install B-pillar upper trim panel.

(9) Install A-pillar trim panel.

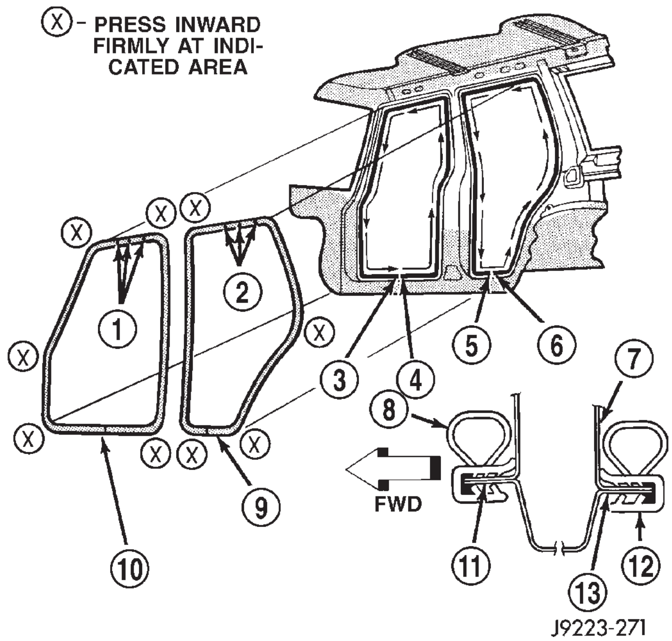


Fig. 34 Door Opening Weatherstrip

1 – VENT HOLES
2 – VENT HOLES
3 – FINISH
4 – START
5 – FINISH
6 – START
7 – B-PILLAR
8 – SEAL
9 – REAR DOOR WEATHERSTRIP SEAL
10 – FRONT DOOR WEATHERSTRIP SEAL
11 – FLANGE
12 – SEAL
13 – FLANGE

FRONT DOOR OPENING SECONDARY WEATHERSTRIP

REMOVAL

The front door opening secondary weatherstrip is attached to the A-pillar with adhesive tape (Fig. 33).

(1) Using a heat gun, heat the weatherstrip and slowly peel the weatherstrip from the A-pillar

INSTALLATION

(1) Clean the contact surface on the A-pillar.

(2) Remove the carrier backing and position the weatherstrip on the A-pillar. Press into place.

FRONT DOOR GLASS EXTERIOR MOLDING

REMOVAL

(1) Open the window completely.

(2) Remove the outer belt weatherstrip.

(3) Pry and pull the molding sections from the door panel flange (Fig. 35).

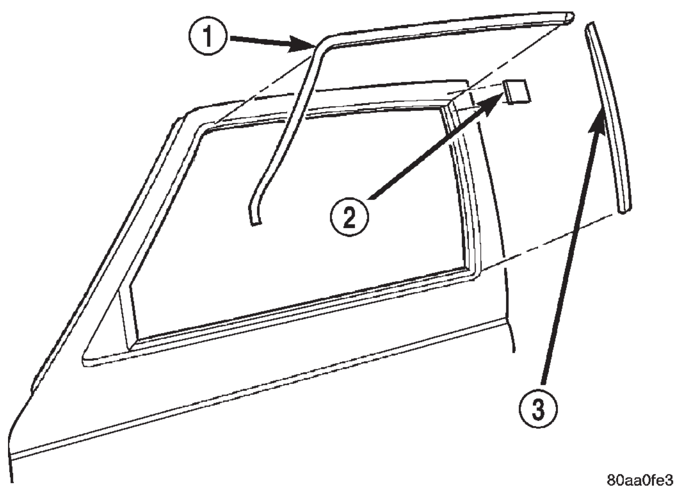


Fig. 35 Front Door Glass Exterior Molding

1 – UPPER MOLDING
2 – SHIM
3 – REAR MOLDING

INSTALLATION

(1) Start at the forward end of the upper molding, force the molding onto the door panel and continue rearward until it is completely seated on the flange.

(2) Mate the rear molding with the upper molding and force the molding edge inward.

(3) Continue pressing and moving downward to complete the installation.

(4) Install the outer belt weatherstrip.

FRONT DOOR WINDOW REGULATOR

REMOVAL

(1) Remove the door trim panel.

(2) Remove the waterdam.

(3) Remove the window glass

REMOVAL AND INSTALLATION (Continued)

(4) Loosen the bolts attaching the regulator to the inner door panel (Fig. 36) and (Fig. 37) as applicable.

(5) Lift the regulator upward to release it from the key hole slots and remove it through the access hole in the door inner panel.

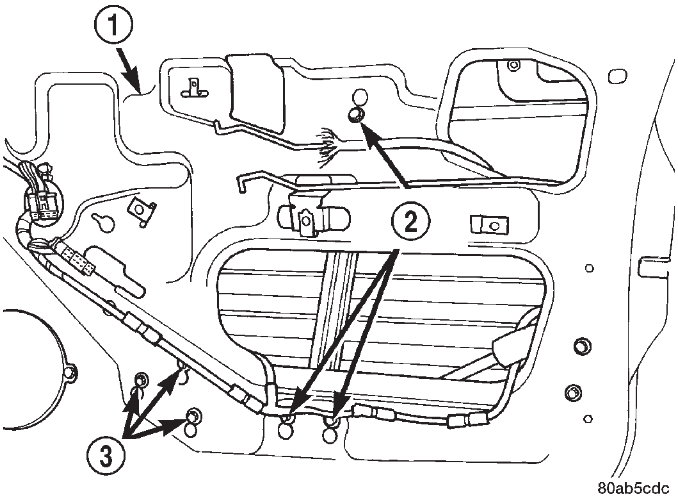


Fig. 36 Power Window Regulator

1 – FRONT DOOR
2 – LOOSEN BOLTS
3 – LOOSEN NUTS

INSTALLATION

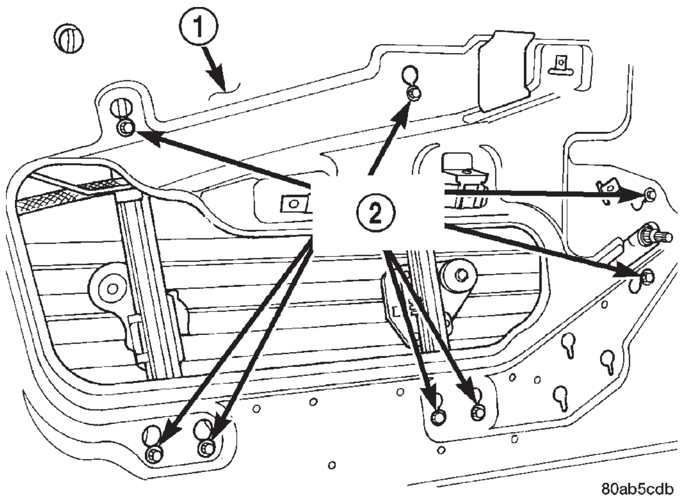


Fig. 37 Manual Window Regulator

1 – FRONT DOOR
2 – LOOSEN BOLTS

(1) Position the regulator in the door and align with key hole slots.

(2) Attach the regulator to door inner panel with bolts (Fig. 38).

(3) Install the window glass

(4) Install the waterdam.

(5) Install the trim panel.

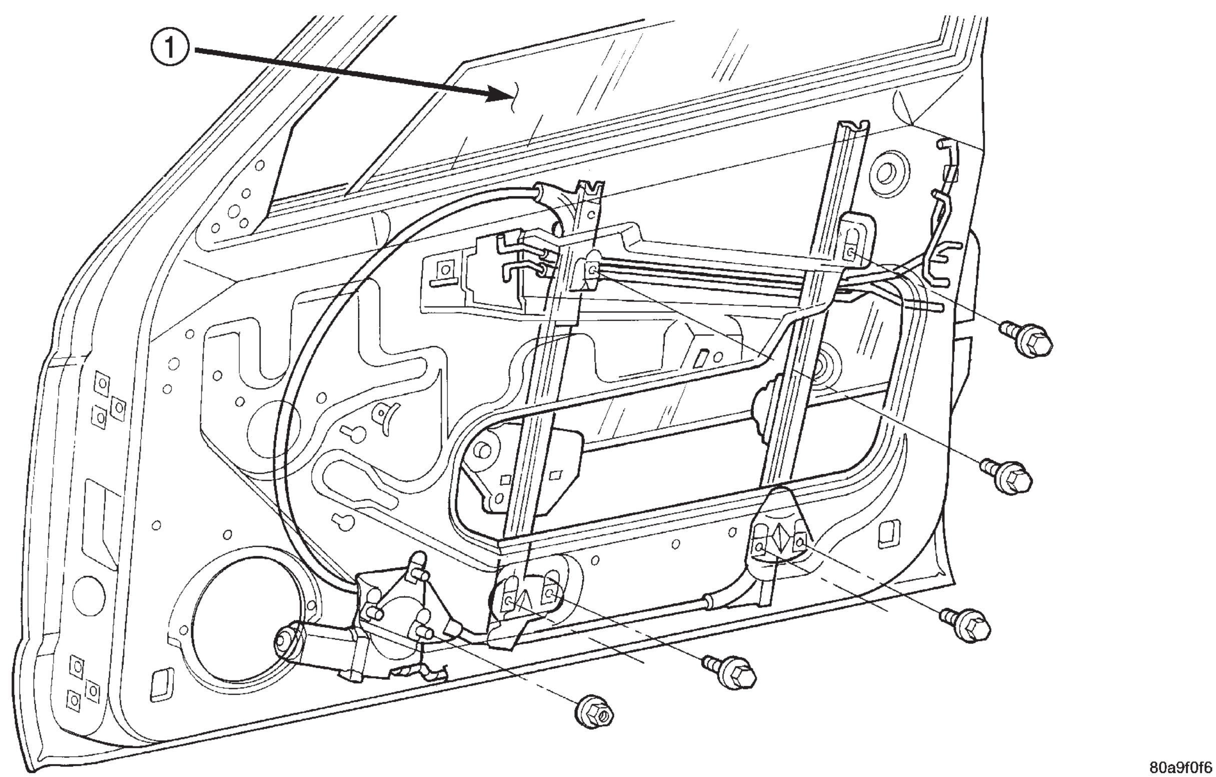


Fig. 38 Front Door Regulator

1 – GLASS

REMOVAL AND INSTALLATION (Continued)

FRONT DOOR SPACER BLOCKS—TWO-DOOR VEHICLES

REMOVAL

(1) Upper spacer block: drill-out the rivet heads and remove them from the reinforcement plate (Fig. 39).

(2) Lower spacer block: remove the screws from the door face (Fig. 40).

(3) As applicable, remove the spacer block from the door window frame or door face.

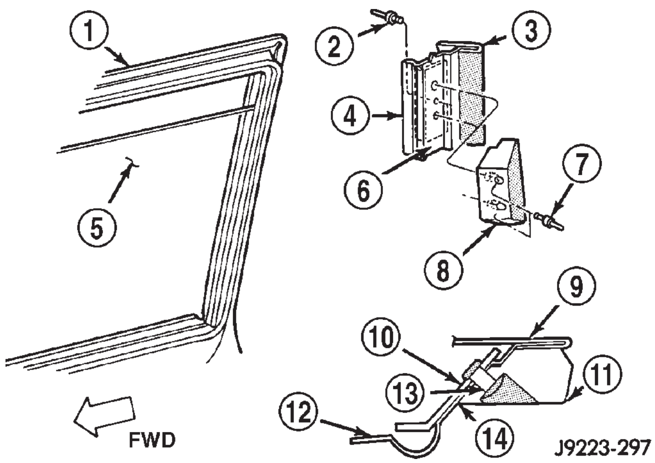


Fig. 39 Front Door Upper Spacer Block—Two-Door

1 – FRONT DOOR WINDOW FRAME
2 – RIVET
3 – WINDOW OUTER FRAME
4 – WINDOW INNER FRAME
5 – WINDOW GLASS
6 – REINFORCEMENT PLATE
7 – RIVET
8 – DOOR UPPER SPACER BLOCK
9 – WINDOW OUTER FRAME
10 – REINFORCEMENT PLATE
11 – DOOR UPPER SPACER BLOCK
12 – WINDOW INNER FRAME
13 – RIVET
14 – ADHESIVE

INSTALLATION

(1) As applicable, position the spacer block on the door window frame or door face.

(2) Upper spacer block: Install the replacement rivets in the spacer block and reinforcement plate.

(3) Lower spacer block: install the screws in the door face. Tighten the screws to 1 N·m (11 in-lbs) torque.

FRONT DOOR GLASS

REMOVAL

(1) Remove the door trim panel.

(2) Remove the waterdam.

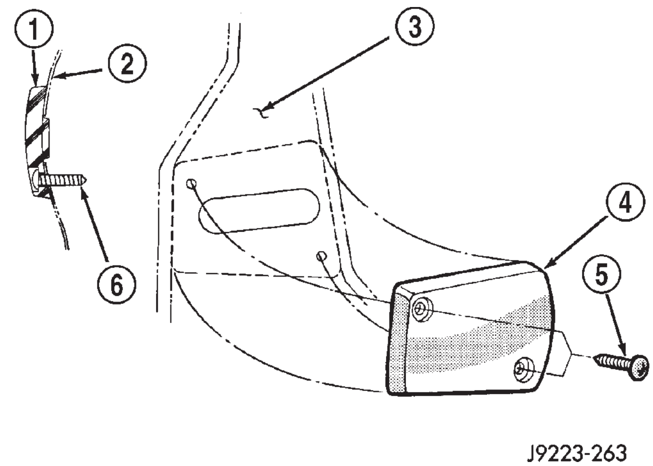


Fig. 40 Front Door Lower Spacer Block—Two-Door

1 – DOOR SPACER
2 – DOOR FACE
3 – DOOR FACE
4 – DOOR SPACER
5 – SCREW
6 – SCREW

(3) Remove inner and outer belt weatherstrip.

(4) Roll glass up to expose the bolts attaching the glass to the regulator.

(5) Remove the bolts attaching the glass to the regulator (Fig. 41).

(6) Lift the glass upward and out of the door.

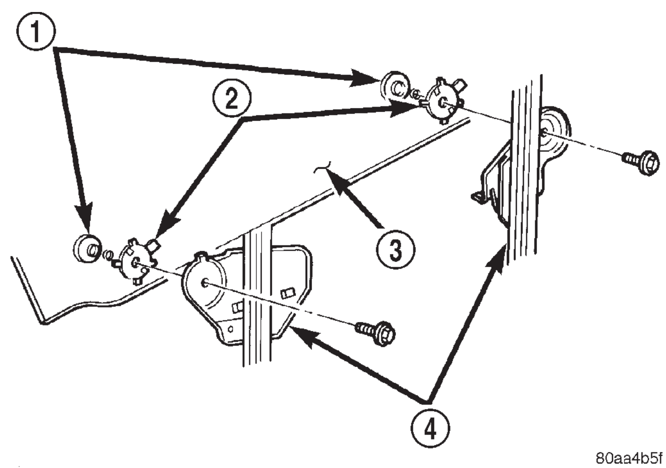


Fig. 41 Front Door Glass

1 – NUT
2 – RETAINER
3 – WINDOW GLASS
4 – REGULATOR

INSTALLATION

(1) Position the glass in the door.

(2) Install the bolts attaching the glass to the regulator Tighten the bolts to 4 N·m (36 in-lbs) torque.

(3) Install inner and outer belt weatherstrip.

REMOVAL AND INSTALLATION (Continued)

(4) Attach the door waterdam to the door inner panel with adhesive/sealant.
(5) Install the waterdam.
(6) Install the door trim panel.

REAR DOOR TRIM PANEL

REMOVAL

(1) Roll window down.
(2) Remove window crank, if equipped (Fig. 42).
(3) Remove the screws attaching the trim panel to the door inner panel (Fig. 43) and (Fig. 44).
(4) Separate the trim panel fasteners from door inner panel with a pry tool (use special tool C-4829) (Fig. 45).
(5) Lift the trim panel up and outward to separate from the inner belt seal.
(6) Move the door trim panel outward and disconnect the handle-to-latch rods (Fig. 46).
(7) Disconnect the power windows wire harness connectors, if equipped.
(8) Remove the trim panel from door.

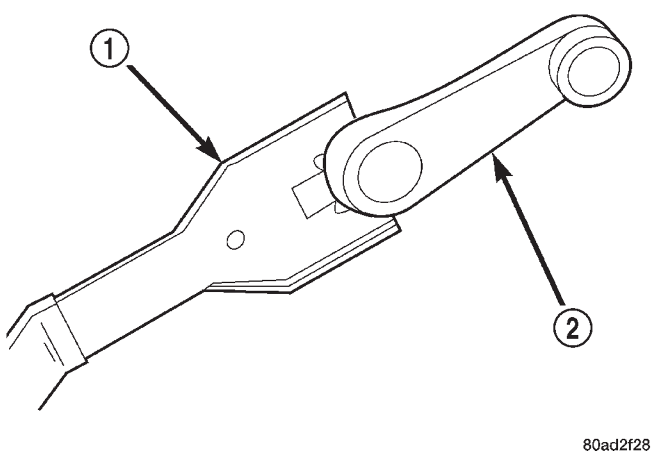


Fig. 42 Window Crank—Typical

1 – WINDOW CRANK REMOVAL TOOL
2 – WINDOW CRANK

INSTALLATION

(1) Replace any broken or damaged push-in fasteners.
(2) Connect the power window wire harness connectors, if equipped.
(3) Move the door trim panel outward and connect the handle-to-latch rods.
(4) Position the trim panel on the inner belt seal and push down to seat.
(5) Align the locating pins and push-in fasteners (Fig. 47). Press inward to secure.
(6) Install the screws attaching the trim panel to the door inner panel.
(7) Install the window crank, if equipped.

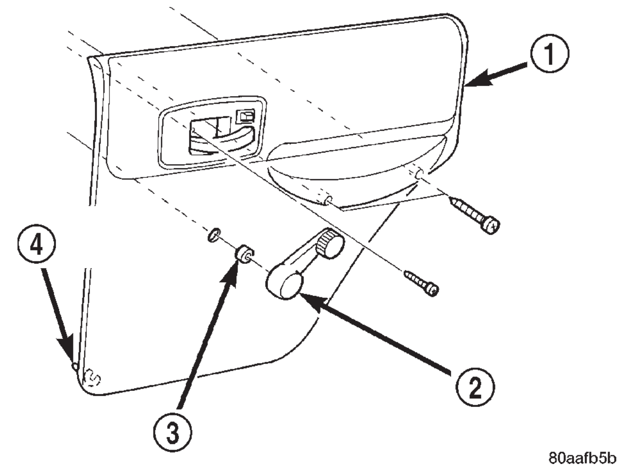


Fig. 43 Rear Door Trim Panel—Manual Window

1 – TRIM PANEL
2 – WINDOW CRANK
3 – SPACER
4 – PUSH-IN FASTENER

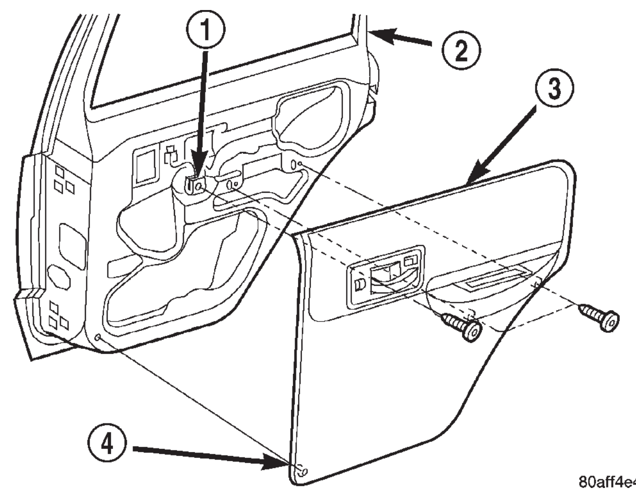


Fig. 44 Rear Door Trim Panel—Power Window

1 – U-NUT
2 – REAR DOOR
3 – TRIM PANEL
4 – PUSH-IN FASTENER

REAR DOOR WATERDAM

REMOVAL

(1) Remove door trim panel.
(2) Peel the waterdam from the door.
(3) Route the latch rods and wire harnesses through the waterdam.
(4) Separate the waterdam from the door inner panel.

INSTALLATION

(1) Route the latch rods and wire harnesses through the waterdam.

REMOVAL AND INSTALLATION (Continued)

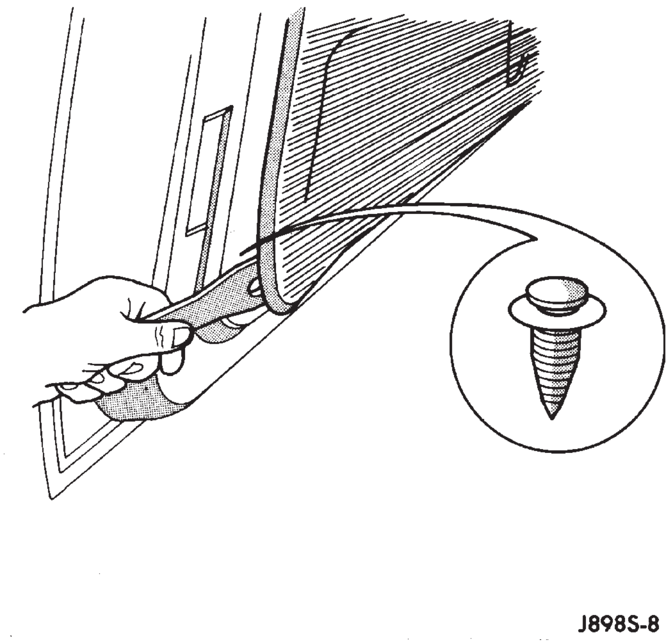


Fig. 45 Detaching Trim Panel Push-In Fasteners

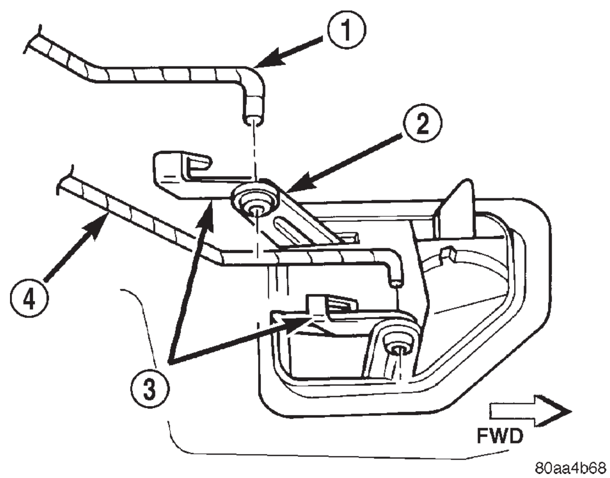


Fig. 46 Latch Rods

1 – INSIDE HANDLE TO LATCH ROD
2 – INSIDE HANDLE ACTUATOR
3 – CLIP
4 – LOCK TO LATCH ROD

(2) Position the waterdam on the door, apply adhesive as necessary and press into place.
(3) Install door trim panel.

REAR DOOR

REMOVAL

(1) Remove door restraint (check) retaining pin.
(2) For vehicles equipped with power windows and power door locks, remove trim panel and waterdam. Disconnect all components and route wire harness out of door.

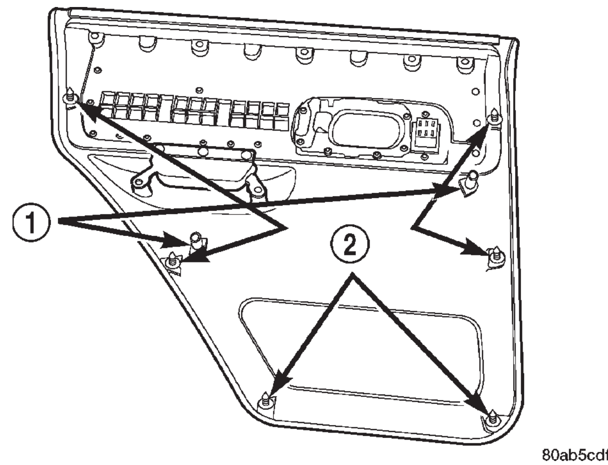


Fig. 47 Push-In Fasteners

1 – LOCATING PINS
2 – PUSH-IN FASTENERS

(3) Remove bolts attaching hinge to door face.
(4) Separate door from vehicle.

INSTALLATION

(1) Position door in body opening.
(2) Align door hinges, plates and shims and install bolts. Tighten bolts to 3 N·m (2 ft. lbs.) torque.
(3) Install door restraint (check).
(4) If applicable, route and connect wire harness connectors.
(5) If necessary, install door waterdam and trim panel.

REAR DOOR RESTRAINT

REMOVAL

(1) Remove the door trim panel.
(2) Remove the door restraint (check) retaining pin from the bracket with a punch.
(3) Remove the nuts and remove the restraint via the access opening in the door inner panel (Fig. 48).

INSTALLATION

(1) Position the door restraint in the door by way of the opening and install the nuts. Tighten the nuts to 10 N·m (7 ft-lbs) torque.
(2) Position the door restraint in bracket with the holes aligned and insert the retaining pin.

REAR DOOR HINGE

REMOVAL

(1) Remove door restrain (check) pin.
(2) Remove door hinge bolts and shims.
(3) Retain bolts and shims for correct installation.

REMOVAL AND INSTALLATION (Continued)

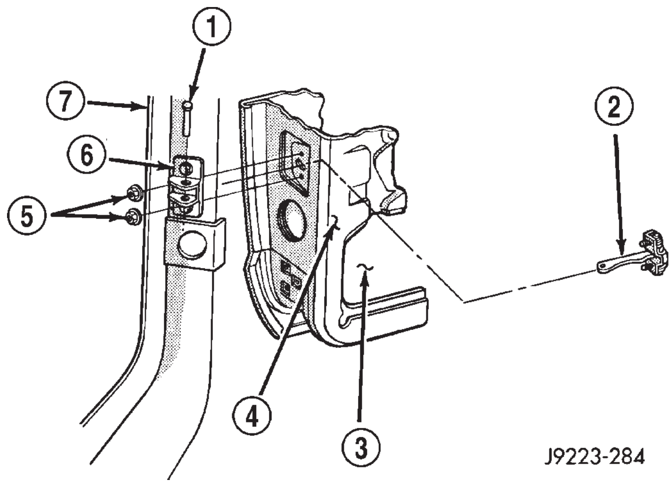


Fig. 48 Door Restraint (Check)

1 – RETAINING PIN
2 – DOOR RESTRAINT
3 – ACCESS OPENING
4 – DOOR INNER PANEL
5 – NUT
6 – RESTRAINT BRACKET
7 – B-PILLAR

INSTALLATION

(1) Position hinge plates and shims on door face.

(2) Align door hinges and shims with bolt holes and install hinges. Tighten bolts to 3 N·m (2 ft. lbs.).

(3) Adjust/align latch striker and latch as necessary.

(4) Install door restrain (check) retaining pin.

REAR DOOR OUTSIDE HANDLE

REMOVAL

(1) Remove the door trim panel.

(2) Roll the window to the full up position.

(3) Peel back the waterdam to access the fasteners for the outside handle.

(4) Remove the latch.

(5) Remove the access hole cover.

(6) Remove the nuts attaching the door handle to the door (Fig. 49).

(7) Disconnect the handle-to-latch rod from the handle latch release lever arm (Fig. 50).

INSTALLATION

(1) Position the handle at the door panel.

(2) Connect the latch-to-handle rod to the handle latch release lever arm.

(3) Install nuts attaching the door handle to the door.

(4) Install the latch.

(5) Install the waterdam.

(6) Install the trim panel.

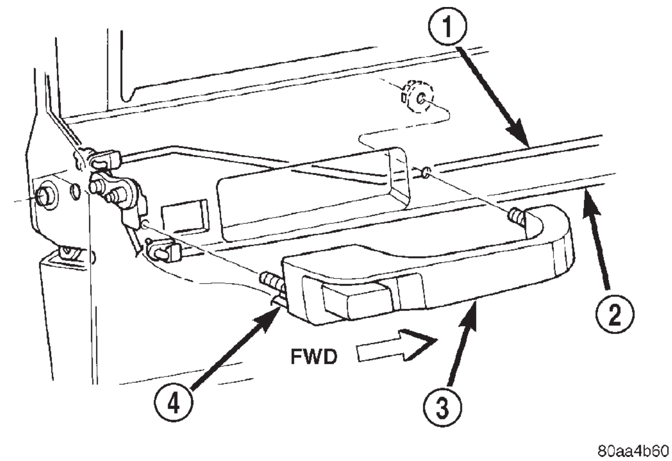


Fig. 49 Rear Door Outside Handle

1 – INSIDE HANDLE TO LATCH ROD
2 – LOCK TO LATCH ROD
3 – OUTSIDE HANDLE
4 – OUTSIDE HANDLE TO LATCH ROD

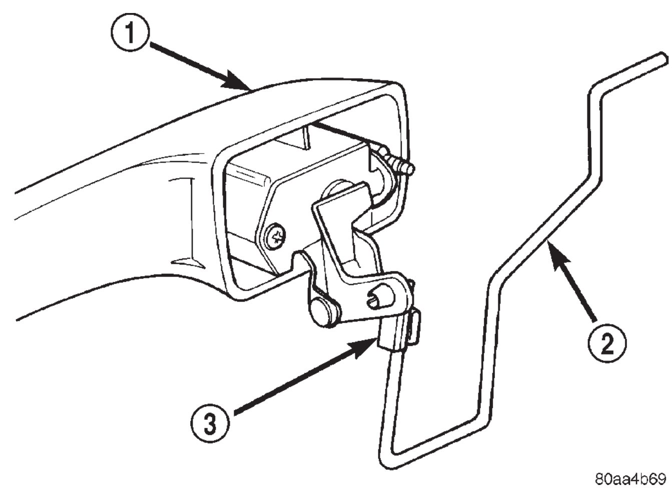


Fig. 50 Latch Rod

1 – OUTSIDE HANDLE
2 – OUTSIDE HANDLE TO LATCH ROD
3 – CLIP

REAR DOOR LATCH

REMOVAL

(1) Remove access plug.

(2) Remove door trim panel.

(3) Remove waterdam.

(4) Remove screws attaching door latch to door (Fig. 51).

(5) Disconnect all rods from door latch.

(6) Remove door latch from door.

INSTALLATION

(1) Position door latch in door.

(2) Connect all rods to door latch.

REMOVAL AND INSTALLATION (Continued)

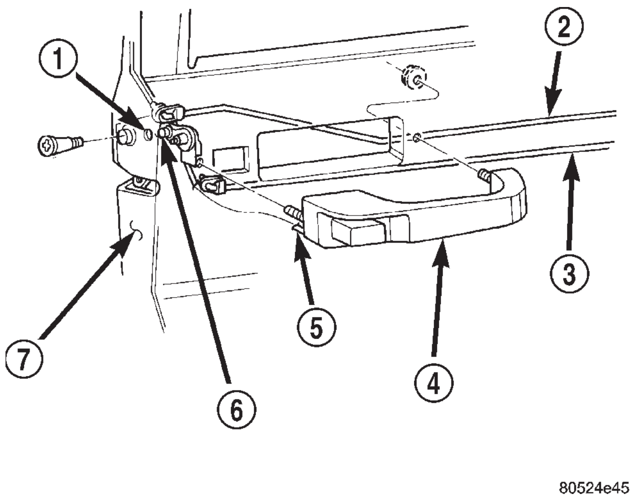


Fig. 51 Rear Door Latch

1 – ACCESS HOLE
2 – INSIDE RELEASE TO LATCH ROD
3 – INSIDE LOCK TO LATCH ROD
4 – HANDLE
5 – LATCH ROD
6 – LATCH ADJUSTMENT SCREW
7 – REAR DOOR

(3) Install screws attaching door latch to door. Tighten screws to 11 N·m (8 ft. lbs.) torque.
(4) Install waterdam.
(5) Install door trim panel.
(6) Install access plug.

REAR DOOR LATCH STRIKER

REMOVAL

(1) Using a grease pencil or equivalent, mark position of striker.
(2) Remove screws attaching striker to C-pillar (Fig. 52).
(3) Separate striker from C-pillar.

INSTALLATION

(1) Position and align striker on C-pillar.
(2) Install screws attaching striker to C-pillar. Tighten screws to 28 N·m (20 ft. lbs.) torque.

REAR DOOR INSIDE HANDLE ACTUATOR

REMOVAL

The rear door inside handle actuator is heat staked to the rear door trim panel during the manufacturing process.
(1) Remove the door trim panel.
(2) Using an X–ACTO knife or equivalent, cut the melted tabs securing the inside handle to the door trim panel.

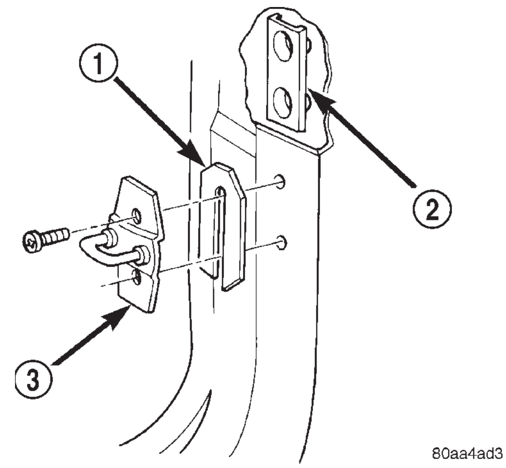


Fig. 52 Rear Door Latch Striker

1 – SPACER
2 – TAPPING PLATE
3 – STRIKER

(3) Separate the inside handle from the trim panel.

INSTALLATION

(1) Position the inside handle in the trim panel.
(2) Heat stake the inside handle to the trim panel.
(3) Install the door trim panel.

REAR DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Roll window down.
(2) Remove door trim panel.
(3) Pull up on the rear corner of the weatherstrip and lift from the door (Fig. 53).

INSTALLATION

(1) Position the weatherstrip on the door.
(2) Push weatherstrip down to seat onto door.
(3) Install door trim panel.

REAR DOOR OUTER BELT WEATHERSTRIP

REMOVAL

(1) Roll window down.
(2) Using a trim stick, pry up the rear outer corner of the weatherstrip.
(3) Slowly and carefully, lift the weatherstrip up to separate from the door (Fig. 53).

REMOVAL AND INSTALLATION (Continued)

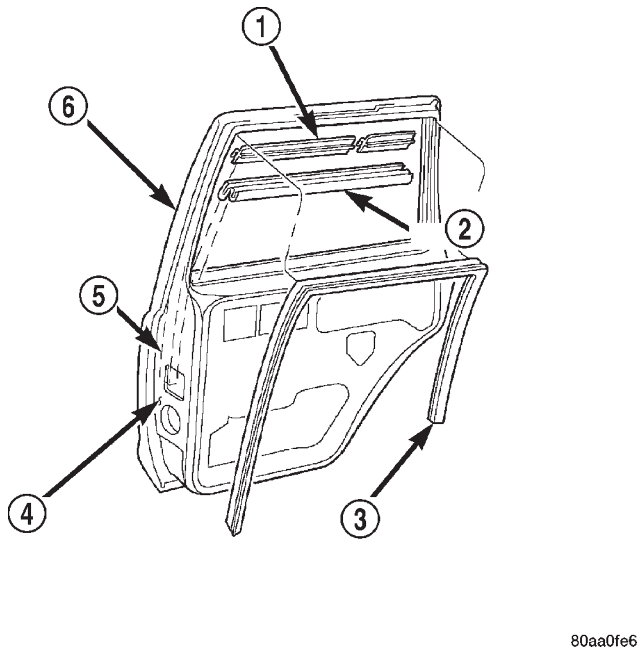


Fig. 53 Rear Door Inner/Outer Belt Weatherstrip

1 – OUTER BELT WEATHERSTRIP
2 – INNER BELT WEATHERSTRIP
3 – GLASS CHANNEL WEATHERSTRIP
4 – DOOR INNER PANEL
5 – GLASS CHANNEL
6 – DOOR OUTER PANEL

INSTALLATION

(1) Position the weatherstrip on the door.
(2) Push weatherstrip down to seat onto door.

REAR DOOR GLASS RUN CHANNEL WEATHERSTRIP

REMOVAL

(1) Remove door trim panel.
(2) Remove waterdam.
(3) Remove window glass.
(4) Starting at rear corner, peel weatherstrip from around door frame (Fig. 53).

INSTALLATION

(1) Starting at the top corner, press seal into place. A small amount of adhesive can be used to hold the weatherstrip in-place, if necessary.
(2) As applicable, move downward evenly until the weatherstrip seal is fully seated in the channel.
(3) Install window glass.
(4) Install waterdam.
(5) Install door trim panel.

REAR DOOR GLASS EXTERIOR MOLDING

REMOVAL

(1) Open the window.
(2) Remove the outer belt molding.
(3) Pry and pull the molding sections from the door panel flange (Fig. 54).

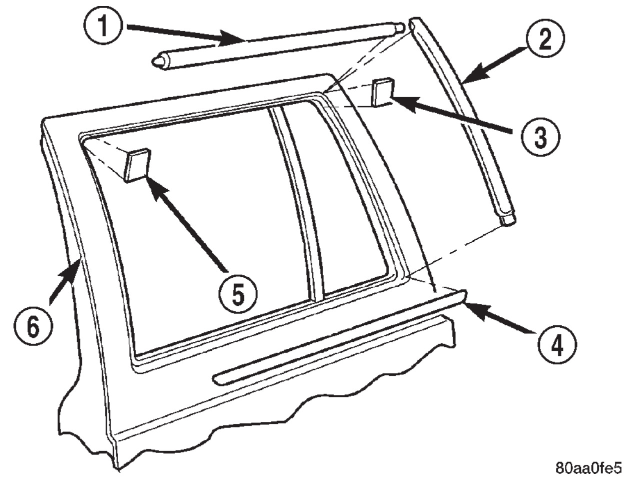


Fig. 54 Rear Glass Exterior Molding

1 – UPPER MOLDING
2 – MOLDING
3 – SHIM
4 – OUTER BELT MOLDING
5 – SHIM
6 – OUTER DOOR PANEL

INSTALLATION

(1) Starting at the forward end of the upper molding, force the molding onto the door panel flange and continue rearward until it is completely seated on the flange.
(2) Mate the rear molding with the upper molding and force the molding edge inward.
(3) Continue pressing and moving downward to complete the installation.
(4) Install the outer belt molding.

REAR DOOR WEATHERSTRIP

REMOVAL

(1) Remove B-pillar upper trim.
(2) Remove inner scuff plate.
(3) Remove B-pillar lower trim.
(4) Remove upper door opening trim.
(5) Grasp seal and separate from door opening (Fig. 55).

REMOVAL AND INSTALLATION (Continued)

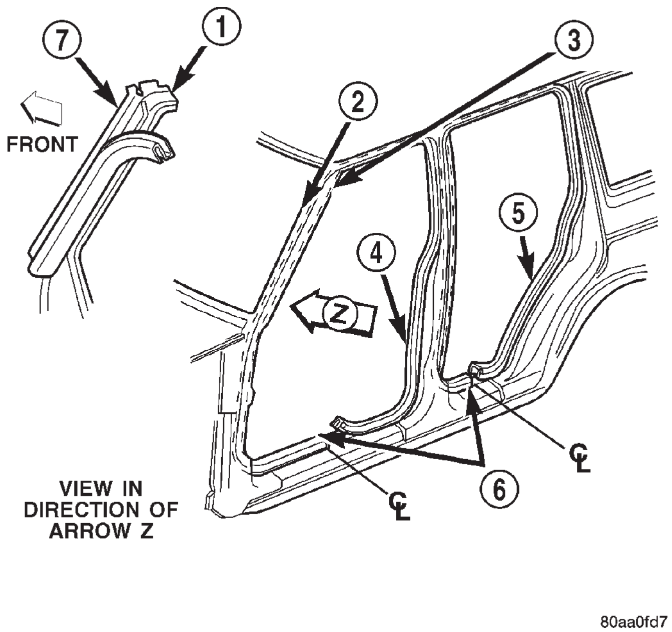


Fig. 55 Door Opening Weatherstrip

1 – FRONT DOOR SEAL
2 – A PILLAR
3 – SECONDARY DOOR SEAL
4 – FRONT DOOR SEAL
5 – REAR DOOR SEAL
6 – ENDS MEET AT CENTERLINE
7 – A PILLAR

INSTALLATION

(1) When installing a door opening weatherstrip seal, start at the door sill center line.

(2) Move upward and around edge of door opening. Seat seal on flange.

(3) Move upward and around the perimeter of the door opening and seat the weatherstrip on the flange (Fig. 56).

(4) Install upper door opening trim.

(5) Install inner scuff plate.

(6) Install B-pillar lower trim panel.

(7) Install B-pillar upper trim panel.

REAR DOOR WINDOW REGULATOR

REMOVAL

(1) Remove the door trim panel.

(2) Remove the waterdam.

(3) Remove the bolt attaching the window glass to the regulator and support the glass (Fig. 57).

(4) Remove the lower bolts attaching the regulator to the inner door panel (Fig. 58).

(5) Remove the nuts attaching the regulator motor to the inner door panel, if equipped.

(6) Loosen the upper bolt that attaches the regulator to the inner door panel.

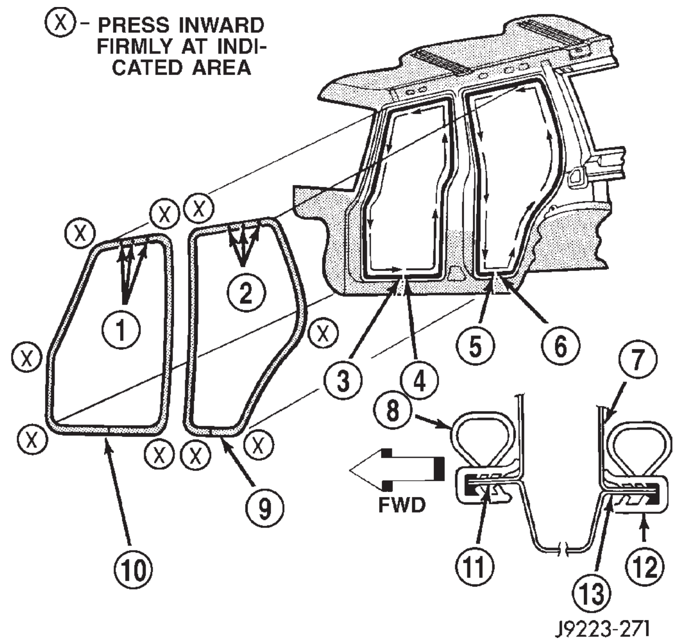


Fig. 56 Door Opening Weatherstrip

1 – VENT HOLES
2 – VENT HOLES
3 – FINISH
4 – START
5 – FINISH
6 – START
7 – B-PILLAR
8 – SEAL
9 – REAR DOOR WEATHERSTRIP SEAL
10 – FRONT DOOR WEATHERSTRIP SEAL
11 – FLANGE
12 – SEAL
13 – FLANGE

(7) Disconnect the wire harness connector from the regulator drive motor, if equipped.

(8) Remove the regulator and drive motor, if equipped.

INSTALLATION

(1) Position window regulator and, if equipped, drive motor within the door panels.

(2) Install the fasteners attaching the regulator to the door inner panel.

(3) Connect the regulator wire harness connector.

(4) Position the window glass at the regulator and install the retainer, bushing and bolt.

(5) Install the waterdam.

(6) Install the trim panel.

REAR DOOR WINDOW GLASS

REMOVAL

(1) Lower the window glass.

(2) Remove the trim panel.

REMOVAL AND INSTALLATION (Continued)

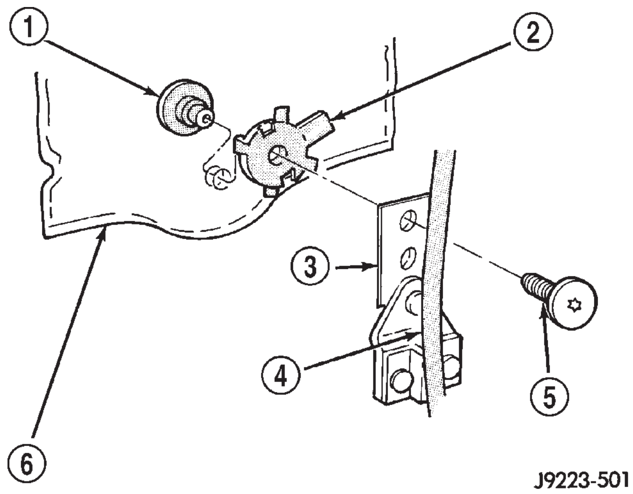


Fig. 57 Regulator To Glass Screw Removal/ Installation

1 – ANCHOR
2 – RETAINER (WITH TABS)
3 – BRACKET
4 – REGULATOR
5 – SCREW AND BUSHING
6 – WINDOW GLASS

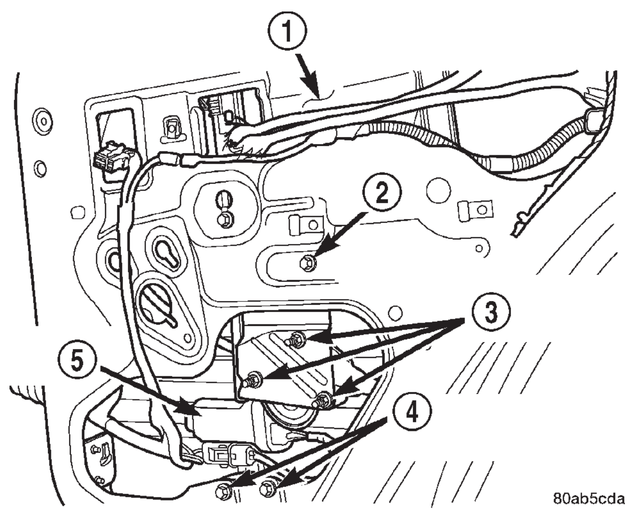


Fig. 58 Rear Door Window

1 – REAR DOOR
2 – LOOSEN BOLT
3 – REMOVE NUTS
4 – REMOVE BOLTS
5 – REGULATOR MOTOR

(3) Remove the waterdam.
(4) Remove inner and outer beltline weatherstrip.
(5) Remove the window weatherstrip from the door.
(6) Remove the division bar/stationary glass (Fig. 59).
(7) Remove the window glass screw, bushing and retainer from the regulator.
(8) Remove the window glass from door.

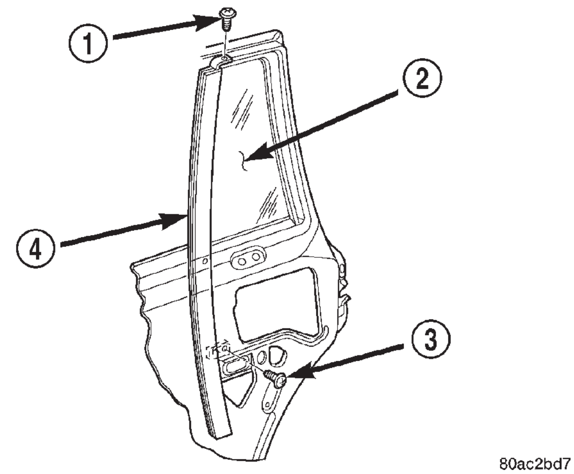


Fig. 59 Division Bar/Stationary Glass

1 – UPPER SCREW
2 – GLASS
3 – LOWER SCREW
4 – DIVISION BAR

INSTALLATION

(1) Install the glass in the door, and install the retainer, bushing and screw.
(2) Tighten the glass attaching screw 6 N·m (53 in-lbs) torque.
(3) Install the division bar/stationary glass in the door.
(4) Install the glass run channel weatherstrip.
(5) Install the inner and outer beltline weather-strip.
(6) Install the waterdam.
(7) Install the trim panel.

BODY SIDE MOLDING

REMOVAL

(1) Loosen the body side molding (Fig. 60) with a heat gun.
(2) Lift edge of molding with a putty knife and peel molding from body panel. Apply heat to any location where the molding remains adhered to a panel.
(3) Remove the adhesive from the body panel with Mopar Super Clean solvent or equivalent.
(4) If the original molding will be installed, also remove all adhesive from it.

INSTALLATION

(1) If the original molding will be installed, apply 3M 5344 double-sided tape on the molding.
(2) For vertical alignment, use masking tape or a string as reference.

REMOVAL AND INSTALLATION (Continued)

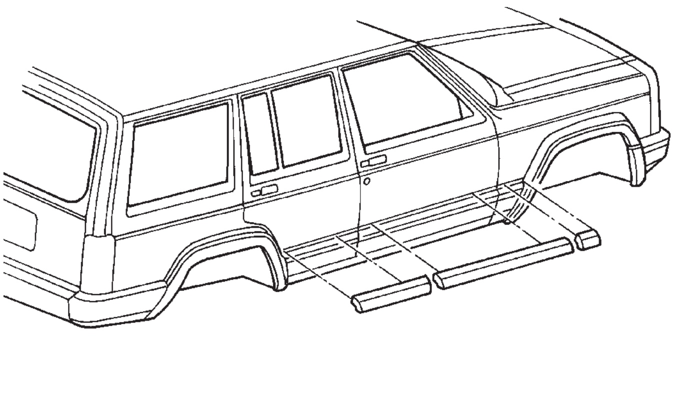


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Fig. 60 Body Side Molding—4-Door

(3) Remove the backing from the tape, align the molding and position it on the body panel.

(4) Press the molding onto the body panel with a roller or hand pressure.

REAR FENDER FLARE

REMOVAL

(1) Remove the screw attaching the lower part of flare to the bottom of the fender.

(2) Remove the nuts attaching the fender flare retainer to the wheelhouse liner (Fig. 61).

(3) Separate the fender flare and retainer from the fender.

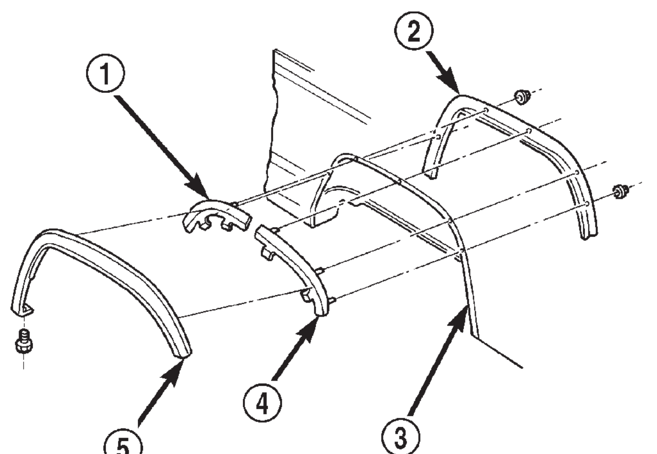

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Fig. 61 Fender Flare

1 – CENTER RETAINER
2 – WHEELHOUSE LINER
3 – BODY
4 – REAR RETAINER
5 – FENDER FLARE

INSTALLATION

(1) Position the fender flare and retainer on the fender.

(2) Install the nuts attaching the fender flare and retainer to the wheelhouse liner.

(3) Install the screw attaching the lower part of flare to the bottom of the fender.

QUARTER WINDOW APPLIQUE

REMOVAL

(1) Remove the liftgate pillar trim.

(2) Remove nuts from inside vehicle (Fig. 62).

(3) Using a trim sick or equivalent, carefully pry the applique the from panel.

INSTALLATION

(1) Position the replacement applique the on panel and install the nuts.

(2) Install the liftgate pillar trim.

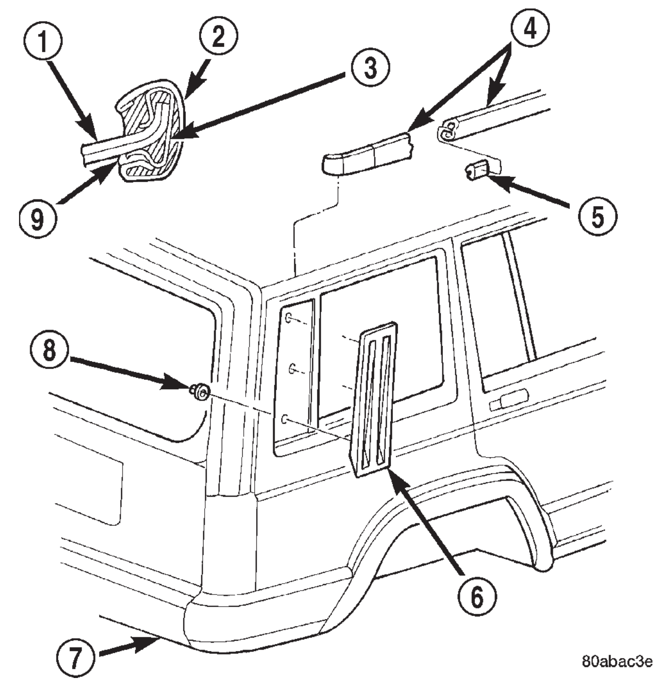

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Fig. 62 Quarter Window Applique and Drip Molding

1 – VEHICLE ROOF
2 – DRIP MOLDING
3 – DRIP MOLDING CLIP
4 – DRIP MOLDING
5 – CLIP
6 – QUARTER WINDOW APPLIQUE
7 – VEHICLE BODY
8 – NUT
9 – SEALANT

DRIP RAIL MOLDING

REMOVAL

(1) Pry the clips from the roof flange.

(2) Remove the clips and molding from the roof flange (Fig. 62).

REMOVAL AND INSTALLATION (Continued)

(3) Remove the remaining sealant and clean the roof flange.

INSTALLATION

(1) Position the drip rail molding with clips at the roof flange and force the clips onto the roof flange.

(2) Apply sealant to the inner side of the molding to seal the roof flange.

LUGGAGE RACK

REMOVAL

(1) Remove slide rail screws (Fig. 63).

(2) Remove luggage rack from roof.

NOTE: Skid strips are attached to roof panel with adhesive.

(3) Loosen each skid strip with a heat gun.

(4) Lift one edge of each skid strip with a putty knife and peel it from roof panel.

(5) Remove original adhesive from roof with an adhesive removal solution.

(6) If original skid strips are installed, remove all original adhesive from m.

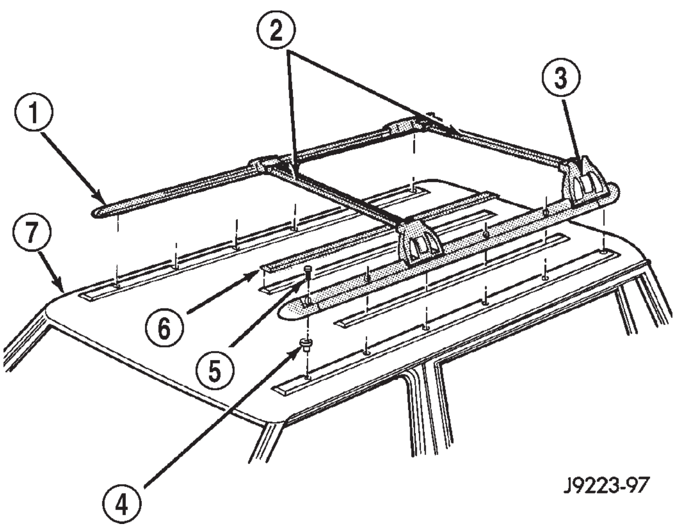


Fig. 63 Luggage Rack

1 – SIDE RAIL
2 – CROSS RAIL
3 – CROSS RAIL ADJUSTMENT RELEASE BUTTON
4 – RIVET-NUT
5 – SCREW
6 – SKID STRIP
7 – ROOF

INSTALLATION

(1) Install 3M 06379 double-sided tape, or an equivalent on skid strips.

(2) Remove backing from double-sided tape, align each skid strip on roof, and position it on roof panel.

(3) Verify that each skid strip is properly aligned.

(4) Press each skid strip onto roof panel with a roller (or use hand pressure).

NOTE: To prevent water leaks, apply 3M Drip-Chek Sealant, or equivalent.

(5) Position luggage rack on roof with screw holes aligned.

(6) Install and tighten slide rail screws.

AIR EXHAUST GRILLE

REMOVAL

(1) Remove the screw that attaches the grille to door the opening panel (Fig. 64).

(2) Pry the bottom edge of the grille from the door opening panel.

(3) Pull downward and remove the grille from exhaust port in the door opening panel.

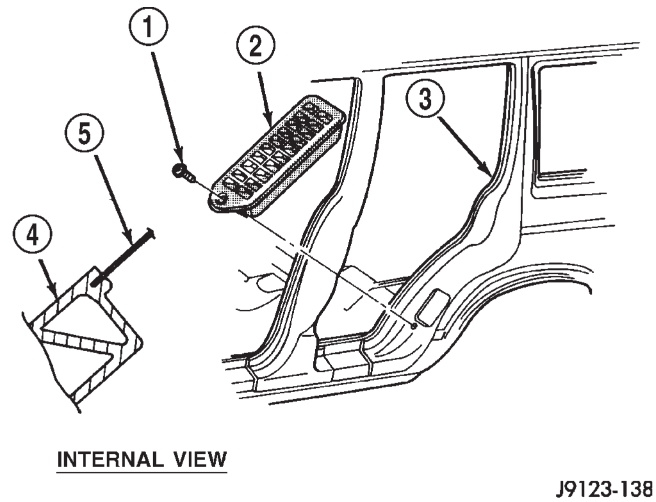


Fig. 64 Door Opening Air Exhaust Grille

1 – SCREW
2 – AIR EXHAUST GRILLE
3 – C-PILLER
4 – AIR EXHAUST GRILLE
5 – DOOR OPENING PANEL

INSTALLATION

(1) Position the slot located in the upper end of replacement grille at the exhaust port and insert edge in the slot.

(2) Push inward and seat the grille in the exhaust port.

(3) Install the screw to attach the grille to the door opening panel.

REMOVAL AND INSTALLATION (Continued)

A-PILLAR TRIM

REMOVAL

(1) Remove front and rear assist handles, if equipped.

(2) Remove the inner scuff plate.

(3) Remove the lower A-pillar cowl trim.

(4) Using a small flat blade, pry the trim plugs from the A-pillar trim.

(5) Remove the screws attaching the A-pillar trim to the A-pillar (Fig. 65).

(6) Separate the A-pillar trim from the A-pillar.

INSTALLATION

(1) Position the A-pillar trim on the A-pillar.

(2) Install the screws attaching the A-pillar trim to the A-pillar.

(3) Install the trim plugs.

(4) Install the lower A-pillar cowl trim.

(5) Install the inner scuff plate.

(6) Install the assist handles.

LOWER A-PILLAR COWL TRIM

REMOVAL

(1) Remove the inner scuff plate.

(2) Remove the nut behind the fuse panel access door (Right side only) (Fig. 66).

(3) Remove the fasteners attaching the lower A-pillar cowl trim to the A-pillar lower cowl.

(4) Separate the lower A-pillar cowl trim from the A-pillar lower cowl.

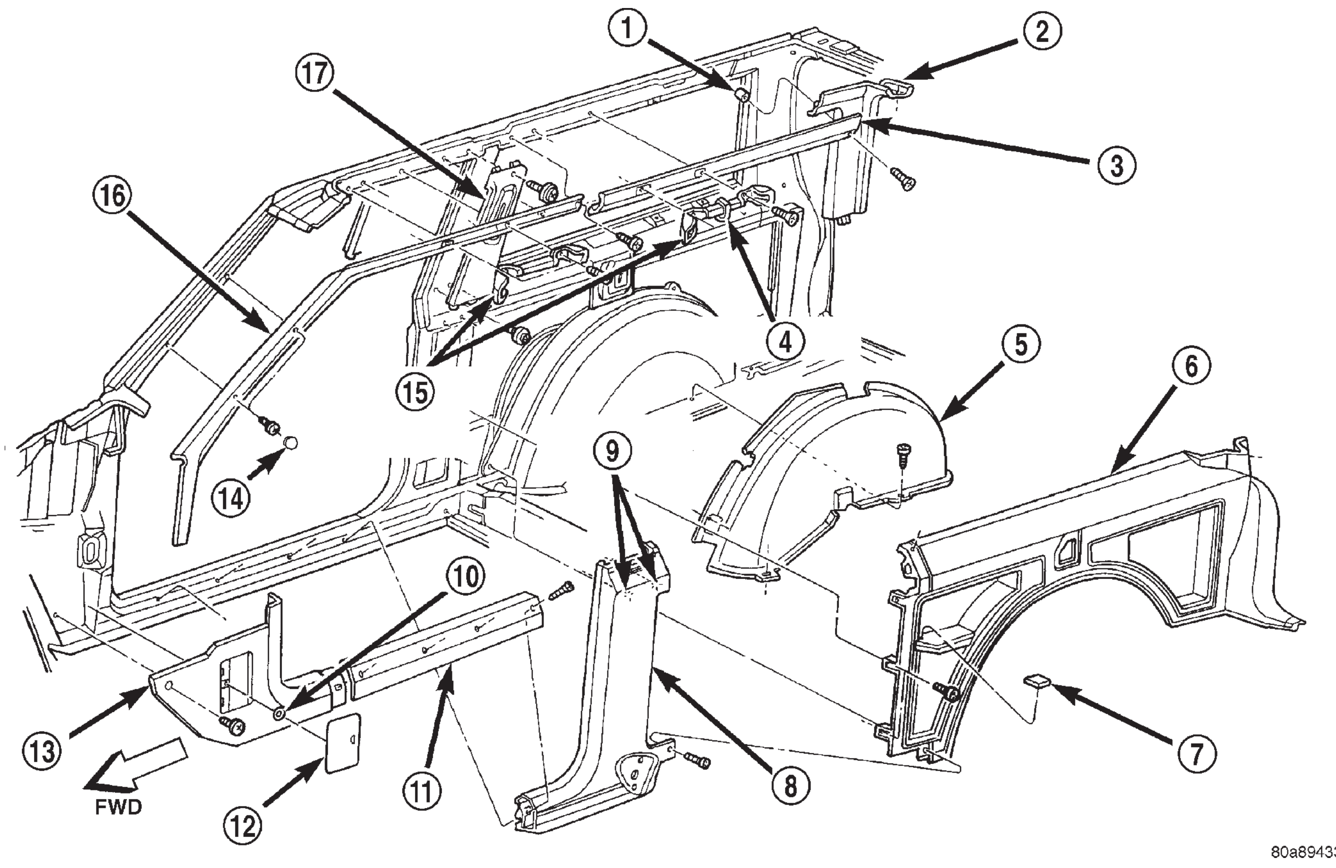


Fig. 65 Trim Panels—2-Door Vehicles

1 – SPACER
2 – LIFTGATE PILLAR TRIM
3 – UPPER QUARTER PANEL TRIM
4 – COAT HOOK
5 – WHEELHOUSE COVER
6 – LOWER QUARTER PANEL TRIM
7 – COVER
8 – LOWER B-PILLAR TRIM
9 – PUSH-IN FASTENER
10 – NUT
11 – INNER SCUFF PLATE
12 – ACCESS DOOR
13 – COWL PANEL TRIM
14 – TRIM PLUG
15 – OVERHEAD ASSIST HANDLE
16 – A-PILLAR TRIM
17 – UPPER B-PILLAR TRIM

REMOVAL AND INSTALLATION (Continued)

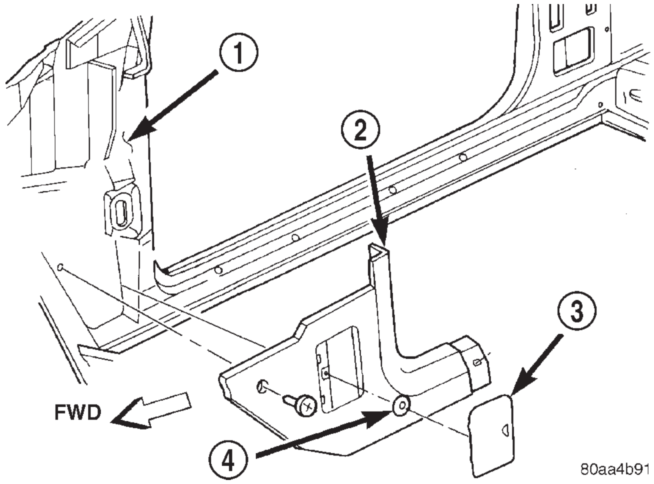


Fig. 66 Lower A-Pillar Cowl Trim

1 – COWL PANEL
2 – COWL PANEL TRIM
3 – ACCESS DOOR
4 – NUT

INSTALLATION

(1) Position the lower A-pillar cowl trim on the A-pillar lower cowl.

(2) Install the screws attaching the lower A-pillar cowl trim to the A-pillar lower cowl.

(3) Install the nut behind the fuse panel access door (Right side only).

(4) Install the inner scuff plate.

FRONT INNER SCUFF PLATE

REMOVAL

(1) If necessary, remove the bucket seat side shield trim cover.

(2) Remove the screws attaching the inner scuff plate to the front door sill (Fig. 65).

(3) Separate the inner scuff plate from the door sill.

INSTALLATION

(1) Position the inner scuff plate on the front door sill.

(2) Install the screws attaching the inner scuff plate to the front door sill.

(3) If removed, install the bucket seat side shield trim cover.

DOOR SILL SCUFF PLATE

REMOVAL

(1) Remove the screws attaching the door sill scuff plate to the door sill (Fig. 67).

(2) Separate the scuff plate from the door sill.

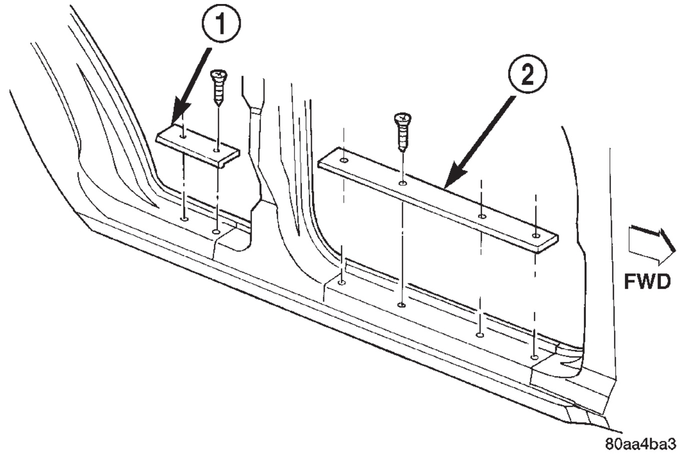


Fig. 67 Door Sill Scuff Plate

1 – REAR DOOR SILL SCUFF PLATE
2 – FRONT DOOR SILL SCUFF PLATE

INSTALLATION

(1) Position the scuff plate on the door sill.

(2) Install the screws attaching the door sill scuff plate to the door sill.

ASSIST HANDLE

REMOVAL

(1) Using a trim stick or equivalent, open the end covers to access the screws.

(2) Remove the screws (Fig. 65).

(3) Separate the assist handle from the trim.

INSTALLATION

(1) Position the handle on the trim.

(2) Install the screws.

(3) Install the covers.

B-PILLAR TRIM

REMOVAL

(1) Remove the inner scuff plate.

(2) Remove the upper door opening trim (4-door vehicles) (Fig. 68).

(3) Remove the upper quarter panel trim (2-door vehicles) (Fig. 65).

(4) Remove the rear A-pillar trim screw.

(5) Remove the shoulder belt turning loop.

(6) Remove the seat/shoulder belt anchor bolt.

(7) Remove the screws attaching the B-pillar trim to the B-pillar (2-door vehicles).

(8) Route the shoulder belt through the lower B-pillar trim (2-door vehicles).

(9) Separate the B-pillar trim from the B-pillar.

REMOVAL AND INSTALLATION (Continued)

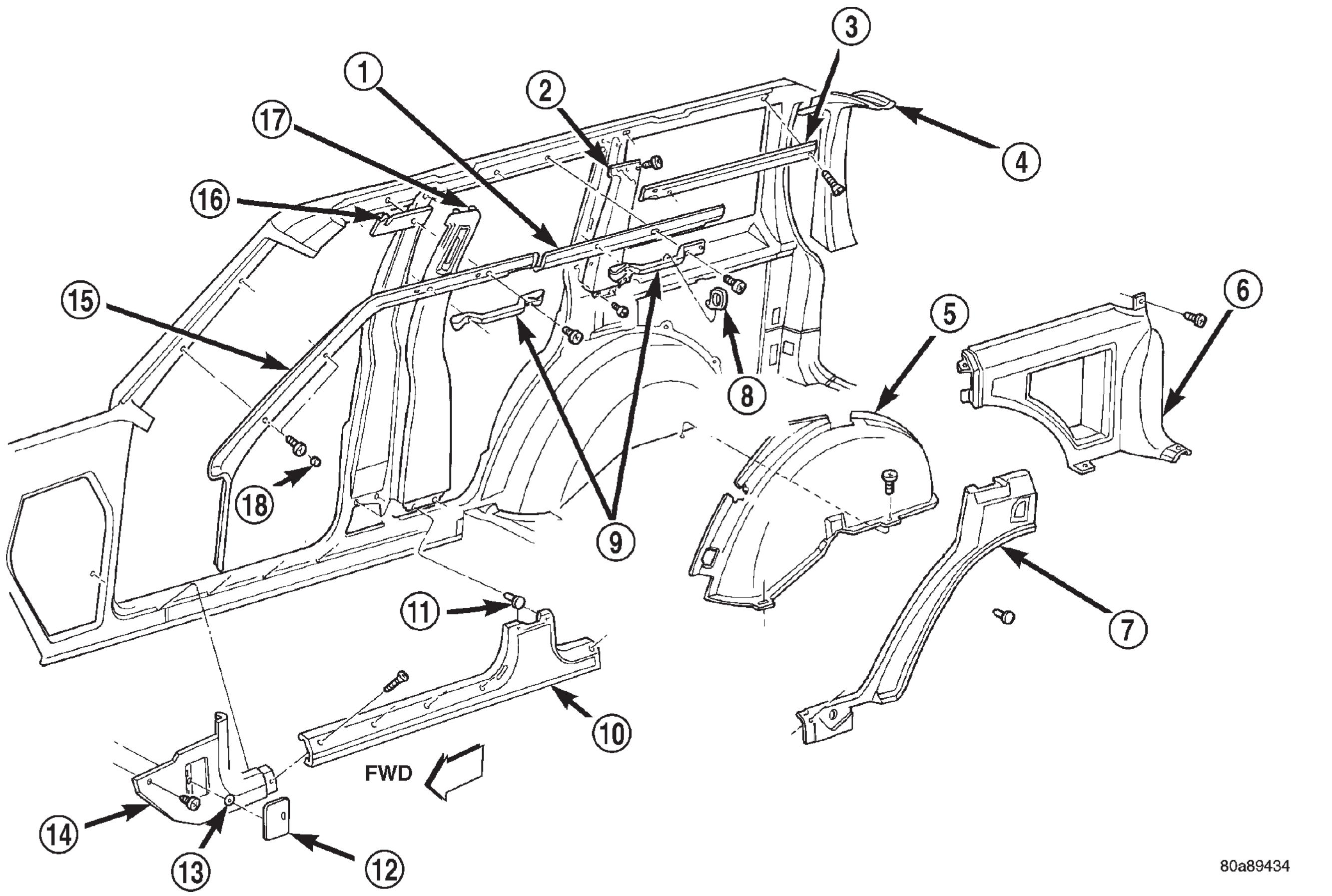


Fig. 68 B-Pillar Trim—4-Door Vehicles

1 – UPPER DOOR OPENING TRIM
2 – C-PILLAR TRIM
3 – UPPER QUARTER PANEL TRIM
4 – LIFTGATE PILLAR TRIM
5 – WHEEL HOUSE COVER
6 – LOWER QUARTER PANEL TRIM
7 – QUARTER PANEL TRIM EXTENSION
8 – COAT HOOK
9 – OVERHEAD ASSIST HANDLE
10 – INNER SCUFF PLATE
11 – PUSH-IN FASTENER
12 – ACCESS DOOR
13 – NUT
14 – COWL PANEL TRIM
15 – A-PILLAR TRIM
16 – HEADLINER
17 – B-PILLAR TRIM
18 – TRIM PLUG

INSTALLATION

(1) Route the shoulder belt through the lower B-pillar trim (2-door vehicles).

(2) Position the B-pillar trim on the B-pillar and align push-in fasteners.

(3) Press the B-pillar trim on the B-pillar to secure.

(4) Install the screws attaching the B-pillar trim to the B-pillar (2-door vehicles).

(5) Install the seat/shoulder belt anchor bolt.

(6) Install the shoulder belt turning loop.

(7) Install the A-pillar trim.

(8) Install the upper quarter panel trim (2-door vehicles) (Fig. 65).

(9) Install the upper door opening trim (4-door vehicles) (Fig. 68).

(10) Install the inner scuff plate.

C-PILLAR TRIM

REMOVAL

(1) Remove the inner scuff plate.

(2) Remove the upper door opening trim.

(3) Remove the upper quarter panel trim.

(4) Remove the quarter panel trim extension.

(5) Remove the screws attaching the C-pillar trim to the C-pillar (Fig. 68).

(6) Separate the C-pillar trim from the C-pillar.

INSTALLATION

(1) Position the C-pillar trim on the C-pillar.

REMOVAL AND INSTALLATION (Continued)

(2) Install the screws attaching the C-pillar trim to the C-pillar.

(3) Install the quarter panel trim extension.

(4) Install the upper quarter panel trim.

(5) Install the upper door opening trim.

(6) Install the inner scuff plate.

QUARTER PANEL TRIM EXTENSION

REMOVAL

(1) Remove the inner scuff plate.

(2) Separate quarter panel trim extension from the wheelhouse and quarter trim panels (Fig. 68).

INSTALLATION

(1) Position the quarter panel trim extension on the wheelhouse and quarter trim panels.

(2) Install the inner scuff plate.

QUARTER PANEL TRIM AND WHEELHOUSE COVER

REMOVAL

(1) Remove the inner scuff plate.

(2) Remove quarter panel trim extension.

(3) Remove liftgate scuff plate.

(4) Remove the screws attaching the quarter panel trim from the quarter panel and wheelhouse trim cover (Fig. 68) and (Fig. 65).

(5) If necessary, remove the tire and mounting brackets from the left quarter panel trim (Fig. 69).

(6) Remove the screws attaching the wheelhouse cover to the wheelhouse.

(7) Separate the wheelhouse cover from the wheelhouse

INSTALLATION

(1) Position the wheelhouse cover on the wheelhouse.

(2) Install the screws attaching the wheelhouse cover to the wheelhouse.

(3) If removed, install the tire and mounting bracket on the left quarter panel trim.

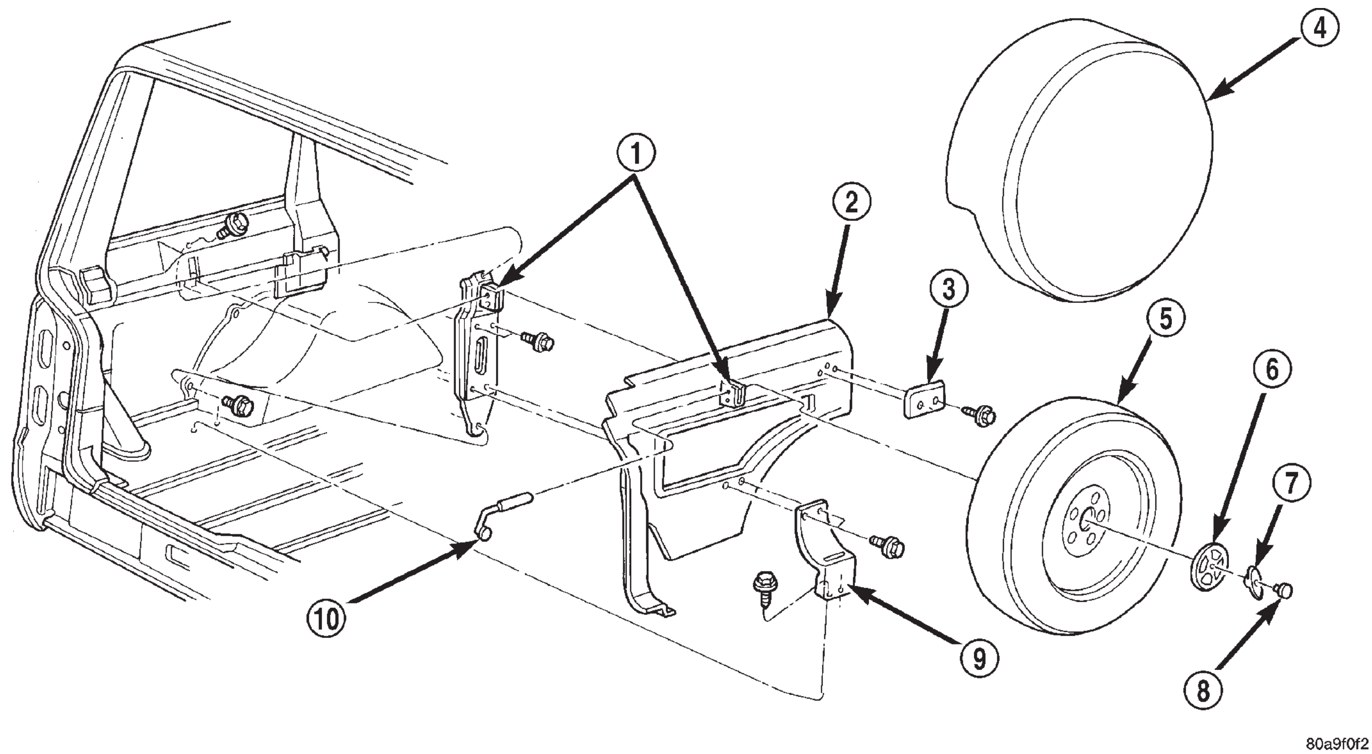


Fig. 69 Spare Tire

1 – MOUNTING BRACKET
2 – QUARTER TRIM
3 – TIRE REST
4 – COVER
5 – TIRE/WHEEL
6 – CUP
7 – WING NUT
8 – CAP
9 – MOUNTING BRACKET
10 – HOLD DOWN BOLT

REMOVAL AND INSTALLATION (Continued)

(4) Position the quarter panel trim on the quarter panel and wheelhouse cover.

(5) Install the screws attaching quarter panel trim on the quarter panel and wheelhouse cover

(6) Install liftgate scuff plate.

(7) Install quarter panel trim extension.

(8) Install the inner scuff plate.

LIFTGATE PILLAR TRIM

REMOVAL

(1) Remove the liftgate opening upper trim.

(2) Remove the liftgate pillar trim screws (Fig. 70).

(3) Remove the screws attaching the lower quarter panel trim to the liftgate pillar.

(4) Pull the trim panel outward to detach the spring steel clips attaching the trim panel to the pillar (2-dr vehicles).

(5) Remove liftgate pillar trim.

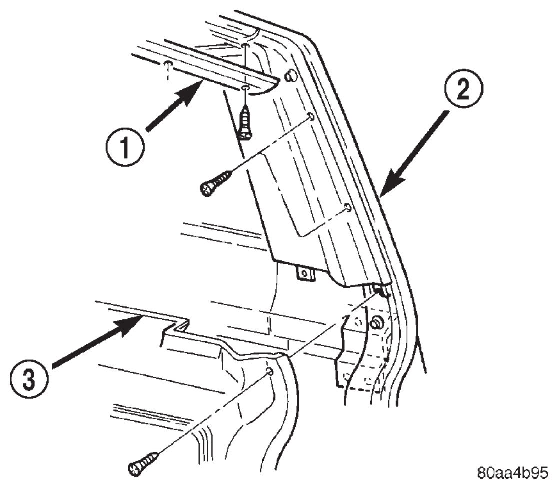


Fig. 70 Liftgate Pillar Trim

1 – UPPER LIFTGATE OPENING TRIM
2 – UPPER LIFTGATE PILLAR TRIM
3 – LOWER QUARTER TRIM

INSTALLATION

(1) Position the liftgate pillar trim on the liftgate pillar.

(2) Press the trim panel into place to engage the spring steel clips attaching the trim panel to the pillar (2-dr vehicles).

(3) Install the screws attaching the lower quarter panel trim to the liftgate pillar.

(4) Install the liftgate pillar trim screws.

(5) Install the liftgate opening upper trim.

LIFTGATE OPENING UPPER TRIM

REMOVAL

(1) Remove the screws attaching the liftgate opening upper trim to the roof panel (Fig. 71).

(2) Pull downward to disengage steel clips attaching the liftgate opening upper trim to the roof panel.

(3) Separate trim from vehicle.

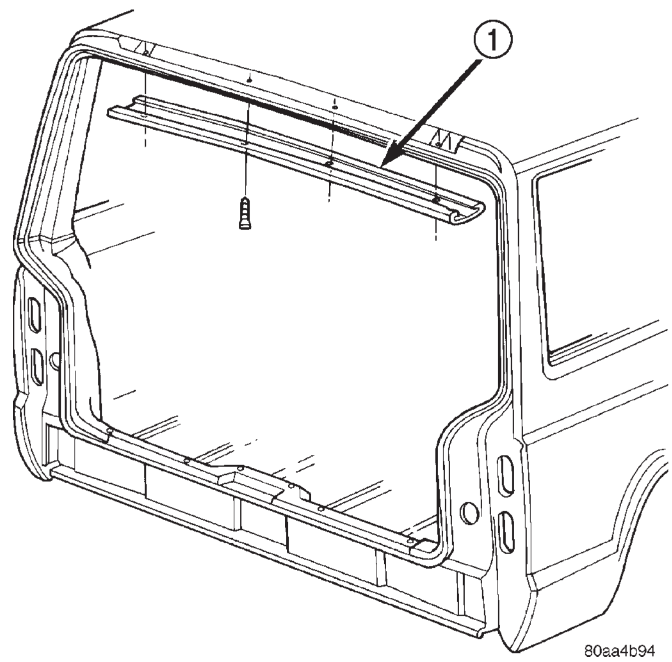


Fig. 71 Liftgate Opening Upper Trim

1 – UPPER LIFTGATE OPENING TRIM

INSTALLATION

Steel clips are used for manufacturing purposes and are not required for service.

(1) Position trim on roof panel.

(2) Install the screws attaching the liftgate opening upper trim to the roof panel.

LIFTGATE SCUFF PLATE

REMOVAL

(1) Remove the screws attaching the liftgate scuff plate to the floor pan (Fig. 72).

(2) Separate the scuff plate from the vehicle.

INSTALLATION

(1) Position the scuff plate on the vehicle.

(2) Center striker in opening.

(3) Install the screws attaching the liftgate scuff plate to the floor pan.

FRONT SHOULDER BELT/BUCKLE

CAUTION: Inspect the front shoulder belts and buckles. Replace any belt that is either cut, frayed, torn or damaged in any way. Replace the shoulder belt if the retractor is damaged or inoperative.

REMOVAL AND INSTALLATION (Continued)

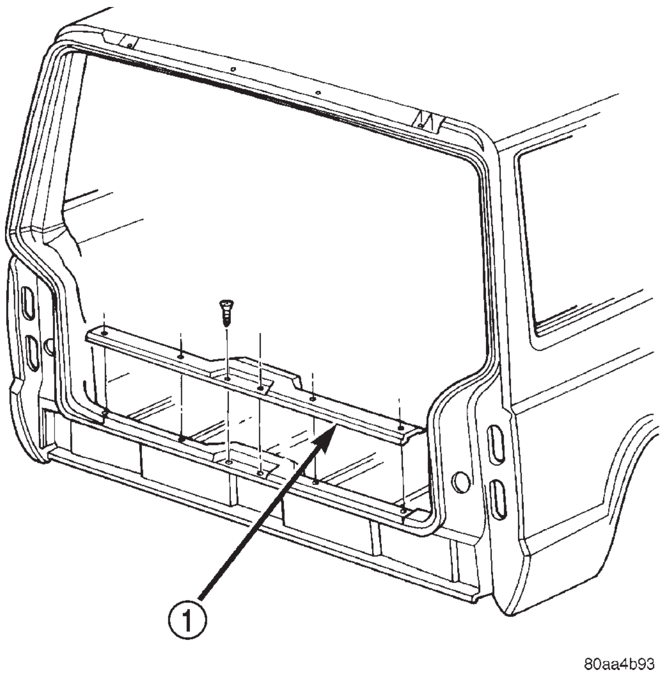


Fig. 72 Liftgate Scuff Plate

1 – LIFTGATE SCUFF PLATE

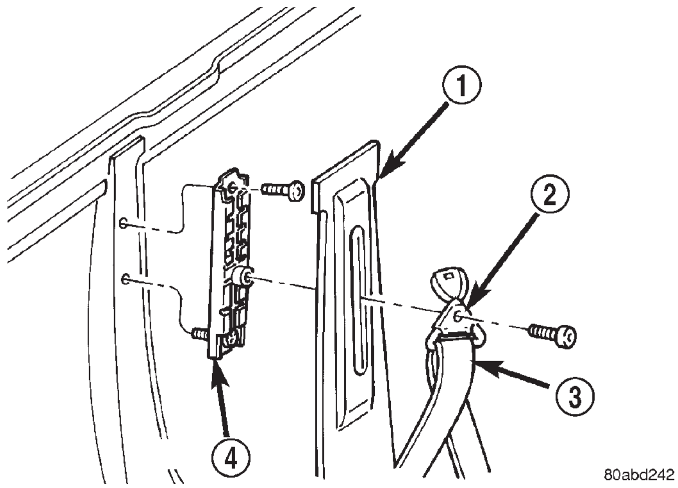


Fig. 73 Anchor Bolt

1 – TRIM PANEL
2 – TURNING LOOP
3 – BELT
4 – ADJUSTER

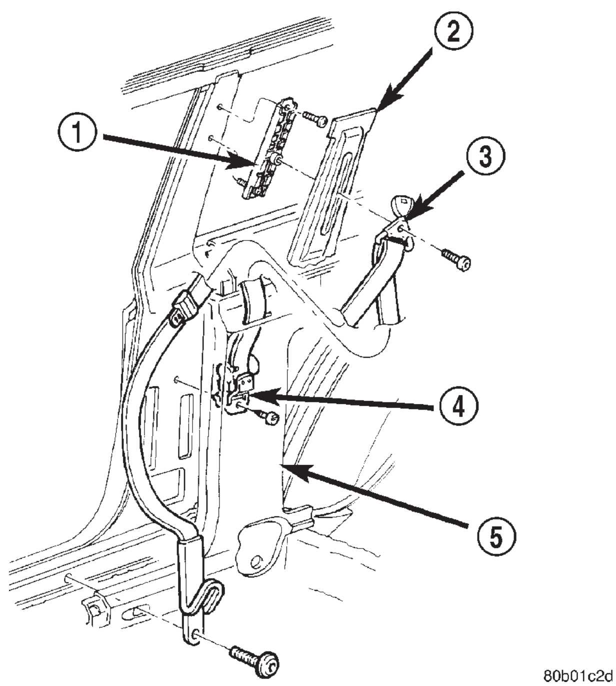


Fig. 74 Front Shoulder Belt—2-Door Vehicles

1 – ADJUSTER
2 – TRIM PANEL
3 – TURNING LOOP
4 – RETRACTOR
5 – TRIM PANEL

REMOVAL

(1) Slide the front seats all the way forward for access to the belt anchor bolt.

(2) Disconnect the belt wire harness connector.

(3) Remove the anchor bolt cover.

(4) Remove the anchor bolt attaching the buckle to the seat.

(5) Remove the turning loop cover concealing the shoulder belt upper anchor bolt.

(6) Use a Torx bit to remove the upper anchor bolt (Fig. 73). Remove the support/guide washer.

(7) Remove the inner scuff plate/trim panel from the door sill and remove the shoulder belt lower anchor bolt(s) with a Torx bit (Fig. 74) and (Fig. 75).

(8) Remove the shoulder belt and the retractor.

INSTALLATION

(1) Position the shoulder belt retractor in the shield and install the lower anchor bolt with a Torx bit. Tighten bolt to 43 N·m (32 ft. lbs.) torque.

(2) Position the support/guide washer and shoulder belt upper anchor plate on the trim panel. Install the upper anchor bolt with a Torx bit.

(3) Route belt through trim panel.

(4) Tighten the upper and lower anchor bolts to 43 N·m (32 ft. lbs.) torque.

(5) Install the door sill inner scuff plate/trim panel and install the cap over the upper anchor bolt.

(6) Install the shoulder belt buckle and anchor bolt. Connect the wire harness connectors. Tighten the buckle anchor bolt to 43 N·m (32 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

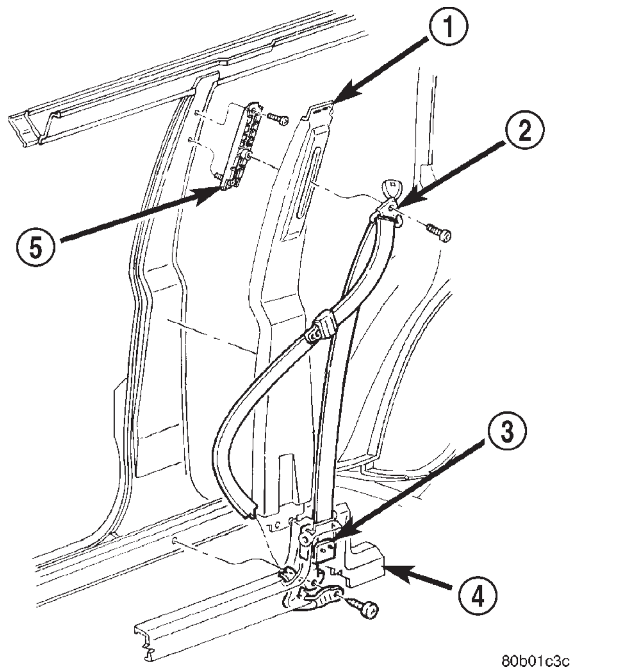


Fig. 75 Front Shoulder Belt—4-Door Vehicles

1 – TRIM PANEL
2 – TURNING LOOP
3 – RETRACTOR
4 – TRIM PANEL
5 – ADJUSTER

REAR SHOULDER/LAP BELT/BUCKLE

WARNING: Inspect rear shoulder/lap belts and buckles. Replace any belt that is either cut, frayed, torn or damaged in any way. Replace shoulder belt if retractor is damaged or inoperative.

REMOVAL

(1) Pull rear seat release strap and tilt seat cushion forward.

(2) Remove shoulder belt buckle and lap belt/buckle anchor plate bolts from floor pan (Fig. 76).

(3) Remove shoulder belt lower outer anchor bolt.

(4) Remove quarter trim panel. If necessary, refer to removal procedure.

(5) Remove shoulder belt upper anchor bolt.

(6) Remove bolt attaching retractor to rear quarter rail.

(7) Separate retractor and shoulder belt from trim panel.

INSTALLATION

(1) Position shoulder belt buckle and lap belt/buckle anchor plates on floor panel.

(2) Install anchor bolts. Tighten bolts to 43 N·m (32 ft. lbs.) torque.

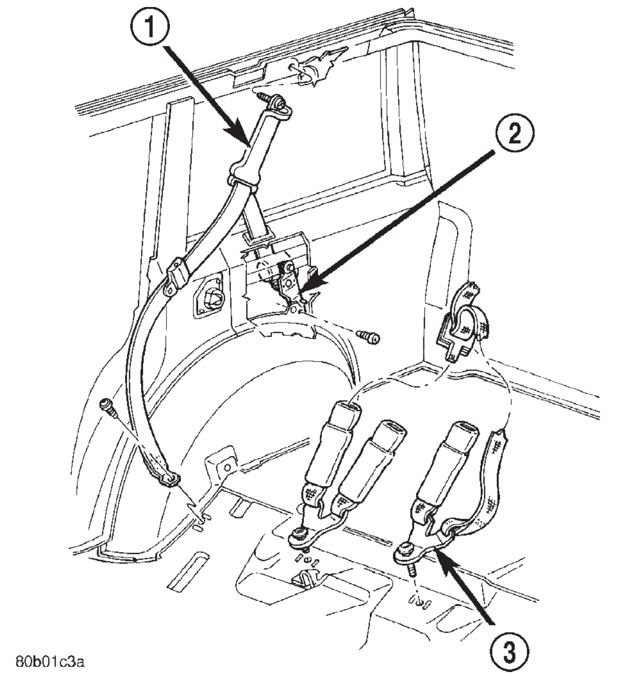


Fig. 76 Rear Seat Shoulder/Lap Belts and Buckles

1 – TURNING LOOP
2 – RETRACTOR
3 – LAP BELT AND BUCKLE

(3) Install retractor support on rear quarter rail. Tighten screw.

(4) Route shoulder belt through quarter trim panel slot.

(5) Position shoulder belt at roof rail and install upper anchor bolt. Tighten bolt to 43 N·m (32 ft. lbs.) torque.

(6) Install quarter trim panel.

(7) Install shoulder belt lower anchor bolt. Tighten bolt to 43 N·m (32 ft. lbs.) torque.

(8) Return rear seat cushion to normal position and engage latch.

FULL FLOOR CONSOLE

REMOVAL

(1) Remove the transmission shift lever handle/knob:

- Automatic transmissions, pull the handle straight upward to remove it.
- Insert a thin-blade tool under the edge of the transmission shift indicator bezel and pry up to remove.
- Manual transmissions, loosen the locknut and un-thread the shift knob from the shaft.
- Pull the shift boot up to remove.

(2) Insert a thin-blade tool under the edge of the transfer case shift indicator bezel or cover plate and pry up to remove.

REMOVAL AND INSTALLATION (Continued)

(3) Open the console lid.

(4) Remove the screws attaching the console to the floor and mounting bracket (Fig. 77).

(5) Disconnect the wire harness connector.

(6) Separate the console from the floor.

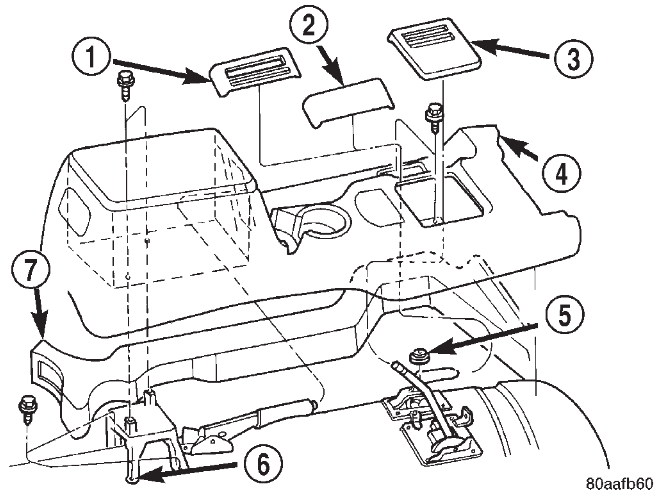


Fig. 77 Floor Console

1 – TRANSFER CASE SHIFT BEZEL
2 – COVER
3 – TRANS SHIFT BEZEL
4 – FLOOR CONSOLE
5 – WASHER (2WD)
6 – BRACKET
7 – DUCT

INSTALLATION

(1) Position the console on the floor.

(2) Attach the air duct to the air outlet duct.

(3) Connect the wire harness connectors.

(4) Install the screws attaching the console to the mounting bracket.

(5) Install the shift indicator bezels (or cover plate).

(6) Install the shift lever handle/knob.

FRONT CARPET/MAT

REMOVAL

(1) Remove the door sill inner scuff plates.

(2) Remove the front and rear seats (as applicable).

(3) Remove floor console.

(4) As necessary, remove the trim panels and moldings.

(5) Remove all other interfering components.

(6) Remove the carpet and mat from the floor panel (Fig. 78).

INSTALLATION

(1) Position the carpet and mat on the floor panel.

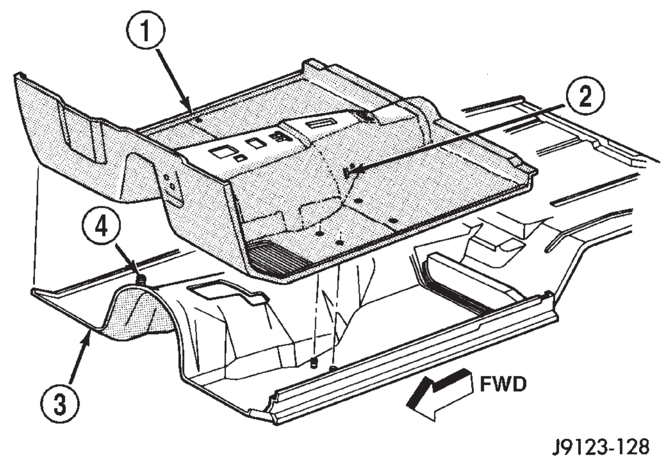


Fig. 78 Front Carpet and Mat

1 – CARPET AND MAT
2 – POWER SEAT WIRE HARNESS SLOT
3 – FLOOR PANEL
4 – SEAT FRAME STUD

(2) Install all the components that were removed to facilitate carpet/mat removal.

(3) Install the trim panels and moldings.

(4) Install the door sill inner scuff plates.

(5) Install floor console.

(6) Install the front and rear seats (as applicable).

REAR CARPET/MAT

REMOVAL

(1) Remove the liftgate latch striker and scuff plate.

(2) Drill-out the retaining rivet heads and remove the cargo tie-down footman loops from the carpet.

(3) As necessary, remove the trim panels and moldings.

(4) Remove the all other interfering components.

(5) Remove the carpet and mat from the floor panel.

(6) If necessary, remove the insulation from the wheelhouse (Fig. 79).

INSTALLATION

(1) If removed, install the insulation on the wheelhouses.

(2) Position the mat on the floor panel.

(3) Position the carpet on the mat.

(4) Install all the components that were removed to facilitate carpet and mat removal.

(5) Install the trim panels and moldings.

(6) Install the cargo tie-down footman loops on the carpet with replacement rivets.

(7) Install the liftgate scuff plate and latch striker.

REMOVAL AND INSTALLATION (Continued)

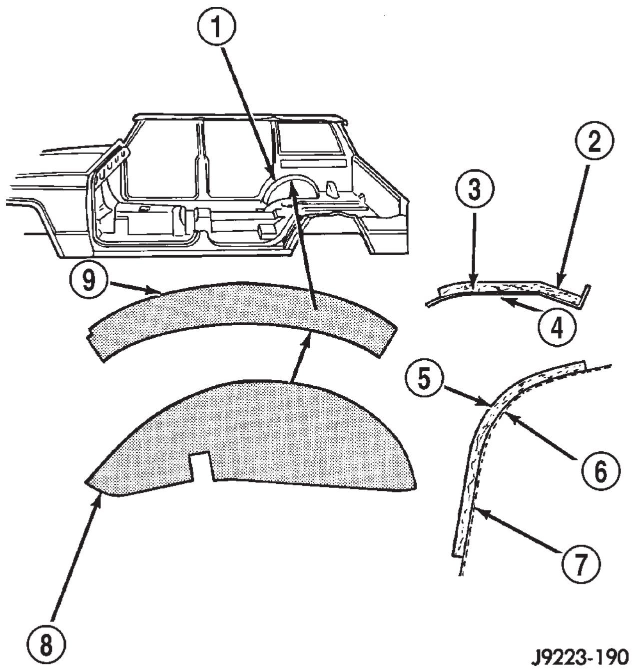


Fig. 79 Wheelhouse Insulation

1 – REAR WHEELHOUSE
2 – FACE SIDE
3 – ADHESIVE
4 – WHEELHOUSE PANEL
5 – FACE SIDE
6 – ADHESIVE
7 – WHEELHOUSE PANEL
8 – LOWER INSULATION
9 – UPPER INSULATION

REARVIEW MIRROR

REMOVAL

(1) Loosen the mirror base setscrew (Fig. 80).

(2) Slide the mirror base upward and off the bracket.

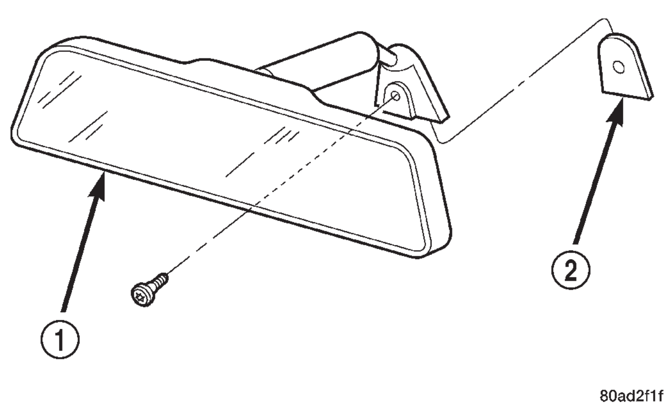


Fig. 80 Rearview Mirror

1 – MIRROR
2 – SUPPORT BUTTON

INSTALLATION

(1) Position the mirror base at the bracket and slide it downward onto the support bracket.

(2) Tighten setscrew to1 N·m (9 in. lbs.) torque.

REARVIEW MIRROR SUPPORT BRACKET

INSTALLATION

(1) Mark the position for the mirror bracket on the outside of the windshield glass with a wax pencil.

(2) Clean the bracket contact area on the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.

(3) Sand the surface on the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.

(4) Apply accelerator to the surface on the bracket according to the following instructions:

- Crush the vial to saturate the felt applicator.
- Remove the paper sleeve.
- Apply accelerator to the contact surface on the bracket.
- Allow the accelerator to dry for five minutes.
- Do not touch the bracket contact surface after the accelerator has been applied.

(5) Apply adhesive accelerator to the bracket contact surface on the windshield glass. Allow the accelerator to dry for one minute. Do not touch the glass contact surface after the accelerator has been applied.

(6) Install the bracket according to the following instructions:

- Apply one drop of adhesive at the center of the bracket contact-surface on the windshield glass.
- Apply an even coat of adhesive to the contact surface on the bracket.
- Align the bracket with the marked position on the windshield glass.
- Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

(7) Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.

(8) Allow the adhesive to cure for an additional 8-10 minutes before installing the mirror.

REMOVAL AND INSTALLATION (Continued)

SUNVISORS

REMOVAL

(1) Remove the screws that attach the sunvisor arm support bracket to the headliner and the roof panel (Fig. 81) and (Fig. 82).

(2) Disconnect vanity lamp connector, if equipped.

(3) Detach the sunvisor from the support clip.

(4) Remove the sunvisor from the vehicle.

(5) Remove the retaining screw and support clip. On vehicles equipped with an overhead console, the support clip is integral with the overhead console.

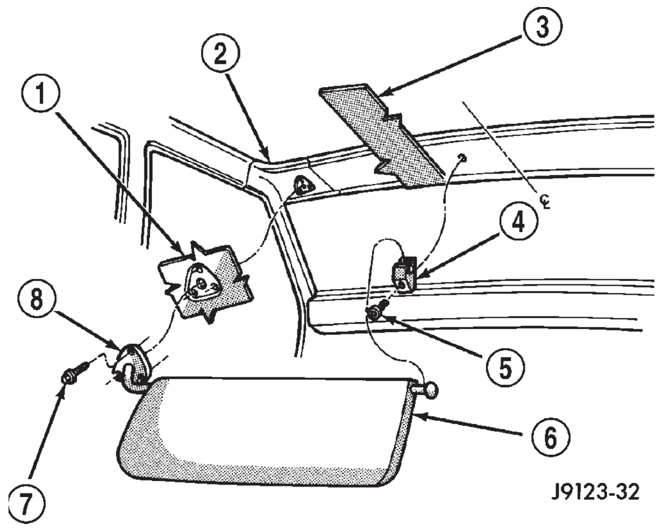


Fig. 81 Sunvisor

1 – HEADLINER
2 – VEHICLE ROOF
3 – HEADLINER
4 – SUPPORT CLIP
5 – SCREW
6 – SUN VISOR
7 – SCREW
8 – SUN VISOR ARM SUPPORT BRACKET

INSTALLATION

(1) Install the support bracket and the retaining screw.

(2) Connect vanity lamp connector, if equipped.

(3) Position the sunvisor in the support clip and align the arm support bracket holes with the headliner holes.

(4) Install the screws that attach the sunvisor arm support bracket to the headliner and the roof panel.

HEADLINER

The upper trim moldings and the headliner are attached to the roof rail with a combination of screws, clip retainers and rail retainers (Fig. 83).

To remove a headliner, all of the upper trim moldings must be removed from the perimeter of the headliner along with (as applicable):

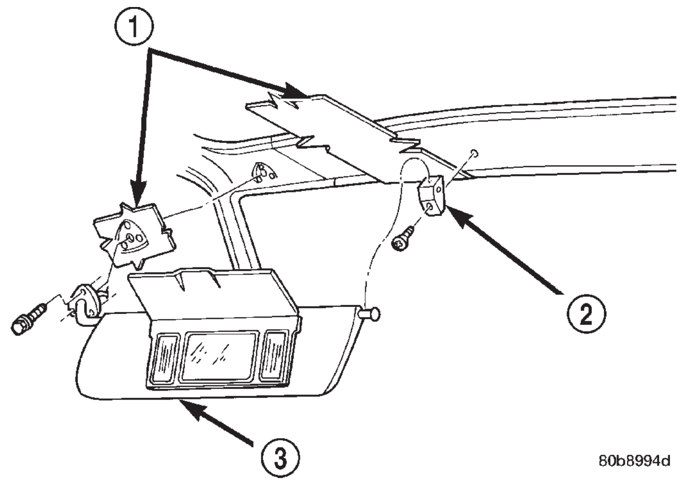


Fig. 82 Sunvisor w/Vanity Lamp

1 – HEADLINER
2 – SUPPORT CLIP
3 – SUNVISOR

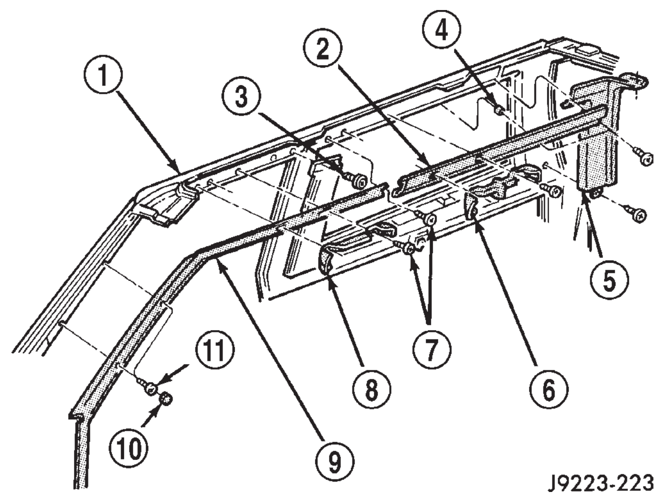


Fig. 83 Headliner Trim Moldings

1 – ROOF RAIL
2 – HEADLINER MOULDING
3 – SCREW
4 – SPACER
5 – LIFTGATE PILLAR TRIM COVER
6 – ASSIST HANDLE
7 – SCREW
8 – ASSIST HANDLE
9 – WINDSHIELD SIDE MOULDING
10 – COVER PLUG
11 – SCREW

- Assist handles.
- Sunvisors.
- Dome/cargo lamps.
- Overhead console.
- All other attached/overlapping components.

REMOVAL AND INSTALLATION (Continued)

Refer to the appropriate removal and installation procedure locate in this section or in Group 8, Electrical.

REMOVAL

CAUTION: The headliner is a one-piece, molded component (Fig. 84). It has limited flexibility and must not be bent during removal/installation.

(1) Remove the upper trim moldings from the perimeter of the headliner (Fig. 85).

(2) Ensure that all the retainer clips and screws are disengaged before removing the headliner.

(3) Disengage tabs attaching headliner/speaker structure to roof rail, if equipped (Fig. 84).

(4) Disengage rear speaker harness connector, if equipped.

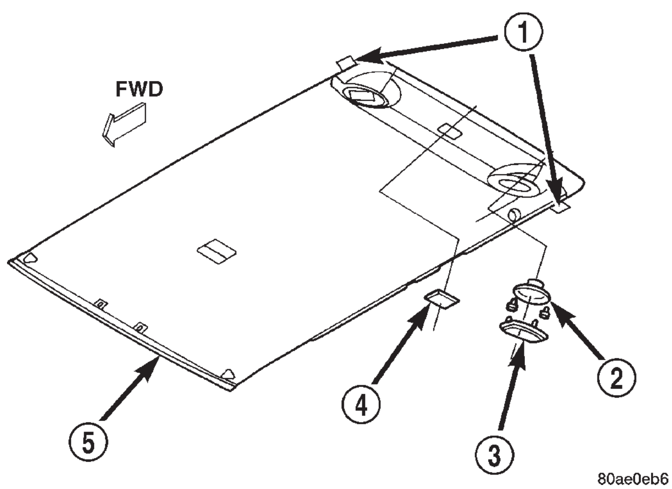


Fig. 84 Headliner

1 – TAB
2 – SPEAKER
3 – GRILLE
4 – CARGO LAMP
5 – HEADLINER

INSTALLATION

(1) Engage tabs attaching headliner/speaker structure to roof rail, if equipped. (Fig. 84)

(2) On vehicles without headliner speakers, ensure that the retainer clips on upper liftgate opening trim and rails are installed. (Fig. 86)

(3) Engage rear speaker harness connector.

(4) Install the upper trim moldings around the perimeter of the headliner. Tighten the retaining screws to 1 N·m (11 in. lbs.) torque.

(5) As applicable, install:

- Assist handles.
- Sunvisors.
- Dome/cargo lamps.
- Overhead console.

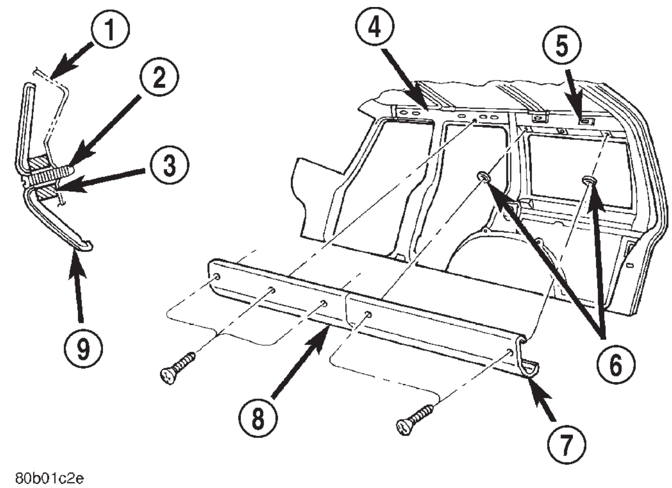


Fig. 85 Upper Trim Molding—4-Door

1 – ROOF RAIL
2 – SCREW
3 – SPACER
4 – ROOF RAIL
5 – HEADLINER SLOT
6 – SPACER
7 – REAR HEADLINER TRIM MOLDING
8 – FRONT HEADLINER TRIM MOLDING
9 – TRIM MOLDING

- All other attached/overlapping components.

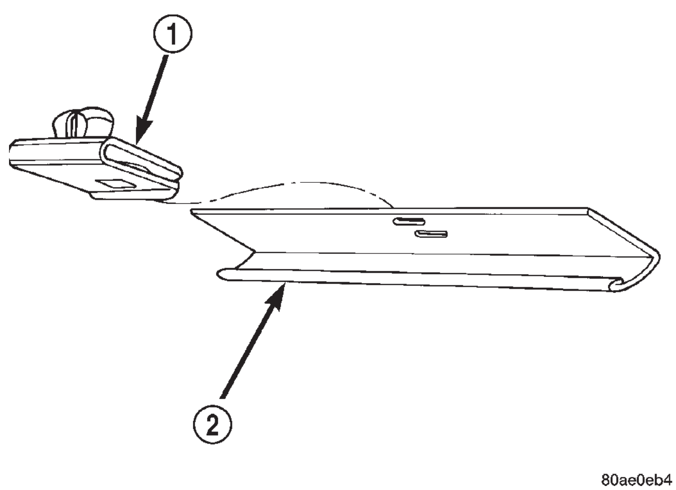


Fig. 86 Headliner Retainer Clip and Retainer Rail

1 – CLIP
2 – RETAINER REAR

LIFTGATE TRIM PANEL

REMOVAL

(1) Using a small flat blade, pry out the trim plugs from the liftgate assist handle.

(2) Remove the screws attaching the assist handle to the liftgate (Fig. 87).

REMOVAL AND INSTALLATION (Continued)

(3) Remove the screws that attach the liftgate trim panel to the liftgate.

(4) Using a trim panel removal tool, detach the push-in fasteners from the liftgate.

(5) Remove the trim panel from the liftgate.

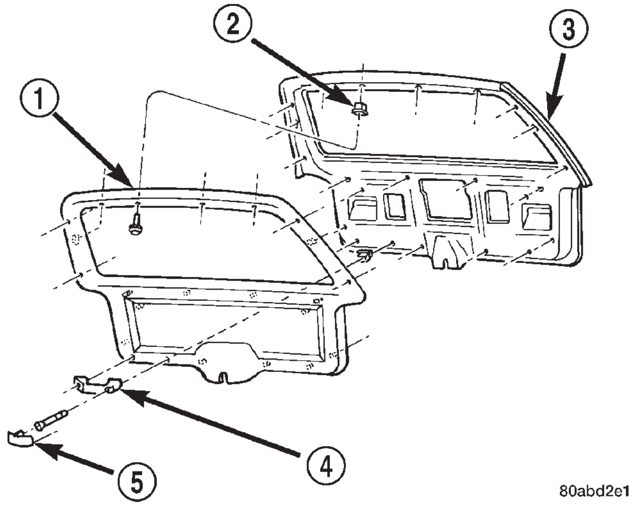


Fig. 87 Liftgate Trim Panel

1 – TRIM PANEL
2 – PUSH NUT
3 – LIFTGATE
4 – ASSIST HANDLE
5 – PLUG

INSTALLATION

(1) Position the trim panel on liftgate.

(2) Using new push-in fasteners, align the push-in fasteners with the holes in the liftgate inner panel and press the trim panel into place.

(3) Install the screws to attach the liftgate trim panel to the liftgate.

(4) Install the screws attaching the assist handle to the liftgate.

(5) Press the trim plugs into the liftgate assist handle.

LIFTGATE

REMOVAL

WARNING: DO NOT DISCONNECT SUPPORT ROD CYLINDERS WITH LIFTGATE CLOSED. SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS. THIS COULD CAUSE DAMAGE AND/OR PERSONAL INJURY IF THEY ARE REMOVED WHILE PISTONS ARE COMPRESSED.

(1) Remove center high mounted stop lamp (CHMSL).

(2) Open and support liftgate.

(3) Remove liftgate trim panel.

(4) Disconnect and plug backlite washer fluid supply line.

(5) Remove screws that attach rear wiper and liftgate power lock wire harness connectors to liftgate and disconnect connectors.

(6) Using access hole created by removal of CHMSL, route backlite washer fluid supply line and rear wiper and liftgate power lock wire harness/grommets through access hole and separate from liftgate.

(7) Remove retainer clips that secure support rods to ball studs.

(8) Remove support rods from ball studs.

(9) Remove bolts attaching hinges to liftgate.

(10) Remove liftgate from vehicle.

INSTALLATION

(1) Position and support liftgate at opening in body and install bolts attaching hinges to liftgate. Tighten bolts to 26 N·m (19 ft. lbs.) torque.

(2) Connect liftgate support rods to ball studs and install retainer clips.

(3) Route backlite washer fluid supply line and rear wiper and liftgate power lock wire harnesses/grommets through access hole.

(4) Connect connectors and install screws that attach rear wiper and liftgate power lock wire harness connectors to liftgate

(5) Unplug and connect backlite washer fluid supply line.

(6) Install liftgate trim panel.

(7) Remove supports and close liftgate.

(8) Install (CHMSL).

LIFTGATE HINGE

REMOVAL

It is not necessary to remove the liftgate to replace one or both hinges.

(1) Open and support the liftgate.

(2) Remove the liftgate opening upper trim.

(3) Remove the bolts attaching the hinge to the header panel (Fig. 88).

(4) Remove the bolts attaching the hinge to the liftgate.

REMOVAL AND INSTALLATION (Continued)

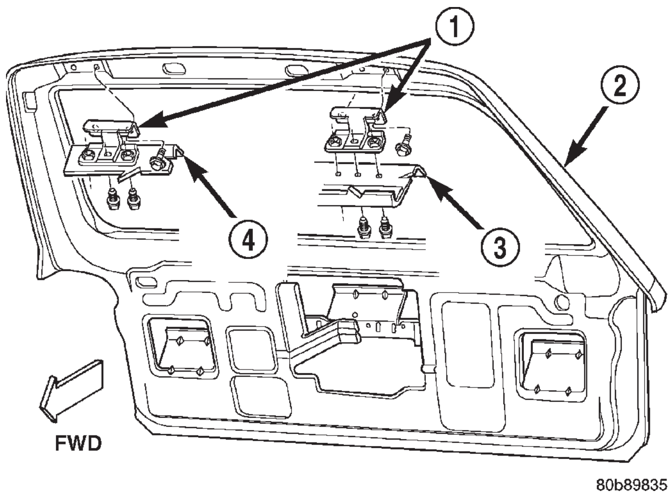


Fig. 88 Liftgate Hinge

1 – LIFTGATE HINGE
2 – LIFTGATE
3 – HEADER PANEL
4 – HEADER PANEL

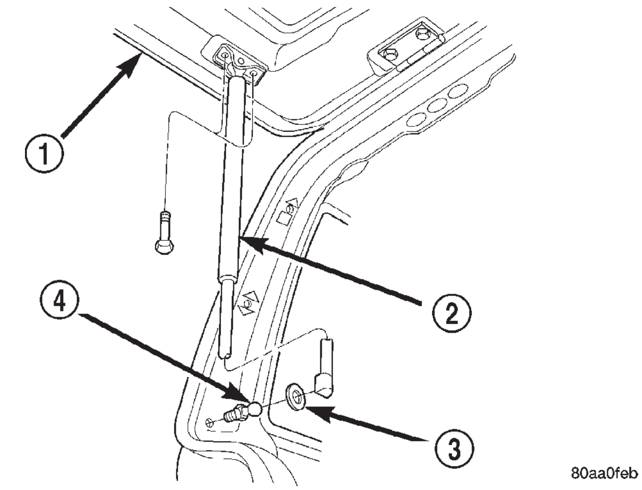


Fig. 89 Liftgate Support Rod

1 – LIFTGATE
2 – SUPPORT ROD CYLINDER
3 – WASHER
4 – BALL STUD

INSTALLATION

(1) Position the hinge on the liftgate.
(2) Install the bolts attaching the hinge to the liftgate. Tighten to 26 N·m (19 ft. lbs.) torque.
(3) Install the bolts attaching the hinge to the header panel. Tighten to 26 N·m (19 ft. lbs.) torque.
(4) Install the liftgate opening upper trim.
(5) Remove the support and close the liftgate.

LIFTGATE SUPPORT ROD CYLINDER

REMOVAL

WARNING: DO NOT REMOVE A SUPPORT ROD CYLINDER WITH THE LIFTGATE CLOSED. EACH SUPPORT ROD PISTON IS OPERATED BY HIGH PRESSURE GAS. IT CAN CAUSE DAMAGE AND/OR PERSONAL INJURY IF IT IS REMOVED WITH THE PISTON COMPRESSED. DO NOT ATTEMPT TO DISASSEMBLE OR REPAIR A SUPPORT ROD CYLINDER.

(1) Open the liftgate.
(2) Support the liftgate in the open position.
(3) Remove the clip attaching the support rod to the ball stud.
(4) Disconnect the support rod from the ball stud.
(5) Remove the bolts attaching the support rod to the liftgate (Fig. 89).
(6) Separate the support rod from the liftgate.

INSTALLATION

(1) Position the support rod on the liftgate.
(2) Install the bolts attaching the support rod to the liftgate.
(3) Connect the support rod to the ball stud.
(4) Secure the support rod to the ball stud with the retainer clip.
(5) Remove the support from the liftgate.

LIFTGATE SUPPORT ROD BALL STUD

REMOVAL

(1) Open the liftgate.
(2) Support the liftgate in the open position.
(3) Remove the retainer clip attaching the support rod to the ball stud.
(4) Disconnect the support rod from the ball stud.
(5) Remove the ball stud.

INSTALLATION

(1) Install the replacement ball stud.
(2) Connect the support rod to the ball stud.
(3) Secure the support rod to the ball stud with the clip.
(4) Remove the support from the liftgate.

LIFTGATE OUTSIDE HANDLE

REMOVAL

(1) Remove liftgate trim panel.
(2) Disconnect liftgate actuator linkages.
(3) Disconnect liftgate outside handle to latch rod.
(4) Remove nut attaching outside handle to liftgate (Fig. 90).
(5) Separate outside handle from liftgate.
(6) If necessary, remove lock cylinder (Fig. 91).

REMOVAL AND INSTALLATION (Continued)

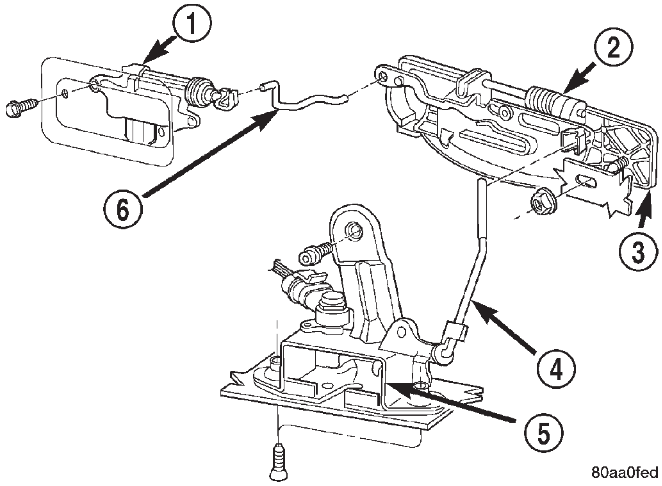


Fig. 90 Liftgate Outside Handle

1 – POWER ACTUATOR
2 – LIFTGATE LOCK
3 – OUTSIDE HANDLE
4 – OUTSIDE HANDLE TO LATCH ROD
5 – LIFTGATE LATCH
6 – ACTUATOR TO LIFTGATE LOCK ROD

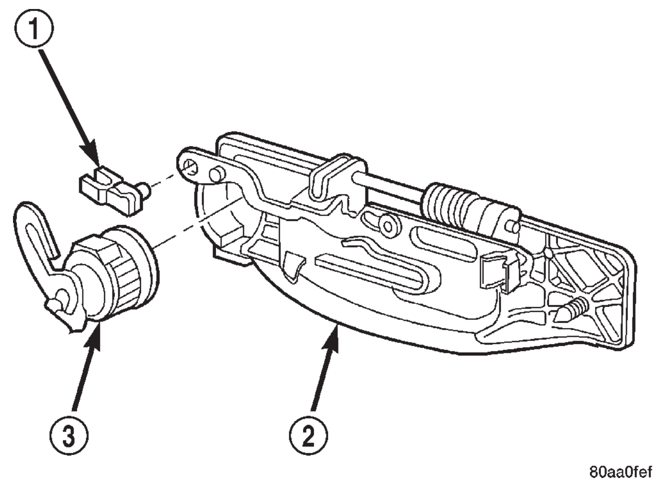


Fig. 91 Liftgate Lock Cylinder

1 – CLIP
2 – OUTSIDE HANDLE
3 – LOCK CYLINDER

INSTALLATION

(1) If necessary, install lock cylinder.
(2) Position outside handle on liftgate.
(3) Install nut attaching outside handle to liftgate.
(4) Connect liftgate outside handle to latch rod.
(5) Connect liftgate actuator linkages.
(6) Install liftgate trim panel.

LIFTGATE LOCK CYLINDER

For service procedures, refer to the Liftgate Outside Handle Removal/Installation procedures.

LIFTGATE LATCH

REMOVAL

(1) Raise liftgate.
(2) Remove liftgate trim panel.
(3) Remove screws attaching latch to liftgate (Fig. 92).
(4) Disconnect rod from latch.
(5) Disconnect power lock connector from handle, if equipped.
(6) Remove latch from liftgate.

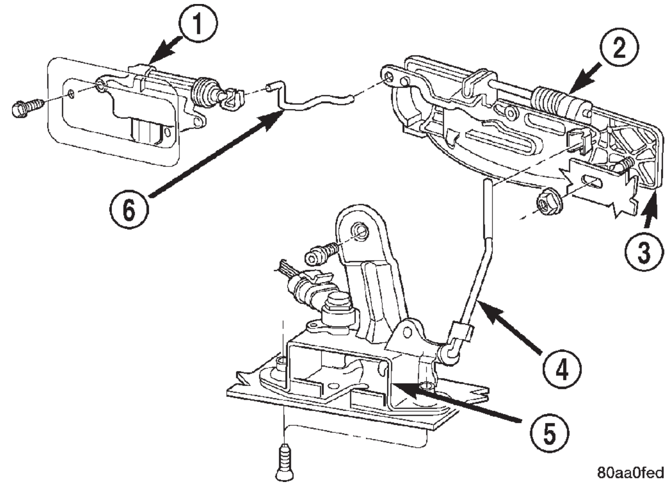


Fig. 92 Liftgate Latch

1 – POWER ACTUATOR
2 – LIFTGATE LOCK
3 – OUTSIDE HANDLE
4 – OUTSIDE HANDLE TO LATCH ROD
5 – LIFTGATE LATCH
6 – ACTUATOR TO LIFTGATE LOCK ROD

INSTALLATION

(1) Position latch in liftgate.
(2) Connect power lock connector to handle, if equipped.
(3) Connect latch rod.
(4) Install screws attaching latch to liftgate. Tighten screws to 13 N·m (9 ft. lbs.) torque.
(5) Install liftgate trim panel.

LIFTGATE LATCH STRIKER

REMOVAL

(1) From underside of vehicle, remove nuts attaching striker to floor pan (Fig. 93).
(2) Separate striker from vehicle.

INSTALLATION

(1) Position striker on vehicle.
(2) Install nuts. Tighten nuts to 54 N·m (40 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

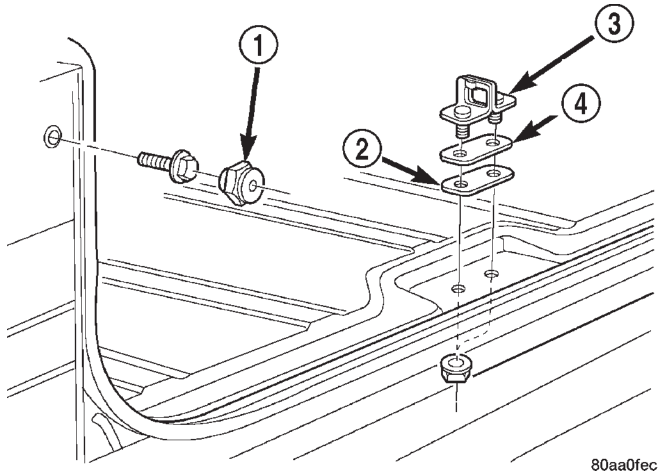


Fig. 93 Liftgagte Striker

1 – OVERSLAM BUMPER
2 – STRIKER PLATE
3 – STRIKER
4 – SHIM

LIFTGATE WEATHERSTRIP

REMOVAL

(1) Pull the seal away from the flange around the perimeter of liftgate opening and remove it.

(2) Clean the flange as necessary.

INSTALLATION

(1) Position weatherstrip seal in the opening with the left end of the seal at the opening centerline. Install the seal in a clockwise direction.

(2) Move to the left and mate the seal with the bottom-left flange (Fig. 94).

(3) Move upward and mate the seal with the left-side flange.

(4) Move to the right and mate the seal with the top-left roof flange.

(5) Seat the installed part of the seal with a roller. Move the roller from the left-bottom end of seal to the top-left half of the seal.

(6) Move to the right and mate the seal with the top-right roof flange.

(7) Move downward and mate the seal with the right-side flange.

(8) Move to the left and mate the seal with the bottom-right flange.

(9) Center and butt seal the ends together at the centerline.

(10) Seat the remaining part of the seal with a roller. Move the roller the from top-left half of the seal to the right-bottom end of the seal.

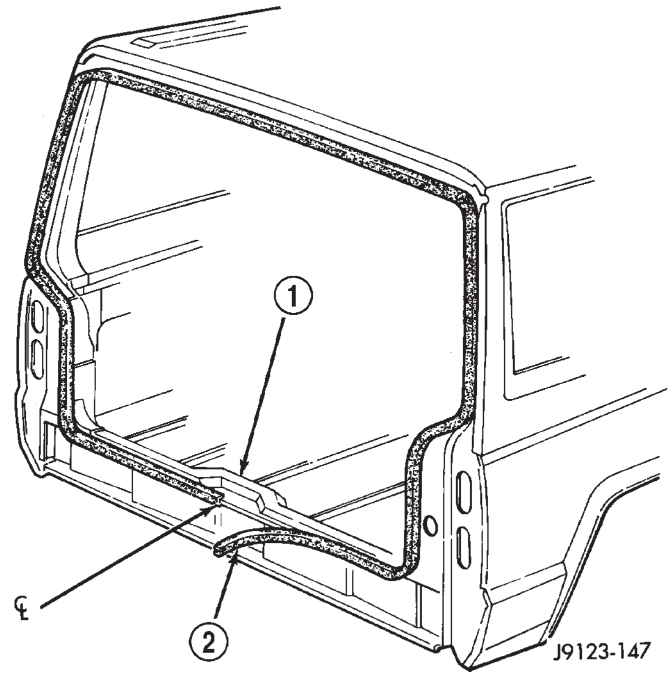


Fig. 94 Liftgate Weatherstrip Installation

1 – LIFTGATE OPENING
2 – WEATHERSTRIP SEAL

ADJUSTMENTS

HOOD

The hood bolt holes are elongated for fore and aft and side-to-side adjustment.

(1) If hood is low to the cowl panel, insert shims between the hinge and hood at the rear hinge bolts.

(2) Adjust the hood bumper (Fig. 95) in or out to provide proper hood-to-fender height alignment.

(3) Adjust the hood strikers (Fig. 96) with shims as necessary. Tighten the screws to 22 N·m (16 ft-lbs) torque after adjustment.

(4) Align each latch and striker so that the striker enters latch squarely.

DOOR

IN AND OUT—MINOR ADJUSTMENT

(1) Loosen the latch striker.

(2) Tap the latch striker inward if the door character line is outboard of the body character line or tap the latch striker outward if the door character line is inboard of the body character line.

(3) Inspect alignment. If correct, tighten striker with 28 N·m (20 ft. lbs.) torque.

ADJUSTMENTS (Continued)

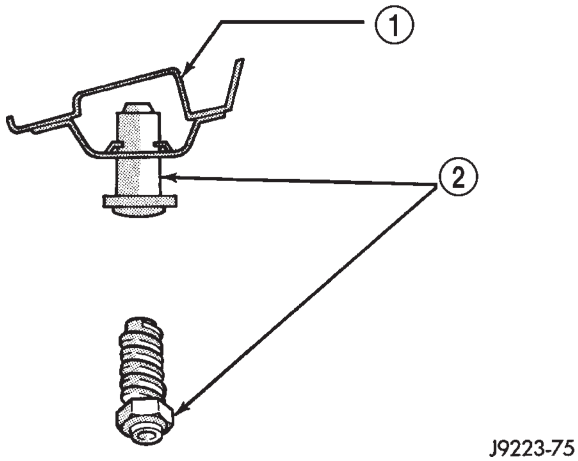


Fig. 95 Hood Bumper

1 – HOOD LATCH STRIKER REINFORCEMENT PANEL
2 – HOOD BUMPER

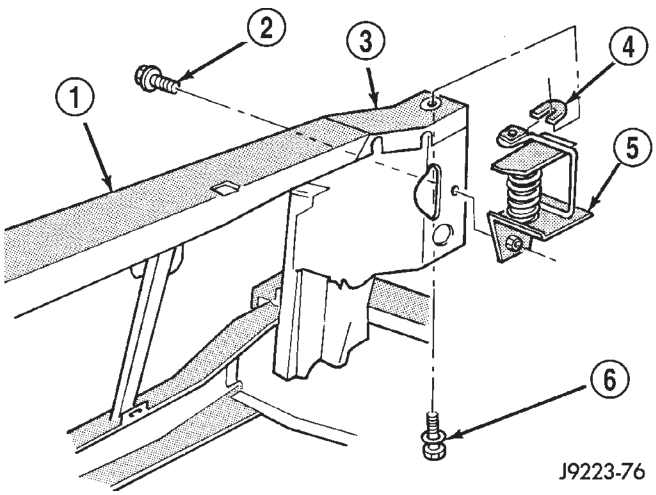


Fig. 96 Hood Latch Striker

1 – RADIATOR SUPPORT CROSSMEMBER
2 – SCREW
3 – RADIATOR BAFFLE
4 – SHIM
5 – HOOD LATCH STRIKER
6 – SCREW

UP AND DOWN—MINOR ADJUSTMENT

(1) Loosen the latch striker.

(2) Tap the latch striker downward if the door character line is higher than the body character line or tap the latch striker upward if the door character line is lower than the body character line.

(3) Inspect alignment. If correct, tighten striker with 28 N·m (20 ft. lbs.) torque.

ALIGNMENT MAJOR—ADJUSTMENT

Adjustment for alignment of the door is made by installing shims between hinge and door face (Fig. 97).

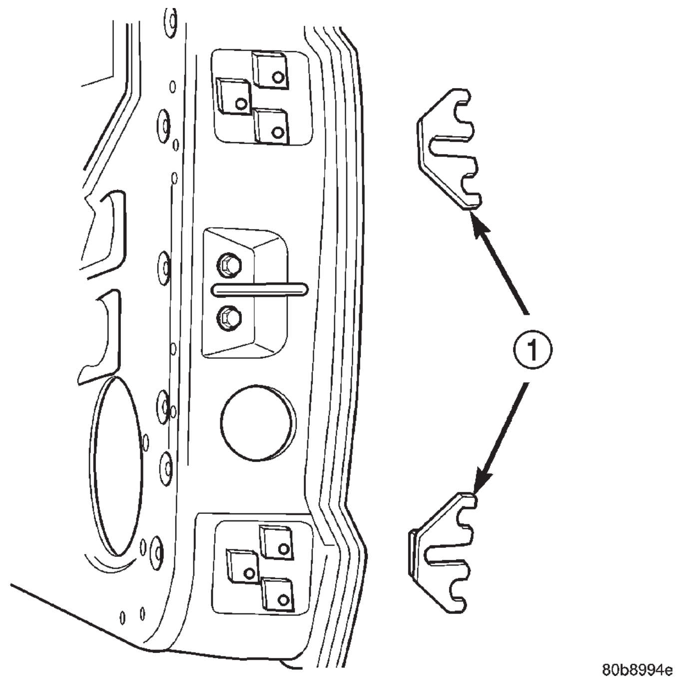


Fig. 97 Door Adjustment Shims

1 – ADJUSTMENT SHIMS

(1) If not loosened, loosen the door hinge bolts.

(2) Add or remove shims as necessary to obtain the best door fit.

(3) Tighten door hinge bolts to 3 N·m (2 ft-lbs) torque after adjustment is completed.

(4) Apply general purpose sealant around the door hinges/door face mating area.

DOOR LATCH ADJUSTMENT

(1) Locate access hole (Fig. 98).

(2) Insert a 5/32-inch hex-wrench through hole and into adjustment screw. Loosen screw.

(3) Operate outside handle button several times to release any restriction because of mis-alignment.

(4) Tighten adjustment screw to 3 N·m (30 in-lbs) torque.

(5) Test handle button and lock cylinder for proper operation.

ADJUSTMENTS (Continued)

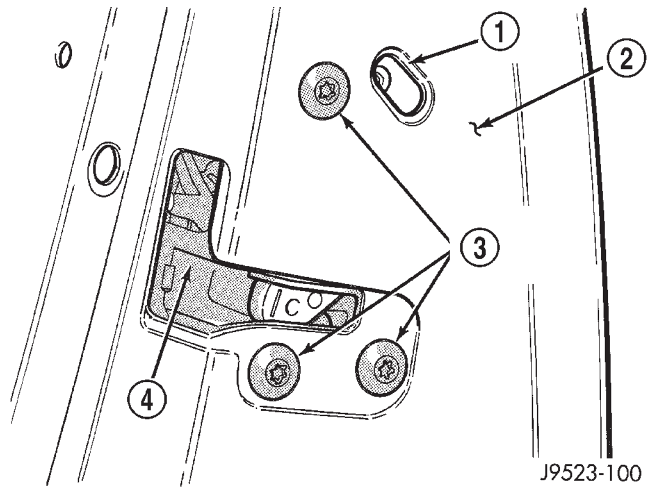


Fig. 98 Door Latch Adjustment

1 – ACCESS HOLE
2 – DOOR
3 – LATCH MOUNTING BOLTS
4 – LATCH

LIFTGATE

The position of liftgate can be adjusted upward or downward by use of slots in the hinge. An inward or outward adjustment is achieved by use of slots in the body. If an inward or outward adjustment is needed, use 3M™ Fast and Firm or equivalent on the hinge to body mating surface as a sealant.

REAR SEATBACK

(1) Unlatch and position seatback in cargo position.
(2) Loosen the screws attaching the strikers to the rear wheelhouse.
(3) Position the seat back in the full upright position and secure the latch into the strikers.
(4) From the cargo area of the vehicle, push the rear of the seatback forward.
(5) Unlatch and position seatback in cargo position.
(6) Tighten the screws attaching the strikers to the rear wheelhouse.
(7) Position the seat back in the full upright position and secure the latch into the strikers.
(8) Verify latch operation.

SPECIFICATIONS

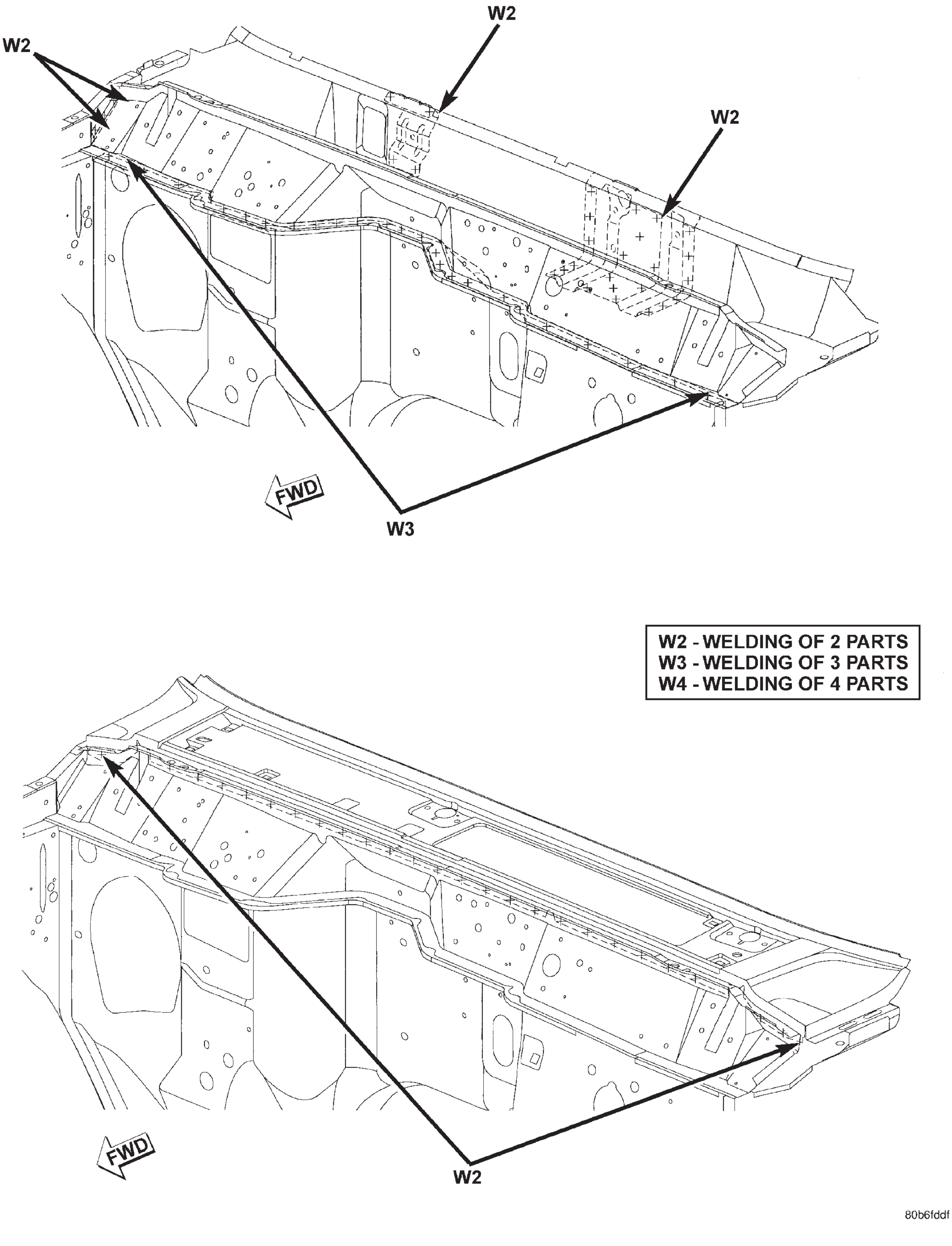
BODY LUBRICANTS

COMPONENT	SERVICE INTERVAL	LUBRICANT
Door Latches	As Required	Multi-Purpose Grease NLGI GC-LB (Water Resistant) (1)
Hood Latch, Release Mechanism & Safety Latch	As Required (When Performing Other Underhood Service)	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Hood Hinges	As Required	Engine Oil
Seat Track & Release Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Hinge	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Support Arms	As Required	Engine Oil
Liftgate Latches	As Required	White Spray Lubricant (3)
Liftgate Release Handle (Pivot & Slide Contact Surfaces)	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Window System Components	As Required	White Spray Lubricant (3)
Lock Cylinders	Twice A Year	Lock Cylinder Lubricant (4)
Parking Brake Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (1)
1 = Mopar Wheel Bering Grease (High Temp) 2 = Mopar Multi-Mileage Lubricant 3 = Mopar Spray White Lube 4 = Mopar Lock Cylinder Lubricant		

SPECIFICATIONS (Continued)

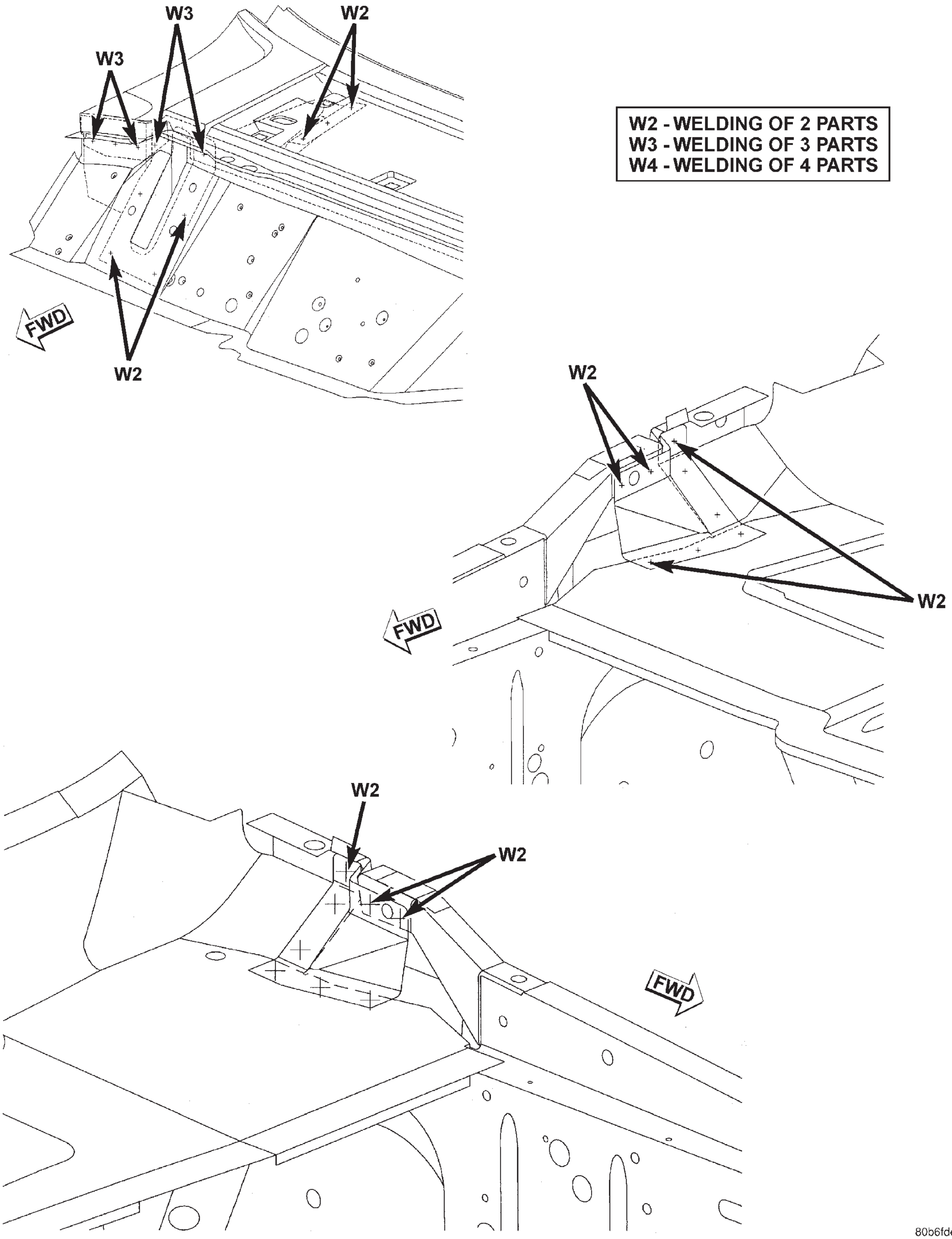
WELD LOCATIONS

UPPER COWL



SPECIFICATIONS (Continued)

UPPER COWL



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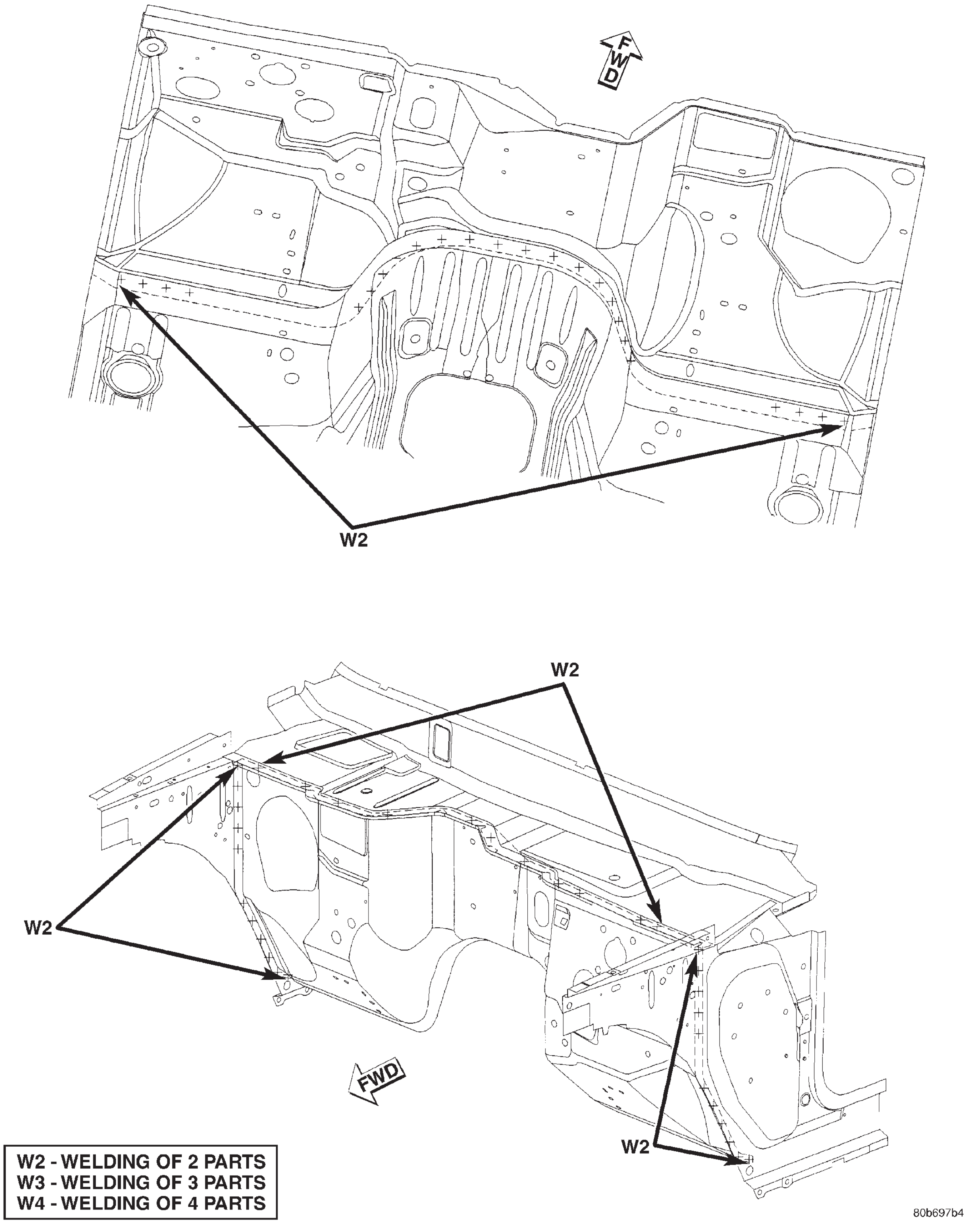
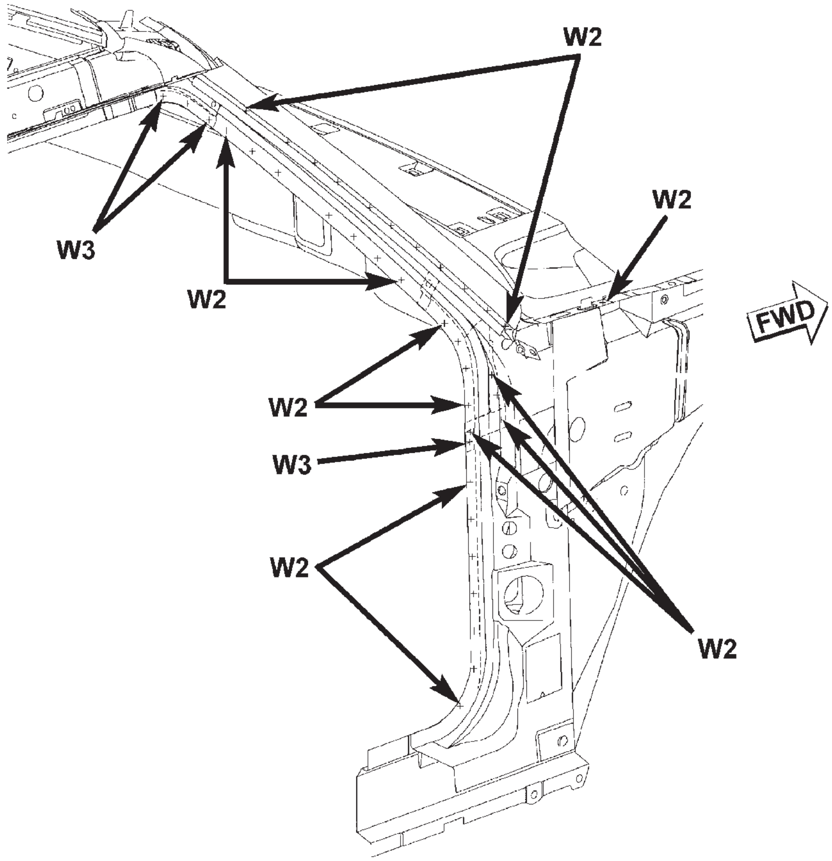
SPECIFICATIONS (Continued)

COWL

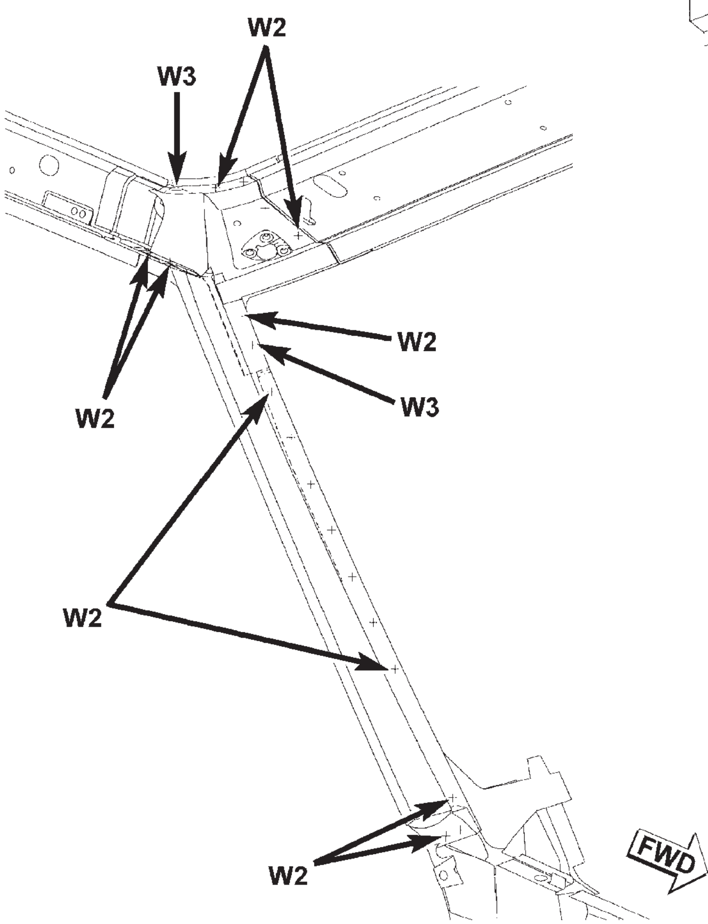


SPECIFICATIONS (Continued)

A—PILLAR



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS



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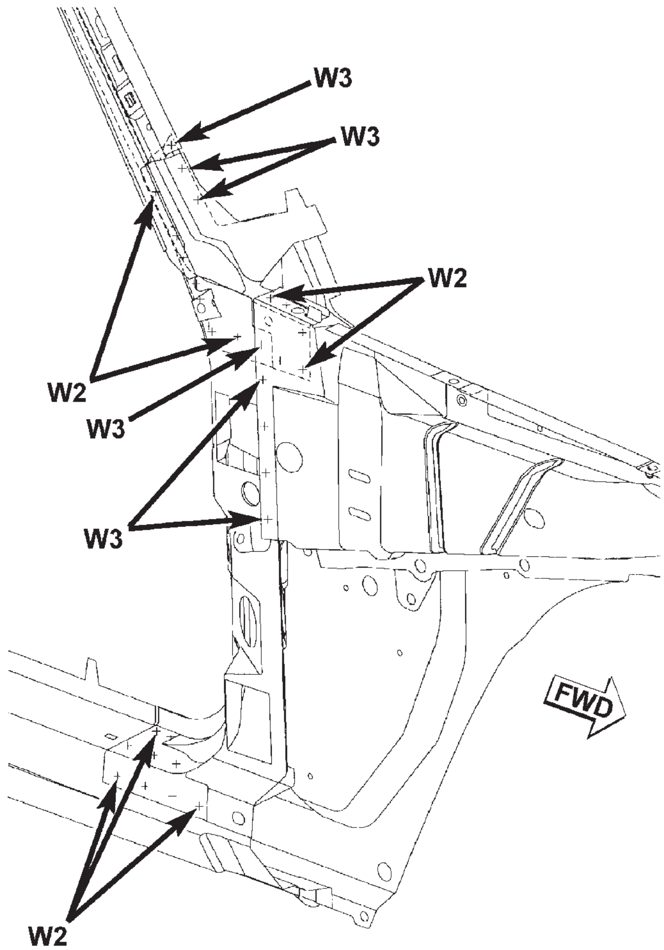
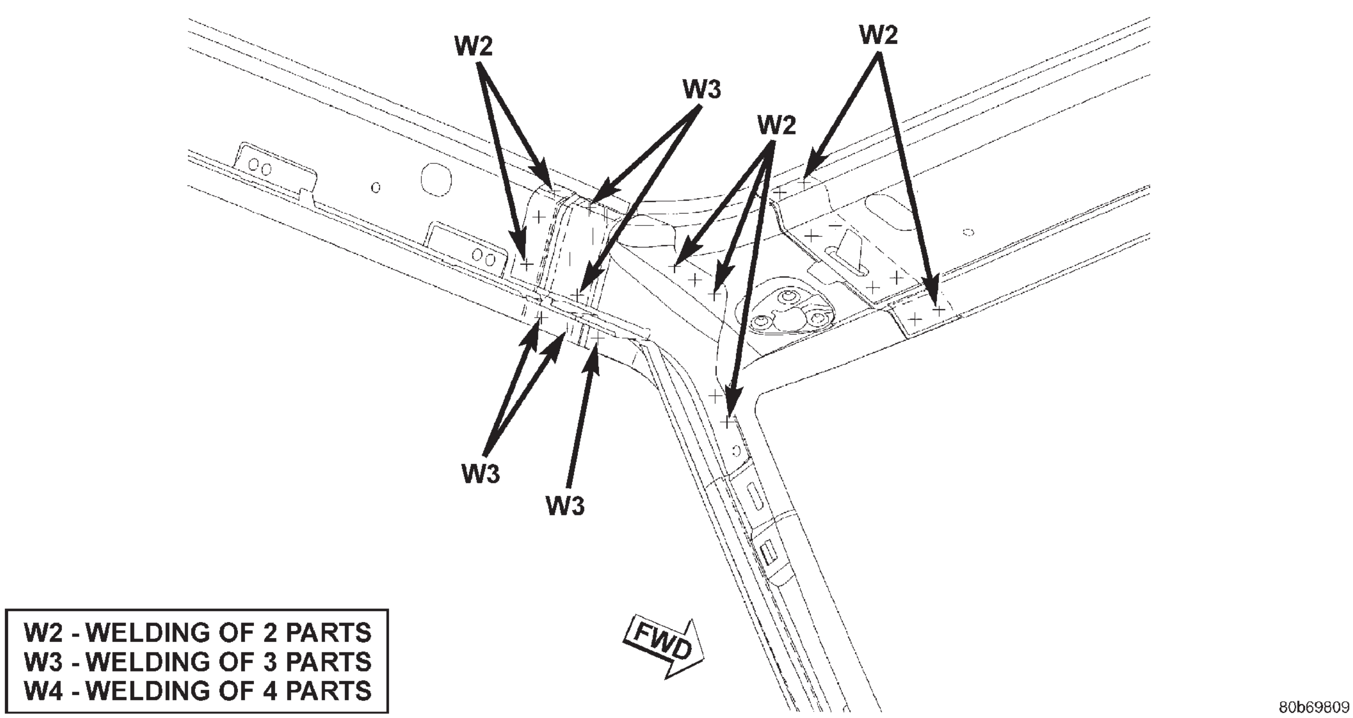
SPECIFICATIONS (Continued)

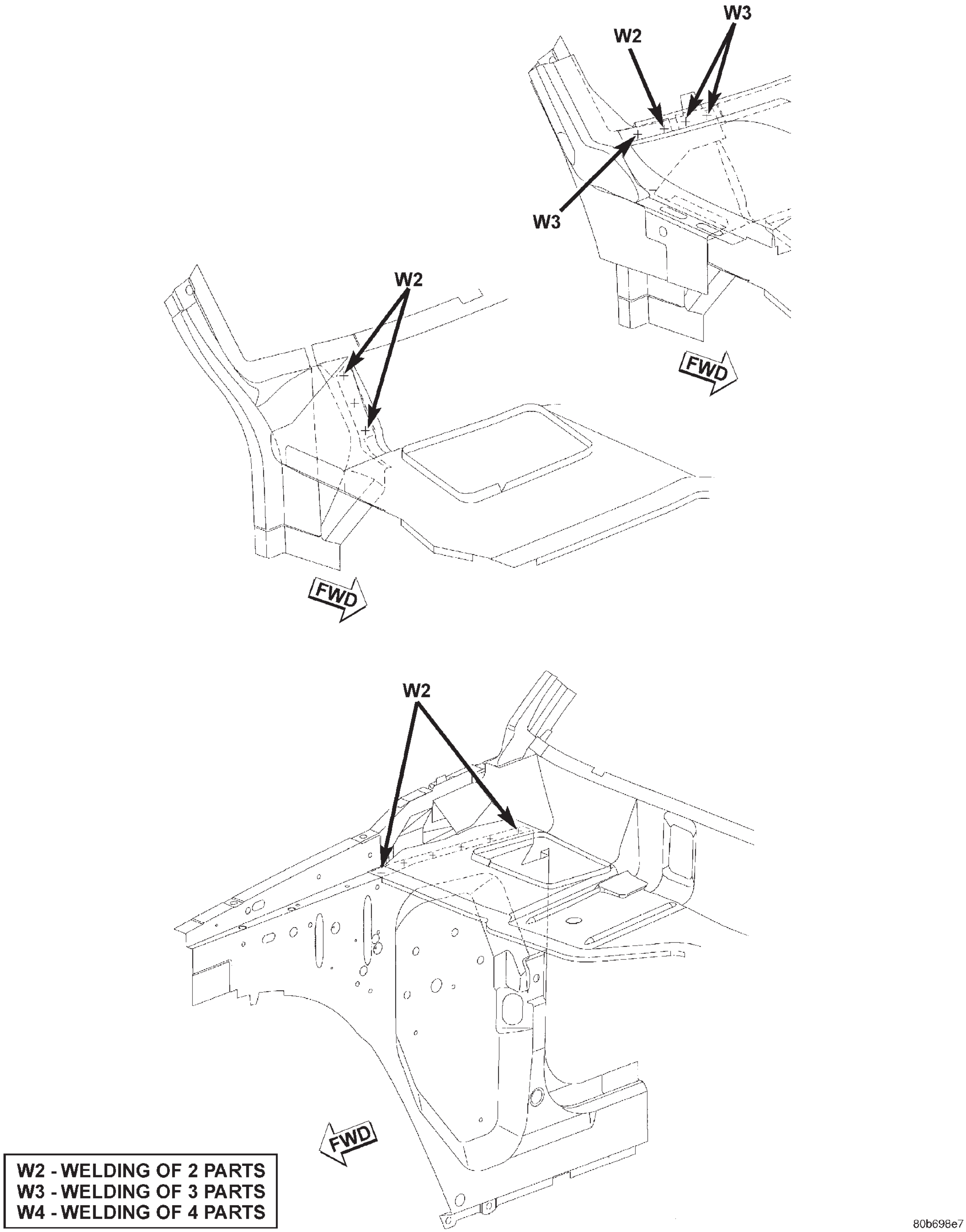
A—PILLAR





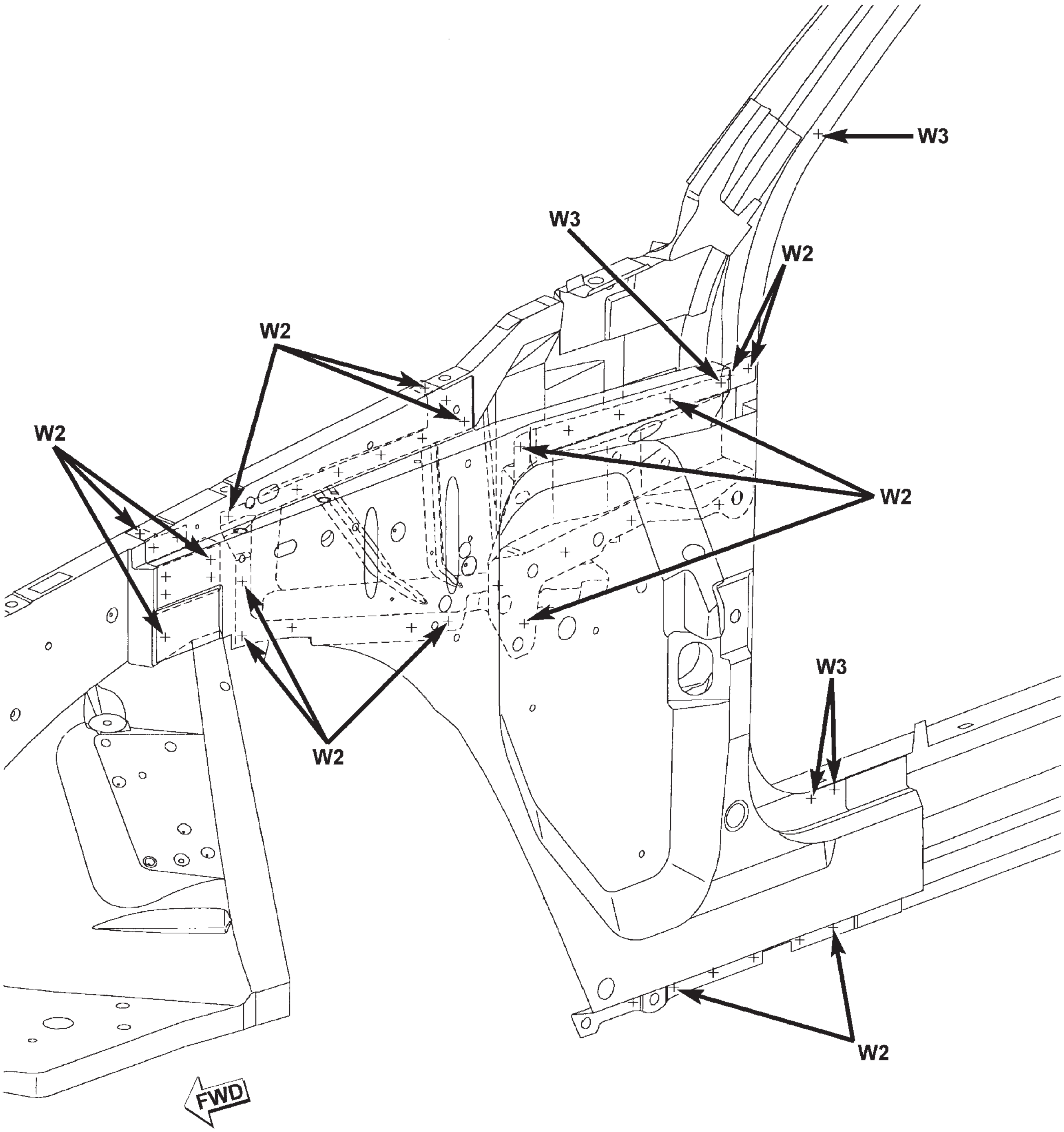
SPECIFICATIONS (Continued)

A—PILLAR



SPECIFICATIONS (Continued)

A—PILLAR



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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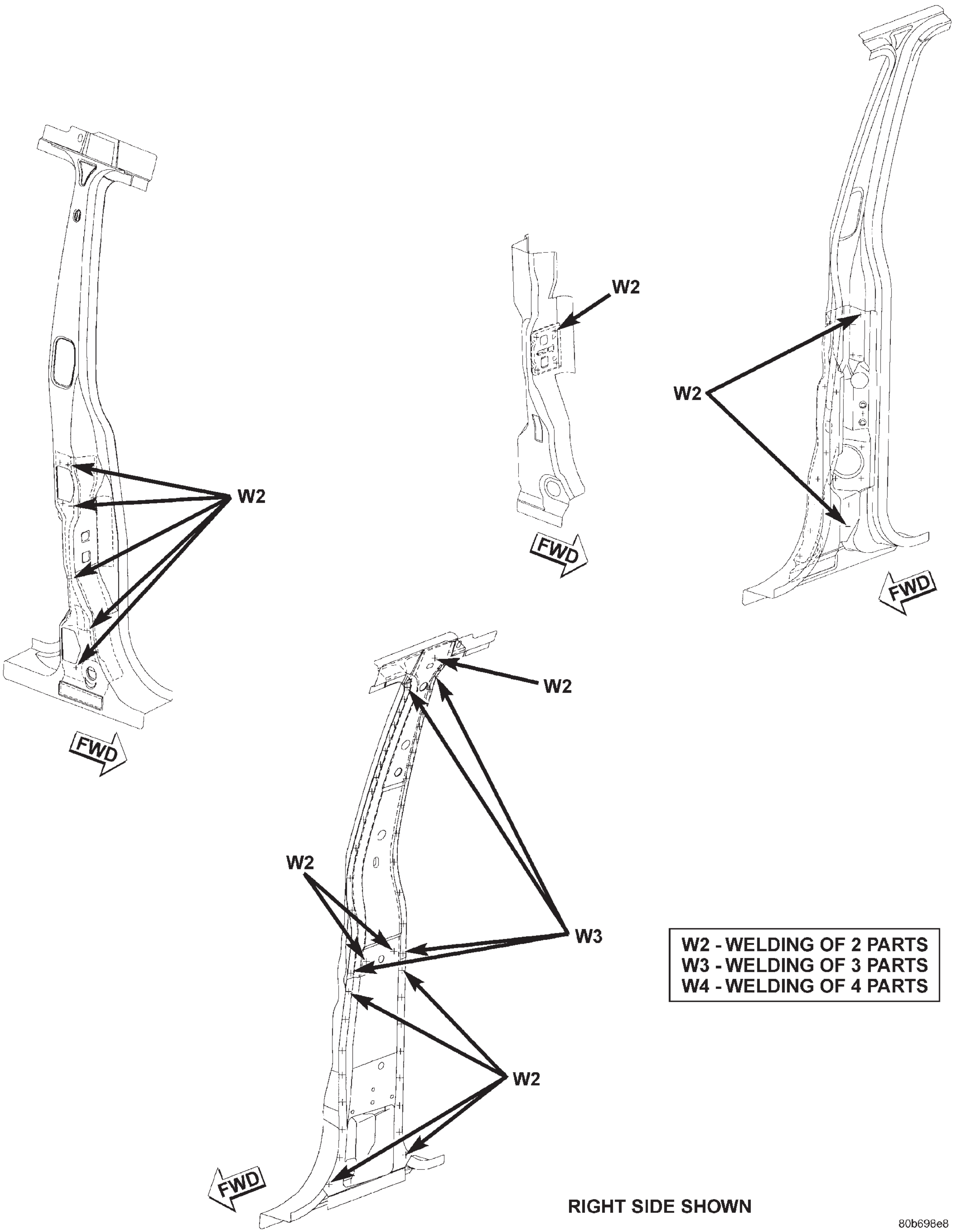
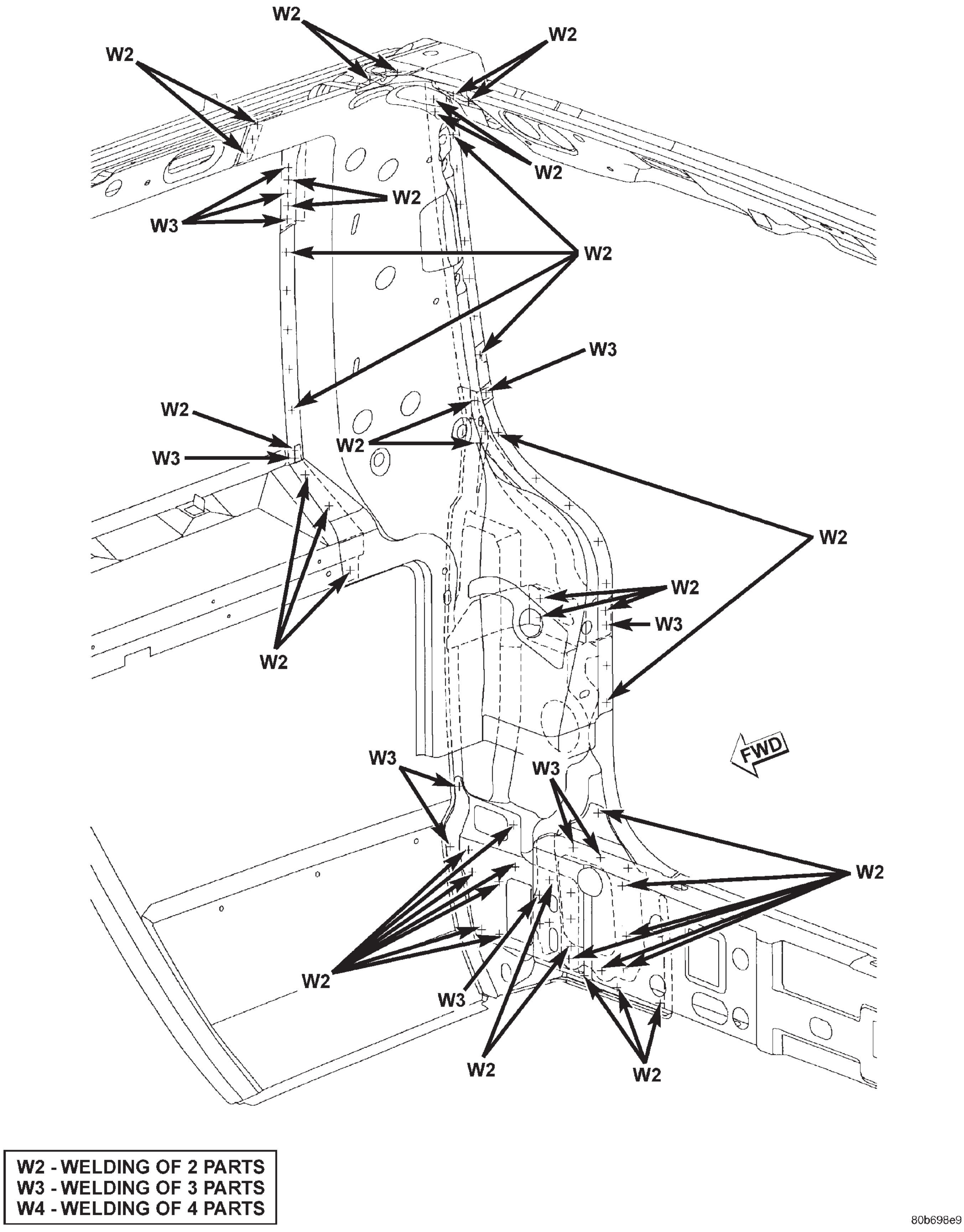
SPECIFICATIONS (Continued)

B—PILLAR



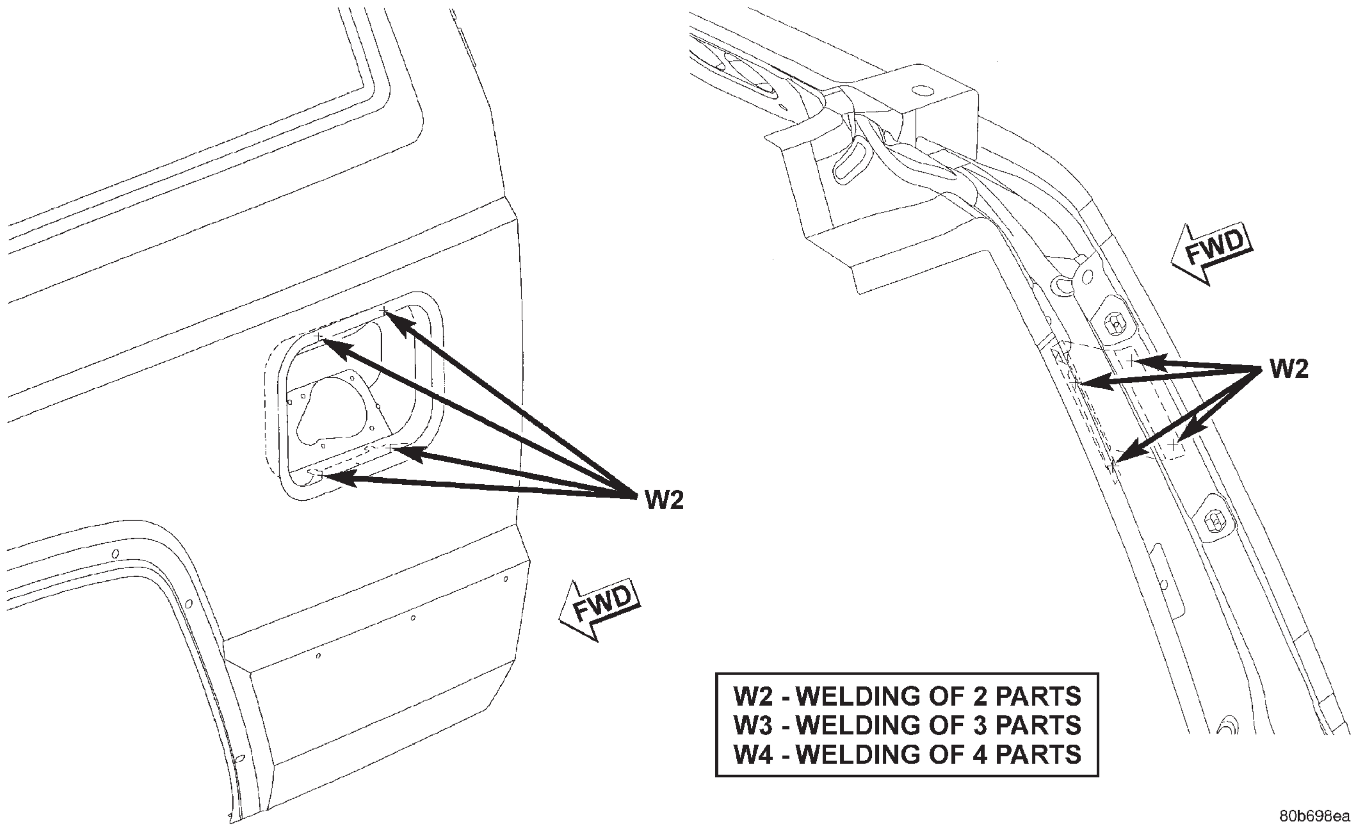
SPECIFICATIONS (Continued)

D—PILLAR



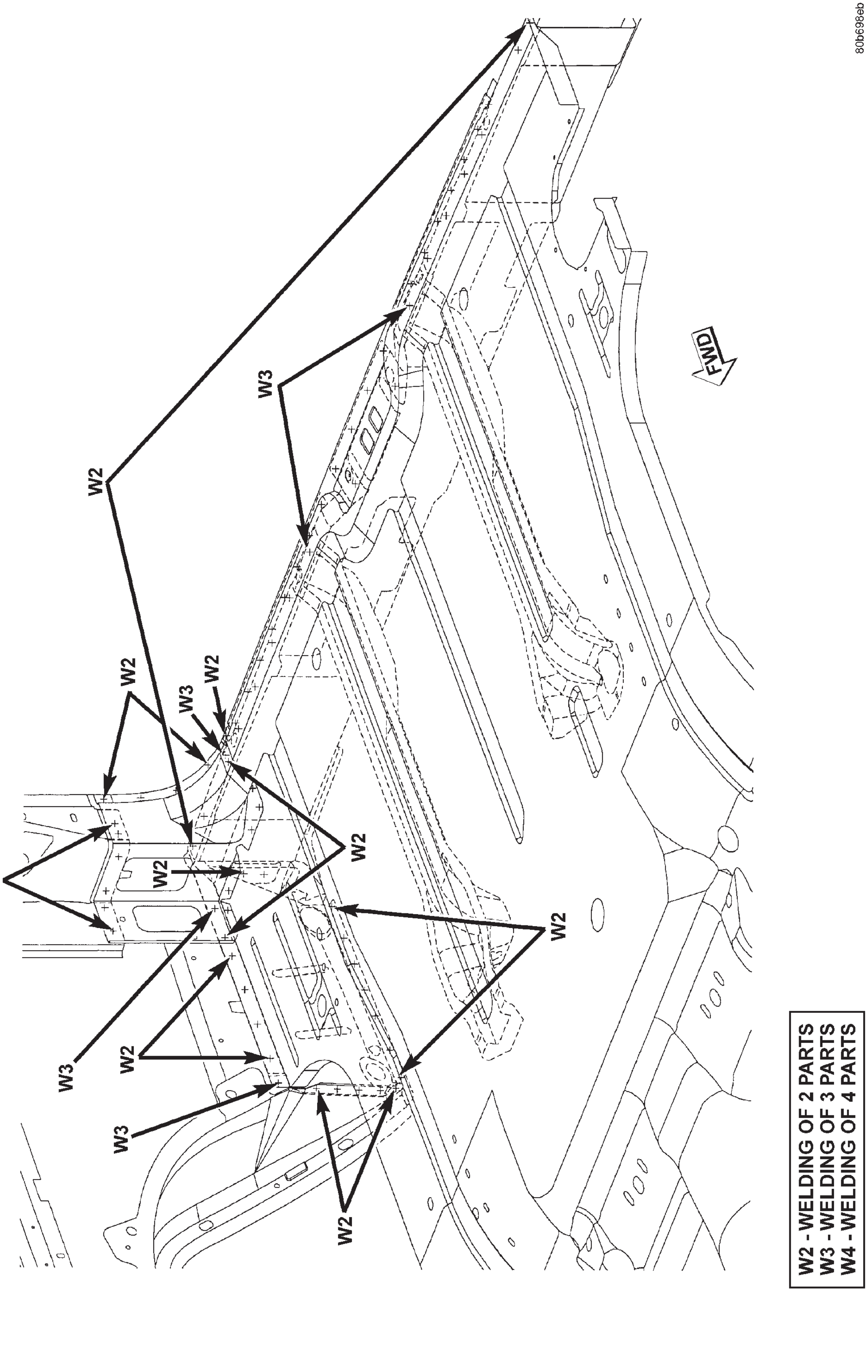
SPECIFICATIONS (Continued)

FUEL FILLER OPENING



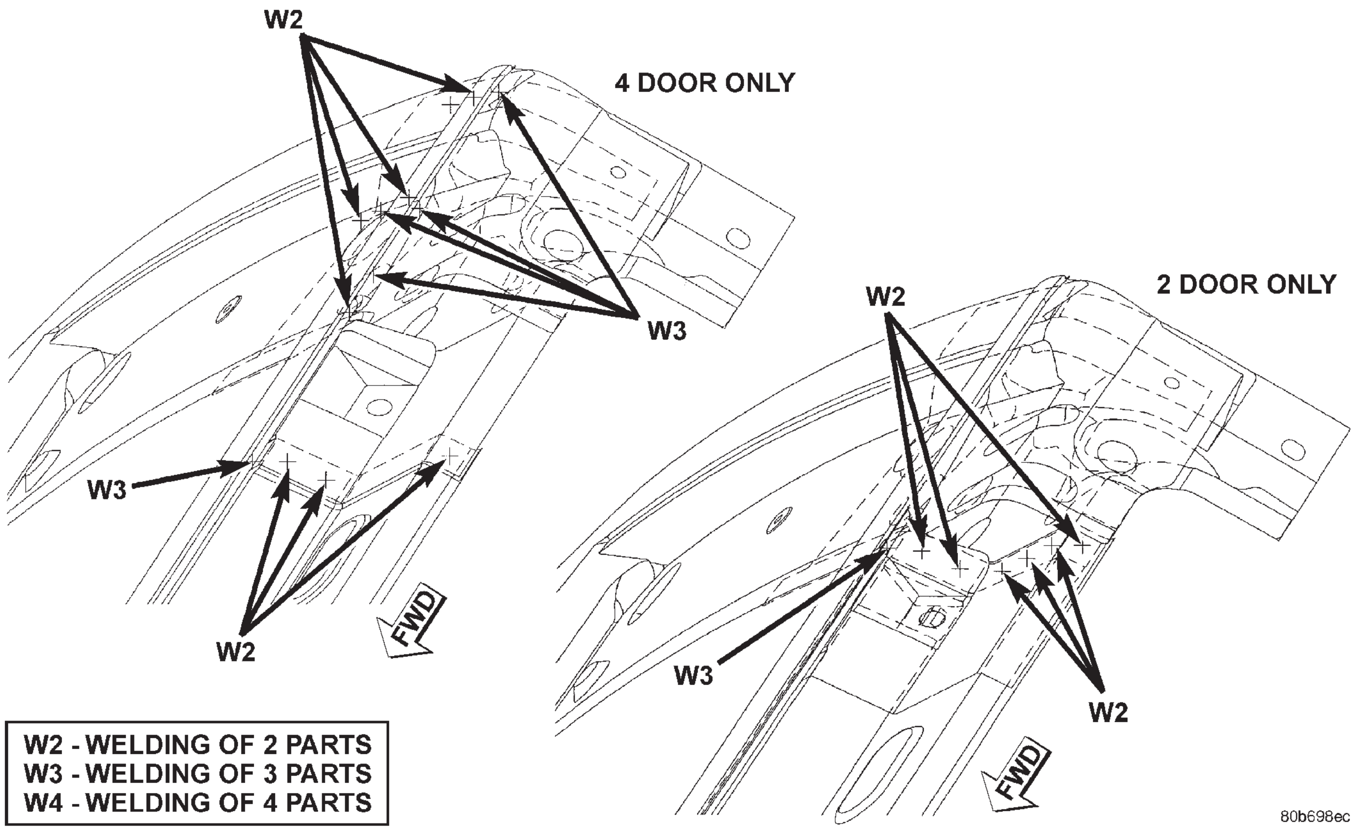
SPECIFICATIONS (Continued)

CARGO AREA FLOOR PAN



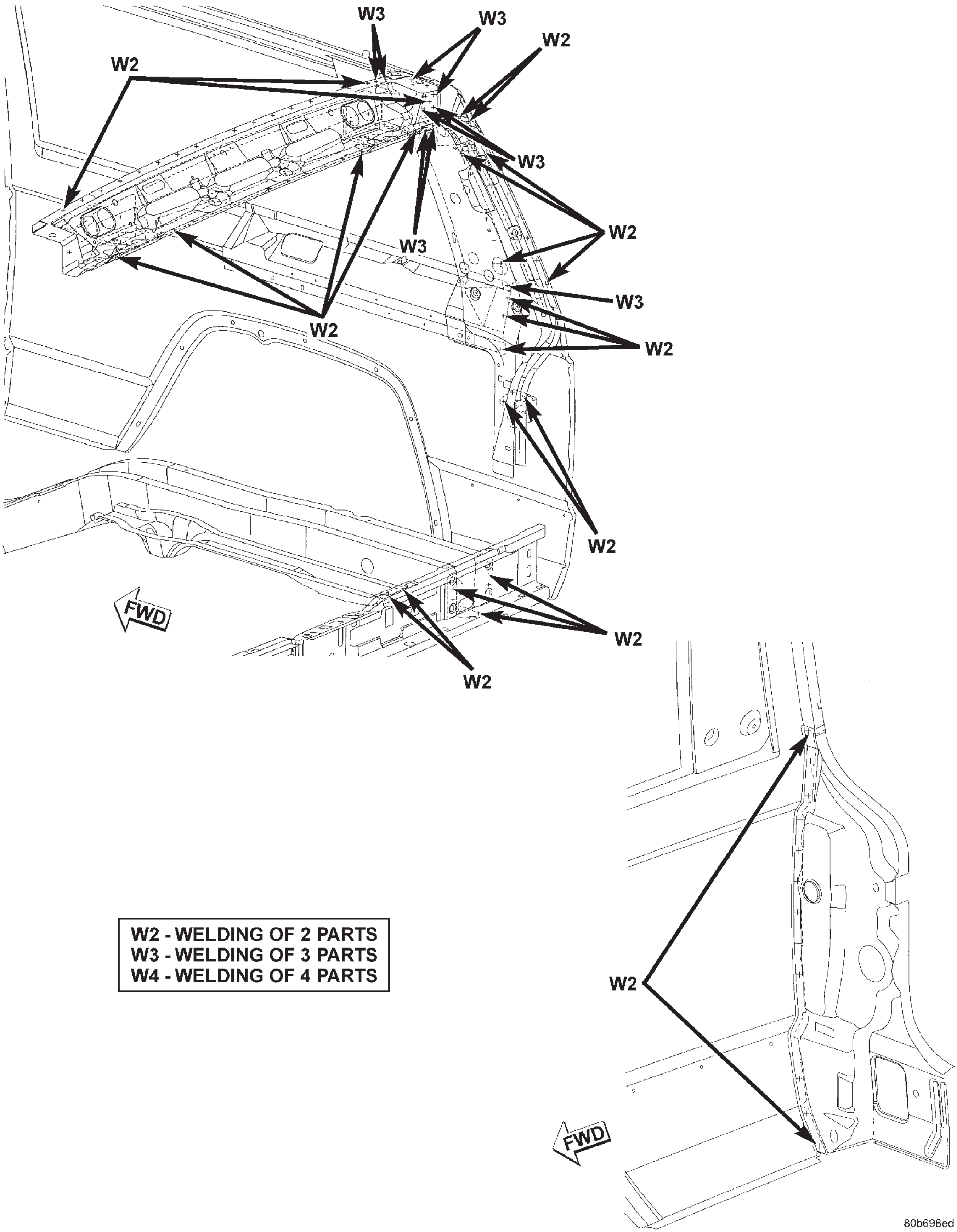
SPECIFICATIONS (Continued)

ROOF AND D—PILLAR



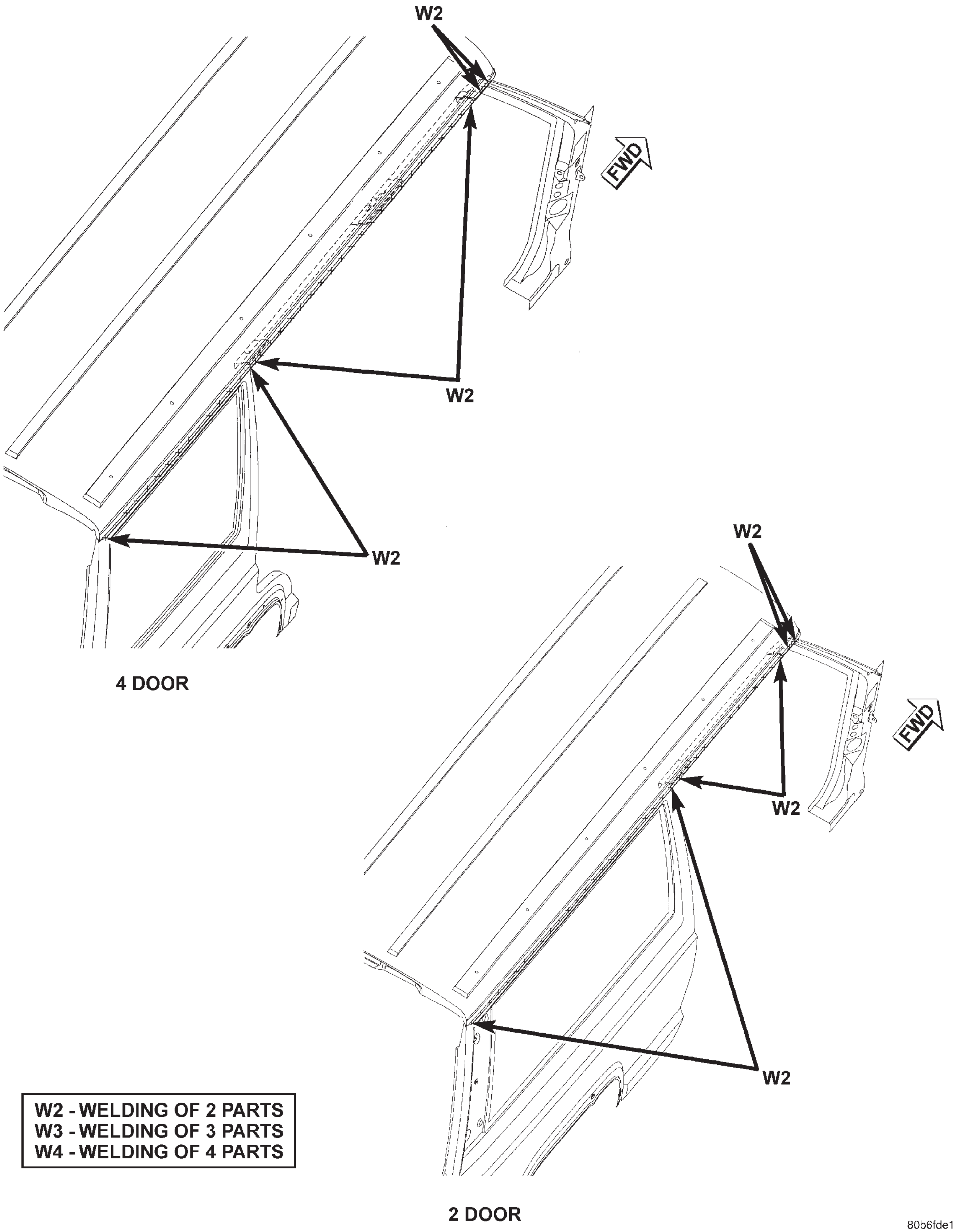
SPECIFICATIONS (Continued)

LIFTGATE OPENING



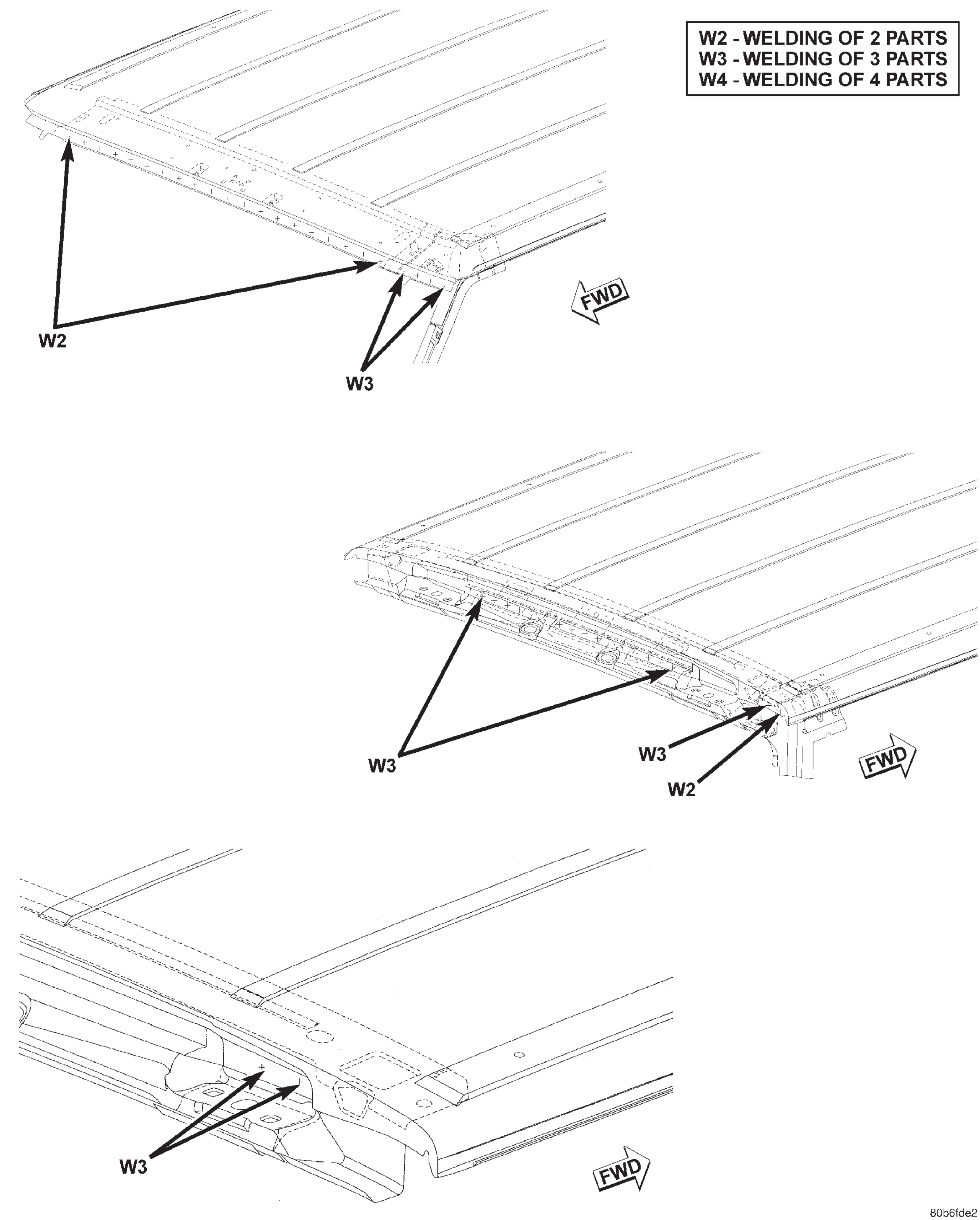
SPECIFICATIONS (Continued)

ROOF



SPECIFICATIONS (Continued)

ROOF



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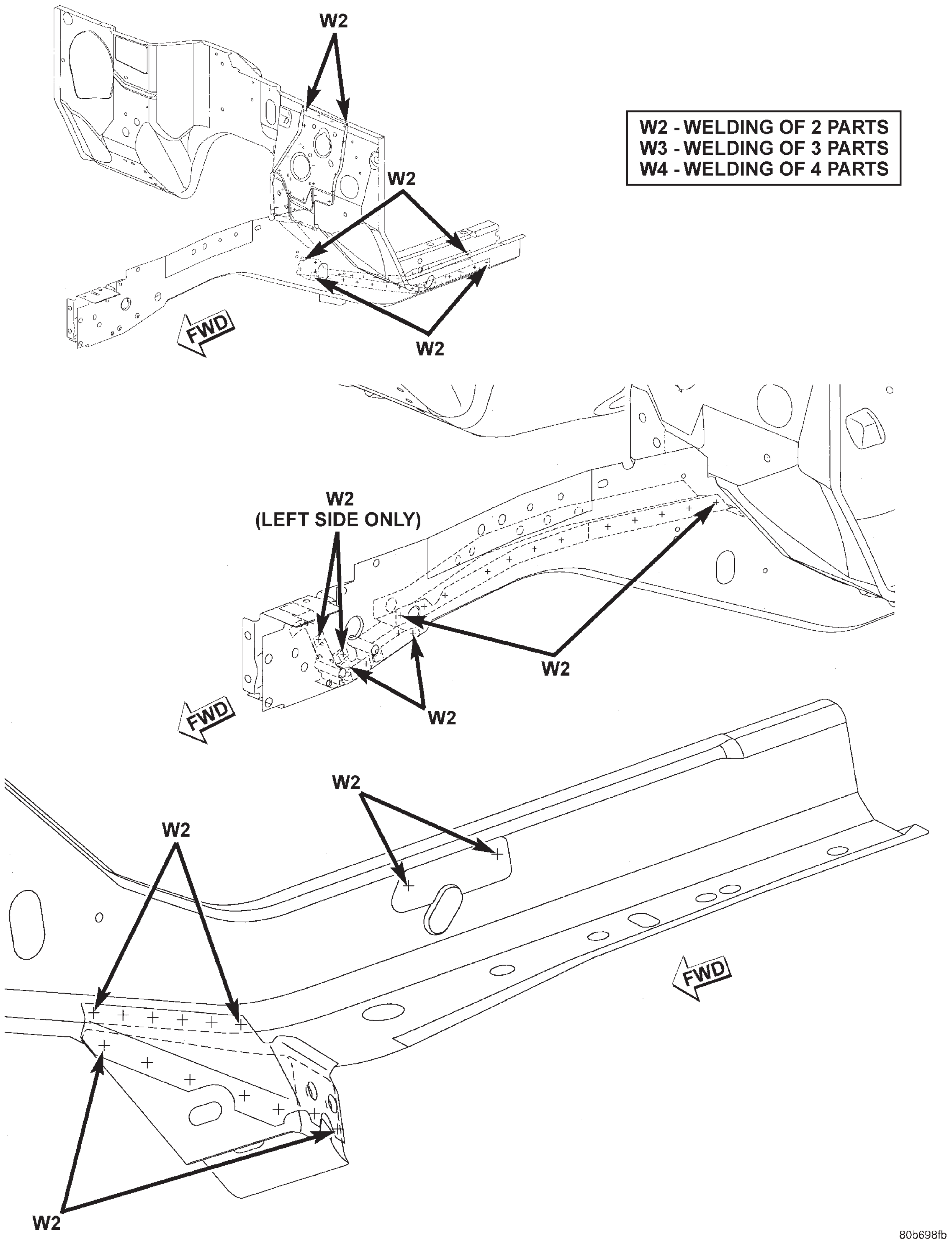
SPECIFICATIONS (Continued)

FRAME RAIL



SPECIFICATIONS (Continued)

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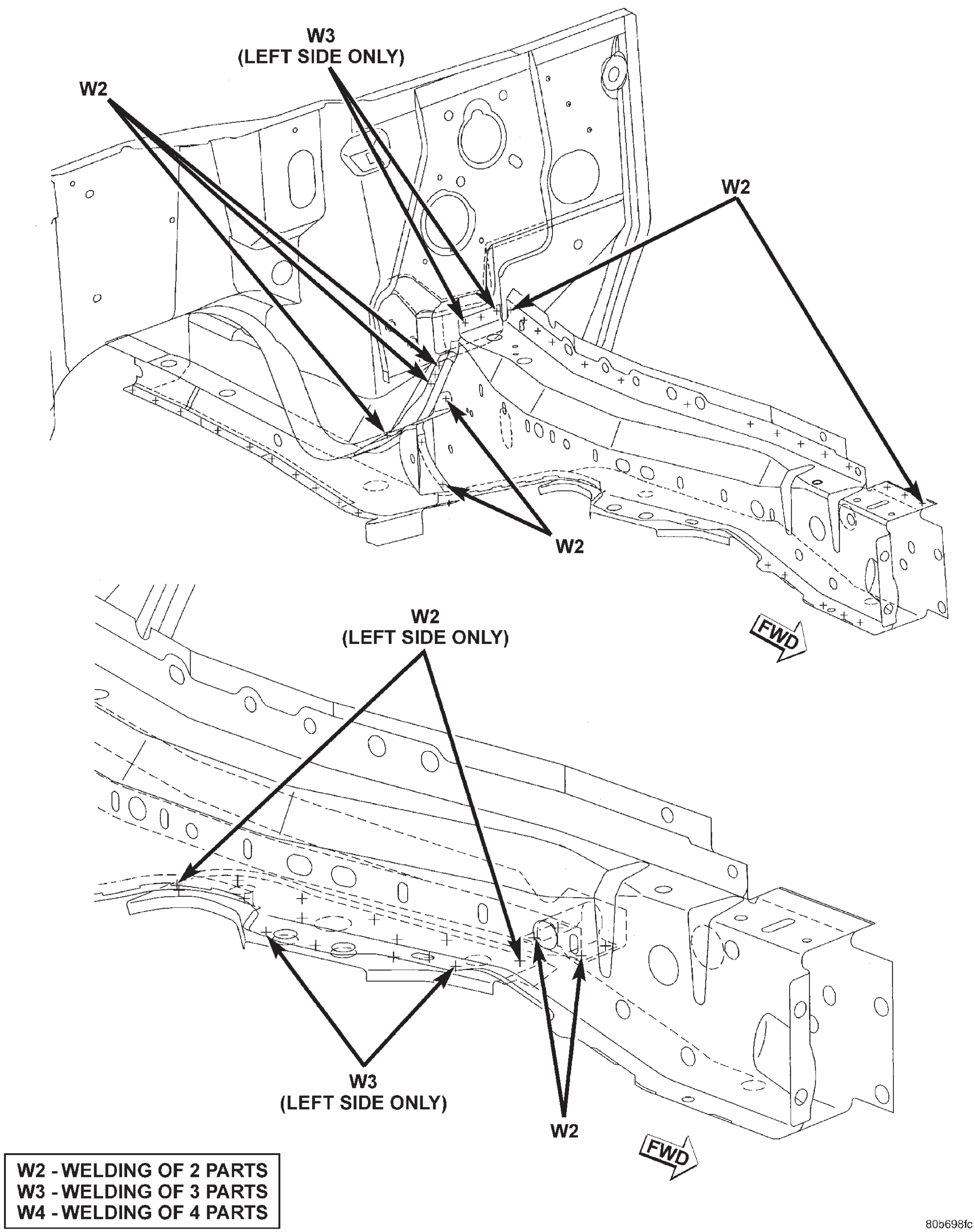

SPECIFICATIONS (Continued)

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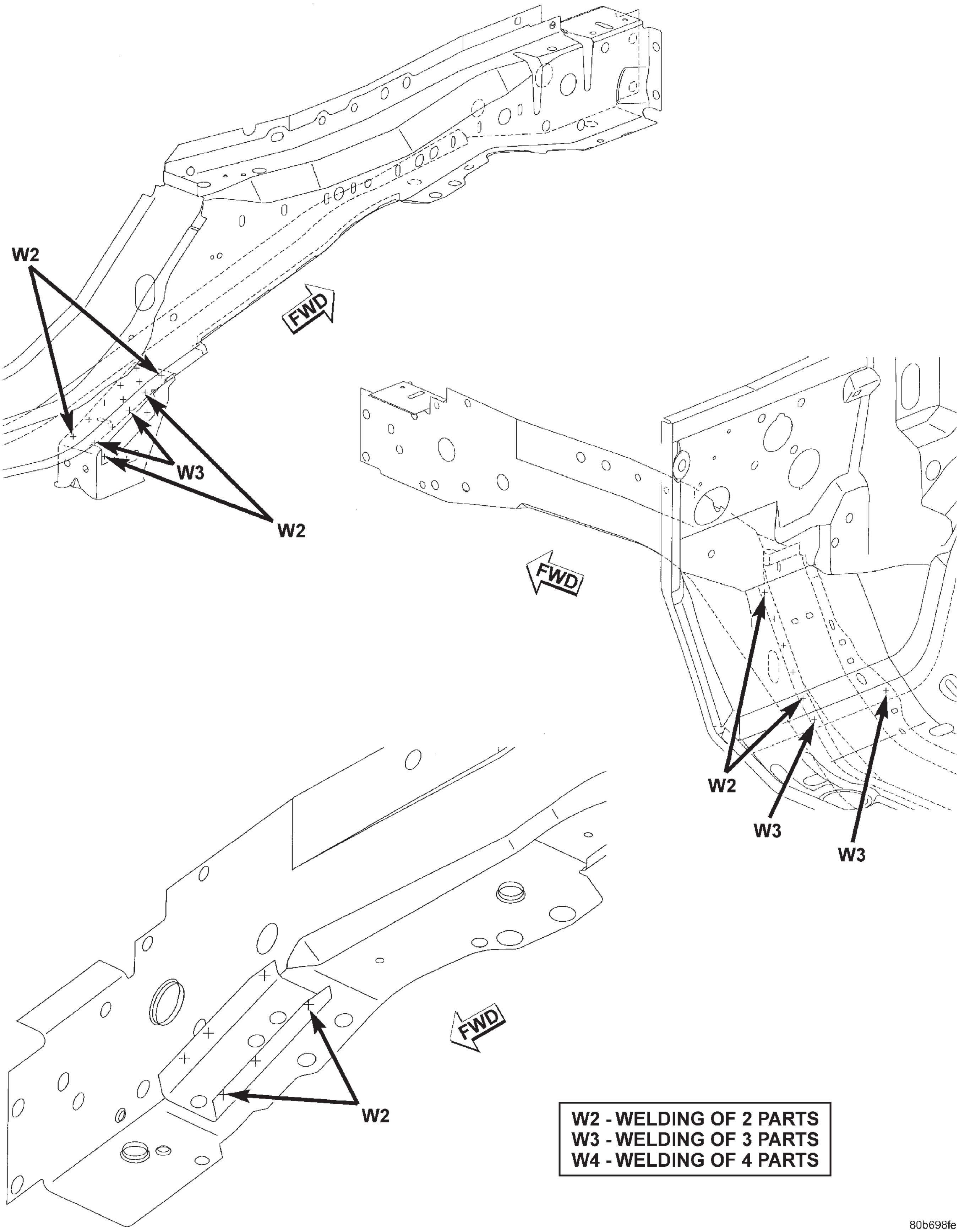

SPECIFICATIONS (Continued)

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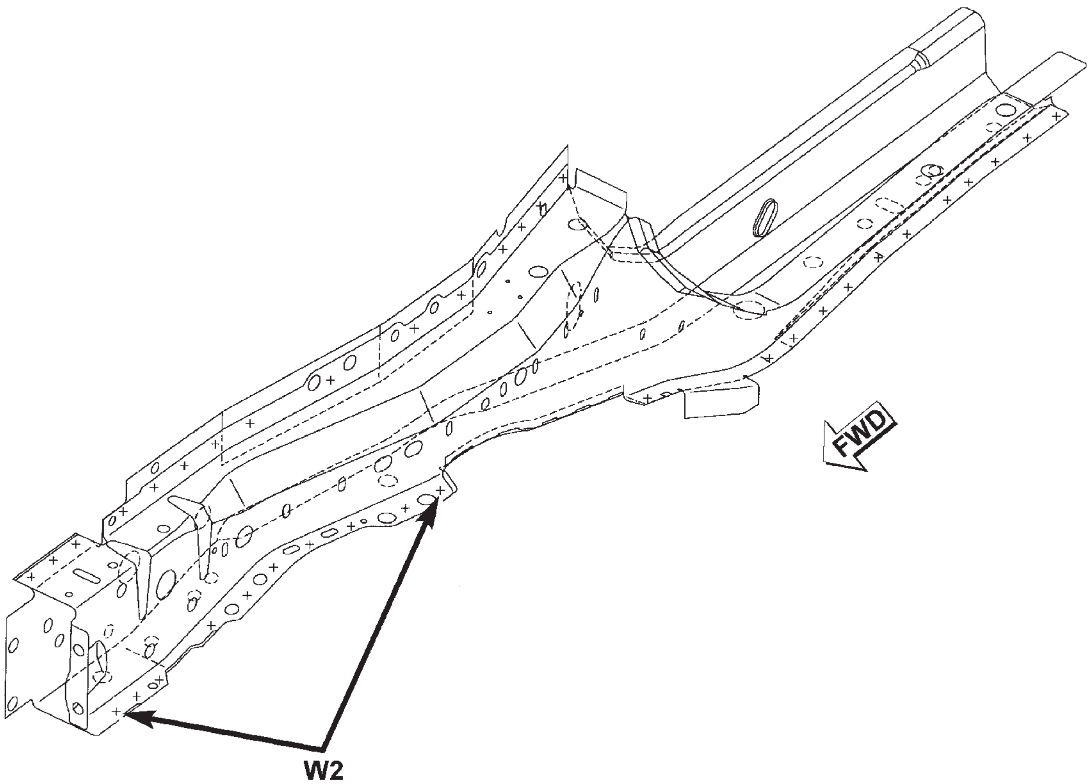

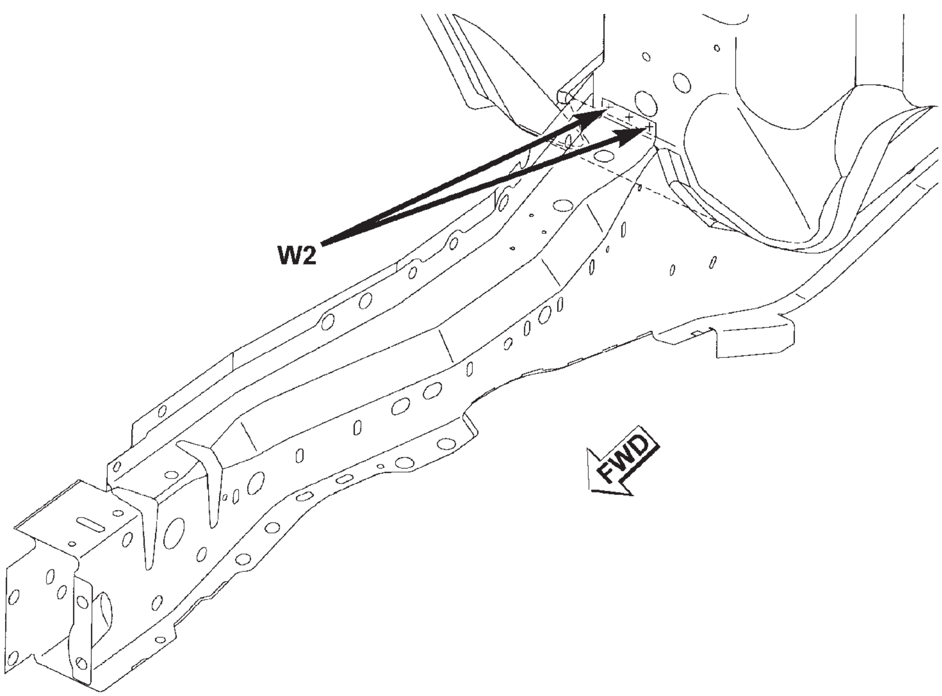

W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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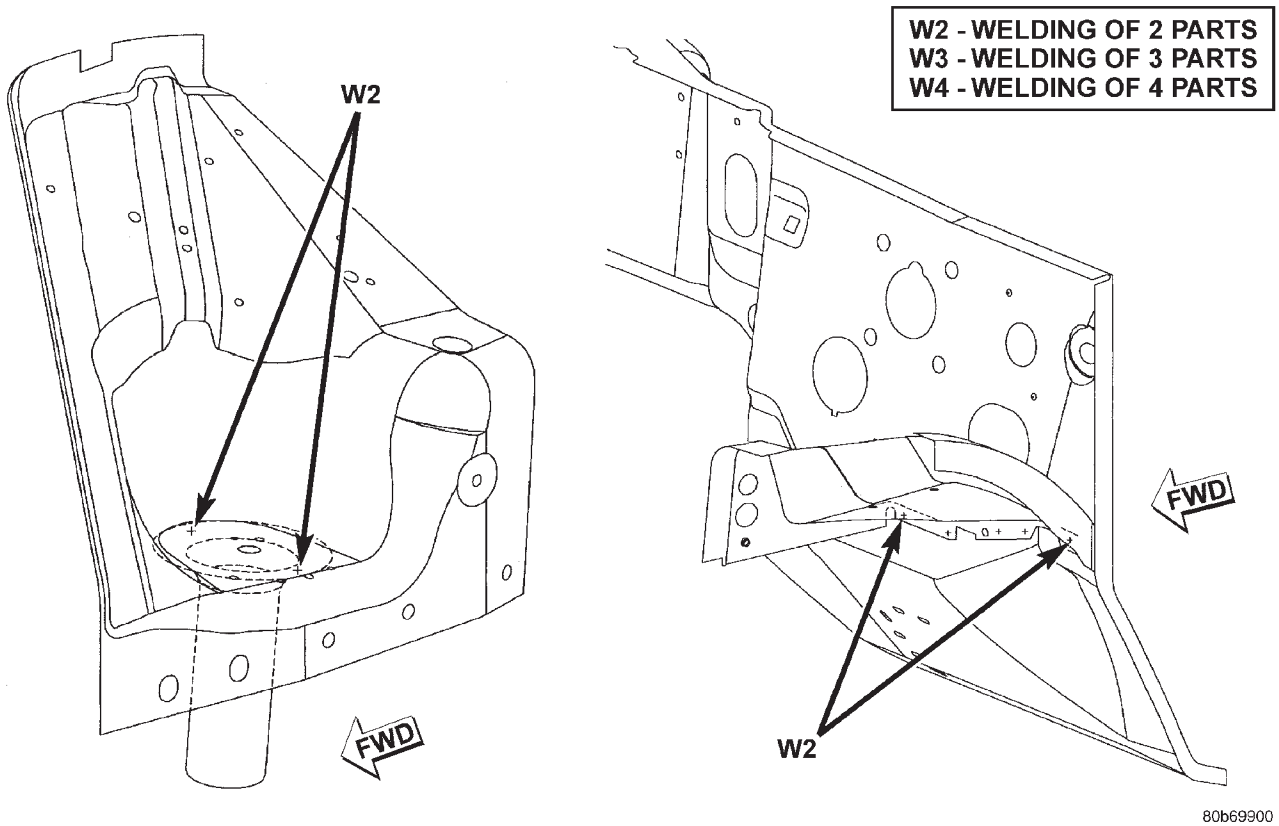
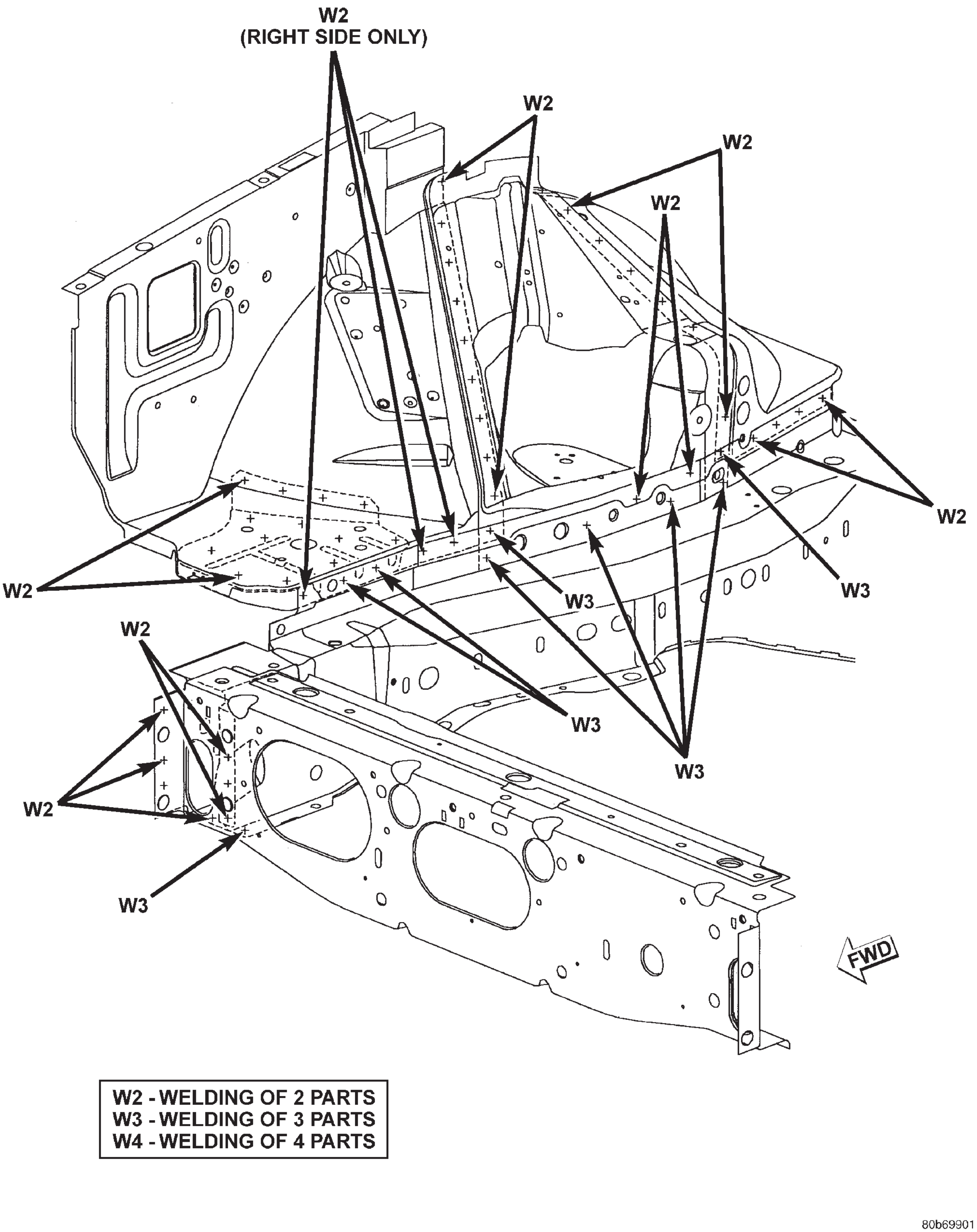
SPECIFICATIONS (Continued)

REINFORCEMENT



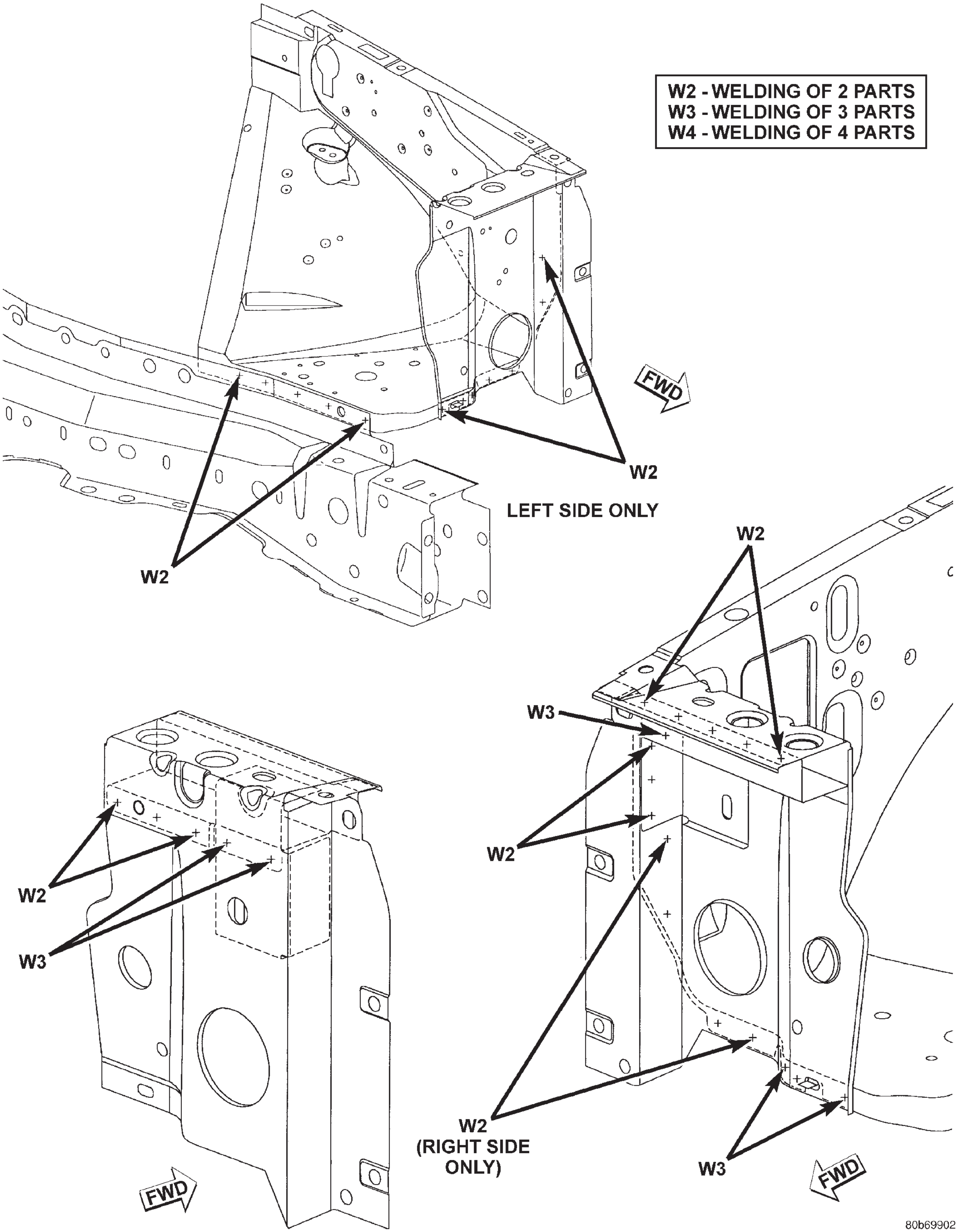
SPECIFICATIONS (Continued)

FRONT INNER FENDER



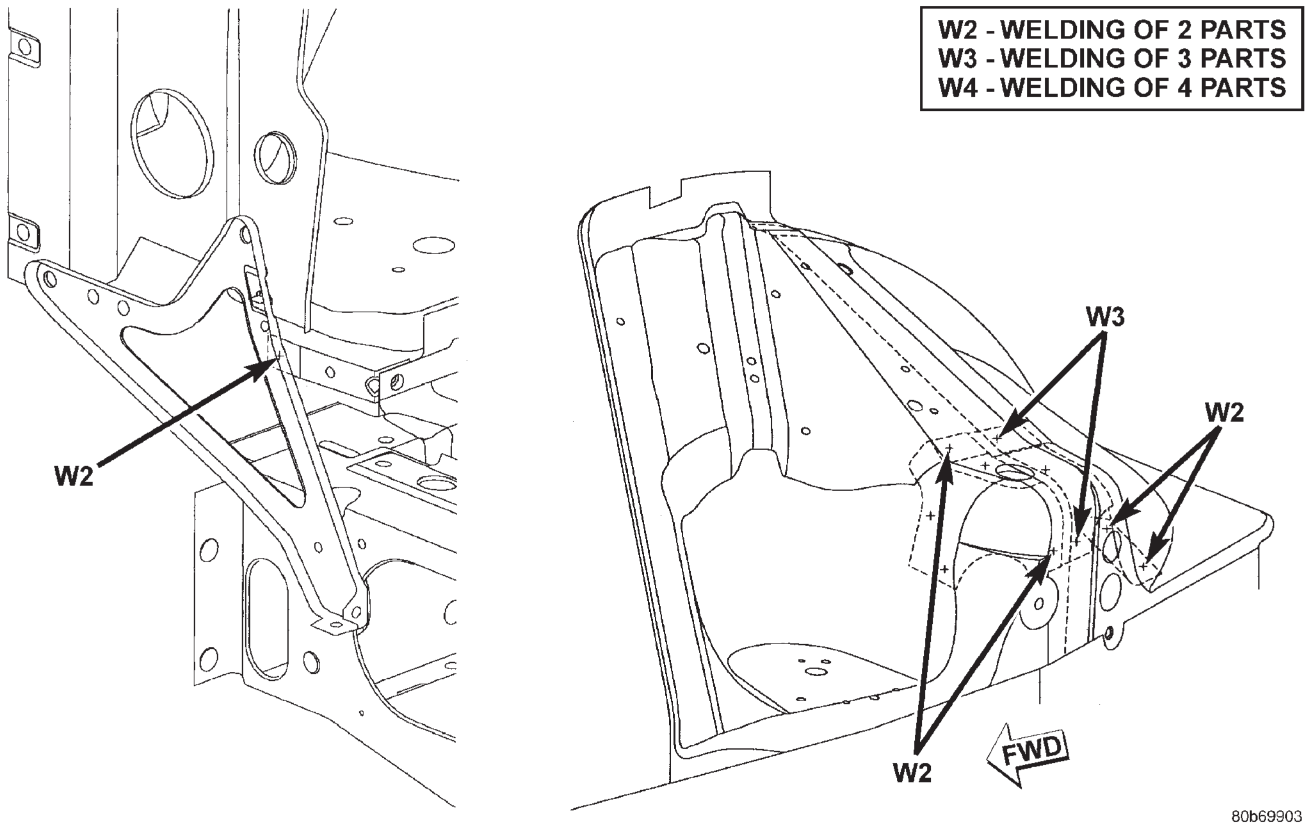
SPECIFICATIONS (Continued)

FRONT INNER FENDER AND RADIATOR CLOSURE PANEL



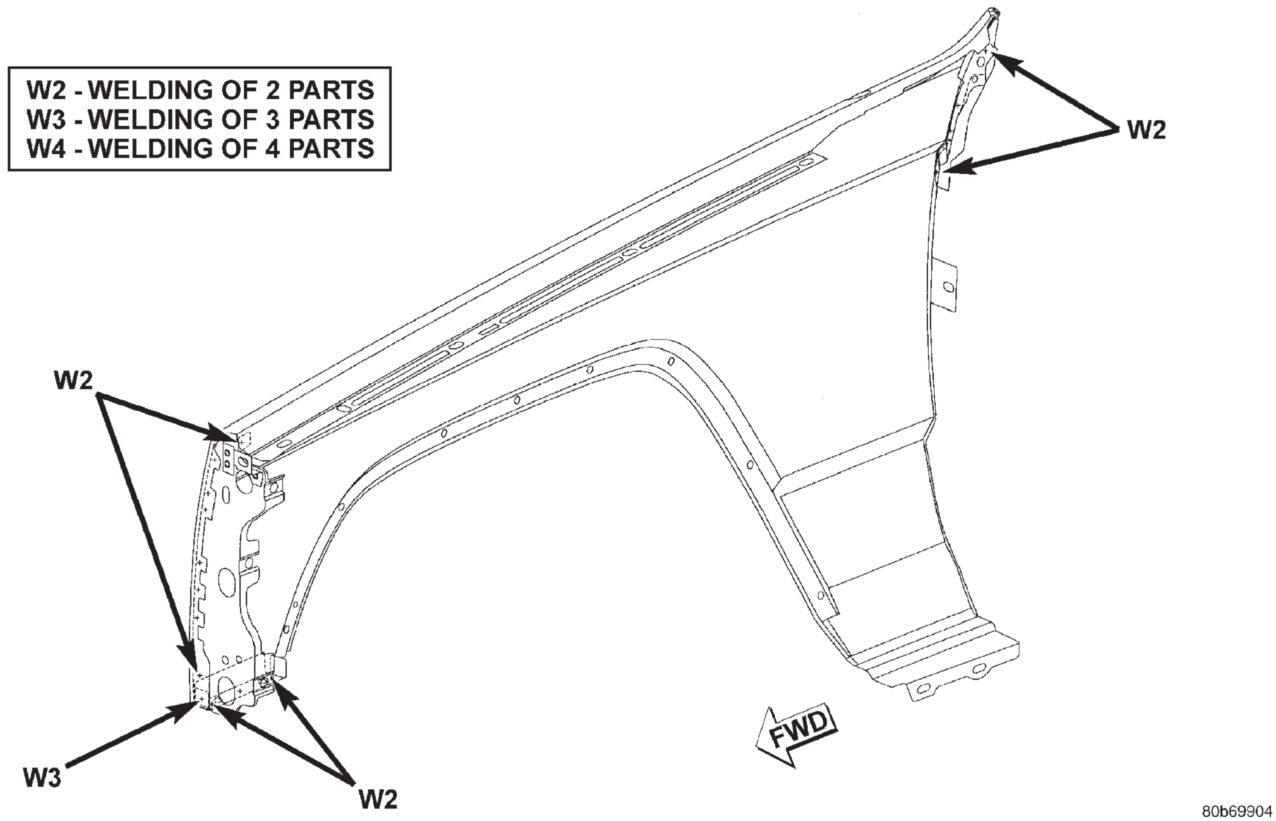
SPECIFICATIONS (Continued)

REINFORCEMENT



SPECIFICATIONS (Continued)

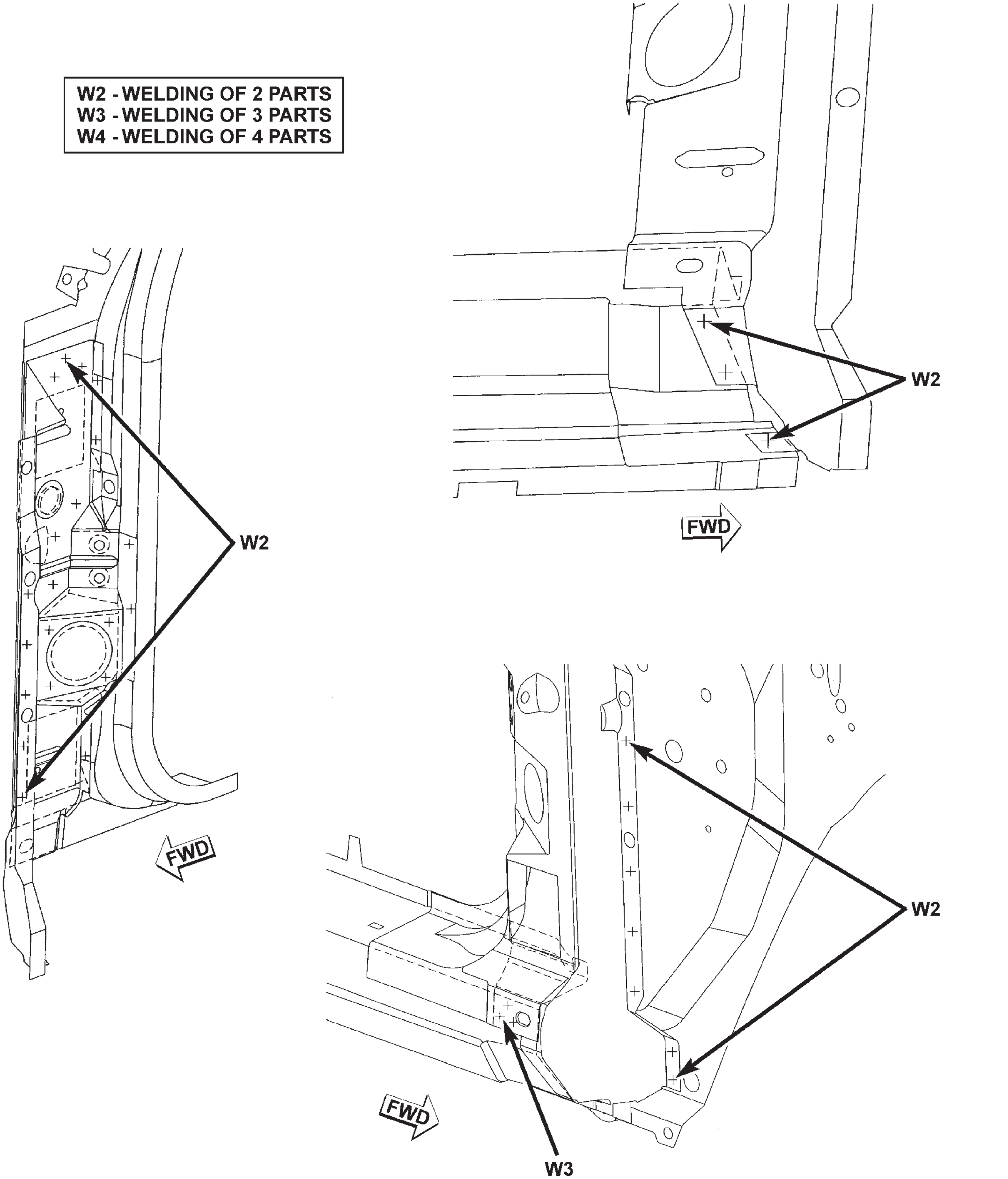
FRONT FENDER



SPECIFICATIONS (Continued)

BODY SIDE

W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS



RIGHT SIDE SHOWN

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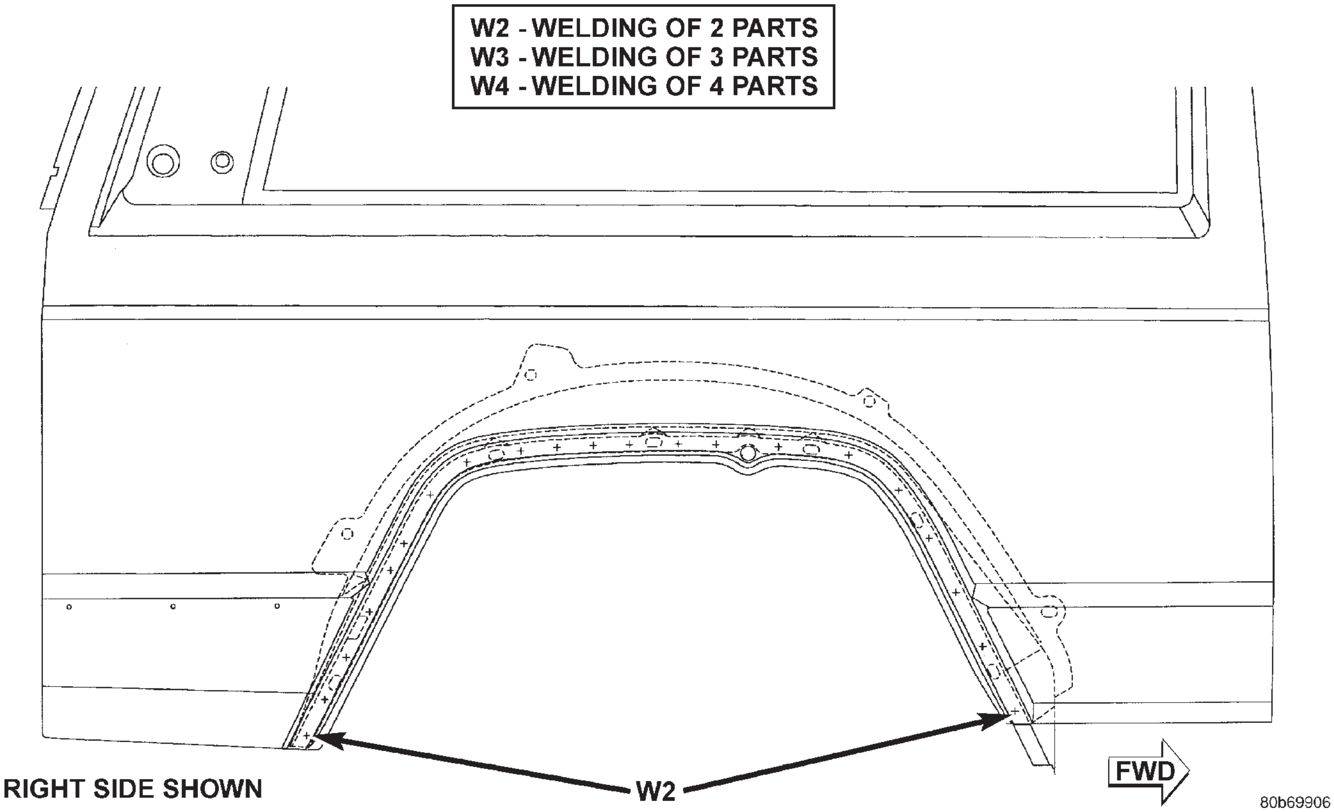
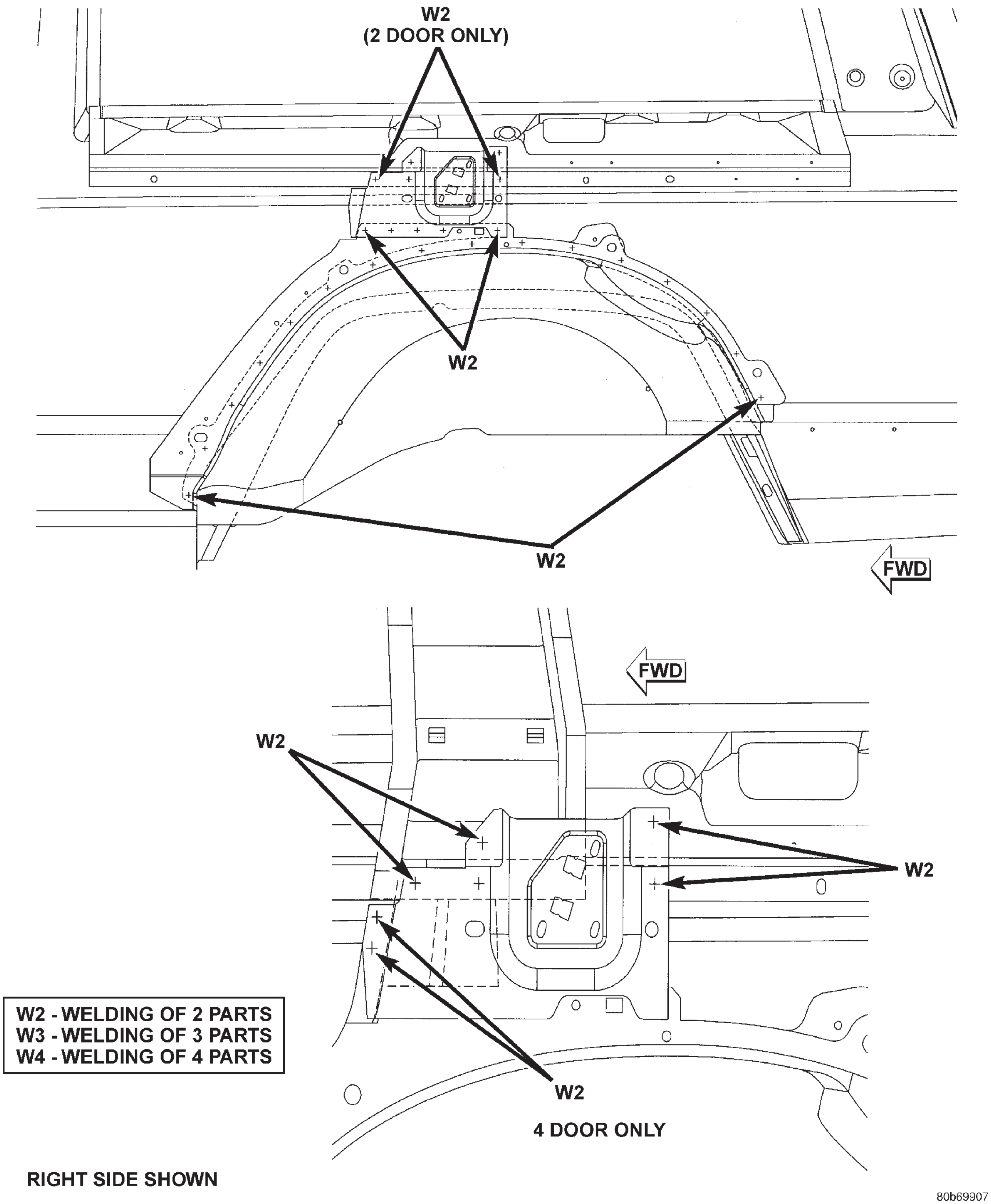
SPECIFICATIONS (Continued)

REAR WHEELHOUSE



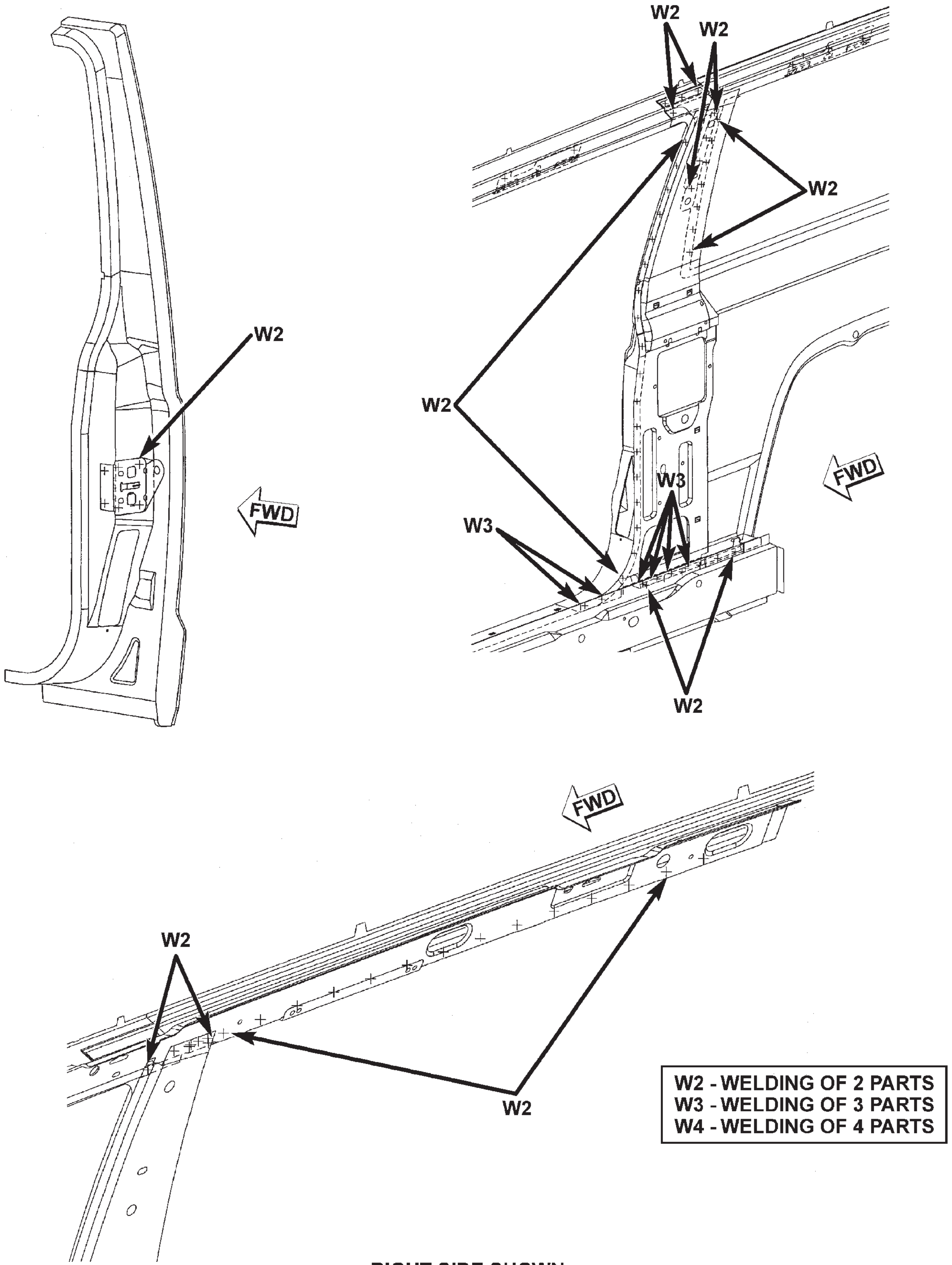
SPECIFICATIONS (Continued)

REAR INNER WHEELHOUSE



SPECIFICATIONS (Continued)

BODY SIDE



RIGHT SIDE SHOWN

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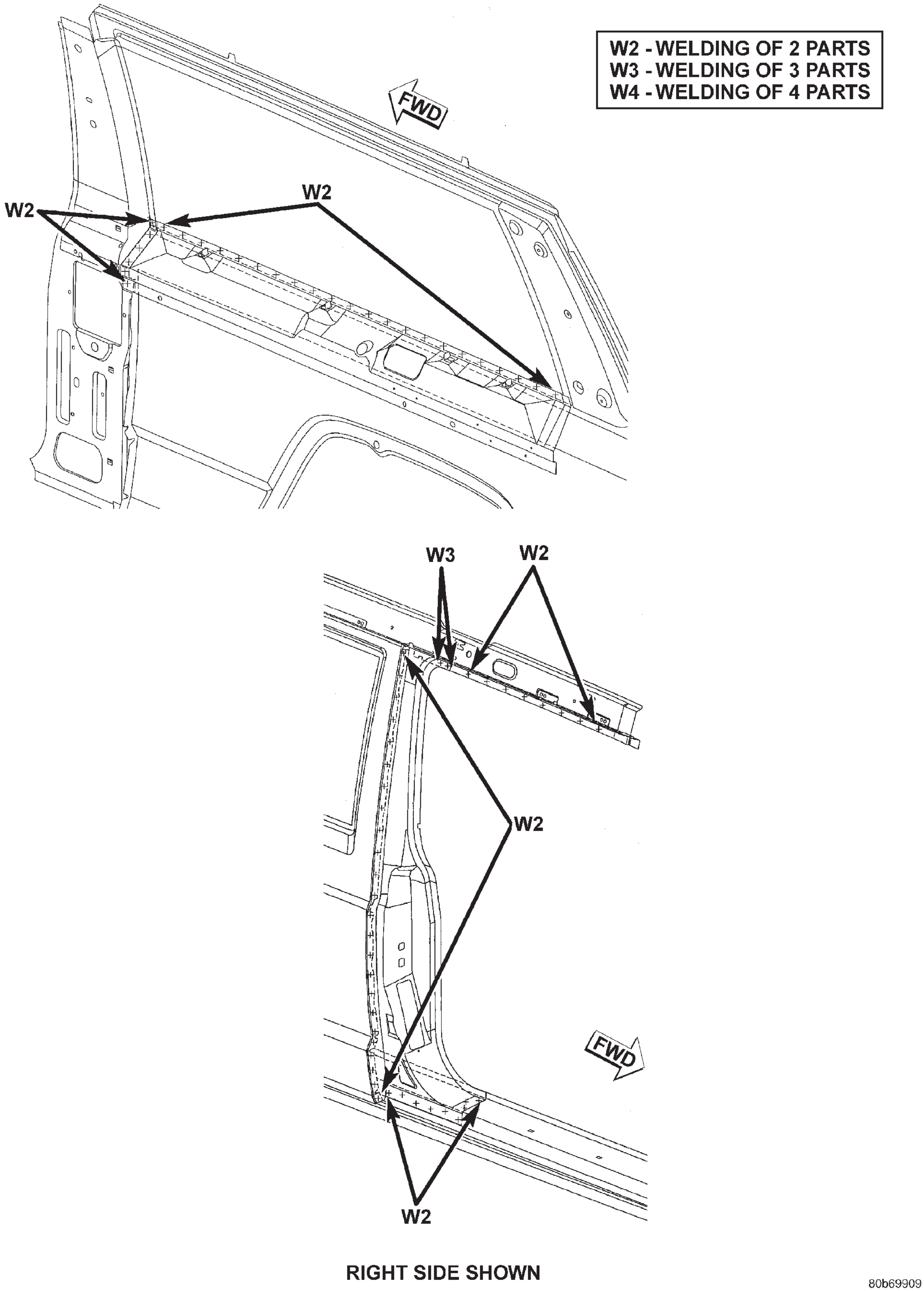
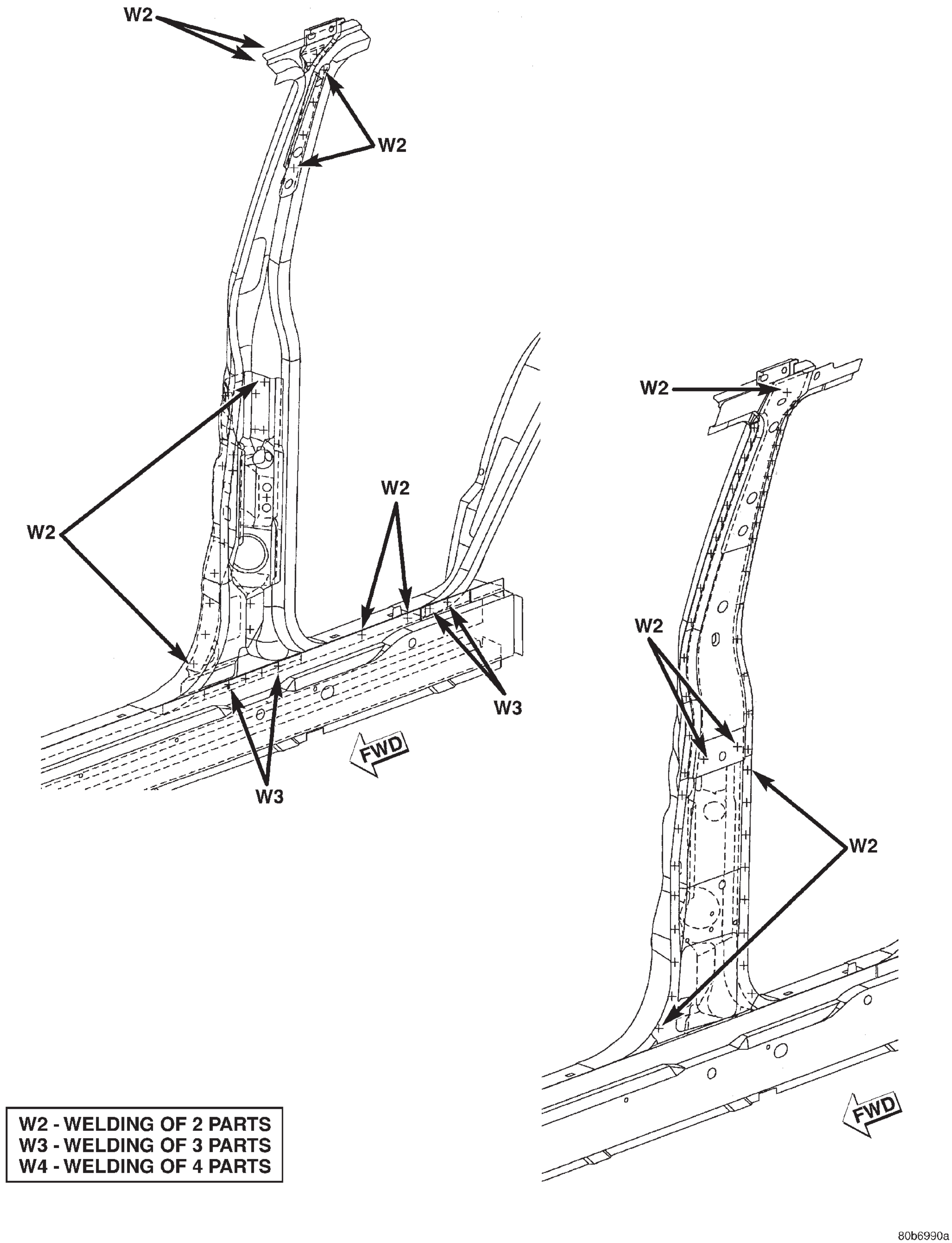
SPECIFICATIONS (Continued)

BODY SIDE



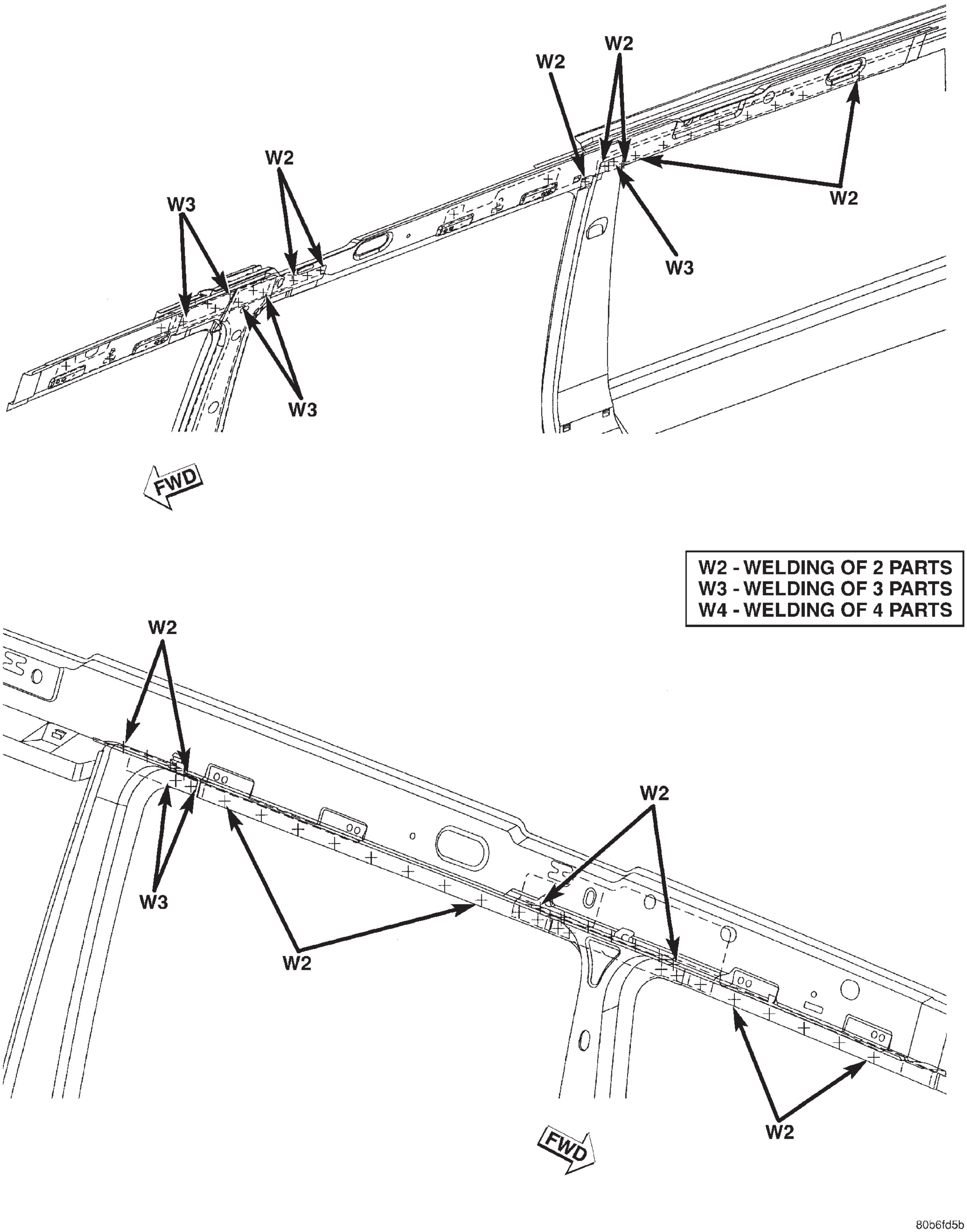
SPECIFICATIONS (Continued)

BODY SIDE



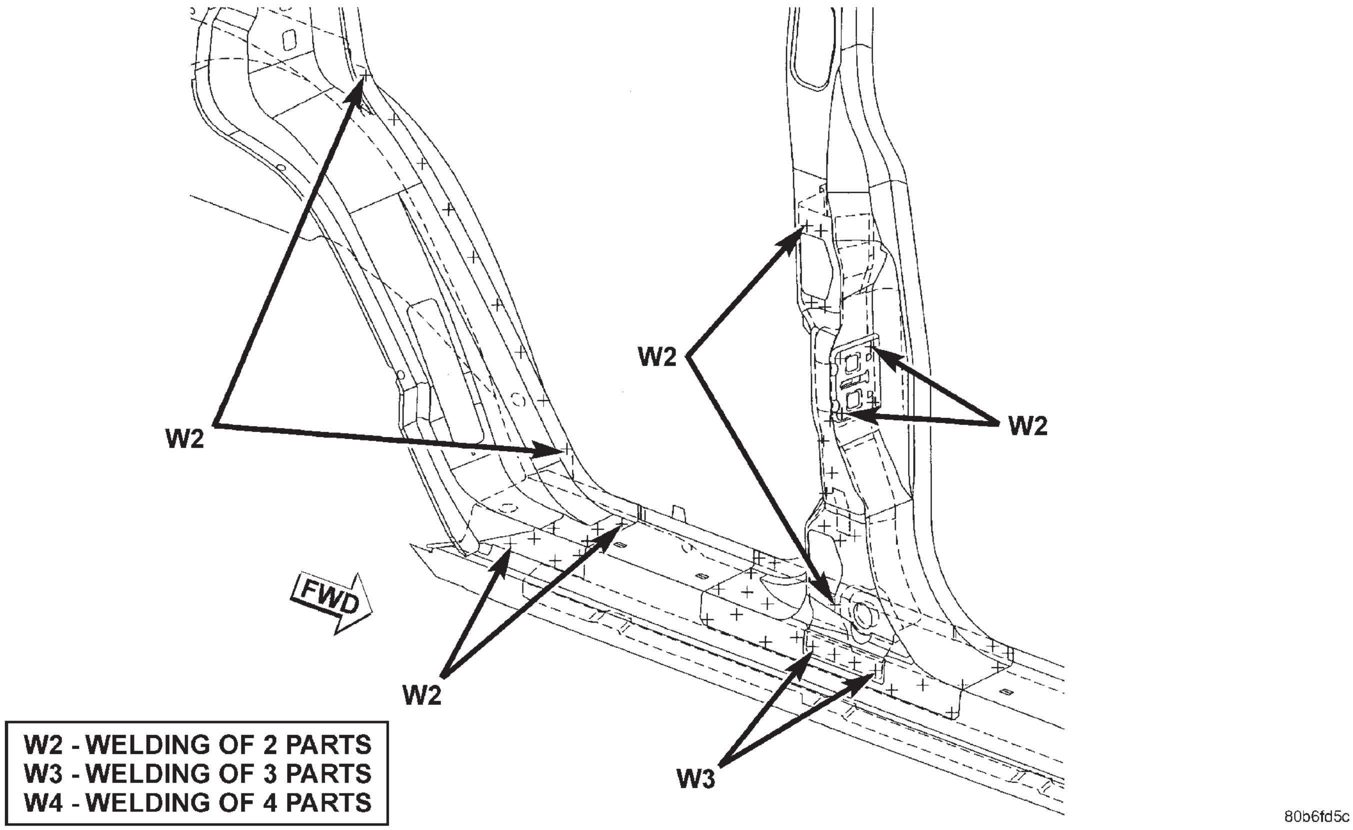
SPECIFICATIONS (Continued)

BODY SIDE



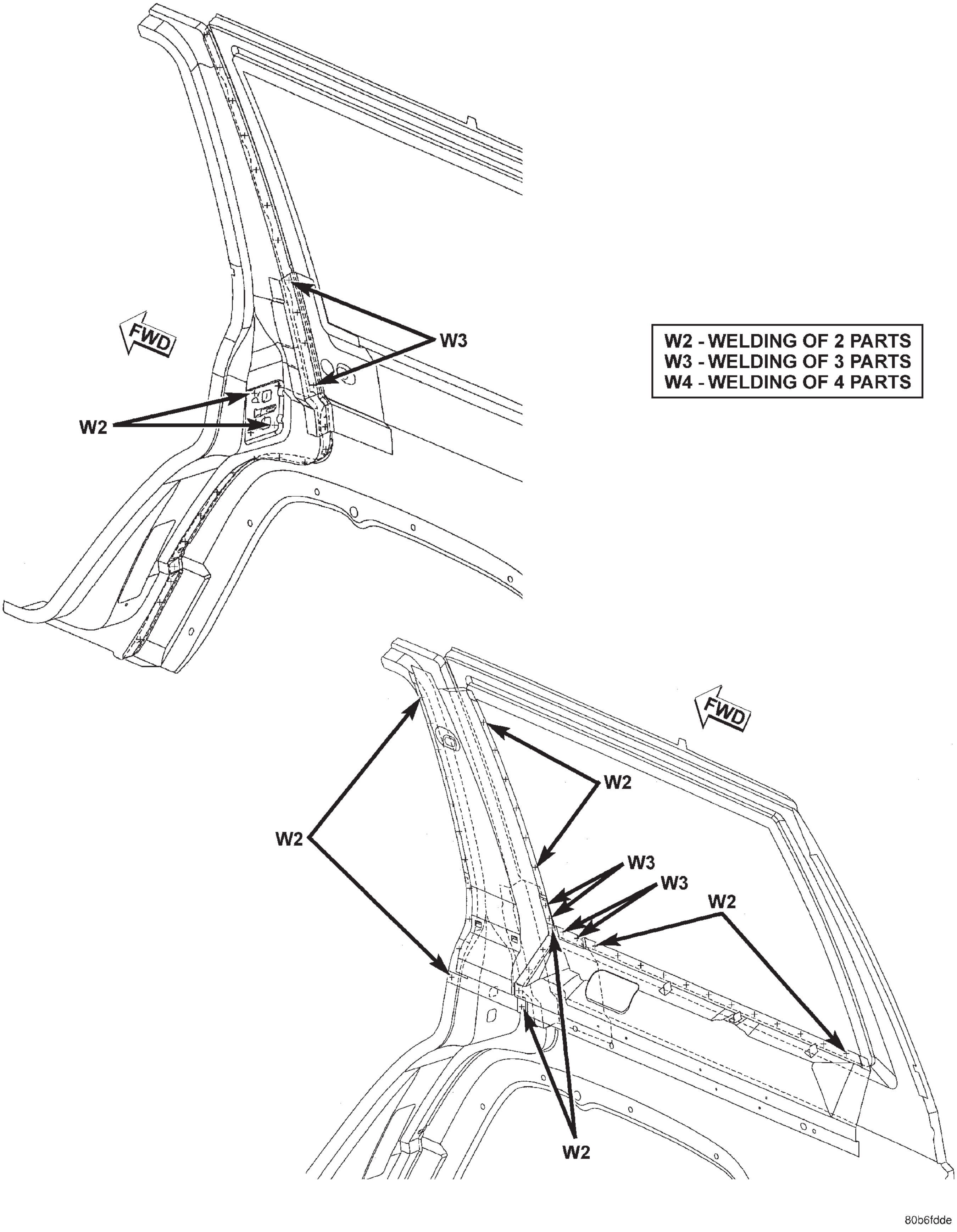
SPECIFICATIONS (Continued)

BODY SIDE



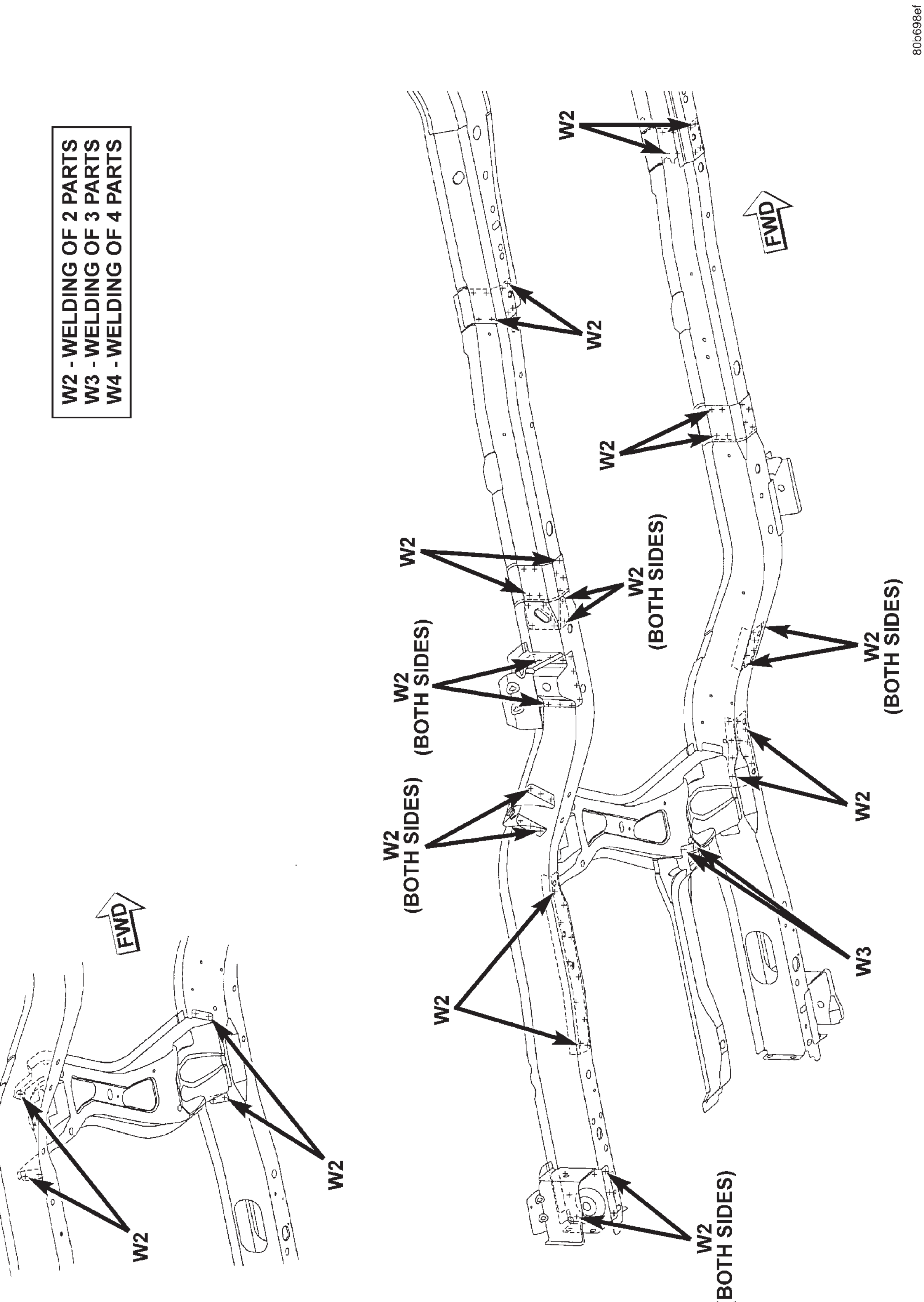
SPECIFICATIONS (Continued)

BODY SIDE



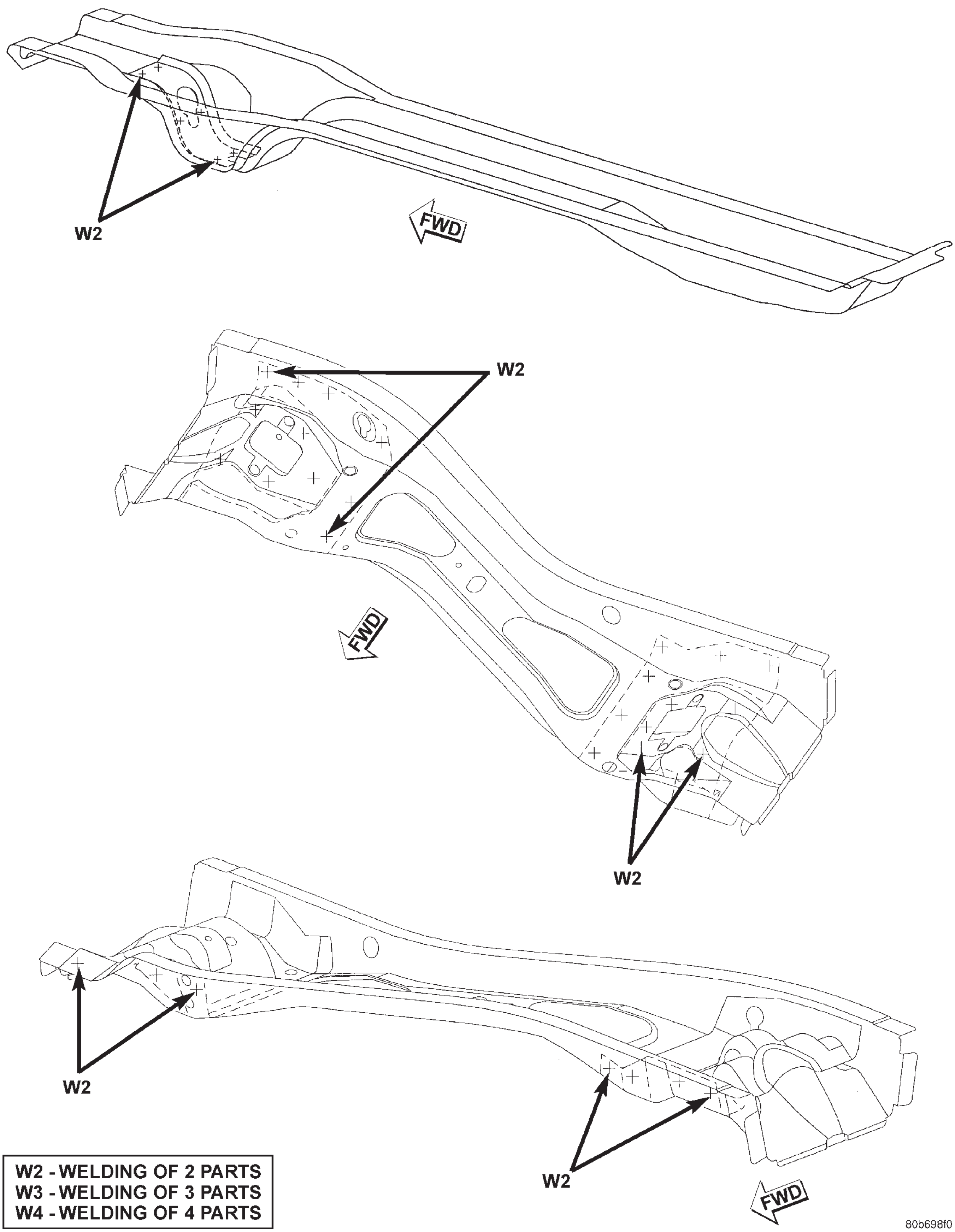
SPECIFICATIONS (Continued)

UNDERBODY



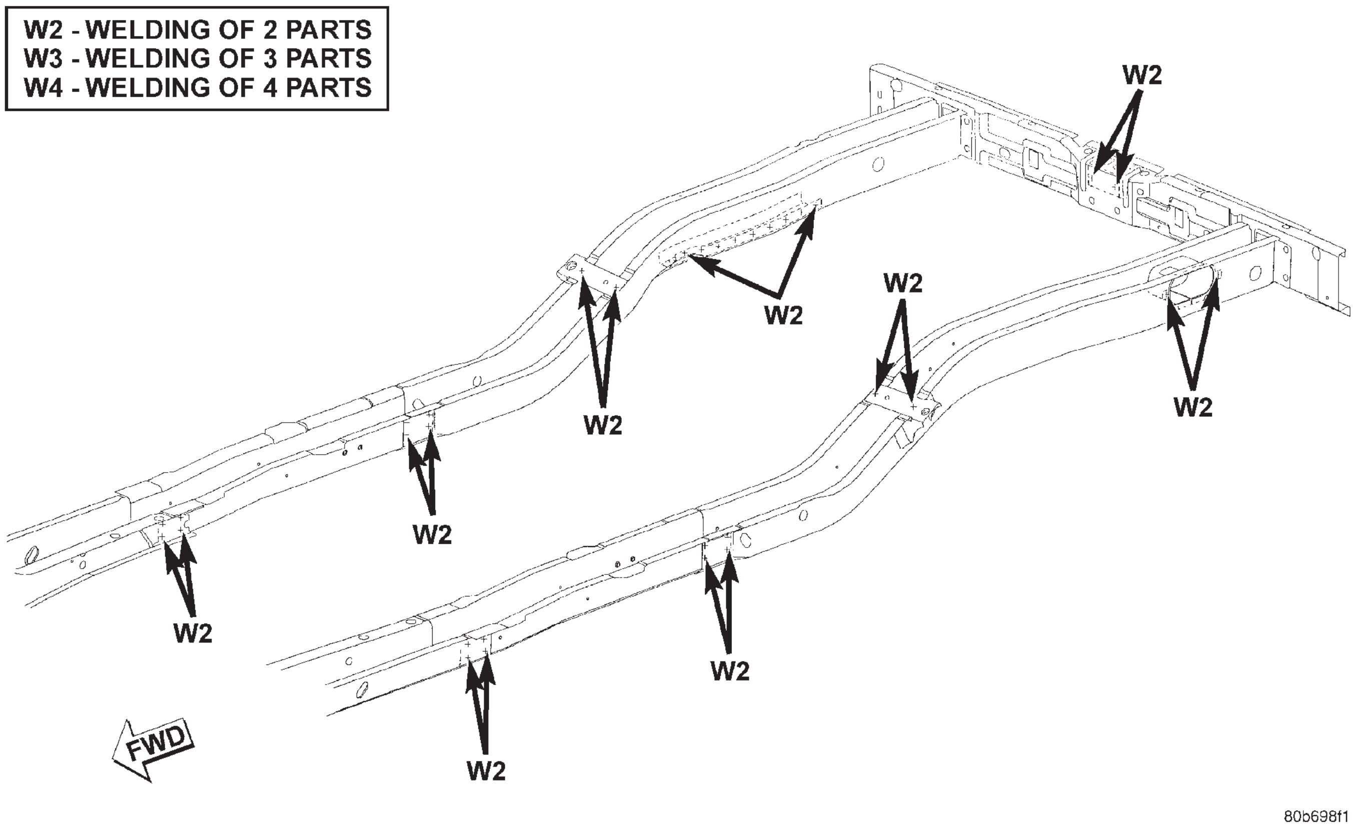
SPECIFICATIONS (Continued)

UNDERBODY



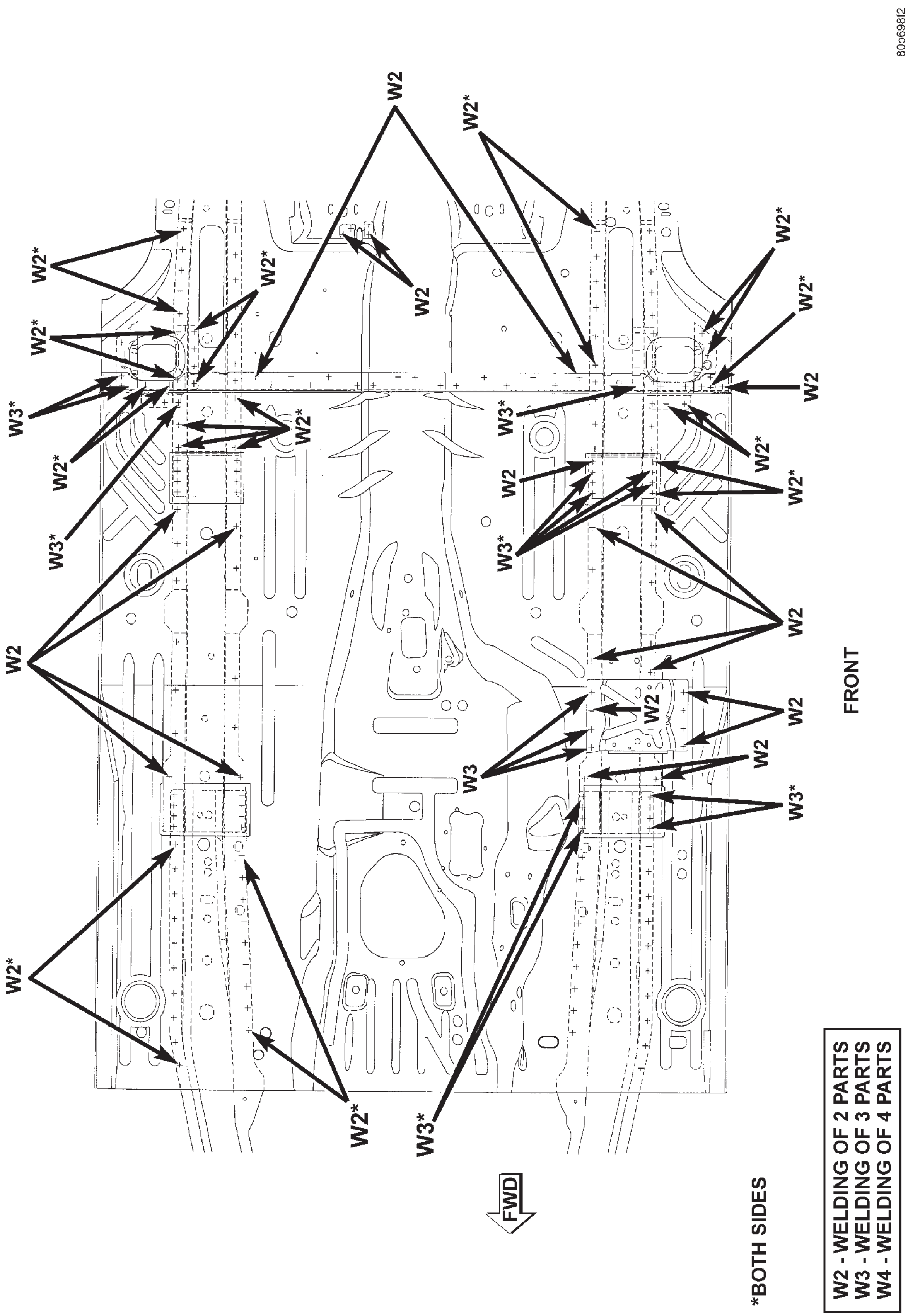
SPECIFICATIONS (Continued)

UNDERBODY



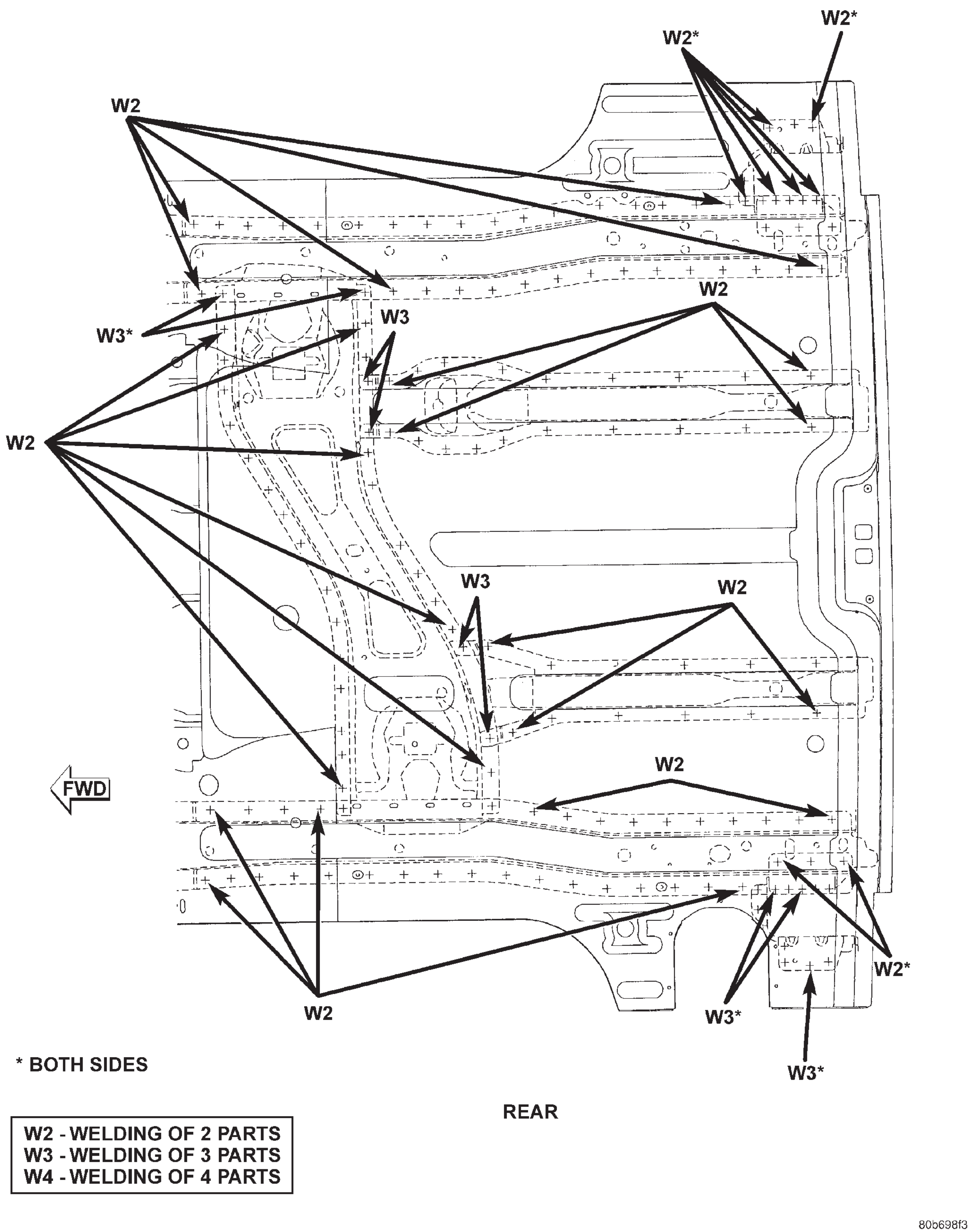
SPECIFICATIONS (Continued)

UNDERBODY



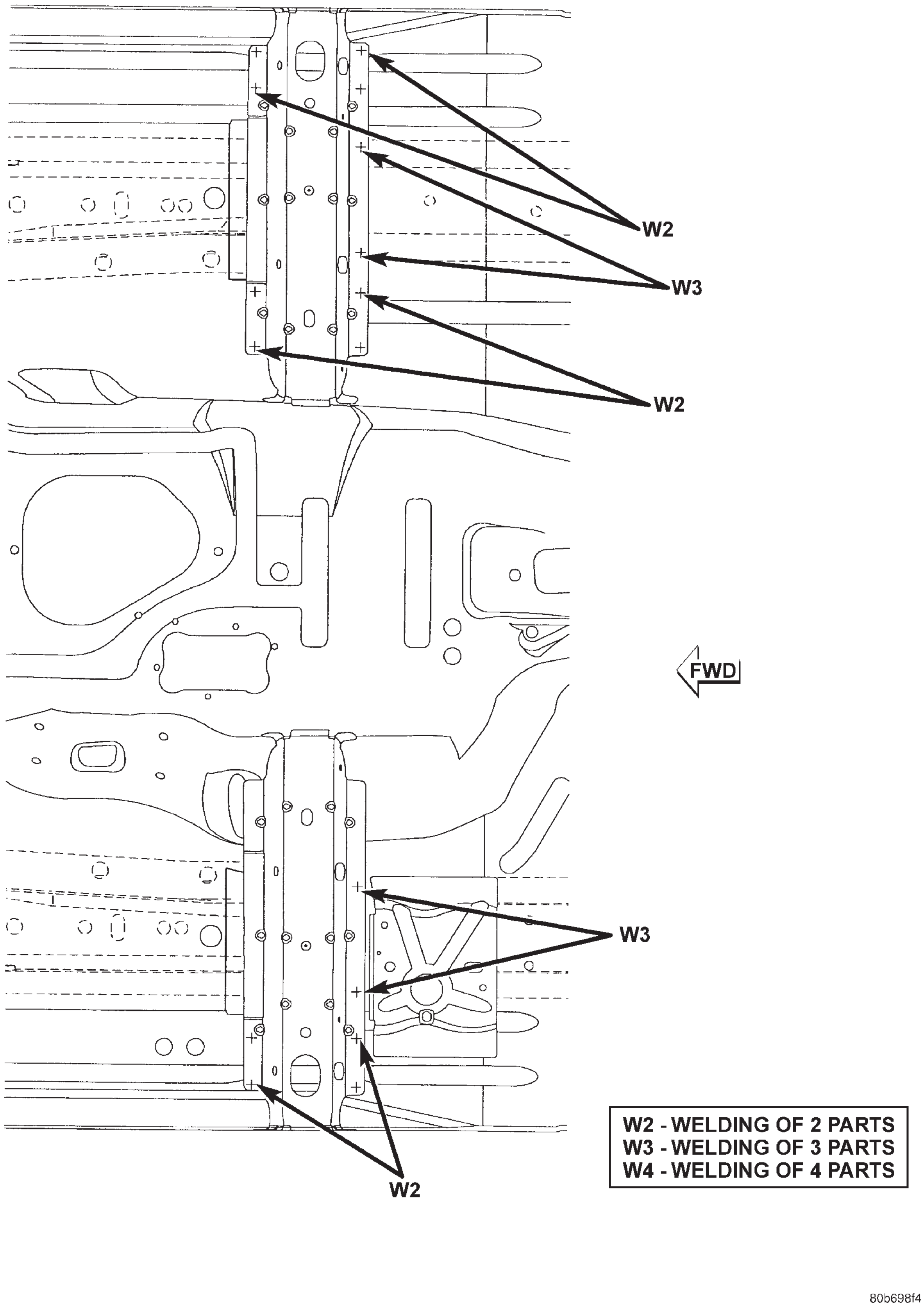
SPECIFICATIONS (Continued)

UNDERBODY



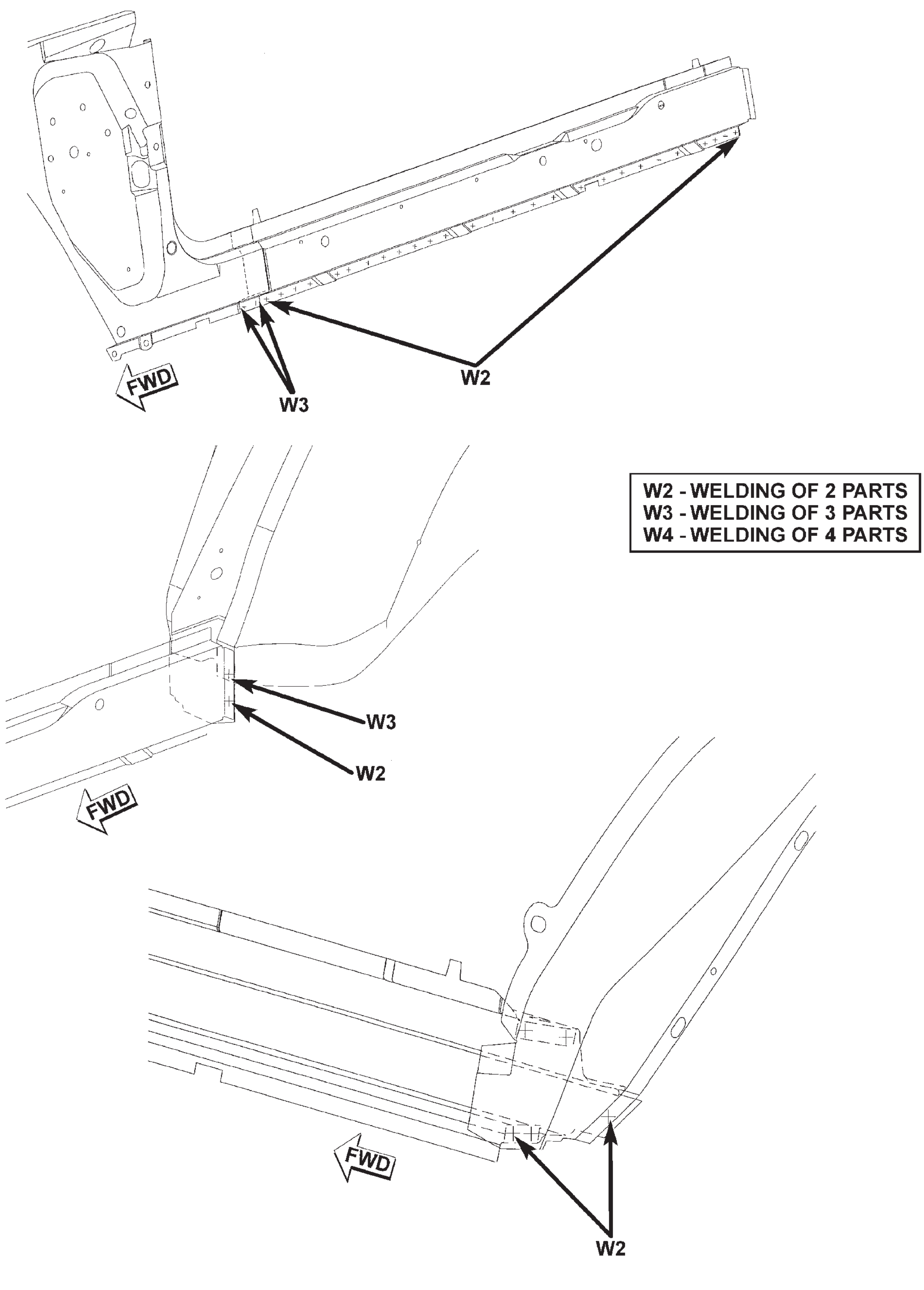
SPECIFICATIONS (Continued)

UNDERBODY



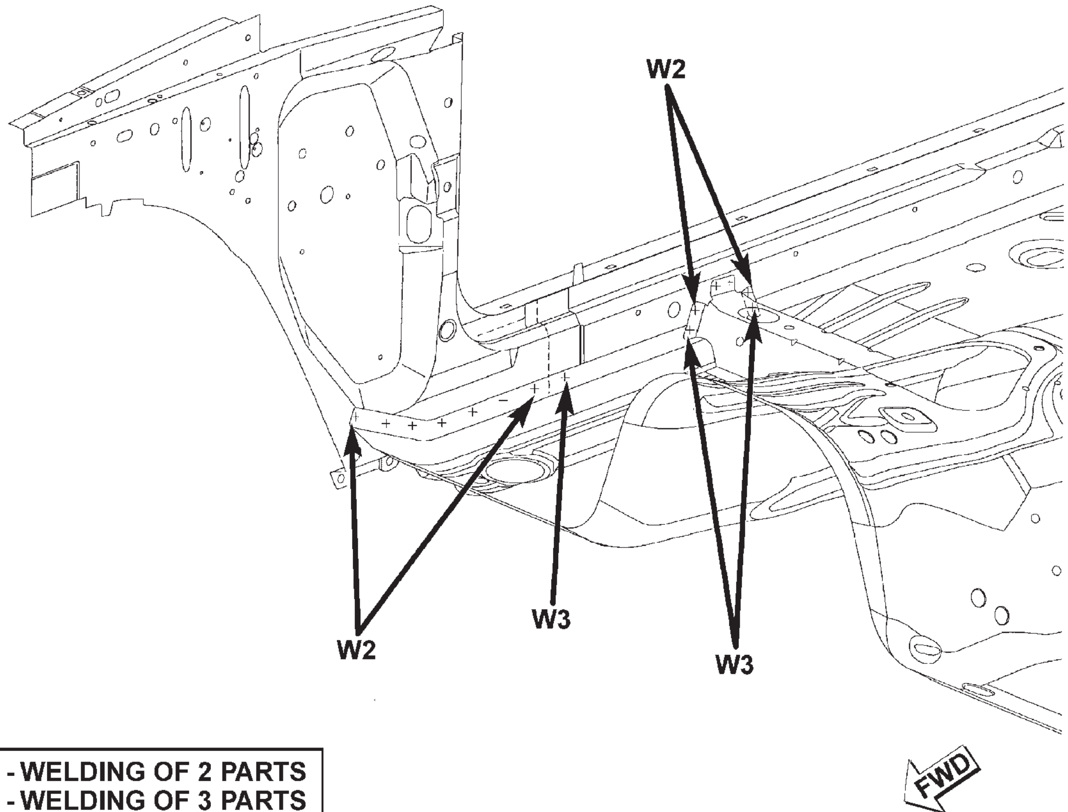
SPECIFICATIONS (Continued)

UNDERBODY

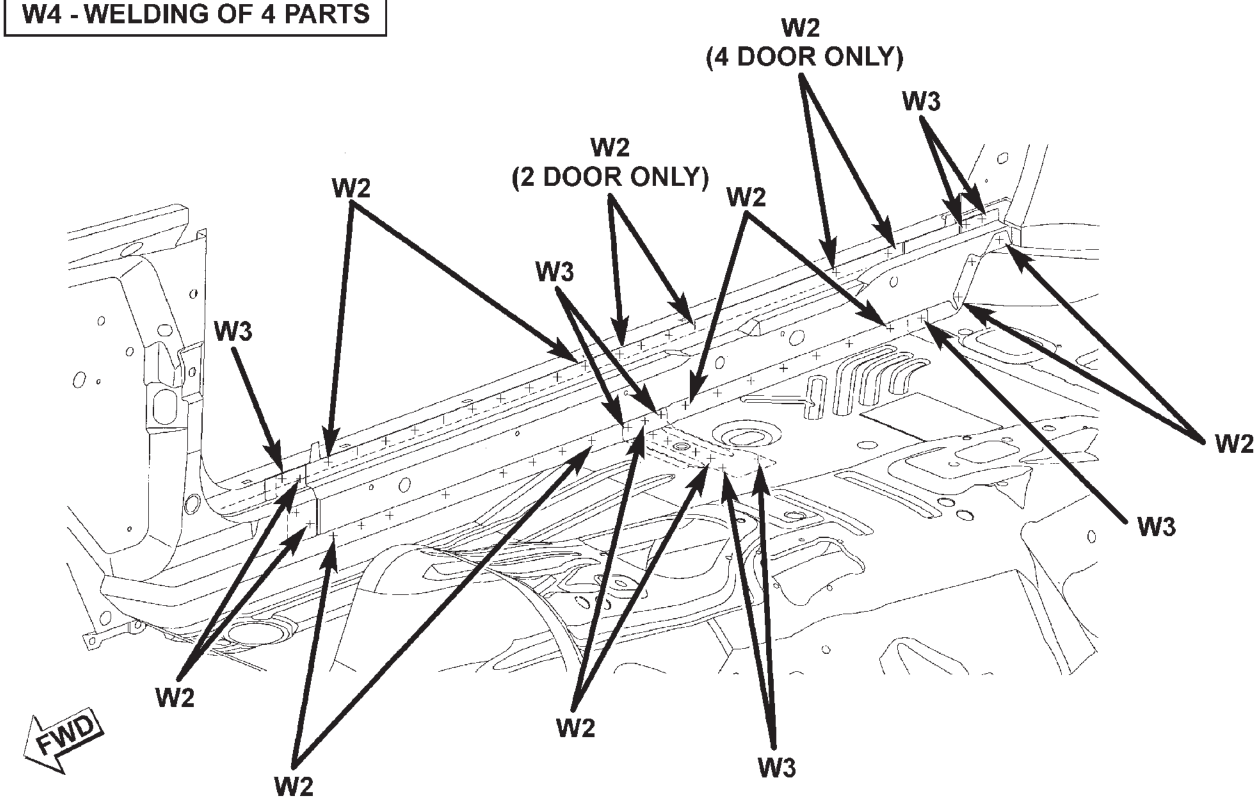


SPECIFICATIONS (Continued)

UNDERBODY



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS



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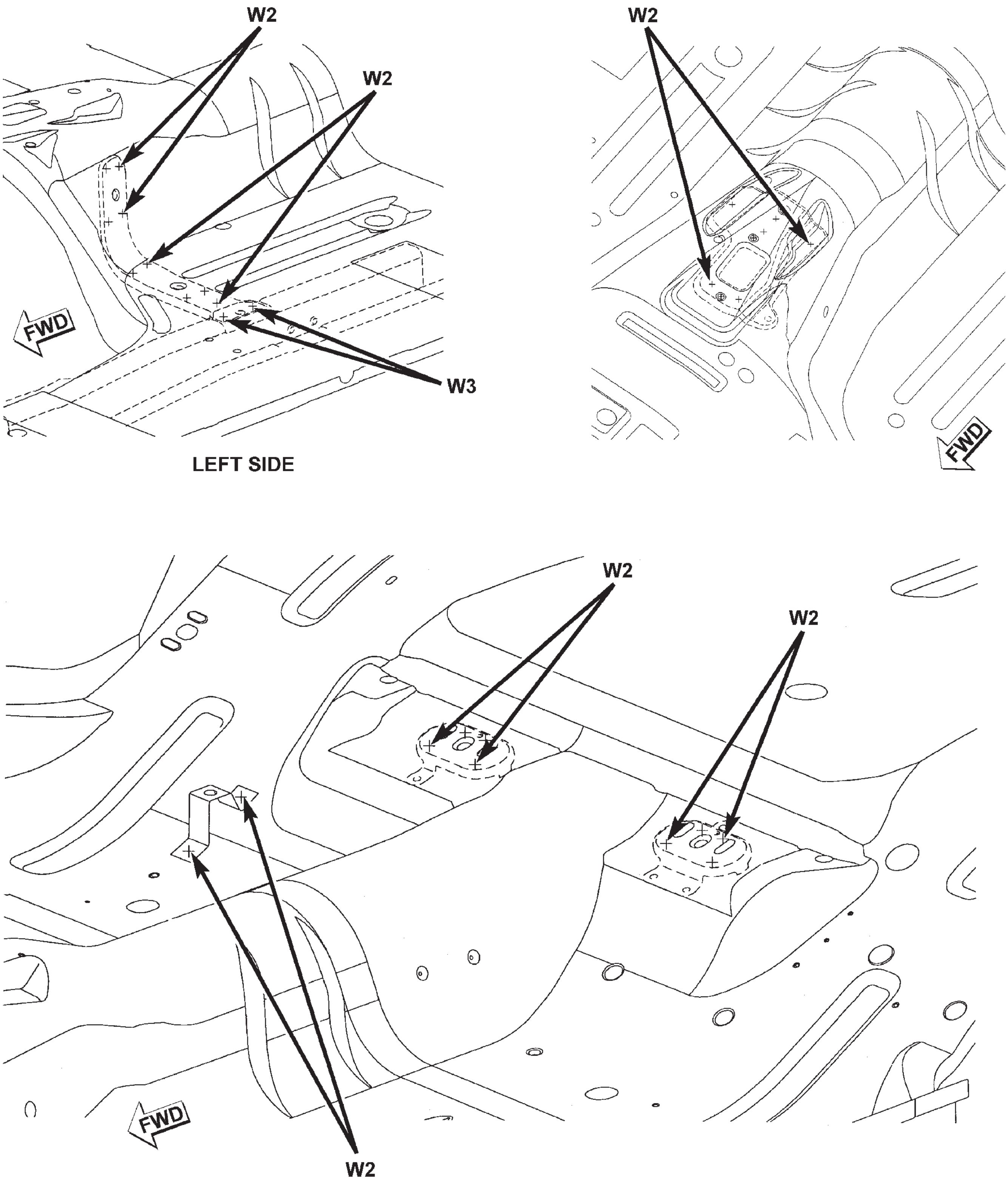
SPECIFICATIONS (Continued)

UNDERBODY



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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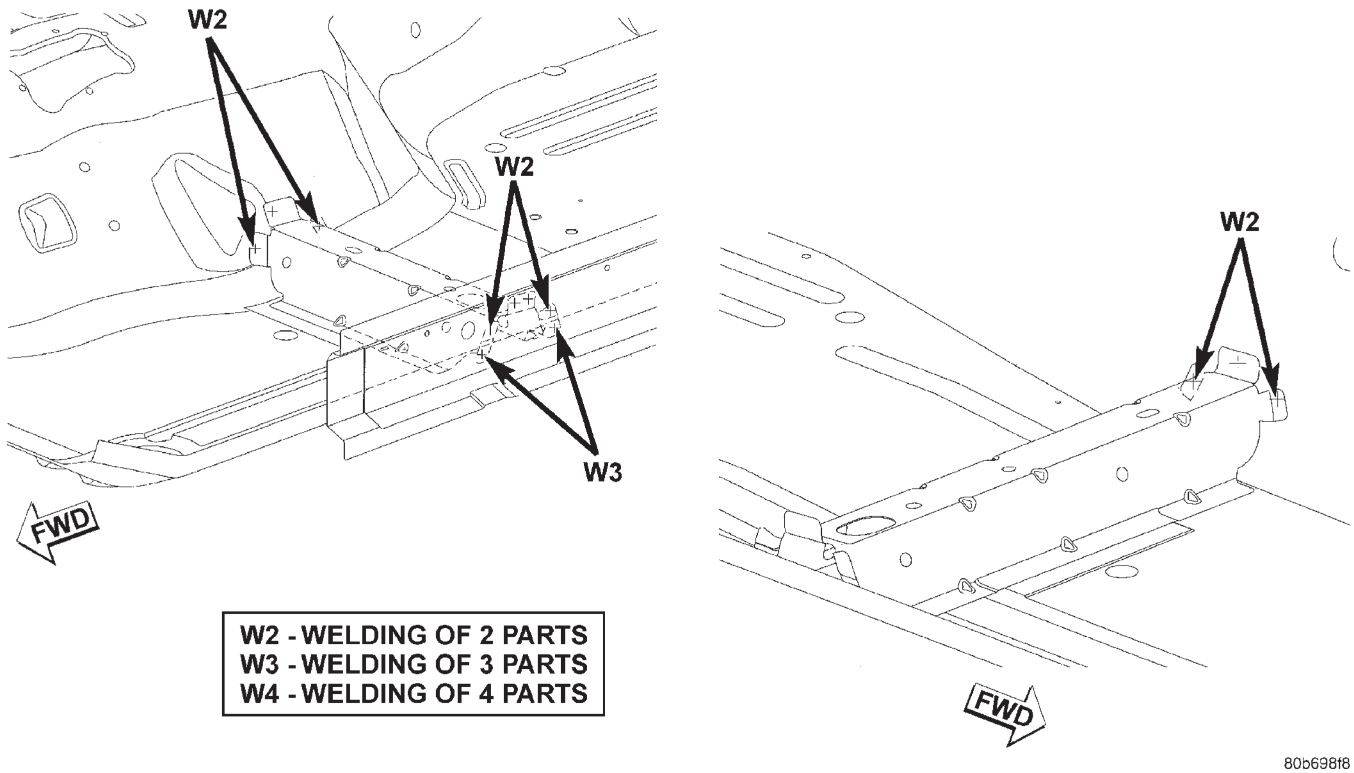
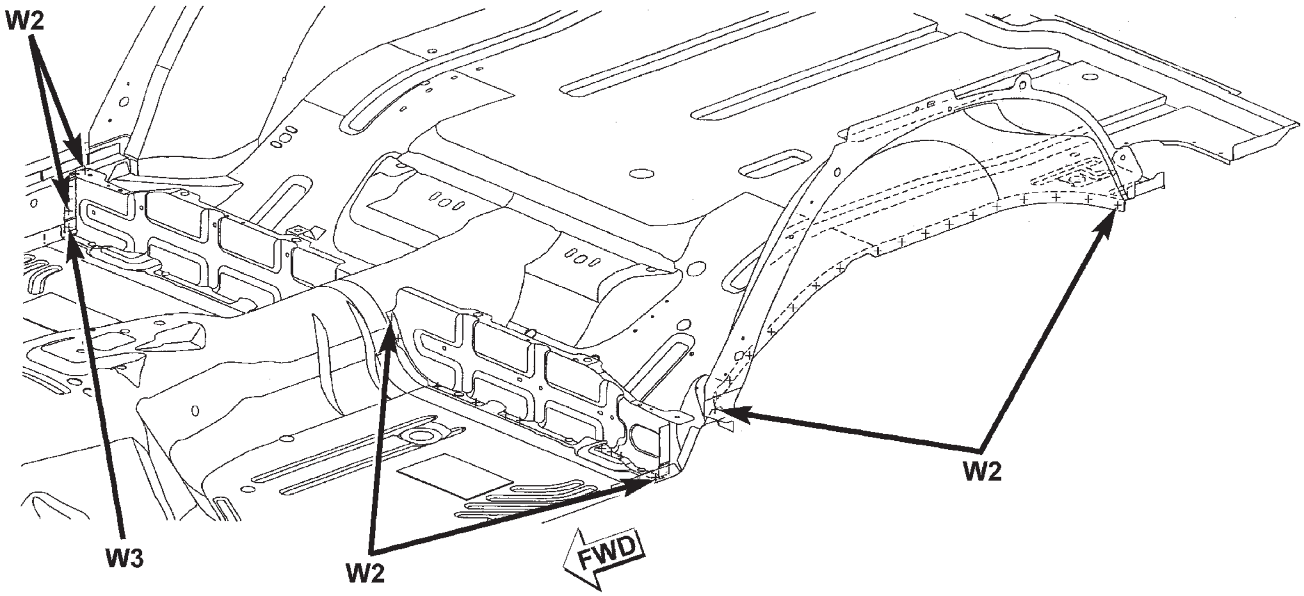
SPECIFICATIONS (Continued)

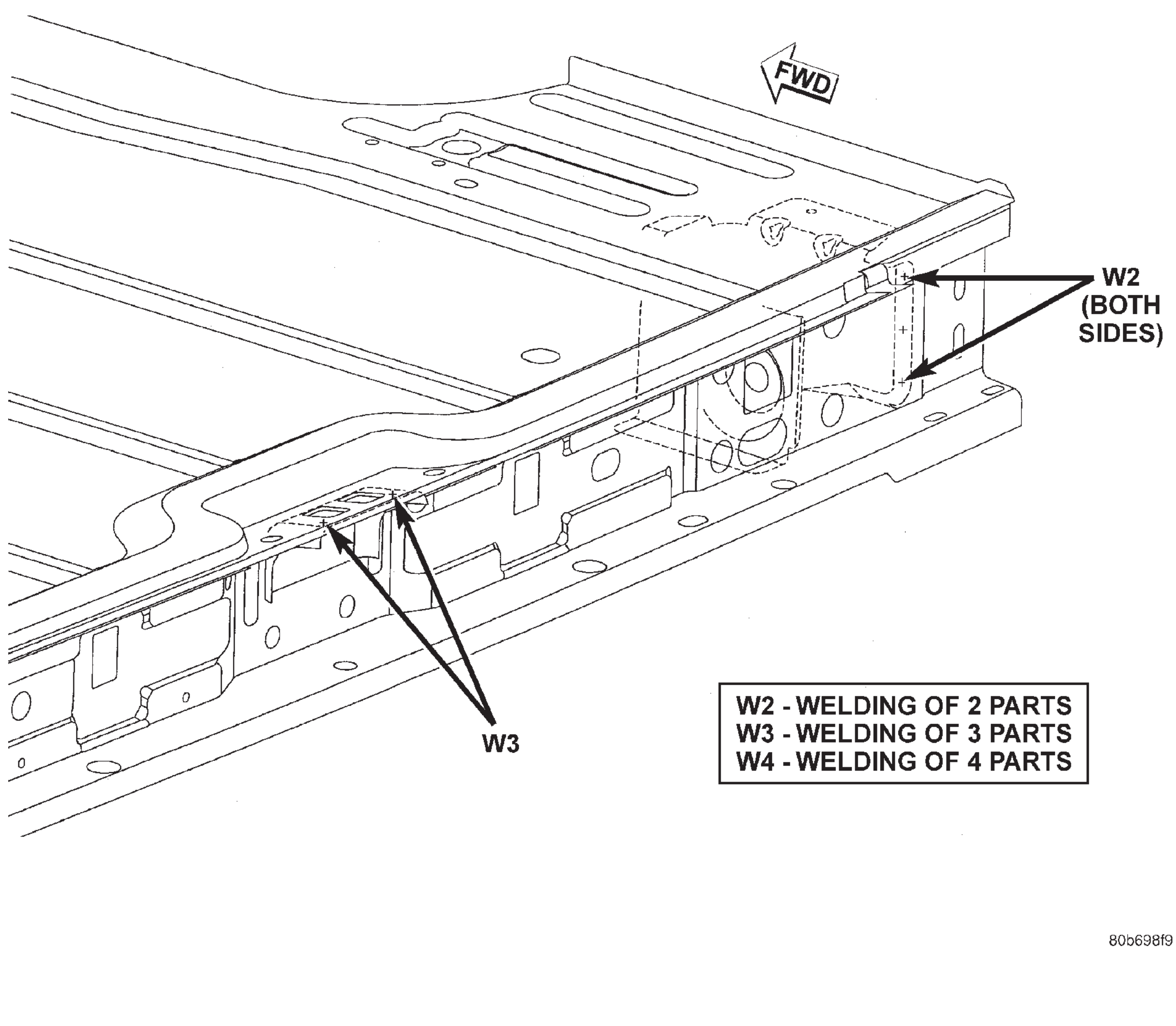
UNDERBODY



SPECIFICATIONS (Continued)

UNDERBODY

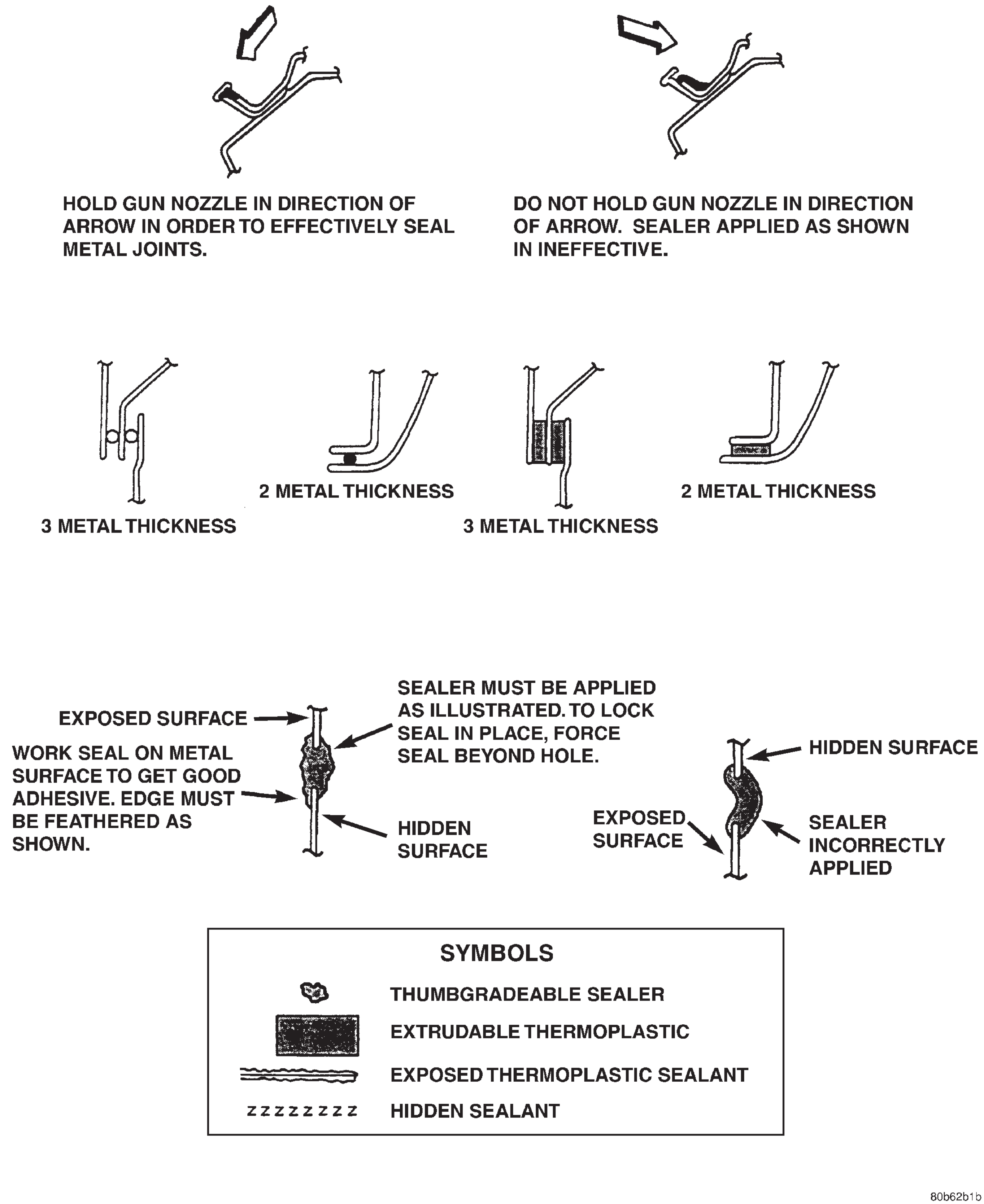




SPECIFICATIONS (Continued)

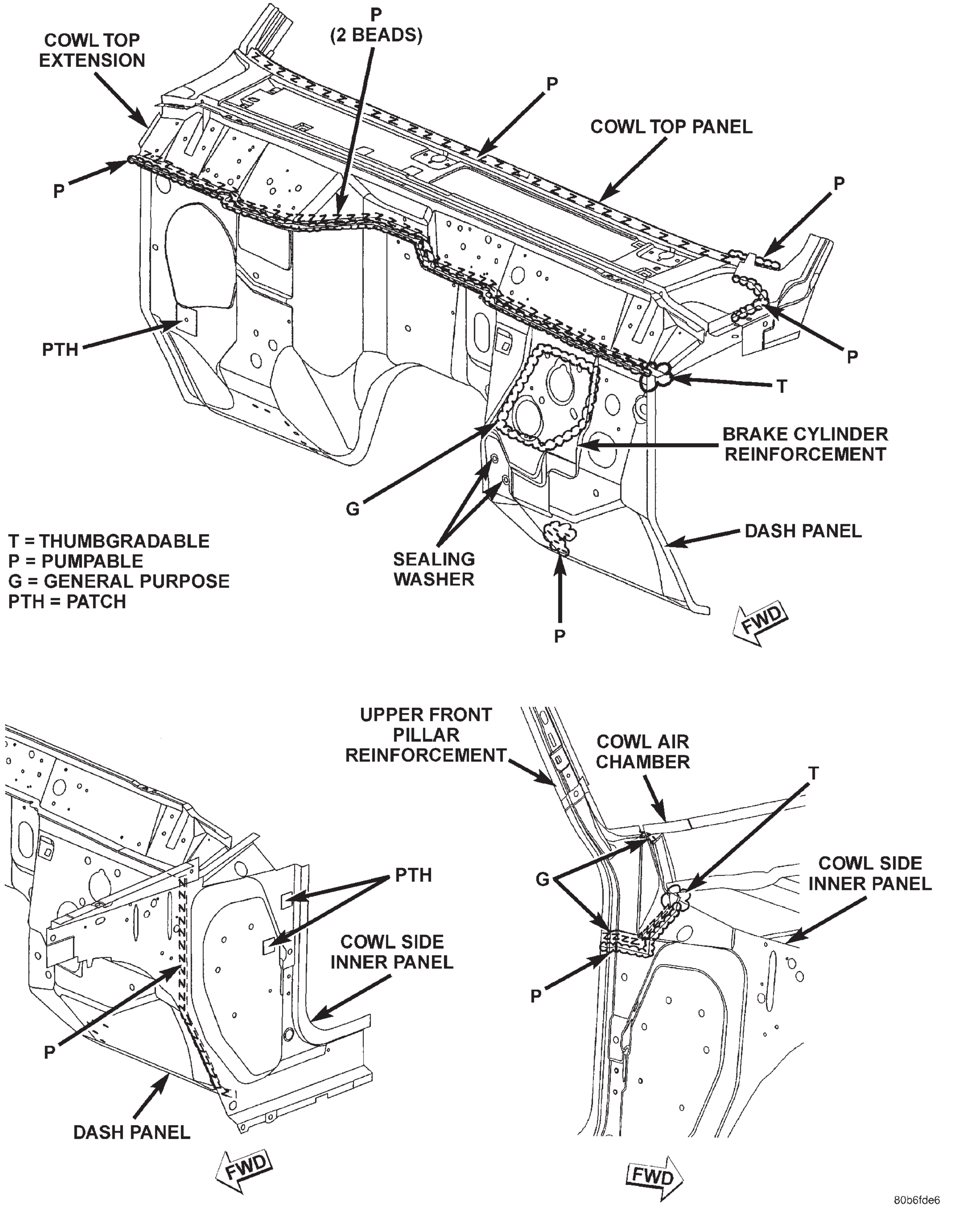
BODY SEALING LOCATIONS

APPLICATION METHODS



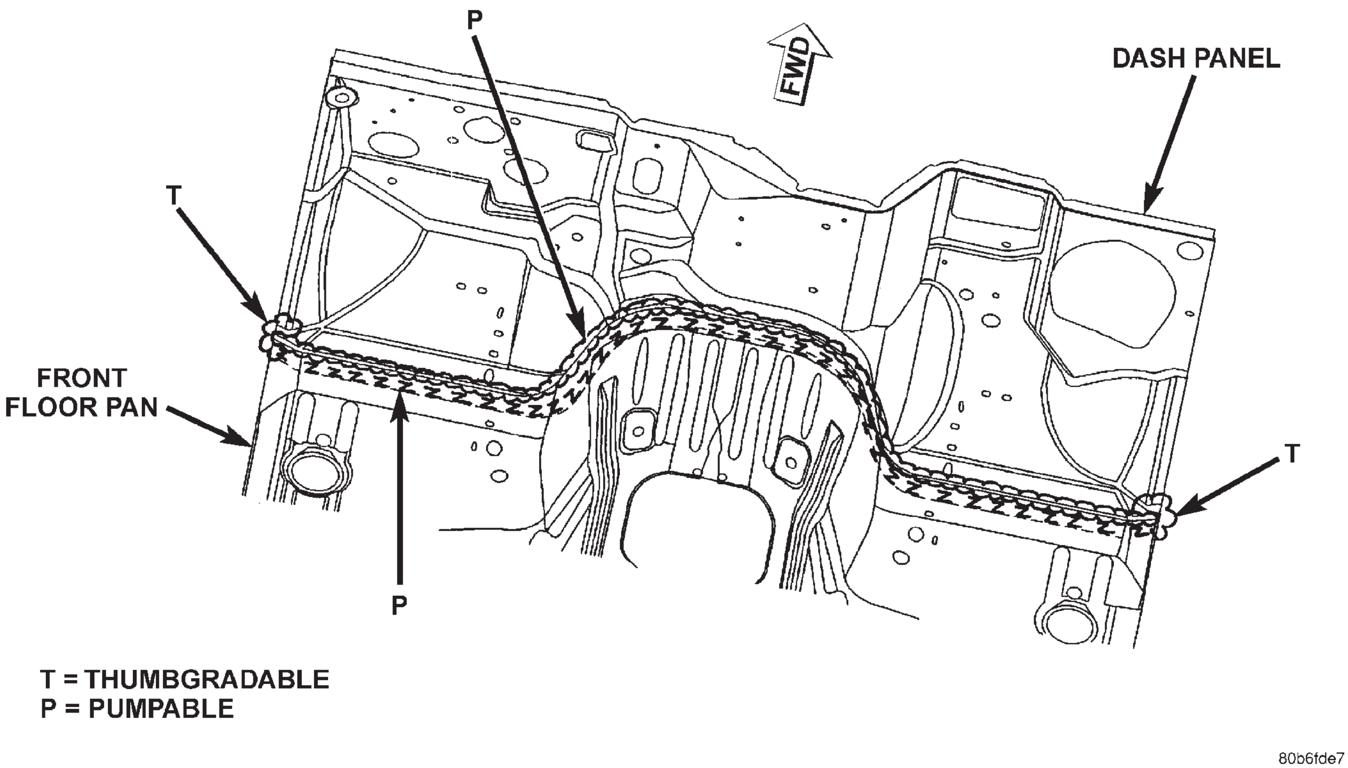
SPECIFICATIONS (Continued)

COWL AND DASH PANEL



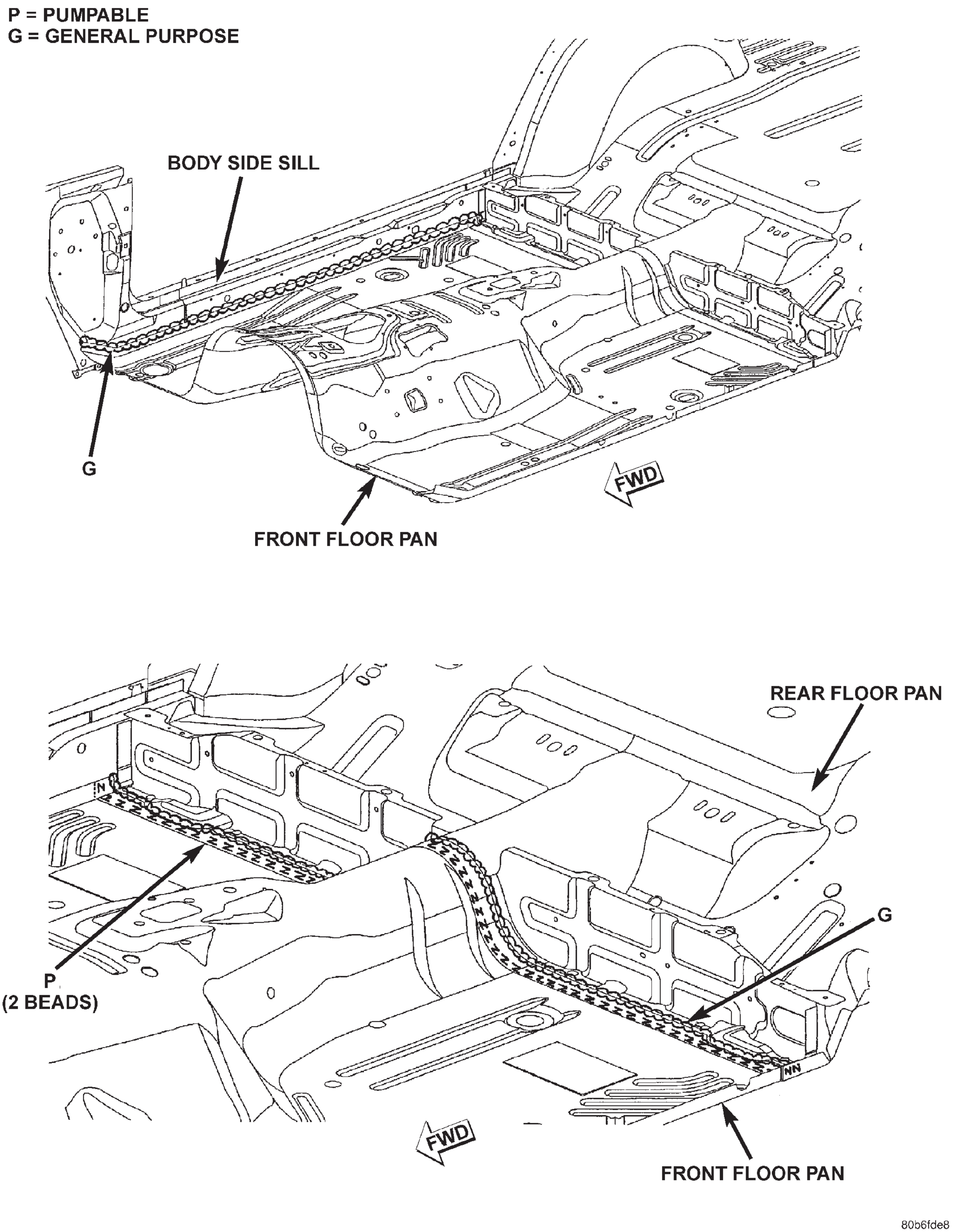
SPECIFICATIONS (Continued)

DASH PANEL AND FLOOR PAN



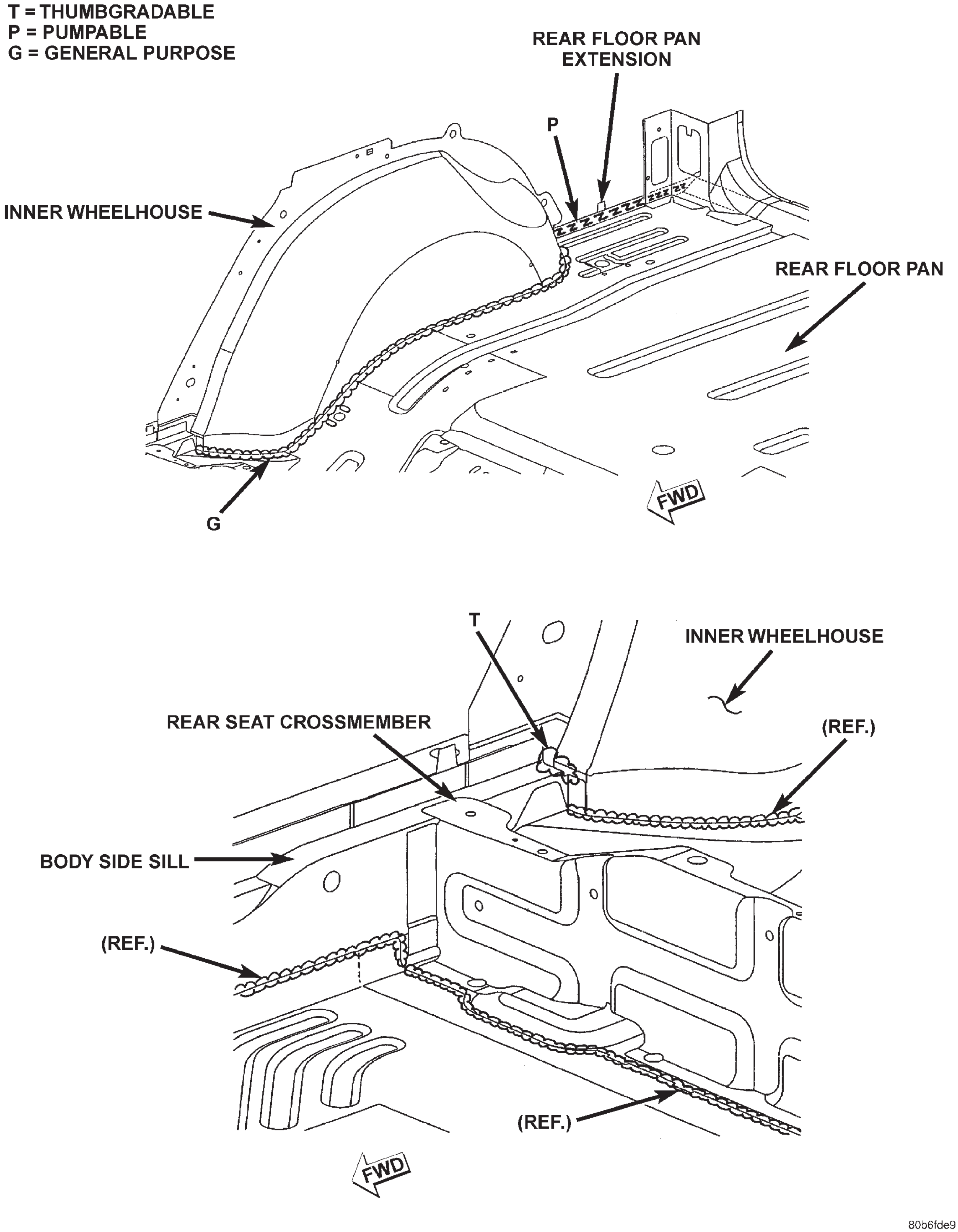
SPECIFICATIONS (Continued)

FLOOR PAN



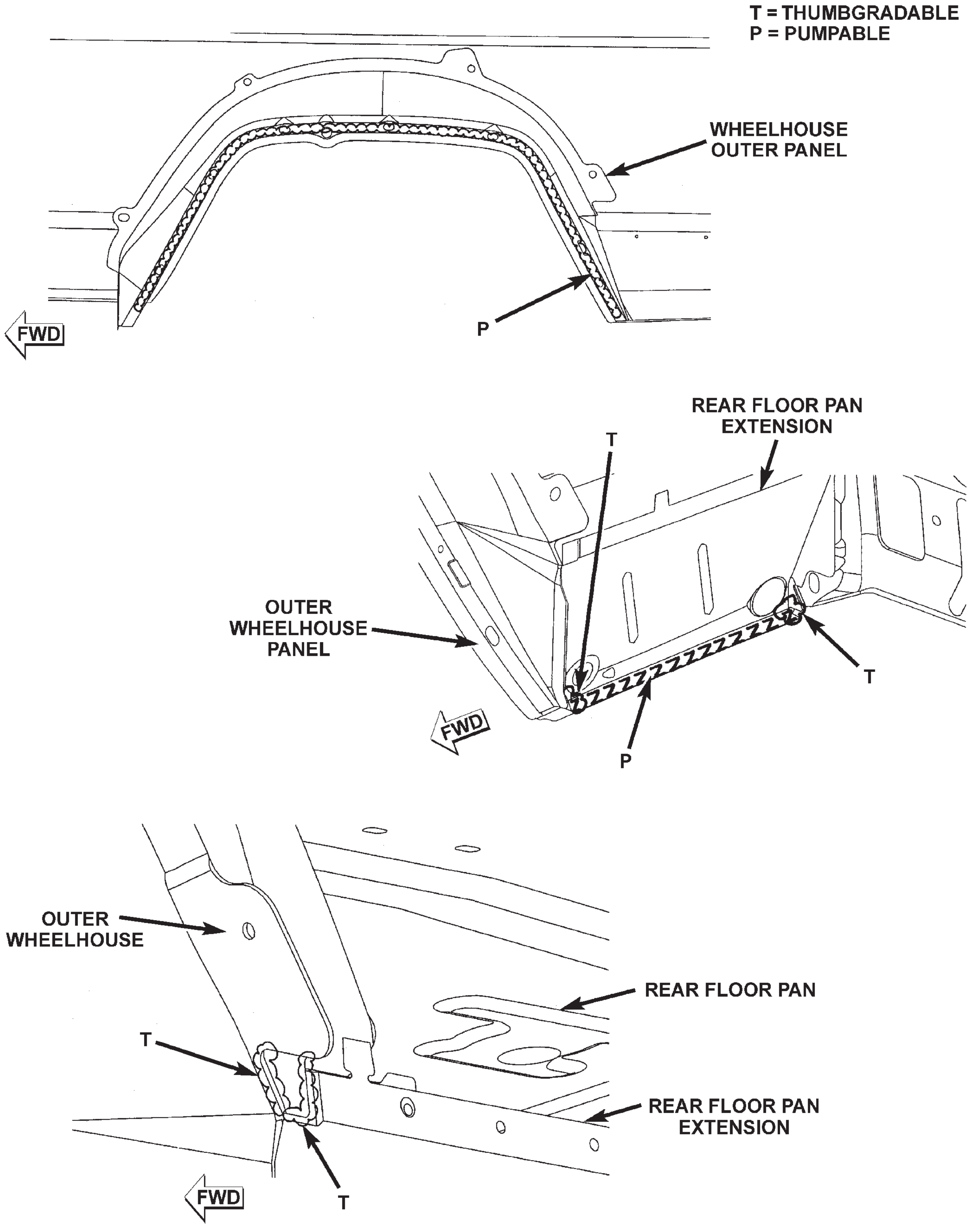
SPECIFICATIONS (Continued)

REAR INNER WHEELHOUSE



SPECIFICATIONS (Continued)

FRONT INNER WHEELHOUSE



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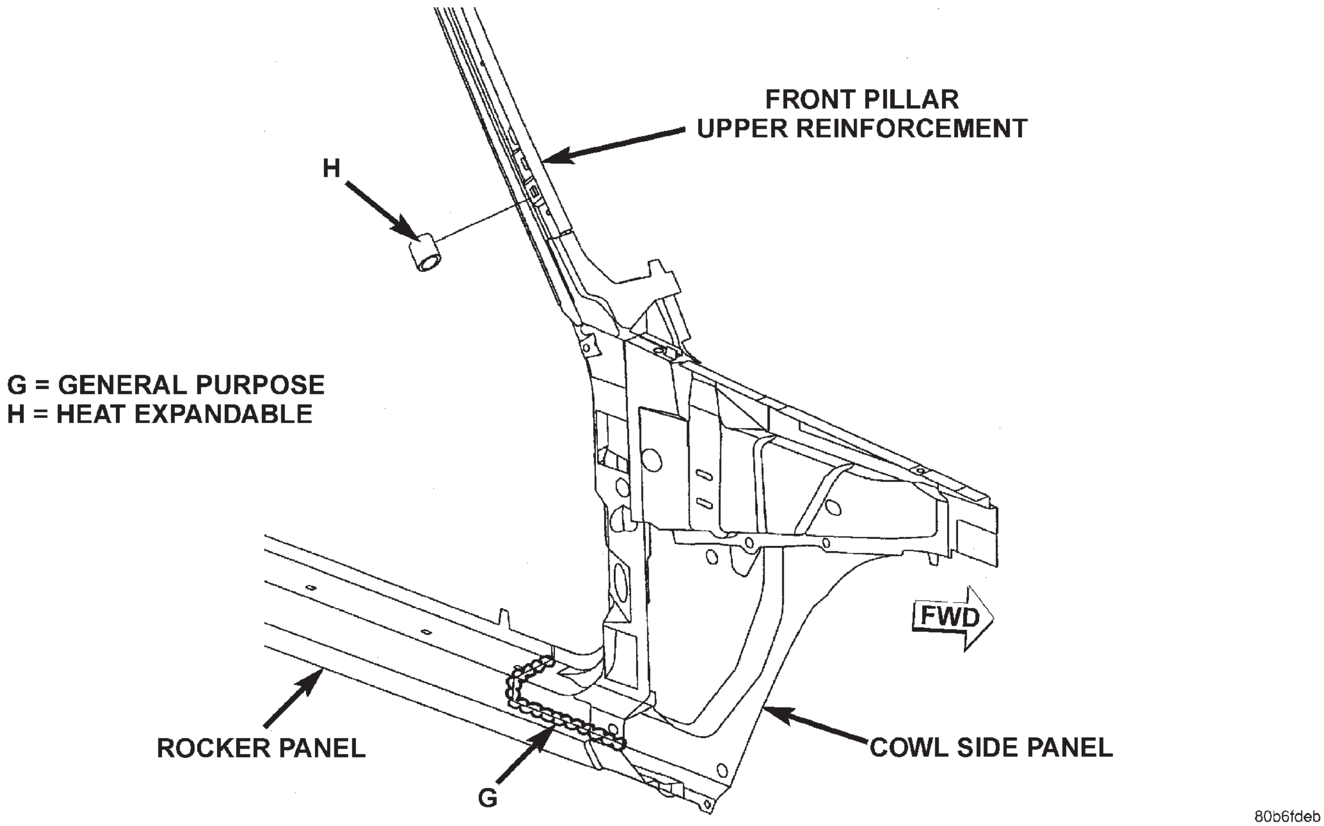
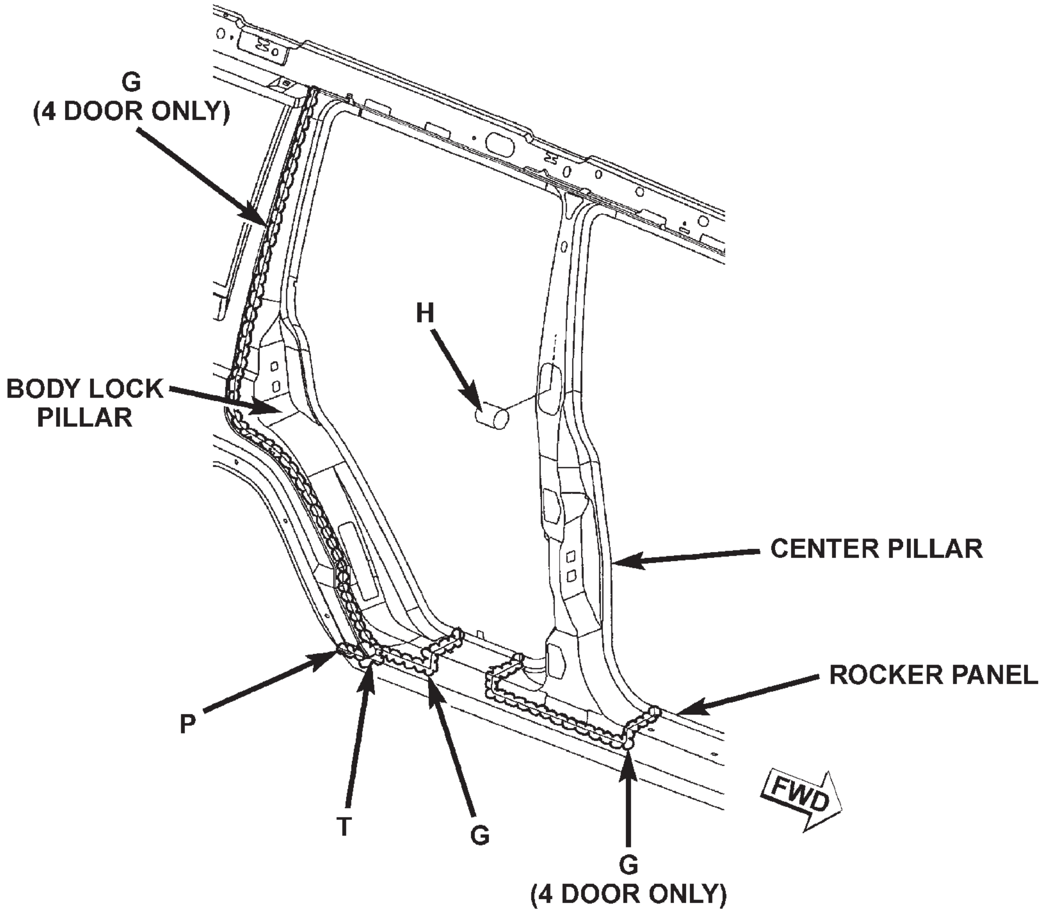
SPECIFICATIONS (Continued)

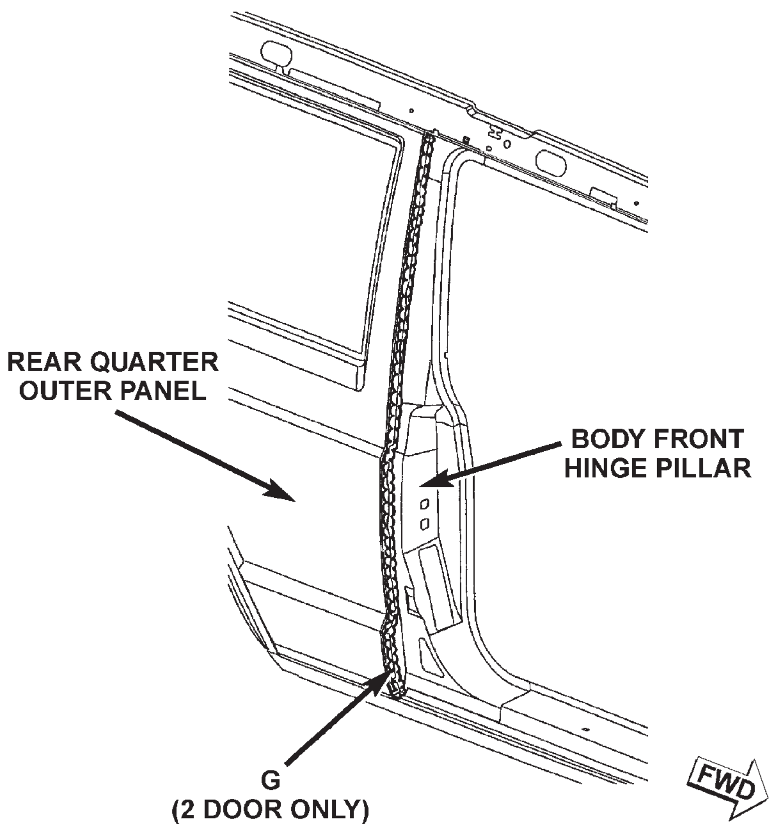
BODY SIDE



SPECIFICATIONS (Continued)

BODY SIDE





T = THUMBGRADABLE
P = PUMPABLE
G = GENERAL PURPOSE
H = HEAT EXPANDABLE

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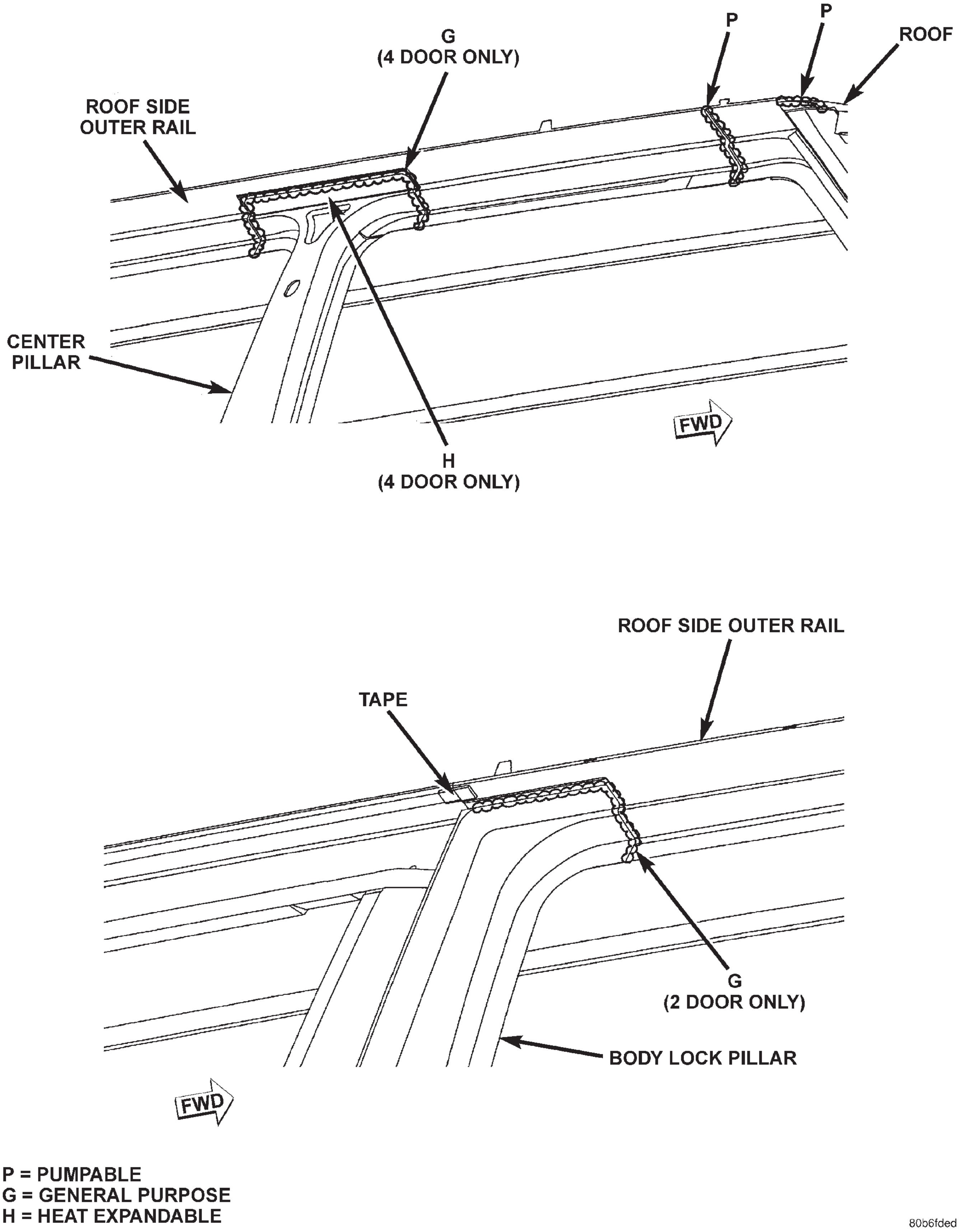
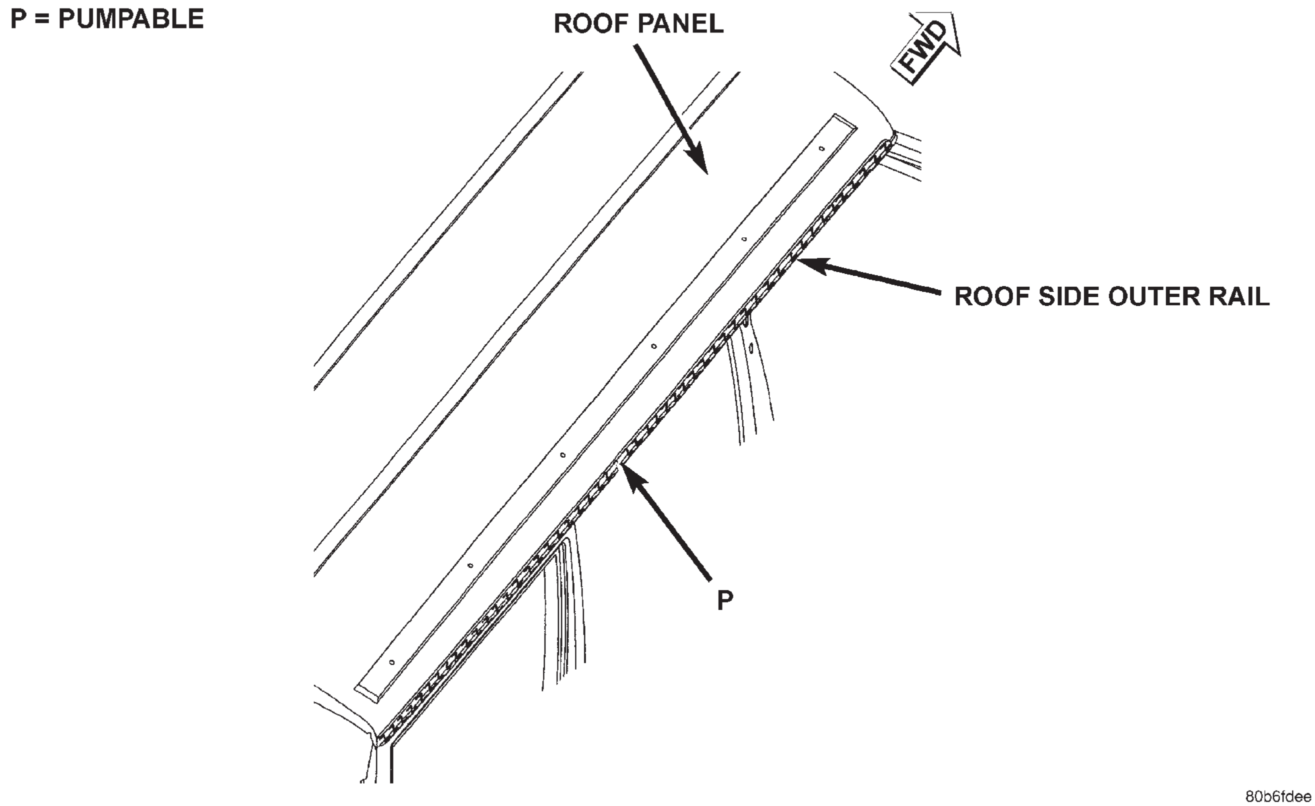
SPECIFICATIONS (Continued)

BODY SIDE



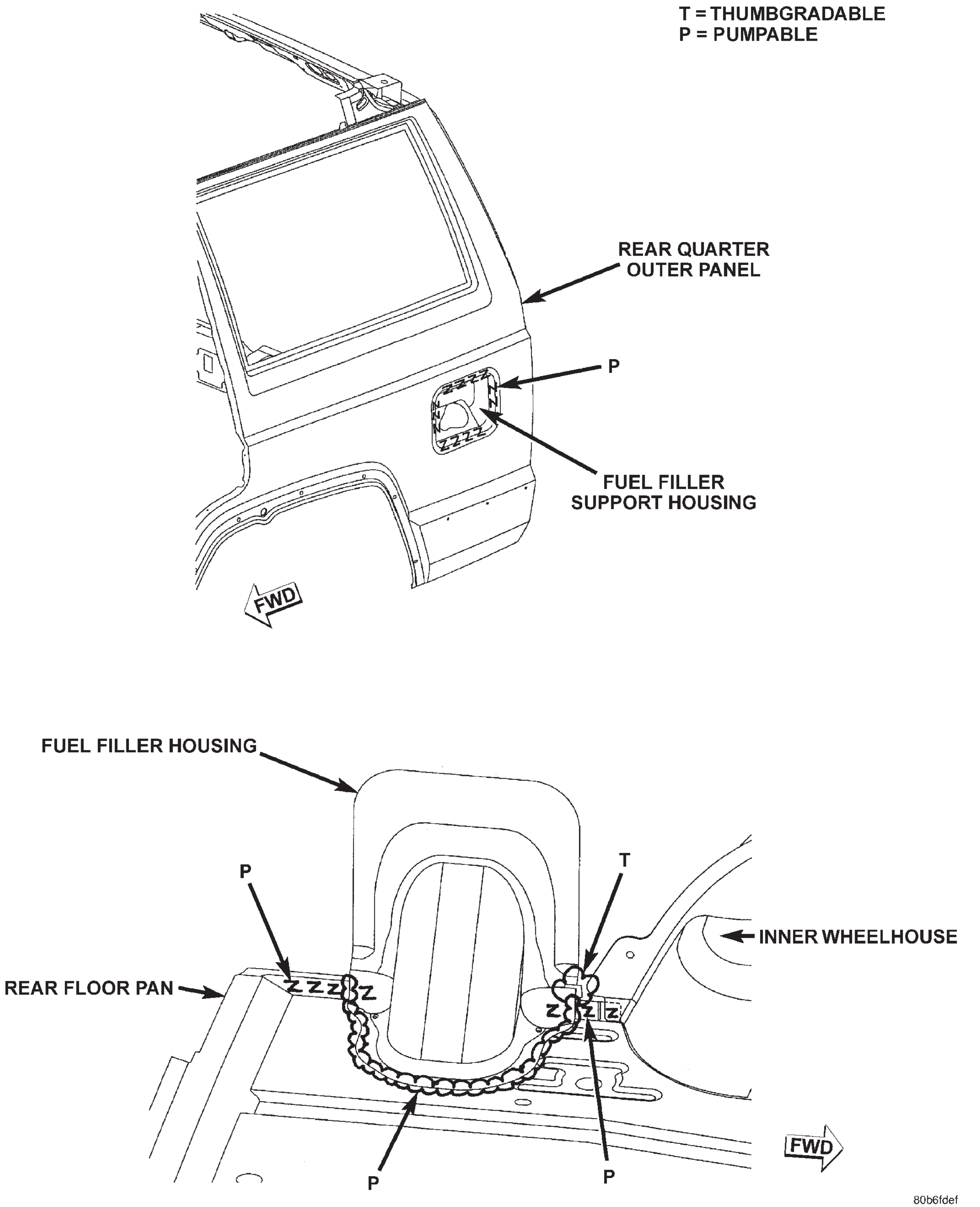
SPECIFICATIONS (Continued)

ROOF PANEL



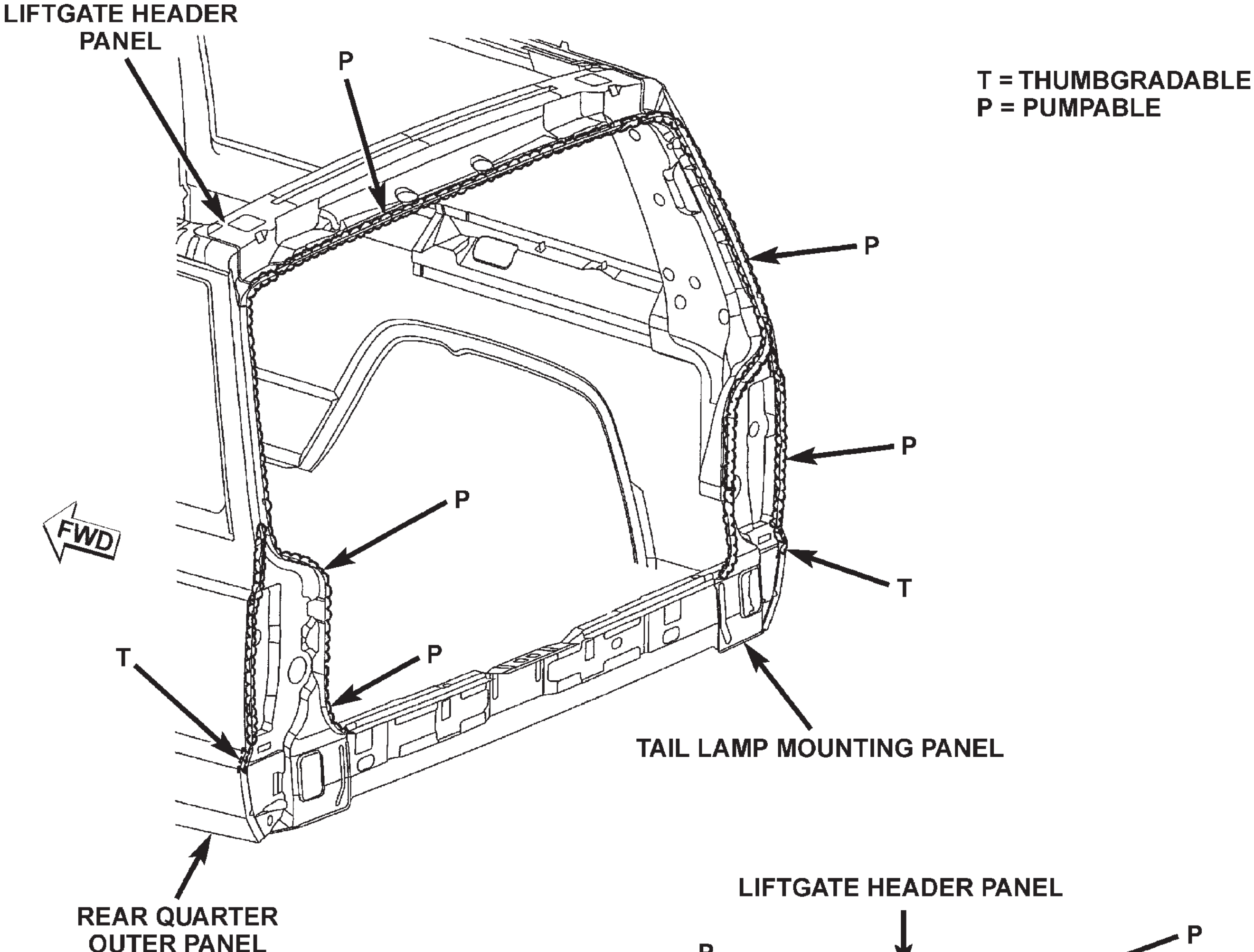
SPECIFICATIONS (Continued)

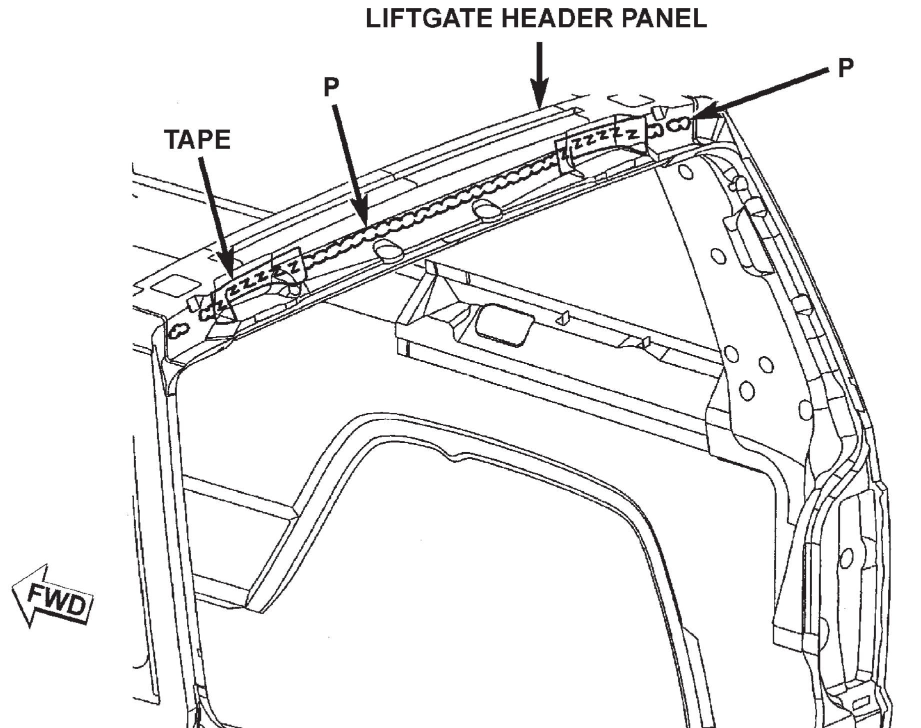
FUEL FILLER HOUSING



SPECIFICATIONS (Continued)

LIFTGATE OPENING





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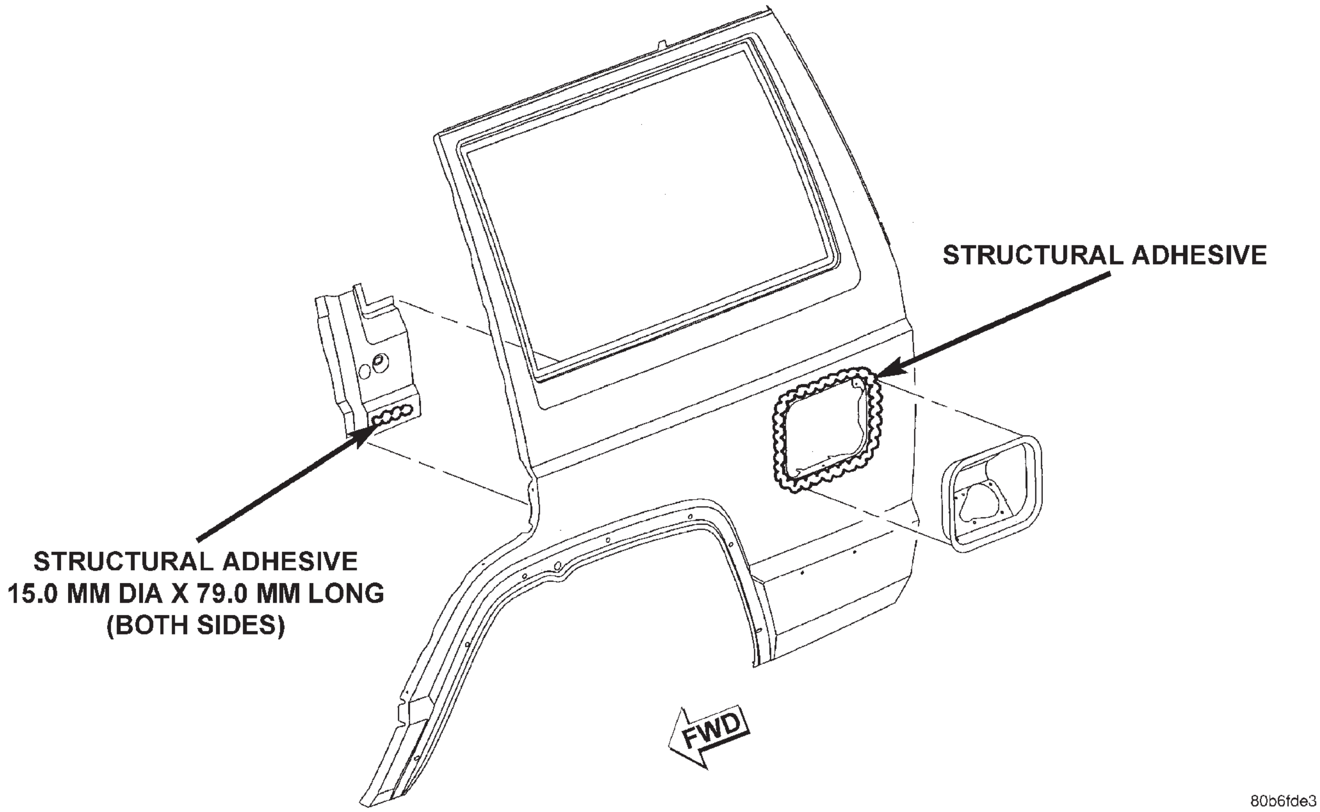
SPECIFICATIONS (Continued)

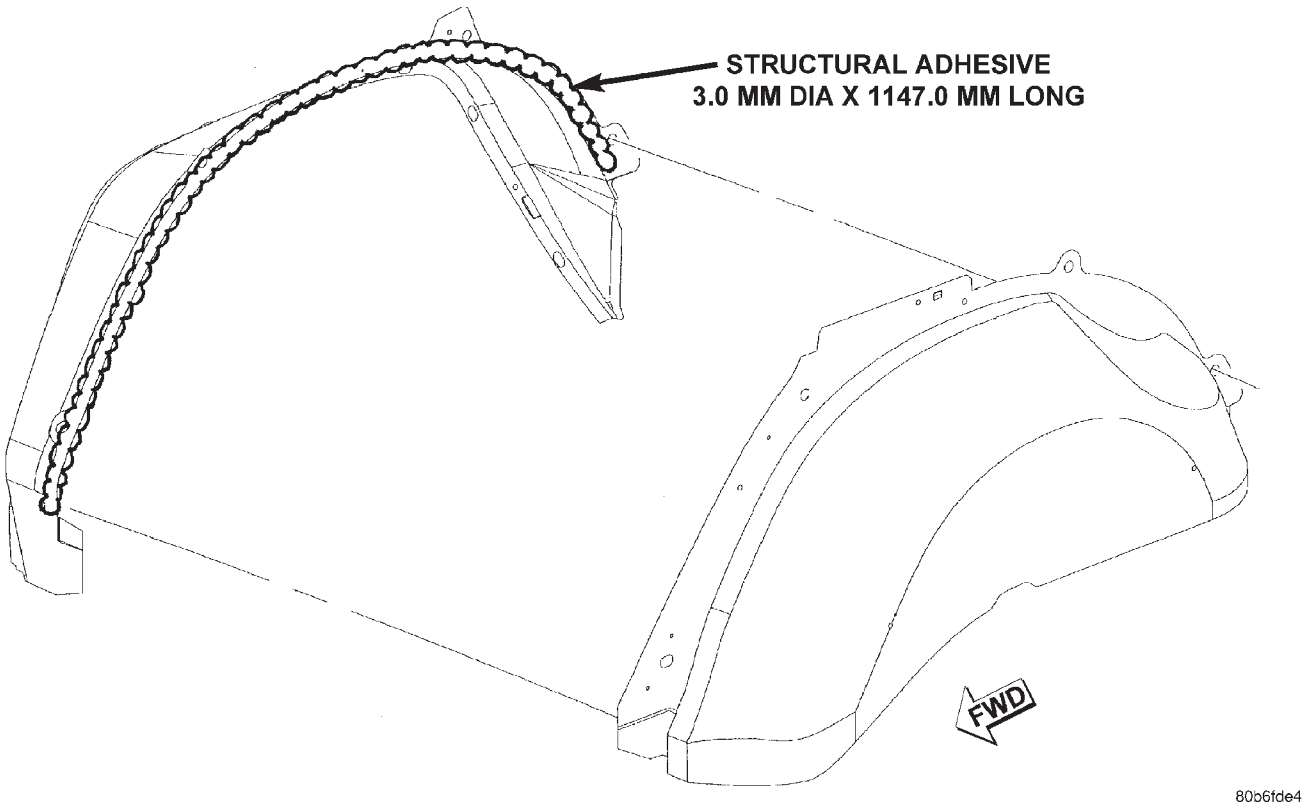
STRUCTURAL ADHESIVE LOCATIONS

LEFT QUARTER PANEL



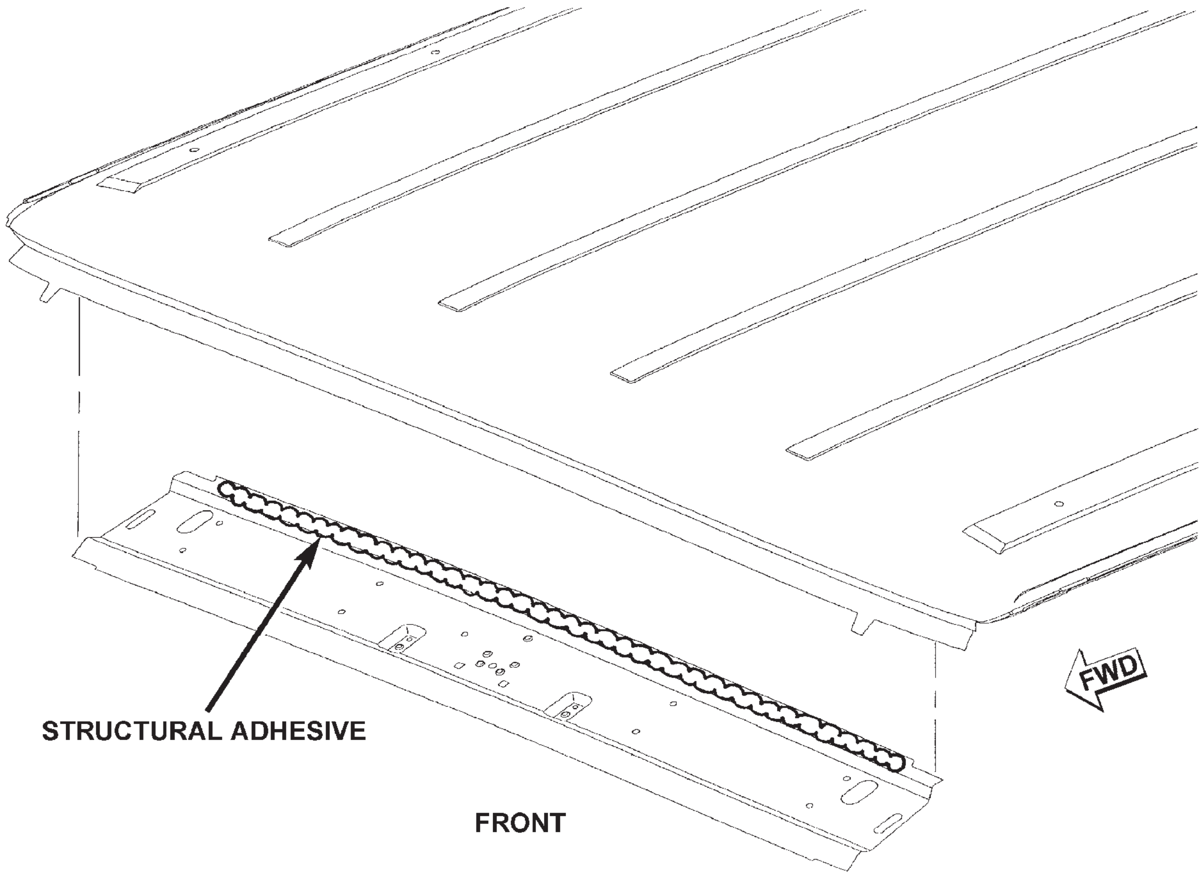
SPECIFICATIONS (Continued)

REAR WHEELHOUSE

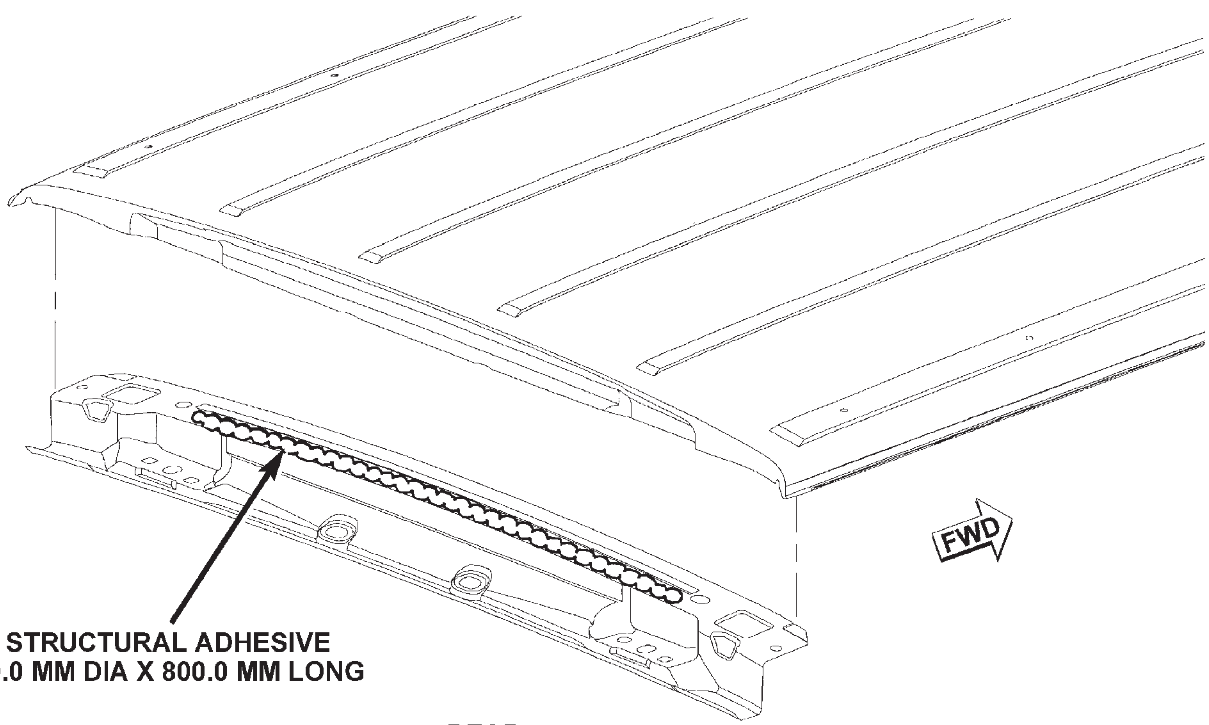


SPECIFICATIONS (Continued)

ROOF BOWS



FRONT



REAR

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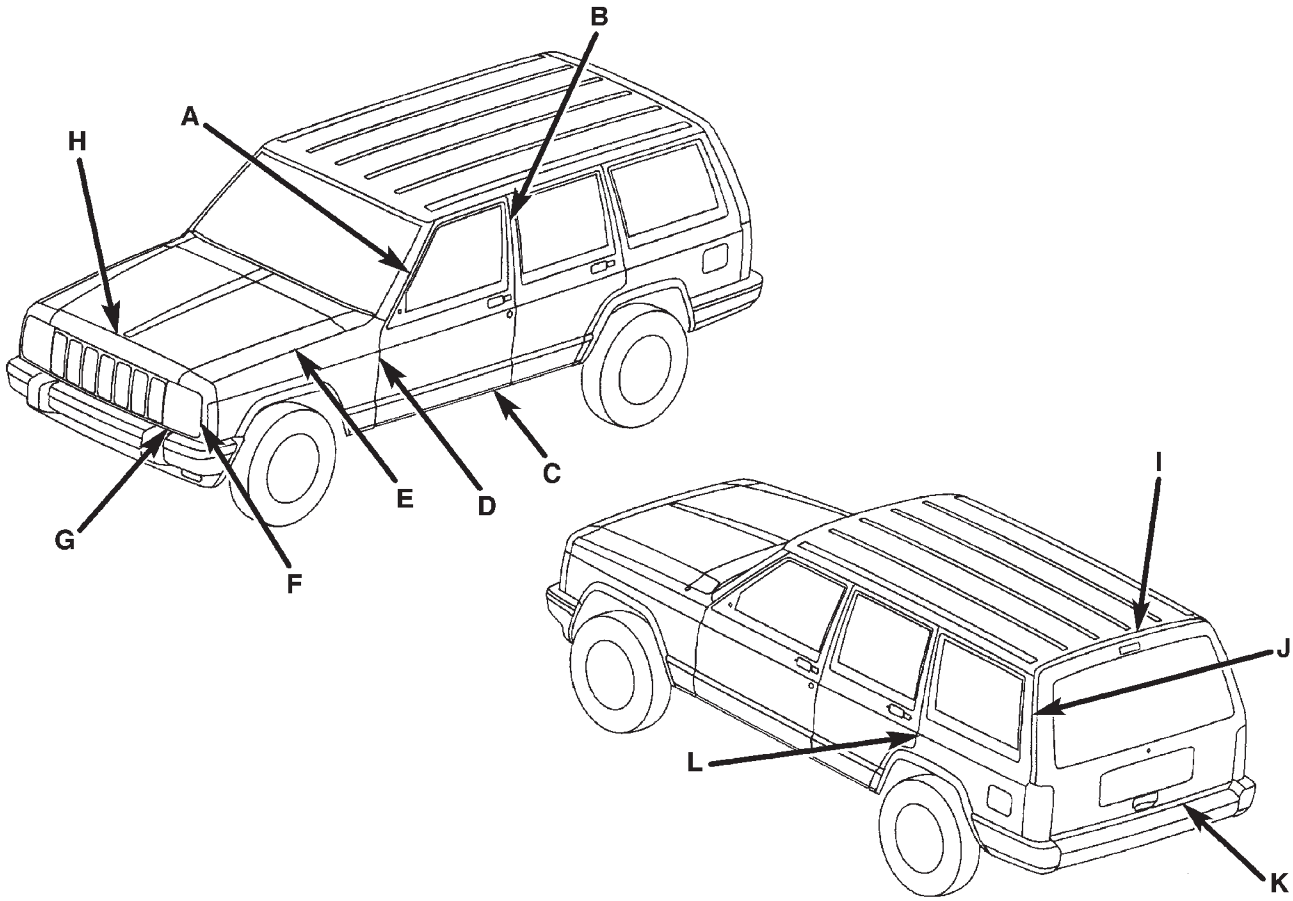
SPECIFICATIONS (Continued)

BODY GAP AND FLUSH MEASUREMENTS



	LOCATION	GAP	FLUSH
A	Front Door to Windshield Pillar	6.4 +/- 2.0	1.6 +/- 2.0
B	Front Door to REar Door	6.4 +/1 1.5	0.0 +/- 1.5
C	Front Door to Aperture at Sill	8.1 +/- 1.5	0.0 +/- 1.5
D	Front Door to Fender	6.4 +/- 1.5	00 +/- 1.5
E	Hood to Fender	5.6 +/- 1.5	0.5 +/- 1.5
F	Headlamp to Fender	5.6 +/- 1.5	0.5 +/- 1.5
G	Headlamp to Roof	N/A	0.74 +/- 1.0
H	Grille to Hood	6.0 +/- 1.5	0.24 +/- 1.5
I	Liftgate to Roof	7.5 +/- 1.5	0.5 +/- 1.5
J	Liftgate to Aperture	6.5 +/- 1.5	0.0 +/- 1.5
K	Liftgate to Fascia	X. X +/- 2.0	N/A
L	Rear Door to Quarter Panel	6.4 +/- 1.5	0.0 +/- 1.5

NOTE: ALL MEASUREMENTS ARE IN MM.

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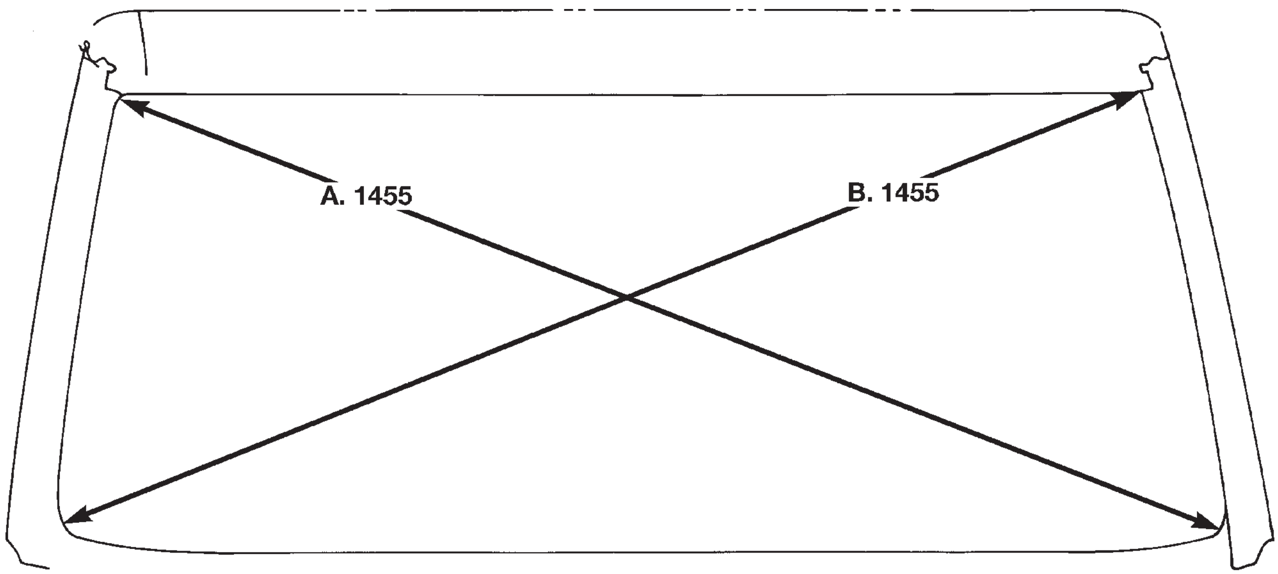
SPECIFICATIONS (Continued)

BODY OPENING DIMENSIONS

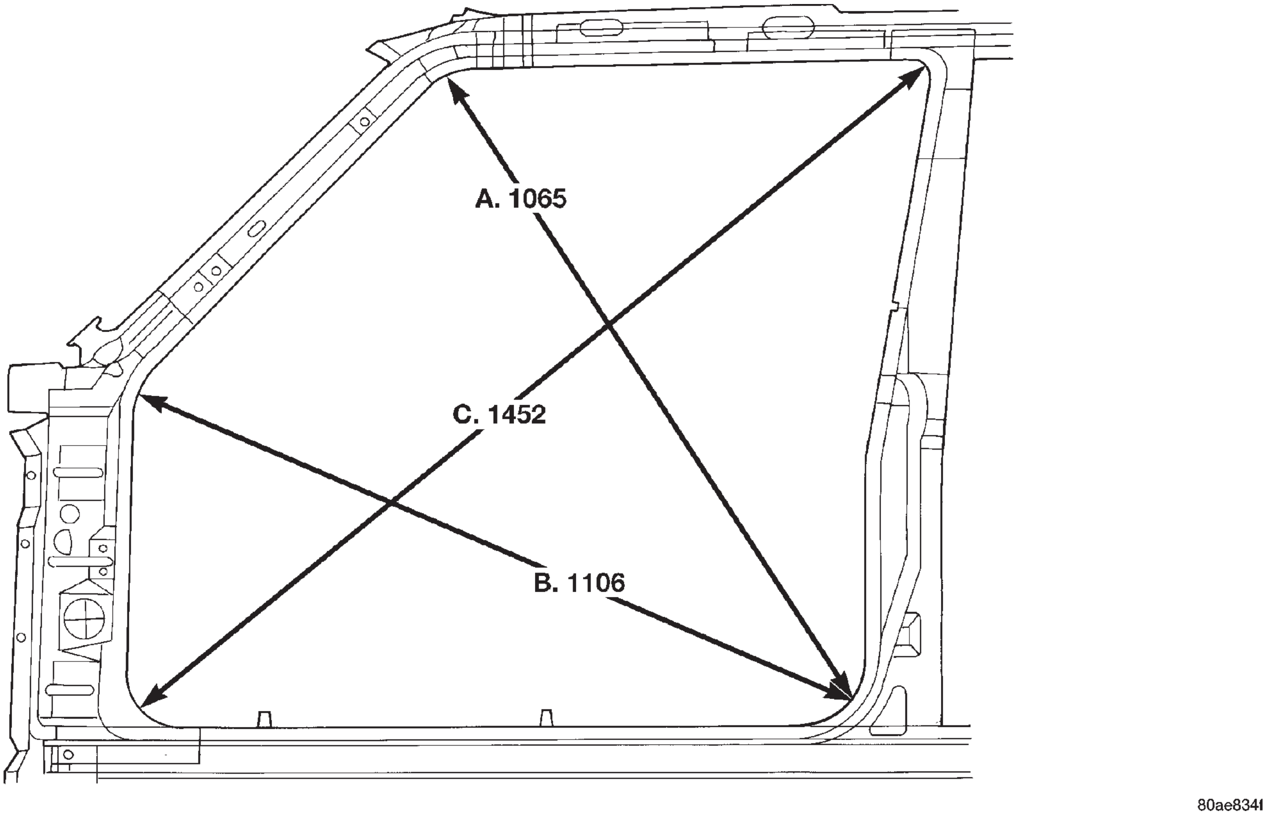
WINDSHIELD OPENING



• A. & B. Center of radius at bottom to center of radius at top

SPECIFICATIONS (Continued)

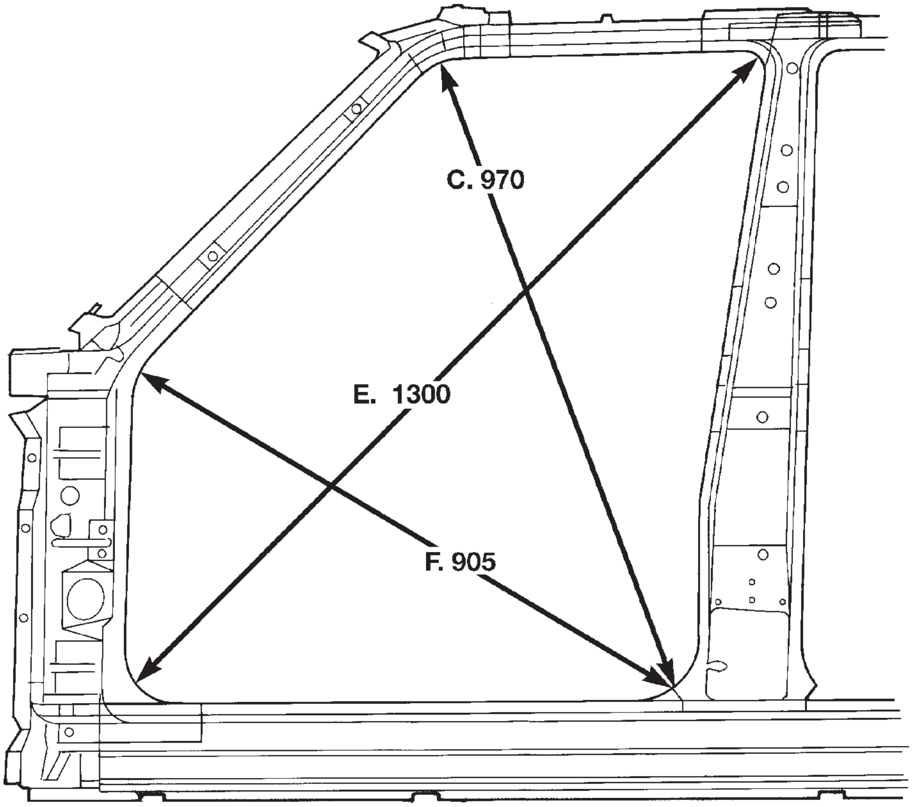
FRONT DOOR OPENING 2–DOOR



- A. Center of front door lower rear radius to center of A-pillar radius
- B. Center of radius at bottom rear to center of radius at lower A-pillar
- C. Center of radius at bottom front to center of radius at top rear

SPECIFICATIONS (Continued)

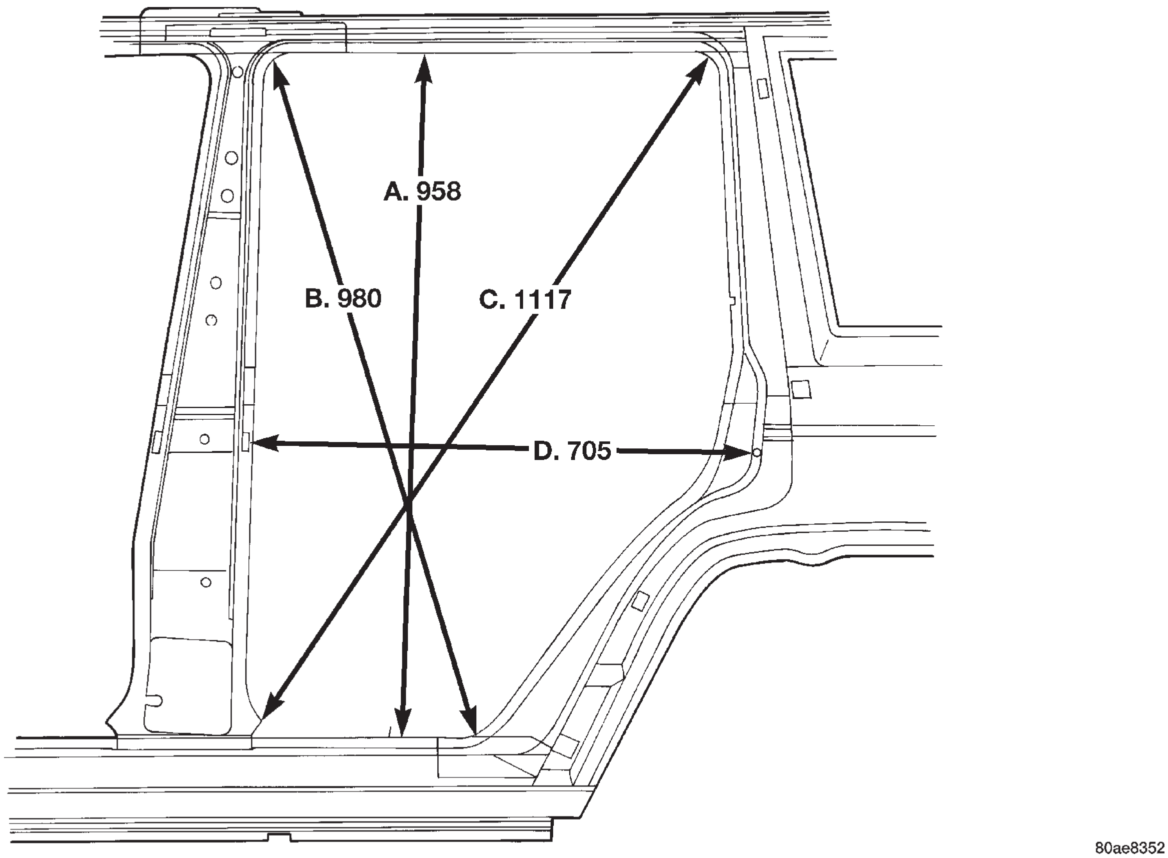
FRONT DOOR OPENING 4–DOOR



- C. Center of front door lower rear radius to center of A-pillar radius
- E. Center of radius at bottom rear to center of radius at lower A-pillar
- F. Center of radius at bottom front to center of radius at top rear

SPECIFICATIONS (Continued)

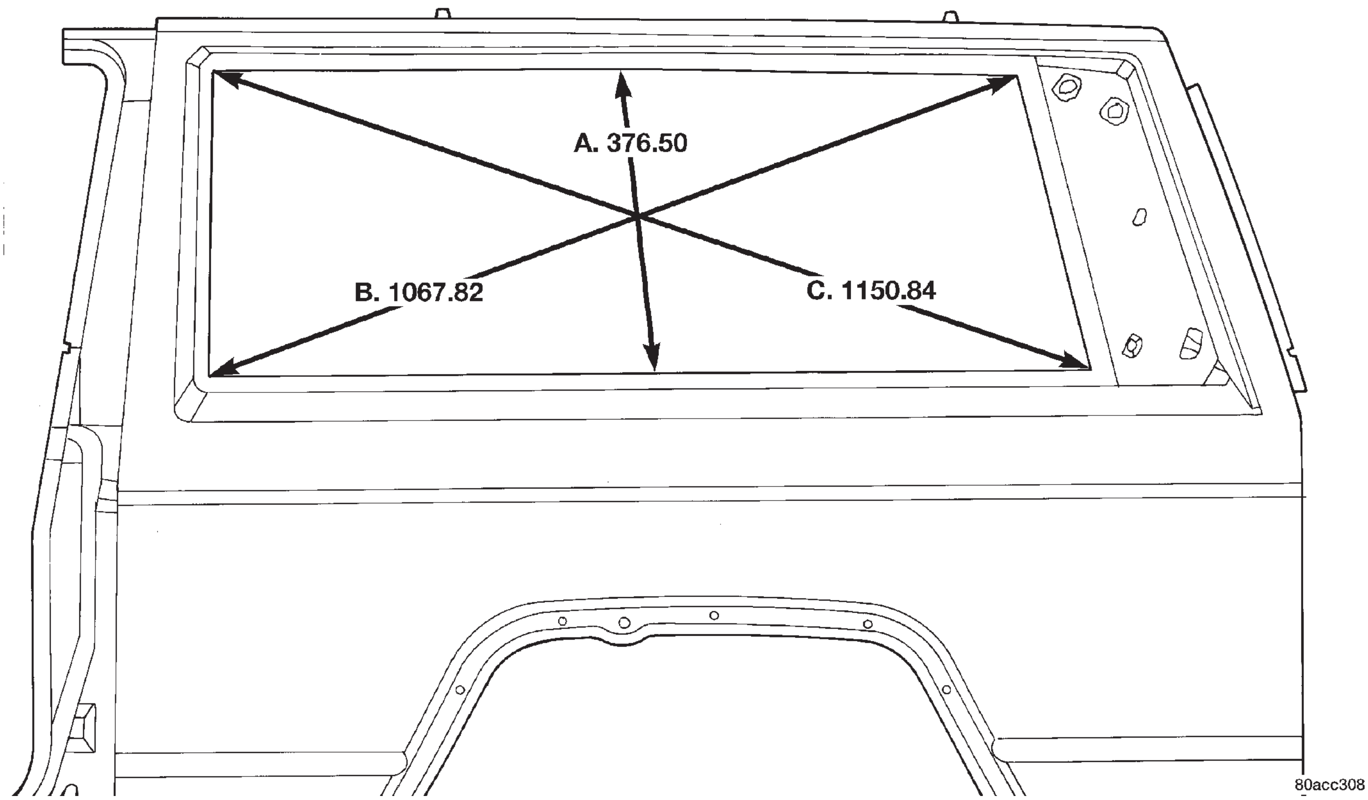
REAR DOOR OPENING



- A. Quarter panel to front outer body side upper and lower seam
- B. Center of front upper door radius to center of rear lower door radius
- C. Center of front lower door radius to center of rear upper door radius
- D. Flange to rear door striker mount

SPECIFICATIONS (Continued)

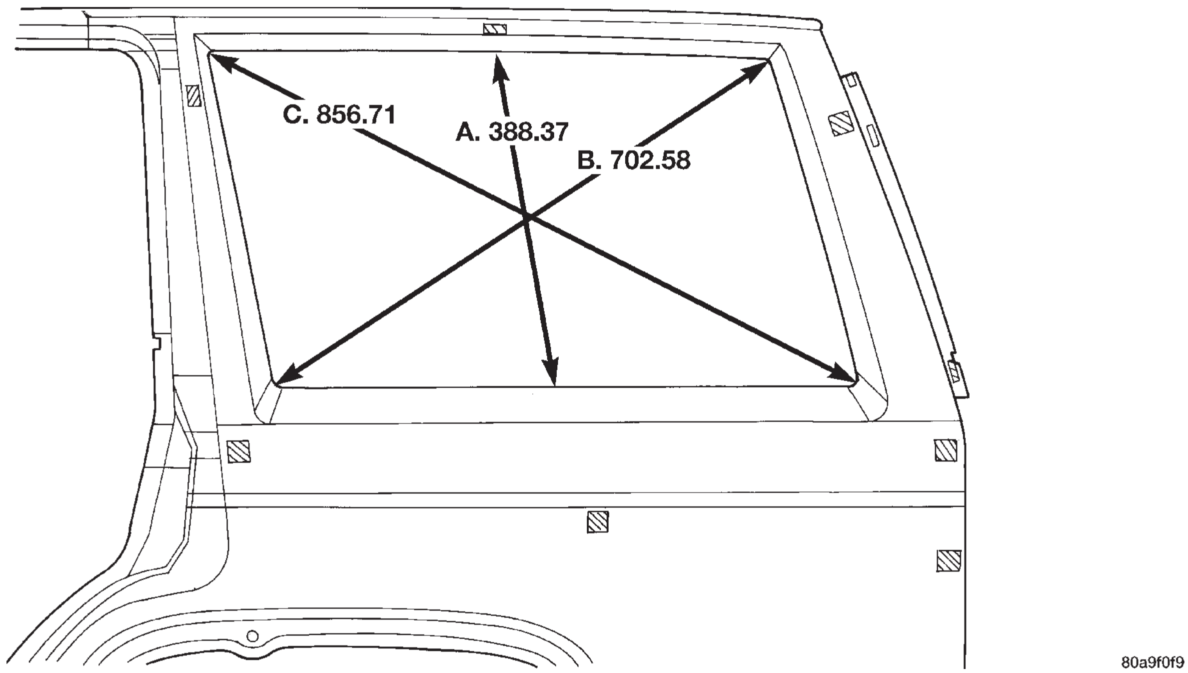
QUARTER WINDOW OPENING 2–DOOR



- A. Center of upper and lower rear quarter window opening
- B. Center of radius front lower corner to center of radius rear upper corner
- C. Center of radius front upper corner to center of radius rear lower corner

SPECIFICATIONS (Continued)

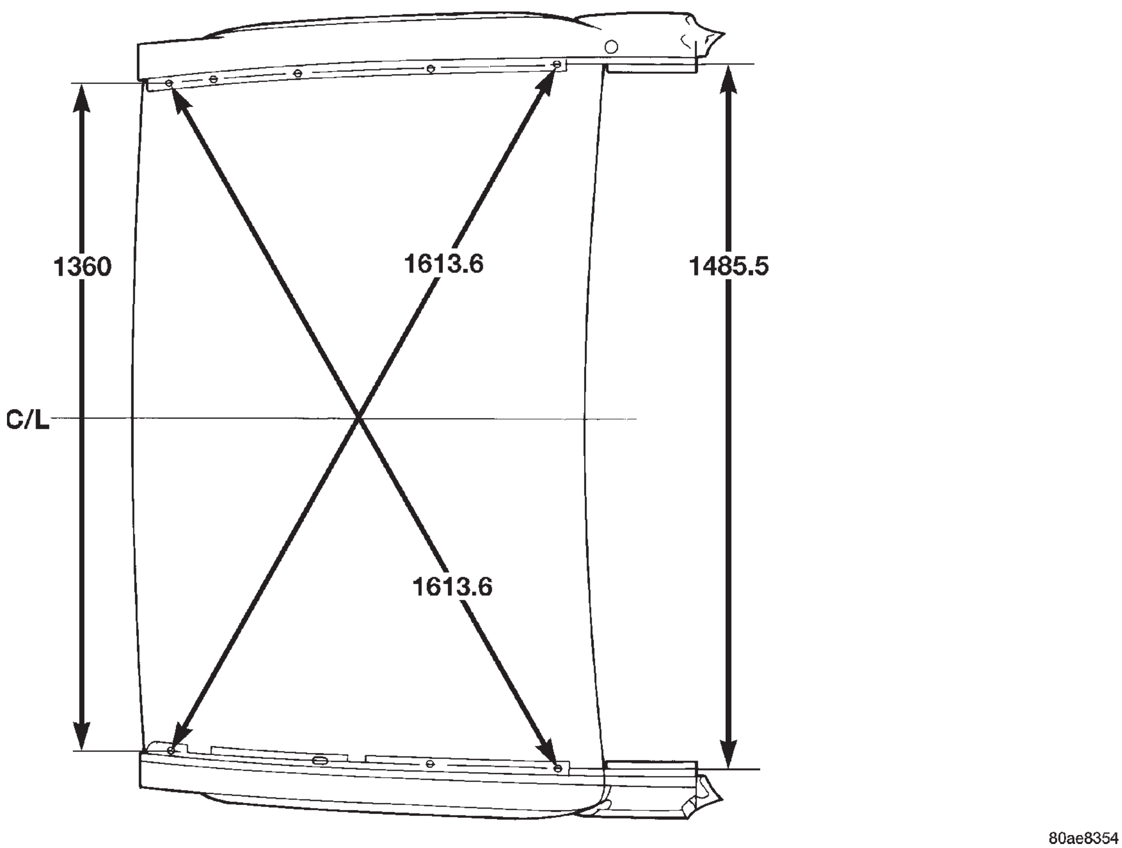
QUARTER WINDOW OPENING 4–DOOR



• A. Center of upper and lower rear quarter window opening
• B. Center of radius front lower corner to center of radius rear upper corner
• C. Center of radius front upper corner to center of radius rear lower corner

SPECIFICATIONS (Continued)

ENGINE COMPARTMENT

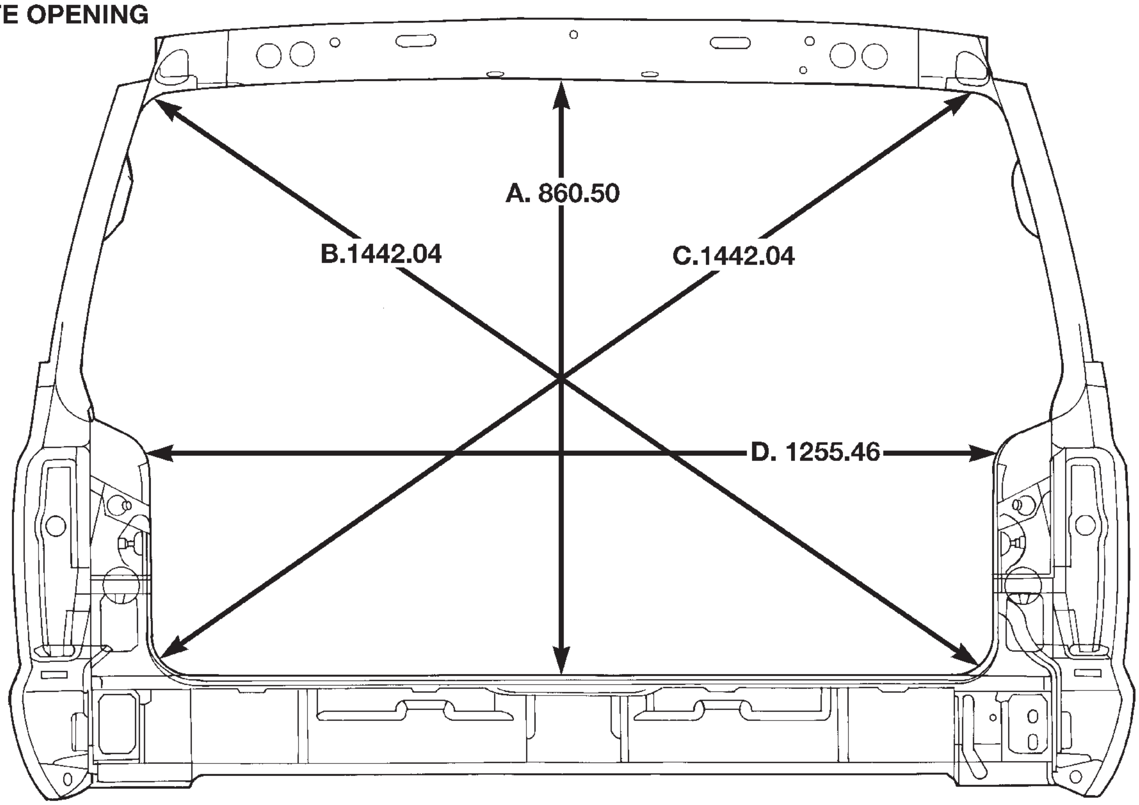


LIFTGATE OPENING

- A. Center of upper liftgate opening to liftgate striker mount
- B. & C. Center of radius upper corner to center of radius lower corner
- D. Distance between outer quarter panel to tail lamp mounting panel to inner quarter panel seams

SPECIFICATIONS (Continued)

LIFTGATE OPENING

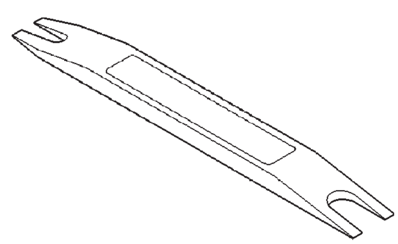


TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Bucket Seat to Floor Pan Bolt	27 N·m (20 ft. lbs.)
Bucket Seat to Floor Pan Nut	40 N·m (30 ft. lbs.)
Front Door Hinge Bolts	3 N·m (2 ft. lbs.)
Front Door Latch Screw	11 N·m (8 ft. lbs.)
Front Door Latch Striker Screw	28 N·m (20 ft. lbs.)
Front Seat Belt Anchor Bolt	43 N·m (32 ft. lbs.)
Front Retractor Anchor Bolt	43 N·m (32 ft. lbs.)
Front Seat Belt Buckle Anchor Bolt	43 N·m (32 ft. lbs.)
GOP to Support Bracket Nut	4 N·m (38 in. lbs.)
GOP to Fender Nut	4 N·m (38 in. lbs.)
Liftgate Hinge to Body and/or Liftgate Bolt	26 N·m (19 ft. lbs.)
Liftgate Latch Screw	13 N·m (9 ft. lbs.)
Liftgate Latch Striker Nut	54 N·m (40 ft. lbs.)
Rear Door Hinge Bolt	3 N·m (2 ft. lbs.)
Rear Door Latch Screw	11 N·m (8 ft. lbs.)
Rear Door Latch Striker Screw	28 N·m (20 ft. lbs.)
Rear Shoulder Belt Lower Anchor Bolt	43 N·m (32 ft. lbs.)
Rear Seatback Pivot Bolt	33 N·m (25 ft. lbs.)
Rear Seat Belt/Buckle Anchor Bolt	43 N·m (32 ft. lbs.)
Rear Shoulder Belt Upper Anchor Bolt	43 N·m (32 ft. lbs.)

SPECIAL TOOLS

BODY



Remover, Moldings C-4829

HEATING AND AIR CONDITIONING

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

ACCUMULATOR

DESCRIPTION

The accumulator is mounted in the engine compartment between the evaporator coil outlet tube and the compressor inlet.

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 canister, which acts as a separator. A desiccant bag is mounted inside the accumulator canister to absorb any moisture which may have entered and become trapped within the refrigerant system (Fig. 1).

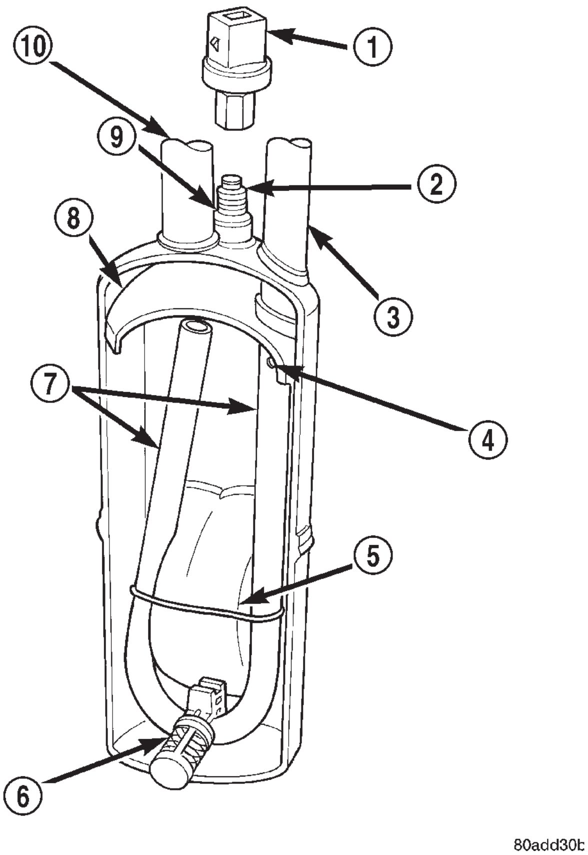


Fig. 1 Accumulator - Typical

1 – LOW PRESSURE CYCLING CLUTCH 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

BLOWER MOTOR

DESCRIPTION

The blower motor and blower wheel are located in the passenger side end of the heater-A/C housing, below the glove box. The blower motor controls the velocity of air flowing through the heater-A/C housing by spinning a squirrel cage-type blower wheel within the housing at the selected speed. The blower motor and wheel can be removed through an opening in the engine compartment side of the dash panel without heater-A/C housing removal.

OPERATION

The blower motor will only operate when the ignition switch is in the On position, and the heater-A/C mode control switch knob is in any position, except Off. The blower motor receives a fused battery feed through the blower motor relay whenever the ignition switch is in the On position. The blower motor battery feed circuit is protected by a fuse in the Power Distribution Center (PDC). Blower motor speed is controlled by regulating the ground path through the heater-A/C control blower motor switch and the blower motor resistor.

The blower motor and blower motor wheel cannot be repaired and, if faulty or damaged, they must be replaced. The blower motor and blower wheel are serviced only as a unit.

BLOWER MOTOR RELAY

DESCRIPTION

The blower motor relay is a International Standards Organization (ISO)-type relay. The relay is a electromechanical device that switches battery current from a fuse in the Power Distribution Center (PDC) directly to the blower motor. The relay is energized when the relay coil is provided a voltage signal by the ignition switch. See Blower Motor Relay in the Diagnosis and Testing section of this group for more information.

OPERATION

The blower motor relay is installed in a wire harness connector that is secured to the passenger side outboard end of the heater-A/C housing in the passenger compartment, next to the heater-A/C wire harness connector.

The blower motor relay cannot be repaired and, if faulty or damaged, it must be replaced.

DESCRIPTION AND OPERATION (Continued)

BLOWER MOTOR RESISTOR

DESCRIPTION

The blower motor resistor is mounted to the bottom of the heater-A/C housing on the passenger side of the vehicle under the instrument panel. It can be accessed for service by removing the heater-A/C housing kick cover.

OPERATION

The resistor has multiple resistor wires, each of which reduce the current flow to the blower motor, to change the blower motor speed. The blower motor switch directs the ground path through the correct resistor wire to obtain the selected speed. When the highest blower speed is selected, the blower motor switch connects the blower motor directly to ground, bypassing the blower motor resistor.

The blower motor resistor cannot be repaired and, if faulty or damaged, it must be replaced.

BLOWER MOTOR SWITCH

DESCRIPTION

The heater-only or heater-A/C blower motor is controlled by a four position rotary-type blower motor switch, mounted in the heater-A/C control panel. The switch allows the selection of one of four blower motor speeds, but can only be turned off by selecting the Off position with the heater-A/C mode control switch knob.

OPERATION

The blower motor switch directs the blower motor ground path through the mode control switch to the blower motor resistor, or directly to ground, as required to achieve the selected blower motor speed.

The blower motor switch cannot be repaired and, if faulty or damaged, the entire heater-only or heater-A/C control unit must be replaced.

COMPRESSOR

DESCRIPTION

The air conditioning system uses a Sanden SD7H15 seven cylinder, reciprocating wobble plate-type compressor on all models. This compressor has a fixed displacement of 150 cubic centimeters (9.375 cubic inches), and has both the suction and discharge ports located on the cylinder head. A label identifying the use of R-134a refrigerant is located on the compressor.

OPERATION

The 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 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, which is then pumped to the condenser through the compressor discharge port.

The compressor cannot be repaired. If faulty or damaged, the entire compressor assembly must be replaced. The compressor clutch, pulley and clutch coil are available for service.

COMPRESSOR CLUTCH

DESCRIPTION

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 2). 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 nut. These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt.

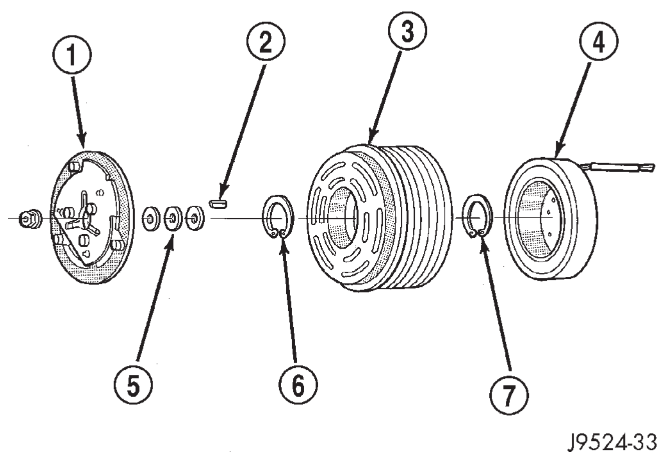


Fig. 2 Compressor Clutch - Typical

1 – CLUTCH PLATE
2 – SHAFT KEY
3 – PULLEY
4 – COIL
5 – CLUTCH SHIMS
6 – SNAP RING
7 – SNAP RING

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

DESCRIPTION AND OPERATION (Continued)

bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch engagement is controlled by several components: the heater-A/C mode control switch, the low pressure cycling clutch switch, the high pressure cut-off switch, the compressor clutch relay, and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to thirty seconds. Refer to Group 14 - Fuel System for more information on the PCM controls.

COMPRESSOR CLUTCH RELAY

DESCRIPTION

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, the current capacity is lower, and the relay case dimensions are smaller than those of the conventional ISO relay.

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

OPERATION

The compressor clutch relay is a electromechanical device that switches battery current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds to inputs from the heater-A/C mode control switch, the low pressure cycling clutch switch, and the high pressure cut-off switch. See Compressor Clutch Relay in the Diagnosis and Testing section of this group for more information.

The compressor clutch relay cannot be repaired and, if faulty or damaged, it must be replaced.

CONDENSER

DESCRIPTION

The condenser is located in the air flow in front of the engine cooling radiator. The condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the compressor to give up its heat to the air passing over the condenser fins.

OPERATION

When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it has become a high-pressure liquid refrigerant. 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 in 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 condenser service.

The condenser cannot be repaired and, if faulty or damaged, it must be replaced.

DUAL FUNCTION HIGH PRESSURE SWITCH (4.0 L)

DESCRIPTION

The Dual Function High Pressure Switch controls both A/C clutch engagement/disengagement, and electric cooling fan operations. The switch is located on the discharge line near the compressor. The switch is screwed onto a fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The discharge line fitting is equipped with an O-ring to seal the switch connection.

OPERATION

The dual function switch is connected in series electrically with the low pressure cycling clutch switch between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This prevents compressor operation when the discharge line pressure approaches high levels, and also reduces electrical surging from compressor clutch engagement.

The dual function switch controls the electric cooling fan operation by monitoring refrigerant line pressures. When the discharge line pressure rises above 1900 to 2200 kPa (280 to 320 psi) the fan will turn on. The cooling fan will turn off when the discharge line pressure drops to 1600 kPa (235 psi).

The dual function switch controls the A/C clutch operation by disengaging the clutch when the discharge line pressure rises above 3100 to 3375 kPa (450 to 490 psi). The switch contacts will close and allow A/C clutch engagement when the discharge line pressure drops to 1860 to 2275 kPa (270 to 330 psi).

The Dual Function High Pressure Switch is a factory-calibrated unit. The switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

EVAPORATOR COIL

DESCRIPTION

The evaporator coil is located in the heater-A/C housing, under the instrument panel. The evaporator coil is positioned in the heater-A/C housing so that

DESCRIPTION AND OPERATION (Continued)

all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator coil fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

OPERATION

Refrigerant enters the evaporator from the fixed orifice tube 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 coil cannot be repaired and, if faulty or damaged, it must be replaced.

FIXED ORIFICE TUBE

DESCRIPTION

The fixed orifice tube is installed in the liquid line (left-hand drive) or liquid line jumper (right-hand drive) between the outlet of the condenser and the inlet of the evaporator. The fixed orifice tube is located in the end of the liquid line or liquid line jumper that is closest to the condenser outlet tube.

The inlet end of the fixed orifice tube has a nylon mesh filter screen, which filters the refrigerant and helps to reduce the potential for blockage of the metering orifice by refrigerant system contaminants (Fig. 3). The outlet end of the tube has a nylon mesh diffuser screen. The O-rings on the plastic body of the fixed orifice tube seal the tube to the inside of the liquid line and prevent the refrigerant from bypassing the fixed metering orifice.

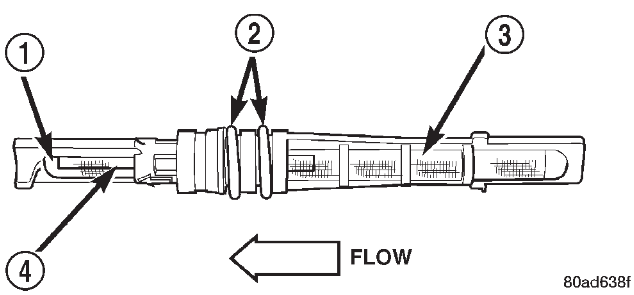


Fig. 3 Fixed Orifice Tube - Typical

1 – DIFFUSER SCREEN
2 – “O” RINGS
3 – INLET FILTER SCREEN
4 – ORIFICE

OPERATION

The fixed orifice tube 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 orifice and diffuser screen of the fixed orifice tube.

The fixed orifice tube cannot be repaired and, if faulty or plugged, the liquid line and fixed orifice tube unit or liquid line jumper and fixed orifice tube unit must be replaced.

HEATER AND AIR CONDITIONER

DESCRIPTION

All vehicles are equipped with a common heater-A/C housing assembly (Fig. 4). The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. On heater-only systems, the evaporator coil and recirculating air door are omitted from the housing.

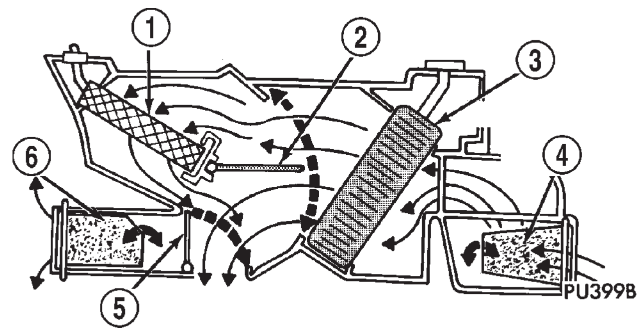


Fig. 4 Common Blend-Air Heater-Air Conditioner System - Typical

1 – HEATER CORE
2 – BLEND-AIR DOOR
3 – EVAPORATOR A/C ONLY
4 – RECIRCULATING AIR DOOR A/C ONLY
5 – FLOOR/PANEL DOOR
6 – FLOOR/DEFROST DOOR

Outside fresh air enters the vehicle through the cowl top opening at the base of the windshield, and passes through a plenum chamber to the heater-A/C system blower housing. Air flow velocity can then be adjusted with the blower motor speed selector switch on the heater-A/C control panel. The air intake openings must be kept free of snow, ice, leaves, and other obstructions for the heater-A/C system to receive a sufficient volume of outside air.

It is also important to keep the air intake openings clear of debris because leaf particles and other debris that is small enough to pass through the cowl plenum screen can accumulate within the heater-A/C housing. The closed, warm, damp and dark environment created within the heater-A/C housing is ideal for the growth of certain molds, mildews and other fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, which enter the housing with the fresh air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during heater-A/C system operation.

OPERATION

The heater and optional air conditioner are blend-air type systems. In a blend-air system, a blend-air door controls the amount of unconditioned air (or cooled air from the evaporator on models with air conditioning) that is allowed to flow through, or around, the heater core. A temperature control knob on the heater-A/C control panel determines the discharge air temperature by controlling an electric motor, which moves the blend-air door. This allows an almost immediate control of the output air temperature of the system.

The mode control knob on the heater-only or heater-A/C control panel is used to direct the conditioned air to the selected system outlets. Both mode control switches use engine vacuum to control the mode doors, which are operated by vacuum actuator motors.

On air conditioned vehicles, the outside air intake can be shut off by selecting the Recirculation Mode with the mode control knob. This will operate a vacuum actuated recirculating air door that closes off the outside fresh air intake and recirculates the air that is already inside the vehicle.

The optional air conditioner for all models is designed for the use of non-CFC, R-134a refrigerant. The air conditioning system has an evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. This air conditioning system uses a fixed orifice tube in the liquid line near the condenser outlet tube to meter refrigerant flow to the evaporator coil. To maintain minimum evaporator temperature and prevent evaporator freezing, a fixed pressure setting switch on the accumulator cycles the compressor clutch.

HEATER AND AIR CONDITIONER CONTROL

DESCRIPTION

Both the heater-only and heater-A/C systems use a combination of mechanical, electrical, 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.

OPERATION

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 a rotary-type temperature control knob, a rotary-type mode control switch knob, and a rotary-type blower motor speed switch knob.

The heater-only or heater-A/C control panel cannot be repaired. If faulty or damaged, the entire unit must be replaced. The illumination lamps are available for service replacement.

HEATER CORE

DESCRIPTION

The heater core is located in the heater-A/C housing, under the instrument panel. It is a heat exchanger made of rows of tubes and fins.

OPERATION

Engine coolant is circulated through heater hoses to the 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 air door allows control of the heater output air temperature by controlling how much of the air flowing through the heater-A/C housing is directed through the heater core. The blower motor speed controls the volume of air flowing through the heater-A/C housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced. Refer to Group 7 - Cooling System for more information on the engine cooling system, the engine coolant and the heater hoses.

HIGH PRESSURE CUT-OFF SWITCH

DESCRIPTION

The high pressure cut-off switch is located on the discharge line between the compressor and the condenser inlet. The switch is screwed onto a fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The discharge line fitting is equipped with an O-ring to seal the switch connection.

OPERATION

The high pressure cut-off switch is connected in series electrically with the low pressure cycling clutch switch between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This prevents compressor operation when the discharge line pressure approaches high levels.

DESCRIPTION AND OPERATION (Continued)

The high pressure cut-off switch contacts are open when the discharge line pressure rises above 3100 to 3375 kPa (450 to 490 psi). The switch contacts will close when the discharge line pressure drops to 1860 to 2275 kPa (270 to 330 psi).

The high pressure cut-off switch is a factory-calibrated unit. The switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

HIGH PRESSURE RELIEF VALVE

DESCRIPTION

A high pressure relief valve is located on the compressor manifold, which is on the side of the compressor. This mechanical valve is designed to vent refrigerant from the system to protect against damage to the compressor and other system components, caused by condenser air flow restriction or an overcharge of refrigerant.

OPERATION

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 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.

LOW PRESSURE CYCLING CLUTCH SWITCH

DESCRIPTION

The low pressure cycling clutch switch is located on the top of the accumulator. The switch is screwed onto an accumulator fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The accumulator fitting is equipped with an O-ring to seal the switch connection.

OPERATION

The low pressure cycling clutch switch is connected in series electrically with the high pressure cut-off switch, between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This regulates the refrigerant system pressure and controls evaporator temperature. Controlling the evaporator temperature prevents condensate water on the evaporator fins from freezing and obstructing air conditioning system air flow.

The low pressure cycling clutch switch contacts are open when the suction pressure is approximately 141 kPa (20.5 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 switch contacts to open. This is due to the pressure/temperature relationship of the refrigerant in the system.

The low pressure cycling clutch switch is a factory-calibrated unit. It cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

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 LINES

DESCRIPTION

The refrigerant lines and hoses are used to carry the refrigerant between the various air conditioning

DESCRIPTION AND OPERATION (Continued)

system components. A barrier hose design with a nylon tube, which is sandwiched between rubber layers, is used for the R-134a air conditioning system on this vehicle. This nylon tube helps to further contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant hoses are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

OPERATION

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. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

The refrigerant lines and hoses are coupled with other components of the HVAC system with peanut-block style fittings. A stat-O seal type flat steel gasket with a captured compressible O-ring, is used to mate plumbing lines with A/C components to ensure the integrity of the refrigerant system.

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

REFRIGERANT LINE COUPLERS

DESCRIPTION

Spring-lock type refrigerant line couplers are used to connect many of the refrigerant lines and other components to the refrigerant system. These couplers require a special tool for disengaging the two coupler halves.

OPERATION

The spring-lock coupler is held together by a garter spring inside a circular cage on the male half of the fitting (Fig. 5). When the two coupler halves are connected, the flared end of the female fitting slips behind the garter spring inside the cage on the male fitting. The garter spring and cage prevent the flared end of the female fitting from pulling out of the cage.

Two O-rings on the male half of the fitting are used to seal the connection. These O-rings are compatible with R-134a refrigerant and must be replaced with O-rings made of the same material.

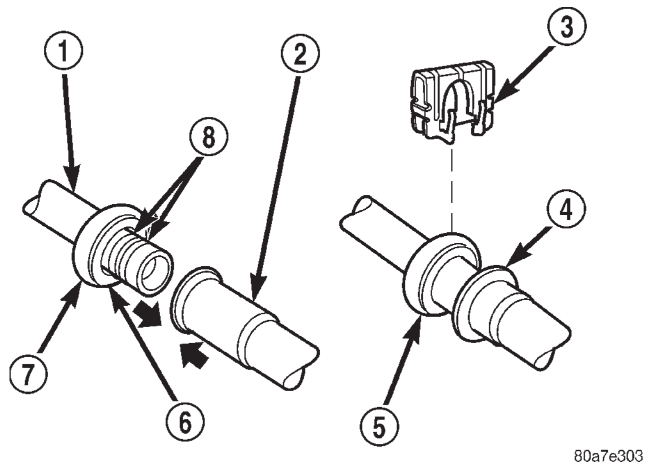


Fig. 5 Spring-Lock Coupler - Typical

1 – MALE HALF SPRING-LOCK COUPLER
2 – FEMALE HALF SPRING-LOCK COUPLER
3 – SECONDARY CLIP
4 – CONNECTION INDICATOR RING
5 – COUPLER CAGE
6 – GARTER SPRING
7 – COUPLER CAGE
8 – “O” RINGS

Secondary clips are installed over the two connected coupler halves at the factory for added blowoff protection. In addition, some models have a plastic ring that is used at the factory as a visual indicator to confirm that these couplers are connected. After the coupler is connected, the plastic indicator ring is no longer needed; however, it will remain on the refrigerant line near the coupler cage.

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 10PA17 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

DESCRIPTION AND OPERATION (Continued)

oil can cause compressor damage, and too much can reduce air conditioning system performance.

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.

REFRIGERANT SYSTEM SERVICE PORT

DESCRIPTION

The two refrigerant system service ports are used to charge, recover/recycle, evacuate, and test the air conditioning refrigerant system. Unique service port coupler sizes are used on the R-134a system, to ensure that the refrigerant system is not accidentally contaminated by the use of the wrong refrigerant (R-12), or refrigerant system service equipment.

OPERATION

The high pressure service port is located on the refrigerant line, near the discharge port of the compressor. The low pressure service port is located on the liquid line at the rear of the engine compartment, near the evaporator inlet tube.

Each of the service ports has a threaded plastic protective cap installed over it from the factory. After servicing the refrigerant system, always reinstall both of the service port caps.

VACUUM CHECK VALVE

DESCRIPTION

A vacuum check valve is installed in the accessory vacuum supply line in the engine compartment, near the vacuum tap on the engine intake manifold, and at the HVAC unit takeout. The vacuum check valve is designed to allow vacuum to flow in only one direction through the accessory vacuum supply circuits.

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.

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is mounted to the front bumper bar behind the passenger side bumper end cap. The bumper end cap must be removed from the vehicle to access the vacuum reservoir for service.

OPERATION

Engine vacuum is stored in the vacuum reservoir. The stored vacuum is used to operate the vacuum-controlled vehicle accessories during periods of low engine vacuum such as when the vehicle is climbing a steep grade, or under other high engine load operating conditions.

The vacuum reservoir cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

A/C PERFORMANCE

The air conditioning system is designed to provide the passenger compartment with low temperature and low humidity air. The evaporator, located in the heater-A/C housing on the dash panel below the instrument panel, is cooled to temperatures near the freezing point. As warm damp air passes through the cooled evaporator, the air transfers its heat to the refrigerant in the evaporator and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an air conditioning system will be more effective in the Recirculation Mode. With the system in the Recirculation Mode, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, the air conditioning system performance levels improve.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the air conditioning system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. High humidity greatly reduces the ability of the evaporator to lower the temperature of the air.

DIAGNOSIS AND TESTING (Continued)

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their air conditioning system on humid days. A performance test is the best way to determine whether the system is performing up to standard. This test also provides valuable clues as to the possible cause of trouble with the air conditioning system.

Review the Service Warnings and Precautions in the front of this group before performing this procedure. The air temperature in the test room and in the vehicle must be a minimum of 21° C (70° F) for this test.

(1) Connect a tachometer and a manifold gauge set.

(2) Set the heater-A/C mode control switch knob in the Recirculation Mode position, the temperature control knob in the full cool position, and the blower motor switch knob in the highest speed position.

(3) Start the engine and hold the idle at 1,000 rpm with the compressor clutch engaged.

(4) The engine should be at operating temperature. The doors and windows must be open.

(5) Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.

(6) The compressor clutch may cycle, depending upon the ambient temperature and humidity. If the clutch cycles, unplug the low pressure cycling clutch switch wire harness connector from the switch located on the accumulator (Fig. 6). Place a jumper wire across the terminals of the low pressure cycling clutch switch wire harness connector.

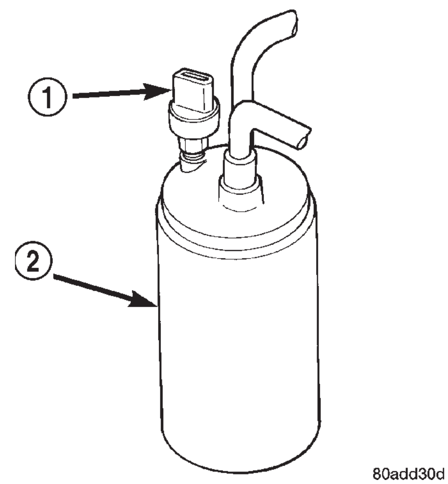


Fig. 6 Low Pressure Cycling Clutch Switch - Typical

1 – LOW PRESSURE CYCLING CLUTCH SWITCH
2 – ACCUMULATOR

(7) With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.

(8) Compare the discharge air temperature to the Performance Temperature and Pressure chart. If the discharge air temperature is high, see Refrigerant System Leaks and Refrigerant System Charge in this group.

Performance Temperature and Pressure					
Ambient Air Temperature	21° C (70° F)	27° C (80° F)	32° C (90° F)	38° C (100° F)	43° C (110° F)
Air Temperature at Center Panel Outlet	-3 to 3° C (27 to 38° F)	1 to 7° C (33 to 44° F)	3 to 9° C (37 to 48° F)	6 to 13° C (43 to 55° F)	10 to 18° C (50 to 64° F)
Evaporator Inlet Pressure at Charge Port	179 to 241 kPa (26 to 35 psi)	221 to 283 kPa (32 to 41 psi)	262 to 324 kPa (38 to 47 psi)	303 to 365 kPa (44 to 53 psi)	345 to 414 kPa (50 to 60 psi)
Compressor Discharge Pressure	1240 to 1655 kPa (180 to 240 psi)	1380 to 1790 kPa (200 to 260 psi)	1720 to 2070 kPa (250 to 300 psi)	1860 to 2345 kPa (270 to 340 psi)	2070 to 2690 kPa (300 to 390 psi)

(9) Compare the compressor discharge pressure to the Performance Temperature and Pressure chart. If the compressor discharge pressure is high, see the Pressure Diagnosis chart.

DIAGNOSIS AND TESTING (Continued)

Pressure Diagnosis		
Condition	Possible Causes	Correction
Rapid compressor clutch cycling (ten or more cycles per minute).	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system. 2. Faulty fuse. 3. Faulty compressor clutch coil. 4. Faulty compressor clutch relay. 5. Improperly installed or faulty low pressure cycling clutch switch. 6. Faulty high pressure cut-off switch. 7. Faulty Powertrain Control Module (PCM).	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 2. Check the fuses in the Power Distribution Center and the junction block. Repair the shorted circuit or component and replace the fuses, if required. 3. See Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required. 4. See Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required. 5. See Low Pressure Cycling Clutch Switch in this group. Test the low pressure cycling clutch switch and tighten or replace, if required. 6. See High Pressure Cut-Off Switch in this group. Test the high pressure cut-off switch and replace, if required. 7. Refer to the proper Diagnostic Procedures manual for testing of the PCM. Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system. 2. Blend-Air door inoperative or sealing improperly. 3. Blend-Air door motor faulty or inoperative.	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required. 2. See Blend-Air Door under Heater-A/C Housing Door in this group. Inspect the blend-air door for proper operation and sealing and correct, if required. 3. Perform Blend-Air door motor diagnosis, replace if faulty.
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge. 2. Refrigerant flow through the accumulator is restricted. 3. Refrigerant flow through the evaporator coil is restricted. 4. Faulty compressor.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 2. See Accumulator in this group. Replace the restricted accumulator, if required. 3. See Evaporator Coil in this group. Replace the restricted evaporator coil, if required. 4. See Compressor in this group. Replace the compressor, if required.

DIAGNOSIS AND TESTING (Continued)

Pressure Diagnosis		
Condition	Possible Causes	Correction
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. Condenser air flow restricted. 2. Inoperative cooling fan. 3. Refrigerant system overcharged. 4. Air in the refrigerant system. 5. Engine overheating.	1. Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Refer to Group 7 - Cooling System for more information on air seals. Clean, repair, or replace components as required. 2. Refer to Group 7 - Cooling System for more information. Test the cooling fan and replace, if required. 3. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required. 4. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 5. Refer to Group 7 - Cooling System for more information. Test the cooling system and repair, if required.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping. 2. Fixed orifice tube not installed. 3. Faulty compressor.	1. Refer to Group 7 - Cooling System for more information. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required. 2. See Fixed Orifice Tube in this group. Install the missing fixed orifice tube, if required. 3. See Compressor in this group. Replace the compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines. 2. Restricted refrigerant flow through the fixed orifice tube. 3. Restricted refrigerant flow through the condenser.	1. See Liquid Line and Suction and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required. 2. See Fixed Orifice Tube in this group. Replace the restricted fixed orifice tube, if required. 3. See Condenser in this group. Replace the restricted condenser, if required.

BLOWER MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor resistor
- Faulty blower motor relay
- Faulty blower motor switch
- Faulty heater-A/C mode control switch
- Faulty blower motor.

Possible causes of the blower motor not operating in all speeds include:

- Faulty fuse
- Faulty blower motor switch
- Faulty blower motor resistor
- Faulty blower motor circuit wiring or wire harness connectors.

DIAGNOSIS AND TESTING (Continued)

VIBRATION

Possible causes of blower motor vibration include:
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or bent
- Blower motor faulty.

NOISE

To verify that the blower is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:
- Foreign material in the heater-A/C housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

BLOWER MOTOR RELAY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

RELAY TEST

The blower motor relay (Fig. 7) is located in a wire harness connector that is secured to the heater-A/C housing behind the glove box on the passenger side of the vehicle, next to the heater-A/C wire harness connector in the passenger compartment. Remove the relay from its connector to perform the following tests:

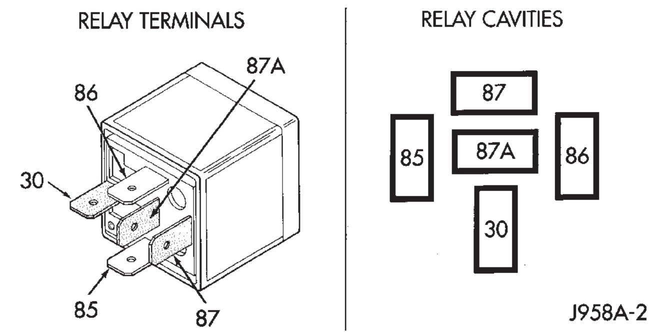
(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(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 to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test procedure in this group. If not OK, replace the faulty relay.

RELAY CIRCUIT TEST

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 7 Blower Motor Relay

(1) The relay common feed terminal cavity (30) is connected to fused battery feed directly from a fuse in the Power Distribution Center (PDC), and should be hot at all times. Check for battery voltage at the connector cavity for relay terminal 30. 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 cavity (87A) is not used for this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the blower motor. When the relay is energized, terminal 87 is connected to terminal 30 and provides full battery current to the blower motor feed circuit. There should be continuity between the connector cavity for terminal 87 and the blower motor relay output circuit cavity of the blower motor wire harness connector at all times. If OK, go to Step 4. If not OK, repair the open circuit to the blower motor as required.

(4) The coil battery terminal cavity (86) is connected to the ignition switch. When the ignition switch is placed in the On position, fused ignition switch output is directed from a fuse in the junction block to the relay electromagnetic coil to energize the relay. There should be battery voltage at the connector cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the junction block fuse as required.

(5) The coil ground terminal cavity (85) is connected to ground. This terminal supplies the ground for the relay electromagnet coil. There should be continuity between the connector cavity for relay termi-

DIAGNOSIS AND TESTING (Continued)

nal 85 and a good ground at all times. If not OK, repair the open circuit as required.

BLOWER MOTOR RESISTOR

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the kick cover from the heater-A/C housing and unplug the wire harness connector from the blower motor resistor.

(3) Check for continuity between each of the blower motor switch input terminals of the resistor and the resistor output terminal. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor relay as required. If not OK, replace the faulty blower motor resistor.

BLOWER MOTOR SWITCH

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Check for battery voltage at the fuse in the Power Distribution Center (PDC). 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 Off position. Disconnect and isolate the battery negative cable. Remove the heater-A/C control from the instrument panel. Check for continuity between the ground circuit cavity of the heater-A/C control 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.

(3) With the heater-A/C control wire harness connector unplugged, place the heater-A/C mode control switch knob in any position except the Off position. Check for continuity between the ground circuit terminal and each of the blower motor driver circuit terminals of the heater-A/C control as you move the blower motor switch knob to each of the four speed positions. There should be continuity at each driver circuit terminal in only one blower motor switch speed position. If OK, test and repair the blower driver circuits between the heater-A/C control connector and the blower motor resistor as required. If not OK, replace the faulty heater-A/C control unit.

COMPRESSOR

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 Group 7 - Cooling System 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. See Compressor and Compressor Clutch in the Removal and Installation section of this group for the procedures.

(3) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set

DIAGNOSIS AND TESTING (Continued)

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. See Suction and Discharge Line in the Removal and Installation section of this group for more information.

(5) If the noise is from opening and closing of the high pressure relief valve, evacuate and recharge the refrigerant system. See Refrigerant System Evacuate and Refrigerant System Charge in the Service Procedures section of this group. If the high pressure relief valve still does not seat properly, replace the compressor.

(6) If the noise is from liquid slugging on the suction line, replace the accumulator. See Accumulator in the Removal and Installation section of this group for the procedures. Check the refrigerant oil level and the refrigerant system charge. See Refrigerant Oil Level and Refrigerant System Charge in the Service Procedures section of this group. If the liquid slugging condition continues following accumulator replacement, replace the compressor.

(7) If the noise continues, replace the compressor and repeat Step 1.

COMPRESSOR CLUTCH COIL

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. The battery must be fully-charged before performing the following tests. Refer to Group 8A - Battery for more information.

(1) Connect an ammeter (0 to 10 ampere scale) in series with the clutch coil terminal. Use a voltmeter (0 to 20 volt scale) with clip-type leads for measuring the voltage across the battery and the compressor clutch coil.

(2) With the heater-A/C mode control switch in any A/C mode, and the blower motor switch in the lowest speed position, start the engine and run it at normal idle.

(3) The compressor clutch coil voltage should read within two volts of the battery voltage. If there is voltage at the clutch coil, but the reading is not within two volts of the battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as required. If there is no voltage reading at the clutch coil, use a DRB scan tool and the proper Diagnostic Procedures manual for testing of the compressor clutch circuit. The following components must be checked and repaired as required before you can complete testing of the clutch coil:

- Fuses in the junction block and the Power Distribution Center (PDC)
- Heater-A/C mode control switch
- Compressor clutch relay
- High pressure cut-off switch
- Low pressure cycling clutch switch
- Powertrain Control Module (PCM).

(4) The compressor clutch coil is acceptable if the current draw measured at the clutch coil is 2.0 to 3.9 amperes with the electrical system voltage at 11.5 to 12.5 volts. This should only be checked with the work area temperature at 21° C (70° F). If system voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until the system voltage drops below 12.5 volts.

(a) If the clutch coil current reading is four amperes or more, the coil is shorted and should be replaced.

(b) If the clutch coil current reading is zero, the coil is open and should be replaced.

COMPRESSOR CLUTCH RELAY

RELAY TEST

The compressor clutch relay (Fig. 8) is located in the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location. Remove the relay from the PDC 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 to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see Relay Circuit Test in the Diagnosis and Testing section of this group. If not OK, replace the faulty relay.

RELAY CIRCUIT TEST

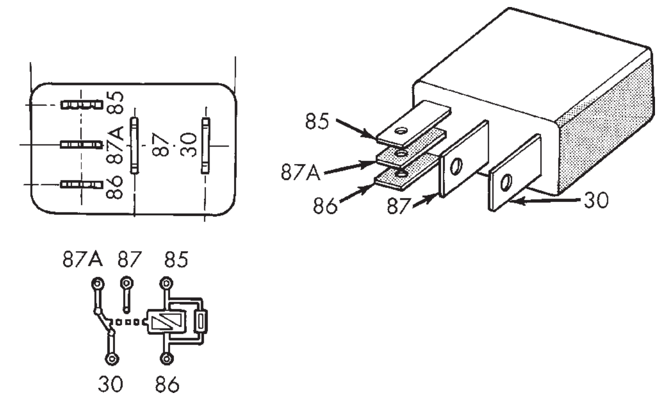
For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) The relay common feed terminal cavity (30) is connected to fused battery feed. There should be battery voltage at the cavity for relay terminal 30 at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is not used in this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the compressor clutch coil. There should be continuity between this cavity and the A/C compressor clutch relay output circuit cavity of the com-

DIAGNOSIS AND TESTING (Continued)



TERMINAL LEGEND	
NUMBER	**IDENTIFICATION**
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Fig. 8 Compressor Clutch Relay

pressor clutch coil wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The relay coil battery terminal (86) is connected to the fused ignition switch output (run/start) circuit. There should be battery voltage at the cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the fuse in the junction block as required.

(5) The coil ground terminal cavity (85) is switched to ground through the Powertrain Control Module (PCM). There should be continuity between this cavity and the A/C compressor clutch relay control circuit cavity of the PCM wire harness connector C (gray) at all times. If not OK, repair the open circuit as required.

DUAL FUNCTION HIGH PRESSURE SWITCH/ HIGH PRESSURE CUT-OFF SWITCH

Before performing diagnosis of the dual function high pressure switch, or the high pressure cut-off switch, verify that the refrigerant system has the correct refrigerant charge. See Refrigerant System Charge in the Service Procedures section of this group for more information.

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the high pressure switch wire harness connector from the switch on the refrigerant system fitting.

(3) On the dual function high pressure switch, check for continuity between terminals C and D. On the two terminal switch, check for continuity between both terminals of the high pressure cut-off switch. There should be continuity. If OK, test and repair the A/C switch sense circuit as required. If not OK, replace the faulty switch.

HEATER PERFORMANCE

Before performing the following tests, refer to Group 7 - Cooling System for the procedures to check the radiator coolant level, serpentine drive belt tension, radiator air flow and the radiator fan operation. Also be certain that the accessory vacuum supply line is connected at the engine intake manifold.

MAXIMUM HEATER OUTPUT

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the floor heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the heater-A/C housing floor outlets. Compare the test thermometer reading to the Temperature Reference chart.

Temperature Reference				
Ambient Air Temperature	15.5° C (60° F)	21.1° C (70° F)	26.6° C (80° F)	32.2° C (90° F)
Minimum Air Temperature at Floor Outlet	62.2° C (144° F)	63.8° C (147° F)	65.5° C (150° F)	67.2° C (153° F)

DIAGNOSIS AND TESTING (Continued)

If the floor outlet air temperature is too low, refer to Group 7 - Cooling System to check the engine coolant temperature specifications. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Group 7 - Cooling System for the procedures.

OBSTRUCTED COOLANT FLOW Possible locations or causes of obstructed coolant flow:

- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS Possible locations or causes of insufficient heat:

- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend-air door not functioning properly.

TEMPERATURE CONTROL

If the heater outlet air temperature cannot be adjusted with the temperature control knob on the heater-A/C control panel, the following could require service:

- The heater-A/C control.
- The temperature control motor.
- The blend-air door.
- Improper engine coolant temperature.

LOW PRESSURE CYCLING CLUTCH SWITCH

Before performing diagnosis of the low pressure cycling clutch switch, be certain that the switch is properly installed on the accumulator fitting. If the switch is too loose it may not open the Schrader-type valve in the accumulator fitting, which will prevent the switch from correctly monitoring the refrigerant system pressure. Remember that lower ambient temperatures, below about -1° C (30° F), during cold weather will open the switch contacts and prevent compressor operation due to the pressure/temperature relationship of the refrigerant.

Also verify that the refrigerant system has the correct refrigerant charge. See Refrigerant System Charge in the Service Procedures section of this group for more information.

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the low pressure cycling clutch switch wire harness connector from the switch on the accumulator fitting.

(3) Install a jumper wire between the two cavities of the low pressure cycling clutch switch wire harness connector.

(4) Connect a manifold gauge set to the refrigerant system service ports. See Refrigerant System Service Equipment and Refrigerant System Service Ports in the Description and Operation section of this group for more information.

(5) Connect the battery negative cable.

(6) Place the heater-A/C mode control switch knob in any A/C position and start the engine.

(7) Check for continuity between the two terminals of the low pressure cycling clutch switch. There should be continuity with a suction pressure reading of 262 kPa (38 psi) or above, and no continuity with a suction pressure reading of 141 kPa (20.5 psi) or below. If OK, test and repair the A/C switch sense circuit as required. If not OK, replace the faulty switch.

REFRIGERANT SYSTEM LEAKS

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE LEAK TESTING THE SYSTEM.

If the air conditioning system is not cooling properly, determine if the refrigerant system is fully-charged. See A/C Performance in this group for the procedures. If the refrigerant system is low or empty; a leak at a refrigerant line, connector fitting, component, or component seal is likely.

An electronic leak detector designed for R-134a refrigerant, or a fluorescent R-134a leak detection dye and a black light are recommended for locating and confirming refrigerant system leaks. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

An oily residue on or near refrigerant system lines, connector fittings, components, or component seals can indicate the general location of a possible refrigerant leak. However, the exact leak location should be confirmed with an electronic leak detector prior to component repair or replacement.

To detect a leak in the refrigerant system with an electronic leak detector, perform one of the following procedures:

SYSTEM EMPTY

(1) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

DIAGNOSIS AND TESTING (Continued)

(2) Connect and dispense 0.283 kilograms (0.625 pounds or 10 ounces) of R-134a refrigerant into the evacuated refrigerant system. See Refrigerant System Charge in this group for the procedures.

(3) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(4) With the engine not running, use a electronic R-134a leak detector and search for leaks. Because R-134a refrigerant is heavier than air, the leak detector probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(5) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, and the mode control switch in the recirculation mode.

SYSTEM LOW

(1) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(2) Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run with the air conditioning system turned on for five minutes.

(3) With the engine not running, use a electronic R-134a leak detector and search for leaks. Because R-134a refrigerant is heavier than air, the leak detector probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(4) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, and the mode control switch in the recirculation mode.

VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the heater-only and heater-A/C housings. Testing of the heater-only and heater-A/C mode control switch operation will determine if the vacuum, electrical, and mechanical controls are functioning. However, it is possible that a vacuum control system that operates perfectly at engine idle (high engine vacuum) may not function properly at high engine speeds or loads (low engine vacuum). This can be caused by leaks in the vacuum system, or a faulty vacuum check valve.

A vacuum system test will help to identify the source of poor vacuum system performance or vacuum system leaks. Before starting this test, stop the engine and make certain that the problem is not a disconnected vacuum supply tube at the engine intake manifold vacuum tap or at the vacuum reservoir.

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.

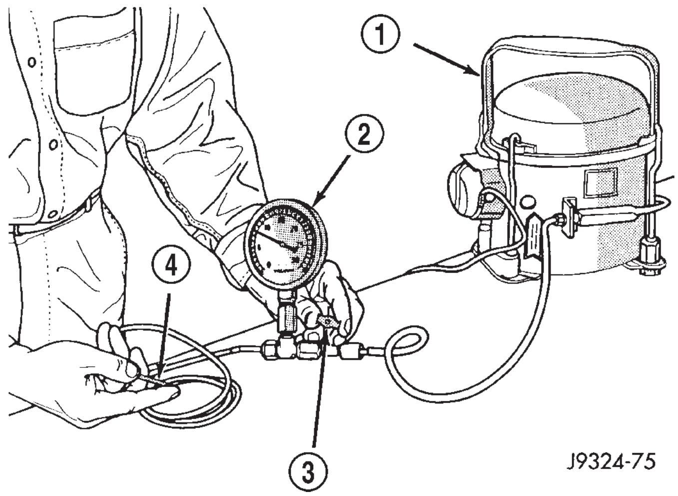


Fig. 9 Adjust Vacuum Test Bleed Valve

1 – VACUUM PUMP TOOL C-4289
2 – VACUUM TEST SET C-3707
3 – BLEED VALVE
4 – PROBE

VACUUM CHECK VALVE

(1) Remove the vacuum check valve. The valve is located in the vacuum supply tube (black) at the heater-A/C system vacuum tee.

(2) Connect the test set vacuum supply hose to the heater-A/C control 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 3. If not OK, replace the faulty valve.

(3) 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.

HEATER-A/C CONTROLS

(1) Connect the test set vacuum probe to the heater-A/C vacuum supply (black) tube at the tee in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

DIAGNOSIS AND TESTING (Continued)

(2) Place the heater-A/C mode control switch knob in each mode position, one position at a time, and pause after each selection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each selection is made. If not OK, a component or vacuum line in the vacuum circuit of the selected mode has a leak. See the procedure in Locating Vacuum Leaks.

CAUTION: Do not use lubricant on the switch ports or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. A drop of clean water in the connector plug holes will help the connector slide onto the switch ports.

LOCATING VACUUM LEAKS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Disconnect the vacuum harness connector behind the glove box and inboard of the glove box opening on the heater-A/C housing.

(2) Connect the test set vacuum hose probe to each port in the heater-A/C housing half of the vacuum harness connector, one port at a time, and pause after each connection (Fig. 10). The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty heater-A/C control. If not OK, go to Step 3.

(3) Determine the vacuum line color of the vacuum circuit that is leaking. To determine the vacuum line colors, refer to the Vacuum Circuits chart (Fig. 11) or (Fig. 12).

(4) Disconnect and plug the vacuum line from the component (fitting, actuator, valve, switch, or reservoir) on the other end of the leaking circuit. Instrument panel disassembly or removal may be necessary to gain access to some components. See the service procedures in this group.

(5) Connect the test set hose or probe to the open end of the leaking circuit. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty disconnected component. If not OK, go to Step 6.

(6) To locate a leak in a vacuum line, leave one end of the line plugged and connect the test set hose or probe to the other end of the line. Run your fingers slowly along the line while watching the test set gauge. The vacuum reading will fluctuate when your fingers contact the source of the leak. To repair the vacuum line, cut out the leaking section of the line. Then, insert the loose ends of the line into a suitable length of 3 millimeter (0.125 inch) inside diameter rubber hose.

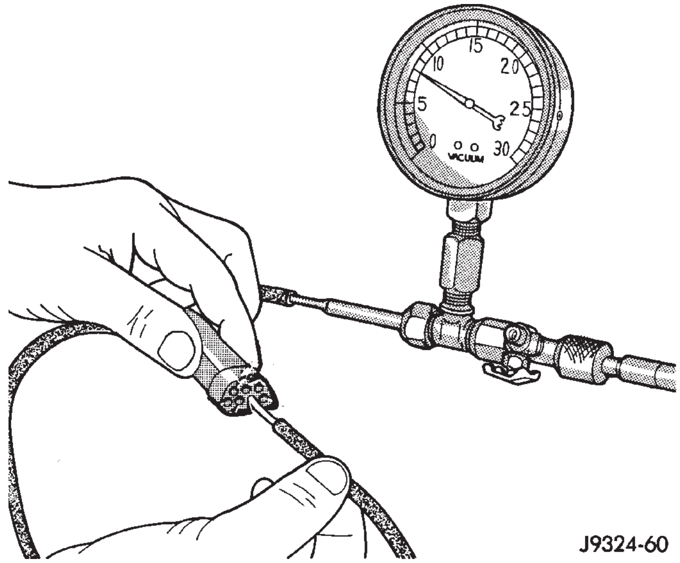


Fig. 10 Vacuum Circuit Test

SERVICE PROCEDURES

REFRIGERANT OIL LEVEL

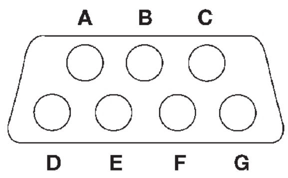
When an air conditioning system is assembled at the factory, all components except the compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the compressor is dispersed throughout the refrigerant system. The accumulator, evaporator, condenser, and compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of oil in the refrigerant system. This ensures proper lubrication of the compressor. Too little oil will result in damage to the compressor. Too much oil will reduce the cooling capacity of the air conditioning system.

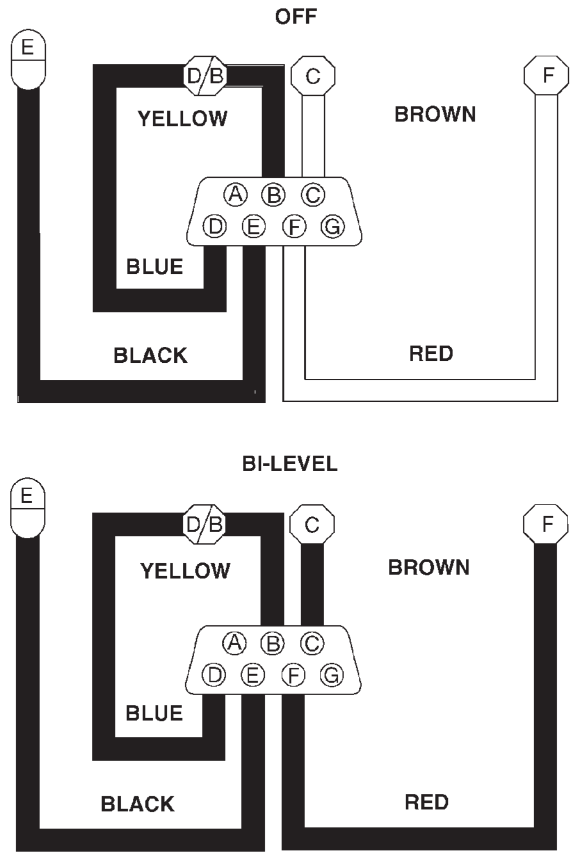
It will not be necessary to check the oil level in the compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant 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.

Refrigerant oil must be added when a accumulator, evaporator coil, or condenser are replaced. See the Refrigerant Oil Capacities chart. When a compressor

SERVICE PROCEDURES (Continued)



VACUUM CIRCUIT LEGEND		
I. D.	Function	Color
A	Not Used	N/A
B	Defrost Actuator (Full Position)	Yellow
C	Floor Actuator	Brown
D	Defrost Actuator (Mid-Position)	Blue
E	Vacuum Supply (Reservoir)	Black
F	Panel Actuator	Red
G	Not Used	N/A



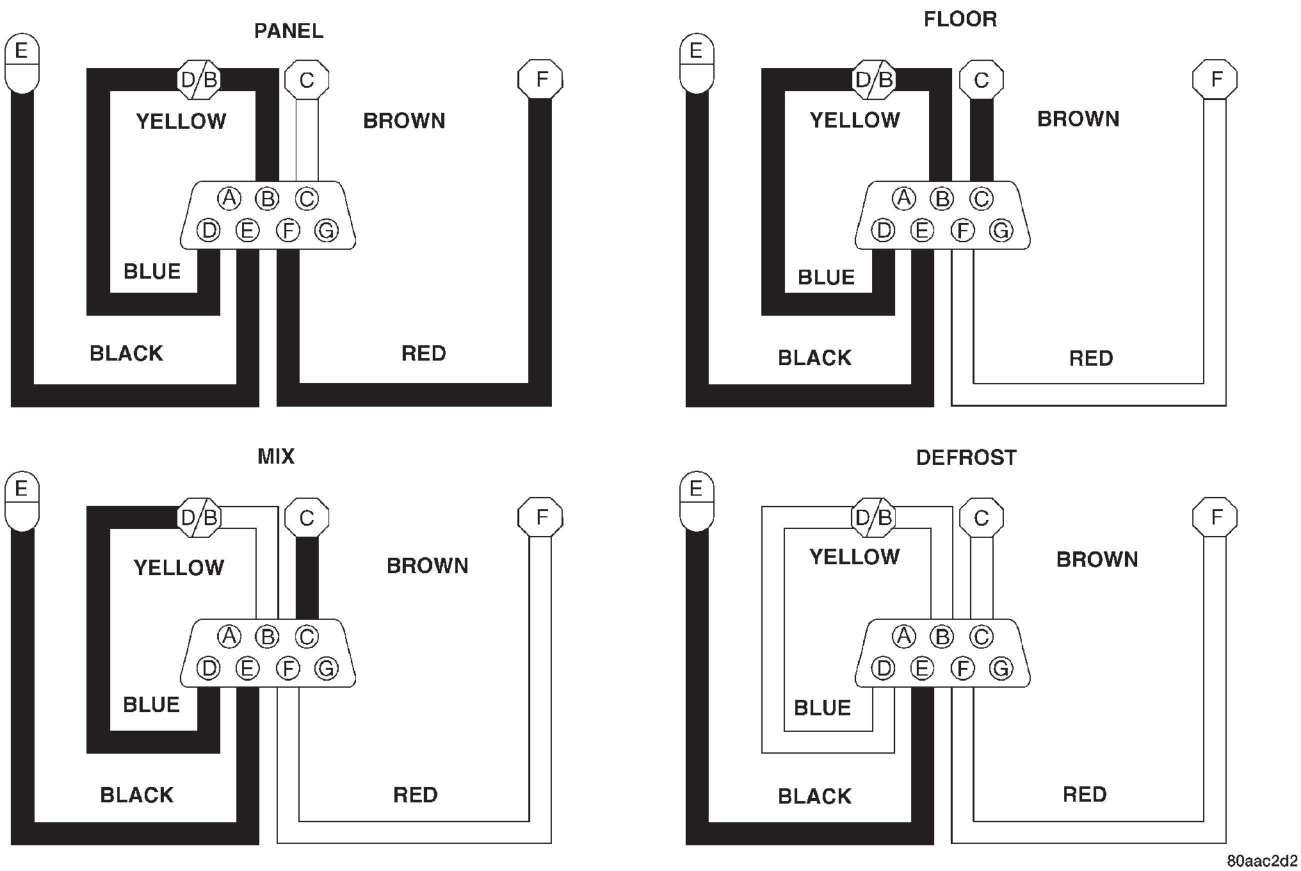
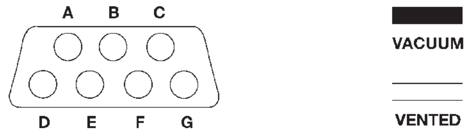
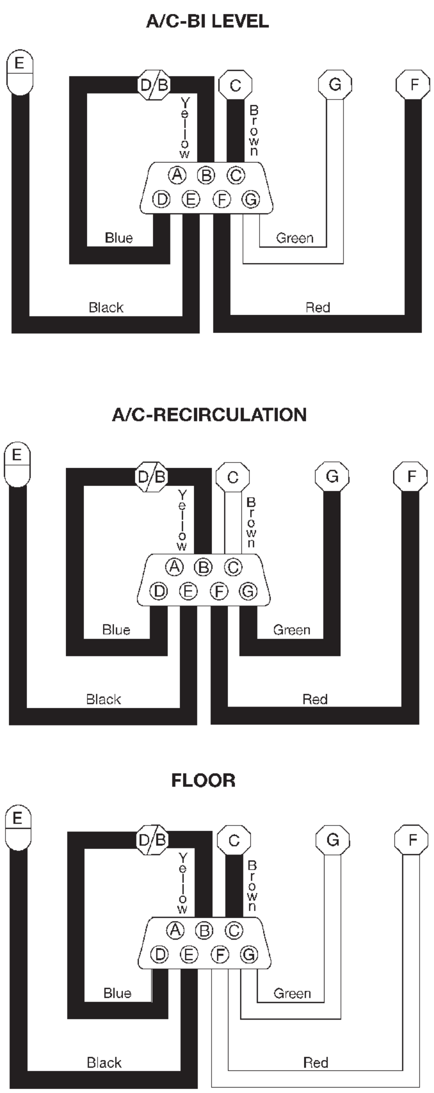


Fig. 11 Vacuum Circuits - Heater Only

SERVICE PROCEDURES (Continued)



VACUUM CIRCUIT LEGEND		
I. D.	Function	Color
A	Not Used	N/A
B	Defrost Actuator (Full Position)	Yellow
C	Floor Actuator	Brown
D	Defrost Actuator (Mid-Position)	Blue
E	Vacuum Supply (Reservoir)	Black
F	Panel Actuator	Red
G	Recirculation Actuator	Green



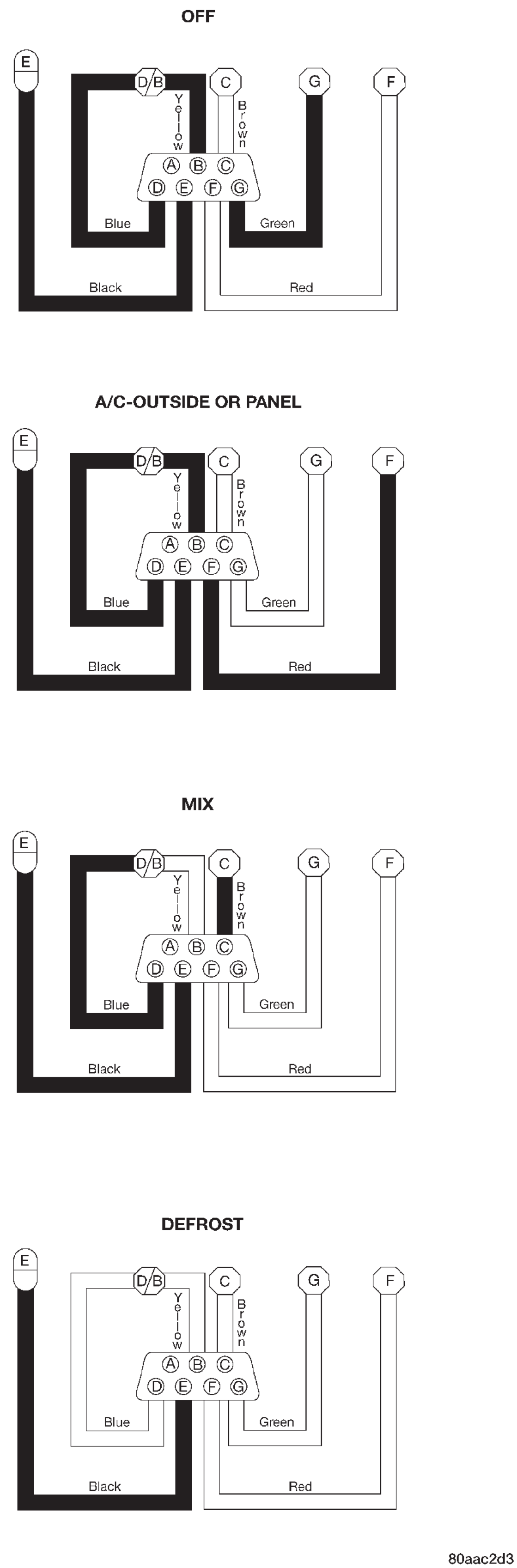


Fig. 12 Vacuum Circuits - Heater-A/C

SERVICE PROCEDURES (Continued)

is replaced, the refrigerant oil must be drained from the old compressor and measured. Drain all of the refrigerant oil from the new compressor, then fill the new compressor with the same amount of refrigerant oil that was drained out of the old compressor.

Refrigerant Oil Capacities		
Component	ml	fl oz
A/C System	180	6.1
Accumulator	90	3
Condenser	22	.75
Evaporator	45	1.5
Compressor	drain and measure the oil from the old compressor as noted	

REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE GENERAL INFORMATION SECTION NEAR THE FRONT OF THIS GROUP BEFORE RECOVERING REFRIGERANT.

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. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.

REFRIGERANT SYSTEM EVACUATE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE GENERAL INFORMATION SECTION NEAR THE FRONT OF THIS GROUP BEFORE EVACUATING THE SYSTEM.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be charged. If moisture and air enters the system and becomes mixed with the refrigerant, the compressor head pressure will rise above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating the refrigerant system will remove the air and boil the moisture out of the system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 and a manifold gauge set to the refrigerant system of the vehicle.

(2) Open the low and high side valves and start the charging station vacuum pump. When the suction gauge reads 88 kPa (26 in. Hg.) vacuum or greater, close all of the valves and turn off the vacuum pump.

(a) If the refrigerant system fails to reach the specified vacuum, the system has a leak that must be corrected. See Refrigerant System Leaks in the Diagnosis and Testing section of this group for the procedures.

(b) If the refrigerant system maintains the specified vacuum for five minutes, restart the vacuum pump, open the suction and discharge valves and evacuate the system for an additional ten minutes.

(3) Close all of the valves, and turn off the charging station vacuum pump.

(4) The refrigerant system is now ready to be charged with R-134a refrigerant. See Refrigerant System Charge in the Service Procedures section of this group.

REFRIGERANT SYSTEM CHARGE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE CHARGING THE REFRIGERANT SYSTEM.

After the refrigerant system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system. See Refrigerant Charge Capacity for the proper amount of the refrigerant charge.

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.

REFRIGERANT CHARGE CAPACITY

The R-134a refrigerant system charge capacity for this vehicle is 0.567 kilograms (1.25 pounds).

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.

When servicing the air conditioning system, a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used. Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the

SERVICE PROCEDURES (Continued)

equipment manufacturer for proper care and use of this equipment.

A manifold gauge set may be needed with some recovery/recycling/charging equipment (Fig. 13). 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.

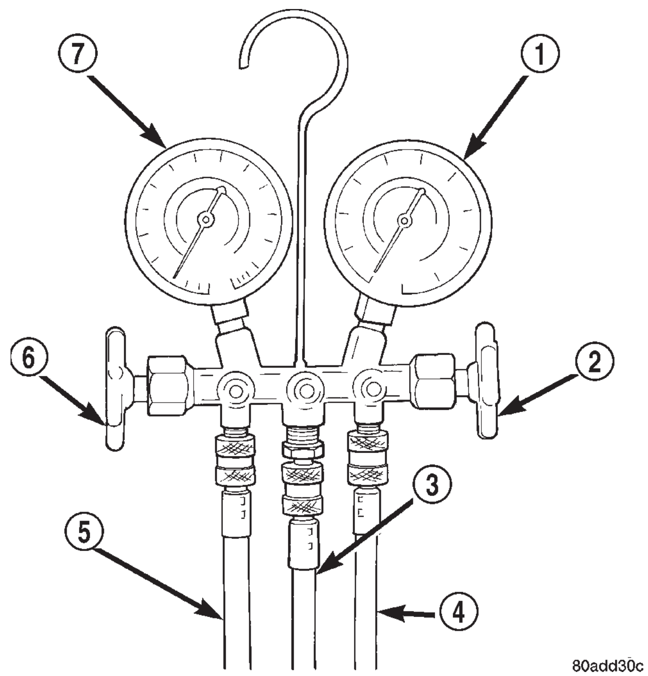


Fig. 13 Manifold Gauge Set - Typical

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

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 suction service port. This port is located on the suction line between the accumulator outlet and the compressor.

HIGH PRESSURE GAUGE HOSE The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the discharge line between the compressor and the condenser inlet.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, 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.

REMOVAL AND INSTALLATION

SERVICE WARNINGS AND PRECAUTIONS

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.**

REMOVAL AND INSTALLATION (Continued)

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. Damage to the system will result.**
- **R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible.**
- **Do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.**
- **Do not overcharge the refrigerant system. This 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.**
- **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.**
- **The refrigerant system must always be evacuated before charging.**
- **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.**
- **Before connecting an open refrigerant fitting, always install a new seal or gasket. Coat the fitting and seal with clean refrigerant oil before connecting.**
- **Do not remove the sealing caps from a replacement component until it is to be installed.**
- **When installing a refrigerant line, avoid sharp bends that may restrict refrigerant flow. Position the refrigerant lines away from exhaust system components or any sharp edges, which may damage the line.**
- **Tighten refrigerant fittings only to the specified torque. The aluminum fittings used in the refrigerant system will not tolerate overtightening.**
- **When disconnecting a refrigerant fitting, use a wrench on both halves of the fitting. This will prevent twisting of the refrigerant lines or tubes.**
- **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 through careless work habits must be avoided.**

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 heater core and the heater hoses. Refer to Group 7 - Cooling System for more information before the opening of, or attempting any service to the engine cooling system.

REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS

Kinks or sharp bends in the refrigerant plumbing will 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 refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

There are two types of refrigerant fittings:

- All fittings with O-rings need to be coated with refrigerant oil before installation. Use only O-rings that are the correct size and approved for use with R-134a refrigerant. Failure to do so may result in a leak.
- Unified plumbing connections with gaskets cannot be serviced with O-rings. The gaskets are not reusable and new gaskets do not require lubrication before installing.

Using the proper tools when making a refrigerant plumbing connection is very important. Improper tools or improper use of the tools can damage the refrigerant fittings. Always use two wrenches when loosening or tightening tube fittings. Use one wrench

REMOVAL AND INSTALLATION (Continued)

to hold one side of the connection stationary, while loosening or tightening the other side of the connection with a second wrench.

The refrigerant must be recovered completely from the system before opening any fitting or connection. Open the fittings with caution, even after the refrigerant has been recovered. If any pressure is noticed as a fitting is loosened, tighten the fitting and recover the refrigerant from the system again.

Do not discharge refrigerant into the atmosphere. Use an R-134a refrigerant recovery/recycling device that meets SAE Standard J2210.

The refrigerant system will remain chemically stable as long as pure, moisture-free R-134a refrigerant and refrigerant oil is used. Dirt, moisture, or air can upset this chemical stability. Operational troubles or serious damage can occur if foreign material is present in the refrigerant system.

When it is necessary to open the refrigerant system, have everything needed to service the system ready. The refrigerant system should not be left open to the atmosphere any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are to be installed.

All tools, including the refrigerant recycling equipment, the manifold gauge set, and test hoses should be kept clean and dry. All tools and equipment must be designed for R-134a refrigerant.

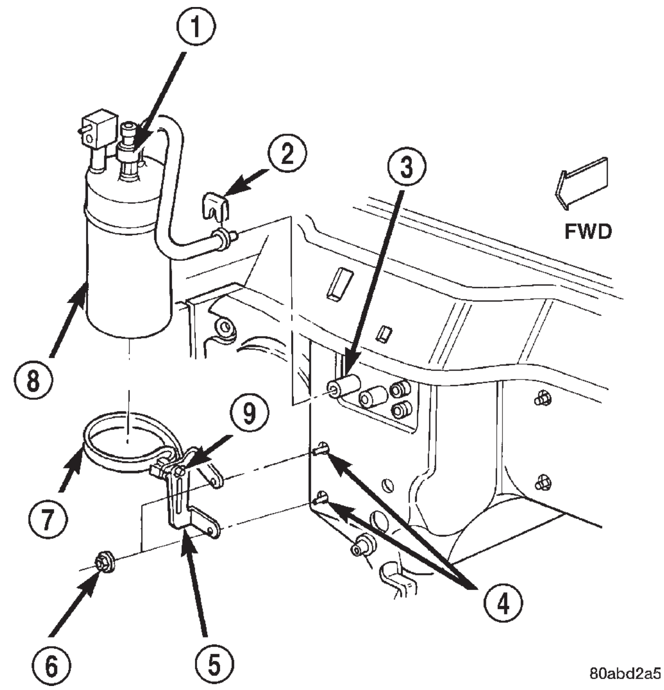


Fig. 14 Accumulator Remove/Install

1 – LOW PRESSURE CYCLING CLUTCH SWITCH
2 – CLIP
3 – EVAPORATOR
4 – STUDS
5 – BRACKET
6 – NUTS
7 – BAND
8 – ACCUMULATOR
9 – SCREW

ACCUMULATOR

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(3) Unplug the wire harness connector from the low pressure cycling clutch switch.

(4) Loosen the screw that secures the accumulator retaining band to the support bracket on the dash panel (Fig. 14).

(5) Disconnect the suction line from the accumulator outlet tube refrigerant line fitting. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Disconnect the accumulator inlet tube refrigerant line fitting from the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Pull the accumulator and retaining band unit forward until the screw in the band is clear of the slotted hole in the support bracket on the dash panel.

(8) Remove the accumulator from the vehicle.

INSTALLATION

(1) Install the accumulator and retaining band as a unit by sliding the screw in the band into the slotted hole in the support bracket on the dash panel.

(2) Remove the tape or plugs from the refrigerant line fittings on the accumulator inlet tube and the evaporator outlet tube. Connect the accumulator inlet tube refrigerant line coupler to the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures.

(3) Tighten the accumulator retaining band screw to 5 N·m (45 in. lbs.).

(4) Remove the tape or plugs from the refrigerant line fittings on the suction line and the accumulator outlet tube. Connect the suction line to the accumu-

REMOVAL AND INSTALLATION (Continued)

lator outlet tube refrigerant line coupler. See Refrigerant Line Coupler in this group for the procedures.

(5) Plug the wire harness connector into the low pressure cycling clutch switch.

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(8) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

NOTE: If the accumulator is replaced, add 120 milliliters (4 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

BLEND-AIR DOOR MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the wire connector from the blend-air door motor.

(3) Remove the screws that secure the blend-air door motor to the housing (Fig. 15).

(4) Remove the blend-air door motor.

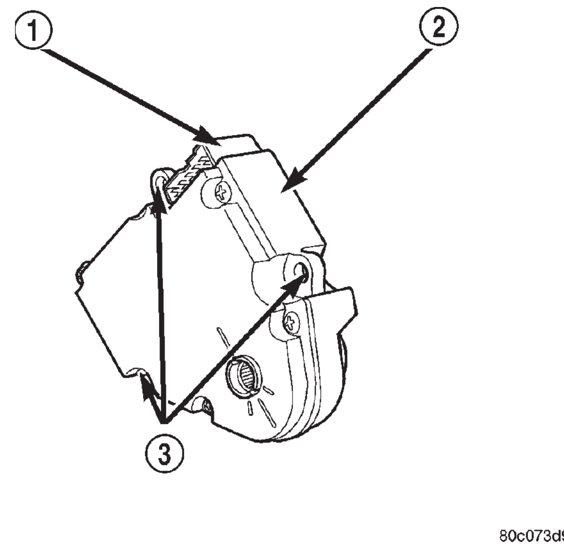


Fig. 15 Blend-Air Door Motor

1 – ELECTRICAL CONNECTOR
2 – BLEND-AIR DOOR MOTOR
3 – SCREW MOUNTING POINTS

INSTALLATION

(1) Reverse the removal procedures for installation.

(2) Install and tighten the screws that secures the blend-air door motor to the housing. Tighten the mounting screws to 1 N·m (10 in. lbs.).

(3) Connect the battery negative cable.

BLOWER MOTOR

REMOVAL

(1) If the vehicle is equipped with air conditioning, recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(2) Disconnect and isolate the battery negative cable.

(3) If the vehicle is equipped with air conditioning, the accumulator must be relocated in order to service the blower motor. This is done by loosening the accumulator retaining band screw and disconnecting the accumulator inlet tube from the evaporator outlet tube. The accumulator can then be moved far enough to access and remove the blower motor. See Accumulator in this group for the procedures.

(4) Unplug the blower motor wire harness connector (Fig. 16).

(5) Remove the three screws that secure the blower motor and wheel assembly to the heater-A/C housing.

(6) Rotate and tilt the blower motor unit as needed for clearance to remove the blower motor and wheel from the heater-A/C housing.

INSTALLATION

(1) Align and install the blower motor and wheel assembly into the heater-A/C housing.

(2) Install and tighten the three screws that secure the blower motor and wheel assembly to the heater-A/C housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Plug in the blower motor wire harness connector.

(4) If the vehicle is equipped with air conditioning, connect the accumulator inlet tube to the evaporator outlet tube and tighten the accumulator retaining band screw. See Accumulator in this group for the procedures.

(5) Connect the battery negative cable.

REMOVAL AND INSTALLATION (Continued)

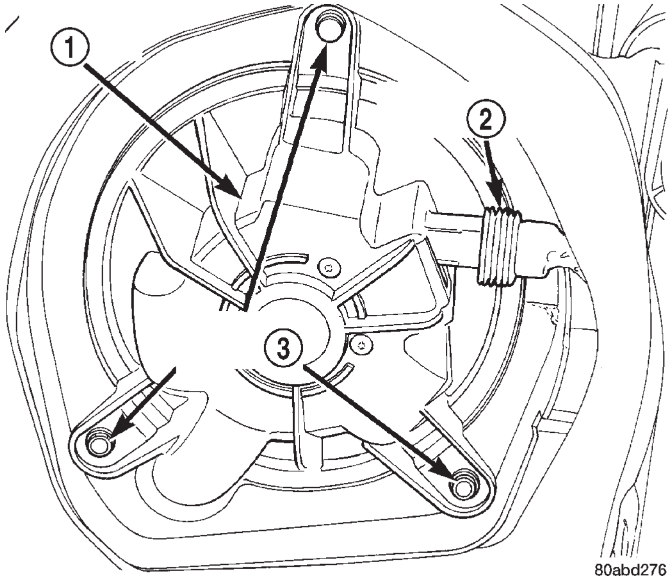


Fig. 16 Blower Motor Remove/Install

1 – BLOWER MOTOR
2 – WIRE HARNESS CONNECTOR
3 – MOUNTING SCREWS

(6) If the vehicle is equipped with air conditioning, evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(7) If the vehicle is equipped with air conditioning, charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

BLOWER MOTOR RELAY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Disconnect and isolate the battery negative cable.

(2) Roll the glove box down from the instrument panel. Refer to Glove Box in Group 8E - Instrument Panel Systems for the procedures.

(3) Reach through the instrument panel glove box opening to locate the blower motor relay (Fig. 17).

(4) Unplug the blower motor relay from its wire harness connector.

(5) Install the blower motor relay by aligning the relay terminals with the cavities in the wire harness connector and pushing the relay firmly into place.

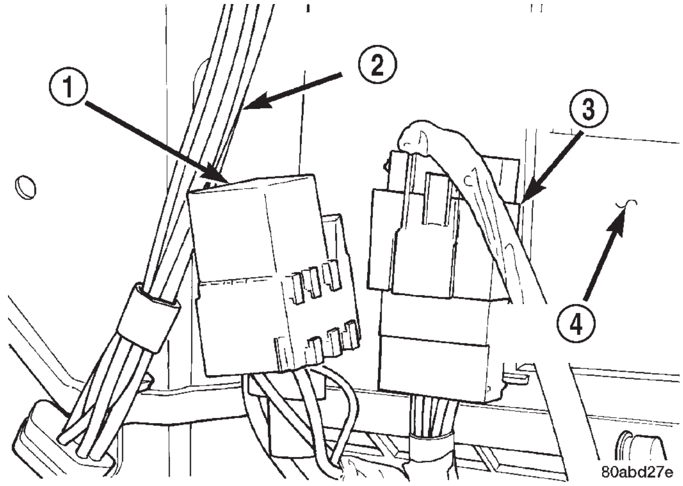


Fig. 17 Blower Motor Relay Remove/Install

1 – BLOWER MOTOR RELAY
2 – VACUUM HARNESS
3 – HEATER-A/C WIRE HARNESS CONNECTOR
4 – HEATER-A/C HOUSING

(6) Roll the glove box back up into the instrument panel. Refer to Glove Box in Group 8E - Instrument Panel Systems for the procedures.

(7) Connect the battery negative cable.

(8) Test the relay operation.

BLOWER MOTOR RESISTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the kick cover from the heater-A/C housing. See Kick Cover in this group for the procedures.

(3) Pull out the lock on the blower motor resistor wire harness connector to unlock the connector latch (Fig. 18).

(4) Depress the latch on the blower motor resistor wire harness connector and unplug the connector from the resistor.

(5) Remove the two screws that secure the resistor to the heater-A/C housing.

(6) Remove the resistor from the heater-A/C housing.

(7) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in lbs.).

REMOVAL AND INSTALLATION (Continued)

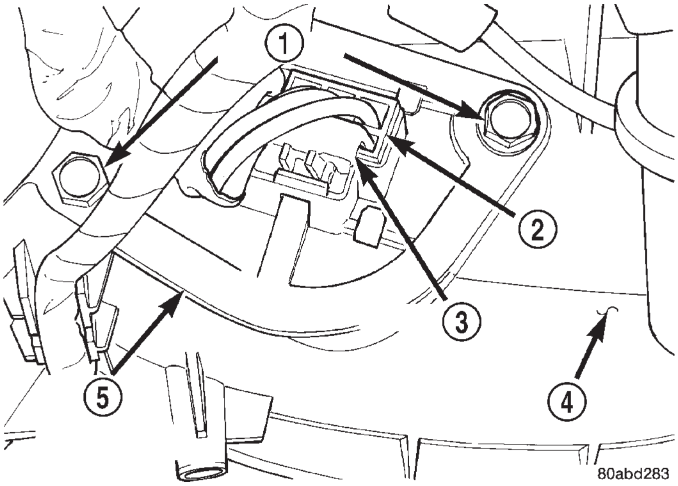


Fig. 18 Blower Motor Resistor Remove/Install

1 – SCREWS
2 – WIRE HARNESS CONNECTOR
3 – CONNECTOR LOCK
4 – HEATER-A/C HOUSING
5 – BLOWER MOTOR RESISTOR

COMPRESSOR

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(2) Disconnect and isolate the battery negative cable.

(3) Remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(4) Unplug the compressor clutch coil wire harness connector.

(5) Remove the suction and discharge refrigerant line manifold from the compressor. See Suction and Discharge Line in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant fittings.

(6) Remove the four bolts that secure the compressor to the mounting bracket (Fig. 19).

(7) Remove the compressor from the mounting bracket.

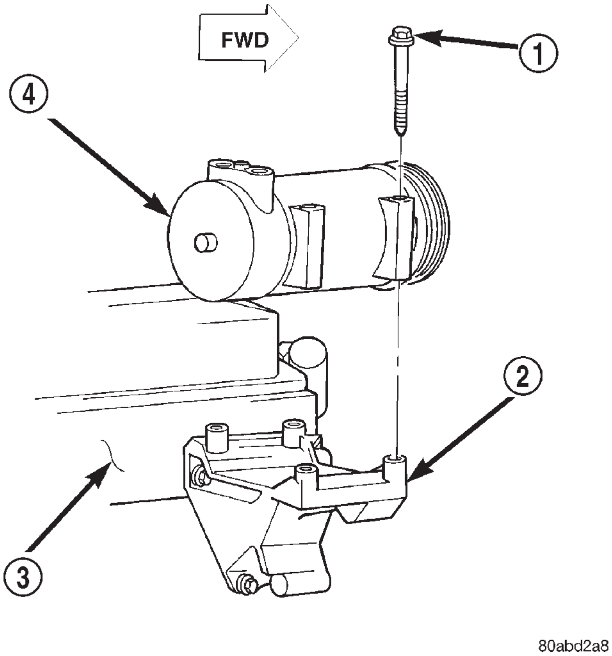


Fig. 19 Compressor Remove/Install - All 2.5L/4.0L Engines

1 – BOLT
2 – MOUNTING BRACKET
3 – ENGINE
4 – COMPRESSOR

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) Install the compressor to the mounting bracket. Tighten the four mounting bolts as follows:

- All 2.5L and 4.0L engines - 27 N·m (20 ft. lbs.)

(2) Remove the tape or plugs from all of the opened refrigerant line fittings. Install the suction and discharge line manifold to the compressor. See Suction and Discharge Line in this group for the procedures.

(3) Install the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(4) Plug in the compressor clutch coil wire harness connector.

(5) Connect the battery negative cable.

(6) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(7) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

REMOVAL AND INSTALLATION (Continued)

COMPRESSOR CLUTCH

The refrigerant system can remain fully-charged during compressor clutch, pulley, or coil replacement. The compressor clutch can be serviced in the vehicle.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(3) Unplug the compressor clutch coil wire harness connector.

(4) Remove the four bolts that secure the compressor to the mounting bracket.

(5) Remove the compressor from the mounting bracket. Support the compressor in the engine compartment while servicing the clutch.

(6) Insert the two pins of the spanner wrench (Special Tool C-4489) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 20).

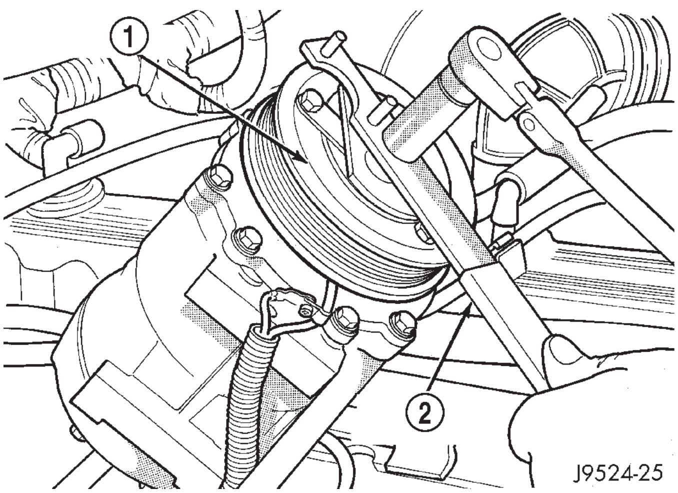


Fig. 20 Clutch Nut Remove

1 – CLUTCH PLATE
2 – SPANNER

(7) Remove the clutch plate with a puller (Special Tool C-6461) (Fig. 21).

(8) Remove the compressor shaft key and the clutch shims.

(9) Remove the external front housing snap ring with snap ring pliers (Fig. 22).

(10) Install the lip of the rotor puller (Special Tool C-6141-1) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141-2) (Fig. 23).

(11) Install the puller through-bolts (Special Tool C-6461) through the puller flange and into the jaws of the rotor puller and tighten (Fig. 24). Turn the puller center bolt clockwise until the rotor pulley is free.

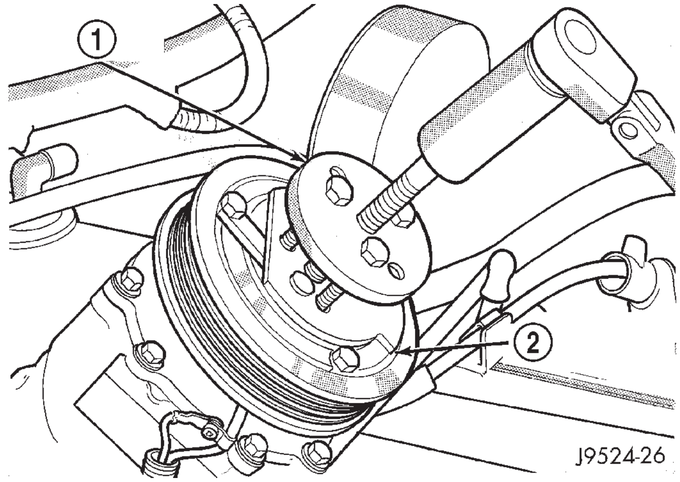


Fig. 21 Clutch Plate Remove

1 – CLUTCH PLATE PULLER
2 – CLUTCH PLATE

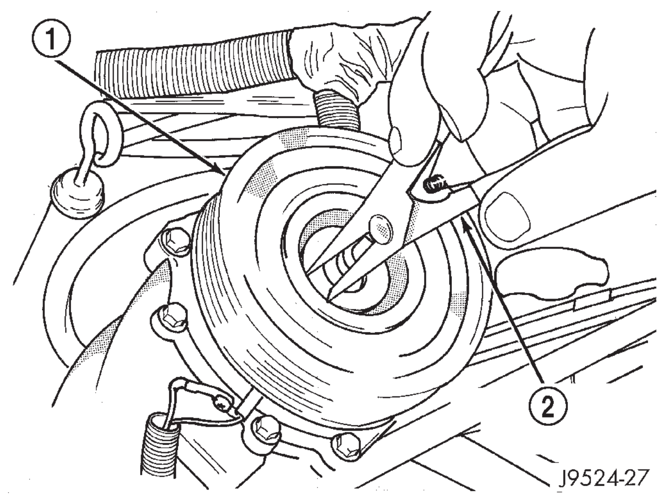


Fig. 22 External Snap Ring Remove

1 – PULLEY
2 – SNAP RING PLIERS

(12) Remove the screw and retainer from the clutch coil lead wire harness on the compressor front housing (Fig. 25).

(13) Remove the snap ring from the compressor hub and remove the clutch field coil (Fig. 26). Slide the clutch field coil off of the compressor hub.

INSPECTION

Examine the friction surfaces of the clutch pulley and the 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 and nose area of the compressor for oil. Remove the

REMOVAL AND INSTALLATION (Continued)

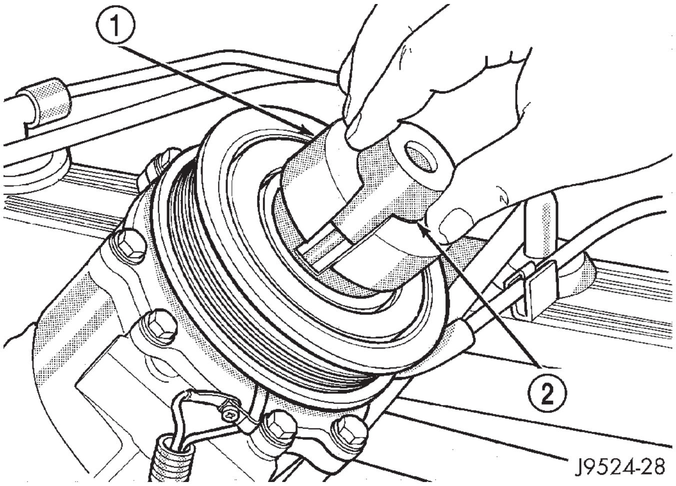


Fig. 23 Shaft Protector and Puller

1 – PULLER JAW
2 – SHAFT PROTECTOR

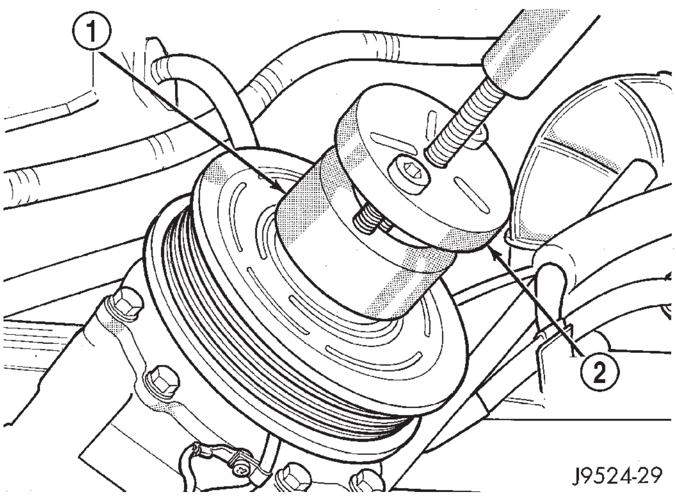


Fig. 24 Install Puller Plate

1 – PULLER JAW
2 – PULLER

felt from the front cover. If the felt is saturated with oil, the shaft seal is leaking and the compressor must be replaced.

Check the clutch pulley bearing for roughness or excessive leakage of grease. Replace the bearing, if required.

INSTALLATION

(1) Install the clutch field coil and snap ring.

(2) Install the clutch coil lead wire harness retaining clip on the compressor front housing and tighten the retaining screw.

(3) Align the rotor assembly squarely on the front compressor housing hub.

(4) Install the pulley bearing assembly with the installer (Special Tool C-6871) (Fig. 27). Thread the

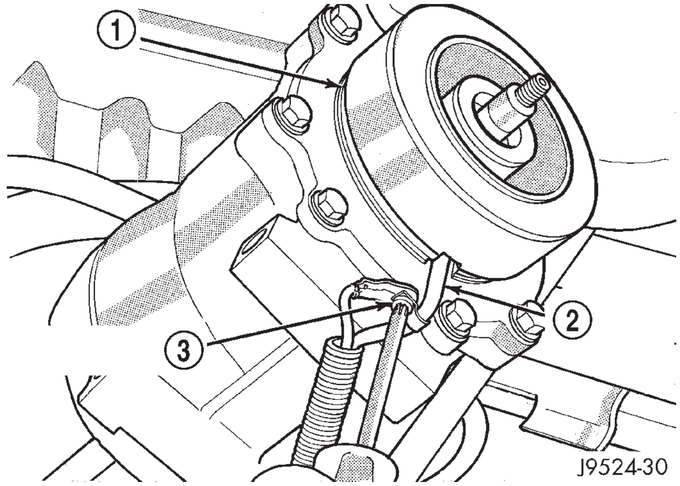


Fig. 25 Clutch Coil Lead Wire Harness

1 – COIL
2 – COIL WIRE
3 – RETAINER SCREW

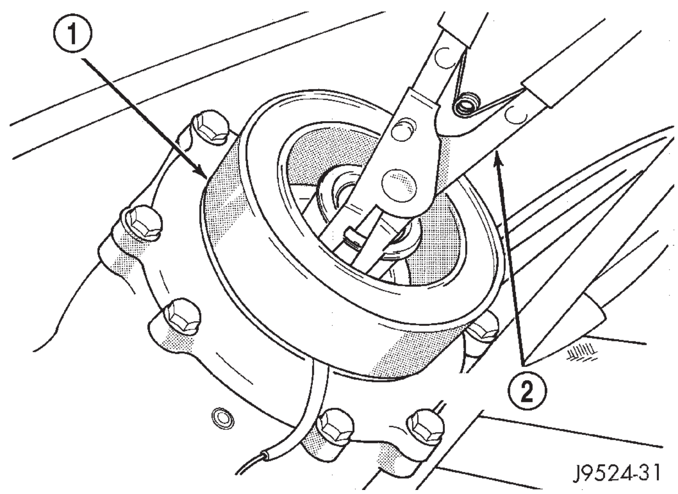


Fig. 26 Clutch Field Coil Snap Ring Remove

1 – COIL
2 – SNAP RING PLIERS

installer on the shaft, then turn the nut until the pulley assembly is seated.

(5) Install the external front snap ring with snap ring pliers. The bevel side of the snap ring must be facing outward. Press the snap ring to make sure it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

(6) Install the compressor shaft key and the original clutch shims on the compressor shaft.

REMOVAL AND INSTALLATION (Continued)

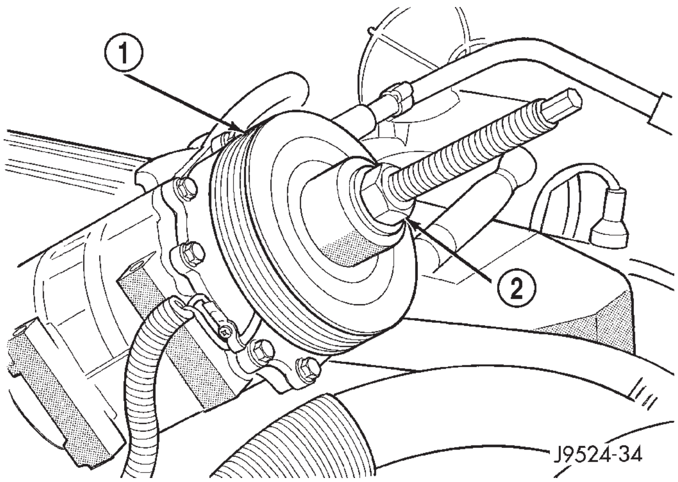


Fig. 27 Clutch Pulley Install

1 – PULLEY BEARING ASSEMBLY
2 – INSTALLER

(7) Install the clutch plate with the driver (Special Tool C-6463) (Fig. 28). Install the shaft hex nut and tighten to 14.4 N·m (10.5 ft. lbs.).

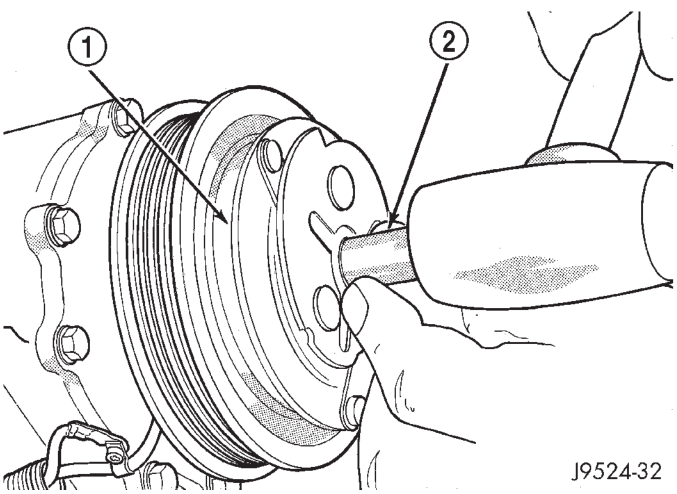


Fig. 28 Clutch Plate Driver

1 – CLUTCH PLATE
2 – DRIVER

(8) Check the clutch air gap with a feeler gauge (Fig. 29). If the air gap does not meet the specification, add or subtract shims as required. The air gap specification is 0.41 to 0.79 millimeter (0.016 to 0.031 inch). If the air gap is not consistent around the circumference of the clutch, lightly pry up at the minimum variations. Lightly tap down at the points of maximum variation.

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use 1.0, 0.50, and 0.13 millimeter (0.040, 0.020, and 0.005 inch) shims from the clutch hardware package that is provided with the new clutch.

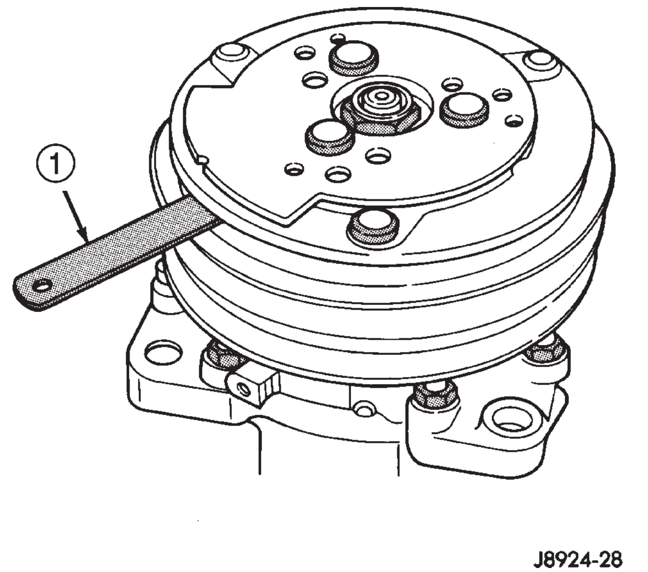


Fig. 29 Check Clutch Air Gap

1 – FEELER GAUGE

(9) Reverse the remaining removal procedures to complete the installation.

CLUTCH BREAK-IN

After a new compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the heater-A/C control to the Recirculation Mode, the blower motor switch in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

COMPRESSOR CLUTCH RELAY

(1) Disconnect and isolate the battery negative cable.
(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 30).
(3) Refer to the label on the PDC for compressor clutch relay identification and location.
(4) Unplug the compressor clutch relay from the PDC.
(5) Install the compressor clutch relay by aligning the relay terminals with the cavities in the PDC and pushing the relay firmly into place.
(6) Install the PDC cover.
(7) Connect the battery negative cable.
(8) Test the relay operation.

REMOVAL AND INSTALLATION (Continued)

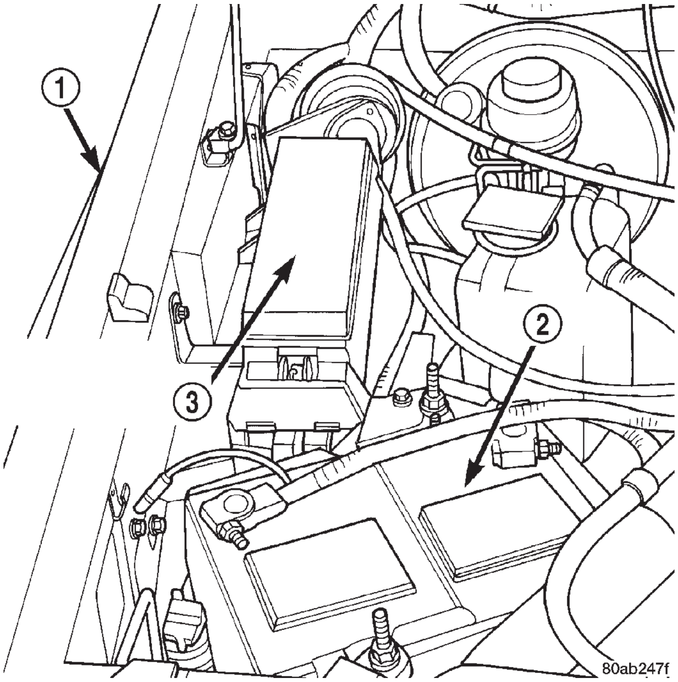


Fig. 30 Power Distribution Center

1 – RIGHT FENDER
2 – BATTERY
3 – POWER DISTRIBUTION CENTER

CONDENSER

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

CAUTION: Before removing the condenser, note the location of each of the radiator and condenser air seals. These seals are used to direct air through the condenser and radiator. The air seals must be reinstalled in their proper locations in order for the air conditioning and engine cooling systems to perform as designed.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(3) Disconnect the discharge line refrigerant line fitting at the condenser inlet. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(4) Disconnect the liquid line (Left-Hand Drive) or liquid line jumper (Right-Hand Drive) refrigerant line fitting at the condenser outlet. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the radiator and the condenser from the vehicle as a unit. Refer to Group 7 - Cooling System for the procedures.

(6) Remove the two nuts that secure the condenser studs to the upper brackets of the radiator (Fig. 31).

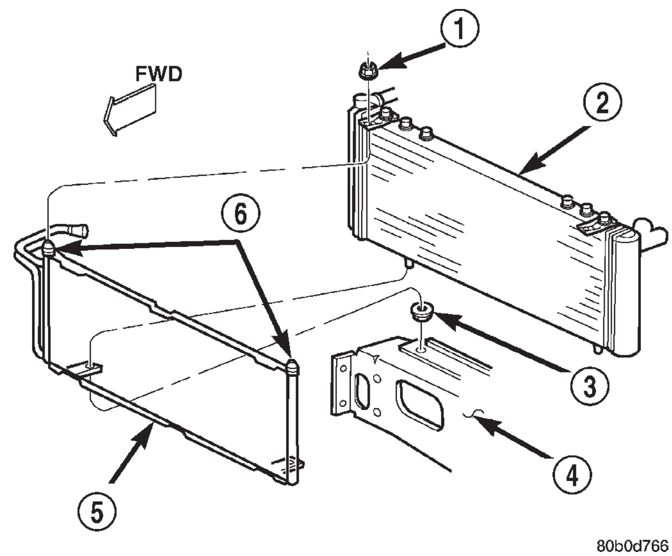


Fig. 31 Condenser Remove/Install

1 – NUT
2 – RADIATOR
3 – GROMMET
4 – LOWER CROSSMEMBER
5 – CONDENSER
6 – STUDS

(7) Slide the condenser down from the radiator far enough for the condenser studs to clear the upper radiator bracket holes, and for the lower condenser bracket holes to clear the dowel pins on the bottom of the radiator.

(8) Remove the condenser from the radiator.

INSTALLATION

(1) Install the holes of the condenser lower brackets over the dowel pins on the bottom of the radiator.

(2) Slide the condenser upwards until both of the condenser studs are installed through the holes in the radiator upper brackets. Tighten the mounting nuts to 5.3 N·m (47 in. lbs.).

(3) Renstall the radiator and condenser unit in the vehicle. Refer to Group 7 - Cooling System for the procedures.

(4) Remove the tape or plugs from the refrigerant line fittings on the condenser outlet and the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive). Install the liquid line or the liq-

REMOVAL AND INSTALLATION (Continued)

uid line jumper to the condenser outlet. See Refrigerant Line Coupler in this group for the procedures.

(5) Remove the tape or plugs from the refrigerant line fittings on the condenser inlet and the discharge line. Connect the discharge line to the condenser inlet. See Refrigerant Line Coupler in this group for the procedures.

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(8) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

NOTE: If the condenser 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.

DUAL FUNCTION HIGH PRESSURE SWITCH/ HIGH PRESSURE CUT-OFF SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the dual function high pressure switch or the high pressure cut-off switch, which is mounted to a fitting on the non-flexible section of the discharge line nearest the compressor.

(3) Unscrew the high pressure switch from the discharge line fitting.

(4) Remove the high pressure switch from the vehicle.

(5) Remove the O-ring seal from the discharge line fitting and discard.

INSTALLATION

(1) Lubricate a new 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 compressor in the vehicle.

(2) Install and tighten the high pressure switch on the discharge line fitting.

(3) Plug the wire harness connector into the high pressure cut-off switch.

(4) Connect the battery negative cable.

DUCTS AND OUTLETS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

PANEL OUTLET DUCTS

The panel outlet ducts are integral to the instrument panel assembly. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

PANEL OUTLET BARRELS

(1) Use a trim stick or another suitable wide flat-bladed tool to gently pry the panel outlet barrel out of the panel outlet housing (Fig. 32). The barrel is retained by a light snap fit.

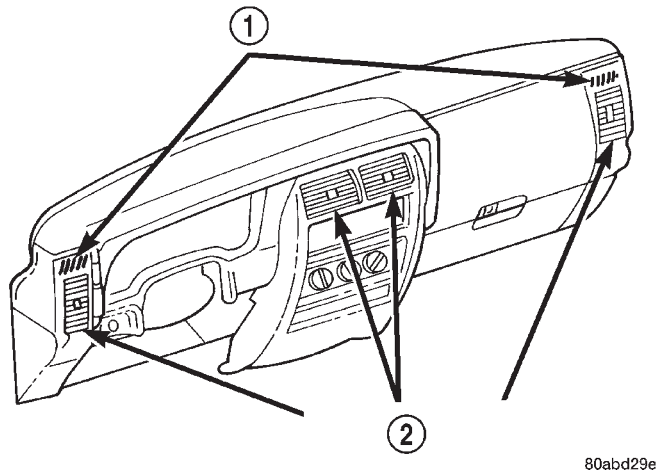


Fig. 32 Panel Outlet Barrels

1 – DEMISTER OUTLETS
2 – PANEL OUTLET BARRELS

(2) To install, position the barrel in the panel outlet housing and press firmly until the barrel snaps into place.

DEMISTER OUTLETS

The side window demister outlets are integral to the instrument panel end caps. Refer to Instrument Panel End Cap in Group 8E - Instrument Panel Systems for the procedures.

DEFROST DUCT/DEMISTER ADAPTER

(1) Remove the instrument panel assembly from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Disconnect the demister hoses from the defrost duct/demister adapter (Fig. 33).

REMOVAL AND INSTALLATION (Continued)

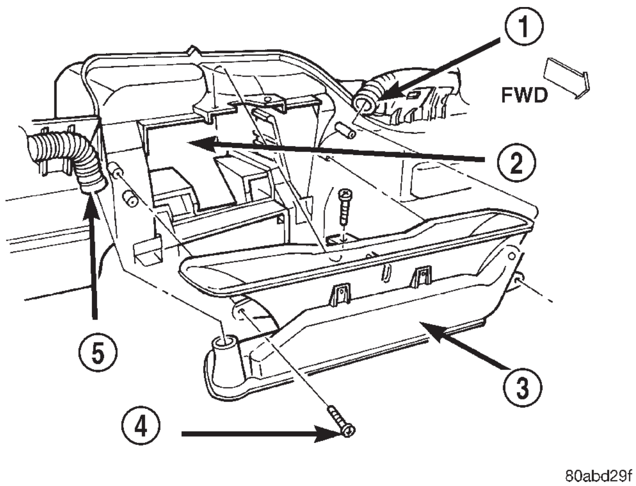


Fig. 33 Defrost Duct/Demister Adapter

1 – HOSE
2 – INSTRUMENT PANEL
3 – DEFROST DUCT/DEMISTER ADAPTER
4 – SCREW
5 – HOSE

(3) Remove the three screws that secure the defrost duct/demister adapter to the instrument panel.

(4) Remove the defrost duct/demister adapter from the instrument panel.

(5) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

DEMISTER HOSES

(1) Remove the instrument panel assembly from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Disconnect the ends of the demister hose from the demister duct (Fig. 34) and the defrost duct/demister adapter (Fig. 33).

(3) Reverse the removal procedures to install.

DEMISTER DUCTS

(1) Remove the instrument panel assembly from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Remove the end cap from the instrument panel. Refer to Instrument Panel End Cap in Group 8E - Instrument Panel Systems for the procedures.

(3) Disconnect the demister hoses from the demister duct (Fig. 34).

(4) Remove the two screws that secure the demister duct to the top of the instrument panel.

(5) Remove the demister duct from the instrument panel.

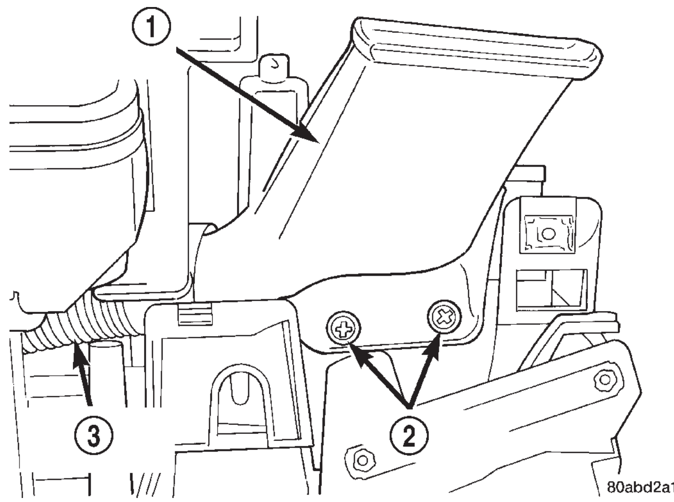


Fig. 34 Demister Duct Remove/Install

1 – DEMISTER DUCT
2 – SCREWS
3 – DEMISTER HOSE

(6) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

CONSOLE REAR DUCT

(1) Disconnect and isolate the battery negative cable.

(2) Remove the floor console from the floor panel transmission tunnel (Fig. 35). Refer to Group 23 - Body for the procedures.

(3) Lift the rear of the console rear duct out of the console rear mounting bracket on the floor panel transmission tunnel and slide the duct rearward to disengage it from the floor duct and adapter.

(4) Remove the console rear duct from the vehicle.

(5) Reverse the removal procedures to install.

FLOOR DUCT AND ADAPTER

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(3) Remove the three screws that secure the floor duct and adapter to the heater-A/C housing (Fig. 35).

(4) Remove the floor duct and adapter from the heater-A/C housing.

(5) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

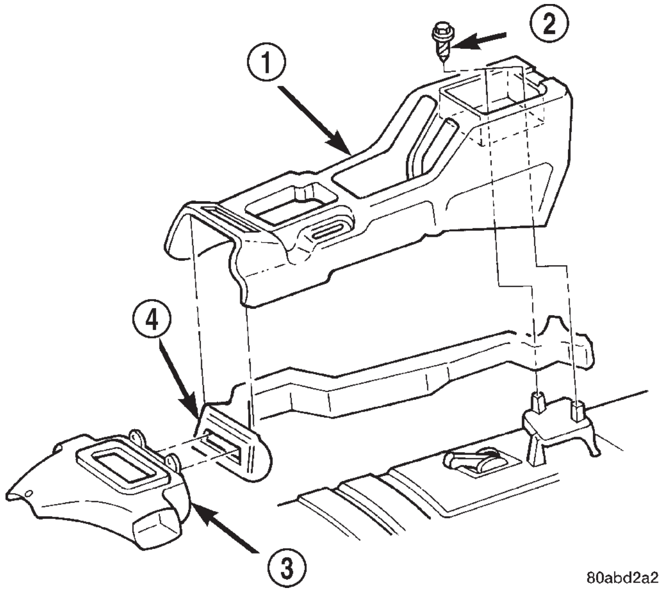


Fig. 35 Floor Duct and Console Rear Duct Remove/Install

1 – FLOOR CONSOLE
2 – SCREW
3 – FLOOR DUCT AND ADAPTER
4 – CONSOLE REAR DUCT

EVAPORATOR COIL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.
(2) Lift the evaporator coil unit out of the lower half of the heater-A/C housing (Fig. 36).
(3) Reverse the removal procedures to install. Be certain that the evaporator foam insulator wrap and rubber tube seal are reinstalled.

NOTE: If the evaporator is replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

FIXED ORIFICE TUBE

The fixed orifice tube is located in the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive) near the condenser. The orifice has filter screens on the inlet and outlet ends of the tube body. If the fixed orifice tube is faulty or plugged, the liquid line unit or liquid line jumper unit must be replaced. See Liquid Line in this group for the service procedures.

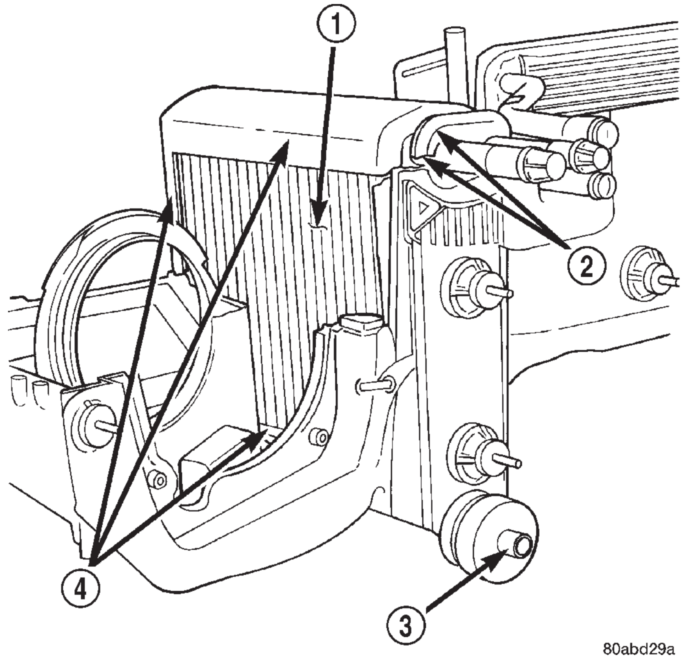


Fig. 36 Evaporator Coil Remove/Install

1 – EVAPORATOR COIL
2 – TUBE SEAL
3 – CONDENSATE DRAIN TUBE
4 – FOAM INSULATOR WRAP

HEATER-A/C CONTROL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Roll down the glove box from the instrument panel. Refer to Glove Box in Group 8E - Instrument Panel Systems for the procedures.
(3) Reach through the instrument panel glove box opening to access and unplug the two halves of the heater-A/C vacuum harness connector.

REMOVAL AND INSTALLATION (Continued)

(4) Remove the center bezel from the instrument panel. Refer to Instrument Panel Center Bezel in Group 8E - Instrument Panel Systems for the procedures.

(5) Release the vacuum harness push-in retainer from the instrument panel directly beneath the heater-A/C control.

(6) Remove the four screws that secure the heater-A/C control to the instrument panel (Fig. 37).

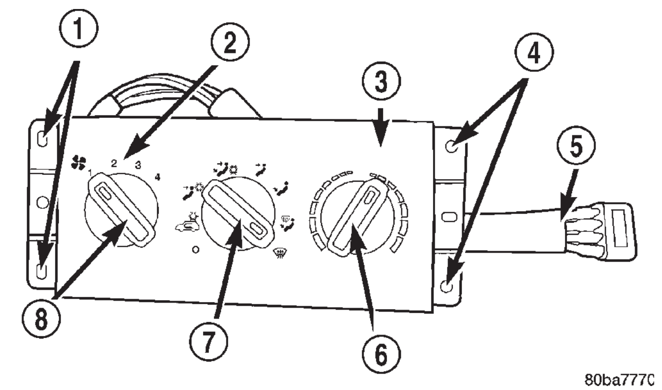


Fig. 37 Heater-A/C Control Remove/Install

1 – MOUNTING HOLES
2 – CONTROL HEAD
3 – HEATER-A/C CONTROL HEAD
4 – MOUNTING HOLES
5 – VACUUM HARNESS
6 – TEMPERATURE SELECT CONTROL
7 – MODE SELECT CONTROL
8 – BLOWER SPEED CONTROL

(7) Pull the heater-A/C control assembly away from the instrument panel far enough to access the connections on the back of the control.

(8) Unplug the wire harness connectors from the back of the heater-A/C control (Fig. 38).

(9) Reach through the instrument panel glove box opening to guide the heater-A/C control half of the vacuum harness around any obstacles while pulling the heater-A/C control out from the front of the instrument panel.

INSTALLATION

(1) Plug the wire harness connectors into the back of the heater-A/C control.

(2) Route the vacuum harness through the instrument panel opening and reinstall the vacuum harness push-in retainer.

(3) Reach through the instrument panel glove box opening to reconnect the two halves of the heater-A/C vacuum harness connector.

(4) Roll the glove box back up into the instrument panel. Refer to Glove Box in Group 8E - Instrument Panel Systems for the procedures.

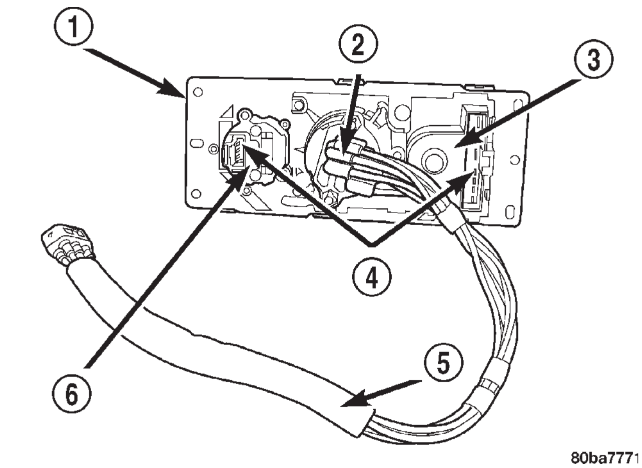


Fig. 38 Heater-A/C Control Connections

1 – HEATER-A/C CONTROL HEAD
2 – MODE SELECT CONTROL
3 – BLOWER SPEED CONTROL
4 – ELECTRICAL CONNECTORS
5 – VACUUM HARNESS
6 – TEMPERATURE SELECT CONTROL

(5) Position the heater-A/C control in the instrument panel and secure it with four screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(6) Reinstall the center bezel onto the instrument panel. Refer to Instrument Panel Center Bezel in Group 8E - Instrument Panel Systems for the procedures.

(7) Connect the battery negative cable.

HEATER-A/C HOUSING

The heater-A/C housing assembly must be removed from the vehicle and the two halves of the housing separated for service access of the heater core, evaporator coil, blend-air door, and each of the various mode control doors.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

REMOVAL AND INSTALLATION (Continued)

(3) If the vehicle is not equipped with air conditioning, go to Step 6. If the vehicle is equipped with air conditioning, recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(4) Disconnect the liquid line refrigerant line fitting from the evaporator inlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Disconnect the accumulator inlet tube refrigerant line fitting from the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Drain the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

(7) Disconnect the heater hoses from the heater core tubes. Refer to Group 7 - Cooling System for the procedures. Install plugs in, or tape over the opened heater core tubes.

(8) Unplug the heater-A/C system vacuum supply line connector from the tee fitting near the heater core tubes.

(9) Unplug the heater-A/C unit wire harness connector, which is fastened to the heater-A/C housing next to the blower motor relay (Fig. 39).

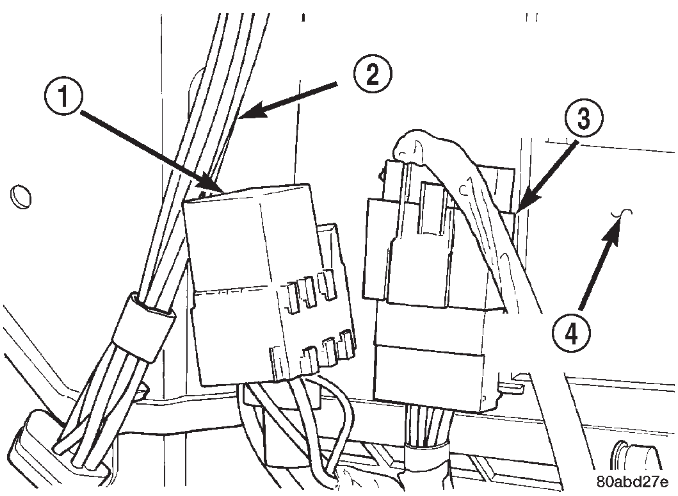


Fig. 39 Heater-A/C Unit Connector

1 – BLOWER MOTOR RELAY
2 – VACUUM HARNESS
3 – HEATER-A/C WIRE HARNESS CONNECTOR
4 – HEATER-A/C HOUSING

(10) Remove the five nuts from the heater-A/C housing mounting studs on the engine compartment side of the dash panel (Fig. 40). Remove or reposition the evaporation canister for additional access, if required.

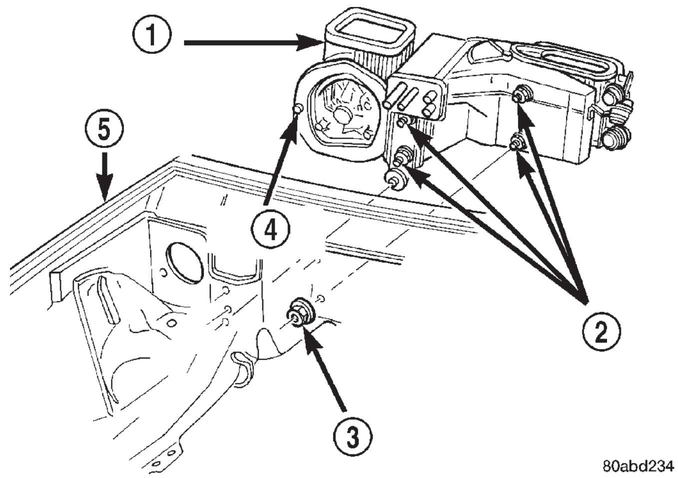


Fig. 40 Heater-A/C Housing Remove/Install

1 – HEATER-A/C HOUSING
2 – STUD
3 – NUT
4 – STUD
5 – RIGHT FRONT FENDER

(11) Pull the heater-A/C housing rearward far enough for the mounting studs and the evaporator condensate drain tube to clear the dash panel holes.

(12) Remove the heater-A/C housing from the vehicle.

DISASSEMBLY

(1) Remove the heater-A/C housing from the vehicle and place it on a work bench.

(2) Unplug the vacuum harness connectors from the floor door actuator and, if the unit is so equipped, the recirculation air door actuator.

(3) Disengage the vacuum harness from any routing clips located on the lower half of the heater-A/C housing.

(4) Disengage the heater-A/C wire harness connector and the blower motor relay wire harness connector push-in retainers from their mounting holes on the heater-A/C housing.

(5) Remove the blower motor and blower wheel unit from the heater-A/C housing. See Blower Motor in this group for the procedures.

(6) Carefully remove the foam seal from the flange around the blower motor opening in the heater-A/C housing. If the seal is deformed or damaged, it must be replaced.

(7) Pull the vacuum supply line and connector through the foam seal on the heater core and evaporator coil tube mounting flange of the heater-A/C housing (Fig. 41).

(8) If the unit is equipped with air conditioning, remove the screw that secures the clamp to the evaporator coil tubes and remove the clamp.

REMOVAL AND INSTALLATION (Continued)

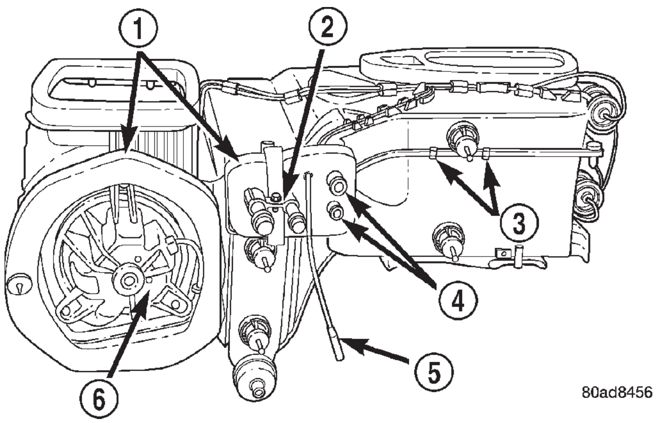


Fig. 41 Heater-A/C Housing Disassembly

1 – SEALS
2 – EVAPORATOR TUBE CLAMP
3 – CLIPS
4 – HEATER CORE TUBES
5 – VACUUM SUPPLY LINE
6 – BLOWER MOTOR

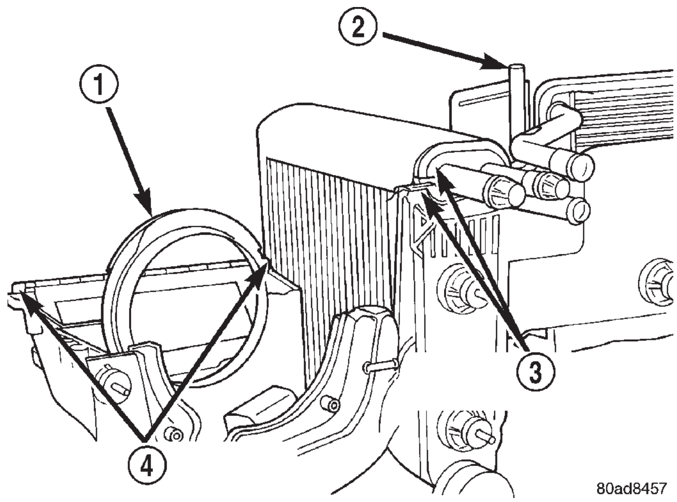


Fig. 42 Heater-A/C Housing Assembly

1 – BLOWER MOTOR VENTURI RING
2 – BLEND-AIR DOOR PIVOT
3 – EVAPORATOR COIL TUBE RUBBER SEAL
4 – RECIRCULATION AIR DOOR PIVOTS

(9) Carefully remove the foam seal from the heater core and evaporator coil tube mounting flange of the heater-A/C housing. If the seal is deformed or damaged, it must be replaced.

(10) Use a screwdriver to pry off the two snap clips that help secure the upper and lower heater-A/C housing halves to each other.

(11) Remove the 14 screws that secure the upper and lower heater-A/C housing halves to each other.

(12) Carefully separate the upper heater-A/C housing half from the lower half.

ASSEMBLY

(1) Assemble the upper heater-A/C housing half to the lower half. During assembly, be certain of the following:

(a) That each of the mode door pivot shaft ends is properly engaged in its pivot hole (Fig. 42).

(b) That the blower motor venturi ring is properly indexed and installed.

(c) If the unit is equipped with air conditioning, that the evaporator coil tube rubber seal is properly positioned in the grooves in both the upper and lower heater-A/C housing halves.

(2) Install the 14 screws and two snap clips that secure the upper and lower heater-A/C housing halves to each other. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Install the blower motor and wheel unit in the heater-A/C housing. See Blower Motor in this group for the procedures.

(4) Install the foam seals on the flanges around the blower motor opening and the heater core and evaporator coil tube mounting flange of the heater-A/C housing.

(5) Insert the vacuum supply line and connector through the foam seal on the heater core and evaporator coil tube mounting flange of the heater-A/C housing.

(6) If the unit is equipped with air conditioning, reinstall the evaporator coil tube clamp. Tighten the mounting screw to 2.2 N·m (20 in. lbs.).

(7) Engage the heater-A/C wire harness connector and blower motor relay wire harness connector push-in retainers with their mounting holes in the heater-A/C housing.

(8) Engage the vacuum harness to the routing clips and plug in the vacuum harness connector at the floor door actuator and, if the unit is so equipped, at the recirculation air door actuator.

(9) Install the heater-A/C housing in the vehicle.

INSTALLATION

(1) Position the heater-A/C housing to the dash panel. Be certain that the evaporator condensate drain tube and the housing mounting studs are inserted into their correct mounting holes.

(2) Install and tighten the five nuts onto the heater-A/C housing mounting studs on the engine compartment side of the dash panel. Tighten the nuts to 6.2 N·m (55 in. lbs.).

(3) If the evaporation canister was repositioned during the removal procedure, reinstall it to its proper position.

(4) Connect the heater-A/C system vacuum supply line connector to the tee fitting near the heater core tubes.

(5) Unplug or remove the tape from the heater core tubes. Connect the heater hoses to the heater

REMOVAL AND INSTALLATION (Continued)

core tubes and fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

(6) If the vehicle is not equipped with air conditioning, go to Step 10. If the vehicle is equipped with air conditioning, unplug or remove the tape from the accumulator inlet tube and the evaporator outlet tube fittings. Connect the accumulator inlet tube coupler to the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures.

(7) Unplug or remove the tape from the liquid line and the evaporator inlet tube fittings. Connect the liquid line coupler to the evaporator inlet tube. See Refrigerant Line Coupler in this group for the procedures.

(8) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(9) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

(10) Install the instrument panel in the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(11) Connect the battery negative cable.

(12) Start the engine and check for proper operation of the heating and air conditioning systems.

HEATER-A/C HOUSING DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

BLEND-AIR DOOR

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Lift the blend-air door pivot shaft out of the pivot hole in the bottom of the lower half of the heater-A/C housing (Fig. 43).

(3) Reverse the removal procedures to install.

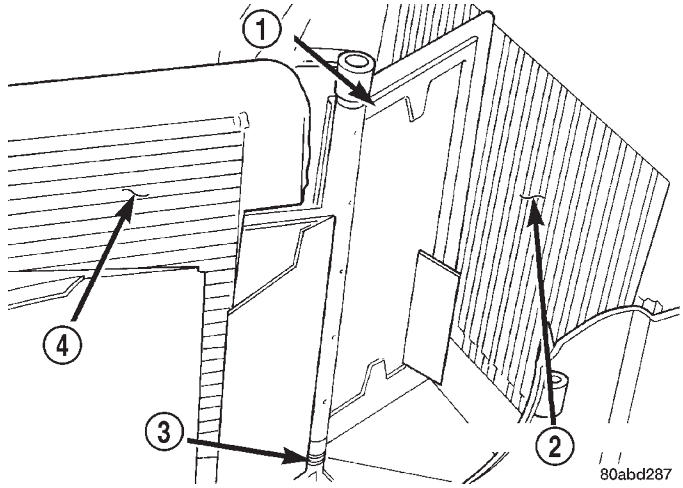


Fig. 43 Blend-Air Door

1 – BLEND-AIR DOOR
2 – EVAPORATOR COIL
3 – PIVOT HOLE
4 – HEATER CORE

PANEL/DEMIST DOOR AND LEVER

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Remove the defrost and panel/demist door vacuum actuators from the heater-A/C housing. See Mode Door Vacuum Actuator in this group for the procedures.

(3) Insert a screwdriver into the latch hole (Fig. 44) of the panel/demist door pivot shaft to release the latch of the panel/demist door lever, and pull the lever out of the pivot shaft from the outside of the upper half of the heater-A/C housing.

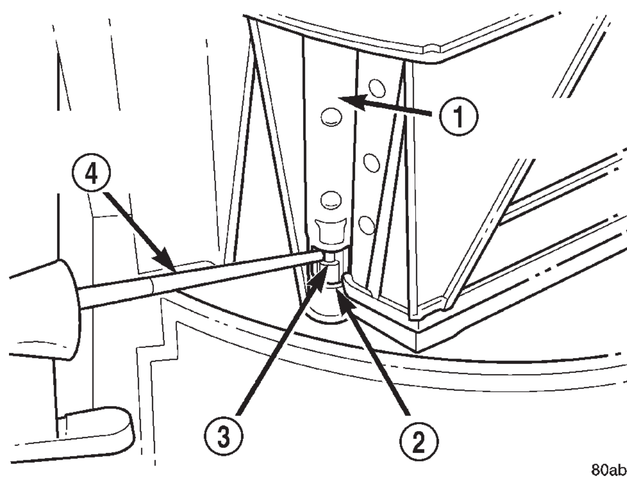


Fig. 44 Mode Door Lever Remove/Install - Typical

1 – DOOR PIVOT SHAFT
2 – LATCH HOLE
3 – CRANK ARM LATCH
4 – FLAT BLADE PRY TOOL

(4) Reach inside the upper half of the heater-A/C housing and carefully flex the panel/defrost door (Fig. 45) enough so that the door pivot clears the pivot hole in the housing.

(5) Remove the panel/demist door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

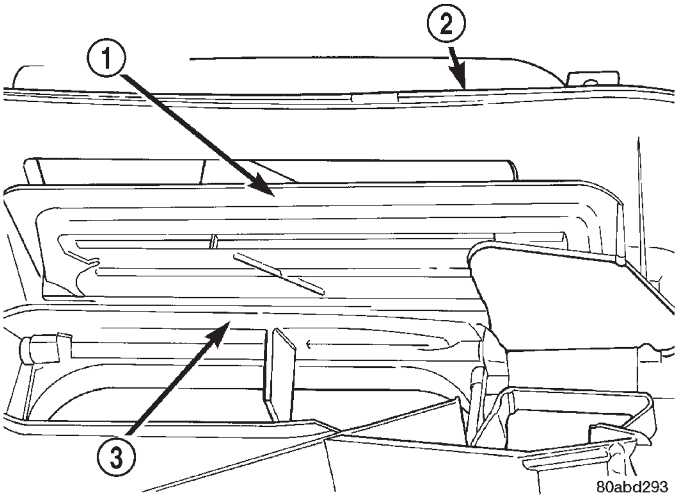


Fig. 45 Panel/Demist and Defrost Doors

1 – PANEL/DEMIST DOOR
2 – UPPER HEATER-A/C HOUSING
3 – DEFROST DOOR

DEFROST DOOR AND LEVER

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Remove the panel/demist door and lever from the upper heater-A/C housing. See Panel/Demist Door and Lever in this group for the procedures.

(3) Insert a screwdriver into the latch hole (Fig. 44) of the defrost door pivot shaft to release the latch of the defrost door lever, and pull the lever out of the pivot shaft from the outside of the upper half of the heater-A/C housing.

(4) Reach inside the upper half of the heater-A/C housing and carefully flex the defrost door (Fig. 45) enough so that the door pivot clears the pivot hole in the housing.

(5) Remove the defrost door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

FLOOR DOOR AND LEVER

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Remove the floor door vacuum actuator from the lower heater-A/C housing. See Mode Door Vacuum Actuator in this group for the procedures.

(3) Insert a screwdriver into the latch hole (Fig. 44) of the floor door pivot shaft to release the latch of the floor door lever, and pull the lever out of the pivot shaft from the outside of the lower half of the heater-A/C housing.

(4) Reach inside the lower half of the heater-A/C housing and carefully flex the floor door (Fig. 46) enough so that the door pivot clears the pivot hole in the housing.

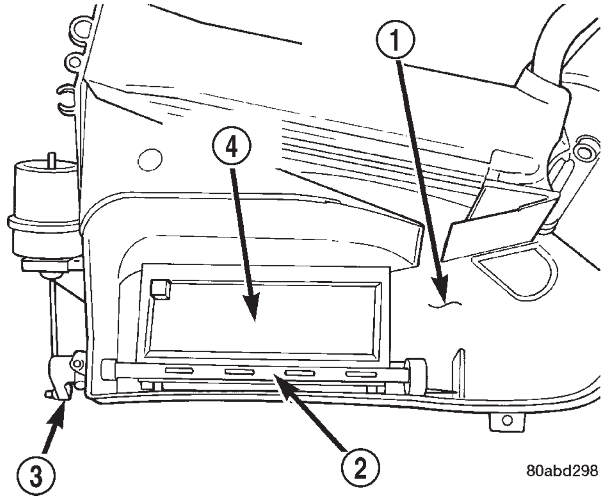


Fig. 46 Floor Door

1 – LOWER HEATER-A/C HOUSING
2 – PIVOT SHAFT
3 – CRANK ARM
4 – FLOOR DOOR

(5) Remove the floor door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

RECIRCULATION AIR DOOR

A recirculation air door and vacuum actuator are used only on models with the optional air conditioning system.

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Remove the recirculation air door vacuum actuator from the lower heater-A/C housing. See Mode Door Vacuum Actuator in this group for the procedures.

(3) Reach inside the lower half of the heater-A/C housing and lift the bottom edge of the recirculation air door upwards (Fig. 47).

(4) Guide the recirculation air door lever through the air intake grille of the heater-A/C housing while removing the door from the housing.

(5) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

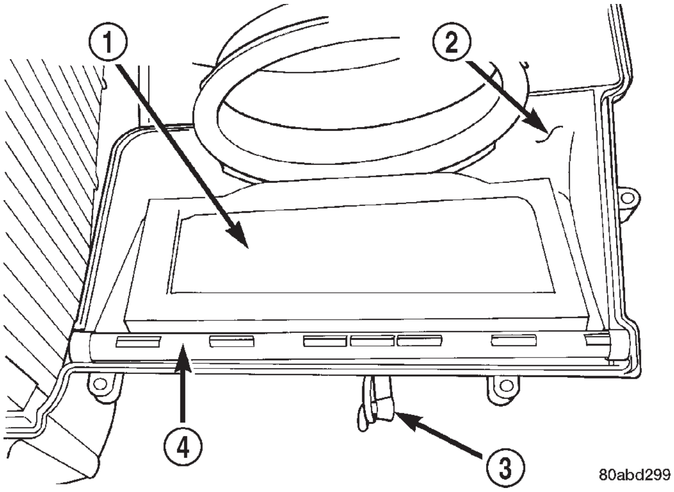


Fig. 47 Recirculation Air Door

1 – RECIRCULATION AIR DOOR
2 – LOWER HEATER-A/C HOUSING
3 – LEVER
4 – PIVOT SHAFT

HEATER CORE

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

(1) Remove and disassemble the heater-A/C housing. See Heater-A/C Housing in this group for the procedures.

(2) Lift the heater core out of the lower half of the heater-A/C housing (Fig. 48).

(3) Reverse the removal procedures to install. Be certain that the heater core foam insulator is reinstalled.

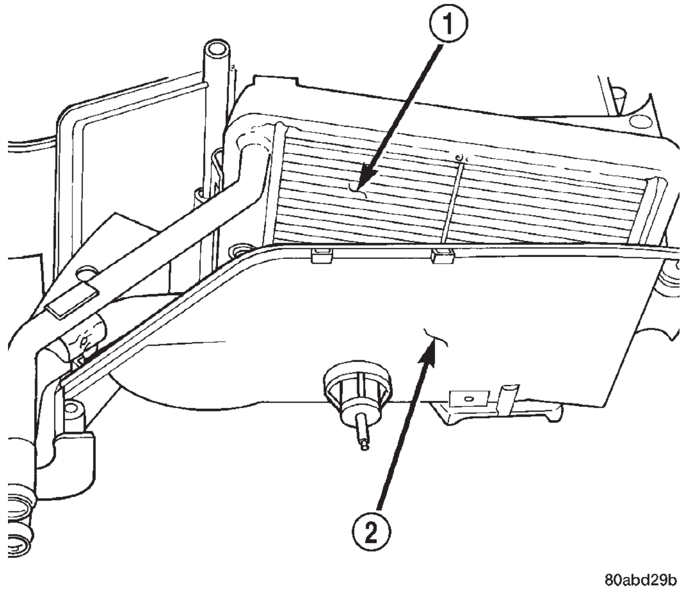


Fig. 48 Heater Core Remove/Install

1 – HEATER CORE
2 – LOWER HEATER-A/C HOUSING

LIQUID LINE

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

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. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(3) Disconnect the liquid line refrigerant line couplers at the evaporator inlet and the condenser outlet (Fig. 49). See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(4) Remove the liquid line from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the refrigerant line fittings on the liquid line, the evaporator inlet and the condenser outlet. Connect the liquid line to the evaporator inlet and condenser outlet refrigerant line couplers. See Refrigerant Line Coupler in this group for the procedures.

(2) Connect the battery negative cable.

REMOVAL AND INSTALLATION (Continued)

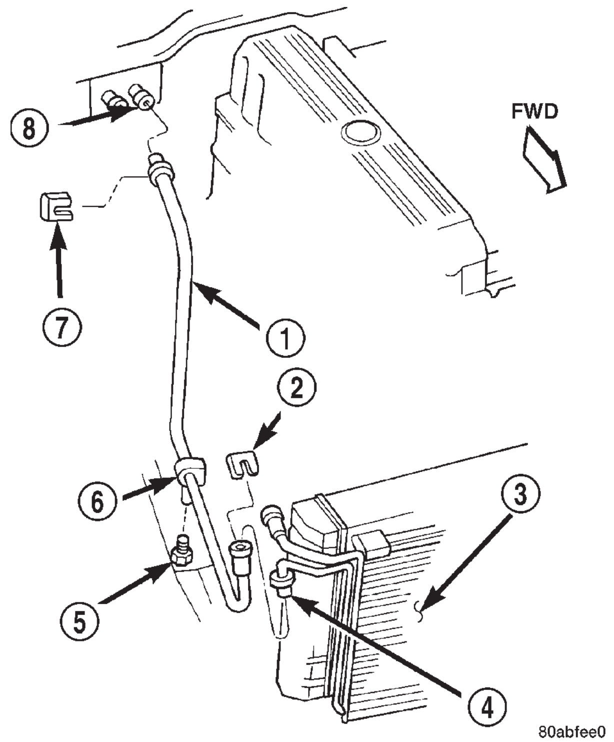


Fig. 49 Liquid Line Remove/Install

1 – LIQUID LINE WITH ORIFICE TUBE
2 – CLIP
3 – CONDENSER
4 – OUTLET TUBE
5 – STUD
6 – CLIP
7 – CLIP
8 – EVAPORATOR INLET

(3) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(4) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

LOW PRESSURE CYCLING CLUTCH SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the low pressure cycling clutch switch on the top of the accumulator (Fig. 50).

(3) Unscrew the low pressure cycling clutch switch from the fitting on the top of the accumulator.

(4) Remove the O-ring seal from the accumulator fitting and discard.

INSTALLATION

(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 compressor in the vehicle.

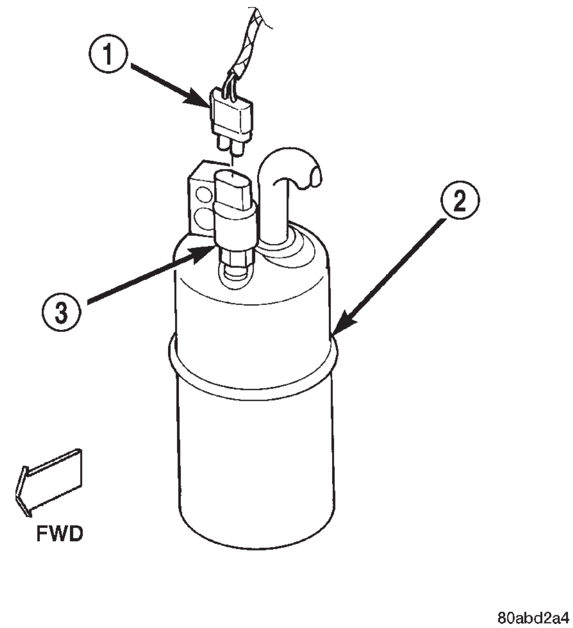


Fig. 50 Low Pressure Cycling Clutch Switch Remove/Install - Typical

1 – WIRE HARNESS CONNECTOR
2 – ACCUMULATOR
3 – LOW PRESSURE CYCLING CLUTCH SWITCH

(2) Install and tighten the low pressure cycling clutch switch on the accumulator fitting. The switch should be hand-tightened onto the accumulator fitting.

(3) Plug the wire harness connector into the low pressure cycling clutch switch.

(4) Connect the battery negative cable.

KICK COVER

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REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Loosen the two screws that secure the upper half of the kick cover to the heater-A/C housing

REMOVAL AND INSTALLATION (Continued)

under the passenger side end of the instrument panel (Fig. 51).

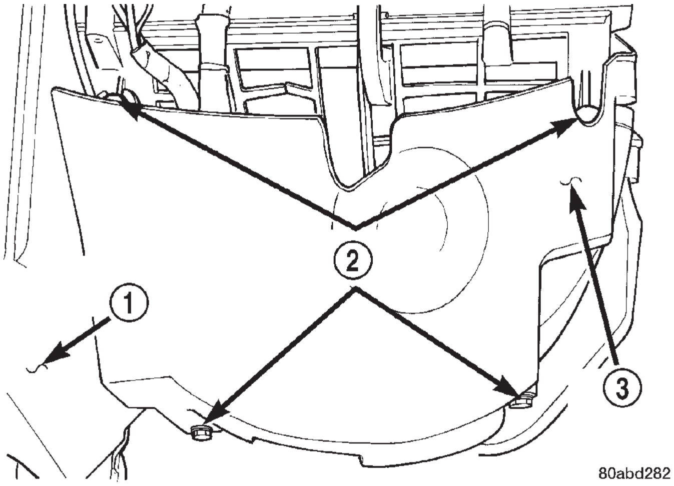

Fig. 51 Kick Cover Remove/Install

1 – HEATER-A/C HOUSING
2 – MOUNTING SCREWS
3 – KICK COVER

(3) Remove the two screws that secure the lower half of the kick cover to the heater-A/C housing.

(4) Pull the kick cover down towards the floor panel to disengage the slotted upper mounting tabs from under the two loosened heater-A/C housing screws.

(5) Remove the kick cover from the heater-A/C housing.

INSTALLATION

(1) Position the slotted upper kick cover mounting tabs under the heads of the two loosened heater-A/C housing screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(2) Install the two screws that secure the lower kick cover to the heater-A/C housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Connect the battery negative cable.

MODE DOOR VACUUM ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE 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.

DEFROST DOOR ACTUATOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(3) Unplug the two vacuum harness connectors from the defrost door actuator (Fig. 52).

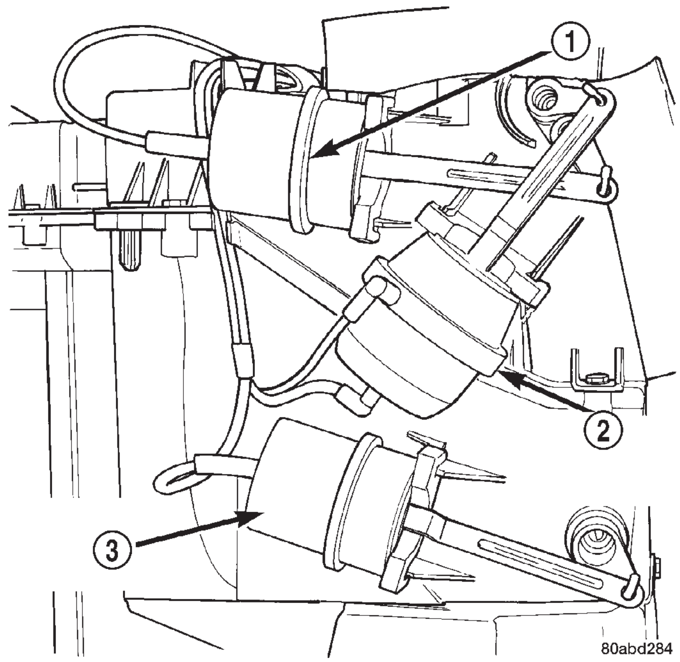

Fig. 52 Defrost, Floor, and Panel/Demist Door Vacuum Actuators

1 – PANEL/DEMIST DOOR ACTUATOR
2 – DEFROST DOOR ACTUATOR
3 – FLOOR DOOR ACTUATOR

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount (Fig. 53). Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount.

(5) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the defrost door lever.

(6) Remove the defrost door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

FLOOR DOOR ACTUATOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly from the vehicle. Refer to Instrument Panel Assembly in

REMOVAL AND INSTALLATION (Continued)

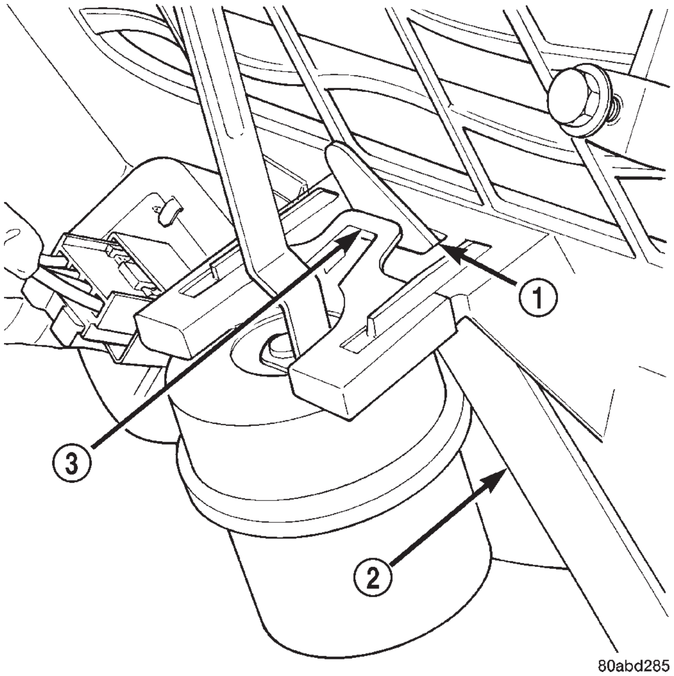

Fig. 53 Vacuum Actuator Remove/Install - Typical

1 – ACTUATOR MOUNT LATCH HOLE
2 – TRIM STICK
3 – ACTUATOR LATCH

Group 8E - Instrument Panel Systems for the procedures.

(3) Unplug the vacuum harness connector from the floor door actuator (Fig. 52).

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount (Fig. 53). Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount.

(5) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the floor door lever.

(6) Remove the floor door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

PANEL/DEMIST DOOR ACTUATOR

(1) Remove the defrost door actuator from the heater-A/C housing. See Defrost Door Actuator in this group for the procedures.

(2) Unplug the vacuum harness connector from the panel/demist door actuator (Fig. 52).

(3) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount (Fig. 53). Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount.

(4) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the panel/demist door lever.

(5) Remove the panel/demist door vacuum actuator from the vehicle.

(6) Reverse the removal procedures to install.

RECIRCULATION AIR DOOR ACTUATOR

A recirculation air door and vacuum actuator are used only on models with the optional air conditioning system.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the kick cover from the heater-A/C housing. See Kick Cover in this group for the procedures.

(3) Unplug the vacuum harness connector from the recirculation air door actuator (Fig. 54).

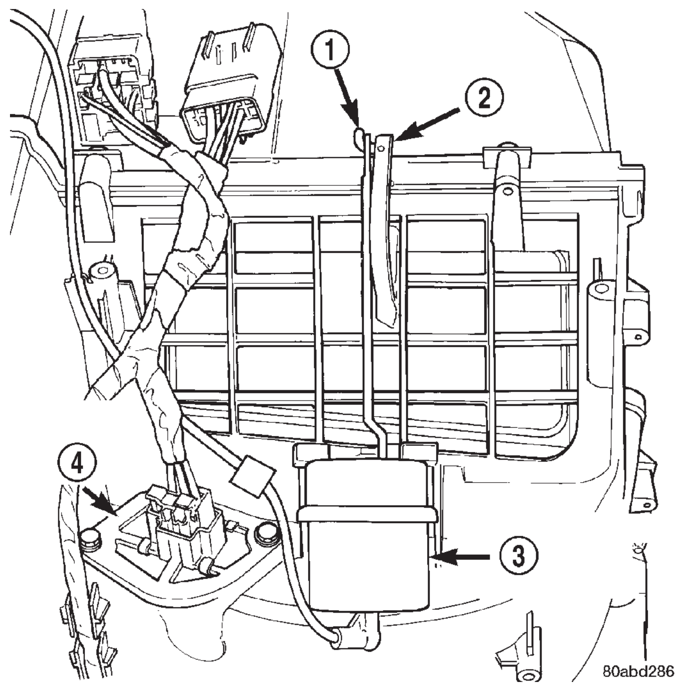

Fig. 54 Recirculation Air Door Vacuum Actuator Remove/Install

1 – HOOK
2 – LEVER
3 – RECIRCULATION AIR DOOR ACTUATOR
4 – BLOWER MOTOR RESISTOR

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount (Fig. 53). Gently pry the actuator latch while pulling firmly outwards on the actuator to remove the actuator from the mount.

(5) Rotate and tilt the vacuum actuator as required to disengage the hole on the end of the

REMOVAL AND INSTALLATION (Continued)

actuator link from the hooked pin on the end of the recirculation air door lever.

(6) Remove the recirculation air door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

REFRIGERANT LINE COUPLER

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE GENERAL INFORMATION SECTION NEAR THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in the Service Procedures section of this group.

(2) Remove the secondary clip from the spring-lock coupler.

(3) Fit the proper size A/C line disconnect tool (Special Tool Kit 7193) over the spring-lock coupler cage (Fig. 55).

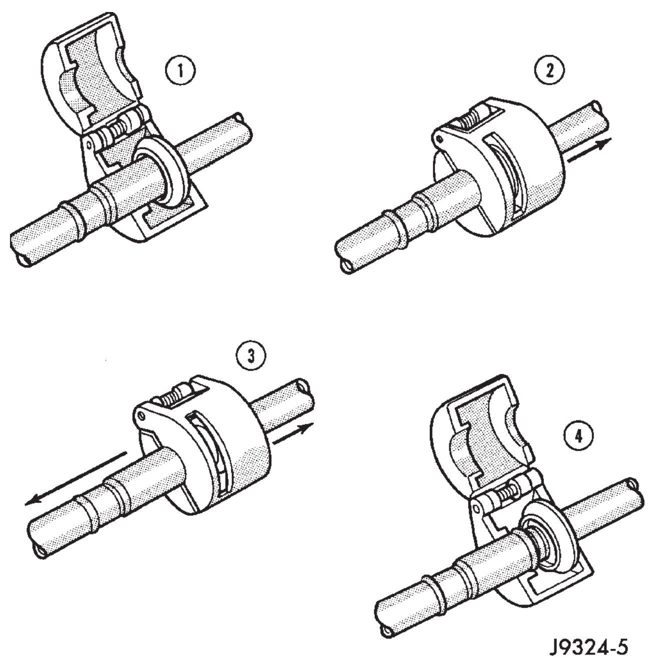

Fig. 55 Refrigerant Line Spring-Lock Coupler Disconnect

(4) Close the two halves of the A/C line disconnect tool around the spring-lock coupler.

(5) Push the A/C line disconnect tool into the open side of the coupler cage to expand the garter spring. Once the garter spring is expanded and while still pushing the disconnect tool into the open side of the coupler cage, pull on the refrigerant line attached to the female half of the coupler fitting until the flange on the female fitting is separated from the garter spring and cage on the male fitting within the disconnect tool.

NOTE: The garter spring may not release if the A/C line disconnect tool is cocked while pushing it into the coupler cage opening.

(6) Open and remove the A/C line disconnect tool from the disconnected spring-lock coupler.

(7) Complete the separation of the two halves of the coupler fitting.

INSTALLATION

(1) Check to ensure that the garter spring is located within the cage of the male coupler fitting, and that the garter spring is not damaged.

(a) If the garter spring is missing, install a new spring by pushing it into the coupler cage opening.

(b) If the garter spring is damaged, remove it from the coupler cage with a small wire hook (DO NOT use a screwdriver) and install a new garter spring.

(2) Clean any dirt or foreign material from both halves of the coupler fitting.

(3) Install new O-rings on the male half of the coupler fitting.

CAUTION: Use only the specified O-rings as they are made of a special material for the R-134a system. The use of any other O-rings may allow the connection to leak intermittently during vehicle operation.

(4) Lubricate the male fitting and O-rings, and the inside of the female fitting with clean R-134a refrigerant oil. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(5) Fit the female half of the coupler fitting over the male half of the fitting.

(6) Push together firmly on the two halves of the coupler fitting until the garter spring in the cage on the male half of the fitting snaps over the flanged end on the female half of the fitting.

(7) Ensure that the spring-lock coupler is fully engaged by trying to separate the two coupler halves. This is done by pulling the refrigerant lines on either side of the coupler away from each other.

(8) Reinstall the secondary clip over the spring-lock coupler cage.

SUCTION AND DISCHARGE LINE

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose.

REMOVAL AND INSTALLATION (Continued)

In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

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. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(3) Unplug the wire harness connector from the high pressure cut-off switch.

(4) Disconnect the discharge line refrigerant line fitting from the condenser inlet tube (Fig. 56). See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the nut that secures the suction line block fitting to the accumulator outlet. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Remove the screw that secures the suction and discharge line manifold to the compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Remove the suction and discharge line assembly from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the suction and discharge line manifold and the compressor. Install the suction and discharge line manifold to the compressor. Tighten the mounting screw to 28 N·m (250 in. lbs.).

(2) Remove the tape or plugs from the suction line and the accumulator outlet block fittings. Install the suction line to the accumulator outlet and tighten the mounting nut to 9 N·m (80 in. lbs.).

(3) Remove the tape or plugs from the refrigerant line fittings on the discharge line and the condenser inlet tube. Connect the discharge line refrigerant line coupler to the condenser inlet tube. See Refrigerant Line Coupler in this group for the procedures.

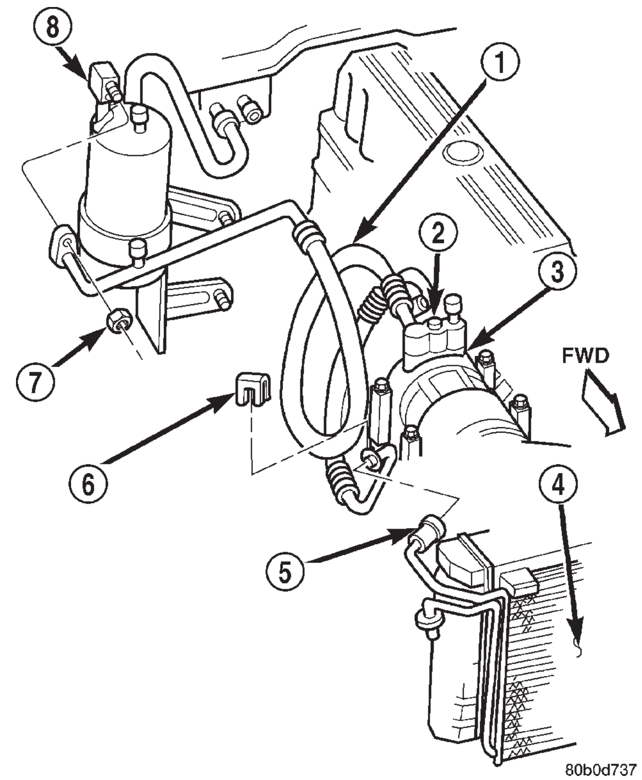

Fig. 56 Suction and Discharge Line

1 – SUCTION AND DISCHARGE LINE
2 – SCREW
3 – COMPRESSOR
4 – CONDENSER
5 – INLET
6 – CLIP
7 – HEX NUT
8 – ACCUMULATOR

(4) Plug in the wire harness connector to the high pressure cut-off switch.

(5) Connect the battery negative cable.

(6) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(7) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

VACUUM CHECK VALVE

(1) Unplug the heater-A/C vacuum supply line connector at the vacuum check valve (Fig. 57).

(2) Note the orientation of the check valve in the vacuum supply line for correct reinstallation.

(3) Unplug the vacuum check valve from the vacuum supply line fittings.

(4) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

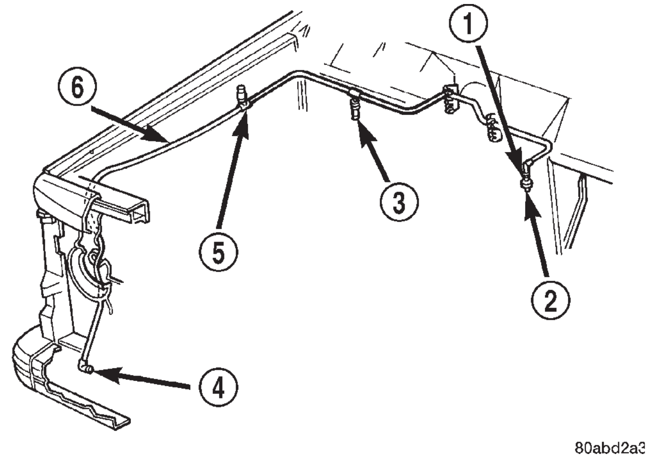

Fig. 57 Vacuum Supply

1 – VACUUM CHECK VALVE
2 – TO ENGINE INTAKE MANIFOLD
3 – TO HEATER-A/C CONTROLS
4 – TO VACUUM RESERVOIR
5 – TO SPEED CONTROL SERVO
6 – VACUUM SUPPLY LINE

VACUUM RESERVOIR

(1) Remove the passenger side bumper end cap from the front bumper. Refer to Group 23 - Body for the procedures.

(2) Unplug the vacuum supply line connector from the vacuum reservoir (Fig. 58).

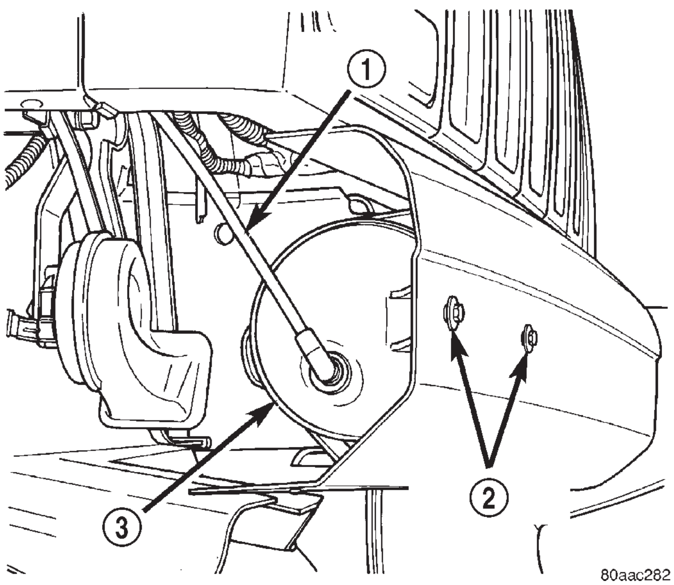

Fig. 58 Vacuum Reservoir Remove/Install

1 – VACUUM LINE
2 – RESERVOIR SCREWS
3 – VACUUM RESERVOIR

(3) Remove the two screws that secure the vacuum reservoir to the front bumper.

(4) Remove the vacuum reservoir from behind the front bumper.

(5) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

SPECIFICATIONS

A/C APPLICATION TABLE

Item	Description	Notes
Vehicle	XJ Cherokee/ Laredo	
System	R134a w/orifice tube	
Compressor	Sanden SD7H15	SP-20 PAG oil
Freeze–up Control	Low Pressure cycling cutout switch	accumulator mounted
Low psi Control	opens < 25 psi - resets > 43 psi	
High psi Control	switch - opens > 450-490 psi - resets < 270-330 psi	discharge line
Control Head	manual type	
Mode Door	vacuum	
Blend-Air Door	electric	
Fresh/Recirc door	vacuum	
Blower Motor	hardwired to control head	resistor block
Cooling Fan	viscous for cooling, single speed electric for A/C	
Clutch		
Control	relay	PCM
Draw	2 - 3.7 amps @ 12V	± 0.5V @ 70° F
Gap	0.016” - 0.031″	
DRB III®		
Reads	TPS, RPM, A/C switch test	
Actuators	clutch and fan relay	

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