Welcome to the

1999 Jeep® Grand Cherokee

Electronic Service Manual

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DaimlerChrysler
International Operations

SPECIFICATIONS (Continued)

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

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belt (4.0L only).
- Drain and refill automatic transmission fluid and change filter.
- Drain and refill transfer case fluid.
- Lubricate upper knuckle ball stud.

37,500 Miles (60 000 km) or at 30 months

- Change engine oil.
- Replace engine oil filter.

45,000 Miles (72 000 km) or at 36 months

- Change engine oil.
- Replace engine oil filter.
- Inspect brake linings.
- Flush and replace engine coolant at 36 months, regardless of mileage.
- Lubricate upper knuckle ball stud.

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.

60,000 Miles (96 000 km) or at 48 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- **Inspect PCV valve and replace if necessary (4.7L only).***
- Inspect and adjust drive belt (4.0L only).
- Drain and refill automatic transmission fluid and change filter.
- Drain and refill transfer case fluid.
- Lubricate upper knuckle ball stud.

67,500 Miles (108 000 km) or at 54 months

- Change engine oil.
- Replace engine oil filter.
- Inspect brake linings

75,000 Miles (120 000 km) or at 60 months

- Change engine oil.
- Replace engine oil filter.
- Lubricate upper knuckle ball stud.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

82,500 Miles (132 000 km) or at 66 months

- Change engine oil.
- Replace engine oil filter.
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.

90,000 Miles (144 000 km) or at 72 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- Inspect and adjust drive belt (4.0L only).
- Inspect and replace drive belt if needed (4.7L only).
- Drain and refill automatic transmission fluid and change filter.
- Drain and refill transfer case fluid.
- Inspect brake linings.
- Lubricate upper knuckle ball stud.

97,500 Miles (156 000 km) or at 78 months

- Change engine oil.
- Replace engine oil filter.

105,000 Miles (168 000 km) or at 84 months

- Change engine oil.
- Replace engine oil filter.
- Inspect and replace drive belt if not previously replaced (4.7L only).
- Flush and replace engine coolant if it has been 30,000 miles (48 000 km) or 24 months since last change.
- Lubricate upper knuckle ball stud.

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.

120,000 Miles (192 000 km) or at 96 months

- Change engine oil.
- Replace engine oil filter.
- **Replace engine air cleaner element.**
- **Replace spark plugs.**
- **Inspect PCV valve and replace if necessary (4.7L only).***
- Inspect and adjust drive belt (4.0L only).
- Inspect and replace drive belt if not previously replaced (4.7L only).
- Drain and refill automatic transmission fluid and change filter.
- Drain and refill transfer case fluid.

REAR SUSPENSION

INDEX

DESCRIPTION AND OPERATION

REAR SUSPENSION

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

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

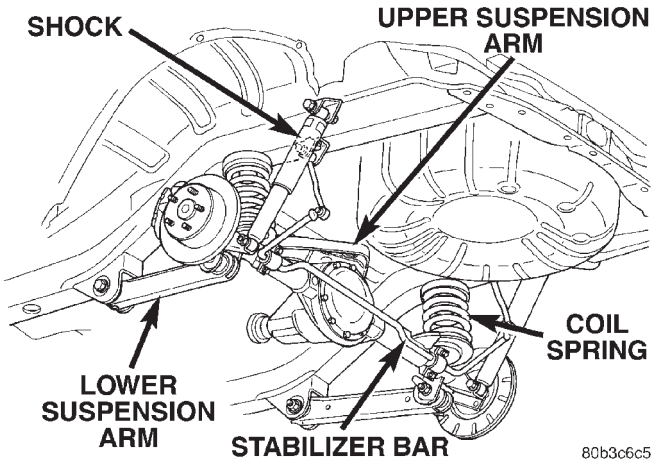


Fig. 1 Rear Suspension

CAUTION: Suspension components with rubber/ urethane bushings 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. This will maintain vehicle ride comfort and prevent premature bushing wear.

SHOCK ABSORBERS

DESCRIPTION

The top of the shock absorbers are bolted to the body. The bottom of the shocks are bolted to the axle brackets. The standard shocks have conventional twin tube construction and are low pressure gas charged. Gas charging prevents cavitation during rough road operation. Up-Country shocks are mono tube design and are high pressure gas charged.

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 mounted inside the coil spring, between the axle and the frame rail, to minimize transmission of noise to the passenger compartment.

OPERATION

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

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 body. The bottom of the spring seats on a axle isolator

DIAGNOSIS AND TESTING (Continued)

FRONT AXLES

DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces.	1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 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 excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

ADJUSTMENTS (Continued)

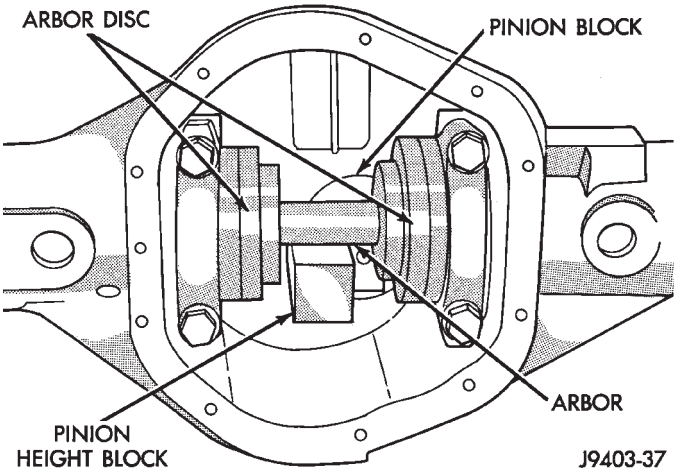


Fig. 58 Gauge Tools In Housing—Typical

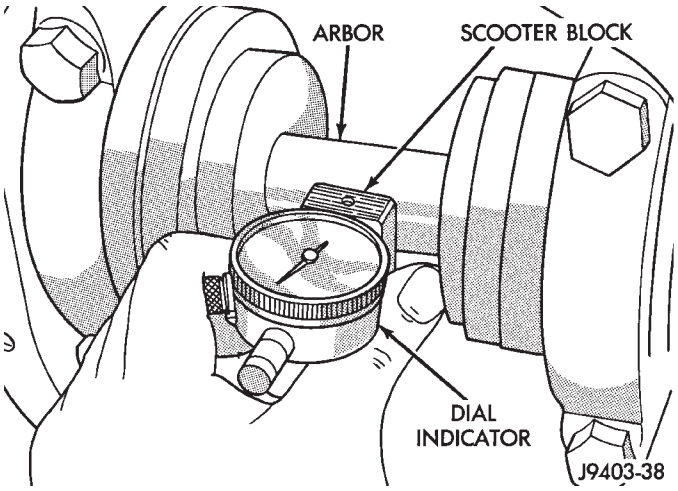


Fig. 59 Pinion Gear Depth Measurement—Typical

(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. 56). 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. 59). 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. 54). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

NOTE: If an oil slinger is used behind the inner pinion bearing cone, deduct the thickness of the slinger from the dial indicator reading and use that total for shim selection.

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 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 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. 60). Differential shim measurements are performed with axle spreader W-129-B removed.

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. 61).

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 62) and (Fig. 63).

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 64).

REMOVAL AND INSTALLATION (Continued)

AXLE SHAFT SEAL AND BEARING

REMOVAL

(1) Remove axle shaft from vehicle.

(2) Using a 3/8 in. dia. drill bit, drill a shallow hole into soft steel axle bearing retaining ring (Fig. 25). If possible, use a drill depth stop to avoid marking axle.

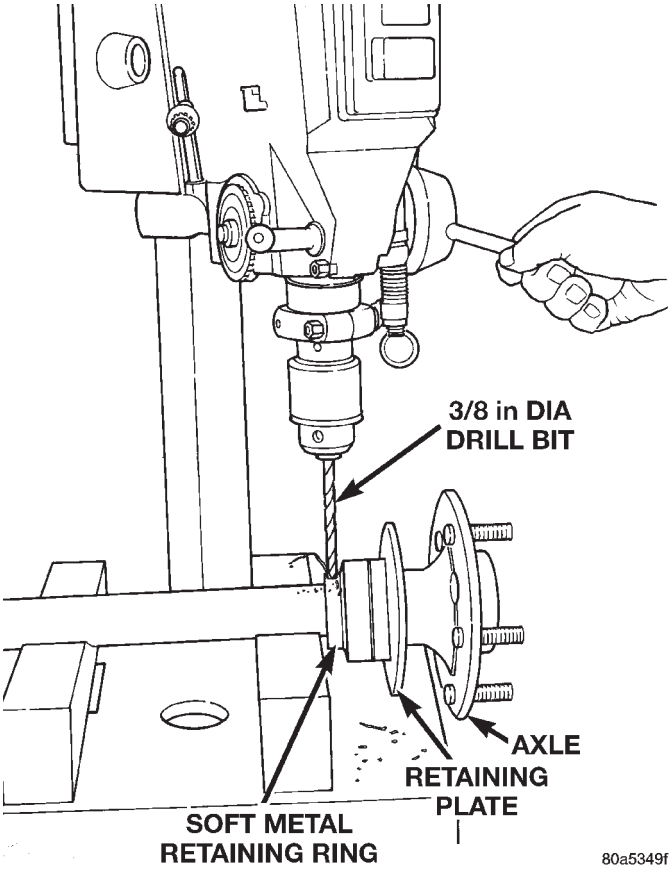


Fig. 25 Drill Retaining Ring

(3) Using a suitable cold chisel, cut retaining ring across drilled hole. (Fig. 26)

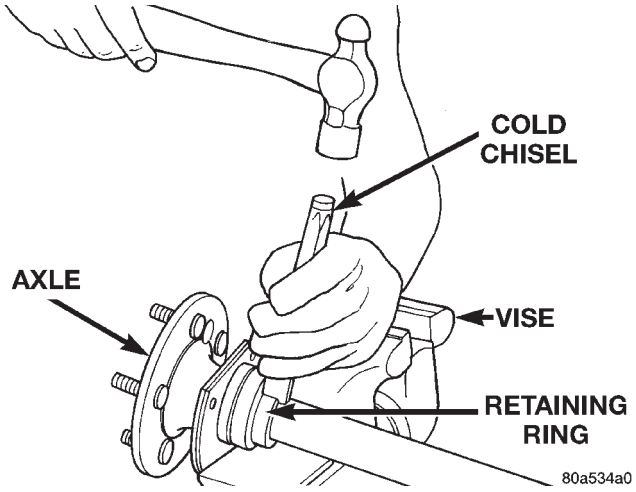


Fig. 26 Cut Retaining Ring

(4) Slide retaining ring from axle shaft.

(5) Using Splitter 1130 placed between the seal and bearing and a suitable Arbor Press, press unit bearing from axle shaft (Fig. 27).

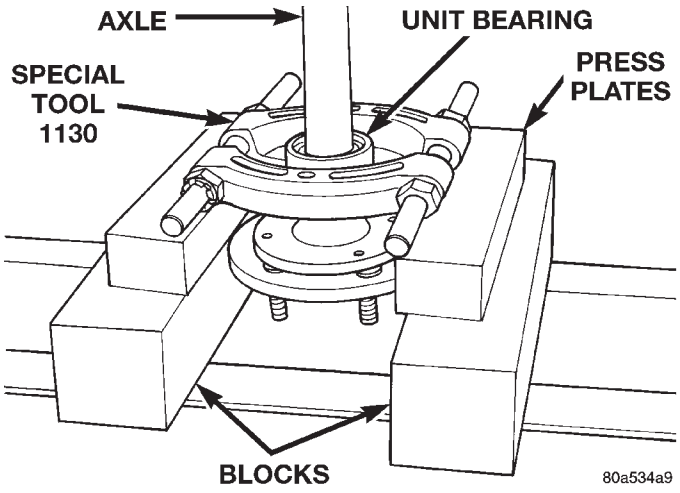


Fig. 27 Axle Bearing and Seal Remove

(6) Slide seal from axle.

(7) Slide retaining plate from axle shaft.

INSTALLATION

(1) Using a suitable straight edge, verify flatness of axle shaft retaining plate. Replace plate if warped.

(2) Install retaining plate on axle (Fig. 28).

(3) Apply a coat of multi-purpose grease on sealing surface of axle seal.

(4) Install seal on axle with cavity away from retaining plate (Fig. 28).

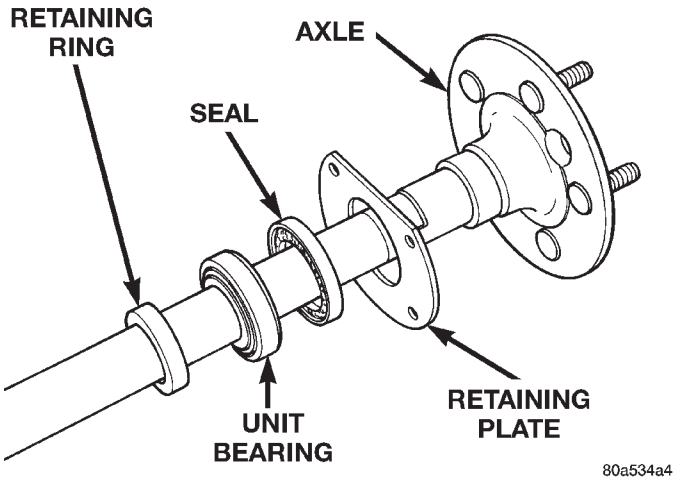


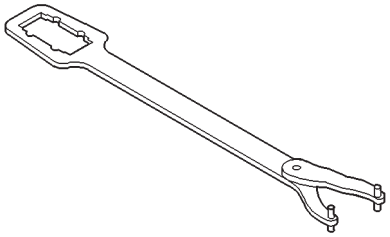
Fig. 28 Axle Bearing and Seal Components

(5) Lubricate bearing with Mopar® Wheel Bearing Grease, or equivalent. Wipe excess grease from outside of bearing.

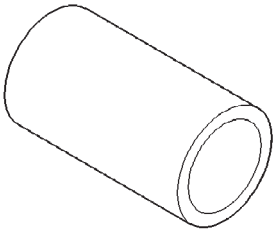
(6) Slide bearing onto axle shaft with groove in outer surface toward seal (Fig. 28).

(7) Using Installer 7913 and shop press, press bearing onto axle shaft (Fig. 29).

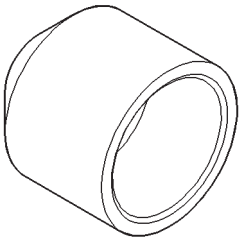
SPECIAL TOOLS (Continued)



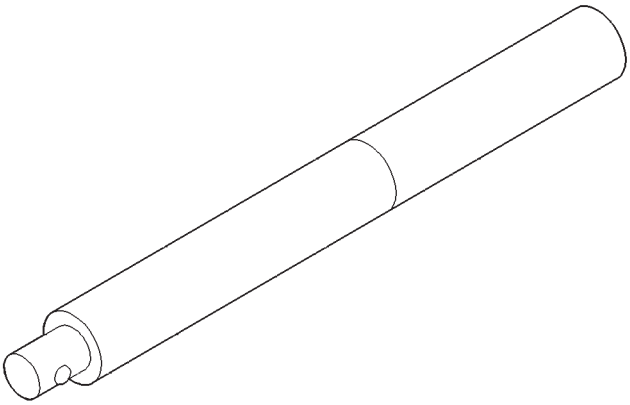
Wrench—C-3281



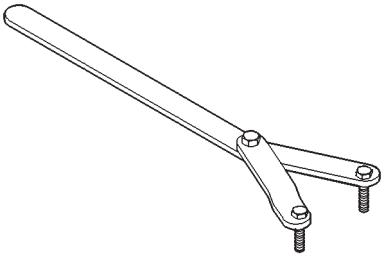
Cup—8109



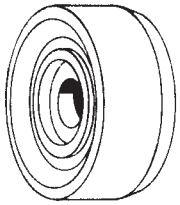
Installer—C-3972-A



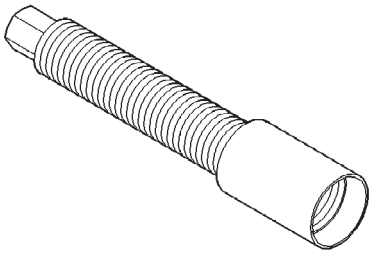
Handle—C-4171



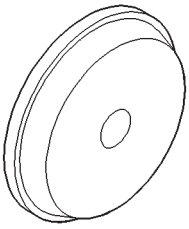
Spanner—6958



Driver—C-3716-A



Installer Screw—8112



Installer—D-130

REMOVAL AND INSTALLATION (Continued)

(6) Remove the pinion gear from housing (Fig. 46). Catch the pinion with your hand to prevent it from falling and being damaged.

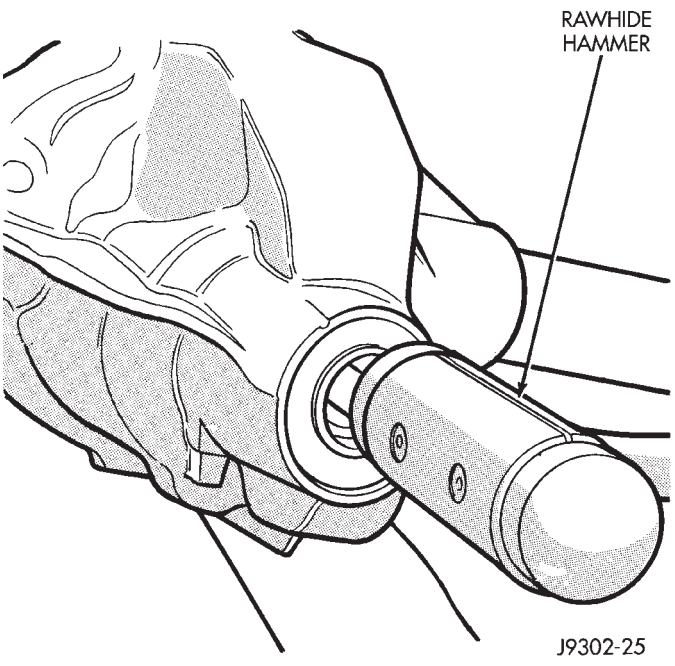


Fig. 46 Remove Pinion Gear

(7) Remove the pinion seal with a slide hammer or pry out with bar.

(8) Remove oil slinger, if equipped, and the front pinion bearing.

(9) Remove the front pinion bearing cup with Remover D-103 and Handle C-4171 (Fig. 47).

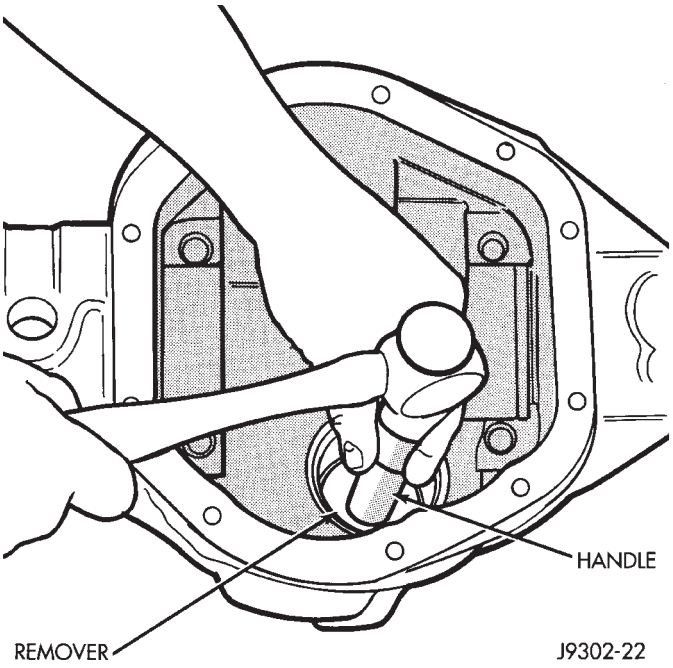


Fig. 47 Front Bearing Cup Removal

(10) Remove the rear bearing cup from housing (Fig. 48). Use Remover C-4307 and Handle C-4171.

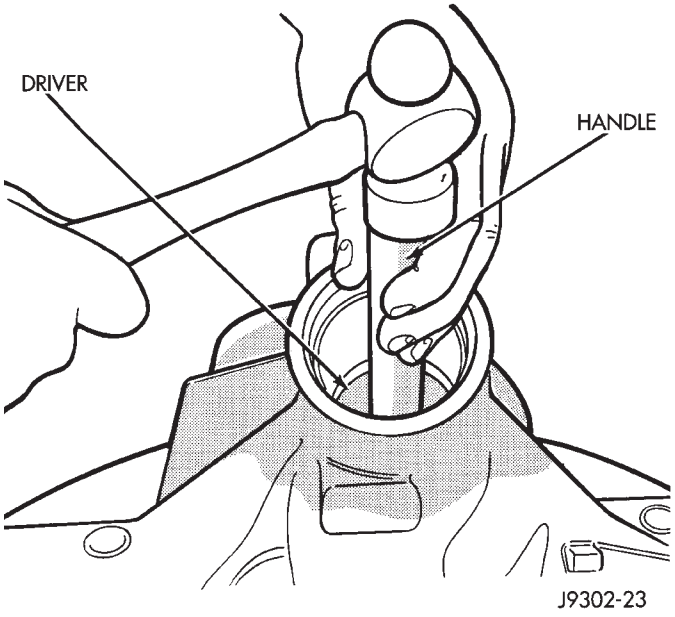


Fig. 48 Rear Bearing Cup Removal

(11) Remove the collapsible preload spacer (Fig. 49).

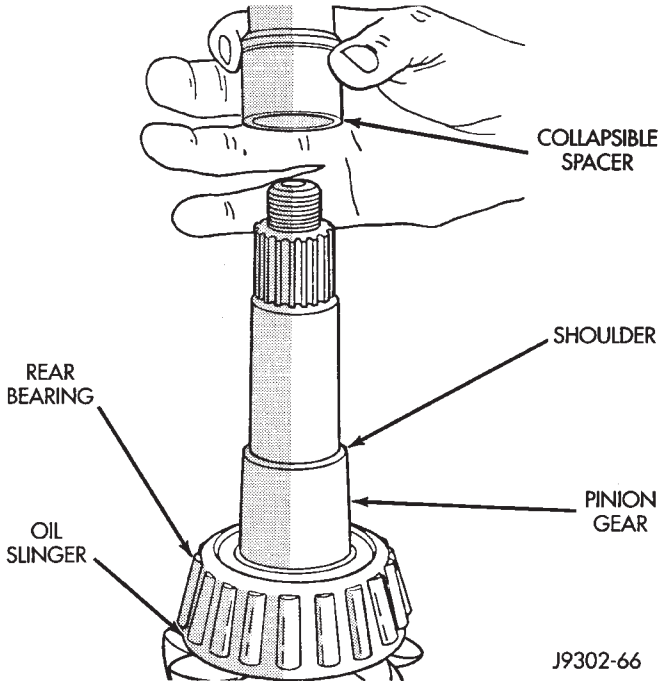


Fig. 49 Collapsible Spacer

(12) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-42 (Fig. 50).

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

DESCRIPTION AND OPERATION (Continued)

pulsed. This increases the pressure to the rear brakes. This will continue until the required slip difference is obtained. At the end of EBD braking (no brake application) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EBD will remain functional during many ABS fault modes. If the red and amber warning lamps are illuminated the EBD may have a fault.

RED BRAKE WARNING LAMP

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument cluster. The red warning light alerts the driver if the fluid level is low 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.

A red warning lamp with a amber warning lamp may indicate a electronic brake distribution fault.

POWER BRAKE BOOSTER

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.

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is

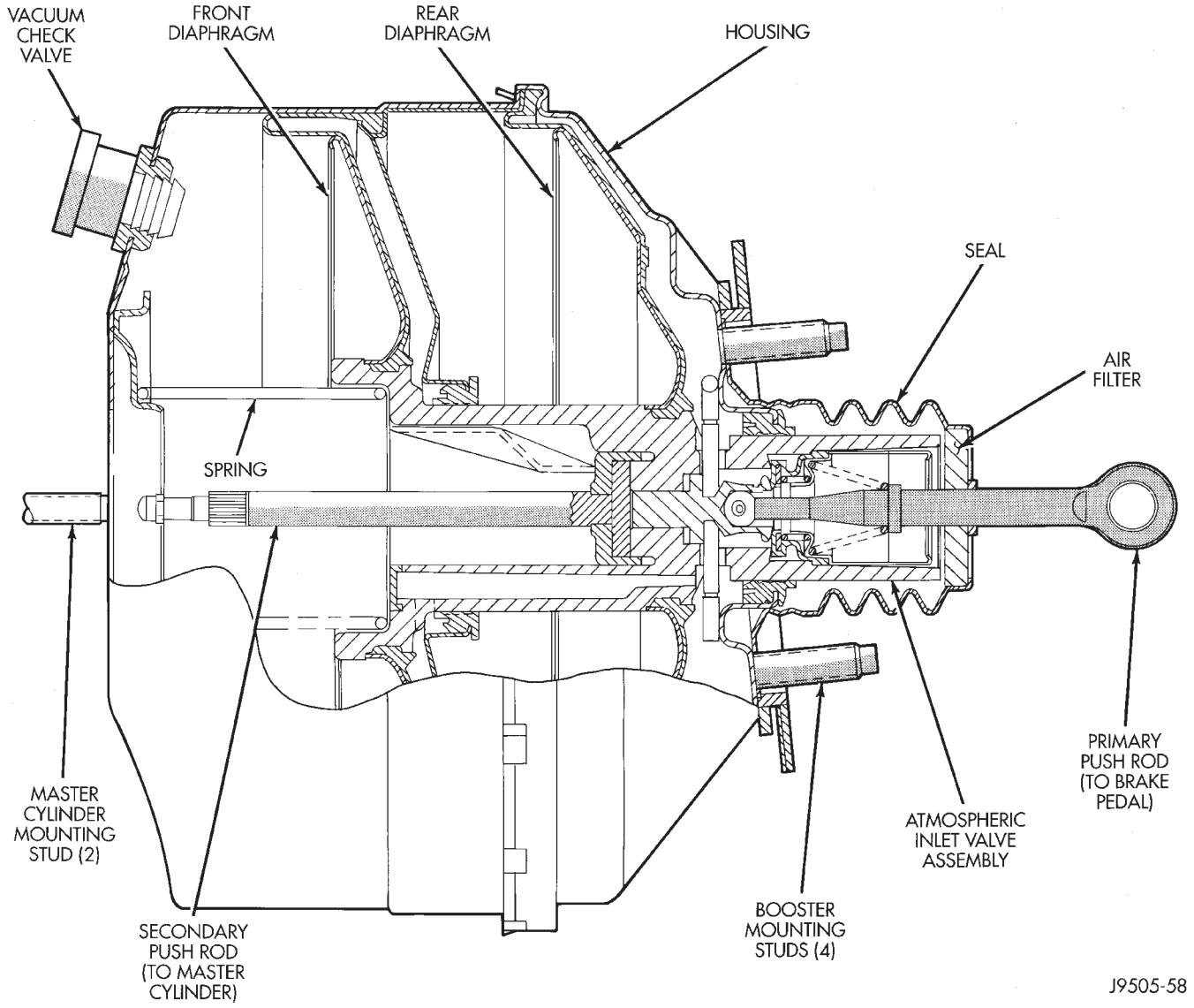


Fig. 1 Power Brake Booster–Typical

REMOVAL AND INSTALLATION (Continued)

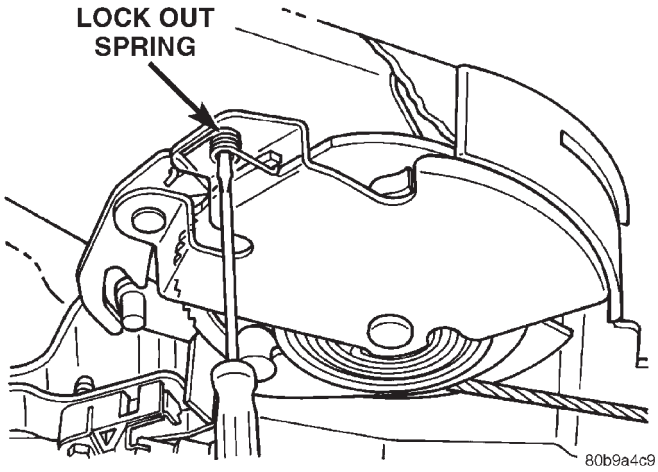


Fig. 53 Lock Out Spring

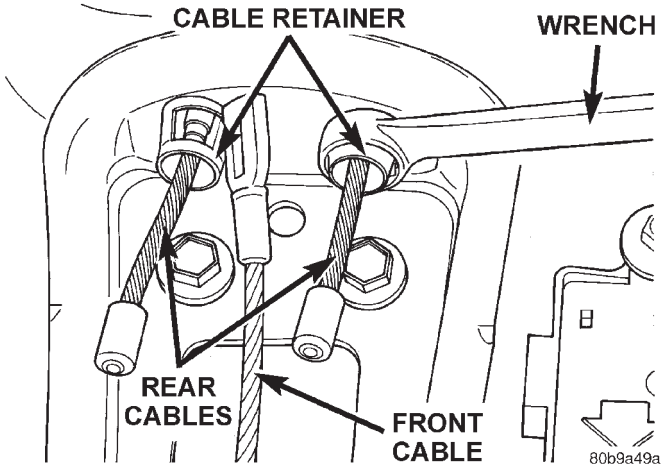


Fig. 54 Cable Retainers

(8) Remove the wheel and tire assemblies.

(9) Remove the brake calipers, caliper anchors and rotors.

(10) Remove the ABS sensor wiring harness (Fig. 55) from the rear brake cables.

(11) Remove the cable retainer bolts (Fig. 55) from the rear spring pads.

(12) Pull the cables out of the upper suspension arm brackets.

(13) Push the cable in and lift up the end of cable with a small screw driver to disengage the cable from the parking brake actuator (Fig. 56).

(14) Remove the cable from the vehicle.

INSTALLATION

(1) Install the cables through the caliper anchor mount. Then push the end of cable strand in to engage the cable end to the parking brake actuator.

(2) Feed the other end of the cables through the body and into the equalizer bracket (Fig. 57).

(3) Push the cables into the upper suspension arm brackets.

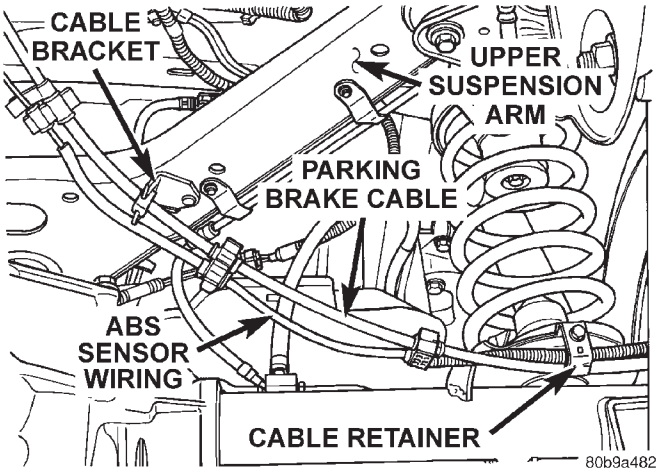


Fig. 55 Left Rear Parking Brake Cable

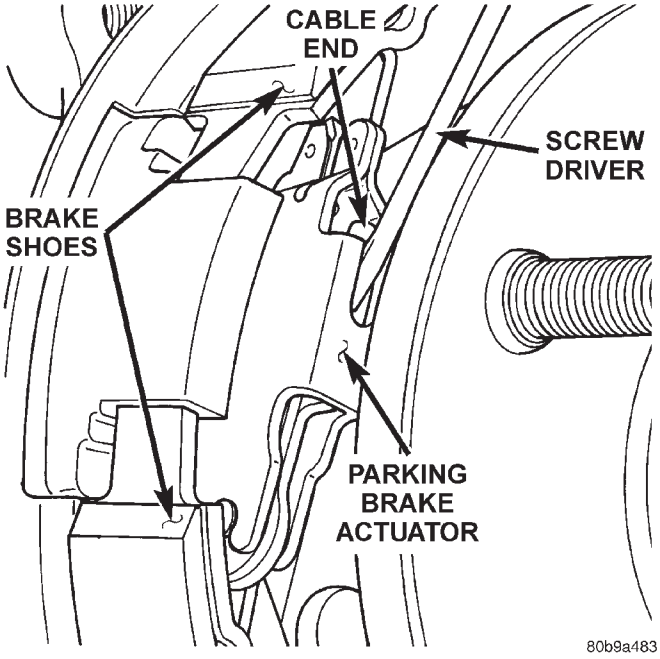


Fig. 56 Parking Brake Actuator

(4) Install the cable retainer bolts to the rear spring pads.

(5) Install the ABS sensor wiring harness to the rear brake cables.

(6) Install the rotors, caliper anchors and brake calipers.

(7) Install the wheel and tire assemblies.

(8) Remove support and lower the vehicle.

(9) Engage the cable ends into the parking brake equalizer.

(10) Pull on the lever to release the lock out spring.

(11) Install center console, refer to Group 23 Body.

(12) Fold down the rear carpet cover and rear seat.

(13) Verify parking brake operation.

DESCRIPTION AND OPERATION (Continued)

with a 68 percent antifreeze concentration, which prevents freezing down to -67.7 deg. C (-90 deg. F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

100 Percent Ethylene-Glycol—Should Not Be Used in Chrysler Vehicles

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149 deg. C (300) deg. F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22 deg. C (-8 deg. F).

Propylene-glycol Formulations—Should Not Be Used in Chrysler Vehicles

Propylene-glycol formulations do not meet Chrysler coolant specifications. It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32 deg. C (-26 deg. F). 5 deg. C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125 deg. C (257 deg. F) at 96.5 kPa (14 psi), compared to 128 deg. C (263 deg. F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up in Chrysler vehicles, which are designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/Ethylene-glycol Mixtures—Should Not Be Used in Chrysler Vehicles

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

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

COOLANT SELECTION AND ADDITIVES

The presence of aluminum components in the cooling system requires strict corrosion protection. Maintain coolant at specified level with a mixture of ethylene-glycol based antifreeze and water. Chrysler Corporation recommends Mopar Antifreeze or equivalent. If coolant becomes contaminated or looses color, drain and flush cooling system and fill with correctly mixed solution.

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

RADIATOR PRESSURE CAP

All radiators are equipped with a pressure cap. This cap releases pressure at some point within a range of 124-to-145 kPa (18-to-21 psi). The pressure relief point (in pounds) is engraved on top of the cap (Fig. 11).

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 (Fig. 11) contains a spring-loaded pressure relief valve. This valve opens when system pressure reaches the release range of 124-to-145 kPa (18-to-21 psi).

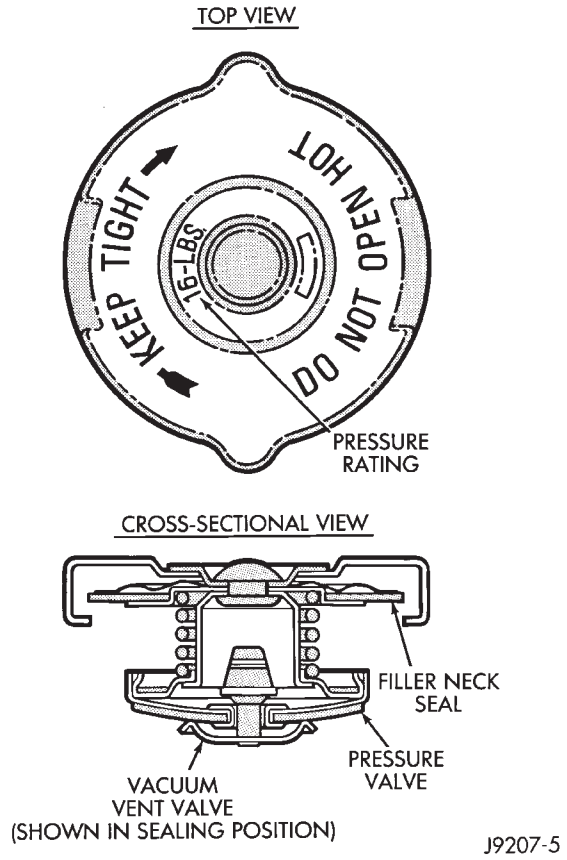


Fig. 11 Radiator Pressure Cap—Typical

REMOVAL AND INSTALLATION (Continued)

WATER PUMP—4.7L ENGINE

The water pump on 4.7L engines is bolted directly to the engine timing chain case/cover.

A gasket is used as a seal between the water pump and timing chain case/cover.

If water pump is replaced because of bearing/shaft damage, or leaking shaft seal, the mechanical cooling fan assembly should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan if any of these conditions are found. Also check condition of the thermal viscous fan drive. Refer to Viscous Fan Drive in this group.

The water pump can be removed without discharging the air conditioning system (if equipped).

REMOVAL

(1) Disconnect negative battery cable from battery.

(2) Drain cooling system. Refer to Draining Cooling System in this group.

Do not waste reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

(3) The thermal viscous fan drive is attached (threaded) to the water pump hub shaft. Remove fan/viscous fan drive assembly from water pump by turning mounting nut counterclockwise as viewed from front. Threads on viscous fan drive are **RIGHT HAND.** Using special tool spanner wrench 6958 with adapter pins 8346 and a suitable fan wrench loosen the fan drive (Fig. 31). Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

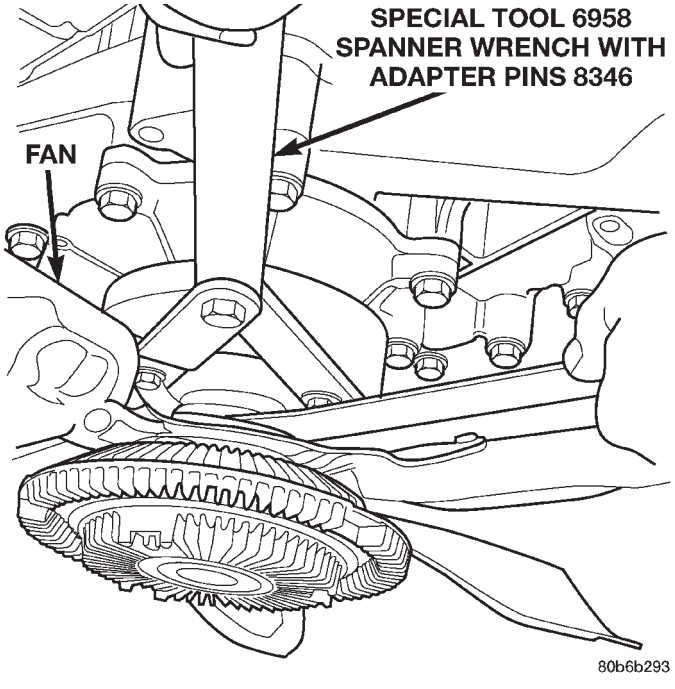


Fig. 31 Viscous Fan and Fan Drive 4.7L

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). 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. If replacement is necessary, use only an original equipment clamp with matching number or letter.

(4) If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.

(5) Remove two fan shroud-to-radiator nuts (Fig. 32). Do not attempt to remove fan shroud at this time.

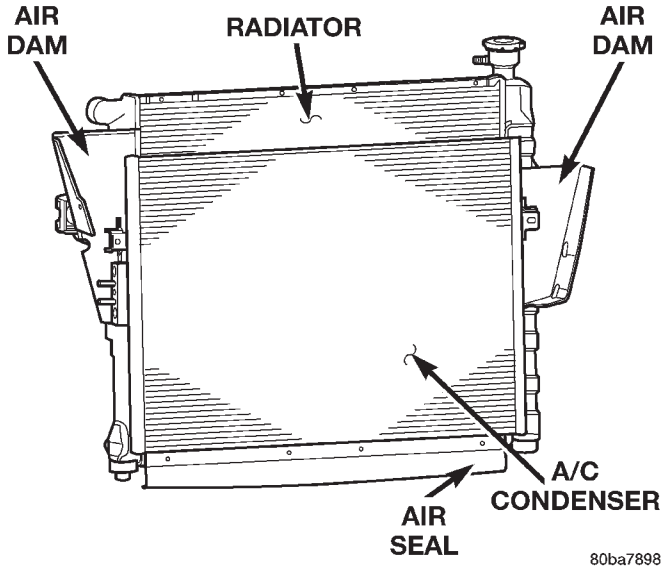


Fig. 32 Fan Shroud Nuts

(6) Remove fan shroud and fan blade/viscous fan drive assembly from vehicle as a complete unit.

(7) 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.

(8) **Do not** remove water pump pulley bolts at this time.

(9) Remove accessory drive belt as follows: The drive belt is equipped with a spring loaded automatic belt tensioner. Relax tension from belt by rotating tensioner clockwise (as viewed from front) (Fig. 33). When all belt tension has been relaxed, remove accessory drive belt.

DESCRIPTION AND OPERATION (Continued)

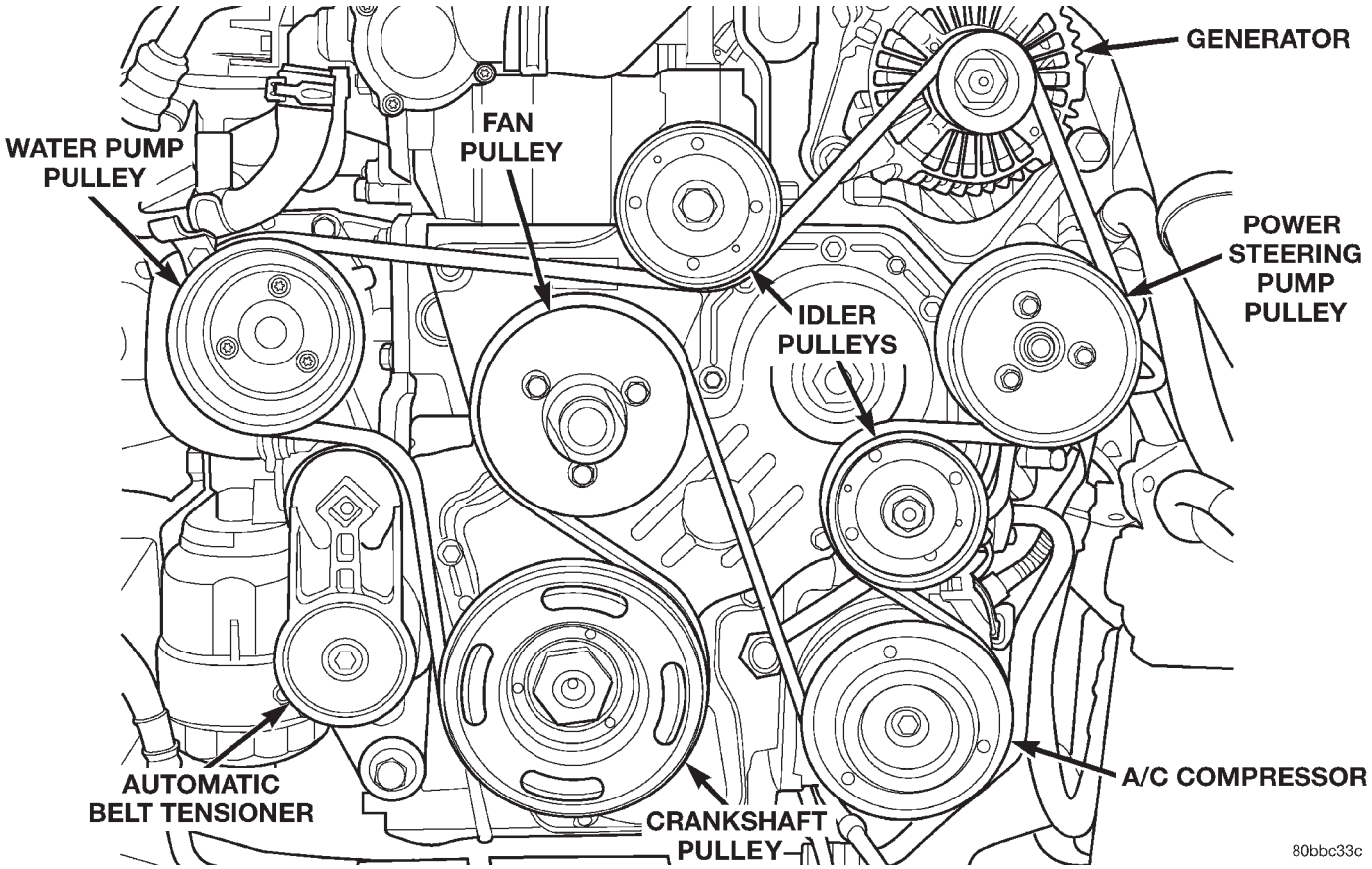


Fig. 8 Automatic Belt Tensioner Assembly

DIAGNOSIS AND TESTING

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:

(1) 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.

(2) TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

(3) 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
- Brakes (possibly dragging)
- Changed parts (incorrect water pump)
- 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.

CLEANING AND INSPECTION (Continued)

CLEANING

Drain cooling system and refill with water. Run engine with coolant tank pressure/vent cap installed until upper radiator hose is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine and drain system. Repeat until water drains clean.

REVERSE FLUSHING

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.

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 90-to-117 kPa (13-to-17 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the coolant tank and 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 water 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.

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 new replacement rubber seal. Refer to Thermostat Installation. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture.

CHEMICAL CLEANING

In some instances, 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.

SPECIFICATIONS

COOLING SYSTEM CAPACITY

3.1L Diesel Engine: 9.8 Liters (10.4 qts.)

THERMOSTAT

Starts to open at 80°C (176°F).

TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Automatic Belt Tensioner-to-Mounting Bracket	
Bolt (1)	75 N·m
Automatic Belt Tensioner to Block	
Bolts (2)	120 N·m
Coolant Tank	
Cap	5 N·m
Fan Shroud-to-Radiator Mounting	
Bolts	3 N·m
Fan Blade-to-Thermal Viscous Fan Drive	
Bolts	23 N·m
Hose	
Clamps	4 N·m
Radiator-to-A/C Condenser Isolator	
Nuts	6 N·m
Thermal Viscous Fan Drive-to-Fan Hub	
Bolts	56 N·m
Thermostat Housing	
Bolts	11 N·m
Water Pump Mounting	
Bolts	24 N·m
Water Pump Pulley	
Bolts	24 N·m

DESCRIPTION AND OPERATION (Continued)

Disregard the curvature of the liquid where the surface rises against the float because of surface cohesion (Fig. 2). Remove only enough electrolyte from the battery to keep the float off the bottom of the hydrometer barrel with pressure on the bulb released. Keep the hydrometer in a vertical position while drawing the electrolyte into the hydrometer and observing the specific gravity. Exercise care when inserting the tip of the hydrometer into a cell to avoid damage to the separators. Damaged separators can cause premature battery failure.

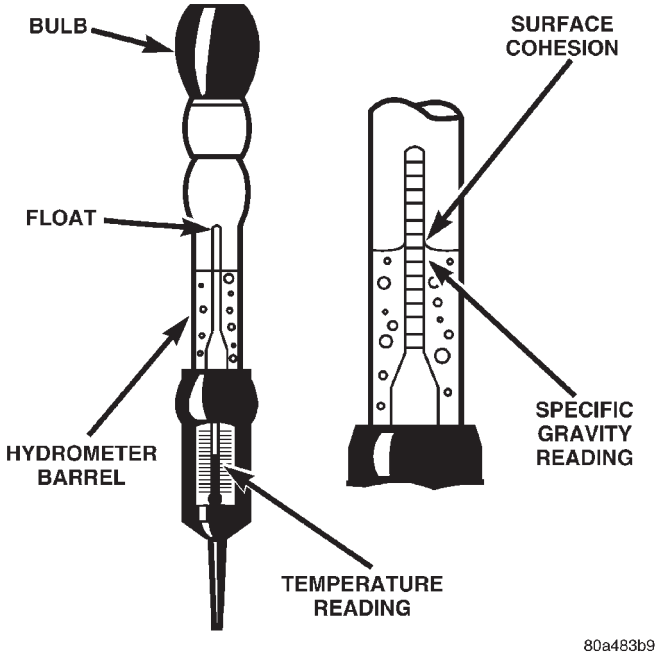


Fig. 2 Battery Hydrometer

Hydrometer floats are generally calibrated to indicate the specific gravity correctly only at one fixed temperature, 20°C (68°F). When testing the specific gravity at any other temperature, a correction factor is required, otherwise specific gravity readings will not indicate the true state of charge.

The correction factor is approximately a specific gravity value of 0.004, referred to as 4 points of specific gravity for every 5.5°C (10°F). If electrolyte temperature is below 20°C (68°F) you subtract. If the temperature is above 20°C (68°F) you add to the hydrometer reading. Always correct the specific gravity for temperature variation. Test the specific gravity of the electrolyte in each battery cell. Refer to the information with the Hydrometer.

Example 1:

- Hydrometer reading: 1.260
- Electrolyte temperature: -7°C (20°F)
- Subtract specific gravity: -0.019
- Correction specific gravity: 1.241

Example 2:

- Hydrometer reading: 1.225
- Electrolyte temperature: +38°C (100°F)
- Add specific gravity: +0.013
- Correction specific gravity: 1.238

A fully charged relatively new battery has a specific gravity reading of 1.285 plus 0.015 or minus 0.010.

If the specific gravity of all cells is above 1.235, but variation between cells is more than 50 points (0.050), it is an indication that the battery is unserviceable.

If the specific gravity of one or more cells is less than 1.235, recharge the battery at a rate of approximately 5 amperes. Continue charging until three consecutive specific gravity tests, taken at one-hour intervals, are constant.

If the cell specific gravity variation is more than 50 points (0.050) at the end of the charge period, replace the battery.

When the specific gravity of all cells is above 1.235 and variation between cells is less than 50 points (0.050), the battery may be tested under heavy load.

DIAGNOSIS AND TESTING

BATTERY DISCHARGING

CAUSE OF BATTERY DISCHARGING

It is normal to have a small 5 to 25 milliamperes continuous electrical draw from the battery. This draw will take place with the ignition in the OFF position, and the courtesy, dome, storage compartments, and engine compartment lights OFF. The continuous draw is due to various electronic features or accessories that require electrical current with the ignition OFF to function properly. When a vehicle is not used over an extended period of approximately 20 days the IOD fuse should be disconnected. The fuse is located in the power distribution center. Disconnection of this fuse will reduce the level of battery discharge. Refer to Battery Diagnosis and Testing Chart and to the proper procedures.

CHARGING SYSTEM

CONTENTS

DESCRIPTION AND OPERATION

CHARGING SYSTEM

DESCRIPTION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to Group 8D, Ignition System for information)
- Battery (refer to Group 8A, Battery for information)
- Battery temperature sensor
- Generator Lamp (if equipped)
- Check Gauges Lamp (if equipped)
- Voltmeter (refer to Group 8E, Instrument Panel and Gauges for information)
- Wiring harness and connections (refer to Group 8W, Wiring for information)

OPERATION

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. When the ASD relay is on, voltage is supplied to the ASD relay sense circuit at the PCM. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

A battery temperature sensor, located in the battery tray housing, is used to sense battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects. Refer to On-Board Diagnostics in Group 25, Emission Control System for more DTC information.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The signal to activate the lamp is sent via the CCD bus circuits. The lamp is located on the instrument panel. Refer to Group 8E, Instrument Panel and Gauges for additional information.

GENERATOR

DESCRIPTION

The generator is belt-driven by the engine using a serpentine type drive belt. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

REMOVAL AND INSTALLATION (Continued)

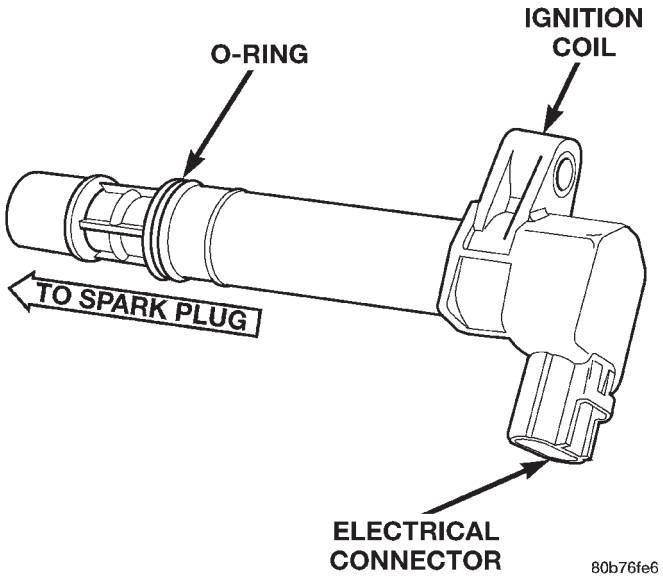


Fig. 27 Ignition Coil—4.7L V–8 Engine

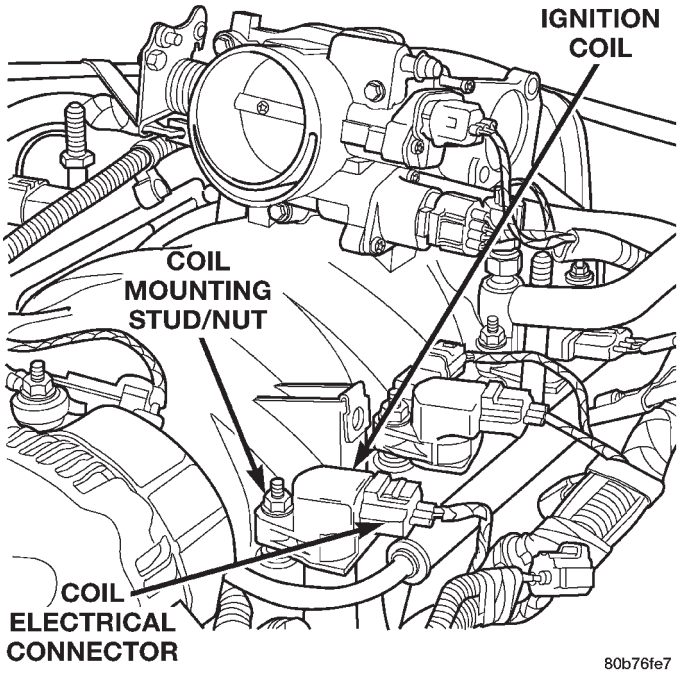


Fig. 28 Ignition Coil Location—4.7L V–8 Engine

CRANKSHAFT POSITION SENSOR—4.0L ENGINE

The Crankshaft Position (CKP) sensor is mounted to the transmission bellhousing at the left/rear side of the engine block (Fig. 29). The sensor **is adjustable** and is attached with one bolt. A wire shield/router is attached to the sensor (Fig. 29).

REMOVAL

(1) Disconnect sensor pigtail harness (3–way connector) from main engine wiring harness.

(2) Remove sensor mounting bolt.

(3) Remove wire shield and sensor.

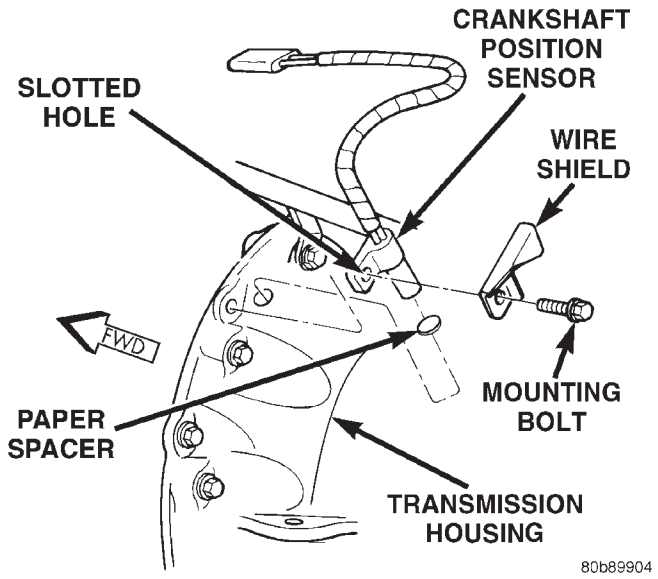


Fig. 29 CKP Sensor—4.0L 6-Cylinder Engine

INSTALLATION

4.0L engines with automatic transmission:

New replacement sensors will be equipped with a paper spacer glued to bottom of sensor. If installing (returning) a **used** sensor to vehicle, a new paper spacer must be installed to bottom of sensor. This spacer will be ground off the first time engine is started. If spacer is not used, sensor will be broken the first time engine is started.

(1) New Sensors: Be sure paper spacer is installed to bottom of sensor. If not, obtain spacer PN05252229.

(2) Used Sensors: Clean bottom of sensor and install spacer PN05252229.

(3) Install sensor into transmission bellhousing hole.

(4) Position sensor wire shield to sensor (Fig. 29).

(5) Push sensor against flywheel/drive plate. With sensor pushed against flywheel/drive plate, tighten mounting bolt to 7 N·m (60 in. lbs.) torque.

(6) Route sensor wiring harness into wire shield.

(7) Connect sensor pigtail harness electrical connector to main wiring harness.

CRANKSHAFT POSITION SENSOR—4.7L V-8 ENGINE

REMOVAL

The Crankshaft Position (CKP) sensor is bolted to the side of the engine cylinder block above the starter motor (Fig. 30). It is positioned into a machined hole at the side of the engine block.

(1) Remove starter motor. Refer to Starter Removal/Installation.

REMOVAL AND INSTALLATION (Continued)

and two inboard that secure it to the instrument panel.

(7) Remove the steering column opening cover from the instrument panel.

INSTALLATION

(1) Position the steering column opening cover to the instrument panel.

(2) Align the three snap clips on the steering column opening cover with the receptacles on the instrument panel.

(3) Press firmly on the steering column opening cover over the snap clip locations until each of the snap clips is fully engaged in its receptacle.

(4) Install and tighten the two screws that secure the lower edge of the steering column opening cover to the instrument panel steering column support bracket. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install and tighten the one screw that secures the outboard end of the steering column opening cover to the U-nut on the instrument panel top pad. Tighten the screw to 2.2 N·m (20 in. lbs.).

(6) Install the cluster bezel onto the instrument panel. Refer to **Cluster Bezel** in the Removal and Installation section of this group for the procedures.

(7) Install the fuse cover onto the junction block under the instrument panel. Refer to **Instrument Panel Fuse Cover** in the Removal and Installation section of this group for the procedures.

(8) Reconnect the battery negative cable.

INSTRUMENT PANEL STEERING COLUMN BRACKET

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 steering column opening cover from the instrument panel. Refer to **Steering Column Opening Cover** in the Removal and Installation section of this group for the procedures.

(3) Remove the four screws that secure the steering column bracket to the instrument panel steering column support bracket (Fig. 9).

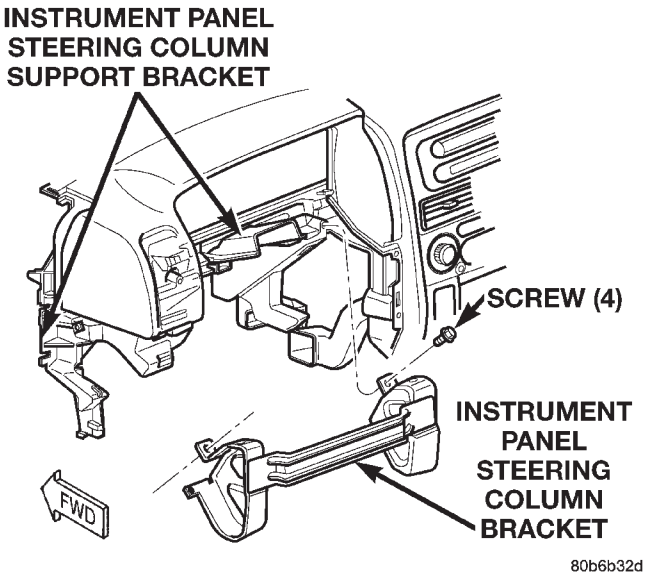


Fig. 9 Instrument Panel Steering Column Bracket Remove/Install

(4) Remove the steering column bracket from the instrument panel steering column support bracket.

INSTALLATION

(1) Position the steering column bracket to the instrument panel steering column support bracket.

(2) Install and tighten the four screws that secure the steering column bracket to the instrument panel steering column support bracket. Tighten the screws to 11.8 N·m (105 in. lbs.).

(3) Install the steering column opening cover. Refer to **Steering Column Opening Cover** in the Removal and Installation section of this group for the procedures.

(4) Reconnect the battery negative cable.

INSTRUMENT CLUSTER

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 cluster bezel from the instrument panel. Refer to **Cluster Bezel** in the Removal and Installation section of this group for the procedures.

REMOVAL AND INSTALLATION (Continued)

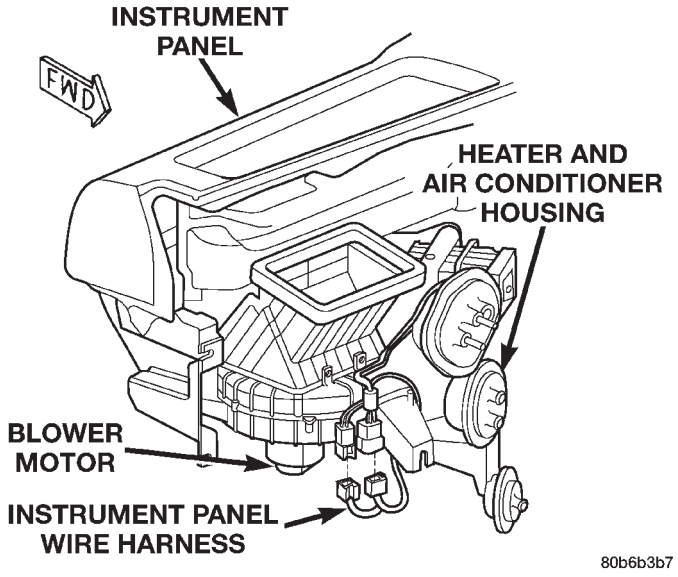


Fig. 43 Heater and Air Conditioner Housing Connections

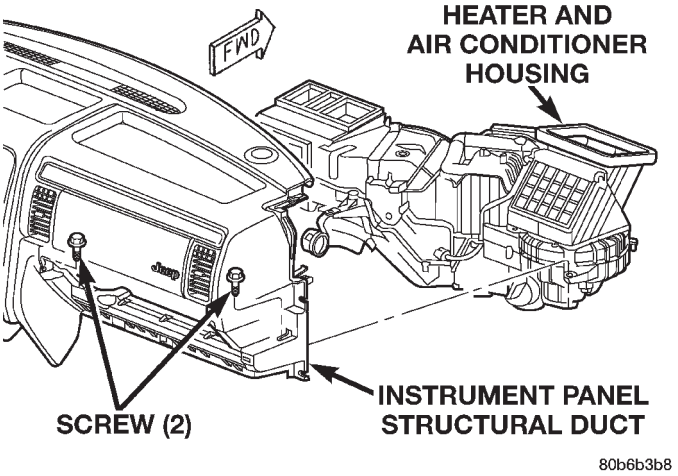


Fig. 44 Passenger Side Instrument Panel to Heater-A/C Housing Mounting

(38) With the aid of an assistant, lift the instrument panel assembly upward off of the studs on the dash panel near the windshield fence line and to disengage the molded plastic hook formations on the instrument panel structural duct from the guide holes at each cowl side inner panel.

(39) Pull the instrument panel rearward from the dash panel and the cowl side inner panels and remove it through the driver side front door of the vehicle.

INSTALLATION

(1) Prior to installing the instrument panel into the vehicle, loosen the three nuts that secure the instrument panel intermediate bracket and the accelerator pedal assembly to the studs on the dash panel.

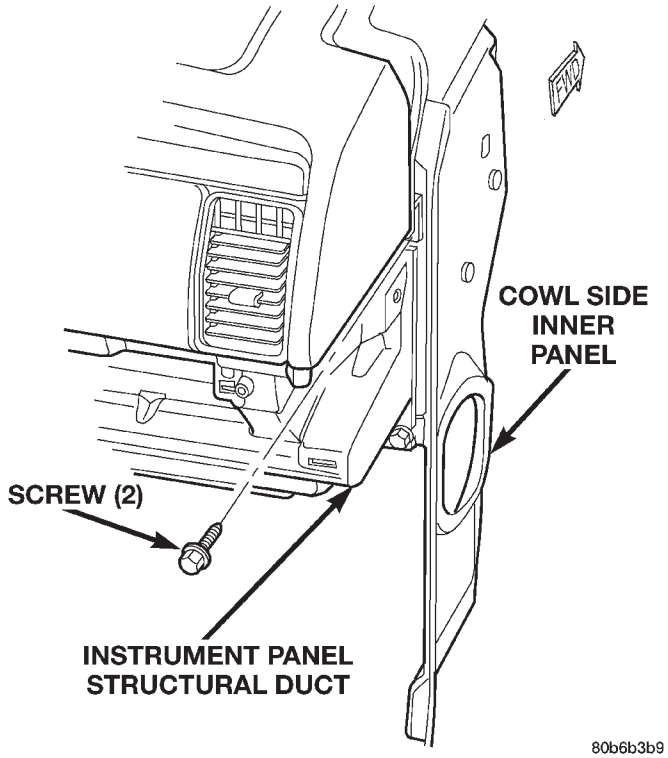


Fig. 45 Instrument Panel to Passenger Side Cowl Side Inner Panel Mounting

(2) With the aid of an assistant, load the instrument panel assembly through the driver side front door of the vehicle and hang it on the studs on the dash panel near the windshield fence line.

(3) Be certain that the molded plastic hook formations on the instrument panel structural duct are inserted into and seated in the guide holes at each cowl side inner panel.

(4) Loosely install the two screws that secure each end of the instrument panel to the cowl side inner panels.

(5) Install and tighten the two screws that secure the passenger side instrument panel structural duct to the heater and air conditioner housing. Tighten the screws to 11.8 N·m (105 in. lbs.).

(6) Install and tighten the one screw that secures the instrument panel steering column support bracket to the driver side end of the heater and air conditioner housing. Tighten the screw to 11.8 N·m (105 in. lbs.).

(7) Tighten the two screws that secure each end of the instrument panel to the cowl side inner panels. Tighten the screws to 11.8 N·m (105 in. lbs.).

(8) Install and tighten the one screw that secures the instrument panel steering column support bracket to the intermediate bracket on the driver side dash panel. Tighten the screw to 11.3 N·m (100 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

FRONT DOOR SPEAKER

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the front door. Refer to **Front Door Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

(3) Remove the four screws that secure the speaker to the front door inner panel (Fig. 9).

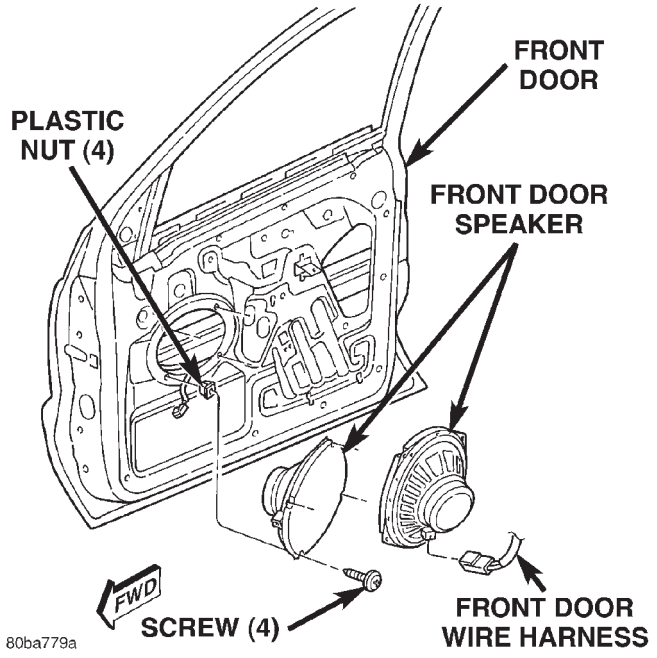


Fig. 9 Front Door Speaker Remove/Install

(4) Pull the speaker away from the front door inner door panel far enough to access the front door wire harness connector.

(5) Disconnect the front door wire harness connector from the speaker connector receptacle.

(6) Remove the speaker from the front door inner panel.

REAR DOOR SPEAKER

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the rear door. Refer to **Rear Door Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

(3) Remove the three screws that secure the speaker to the rear door inner panel (Fig. 10).

(4) Pull the speaker away from the rear door inner panel far enough to access the rear door wire harness connector.

(5) Disconnect the rear door wire harness connector from the speaker connector receptacle.

(6) Remove the speaker from the rear door inner panel.

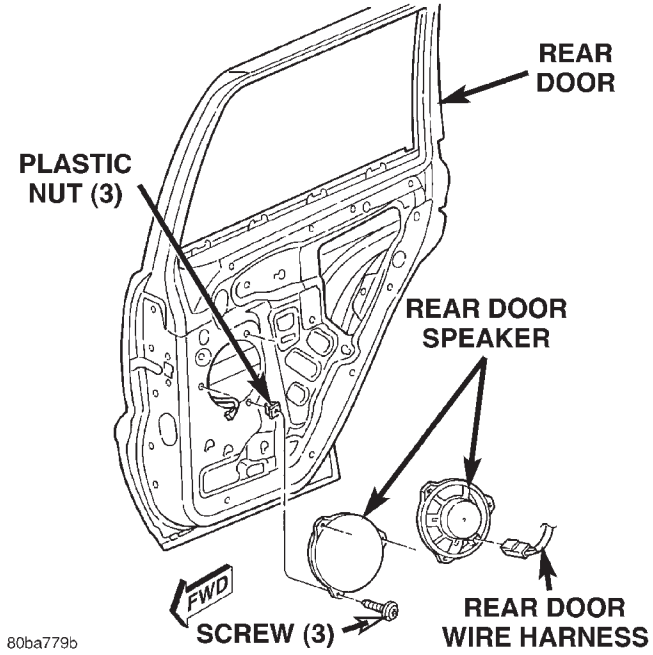


Fig. 10 Rear Door Speaker Remove/Install

INSTALLATION

INSTRUMENT PANEL SPEAKER

(1) Position the speaker onto the top of the instrument panel.

(2) Install and tighten the two screws that secure the speaker to the top of the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reconnect the instrument panel wire harness connector to the speaker wire harness connector.

(4) Install the top cover onto the instrument panel. Refer to **Instrument Panel Top Cover** in the Removal and Installation section of Group 8E - Instrument Panel Systems for the procedures.

(5) Reconnect the battery negative cable.

FRONT DOOR SPEAKER

(1) Position the speaker to the front door inner panel.

(2) Reconnect the front door wire harness connector to the speaker connector receptacle.

(3) Position the speaker onto the front door inner door panel.

(4) Install and tighten the four screws that secure the speaker to the front door inner panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install the trim panel onto the front door. Refer to **Front Door Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

(6) Reconnect the battery negative cable.

DESCRIPTION AND OPERATION (Continued)

TURN SIGNAL SWITCH AND HAZARD WARNING SWITCH

DESCRIPTION

The turn signal and hazard warning switches are integral to the left (lighting) multi-function switch unit, which is secured to the left side of the multi-function switch mounting housing at the top of the steering column (Fig. 1). The only visible parts of the left multi-function switch are the control stalk that extends from the left side of the steering column, and the hazard warning switch push button that protrudes from the top of the steering column. The left multi-function switch control stalk has both nomenclature and international control symbols on it, which identify its many functions. The hazard warning switch push button is identified with a double triangle, which is the international control symbol for hazard warning. The remainder of the left multi-function switch is concealed beneath the steering column shrouds.

The left multi-function switch also contains circuitry for the following functions:

- Exterior lighting control, including:
- Fog lamps
- Park lamps
- Headlamps
- Auto headlamps (if equipped)
- Headlamp beam selection
- Headlamp optical horn.
- Interior lighting control, including:
- Interior lamps defeat
- Interior lamps on
- Panel lamps dimming.

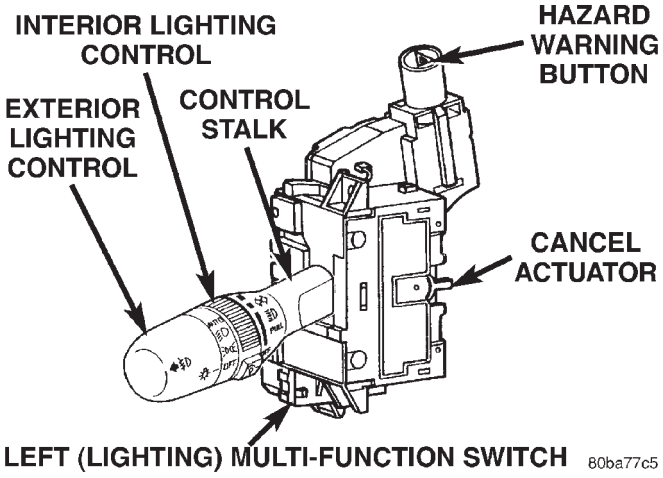


Fig. 1 Left (Lighting) Multi-Function Switch

The information contained in this group addresses only the left multi-function switch turn signal and hazard warning functions. For information relative to the other systems that are controlled by and circuits that are integral to the left multi-function switch, see the group in this service manual that covers that system. However, the turn signal and hazard warning switches cannot be repaired. If these switches or any other circuit or component of the left multi-function switch unit is faulty or damaged, the entire left multi-function switch unit must be replaced.

OPERATION

TURN SIGNAL SWITCH

The left multi-function switch control stalk that extends from the left side of the steering column just below the steering wheel is moved up or down to activate the turn signal switch. When the control stalk is moved in the upward direction, the right turn signal switch circuitry is activated; and, when the control stalk is moved in the downward direction, the left turn signal switch circuitry is activated. The turn signal switch has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate momentary position in each direction that provides turn signals only until the left multi-function switch control stalk is released.

When the turn signal switch is in a detent position, it is turned off by one of two lobes of the turn signal cancelling cam, which is located beneath the clockspring mechanism within the multi-function switch mounting housing on the steering column. Turning the steering wheel causes the turn signal cancelling cam lobes to contact a cancel actuator in the left multi-function switch, and the turn signal switch automatically returns to the off position.

HAZARD WARNING SWITCH

The hazard warning switch is controlled by the hazard warning switch push button. Push the switch button in to unlatch the switch and activate the hazard warning system, and push in on the button again to latch the switch and turn the system off. When the hazard warning switch is latched (hazard warning off), the push button will be in a lowered position on the top of the steering column shroud; and, when the hazard warning switch is unlatched (hazard warning on), the push button will be in a raised position.

DIAGNOSIS AND TESTING (Continued)

or other foreign material in the reservoir, and for pinched, disconnected, broken, or incorrectly routed washer system plumbing. For complete circuit diagrams, refer to **Wipers** in the Contents of 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) Turn the ignition switch to the On position. Turn the windshield wiper switch to the Low or High speed position. Check whether the windshield wipers operate. If OK, go to Step 2. If not OK, refer to **Windshield Wiper System** in the Diagnosis and Testing section of this group.

(2) Turn the wiper switch to the Off position. Actuate the windshield washer switch. The washer pump should operate and the windshield wipers should operate for about three sweep cycles after the switch is released before they park. If the wipers are OK, but the washers are not, go to Step 3. If the washers are OK, but the wipers are not, go to Step 5.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector from the front washer pump connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the front washer pump and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Reconnect the battery negative cable. Turn the ignition switch to the On position. With the windshield washer switch activated, check for battery voltage at the washer pump control switch output circuit cavity of the left headlamp and dash wire harness connector for the front washer pump. If OK, replace the faulty washer pump. If not OK, repair the open washer pump control switch output circuit to the wiper and washer (right multi-function) switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. With the windshield washer switch activated, check for battery voltage at the washer pump control switch output circuit cavity of the 22-way instrument panel wire harness connector for the BCM. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to diagnose the BCM. If not OK, repair the open washer pump control switch output circuit to the wiper and washer (right multi-function) switch as required.

REAR

The diagnosis found here addresses an inoperative rear washer system. If the washer pump operates, but no washer fluid is emitted from the washer nozzles, be certain to check the fluid level in the reservoir. Check for ice or other foreign material in the reservoir, and for pinched, disconnected, broken, or incorrectly routed washer system plumbing. For complete circuit diagrams, refer to **Wipers** in the Contents of 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) Turn the ignition switch to the On position. Turn the rear wiper switch to the On position. Check whether the rear wiper system is operating. If OK, go to Step 2. If not OK, refer to **Rear Wiper System** in the Diagnosis and Testing section of this group.

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector from the rear washer pump connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit to ground as required.

(3) Connect the battery negative cable. Turn the ignition switch to the On position. With the rear washer switch actuated, check for battery voltage at the rear washer motor control circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump. If OK, replace the faulty rear washer pump. If not OK, repair the open rear washer motor control circuit to the wiper and washer (right multi-function) switch as required.

SERVICE PROCEDURES (Continued)

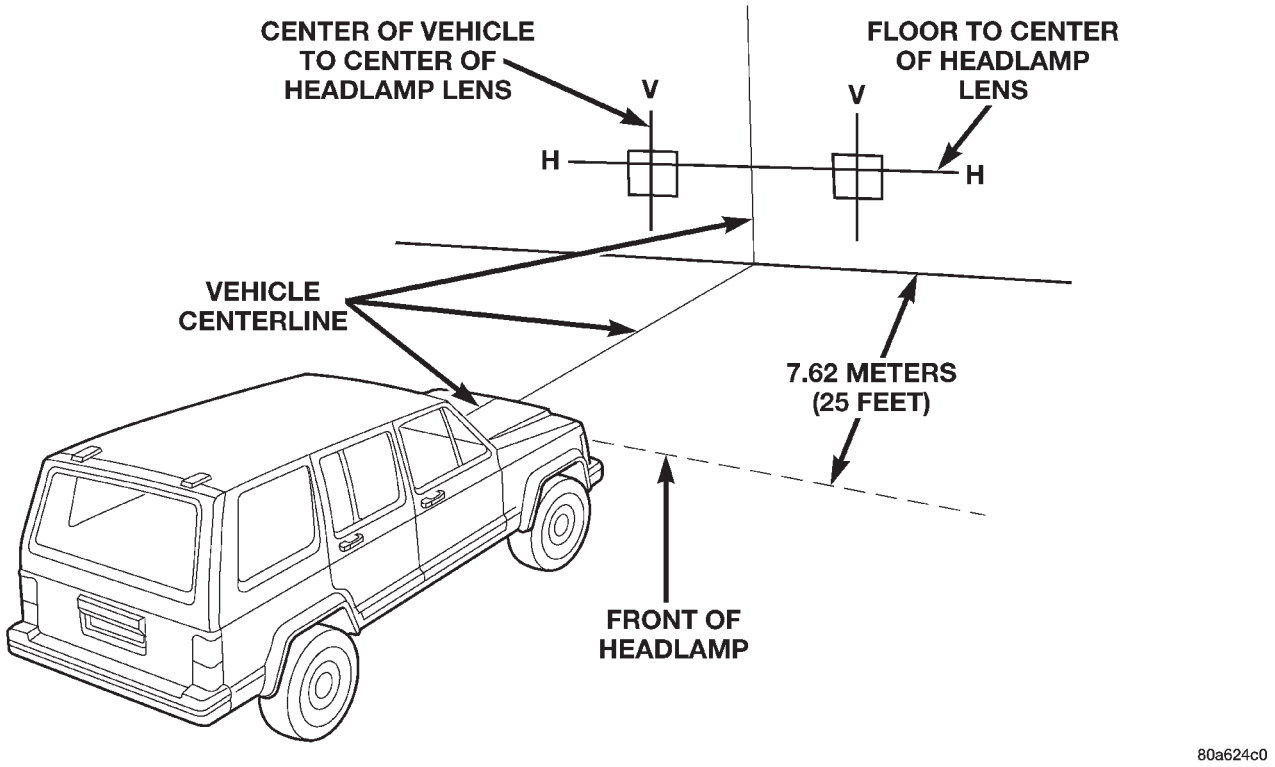


Fig. 1 Headlamp Alignment Screen—Typical

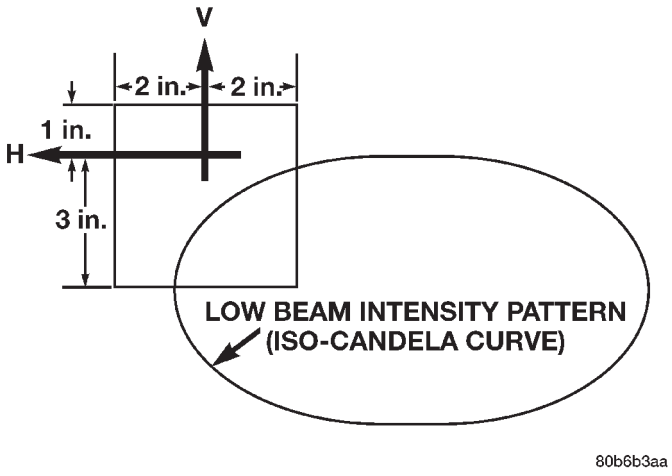


Fig. 2 Low Beam Pattern

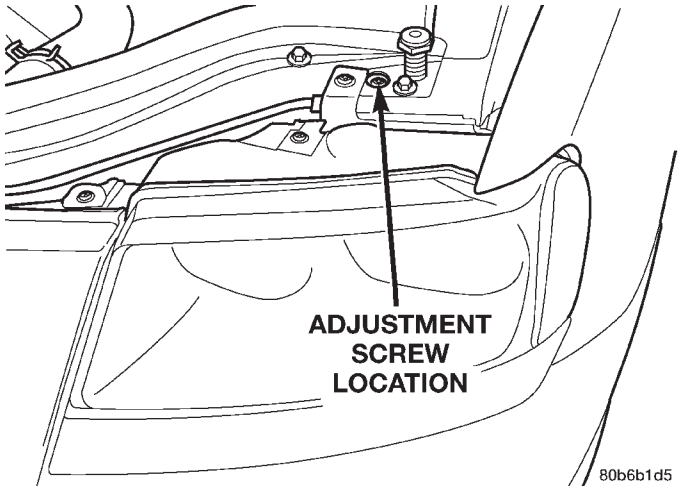


Fig. 3 Headlamp Beam Adjustment Screw

REMOVAL AND INSTALLATION (Continued)

lamp. Remove the sockets by rotating counter-clockwise and pulling straight from the headlamp.

(4) Remove the headlamp from the vehicle.

INSTALLATION

(1) Position the headlamp and install the bulb and socket assemblies.

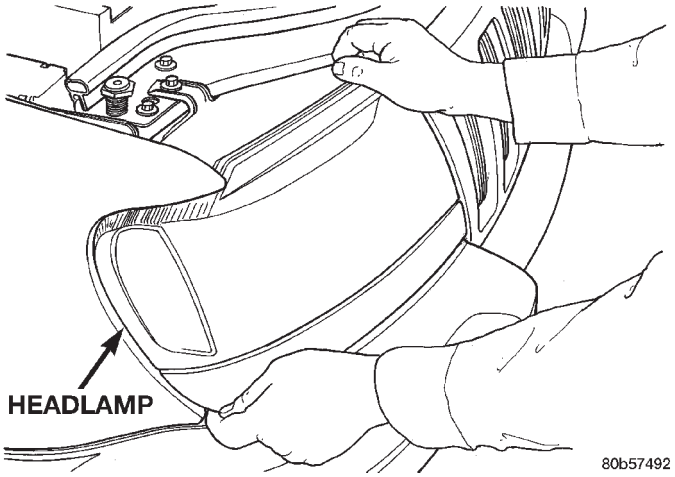


Fig. 4 Installing The Headlamp

(2) Align the headlamp mounting studs with the corresponding holes in the headlamp mounting module (HMM). Forcefully push the headlamp in to secure both of the ball and socket connections (Fig. 4).

(3) Position the headlamp and install the retaining jackscrew (Fig. 5).

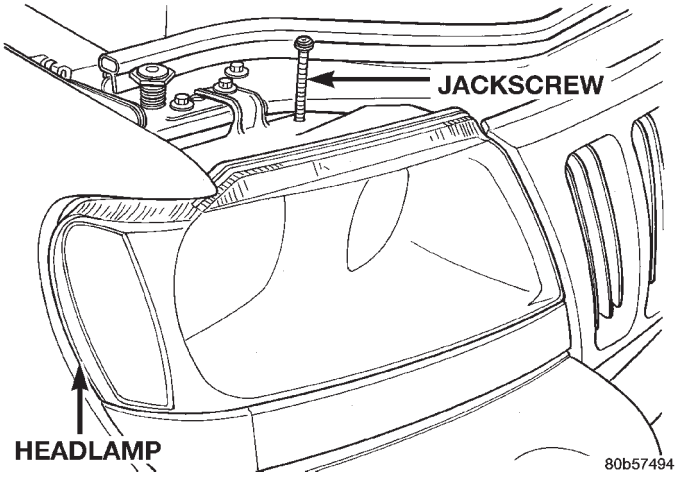


Fig. 5 Headlamp Retaining Fastener

HEADLAMP LEVELING MOTOR

The headlamp leveling motor cannot be serviced separately from the headlamp assembly. If the headlamp leveling motor is found to be defective the entire headlamp assembly must be replaced. Refer to Headlamp removal and installation in Lamp Service for the procedure.

FRONT FOG LAMP

REMOVAL

(1) Raise the vehicle on a hoist or position a creeper under the front of the vehicle.

(2) Remove the pushpin securing the wheel well trim to the front fascia.

(3) Working behind the front fascia, disconnect the fog lamp electrical connector.

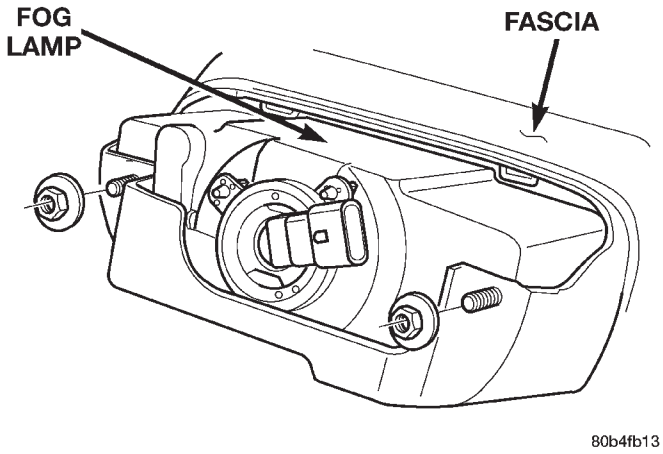


Fig. 6 Front Fog Lamp

(4) Remove the (2) fog lamp retaining nuts (Fig. 6).

(5) Remove the fog lamp from the fascia.

INSTALLATION

(1) Position the fog lamp in the fascia and install the retaining nuts (Fig. 7).

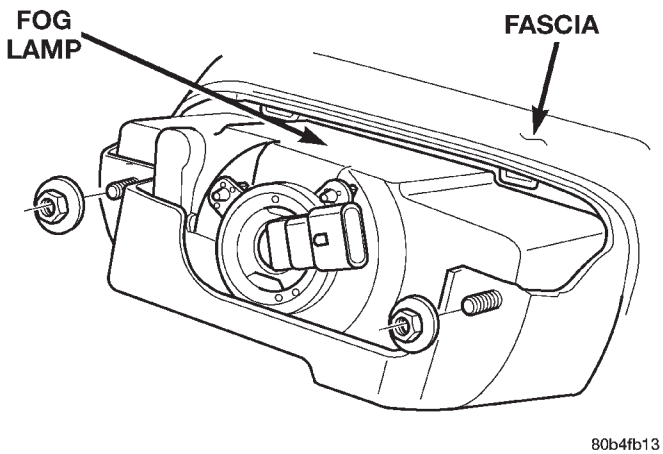


Fig. 7 Front Fog Lamp

(2) Connect the fog lamp electrical connector.

(3) Verify lamp operation.

(4) Install the pushpin securing the wheel well trim to the front fascia.

DESCRIPTION AND OPERATION (Continued)

OPERATION

The rear glass heating grid is energized and de-energized by the rear window defogger relay. The Body Control Module (BCM) monitors the rear window defogger switch. When the BCM receives an input from the switch, it energizes or de-energizes the rear window defogger relay through a hard wired control output. The rear defogger relay switches fused battery current to the rear window grid lines through the bus bars. The grid lines heat the rear window glass to clear the surface of ice, snow or fog. Protection for the rear glass heating grid circuit is provided by a fuse in the Power Distribution Center (PDC).

REAR WINDOW DEFOGGER SWITCH

DESCRIPTION

The rear window defogger switch is integral to the heating and air conditioning control unit, which is located in the instrument panel center stack below the radio receiver. This momentary switch provides a hard wired ground signal to the Body Control Module (BCM) each time it is depressed. A Light Emitting Diode (LED) in the push button for the rear window defogger switch illuminates to indicate when the rear window defogger system is turned on.

The rear window defogger switch and the rear window defogger switch LED indicator cannot be repaired and, if faulty or damaged, the entire heating and air conditioning control unit must be replaced. Refer to **Heater-A/C Control** in the Removal and Installation section of Group 24 - Heating and Air Conditioning for the service procedures.

OPERATION

When the rear window defogger switch push button is depressed, it momentarily closes the rear window defogger switch sense circuit for the BCM to ground. The BCM monitors the rear window defogger switch sense circuit. Each time the BCM rear window defogger timer and logic circuitry sees another input from the switch, it toggles a control output to the rear window defogger relay. Energizing the rear window defogger relay provides electrical current to the rear window defogger grid and to the LED indicator in the switch, which lights to indicate when the defogger system is turned on. A dedicated fuse in the junction block protects the rear window defogger relay output circuit to the LED indicator.

REAR WINDOW DEFOGGER RELAY

DESCRIPTION

The rear window defogger relay is an electromechanical device that switches fused battery current to the rear glass heating grid and the Light-Emitting Diode (LED) indicator of the rear window defogger switch, when the Body Control Module (BCM) rear window defogger timer and logic circuitry grounds the relay coil. The rear window defogger relay is located in the junction block, under the left end of the instrument panel in the passenger compartment.

The rear window defogger relay is a International Standards Organization (ISO) relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

The rear window defogger relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING

REAR WINDOW DEFOGGER SYSTEM

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 complete circuit diagrams, refer to **Rear Window Defogger** in the Contents of Group 8W - Wiring Diagrams. The operation of the electrically heated rear window defogger system can be confirmed in one of the following manners:

1. Turn the ignition switch to the On position. While monitoring the instrument panel voltmeter, depress the rear window defogger switch to the On position. When the rear window defogger switch is turned On, a distinct voltmeter needle deflection should be noted.

DESCRIPTION AND OPERATION (Continued)

turned to the On position. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power lock switches.

DOOR MODULE

DESCRIPTION

A Driver Door Module (DDM) and a Passenger Door Module (PDM) are used on this model to control and integrate many of the electronic features and functions of the vehicle. The door modules are mounted to the inside surface of the trim panel on each front door. The only visible parts of the door modules are the switches and the bezel that are located on the outside of each front door trim panel. Each door module houses both the front power lock and power window switches. The DDM also houses individual switches for each passenger door power window, a power window lockout switch and the power mirror switch. The remainder of both door modules is concealed behind the front door trim panels.

The DDM and PDM each contain a central processing unit and interface with each other, as well as with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

The circuitry of the door modules controls the following hard wired outputs:

- Door and liftgate power lock motors
- Front and rear door power window motors
- Front door courtesy lamps
- Power mirror control and heating
- Rear door power window switch control and illumination.

The door modules also receive the following hard wired inputs:

- Front door ajar switch
- Front door power window switches
- Memory switch (with the Memory System option only)
- Power lock switches
- Power mirror position potentiometers (with the Memory System option only)
- Power mirror switches
- Power window lockout switch.

In addition, the DDM contains the program logic for the optional Memory System, while the PDM contains the program logic and the receiver for the standard Remote Keyless Entry (RKE) System. Refer to **Memory System** in the Memory System section of Group 8R - Power Seat Systems for more information on the features of the Memory System. Refer to **Remote Keyless Entry System** in the Remote Keyless Entry System section of this group for more information on the features of the RKE system.

For diagnosis of the DDM, PDM, or the PCI data bus network, a DRB scan tool and the proper Diagnostic Procedures manual are recommended. The DDM and the PDM cannot be adjusted or repaired and, if damaged or faulty, they must be replaced.

OPERATION

The functions and features provided by the door modules are possible because of their hard wired inputs and outputs, as well as the resources they share with each other and with the other electronic modules in the vehicle through their communication over the PCI data bus network. The door modules use their internal programming and all of these inputs to decide which functions they should perform and both the standard and optional features they should provide. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of Group 8V - Overhead Console Systems for more information on the customer programmable feature options.

POWER LOCK MOTOR

DESCRIPTION

Power operated front door, rear door and liftgate locking mechanisms are standard equipment on this model. The lock mechanisms are actuated by a reversible electric motor mounted within each door and the liftgate. The power lock motors for the doors are integral to the door latch units. The liftgate power lock motor is a separate unit secured to the latch brainplate near the center of the liftgate and operates the liftgate latch lock mechanism through a connecting linkage rod.

The power lock motors for the four doors cannot be adjusted or repaired and, if faulty or damaged, the entire door latch unit must be replaced. The liftgate power lock motor cannot be adjusted or repaired and, if faulty or damaged, the entire liftgate latch brainplate unit must be replaced.

OPERATION

The driver side front door power lock motor is controlled by the Driver Door Module (DDM). The remaining power door lock motors and the liftgate power lock motor are controlled by the Passenger Door Module (PDM). A positive and negative battery connection to the two motor terminals will cause the power lock motor plunger to move in one direction.

DESCRIPTION AND OPERATION (Continued)

POWER SEAT RECLINER

DESCRIPTION

The ten-way power seat option includes an electrically operated seat back recliner mechanism. The only visible evidence of this option is the separate power seat recliner switch control knob that is located on the outboard seat cushion side shield, just behind the other power seat switch control knob. The power seat recliner switch is integral to the ten-way power seat switch unit, but is actuated with a separate switch knob.

The power seat recliner unit is mounted in the place of a seat hinge on the outboard side of the seat (Fig. 2). The upper hinge plate of the power seat recliner mechanism is secured with two screws to the seat back frame and is concealed beneath the seat back trim cover and padding. The lower hinge plate and the motor and drive unit of the power seat recliner mechanism is secured with two screws to the seat cushion frame, and is concealed by the outboard seat cushion side shield.

The power seat recliner cannot be repaired. If the unit is faulty or damaged, it must be replaced. Refer to **Bucket Seat Recliner** in the Removal and Installation section of Group 23 - Body for the service procedures.

OPERATION

The power seat recliner includes a reversible electric motor that is secured to the lower hinge plate of the recliner unit. The motor is connected to a gearbox that moves the upper hinge plate of the power seat recliner through a screw-type drive unit. The driver side power seat recliner motor used on models equipped with the optional memory system also has a position potentiometer integral to the motor assembly, which electronically monitors the motor position.

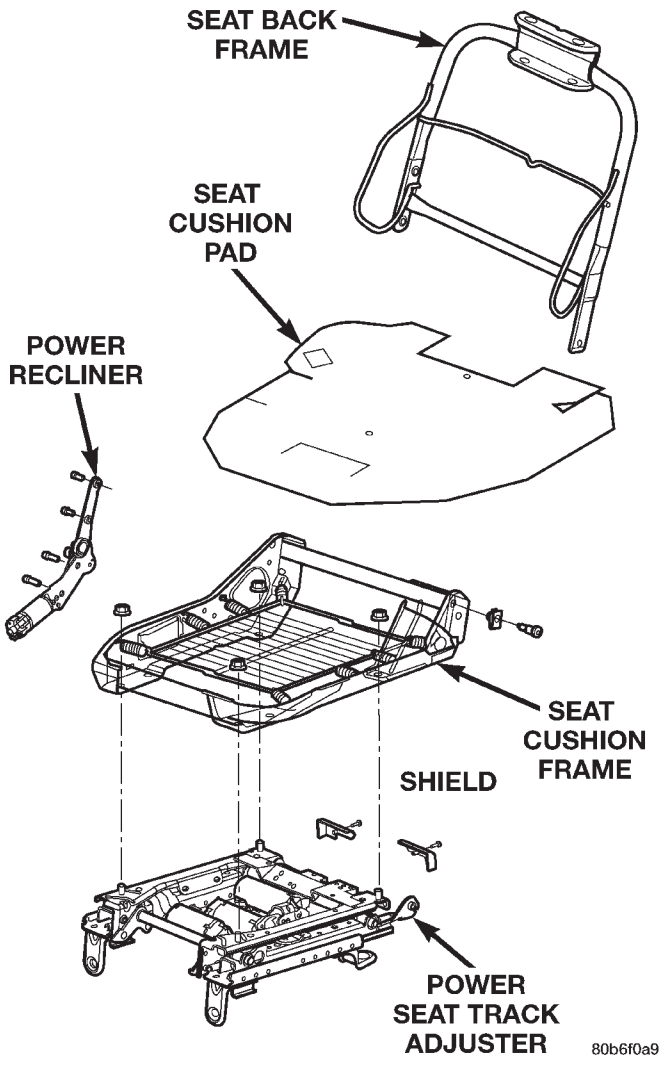


Fig. 2 Power Seat Recliner and Track

POWER SEAT SWITCH

DESCRIPTION

Two different power seat switches are used on this vehicle, depending upon the optional power seat system installed in the vehicle. The six-way power seats are each equipped with a switch featuring three switch control knobs ganged together on the outboard seat cushion side shield (Fig. 3). The ten-way power seats are each equipped with a switch featuring two knobs ganged together on the outboard seat cushion side shield (Fig. 4).

The switch units for both power seat types are secured to the back of the seat cushion side shield with two screws. However, the control knobs for the six-way power seat switch unit remain installed during switch unit removal and installation, while both knobs for the ten-way power seat switch unit must be removed.

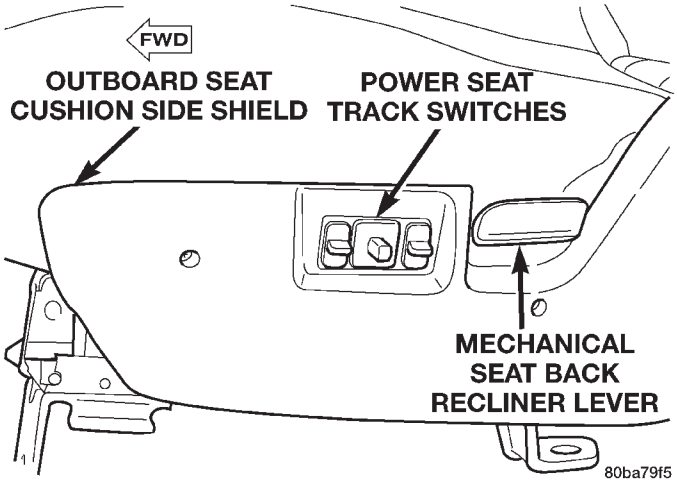


Fig. 3 Six-Way Power Seat Switches

The individual switches in both power seat switch units cannot be repaired. If one switch is damaged or

DIAGNOSIS AND TESTING (Continued)

NO MIRROR MEMORY

For diagnosis of the memory system, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended. Refer to **Memory System** in the Memory System section of Group 8P - Power Seat Systems.

REMOVAL AND INSTALLATION

POWER MIRROR

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the front door. Refer to **Front Door Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

(3) Disconnect the power mirror wire harness connector from the door wire harness connector (Fig. 2).

(4) Remove the mirror flag seal from the inner door panel.

(5) Remove the three nuts that secure the power mirror mounting studs to the door flag.

(6) Remove the power mirror from the outside of the door.

INSTALLATION

(1) Position the power mirror onto the outside of the door.

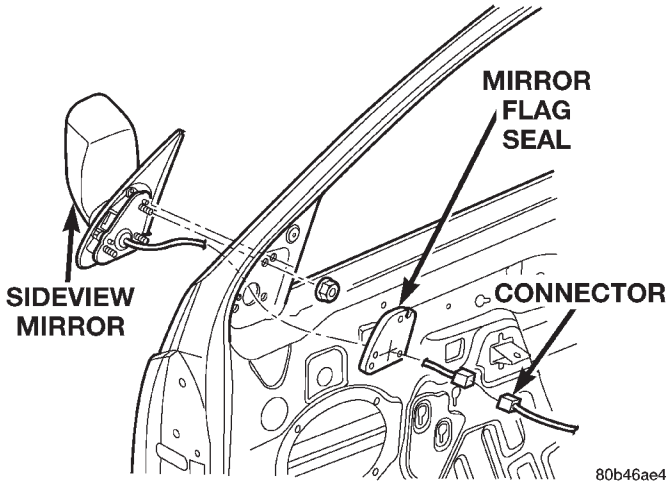


Fig. 2 Power Mirror Remove/Install

(2) Install and tighten the three nuts that secure the power mirror mounting studs to the door flag. Tighten the nuts to 7.4 N·m (65 in. lbs.).

(3) Install the mirror flag seal onto the inner door panel.

(4) Reconnect the power mirror wire harness connector to the door wire harness connector.

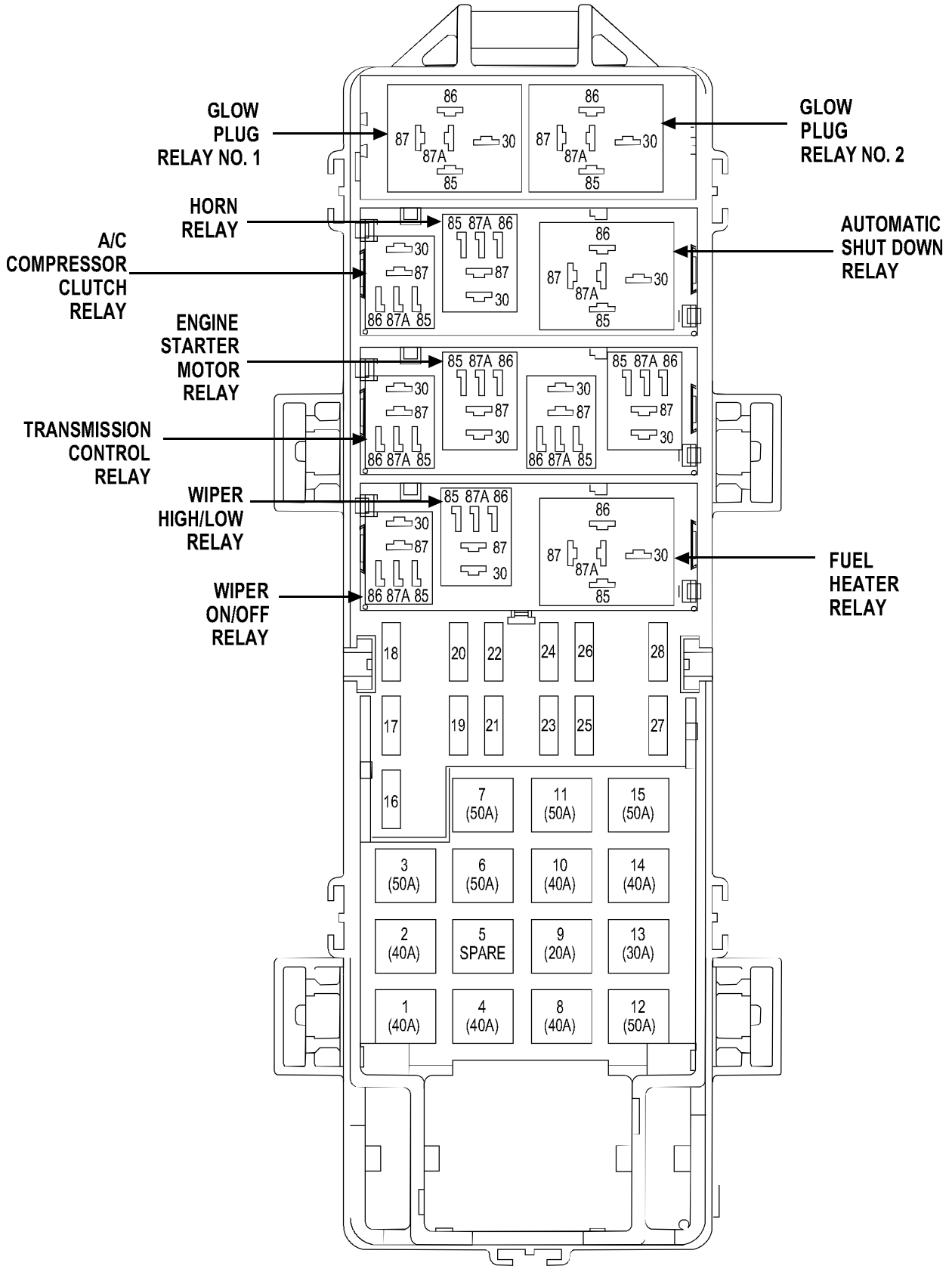
(5) Install the trim panel onto the front door. Refer to **Front Door Trim Panel** in the Removal and Installation section of Group 23 - Body for the procedures.

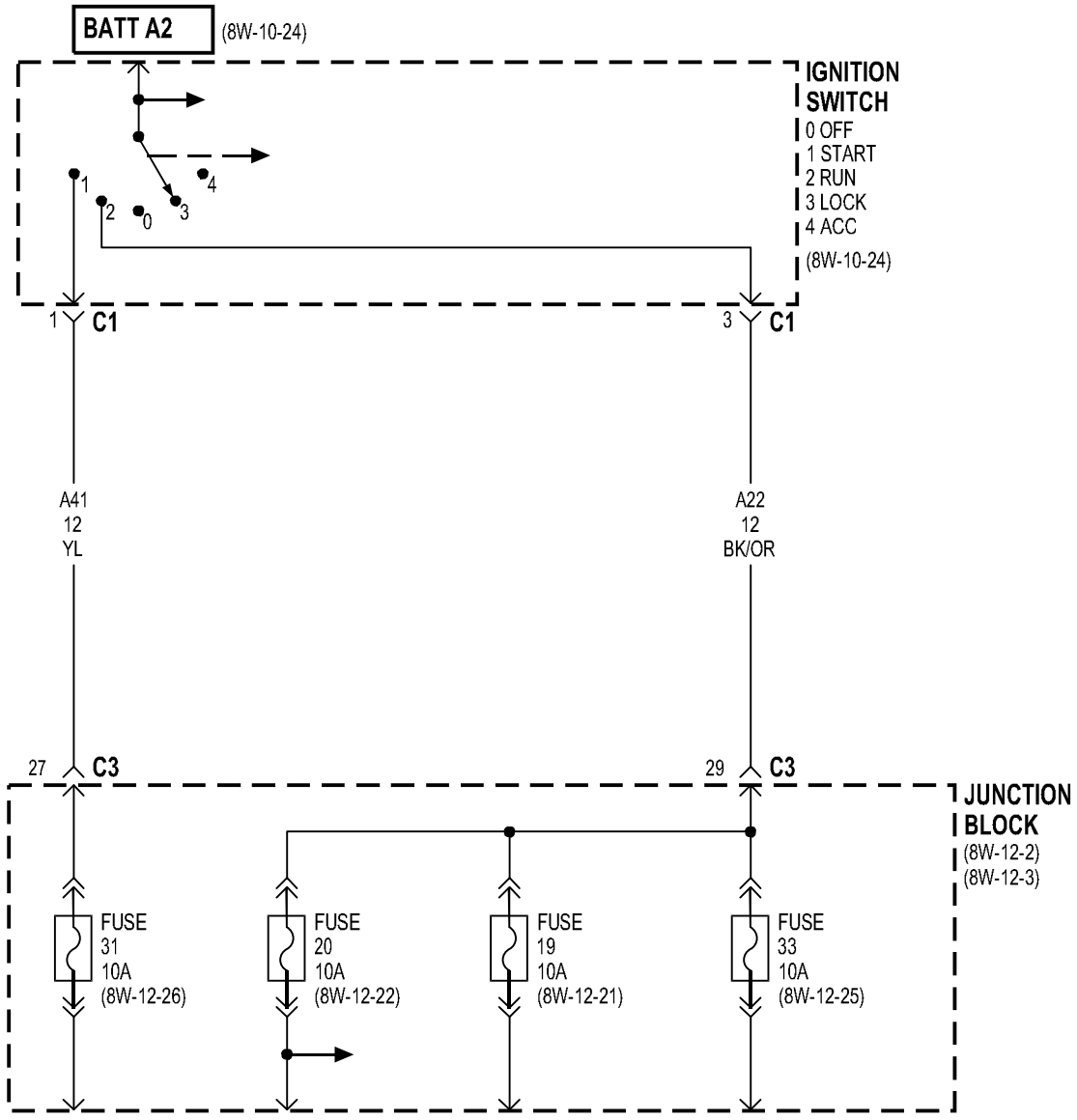
(6) Reconnect the battery negative cable.

WIRING DIAGRAMS

CONTENTS

POWER DISTRIBUTION CENTER

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(8W-10-24)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-24)
1
2
0
3
4
1 C1
3 C1
A41
12
YL
A22
12
BK/OR
27 C3
29 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
31
10A
(8W-12-26)
FUSE
20
10A
(8W-12-22)
FUSE
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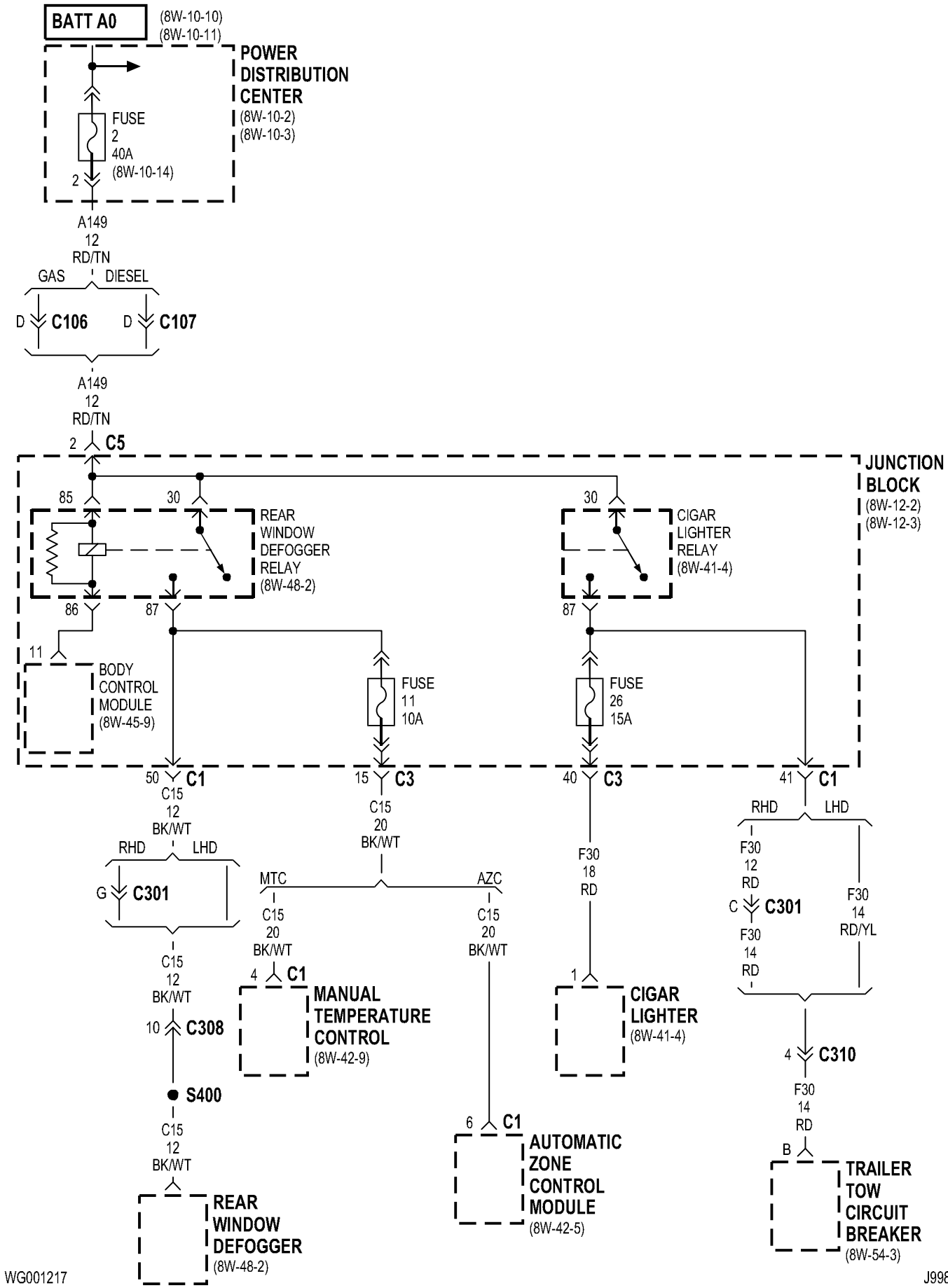
10A
(8W-12-21)
FUSE
33
10A
(8W-12-25)



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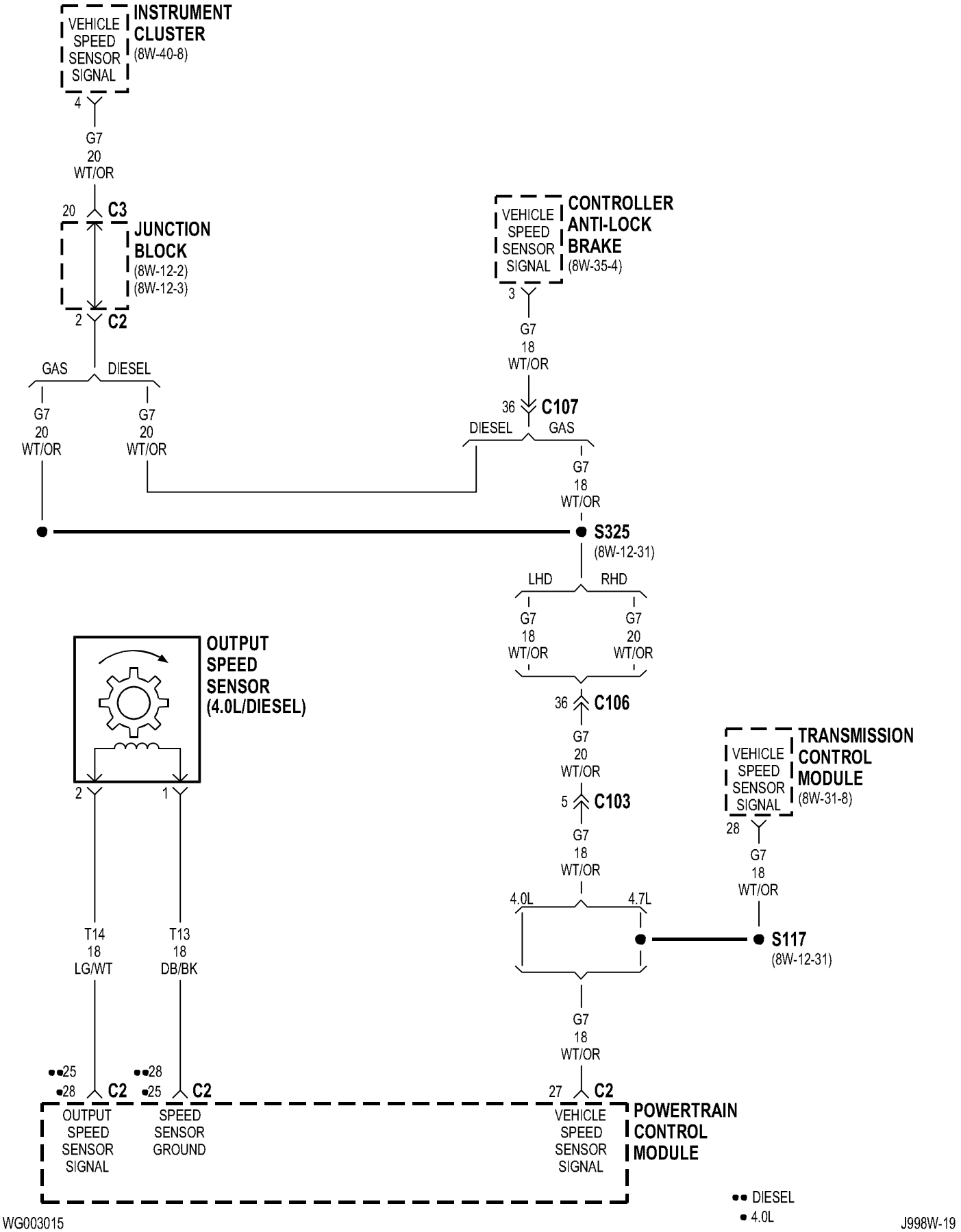
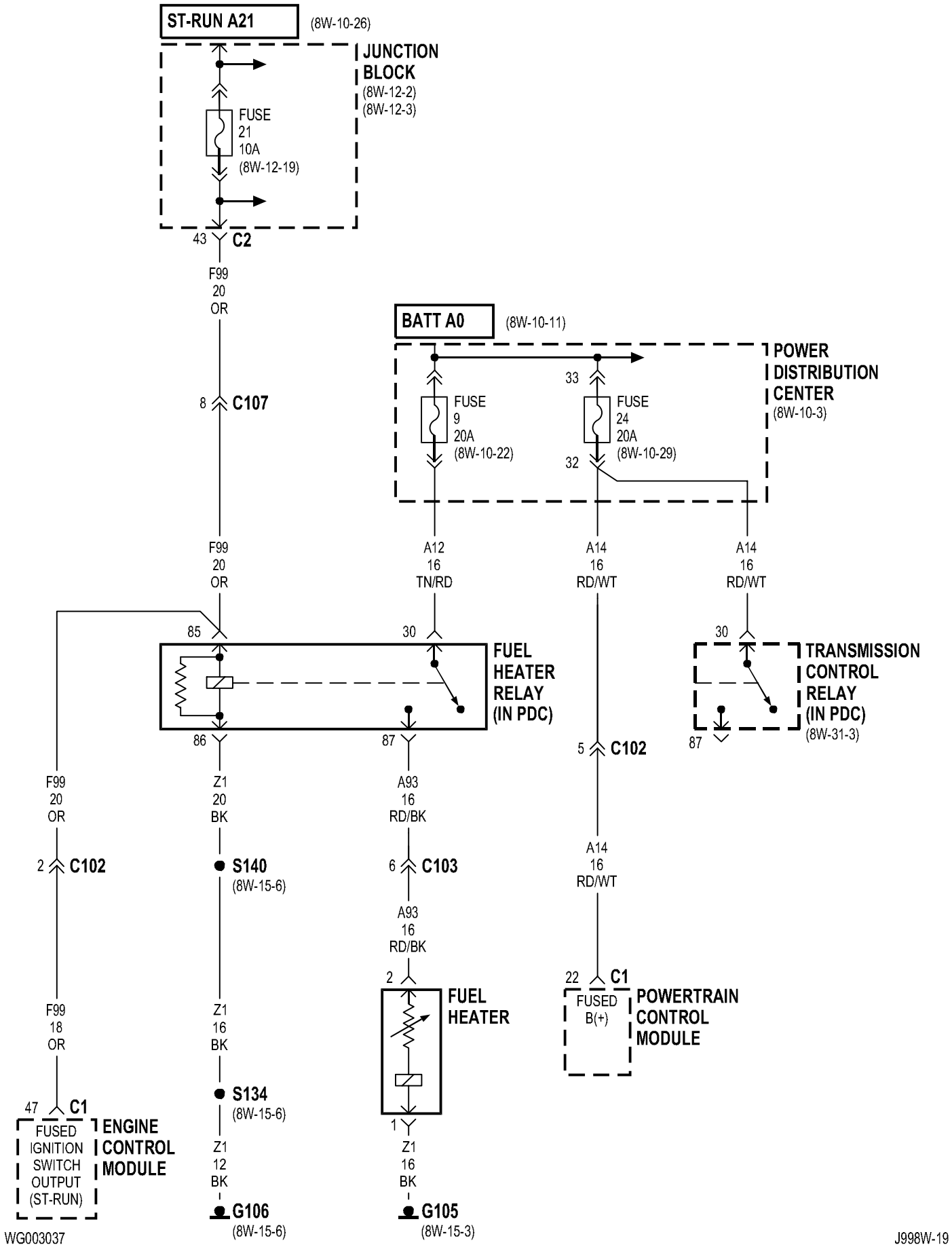
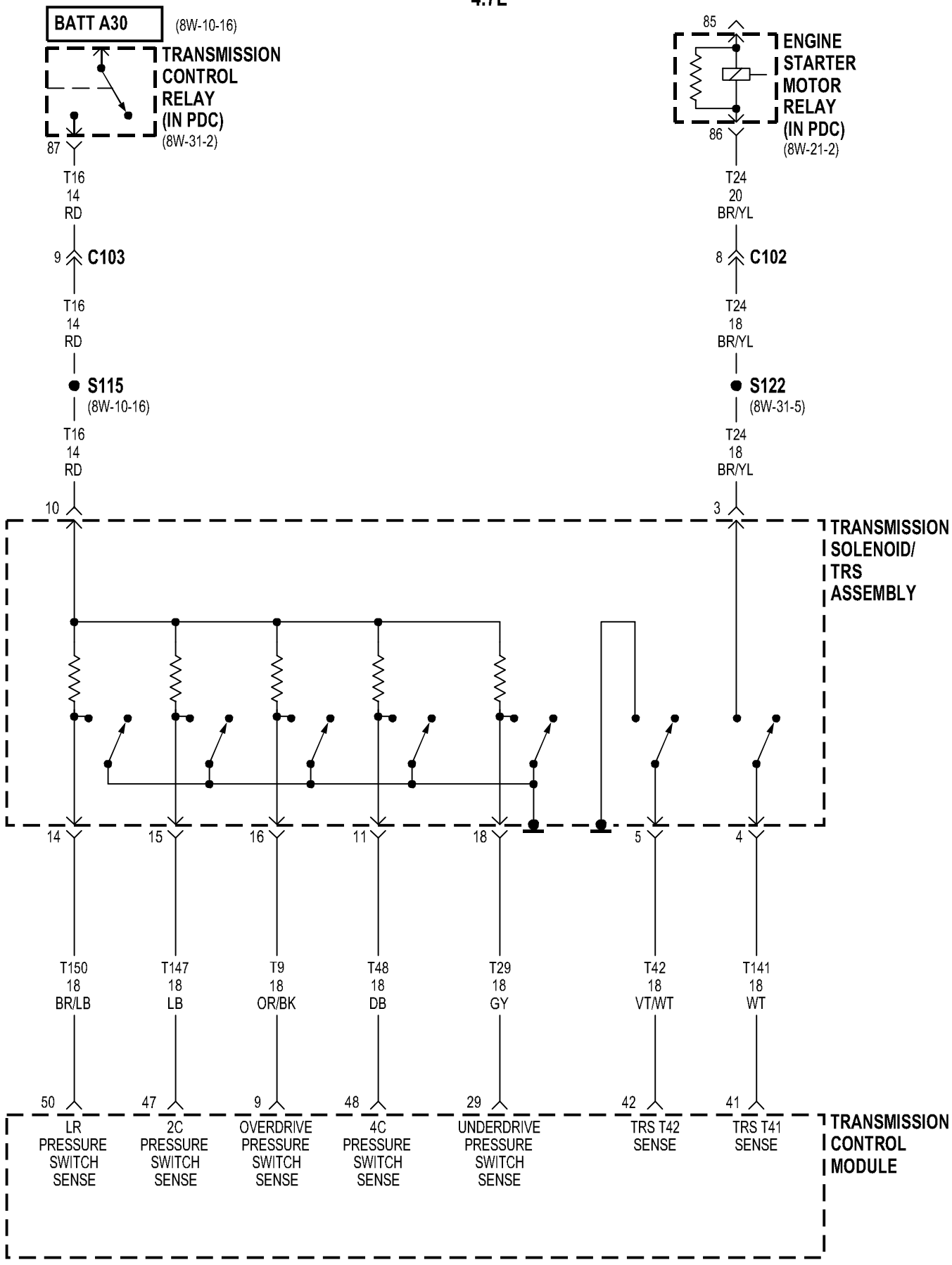
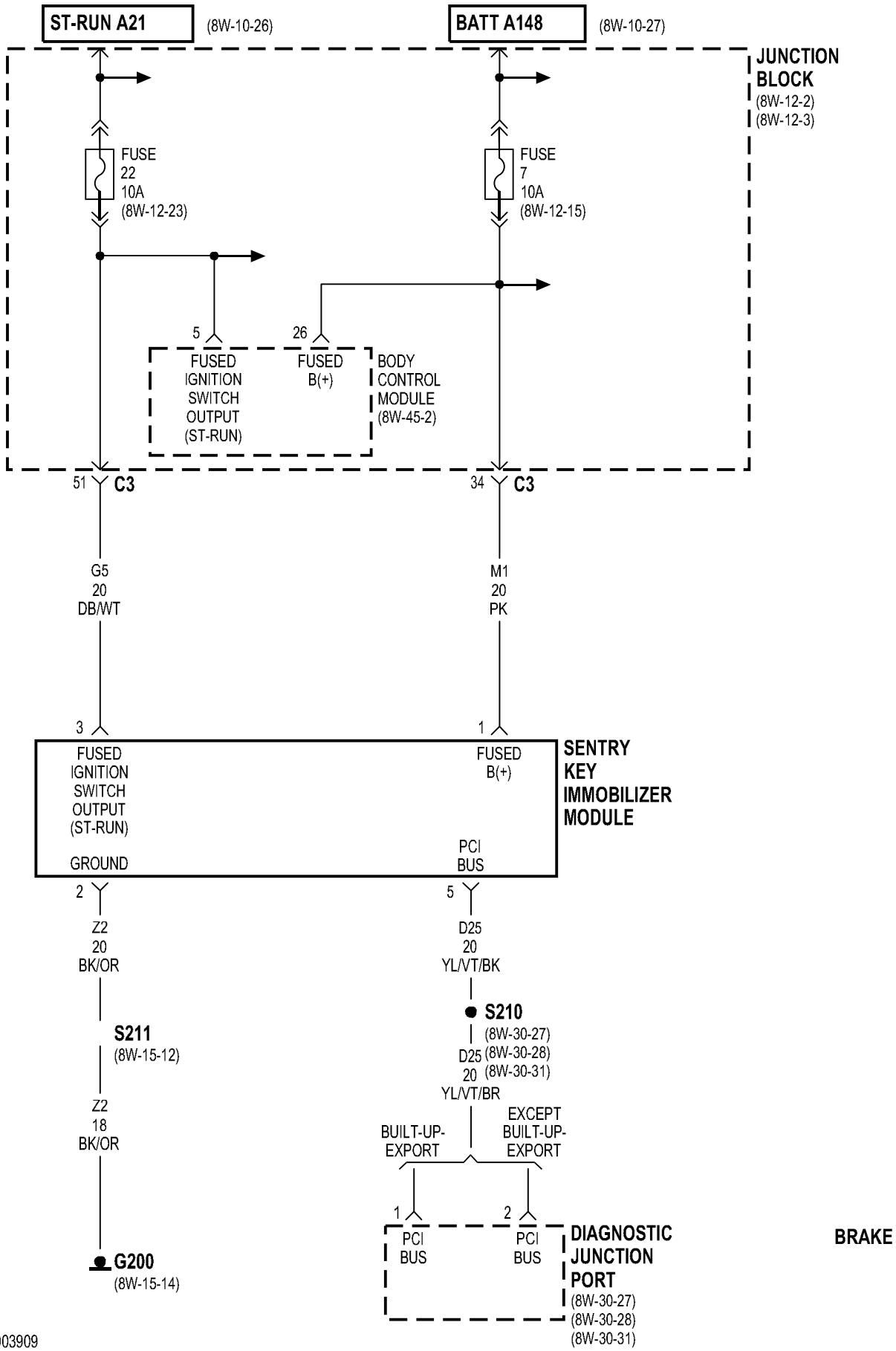
8W-15 GROUND DISTRIBUTION

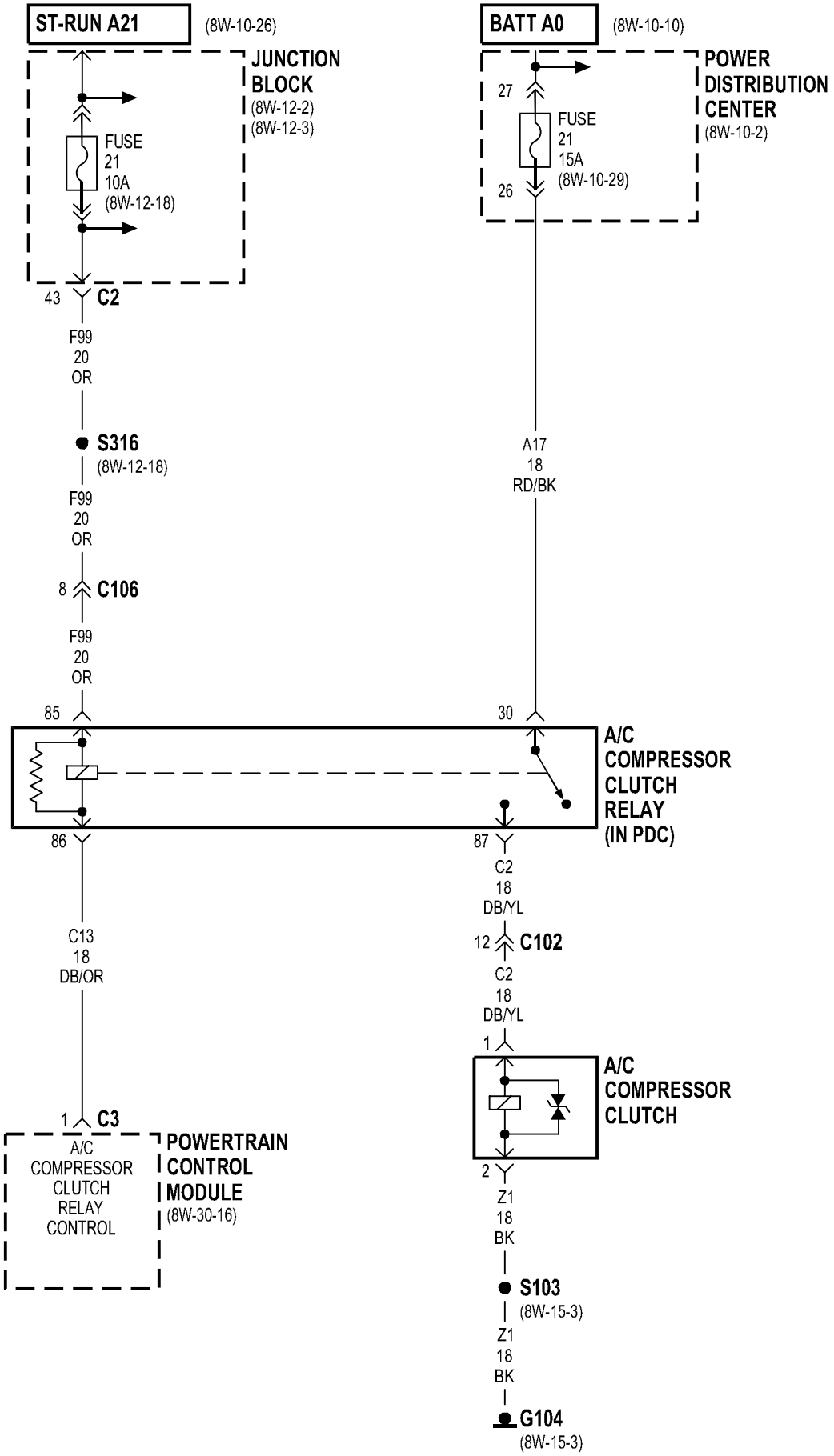
8W-20 CHARGING SYSTEM

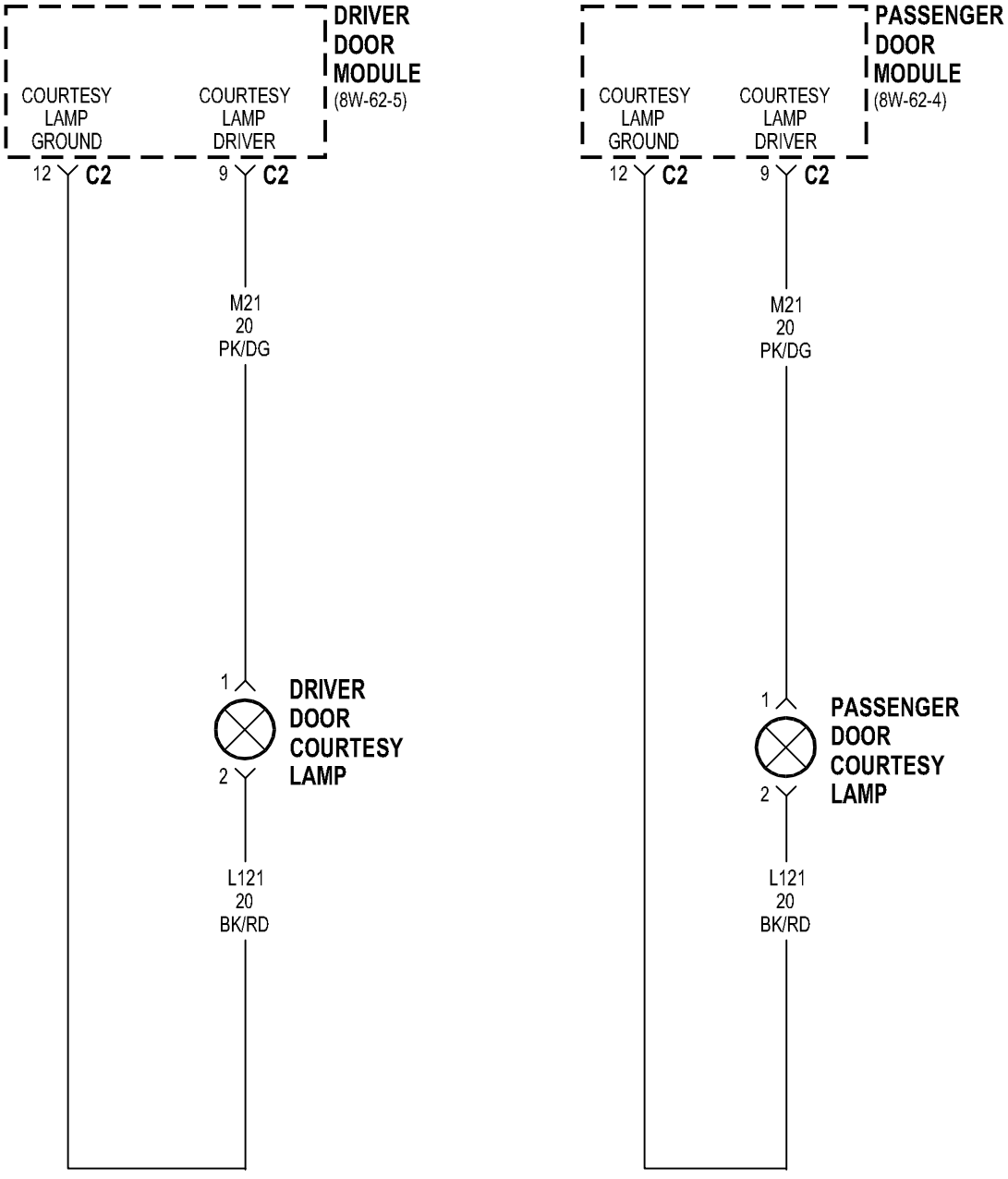

VEHICLE SPEED SENSOR SIGNAL
INSTRUMENT CLUSTER
(8W-40-8)
4
G7
20
WT/OR
20
C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
2
C2
GAS
DIESEL
G7
20
WT/OR
G7
20
WT/OR
VEHICLE SPEED SENSOR SIGNAL
CONTROLLER ANTI-LOCK BRAKE
(8W-35-4)
3
G7
18
WT/OR
36
C107
DIESEL
GAS
G7
18
WT/OR
S325
(8W-12-31)
LHD
RHD
G7
18
WT/OR
G7
20
WT/OR
36
C106
G7
20
WT/OR
5
C103
G7
18
WT/OR
4.0L
4.7L
OUTPUT SPEED SENSOR (4.0L/DIESEL)
2
1
T14
18
LG/WT
T13
18
DB/BK
VEHICLE SPEED SENSOR SIGNAL
TRANSMISSION CONTROL MODULE
(8W-31-8)
28
G7
18
WT/OR
S117
(8W-12-31)
G7
18
WT/OR
••25
•28
C2
••28
•25
C2
27
C2
OUTPUT SPEED SENSOR SIGNAL
SPEED SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL
POWERTRAIN CONTROL MODULE
•• DIESEL
• 4.0L

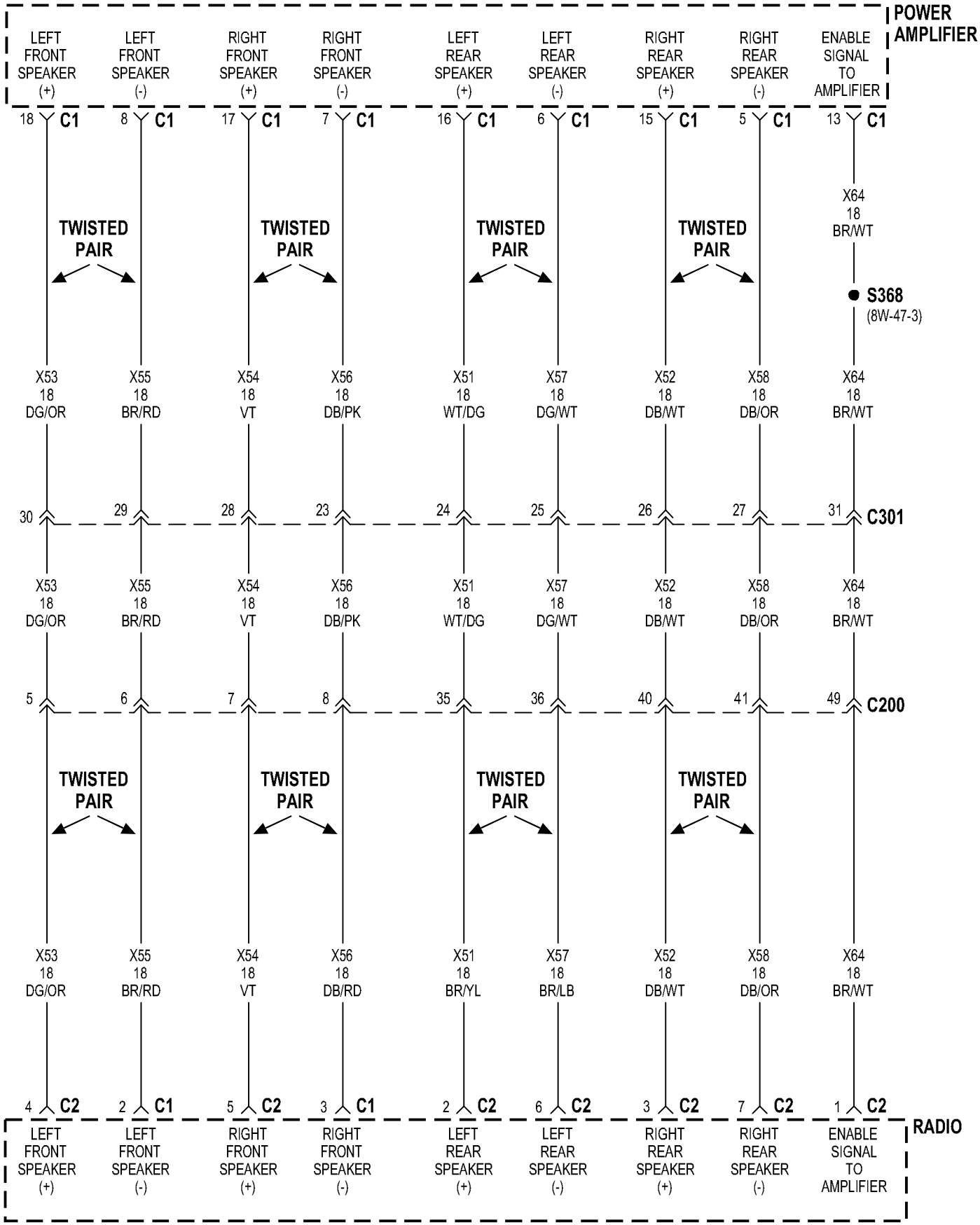

ST-RUN A21
(8W-10-26)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 21 10A
(8W-12-19)
43 C2
F99 20 OR
8 C107
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 9 20A
(8W-10-22)
33
FUSE 24 20A
(8W-10-29)
32
F99 20 OR
A12 16 TN/RD
A14 16 RD/WT
A14 16 RD/WT
85
30
FUEL HEATER RELAY (IN PDC)
86
87
30
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-3)
87
5 C102
F99 20 OR
2 C102
Z1 20 BK
S140
(8W-15-6)
A93 16 RD/BK
6 C103
A14 16 RD/WT
A93 16 RD/BK
2
FUEL HEATER
22 C1
FUSED B(+)
POWERTRAIN CONTROL MODULE
F99 18 OR
Z1 16 BK
S134
(8W-15-6)
47 C1
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
ENGINE CONTROL MODULE
Z1 12 BK
G106
(8W-15-6)
1
Z1 16 BK
G105
(8W-15-3)
WG003037
J998W-19

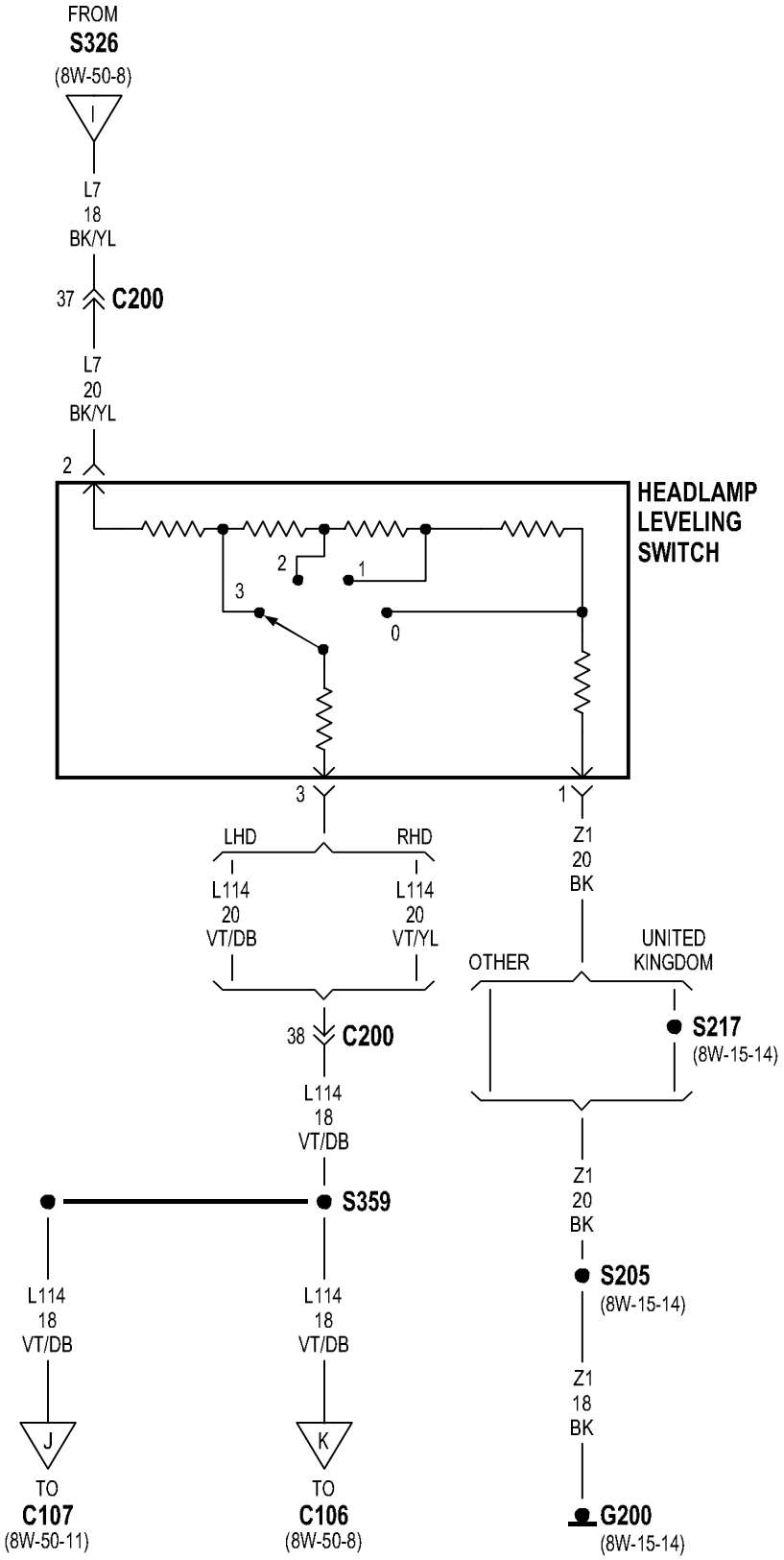

BATT A30
(8W-10-16)
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
87
T16
14
RD
9
C103
T16
14
RD
S115
(8W-10-16)
T16
14
RD
10
85
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
86
T24
20
BR/YL
8
C102
T24
18
BR/YL
S122
(8W-31-5)
T24
18
BR/YL
3
TRANSMISSION SOLENOID/ TRS ASSEMBLY
14
15
16
11
18
5
4
T150
18
BR/LB
T147
18
LB
T9
18
OR/BK
T48
18
DB
T29
18
GY
T42
18
VT/WT
T141
18
WT
50
47
9
48
29
42
41
LR PRESSURE SWITCH SENSE
2C PRESSURE SWITCH SENSE
OVERDRIVE PRESSURE SWITCH SENSE
4C PRESSURE SWITCH SENSE
UNDERDRIVE PRESSURE SWITCH SENSE
TRS T42 SENSE
TRS T41 SENSE
TRANSMISSION CONTROL MODULE


ST-RUN A21
(8W-10-26)
BATT A148
(8W-10-27)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 22 10A (8W-12-23)
FUSE 7 10A (8W-12-15)
5
26
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
FUSED B(+)
BODY CONTROL MODULE (8W-45-2)
51 C3
34 C3
G5 20 DB/WT
M1 20 PK
3
1
FUSED IGNITION SWITCH OUTPUT (ST-RUN)
FUSED B(+)
GROUND
PCI BUS
SENTRY KEY IMMOBILIZER MODULE
2
5
Z2 20 BK/OR
D25 20 YL/VT/BK
S211
(8W-15-12)
S210
(8W-30-27)
(8W-30-28)
(8W-30-31)
Z2 18 BK/OR
D25 20 YL/VT/BR
BUILT-UP-EXPORT
EXCEPT BUILT-UP-EXPORT
1
2
PCI BUS
PCI BUS
DIAGNOSTIC JUNCTION PORT
(8W-30-27)
(8W-30-28)
(8W-30-31)
G200
(8W-15-14)
BRAKE


ST-RUN A21
(8W-10-26)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
21
10A
(8W-12-18)
43
C2
F99
20
OR
S316
(8W-12-18)
F99
20
OR
8
C106
F99
20
OR
85
86
BATT A0
(8W-10-10)
POWER DISTRIBUTION CENTER
(8W-10-2)
27
FUSE
21
15A
(8W-10-29)
26
A17
18
RD/BK
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
87
C2
18
DB/YL
12
C102
C2
18
DB/YL
1
A/C COMPRESSOR CLUTCH
2
Z1
18
BK
S103
(8W-15-3)
Z1
18
BK
G104
(8W-15-3)
C13
18
DB/OR
1
C3
A/C COMPRESSOR CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-16)

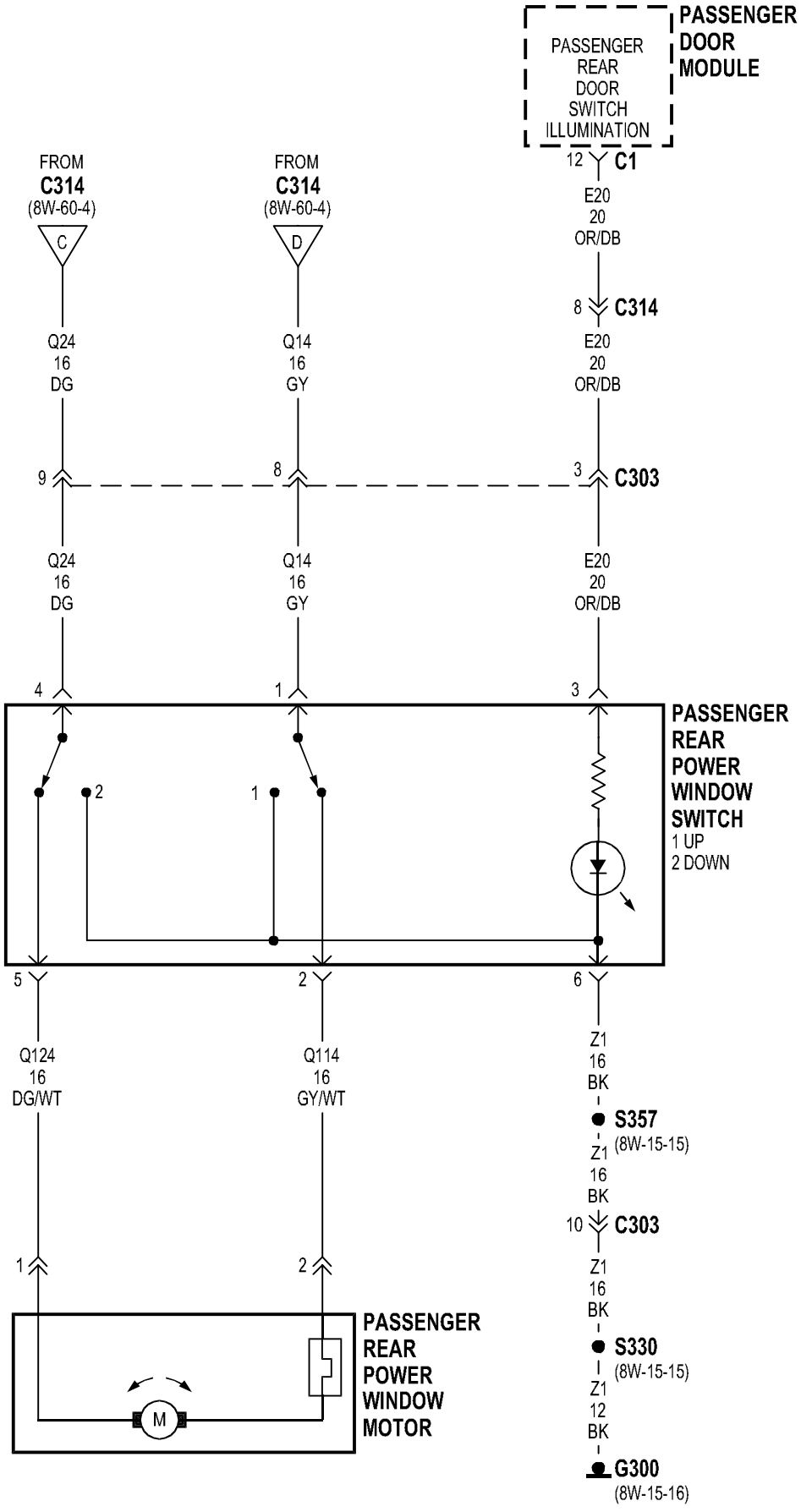

DRIVER DOOR MODULE
(8W-62-5)
COURTESY LAMP GROUND
COURTESY LAMP DRIVER
12 C2
9 C2
M21
20
PK/DG
1
DRIVER DOOR COURTESY LAMP
2
L121
20
BK/RD
PASSENGER DOOR MODULE
(8W-62-4)
COURTESY LAMP GROUND
COURTESY LAMP DRIVER
12 C2
9 C2
M21
20
PK/DG
1
PASSENGER DOOR COURTESY LAMP
2
L121
20
BK/RD


POWER AMPLIFIER
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)
ENABLE SIGNAL TO AMPLIFIER
18 C1
8 C1
17 C1
7 C1
16 C1
6 C1
15 C1
5 C1
13 C1
TWISTED PAIR
X64 18 BR/WT
S368 (8W-47-3)
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
X64 18 BR/WT
30 29 28 23 24 25 26 27 31 C301
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
X64 18 BR/WT
5 6 7 8 35 36 40 41 49 C200
TWISTED PAIR
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/RD
X51 18 BR/YL
X57 18 BR/LB
X52 18 DB/WT
X58 18 DB/OR
X64 18 BR/WT
4 C2
2 C1
5 C2
3 C1
2 C2
6 C2
3 C2
7 C2
1 C2
RADIO
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)
ENABLE SIGNAL TO AMPLIFIER

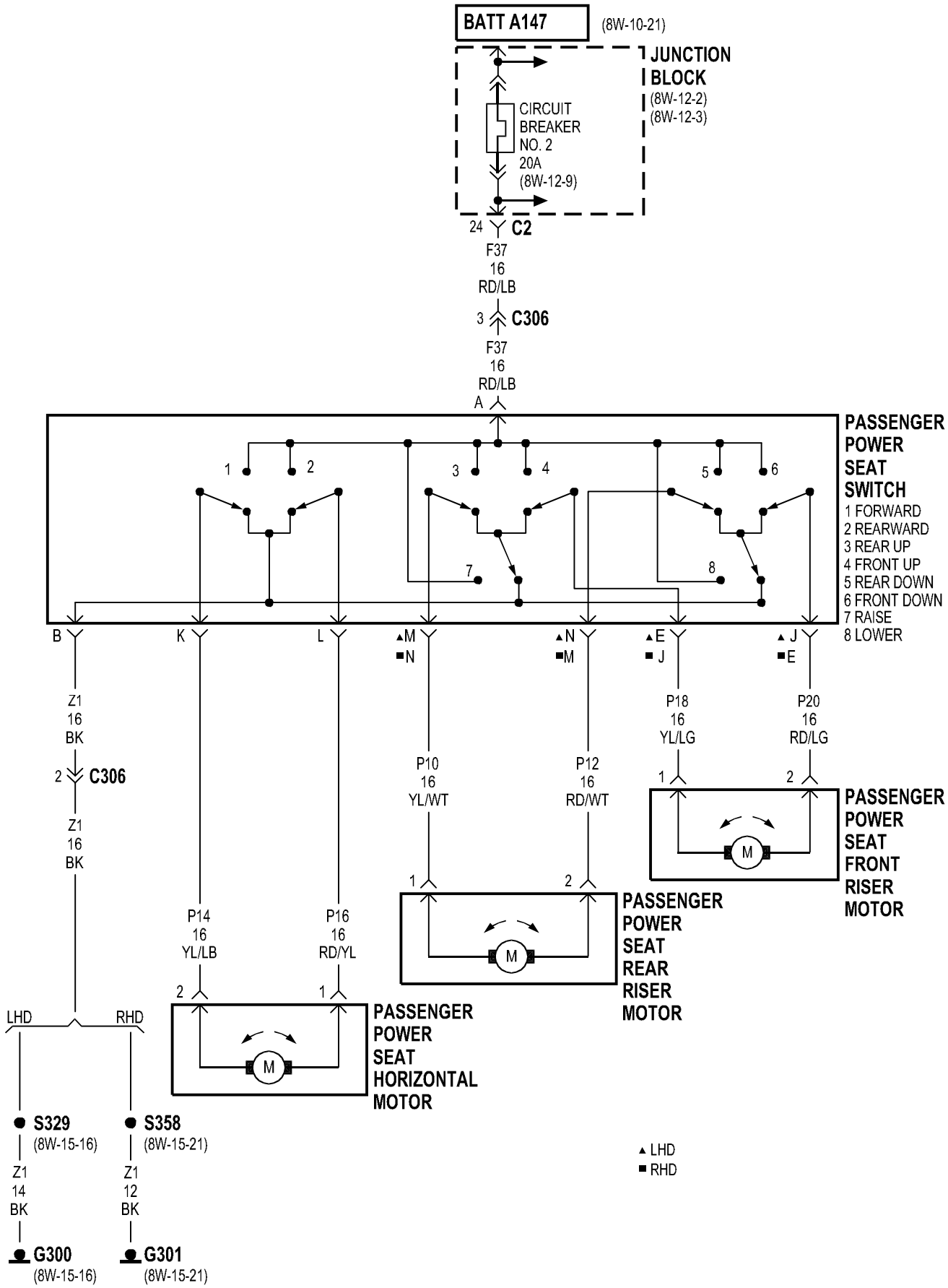

FROM
S326
(8W-50-8)
I
L7
18
BK/YL
37
C200
L7
20
BK/YL
2
HEADLAMP
LEVELING
SWITCH
2
1
3
0
3
1
LHD
RHD
L114
20
VT/DB
L114
20
VT/YL
Z1
20
BK
OTHER
UNITED
KINGDOM
38
C200
S217
(8W-15-14)
L114
18
VT/DB
S359
Z1
20
BK
S205
(8W-15-14)
L114
18
VT/DB
L114
18
VT/DB
Z1
18
BK
J
K
TO
C107
(8W-50-11)
TO
C106
(8W-50-8)
G200
(8W-15-14)

8W-53 WIPERS

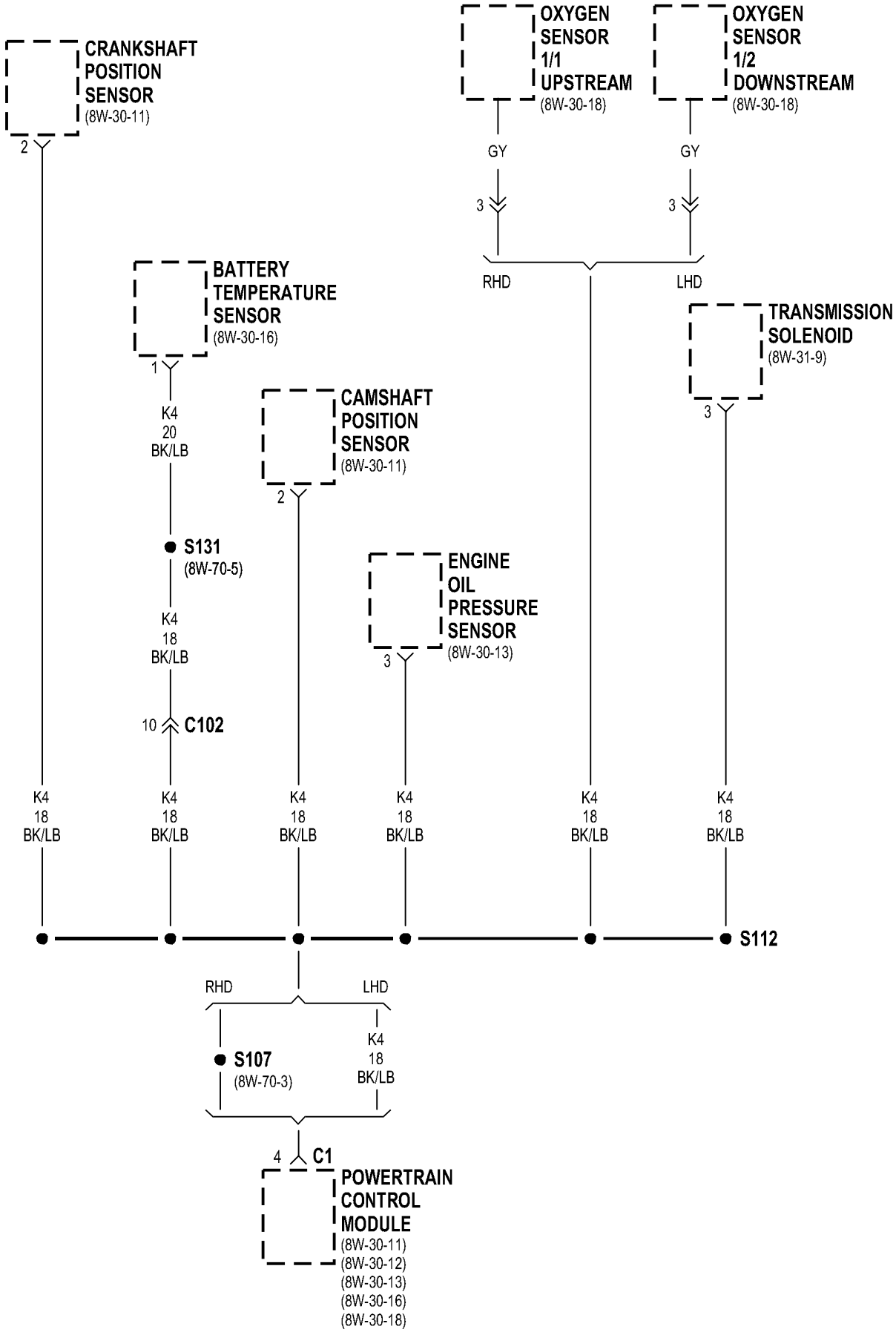
LHD

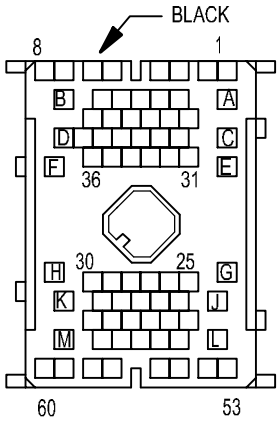

PASSENGER DOOR MODULE
PASSENGER REAR DOOR SWITCH ILLUMINATION
12 C1
E20 20 OR/DB
8 C314
E20 20 OR/DB
3 C303
E20 20 OR/DB
FROM C314 (8W-60-4)
C
Q24 16 DG
9
Q24 16 DG
4
FROM C314 (8W-60-4)
D
Q14 16 GY
8
Q14 16 GY
1
4
1
3
2
1
PASSENGER REAR POWER WINDOW SWITCH
1 UP
2 DOWN
5
2
6
Q124 16 DG/WT
Q114 16 GY/WT
Z1 16 BK
S357
(8W-15-15)
Z1 16 BK
10 C303
Z1 16 BK
S330
(8W-15-15)
Z1 12 BK
G300
(8W-15-16)
1
2
M
PASSENGER REAR POWER WINDOW MOTOR

BASE


BATT A147
(8W-10-21)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
24 C2
F37 16 RD/LB
3 C306
F37 16 RD/LB
A
PASSENGER POWER SEAT SWITCH
1 FORWARD
2 REARWARD
3 REAR UP
4 FRONT UP
5 REAR DOWN
6 FRONT DOWN
7 RAISE
8 LOWER
B
K
L
▲M ■N
▲N ■M
▲E ■J
▲J ■E
Z1 16 BK
2 C306
Z1 16 BK
P10 16 YL/WT
P12 16 RD/WT
P18 16 YL/LG
P20 16 RD/LG
P14 16 YL/LB
P16 16 RD/YL
PASSENGER POWER SEAT FRONT RISER MOTOR
PASSENGER POWER SEAT REAR RISER MOTOR
PASSENGER POWER SEAT HORIZONTAL MOTOR
LHD
RHD
S329
(8W-15-16)
S358
(8W-15-21)
Z1 14 BK
Z1 12 BK
G300
(8W-15-16)
G301
(8W-15-21)
▲ LHD
■ RHD

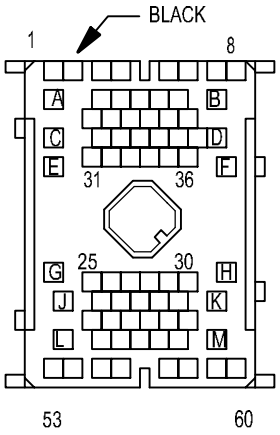
4.0L


CRANKSHAFT POSITION SENSOR (8W-30-11)
2
OXYGEN SENSOR 1/1 UPSTREAM (8W-30-18)
OXYGEN SENSOR 1/2 DOWNSTREAM (8W-30-18)
GY
GY
3
3
RHD
LHD
BATTERY TEMPERATURE SENSOR (8W-30-16)
1
TRANSMISSION SOLENOID (8W-31-9)
3
K4 20 BK/LB
CAMSHAFT POSITION SENSOR (8W-30-11)
2
S131 (8W-70-5)
ENGINE OIL PRESSURE SENSOR (8W-30-13)
3
K4 18 BK/LB
10 C102
K4 18 BK/LB
K4 18 BK/LB
K4 18 BK/LB
K4 18 BK/LB
K4 18 BK/LB
K4 18 BK/LB
S112
RHD
LHD
S107 (8W-70-3)
K4 18 BK/LB
4 C1
POWERTRAIN CONTROL MODULE
(8W-30-11)
(8W-30-12)
(8W-30-13)
(8W-30-16)
(8W-30-18)



C107
(DIESEL)

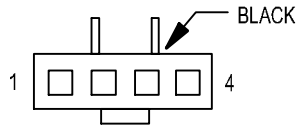
CAV	CIRCUIT
1	X2 18DG/RD
2	V11 20BK/TN
3	K4 20BK/LB
4	V37 22RD/LG
5	V55 16TN/RD
6	V6 16DB
7	V10 22BR
8	F99 20OR
9	-
10	X4 22GY/OR
11	F15 20DB/WT
12	F45 20YL/RD
13	-
14	T9 18OR/BK
15	G70 20BR/TN
16	-
17	-
18	-
19	D32 20LG/DG
20	K35 18GY/YL
21	
22	-
23	-
24	K480 18DB/OR
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL
30	B1 18YL/DB
31	-
32	M1 20PK/RD
33	F20 18DB/PK
34	L50 18WT/TN
35	-
36	G7 20WT/OR
37	Z21 20BK/LG
38	Z2 20BK/OR
39	V10 22BR
40	K29 18WT/PK



C107
(DIESEL)

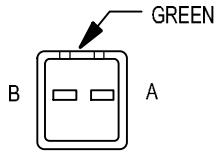
CAV	CIRCUIT
1	X2 18DG/RD
2	V11 20BK/TN
3	K4 20BK/LB
4	V37 18RD/LG
5	V55 16TN/RD
6	V6 16DB
7	V10 20BR
8	F99 20OR
9	-
10	X4 20GY/OR
11	F15 20DB/WT
12	F45 20YL/RD
13	-
14	T9 18OR/BK
15	G70 20BR/TN
16	-
17	-
18	-
19	D32 18LG/DG
20	K35 18GY/YL
21	
22	-
23	-
24	-
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL
30	B1 18YL/DB
31	-
32	M1 20PK/RD
33	F20 18DB/PK
34	L50 18WT/TN
35	-
36	G7 18WT/OR
37	Z21 20BK/LG
38	Z2 20BK/OR
39	V10 20BR
40	K29 18WT/PK

(CONTINUED ON NEXT PAGE)



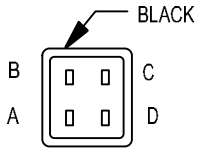
DRIVER DOOR MODULE-C3

CAV	CIRCUIT	FUNCTION
1	BK	MEMORY SWITCH RETURN
2	BR	MEMORY SWITCH MUX
3	OR	MEMORY SET INDICATOR DRIVER
4	GY	SWITCH ILLUMINATION DRIVER



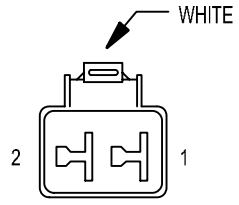
DRIVER HEATED SEAT BACK (PREMIUM I/III)

CAV	CIRCUIT	FUNCTION
A	P88 16BK/BR	HEATED SEAT DRIVER
B	Z6 16BK/YL	DRIVER SEAT HEATER GROUND



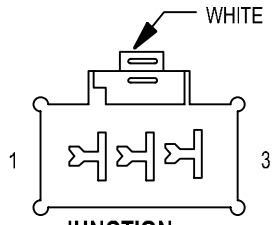
DRIVER HEATED SEAT CUSHION (PREMIUM I/III)

CAV	CIRCUIT	FUNCTION
A	P131 16BK/OR	DRIVER SEAT HEATER B(+) DRIVER
B	P88 16BK/BR	HEATED SEAT DRIVER
C	P135 20LB/BK	DRIVER SEAT TEMPERATURE SENSOR INPUT
D	P29 20BR/WT	SEAT SENSOR 5V SUPPLY



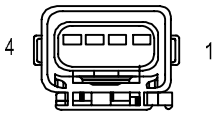
JUNCTION BLOCK - C4

CAV	CIRCUIT	FUNCTION
1	A148 10PK/WT	FUSED B(+)
2	A146 10OR/WT	FUSED B(+)



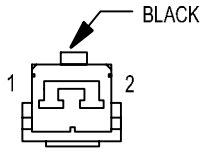
JUNCTION BLOCK - C5

CAV	CIRCUIT	FUNCTION
1	A145 10WT/RD	FUSED B(+)
2	A149 12RD/TN	FUSED B(+)
3	A147 10RD/GY	FUSED B(+)



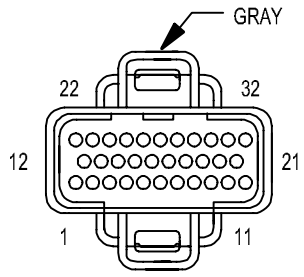
LEAK DETECTION PUMP (EXCEPT BUILT-UP-EXPORT)

CAV	CIRCUIT	FUNCTION
1	-	-
2	F142 18OR/DG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K106 20WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K107 20OR/PK	LEAK DETECTION PUMP SWITCH SENSE



LEFT COURTESY LAMP

CAV	CIRCUIT	FUNCTION
1	F70 20PK/BK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



POWERTRAIN CONTROL MODULE - C3 (DIESEL)

CAV	CIRCUIT	FUNCTION
1	C90 18LG	A/C SWITCH SENSE
2	-	-
3	-	-
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	V32 18OR/DG	SPEED CONTROL POWER SUPPLY
12	A142 14DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
13	T9 18OR/BK	OVERDRIVE OFF SWITCH SENSE
14	-	-
15	K25 18VT/LG	BATTERY TEMPERATURE SENSOR SIGNAL
16	G55 18OR/LG	ENGINE DISABLE SIGNAL
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	G3 18BK/PK	CHECK ENGINE INDICATOR DRIVER
23	K185 18OR/LB	WAIT TO START INDICATOR
24	K29 18WT/PK	BRAKE SWITCH SENSE
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18LB/YL	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG/DG	SCI RECEIVE
30	D25 18YL/VT	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL

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 (LHD)

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 Compressor Clutch	BK	At Compressor	4, 10
A/C High Pressure Cutout Switch	BK	Near Compressor	12
A/C Low Pressure Cycle Clutch Switch	DK GY	Right Rear of Engine Compartment	12
Airbag Control Module	YL	At Center Console	15, 17, 18
Ambient Air Temperature Sensor	BK	At Radiator Center Support	12
Antenna Module	WT	Above Rear Liftgate Glass	29
Ash Receiver Lamp	BK	Rear of Ash Receiver	18
Automatic Day/Night Mirror	BK	Overhead Console Near Driver Rearview Mirror	N/S
Automatic Headlamp Light Sensor/VTSS LED	BK	Top Left Side of Instrument Panel	18
Automatic Zone Control Module - C1	BK	Center of Instrument Panel	18
Automatic Zone Control Module - C2	BK	Center of Instrument Panel	18
Battery Temperature Sensor	BK	At Battery Tray	12
Blower Motor		Center of Instrument Panel	18
Blower Motor Controller (AZC)		On HVAC Housing	N/S
Blower Motor Resistor Block (MTC)	BK	On HVAC Housing Near Blower Motor	N/S
Body Control Module - C1	GY	Left Side of Instrument Panel Near Data Link Connector	17
Body Control Module - C2	WT	Left Side of Instrument Panel Near Data Link Connector	17
Brake Lamp Switch	GY	Top of Brake Pedal	20
Brake Shift Interlock Solenoid	WT	On Steering Column Near Ignition Switch	19
Brake Warning Indicator Switch	GY	Left Side of Engine Compartment Near Brake Fluid Reservoir	N/S
C100	BK	On Battery Harness Near Front of Battery	2, 13
C102 (Diesel)	BK	Near Starter	4
C102 (Gas)	BK	Rear of Engine Near Powertrain Control Module	5, 9, 12, 14
C103 (Diesel)	GY	Near Starter	4
C103 (Gas)	GY	Rear of Engine Near Powertrain Control Module	5, 9, 14

DESCRIPTION AND OPERATION (Continued)

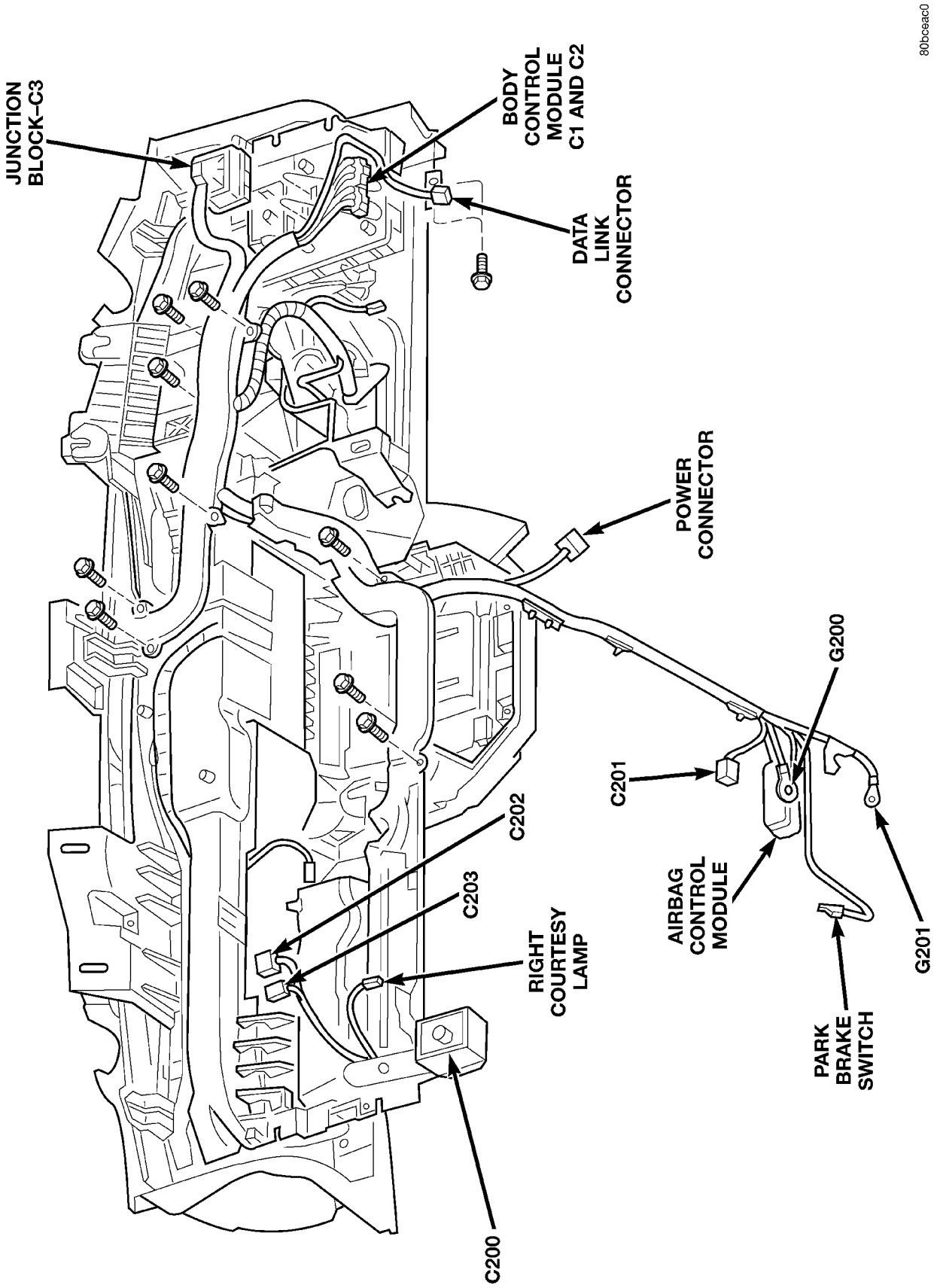


Fig. 17 Instrument Panel Connectors — LHD

DESCRIPTION AND OPERATION (Continued)

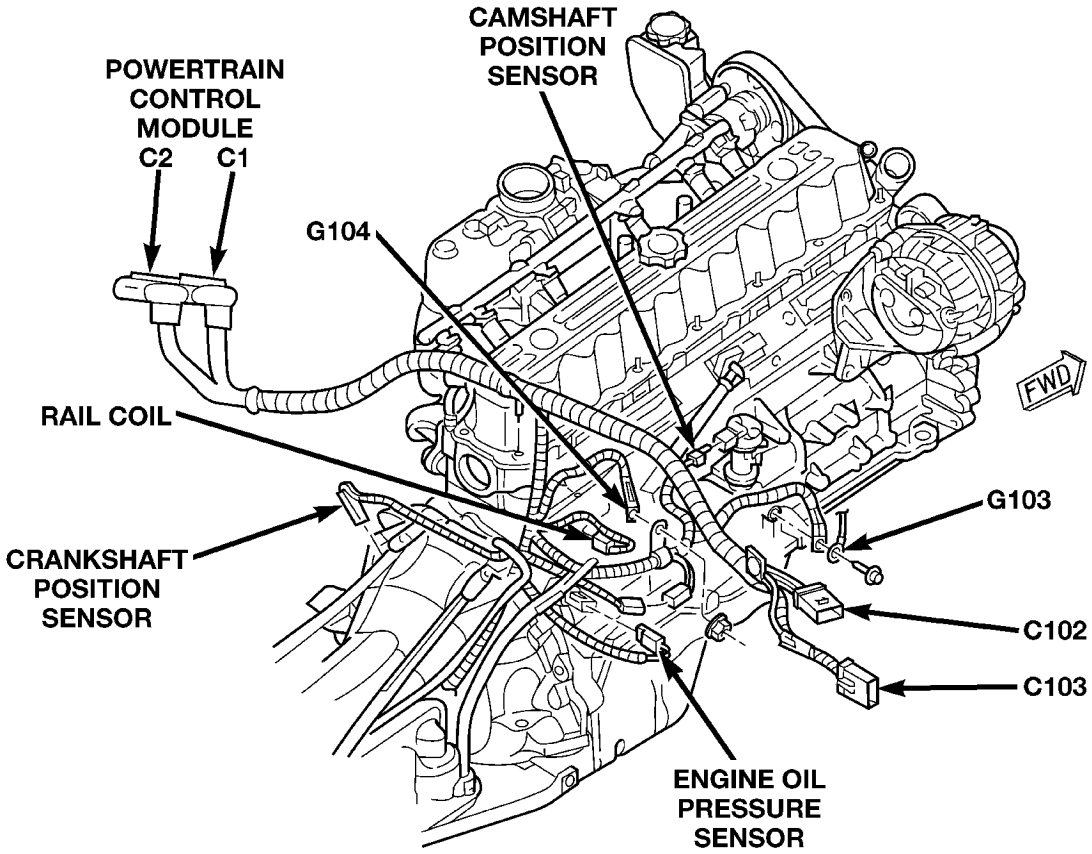


Fig. 40 Engine Connections (4.0L) — RHD

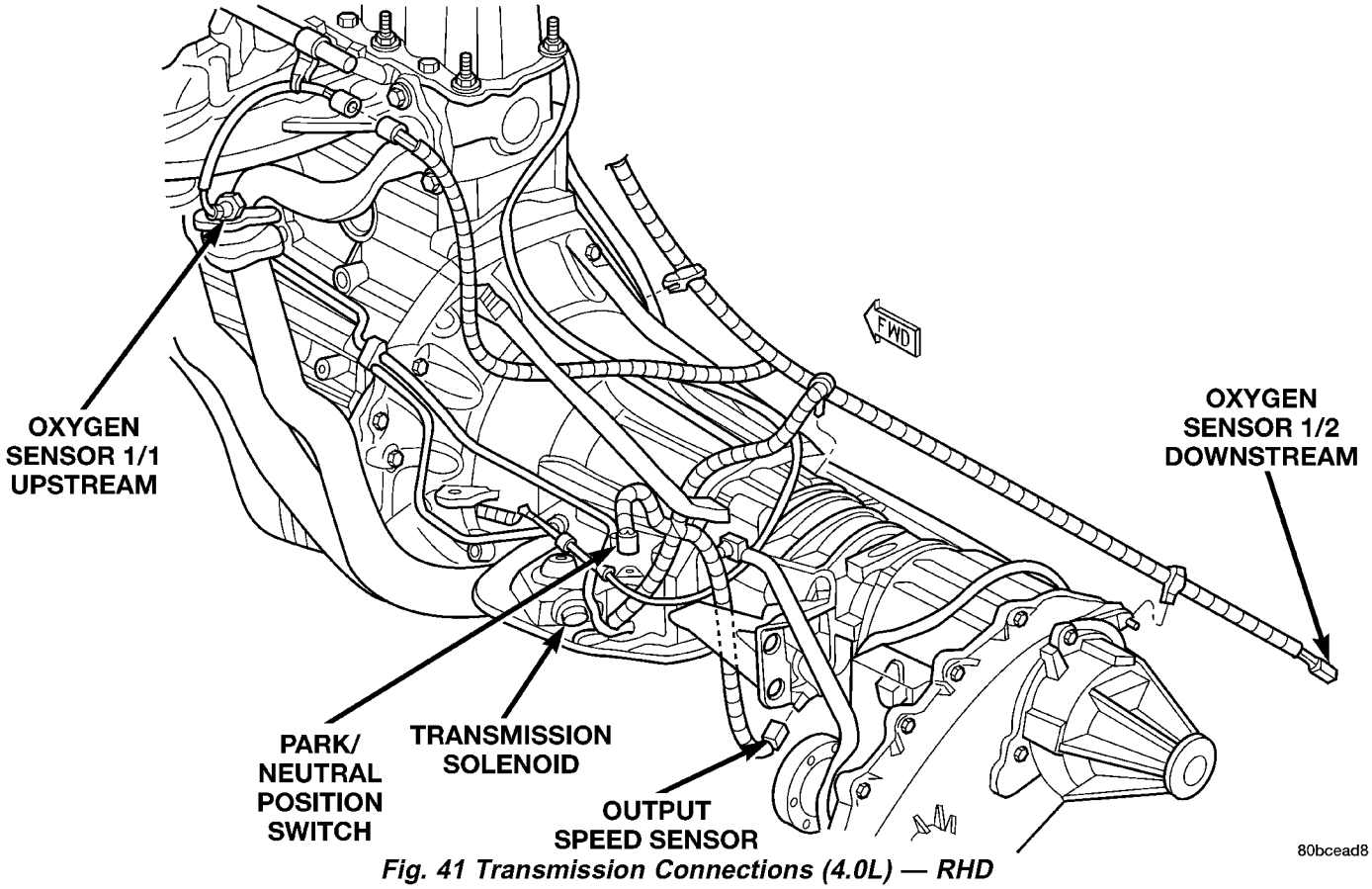


Fig. 41 Transmission Connections (4.0L) — RHD

DESCRIPTION AND OPERATION (Continued)

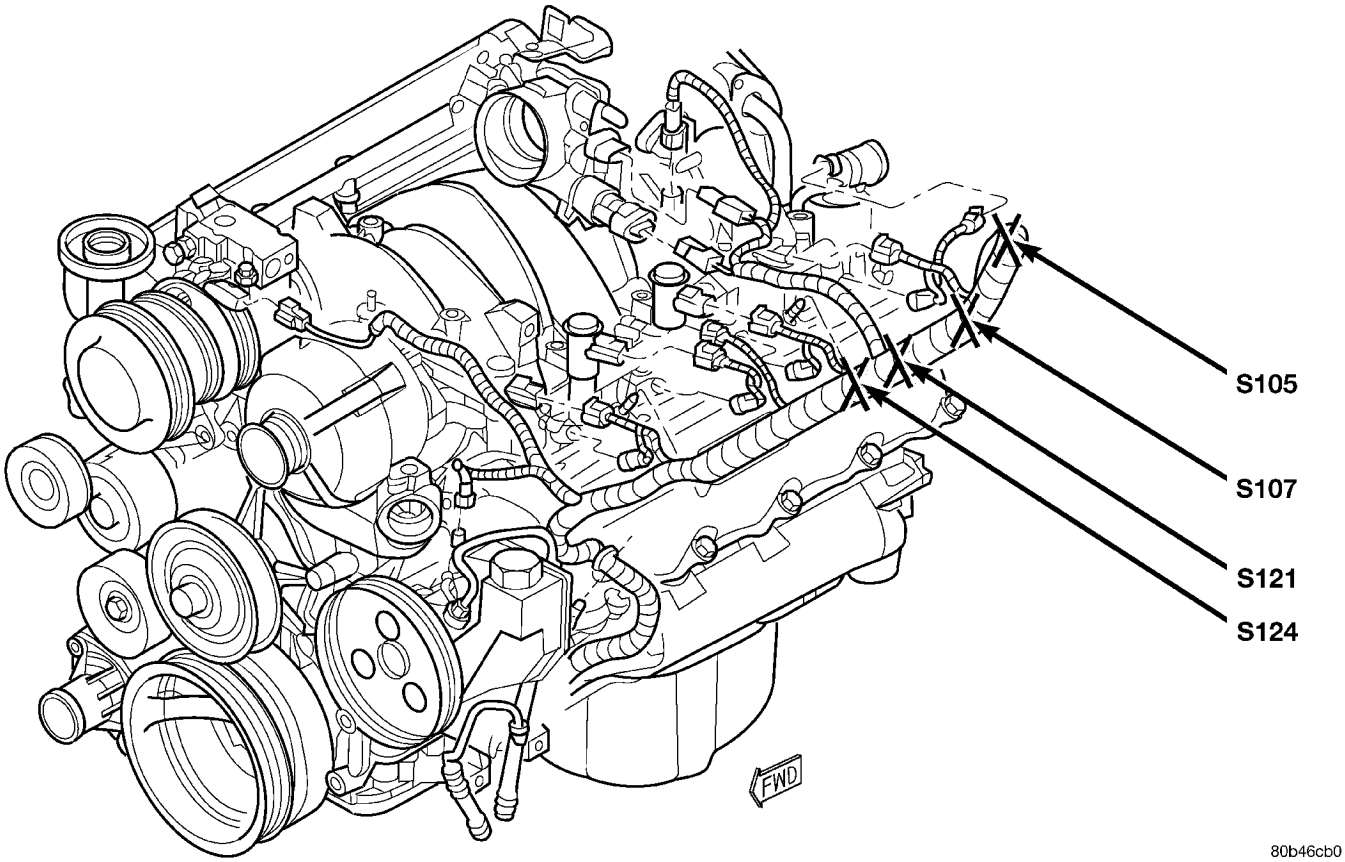


Fig. 1 Engine Splices (4.7L) — LHD

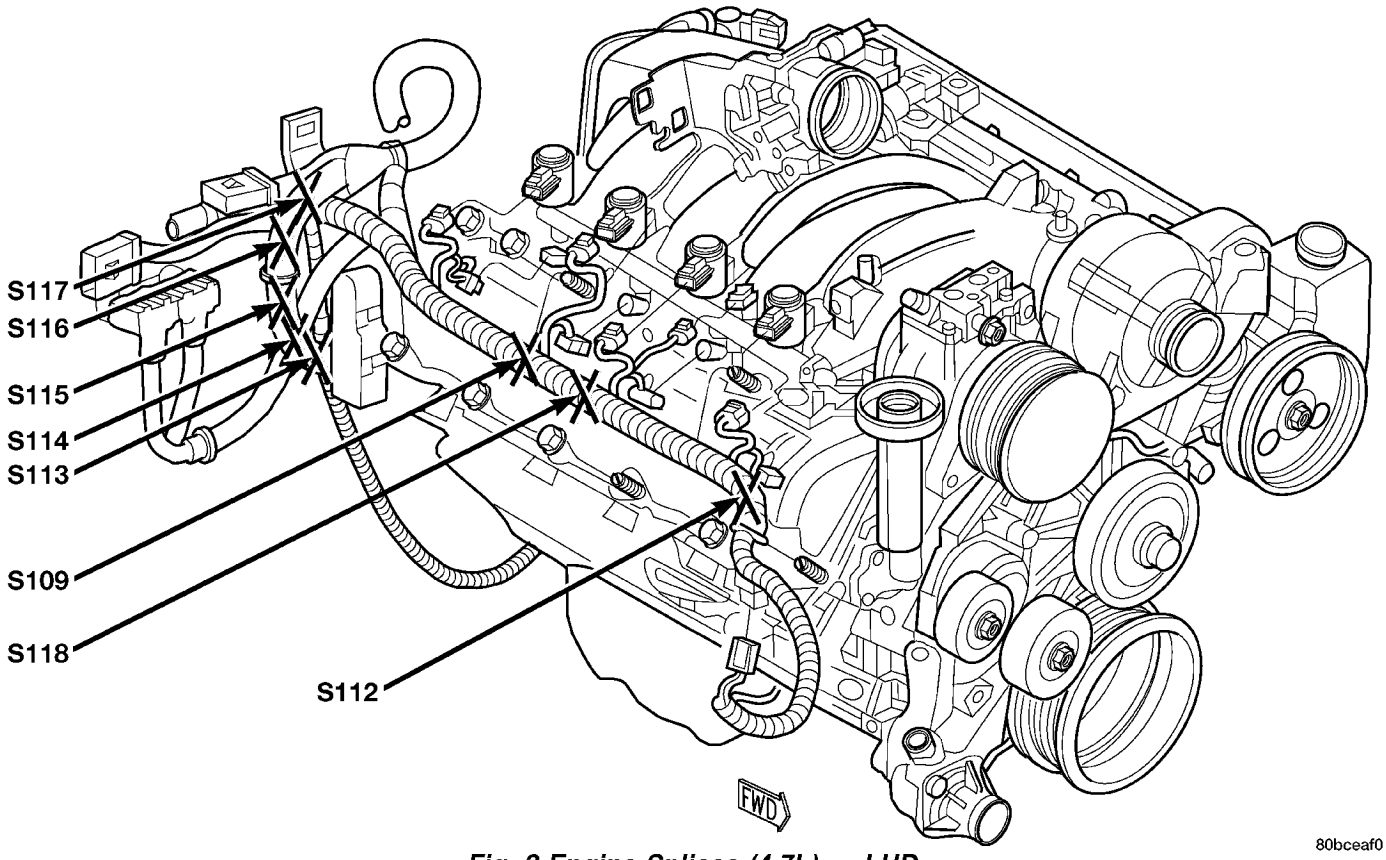


Fig. 2 Engine Splices (4.7L) — LHD

DESCRIPTION AND OPERATION (Continued)

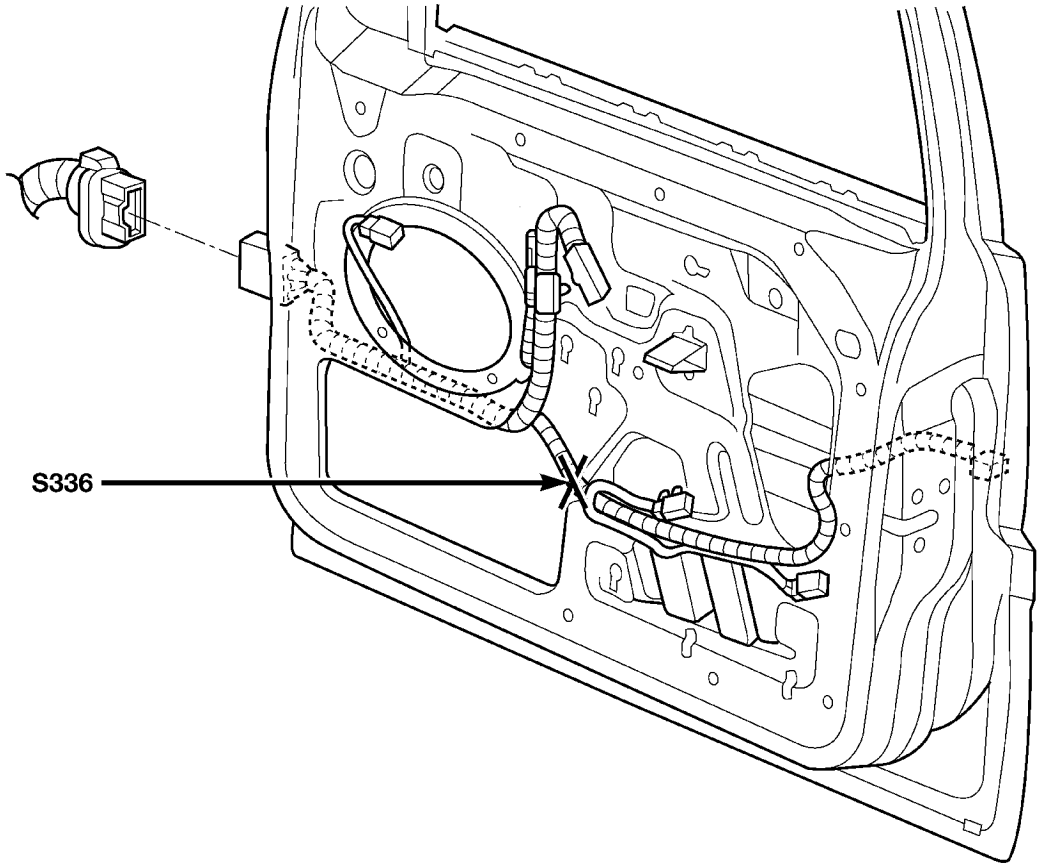


Fig. 30 Door Splices (Driver Door) — RHD

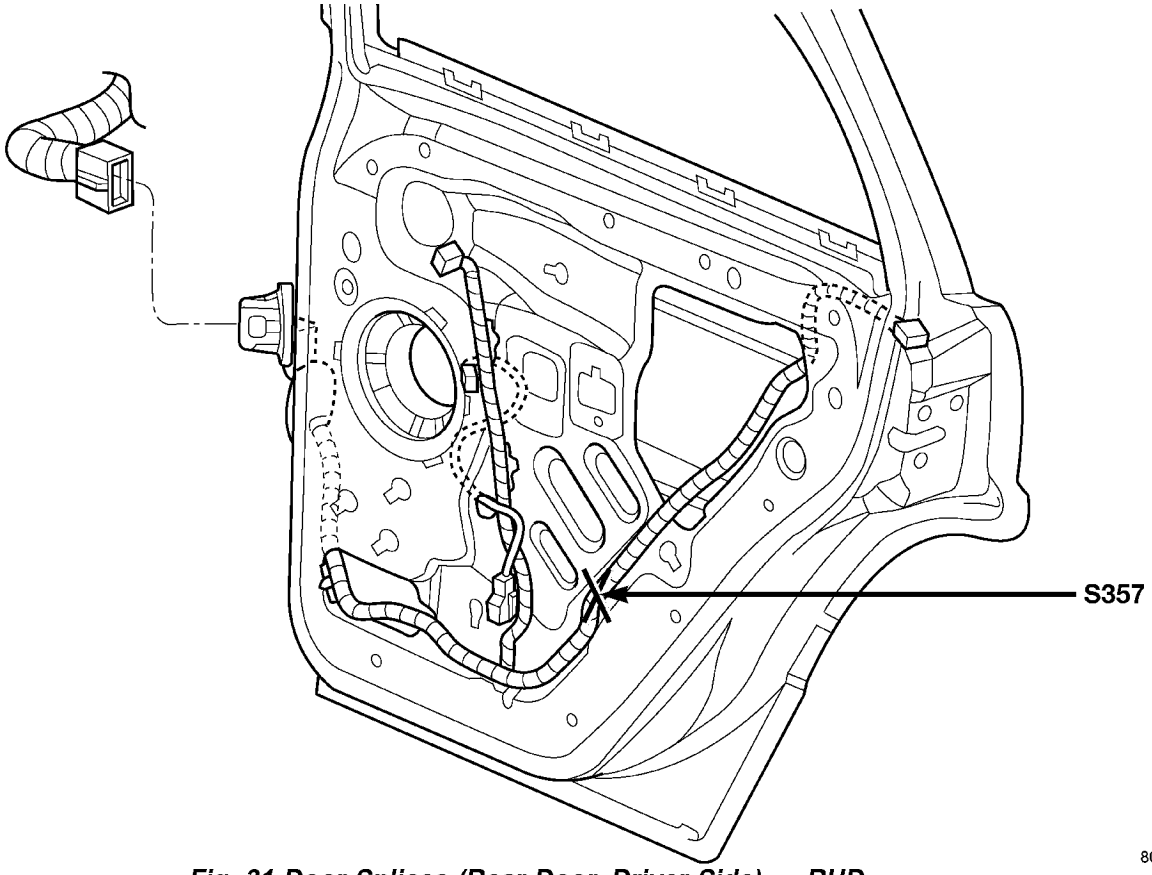


Fig. 31 Door Splices (Rear Door, Driver Side) — RHD

SERVICE PROCEDURES (Continued)

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.

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. 4).

(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. 3). 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 SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 to 98.448 mm (3.8755 to 3.8759 in.)	A
98.448 to 98.458 mm (3.8759 to 3.8763 in.)	B
98.458 to 98.468 mm (3.8763 to 3.8767 in.)	C
98.468 to 98.478 mm (3.8767 to 3.8771 in.)	D
98.478 to 98.488 mm (3.8771 to 3.8775 in.)	E
98.488 to 98.498 mm (3.8775 to 3.8779 in.)	F

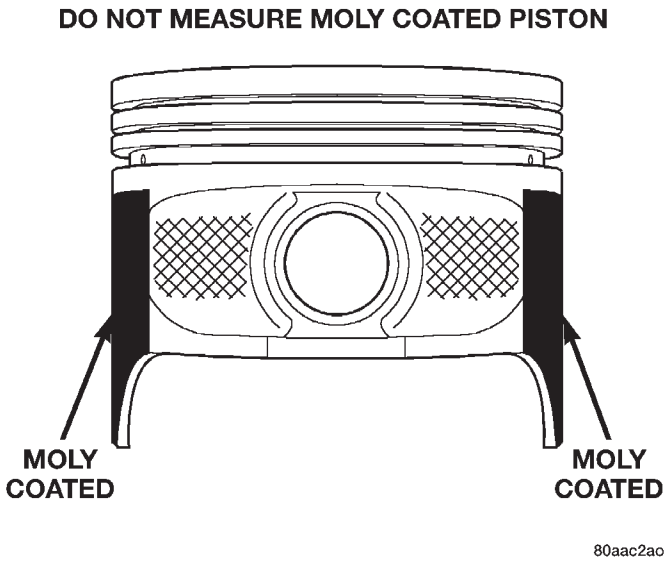


Fig. 3 Moly Coated Piston

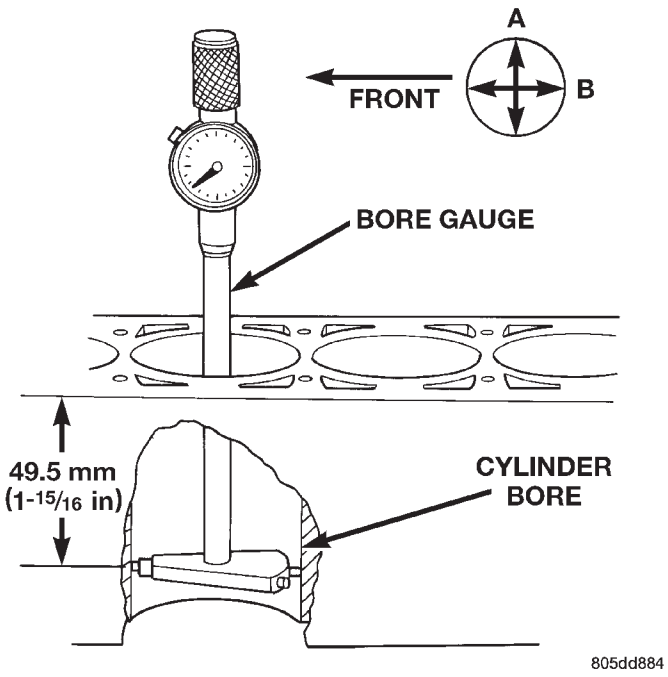


Fig. 4 Bore Gauge

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. 5) (Fig. 6). Rotate the ring in the groove. It must move freely around circumference of the groove.

REMOVAL AND INSTALLATION (Continued)

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 distributor cap and mark the position of the rotor.
(5) Remove the front fascia and/or grille, as required.
(6) Disconnect camshaft position sensor electrical connector and remove camshaft position sensor.
(7) Remove the engine cylinder head cover.
(8) Remove the rocker arms, bridges and pivots.
(9) Remove the push rods.
(10) Remove the engine cylinder head and gasket.
(11) Remove the hydraulic valve tappets from the engine cylinder block.
(12) Remove the vibration damper.
(13) Remove the timing case cover.
(14) Remove the timing chain and sprockets.
(15) Remove the two thrust plate retaining screws and thrust plate.
(16) Remove the camshaft (Fig. 45).

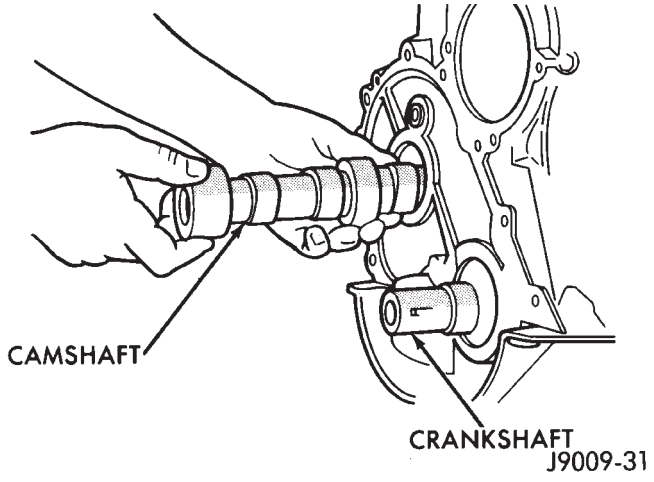


Fig. 45 Camshaft

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 thrust surface appears to have excessive wear, 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. 45).
(8) Inspect thrust plate surfaces for excessive wear, 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.).
(11) Install the timing case cover with a replacement oil seal (Fig. 46). Refer to Timing Case Cover Installation.
(12) Install the vibration damper (Fig. 46).

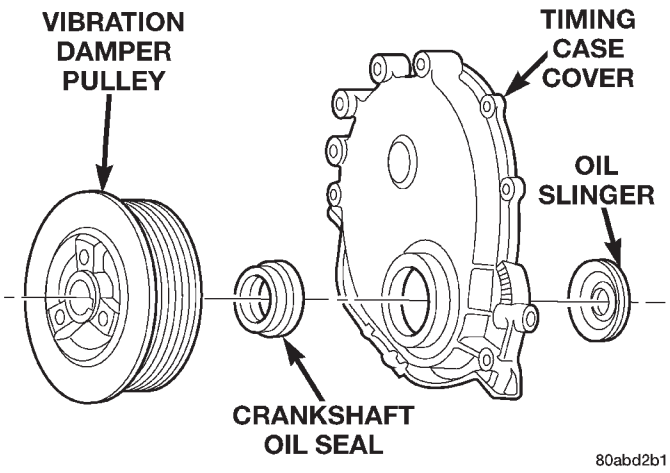


Fig. 46 Timing Case Cover Components

(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) Position the oil pump gear. Refer to Camshaft position sensor in the Component Removal/Installation section of Group 14, Fuel Systems.
(20) Install the Camshaft position sensor and ignition coil rail. Refer to Camshaft position sensor in

DESCRIPTION AND OPERATION (Continued)

intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

CYLINDER HEAD COVERS

The cylinder head covers are made of die cast magnesium, and are not interchangeable from side-to-side. It is imperative that nothing rest on the cylinder head covers. Prolonged contact with other items may wear a hole in the cylinder head cover.

HYDRAULIC LASH ADJUSTERS

Valve lash is controlled by hydraulic lash adjusters that are stationary mounted in the cylinder heads. The lash adjusters have a hole in the ball plunger that feeds oil through the rocker arm squirt holes for rocker arm roller and camshaft lobe lubrication.

VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

OIL PAN

The engine oil pan is made of laminated steel and has a single plane sealing surface. The sandwich style oil pan gasket has an integrated windage tray and steel carrier. The sealing area of the gasket is molded with rubber and is designed to be reused as long as the gasket is not cut, torn or ripped.

STRUCTURAL DUST COVER

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine bedplate. The structural cover provides additional powertrain stiffness and reduces noise and vibration.

VALVE STEM SEALS

The valve stem seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

INTAKE MANIFOLD

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks. Eight studs and two bolts are used to fasten the intake to the head.

EXHAUST MANIFOLD

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

DIAGNOSIS AND TESTING

CHECKING ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit (Fig. 3) and install gauge assembly C-3292.

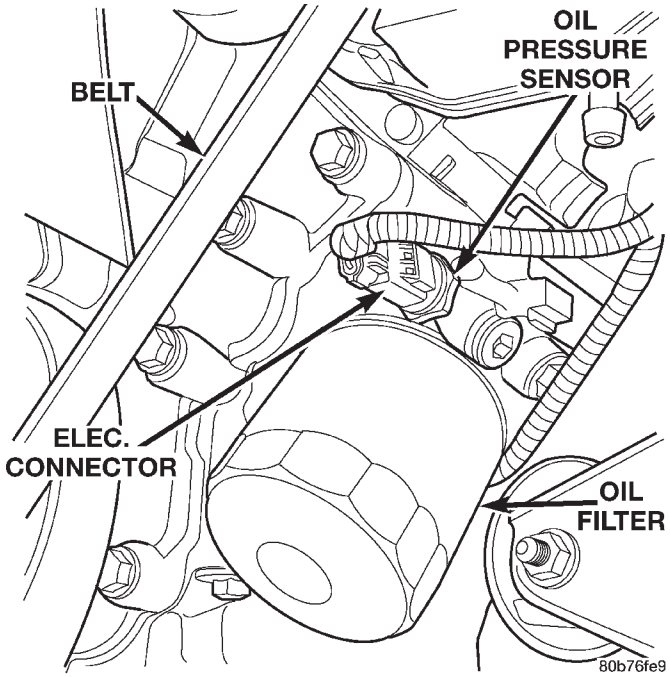


Fig. 3 Oil Pressure Sending Unit

(2) Run engine until thermostat opens.
(3) Oil Pressure:
- Curb Idle—25 Kpa (4 psi) minimum
- 3000 rpm—170 - 550 KPa (25 - 80 psi)

(4) If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

REMOVAL AND INSTALLATION (Continued)

(4) Drain the engine coolant. Refer to group 7 Cooling system for procedure.
(5) Lower the vehicle.
(6) Remove the intake manifold. Refer to procedure in this section.
(7) Remove the cylinder head cover. Refer to Cylinder Head Cover in this section.
(8) Remove the fan shroud. Refer to Group 7, Cooling System for procedure.
(9) Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (Fig. 42).
(10) Verify the V8 mark on the camshaft sprocket is at the 12 o'clock position (Fig. 44). Rotate the crankshaft one turn if necessary.
(11) Remove the crankshaft damper. Refer to Crankshaft Damper in this section.
(12) Remove the timing chain cover. Refer to Timing Chain Cover in this section.
(13) Lock the secondary timing chains to the idler sprocket using Special Tool 8515 (Fig. 43).

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

(14) Mark the secondary timing chain, one link on each side of the V8 mark on the camshaft drive gear (Fig. 44).
(15) Remove the right side secondary chain tensioner. Refer to Timing Chain and Sprockets in this section.
(16) Remove the cylinder head access plug (Fig. 49).

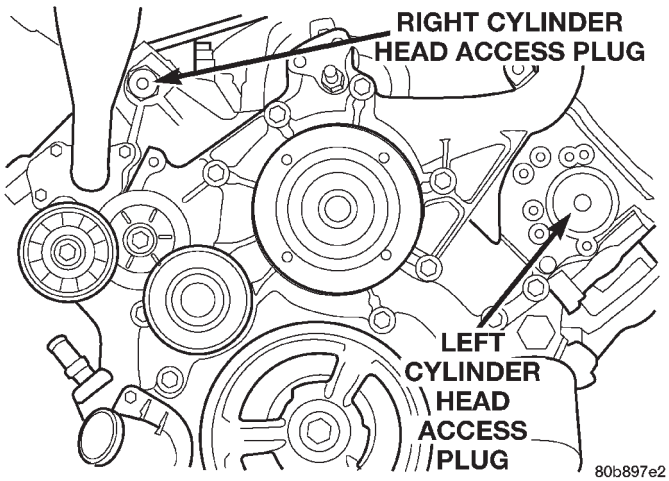


Fig. 49 Cylinder Head Access Plugs

(17) Remove the right side secondary chain guide. Refer to Timing Chain and Sprockets in this section.
(18) Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

NOTE: The cylinder head is attached to the cylinder block with fourteen bolts.

(19) Remove the cylinder head retaining bolts.
(20) Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on it's gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

INSTALLATION

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced (Fig. 46).

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

(1) Clean the cylinder head and cylinder block mating surfaces (Fig. 50).
(2) Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

(3) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

(4) Lubricate the cylinder head bolt threads with clean engine oil and install the ten M10 bolts.

REMOVAL AND INSTALLATION (Continued)

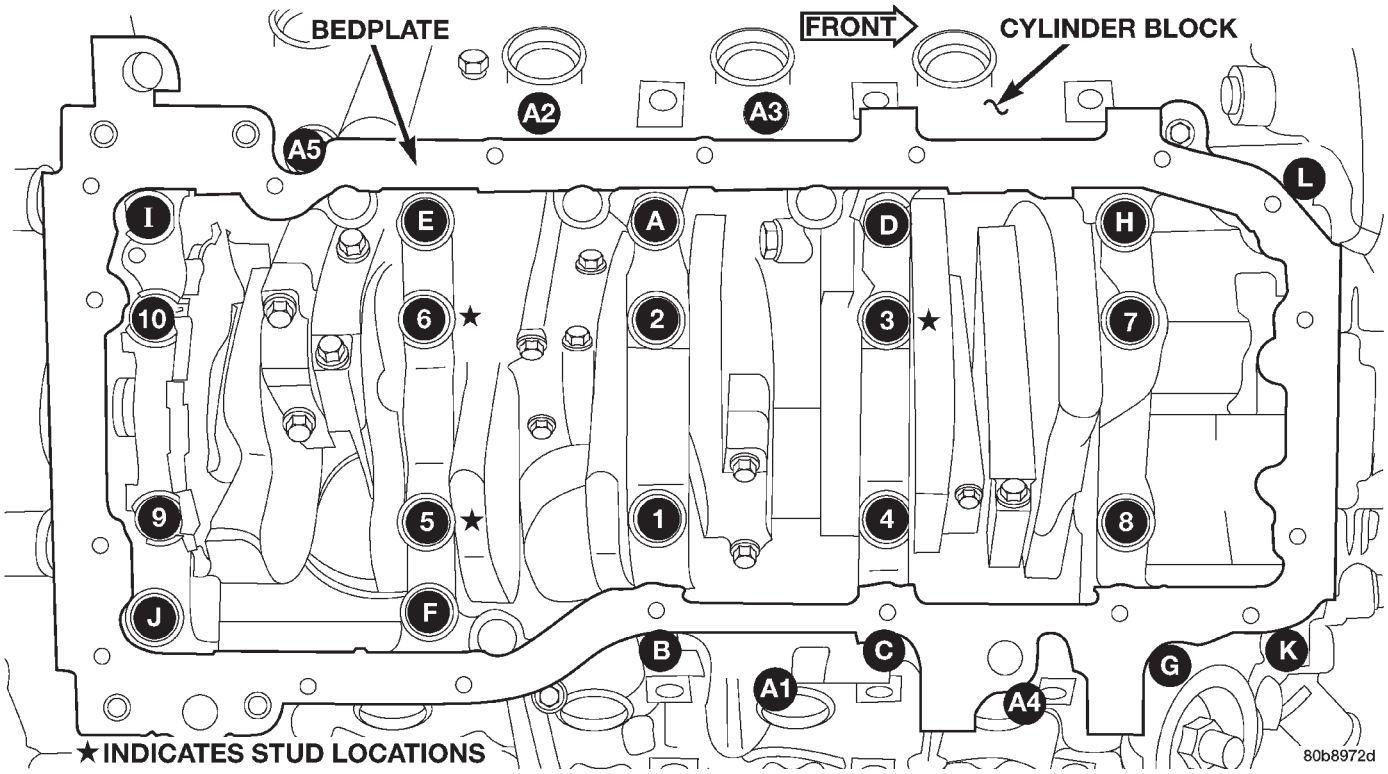


Fig. 102 Bedplate Tightening Sequence

- Tighten bolts **1–10** to 2.8 N·m (25 in. lbs.)
- Turn bolts **1–10** an additional 90°.
- Tighten bolts **A – K** to 54 N·m (40 ft. lbs.)
- Tighten bolts **A1– A5** to 27 N·m (20 ft. lbs.)

(8) Measure crankshaft end play. Refer to Crankshaft Main Bearings in this section for procedure.

(9) Install the connecting rods and measure side clearance. Refer to Connecting Rod Bearings in this section for procedure.

(10) Position the oil pan gasket/windage tray, using a new o-ring, install the oil pickup tube. Torque the bolt to 28N·n (20 ft. lbs.) torque the nuts to 28N·m (20 ft. lbs.).

(11) Install the oil pan. Torque the retaining bolts to 15 N·m (11 ft. lbs.) in the sequence shown (Fig. 103).

(12) Install the engine.

FLEXPLATE

REMOVAL

(1) Remove the transmission. Refer to Group 21, Transmission and Transfer Case for procedure.

(2) Remove the bolts and flexplate.

INSTALLATION

(1) Position the flexplate onto the crankshaft and install the bolts hand tight.

(2) Tighten the flexplate retaining bolts to 60 N·m (45 ft. lbs.) in the sequence shown (Fig. 104).

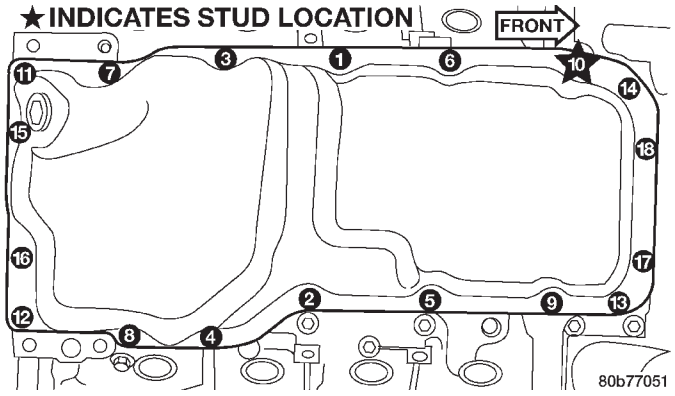


Fig. 103 Oil Pan Tightening Sequence

(3) Install the transmission.

OIL PUMP

REMOVAL

(1) Remove the timing chain cover. Refer to the procedure in this section.

(2) Remove the timing chains and tensioners. Refer to Timing Chain and Sprockets in this section.

(3) Remove the four bolts, primary timing chain tensioner and the oil pump.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST SMOKE	1. Engine running too cold (white smoke).	1. Refer to troubleshooting for coolant temperature below normal (refer to Group 7, Cooling System). Inspect cylinder head heater plugs for proper operation.
	2. Improper starting procedure (white smoke).	2. Use proper starting procedures.
	3. Fuel supply inadequate.	3. Check fuel supply pressure and inlet restriction.
	4. Injection pump timing.	4. Check and time pump (refer to Group 14, Fuel System).
	5. Inadequate intake air.	5. Inspect/change air filter. Look for other restriction. Check charge air cooler for obstructions.
	6. Air leak between turbocharger and intake manifold.	6. Check/correct leaks in the air crossover tube, hoses, gaskets, mounting capscrews or through holes in the manifold cover.
	7. Exhaust leak at the manifold or turbocharger.	7. Check/correct leaks in the manifold or turbocharger gaskets. If cracked replace manifold.
	8. Improperly operating turbocharger.	8. Inspect/replace turbocharger.
	9. Improperly operating injectors.	9. Check and replace inoperative injectors.
	10. Improperly operating or overfueled injector pump.	10. Repair or replace injection pump.
	11. Piston rings not sealing (blue smoke).	11. Perform blow-by check. Correct as required.
ENGINE WILL NOT SHUT-OFF	1. Fuel shutoff solenoid inoperative.	1. Check/replace fuel shutoff solenoid.
	2. Engine running on fumes drawn into the air intake.	2. Check the air intake ducts for the source of fumes. **WARNING: In case of engine runaway due to flammable fumes from gasoline spills or turbocharger oil leaks being sucked into the engine, shut off engine ignition switch first then use a CO2 fire extinguisher and direct the spray under the front bumper to remove oxygen supply. The engine air intake is on the passenger side behind the bumper. The fire extinguisher must be directed at this location for emergency shutdown conditions.**
	3. Fuel injection pump malfunction.	3. Repair or replace fuel injection pump.

REMOVAL AND INSTALLATION (Continued)

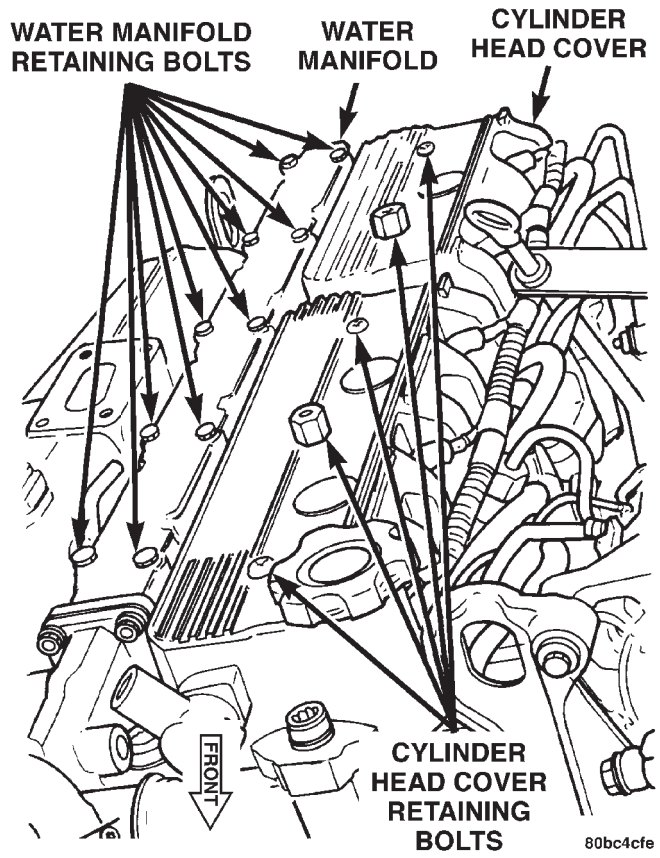


Fig. 48 Cylinder Head Cover

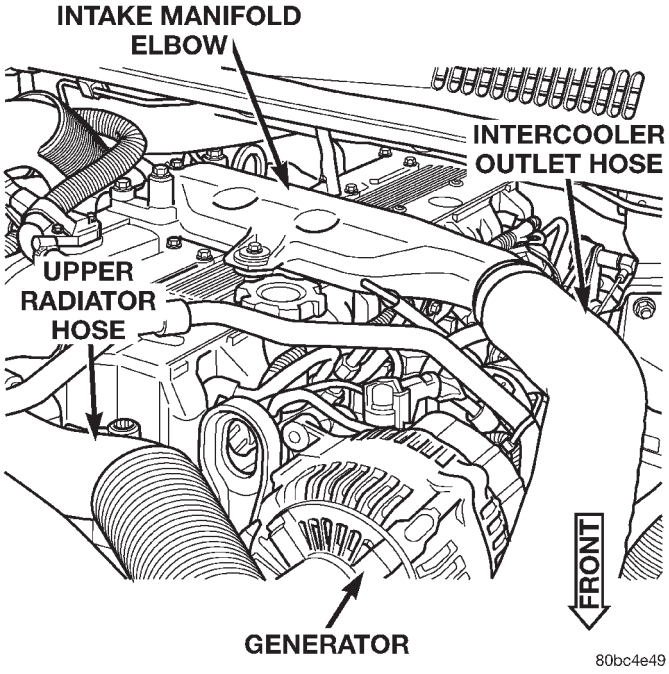


Fig. 49 Intake Manifold Elbow

(8) Install the intake manifold elbow inlet hose (Fig. 49).

(9) Raise the vehicle on the hoist.

(10) Install the left engine mount throughbolt nut. Torque the nut to 61 N·m (45 ft. lbs.).

(11) Install the low pressure refrigerant line and retaining bolt. Torque the bolt to 28 N·m (21 ft. lbs.). Be certain the sealing o-ring is well lubricated and free of tears.

(12) Install the front splash shield.

(13) Lower the vehicle on the hoist.

(14) Connect the negative battery cable.

(15) Evacuate and charge the refrigerant system. Refer to Group 24, Heater and Air Conditioning for the procedure.

(16) Start the engine and 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.

HYDRAULIC TAPPETS

REMOVAL

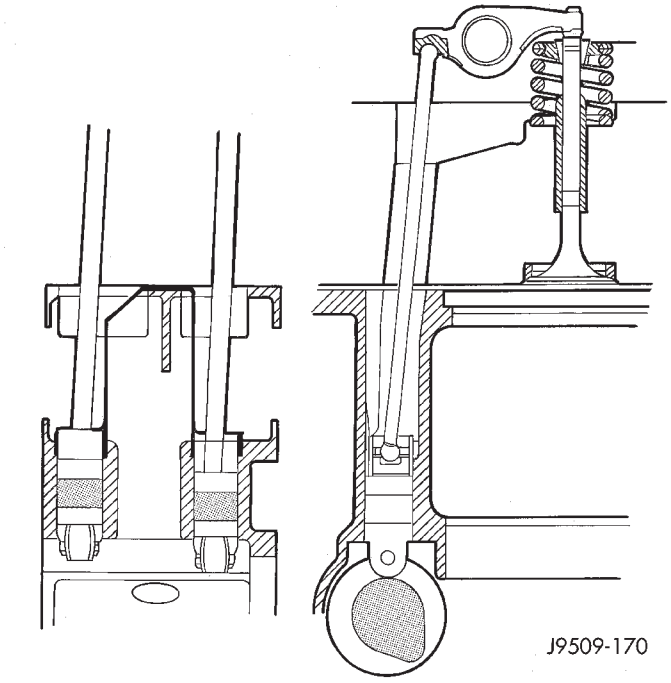


Fig. 50 Tappet And Rocker Arm Assembly

(1) Disconnect the negative battery cable.

(2) Discharge the air conditioning system. Refer to Group 24, Heating and Air Conditioning for procedure.

(3) Remove the A/C lines at the compressor and cap.

(4) Remove the A/C line bracket attached to the cylinder head cover and move the lines away from the cylinder head.

REMOVAL AND INSTALLATION (Continued)

(8) Fit the liners in the crankcase making sure that the shim is positioned correctly in the seat. Lock the liners in position using special tool (VM-1016) and bolts (Fig. 107). Clean the residual LOCTITE on the upper surface of the block deck.

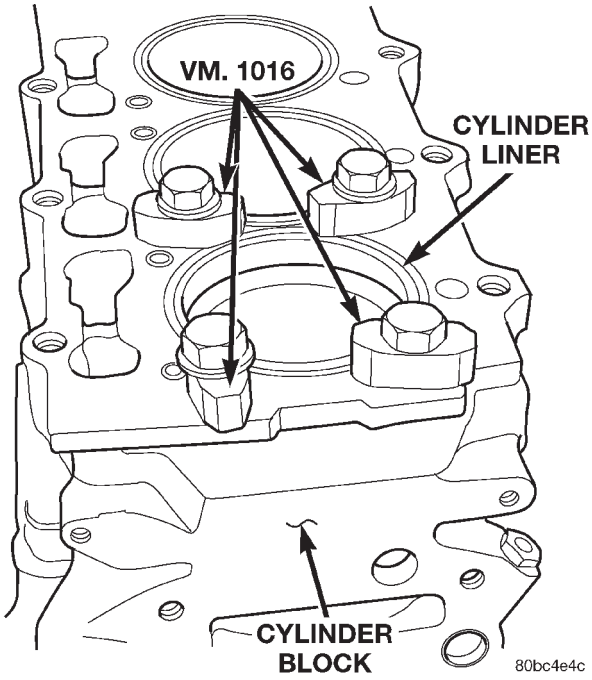


Fig. 107 Liner Clamp Location

(9) Recheck the liner protrusion. It should be 0.01 - 0.06 mm.

NOTE: A period of six hours must elapse between the liners being installed and engine start-up. If engine assembly is not continued after liner installation, the liners need to be clamped for twelve hours minimum.

CRANKSHAFT AND MAIN BEARINGS

REMOVAL

(1) Disconnect the negative battery cable.

(2) Remove the engine from vehicle. Refer to engine removal and installation in this section.

(3) Install the engine on an engine stand.

(4) Remove the accessary drive system.

(5) Remove the cylinder head cover. Refer to cylinder head cover removal and installation in this section.

(6) Remove the rocker arm assemblies and push rods. Refer to rocker arm and push rod removal and installation in this section.

(7) Remove the intake manifold, exhaust manifold and turbocharger. Refer to Group 11, Exhaust System and Turbocharger.

(8) Remove the water manifold.

(9) Remove the oil feed lines to rocker arms.

(10) Remove the cylinder heads. Refer to cylinder head removal and installation in this section.

(11) Remove the oil pan and oil pick-up.

(12) Remove the pistons and connecting rods.

(13) Remove the vibration damper. Refer to vibration damper removal and installation in this section.

(14) Remove the timing gear cover. Refer to timing gear cover removal and installation in this section.

(15) Remove the oil pump and vacuum pump from block.

(16) Install special tool VM.1004 onto crankshaft over gear (Fig. 108).

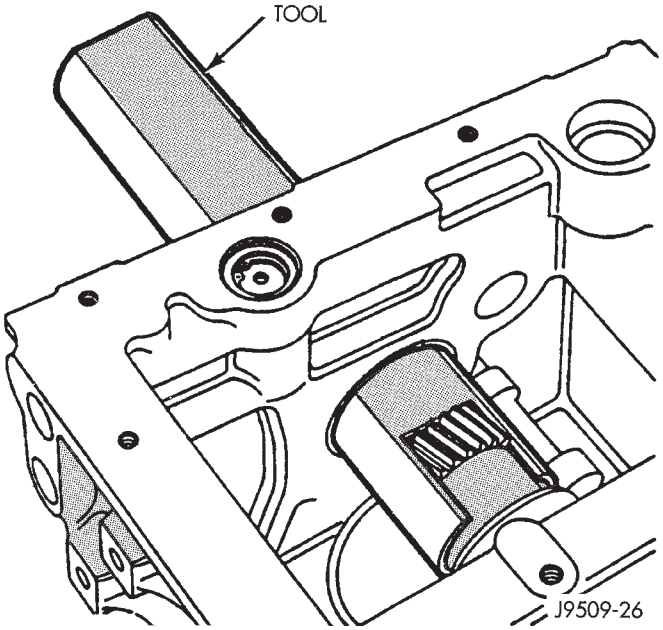


Fig. 108 Crankshaft Special Tool VM.1004

(17) Remove the main bearing oil feed and crankshaft support locators from block.

(18) Remove the flywheel and adaptor plate from engine block.

(19) Remove the thrust bearings from rear main bearing carrier.

(20) Slide the crankshaft and bearing carriers rearward to rear of cylinder block. Remove crankshaft from the rear of the cylinder block.

(21) Mark the carriers for assembly and remove the bolts, two for each carrier. Separate the two halves of each carrier, remove from the crankshaft and temporarily re-assemble the carriers (Fig. 109).

(22) Install the Crankshaft Bearing Remover/Installer VM.1002 on the front main bearing (Fig. 110).

(23) Using the VM.1002 pull the front main bearing out of the cylinder block (Fig. 110).

REMOVAL AND INSTALLATION (Continued)

(5) Position the exhaust clamp over the exhaust pipe/catalytic converter connection. Tighten clamp retaining nuts to (Fig. 12)

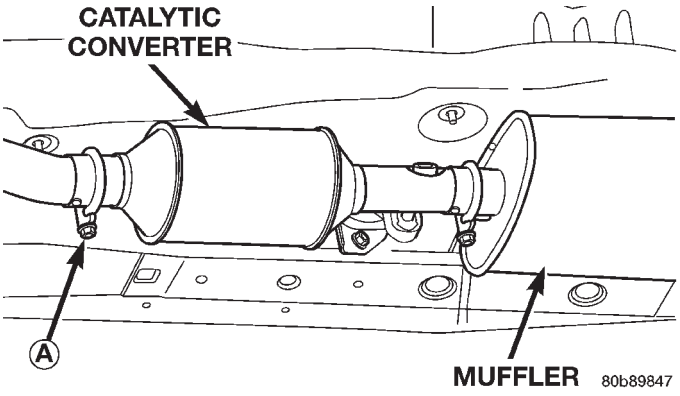


Fig. 12 Installing Exhaust Clamps

ITEM	DESCRIPTION
A	NUT. Torque to 61 N·m (45 ft. lbs.)

(6) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque (Fig. 7) (Fig. 6).

(7) Lower the vehicle.

(8) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

(9) After initial start-up, check the engine exhaust manifold to exhaust pipe nuts for proper torque.

CATALYTIC CONVERTER

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.

(3) Remove exhaust clamp from the catalytic converter and exhaust pipe connection (Fig. 13).

(4) Remove exhaust clamp from the catalytic converter and muffler connection (Fig. 13).

(5) Disconnect oxygen sensor wiring (Fig. 13).

(6) Heat the exhaust pipe, catalytic converter and muffler connections with an torch until the metal becomes cherry red.

(7) While the metal is still cherry red, twist the catalytic converter back and forth to separate it from the exhaust pipe and the muffler (Fig. 14).

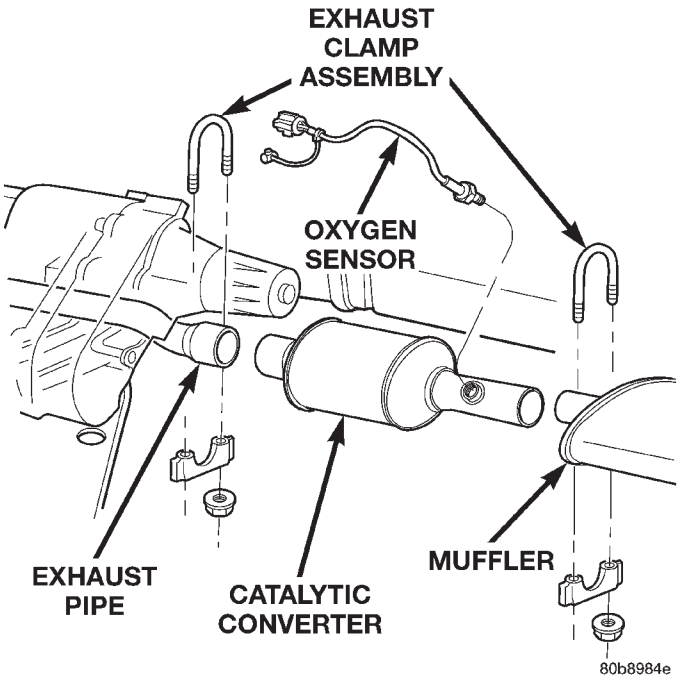


Fig. 13 Exhaust Pipe-to-Catalytic Converter-to-Muffler Connection

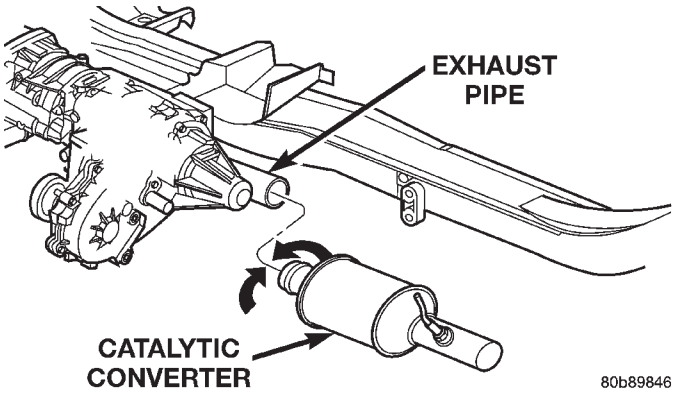


Fig. 14 Catalytic Converter—Removal

INSTALLATION

(1) Position the exhaust clamp over the exhaust pipe/catalytic converter connection (Fig. 13). 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 the exhaust clamp at the muffler and catalytic converter connection (Fig. 13). Tighten the clamp nuts to 61 N·m (45 ft. lbs.) torque.

(4) Connect oxygen sensor wiring (Fig. 13).

(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.

DESCRIPTION AND OPERATION (Continued)

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

FUEL DELIVERY SYSTEM

DESCRIPTION

The fuel delivery system consists of:

- the fuel pump module containing the electric fuel pump, fuel gauge sending unit (fuel level sensor) and a separate fuel filter located at bottom of pump module
- a separate combination fuel filter/fuel pressure regulator
- 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

The fuel tank assembly consists of: the fuel tank, fuel tank shield, fuel tank straps, fuel pump module assembly, fuel pump module locknut/gasket, and roll-over valve (refer to Emission Control System for roll-over valve information).

A fuel filler/vent tube assembly using a pressure/vacuum fuel filler cap is used. The fuel filler tube contains a spring-loaded flap (door) located below the fuel fill cap. The flap is used as a secondary way of sealing the fuel tank if the fuel fill cap has not been properly tightened. The flap is used as part of the EVAP monitor system when the vehicle is equipped with a Leak Detection Pump (LDP). The flap will be installed to all fuel filler tubes (equipped/not equipped with LDP and EVAP monitor system).

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 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). The fuel pump module (Fig. 2) contains the following components:

- 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
- Fuel return tube (line) connection

The fuel gauge sending unit and pick-up filter may be serviced separately. If the electrical fuel pump requires service, the entire fuel pump module must be replaced.

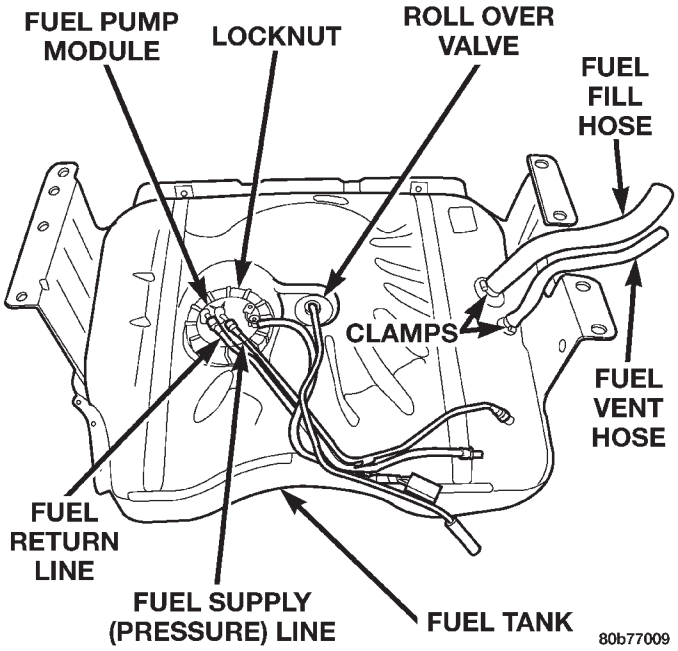


Fig. 1 Fuel Tank/Fuel Pump Module Location (Top View)

FUEL PUMP

DESCRIPTION

The electric fuel pump is located inside of the fuel pump module.

OPERATION

The fuel pump used in this system has a permanent magnet electric motor. Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

REMOVAL AND INSTALLATION (Continued)

(6) Remove cable housing from dash panel and pull into engine compartment.

(7) Using finger pressure only, disconnect accelerator cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 46). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

(8) Lift accelerator cable from top of cable cam (Fig. 46).

(9) Press tab (Fig. 47) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (Fig. 47) towards passenger side of vehicle to remove cable from bracket.

(10) Remove throttle cable from vehicle.

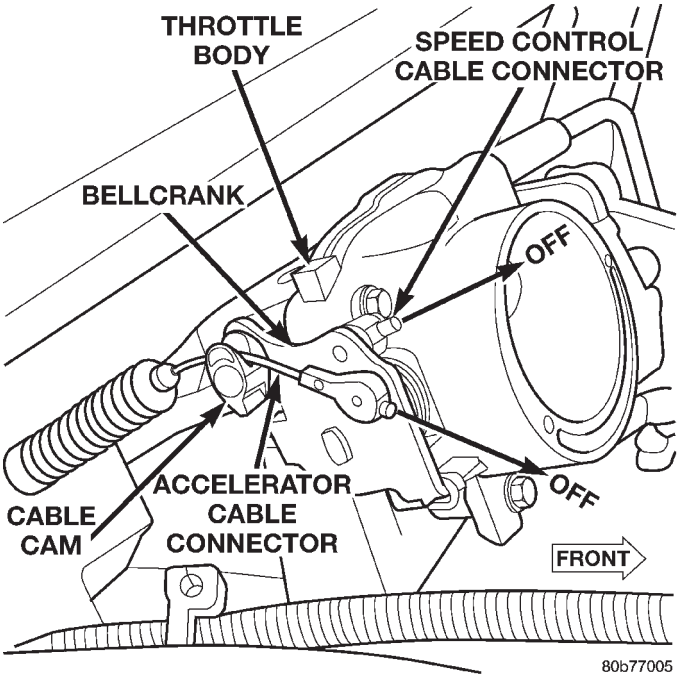


Fig. 46 Accelerator Cable at Bell Crank—4.7L V-8 Engine

INSTALLATION

(1) Slide accelerator cable plastic mount into bracket. Continue sliding until tab (Fig. 47) is aligned to hole in mounting bracket.

(2) Route accelerator cable over top of cable cam.

(3) Connect cable end to throttle body bellcrank pin (snaps on rearward).

(4) Slide rubber grommet away from plastic cable housing.

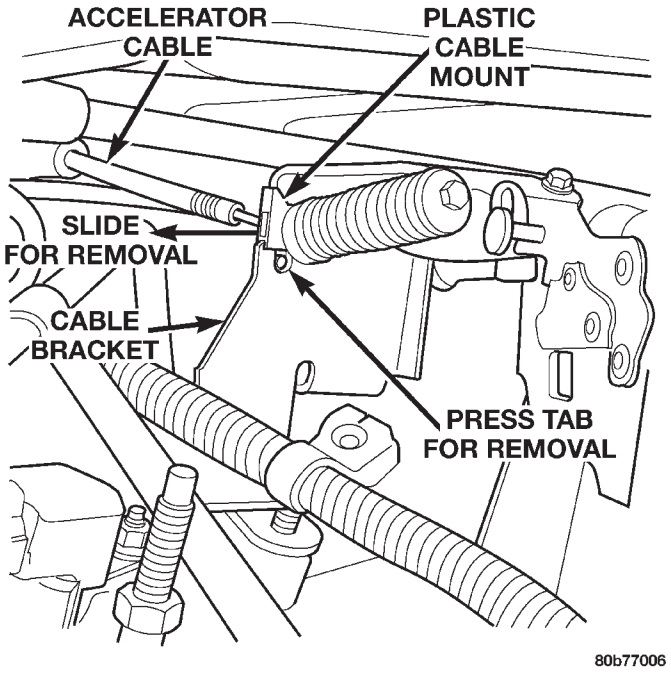


Fig. 47 Accelerator Cable Release Tab—4.7L V-8 Engine

(5) Install rubber grommet into dash panel until seated.

(6) Push cable housing into rubber grommet and through opening in dash panel.

(7) From inside vehicle, install clip holding cable to dashpanel (Fig. 44).

(8) From inside vehicle, slide throttle cable core wire into opening in top of pedal arm.

(9) Push cable retainer (clip) into pedal arm opening until it snaps in place.

(10) Snap cable into dashpanel routing clip.

(11) Install air box to throttle body.

(12) Before starting engine, operate accelerator pedal to check for any binding.

SPECIFICATIONS

FUEL TANK CAPACITY

Models	Liters	U.S. Gallons
All	78	20.5
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 ± 5 psi).

REMOVAL AND INSTALLATION (Continued)

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR—4.7L V–8 ENGINE

The MAP sensor is located on the front of the intake manifold (Fig. 31). An o-ring seals the sensor to the intake manifold.

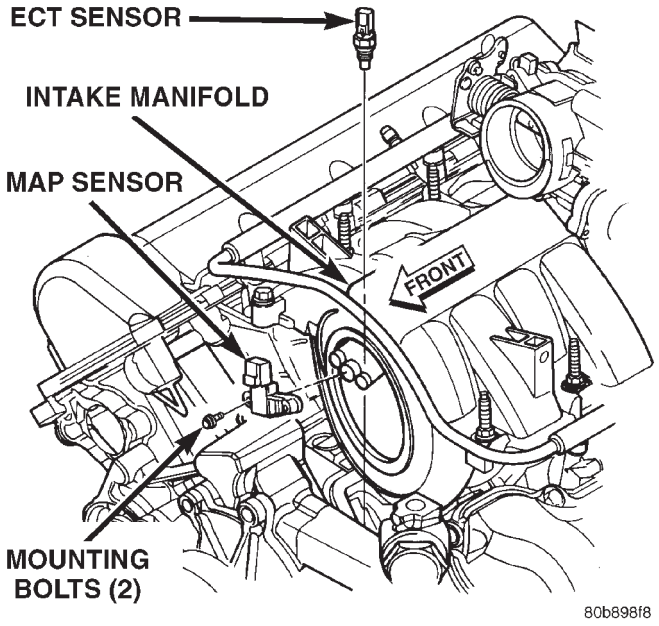


Fig. 31 MAP and ECT Sensor Locations—4.7L V–8 Engine

REMOVAL

(1) Disconnect electrical connector at sensor.
(2) Clean area around MAP sensor.
(3) Remove 2 sensor mounting bolts (Fig. 31).
(4) Remove MAP sensor from intake manifold.

INSTALLATION

(1) Clean MAP sensor mounting hole at intake manifold.
(2) Check MAP sensor o-ring seal for cuts or tears.
(3) Position sensor into manifold.
(4) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.
(5) Connect electrical connector.

POWERTRAIN CONTROL MODULE (PCM)

The PCM is located on the cowl panel in right/rear side of engine compartment (Fig. 32).

REMOVAL

To avoid possible voltage spike damage to 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) If equipped, remove Transmission Control Module (TCM).
(3) Remove coolant reserve/overflow tank.

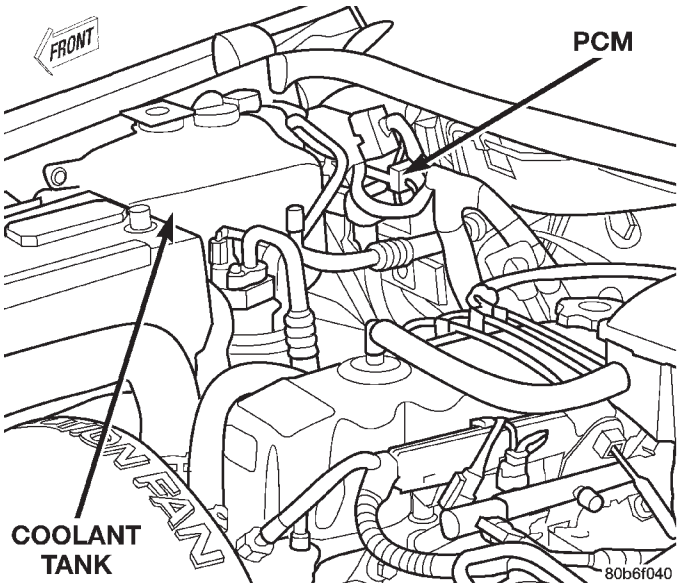


Fig. 32 Powertrain Control Module (PCM) Location

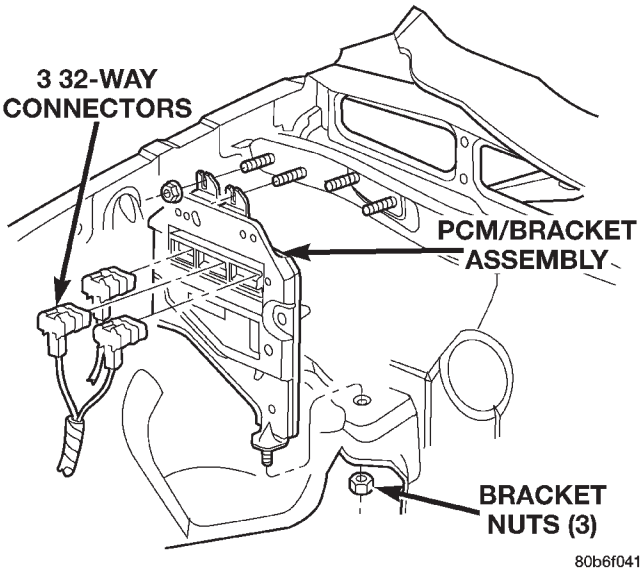


Fig. 33 Powertrain Control Module (PCM) 32–Way Connectors

(4) Remove cover over electrical connectors. Cover snaps onto PCM.
(5) Carefully unplug three 32–way connectors at PCM.
(6) Remove three PCM bracket-to-body mounting nuts (Fig. 33).
(7) Remove PCM/PCM bracket assembly from vehicle.
(8) Remove 3 PCM-to-PCM bracket bolts (screws) (Fig. 34).

INSTALLATION

(1) Check pins in three 32–way electrical connectors for damage. Repair as necessary.
(2) Install PCM to its mounting bracket. Tighten three mounting bolts to 3 N·m (25 in. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

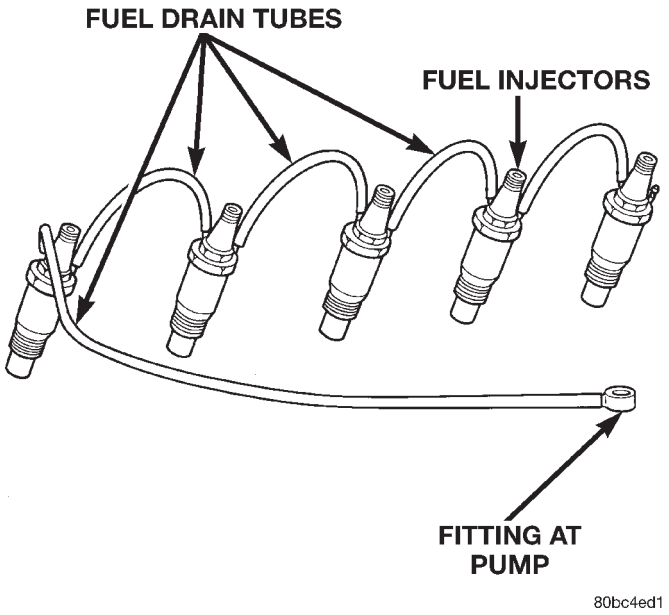


Fig. 20 Fuel Injectors and Drain Tubes

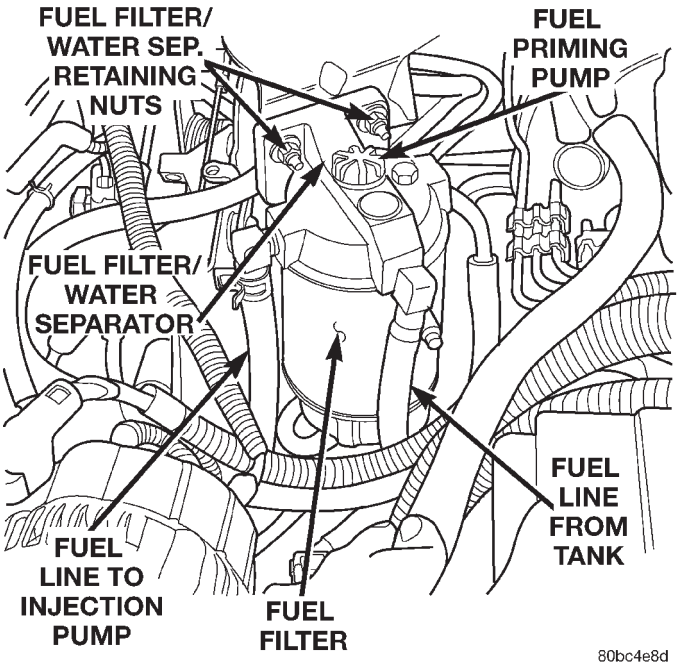


Fig. 21 Fuel Filter / Water Separator Position & Orientation

injection pump can cause serious damage to the pump. **Note that the bulb will be illuminated for approximately 2 seconds each time the key is initially placed in the ON position. This is done for a bulb check.**

WARNING: DO NOT ATTEMPT TO DRAIN WATER FROM THE FILTER/SEPARATOR WITH THE ENGINE HOT.

(1) The bottom of the filter/separator bowl is equipped with a drain valve. The drain valve is equipped with a fitting. Attach a piece of rubber hose to this fitting. This hose is to be used as a drain hose.

(2) Place a drain pan under the drain hose.

(3) With the engine not running, open the drain valve (unscrew—drain valve has right hand threads) from the filter/separator bowl. To gain access to this fitting, the two filter–to–mounting bracket nuts may have to be loosened a few turns.

(4) Hold the drain open until clean fuel exits the drain.

(5) After draining, close drain valve.

(6) Remove rubber drain hose.

(7) Dispose of mixture in drain pan according to applicable local or federal regulations.

FUEL FILTER REMOVAL

(1) Drain all fuel and/or water from fuel filter/water separator assembly. Refer to the previous Draining Water From Filter Bowl.

(2) Unplug the electrical connectors at bottom of plastic bowl.

(3) Remove plastic bowl from bottom of fuel filter (unscrews).

(4) Remove fuel filter from bottom of filter base (unscrews).

FUEL FILTER INSTALLATION

(1) Clean bottom of fuel filter base.

(2) Apply clean diesel fuel to new fuel filter gasket.

(3) Install and tighten filter to filter base. The beveled part of the rubber gasket should be facing up towards the filter base.

(4) Clean the inside of bowl with a soap and water mixture before installation. Carefully clean any residue between the two metal probes at the top of the water–in–fuel sensor. Do not use chemical cleaners as damage to the plastic bowl may result.

(5) Pour diesel fuel into the plastic bowl before installing bowl to bottom of fuel filter. Do this to help prevent air from entering fuel injection pump while attempting to starting engine.

(6) Install filter bowl to bottom of filter.

(7) Install the electrical connectors at bottom of bowl.

(8) Tighten the filter–to–mounting bracket nuts (Fig. 21) to 28 N·m (250 in. lbs.) torque.

FUEL HEATER

If the fuel heater element needs replacement, the plastic filter bowl assembly must be replaced. Refer to Fuel Filter/Water Separator for information.

SPECIFICATIONS

GLOW PLUG CURRENT DRAW

Initial Current Draw: Approximately 22–25 amps per plug.

After 20 seconds of operation: Approximately 9–12 amps per plug.

TORQUE CHART—3.1L DIESEL

DESCRIPTION	TORQUE
Accelerator Pedal Bracket Mounting Nuts	5 N·m (46 in. lbs.)
Banjo-Type Fittings	19 N·m (14 ft. lbs.)
Engine Coolant Temperature Sensor	8 N·m (70 in. lbs.)
Engine Speed Sensor Bolts	11 N·m (97 in. lbs.)
Fuel Hose (Tube) Clamps For Rubber Hose	2 N·m (20 in. lbs.)
Fuel Injector	70 N·m (52 ft. lbs.)
Fuel Injector Line At Injector	19 N·m (168 in. lbs.)
Fuel Injector Line At Injector Pump	19 N·m (168 in. lbs.)
Fuel Injection Pump Mounting Nuts	27 N·m (241 in. lbs.)
Fuel Injection Pump Drive Gear Nut	86 N·m (64 ft. lbs.)
Fuel Line Clamp Bracket Bolts	24 N·m (18 ft. lbs.)
Fuel Tank Nuts	11 N·m (100 in. lbs.)
Glow Plugs	14 N·m (123 in. lbs.)
Powertrain Control Module Mounting Bolts	1 N·m (9 in. lbs.)
Throttle Position Sensor Mounting Bolts	7 N·m (60 in. lbs.)
Vehicle Speed Sensor Mounting Bolt	3 N·m (26 in. lbs.)

80bceaa2

Torque Specifications

REMOVAL AND INSTALLATION (Continued)

(4) Remove the damper from the tie rod with Puller C-3894-A.

(5) Remove the cotter pins and nuts from the tie rod ends at the steering knuckles (Fig. 2).

(6) Remove the tie rod ends from the steering knuckles with Puller C-3894-A.

(7) Loosen the adjustment sleeve clamp bolts and unscrew the tie rod ends from the sleeve.

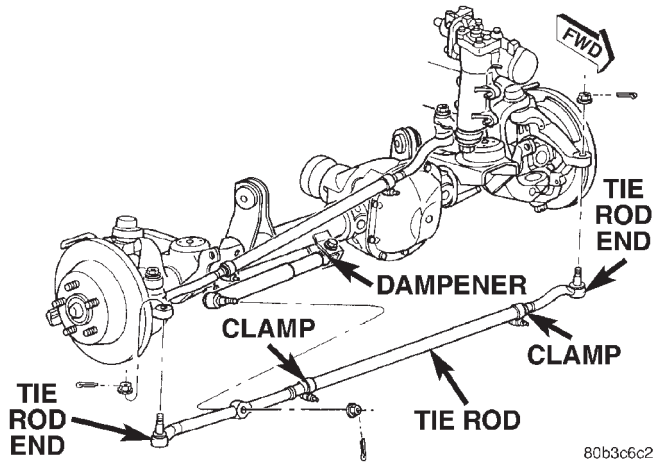


Fig. 2 Tie Rod Assembly

INSTALLATION

(1) Screw the tie rod ends into the adjustment sleeve.

(2) Install the tie rod on the steering knuckles and install the nuts.

(3) Tighten the nuts to 47 N·m (35 ft. lbs.). Install new cotter pins and bend end 60°.

(4) Position the adjustment sleeve clamp bolts to their original location and tighten to 68 N·m (50 ft. lbs.).

(5) Install the damper on the tie rod and install the nut.

(6) Tighten the nut to 68 N·m (50 ft. lbs.). Install new cotter pins and bend end 60°.

(7) Install wheel and tire assemblies.

(8) Remove support and lower the vehicle.

(9) Perform toe position adjustment.

PITMAN ARM

REMOVAL

(1) Remove the cotter pin and nut from the drag link at the pitman arm (Fig. 3).

(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-4150A (Fig. 4).

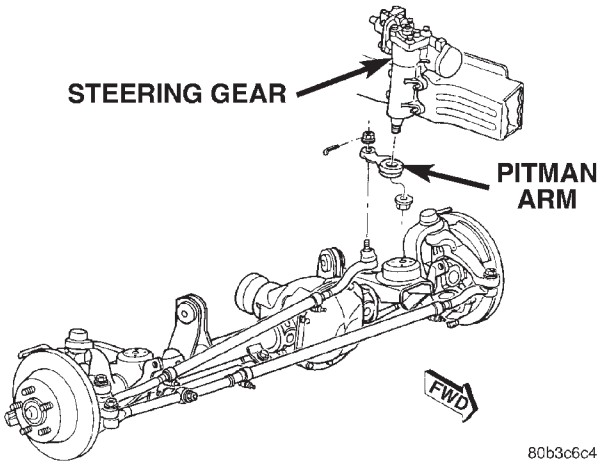


Fig. 3 Pitman Arm

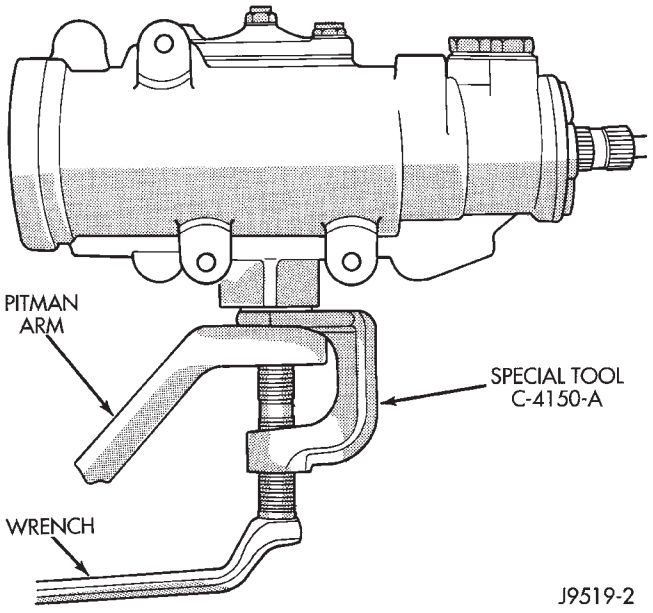


Fig. 4 Pitman Arm Removal

INSTALLATION

(1) Align and install the pitman arm on steering gear shaft.

(2) Install the washer and nut on the shaft and tighten the nut to 251 N·m (185 ft. lbs.).

(3) Install drag link ball stud to pitman arm. Install nut and tighten to 88 N·m (65 ft. lbs.). Install a new cotter pin.

DRAG LINK

REMOVAL

(1) Raise and support the vehicle.

(2) Remove right wheel and tire assembly.

(3) Remove the cotter pins and nuts at the right steering knuckle and pitman arm (Fig. 5).

DIAGNOSIS AND TESTING (Continued)

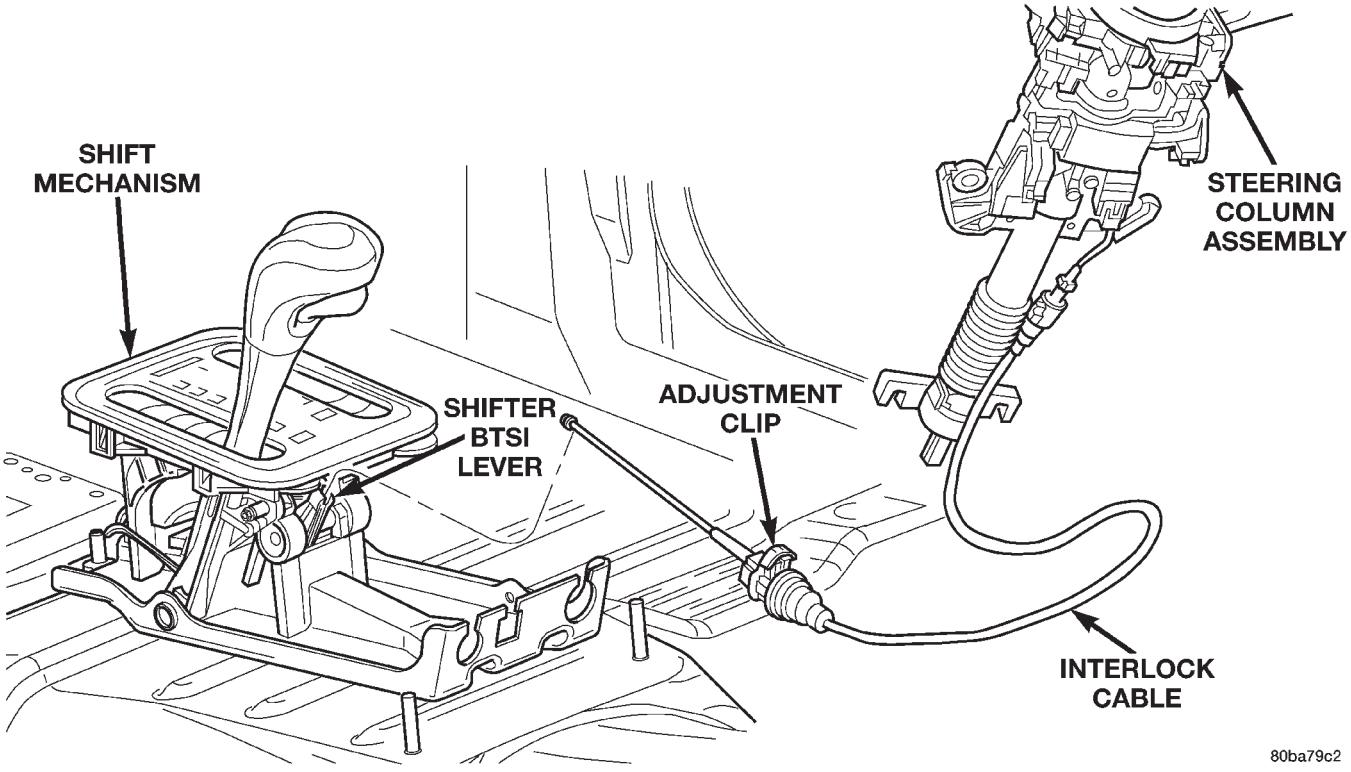


Fig. 6 Ignition Interlock Cable

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.

REMOVAL AND INSTALLATION (Continued)

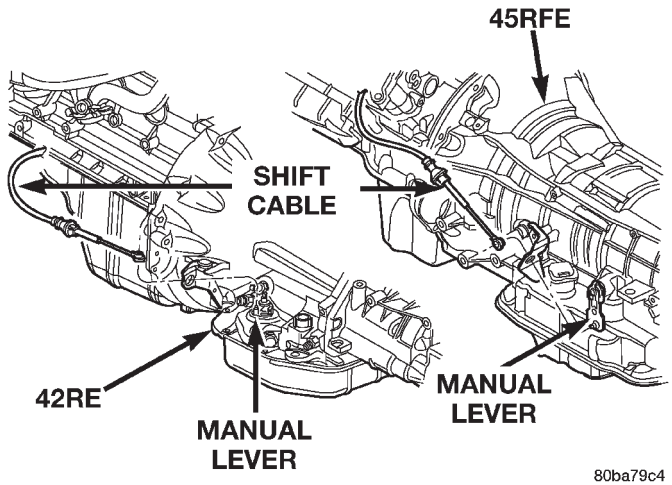


Fig. 15 Transmission Shift Cable

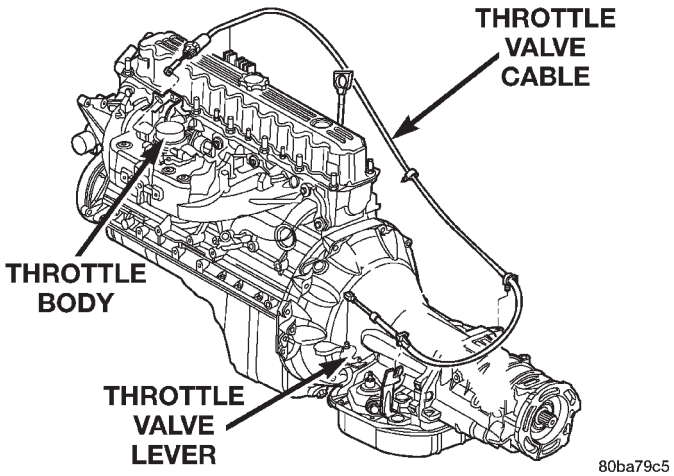


Fig. 16 Throttle Valve Cable

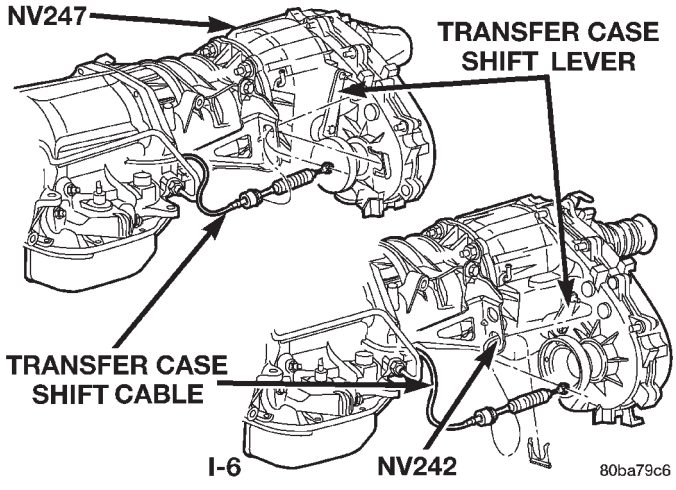


Fig. 17 Transfer Case Shift Cable

(24) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 18).

(25) Remove bolts attaching crossmember to frame and remove crossmember.

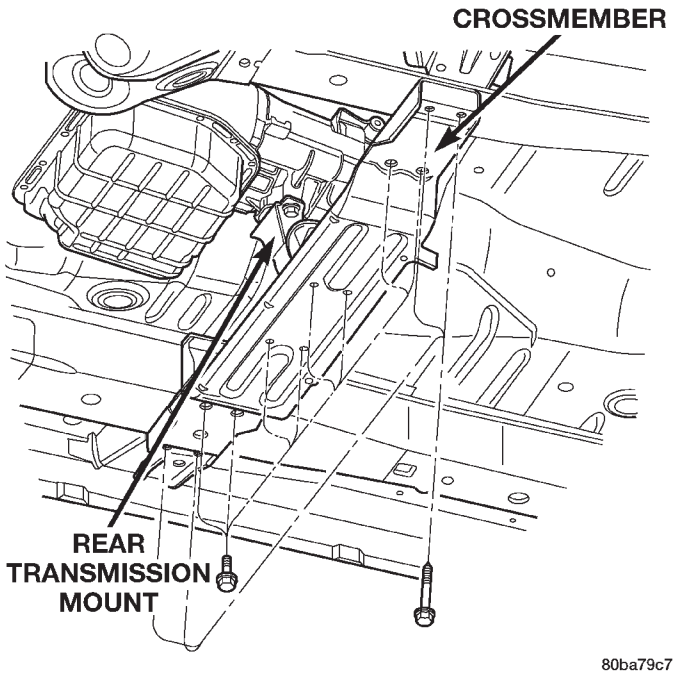


Fig. 18 Rear Transmission Crossmember

(26) Remove transfer case (Fig. 19) and (Fig. 20).

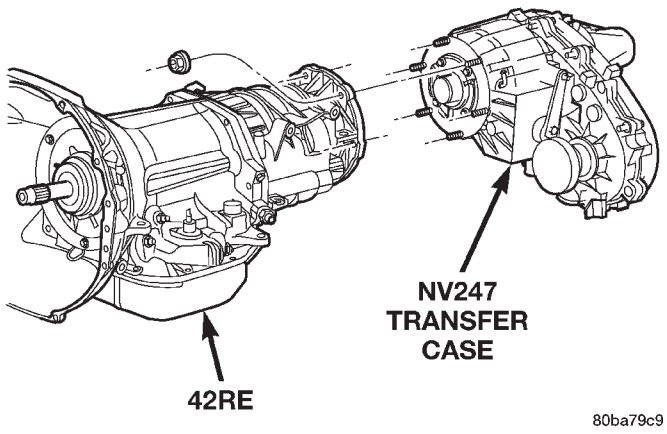


Fig. 19 Remove NV247 Transfer Case

(27) Remove bolts holding the upper transmission bending braces to the torque converter housing and the overdrive unit (Fig. 21).

(28) Remove all remaining converter housing bolts.

(29) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(30) Hold torque converter in place during transmission removal.

(31) Lower transmission and remove assembly from under the vehicle.

(32) To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY AND ASSEMBLY (Continued)

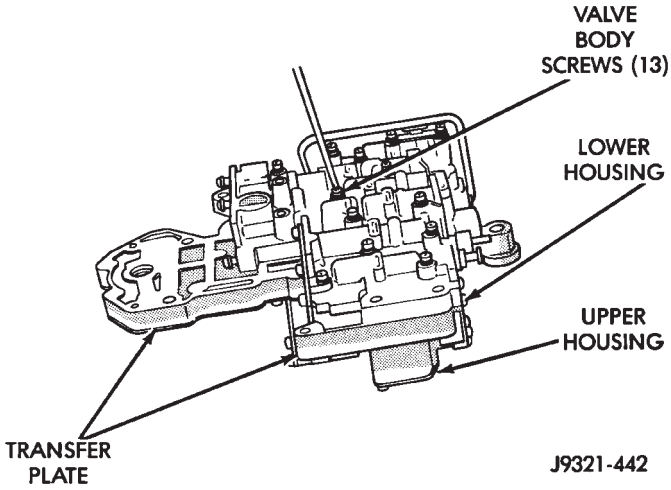


Fig. 84 Installing Lower Housing On Transfer Plate And Upper Housing

UPPER HOUSING VALVE AND PLUG

Refer to (Fig. 85), (Fig. 86) and (Fig. 87) to perform the following steps.

(1) Lubricate valves, plugs, springs with clean transmission fluid.

(2) Assemble regulator valve line pressure plug, sleeve, throttle plug and spring. Insert assembly in upper housing and install cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(3) Install 1-2 and 2-3 shift valves and springs.

(4) Install 1-2 shift control valve and spring.

(5) Install retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing.

(6) Install limit valve housing and cover plate. Tighten screws to 4 N·m (35 in. lbs.).

(7) Install shuttle valve as follows:

(a) Insert plastic guides in shuttle valve secondary spring and install spring on end of valve.

(b) Install shuttle valve into housing.

(c) Hold shuttle valve in place.

(d) Compress secondary spring and install E-clip in groove at end of shuttle valve.

(e) Verify that spring and E-clip are properly seated before proceeding.

(8) Install shuttle valve cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(9) Install 1-2 and 2-3 valve governor plugs in valve body.

(10) Install shuttle valve primary spring and throttle plug.

(11) Align and install governor plug cover. Tighten cover screws to 4 N·m (35 in. lbs.) torque.

BOOST VALVE TUBE AND BRACE

(1) Position valve body assembly so lower housing is facing upward (Fig. 88).

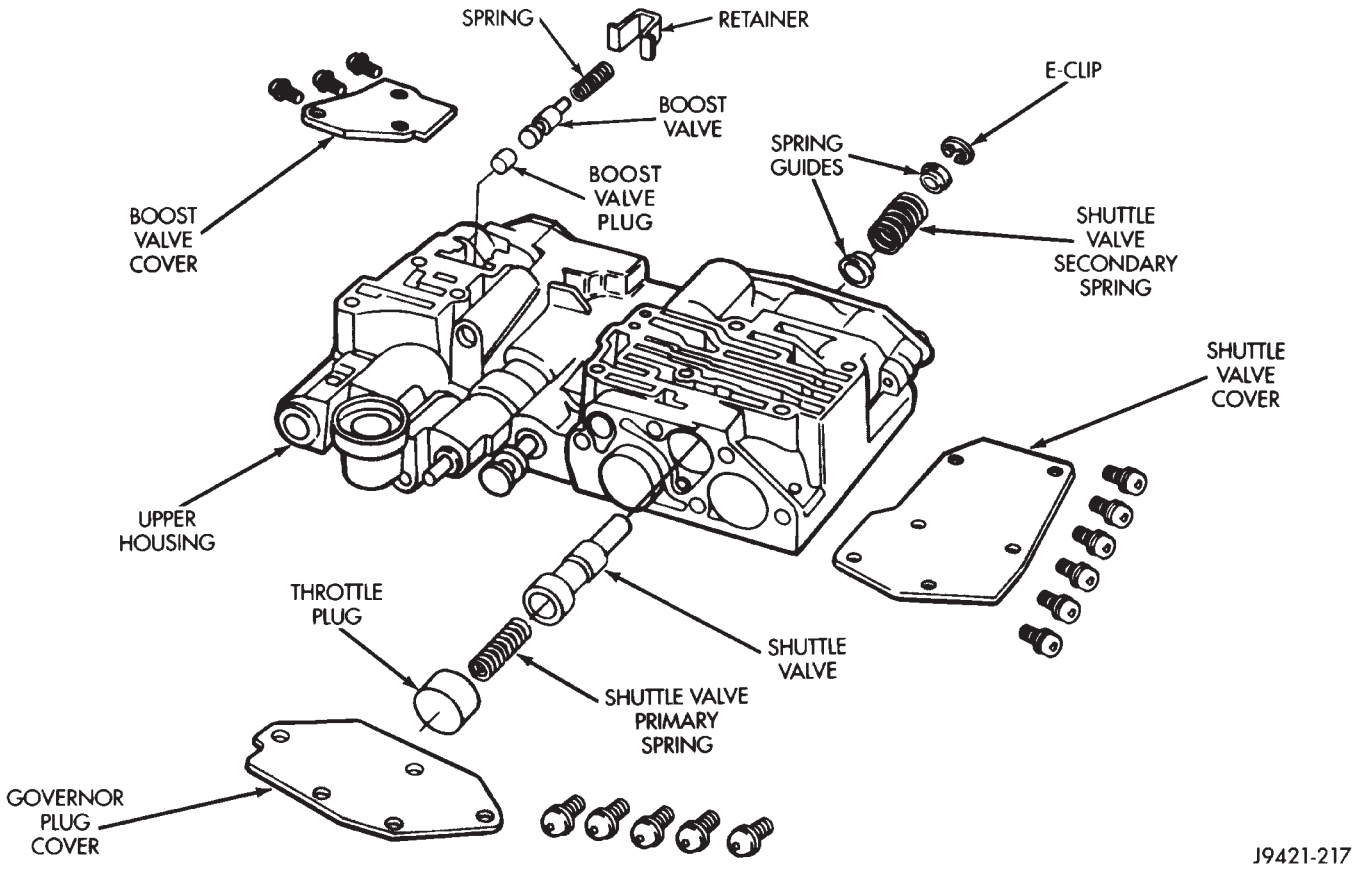


Fig. 85 Shuttle And Boost Valve Components

DISASSEMBLY AND ASSEMBLY (Continued)

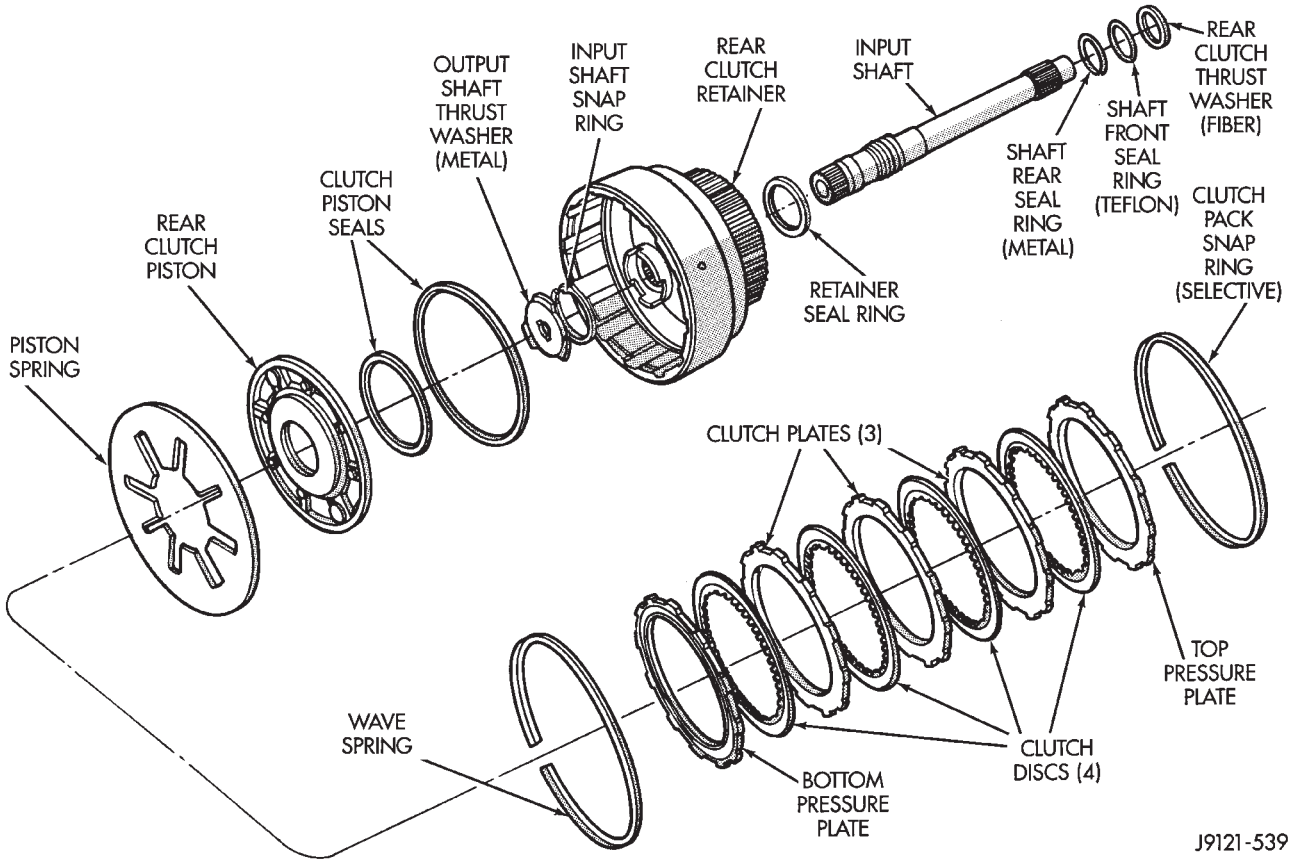


Fig. 164 Rear Clutch Components

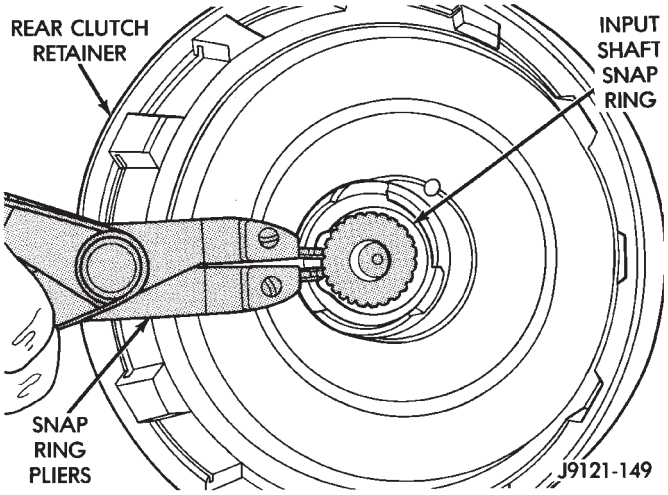


Fig. 165 Removing/Installing Input Shaft Snap-Ring

(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. 165).

(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.

(9) Install piston spring in retainer and on top of piston (Fig. 169). Concave side of spring faces downward (toward piston).

(10) Install wave spring in retainer (Fig. 169). Be sure spring is completely seated in retainer groove.

(11) Install bottom pressure plate (Fig. 164). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

(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. 164).

CLEANING AND INSPECTION (Continued)

Lubricate the front band adjusting screw threads with petroleum jelly and thread the screw part-way into the case. Be sure the screw turns freely.

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.

ACCUMULATOR

Inspect the accumulator piston and seal rings (Fig. 252). Replace the seal rings if worn or cut. Replace the piston if chipped or cracked.

Check condition of the accumulator inner and outer springs (Fig. 252). Replace the springs if the coils are cracked, distorted or collapsed.

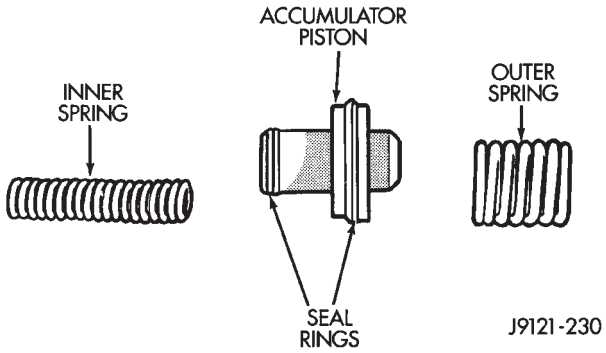


Fig. 252 Accumulator Components

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. 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.

REAR SERVO

Remove and discard the servo piston seal ring (Fig. 253). 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.

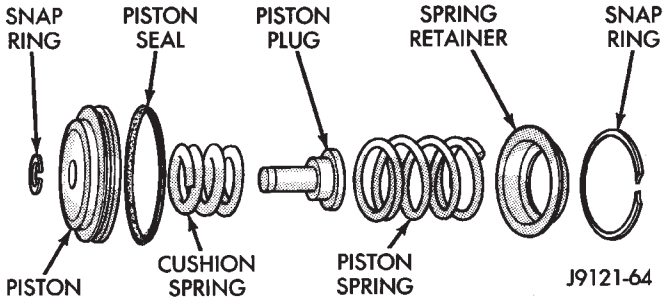


Fig. 253 Rear Servo Components

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.

(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.

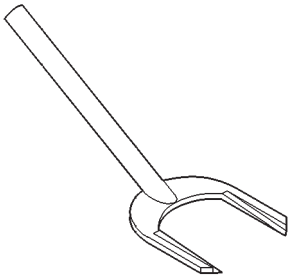
(5) Install the gears in the pump body and measure pump component clearances as follows:

(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:

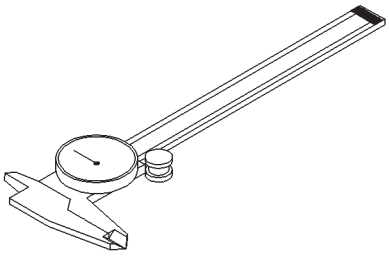
(I) Installing the pump gears in the pump housing.

(II) Position an appropriate piece of Plastigage™ across both gears.

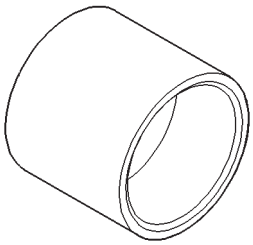
SPECIAL TOOLS (Continued)



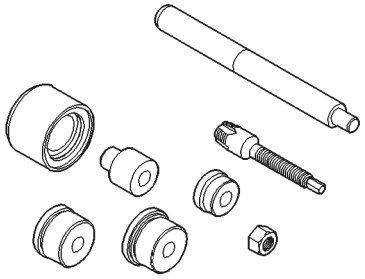
Seal Remover—C-3985-B



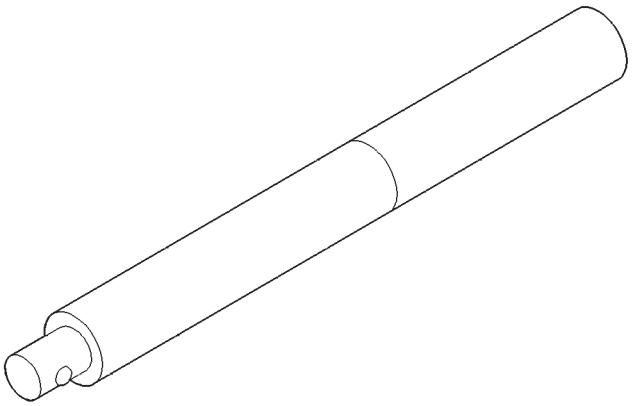
Dial Caliper—C-4962



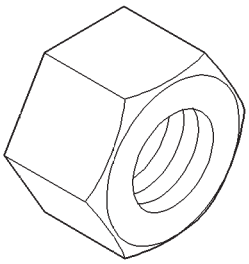
Installer—C-3995-A



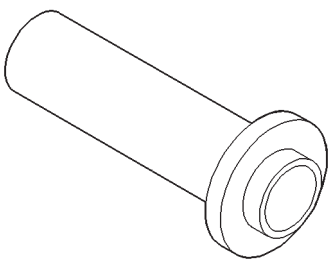
Bushing Remover/Installer Set—C-3887-J



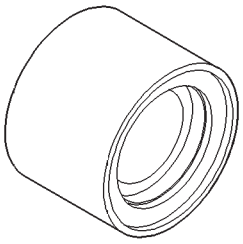
Universal Handle—C-4171



Nut, Bushing Remover—SP-1191, From kit C-3887-J



Seal Installer—C-4193-A



Cup, Bushing Remover—SP-3633, From kit C-3887-J

REMOVAL AND INSTALLATION (Continued)

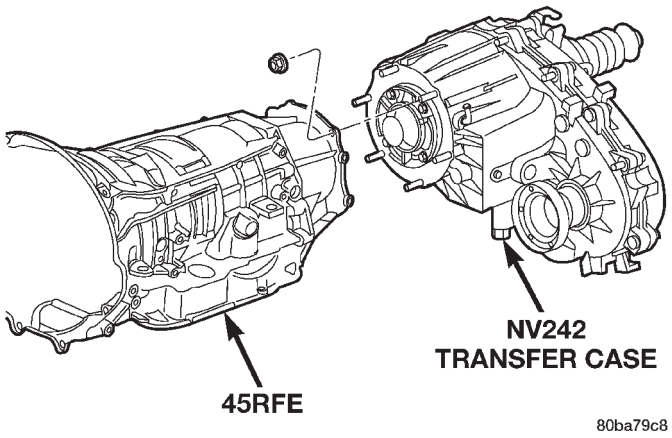


Fig. 21 Remove NV242 Transfer Case

(24) Hold torque converter in place during transmission removal.

(25) Lower transmission and remove assembly from under the vehicle.

(26) 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) If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.

(3) Lubricate converter drive hub and oil pump seal lip with transmission fluid.

(4) Lubricate converter pilot hub with transmission fluid.

(5) Align converter and oil pump.

(6) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(7) Check converter seating with steel scale and straightedge (Fig. 22). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(8) Temporarily secure converter with C-clamp.

(9) Position transmission on jack and secure it with chains.

(10) 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.**

(11) Raise transmission and align converter with drive plate and converter housing with engine block.

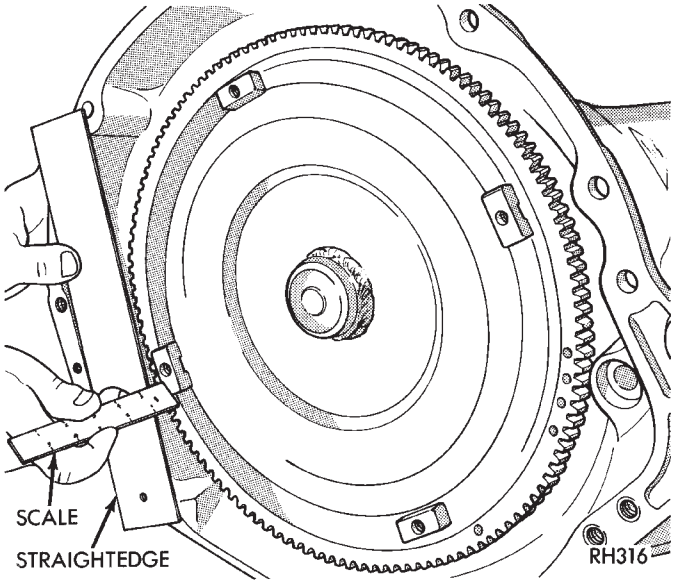


Fig. 22 Typical Method Of Checking Converter Seating

(12) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

(13) Rotate converter so alignment marks scribed on converter are aligned with mark on driveplate.

(14) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.

(15) Install two bolts to attach converter housing to engine.

(16) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft. lbs.).

(17) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft. lbs.).

(18) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft. lbs.).

(19) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft. lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft. lbs.).

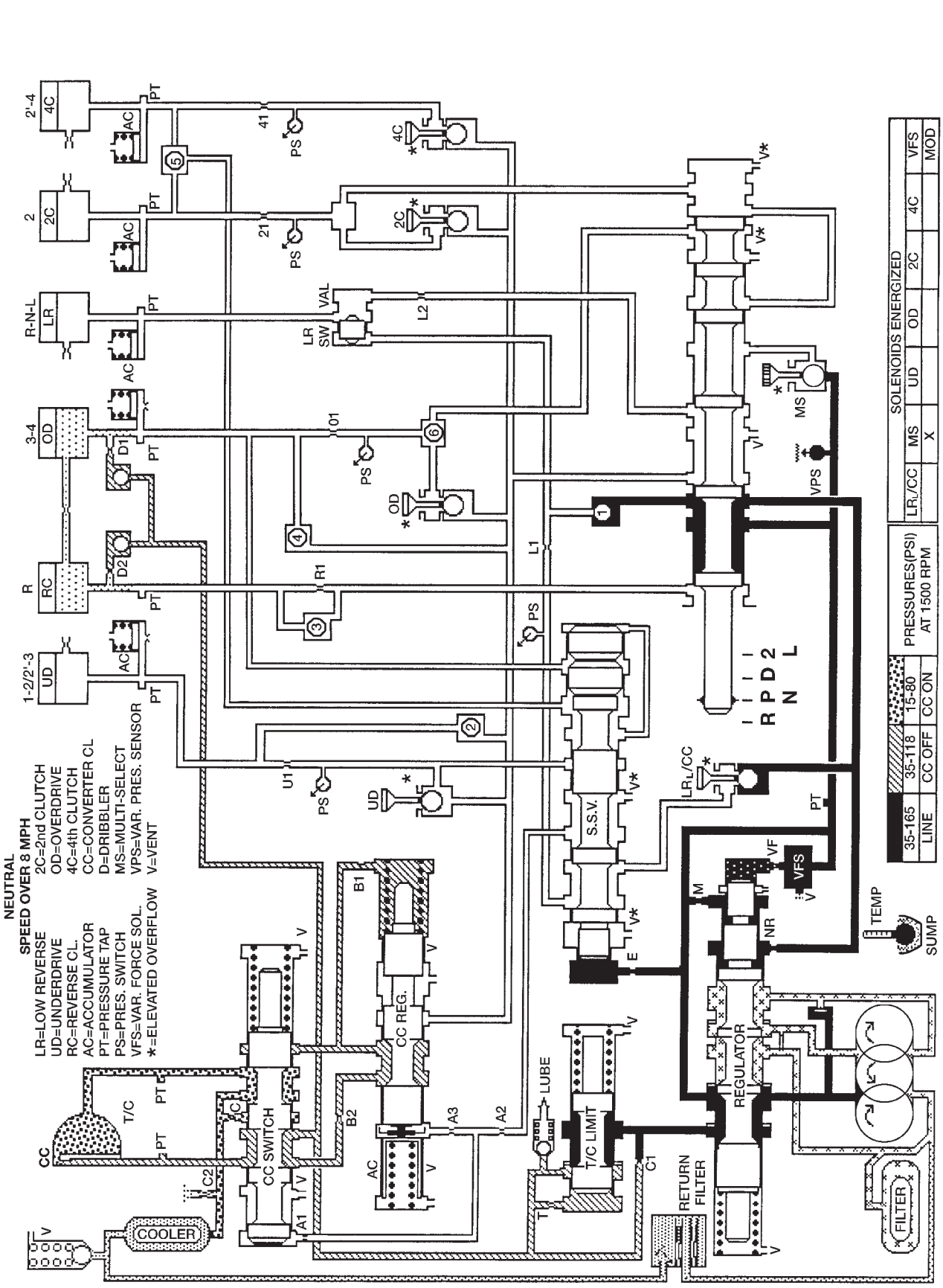
(20) Remove engine support fixture.

(21) Install new plastic retainer grommet on any shift cable 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 cable and to snap grommet onto lever.

(22) Connect gearshift cable to transmission.

(23) Connect wires to solenoid and pressure switch assembly connector, input and output speed sensors, and line pressure sensor. Be sure transmission harnesses are properly routed.

SCHEMATICS AND DIAGRAMS (Continued)



45RFE HYDRAULIC SCHEMATIC

NV242 TRANSFER CASE

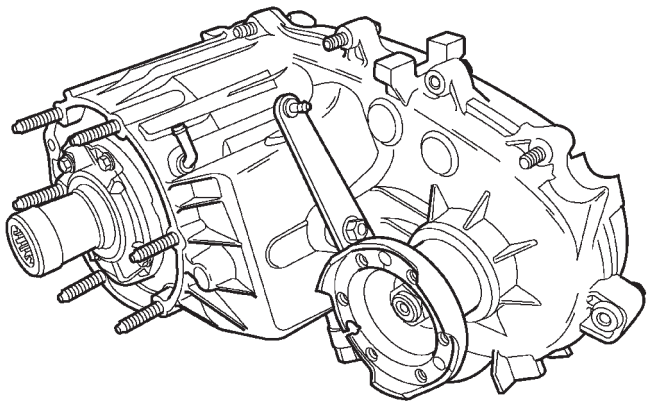
INDEX

GENERAL INFORMATION

NV242 TRANSFER CASE

The NV242 is a full and part-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.



80ba7a31

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.

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.

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.

DISASSEMBLY AND ASSEMBLY (Continued)

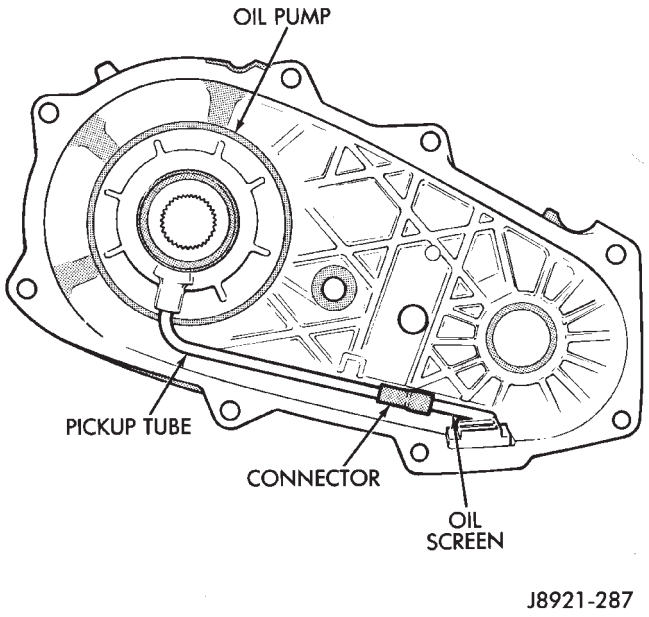


Fig. 84 Oil Screen And Pickup Tube Installation

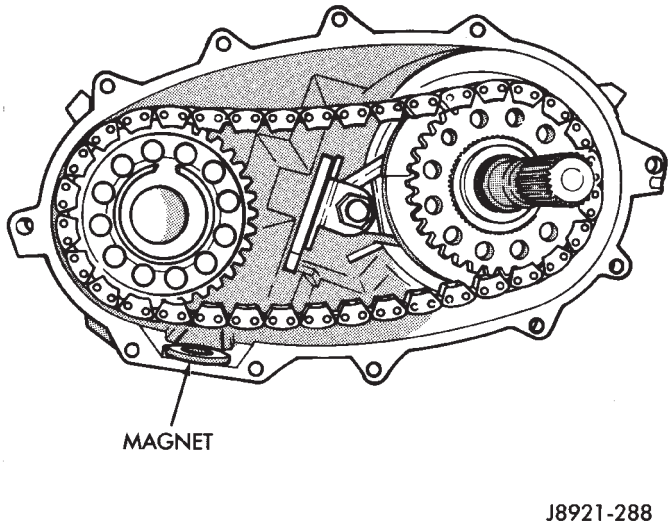


Fig. 85 Installing Case Magnet

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. 86).

(3) Install rear bearing O.D. retaining ring with snap-ring pliers (Fig. 87). 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.

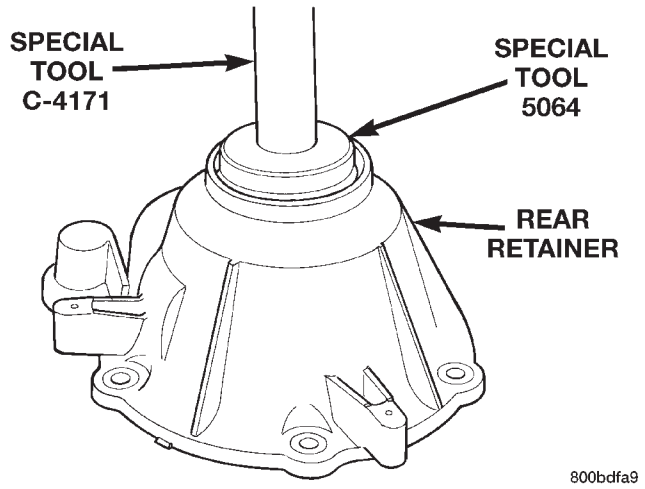


Fig. 86 Installing Rear Bearing In Retainer

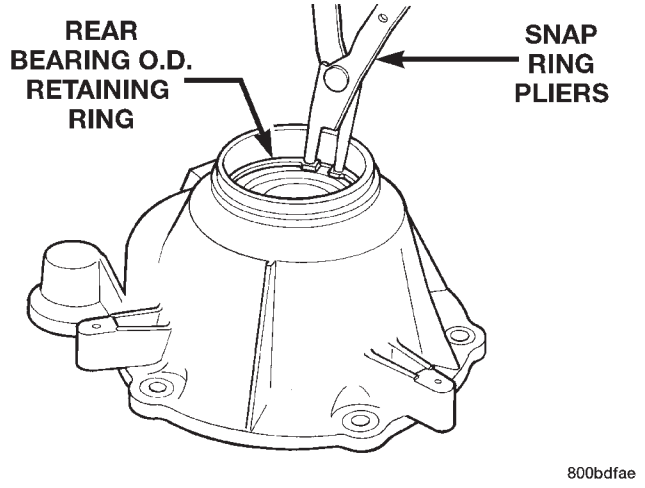


Fig. 87 Rear Bearing Retaining Ring Installation

(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. 88). 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. Drive seal into rear bearing retainer with installer C-4076-B and handle MD-998323 (Fig. 89).

(10) Install rear slinger with installer C-4076-A and handle MD-998323 (Fig. 89).

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 90).

COMPANION FLANGE INSTALLATION

(1) Lubricate companion flange hub with transmission fluid and install flange on front shaft.

(2) Install new seal washer on front shaft.

(3) Install flange on front shaft and tighten nut to 122–176 N·m (90–130 ft. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

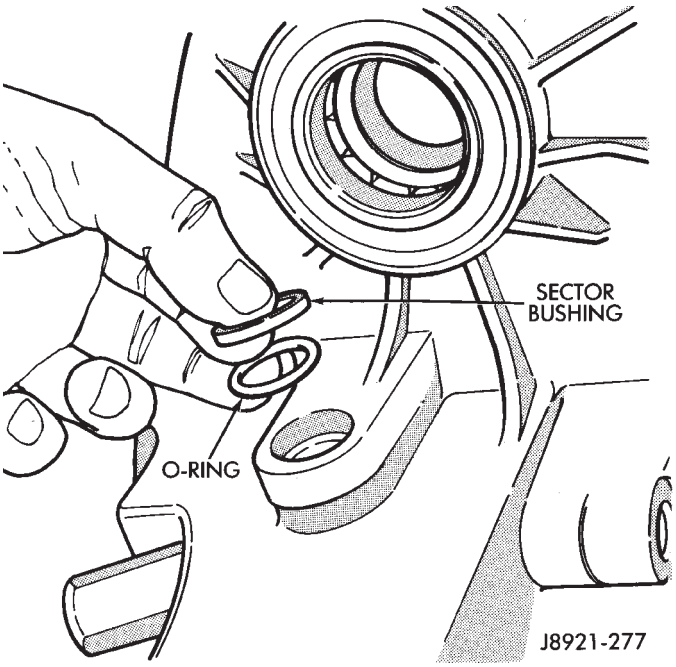


Fig. 56 Sector O-Ring And Bushing Installation

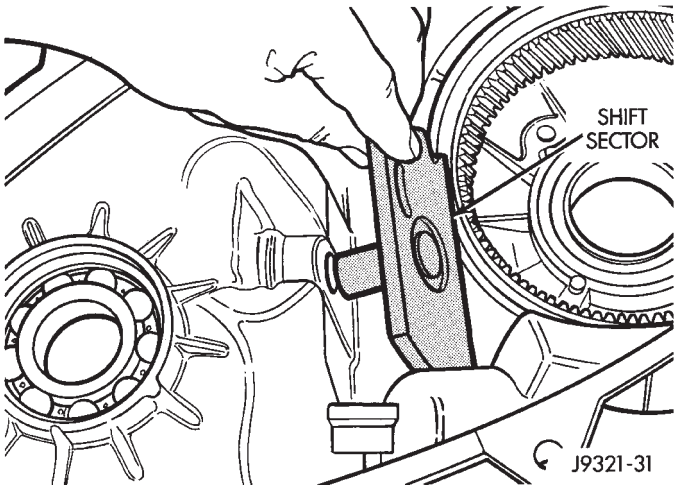


Fig. 57 Shift Sector Installation

(3) Install locking clutch spring, locking clutch, blockout spring, and range clutch sleeve, to mainshaft as shown in (Fig. 58). Install snap ring.

(4) Install drive sprocket hub to mainshaft and manually load the needle bearings.

(5) Install new pads on range fork, if necessary.

(6) Install range shift fork to range clutch sleeve. Install mainshaft/range shift fork assembly into transfer case and input planetary assembly. Rotate fork until it engages with slot in shift sector.

(7) Install shift rail to shift range fork and transfer case housing.

(8) Rotate shift sector to Neutral position.

(9) Install new O-ring on detent plug (Fig. 59).

(10) Lubricate detent plunger with transmission fluid or light coat of petroleum jelly.

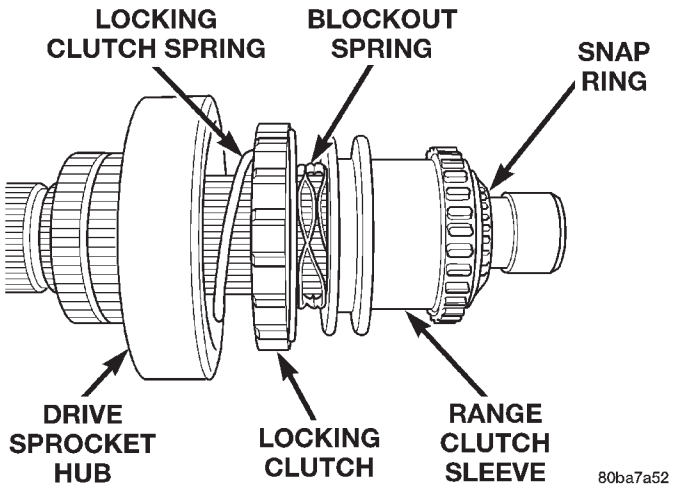


Fig. 58 Range Clutch Sleeve, Blockout Spring, Locking Clutch and Spring

(11) Install detent plunger, spring and plug (Fig. 59).

(12) Verify that plunger is properly engaged in sector.

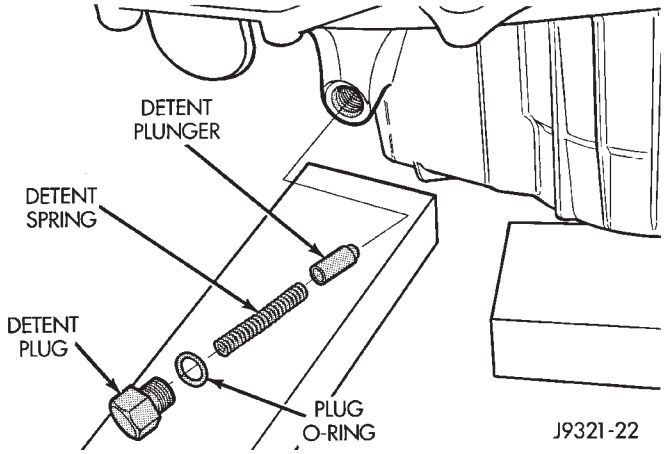


Fig. 59 Shift Detent Components

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Lubricate front output shaft-sprocket assembly, drive chain and drive sprocket with transmission fluid.

(2) Assemble drive chain, drive sprocket and front output shaft (Fig. 60).

(3) Start drive sprocket on mainshaft.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 60).

(5) Install drive sprocket snap-ring (Fig. 61).

(6) Install roller bearings if removed.

(7) Install progressive coupling (Fig. 62).

(8) Install oil pickup tube in rear case. Be sure tube is seated in case notch as shown (Fig. 63).

(9) Install magnet in front case pocket (Fig. 64).

DIAGNOSIS AND TESTING (Continued)

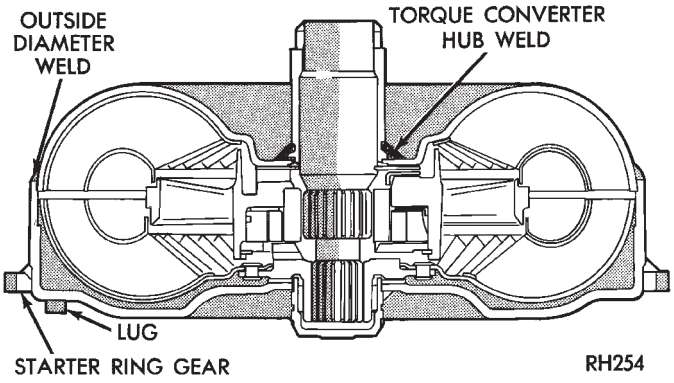


Fig. 10 Converter Leak Points—Typical

(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 rings 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 TABLES AND CHARTS—RE TRANSMISSION

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.

REMOVAL AND INSTALLATION (Continued)

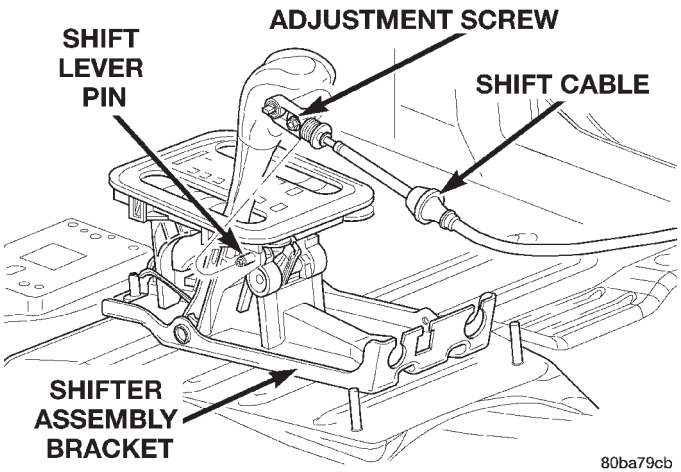


Fig. 36 Transmission Shift Cable at Shifter

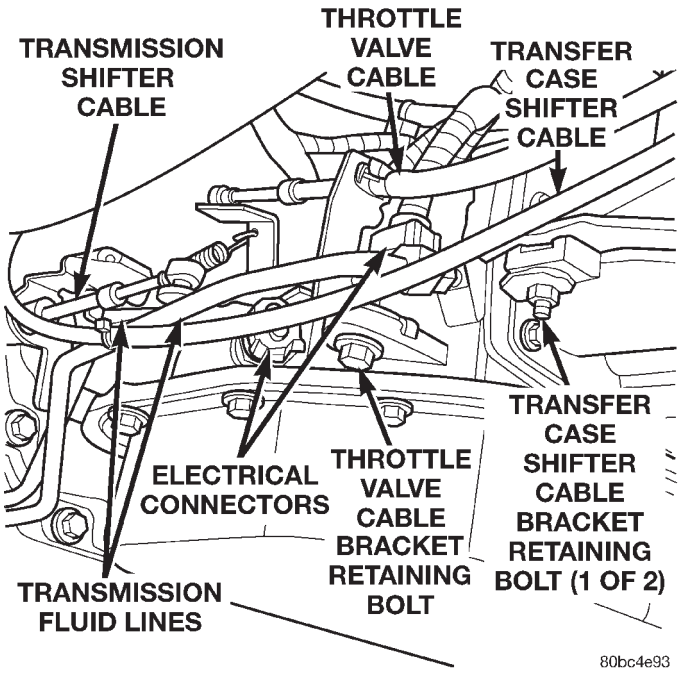


Fig. 37 Shift Cable at Transmission

(9) Place the transmission shift lever in the "PARK" position. Park is the rearmost detent position on the transmission manual shift lever (Fig. 37).

(10) Snap the shifter cable on the shift control lever (Fig. 37).

CAUTION: Be certain shift cable is routed correctly, free of binding, sharp edges and hot exhaust system components.

(11) Lower the vehicle from the hoist.

(12) Verify the transmission and shifter are in the "PARK" position.

(13) Torque the adjustment screw to 7 N·m (65 in. lbs.) (Fig. 36).

(14) Verify correct shifter operation.

(15) Install the shift lever bezel and any console parts removed to access the shift control cable.

FLOOR SHIFTER

REMOVAL

(1) Shift the transmission into the "PARK" position.

(2) Remove the shift lever bezel and any necessary console parts for access to the shift lever assembly and shift cables.

(3) Disconnect the shift cable from the shifter and support bracket assembly (Fig. 38).

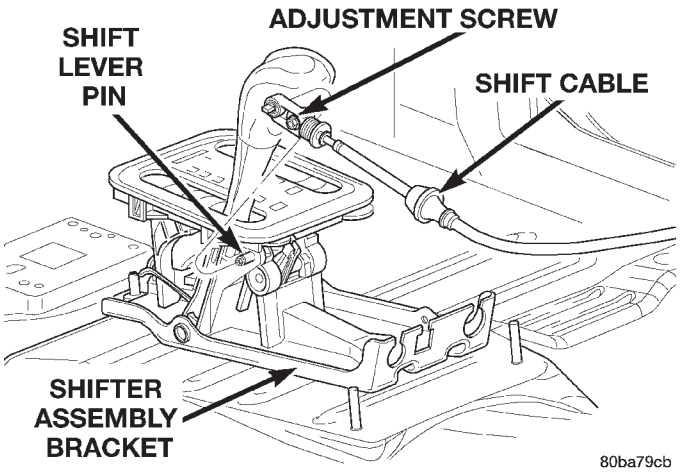


Fig. 38 Shift Cable at Shifter

(4) Disconnect the brake transmission shift interlock cable from the shifter BTSI lever and the shifter bracket assembly.

(5) Disconnect the transfer case shift cable from the transfer case shift lever pin (Fig. 39).

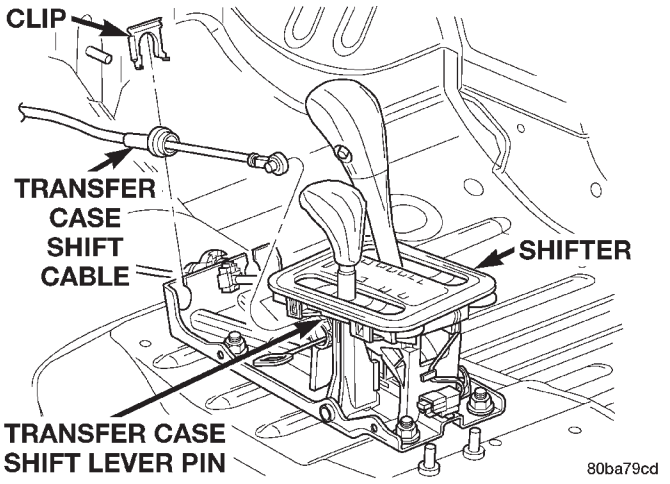


Fig. 39 Transfer Case Shift Cable

(6) Remove the clip retaining the transfer case shift cable to the shifter bracket assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

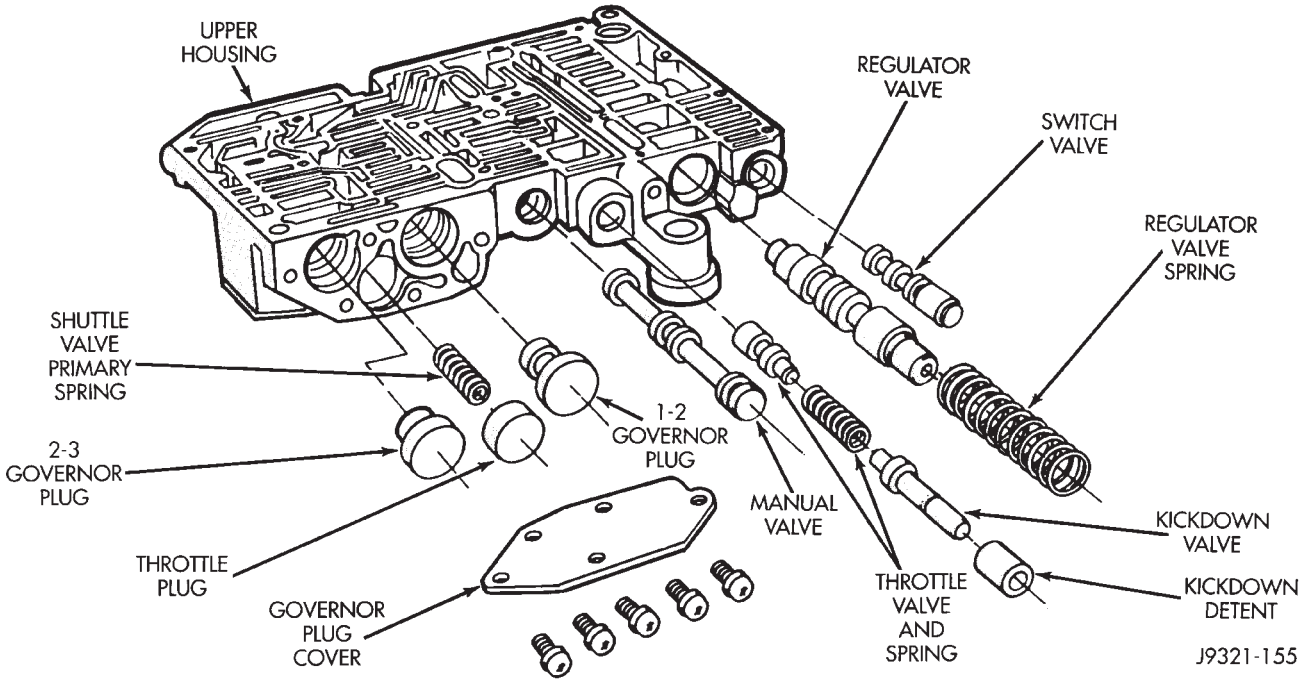


Fig. 103 Upper Housing Control Valve Locations

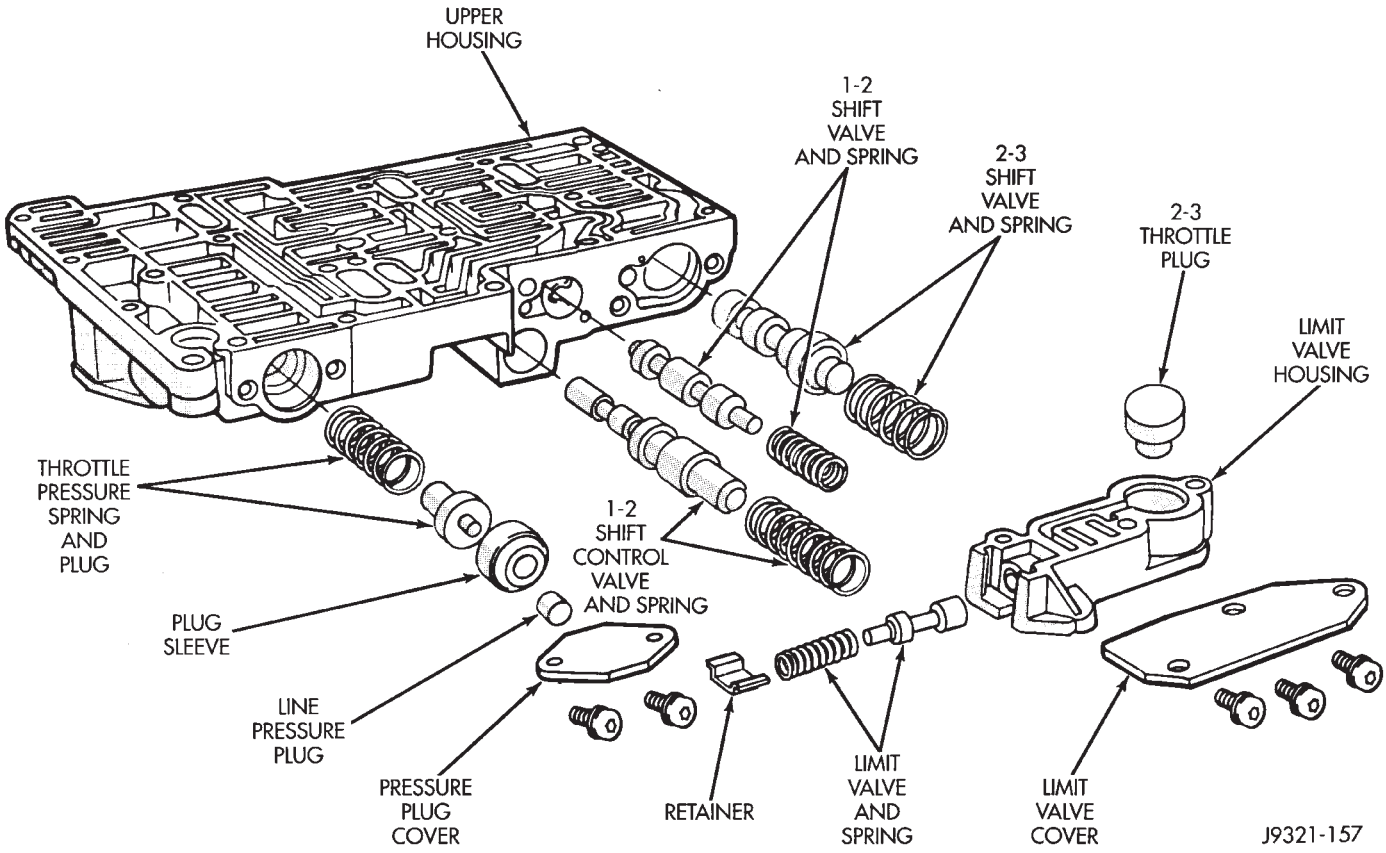


Fig. 104 Upper Housing Shift Valve And Pressure Plug Locations

DISASSEMBLY AND ASSEMBLY (Continued)

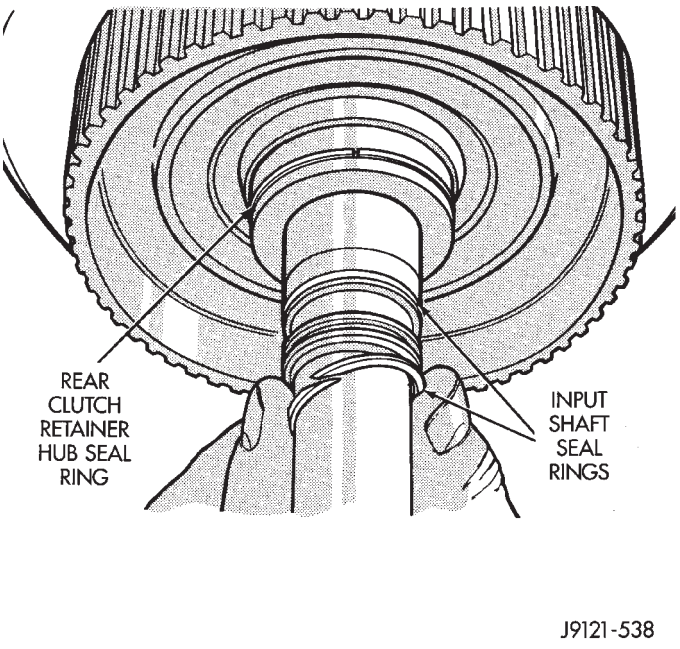


Fig. 182 Rear Clutch Retainer And Input Shaft Seal Ring Installation

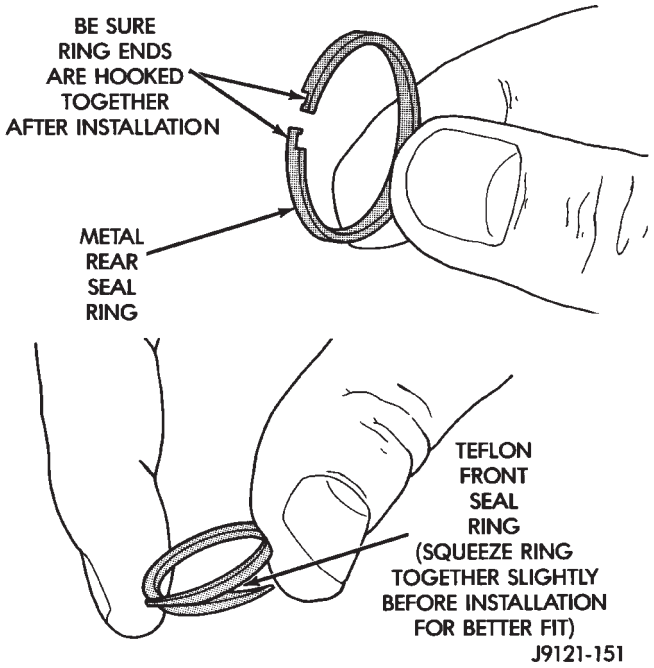


Fig. 183 Input Shaft Seal Ring Identification

(11) Install bottom pressure plate (Fig. 180). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

(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. 180).

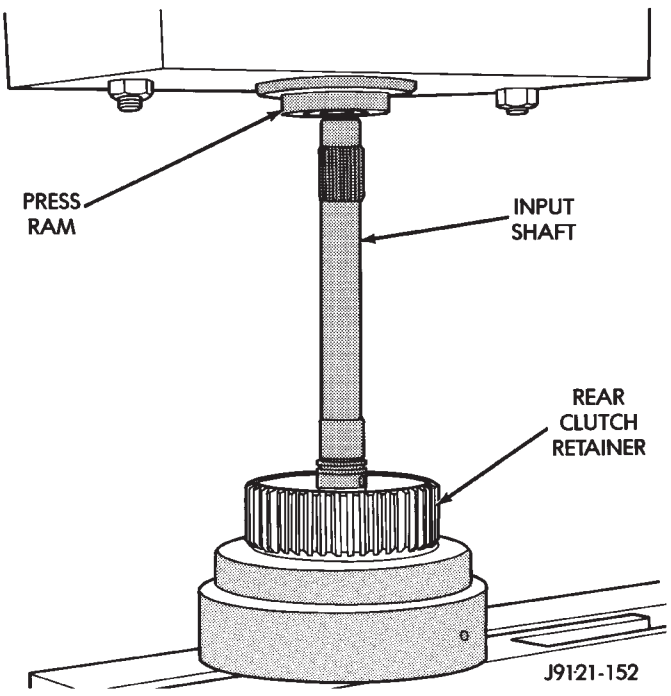


Fig. 184 Pressing Input Shaft Into Rear Clutch Retainer

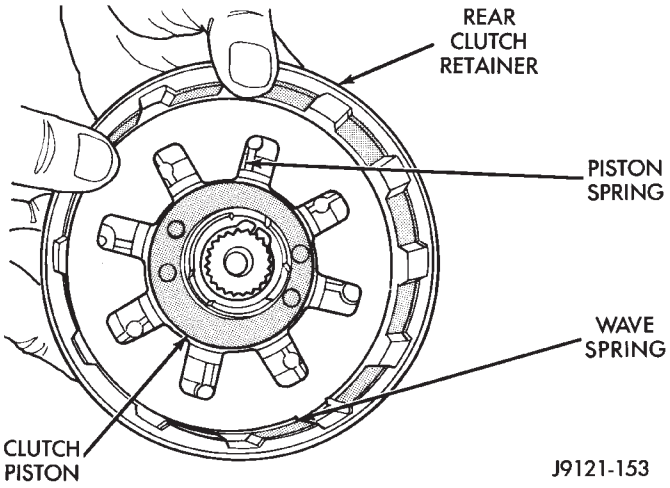


Fig. 185 Piston Spring/Wave Spring Position

(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. 186).

(a) Position gauge bar across the clutch drum with the dial indicator pointer on the pressure plate (Fig. 186).

(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.

CLEANING AND INSPECTION (Continued)

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.

REAR SERVO

Remove and discard the servo piston seal ring (Fig. 267). 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.

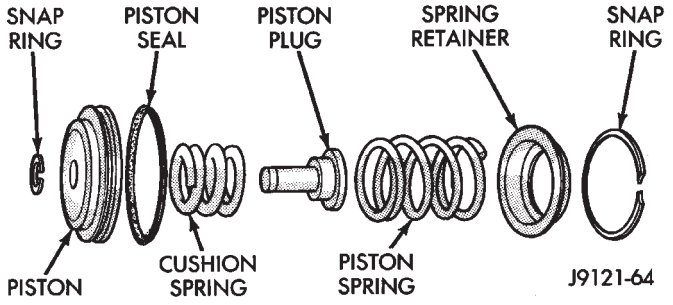


Fig. 267 Rear Servo Components

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.

(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. 268). The ball must move freely and not stick.

NOTE: Inspect the clutch retainer bushings carefully (Fig. 269). 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.

REAR CLUTCH

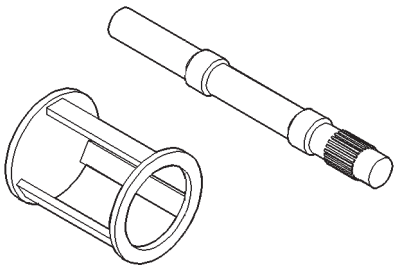
Clean the clutch components with solvent and dry them with compressed air. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to component surfaces and could restrict or block fluid passages after assembly.

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off. Replace the top and bottom pressure plates if scored, warped, or cracked. Be sure the driving lugs on the pressure and clutch plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

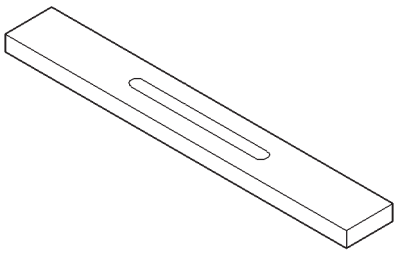
Replace the piston spring and wave spring if either part is distorted, warped or broken.

SPECIAL TOOLS

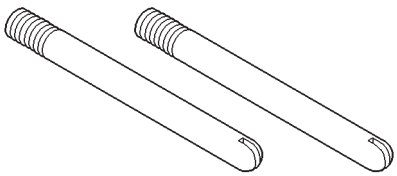
RE TRANSMISSIONS



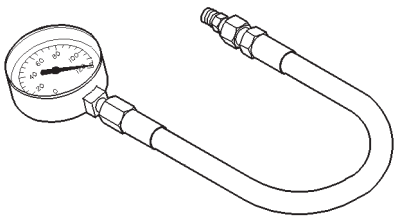
Spring Compressor and Alignment Shaft—6227



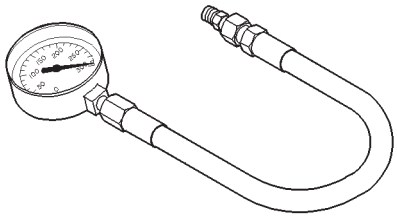
Gauge Bar—6311



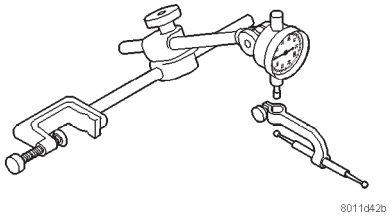
Extension Housing Pilot—C-3288-B



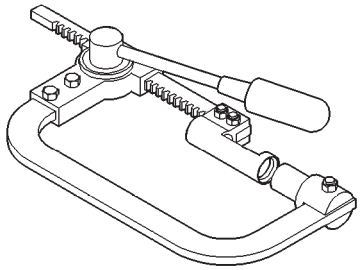
Pressure Gauge—C-3292



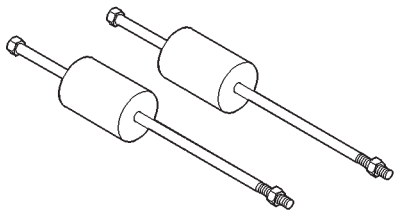
Pressure Gauge—C-3293SP



Dial Indicator—C-3339



Spring Compressor—C-3422-B



Puller, Slide Hammer—C-3752

REMOVAL AND INSTALLATION (Continued)

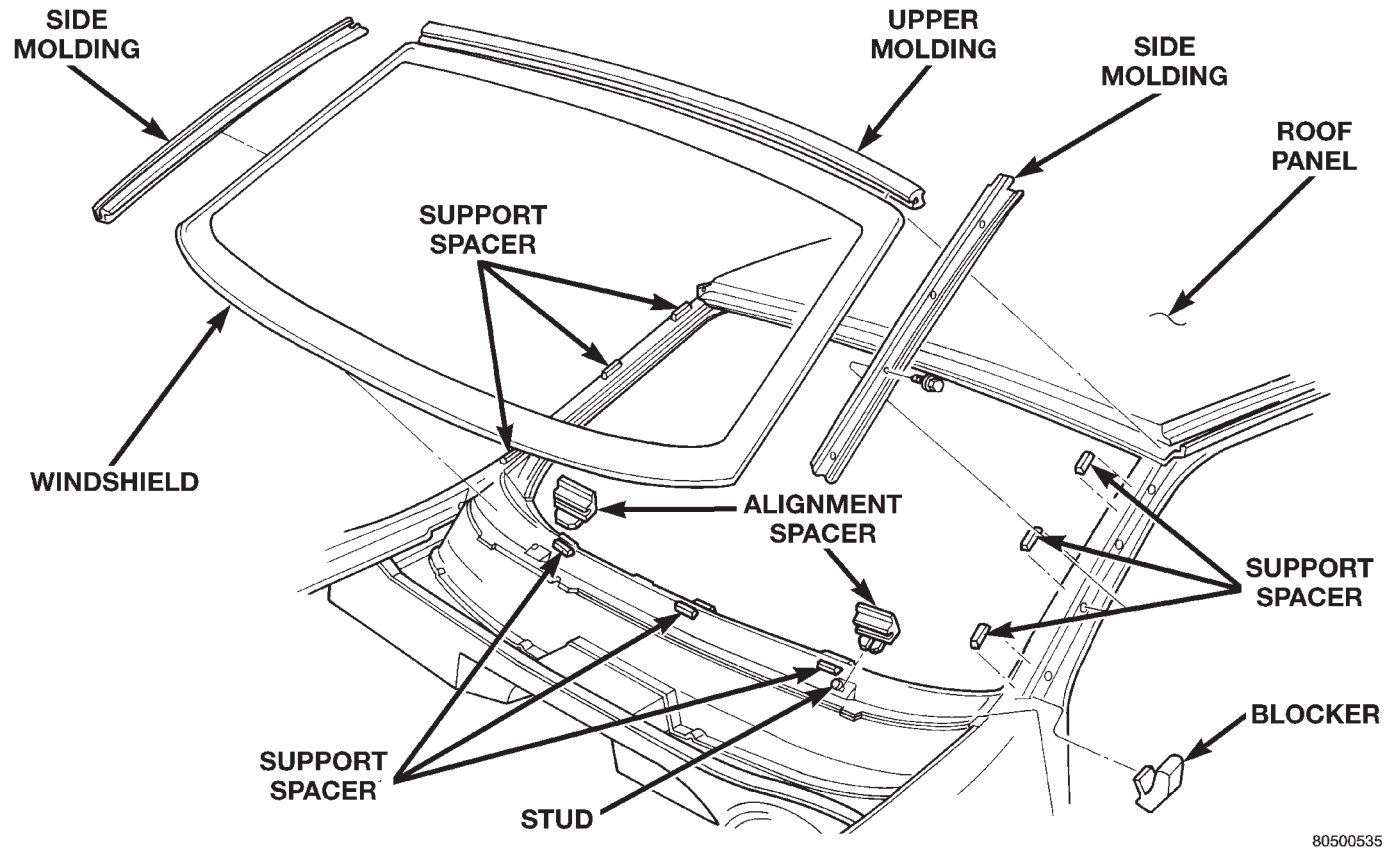


Fig. 1 Windshield

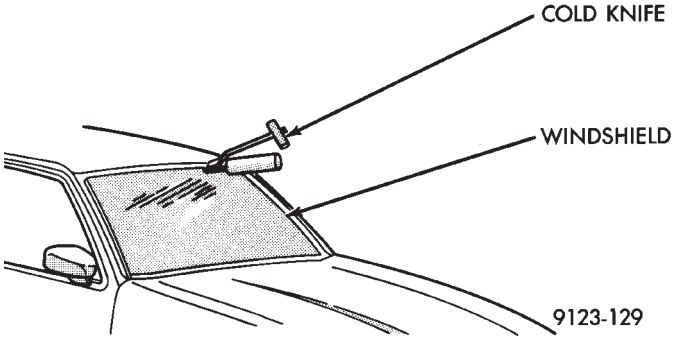


Fig. 2 Cut Urethane Around Windshield—Typical

cleaned and properly installed on weld studs or repair screws at bottom of windshield opening.

(1) Place replacement windshield into windshield opening. Position glass in the center of the opening against the support spacers. Mark the glass at the support spacers with a grease pencil or masking tape and ink pen to use as a reference for installation. Remove replacement windshield from windshield opening (Fig. 3).

(2) Position the windshield inside up on a suitable work surface with two padded, wood 10 cm by 10 cm by 50 cm (4 in. by 4 in. by 20 in.) blocks, placed parallel 75 cm (2.5 ft.) apart (Fig. 4).

(3) Clean inside of windshield with Mopar Glass Cleaner and lint-free cloth.

(4) Apply clear glass primer 25 mm (1 in.) wide around edge of windshield. Wipe with clean/dry lint-free cloth.

(5) Apply black-out primer 15 mm (.75 in.) wide on top and sides of windshield and 25 mm (1 in.) on bottom of windshield. Allow at least three minutes drying time.

(6) Position windshield spacers on lower fence above support spacers at the edge of the windshield opening (Fig. 1).

(7) Apply a 10 mm (0.4 in.) bead of urethane around perimeter of windshield along the inside of the moldings. Apply two beads along the bottom edge.

(8) Install upper molding onto windshield.

(9) Apply fence primer around the perimeter of the windshield opening fence. Allow at least 18 minutes drying time.

(10) With aid of a helper, position windshield over windshield opening. Align reference marks at bottom of windshield to support spacers.

(11) Slowly lower windshield glass to windshield opening fence. Guide top molding into proper position if necessary. Push windshield inward to fence spacers at bottom and until top molding is flush to roof line.

REMOVAL AND INSTALLATION (Continued)

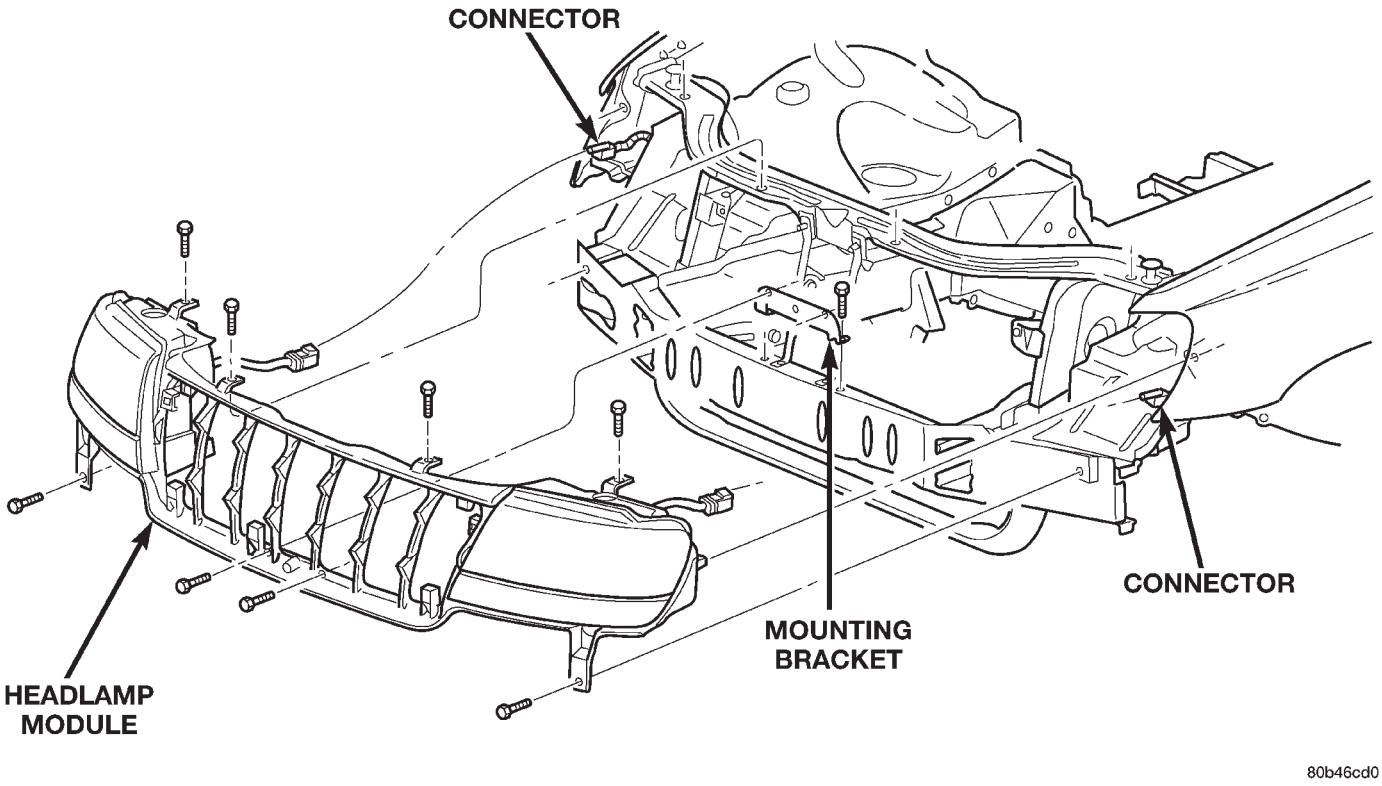


Fig. 3 Headlamp Mounting Module

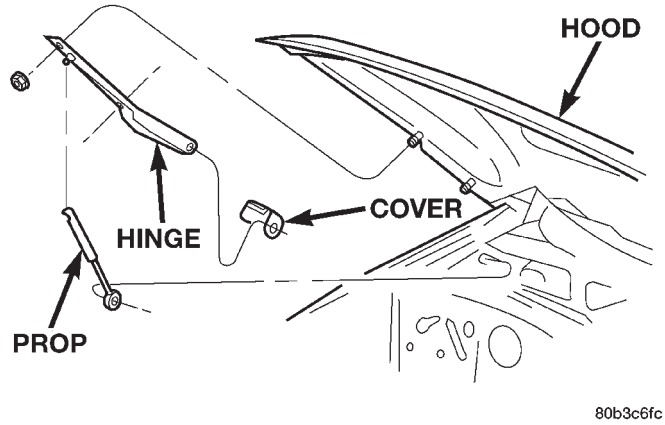


Fig. 4 Hood Support Prop

INSTALLATION

(1) Position hood support prop on upper ball stud.
(2) Slide retainer upward to secure support prop to upper ball stud.
(3) Position support prop on lower ball stud and press retainer inward to secure.

HOOD HINGE

REMOVAL

(1) Raise and support hood.
(2) Using a wax crayon or equivalent, mark position of hinge.
(3) Remove hood hinge prop rod.
(4) Remove nuts attaching hinge to hood (Fig. 4).
(5) Remove bolts attaching hinge to body.
(6) Separate hinge from vehicle.

INSTALLATION

(1) Position hinge on vehicle and align reference marks.
(2) Install bolts attaching hinge to body.
(3) Install nuts attaching hinge to hood.
(4) Install hood hinge prop rod.

HOOD LATCH

REMOVAL

(1) Remove nuts attaching latch to radiator crossmember support (Fig. 5).
(2) Disconnect hood release cable from latch.
(3) Separate latch from vehicle.

REMOVAL AND INSTALLATION (Continued)

(6) Route rear shoulder belt through access hole.
(7) Separate C-pillar upper trim from vehicle.

INSTALLATION

(1) Position C-pillar upper trim at C-pillar.
(2) Route rear shoulder belt through access hole.
(3) Press C-pillar upper trim onto C-pillar.
(4) Press quarter panel trim into place as necessary.
(5) Ensure front edge of trim is covered by weatherstrip.
(6) Install screws attaching quarter panel trim.
(7) Install rear shoulder belt height adjustment knob.
(8) Install rear shoulder belt turning loop.

QUARTER PANEL TRIM

REMOVAL

(1) Move rear sear to cargo position.
(2) If equipped, remove sunshade cover.
(3) Remove screw attaching quarter panel trim to lower B pillar trim (Fig. 60).
(4) Open liftgate.
(5) Remove upper and lower liftgate opening trim panels.
(6) Remove D-pillar upper trim.
(7) Remove storage bin (right side only).
(8) Remove C-pillar upper trim panel.
(9) Remove mounting screws.
(10) Pull quarter trim panel forward and disengage connectors for CD player and power outlet, if equipped.
(11) Pull quarter trim panel extension in the rear door opening upward.
(12) Remove rear quarter trim panel.

INSTALLATION

(1) Position quarter trim panel, engage connectors for CD player and power outlet, if equipped, and align screw holes.
(2) Install quarter trim panel.
(3) Install C-pillar upper trim panel.
(4) Install storage bin.
(5) Install D-pillar upper trim panel.
(6) Install upper and lower liftgate opening trim panels.
(7) Install screw at lower B pillar.

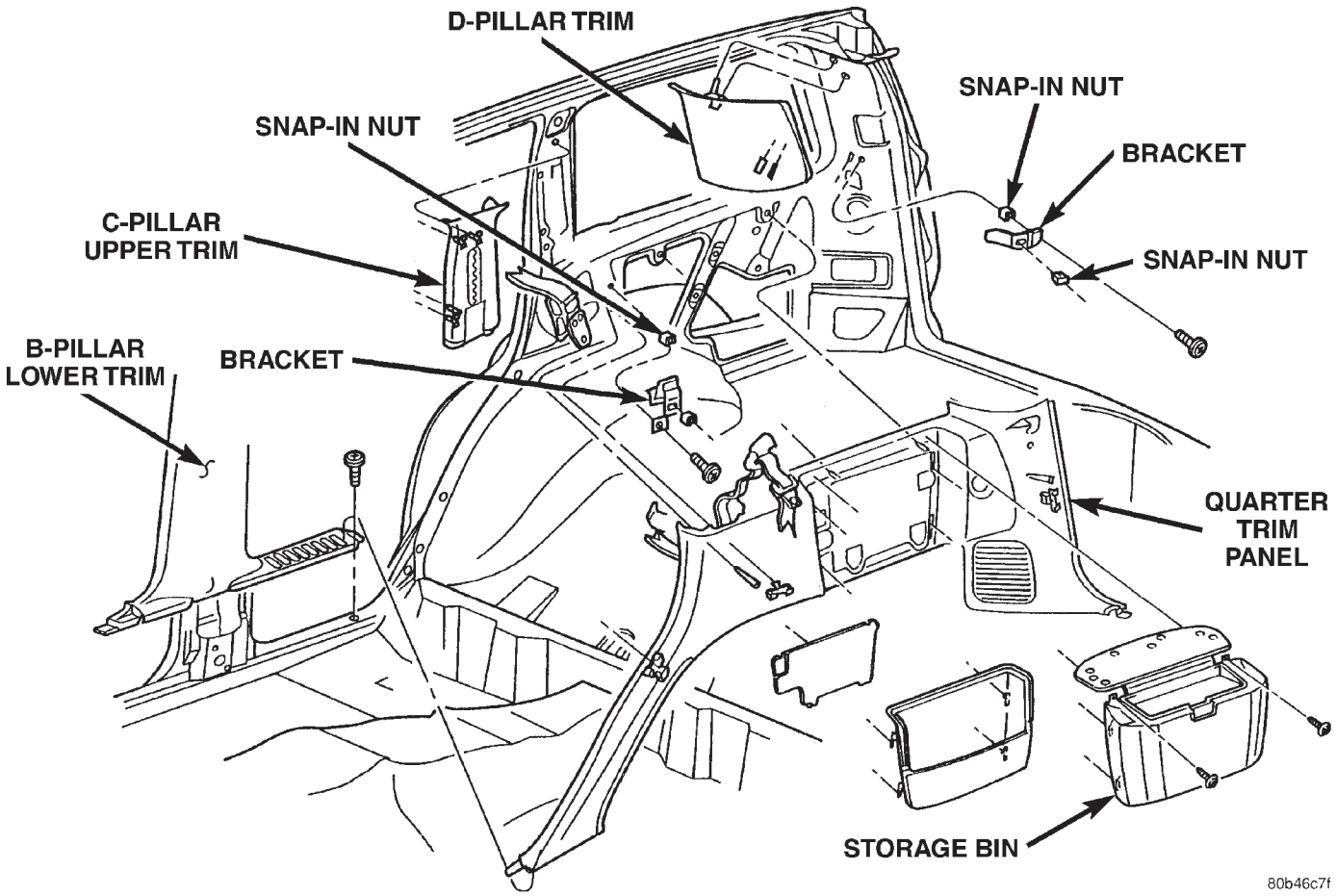
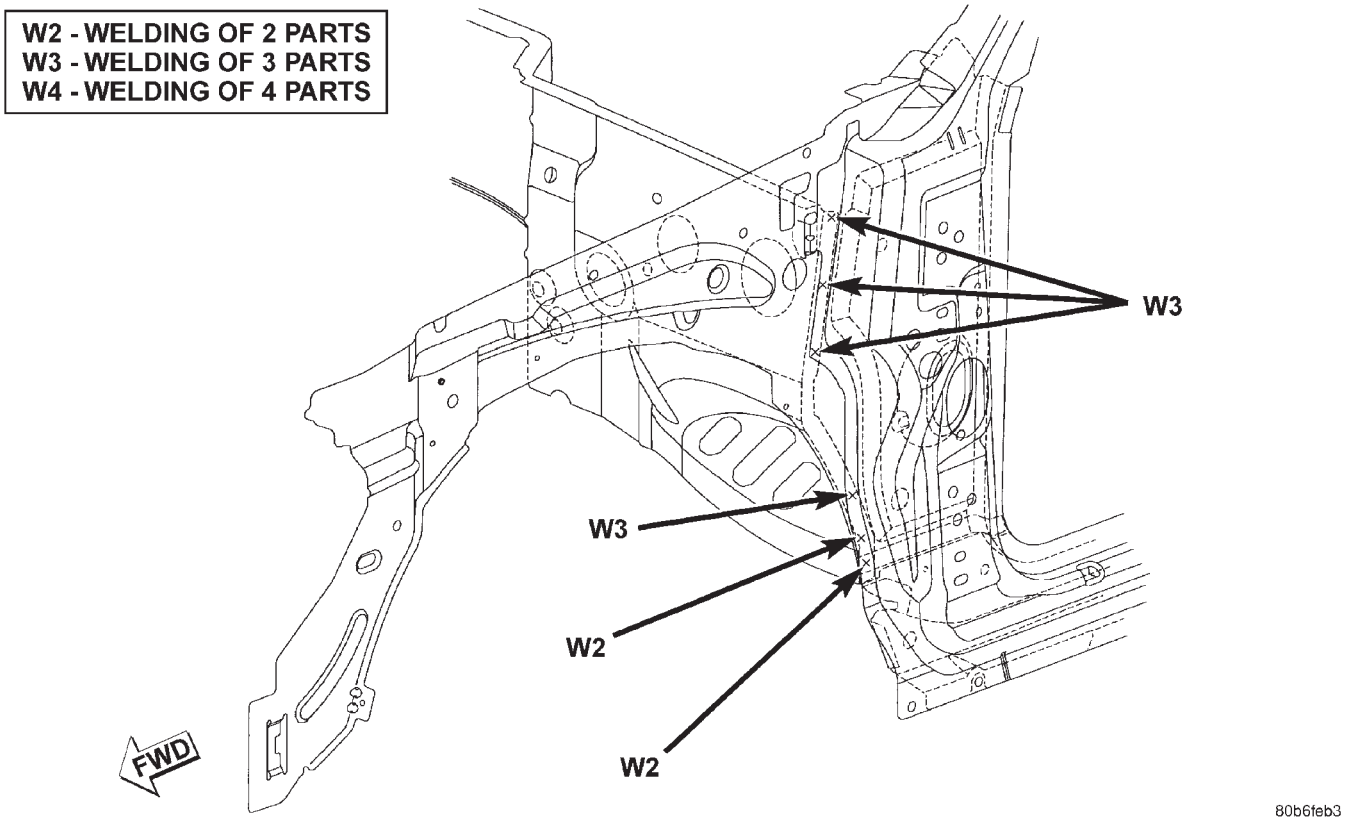


Fig. 60 Right Side Trim Panel

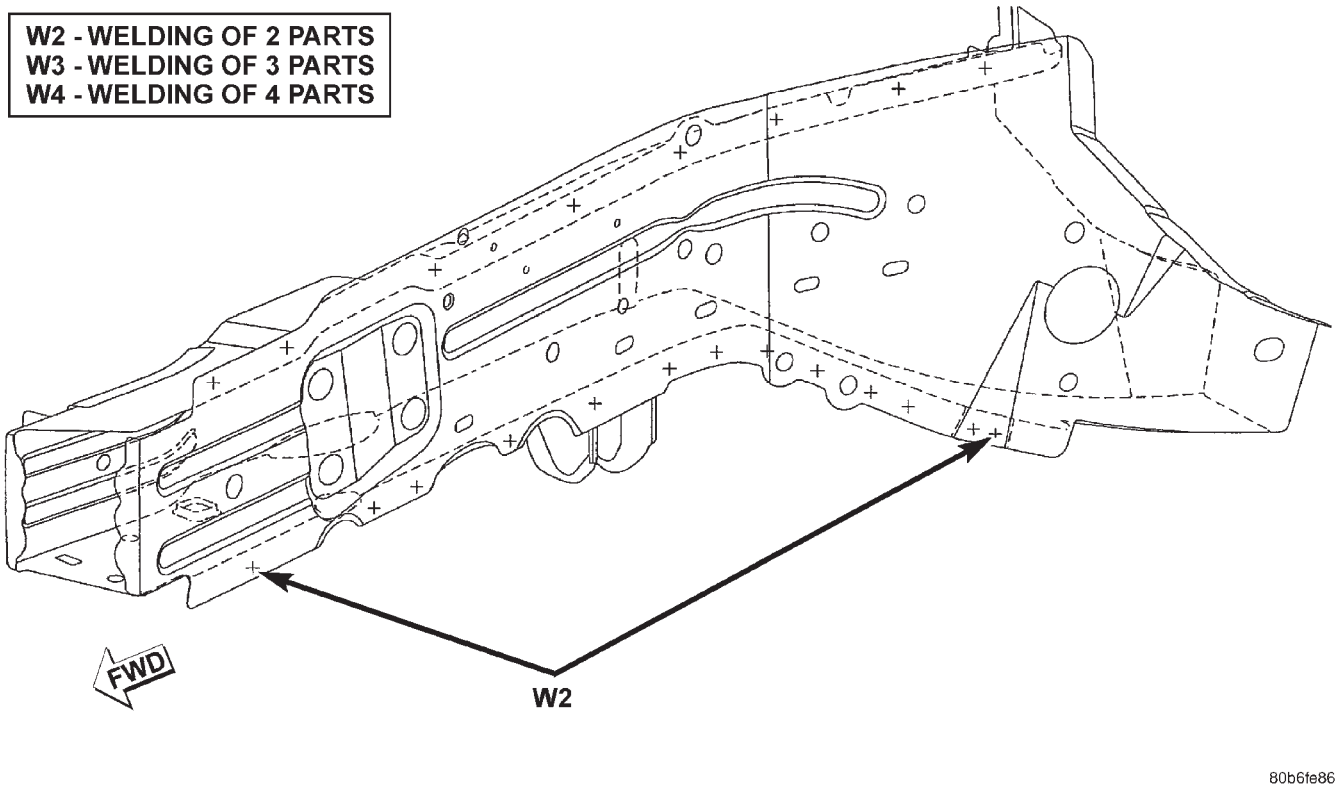
SPECIFICATIONS (Continued)

COWL SIDE PANEL TO DASH PANEL AND INNER BODYSIDE PANEL AND SILL



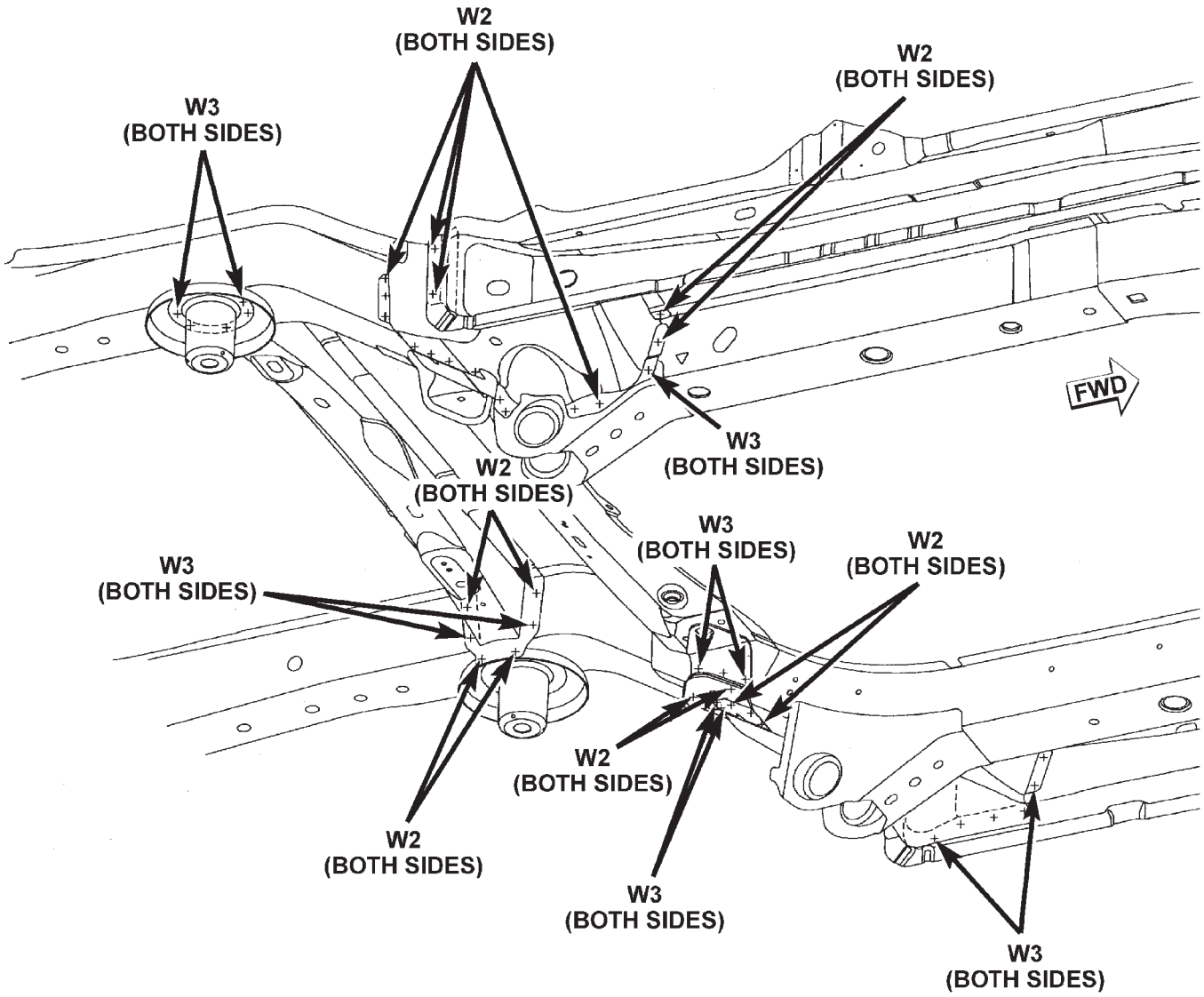
SPECIFICATIONS (Continued)

FRONT INNER SILL TO FRONT OUTER SILL



SPECIFICATIONS (Continued)

UPPER CONTROL ARM REINFORCEMENTS TO REAR RAIL



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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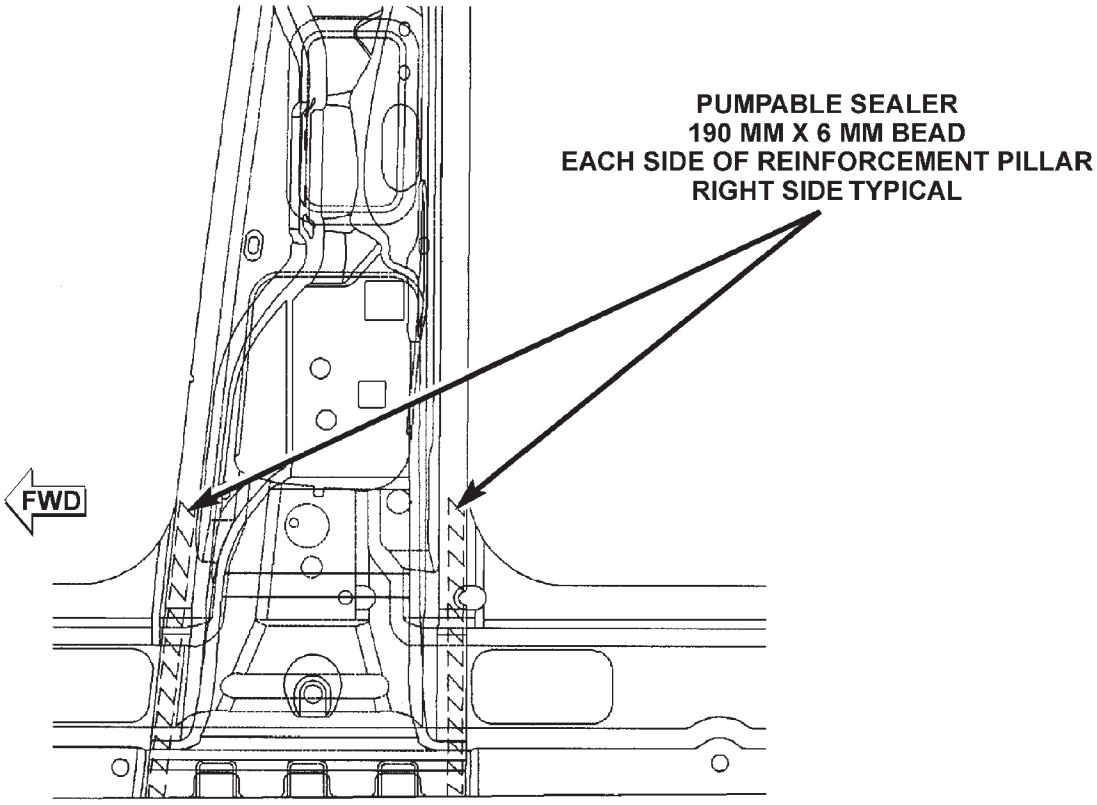
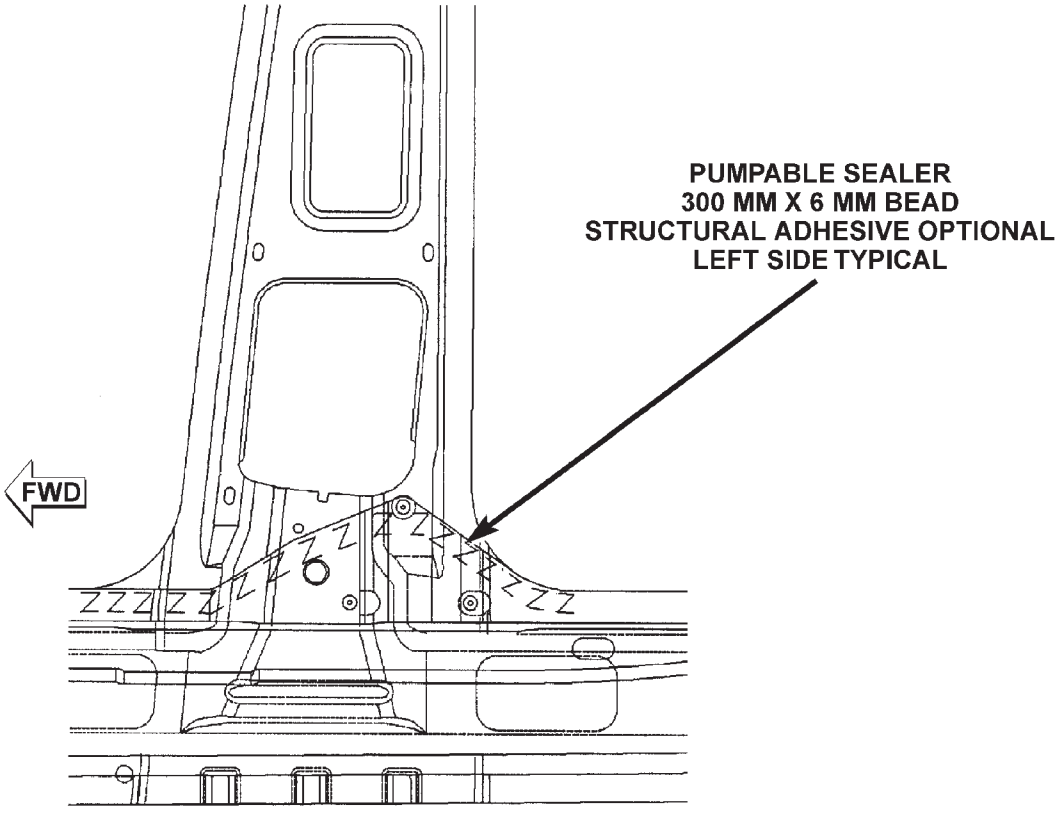
SPECIFICATIONS (Continued)

B-PILLAR AND SILL





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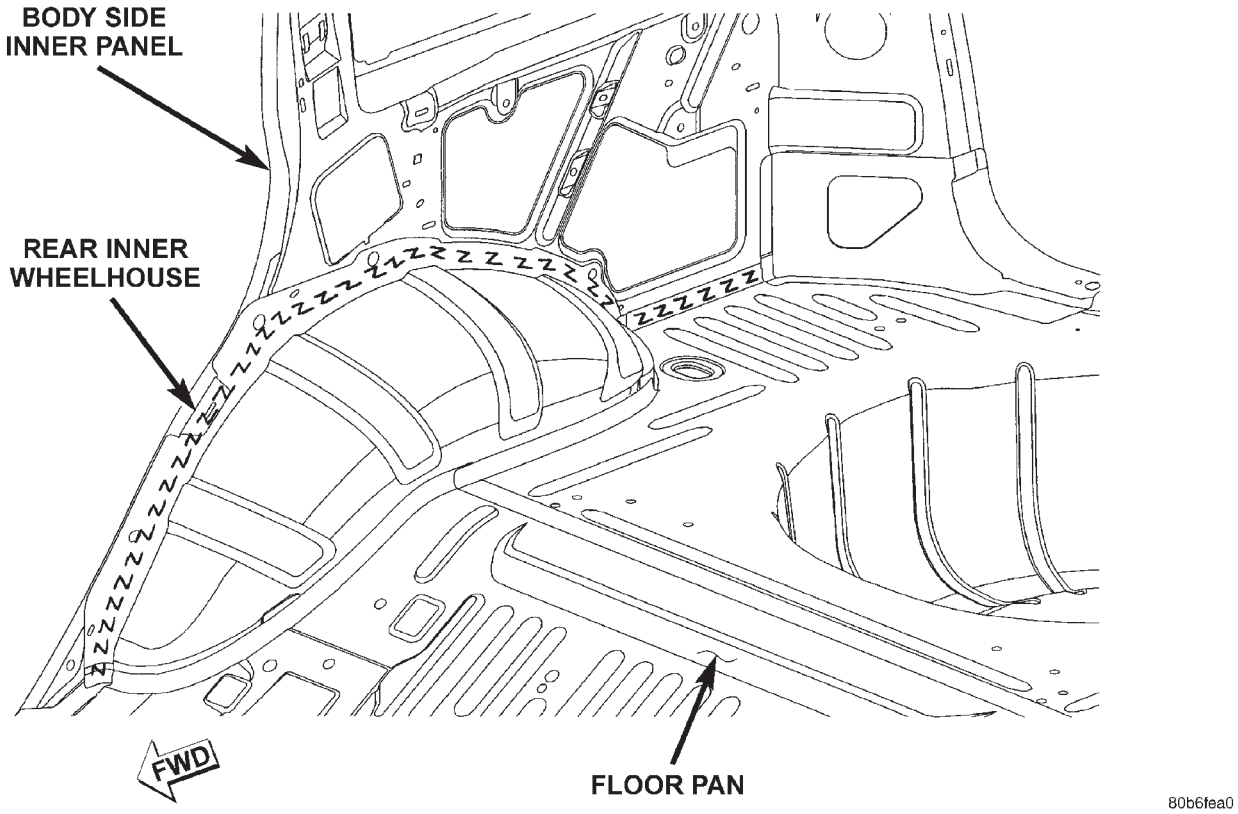
SPECIFICATIONS (Continued)

BODY SIDE INNER PANEL AND WHEELHOUSE



DESCRIPTION AND OPERATION (Continued)

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.

HIGH PRESSURE SWITCH

The high pressure switch is located on the discharge line or discharge line block fitting 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.

The high pressure switch is connected in series electrically with the low pressure 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.

The high pressure 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 switch is a factory-calibrated unit. The switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

INFRARED TEMPERATURE SENSOR

Models equipped with the optional Automatic Zone Control (AZC) system use automatic dual zone temperature control with infrared sensing technology. The temperature sensor is located in the center instrument panel, between the dual temperature knobs of the AZC.

The AZC module uses infrared sensing technology to control occupant comfort levels, not the actual passenger compartment air temperature. Dual infrared sensors mounted in the face of the control unit independently measure the surface temperature to maintain customer-perceived comfort temperature under changing conditions. Dual Zone temperature control provides wide side-to-side variation in comfort temperature to exceed the needs of either front seat occupant. This sensing system replaces interior air temperature and solar sensors used to approximate direct sensing control through complex control programs.

The infrared temperature sensor cannot be adjusted or repaired and, if faulty or damaged, the module must be replaced.

NOTE: The infrared sensor window may be permanently damaged if any type of cosmetic vinyl dressings are allowed to contact the lens. Avoid spraying or wiping this area with any cleaner or conditioner. This may result in impaired temperature sensing and control.

LOW PRESSURE SWITCH

The low pressure 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.

The low pressure switch is connected in series electrically with the high pressure 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 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 switch is a factory-calibrated unit. It cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REFRIGERANT

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.

DIAGNOSIS AND TESTING (Continued)

(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

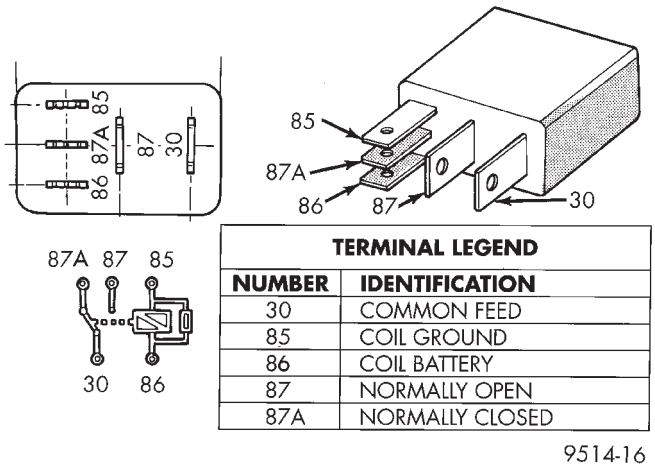
For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

The compressor clutch relay (Fig. 13) 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 the Relay Circuit Test procedure in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Fig. 13 Compressor Clutch 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 compressor 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.

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.

REMOVAL AND INSTALLATION (Continued)

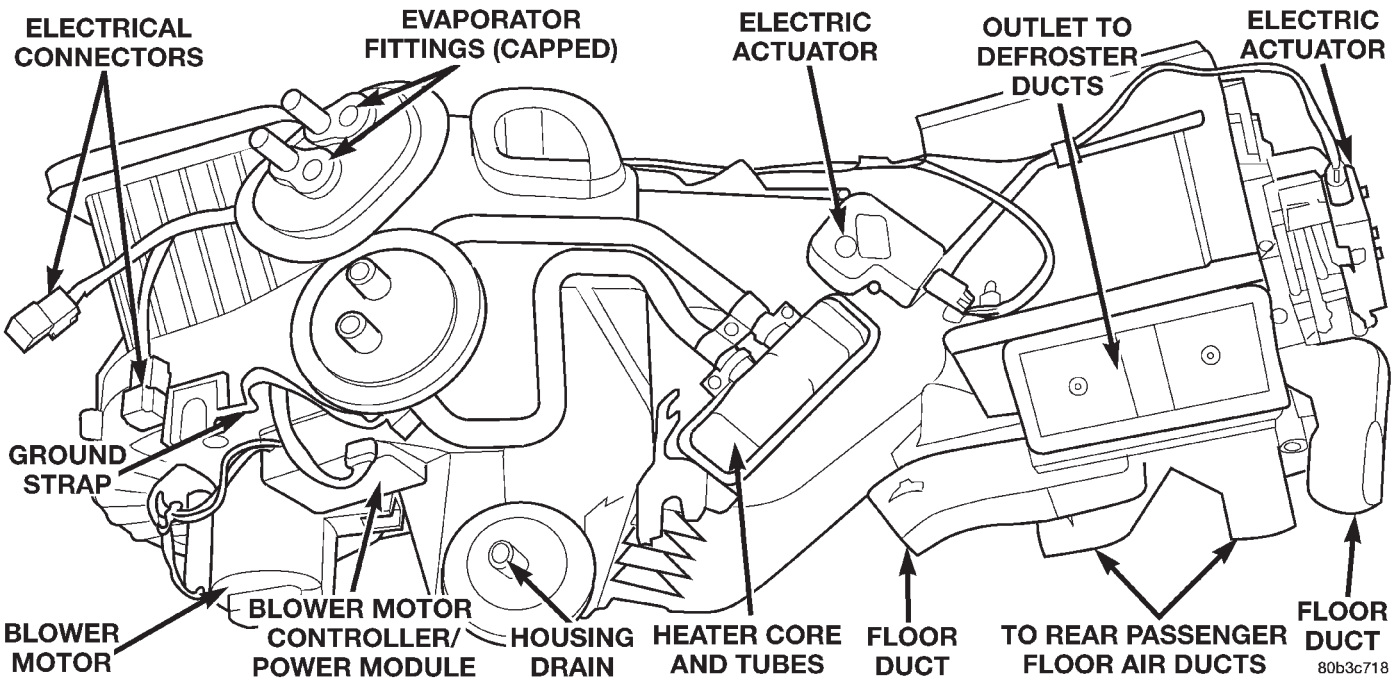


Fig. 55 Heater Core and Tubes

INSTALLATION

(1) When installing individual tubes, insert tube into core ensuring that tube O-ring is seated in core and not pinched. Hold tube in seated position while installing the round tube-to-core clamp (Fig. 56).

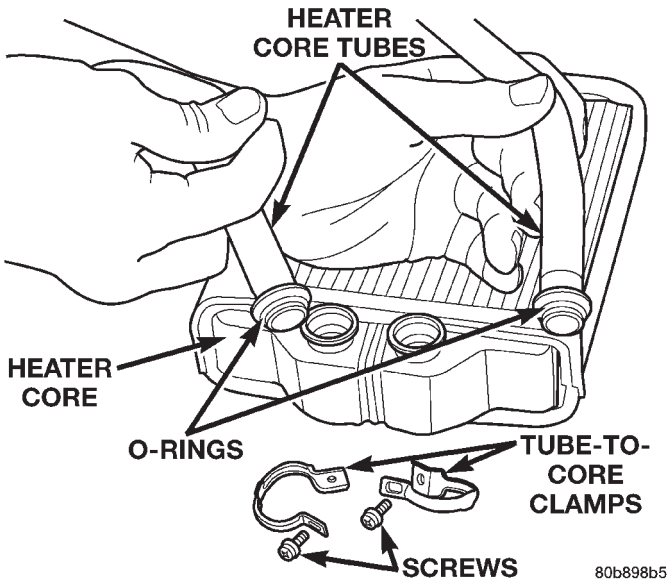


Fig. 56 Heater Core, Tubes, O-rings

NOTE: The round tube-to-heater-core clamp should be left loose enough to turn the tube in the core. Position the core in the housing, and then tighten the tube-to-heater-core clamp after orienting the tubes to the molded heater-A/C housing.

(2) Lower the heater core into the heater-A/C housing.

(3) Install the mode door actuator, if removed from housing for core removal.

(4) Position the retainers over the heater core tubes. Install and tighten the screws that secure the heater core and retainers to the heater-A/C housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

NOTE: The grounding strap is to be attached to the lower heater core tube retainer.

(5) Reinstall the heater-A/C housing to the vehicle. See Heater-A/C Housing in this group for the procedures.

HIGH PRESSURE RELIEF VALVE

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) Turn the relief valve counterclockwise to remove it from the compressor manifold (Fig. 57). Install a plug in, or tape over the opened relief valve fitting on the compressor manifold.

DIAGNOSIS AND TESTING (Continued)

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.

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 switch. 6. Faulty high pressure 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 fuseblock module. 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 switch and tighten or replace, if required. 6. See High Pressure Switch in this group. Test the high pressure 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.

REMOVAL AND INSTALLATION (Continued)

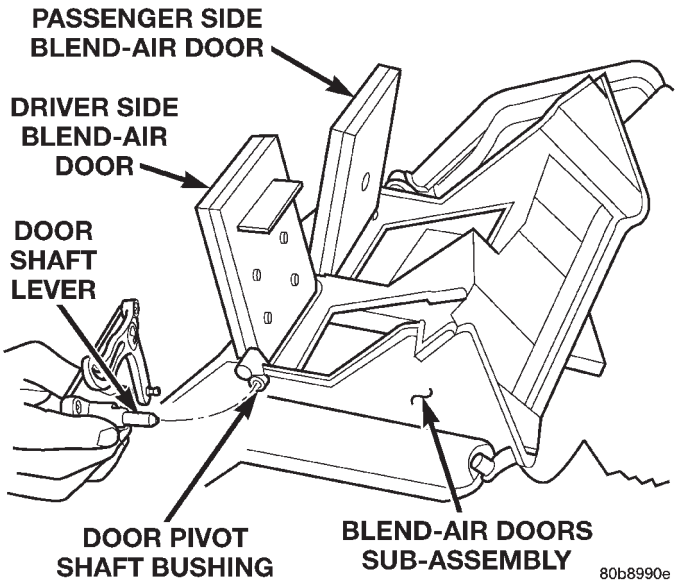


Fig. 24 Blend-Air Doors Sub-Assembly (AZC)

INSTALLATION

Reverse the removal procedures to install.

- Be certain that each of the door pivot pins align with the pivot holes in the heater-A/C housing.
- Tighten the heater-A/C housing screws to 2.2 N·m (20 in. lbs.).
- Check doors for binding after replacement, and after assembly of housing.

BLOWER MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIR-BAGS, 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 PRE-CAUTIONS COULD RESULT IN ACCIDENTAL AIR-BAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Pinch the connector retainer and unplug the blower motor wire harness from the heater-A/C blower motor (Fig. 25).

(3) Remove the three screws that secure the blower motor and blower wheel assembly to the heater-A/C housing, using either a T-25 Torx® head or flat-bladed screwdriver.

(4) Lower the blower motor and wheel from the heater-A/C housing.

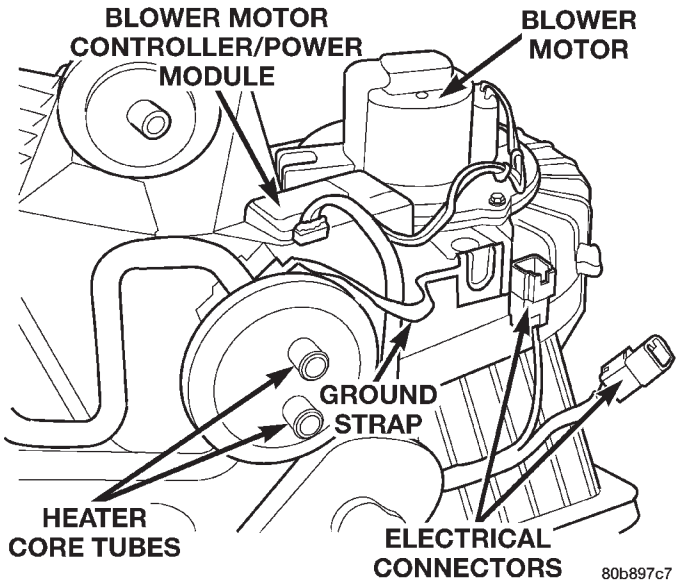


Fig. 25 Blower Motor (housing removed from vehicle)

(5) Remove the blower wheel retainer clip (Fig. 26).

(6) Remove the wheel from the blower motor shaft.

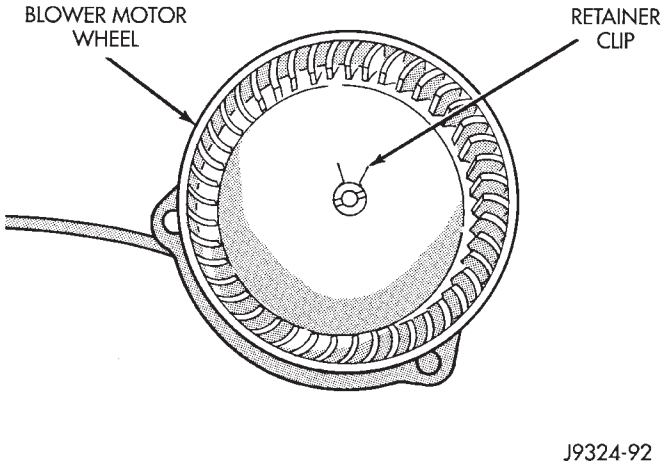


Fig. 26 Blower Motor Wheel Remove/Install

INSTALLATION

(1) Press the blower wheel hub onto the blower motor shaft. Be sure the flat on the blower motor shaft is indexed to the flat on the inside of the blower wheel hub.

(2) Install the retainer clip over the blower wheel hub.

(3) Install the blower motor in the heater-A/C housing with three mounting screws. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(4) Plug the blower motor wire harness connector into the blower motor socket.

(5) Connect the battery negative cable.