COOLING SYSTEM

CONTENTS

page

GENERAL INFORMATION
- COOLANT PRESSURE BOTTLE 1
- COOLING SYSTEM — 2.0L GASOLINE 1
- COOLING SYSTEM — 2.5L VM DIESEL 1
- LOW COOLANT LEVEL SENSOR 1
- RADIATOR 2

DESCRIPTION AND OPERATION
- AUTOMATIC BELT TENSIONER 6
- BELT TENSION 5
- COOLANT PERFORMANCE 5
- PRESSURE/VENT CAP 4
- THERMOSTAT OPERATION 4
- THERMOSTAT 6
- WATER PUMP 3

SERVICE PROCEDURES
- ADDING ADDITIONAL COOLANT 7
- DRAINING COOLING SYSTEM 7
- REFILLING COOLING SYSTEM 7

REMOVAL AND INSTALLATION
- ENGINE THERMOSTAT— 2.0L GASOLINE ... 9

page

- GENERATOR/POWER STEERING BELT — 2.5L VM DIESEL 10
- RADIATOR — 2.5L VM DIESEL 9
- THERMOSTAT — 2.5L VM DIESEL 9
- WATER PUMP BELT — 2.5L VM DIESEL ... 10
- WATER PUMP — 2.0L GASOLINE 7
- WATER PUMP — 2.5L VM DIESEL 8

CLEANING AND INSPECTION
- WATER PUMP 10

ADJUSTMENTS
- BELT TENSION CHART 11
- BELT TENSION GAUGE METHOD 11

SPECIFICATIONS
- COOLING SYSTEM CAPACITY 12
- TORQUE CHART 12

SPECIAL TOOLS
- COOLING 12

GENERAL INFORMATION

COOLING SYSTEM — 2.0L GASOLINE

The 2.0L gasoline engine cooling system consists of an engine cooling module, thermostat, coolant, a water pump to circulate the coolant. The engine cooling module may consist of a radiator, electric fan motors, fan, shroud, coolant reserve system, hoses, clamps, air condition condenser.

- When the Engine is cold: The thermostat is closed; the cooling system has no flow through the radiator. The coolant flows through the engine, heater system and bypass.
- When the Engine is warm: Thermostat is open; the cooling system has flow through radiator, engine, heater system and bypass.

COOLING SYSTEM — 2.5L VM DIESEL

The cooling system has a radiator, coolant, electric fan motors, shroud, pressure cap, thermostat, coolant pressure bottle, hoses, a water pump to circulate the coolant, to complete the circuit. Coolant flow for the VM diesel engine is shown in (Fig. 1).

COOLANT PRESSURE BOTTLE

2.5L VM DIESEL

This system works with the pressure cap to use thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides some reserve coolant to cover minor leaks and evaporation or boiling losses. The coolant pressure bottle location for 2.5L diesel is above the cylinder head cover (Fig. 2).

LOW COOLANT LEVEL SENSOR

The low coolant level sensor checks for low coolant level in the coolant tank. A signal will be sent from this sensor to the Body Control Module (BCM). When the BCM determines low coolant level for 30 continuous seconds, the instrument panel mounted low coolant level warning lamp will be illuminated. The sensor is located on the front side of the coolant tank (Fig. 4). For information, refer to Group 8E, Instrument Panel and Gauges.

If this lamp is illuminated, it indicates the need to fill the coolant tank and check for leaks.

GENERAL INFORMATION (Continued)

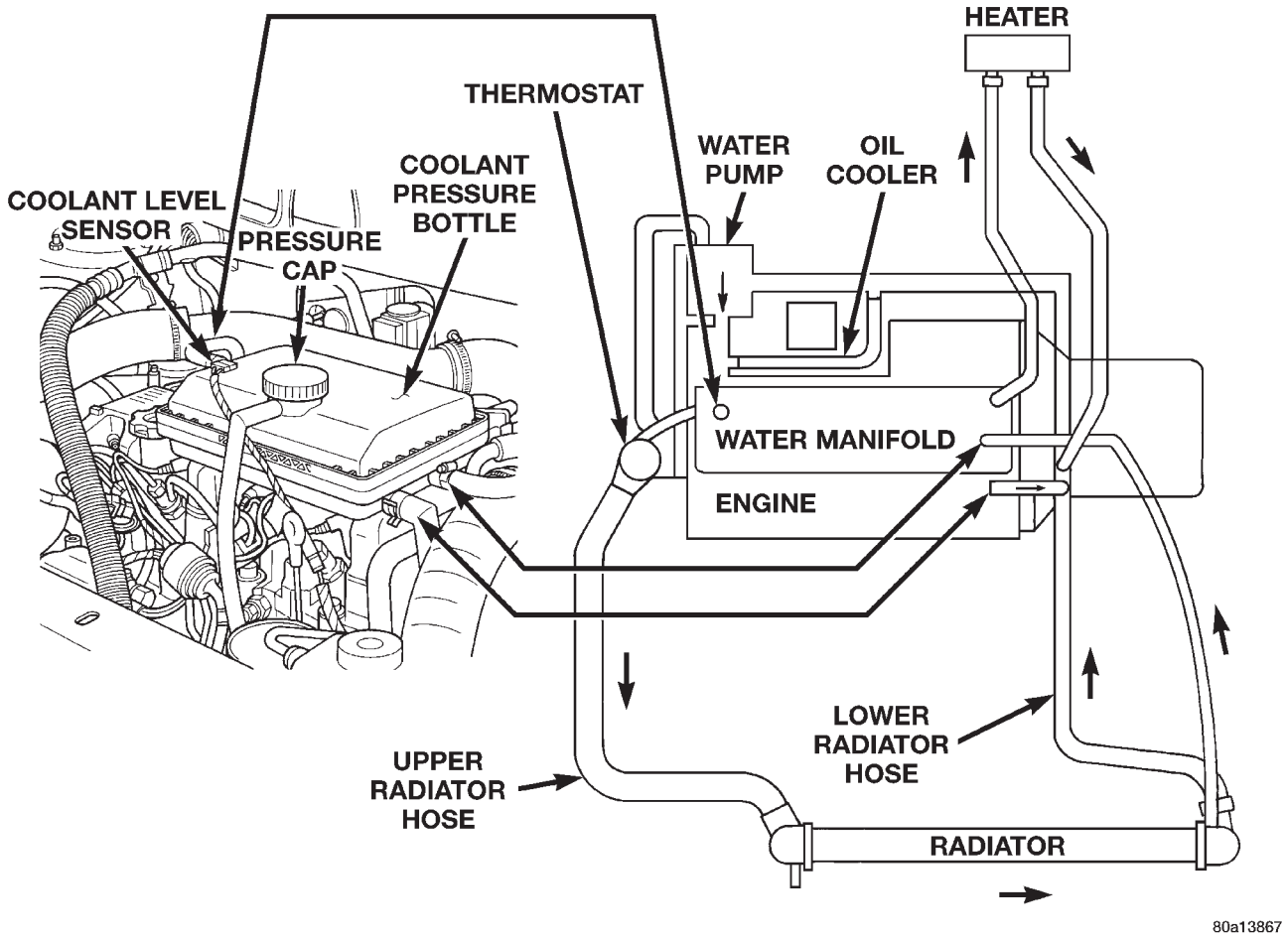


Fig. 1 Cooling System Operation – 2.5L VM Diesel

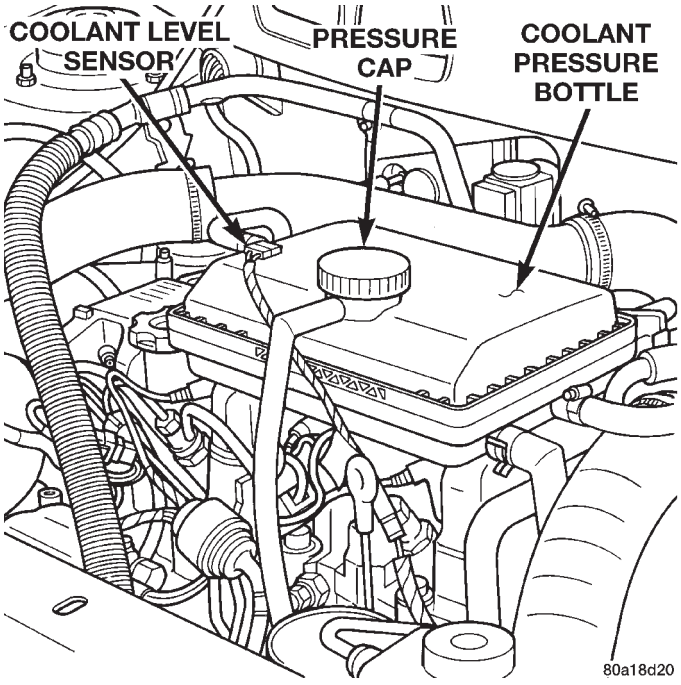


Fig. 2 Coolant Pressure Bottle – 2.5L VM Diesel

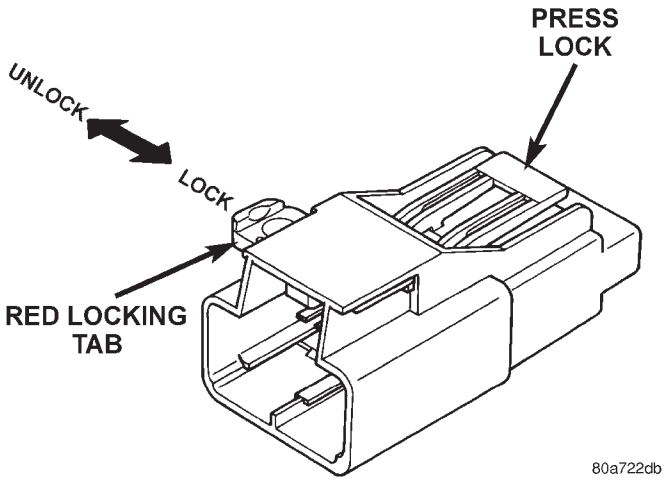


Fig. 3 Low Coolant Warning Sensor Connector – 2.5L VM Diesel

RADIATOR

The radiators are cross-flow types (horizontal tubes) with design features that provide greater strength along with sufficient heat transfer capabili-

GENERAL INFORMATION (Continued)

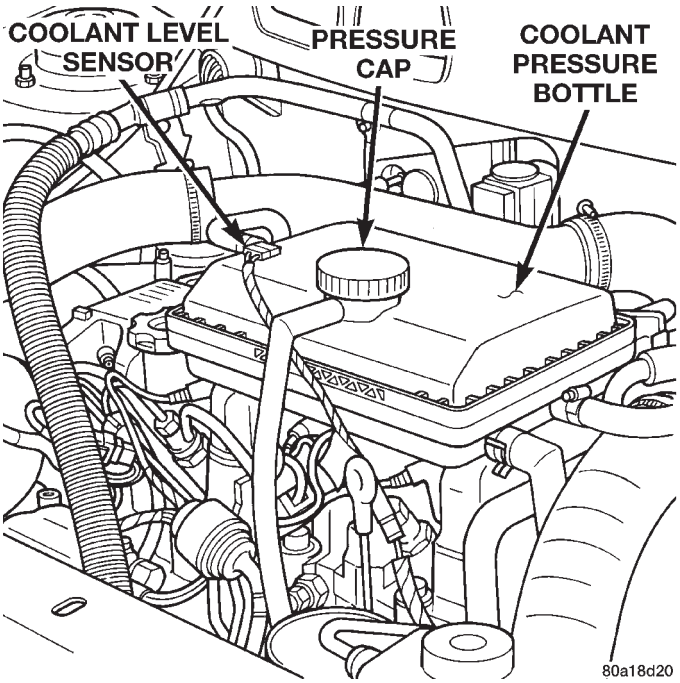


Fig. 4 Low Coolant Level Sensor

ties to keep the engine satisfactorily cooled (Fig. 5) and (Fig. 6).

CAUTION: Plastic tanks, while stronger then brass are subject to damage by impact, such as wrenches etc., or by excessive torque on hose clamps.

If the plastic tank is damaged, replace the radiator.

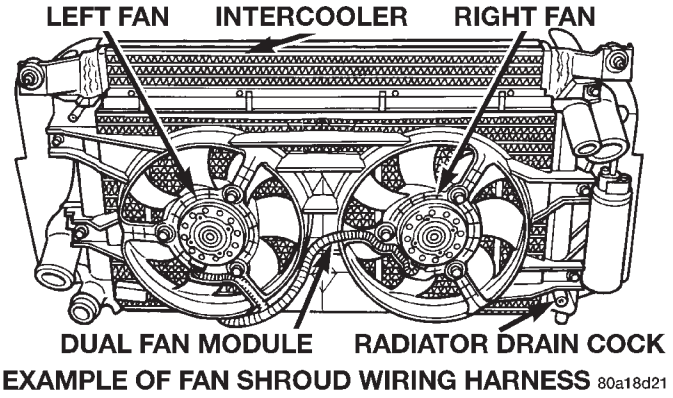


Fig. 6 Cooling Module —VM Diesel

bolts directly to the block (Fig. 7). Cylinder block to water pump sealing is provided by a rubber O-ring. The water pump is driven by the timing belt. Refer to Group 9, Engine section for component removal to access the water pump.

NOTE: The water pump on all models can be replaced without discharging the air conditioning system.

2.5L VM DIESEL

The Diesel engine water pump has an aluminum body and housing with a stamped steel impeller. The pump uses an O-ring gasket between body and housing. The water pump is driven by the accessory drive belt, and the pump housing is bolted to the cylinder block (Fig. 9).

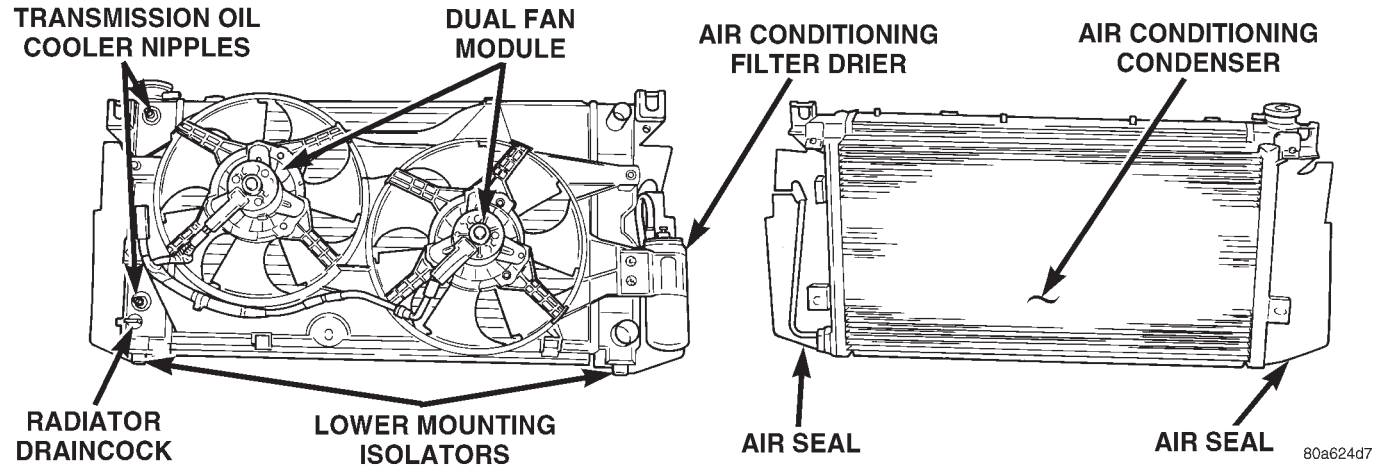


Fig. 5 Cooling Module —2.0LGasoline

DESCRIPTION AND OPERATION

WATER PUMP

2.0L GASOLINE

The water has a diecast aluminum body and housing with a stamped steel impeller. The water pump

NOTE: The water pump on all models can be replaced without discharging the air conditioning system.

DESCRIPTION AND OPERATION (Continued)

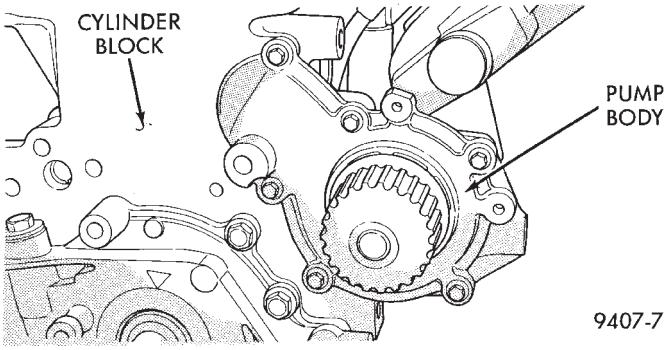


Fig. 7 Water Pump—2.0L Gasoline Engine

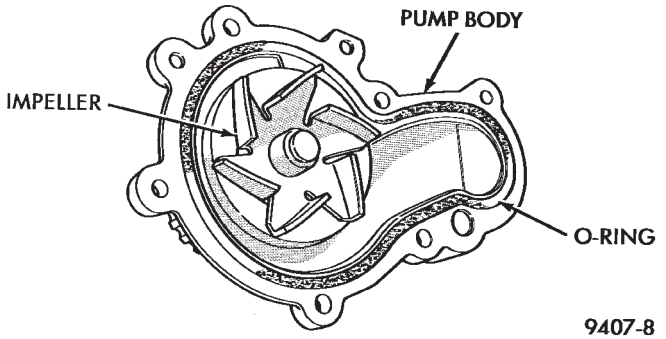


Fig. 8 Water Pump—2.0L Gasoline Engine

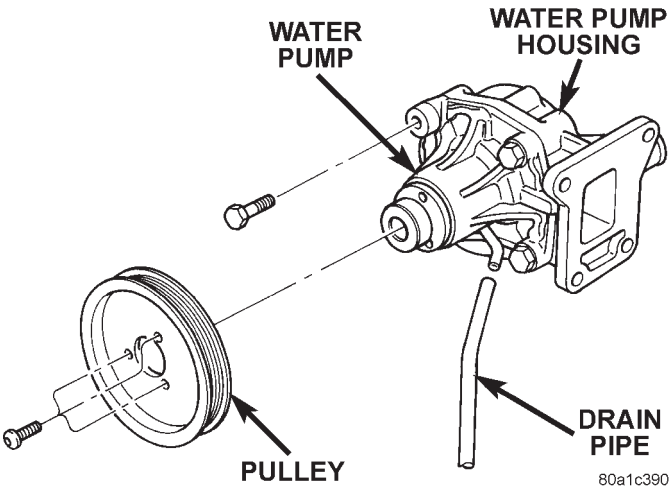


Fig. 9 Water Pump—2.5L VM Diesel

THERMOSTAT OPERATION

2.5 VM DIESEL

The engine cooling thermostats are wax pellet driven, reverse poppet choke type. They are designed to provide the fastest warm up possible by preventing leakage through them and to guarantee a minimum engine operating temperature (Fig. 10). The thermostat has a hole to bleed off air in the cooling system during engine warm up. The thermostat begins to open at 80° C ± 2° (176° F ± 4°).

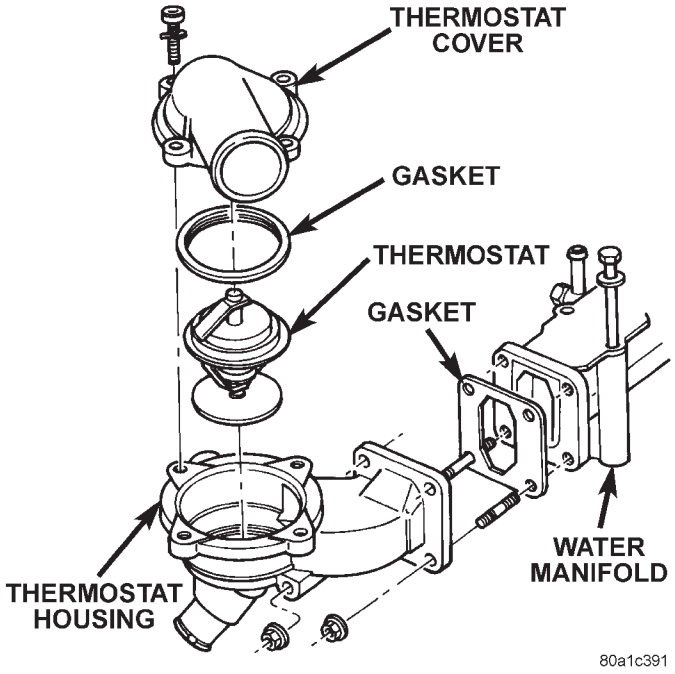


Fig. 10 Thermostat and Housing — 2.5L VM Diesel

PRESSURE/VENT CAP

WARNING: Engine coolant can reach temperatures of 200° fahrenheit or greater. If the cooling system is opened with coolant at a high temperature, hot coolant can be forced out of the system under high pressures, causing personal injury. Allow system to cool down prior to removing the pressure cap.

The pressure/vent cap is secured to the coolant tank neck by a means of a cam lock system. This cap releases excess pressure at some point within a range of 90-117 kPa (13- 17 psi) for gasoline engines, and 110–124 kPa (16–18 psi) for diesel engines. The actual pressure relief point (in pounds) is labeled 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 approximately 103 kPa (15 psi).

When the engine is cooling down, vacuum is formed within the cooling system. To prevent collapse of the radiator and coolant hoses from this vacuum, a vacuum valve is used within the cap. This valve prevents excessive pressure differences from occurring between the closed cooling system and the atmosphere. If the vacuum valve is stuck shut, the radiator and/or cooling system hoses will collapse on cool-down.

DESCRIPTION AND OPERATION (Continued)

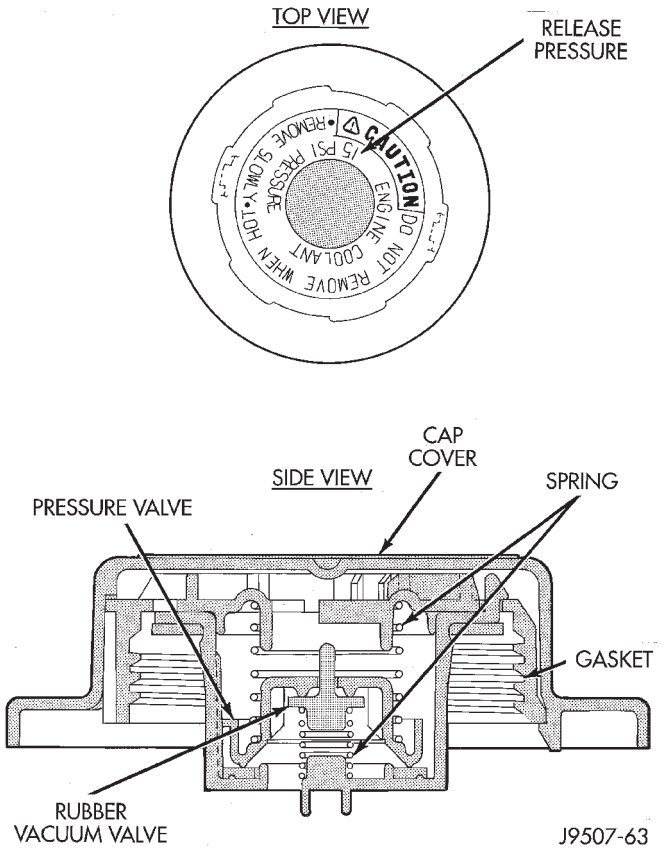


Fig. 11 Coolant Tank Pressure/Vent Cap

NOTE: Do not use any type of tool when tightening the cap. Hand tighten only (approximately 5 N·m or 44 in. lbs.) torque.

COOLANT PERFORMANCE

ETHYLENE-GLYCOL MIXTURES

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37 deg. C (-35 deg. F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided 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.

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.

BELT TENSION

Correct accessory drive belt tension is required to be sure of optimum performance of belt driven engine accessories. If specified tension is not maintained, belt slippage may cause; engine overheating, lack of power steering assist, loss of air conditioning capacity, reduced generator output rate and greatly reduced belt life.

DESCRIPTION AND OPERATION (Continued)

Initial belt adjustment is done with a adjustable tensioner pulley. After the initial adjustment is performed, an automatic belt tensioner is used to maintain correct belt tension at all times. Do not attempt to check belt tension with a belt tension gauge on vehicles equipped with an automatic belt tensioner. Refer to Automatic Belt Tensioner in this group.

AUTOMATIC BELT TENSIONER

Drive belt tension is controlled by a spring loaded automatic belt tensioner located below and to the front of the engine oil filter (Fig. 12). This tensioner is connected to a pivot bracket and a pulley (Fig. 12). The pivot bracket rotates on a pivot pin attached to the engine. Special machined washers with rubber o-rings (Fig. 12) are used at each side of the pivot bracket to help keep dirt and water away from the pivot pin.

If a defective belt tensioner is suspected, a check of this pivot bracket and pivot pin should be made. Corrosion may have formed at the pin and may cause the pivot bracket to stick. Belt slippage will result.

WARNING: BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE THE AUTOMATIC BELT TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY.

THERMOSTAT

DIAGNOSIS

Diesel engines, due to their inherent efficiency are slower to warm up than gasoline powered engines, and will operate at lower temperatures when the vehicle is unloaded. Because of this, lower temperature gauge readings for diesel versus gasoline engines may, at times be normal.

Typically, complaints of low engine coolant temperature are observed as low heater output when combined with cool or cold outside temperatures.

To help promote faster engine warm-up, an electric engine block heater must be used with cool or cold outside temperatures. This will help keep the engine coolant warm when the vehicle is parked. Use the block heater if the outside temperature is below 4°C (40°F). **Do not use the block heater if the outside temperature is above 4°C (40°F).**

TESTING

NOTE: The DRB scan tool shoud be used to monitor engine coolant temperature on the diesel engine. Refer to the 1998 GS Powertrain Diagnostic Manual for thermostat diagnosis procedure.

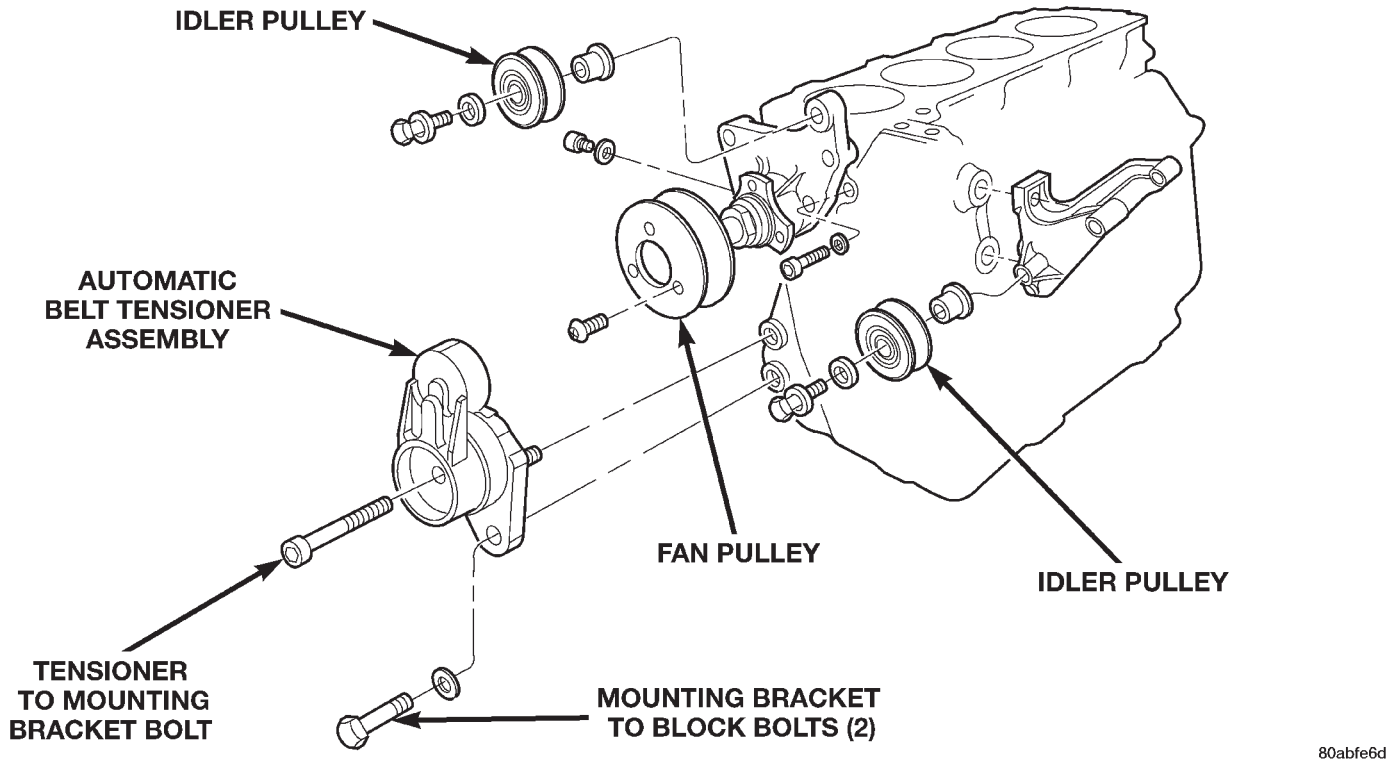


Fig. 12 Automatic Belt Tensioner Assembly

SERVICE PROCEDURES

ADDING ADDITIONAL COOLANT

2.5L VM DIESEL

Do not remove coolant bottle pressure cap when the engine is hot. Remove pressure cap and fill coolant bottle between Min and Max lines inside filler neck. Use only 50/50 mix of ethylene glycol type antifreeze and water (Fig. 13). Squeezing radiator hoses may help purge air from the cooling system.

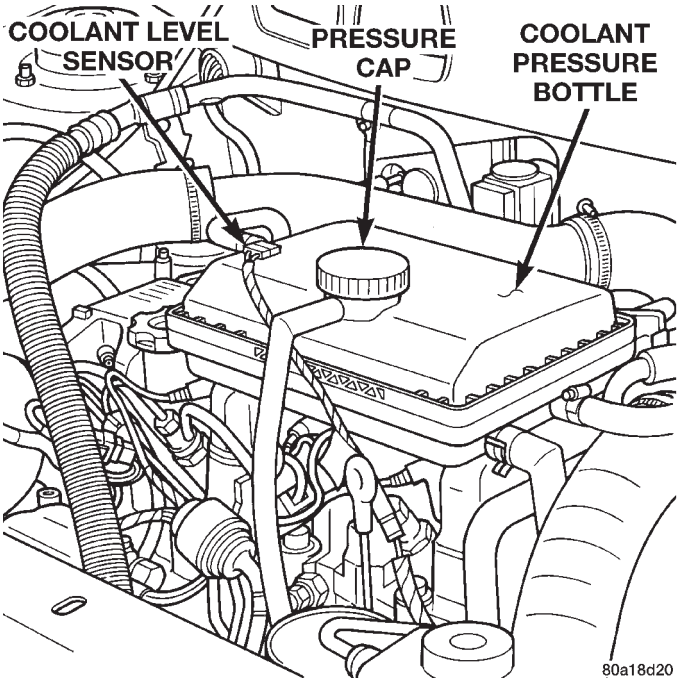


Fig. 13 Coolant Pressure Bottle—2.5L VM Diesel

DRAINING COOLING SYSTEM

2.0L GASOLINE

To drain cooling system move temperature selector for heater to full heat with engine running. **Without removing radiator pressure cap and with system not under pressure,** Shut engine off and open draincock. The coolant reserve tank should empty first, then remove radiator pressure cap and let the radiator drain (if not, see Testing Cooling System for leaks).

2.5L VM DIESEL

The cooling system does not have a radiator mounted pressure cap. Instead the pressure cap is mounted on the coolant pressure bottle (Fig. 14).

(1) Shut off engine.
(2) Remove radiator pressure cap.
(3) Open draincock and allow coolant to drain.

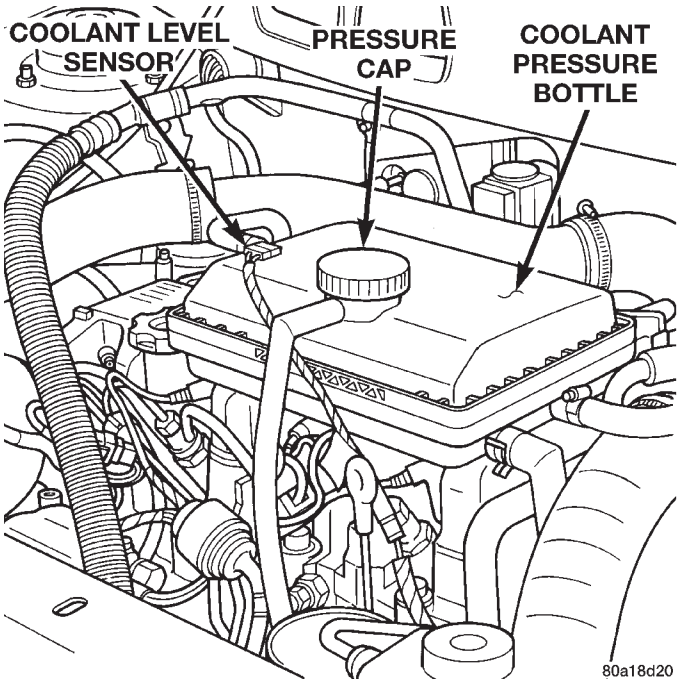


Fig. 14 Pressure Cap and Bottle—VM Diesel

REFILLING COOLING SYSTEM

2.0L GASOLINE

Refer to the gasoline engine cooling system information in this manual. Cooling system capacity is 6.0 liters (6.34 qts.) which includes the heater and coolant recovery tank.

2.5L VM DIESEL

First clean system to remove old glycol, see Cooling System Cleaning.

(1) Disconnect upper radiator hose at thermostat housing.
(2) Remove pressure cap from coolant expansion tank.
(3) Fill cooling system through upper radiator hose until coolant starts to leak out at the thermostat housing. Reconnect hose and re-install clamp.
(4) Fill expansion tank to top of bottle. Run engine at idle without pressure cap installed for 5 minutes. Squeeze upper radiator hose several times.
(5) Shut off engine. Top off coolant and install pressure cap.
(6) Inspect system for leaks.

REMOVAL AND INSTALLATION

WATER PUMP — 2.0L GASOLINE

REMOVAL

(1) Remove accessory drive belts and power steering pump.
(2) Drain cooling system.

REMOVAL AND INSTALLATION (Continued)

(3) Remove power steering pump bracket bolts and set pump and bracket assembly aside. Power steering lines do not need to be disconnected.

(4) Remove timing belt.

(5) Remove inner timing belt cover.

(6) Remove water pump attaching screws to engine (Fig. 15).

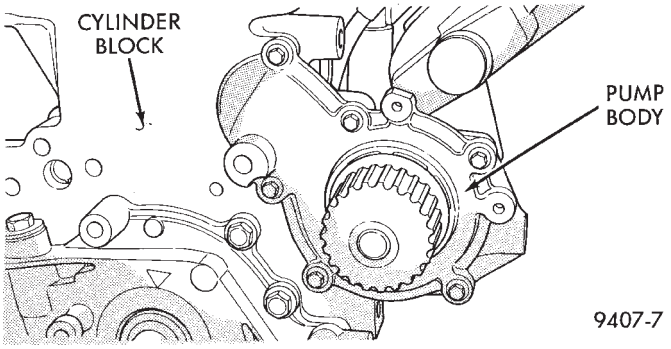


Fig. 15 Water Pump — 2.0L Gasoline

INSTALLATION

(1) Install new O-ring gasket in water pump body O-ring groove (Fig. 16). Use small dabs of Mopar Silicone Rubber Adhesive Sealant around the water pump body to secure O-ring in place during installation.

CAUTION: Make sure O-ring gasket is properly seated in water pump groove before tightening screws. An improperly located O-ring may cause damage to the O-ring and cause a coolant leak.

(2) Assemble pump body to block and tighten screws to 12 N·m (105 in. lbs.). Pressurize cooling system to 15 psi with pressure tester and check water pump shaft seal and O-ring for leaks.

(3) Rotate pump by hand to check for freedom of movement.

(4) Install inner timing belt cover.

(5) Install timing belt.

(6) Fill cooling system. See **Filling Cooling System.**

(7) Install power steering pump and accessory drive belts.

WATER PUMP — 2.5L VM DIESEL

REMOVAL

(1) Drain cooling system. Refer to Draining Cooling System in this Group.

(2) Remove the right inner splash shield (Fig. 17).

(3) Loosen the water pump pulley attaching bolts (Fig. 18) before the accessory drive belt is removed.

(4) Loosen water pump accessory drive belts (Fig. 19). Remove water pump pulley.

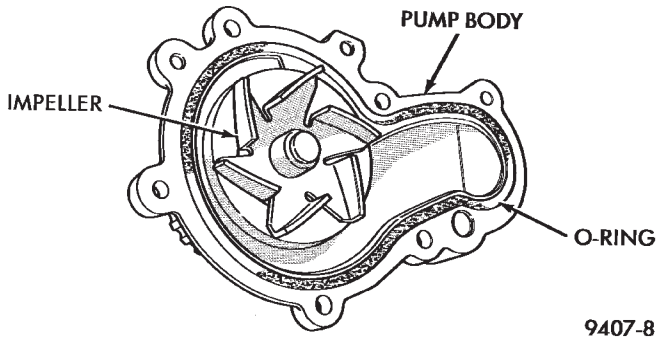


Fig. 16 Water Pump Body — 2.0L Gasoline

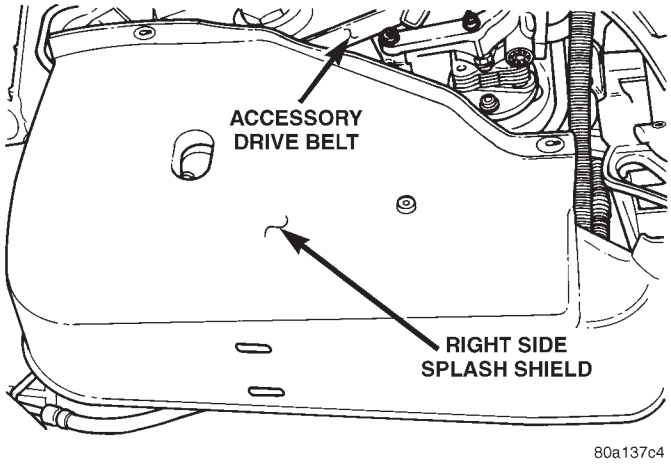


Fig. 17 Right Side Splash Shield

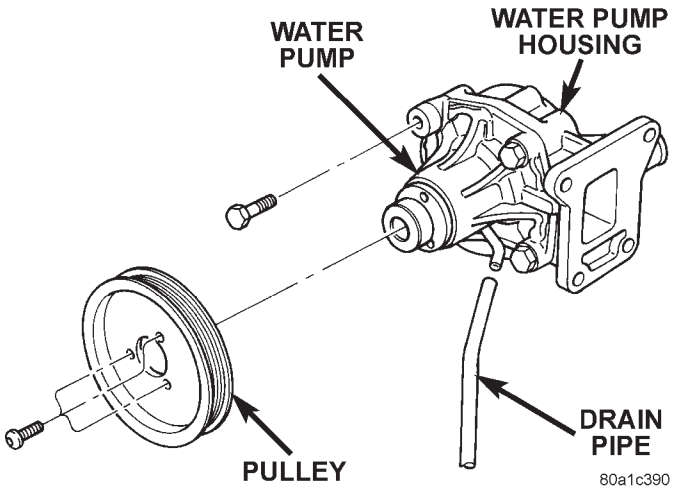


Fig. 18 Water Pump and Pulley — 2.5 L VM Diesel

(5) Remove water pump attaching bolts and remove pump.

INSTALLATION

(1) Install a new water pump to housing O-ring gasket. Install pump and tighten the attaching bolts to 22.6 N·m (205 in. lbs.)

REMOVAL AND INSTALLATION (Continued)

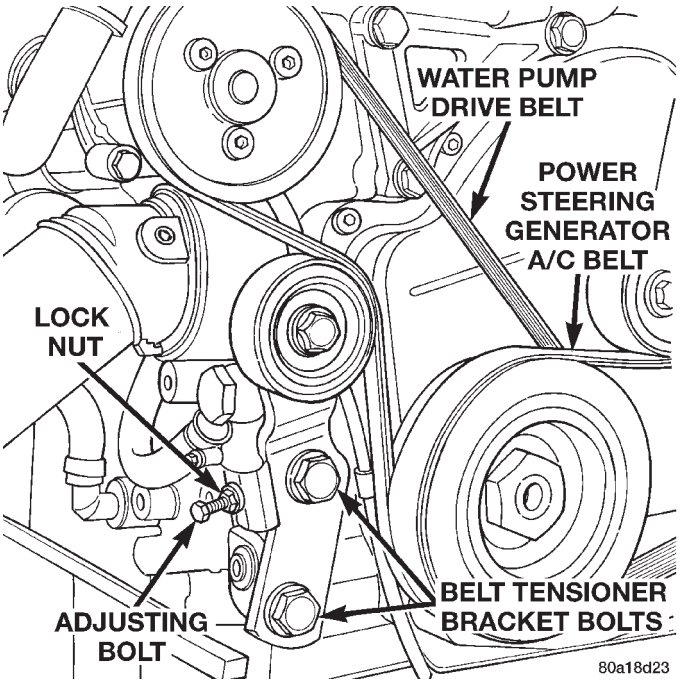


Fig. 19 Water Pump Drive Belt— 2.5 L VM Diesel

(2) Install water pump pulley.
(3) Install drive belt, Refer to Accessory Drive Belts, this Group. Tighten water pump pulley attaching bolts to 27.5 N·m (240 in. lbs.)
(4) Install right inner splash shield.
(5) Refill cooling system. Refer to Refilling Cooling System in this Group.

ENGINE THERMOSTAT— 2.0L GASOLINE

REMOVAL

(1) Drain cooling system to the thermostat level or below.
(2) Remove coolant recovery system (CRS) hose and thermostat/engine outlet connector bolts.
(3) Remove thermostat and seal, and clean sealing surfaces.

INSTALLATION

(1) Place the new thermostat assembly into the thermostat housing/outlet connector. Align air bleed vent with notch in cylinder head.
(2) Install thermostat housing/outlet connector onto cylinder head and tighten bolts to 12.5 N·m (110 in. lbs.). Connect the upper radiator hose.
(3) Refill cooling system (see **Refilling System**).

THERMOSTAT — 2.5L VM DIESEL

REMOVAL

(1) Drain cooling system down below the thermostat level. Refer to Draining Cooling System in this section.
(2) Remove radiator hose at thermostat cover.
(3) Remove thermostat cover bolts (Fig. 20).
(4) Remove Thermostat.

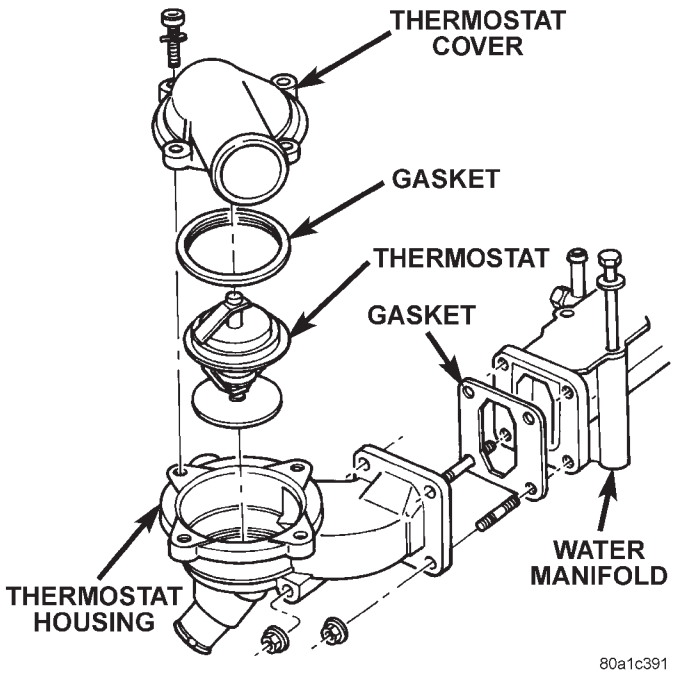


Fig. 20 Thermostat and Housing — 2.5L VM Diesel

INSTALLATION

(1) Remove old gasket material from thermostat housing and cover.
(2) Install new thermostat gasket.
(3) Install thermostat and tighten cover bolts to 10.8 N·m (96 in. lbs.).
(4) Install radiator hose.
(5) Refill cooling system. Refer to Refilling Cooling System in this section.

RADIATOR — 2.5L VM DIESEL

REMOVAL

(1) Disconnect battery.
(2) Remove power steering reservoir attaching bolts, and reposition reservoir.
(3) Remove radiator closure panel crossmember (Fig. 21).
(4) Remove air cleaner housing and intake hose.
(5) Unplug fan module 4 pin wiring connector.
(6) Drain cooling system. Refer to Draining cooling system in this section for procedure.
(7) Remove upper and lower Radiator Hoses.
(8) Remove radiator attaching bolts.
(9) Loosen A/C receiver/dryer lower bolt.
(10) Remove Radiator.
(11) Remove fan module from radiator.

REMOVAL AND INSTALLATION (Continued)

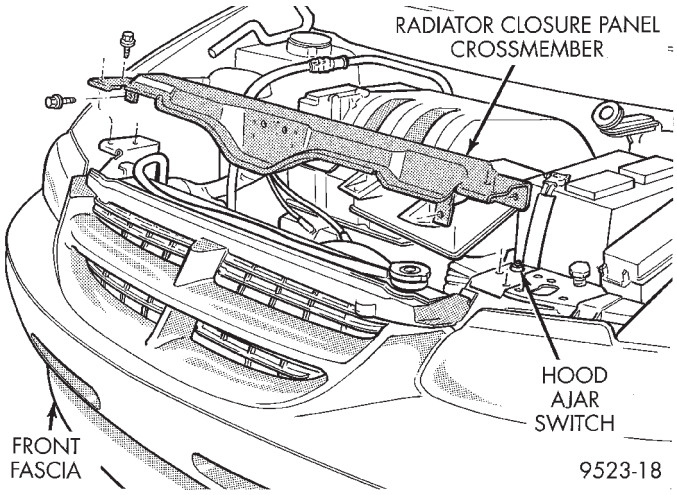


Fig. 21 Radiator Closure Panel Crossmember

INSTALLATION

(1) Install fan module on radiator.
(2) Install radiator.
(3) Tighten receiver/dryer lower bolt.
(4) Install radiator attaching bolts.
(5) Install lower and upper radiator hoses.
(6) Connect fan module.
(7) Install air cleaner housing and intake hose.
(8) Install radiator closure panel crossmember.
(9) Install power steering reservoir attaching bolts.
(10) Refill cooling system. Refer to Refilling cooling system in this section for procedure.
(11) Connect battery.

WATER PUMP BELT — 2.5L VM DIESEL

REMOVAL

(1) Remove generator/power steering belt. Refer to procedure in this section.
(2) Raise vehicle on hoist.
(3) Remove right side splash shield (Fig. 22).
(4) Loosen belt tensioner bracket bolts (Fig. 23).

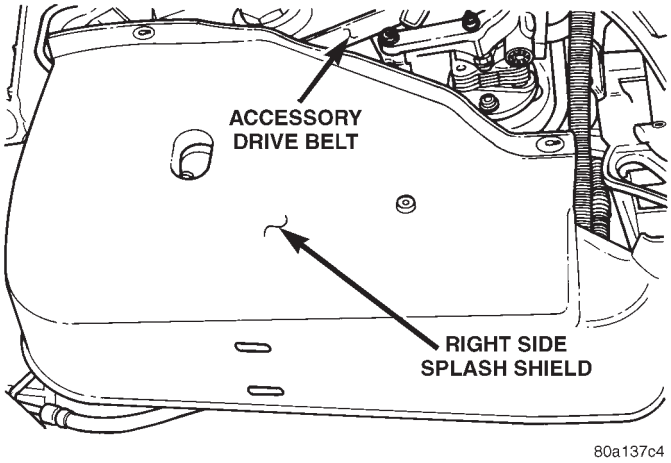


Fig. 22 Right Side Splash Shield

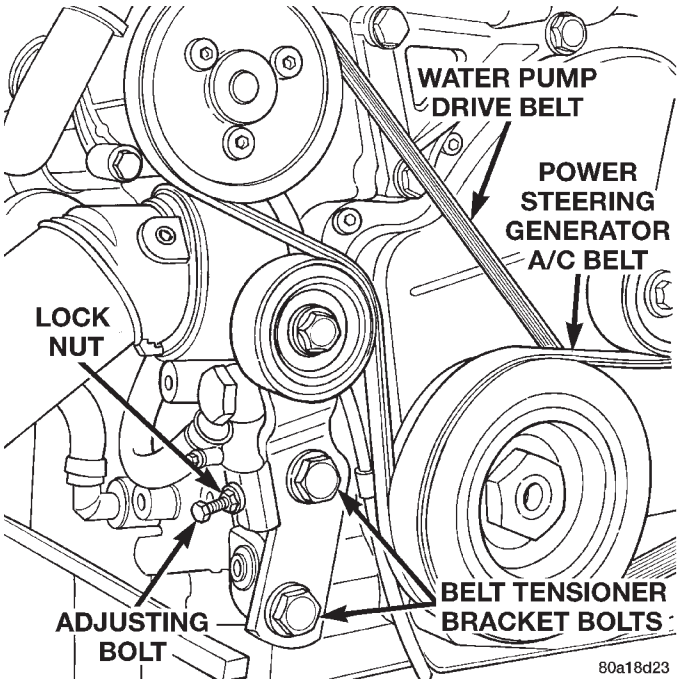


Fig. 23 Water Pump Belt Removal — 2.5L VM Diesel

(5) Loosen adjuster lock nut.
(6) Loosen adjusting bolt, and remove belt.

INSTALLATION

(1) Install water pump belt.
(2) Turn adjusting bolt clockwise to tighten belt.
(3) Tighten lock nut.
(4) Tighten belt tensioner bracket bolts
(5) Lower vehicle.
(6) Install generator/power steering belt. Refer to procedure in this section.

GENERATOR/POWER STEERING BELT — 2.5L VM DIESEL

REMOVAL

(1) Loosen generator pivot bolt (Fig. 24).
(2) Loosen adjusting bracket bolt.
(3) Loosen adjusting nut.
(4) Remove generator/power steering belt.

INSTALLATION

(1) Install generator/power steering belt.
(2) Tighten adjusting nut.
(3) Tighten adjusting bracket bolt.
(4) Tighten generator pivot bolt.

CLEANING AND INSPECTION

WATER PUMP

Replace the water pump if it has any of the following defects.

(1) Damage or cracks on the pump body.

CLEANING AND INSPECTION (Continued)

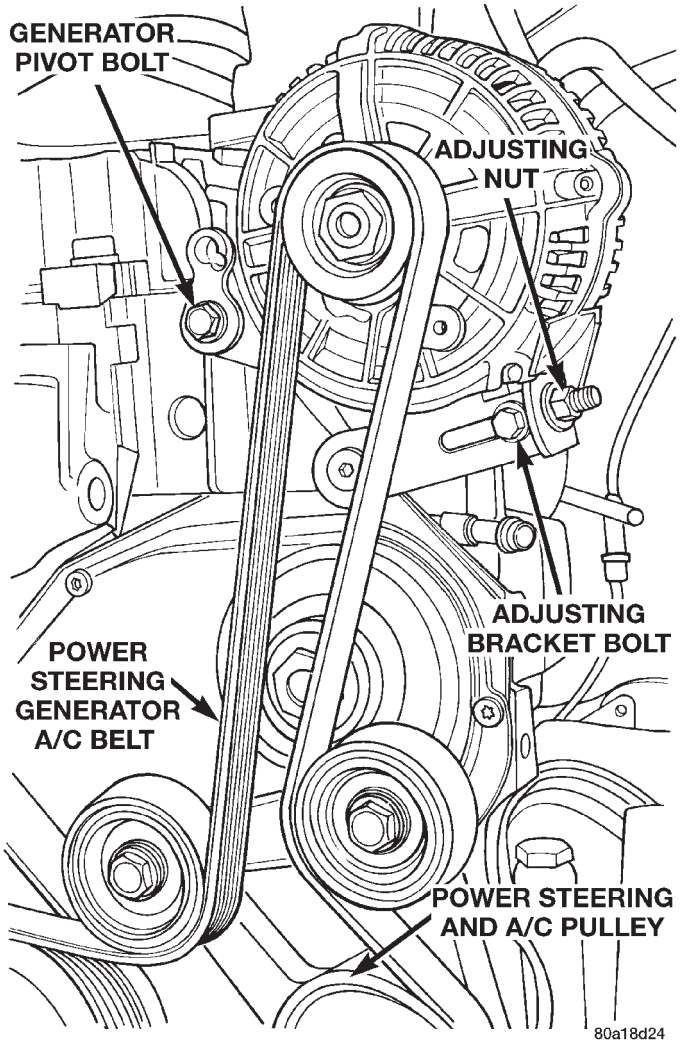


Fig. 24 Generator/Power Steering Removal – 2.5L VM Diesel

(2) Coolant leaks; if the seal is leaking, this will be evident by traces of thick deposits of greenish-brown dried glycol running down the pump body and components below. A thin black stain below pump weep hole is considered normal operation.

(3) Impeller rubs inside of the cylinder block 2.0L engine. Impeller rubs inside of the water pump housing 2.5L VM diesel engine.

(4) Excessively loose or rough turning bearing.

NOTE: It is normal for the water pump to weep a small amount of coolant from the weep hole (black stain on water pump body). Do not replace the water pump if this condition exists. Replace the water pump if a heavy deposit or a steady flow of green/brown engine coolant is evident on water pump body from the weep hole (shaft seal failure). Be sure to perform a thorough analysis before replacing water pump.

ADJUSTMENTS

BELT TENSION GAUGE METHOD

Use belt tensioning Special Tool Kit C-4162 for:

CAUTION: The Burroughs gauge for the Poly-V belt is not to be used on the V-belt. These gauges are not interchangeable.

- For conventional V-belts affix the Burroughs gauge (Special Tool C-4162) to the belt. Adjust the belt tension for New or Used belt as prescribed in the Belt Tension Chart. For a Poly-V belt affix the Poly-V Burroughs gauge to the belt and then apply specified tension to the belt as prescribed in the Belt Tension Chart

Adjust the belt tension for a **New** or **Used** belt as prescribed in the Belt Tension Chart.

BELT TENSION CHART

ACCESSORY DRIVE BELT	GAUGE
2.0L GASOLINE ENGINE	
GENERATOR AND AIR CONDITIONING	NEW 667 ±44 N (150 ±10 LBS).
	USED 556 N (125 LBS.)
POWER STEERING	NEW 578 ±44 N (130 ±10 LBS).
	USED 489 N (110 LBS).
2.5L VM DIESEL	
WATER PUMP	NEW N/A LBS.
	USED N/A LBS.
GENERATOR /AIR CONDITIONING/ POWER STEERING	NEW 667 ± 44 N (150 ±10 LBS).
	USED 556 N (125 LBS).

SPECIFICATIONS

COOLING SYSTEM CAPACITY

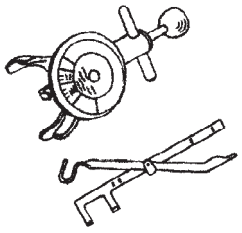
2.0L Gasoline	*10.6 liters (11 qts.)
2.5L VM Diesel	*10.0 liters (10.6 qts.)
*Includes Heater and Coolant recovery/pressure Tank.	

TORQUE CHART

COMPONENT	2.0L GASOLINE	2.5L VM
Thermostat Cover Bolts	105 in-lbs	10.8 N·m (96 in. lbs.)
Water Pump Mounting Bolts	12 N·m (105 in. lbs.)	22.6 N·m (204 in. lbs.)
Water Pump Pulley Bolts	N/A	27.5 N·m (240 in. lbs.)
Upper Radiator Mounting Bracket Bolts	12 N·m (105 in. lbs.)	12 N·m (105 in. lbs.)
Turbocharger Oil Supply Line	N/A	24.5 N·m (215 in. lbs.)
Turbocharger Oil Return Line	N/A	10.8 N·m (96 in. lbs.)
Water Pump Housing Nuts	N/A	9.5 N·m (84 in. lbs.)
Water Manifold Bolts	N/A	11.2 N·m (96 in. lbs.)
Coolant Bottle Bolts	2.0 N·m (18 in. lbs.)	10.8 N·m (96 in. lbs.)

SPECIAL TOOLS

COOLING



Belt Tension Gauge C-4162