

COOLING SYSTEM

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GENERAL INFORMATION

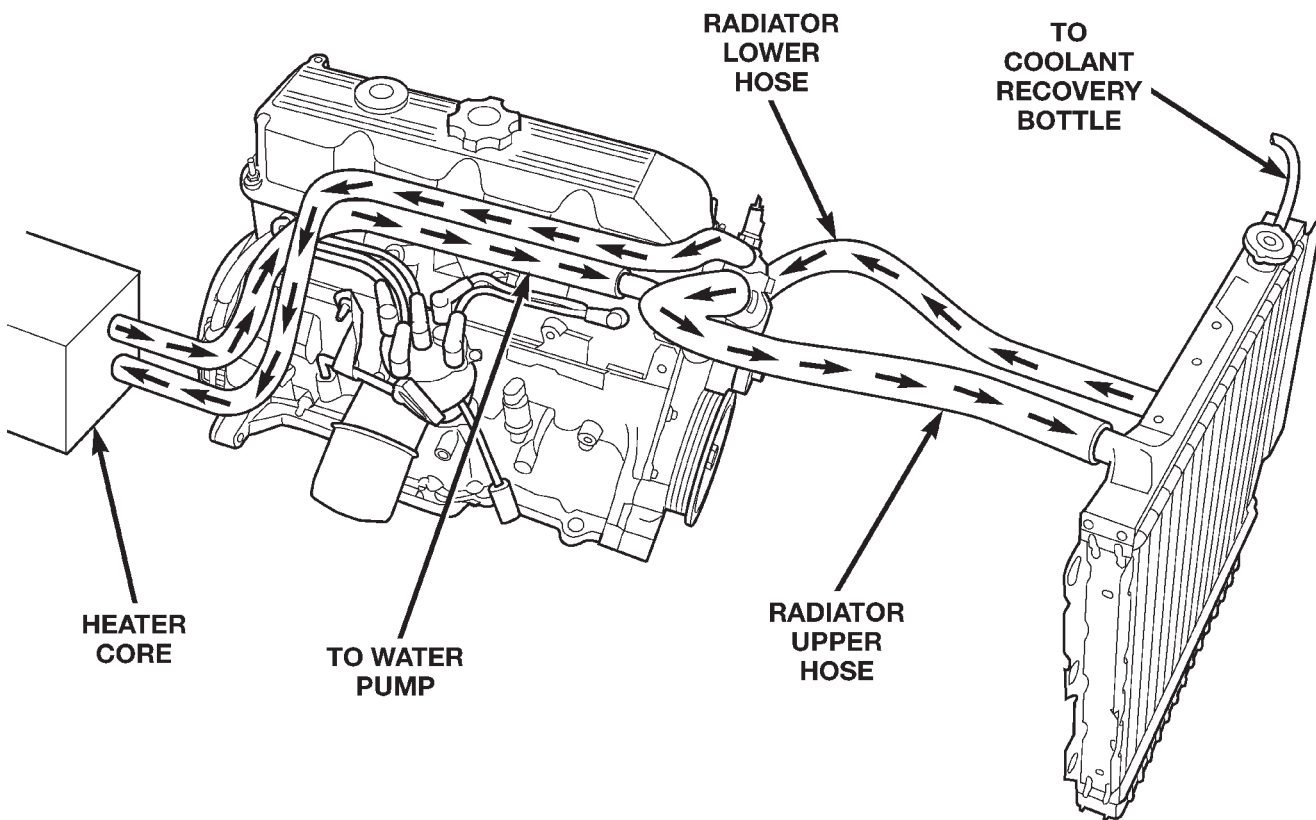
COOLING SYSTEM

The cooling system is designed to maintain engine temperature at an efficient level during all engine operating conditions. Coolant circulation is controlled by the thermostat. The thermostat remains closed until the coolant reaches operating temperature. This provides for fast engine warm up. When the engine reaches operating temperature, the thermostat opens

and the coolant is circulated through the radiator to keep the engine from overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

GENERAL INFORMATION (Continued)



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Fig. 1 Coolant Circulation—2.5L Engine

COMPONENTS

The components of the cooling system are:

- A heavy duty radiator
- Cooling fan (mechanical)
- Thermal viscous fan drive
- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Automatic transmission oil cooler (internal to radiator)
 - Coolant
 - Water pump
 - Coolant hoses and clamps

COOLING SYSTEM CIRCULATION

For cooling system flow routings, refer to (Fig. 1) (Fig. 2).

WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a drive belt on all engines.

COOLANT

The cooling system is designed around the coolant. Coolant flows through the engine water jackets absorbing heat produced during engine operation. The coolant carries heat to the radiator and heater core. Here it is transferred to the ambient air passing through the radiator and heater core fins. The coolant also removes heat from the automatic transmission fluid in vehicles equipped with an automatic transmission.

RADIATOR

A heavy duty down-flow aluminum/plastic radiator is used. The radiator consists of an aluminum core and plastic end tanks, which are fastened to the core with clinch tabs and sealed with a high temperature rubber gasket. On automatic transmission equipped vehicles, the lower tank contains a concentric-tube transmission oil cooler.

CAUTION: Plastic tanks, while stronger than brass, are subject to damage by impact, such as wrenches, mishandling, etc.

If the plastic tank has been damaged, individual parts are not available, and the radiator must be replaced.

GENERAL INFORMATION (Continued)

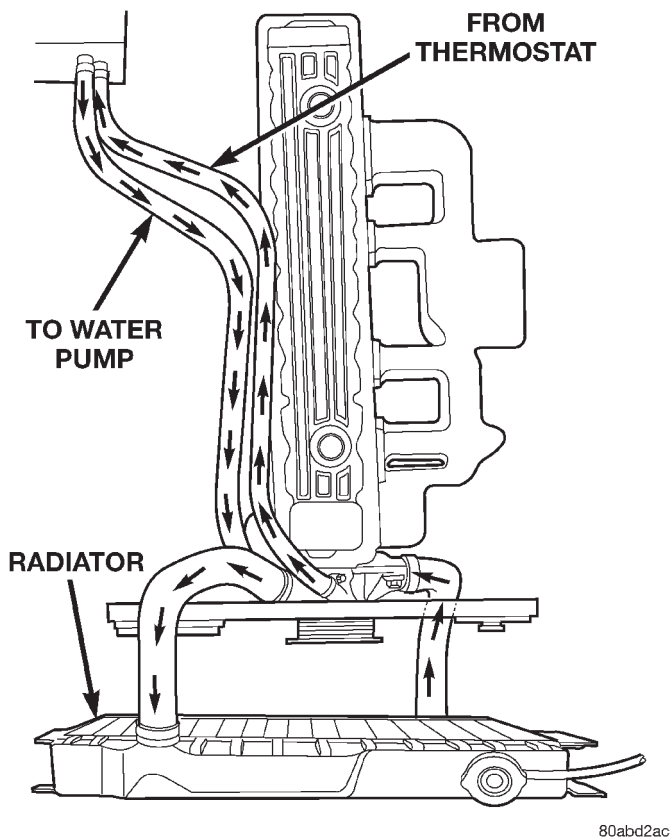


Fig. 2 Coolant Circulation—4.0L Engine

ACCESSORY DRIVE BELTS

When installing an accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to water pump rotating in wrong direction. Refer to the appropriate engine Belt Schematic in this group for the correct belt routing, or refer to the Belt Routing Label located in the engine compartment.

BLOCK HEATER

An optional engine block heater is available for all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block (in place of a freeze plug) with the heating element immersed in engine coolant. Connect the power cord to a grounded 110-120 volt AC electrical outlet with a grounded, three-wire extension cord.

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE.

DESCRIPTION AND OPERATION

TRANSMISSION OIL COOLER

All models equipped with an automatic transmission are equipped with a transmission oil cooler (water-to-oil) mounted internally within the radiator tank. This internal cooler is supplied as standard equipment on all models equipped with an automatic transmission.

Transmission oil is cooled when it passes through this separate cooler. In case of a leak in the internal radiator mounted transmission oil cooler, engine coolant may become mixed with transmission fluid or transmission fluid may enter the cooling system. Both cooling system and transmission should be drained and inspected if the internal radiator mounted transmission cooler is leaking.

These models do not come equipped with “auxiliary” transmission air-to-oil coolers.

COOLANT RESERVE/OVERFLOW SYSTEM

The system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.
- A convenient and safe method for checking/adjusting coolant level at atmospheric pressure. This is done without removing the radiator pressure cap.
- Some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

The coolant reserve/overflow system consists of a radiator mounted pressurized cap, a plastic coolant recovery bottle (Fig. 3), a tube (hose) connecting the radiator and recovery bottle, and an overflow tube on the side of the bottle.

BLOCK HEATER

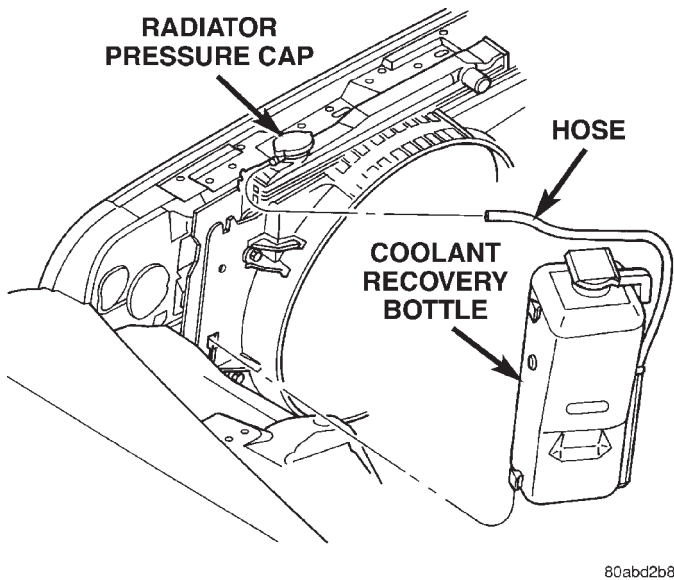
The heater unit is mounted in a block core hole and is immersed in coolant. The heater uses ordinary house current (110 Volt A.C.) and should **never** be plugged in unless it is immersed in coolant.

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE.

BLOCK HEATER SPECIFICATIONS

- 2.5L 4-Cylinder Engine: 115 Volts 400 Watts
- 4.0L 6-Cylinder Engine: 120 Volts 600 Watts

DESCRIPTION AND OPERATION (Continued)



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Fig. 3 Coolant Recovery Bottle

THERMOSTAT

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm-up and overall temperature control.

An arrow plus the word **UP** is stamped on the front flange next to the air bleed. The words **TO RAD** are stamped on one arm of the thermostat. They indicate the proper installed position.

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warm-up time, unreliable warm-up performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water- Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol- The corrosion inhibiting additives in ethylene-glycol need the pres-

ence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°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°C (-8°F).

50/50 Ethylene-Glycol and Water -Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to over-heat because specific heat of antifreeze is lower than that of water.

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

Coolant should be maintained at the specified level with a mixture of ethylene glycol-based antifreeze and low mineral content water.

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 83-124 kPa (12-18 psi). The pressure relief point (in pounds) is engraved on top of the cap (Fig. 4).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve. This valve opens when system pressure reaches the release range of 83-124 kPa (12-18 psi).

A vent valve in the center of the cap allows a small coolant flow through the cap when coolant is below boiling temperature. The valve is completely closed when boiling point is reached. As coolant cools, it contracts and creates a vacuum in the cooling system. This causes the vacuum valve to open and coolant in reserve/overflow tank to be drawn through

DESCRIPTION AND OPERATION (Continued)

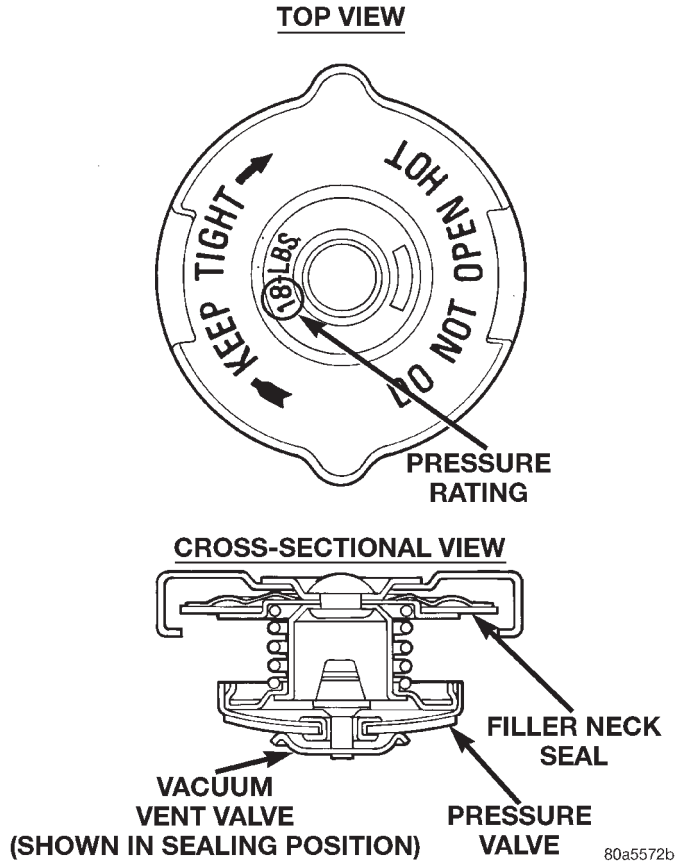


Fig. 4 Radiator Pressure Cap

connecting hose into radiator. If the vacuum valve is stuck shut, radiator hoses will collapse on cool-down.

A rubber gasket seals the radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.

WATER PUMP

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has a small hole to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

CAUTION: All engines are equipped with a reverse (counter-clockwise) rotating water pump and viscous fan drive assembly. REVERSE is stamped or imprinted on the cover of the viscous fan drive and inner side of the fan. The letter R is stamped into the back of the water pump impeller (Fig. 5).

Engines from previous model years, depending upon application, may have been equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump will cause engine overheating.

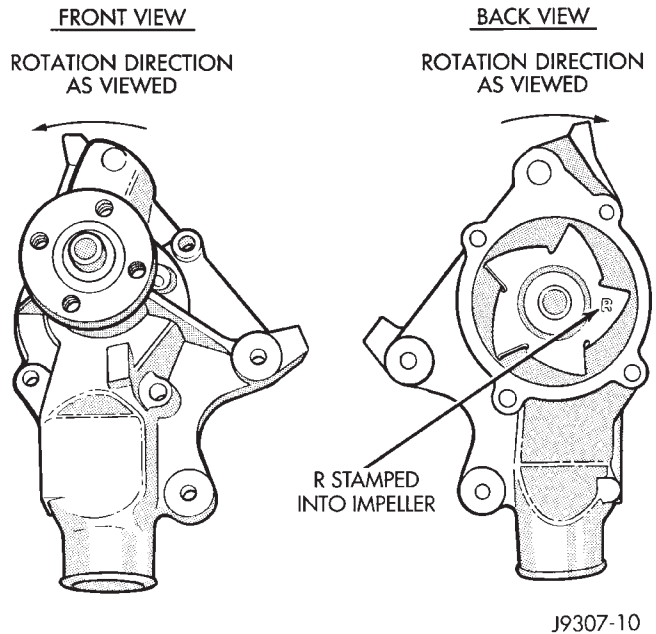


Fig. 5 Reverse Rotating Water Pump—Typical COOLING SYSTEM HOSES

Rubber hoses route coolant to and from the radiator, intake manifold and heater core.

Radiator lower hoses are spring-reinforced to prevent collapse from water pump suction at moderate and high engine speeds.

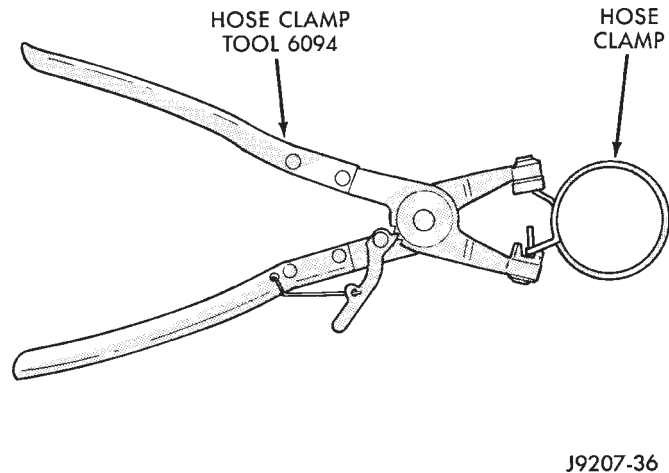
WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 6). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 7). If replacement is necessary, use only an original equipment clamp with matching number or letter.

Inspect the hoses at regular intervals. Replace hoses that are cracked, feel brittle when squeezed, or swell excessively when the system is pressurized.

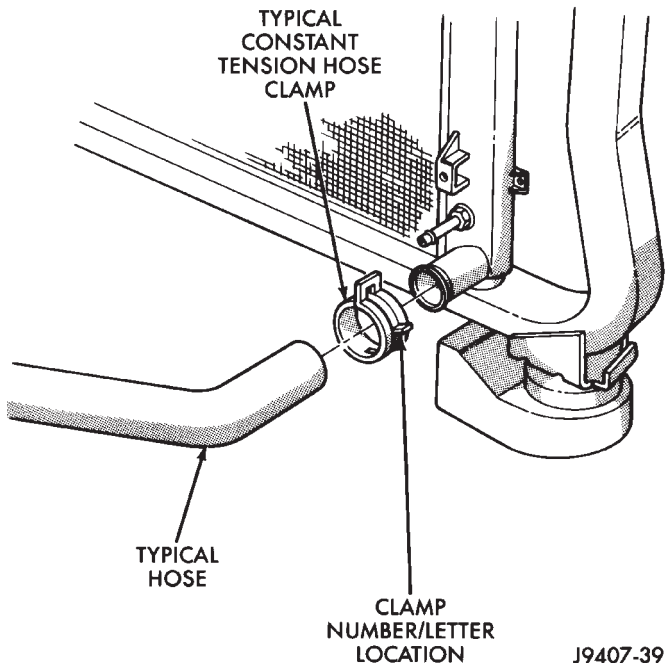
For all vehicles: In areas where specific routing clamps are not provided, be sure that hoses are positioned with sufficient clearance. Check clearance from exhaust manifolds and pipe, fan blades, drive belts and sway bars. Improperly positioned hoses can be damaged, resulting in coolant loss and engine overheating.

DESCRIPTION AND OPERATION (Continued)



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Fig. 6 Hose Clamp Tool—Typical



J9407-39

Fig. 7 Clamp Number/Letter Location

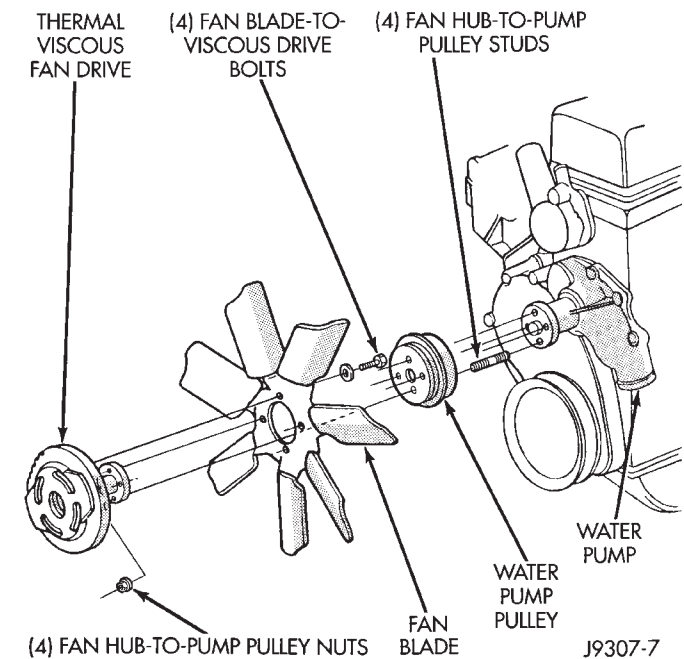
Ordinary worm gear type hose clamps (when equipped) can be removed with a straight screwdriver or a hex socket. **To prevent damage to hoses or clamps, the hose clamps should be tightened to 4 N·m (34 in. lbs.) torque. Do not over tighten hose clamps.**

When performing a hose inspection, inspect the radiator lower hose for proper position and condition of the internal spring.

VISCOUS FAN DRIVE

The thermal viscous fan drive (Fig. 8) is a silicone-fluid-filled coupling used to connect the fan blades to either the engine or the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the

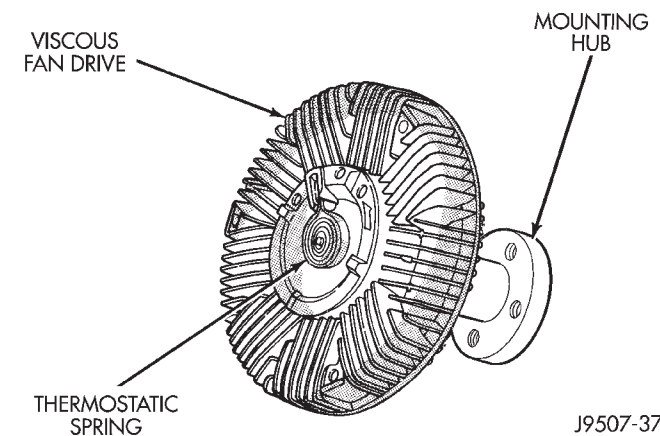
top speed of the fan to a predetermined maximum level at higher engine speeds.



J9307-7

Fig. 8 Water Pump Mounted Fan Drive

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit (a typical viscous unit is shown in (Fig. 9)). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, the fan will remain at a reduced rpm regardless of engine speed.



J9507-37

Fig. 9 Viscous Fan Drive—Typical

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the

DESCRIPTION AND OPERATION (Continued)

bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word **REVERSE** to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

DIAGNOSIS AND TESTING

ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The Powertrain Control Module (PCM) has been programmed to monitor the certain following cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicate an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to Group 25, Emission Control Systems for proper procedures)

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, refer to Group 25, Emission Control Systems for proper procedures.

ACCESSORY DRIVE BELT DIAGNOSIS

VISUAL DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib (Fig. 10), are considered normal. These are not a reason to replace the belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 10). Also replace the belt if it has excessive wear, frayed cords or severe glazing.

Refer to the Accessory Drive Belt Diagnosis charts for further belt diagnosis.

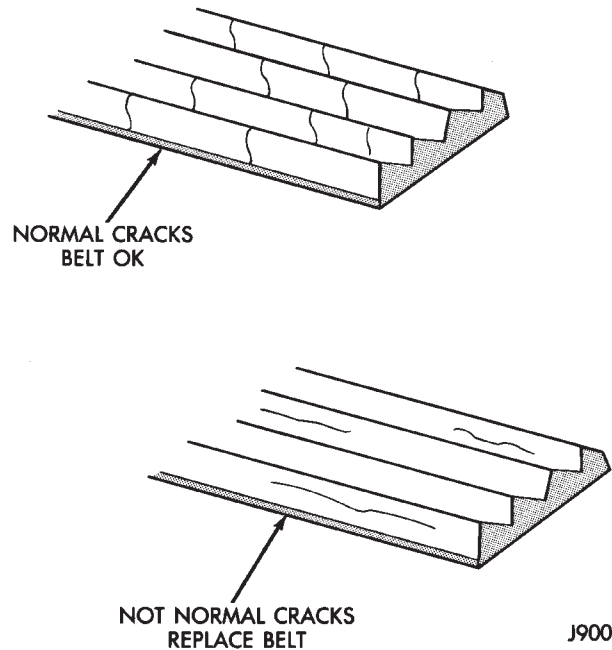


Fig. 10 Belt Wear Patterns

NOISE DIAGNOSIS

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for alignment, glazing, or excessive end play.

DIAGNOSIS AND TESTING (Continued)

ACCESSORY DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	<ol style="list-style-type: none"> 1. Foreign objects imbedded in pulley grooves. 2. Installation damage 	<ol style="list-style-type: none"> 1. Remove foreign objects from pulley grooves. Replace belt. 2. Replace belt
RIB OR BELT WEAR	<ol style="list-style-type: none"> 1. Pulley misaligned 2. Abrasive environment 3. Rusted pulley(s) 4. Sharp or jagged pulley groove tips 5. Belt rubber deteriorated 	<ol style="list-style-type: none"> 1. Align pulley(s) 2. Clean pulley(s). Replace belt if necessary 3. Clean rust from pulley(s) 4. Replace pulley. Inspect belt. 5. Replace belt
BELT SLIPS	<ol style="list-style-type: none"> 1. Belt slipping because of insufficient tension 2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol) 3. Driven component bearing failure (seizure) 4. Belt glazed or hardened from heat and excessive slippage 	<ol style="list-style-type: none"> 1. Adjust tension 2. Replace belt and clean pulleys 3. Replace faulty component or bearing 4. Replace belt.
LONGITUDINAL BELT CRACKING	<ol style="list-style-type: none"> 1. Belt has mistracked from pulley groove 2. Pulley groove tip has worn away rubber to tensile member 	<ol style="list-style-type: none"> 1. Replace belt 2. Replace belt
"GROOVE JUMPING" (Belt does not maintain correct position on pulley)	<ol style="list-style-type: none"> 1. Belt tension either too low or too high 2. Pulley(s) not within design tolerance 3. Foreign object(s) in grooves 4. Pulley misalignment 5. Belt cordline is broken 	<ol style="list-style-type: none"> 1. Adjust belt tension 2. Replace pulley(s) 3. Remove foreign objects from grooves 4. Align component 5. Replace belt
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	<ol style="list-style-type: none"> 1. Excessive tension 2. Tensile member damaged during belt installation 3. Severe misalignment 4. Bracket, pulley, or bearing failure 	<ol style="list-style-type: none"> 1. Replace belt and adjust tension to specification 2. Replace belt 3. Align pulley(s) 4. Replace defective component and belt

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISE (Objectionable squeal, squeak, or rumble is heard or felt while drive belt is in operation)	1. Belt slippage 2. Bearing noise 3. Belt misalignment 4. Belt to pulley mismatch 5. Driven component induced vibration 6. System resonant frequency induced vibration	1. Adjust belt 2. Locate and repair 3. Align belt/pulley(s) 4. Install correct belt 5. Locate defective driven component and repair 6. Vary belt tension within specifications.
TENSION SHEETING FABRIC FAILURE (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object 2. Excessive heat causing woven fabric to age 3. Tension sheeting splice has fractured	1. Correct rubbing condition 2. Replace belt 3. Replace belt
CORD EDGE FAILURE (Tensile member exposed at edges of belt or separated from belt body)	1. Excessive tension 2. Belt contacting stationary object 3. Pulley(s) out of tolerance 4. Insufficient adhesion between tensile member and rubber matrix	1. Adjust belt tension 2. Replace belt 3. Replace pulley 4. Replace belt and adjust tension to specifications

PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause.

PROLONGED IDLE, VERY HIGH AMBIENT TEMPERATURE, SLIGHT TAIL WIND AT IDLE, SLOW TRAFFIC, TRAFFIC JAMS, HIGH SPEED, OR STEEP GRADES:

- Driving techniques that avoid overheating are:
- Idle with A/C off when temperature gauge is at end of normal range.
 - Increasing engine speed for more air flow is recommended.

TRAILER TOWING

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

AIR CONDITIONING; ADD-ON OR AFTER MARKET

These models are equipped with a "heavy duty" cooling system and therefore will accommodate

add-on or aftermarket air conditioning. No modifications are necessary to the cooling system.

RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts (incorrect water pump rotating in wrong direction)
- 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.

DIAGNOSIS AND TESTING (Continued)

COOLING SYSTEM DIAGNOSIS

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	<ol style="list-style-type: none"> 1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open engine thermostat. 2. Is the temperature gauge (if equipped) connected to the temperature gauge coolant sensor on the engine? 3. Is the temperature gauge (if equipped) operating OK? 4. Coolant level low in cold ambient temperatures accompanied with poor heater performance. 5. Improper operation of internal heater doors or heater controls. 	<ol style="list-style-type: none"> 1. Refer to group 25, Emission Control Systems. Replace thermostat if necessary. If a Diagnostic Trouble Code (DTC) has not been set, the problem may be with the temperature gauge. 2. Check the engine temperature sensor connector in the engine compartment. Refer to Group 8E. Repair as necessary. 3. Check gauge operation. Refer to Group 8E. Repair as necessary. 4. Check coolant level in the coolant reserve/overflow tank and the radiator. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section of the manual text for Warnings and precautions before removing the radiator cap. 5. Inspect heater and repair as necessary. Refer to Group 24, Heating and Air Conditioning for procedures.
TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM	<ol style="list-style-type: none"> 1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions. 2. Is temperature gauge (if equipped) reading correctly? 3. Is temperature warning lamp (if equipped) illuminating unnecessarily? 4. Coolant low in coolant reserve/overflow tank and radiator? 5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following step 6. 	<ol style="list-style-type: none"> 1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to normal range, determine the cause for overheating and repair. Refer to POSSIBLE CAUSES (numbers 2 through 18). 2. Check gauge. Refer to Group 8E. Repair as necessary. 3. Check warning lamp operation. Refer to Group 8E. Repair as necessary. 4. Check for coolant leaks and repair as necessary. Refer to Testing Cooling System for Leaks in this group. 5. Tighten cap.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
<p>TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM</p>	<p>6. Poor seals at radiator cap.</p> <p>7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools. As the engine cools, a vacuum is formed in the cooling system of the engine and radiator. If radiator cap seals are defective, or cooling system has leaks, a vacuum can not be formed.</p> <p>8. Freeze point of antifreeze not correct. Mixture may be too rich.</p> <p>9. Coolant not flowing through system.</p> <p>10. Radiator or A/C condenser fins are dirty or clogged.</p> <p>11. Radiator core is corroded or plugged.</p> <p>12. Fuel or ignition system problems.</p> <p>13. Dragging brakes.</p> <p>14. Bug screen is being used reducing airflow.</p> <p>15. Thermostat partially or completely shut. This is more prevalent of high mileage vehicles.</p>	<p>6. (a) Check condition of cap and cap seals. Refer to Radiator Cap. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.</p> <p>7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this group. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator. (c) Check the condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant reserve/overflow tank and tank hoses for blockage. Repair as necessary</p> <p>8. Check antifreeze. Refer to Coolant section of this group. Adjust antifreeze-to-water ratio as required.</p> <p>9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine reason for lack of flow and repair as necessary.</p> <p>10. Clean insects or debris. Refer to Radiator Cleaning in this group.</p> <p>11. Have radiator re-cored or replaced.</p> <p>12. Refer to Fuel and Ignition System groups for diagnosis. Also refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool.</p> <p>13. Check and correct as necessary. Refer to Group 5, Brakes in the manual text.</p> <p>14. Remove bug screen.</p> <p>15. Check thermostat operation and replace as necessary. Refer to Thermostats in this group.</p>

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	<p>16. Thermal viscous fan drive not operating properly.</p> <p>17. Cylinder head gasket leaking.</p> <p>18. Heater core leaking.</p>	<p>16. Check fan drive operation and replace if necessary. Refer to Viscous Fan Drive in this group.</p> <p>17. Check for cylinder head gasket leaks. Refer to Testing Cooling System for Leaks in this group. For repair, refer to Group 9, Engines.</p> <p>18. Check heater core for leaks. Refer to Group 24, Heating and Air Conditioning. Repair as necessary.</p>
<p>TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)</p>	<p>1. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.</p> <p>2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in the circuit.</p> <p>3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running).</p> <p>4. Gauge reading high after restarting a warmed-up (hot) engine.</p> <p>5. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late).</p> <p>6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing thermostat to open late.</p> <p>7. Water pump impeller loose on shaft.</p> <p>8. Loose accessory drive belt (water pump slipping).</p> <p>9. Air leak on the suction side of water pump allows air to build up in cooling system causing thermostat to open late.</p>	<p>1. A normal condition. No correction is necessary.</p> <p>2. Check operation of gauge and repair if necessary. Refer to Group 8E, Instrument Panel and Gauges.</p> <p>3. A normal condition. No correction is necessary. Gauge reading should return to normal range after vehicle is driven.</p> <p>4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.</p> <p>5. Check and correct coolant leaks. Refer to Testing Cooling System for Leaks in this group.</p> <p>6. (a) Check for cylinder head gasket leaks with a commercially available Block Leak Tester. Repair as necessary. (b) Check for coolant in the engine oil. Inspect for white steam emitting from exhaust system. Repair as necessary.</p> <p>7. Check water pump and replace as necessary. Refer to Water Pumps in this group.</p> <p>8. Refer to Engine Accessory Drive Belts in this group. Check and correct as necessary.</p> <p>9. Locate leak and repair as necessary.</p>

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
<p>PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/OVERFLOW TANK</p>	<p>1. Pressure relief valve in radiator cap is defective.</p>	<p>1. Check condition of radiator cap and cap seals. Refer to Radiator Caps in this group. Replace cap as necessary.</p>
<p>COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE IS READING HIGH OR HOT</p>	<p>1. Coolant leaks in radiator, cooling system hoses, water pump or engine.</p>	<p>1. Pressure test and repair as necessary. Refer to Testing Cooling System for Leaks in this group.</p>
<p>DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH</p>	<p>1. Engine overheating. 2. Freeze point of antifreeze not correct. Mixture is too rich or too lean.</p>	<p>1. Check reason for overheating and repair as necessary. 2. Check antifreeze. Refer to the Coolant section of this group. Adjust antifreeze-to-water ratio as required.</p>
<p>HOSE OR HOSES COLLAPSED WHEN ENGINE IS COOLING</p>	<p>1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.</p>	<p>1. (a) Radiator cap relief valve stuck. Refer to Radiator Cap in this group. Replace if necessary. (b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.</p>
<p>NOISY FAN</p>	<p>1. Fan blades loose. 2. Fan blades striking a surrounding object. 3. Air obstructions at radiator or air conditioning condenser. 4. Thermal viscous fan drive has defective bearing. 5. A certain amount of fan noise (roaring) may be evident from the thermal viscous fan drive. Some of this noise is normal.</p>	<p>1. Replace fan blade assembly. Refer to Cooling System Fans in this group. 2. Locate point of fan blade contact and repair as necessary. 3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser. 4. Replace fan drive. Bearing is not serviceable. Refer to Viscous Fan Drive in this group. 5. Refer to Viscous Fan Drive in this group for an explanation of normal fan noise.</p>

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
<p>INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)</p>	<ol style="list-style-type: none"> 1. Radiator and/or A/C condenser is restricted, obstructed or dirty (insects, leaves etc.) 2. Thermal viscous fan drive is free-wheeling. 3. Engine is overheating (heat may be transferred from radiator to A/C condenser. High underhood temperatures due to engine overheating may also transfer heat to A/C components). 4. Some models with certain engines are equipped with air seals at the radiator and/or A/C condenser. If these seals are missing or damaged, not enough air flow will be pulled through the radiator and A/C condenser. 	<ol style="list-style-type: none"> 1. Remove restriction and/or clean as necessary. Refer to Radiator Cleaning in this group. 2. Refer to Viscous Fan Drive for diagnosis. Repair as necessary. 3. Correct overheating condition. Refer to text in Group 7, Cooling. 4. Check for missing or damaged air seals and repair as necessary.
<p>INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION</p>	<ol style="list-style-type: none"> 1. Has a diagnostic trouble code (DTC) been set? 2. Coolant level low. 3. Obstructions in heater hose fittings at engine. 4. Heater hose kinked. 5. Water pump is not pumping water to heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly. The accessory drive belt may also be slipping causing poor water pump operation. 	<ol style="list-style-type: none"> 1. Refer to group 25, Emission Control System and replace thermostat if necessary. 2. Refer to Testing Cooling System for Leaks in the manual text. Repair as necessary. 3. Remove heater hoses at both ends and check for obstructions. Repair as necessary. 4. Locate kinked area and repair as necessary. 5. Refer to Water Pumps in this group. Repair as necessary. If a slipping belt is detected, refer to Engine Accessory Drive Belts in this group. Repair as necessary.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
HEAT ODOR	<ol style="list-style-type: none"> 1. Various heat shields are used at certain drive line components. One or more of these shields may be missing. 2. Engine running hot 3. Cooling fan malfunctioning. 4. Undercoating or other contaminate applied to cooling or exhaust system. 5. Engine may be running rich causing the catalytic converter to overheat. 	<ol style="list-style-type: none"> 1. Locate missing shields and replace or repair as necessary. 2. Perform thermostat, water pump and fan test. Repair or replace as necessary. 3. Refer to Cooling System Fan in this group for diagnosis. Repair as necessary 4. Clean as necessary. 5. Refer to the DRB scan tool and the appropriate Powertrain Diagnostic Procedures service manual. Repair as necessary.
POOR DRIVEABILITY (THERMOSTAT POSSIBLY STUCK OPEN). GAUGE MAY BE READING LOW	<ol style="list-style-type: none"> 1. For proper driveability, good vehicle emissions and for preventing build-up of engine oil sludge, the thermostat must be operating properly. Has a diagnostic trouble code (DTC) been set? 	<ol style="list-style-type: none"> 1. Refer to group 25, Emission Control System. DTC's may also be checked using the DRB scan tool. Refer to the proper Powertrain Diagnostics Procedures service manual for checking the thermostat using the DRB scan tool. Replace thermostat if necessary.
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	<ol style="list-style-type: none"> 1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away. 	<ol style="list-style-type: none"> 1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	<ol style="list-style-type: none"> 1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant. 	<ol style="list-style-type: none"> 1. Refer to Coolant in this group for antifreeze tests. Adjust antifreeze-to-water ratio as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	<ol style="list-style-type: none"> 1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal engine operating temperature, the level should return to within that range after operation at elevated temperatures. 	<ol style="list-style-type: none"> 1. A normal condition. No repair is necessary.

DIAGNOSIS AND TESTING (Continued)

RADIATOR COOLANT FLOW CHECK

The following procedure will determine if coolant is flowing through the cooling system.

If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If hose is hot, the thermostat is open and water is circulating through cooling system.

COOLING SYSTEM—TESTING FOR LEAKS**ULTRAVIOLET LIGHT METHOD**

All Jeep models have a leak detection additive added to the cooling system before they leave the factory. The additive is highly visible under ultraviolet light (black light). If the factory original coolant has been drained, pour one ounce of additive into the cooling system. The additive is available through the part's department. Place the heater control unit in HEAT position. Start and operate the engine until the radiator upper hose is warm to the touch. Aim the commercially available black light tool at the components to be checked. If leaks are present, the black light will cause the additive to glow a bright green color.

The black light can be used along with a pressure tester to determine if any external leaks exist (Fig. 11).

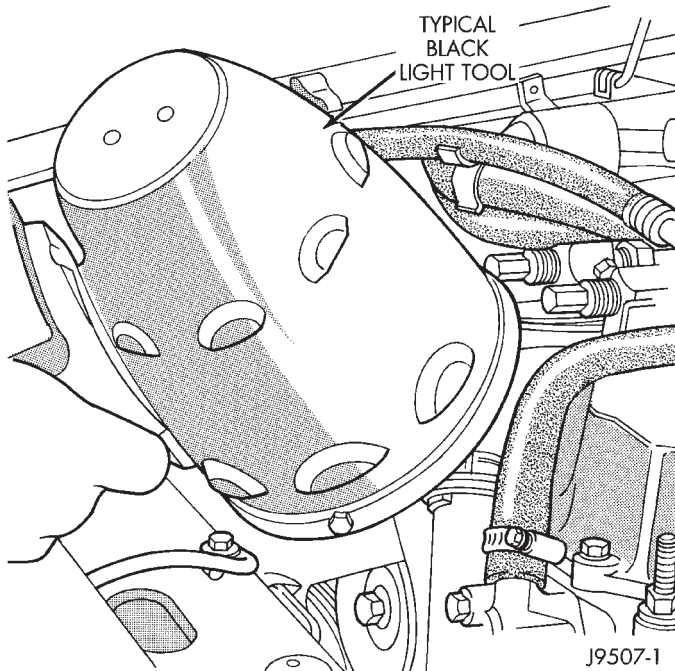


Fig. 11 Leak Detection Using Black Light—Typical
PRESSURE TESTER METHOD

The engine should be at the normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during warm engine examination.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

Carefully remove the radiator pressure cap from the filler neck and check the coolant level. Push down on the cap to disengage it from the stop tabs. Wipe the inner part of the filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the reserve/overflow tank tube for internal obstructions. Insert a wire through the tube to be sure it is not obstructed.

Inspect the cams on the outside part of the filler neck. If the cams are bent, seating of pressure cap valve and tester seal will be affected. Replace cap if cams are bent.

Attach pressure tester 7700 (or an equivalent) to the radiator filler neck (Fig. 12).

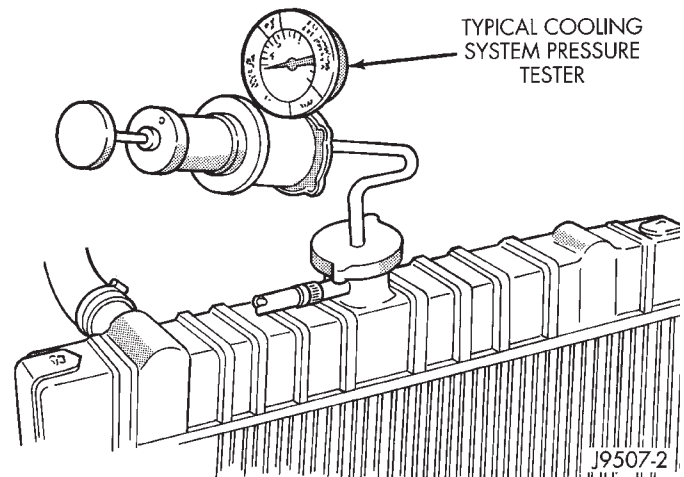


Fig. 12 Pressurizing System—Typical

Operate the tester pump to apply 124 kPa (18 psi) pressure to the system. If the hoses enlarge excessively or bulge while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to the following criteria:

- **Holds Steady:** If the pointer remains steady for two minutes, there are no serious coolant leaks in the system. However, there could be an internal leak that does not appear with normal system test pressure. Inspect for interior leakage or do the Internal Leakage Test. Do this if it is certain that coolant is being lost and no leaks can be detected.

- **Drops Slowly:** Shows a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect the radiator, hoses, gasket edges and heater. Seal any small leak holes with a Sealer Lubricant or equivalent. Repair leak holes and reinspect the system with pressure applied.

- **Drops Quickly:** Shows that a serious leakage is occurring. Examine the system for serious external

DIAGNOSIS AND TESTING (Continued)

leakage. If no leaks are visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove the engine oil pan drain plug and drain a small amount of engine oil. Coolant, being heavier than engine oil, will drain first. Another way of testing is to operate the engine and check for water globules on the engine oil dipstick. Also inspect the automatic transmission oil dipstick for water globules. Inspect the automatic transmission fluid cooler for leakage. Operate the engine without the pressure cap on the radiator until thermostat opens.

Attach a pressure tester to the filler neck. If pressure builds up quickly, a leak exists as a result of a faulty cylinder head gasket or crack in the engine. Repair as necessary.

WARNING: DO NOT ALLOW PRESSURE TO EXCEED 124 KPA (18 PSI). TURN THE ENGINE OFF. TO RELEASE THE PRESSURE, ROCK THE TESTER FROM SIDE TO SIDE. WHEN REMOVING THE TESTER, DO NOT TURN THE TESTER MORE THAN 1/2 TURN IF THE SYSTEM IS UNDER PRESSURE.

If there is no immediate pressure increase, pump the pressure tester until the indicated pressure is within the system range. Vibration of the gauge pointer indicates compression or combustion leakage into the cooling system.

WARNING: DO NOT DISCONNECT THE SPARK PLUG WIRES WHILE THE ENGINE IS OPERATING.

CAUTION: Do not operate the engine with a spark plug shorted for more than a minute. The catalytic converter may be damaged.

Isolate the compression leak by shorting each spark plug to the cylinder block. The gauge pointer should stop or decrease vibration when spark plug for leaking cylinder is shorted. This happens because of the absence of combustion pressure.

COMBUSTION LEAKAGE TEST (WITHOUT PRESSURE TESTER)

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow for thermostat removal. Refer to Thermostat Replacement. Disconnect the water pump drive belt.

Disconnect the upper radiator hose from the thermostat housing. Remove the housing and thermostat. Install the thermostat housing.

Add coolant to the radiator to bring the level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

CAUTION: Avoid overheating. Do not operate the engine for an excessive period of time. Open the draincock immediately after the test to eliminate boil over of coolant.

Start the engine and accelerate rapidly three times (to approximately 3000 rpm) while observing the coolant. If internal engine combustion gases are leaking into the cooling system, bubbles will appear in the coolant. If bubbles do not appear, there is no internal combustion gas leakage.

VISCOUS FAN DRIVE**NOISE**

NOTE: It is normal for fan noise to be louder (roaring) when:

- The underhood temperature is above the engagement point for the viscous drive coupling. This may occur when ambient (outside air temperature) is very high.
- Engine loads and temperatures are high such as when towing a trailer.
- Cool silicone fluid within the fan drive unit is being redistributed back to its normal disengaged (warm) position. This can occur during the first 15 seconds to one minute after engine start-up on a cold engine.

LEAKS

Viscous fan drive operation is not affected by small oil stains near the drive bearing. If leakage appears excessive, replace the fan drive unit.

TESTING

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

DIAGNOSIS AND TESTING (Continued)

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18° -to- 105° C (0° -to- 220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 88° C (190° F). Fan drive **engagement** should have started to occur at between 74° to 85° C (165° to 185° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 88° C (190° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 57° to 82° C (135° to 180° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word **REVERSE** to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

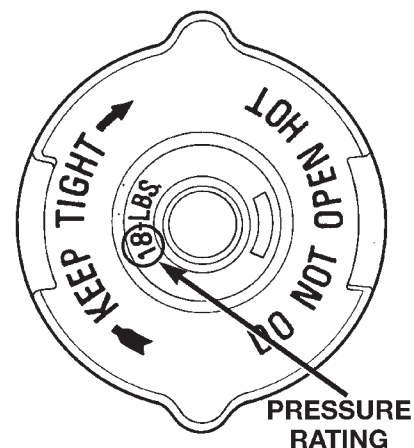
RADIATOR CAP TO FILLER NECK SEAL— PRESSURE RELIEF CHECK

With radiator cap installed on filler neck, remove coolant reserve/overflow tank hose from nipple on filler neck. Connect a hand operated vacuum pump to nipple. Operate pump until a reading of 47 to 61 kPa (14 to 18 in. Hg) appears on gauge. If the reading stays steady, or drops slightly and then remains steady, the pressure valve seal is good. Replace radiator cap if reading does not hold.

WARNING: THE WARNING WORDS (DO NOT OPEN HOT) ON THE RADIATOR PRESSURE CAP (Fig. 13) ARE A SAFETY PRECAUTION. WHEN HOT, PRESSURE BUILDS UP IN COOLING SYSTEM. TO PREVENT SCALDING OR INJURY, THE RADIATOR CAP SHOULD NOT BE REMOVED WHILE THE SYSTEM IS HOT AND/OR UNDER PRESSURE.

There is no need to remove the radiator cap **except** for the following purposes:

TOP VIEW



CROSS-SECTIONAL VIEW

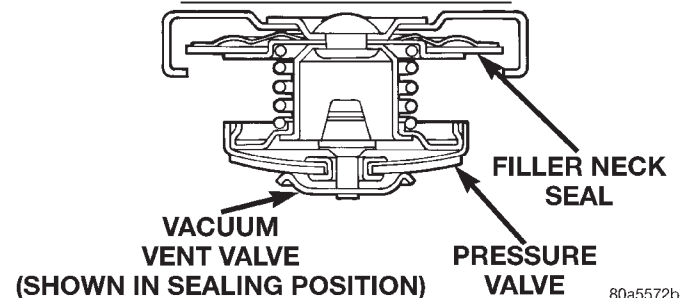


Fig. 13 Radiator Pressure Cap

- (1) To check and adjust antifreeze freeze point.
- (2) To refill system with new antifreeze.
- (3) For conducting service procedures.
- (4) When checking for vacuum leaks.

DIAGNOSIS AND TESTING (Continued)

WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT AT LEAST 15 MINUTES BEFORE REMOVING RADIATOR CAP. WITH A RAG, SQUEEZE RADIATOR UPPER HOSE TO CHECK IF SYSTEM IS UNDER PRESSURE. PLACE A RAG OVER THE CAP AND WITHOUT PUSHING DOWN, ROTATE CAP COUNTER-CLOCKWISE TO THE FIRST STOP. ALLOW FLUID TO ESCAPE THROUGH OVERFLOW HOSE INTO COOLANT RESERVE/OVERFLOW TANK. SQUEEZE RADIATOR UPPER HOSE TO DETERMINE WHEN PRESSURE HAS BEEN RELEASED. WHEN COOLANT AND STEAM STOP BEING PUSHED INTO TANK AND SYSTEM PRESSURE DROPS, REMOVE RADIATOR CAP COMPLETELY.

RADIATOR CAP—PRESSURE TESTING

Remove cap from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 14).

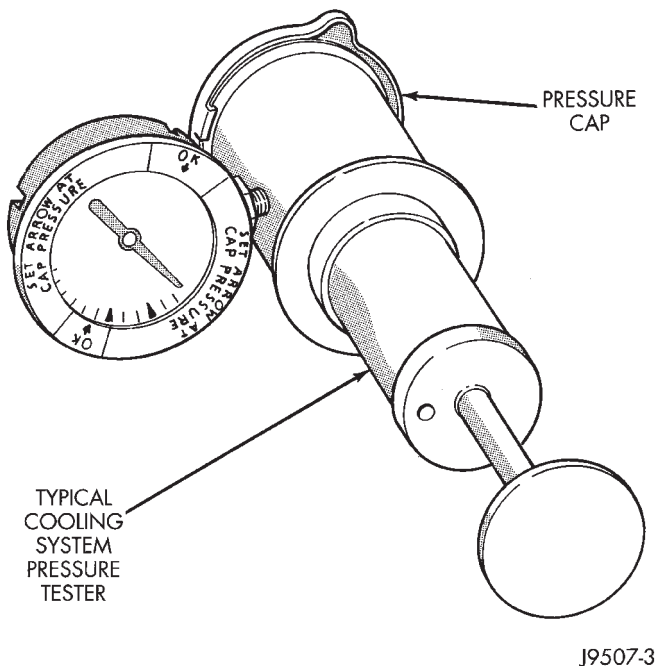


Fig. 14 Pressure Testing Radiator Pressure Cap—Typical

Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 83 to 124 kPa (12 to 18 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 83 to 124 kPa (12 to 18 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause

cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

COOLANT—LOW LEVEL AERATION

If the coolant level in radiator drops below top of radiator core tubes, air will enter cooling system.

Low coolant level can cause thermostat pellet to be suspended in air instead of coolant. This will cause thermostat to open later, which in turn causes higher coolant temperature. Air trapped in cooling system also reduces amount of coolant circulating in heater core resulting in low heat output.

COOLING SYSTEM DEAERATION

As the engine operates, any air trapped in cooling system gathers under the radiator cap. The next time the engine is operated, thermal expansion of coolant will push any trapped air past radiator cap into the coolant reserve/overflow tank. Here it escapes to the atmosphere into the tank. When the engine cools down the coolant, it will be drawn from the reserve/overflow tank into the radiator to replace any removed air.

SERVICE PROCEDURES**COOLANT LEVEL—ROUTINE CHECK**

NOTE: Do not remove radiator cap for routine coolant level inspections. The coolant level can be checked at coolant reserve/overflow tank.

The coolant reserve/overflow system provides a quick visual method for determining coolant level without removing radiator pressure cap. With engine idling and at normal operating temperature, observe coolant level in reserve/overflow tank. The coolant level should be between ADD and FULL marks.

COOLANT—ADDING ADDITIONAL

Do not remove radiator cap to add coolant to system. When adding coolant to maintain correct level, do so at coolant reserve/overflow tank. Use a 50/50 mixture of ethylene-glycol antifreeze containing low mineral content water. Remove radiator cap only

SERVICE PROCEDURES (Continued)

for testing or when refilling system after service. Removing cap unnecessarily can cause loss of coolant and allow air to enter system, which produces corrosion.

SERVICE COOLANT LEVEL

The cooling system is closed and designed to maintain coolant level to top of radiator.

WARNING: DO NOT OPEN RADIATOR DRAINCOCK WITH ENGINE RUNNING OR WHILE ENGINE IS HOT AND COOLING SYSTEM IS UNDER PRESSURE.

When vehicle servicing requires a coolant level check in radiator, drain several ounces of coolant from radiator drain cock. Do this while observing coolant reserve/overflow system tank. The coolant level in reserve/overflow tank should drop slightly. If not, inspect for a leak between radiator and coolant reserve/overflow system connection. Remove radiator cap. The coolant level should be to top of radiator. If not and if coolant level in reserve/overflow tank is at ADD mark, check for:

- An air leak in coolant reserve/overflow tank or its hose
- An air leak in radiator filler neck
- Leak in pressure cap seal to radiator filler neck

COOLING SYSTEM—DRAINING

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

DO NOT remove the radiator cap when draining the coolant from the reserve/overflow tank. Open the radiator draincock and when the tank is empty, remove the radiator cap. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture.

- (1) Drain the coolant from the radiator by loosening the draincock.
- (2) Drain coolant from engine block by removing drain plug at left rear side of block (Fig. 15).

COOLING SYSTEM—REFILLING

- (1) Tighten the radiator draincock and the cylinder block drain plug(s).
- (2) Fill system using a 50/50 mixture of water and antifreeze. This is described in the Coolant section of this group. Fill the radiator to the top and install the

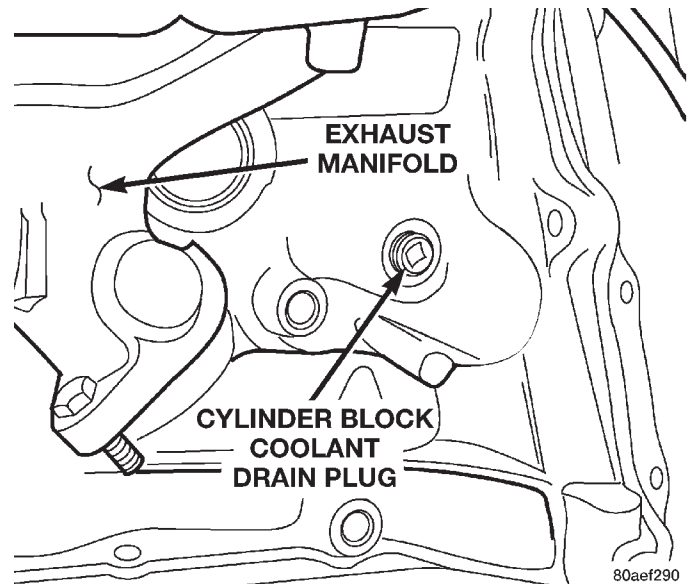


Fig. 15 Draining Coolant From Block—2.5L/4.0L Engines

radiator cap. Add sufficient coolant to the reserve/overflow tank to raise the level to the FULL mark.

- (3) Operate the engine with both the radiator cap and reserve/overflow tank cap in place. After the engine has reached the normal operating temperature, shut the engine off and allow it to cool.

- (4) Add coolant to the reserve/overflow tank as necessary. **Only add coolant when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

COOLING SYSTEM—REVERSE FLUSHING

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 97 to 124 kPa (14 to 18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equip-

SERVICE PROCEDURES (Continued)

ment. 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.

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 replacement gasket. Refer to Thermostat Replacement. Connect the radiator hoses. Refill the cooling system with the correct anti-freeze/water mixture.

REMOVAL AND INSTALLATION

AUTOMATIC TRANSMISSION OIL COOLER

The internal transmission oil cooler located within the radiator is not serviceable. If it requires service, the radiator must be replaced.

Once the repaired or replacement radiator has been installed, fill the cooling system and inspect for leaks. Refer to the Filling Cooling System and Testing Cooling System For Leaks sections in this group. If the transmission operates properly after repairing the leak, drain the transmission and remove the transmission oil pan. Inspect for sludge. Inspect for a dirty or plugged inlet filter. If none of these conditions are found, the transmission and torque converter may require reconditioning. Refer to Group 21 for automatic transmission servicing.

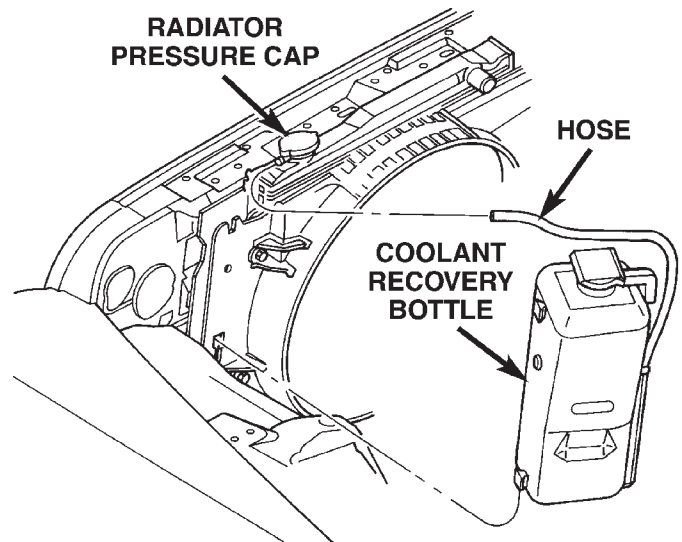
COOLANT RESERVE/OVERFLOW BOTTLE

REMOVAL/INSTALLATION

- (1) Disconnect the hose from radiator filler neck.
- (2) Remove coolant recovery bottle (Fig. 16).
- (3) Reverse the preceding steps for installation.

WATER PUMP

CAUTION: If the water pump is replaced because of mechanical damage, the fan blades and viscous fan drive should also be inspected. These components



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Fig. 16 Coolant Reserve/Overflow Bottle

could have been damaged due to excessive vibration.

REMOVAL

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

CAUTION: All engines have a reverse (counter-clockwise) rotating water pump. The letter R is stamped into the back of the water pump impeller (Fig. 17) to identify. Engines from previous model years, depending upon application, may be equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump will cause engine over heating.

The water pump impeller is pressed on the rear of the pump shaft and bearing assembly. The water pump is serviced only as a complete assembly.

WARNING: DO NOT REMOVE THE BLOCK DRAIN PLUG(S) OR LOOSEN RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain coolant into a clean container for reuse.

- (1) Disconnect negative battery cable at battery.
- (2) Drain the cooling system.
- (3) Loosen (but do not remove at this time) the four fan hub-to-water pump pulley mounting nuts (Fig. 18).

NOTE: The engine accessory drive belt must be removed prior to removing the fan.

REMOVAL AND INSTALLATION (Continued)

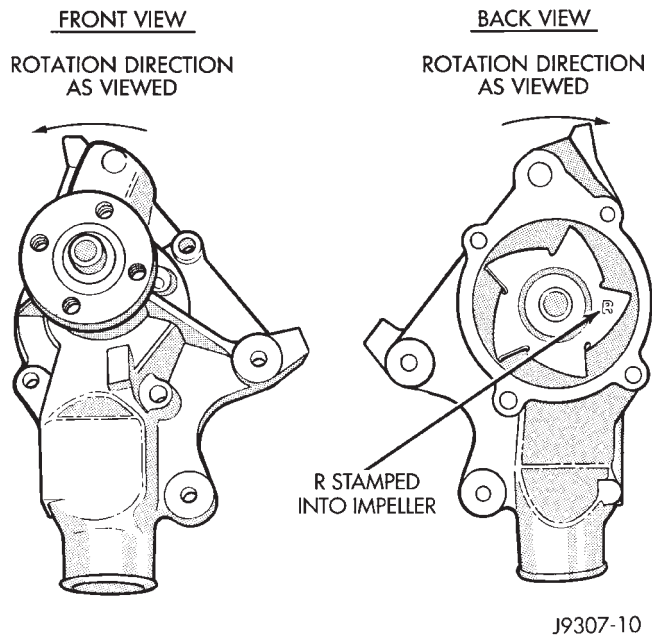


Fig. 17 Reverse Rotating Water Pump—Typical

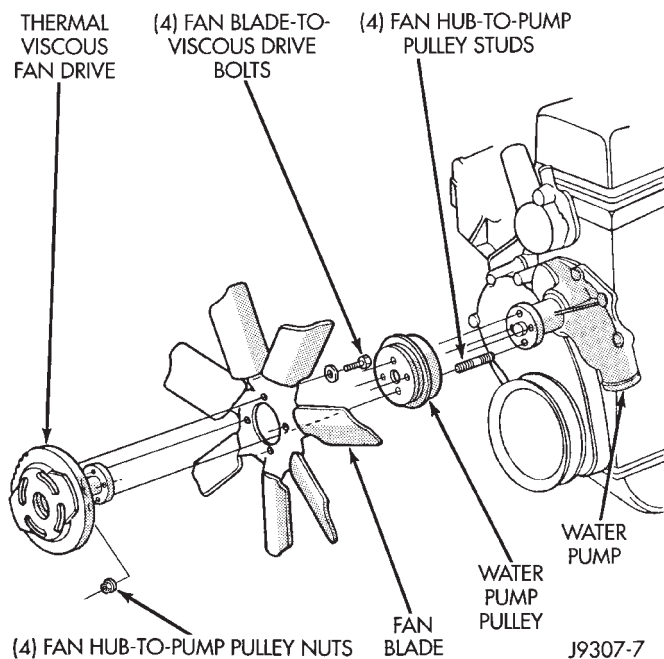


Fig. 18 Fan Mounting Nuts

- (4) Remove accessory drive belt.
- (5) Remove power steering pump (Fig. 19). (Refer to Group 19 Steering).

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 20) SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS.

ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 21). If replacement is necessary, use only an original equipment clamp with matching number or letter.

(6) Remove lower radiator hose from water pump. Remove heater hose from water pump fitting.

(7) Remove four nuts previously loosened and remove the fan blade assembly and pulley.

(8) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(9) Remove the four pump mounting bolts (Fig. 22) and remove pump from vehicle. Discard old gasket. Note that one of the four bolts is longer than the other bolts.

(10) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

INSTALLATION

(1) If pump is being replaced, install the heater hose fitting to the pump. Use a sealant on the fitting such as Mopar® Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other foreign material. Inspect the cylinder block and water pump mating surfaces for erosion or damage from cavitation.

(3) Install the gasket and water pump. The silicone bead on the gasket should be facing the water pump. Also, the gasket is installed dry. Tighten mounting bolts to 23 N·m (200 in. lbs.) torque. Rotate the shaft by hand to be sure it turns freely.

(4) Connect the radiator and heater hoses to the water pump.

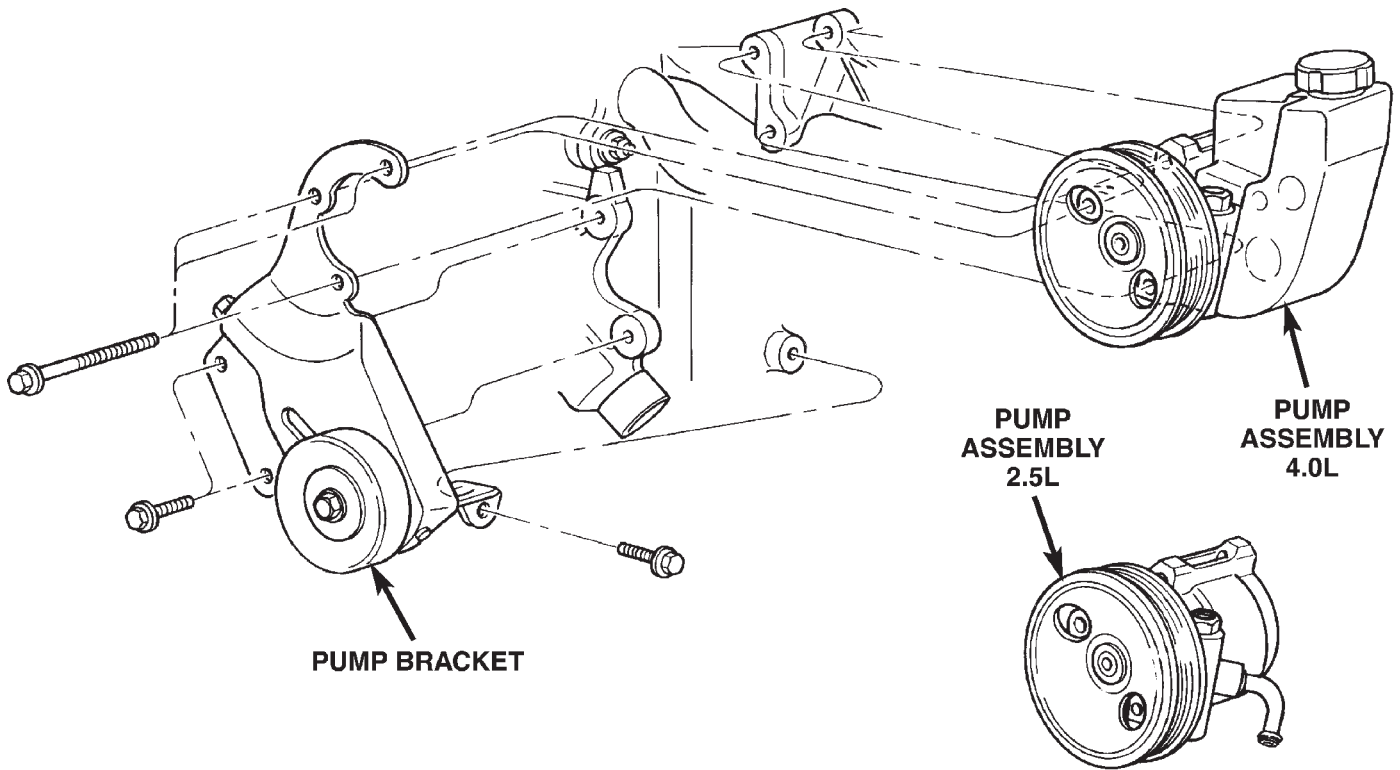
(5) Position water pump pulley to water pump hub.

(6) Install fan and four nuts to water pump hub. Tighten or nuts to 27 N·m (20 ft. lbs.) torque.

(7) Install power steering pump.

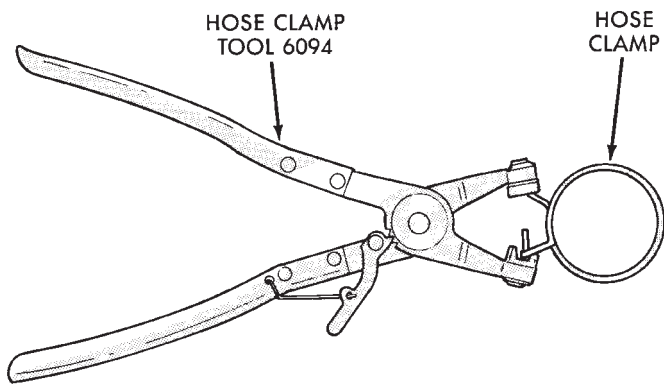
CAUTION: When installing the serpentine engine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to the Belt Removal and Installation in this group for appropriate belt routing. You may also refer to the Belt Routing Label in the vehicle engine compartment.

REMOVAL AND INSTALLATION (Continued)



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Fig. 19 Power Steering Pump Attachment



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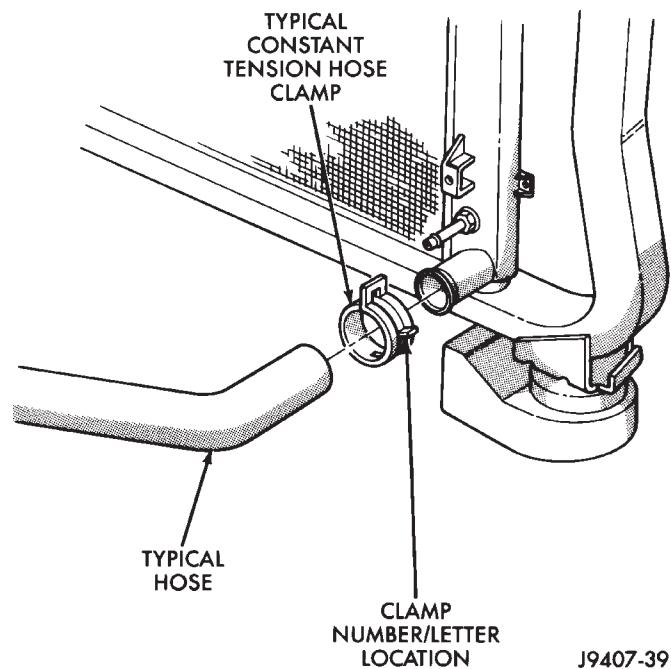
Fig. 20 Hose Clamp Tool—Typical

(8) Install and tension accessory drive belt. Refer to Accessory Drive Belt removal and installation in this group.

(9) Fill cooling system with coolant and check for leaks. Refer to Refilling Cooling System in this group.

(10) Connect battery cable to battery.

(11) Start and warm the engine. Check for leaks.



J9407-39

Fig. 21 Clamp Number/Letter Location

REMOVAL AND INSTALLATION (Continued)

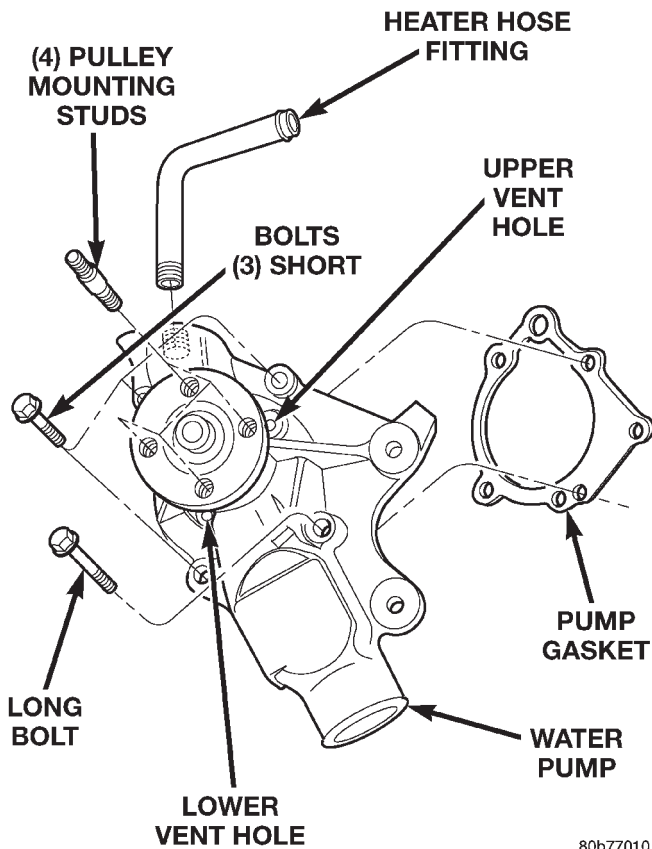


Fig. 22 Water Pump Remove/Install—Typical

THERMOSTAT

REMOVAL

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Drain the coolant from the radiator until the level is below the thermostat housing.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 20). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 21). If

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

(2) Remove radiator upper hose and heater hose at thermostat housing.

(3) Disconnect wiring connector at engine coolant temperature sensor.

(4) Remove thermostat housing mounting bolts, thermostat housing, gasket and thermostat (Fig. 23). Discard old gasket.

(5) Clean the gasket mating surfaces.

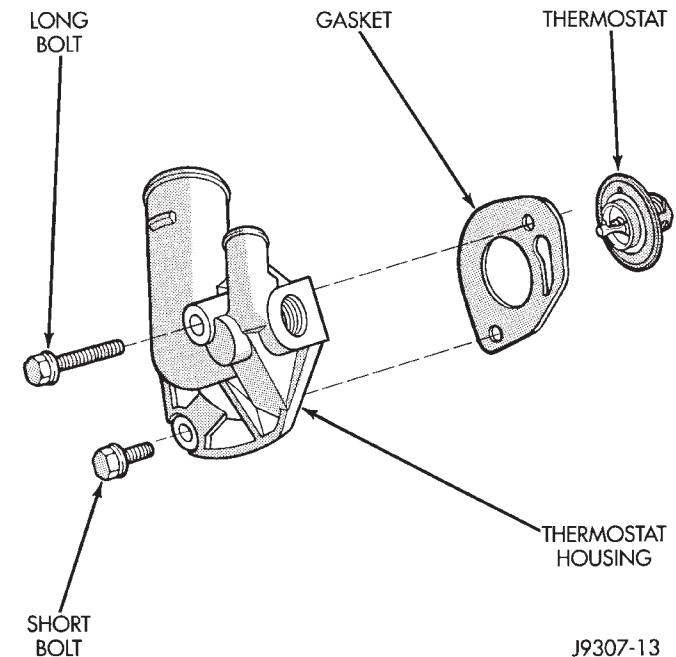


Fig. 23 Thermostat Removal/Installation

INSTALLATION

(1) Install the replacement thermostat so that the pellet, which is encircled by a coil spring, faces the engine. All thermostats are marked on the outer flange to indicate the proper installed position.

(2) Observe the recess groove in the engine cylinder head (Fig. 24).

(3) Position thermostat into this groove with arrow and air bleed hole on outer flange pointing up.

(4) Install replacement gasket and thermostat housing.

CAUTION: Tightening the thermostat housing unevenly or with the thermostat out of its recess may result in a cracked housing.

(5) Tighten the housing bolts to 20 N·m (15 ft. lbs.) torque.

(6) Install hoses to thermostat housing.

(7) Install electrical connector to coolant temperature sensor.

REMOVAL AND INSTALLATION (Continued)

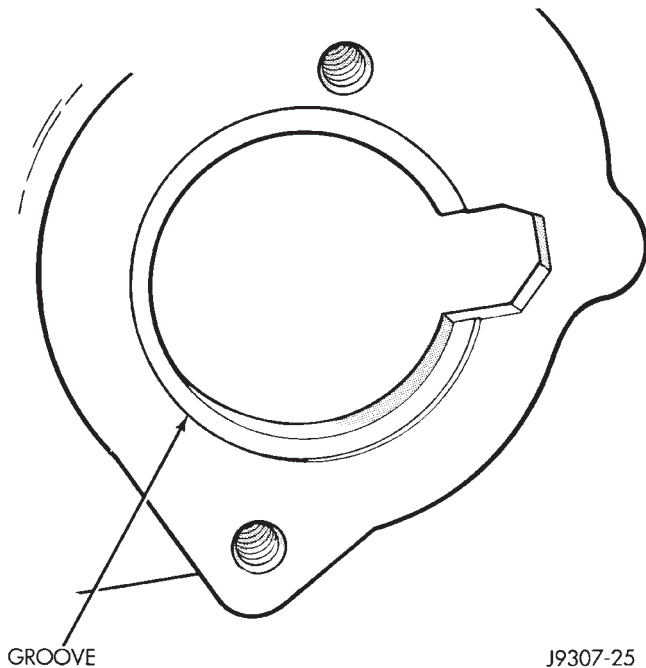


Fig. 24 Thermostat Recess

(8) Be sure that the radiator draincock is tightly closed. Fill the cooling system to the correct level with the required coolant mixture. Refer to Refilling Cooling System in this group.

(9) Start and warm the engine. Check for leaks.

RADIATOR

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

- (1) Disconnect negative battery cable at battery.
- (2) Observe the previous **WARNING**. Remove the radiator cap.
- (3) Position drain pan under draincock. Open radiator draincock and drain radiator. **DO NOT WASTE** reusable coolant. If solution is clean, drain coolant into a clean container for reuse.
- (4) Remove radiator upper and lower hose clamps. Remove radiator hoses.
- (5) Disconnect coolant reserve/overflow tank hose from radiator.
- (6) Remove the four fan shroud mounting bolts (Fig. 25). On some models the power steering fluid reservoir tank is attached to the side of the fan shroud. Tie the reservoir back to prevent spillage. Position the fan shroud back over the fan blades.

(7) If equipped, disconnect and plug automatic transmission fluid cooler lines.

(8) Remove six radiator mounting bolts. Position the front axle vent hose (Fig. 25) to the side.

(9) Lift radiator straight up and out of vehicle taking care not to damage radiator fins.

(10) When removing radiator, note position of the rubber seals located on the top and bottom of radiator (on certain models only) (Fig. 25). To prevent possible overheating, these seals must be installed to their original positions.

INSTALLATION

(1) Position the radiator. Install and tighten the six mounting bolts (Fig. 25) to 8 N·m (72 in. lbs.) torque.

(2) Close radiator draincock.

(3) Position fan shroud and power steering reservoir tank (if equipped). Install and tighten four mounting bolts to 8 N·m (72 in. lbs.) torque.

(4) If equipped, remove plugs and connect automatic transmission fluid cooler lines. Tighten fittings to 16 N·m (140 in. lbs.)

(5) Connect radiator hoses and install hose clamps.

(6) Connect battery negative cable.

(7) Fill cooling system with correct coolant. Refer to Cooling System Refilling in this group.

(8) Connect coolant recovery bottle hose.

(9) Install radiator cap.

(10) Check and adjust automatic transmission fluid level (if equipped).

(11) Start engine and check for leaks.

BLOCK HEATER

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

(1) Drain coolant from radiator and engine cylinder block.

(2) Unplug power cord from block heater.

(3) Loosen screw in center of block heater (Fig. 26) or (Fig. 27).

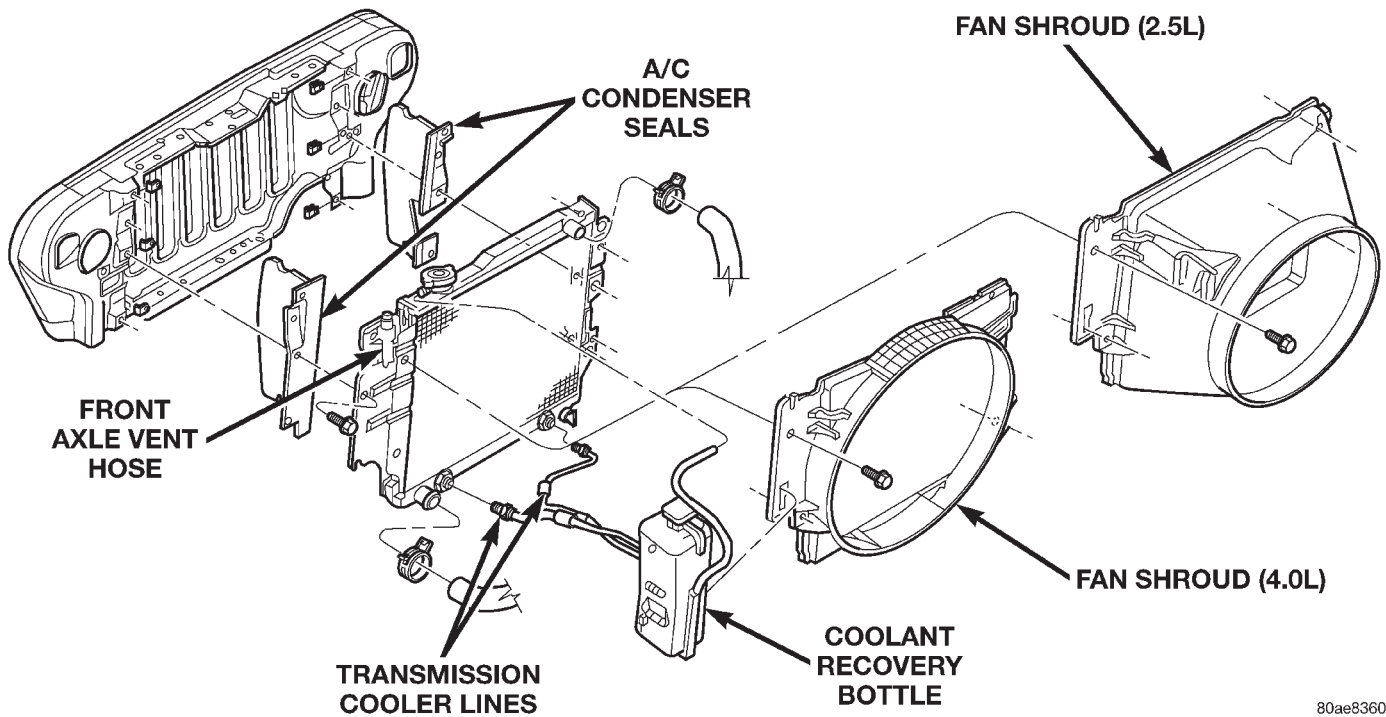
(4) Remove block heater from cylinder block.

INSTALLATION

(1) Thoroughly clean the engine core hole and the block heater seat.

(2) Insert block heater assembly into core hole with element loop pointing **Up**.

REMOVAL AND INSTALLATION (Continued)

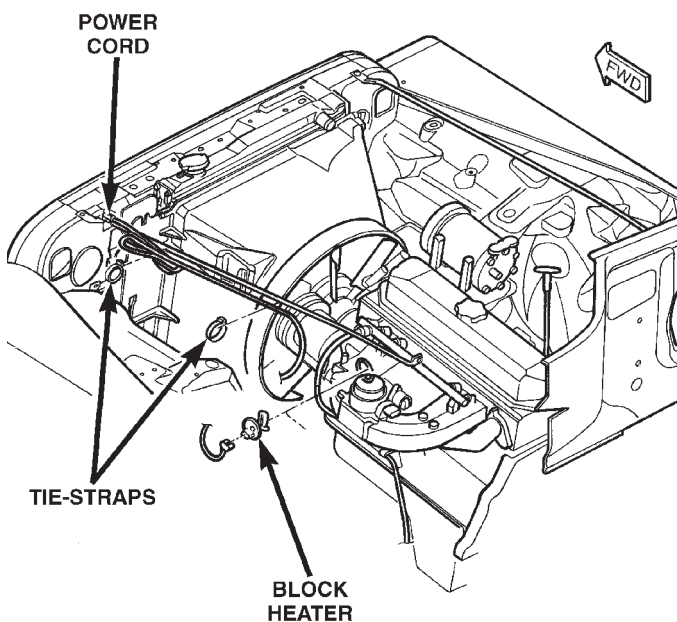


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Fig. 25 Radiator—Remove/Install

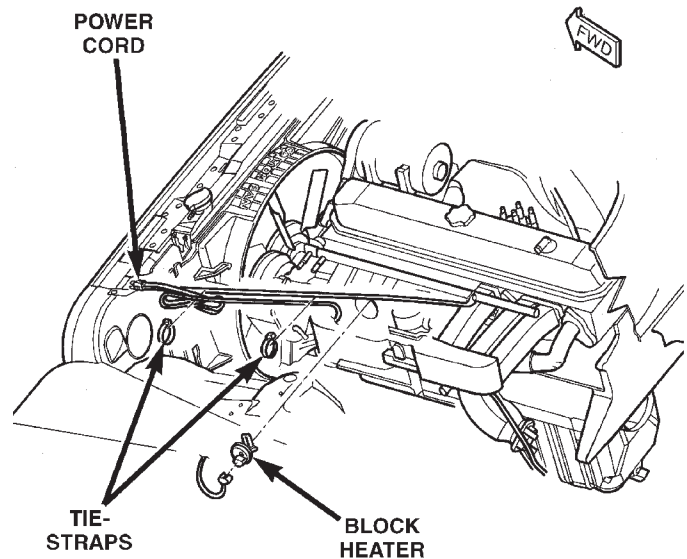
- (3) Seat block heater flush against block face. Tighten mounting screw to 4 N·m (31 in. lbs.) torque.
- (4) Fill cooling system with coolant. Pressurize system and inspect for leaks.
- (5) Plug power cord into block heater. Route cord away from moving parts, linkages and exhaust system components. Secure cord in place with tie-straps.

VISCOUS FAN



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Fig. 26 Block Heater and Cord—2.5L Engine



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**Fig. 27 Block Heater and Cord—4.0L Engine
REMOVAL**

- (1) Loosen but do not remove at this time, the four fan hub mounting nuts (Fig. 28).

REMOVAL AND INSTALLATION (Continued)

(2) Remove accessory drive belt. Refer to Belt Service in the Engine Accessory Drive Belt section of this group.

(3) Some models with certain engines may require the removal of the fan shroud to remove the viscous fan drive. The fan shroud and fan blade/viscous fan drive should be removed from the vehicle as one assembly.

(4) Remove four fan hub mounting nuts (Fig. 28) and remove fan/viscous fan drive assembly from vehicle.

(5) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

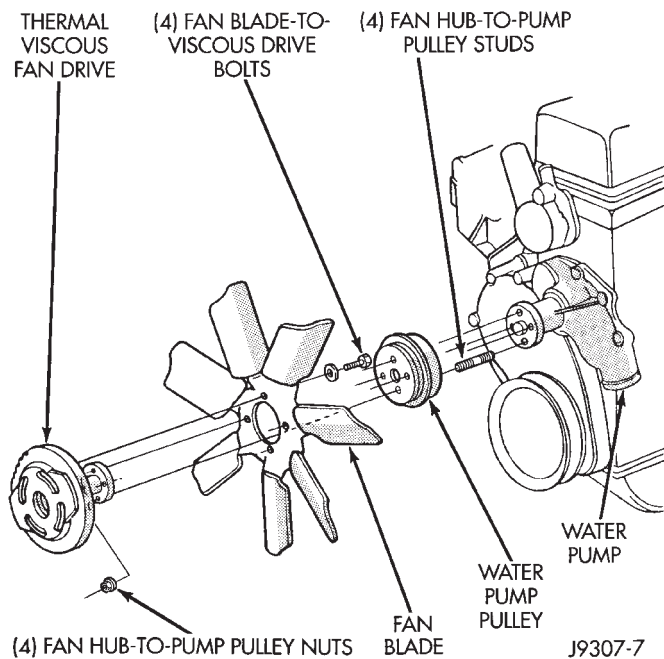


Fig. 28 Fan Mount

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

(2) Position mounting flange of fan blade/viscous fan drive assembly onto hub. Install four nuts and tighten to 24 N·m (18 ft. lbs.) torque. Tighten the first two nuts 180 degrees apart. Then tighten last two nuts.

CAUTION: When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to Serpentine Drive Belt Removal and Installation in this group for correct belt routing.

VISCOUS FAN DRIVE

Refer to Cooling System Fan for removal and installation procedures of the viscous drive unit.

Viscous Fan Drive Fluid Pump Out Requirement: After installing a **new** viscous fan drive, bring the engine speed up to approximately 2000 rpm and hold for approximately two minutes. This will ensure proper fluid distribution within the drive.

ACCESSORY DRIVE BELT

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different types of adjustment gauges for checking either a serpentine or a V-type belt. Refer to the instructions supplied with the gauge. Use the correct gauge when checking belt tension. Place gauge in the middle of the section of belt being tested (between two pulleys) to check tension. Do not allow the gauge (or gauge adapter) to contact anything but the belt.

BELT SCHEMATICS

The belt routing schematics are published from the latest information available at the time of publication. Vehicles not equipped with Power Steering have an idler pulley in place of the power steering pump pulley. **If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label.** This label is located in the engine compartment.

Refer to (Fig. 29) (Fig. 30) and (Fig. 31) for correct belt routing, or refer to Belt Routing Label located in the vehicle engine compartment.

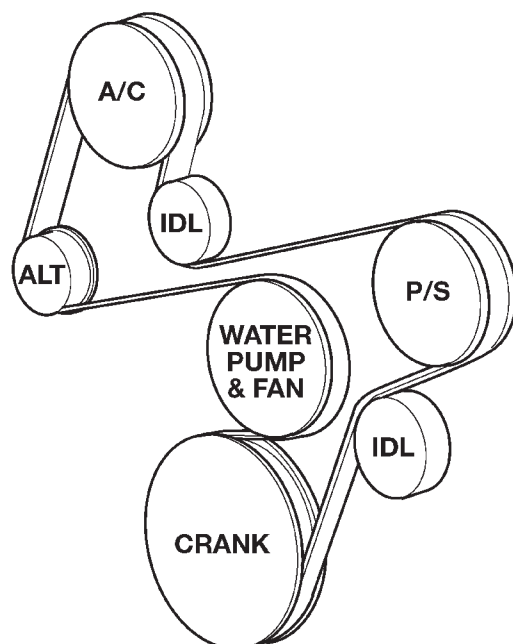
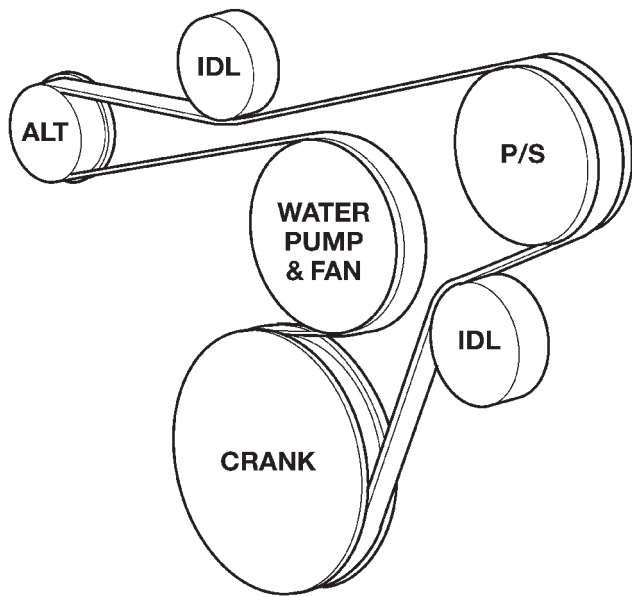


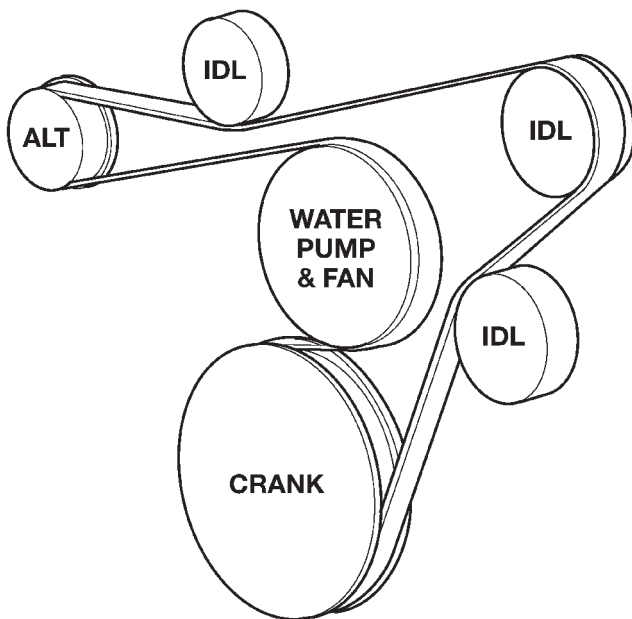
Fig. 29 2.5L/4.0L Engines—With A/C

REMOVAL AND INSTALLATION (Continued)



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Fig. 30 2.5L/4.0L Engines—Without A/C



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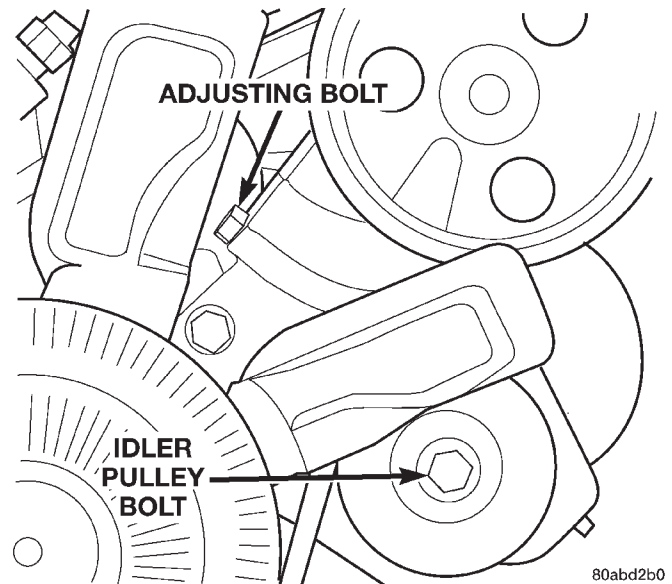
Fig. 31 2.5L/4.0L Engines—Without A/C or P/S

BELT REPLACEMENT

REMOVAL

Belt tension is adjusted at the power steering pump bracket and idler pulley assembly.

- (1) Disconnect negative battery cable from battery.
- (2) Loosen idler pulley bolt (Fig. 32).
- (3) Loosen tension adjusting bolt (Fig. 32) and remove accessory drive belt.



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Fig. 32 Power Steering Pump Bracket and Idler Pulley

INSTALLATION

- (1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to (Fig. 29) (Fig. 30) (Fig. 31) for correct belt routing.

- (2) Install new belt. Install belt tension gauge C-4162 and tighten adjustment bolt (Fig. 32) until belt tension is within specification range. Refer to the end of this group for Drive Belt Tension specifications.

- (3) Tighten idler pulley bolt and re-check belt tension. Adjust if necessary.

CLEANING AND INSPECTION

RADIATOR PRESSURE CAP

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

RADIATOR

The radiator and air conditioning fins should be cleaned when an accumulation of bugs, leaves etc. has occurred. Clean radiator fins are necessary for good heat transfer. With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

CLEANING AND INSPECTION (Continued)

COOLING SYSTEM

CAUTION: The cooling system normally operates at 97 to 124 kPa (14 to 18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

CLEANING

Drain cooling system and refill with water. Run engine with radiator 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.

FAN BLADE

The fan blades cannot be repaired. If fan is damaged, it must be replaced. Inspect fan as follows:

- (1) Remove fan blade and viscous fan drive as an assembly from the engine. Refer to Removal procedure.
- (2) Remove fan blade assembly from viscous fan drive unit (four bolts).
- (3) Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF NOT WITHIN SPECIFICATIONS.

- (4) Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

COOLING SYSTEM HOSES—INSPECTION

Inspect the hoses at regular intervals. Replace hoses that are cracked, feel brittle when squeezed, or swell excessively when the system is pressurized.

For all vehicles: In areas where specific routing clamps are not provided, be sure that hoses are positioned with sufficient clearance. Check clearance from exhaust manifolds and pipe, fan blades, drive belts and sway bars. Improperly positioned hoses can be damaged, resulting in coolant loss and engine overheating.

Ordinary worm gear type hose clamps (when equipped) can be removed with a straight screw-

driver or a hex socket. **To prevent damage to hoses or clamps, the hose clamps should be tightened to 4 N·m (34 in. lbs.) torque. Do not over tighten hose clamps.**

When performing a hose inspection, inspect the radiator lower hose for proper position and condition of the internal spring.

ADJUSTMENTS

ACCESSORY DRIVE BELT

Correct drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different types of adjustment gauges for checking either a serpentine or a V-type belt. Refer to the instructions supplied with the gauge. Use the correct gauge when checking belt tension. Place gauge in the middle of the section of belt being tested (between two pulleys) to check tension. Do not allow the gauge (or gauge adapter) to contact anything but the belt.

With the engine off (not running), visually inspect accessory drive belt for glazing, cracks or chunks missing. Also inspect pulleys for misalignment or defects. Refer to accessory drive belt diagnosis in this group for the correct belt diagnostic procedures.

ACCESSORY DRIVE BELT TENSION CHART

BELT	TENSION
**NEW SERPENTINE BELT	800-900 N (180-200 lbs.)
USED SERPENTINE BELT	623-712 N (140-160 lbs.)
**Belt is considered new if it has been used 15 minutes or less.	
Specifications for use with a belt tension gauge. Refer to operating instructions supplied with gauge.	

- (1) Disconnect battery negative cable.
- (2) Install belt tension gauge C-4162 and compare reading with those in the accessory drive belt tension specification chart.

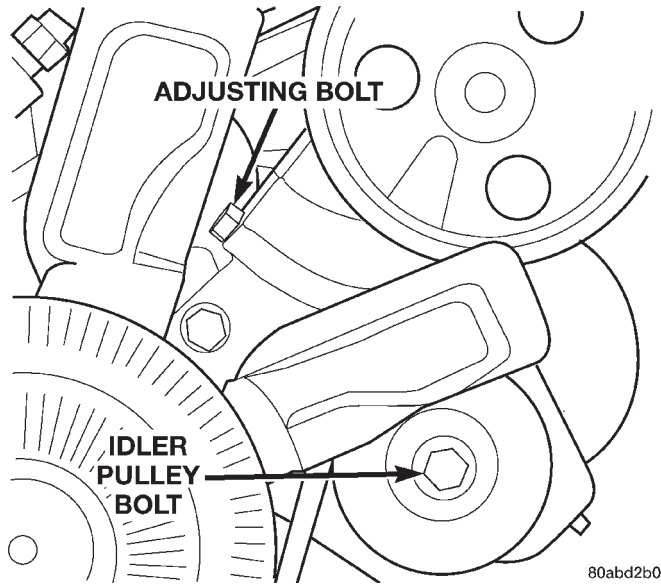
If tension is within specifications and no adjustment is needed, remove belt tension gauge C-4162 and connect battery negative cable.

If belt tension is out of specification and adjustment is necessary, continue with the following procedure.

- (3) Loosen idler pulley bolt (Fig. 33).
- (4) Adjust tension adjusting bolt (Fig. 33) until reading is within specification.

ADJUSTMENTS (Continued)

(5) Tighten idler pulley bolt and re-check belt tension. Adjust if necessary.



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Fig. 33 Power Steering Pump Bracket and Idler Pulley

SPECIFICATIONS

COOLING SYSTEM CAPACITIES

ENGINE	CAPACITY
2.5L	8.5L (9.0 Qts.)
4.0L	9.9L (10.5 Qts.)

NOTE: Cooling system capacity does not vary with or without A/C since the components are the same.

ACCESSORY DRIVE BELT TENSION

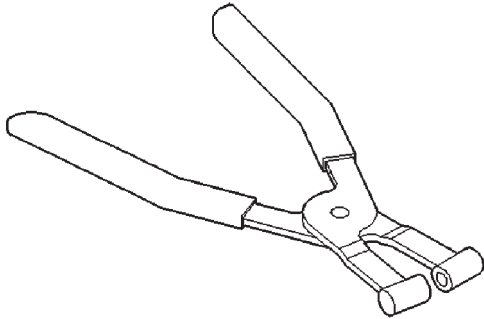
BELT	TENSION
**NEW SERPENTINE BELT	800-900 N (180-200 lbs.)
USED SERPENTINE BELT	623-712 N (140-160 lbs.)
**Belt is considered new if it has been used 15 minutes or less.	
Specifications for use with a belt tension gauge. Refer to operating instructions supplied with gauge.	

TORQUE

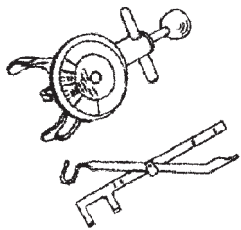
DESCRIPTION	TORQUE
Block Heater	
Fastener	4 N·m (31 in. lbs.)
Fan Blade-to-Viscous Fan Drive	
Bolts	24 N·m (18 ft. lbs.)
Fan Shroud—2.5L	
Screws	8 N·m (72 in. lbs.)
Fan Shroud—4.0L	
Screws	8 N·m (72 in. lbs.)
Generator Pivot	
Bolt	38 N·m (28 ft. lbs.)
Generator Rear Adjusting	
Bolt	27 N·m (20 ft. lbs.)
Radiator	
Bolts	8 N·m (72 in. lbs.)
Thermostat Housing	
Bolts	20 N·m (15 ft. lbs.)
Transmission Cooler Lines	
Fittings at Radiator	16 N·m (140 in. lbs.)
Pressure Fitting at Trans.	20 N·m (180 in. lbs.)
Viscous Fan Drive-to-Water Pump	
Nuts	23 N·m (200 in. lbs.)
Viscous Fan Drive to Water Pump	
Studs	11 N·m (100 in. lbs.)
Water Pump—2.5L/4.0L	
Bolts	23 N·m (200 in. lbs.)

SPECIAL TOOLS

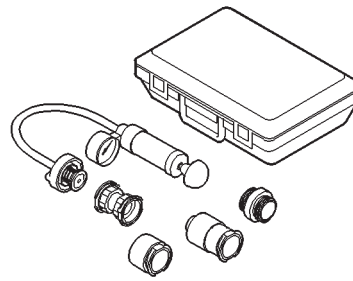
COOLING



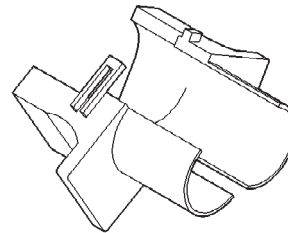
Hose Clamp Pliers—6094



Belt Tension Gauge —C-4162



Cooling System Pressure Tester—7700-A



Quick Disconnect Tool—6935

