COOLING SYSTEM

CONTENTS

	Page		Page
ACCESSORY DRIVE BELTS	23	SERVICE PROCEDURES	5
DIAGNOSIS	2	SPECIFICATIONS	28
GENERAL INFORMATION	1		

INDEX

	Page
Cooling System	1

GENERAL INFORMATION

COOLING SYSTEM

The cooling system consists of a radiator, electric cooling fan, water pump, thermostat, coolant pressure bottle, heater core, and hoses. The cooling system regulates the engine operating temperature by allowing the engine to reach normal operating temperature as quickly as possible, maintaining normal operating temperature and preventing overheating.

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

The cooling system is pressurized and designed to maintain coolant level to the top of the post located inside the coolant pressure bottle. The radiator does not have a cap. Coolant level checks and cooling system filling is performed at the coolant pressure bottle with the engine cold.

System Coolant Routing

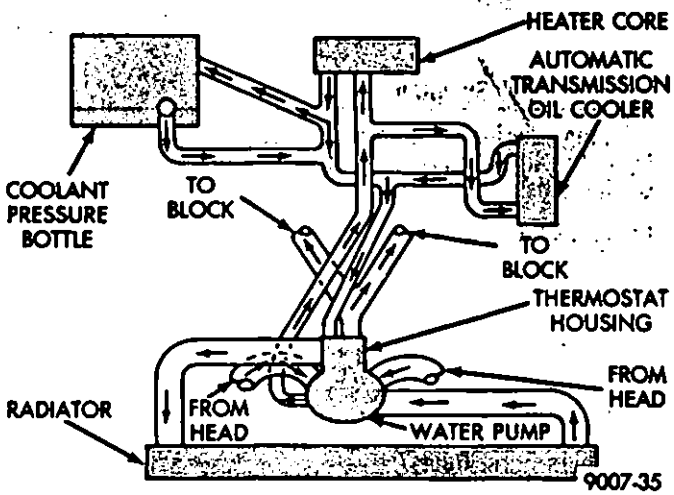


Fig. 1—Cooling System Routing—3.0L Engine with ZF Automatic Transmission

COOLING SYSTEM DIAGNOSIS

Engine Cooling System Overheat Diagnosis

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

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

Idle with A/C off when temperature gauge is at end of normal range.

2. TRAILER TOWING:

Consult owner's manual—Trailer Towing. Do not exceed limits.

3. RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on the vehicle that may affect the cooling system such as: engine adjustments (incorrect timing), slipping accessory drive belt(s), brakes (possibly dragging), changed parts (incorrect water pump—rotating in wrong direction), recorded radiator or cooling system refilling (possibly under filled or trapped air).

If investigation reveals none of the above as a cause for engine overheating complaint, refer to the following symptom and action chart.

SYMPTOM and ACTION

Symptom	Action
Blinking Engine Temperature Warning Light Or High Gauge Indication-Without Coolant Loss	Normal with temporary operation with heavy load, towing a trailer, high outdoor temperatures, and/or on a steep grade.
Coolant Loss	Improper refilling procedures can result in trapped air in the system. Subsequent operation of the pressure cap will deareate the cooling system. A low coolant level will then result in the Coolant Pressure Bottle. Add coolant. If condition persists see System Diagnosis.
Hot Vehicle (Not Engine) **Heat Damage,** **Hot Carpet, Seat,** **Hot Catalytic Converter,** **Smoke, Burnt Odor**	Check heat shielding, exhaust system, engine emission controls, ignition timing, engine misfiring.
Hot Engine **Crackling Noise** **Hot Smell** **Severe Local Hot Spots**	A moderate amount of sound from heating metal can be expected with any vehicle. However, a crackling sound from the thermostat housing, a hot smell and/or severe local hot spots on an engine can indicate blocked coolant passages, bad casting, core sand deposits and subsequent blockage, cracked cylinder block or head, or blown cylinder head gasket.
Coolant Pressure Bottle **Level Changes**	Level changes are to be expected as coolant volume fluctuates with engine temperature. During operation at higher temperatures and/or under heavy loads the coolant level in the pressure bottle may increase above the top of the post inside the bottle. Coolant level should return between the top of the post and the minimum mark on the post when the engine returns to normal operating temperature.
Cooling Fan Never Runs	Consult Inoperative Auxiliary Cooling Fan section of this group.
Cooling Fan	The Fan will run when the air conditioning compressor is engaged regardless of coolant temperature.

CONDITION	POSSIBLE CAUSE	CORRECTION
NOISE	(1) Fan contacting shroud.	(1) Reposition shroud and inspect engine mounts.
	(2) Loose water pump impeller.	(2) Replace pump.
	(3) Glazed accessory drive belt.	(3) Replace belt.
	(4) Loose accessory drive belt.	(4) Adjust accessory belt tension.
	(5) Rough surface on drive pulley.	(5) Replace pulley.
	(6) Water pump bearing worn.	(6) Remove belt to isolate. Replace pump.
	(7) Belt alignment.	(7) Check pulley alignment. Repair as necessary.
	(8) Coolant on belt.	(8) Clean belt with water.
COOLANT LOSS - BOILOVER	**Refer to Overheating Causes in addition to the following items.**	
	(1) Overfilled cooling system.	(1) Reduce coolant level to proper specification.
	(2) Quick shutdown after hard (hot) run.	(2) Allow engine to run at fast idle prior to shutdown.
	(3) Air in system resulting in occasional "burping of coolant.	(3) Purge system.
	(4) Insufficient antifreeze allowing coolant boiling point to be too low.	(4) Add antifreeze to raise boiling point.
	(5) To much antifreeze in coolant mixture.	(5) Replace coolant with 50/50 mix of antifreeze and water.
	(6) Antifreeze deteriorated because of age or contamination.	(6) Replace coolant.
	(7) Leaks due to loose hose clamps, loose nuts, bolts, drain plugs, faulty hoses, or defective radiator.	(7) Pressure test system to locate source of leak(s), then repair as necessary.
	(8) Faulty head gasket.	(8) Replace head gasket.
	(9) Cracked head, manifold, or block.	(9) Replace as necessary.
	(10) Faulty pressure cap on pressure bottle.	(10) Replace cap.
	(11) Restricted radiator core.	(11) Remove restriction.
	(12) Faulty thermostat.	(12) Replace thermostat.
COOLANT ENTRY INTO CRANKCASE OR CYLINDER(S)	(1) Low cylinder head bolt torque.	(1) Replace gasket retorque head.
	(2) Faulty head gasket.	(2) Replace head gasket.
	(3) Crack in head, manifold or block.	(3) Replace as necessary.
NO COOLANT FLOW THROUGH HEATER CORE	(1) Restricted return inlet in water pump.	(1) Remove restriction.
	(2) Heater hose collapsed or restricted.	(2) Remove restriction or replace hose.
	(3) Restricted heater core.	(3) Remove restriction or replace core.
	(4) Restricted outlet in thermostat housing.	(4) Remove flash or restriction.
	(5) Intake manifold bypass hole in cylinder head restricted.	(5) Remove restriction.

CONDITION	POSSIBLE CAUSE	CORRECTION
HIGH TEMPERATURE GAUGE INDICATION	(1) Coolant level low.	(1) Replenish coolant.
	(2) Accessory drive belt loose.	(2) Adjust accessory drive belt tension.
	(3) Radiator hose(s) collapsed.	(3) Replace hose(s).
	(4) Radiator airflow blocked.	(4) Remove restriction (bug screen fog lamps, etc.).
	(5) Faulty coolant pressure bottle cap.	(5) Replace coolant pressure bottle cap.
	(6) Air trapped in cooling system.	(6) Purge air.
	(7) Heavy traffic driving.	(7) Leave traffic. Stop vehicle. Turn A/C off. Allow engine to cool.
	(8) Incorrect cooling system component(s) installed.	(8) Install proper component(s).
	(9) Faulty thermostat.	(9) Replace thermostat.
	(10) Water pump shaft broken or impeller loose.	(10) Replace water pump.
	(11) Radiator tubes clogged.	(11) Flush radiator.
	(12) Cooling system clogged.	(12) Flush system.
	(13) Casting flash in cooling passages.	(13) Repair or replace as necessary. Flash may be visible by removing cooling system components or removing core plugs.
	(14) Brakes dragging.	(14) Repair brakes.
	(15) Excessive engine friction.	(15) Repair engine.
	(16) Antifreeze concentration over 50%.	(16) Lower antifreeze concentration percentage to 50%.
	(17) Faulty gauge or sending unit.	(17) Repair or replace component.
	(18) Loss of coolant flow caused by leakage or foaming.	(18) Repair or replace leaking component, replace coolant.
	(19) Faulty cooling fan operation.	(19) Check cooling fan operation.
LOW TEMPERATURE INDICATION	(1) Thermostat stuck open.	(1) Repair or replace faulty component.
	(2) Faulty gauge or sending unit.	(2) Repair or replace faulty component.

SERVICE PROCEDURES

INDEX

	Page
Water Pumps	5
Engine Thermostat	8
Coolant	10
Cooling System Drain, clean Flush and Refill	11
Draining Coolant System	11
Refilling Cooling System	12
Cleaning and Reverse Flushing	11
Testing Cooling System for Leaks	14
Coolant Pressure Bottle System	14
Pressure Bottle Cap	15
Pressure Testing Coolant Pressure Bottle Cap	15
Radiators	16
Cooling System Hoses and Clamps	17
Electric Cooling Fan	18
Automatic Transmission Oil Coolers	20

WATER PUMP

A centrifugal water pump circulates the coolant through the water jackets, passages, radiator core, cooling system hoses and heater core (Fig. 1). The pump is driven from the engine crankshaft by a serpentine drive belt.

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

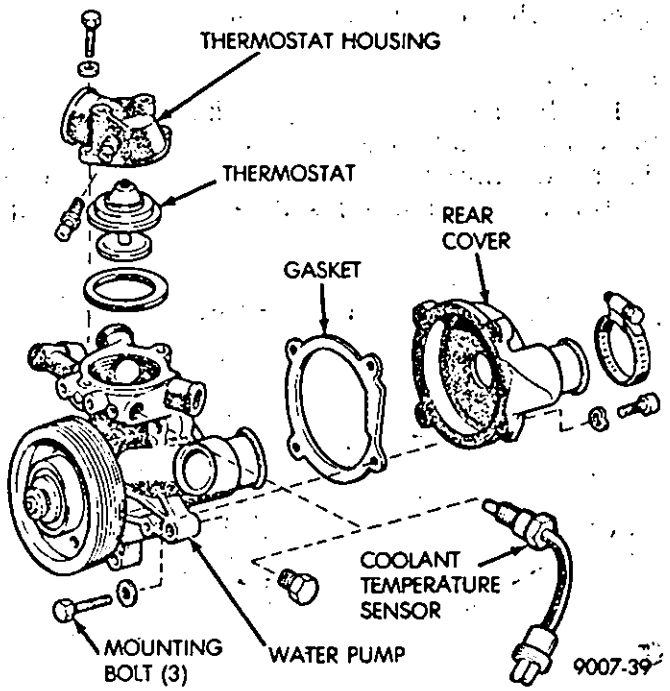


Fig. 1—Water Pump—3.0L Engine

Removal—3.0L Engine

CAUTION: When servicing the coolant system, it is essential that coolant does not drip onto the accessory drive belt and/or pulleys. Protect the belt with clean, dry shop towels before servicing the cooling system. If coolant contact belt or pulleys, flush them with clean water.

If the water pump pulley is also being replaced (or reused), remove the pulley with the old water pump mounted to the engine and install the pulley with the replacement water pump mounted to the engine. Install the lower mounting bolt before installing the replacement pulley. The lower bolt cannot be installed with the pulley pressed onto the water pump shaft.

(1) Disconnect battery negative cable from battery.

(2) Loosen accessory drive belt. Refer to Accessory Drive Belt section of this group.

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

(3) Attach one end of a 6.35 mm (¼ in) ID hose that is approximately 914 mm (36 in) long, to radiator drain (Fig. 2). Place the other end of the hose in a clean container.

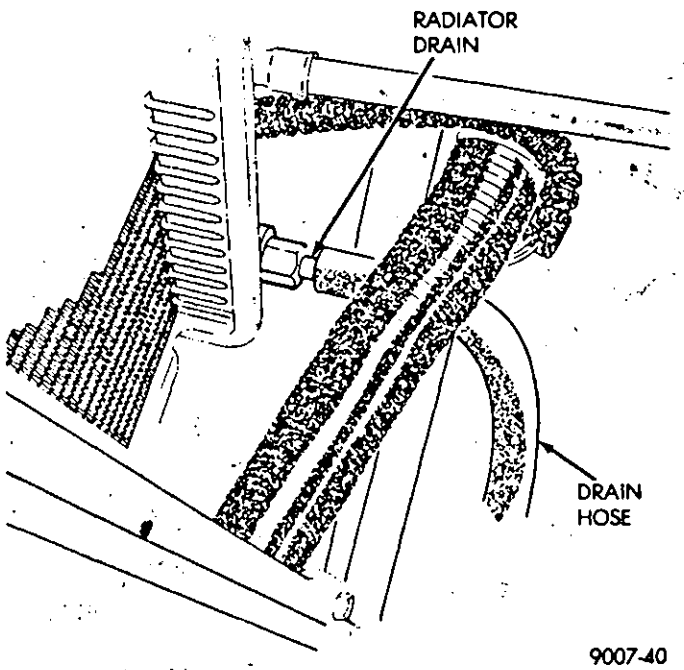


Fig. 2—Radiator Drain and Drain Hose

(4) Open radiator drain.
(5) Remove coolant pressure bottle cap (Fig. 3) and let radiator drain.
(6) Remove engine cover.
(7) Remove spark plug wire retainer from top of thermostat housing (Fig. 4).
(8) Remove front damper mounting bracket nuts. Push bracket towards radiator but do not contact radiator fins.

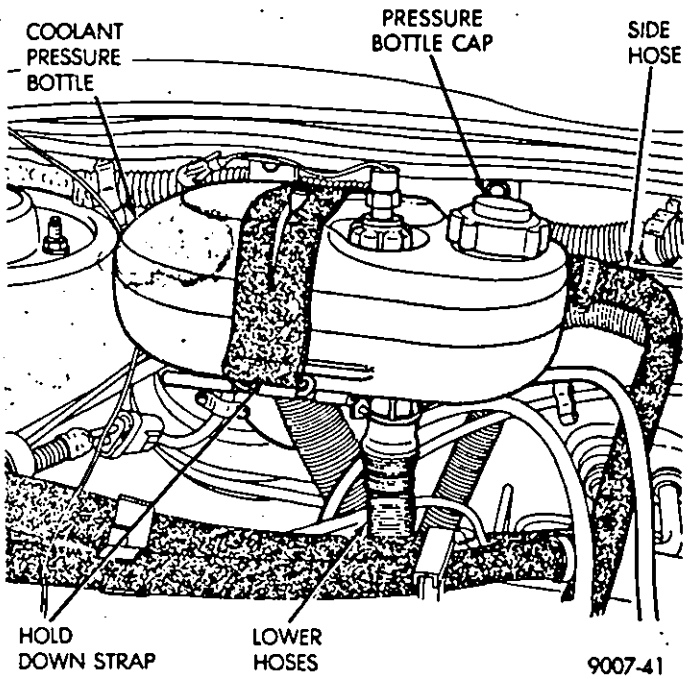


Fig. 3—Coolant pressure bottle Cap

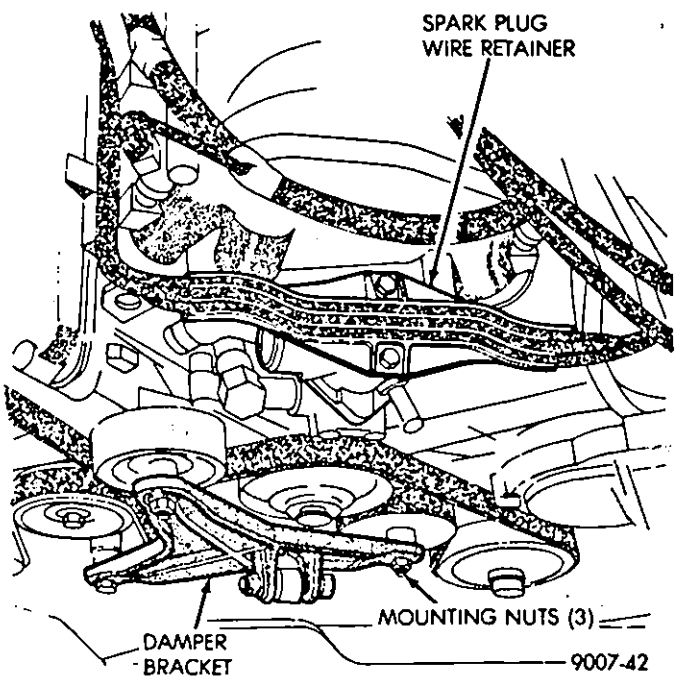


Fig. 4—Spark Plug Wire Retainer and Engine Front Damper Bracket

(9) Position accessory drive belt away from water pump.
(10) Remove radiator upper and lower hoses from water pump.
(11) Disconnect coolant temperature sensor wire connector from harness (Fig. 5).
(12) Loosen clamps securing cylinder head to water pump hoses at cylinder heads. Do not remove the hoses at this time.
(13) Loosen clamps securing heater hoses and Y-tube connecting hose at rear of water pump (Fig. 6).
(14) Lightly tap heater tube locking sleeve out of elbow connector of the water pump (Fig. 7).
(15) Remove the water pump upper mounting bolts (Fig. 8).
(16) Using an open end wrench, remove water pump lower mounting bolt (Fig. 8).
Grasp the bottom of water pump pulley, pull out and up to remove water pump.
If necessary, replace cylinder head hoses, coolant temperature sensor, thermostat and housing, and water pump pulley. If a new pump is installed, attach replacement hoses, thermostat and housing, coolant temperature sensor and water pump pulley to new water pump.

Installation

(1) Tilt top of water pump back and start pump to cylinder head hoses over hose necks on cylinder heads. Line up heater hose and Y-tube connecting hose with nipples at rear of water pump.

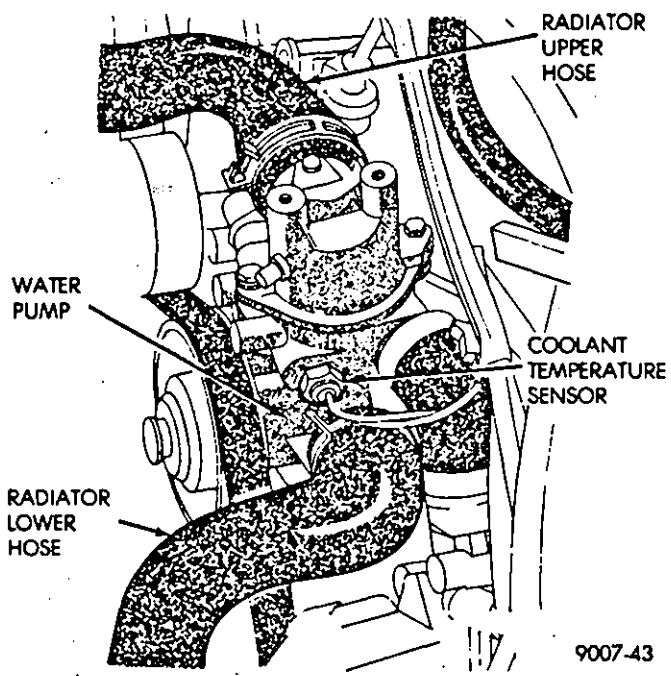


Fig. 5—Radiator Hoses and Coolant Temperature Sensor

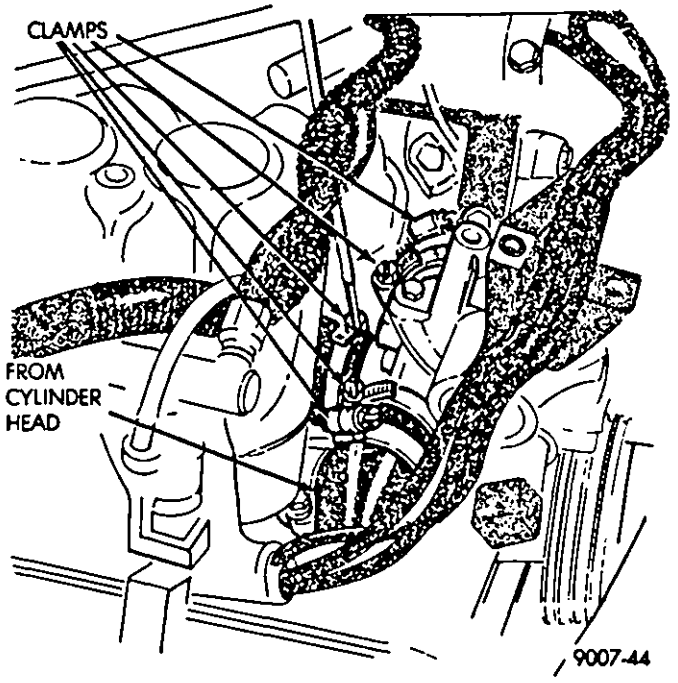


Fig. 6—Cylinder Head and Y-tube Hoses

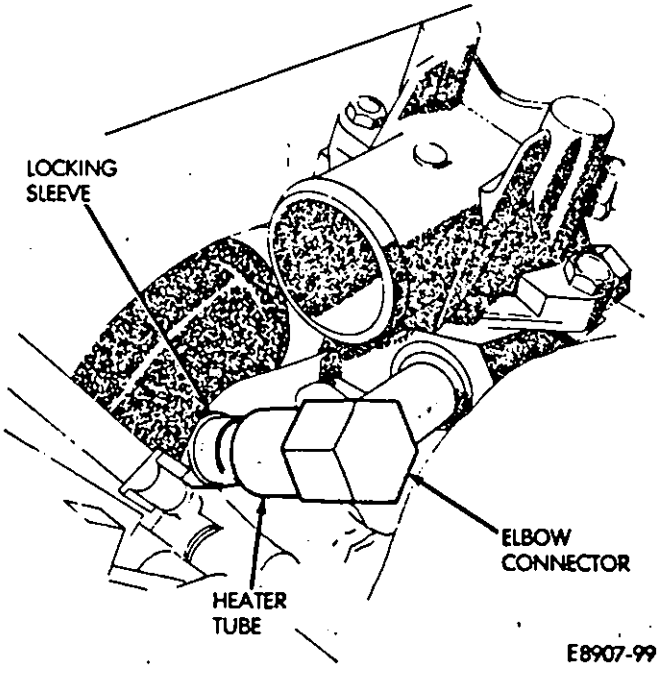


Fig. 7—Heater Tube Locking Sleeve

Align heater tube and lock ring with elbow connector.

(2) Push water pump down and back. Ensure that all hoses are correctly installed and not curled under.

(3) The heater tube elbow connector has O-rings inside that seal the heater tube. The tube must be pushed into the elbow until it stops to ensure complete engagement of the tube and O-rings.

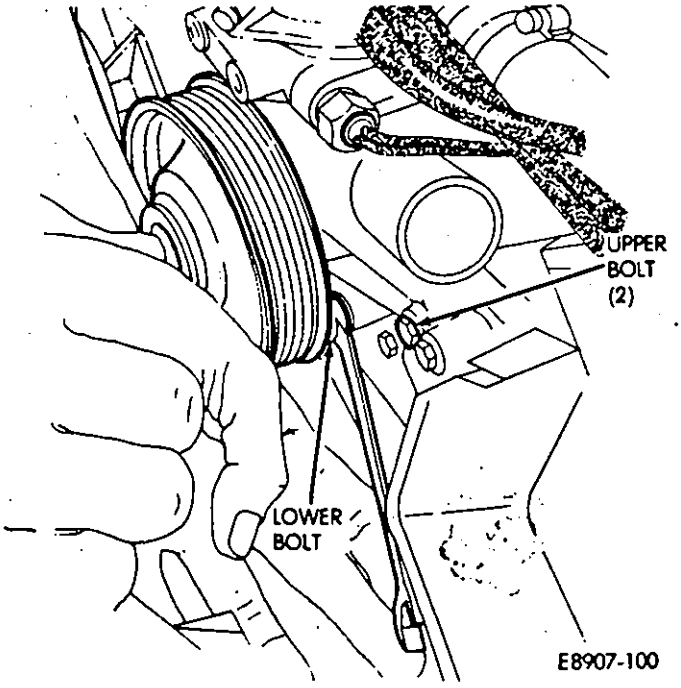


Fig. 8—Water Pump Lower Mounting Bolt Removal/Installation

With the tube completely installed into the elbow, push the lock ring up into the elbow as far as it will travel. The heater tube to elbow connection will leak if not properly connected.

(4) Tighten water pump mounting bolts to 17.5 N·m (13 ft-lbs) torque.

(5) Tighten all hose clamps.

CAUTION: When installing the accessory drive belt, the belt MUST be routed correctly. Incorrect belt routing can cause the water pump to rotate in the opposite direction resulting in engine overheating.

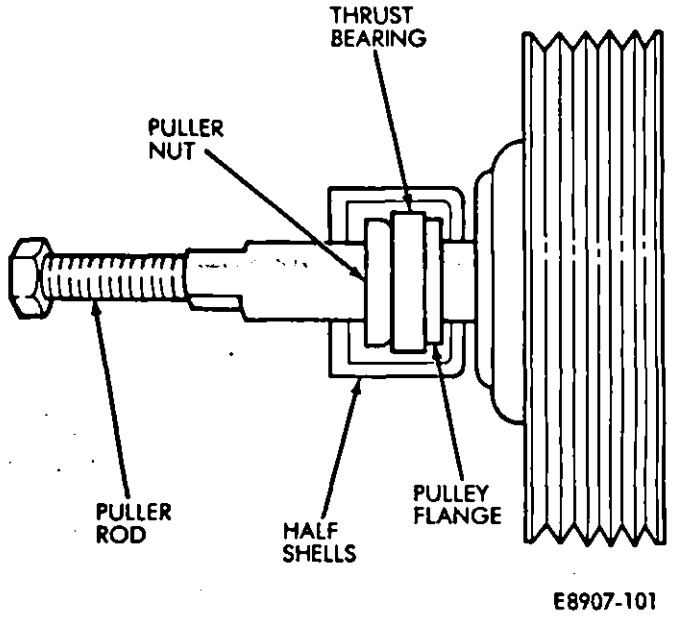


Fig. 9—Water Pump Puller Installation

(6) Install the accessory drive belt. Refer to Accessory Drive Belt section of this group for correct belt routing and tensioning procedures.
(7) Close radiator drain. Remove drain hose.
(8) Fill and bleed cooling system. Refer to Cooling System Filling and Bleeding in this section.

Water Pump Pulley Removal—3.0L Engine

This procedure is performed with the water pump mounted to the engine.
(1) Thread TOOL 6160 water pump pulley puller/installer bolt into water pump shaft with the thrust bearing between the pulley and puller nut (Fig. 9). Thread the puller bolt in until it bottoms out. Then back off the bolt one turn.
(2) Install the half shells over the flange on the pulley and the puller nut and thrust bearing.
(3) Install puller sleeve over half shells (Fig. 10).
(4) Hold puller bolt in place and turn puller nut counterclockwise to remove water pump pulley.

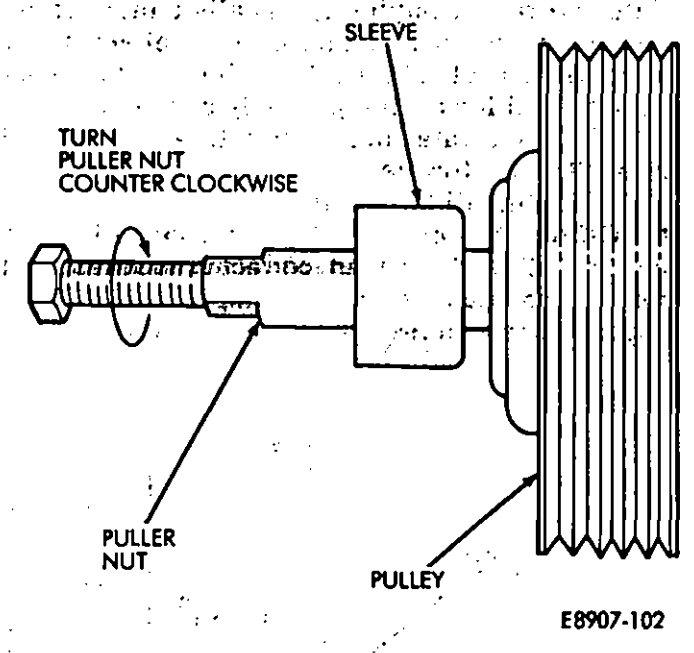


Fig. 10—Water Pump Pulley Removal

Water Pump Pulley Installation—3.0L Engine

(1) Place thrust bearing between puller nut and installation spacer (Fig. 11). **Make sure that shoulder of installation spacer pilots inside water pump pulley hub. When the shoulder stops against the end of water pump shaft the pulley is installed to the correct position on the water pump shaft.**
(2) Thread puller/installer bolt into water pump shaft until it stops. Back off bolt one turn.
(3) Holding puller/installer bolt in place, turn puller nut clockwise until slack between nut,

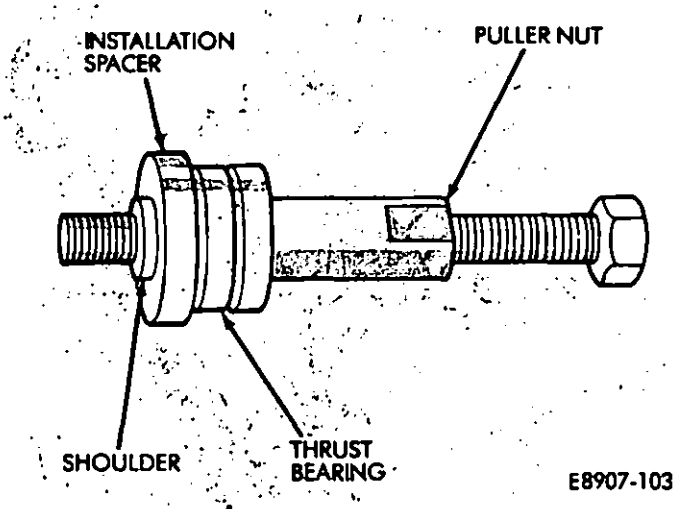


Fig. 11—Water Pump Pulley Installer

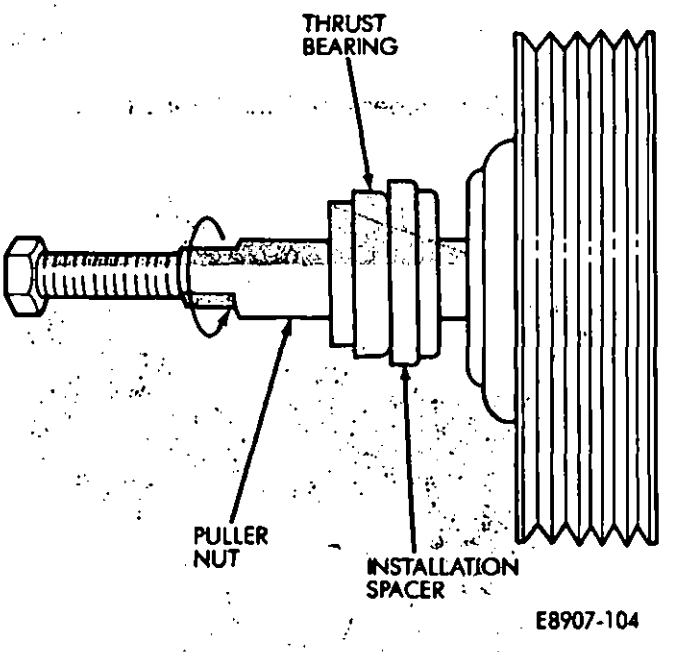


Fig. 12—Water Pump Pulley Installation

thrust bearing, spacer, and pulley is taken up (Fig. 12). **Ensure that water pump pulley is piloted onto water pump shaft and that shoulder of installation spacer is piloted inside of water pump pulley hub.**
(4) Turn puller nut in clockwise direction until it stops. Remove tool.

ENGINE THERMOSTAT

Description and Operation

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. The thermostat used in 3.0L engines is closed below 88°C

(190°F). Above these temperatures, coolant is allowed to flow to the radiator. This provides quick engine warmup and overall temperature control. 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 longer engine warmup time, unreliable warmup performance, increased exhaust emissions, and crankcase condensation that can result in sludge formation.

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

On 3.0L engines, the words TO RAD are stamped onto the top of the thermostat for installation reference. Both thermostats are equipped with an air bleed valve. The thermostat is installed with the air bleed valve positioned in a certain position. Refer to Thermostat Installation in this section.

Thermostat Removal—3.0L Engine

When servicing the thermostat, do not allow coolant to drip onto the accessory drive belt and/or accessory drive pulleys. If coolant does contact the drive belt or pulleys, flush them with clean water.

The thermostat is located at the front of the engine behind the accessory drive belt (Fig. 13).

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

Do not waste reusable coolant. If the solution is clean and being drained only to service the cooling system, drain the coolant into a clean container for reuse.

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

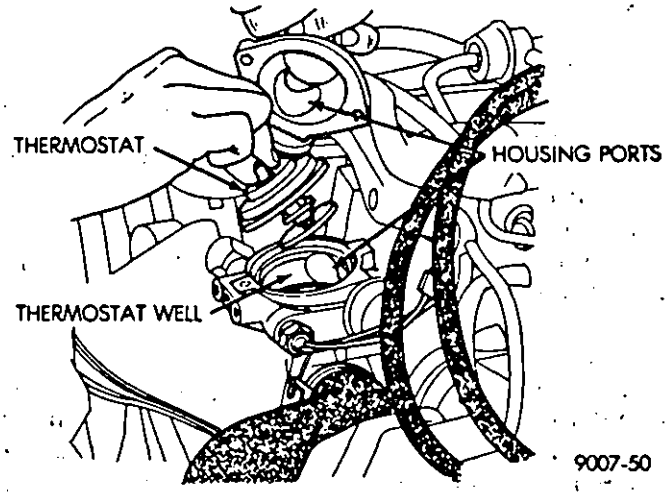


Fig. 13—Thermostat Housing 3.0L

(2) Disconnect the coolant temperature sensor wire connector from the sensor.

(3) Remove the spark plug wire holder from the top of the thermostat housing. Place shop towels on belts and pulleys.

(4) Remove thermostat housing (Leave upper radiator hose connected.)

(5) Remove thermostat.

(6) Check thermostat well and housing ports for blockage. Repair as necessary. (Fig. 13)

(7) Clean gasket surfaces.

Thermostat Testing

Remove the thermostat. Refer to Thermostat Removal. Insert a 0.076mm (0.003-in) feeler gauge, with a wire or string attached, between the thermostat valve and seat (Fig. 14).

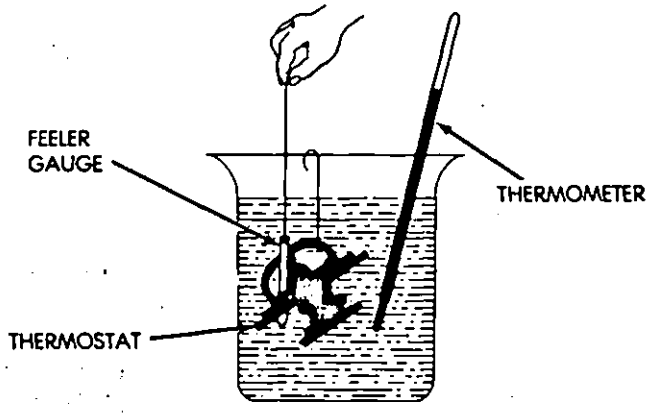
WARNING: ANTIFREEZE IS POISONOUS. KEEP OUT OF THE REACH OF CHILDREN.

Submerge the thermostat in a container containing a 50/50 water/antifreeze mixture and suspend it so that it does not touch the sides or the bottom of the container (Fig. 14).

Suspend a thermometer in the antifreeze so that it does not contact the container or thermostat.

WARNING: DO NOT BREATHE THE VAPOR. ENSURE THAT THE TEST AREA IS PROPERLY VENTILATED.

Heat the antifreeze. Apply a slight tension on the feeler gauge while the antifreeze is heated. When the valve opens the feeler gauge will slip free from the valve. Note the temperature and refer to specifications chart (Fig. 14). The opening and fully open temperatures listed in the



Must Be Open 0.076mm (0.003 inch)	3.0L-88°C (190°F)
Must Be Fully Open	3.0L-101°C (214°F)

9007-51

Fig. 14—Thermostat Calibrations

specifications chart are nominal specifications. If defective, replace the thermostat.

Install the thermostat. Refer to Thermostat Installation.

Installation

The thermostat has an air bleed valve. When installing the thermostat, position the valve to the back of the thermostat well. This is the highest point of the well which is where air will settle in.

(1) Install the thermostat with the air bleed valve to the rear of the thermostat well and the flat disk to the bottom of the thermostat well.

(2) Install the thermostat housing. Tighten the mounting bolts to 12 N·m (9 ft-lbs). (Fig. 13)

(3) Close radiator drain and remove hose.

(4) Fill and bleed the cooling system (see Engine Cooling System Section—Filling and Bleeding Procedures).

COOLANT

Coolant flows through the engine and absorbs heat produced during engine operation. The coolant carries the heat to the radiator and heater core where 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 at the transmission oil cooler.

Coolant Performance

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

Pure Water-For the purpose of heat transfer only, water is able to absorb more heat than a mixture of water and ethylene-glycol. But, water freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve, without water they form deposits in the system which act as insulation causing the temperature to rise. In addition, 100 percent ethylene-glycol freezes at –22°C (–8°F).

50/50 Ethylene-Glycol and Water-A 50/50 mixture by volume is recommended as it provides protection against freezing to –37°C (–35°F). The antifreeze concentration **MUST ALWAYS** be a minimum of 44 percent, year-round in all climates. If the 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 overheat because the specific heat of antifreeze is lower than that of water.

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

Coolant Selection-Additives

Maintain the coolant at the specified level with a mixture of ethylene glycol-based antifreeze (containing ALUGARD 340-2™) and low mineral content water.

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

Coolant Service

It is recommended that the cooling system be drained and flushed at 48,000 kilometers (30,000 miles) or 30 months, which ever comes first and, thereafter, at the start of every winter season.

Coolant Level Check

Check the coolant level at the coolant pressure bottle with engine cold. To check coolant level, slowly remove the coolant pressure bottle cap (engine must be cold) and look down into the bottle. The coolant level is correct when it is at the top of the post inside the coolant pressure bottle.

Adding Additional Coolant-Routine

WARNING: DO NOT REMOVE COOLANT PRESSURE BOTTLE CAP WHEN THE ENGINE IS HOT. SERIOUS PERSONAL INJURY CAN RESULT FROM HOT COOLANT.

Only add coolant when the engine is cold. Remove the coolant pressure bottle cap and add coolant until the level is at the top of the post inside the bottle.

Low Coolant Level-Aeration

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

Deaeration

As the engine operates air trapped in the system gathers in the coolant pressure bottle and is released to atmosphere through the pressure valve in the bottle cap when system pressure reaches 110-124 kPa (16-18 psi). The air is replaced with coolant from the coolant pressure

bottle. The radiator does not have a pressure cap. The cap on the coolant pressure bottle is the only cap used in the system.

COOLING SYSTEM DRAIN, CLEAN FLUSH AND REFILL

Draining Cooling System

When servicing the cooling system, it is essential that coolant does not drip onto the accessory drive belt and/or pulleys. Protect the belt with shop towels before working on the cooling system. If coolant contacts the belt or pulley, flush them with clean water.

(1) Attach one end of a 6.35 mm (1/4 in) ID hose, that is approximately 914 mm (36 in) long, to radiator drain. Place the other end of the hose in a clean container with a capacity of at least three gallons (Fig. 15).

(2) Open radiator drain.

(3) Remove coolant pressure bottle cap and let radiator drain (Fig. 16).

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

(4) ONCE THE ENGINE HAS COOLED DOWN, remove the cylinder block drain plug(s). On 3.0L engines, remove the drain plug located behind and below each exhaust manifold (Fig. 17 and Fig. 18).

(5) Drain engine.

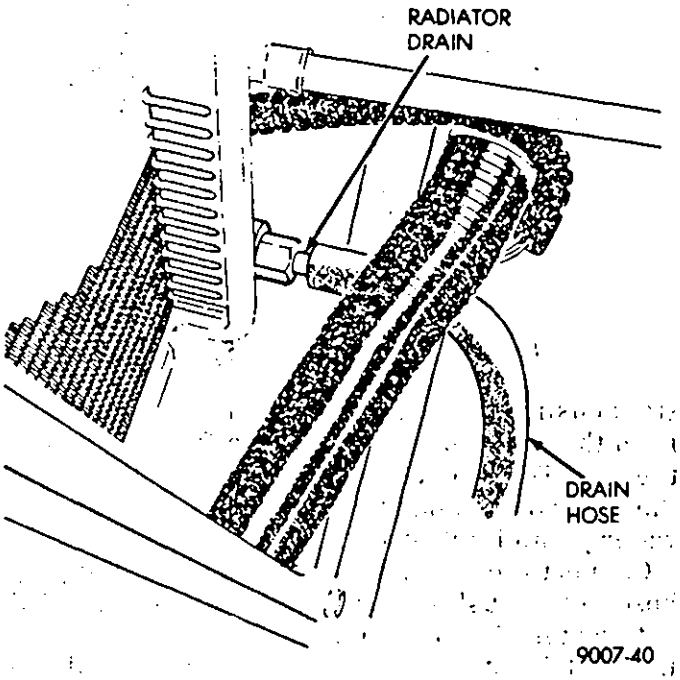


Fig. 15—Radiator Drain and Drain Hose

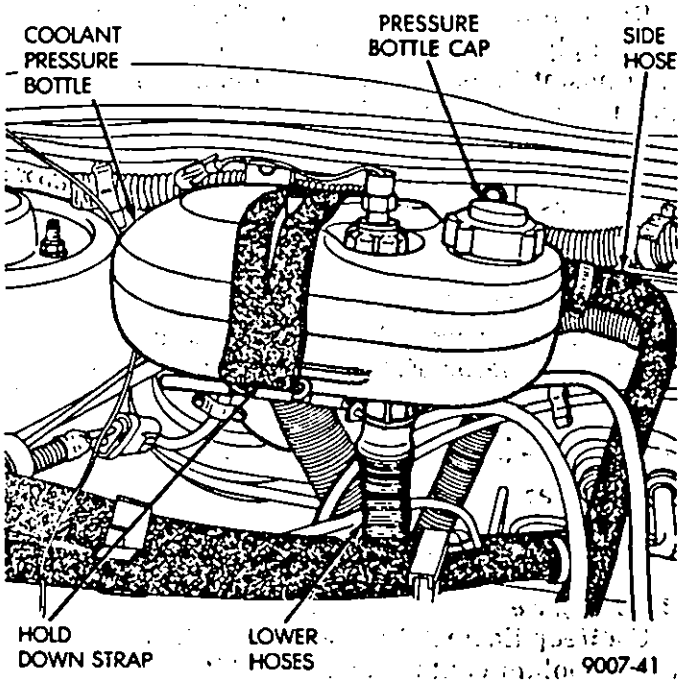


Fig. 16—Coolant Pressure Bottle Cap

Cooling System Cleaning, Reverse Flushing

CAUTION: The cooling system normally operates at 108-140 kPa (16-20 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Cleaning

Drain cooling system and refill with water. Refer to Filling and Bleeding sections of this group. Run engine with pressure bottle cap installed

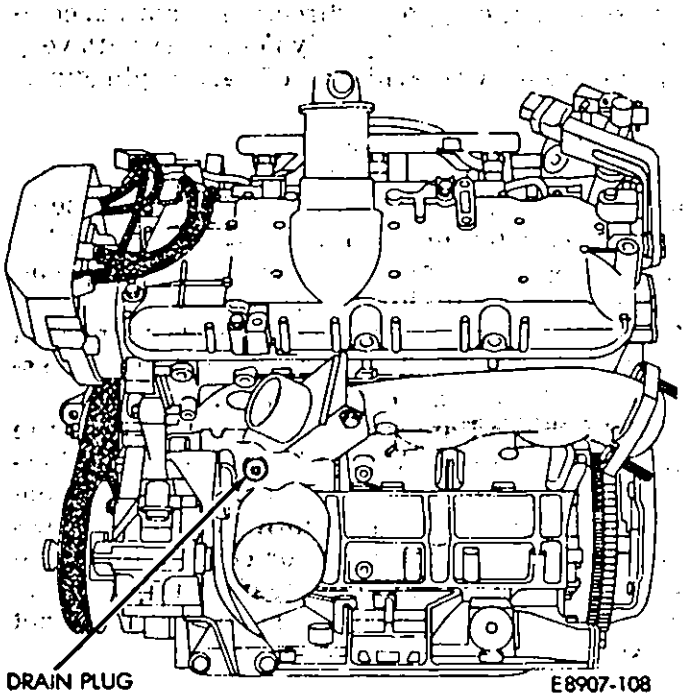


Fig. 17—3.0L Engine Cylinder Block Drain Plug—Left Side

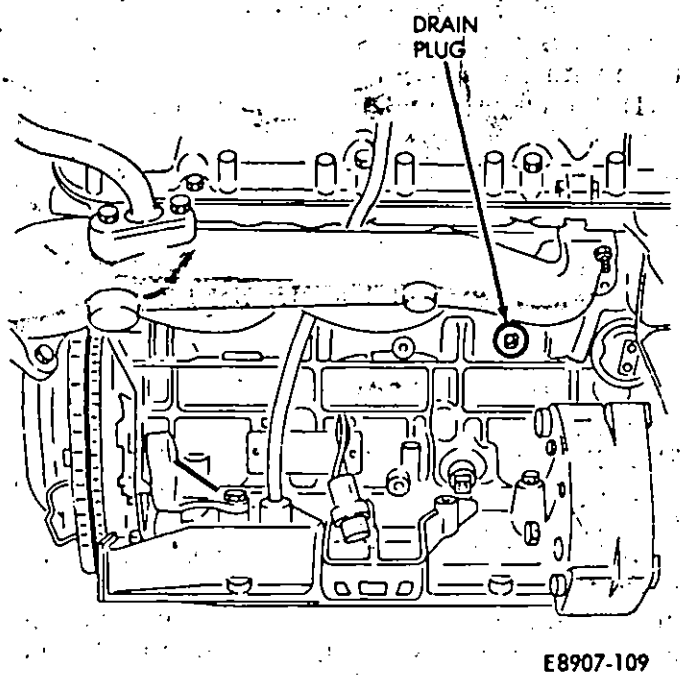


Fig. 18—3.0L Engine Cylinder BLock Drain Plug—Right Side

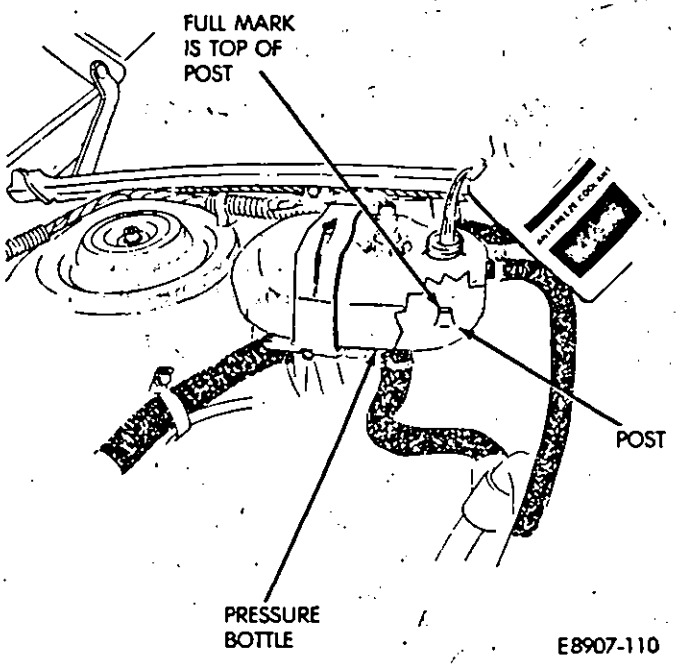


Fig. 19—Filling Cooling System

until radiator upper hose is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine, and drain system. Repeat until water drains clean.

Reverse Flushing

Reverse flushing of the cooling system is forcing of water through the cooling system, using air pressure, in the opposite direction of normal coolant flow. This 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 108-140 kPa (16-20 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When the radiator is filled, apply air in short blasts, allowing the radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear the radiator cooling tube passages. Have the radiator cleaned more extensively by a radiator repair shop if it does not flush clean.

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 and attach a leadaway 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 is fill between air blasts. Continue until clean water flows through the leadaway hose.

Remove the leadaway hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing cover or housing and install the thermostat. Install the thermostat housing cover or housing with a replacement gasket. Refer to Thermostat Replacement. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture.

Chemical Cleaning

In some instances, the use of a radiator cleaner (Mopar Radiator Kleen, or equivalent) before flushing will soften scale and other deposits and aid the flushing operation.

CAUTION: Follow manufacturers instructions when cleaning radiator.

Refilling Cooling System

3.0L Engine

Use Jeep/Eagle All Season Coolant, or an equivalent coolant containing ALUGARD 340-2™.

(1) Close radiator drain.

(2) Remove drain hose.

CAUTION: The gaskets (copper colored washer) on the V-6 cylinder block drain plugs MUST be replaced each time the drain plugs are removed.

(3) Install the cylinder block drain plugs with new gaskets.

WARNING: WHEN INSTALLING DRAIN HOSE TO AIR BLEED VALVE ON THERMOSTAT HOUSING, ROUTE HOSE AWAY FROM ACCESSORY DRIVE BELT, ACCESSORY DRIVE PULLEYS, AND ELECTRIC COOLING FAN.

(4) Attach one end of a 6.35 mm (.250 in) ID hose that is approximately 1219 mm (48 in) long, to the bleed valve on the thermostat housing (Fig. 20). Route the hose away from the accessory drive belt, drive pulleys and electric cooling fan. Place the other end of hose into a clean container. The hose will prevent coolant from contacting the accessory drive belt when bleeding the system during the refilling operation.

(5) Open bleed valve.

(6) Slowly fill coolant pressure bottle (Fig. 19) until a steady stream of coolant flows from hose attached to the bleed valve.

(7) Close bleed valve and continue filling to the full mark of the coolant pressure bottle. The full mark is the top of the post inside the bottle (Fig. 19).

(8) Install cap tightly on coolant pressure bottle.

(9) Remove hose from bleed valve.

(10) Start and run engine until the upper radiator hose is warm to the touch.

(11) Turn engine off.

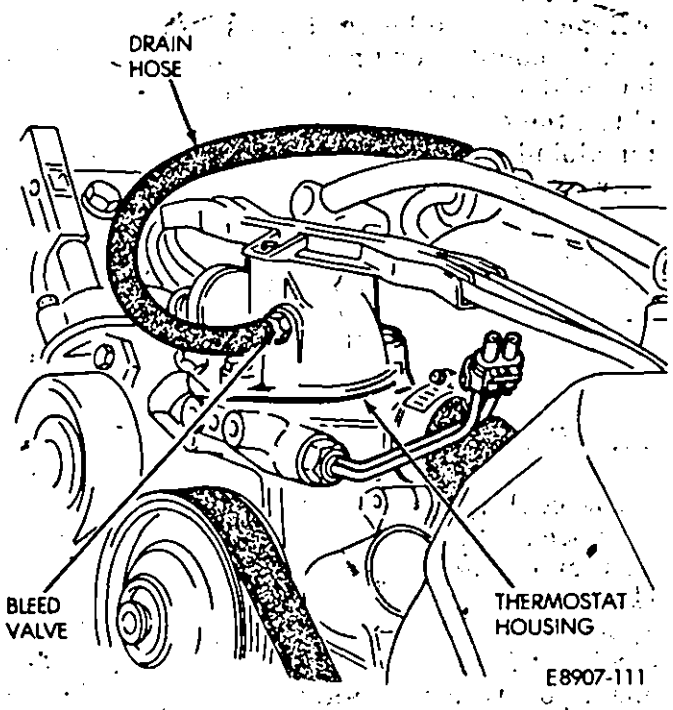


Fig. 20—Air Bleed Valve on Thermostat Housing

(12) Reattach drain hose to bleed valve on thermostat housing. **Route hose away from the accessory drive belt, accessory drive pulleys, and electric cooling fan.**

(13) Open bleed valve until a steady stream of coolant flows from the hose.

(14) Close bleed valve and remove hose.

(15) Ensure that coolant level in coolant pressure bottle is at or slightly above the full mark (at the top of the post inside the coolant pressure bottle). **The full mark on the coolant pressure bottle is the correct coolant level for a cold engine. A hot engine will normally have a coolant level higher than the full mark.**

Cooling System Bleeding Procedure—With 3.0L Engine

This procedure should be followed after any cooling system component has been replaced or removed and installed.

It is essential that coolant does not contact the accessory drive belt or pulleys. If coolant contacts the accessory drive belt or drive pulleys, flush them with clean water.

WARNING: WHEN INSTALLING DRAIN HOSE TO AIR BLEED VALVE ON THERMOSTAT HOUSING, ROUTE HOSE AWAY FROM ACCESSORY DRIVE BELT, ACCESSORY DRIVE PULLEYS, AND ELECTRIC COOLING FAN.

(1) Attach one end of a 6.35 mm (.250 in) ID hose that is approximately 1219 mm (48 in) long, to the bleed valve on the thermostat housing (Fig. 20). Route the hose away from the accessory drive belt and pulleys. Place the other end of the hose into a clean container. The hose will prevent coolant from contacting the accessory drive belt and drive pulleys.

(2) Open bleed valve.

(3) Slowly fill coolant pressure bottle until a steady stream of coolant flows from hose attached to the bleed valve.

(4) Close bleed valve and continue filling to the full mark of the coolant pressure bottle. The full mark is the top of the post inside the bottle.

(5) Install cap tightly on coolant pressure bottle.

(6) Remove hose from bleed valve.

(7) Start and run engine until the upper radiator hose is warm to the touch.

(8) Turn engine off.

(9) Reattach drain hose to bleed valve on thermostat housing. **Route hose away from the accessory drive belt, accessory drive pulleys, and electric cooling fan.**

(10) Open bleed valve until a steady stream of coolant flows from the hose.

(11) Close bleed valve and remove hose.

(12) Ensure that coolant pressure bottle is at or slightly above the full mark (at the top of the post inside the coolant pressure bottle). **The full mark on the coolant pressure bottle is the correct coolant level for a cold engine. A hot engine will normally have a coolant level higher than the full mark.**

TESTING COOLING SYSTEM FOR LEAKS

Ultraviolet Light Method

All vehicles 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, pore one ounce of additive into the cooling system. The additive is available through the parts department. Start and operate the engine until the radiator upper hose is warm to the touch. Aim the black light at the components to be checked. If leaks are present, the black light will cause the additive to glow a bright green color (Fig. 1).

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist.

Pressure Tester Method

(1) Remove cap from pressure bottle and install pressure tester adapter in place.

(2) Connect pressure tester to adapter (Fig. 2).

(3) Start and operate engine until radiator upper hose is warm.

(4) Stop engine.

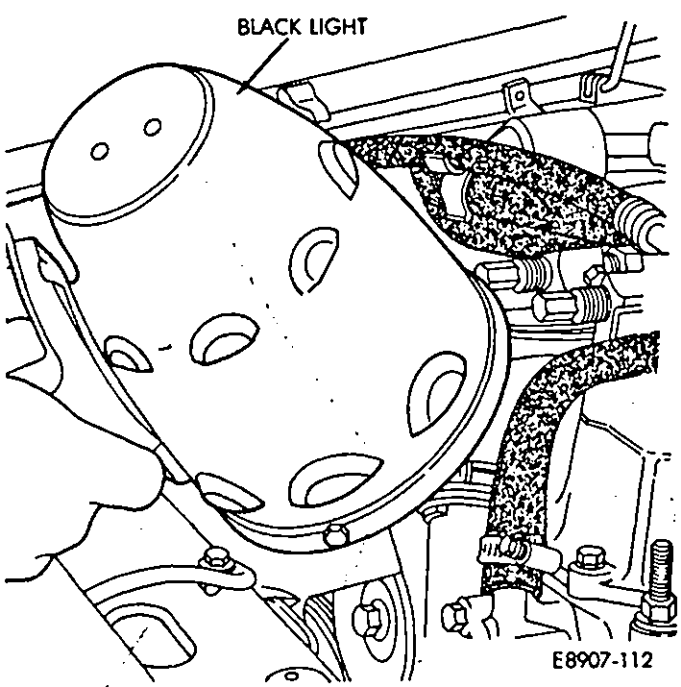


Fig. 1—Leak Detection Using Ultraviolet Light

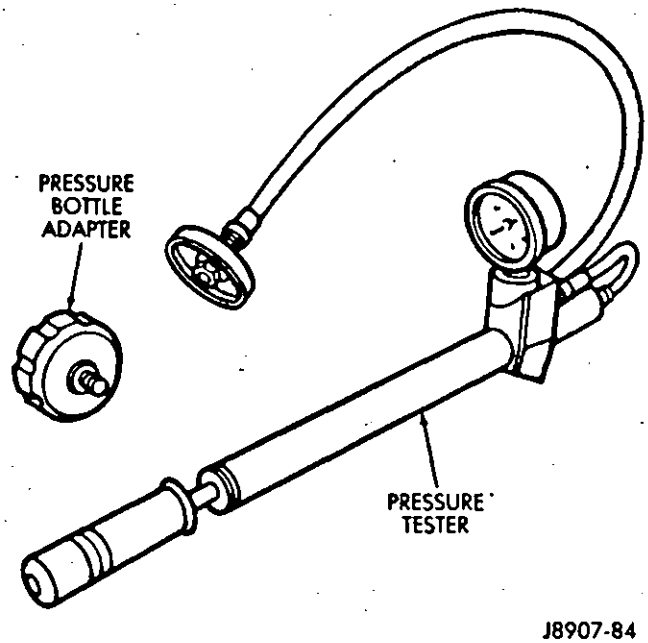


Fig. 2—Pressure Bottle System Pressure Tester

(5) Pump tool pressure tester until pressure reading on tool gauge is 108-140 kPa (16-20 psi). Pressure should remain steady. If a pressure drop occurs, inspect cooling system for leaks.

Correct any leaks and test system again. Disconnect tester tools from pressure bottle and test pressure cap. Refer to pressure cap testing.

Internal Leakage Inspection

Remove the oil pan drain plug and drain a small amount of engine oil. Coolant, being heavier, will drain first. Or operate the engine to churn the oil, then examine the dipstick for water globules. Inspect the transmission dipstick for water globules. Inspect the transmission fluid cooler for leakage.

If visual inspection fails to yield an internal leak, obtain a block leakage tester from a local automotive parts jobber to test for combustion leakage into the cooling system. Follow manufacturers instructions.

COOLANT PRESSURE BOTTLE SYSTEM

The cooling system does not have a radiator pressure cap. Instead the pressure cap is mounted on the coolant pressure bottle. System coolant flows directly through a fully pressurized Hot-Type expansion bottle (Fig. 3). Coolant flows through the pressure bottle at all times during engine operation whether the engine is cold or at normal operating temperatures.

Larger coolant volume caused by thermal expansion during engine operation is absorbed by the expansion chamber in the bottle. Air trapped in the system is purged through the pressure cap vent valve during maximum coolant expansion.

The cooling system remains pressurized when the coolant contracts during engine cool-down. Coolant volume in the pressure bottle returns to the normal cold engine level during this period.

Removal

WARNING: DO NOT REMOVE COOLANT PRESSURE BOTTLE CAP WHEN THE ENGINE IS HOT. SERIOUS PERSONAL INJURY CAN RESULT FROM HOT COOLANT. ALLOW ENGINE TO COOL BEFORE REMOVING COOLANT PRESSURE BOTTLE CAP.

The coolant pressure bottle, located on the passenger side of the dash panel, has two dowels at the rear that fit into slots in the mounting bracket. A rubber hold down strap holds the pressure bottle in place.

(1) Install hose collapsing clamps on coolant bottle lower hose and side hose.

(2) Position a clean container under the coolant bottle. Remove lower hose and catch coolant in container.

(3) Remove hose from side of coolant bottle (Fig. 3).

(4) Remove hold down strap (Fig. 3).

(5) Remove coolant bottle (Fig. 3).

Installation

(1) Install coolant pressure bottle.

(2) Lock hold down strap in place (Fig. 3).

(3) Install lower hose to coolant bottle (Fig. 3).

(4) Install hose to side of coolant bottle (Fig. 3).

(5) Remove hose collapsing clamps.

(6) Refill pressure bottle with coolant to top of post inside bottle.

PRESSURE BOTTLE CAP

The pressure bottle is equipped with a pressure cap which releases pressure at some point within a range of 110-124 kPa (16-18 psi).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve that opens when system pressure reaches the release range of 110-124 kPa (16-18 psi).

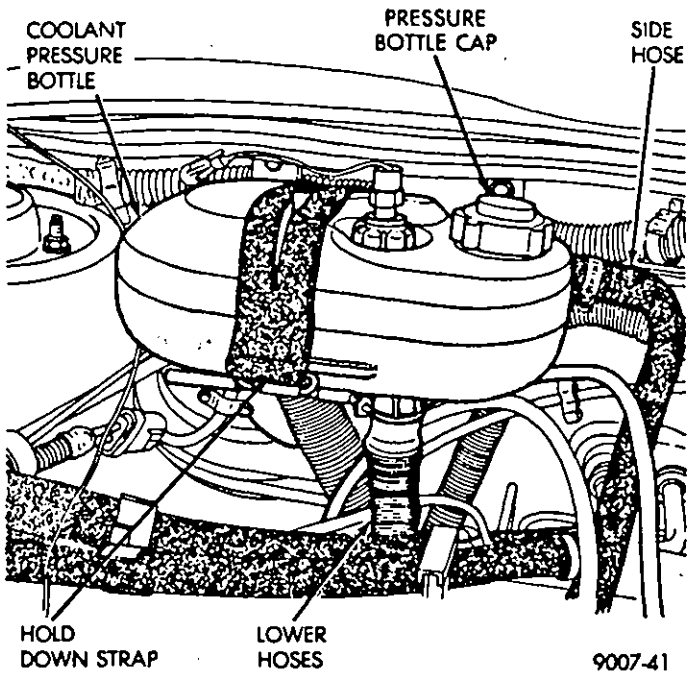


Fig. 3—Coolant Pressure Bottle Removal/Installation

PRESSURE TESTING COOLANT PRESSURE BOTTLE CAP

(1) Install cap adapter on pressure tester (Fig. 4).

(2) Connect pressure bottle cap to adapter and pressurize cap to 124 kPa (18 psi).

(3) Cap pressure should stabilize within ± 6.9 kPa (1 psi) of this setting.

(4) Replace cap if pressure does not stabilize within specified limits.

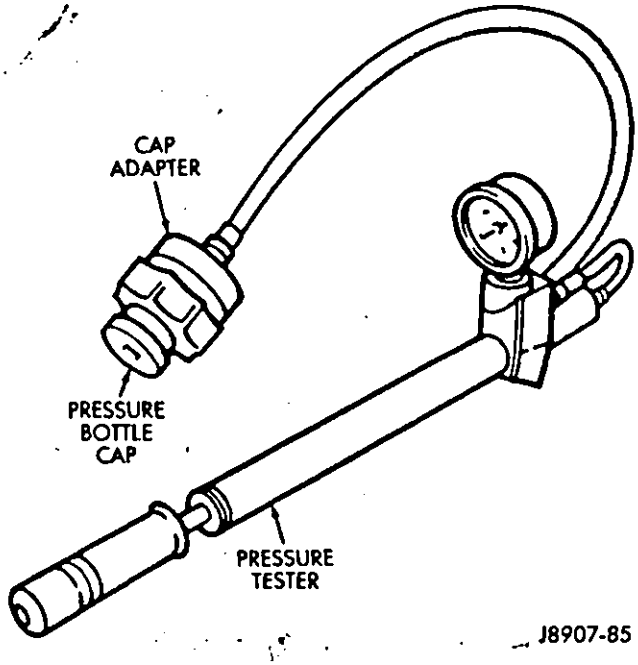


Fig. 4—Pressure Testing Pressure Bottle Cap

Inspection

Visually inspect pressure bottle cap gasket. Replace cap if gasket is swollen, torn, or worn. Inspect pressure bottle in area around cap for white deposits which indicate a leaking cap.

RADIATORS

Removal

(1) Remove the electric cooling fan assembly. Refer to Electric Cooling Fan Removal in this group.

When servicing the cooling system care must be taken to ensure that coolant does not contact the accessory drive belt or pulleys. Cover the belt and pulleys with shop towels prior to working on the system. If coolant contacts the belt and/or pulleys, clean them by flushing with water.

(2) Attach one end of a 6.35 mm (1/4 in) ID hose, that is approximately 914 mm (36 in) long, to radiator drain (Fig. 5). Place the other end of the hose in a clean container.

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

(3) Open radiator drain.

(4) Remove coolant pressure bottle cap and let radiator drain (Fig. 6).

(5) Disconnect radiator upper and lower hoses from radiator.

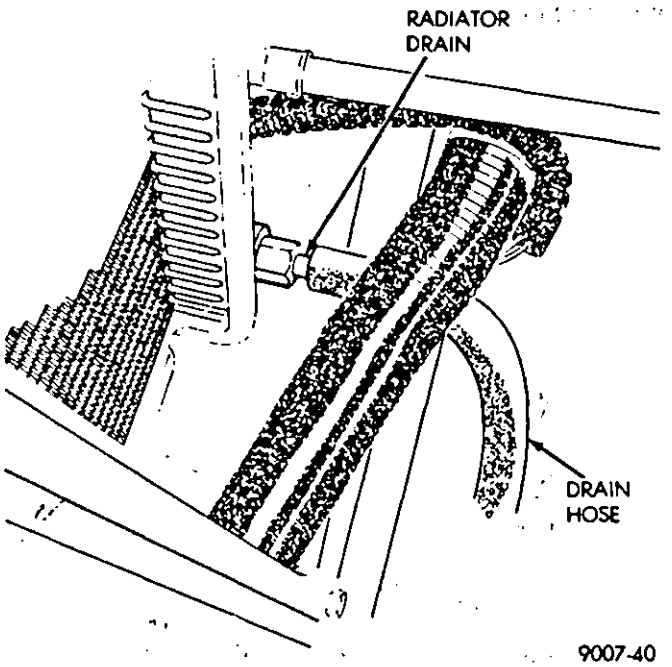


Fig. 5—Radiator Drain and Drain Hose

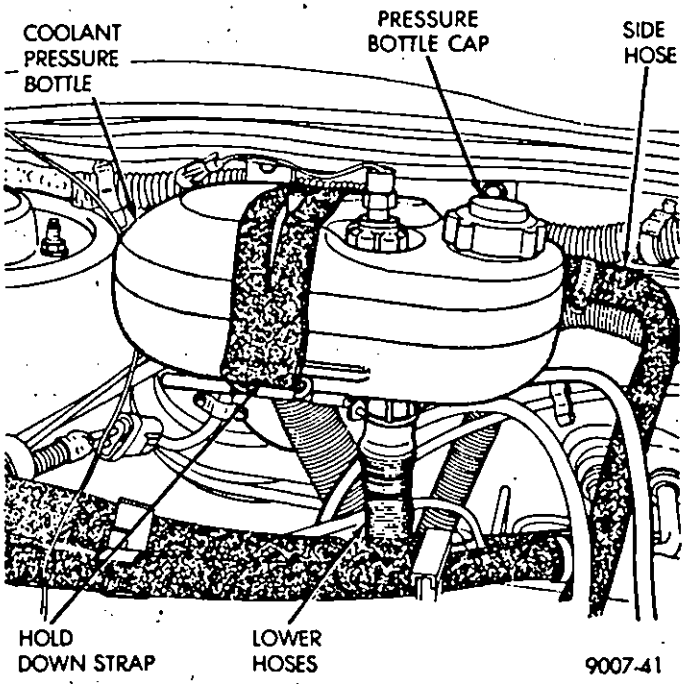


Fig. 6—Coolant Pressure Bottle Cap

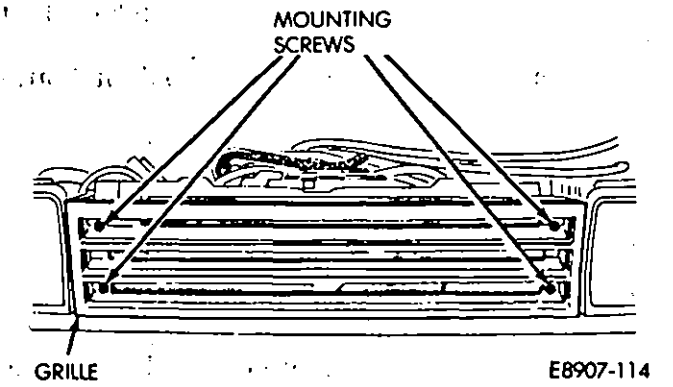


Fig. 7—Grille Removal/Installation

(6) Remove front grille mounting screws (Fig. 7). Remove grille.

(7) Disconnect the radiator from the air conditioning condenser by removing the top and bottom attaching screws (Fig. 8 and 9).

(8) Lift radiator out of vehicle.

Installation

The radiator is equipped with alignment dowels on the bottom that fit into holes in the body crossmember.

(1) Lower radiator into vehicle and align dowels with holes in crossmember (Fig. 10).

(2) Connect the radiator to the air conditioning condenser assembly (Fig. 8 and Fig. 9). Tighten attaching screws to 4 N·m (35 in-lbs) torque.

(3) Install grille (Fig. 7). Tighten grille mounting screws.

(4) Connect radiator upper and lower hoses to radiator.

(5) Close radiator drain. Remove hose used for draining.

(6) Install electric cooling fan. Refer to Electric Cooling Fan Installation in this group.

(7) Fill the cooling system (see Engine Cooling System Section—Filling and Bleeding Procedure).

Radiator Draincock Service

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

(1) Drain radiator. Refer to Cooling System Draining.

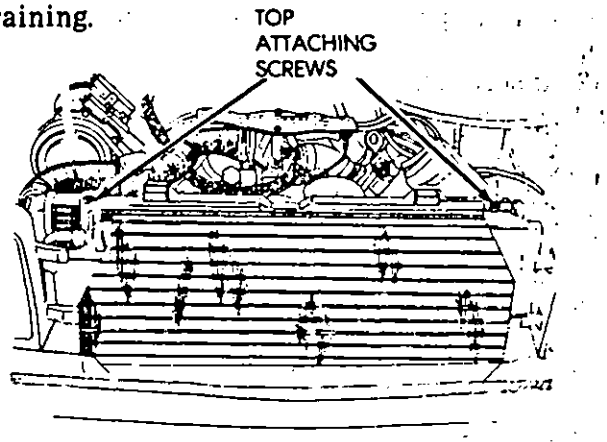


Fig. 8—Radiator to Condenser Top Attaching Screws

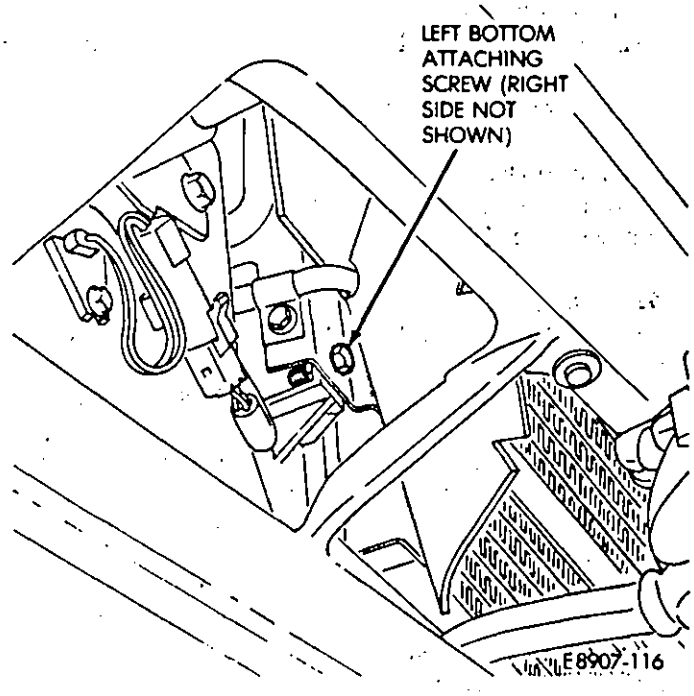


Fig. 9—Radiator to Condenser Bottom Attaching Screws

The Radiator is equipped with a plastic draincock with an integral O-ring seal. Two arms retain the draincock in the radiator once it has been completely unscrewed (Fig. 11).

(2) Pull draincock out of radiator tank after radiator has drained.

(3) Push the replacement draincock into the radiator tank and tighten.

(4) Fill radiator and bleed system. Refer to Filling and Bleeding Cooling System.

COOLING SYSTEM HOSES AND CLAMPS

Hoses

Rubber hoses route coolant to and from the radiator, automatic transmission oil cooler, pressure bottle and heater core.

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

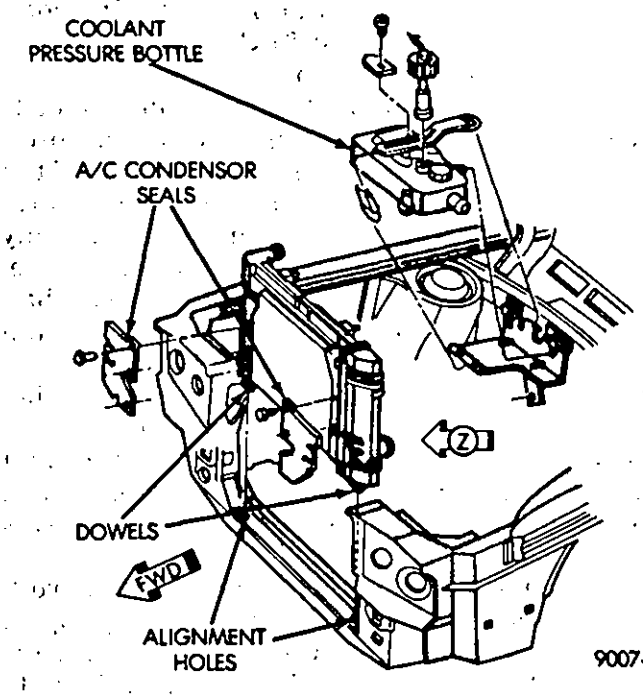


Fig. 10—Radiator Installation

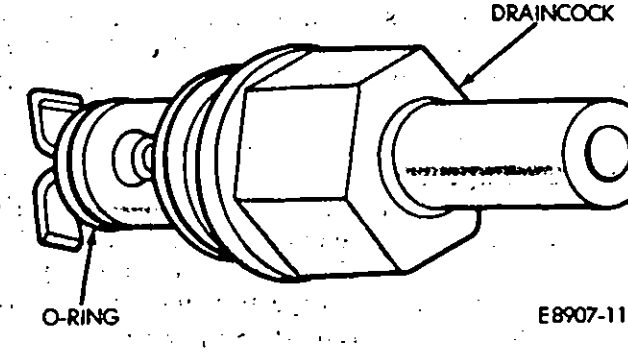


Fig. 11—Draincock Service

In areas where specific routing clamps are not provided, ensure that the hoses are positioned with sufficient clearance from the exhaust manifold and pipe, fan blades, drive belts and sway bars. Otherwise, improperly positioned hoses will be damaged, resulting in coolant loss and overheating.

Clamps

Constant tension hose clamps are used on many of the cooling system hoses. The clamp size is identified by a letter stamped on the tongue. Special pliers for removing and installing the clamps are available from most automotive jobbers.

ELECTRIC COOLING FAN

Operation

The cooling fan is turned on when the contacts of the cooling fan relay close and supply battery voltage to the motor from a fuse link G (Fig. 12). The cooling fan will turn on if the engine coolant temperature is above 87°C (188°F) or if the air conditioning compressor is turned on.

When the engine coolant temperature exceeds 87°C (188°F) the coolant temperature switch closes. Battery voltage is supplied to terminal 5 of the cooling fan relay through the coolant temperature switch and the cooling fan diode assembly (Fig. 12). The cooling fan relay contacts close, allowing cooling fan fuse link G to supply battery voltage to the cooling fan. The cooling fan then begins operating.

When the engine coolant temperature falls below 76°C (168°F) the coolant temperature switch opens. Battery voltage is removed from terminal 5 of the cooling fan relay and its contacts open, the cooling fan stops as it no longer receives battery voltage.

The cooling fan relay also receives battery voltage when the air conditioning system (if equipped) is switched on and the A/C compressor clutch is engaged. A fuse link supplies battery voltage to terminal 5 of the cooling fan relay and the cooling fan diode assembly. The cooling fan relay contacts close. Fuse link G supplies battery voltage to the cooling fan through the closed contacts of the cooling fan relay. The cooling fan then begins to operate.

When the A/C clutch relay contacts open and the A/C compressor disengages and battery voltage is removed from terminal 5 of the cooling fan relay. If the engine coolant temperature does not exceed 87°C (188°F) the cooling fan relay contacts open, battery voltage is removed from the cooling fan, and the fan stops operating.

Removal

(1) Disconnect negative cable from battery.
(2) Remove support bracket screws, vibration cushion nuts, and radiator upper crossmember mounting screws (Fig. 13).
(3) Remove crossmember (Fig. 13).
(4) Disconnect fan motor wire connector (Fig. 14).
(5) Remove cooling fan/shroud assembly mounting screws (Fig. 15).
(6) Remove fan/shroud assembly by lifting upwards.

Installation

(1) Lower fan/shroud assembly into place, ensure that tabs at bottom of fan shroud fit into retaining clips in lower radiator crossmember (Fig. 16).
(2) Install fan/shroud assembly mounting bolts. Tighten screws to 8.8 N·m (78 in-lbs) torque (Fig. 15).
(3) Connect fan motor electrical connector (Fig. 14).
(4) Install crossmember and tighten crossmember mounting screws, vibration cushion nuts, support bracket screws (Fig. 13).

Electric Cooling Fan/Shroud

Disassembly

(1) Remove cooling fan/shroud assembly from vehicle. Refer to
Electric Cooling Fan Removal.
(2) Remove fan blade module retaining clip (Fig. 17).
(3) Remove fan blade module (Fig. 17).
(4) Remove fan motor wire connector from clips in shroud (Fig. 17).
(5) Remove fan motor to shroud mounting screws (Fig. 17).

Assembly

(1) Install fan motor on shroud. Tighten mounting screws.
(2) Place fan motor wire harness into clips in fan shroud.
The bushing at the fan module center has a small groove on the bottom side of it (Fig. 18) that fits over the alignment pin in the fan motor shaft (Fig. 19).
(3) Install fan module onto fan motor shaft.
(4) Install fan blade module retaining clip.
(5) Install fan shroud assembly into vehicle. Refer to Electric Cooling Fan Installation.

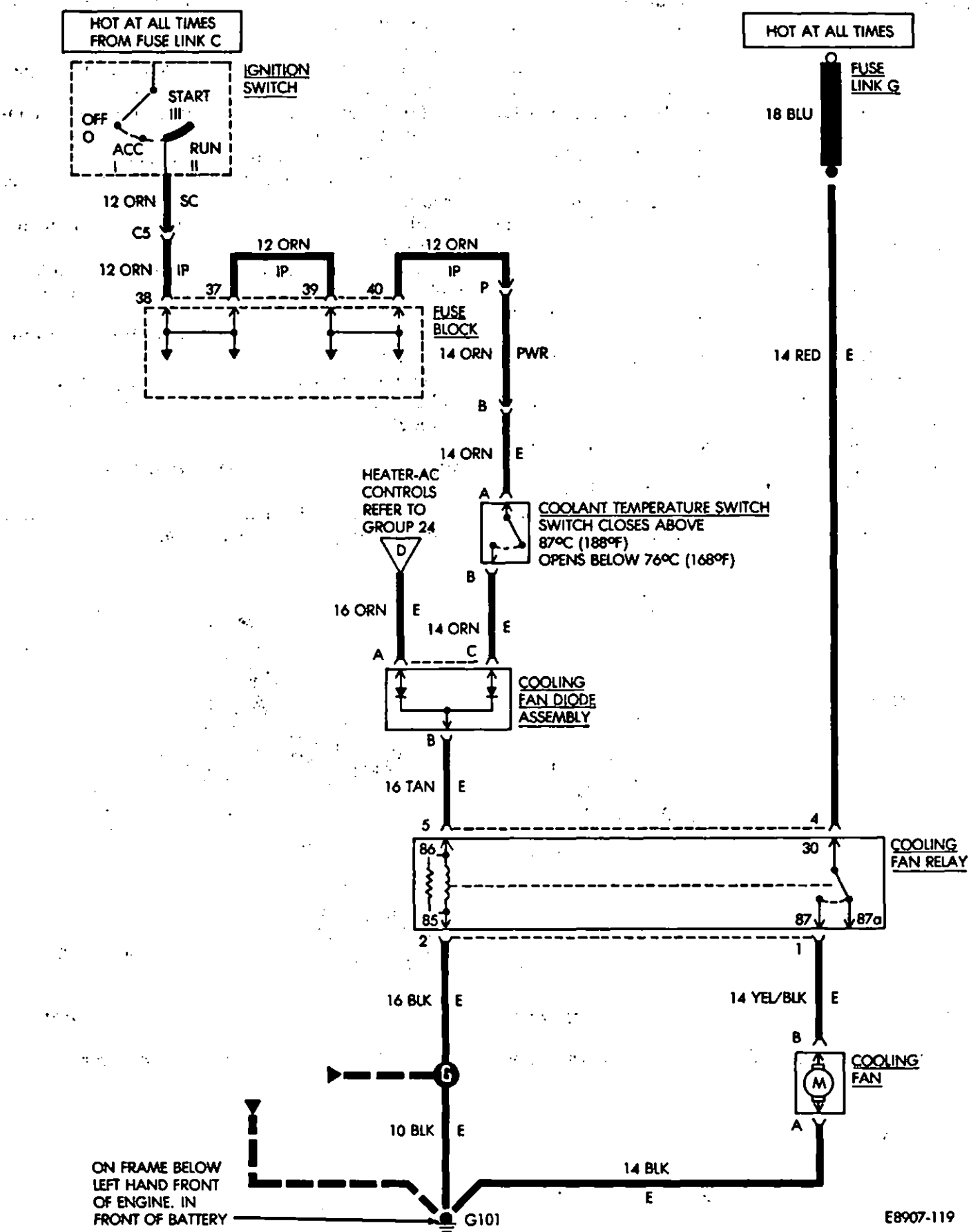


Fig. 12—Cooling Fan Schematic

Electric Cooling Fan Motor Inoperative

Refer to (Fig. 12) for terminal locations during test procedure.

If cooling fan does not operate with the A/C on, but the A/C compressor operates, repair open between terminal 5 of the cooling fan relay connector and the A/C clutch relay.

(1) COOLING FAN TEMPERATURE SWITCH: Ignition Switch in Run Position.

Connect a jumper wire between coolant temperature switch terminals A and B. The cooling fan should operate.

- If cooling fan operates, replace cooling fan temperature switch.
- If cooling fan does not operate, check cooling fan relay.

(2) COOLING FAN RELAY: Ignition Switch in Run Position, Relay Plugged in.

Connect a jumper wire between coolant temperature switch terminals A and B.

(a) Check voltage at cooling fan relay connector terminal 5.

- If battery voltage is present, proceed to (b).
- If battery voltage is not present, repair open between terminal 5 and ignition switch.

(b) Test voltage at cooling fan relay connector terminal 4.

- If battery voltage is present, proceed to (c).
- If battery voltage is not present, repair open between terminal 4 and fuse link G.

(c) Check voltage at cooling fan relay connector terminal 2.

- If zero voltage is present, proceed to (d).
- If zero voltage is not present, repair open to ground.

(d) Check voltage at cooling fan connector terminal 1.

- If battery voltage is present, proceed to (e).
- If battery voltage is not present, replace cooling fan relay.

(e) Inspect connections at cooling fan motor for clean tight fit.

- If connections are OK, replace cooling fan.
- If connections are not OK, repair or replace connections.

AUTOMATIC TRANSMISSION OIL COOLERS

For automatic transmission oil cooler service, refer to Group 21 of this manual.

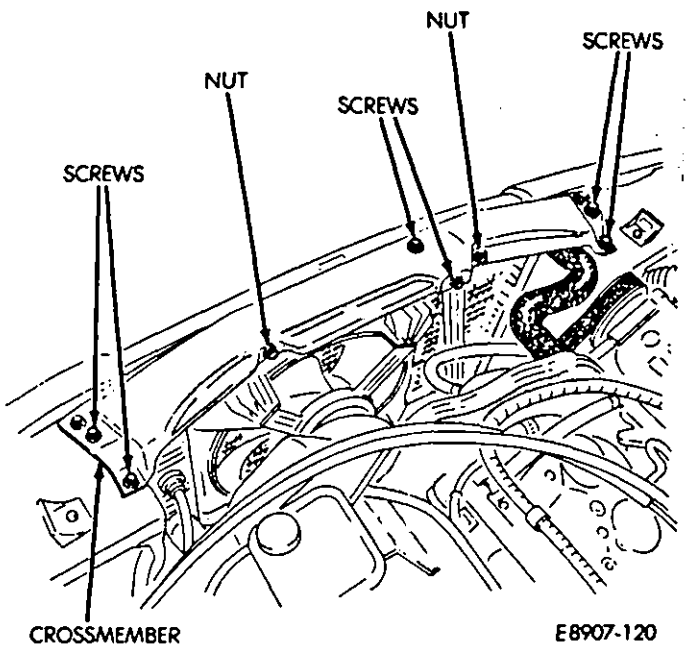


Fig 13—Radiator Crossmember Removal/Installation

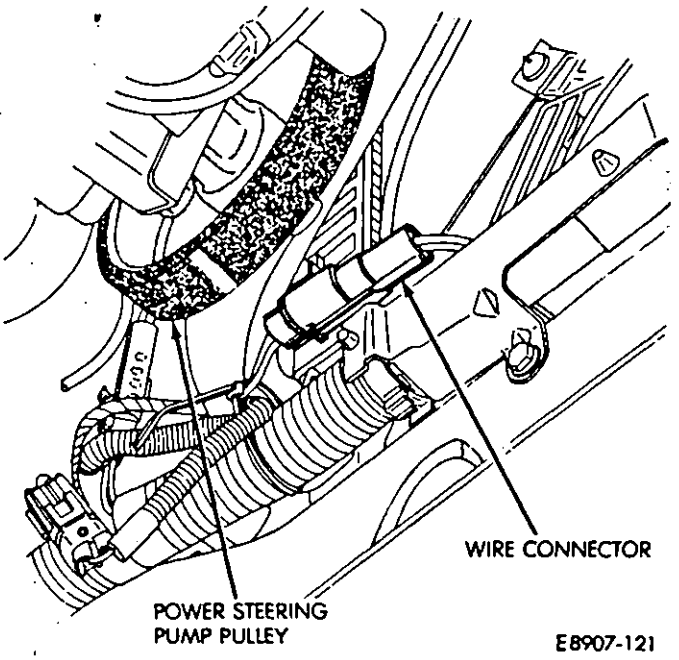


Fig. 14—Fan Motor Wire Connector

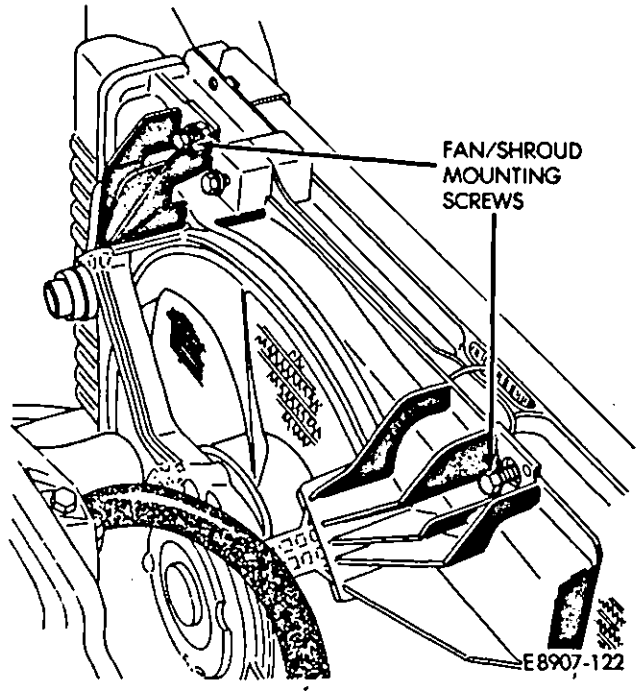


Fig. 15—Fan/Shroud Assembly Removal/Installation

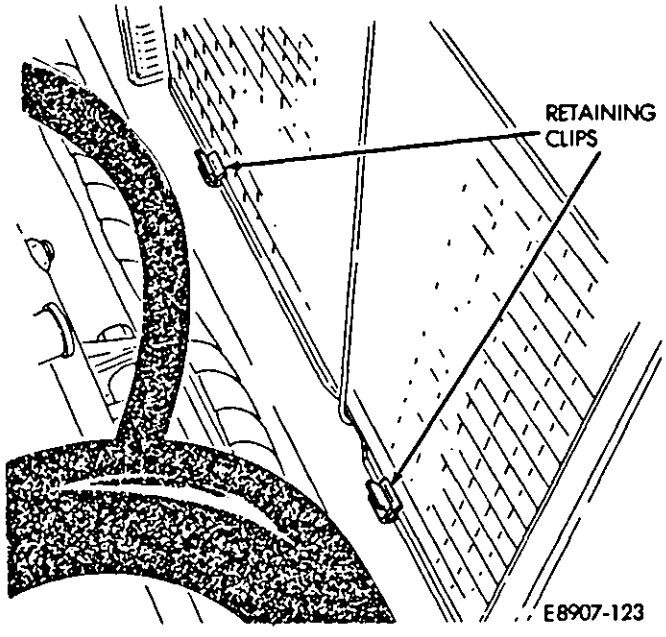


Fig. 16—Fan Shroud Retaining Clips

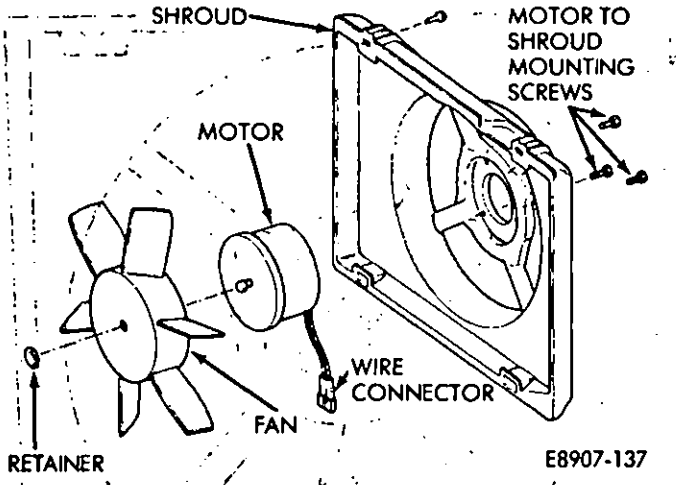


Fig. 17—Electric Cooling Fan (Typical)

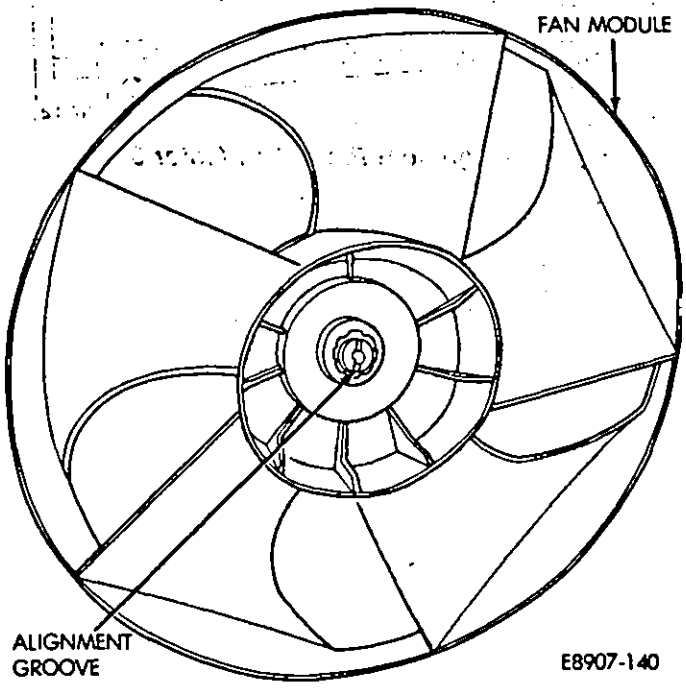


Fig. 18—Fan Module Alignment Groove

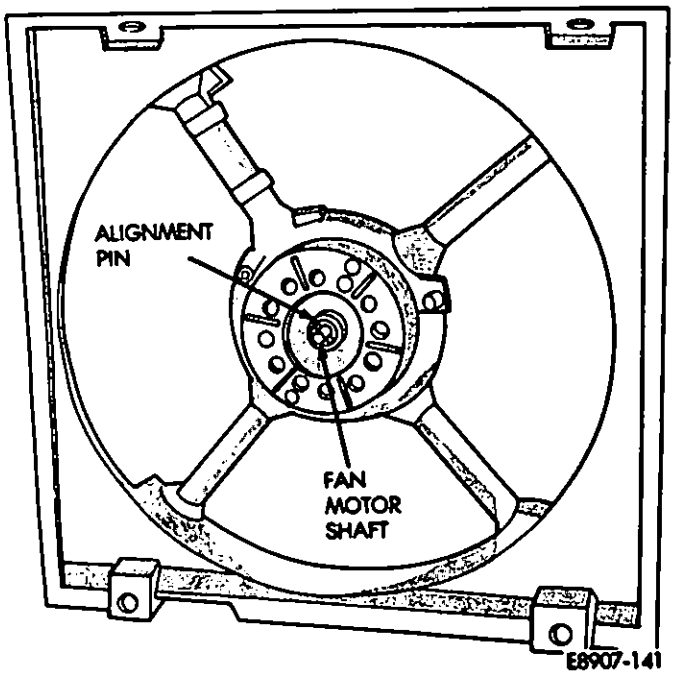


Fig. 19—Alignment Pin in Fan Motor Shaft

ACCESSORY DRIVE BELTS

INDEX

	Page
Serpentine Drive Belt Diagnosis	23
Accessory Drive Belt Service	25

SERPENTINE DRIVE BELT DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks that run across the ribbed surface of the belt from rib to rib are considered normal and 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. 1).**

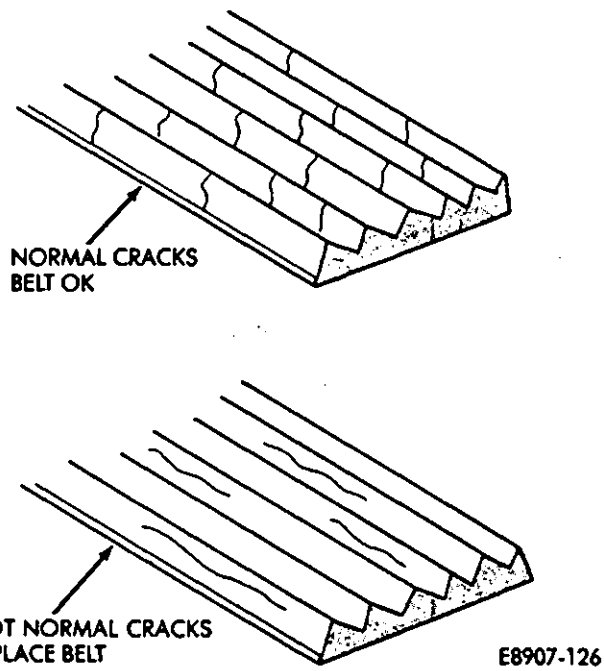


Fig. 1—Serpentine Accessory Drive Belt Wear Patterns

Refer to the following Serpentine Drive Belt diagnosis charts for further belt diagnosis.

Condition	Possible Cause	Correction
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY)	(1) Foreign objects imbedded in pulley grooves.	(1) Remove foreign objects from pulley grooves. Replace belt.
	(2) Installation damage.	(2) Replace belt.
RIB OR BELT WEAR	(1) Pulley(s) misaligned.	(1) Align pulley(s).
	(2) Abrasive environment.	(2) Clean pulley(s). Replace belt if necessary.
	(3) Rusted pulley(s).	(3) Clean rust from pulley(s).
	(4) Sharp or jagged pulley groove tips.	(4) Replace pulley.
	(5) Rubber deteriorated.	(5) Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	(1) Belt has mistracked from pulley groove.	(1) Replace belt.
	(2) Pulley groove tip has worn away rubber to tensile member.	(2) Replace belt.
BELT SLIPS	(1) Belt slipping because of insufficient tension.	(1) Adjust tension.
	(2) Belt or pulley subjected to substance (belt dressing, oil, ethylene glycol) that has reduced friction.	(2) Replace belt and clean pulleys.
	(3) Driven component bearing failure.	(3) Replace faulty component bearing.
	(4) Belt glazed and hardened from heat and excessive slippage.	(4) Replace belt.
"GROOVE JUMPING" (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	(1) Belt tension either too high or too low.	(1) Adjust belt tension.
	(2) Pulley(s) not within design tolerance.	(2) Replace pulley(s).
	(3) Foreign object(s) in grooves.	(3) Remove foreign objects from grooves.
	(4) Pulley misalignment.	(4) Align pulley(s).
	(5) Belt cordline is broken.	(5) Replace belt.
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	(1) Excessive tension.	(1) Replace belt and adjust tension to specification.
	(2) Tensile members damaged during belt installation.	(2) Replace belt.
	(3) Severe misalignment.	(3) Align pulley(s).
	(4) Bracket, pulley, or bearing failure.	(4) Replace defective component and belt.
NOISE (OBJECTIONAL SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION)	(1) Belt slippage.	(1) Adjust belt.
	(2) Bearing noise.	(2) Locate and repair.
	(3) Belt misalignment.	(3) Align belt/pulley(s).
	(4) Belt-to-pulley mismatch.	(4) Install correct belt.

E8907-143

Condition	Possible Cause	Correction
NOISE (OBJECTIONAL SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION) (Continued)	(5) Driven component induced vibration.	(5) Locate defective driven component and repair.
	(6) System resonant frequency induced vibration.	(6) Vary belt tension within specifications. Replace belt.
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.	(1) Correct rubbing condition.
	(2) Excessive heat causing woven fabric to age.	(2) Replace belt.
	(3) Tension sheeting splice has fractured.	(3) Replace belt.
CORD EDGE FAILURE (TENSILE MEMBER EXPOSED AT EDGES OF BELT OR SEPARATED FROM BELT BODY)	(1) Excessive tension.	(1) Adjust belt tension.
	(2) Belt contacting stationary object.	(2) Correct as necessary.
	(3) Pulley(s) out of tolerance.	(3) Replace pulley.
	(4) Insufficient adhesion between tensile member and rubber matrix.	(4) Replace belt and adjust tension to specifications.

E8907-144

ACCESSORY DRIVE BELT SERVICE

Accessory Drive Belt Schematics

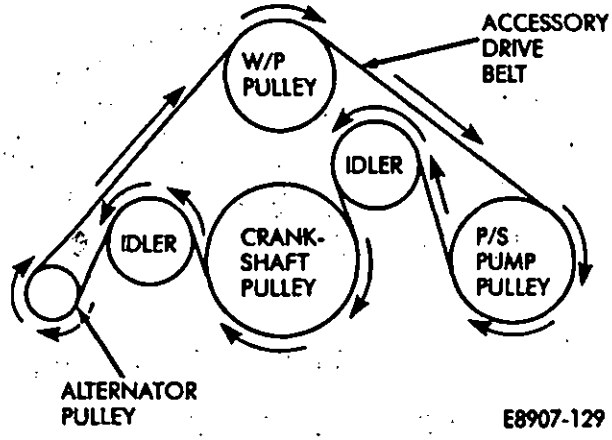


Fig. 2—Engine Without A/C

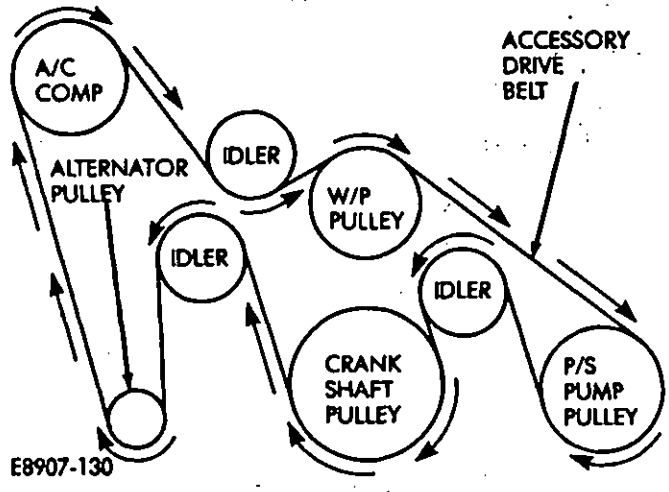


Fig. 3—3.0L Engine With A/C

Proper Belt Tension

Correct accessory drive belt tension is required to ensure optimum performance of the belt driven engine accessories. There are different gauges for checking serpentine and V type belts. Use belt tension gauge, number 7198, or an equivalent gauge, when checking belt tension. Place gauge in the middle of the section of belt being used to check tension. For correct gauge measurement, the gauge must not contact any component other than the drive belt. With the gauge fully seated on the belt, release the gauge handle as rapidly as possible to ensure a correct tension reading.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. It is possible to route the belt incorrectly and rotate the water pump in the opposite direction causing the engine to overheat. Refer to the appropriate accessory drive belt schematic in this section for the correct routing.

Belt Tension Specifications

Proper belt tension for a new serpentine accessory drive belt is 800-900 N (180-200 lbs-f). For a used serpentine accessory drive belt, proper belt tension is 623-712 N (140-160 lbs-f).

3.0L Accessory Drive Belt

Removal

(1) Disconnect battery negative cable from battery.

(2) Raise the vehicle on a hoist (see Group 0 Introduction for vehicle lifting information).

(3) Remove splash shield below alternator.

(4) Loosen alternator pivot bolt (Fig. 4).

(5) Loosen locking bolt (Fig. 4).

(6) Loosen adjusting bolt (Fig. 4) until the belt can be removed from the alternator pulley.

(7) Lower the vehicle.

(8) Remove locknuts securing engine damper mounting bracket to engine (Fig. 5). Push the bracket towards the engine.

(9) Remove the accessory drive belt.

Installation

CAUTION: The accessory drive belt must be routed correctly. It is possible to install the belt incorrectly and rotate the water pump in the opposite direction causing the engine to overheat. Refer to the appropriate accessory drive belt schematic in this section for correct belt routing.

(1) If any of the idler pulleys were removed, they must be installed with the small spacer washer between the pulley and the engine (Fig. 6). The inside bushing is installed between the pulley and locknut.

(2) Install the accessory drive belt on the pulleys.

(3) Install engine damper mounting bracket onto studs in engine front cover (Fig. 5). Tighten locknuts to 40 N·m (30 ft-lbs) torque.

(4) Raise the vehicle.

(5) Tighten the alternator pivot bolt to 50 N· (37 ft-lbs) torque (Fig. 4)

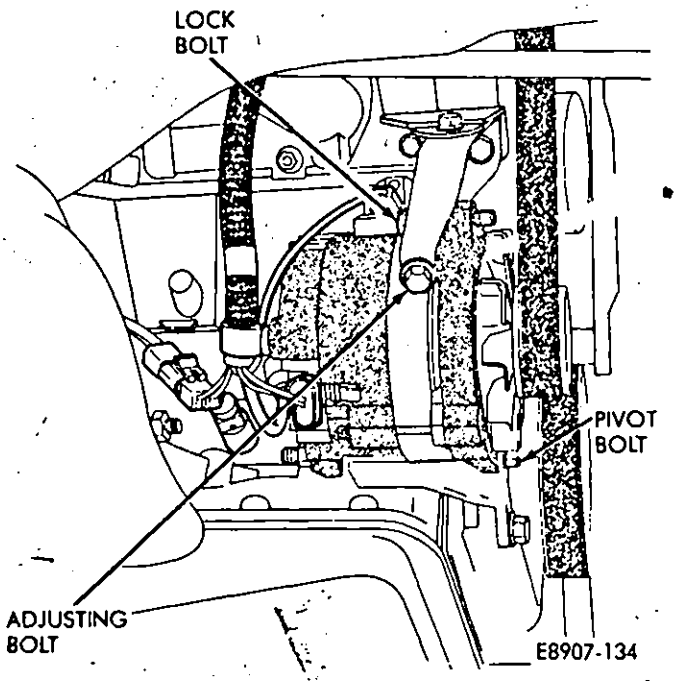


Fig. 4—Alternator Pivot Bolt, Lockbolt and Adjusting Bolt—3.0L Engine

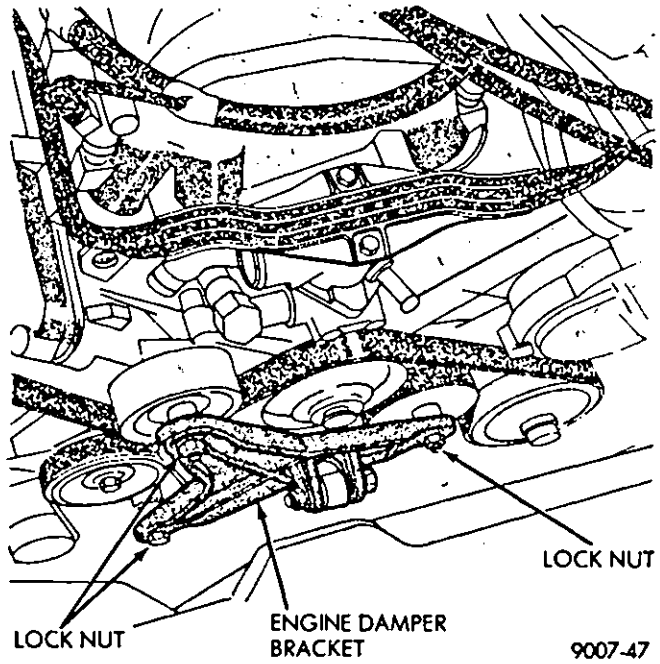


Fig. 5—Engine Damper Mounting Bracket—3.0L Engine

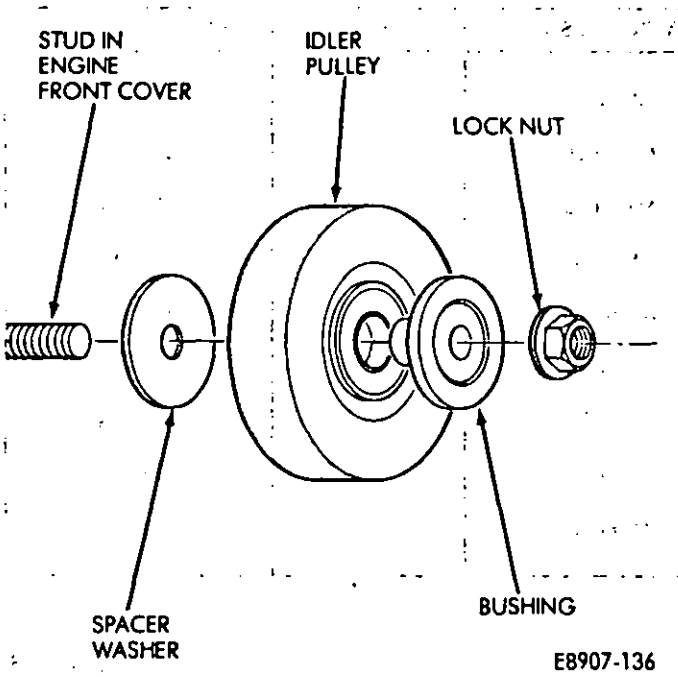


Fig. 6—Idler Pulley Assembly—3.0L Engine

(6) The belt tension gauge must be installed in the middle of the span of belt that is used to check belt tension (Fig. 7).

(a) On vehicles with air conditioning, install belt tension gauge 7198 in the middle of the drive belt span between the air conditioning compressor and the alternator.

(b) On vehicles without air conditioning, install belt tension gauge 7198 in the middle of the drive belt between the water pump and the alternator.

Tighten adjusting bolt (Fig. 4) until the correct belt tension is obtained. Refer to Belt Tension Specifications in this section for belt tension specifications.

If a new belt is installed, it should be tensioned after 12 070 km (7500 miles) of usage.

(7) Tighten locking bolt (Fig. 4) to 27 N·m (20 ft-lbs) torque.

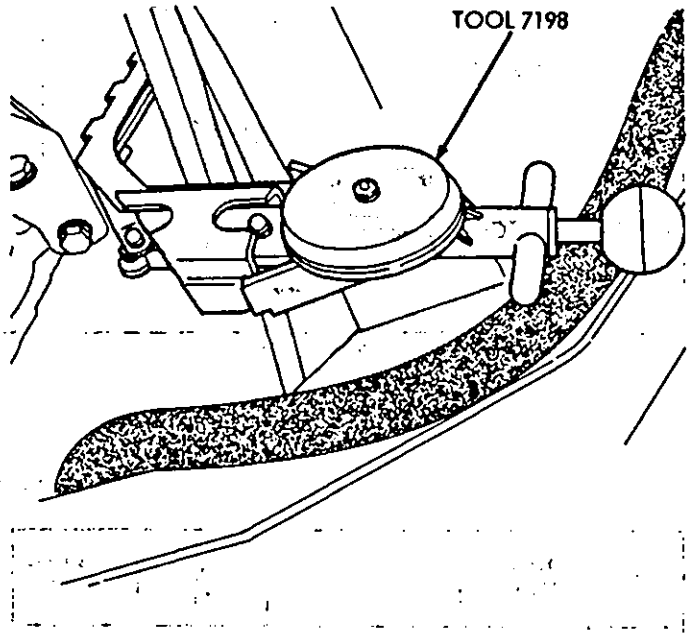


Fig. 7—Checking Belt Tension—3.0L Engine

(8) Tighten alternator pivot bolt (Fig. 5) to 50 N·m (37 ft-lbs) torque.

(9) Install the splash shield.

(10) Lower the vehicle.

(11) Connect negative cable to battery.

COMPONENT	FASTENER SIZE	N·m	FT-LBS (IN-LBS)
Alternator Locking Bolt (3.0L)	M8x1.25	27	20 ft-lbs
Alternator Pivot Bolt (3.0L)	M10x1.50	50	37 ft-lbs
Coolant Temperature Sensor	M14x1.25	28	21 ft-lbs
Electric Cooling Fan to Radiator Screws	M6x1.00	8.8	78 in-lbs
Idler Pulley to Timing Cover Screws (3.0L)	M10x1.50	40	30 ft-lbs
Radiator to Condenser Upper Mounting Screws	M6x1.00	4	35 in-lbs
Radiator to Condenser Lower Mounting Screws	M6x1.00	5	44 in-lbs
Thermostat Cover Mounting Screws (3.0L)	M8x1.25	27	20 ft-lbs
Water Pump Mounting Bolts (3.0L)	M8x1.25	27	20 ft-lbs

9007-48

Torque Specifications

ENGINE	COOLING CAPACITY		RADIATOR		A/C	ELECTRIC COOLING FAN		THERMO-STAT	
3.0L	Qts.	L	Rows Of Tubes	Fins Per Inch		Dia. (Inch)	No. Of Blades	Starts To Open At	Fully Open At
	8.7	8.2L	1	23	•	14.6	5	190°F	214°F

9007-46

Cooling Specifications