2007 ENGINE

Cooling - Nitro

DESCRIPTION

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The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible, maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment. The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system. A separate and remotely mounted, pressurized coolant tank using a pressure/vent cap is used.

COOLING SYSTEM COMPONENTS

The cooling system consists of:

- Charge Air Cooler (Turbocharged vehicles only)
- 2 Speed Electric Cooling Fan
- Engine driven fan with viscous clutch (Diesel Engine)
- A aluminum-core radiator with plastic side tanks
- Combined Coolant Recover Container/Washer Reservoir (Gas Engine)
- Combined coolant pressure bottle/overflow system with pressure cap
- Radiator
- Water pump
- Combination A/C condenser/transmission oil cooler (automatic transmission)
- Thermostat
- Coolant
- Water pump
- Hoses and hose clamps

OPERATION

OPERATION

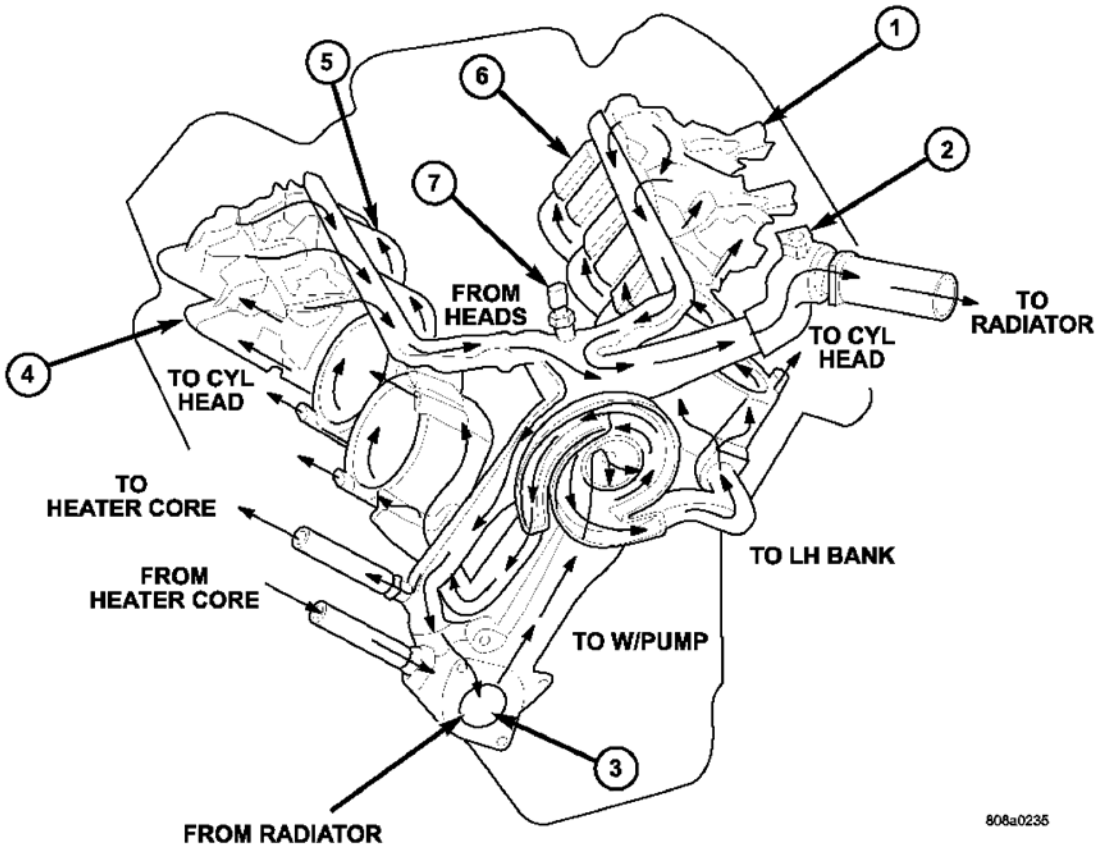

Fig. 1: Coolant Flow - 3.7L/4.7L
Courtesy of CHRYSLER LLC

1 - LH CYL. HEAD
2 - AIR BLEED
3 - THERMOSTAT LOCATION
4 - RH CYL. HEAD
5 - RH BANK CYL. BLOCK
6 - LH BANK CYL. BLOCK
7 - COOLANT TEMP. SENSOR

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

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

DIAGNOSIS AND TESTING

DEAERATION

Air can only be removed from the system by gathering under the pressure cap. On the next heat up it will be pushed past the pressure cap into the coolant recovery bottle by thermal expansion of the coolant. It then escapes to the atmosphere in the coolant recovery bottle and is replaced with coolant on cool down.

To effectively deaerate the system, multiple thermal cycles of the system may be required.

NOTE: Deaeration does not occur at engine idle, higher engine speeds are required. Normal driving will deaerate cooling system.

ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The Powertrain Control Module (PCM) has been programmed to monitor certain 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 **OPERATION** .

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data. Refer to **OPERATION** .

ERASING TROUBLE CODES

After the problem has been repaired, use the diagnostic scan tool to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service information for operation of the diagnostic scan tool.

FLOW CHECK-DIESEL

To determine whether coolant is flowing through the cooling system, use the following procedures:

1. If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If it is hot, coolant is circulating.

   WARNING: Do not remove the cooling system pressure cap with the system hot and under pressure because serious burns from coolant can occur.

2. Remove pressure/vent cap when engine is cold, idle engine until thermostat opens, you should observe coolant flow while looking down in the coolant recovery pressure container. Once flow is detected install the pressure/vent cap.

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
Any accessory that fully or partially blocks grill opening

RECENT SERVICE OR ACCIDENT REPAIR:

Engine adjustments (incorrect timing)
Slipping accessory drive belt
Brakes (possibly dragging)
Changed parts (incorrect water pump)
Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to following Cooling System Diagnosis charts.

TRAILER TOWING:

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

These charts are to be used as a quick-reference only.

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?	1. Refer to **OPERATION** . Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. See **DESCRIPTION**. Repair connector if necessary.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. Repair as necessary.
	4. Coolant level low in cold ambient temperatures	4. Check coolant level in the coolant pressure bottle and the

	accompanied with poor heater performance.	radiator. Inspect system for leaks. Repair leaks as necessary.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. Refer to **DIAGNOSIS AND TESTING** .
	6. Electric fan functioning when not required.	6. Inspect electric fan for proper operation. Refer to **FAN-RADIATOR-ELECTRIC** in this article. Refer to **SYSTEM WIRING DIAGRAMS** for electric cooling fan and relay circuit schematic data.
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM.	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause for overheating and repair.
	2. Is the temperature gauge reading correctly?	2. Check gauge. (Refer to **ENGINE TEMPERATURE GAUGE**). Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. Check warning lamp operation. (Refer to **TRANS TEMP INDICATOR**). Repair as necessary.
	4. Coolant low in coolant pressure bottle and radiator?	4. Check for coolant leaks and repair as necessary.
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following Step 6.	5. Tighten cap.
	6. Poor seals at the radiator cap.	6. (a) Check condition of cap and cap seals. See **DIAGNOSIS AND TESTING**. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.
	7. Coolant not flowing through system.	7. (a) Check condition of pressure bottle cap and cap seals. See **DIAGNOSIS AND TESTING**. (b) Check condition of the hose

		from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (c) Check pressure bottle/overflow tank and tank's hoses for blockage. Repair as necessary.
	8. Incorrect coolant concentration	8. Check coolant. See **DESCRIPTION** for correct coolant/water mixture ratio.
	9. Radiator or A/C condenser fins are dirty or clogged.	9. Remove insects and debris.
	10. Radiator core is corroded or plugged.	10. Replace radiator.
	11. Fuel or ignition system problems.	11. Refer to Fuel System article or appropriate Engine Electrical Diagnostic article for diagnosis and testing procedures
	12. Dragging brakes.	12. Check and correct as necessary. Refer to **DIAGNOSIS AND TESTING** for correct procedures.
	13. Bug screen or cardboard is being used, reducing airflow.	13. Remove bug screen or cardboard.
	14. Thermostat partially or completely shut.	14. Check thermostat operation and replace as necessary. See **REMOVAL**.
	15. Viscous fan drive not operating properly.	15. Check fan drive operation and replace as necessary. See **DIAGNOSIS AND TESTING**.
	16. Cylinder head gasket leaking.	16. Check for cylinder head gasket leaks. See **DIAGNOSIS AND TESTING**. For repair, . Refer to **REMOVAL** .
	17. Heater core leaking.	17. Check heater core for leaks. Refer to **REMOVAL** . Repair as necessary.
	18. Electric fan not functioning.	18. Inspect electric fan for proper operation. See **DIAGNOSIS AND TESTING**.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.	1. A normal condition. No correction is necessary.
	2. Temperature gauge or engine mounted gauge sensor defective or	2. Check operation of gauge and repair if necessary. Refer to

	shorted. Also, corroded or loose wiring in this circuit.	**DIAGNOSIS AND TESTING** .
	3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running).	3. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.
	4. Gauge reading high after re-starting a warmed up (hot) engine.	4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.
	5. Coolant level low in cooling system (air build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks. See **DIAGNOSIS AND TESTING**.
	6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.	6. (a) Check for cylinder head gasket leaks. Refer to **DIAGNOSIS AND TESTING** . (b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.
	7. Water pump impeller loose on shaft.	7. Check water pump and replace as necessary.
	8. Loose accessory drive belt.	8. See **DIAGNOSIS AND TESTING**. Check and correct as necessary.
	9. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM OR COOLANT TO COOLANT RECOVERY CONTAINER. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RECOVERY CONTAINER.	1. Pressure relief valve in radiator pressure cap is defective.	1. Check condition of radiator cap and cap seals. See **DIAGNOSIS AND TESTING**. Replace cap as necessary.
	2. Overfilled cooling system or extremely low coolant level.	2. Wait for engine to cool and adjust coolant level.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. See **DIAGNOSIS AND TESTING**.
DETONATION OR PRE-IGNITION (NOT CAUSED BY	1. Engine overheating.	1. Check reason for overheating and repair as necessary.

IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	2. Freeze point of coolant not correct. Mixture is too rich or too lean.	2. Check coolant concentration. See **DESCRIPTION**, and adjust ratio as required.
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	1. (a) Radiator cap relief valve stuck. See **DIAGNOSIS AND TESTING**. 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.
INADEQUATE HEATER PERFORMANCE.	1. Has a Diagnostic Trouble Code (DTC) been set? 2. Coolant level low. 3. Obstructions in heater hose/fittings. 4. Heater hose kinked. 5. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.	1. Refer to **EMISSIONS CONTROL** 2. See **DIAGNOSIS AND TESTING**. 3. Remove heater hoses at both ends and check for obstructions. 4. Locate kinked area and repair as necessary. 5. If a slipping belt is detected, see **REMOVAL**. If heater core obstruction is detected, . See **STANDARD PROCEDURE** for cooling system reverse flushing.
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILLE AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator or condenser will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator or condenser, steam may be emitted. This usually occurs in cold weather with no fan or	1. Occasional steam emitting from this area is normal. No repair is necessary.

	airflow to blow it away.	
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. See **DESCRIPTION** for coolant concentration information. Adjust coolant mixture as necessary.
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.
FAN RUNS ALL THE TIME	1. Fan control sensors inoperative. 2. Transmission temperature too high. 3. Engine coolant temperature too high. 4. ECM or TIPM defective.	1. Check for DTCs. Verify sensor readings. 2. Check for transmission over temp DTC. 3. (a) Check coolant level. Correct level as required. (b) Thermostat stuck. Replace thermostat. (c) Water pump failed. Replace water pump. (d) Coolant flow restricted. Clean radiator. (e) Air flow over radiator obstructed. Remove obstruction. 4. Replace ECM or TIPM

AERATION

Low coolant level in a cross flow radiator will equalize in both tanks with engine off. With engine running and at operating temperature, the high pressure inlet tank runs full and the low pressure outlet tank drops, resulting in cooling system aeration. Aeration will draw air into the water pump resulting in the following:

High reading shown on the temperature gauge.

Loss of coolant flow through the heater core.

Corrosion in the cooling system.

Water pump seal may run dry, increasing the risk of premature seal failure.

Combustion gas leaks into the coolant can also cause aeration.

LEAK TESTING

ULTRAVIOLET LIGHT METHOD

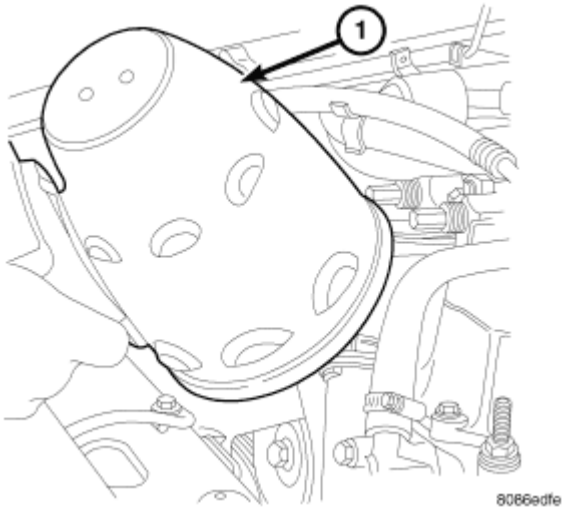

Fig. 2: Identifying Black Light Tool
Courtesy of CHRYSLER LLC

1 - TYPICAL BLACK LIGHT TOOL

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate engine until radiator upper hose is warm to touch. Aim the commercially available black light tool at components to be checked. If leaks are present, black light will cause additive to glow a bright green color.

The black light (1) can be used in conjunction with a pressure tester to determine if any external leaks exist.

PRESSURE TESTER METHOD

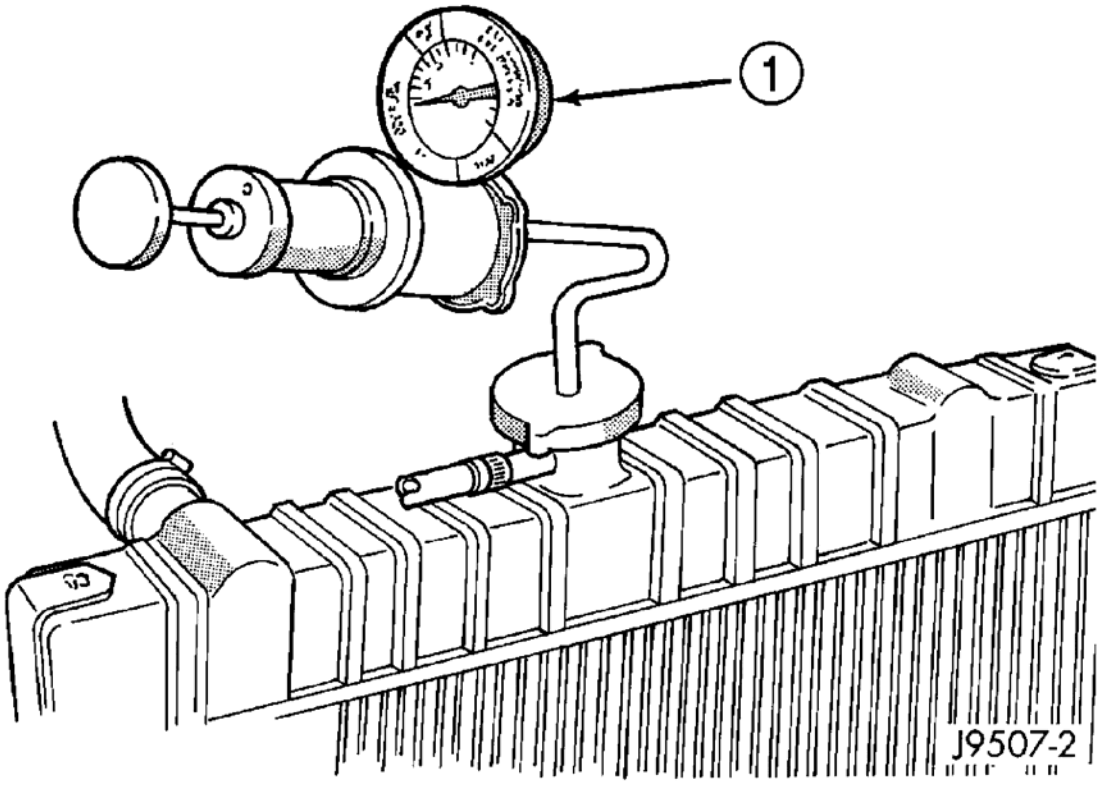

Fig. 3: Pressure Testing Cooling System
Courtesy of CHRYSLER LLC

1 - TYPICAL COOLING SYSTEM PRESSURE TESTER

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

WARNING: Hot, pressurized coolant can cause injury by scalding.

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

Inspect cams on outside of filler neck. If cams are damaged, seating of pressure cap valve and tester seal will be affected.

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

Operate tester pump (1) to apply 110 kPa (16 psi) pressure to system. If hoses enlarge excessively or bulges

while testing, replace as necessary. Observe gauge pointer and determine condition of cooling system according to following criteria:

Holds Steady: If pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test.

Drops Slowly: Indicates a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect radiator, hoses, gasket edges and heater. Seal small leak holes with a Sealer Lubricant (or equivalent). Repair leak holes and inspect system again with pressure applied.

Drops Quickly: Indicates that serious leakage is occurring. Examine system for external leakage. If leaks are not visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove engine dipstick and inspect for water globules. Also inspect transmission dipstick for water globules and transmission fluid cooler for leakage.

WARNING: With radiator pressure tester tool installed on radiator, do not allow pressure to exceed 124 kpa (18 psi). Pressure will build up quickly if a combustion leak is present. To release pressure, rock tester from side to side. When removing tester, do not turn tester more than 1/2 turn if system is under pressure.

Operate engine without pressure cap on radiator until thermostat opens. Attach a Pressure Tester to filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 110 kPa (16 psi). Fluctuation of gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** remove spark plug cables or short out cylinders to isolate compression leak.

If the needle on dial of pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

A convenient check for exhaust gas leakage into cooling system is provided by a commercially available Block Leak Check tool. Follow manufacturers instructions when using this product.

COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

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

WARNING: Do not remove cylinder block drain plugs or loosen radiator draincock with system hot and under pressure. Serious burns from coolant can occur.

Drain sufficient coolant to allow thermostat removal. See **REMOVAL**. Remove accessory drive belt . See **REMOVAL**.

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

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

Start engine and accelerate rapidly three times, to approximately 3000 RPM while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

STANDARD PROCEDURE

DRAINING

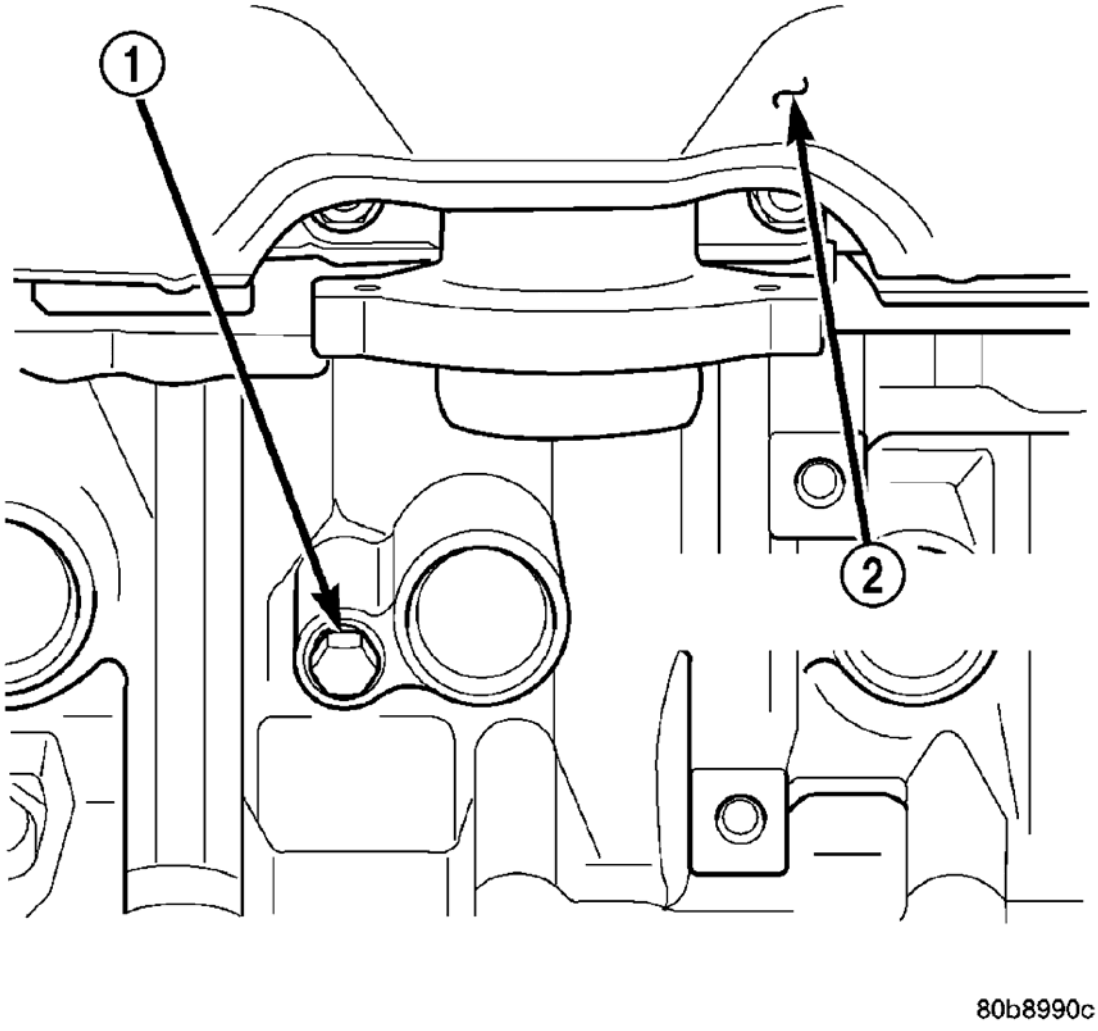

Fig. 4: Identifying Cylinder Block Drain Plug & Exhaust Mainfold And Heat Shield
Courtesy of CHRYSLER LLC

1 - CYLINDER BLOCK DRAIN PLUG
2 - EXHAUST MANIFOLD AND HEAT SHIELD

WARNING: Do not remove the cylinder block drain plugs (1) or loosen the radiator draincock with system hot and under pressure. Serious burns from coolant can occur.

1. DO NOT remove radiator cap first. With engine cold, raise vehicle on a hoist and locate radiator draincock.

NOTE: Radiator draincock is located on the left/lower side of radiator facing to rear of vehicle.

2. Attach one end of a hose to the draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator. This will empty the coolant reserve/overflow tank. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture. When tank is empty, remove radiator cap and continue draining cooling system.

FILLING-DIESEL

1. Tighten the radiator draincock and the cylinder block drain plug(s) (if removed).

CAUTION: Failure to purge air from the cooling system can result in an overheating condition and severe engine damage.

2. Fill cooling system with the antifreeze mixture. Refer to **DESCRIPTION** . Fill pressure bottle to service line and install cap.

NOTE: The engine cooling system will push any remaining air into the coolant bottle within about an hour of normal driving. As a result, a drop in coolant level in the pressure bottle may occur.
If the engine cooling system overheats and pushes coolant into the overflow side of the coolant bottle, this coolant will be sucked back into the cooling system ONLY IF THE PRESSURE CAP IS LEFT ON THE BOTTLE. Removing the pressure cap breaks the vacuum path between the two bottle sections and the coolant will not return to cooling system.

3. With heater control unit in the HEAT position, operate engine with pressure bottle cap in place.
4. Add coolant to pressure bottle as necessary. **Only add coolant to the pressure bottle when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

NOTE: The coolant bottle has two chambers. Coolant will normally only be in the outboard (larger) of the two. The inboard chamber is only to recover coolant in the event of an overheat or after a recent service fill. The inboard chamber should normally be empty. If there is coolant in the overflow side of the coolant bottle (after several warm/cold cycles of the engine) and coolant level is above cold full when cold, disconnect the end of the overflow hose at the fill neck and lower it into a clean container. Allow coolant to drain into the container until emptied. Reconnect overflow hose to fill neck.

FILLING-GAS

Remove radiator pressure cap and fill system, using 50/50 mixture of the appropriate fluid and distilled water. Refer to **DESCRIPTION** .

Continue filling system until full. **Do not spill coolant on drive belts or the generator.** For cooling system capacity,

Fill coolant recovery/reserve container to at least the MAX mark. It may be necessary to add coolant to the recovery/reserve container after three or four warm up/cool down cycles to maintain coolant level between the MAX and MIN mark. This will allow trapped air to be removed from the system.

CLEANING/REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97-110 kPa (14-16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

CHEMICAL CLEANING

If visual inspection indicates the formation of sludge or scaly deposits, use a radiator cleaner (Mopar® Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97-110 kPa (14 -16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

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

REVERSE FLUSHING ENGINE

Drain the cooling system. See **STANDARD PROCEDURE**. Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing. See **REMOVAL**. Install the thermostat and housing with a replacement gasket . See **INSTALLATION**. Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture . See **STANDARD PROCEDURE**.

INSPECTION

COOLING-INSPECTION

After performing a cleaning/flush procedure, inspect all hoses, clamps and connections for deterioration and leaks. Inspect radiator and heater core for leaks.

SPECIFICATIONS

FILL VOLUMES

DESCRIPTION	SPECIFICATION	
Metric	US	
3.7L	13.2L	14.0 qts.
4.0L	13.2 L	14.0 qts.
2.8L Diesel	12.5 L	11.8 qts

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Engine Air Tubes			
Turbocharger to Intercooler	4.7	-	42
Intercooler to Intake Manifold	4.7	-	42
Automatic Belt Tensioner to Mounting Bracket - 3.7L	41	30	-
Automatic Belt Tensioner Pulley Bolt - 3.7L	61	45	-
Accessory Drive Belt Idler Pulley Bolt - 2.8L Diesel	53	39	-
Accessory Drive Belt Tensioner Bolt - 2.8L Diesel	47.1	35	-
Viscous Fan Drive to Engine - 3.7L	95	70	-
Viscous Fan Drive to Engine - 2.8L Diesel	149	110	-
Cooling Fan Support Bolts	47.1	35	-
Block Heater Bolt - 3.7L	2	-	17
Transmission Oil/Condenser to Radiator Bolts	11.9	-	105

Coolant Pressure Bottle to Plenum mounting Bolts -3.7L only	8.5	-	75
Electric Fan to Fan Shroud Bolts	9	-	80
Fan Blade Assy. to Viscous Drive Bolts - 3.7L/2.8L HD Cooling	23.7	-	210
Fan Shroud to Radiator Mounting Bolts	9	-	80
Radiator Upper Isolator to Crossmember - Bolts	10.7	-	95
Thermostat Housing Bolts	-	-	-
2.8L Diesel	27.5	21	-
3.7L	13	-	115
Water Pump Bolts			
3.7L	54	40	-
Water Pump Housing Nuts - 2.8L Diesel	24.4	18	-

SPECIAL TOOLS

SPECIAL TOOLS

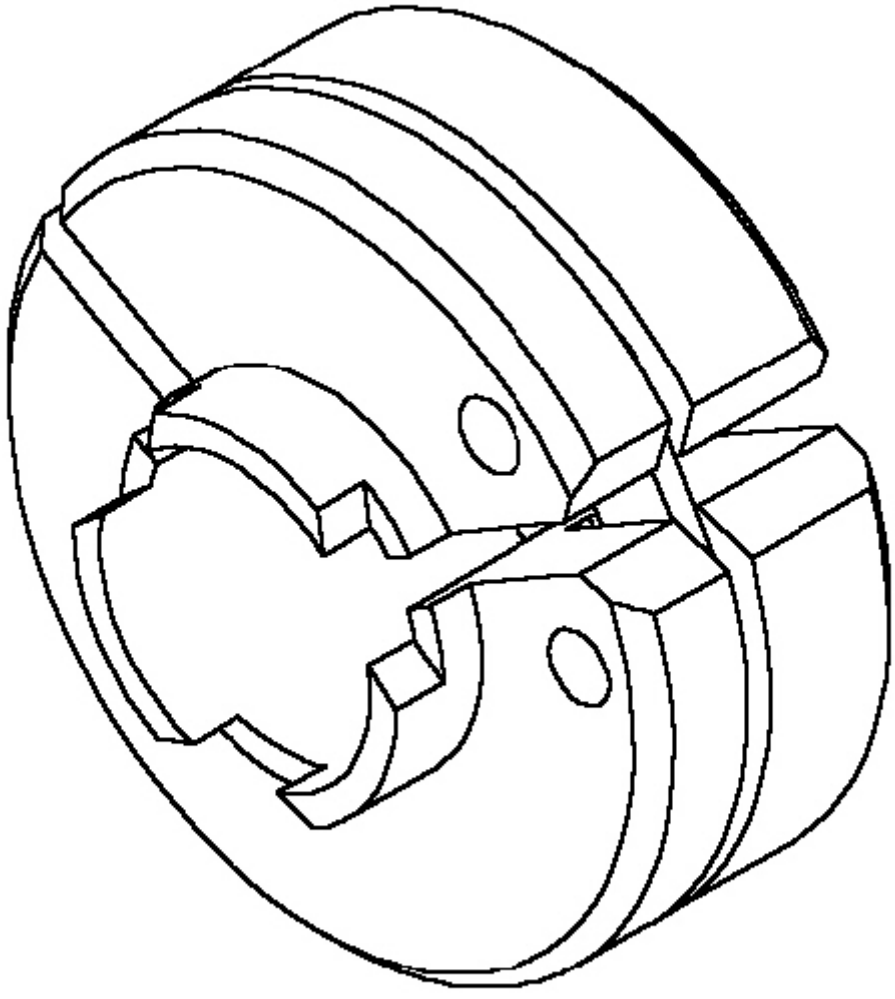

Fig. 5: Release Tool 8875A
Courtesy of CHRYSLER LLC

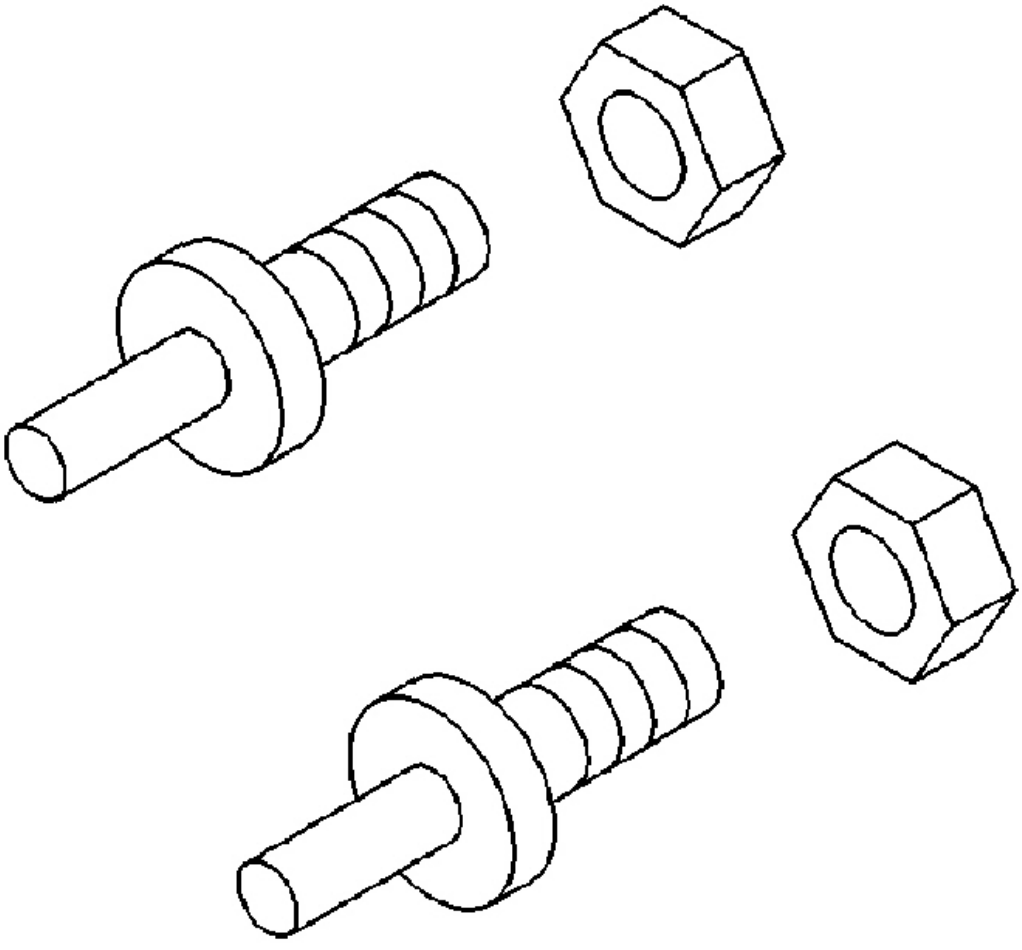

Fig. 6: Adapter Pins 8346
Courtesy of CHRYSLER LLC

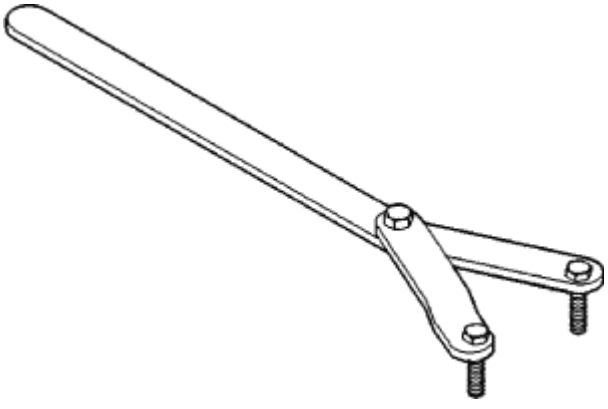

Fig. 7: Spanner Wrench 6958
Courtesy of CHRYSLER LLC

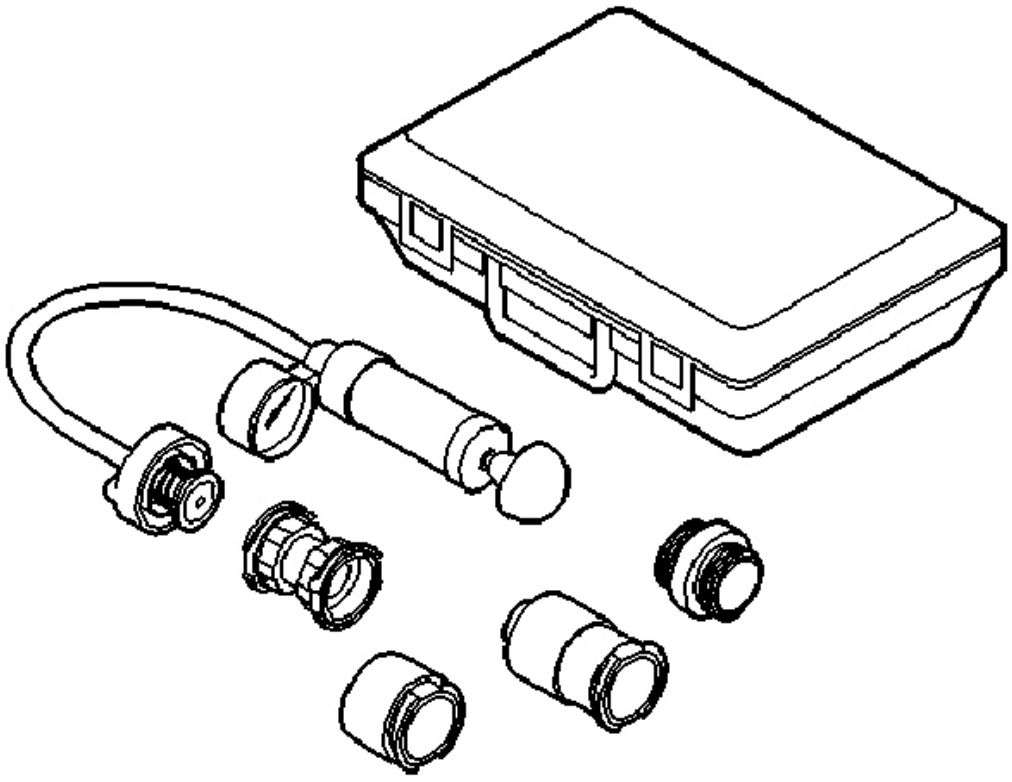

Fig. 8: Cooling System Pressure Tester - 7700A
Courtesy of CHRYSLER LLC

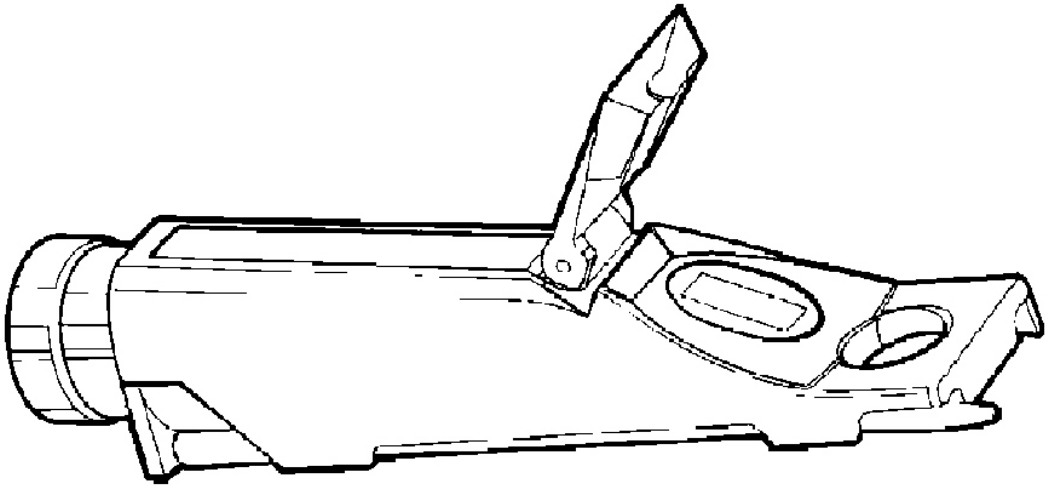

Fig. 9: Coolant Refractometer - 8286
Courtesy of CHRYSLER LLC

ACCESSORY DRIVE

BELT-ACCESSORY DRIVE

DESCRIPTION

DESCRIPTION

The accessory drive belt is a serpentine type belt. Satisfactory performance of these belts depends on belt condition and proper belt tension.

DIAGNOSIS AND TESTING

ACCESSORY DRIVE BELT

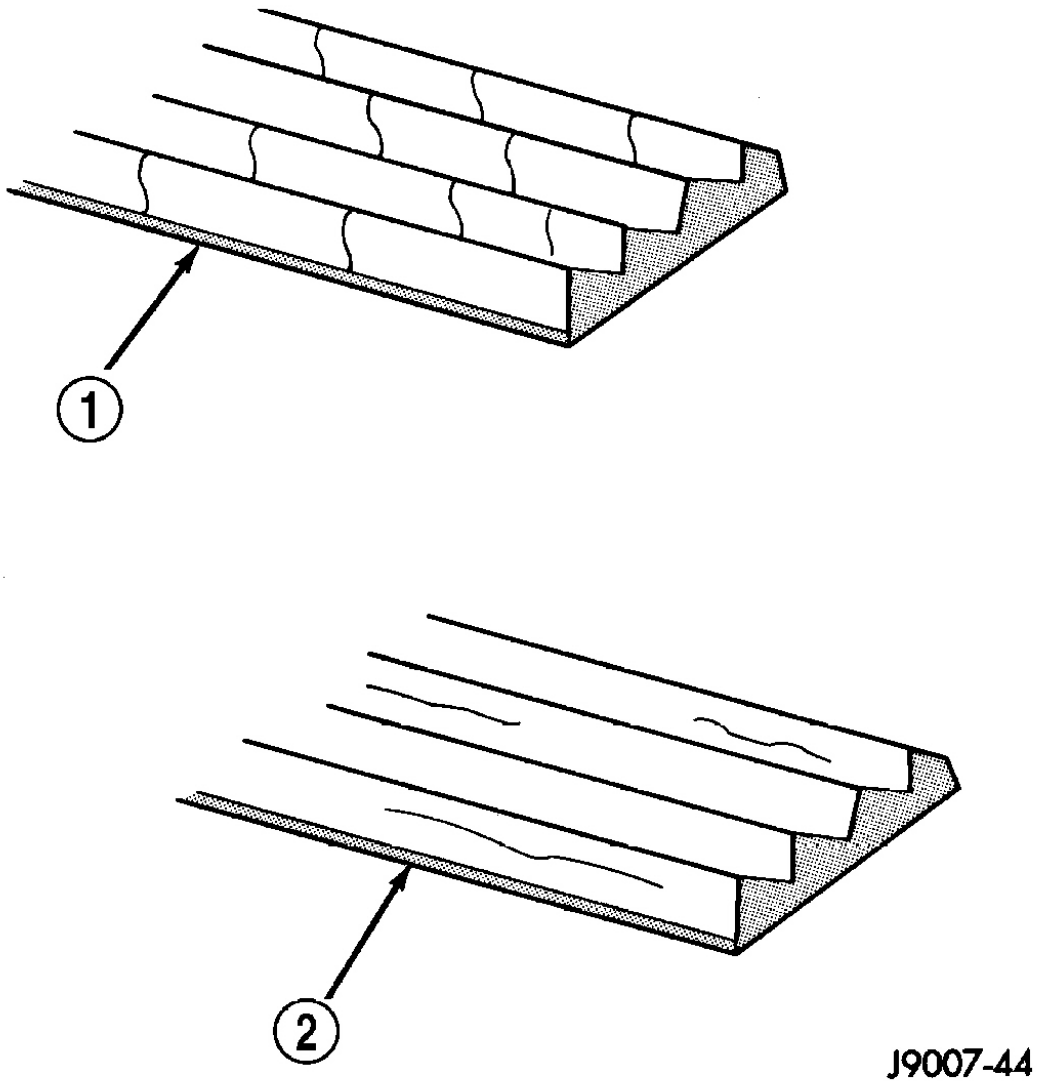

Fig. 10: Belt Wear Patterns
Courtesy of CHRYSLER LLC

1 - NORMAL CRACKS BELT OK
2 - NOT NORMAL CRACKS REPLACE BELT

When diagnosing serpentine drive belts, small cracks (1) that run across ribbed surface of belt from rib to rib, are considered normal. These are not a reason to replace belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced. Also replace belt if it has excessive wear, frayed cords or severe glazing.

SERPENTINE DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY)	1. Foreign objects imbedded in pulley grooves. 2. Installation damage.	1. Remove foreign objects from pulley grooves. Replace belt. 2. Replace belt.
RIB OR BELT WEAR	1. Pulley(s) misaligned. 2. Abrasive environment. 3. Rusted pulley(s). 4. Sharp or jagged pulley groove tips. 5. Rubber deteriorated.	1. Align pulley(s). 2. Clean pulley(s). Replace belt if necessary. 3. Clean rust from pulley(s). 4. Replace pulley. 5. Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	1. Belt has mistracked from pulley groove. 2. Pulley groove tip has worn away rubber to tensile member.	1. Replace belt. 2. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension. 2. Belt routed incorrectly. 3. Incorrect belt. 4. Belt or pulley subjected to substance (belt dressing, oil ethylene glycol) that has reduced friction. 5. Driven component bearing failure. 6. Belt glazed and hardened from heat and excessive slippage.	1. Replace automatic belt tensioner. 2. Verify belt routing. 3. Replace belt. 4. Replace belt and clean pulleys. 5. Replace faulty component bearing. 6. Replace belt.
"GROOVE JUMPING" (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	1. Belt tension either too high or too low. 2. Belt routed incorrectly. 3. Incorrect belt. 4. Pulley(s) not within design tolerance. 5. Foreign object(s) in grooves. 6. Pulley misalignment. 7. Belt cord line is broken.	1. Replace automatic belt tensioner. 2. Verify belt routing. 3. Replace belt. 4. Replace pulley(s). 5. Remove foreign objects from grooves. 6. Check and replace. 7. Replace belt.
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension. 2. Incorrect belt. 3. Tensile member damaged during belt installation. 4. Severe misalignment.	1. Replace belt and automatic belt tensioner. 2. Replace belt. 3. Replace belt. 4. Check and replace.

	5. Bracket, pulley, or bearing failure.	5. Replace defective component and belt.
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.	1. Replace belt or automatic belt tensioner. 2. Locate and repair. 3. Replace belt. 4. Install correct belt.

REMOVAL

REMOVAL-3.7L

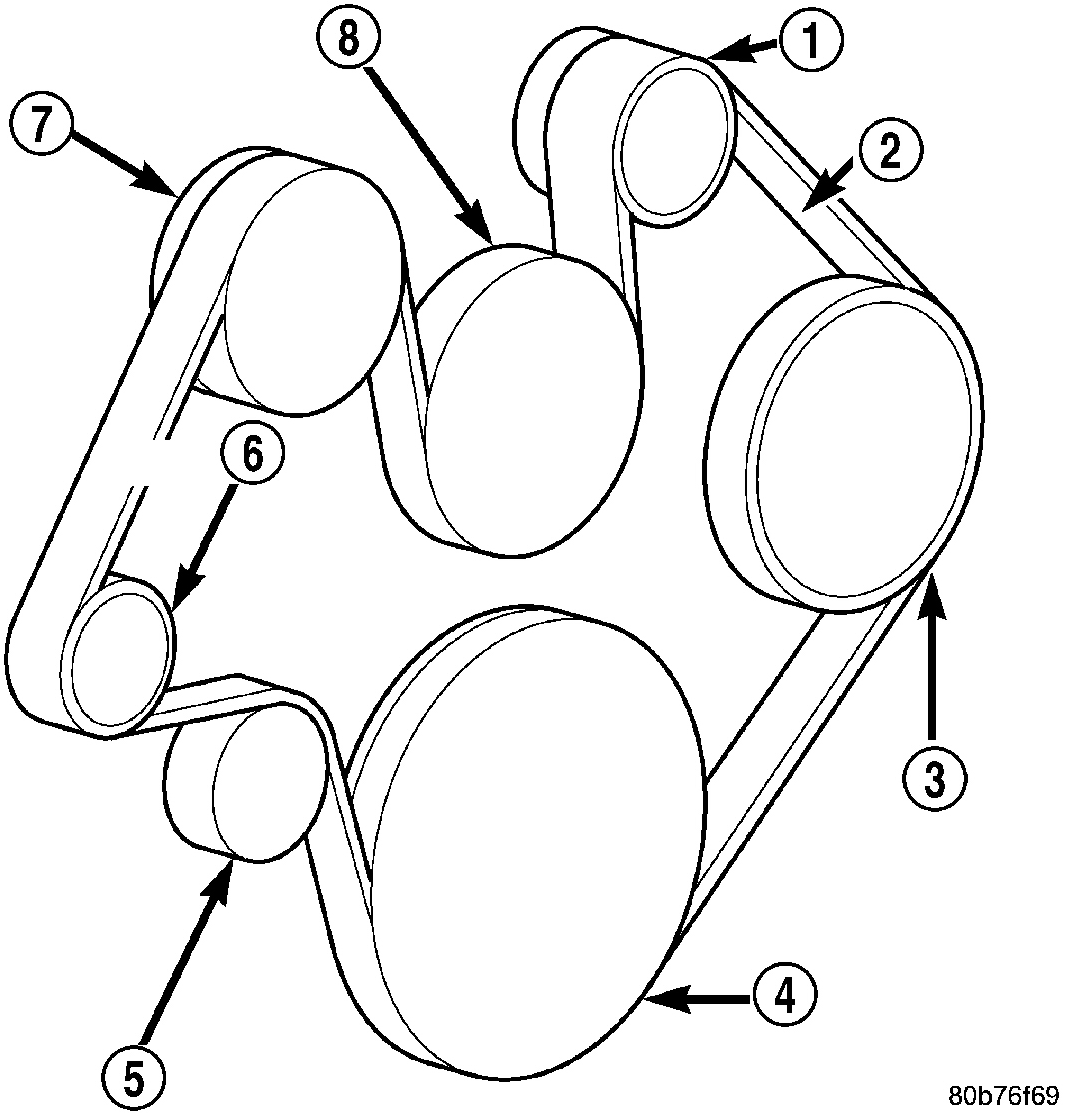

Fig. 11: Identifying Belt Routing - 3.7L
Courtesy of CHRYSLER LLC

1 - GENERATOR PULLEY
2 - ACCESSORY DRIVE BELT
3 - POWER STEERING PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - IDLER PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - WATER PUMP PULLEY

CAUTION: Do not let tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

1. Disconnect negative battery cable.
2. Remove combination washer reservoir/coolant recovery container. See **REMOVAL**.
3. Rotate belt tensioner (6) until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position.

REMOVAL-4.0L

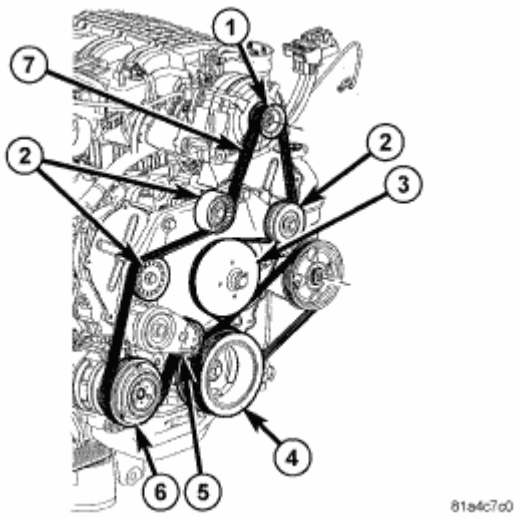

Fig. 12: Accessory Drive Belt Routing - 4.0L
Courtesy of CHRYSLER LLC

1 - GENERATOR
2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER

6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

1. Remove combination coolant recovery/washer reservoir. See **REMOVAL**.
2. Insert a suitable square drive ratchet into the square hole on belt tensioner arm.
3. Rotate accessory drive belt tensioner clockwise to release belt tension.
4. Remove accessory drive belt.

REMOVAL-2.8L DIESEL

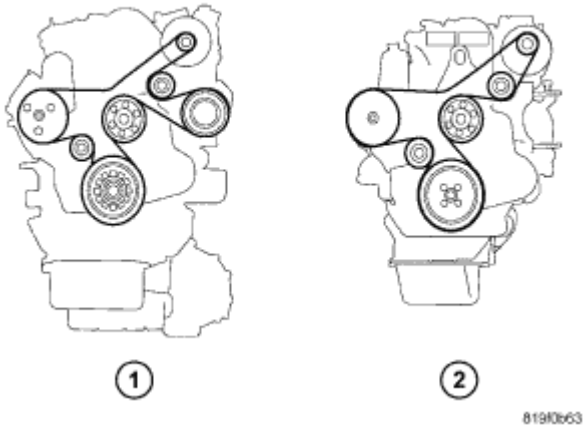

Fig. 13: Belt Routing - 2.8L Diesel
Courtesy of CHRYSLER LLC

1 - WITH A/C
2 - WITHOUT A/C

CAUTION: Do not let tensioner arm snap back to the freearm position, severe damage may occur to the tensioner.

1. Disconnect negative battery cable.

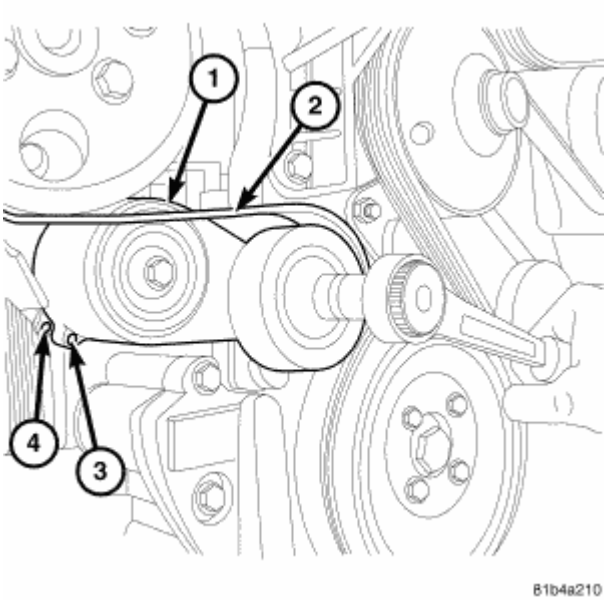

Fig. 14: Identifying Belt Tensioner & Locking Tabs
Courtesy of CHRYSLER LLC

2. Rotate the belt tensioner (1) until the position locking tabs (3 and 4) line up.

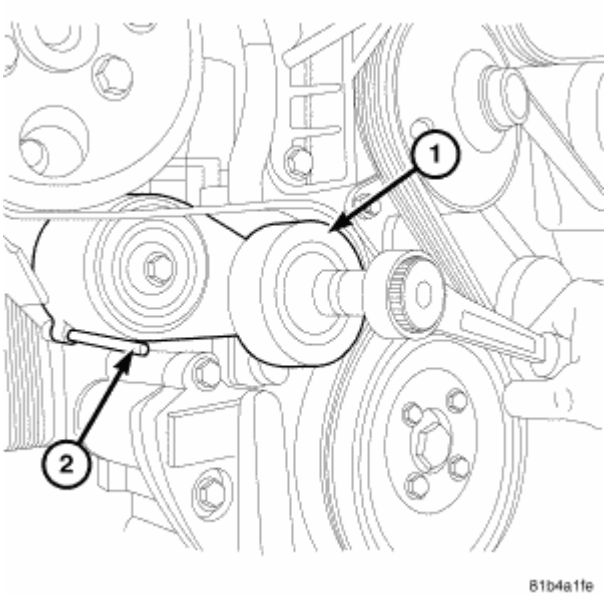

Fig. 15: Removing/Installing Drift
Courtesy of CHRYSLER LLC

3. Install a drift into the belt tensioner (1) at position 2.

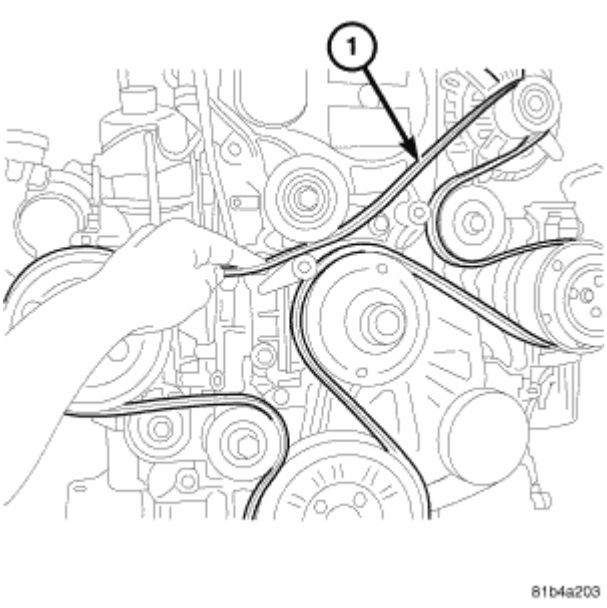

Fig. 16: Removing/Installing Accessory Drive Belt
Courtesy of CHRYSLER LLC

4. Remove the accessory drive belt (1).

CLEANING

CLEANING

Clean all foreign debris from belt pulley grooves. The belt pulleys must be free of oil, grease, and coolants before installing the drive belt.

INSTALLATION

INSTALLATION-2.8L DIESEL

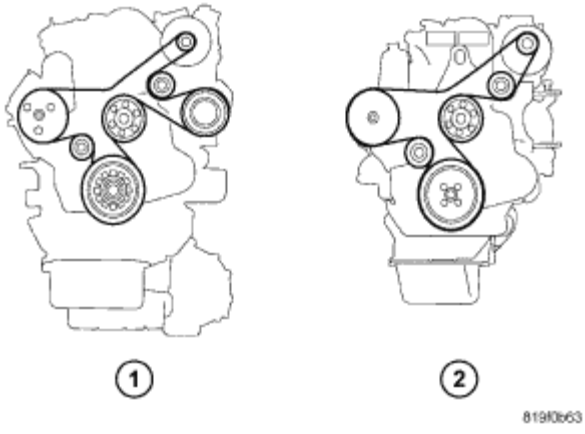

Fig. 17: Belt Routing - 2.8L Diesel
Courtesy of CHRYSLER LLC

1 - WITH A/C 2 - WITHOUT A/C

1. Check condition of all pulleys.

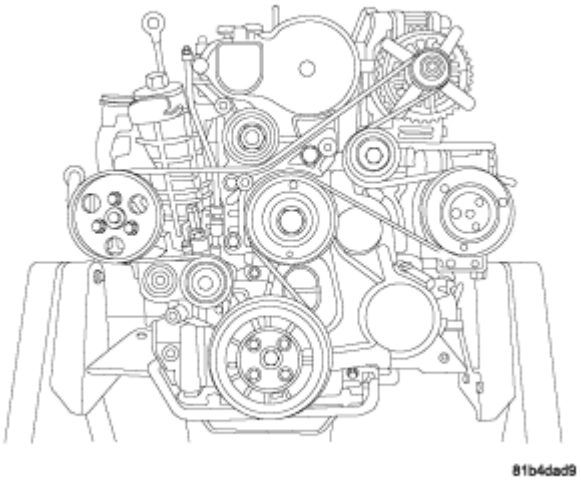

Fig. 18: Identifying Pulley Assembly - 2.8L Diesel
Courtesy of CHRYSLER LLC

CAUTION: When installing the accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

2. Install accessory drive belt. Route the belt around all pulleys (1 or 2) except the idler pulley.

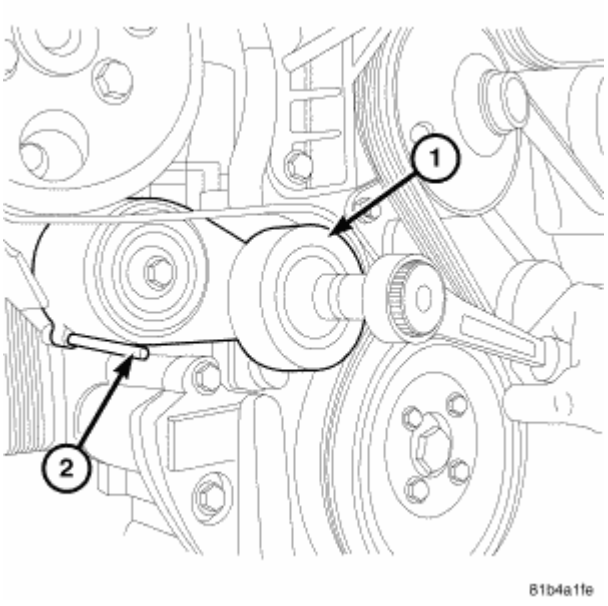

Fig. 19: Rotating Tensioner Arm Until It Contacts Its Stop Position
Courtesy of CHRYSLER LLC

3. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

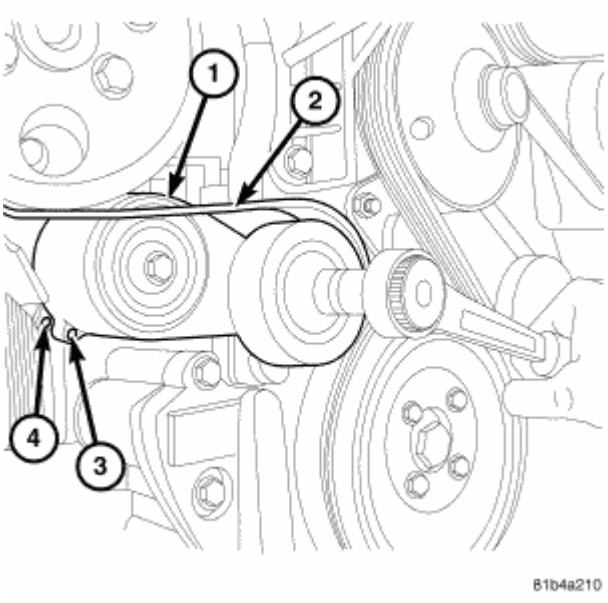

Fig. 20: Identifying Belt Tensioner & Locking Tabs
Courtesy of CHRYSLER LLC

4. Remove the drift from the belt tensioner.

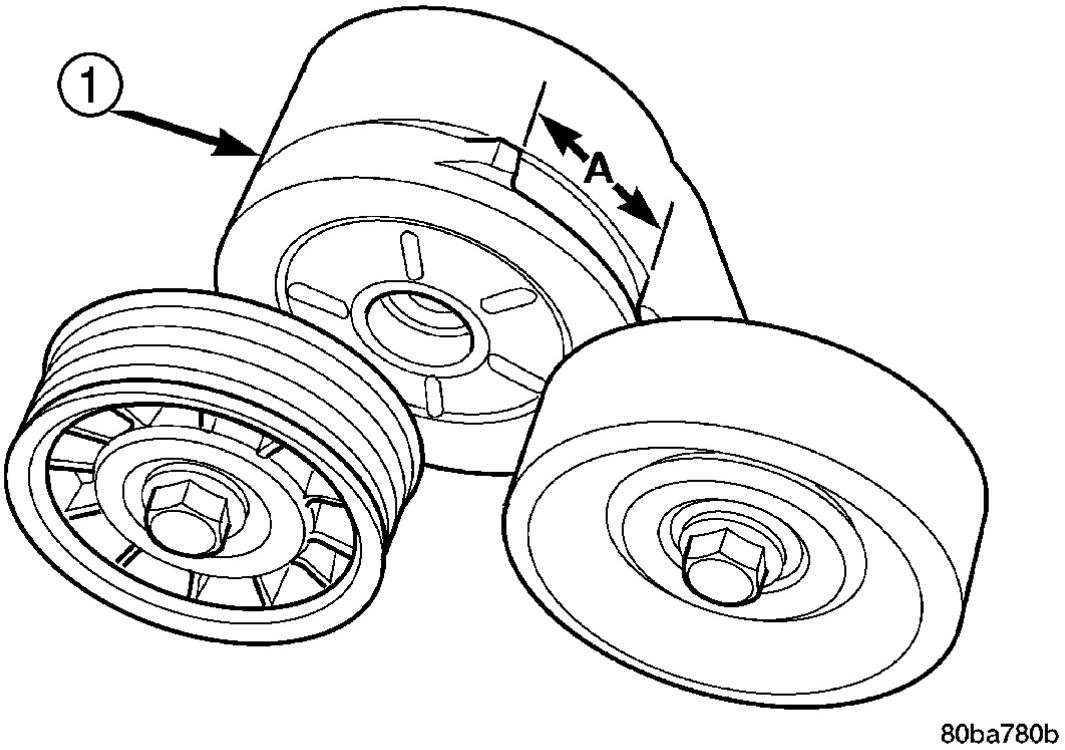

Fig. 21: Automatic Tensioner Assembly
Courtesy of CHRYSLER LLC

1 - AUTOMATIC TENSIONER ASSEMBLY

1. Check condition of all pulleys.

CAUTION: When installing the accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

2. Install new belt. Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm (1) until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.
3. With the drive belt installed, inspect the belt wear indicator. On 3.7L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (0.94 inches).
4. Install combination washer reservoir/coolant recovery container. See **INSTALLATION**.

INSTALLATION-4.0L

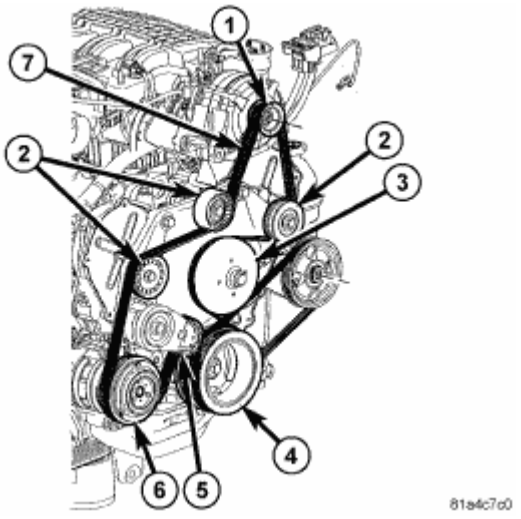

Fig. 22: Accessory Drive Belt Routing - 4.0L
Courtesy of CHRYSLER LLC

1 - GENERATOR 2 - IDLER PULLEY
3 - WATER PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - ACCESSORY DRIVE BELT TENSIONER
6 - A/C COMPRESSOR
7 - ACCESSORY DRIVE BELT

NOTE: When installing accessory drive belt onto pulleys, make sure that belt is properly routed and all V-grooves make proper contact with pulleys.

1. Rotate tensioner **clockwise** and position accessory drive belt over all pulleys.
2. Gently release tensioner.
3. Install combination coolant recovery/washer reservoir. See **INSTALLATION**.

BELTS-DRIVE-POWER STEERING

REMOVAL

REMOVAL

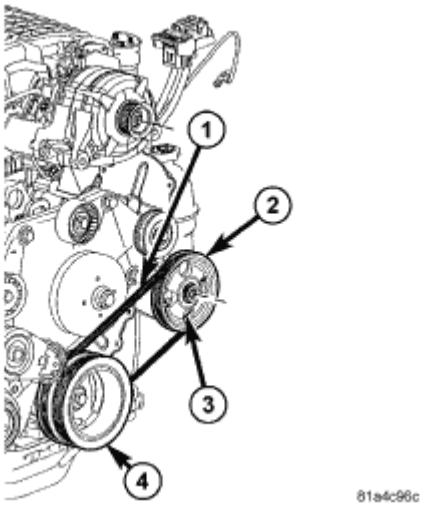

Fig. 23: Removing/Installing Power Steering Belt
Courtesy of CHRYSLER LLC

1 - POWER STEERING BELT 2 - POWER STEERING PULLEY
3 - ACCESS HOLE
4 - CRANKSHAFT PULLEY

1. Remove accessory drive belt. See **REMOVAL**.
2. Position suitable tool between power steering belt (1) and power steering pulley (2) at the top of the pulley.
3. Use a socket and ratchet to rotate the crankshaft clockwise.
4. While rotating the crankshaft clockwise, walk the power steering belt (1) off of the power steering pulley (2).

INSTALLATION

INSTALLATION

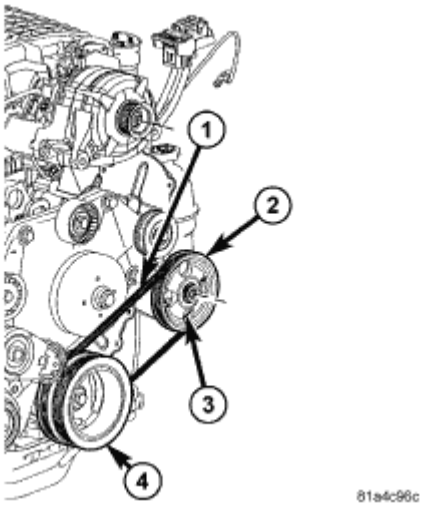

Fig. 24: Removing/Installing Power Steering Belt
Courtesy of CHRYSLER LLC

1 - POWER STEERING BELT 2 - POWER STEERING PULLEY
3 - ACCESS HOLE
4 - CRANKSHAFT PULLEY

1. Position power steering belt (1) on crankshaft pulley (4). Make sure belt is fully seated in crankshaft pulley grooves.
2. Position top of power steering belt on the top of the power steering pulley (2).

NOTE: Use only wire ties with nylon locks, not metal.

3. Working from the back side of the power steering pulley (2) , insert a nylon wire tie, 7.75X1/8x.0.050 in, through one of the access holes (3) in the pulley.
4. Tighten the wire tie to hold the drive belt in position.
5. While holding the drive belt to make sure it stays in position, slowly rotate the engine clockwise.
6. Once the belt is in position on the pulley, continue rotating the engine until the wire tie snaps.
7. Remove the wire tie from the vehicle.

TENSIONER-ACCESSORY DRIVE BELT

DESCRIPTION

BELT TENSIONERS-DESCRIPTION

The automatic belt tensioner is a spring loaded arm and pulley assembly. The tensioner assembly is designed to apply constant pressure on the accessory drive belt to maintain proper belt tension.

OPERATION

BELT TENSIONER-OPERATION

WARNING: The automatic belt tensioner assembly is spring loaded. Do not attempt to disassemble the tensioner assembly.

The automatic belt tensioner maintains correct belt tension using a coiled spring within the tensioner housing. The spring applies pressure to the tensioner arm pressing the arm into the belt, tensioning the belt.

If a new belt is being installed, the arrow must be within approximately 3 mm (1/8 in.) of indexing mark. Belt is considered new if it has been used 15 minutes or less. If this specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed.

REMOVAL

REMOVAL-4.0L

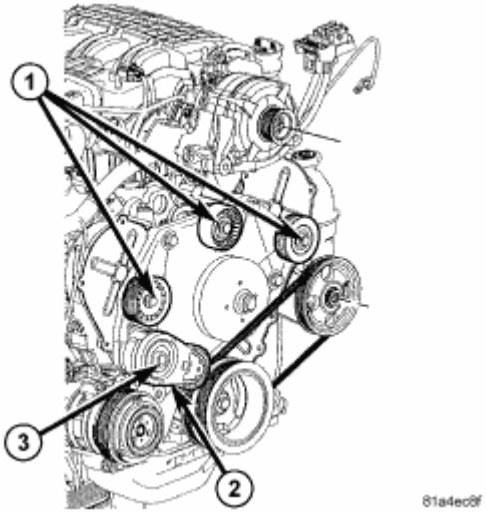

Fig. 25: Removing/Installing Accessory Drive Belt Tensioner - 4.0L
Courtesy of CHRYSLER LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT TENSIONER
3 - MOUNTING BOLT

1. Remove accessory drive belt. See **REMOVAL**.
2. Remove accessory drive belt tensioner.

REMOVAL-3.7L

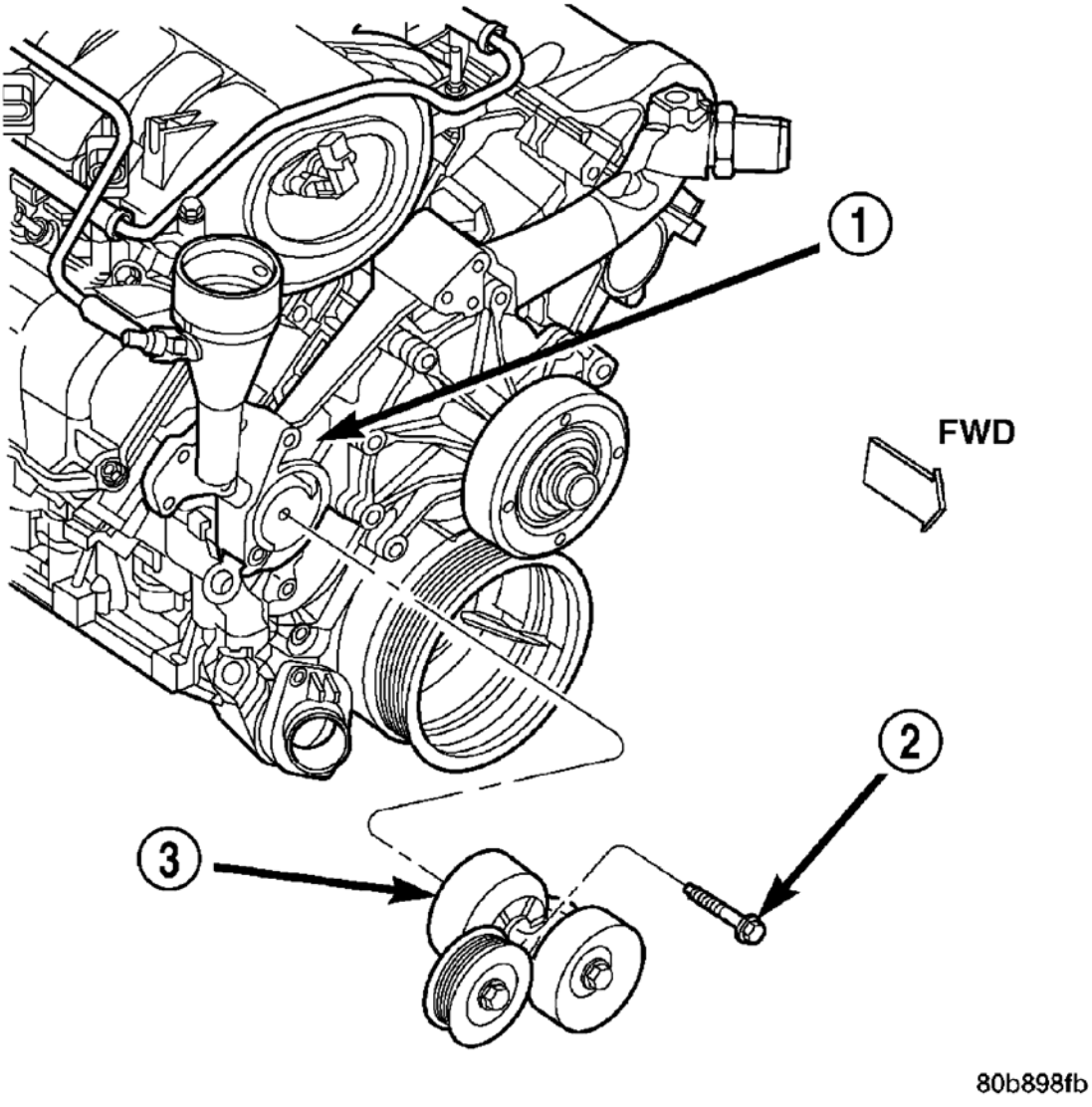

Fig. 26: Removing/Installing Automatic Belt Tensioner - 3.7L
Courtesy of CHRYSLER LLC

1 - TIMING CHAIN COVER 2 - BOLT TORQUE TO 41 N.m (30 FT LBS) 3 - AUTOMATIC BELT TENSIONER

1. Remove accessory drive belt (Refer to **REMOVAL**).

2. Remove tensioner assembly (3) from engine front cover.

WARNING: Because of high spring tension, do not attempt to disassemble automatic tensioner. Unit is serviced as an assembly (except for pulley on tensioner).

3. Remove pulley bolt. Remove pulley from tensioner.

REMOVAL-2.8L DIESEL

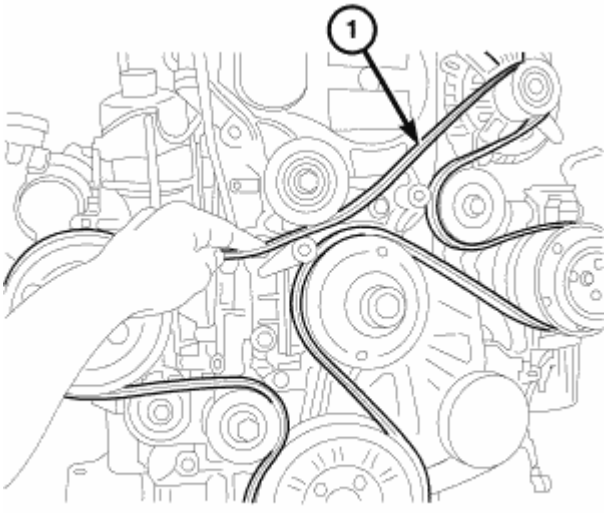

Fig. 27: Removing/Installing Accessory Drive Belt
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove accessory drive belt (9). See **Fig. 27**. See **REMOVAL**.

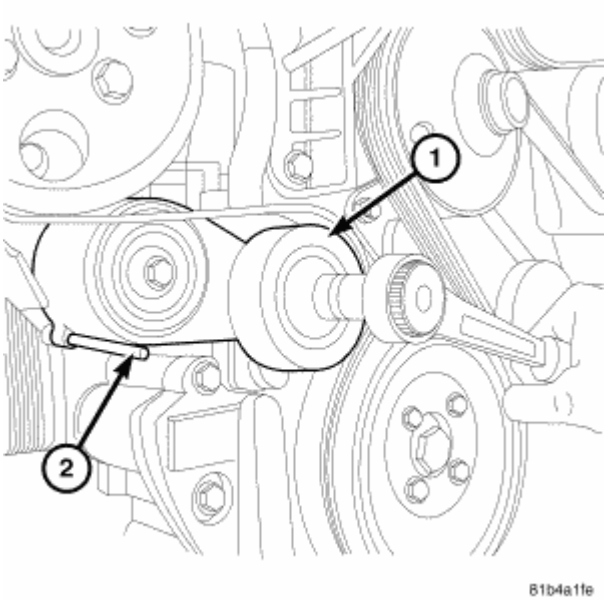

Fig. 28: Removing/Installing Belt Tensioner Retaining Bolt And Tensioner
Courtesy of CHRYSLER LLC

3. Remove belt tensioner retaining bolt and remove tensioner (1).

INSTALLATION

INSTALLATION-3.7L

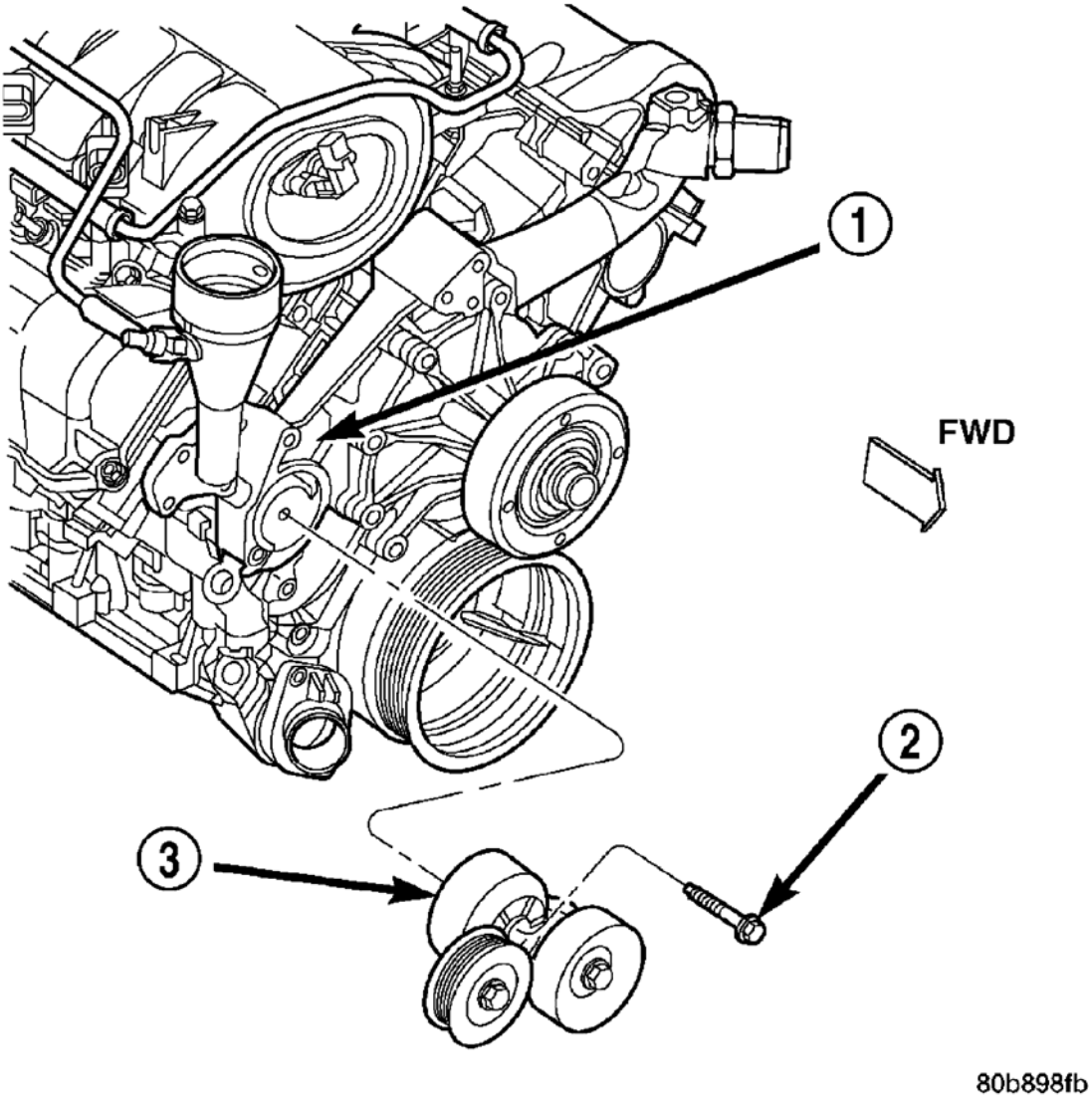

Fig. 29: Removing/Installing Automatic Belt Tensioner - 3.7L
Courtesy of CHRYSLER LLC

1 - TIMING CHAIN COVER 2 - BOLT TORQUE TO 41 N.m (30 FT LBS) 3 - AUTOMATIC BELT TENSIONER

1. Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N.m (45 ft. lbs.) torque.
2. An indexing slot is located on back of tensioner. Align this slot to the head of the bolt on the front cover. Install the mounting bolt. Tighten bolt to 41 N.m (30 ft. lbs.).
3. Install drive belt (Refer to **INSTALLATION**).
4. Check belt indexing marks (Refer to **INSTALLATION**).

INSTALLATION-2.8L DIESEL

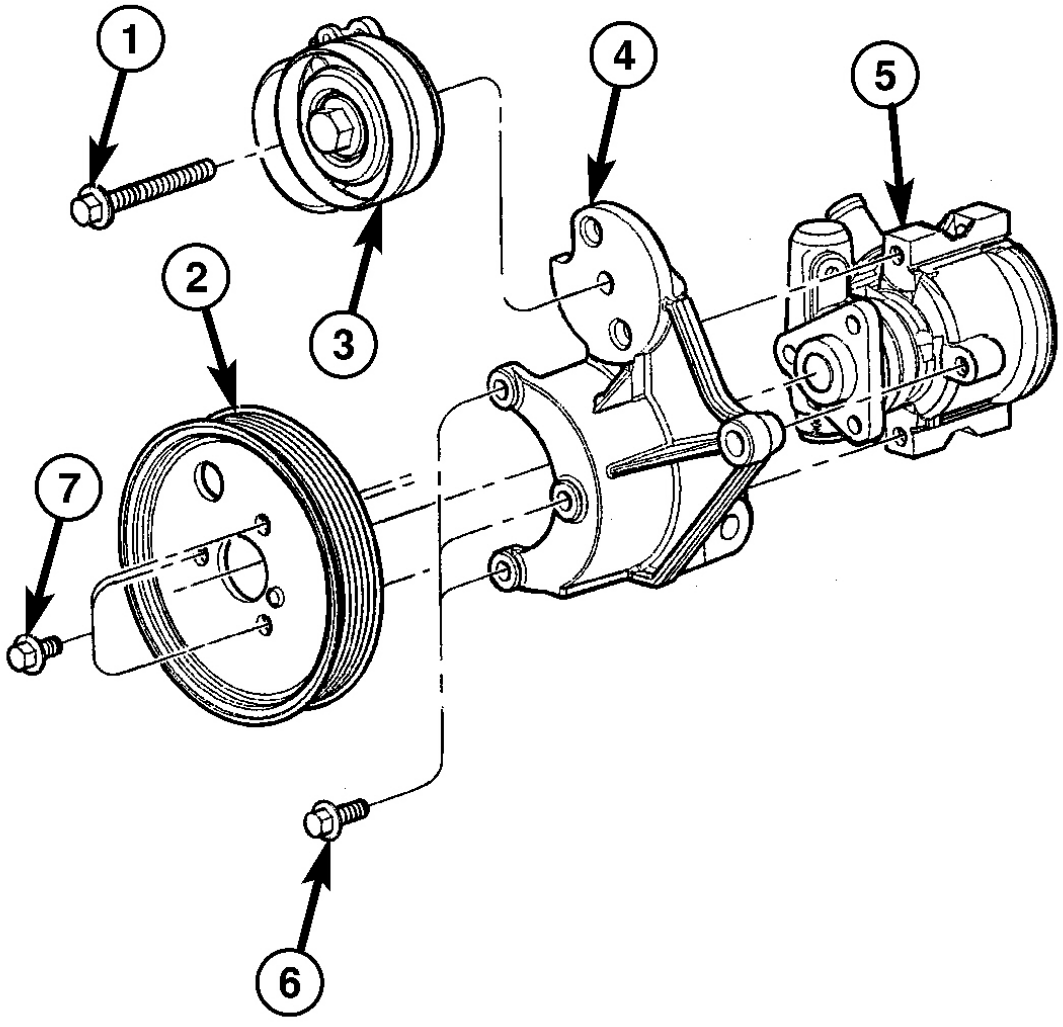

Fig. 30: Belt Tensioner Assembly
Courtesy of CHRYSLER LLC

1 - ACCESSORY BELT TENSIONER RETAINING BOLT
2 - POWER STEERING PUMP PULLEY
3 - BELT TENSIONER
4 - BRACKET
5 - POWER STEERING PUMP

6 - POWER STEERING PUMP RETAINING BOLTS
7 - POWER STEERING PUMP PULLEY RETAINING BOLTS

1. Install belt tensioner on bracket. Tighten retaining bolt to 47 N.m (35 ft. lbs.).

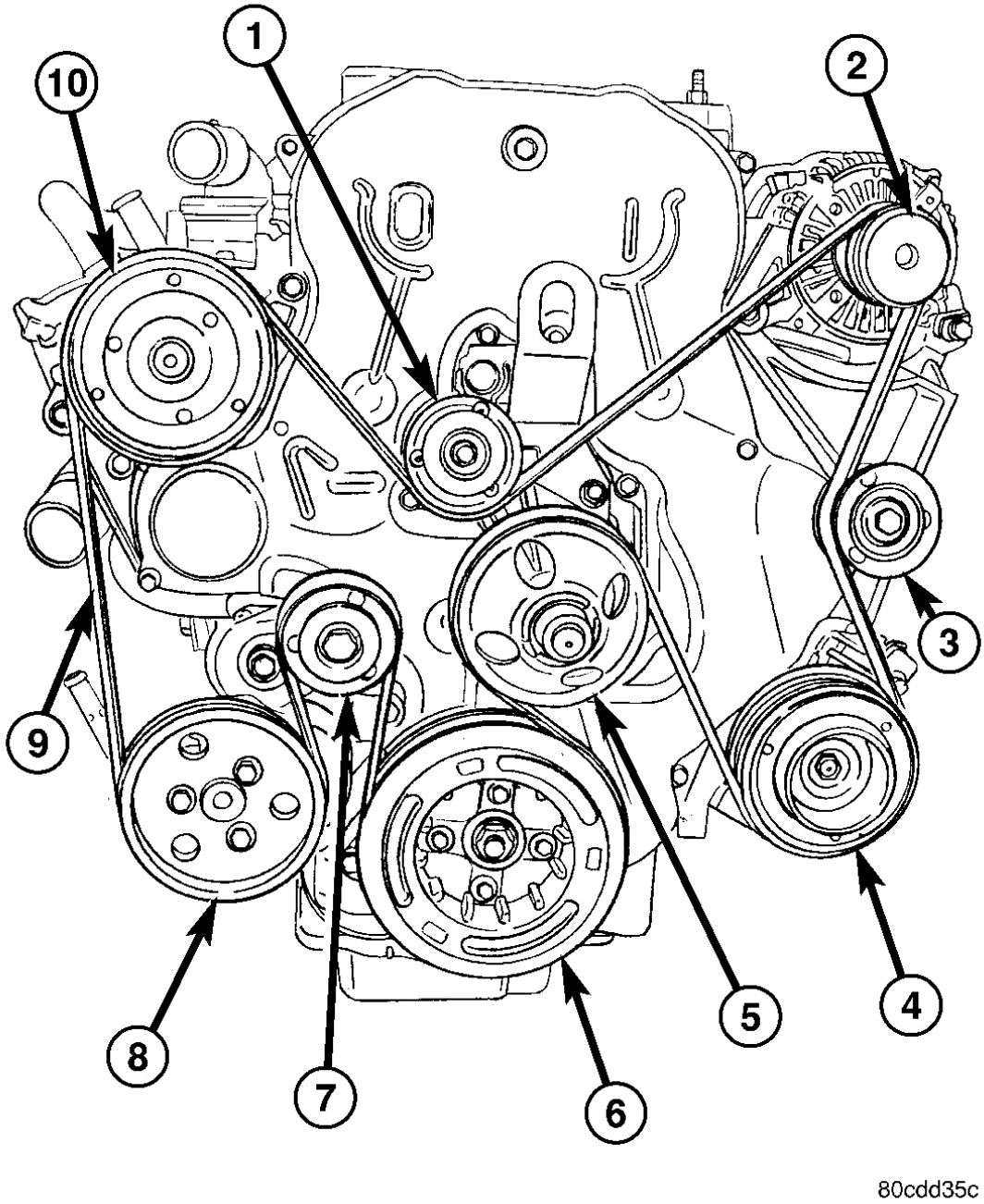

Fig. 31: Accessory Belt Routing

Courtesy of CHRYSLER LLC

1 - IDLER PULLEY
2 - GENERATOR
3 - IDLER PULLEY
4 - A/C COMPRESSOR
5 - COOLING FAN SUPPORT
6 - VIBRATION DAMPER
7 - BELT TENSIONER
8 - POWER STEERING PUMP
9 - ACCESSORY DRIVE BELT
10 - VISCOUS HEATER

2. Install accessory drive belt. See **INSTALLATION**.
3. Connect negative battery cable.

INSTALLATION-4.0L

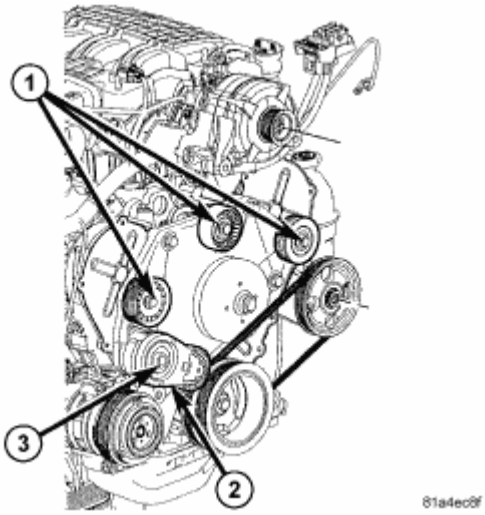

Fig. 32: Removing/Installing Accessory Drive Belt Tensioner - 4.0L
Courtesy of CHRYSLER LLC

1 - IDLER PULLEY
2 - ACCESSORY DRIVE BELT TENSIONER
3 - MOUNTING BOLT

1. Position accessory drive belt tensioner (2).
2. Install mounting bolt (3). Tighten bolt to Tighten bolt to 61 N.m (45 ft. lbs.).
3. Install accessory drive belt. See **INSTALLATION**.

PULLEY-IDLER

REMOVAL

REMOVAL-4.0L

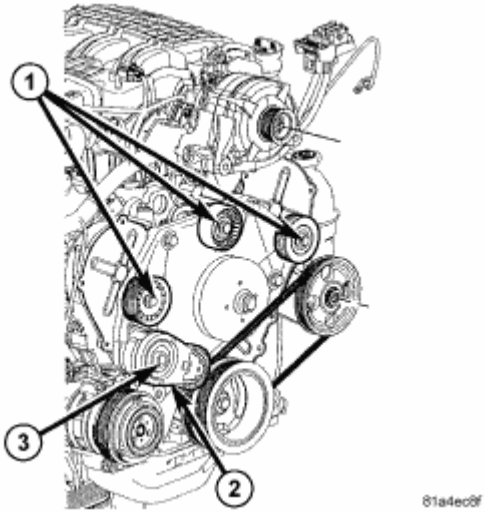

Fig. 33: Removing/Installing Accessory Drive Belt Tensioner - 4.0L
Courtesy of CHRYSLER LLC

1 - IDLER PULLEY 2 - ACCESSORY DRIVE BELT TENSIONER 3 - MOUNTING BOLT

1. Remove accessory drive belt. See **REMOVAL**.
2. Remove cover.
3. Remove bolt and pulley (1).

IDLER PULLEY-REMOVAL-2.8L DIESEL

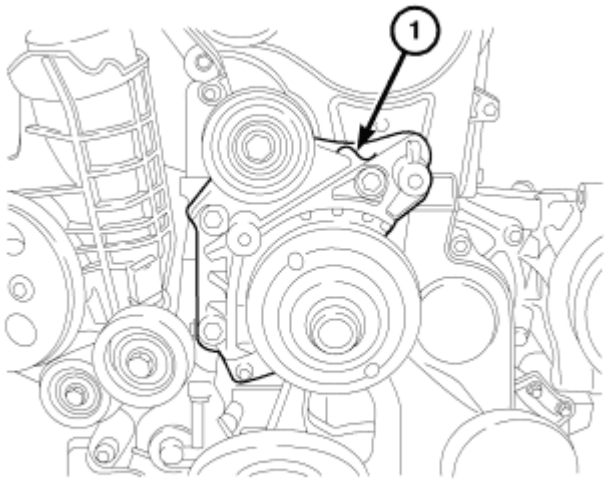

Fig. 34: Idler Pulley
Courtesy of CHRYSLER LLC

CAUTION: The retaining bolts on the idler pulleys are left hand thread.

1. Disconnect negative battery cable.
2. Remove accessory drive belt. See **REMOVAL**.
3. Remove idler pulley retaining bolts and pulley.

INSTALLATION

INSTALLATION-4.0L

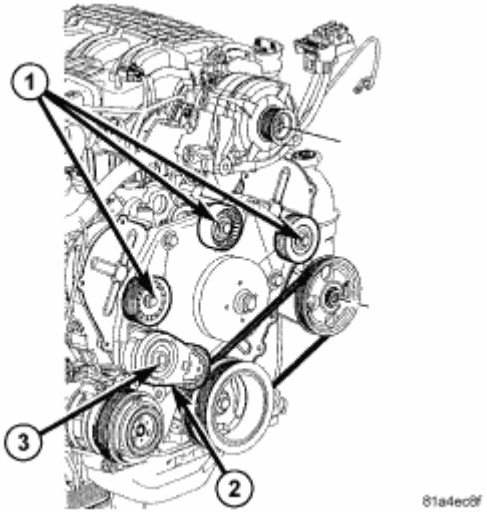

Fig. 35: Removing/Installing Accessory Drive Belt Tensioner - 4.0L

Courtesy of CHRYSLER LLC

1 - IDLER PULLEY 2 - ACCESSORY DRIVE BELT TENSIONER 3 - MOUNTING BOLT

1. Position idler pulley (1).
2. Tighten bolt to (3) 28 N.m (250 in. lbs.).
3. Install cover.
4. Install accessory drive belt. See **INSTALLATION**.

IDLER PULLEY-INSTALLATION-2.8L DIESEL

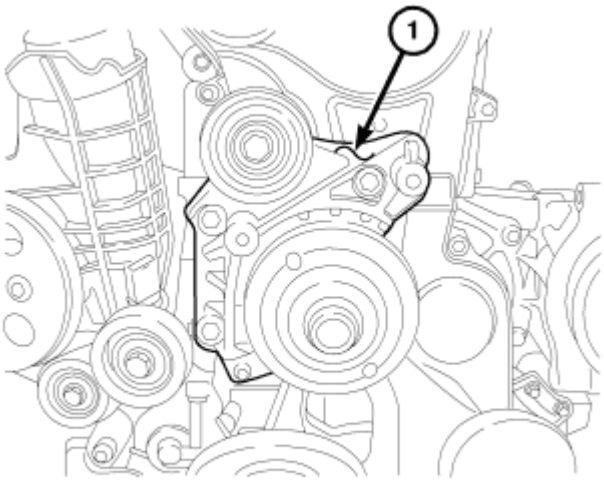

Fig. 36: Idler Pulley
Courtesy of CHRYSLER LLC

1. Install idler pulley and retaining bolt. Tighten bolts to 53 N.m (39 ft. lbs.)
2. Install accessory drive belt. See **INSTALLATION**.
3. Connect negative battery cable.

ENGINE

COOLANT

DESCRIPTION

COOLANT-DESCRIPTION

ETHYLENE-GLYCOL MIXTURES

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

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37°C (-35°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°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.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149°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).

PROPYLENE-GLYCOL MIXTURES

It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32°C (-26°F). 5°C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125°C (257°F) at 96.5 kPa (14 psi), compared to 128°C (263°F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

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

DESCRIPTION

GAS ENGINES

WARNING: Antifreeze is an ethylene glycol based coolant and is harmful if swallowed or inhaled. If swallowed, drink two glasses of water and induce vomiting. If inhaled, move to fresh air area. Seek medical attention immediately. Do not store in open or unmarked containers. Wash skin and clothing thoroughly after coming in contact with ethylene glycol. Keep out of reach of children. Dispose of glycol based coolant properly, contact your government agency for location of collection center in your area. Do not open a cooling system when the engine is at operating temperature or hot

under pressure, personal injury can result. Avoid radiator cooling fan when engine compartment related service is performed, personal injury can result.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less boiling protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol based coolant with hybrid organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

The green coolant **MUST NOT BE MIXED** with the orange or magenta coolants. When replacing coolant the complete system flush must be performed before using the replacement coolant.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Doing so will reduce the corrosion protection and may result in premature water pump seal failure. If non-HOAT coolant is introduced into the cooling system in an emergency, it should be replaced with the specified coolant as soon as possible.

DIESEL ENGINE

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less boiling protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Glysantin G 30-91 Antifreeze/Coolant, 5 Year/150,000 Mile Formula (ASTM D3306), or the equivalent ethylene glycol based coolant. This coolant offers the best engine cooling without corrosion when mixed with 50% coolant and 50% distilled water to obtain a freeze point of -36°C (-34°F). It is dyed purple to distinguish it's unique chemistry from traditional green and yellow silicate coolants. If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

The purple coolant **MUST NOT BE MIXED** with the orange, green or magenta coolants. When replacing

coolant the complete system flush must be performed before using the replacement coolant.

CAUTION: Glysantin G 30-91 Antifreeze/Coolant, 5 Year/150,00 Mile Formula (ASTM D3306) may not be mixed with any other type of antifreeze. Doing so will reduce the corrosion protection and may result in premature water pump seal failure.

OPERATION

OPERATION

Coolant flows through the engine block absorbing the heat from the engine, then flows to the radiator where the cooling fins in the radiator transfers the heat from the coolant to the atmosphere. During cold weather the ethylene-glycol or coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.

DIAGNOSIS AND TESTING

COOLANT-CONCERTRATION TESTING

Coolant concentration should be checked when any additional coolant was added to system or after a coolant drain, flush and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of -37°C (-34°F) to -46°C (-50°F). The use of a hydrometer or Tool 8266, refractometer can be used to test coolant concentration.

A hydrometer will test the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene glycol, the larger the number of balls that will float, and higher the freeze protection (up to a maximum of 60% by volume glycol).

A Refractometer Tool 8286 will test the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

Some coolant manufactures use other types of glycols into their coolant formulations. Propylene glycol is the most common new coolant. However, propylene glycol based coolants do not provide the same freezing protection and corrosion protection and are not recommended.

CAUTION: Do not mix types of coolant - corrosion protection will be severely reduced.

CONTAINER-COOLANT RECOVERY

DESCRIPTION

DESCRIPTION-PRESSURE SYSTEM

This system works on the principal of a closed and deaerated system using thermally generated pressure. The expansion and contraction of the coolant in the pressurized closed system keeps it free of trapped air. It

provides:

- A pressurized surge tank volume for expansion and contraction.
- A non-pressurized overflow volume to capture excess coolant expansion and allow for it's return to the pressurized system.
- A pressurized cap on the pressure bottle rather than the radiator. This facilitates deaeration of the system.
- Reserve coolant is included in the pressurized volume to account for minor leaks and evaporation or boiling losses.
- Provides a warning light for low coolant level.

DESCRIPTION-NON-PRESSURE SYSTEM

This system works on the principal of a closed and completely deaerated system using thermally generated pressure. The bottle acts as a reserve coolant source to keep air out of the system but must have a specified minimum amount of coolant in the bottle at all times. The expansion and contraction of the coolant in the pressurized closed coolant loop allows the reserve bottle to accept and give up excess fluid via a hose from the radiator neck. It provides:

- A non-pressurized reserve coolant tank volume for expansion and contraction of coolant.
- A pressurized cap on the radiator. This keeps the main loop of the cooling system at an elevated operating pressure and prevents coolant boiling at lower temperatures.
- Reserve coolant is included in the non-pressurized tank in enough quantity to account for minor leaks and evaporation or boiling losses, and to keep the return line back to the radiator full at all times. Failure to do so could allow air to be sucked back into the radiator as the engine and engine coolant cool down and the coolant volume contracts.

OPERATION

OPERATION-PRESSURE SYSTEM

As the engine warms, the coolant in the closed system expands. The pressurized bottle accepts the expanding fluid. Then, when the thermostat opens and a high demand for coolant is placed on the system, the pressurized surge tank side of the bottle can supply the temporary additional volume of coolant demanded by the system. Once the water pump catches up with the flow demand, the tank returns to equilibrium. A separate compartment in the bottle accepts the overflow coolant which is then drawn back into the primary side of the bottle when the engine and coolant cool down

The advantage of the pressurized system is that any excess air in the cooling system is routed to the top of the bottle via a vent hose at the thermostat housing to the bottle. This air accumulates at the top of the pressurized volume in the bottle (the highest point in the system) and is forced out of the system through the pressure cap. This keeps the system properly deaerated and maintains pressure in the cooling system to prevent water pump cavitation

The diesel bottle has an additional vent line back to the radiator that is immersed in the coolant bath at the bottle. This also ensures air at the radiator is routed back to bottle for expulsion and that a constant head of liquid is present at the radiator.

OPERATION-NON PRESSURE SYSTEM

The coolant reserve/overflow system works in conjunction with the radiator pressure cap. It utilizes thermal expansion and contraction of coolant to keep coolant free of trapped air. It provides a volume for expansion and contraction of coolant. It also provides a convenient and safe method for checking coolant level and adjusting level at atmospheric pressure. This is done without removing the radiator pressure cap. The system also provides 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.

REMOVAL

REMOVAL-NON PRESSURE SYSTEM

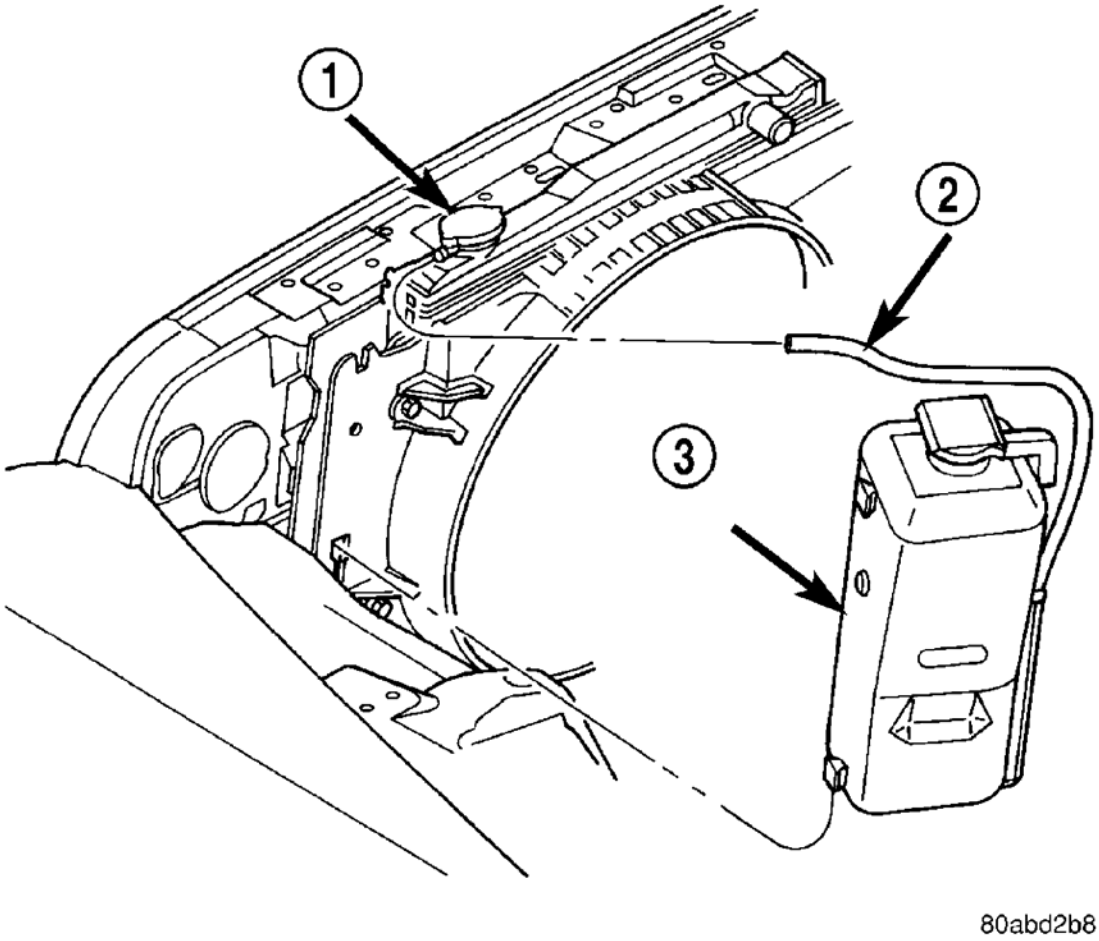

Fig. 37: Identifying Radiator Pressure Cap, Hose & Coolant Recovery Bottle
Courtesy of CHRYSLER LLC

1 - RADIATOR PRESSURE CAP

2 - HOSE
3 - COOLANT RECOVERY BOTTLE

1. Remove hose (2) from radiator.
2. Remove recovery container mounting bolts.
3. Remove recovery container (3).

REMOVAL-PRESSURE SYSTEM

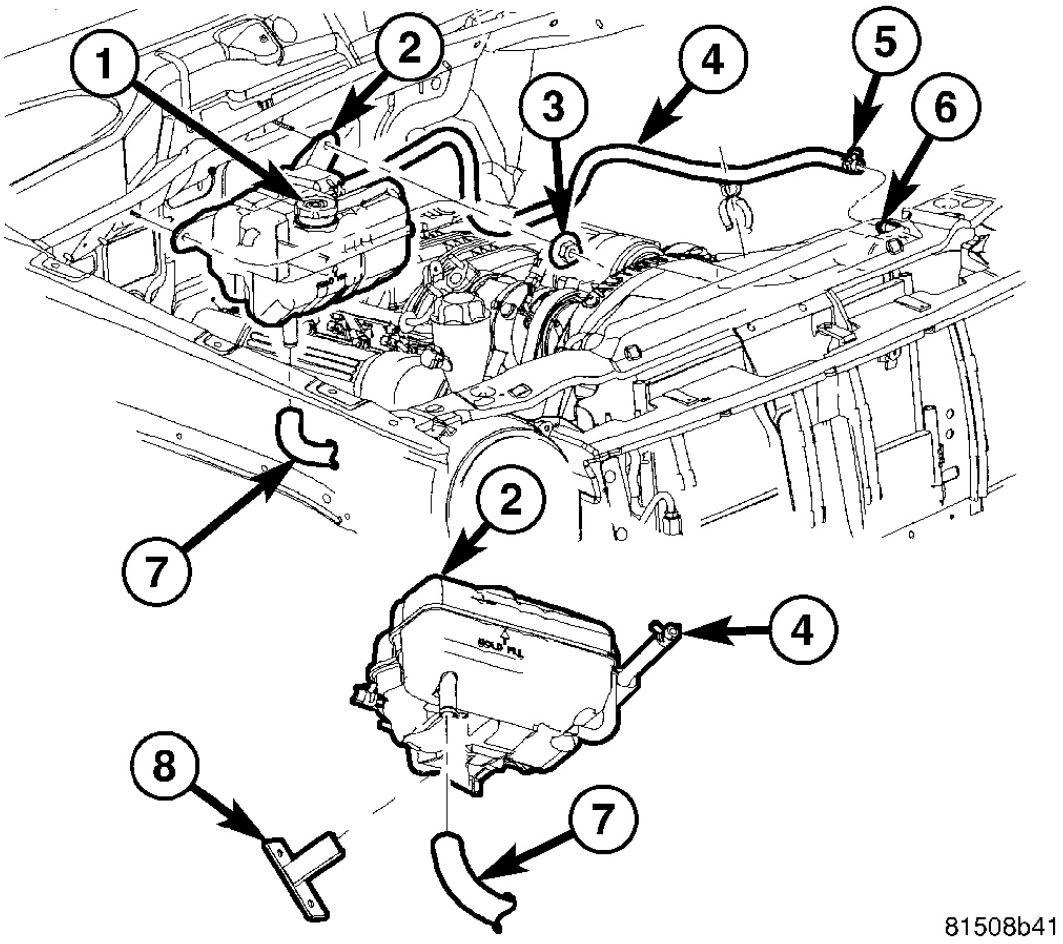

Fig. 38: Coolant Bottle - Pressure System
Courtesy of CHRYSLER LLC

1 - PRESSURE CAP
2 - COOLANT BOTTLE
3 - MOUNTING NUTS

4 - COOLANT BOTTLE TO RADIATOR HOSE
5 - CLAMP
6 - RADIATOR
7 - LOWER HOSE
8 - MOUNTING BRACKET

1. Remove pressure cap from bottle.
2. Siphon coolant from pressure bottle (2) into a contaminant free container.
3. Disconnect coolant bottle to radiator hose at coolant bottle.
4. Disconnect lower hose at coolant bottle.
5. Remove mounting nuts.
6. Remove coolant bottle from bracket.

INSTALLATION

INSTALLATION-NON PRESSURE SYSTEM

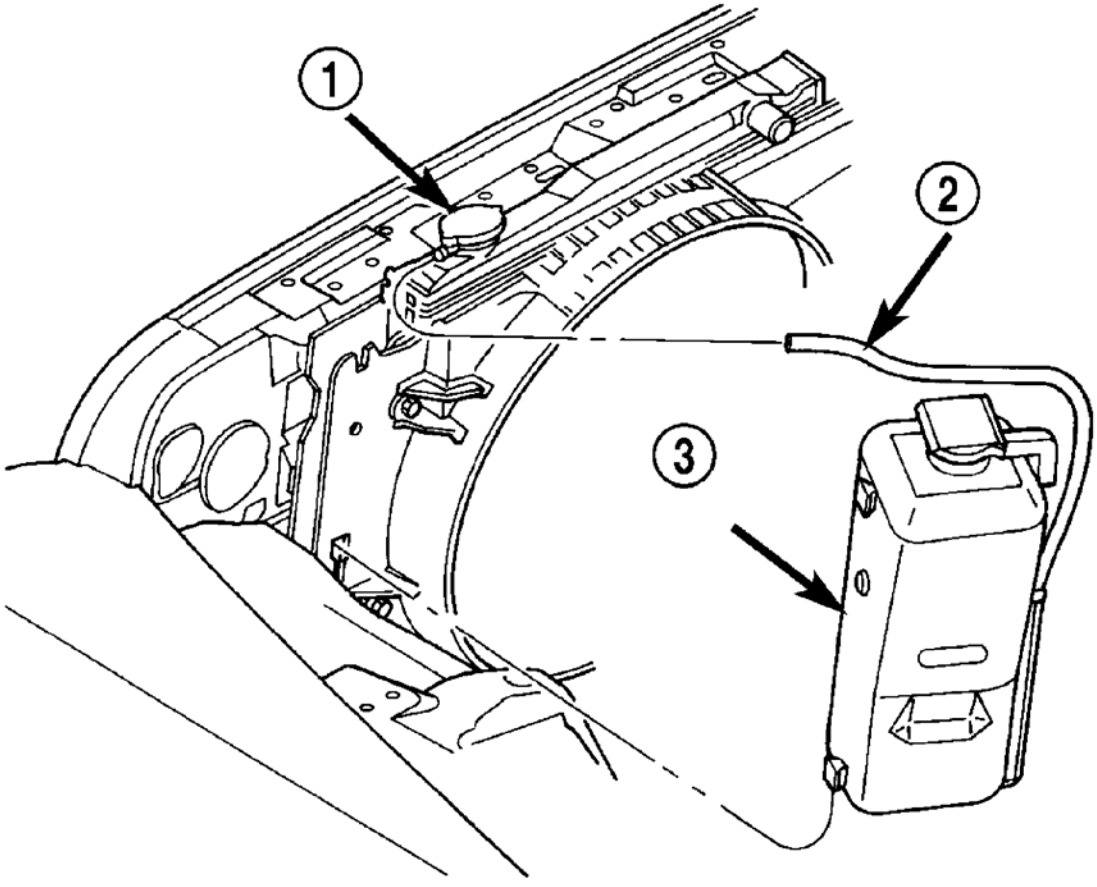

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Fig. 39: Identifying Radiator Pressure Cap, Hose & Coolant Recovery Bottle
Courtesy of CHRYSLER LLC

1 - RADIATOR PRESSURE CAP
2 - HOSE
3 - COOLANT RECOVERY BOTTLE

1. Position coolant recovery container (3).
2. Install coolant recovery container mounting bolts.
3. Install hose (2).

INSTALLATION-PRESSURE SYSTEM

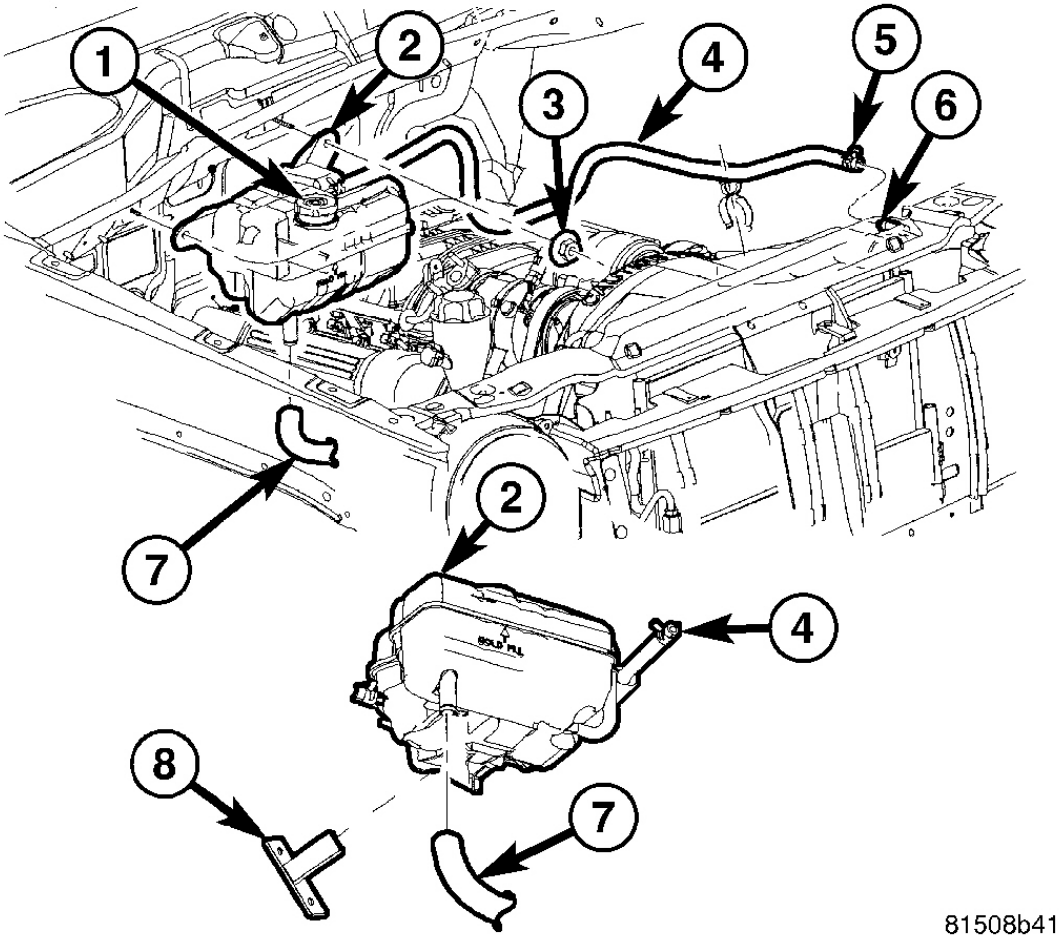


Fig. 40: Coolant Bottle - Pressure System
Courtesy of CHRYSLER LLC

1 - PRESSURE CAP
2 - COOLANT BOTTLE
3 - MOUNTING NUTS
4 - COOLANT BOTTLE TO RADIATOR HOSE
5 - CLAMP
6 - RADIATOR
7 - LOWER HOSE
8 - MOUNTING BRACKET

1. Position pressure bottle on mounting bracket.
2. Install mounting nuts. Tighten nuts to 8.5 N.m (75 in. lbs.).
3. Install lower hose at coolant bottle.
4. Install radiator to coolant bottle hose at coolant bottle.
5. Fill cooling system. See **STANDARD PROCEDURE**.

HOSES-COOLING SYSTEM-2.8L DIESEL

REMOVAL

REMOVAL

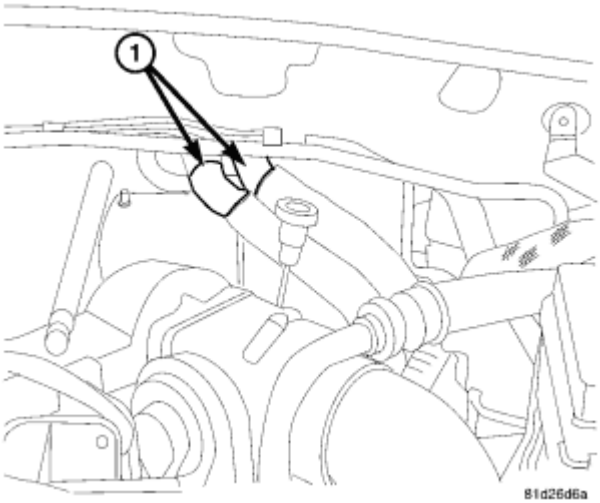


Fig. 41: Heater Core Return Hoses
Courtesy of CHRYSLER LLC

1. Drain cooling system. See **STANDARD PROCEDURE**.
2. Remove engine cover from engine. Refer to **REMOVAL** .
3. Disconnect heater core supply line at heater core and viscous heater. Remove hose from vehicle.
4. Disconnect heater core return line (5) from heater core and EGR cooler. Remove hose from vehicle.

REMOVAL-UPPER HOSE-2.8L DIESEL

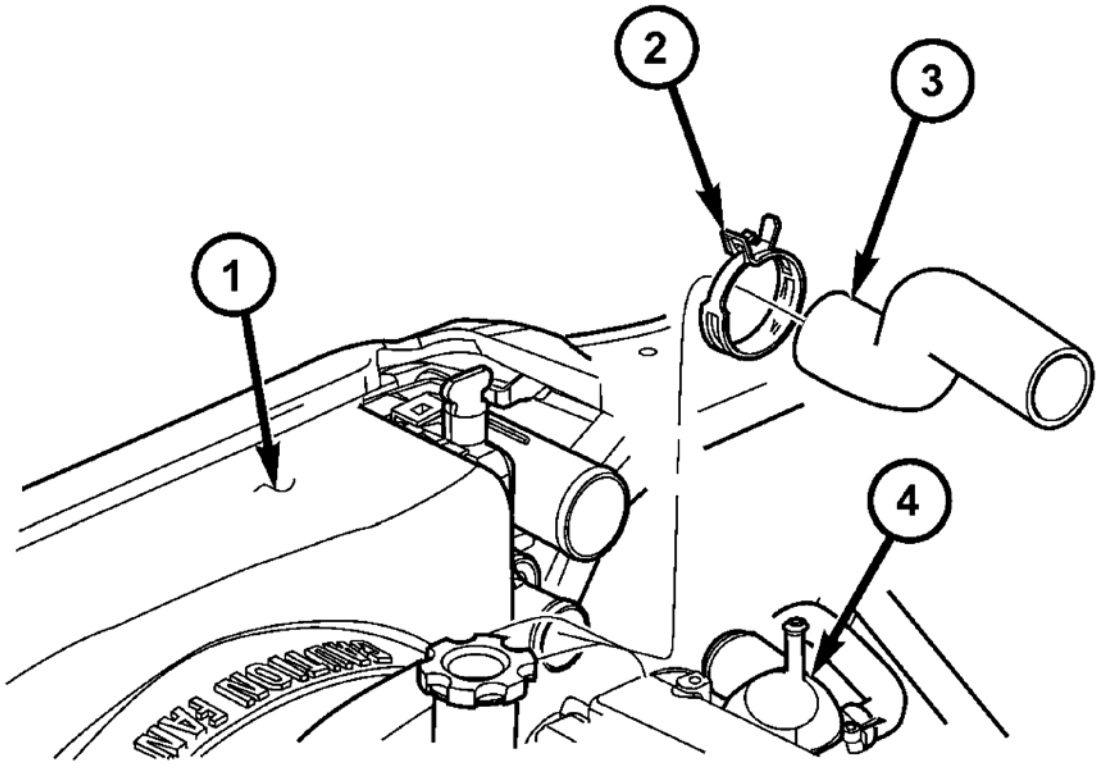


Fig. 42: Identifying Fan Shroud, Hose Clamp, Upper Radiator Hose & Thermostat Housing
Courtesy of CHRYSLER LLC

1 - FAN SHROUD
2 - HOSE CLAMP
3 - UPPER RADIATOR HOSE
4 - THERMOSTAT HOUSING

1. Drain cooling system. See **STANDARD PROCEDURE**.
2. Disconnect upper radiator hose (3) from thermostat housing.
3. Disconnect upper radiator hose from radiator and remove from vehicle.

INSTALLATION

INSTALLATION-UPPER HOSE-2.8L DIESEL

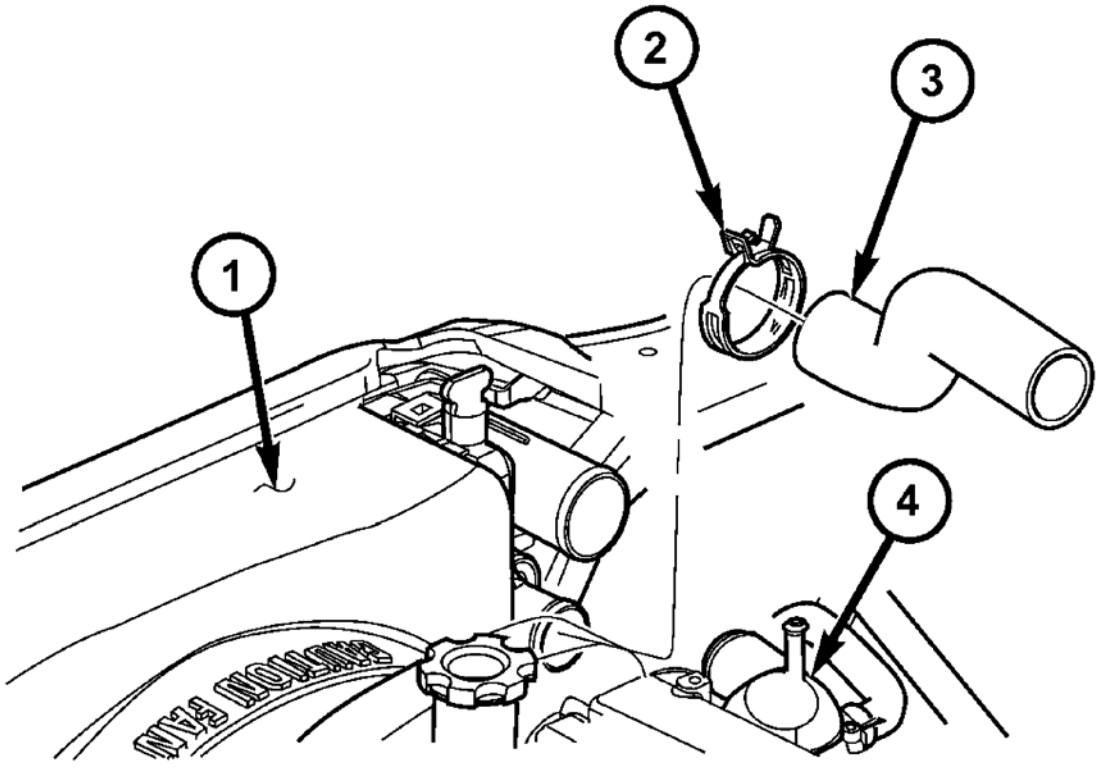


Fig. 43: Identifying Fan Shroud, Hose Clamp, Upper Radiator Hose & Thermostat Housing
Courtesy of CHRYSLER LLC

1 - FAN SHROUD
2 - HOSE CLAMP
3 - UPPER RADIATOR HOSE
4 - THERMOSTAT HOUSING

1. Install upper radiator hose on radiator and thermostat housing.
2. Reposition hose clamps in proper position.
3. Refill cooling system to proper level. See **STANDARD PROCEDURE**.

INSTALLATION

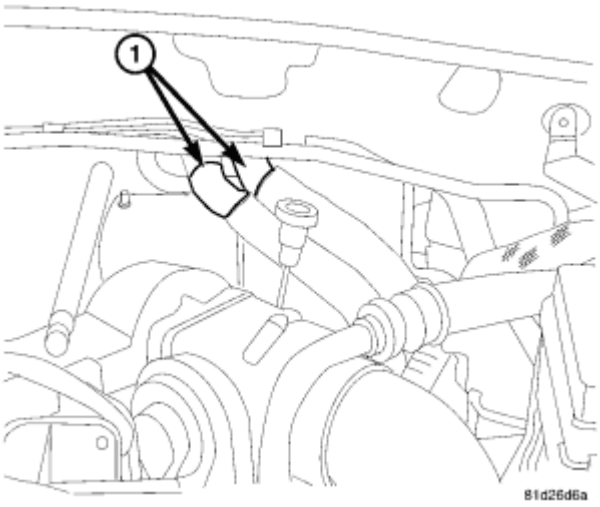


Fig. 44: Heater Core Return Hoses
Courtesy of CHRYSLER LLC

1. Connect heater core supply hose to heater core and viscous heater. Position hose clamps into proper position.
2. Connect heater core return hose to heater core and EGR cooler. Position hose clamps into proper position.
3. Install engine cover to engine. Refer to **INSTALLATION** .
4. Refill cooling system. See **STANDARD PROCEDURE**.

HEATER-ENGINE BLOCK

DESCRIPTION

DESCRIPTION

The block heater is operated by ordinary house current (110 Volt A.C.) through a power cord and connector located in the engine compartment. The heater is mounted in a core hole (in place of a core hole plug) in the engine block, with the heating element immersed in coolant.

CAUTION: The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged.

OPERATION

OPERATION

The block heater element is submerged in the cooling system's coolant. When electrical power (110 volt A.C.) is applied to the element, it creates heat. This heat is transferred to the engine coolant. This provides easier engine starting and faster warm-up when vehicle is operated in areas having extremely low temperatures.

REMOVAL

REMOVAL-3.7L

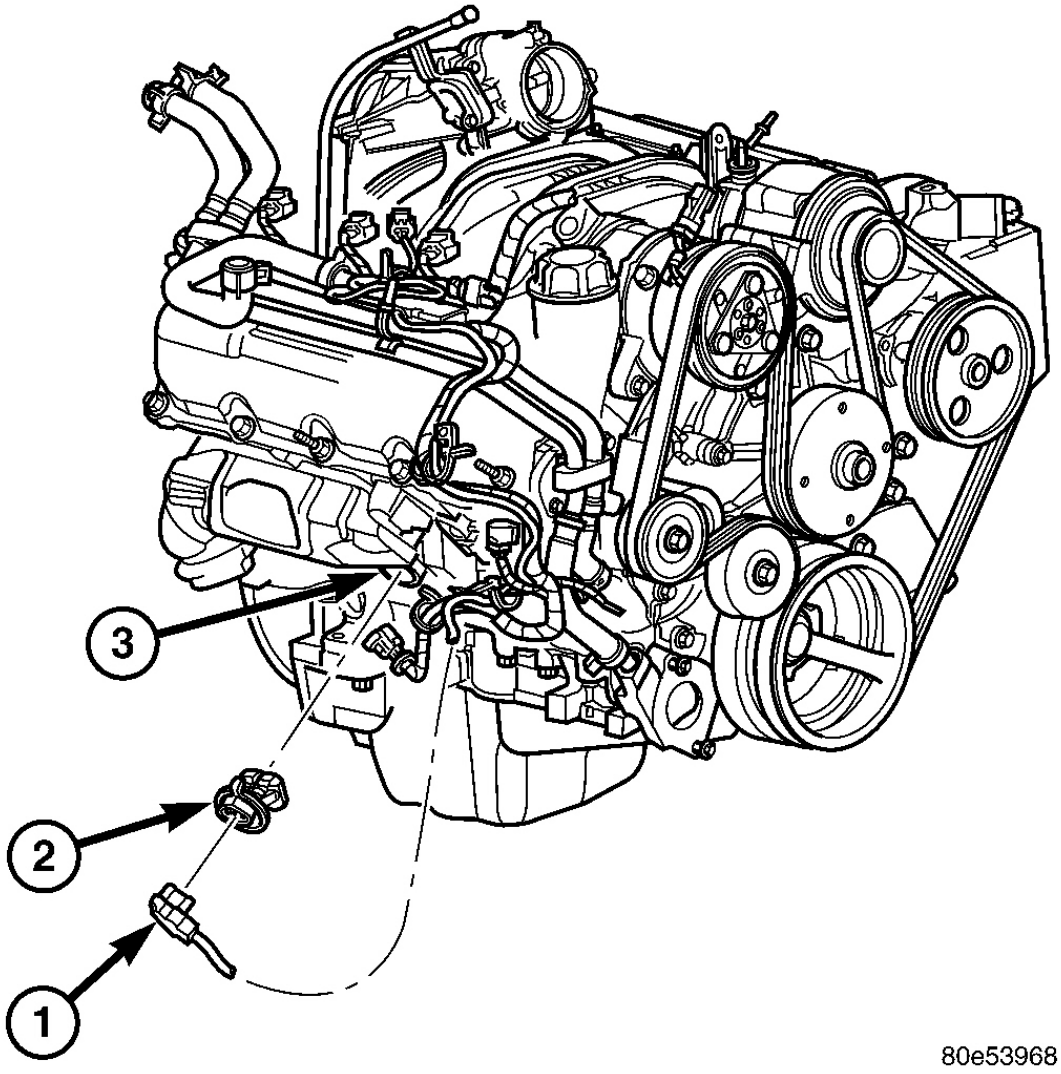


Fig. 45: Identifying Power Cord, Block Heater & Core Hole
Courtesy of CHRYSLER LLC

1 - POWER CORD
2 - BLOCK HEATER
3 - CORE HOLE

1. Drain cooling system. See **STANDARD PROCEDURE**.
2. Raise vehicle on hoist.
3. Detach power cord plug from heater.

4. Loosen screw in center of heater. Remove heater assembly.

INSTALLATION

INSTALLATION-3.7L

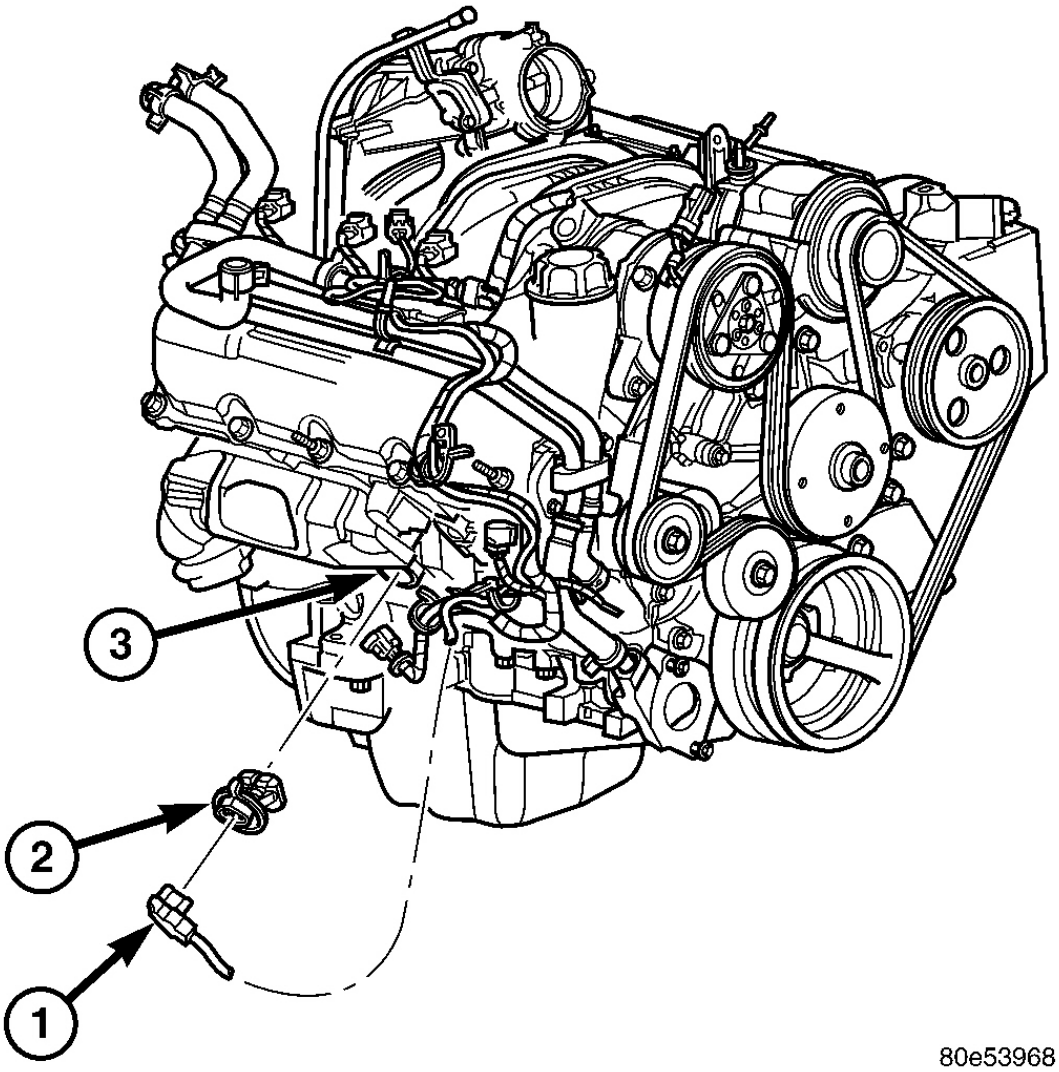


Fig. 46: Identifying Power Cord, Block Heater & Core Hole
Courtesy of CHRYSLER LLC

1 - POWER CORD
2 - BLOCK HEATER
3 - CORE HOLE

1. Thoroughly clean core hole and heater seat.
2. Insert heater assembly (2) with element loop positioned **upward** .
3. With heater seated, tighten center screw securely to assure a positive seal.

CAUTION: To prevent damage, the power cord must be secured in its retaining clips, and not positioned so it could contact linkages or exhaust manifold.

4. Connect power cord to heater.
5. Lower vehicle.
6. Fill cooling system. See **STANDARD PROCEDURE**.

SENSOR-ENGINE COOLANT TEMPERATURE

DESCRIPTION

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to sense engine coolant temperature. The sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

For engine coolant temperature gauge operation through the bus communications
Injector pulse-width
Spark-advance curves
ASD relay shut-down times
Idle Air Control (IAC) motor key-on steps
Pulse-width prime-shot during cranking
O2 sensor closed loop times

Purge solenoid on/off times
EGR solenoid on/off times (if equipped)
Leak Detection Pump operation (if equipped)
Radiator fan relay on/off times (if equipped)
Target idle speed

REMOVAL

REMOVAL-3.7L ENGINE

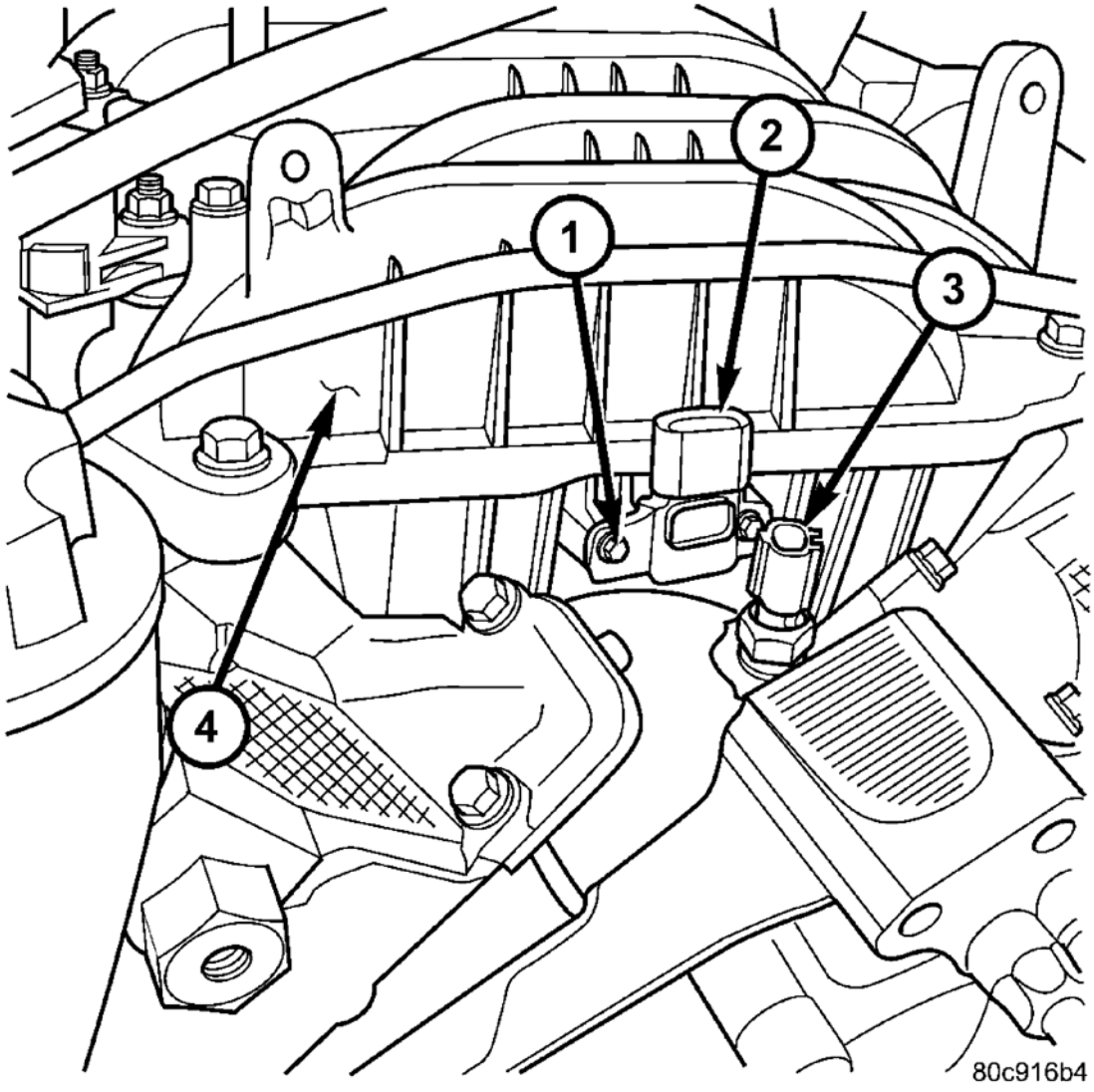


Fig. 47: Removing/Installing MAP Sensor/ECT Sensor
Courtesy of CHRYSLER LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

The Engine Coolant Temperature (ECT) sensor (3) is installed into a water jacket at front of intake manifold near rear of generator.

WARNING: Hot, pressurized coolant can cause injury by scalding. Cooling system must be partially drained before removing the coolant temperature sensor.

1. Partially drain cooling system.
2. Disconnect electrical connector from sensor.
3. Remove sensor from intake manifold.

REMOVAL-2.8L DIESEL

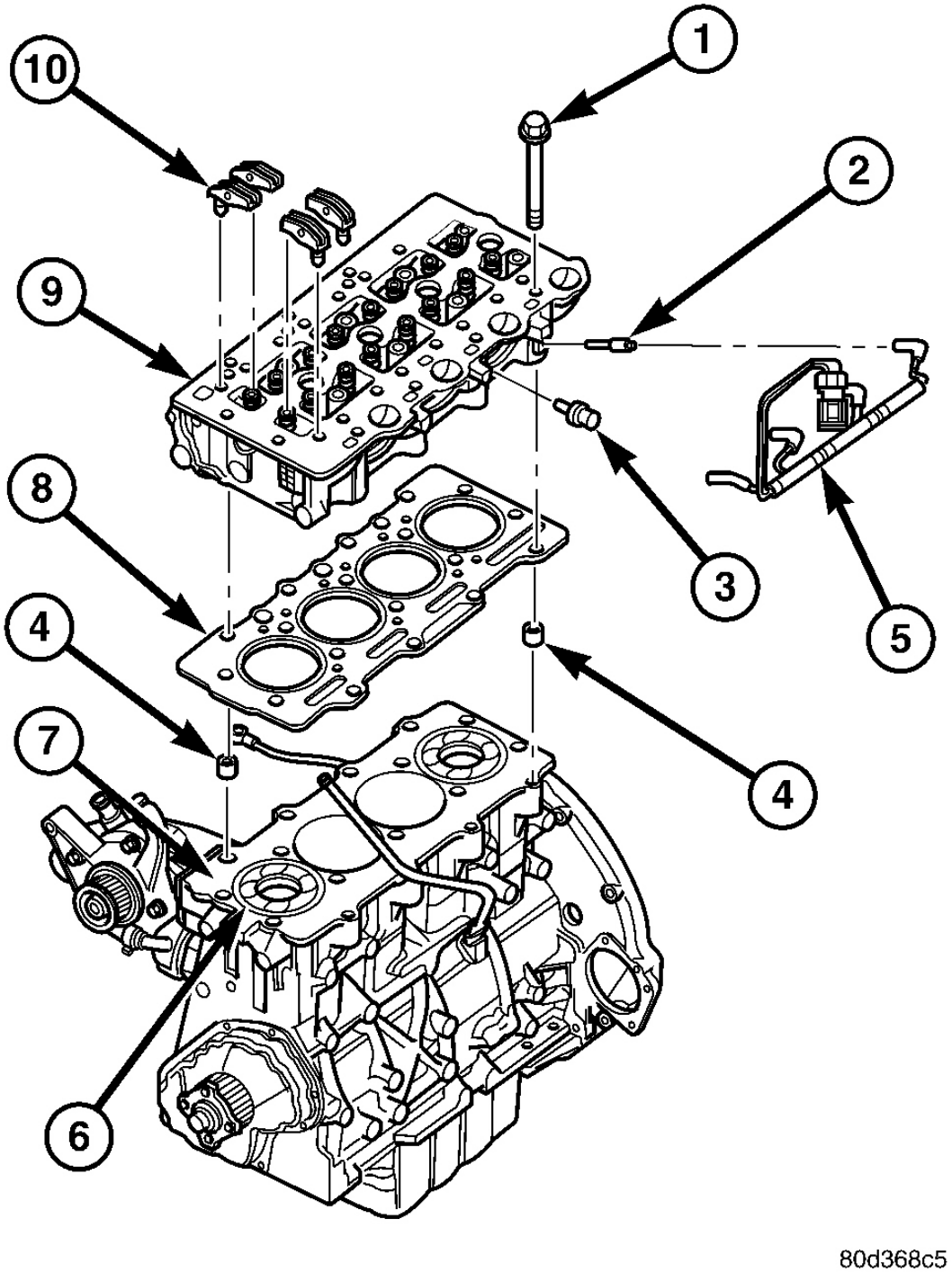


Fig. 48: Cylinder Head Assembly
Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD BOLT
2 - GLOW PLUG
3 - COOLANT FITTING
4 - CYLINDER HEAD ALIGNMENT DOWEL
5 - GLOW PLUG HARNESS
6 - CYLINDER LINER
7 - CYLINDER BLOCK
8 - CYLINDER HEAD GASKET
9 - CYLINDER HEAD
10 - ROCKER ARM ASSEMBLIES

WARNING: Do not remove or loosen the coolant pressure/vent cap, cylinder block drain plugs, or the draincock when the system is hot and under pressure because serious burns from the coolant can occur.

1. Disconnect negative battery cable.
2. Drain the cooling system. See **STANDARD PROCEDURE**.
3. Disconnect coolant temperature sensor electrical connector.
4. Remove coolant temperature sensor (3) from cylinder head.

INSTALLATION

INSTALLATION-3.7L ENGINE

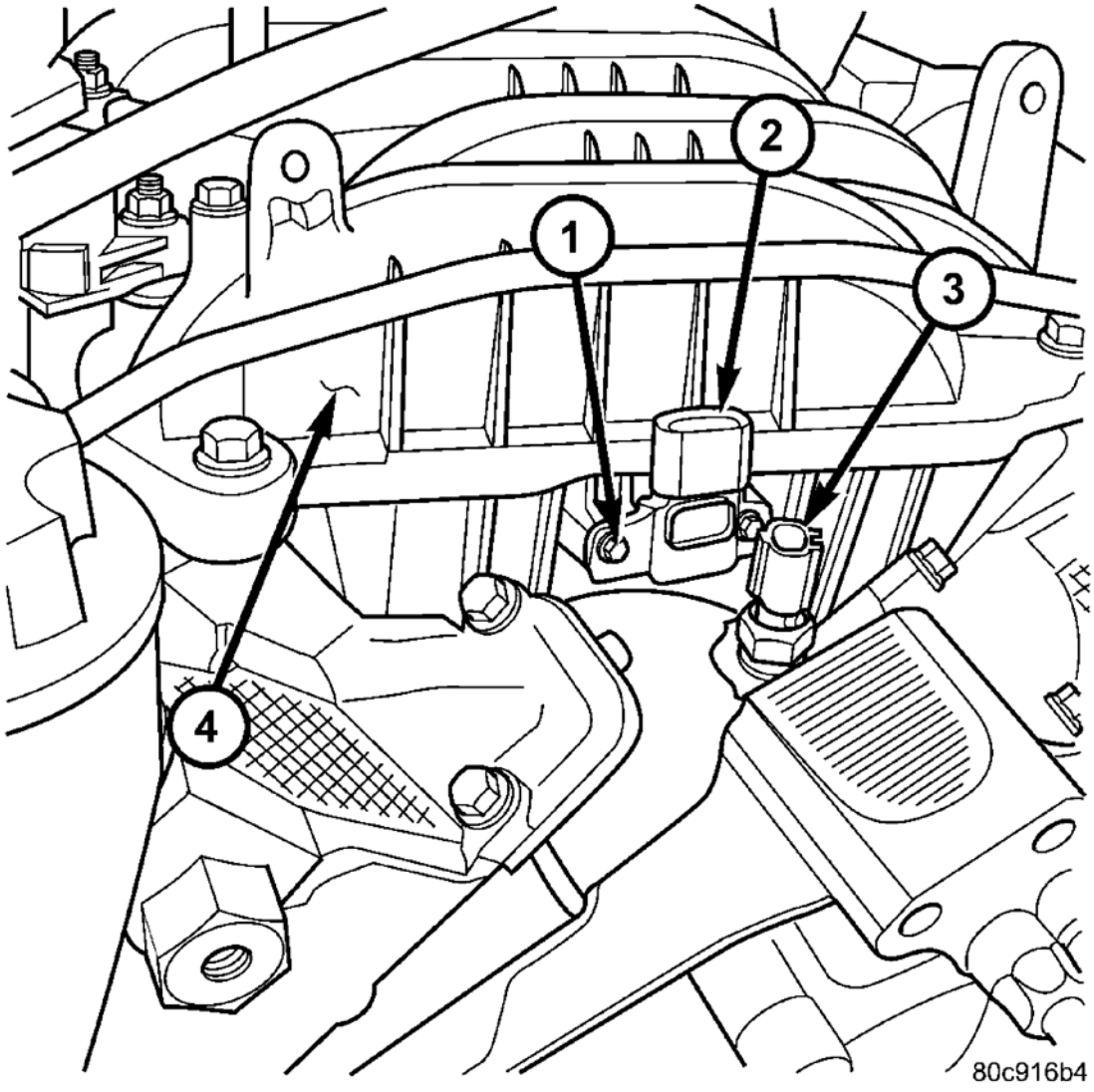


Fig. 49: Removing/Installing MAP Sensor/ECT Sensor
Courtesy of CHRYSLER LLC

1 - MOUNTING SCREWS
2 - MAP SENSOR
3 - ECT SENSOR
4 - FRONT OF INTAKE MANIFOLD

1. Apply thread sealant to sensor threads.
2. Install sensor to engine.
3. Tighten coolant temperature sensor to 11 N.m (8 ft. lbs.) torque.
4. Replace any lost engine coolant.

ENGINE COOLANT TEMPERATURE SENSOR-INSTALLATION-2.8L DIESEL ENGINE

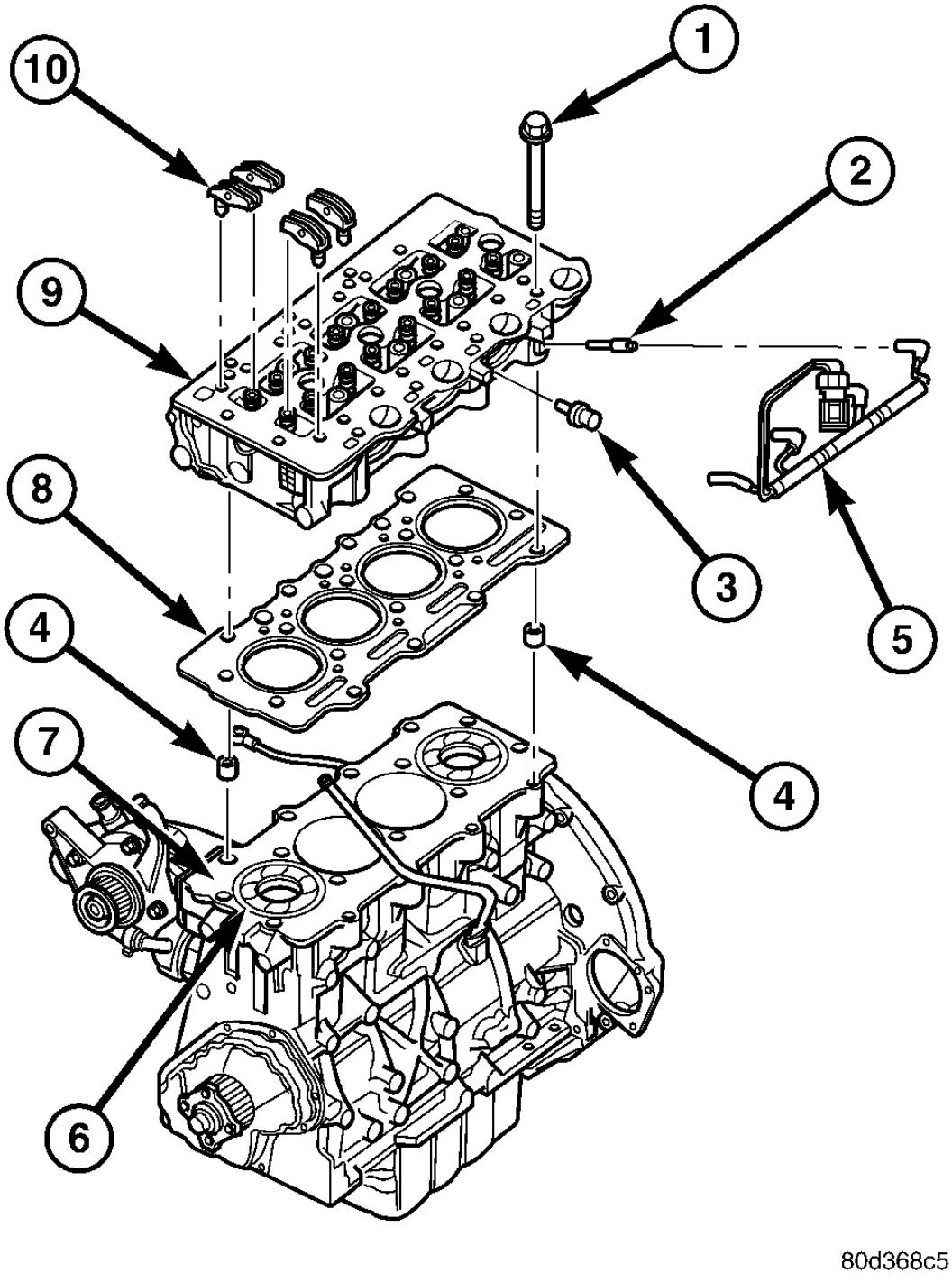


Fig. 50: Cylinder Head Assembly

Courtesy of CHRYSLER LLC

1 - CYLINDER HEAD BOLT
2 - GLOW PLUG
3 - COOLANT FITTING
4 - CYLINDER HEAD ALIGNMENT DOWEL
5 - GLOW PLUG HARNESS
6 - CYLINDER LINER
7 - CYLINDER BLOCK
8 - CYLINDER HEAD GASKET
9 - CYLINDER HEAD
10 - ROCKER ARM ASSEMBLIES

1. Install coolant temperature sensor in thermostat housing.
2. Connect coolant temperature sensor electrical connector.
3. Refill cooling system. See **STANDARD PROCEDURE**.
4. Connect negative battery cable.

FAN-RADIATOR-ELECTRIC

DESCRIPTION

DESCRIPTION

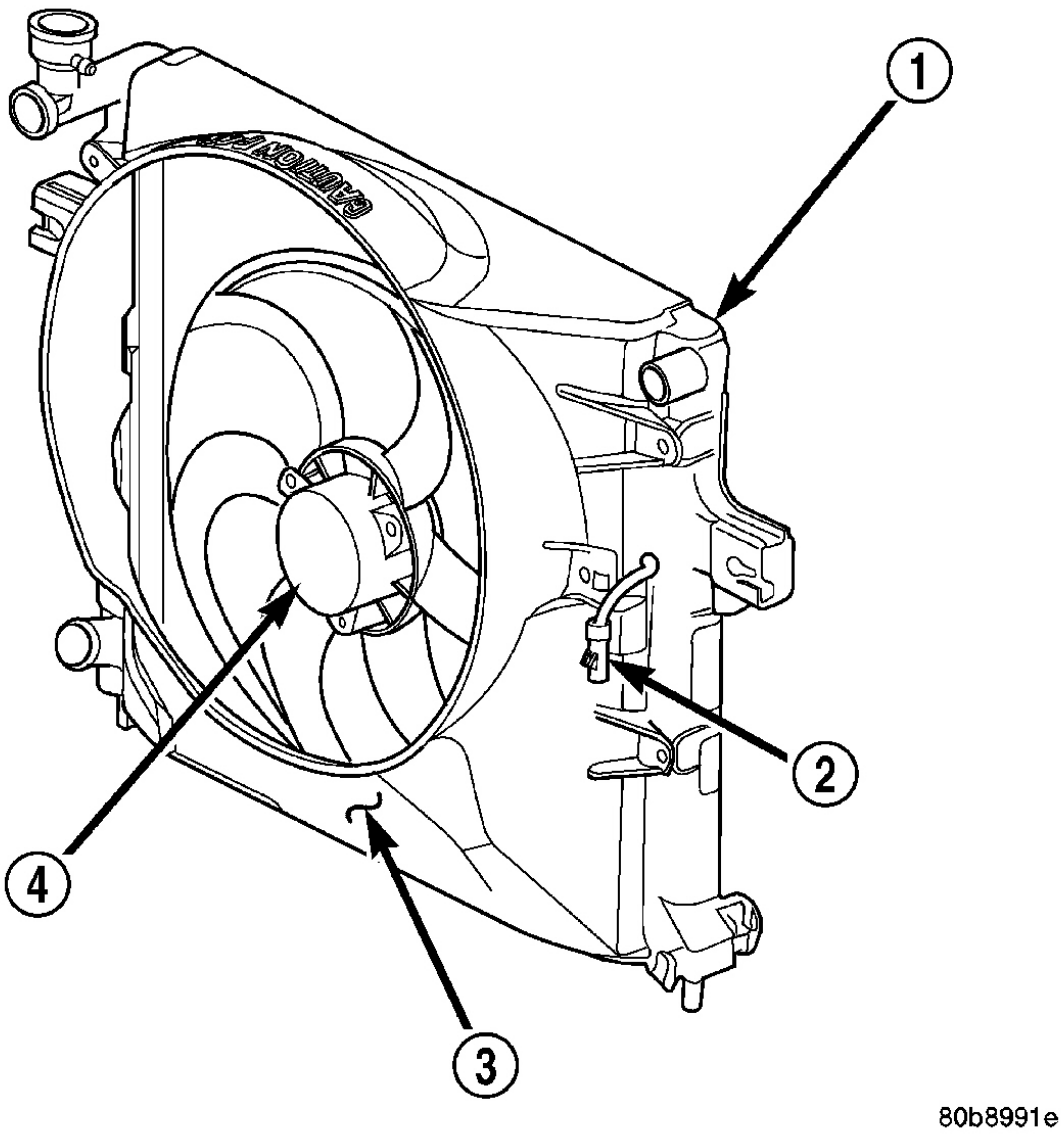


Fig. 51: Identifying Radiator, Electric Cooling Fan Connector, Fan Shroud & 2 Speed Electric Cooling Fan
Courtesy of CHRYSLER LLC

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - 2 SPEED ELECTRIC COOLING FAN

The fan (4) is electrically controlled by the Powertrain Control Module (PCM) through the fan control relays. The relays are located in the PDC in the engine compartment.

OPERATION

OPERATION

The electric radiator cooling fan is controlled by the Powertrain Control Module (PCM) through the radiator cooling fan relays. The PCM regulates fan operation based on input from the engine coolant temperature sensor, battery temperature sensor, air conditioning select switch and vehicle speed.

The fan is not energized during engine cranking regardless of the electrical input from the temperature sensors and air conditioning switch. However, if engine operation conditions warrant fan engagement, the fan will run once engine starts.

On vehicles NOT equipped with AC: The relay is energized when the coolant temperature is above 80°C (176°F), or battery temperature sensor above -12°C (10°F). It will then de-energize when coolant temperature drops below 82°C (180°F), or battery temperature sensor below -9°C (16°F).

Vehicles Equipped with AC: In addition to using coolant temperature and battery temperature sensor to control cooling fan operation, the cooling fan will also be engaged when the, air conditioning system is activated. The relay is also energized when air conditioning is selected and coolant temperature is above 95°C (203°F), or, air conditioning is selected and battery temperature sensor is above 41°C (106°F). It will then de-energize when air conditioning is selected and coolant temperature is below 92°C (198°F), or air conditioning is selected and battery temperature is below 38°C (100°F).

REMOVAL

REMOVAL

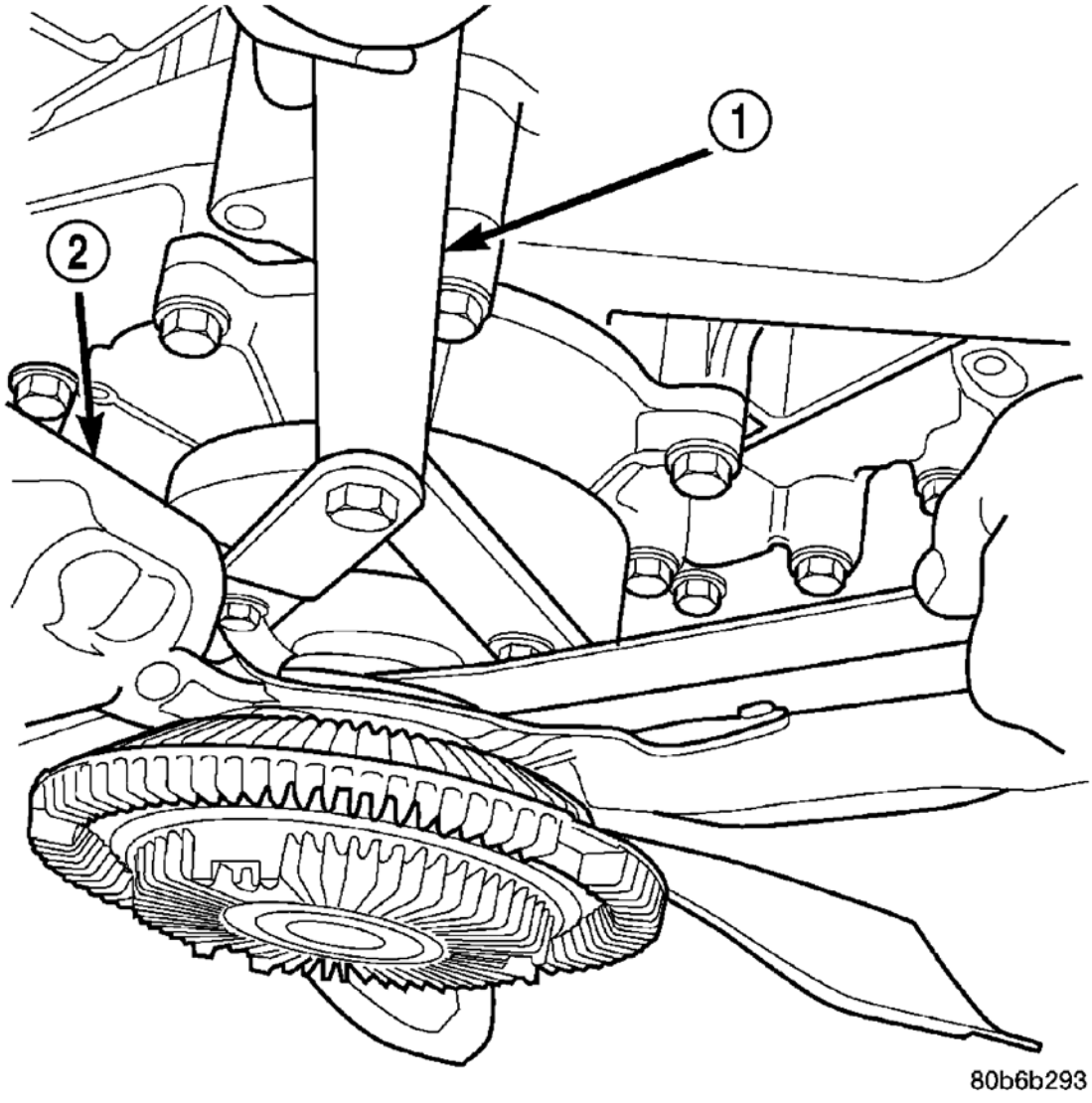


Fig. 52: Identifying Special Tool 6958 Spanner Wrench With Adapter Pins 8346 & Fan
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346 2 - FAN

If the fan blade is bent, warped, cracked or damaged in any way, it must be replaced **only** with a replacement fan blade. **Do not attempt to repair a damaged fan blade.**

NOTE: For 3.7L Heavy Duty/Max Cool/Trailer Tow cooling package, the viscous fan cannot be removed separate from the shroud. Both fan and shroud must be removed together.

1. Disconnect battery negative cable.
2. Using special tool 6958 spanner wrench and 8346 adapters, remove the viscous fan from the water pump. See **Fig. 52**.

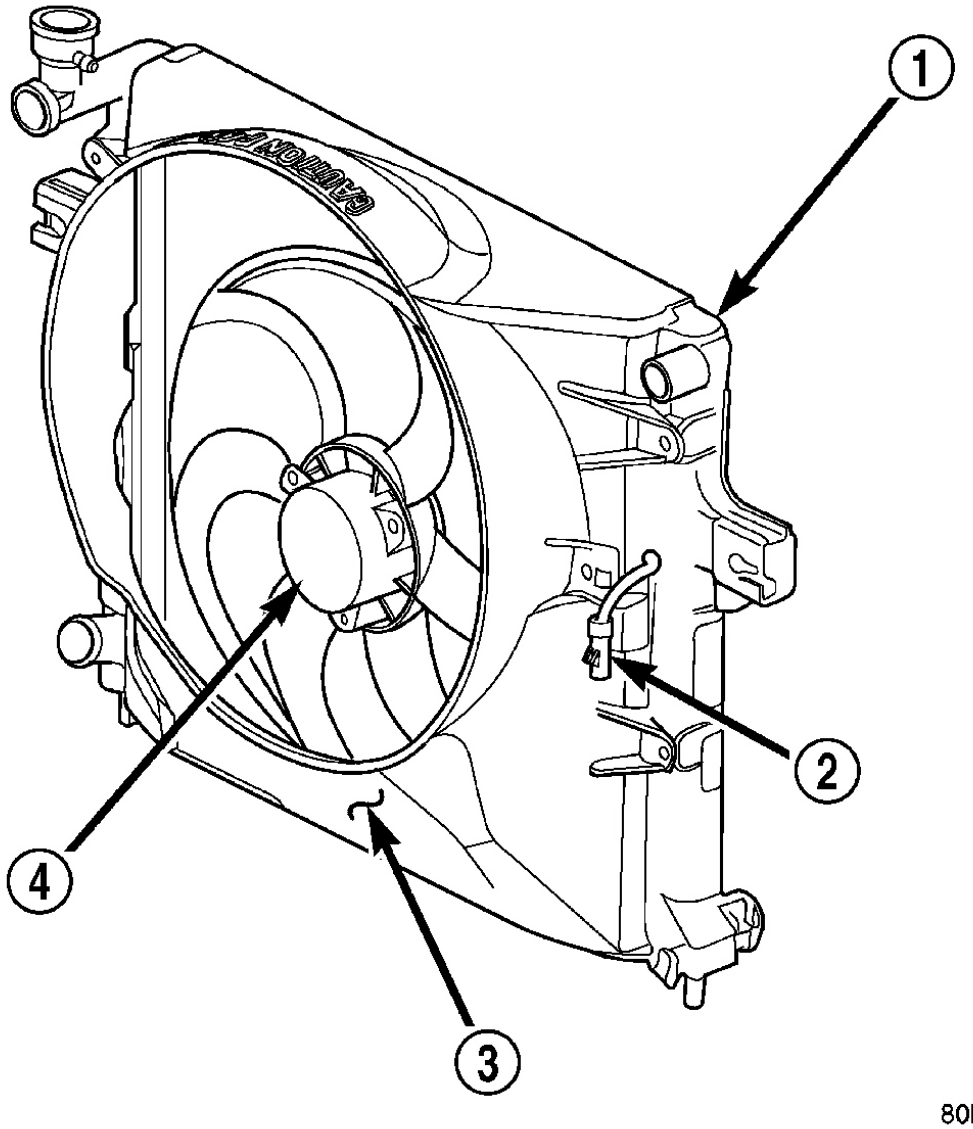


Fig. 53: Identifying Radiator, Electric Cooling Fan Connector, Fan Shroud & 2 Speed Electric Cooling Fan
Courtesy of CHRYSLER LLC

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR

3 - FAN SHROUD
4 - 2 SPEED ELECTRIC COOLING FAN

3. Gently lay fan into shroud.
4. Disconnect the electrical connector (2) for the electric fan, then disconnect connector from shroud.
5. Remove the two fan shroud mounting bolts connecting the fan shroud to the radiator. See **Fig. 53**.
6. Remove the shroud and fan from the vehicle.

INSTALLATION

INSTALLATION

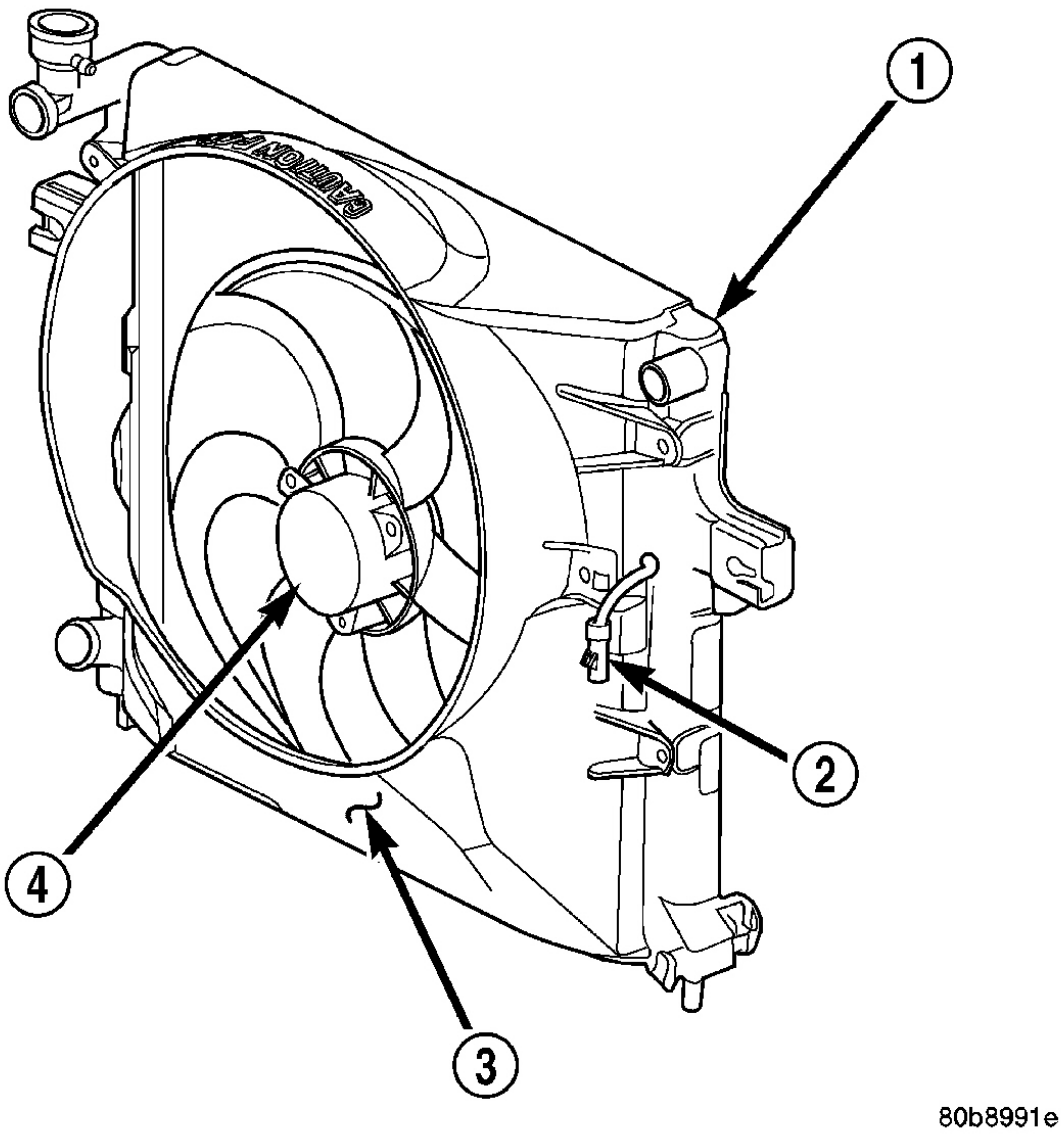


Fig. 54: Identifying Radiator, Electric Cooling Fan Connector, Fan Shroud & 2 Speed Electric Cooling Fan
Courtesy of CHRYSLER LLC

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - 2 SPEED ELECTRIC COOLING FAN

1. Install fan shroud assembly into the vehicle. Tighten fan shroud to radiator bolts to (5.5 N.m (50 in. lbs.).

2. Install shroud mounting bolts tighten bolts to 10 N.m (89 in. lbs.).
3. Connect fan motor wire connector to harness connector, and attach connector to shroud.
4. Connect battery negative cable.
5. Start engine and check fan operation.

FAN-VISCOUS RADIATOR

DESCRIPTION

DESCRIPTION

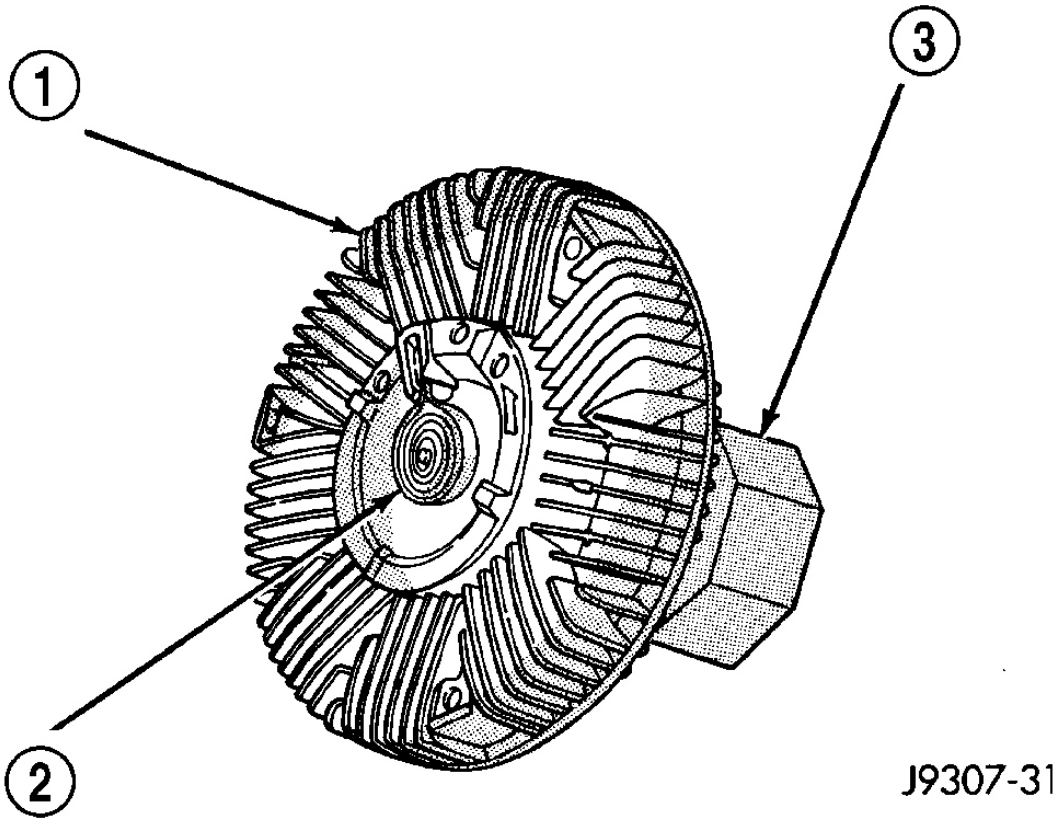


Fig. 55: Identifying Viscous Fan Drive, Thermostatic Spring, Mounting Nut To Water Pump Hub
Courtesy of CHRYSLER LLC

1 - VISCOUS FAN DRIVE
2 - THERMOSTATIC SPRING
3 - MOUNTING NUT TO WATER PUMP HUB

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.

The thermal viscous fan drive (1) is a silicone-fluid-filled coupling used to connect the fan blades to 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. See **Fig. 55**.

OPERATION

OPERATION

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit. 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. Normally less than 800 RPM.**

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

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

DIAGNOSIS AND TESTING

VISCOUS RADIATOR FAN

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

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

WARNING: Be sure that there is adequate fan blade clearance before drilling.

1. Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.
2. Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18° to 105°C (0° to 220°F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.
3. Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).
4. Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner

condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

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

WARNING: Use extreme caution when the engine is operating. Do not stand in a direct line with the fan. Do not put your hands near the pulleys, belts or fan. Do not wear loose clothing.

6. Start the engine and operate at 2400 RPM. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 93°C (200°F). Fan drive **engagement** should have started to occur at between 91° to 96°C (195° to 205°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 93°C (200°F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 62° to 85°C (145° to 185°F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

REMOVAL

REMOVAL-3.7L/4.0L

1. Partially drain the cooling system. See **STANDARD PROCEDURE**.
2. Remove the upper radiator hose.
3. Remove the air filter housing assembly. Refer to **REMOVAL** .

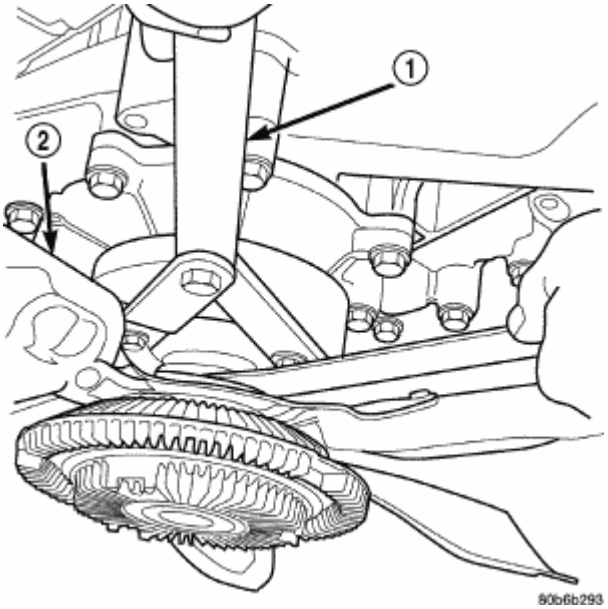


Fig. 56: Using Tool 6958 And Adapter Pins 8346 To Remove Fan/Viscous Fan Drive Assembly From Water Pump
Courtesy of CHRYSLER LLC

4. Using Tool 6958 and adapter pins 8346 (1), remove fan/viscous fan drive assembly from water pump. Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

5. Position the fan/fan drive assembly in the radiator shroud.
6. Remove the two shroud mounting screws.
7. Remove the radiator shroud and fan drive assembly.
8. After removing fan blade/viscous fan drive assembly, **do not** place viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.
9. Remove four bolts securing fan blade assembly to viscous fan drive.

REMOVAL-2.8L DIESEL

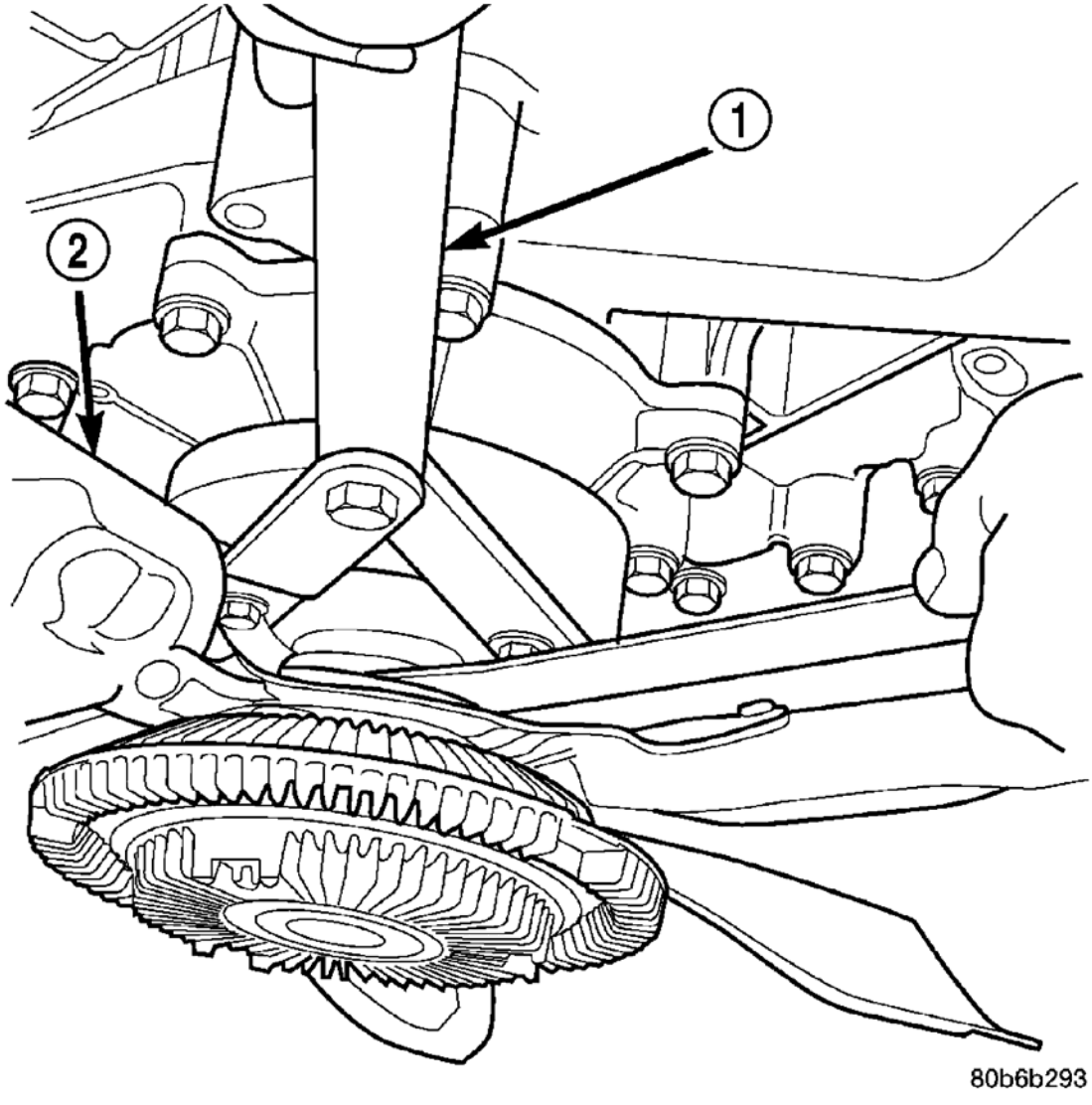


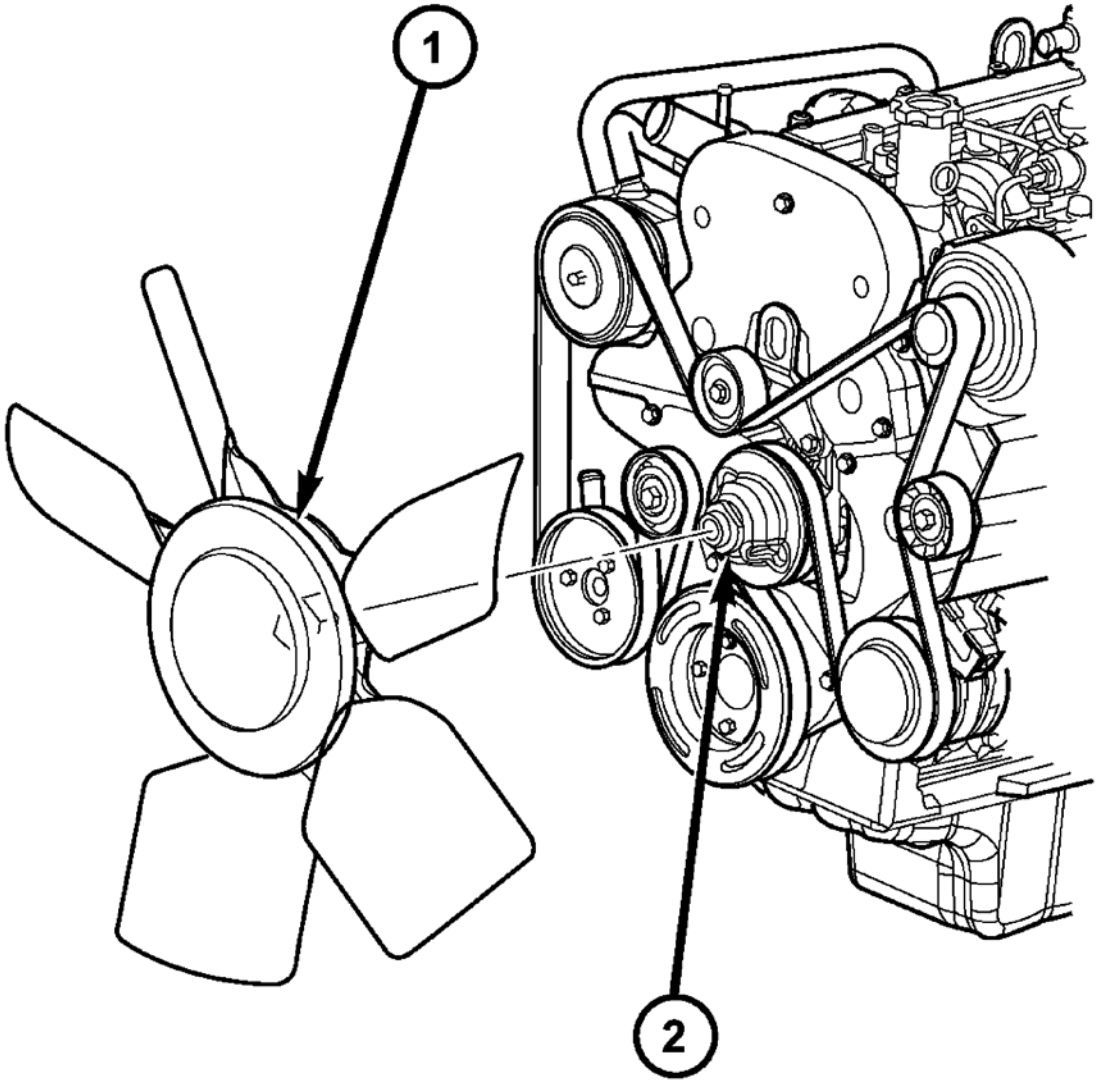
Fig. 57: Identifying Special Tool 6958 Spanner Wrench & Fan
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH
2 - FAN

1. Disconnect negative battery cable.

NOTE: The thermal viscous fan drive/fan blade assembly is attached (threaded) to fan support.

2. Remove fan blade/viscous fan drive assembly from water pump using special tool 6958 spanner wrench, by turning mounting nut counterclockwise as viewed from front. Threads on viscous fan drive are **RIGHT HAND.**



80cda6e4

Fig. 58: Cooling Fan And Fan Drive Viscous Clutch Assembly & Fan Support
Courtesy of CHRYSLER LLC

1 - COOLING FAN AND FAN DRIVE VISCOUS CLUTCH ASSEMBLY 2 - FAN SUPPORT

3. Do not attempt to remove fan/fan drive viscous clutch assembly (1) from vehicle at this time.
4. Do not unbolt fan blade assembly from fan drive viscous clutch at this time.

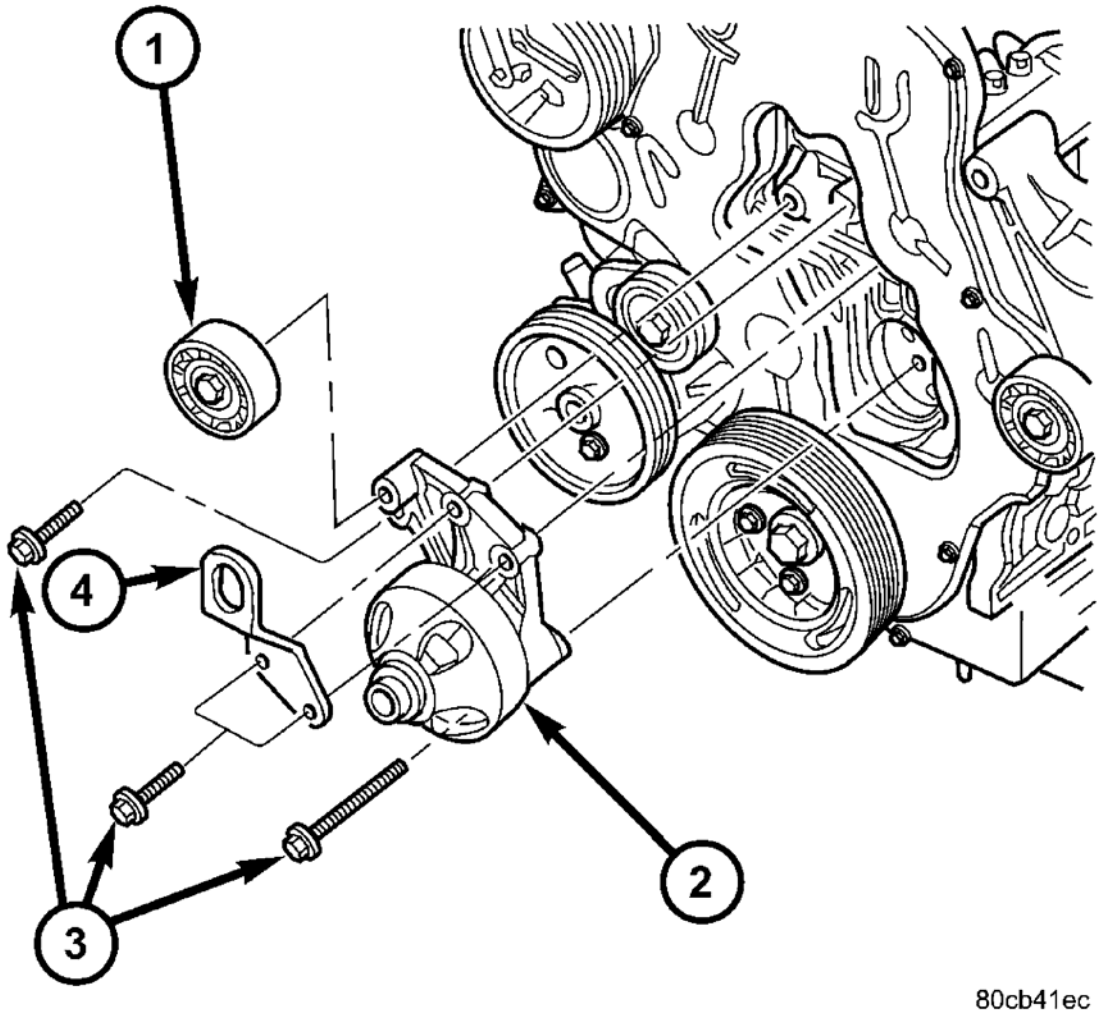


Fig. 59: Identifying Idler Pulley, Cooling Fan Support, Retaining Bolts & Engine Lift Hook
Courtesy of CHRYSLER LLC

1 - IDLER PULLEY 2 - COOLING FAN SUPPORT 3 - RETAINING BOLTS

4 - ENGINE LIFT HOOK

5. Remove fan shroud to radiator bolts.
6. Remove fan shroud and fan blade/fan drive viscous clutch assembly as a complete unit from vehicle.
7. After removing fan blade/fan drive viscous clutch assembly, **do not** place viscous clutch in horizontal position. If stored horizontally, silicone fluid in the fan drive viscous clutch could drain into its bearing assembly and contaminate lubricant.
8. Remove four bolts securing fan blade assembly to fan drive viscous clutch.
9. Remove cooling fan support (2) from engine block.

CLEANING

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

INSPECTION

WARNING: Do not attempt to bend or straighten fan blades if fan is not within specifications.

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

1. Remove fan blade assembly from viscous fan drive unit (four bolts).
2. Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.
3. Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

INSTALLATION

INSTALLATION

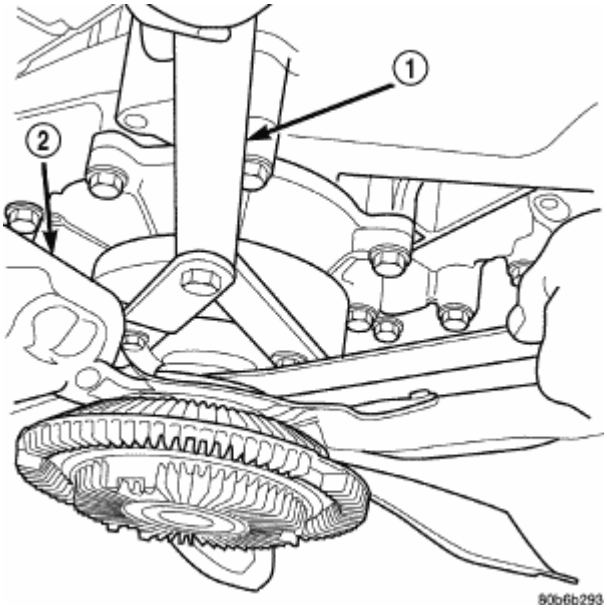


Fig. 60: Using Tool 6958 To Install Fan Blade/Viscous Fan Drive Assembly To Water Pump Shaft
Courtesy of CHRYSLER LLC

1. Install fan blade assembly to viscous fan drive. Tighten bolts to 23 N.m (17 ft. lbs.) torque.
2. Position fan blade/viscous fan drive assembly into the radiator shroud.
3. Install the radiator shroud and fan drive assembly into the vehicle.
4. Install fan shroud retaining screws. Tighten screws to 6 N.M (50 lbs. in.)
5. Using Tool 6958, install the fan blade/viscous fan drive assembly to the water pump shaft. Tighten mounting nut to 50 N.m (37 ft. lbs.).
6. Install the upper radiator hose.
7. Fill cooling system. See **STANDARD PROCEDURE**.
8. Connect battery negative cable.

INSTALLATION-2.8L DIESEL

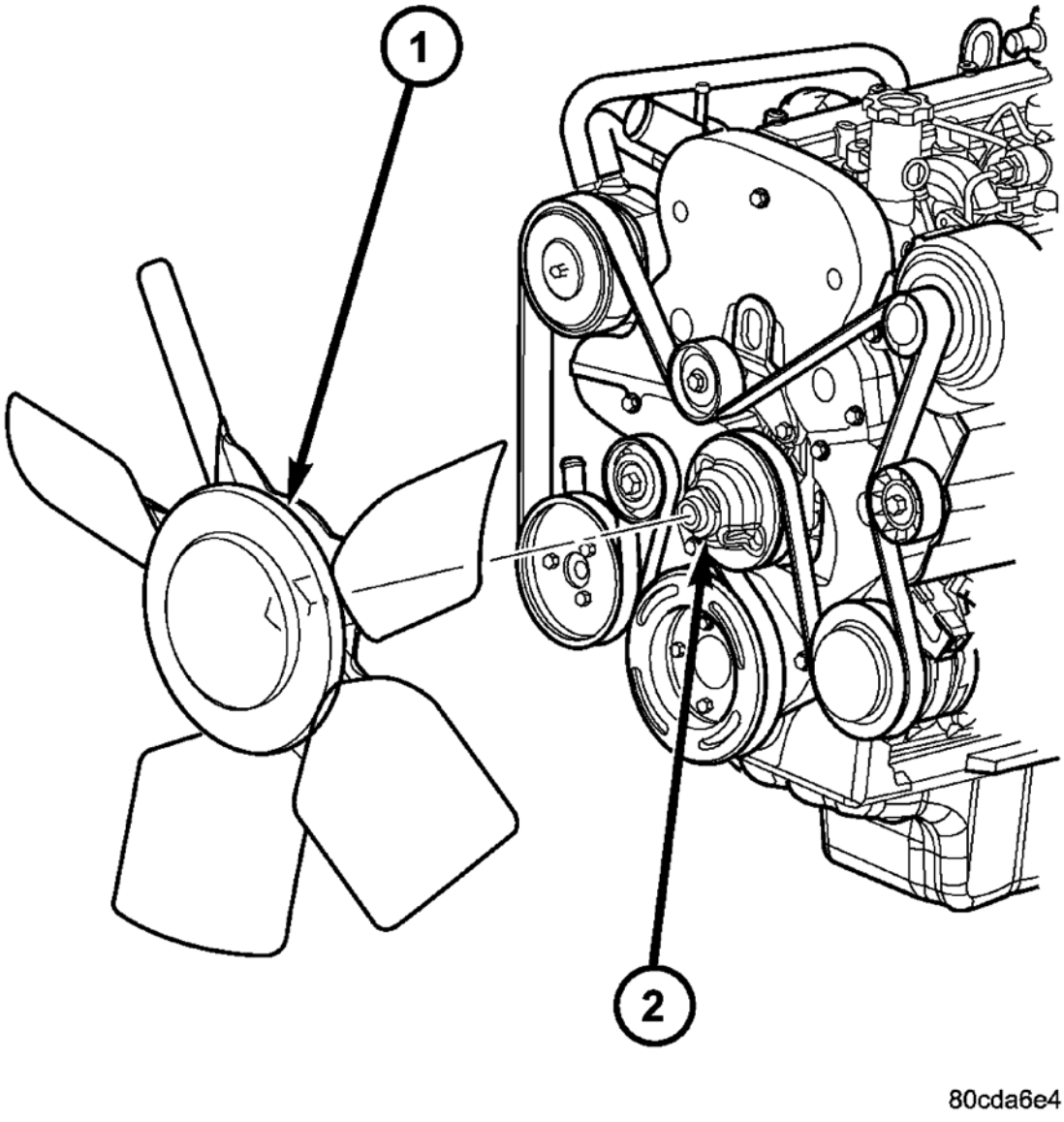


Fig. 61: Cooling Fan And Fan Drive Viscous Clutch Assembly & Fan Support
Courtesy of CHRYSLER LLC

1 - COOLING FAN AND FAN DRIVE VISCOUS CLUTCH ASSEMBLY 2 - FAN SUPPORT

1. Assemble fan blade to viscous fan drive. Tighten mounting bolts to 23.7 N.m (210 in. lbs.) torque.

NOTE: The viscous fan and fan shroud must be installed as an assembly.

2. Gently lay fan and viscous drive into fan shroud.

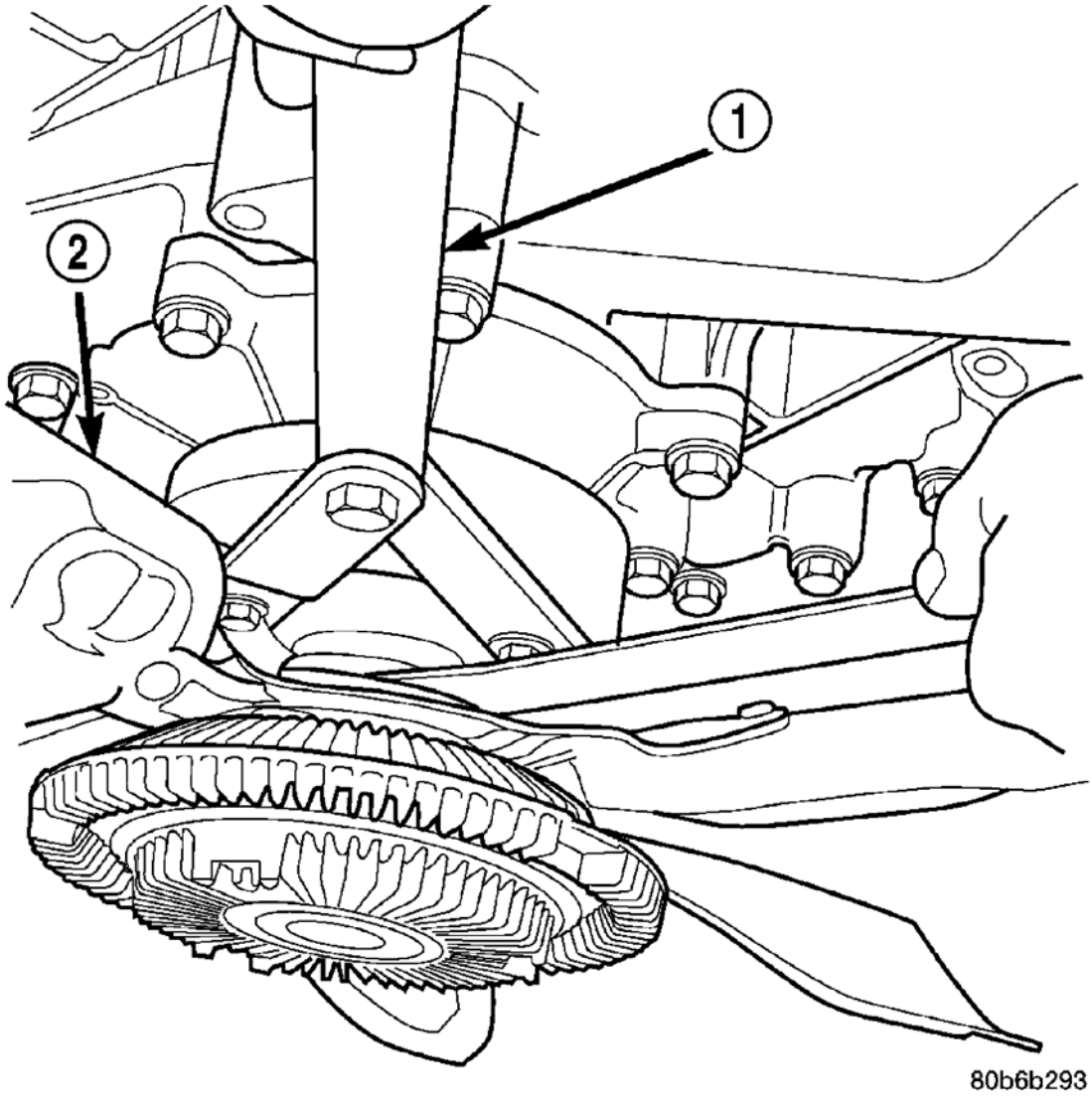


Fig. 62: Identifying Special Tool 6958 Spanner Wrench & Fan
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH 2 - FAN

3. Install the fan shroud to radiator mounting bolt. Tighten bolts to 9 N.m (80 in. lbs.) torque.
4. Thread the fan and viscous drive onto the fan support and tighten nut using special tool 6958 spanner wrench.
5. Install cooling fan support to engine block. Torque bolts to 149 N.m.(110 ft. lbs.).
6. Connect negative battery cable.

THERMOSTAT-ENGINE COOLANT

DESCRIPTION

DESCRIPTION-THERMOSTAT-3.7L

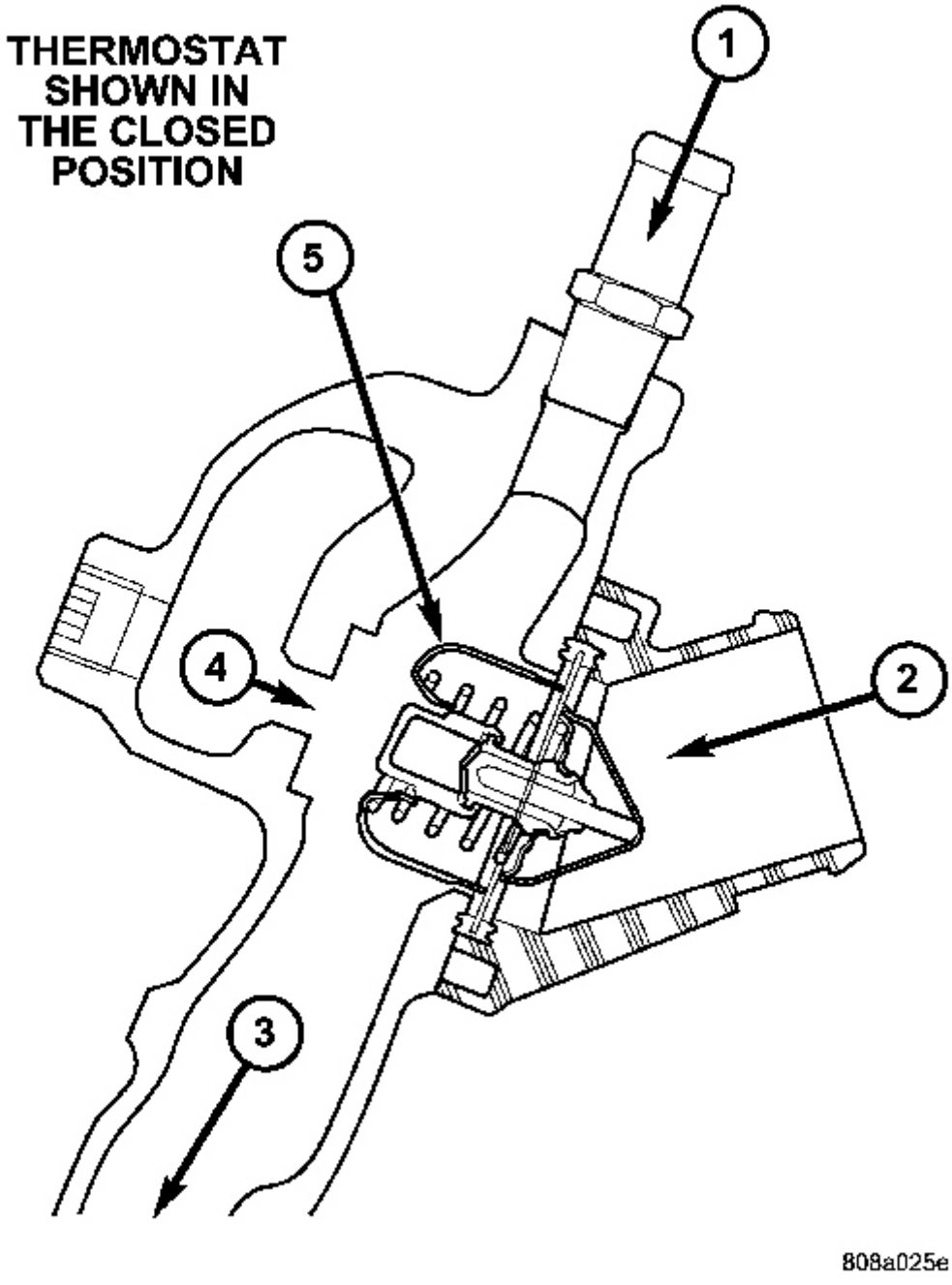


Fig. 63: Cutaway View Of Thermostat & Bypass
Courtesy of CHRYSLER LLC

1 - FROM HEATER
2 - FROM RADIATOR
3 - TO WATER PUMP
4 - ENGINE BYPASS
5 - THERMOSTAT

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

A pellet-type thermostat (5) 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. On the 3.7L engine the thermostat is designed to block the flow of the coolant bypass journal by 50% instead of completely blocking the flow. This design controls coolant temperature more accurately.

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.

DESCRIPTION-THERMOSTAT-2.8L DIESEL

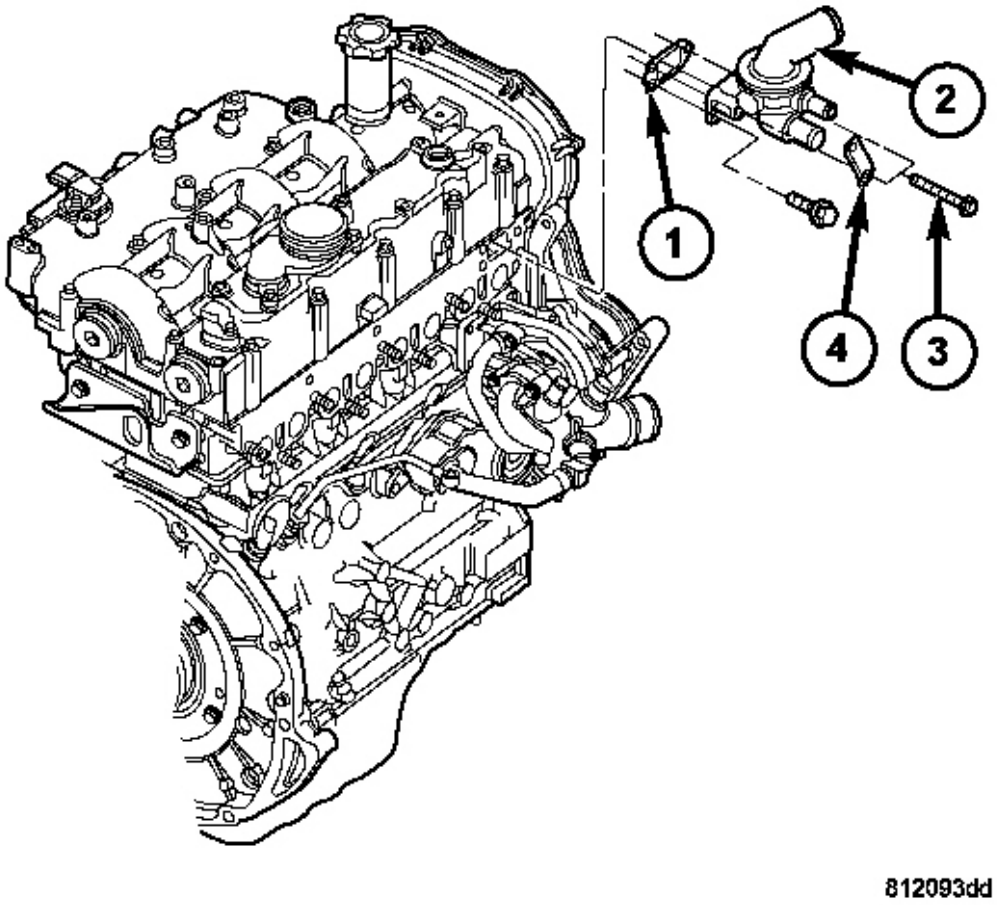


Fig. 64: Thermostat Housing, Gasket, Bolts & Bracket
Courtesy of CHRYSLER LLC

1 - GASKET
2 - THERMOSTAT HOUSING
3 - BOLT(S)
4 - BRACKET

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator.

OPERATION

OPERATION

The thermostat starts to open at 80°C (176°F). Above this temperature, coolant is allowed to flow to the radiator. This provides quicker engine warm-up 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 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.

DIAGNOSIS AND TESTING

ENGINE COOLANT THERMOSTAT

ON-BOARD DIAGNOSTICS

All models are equipped with On-Board Diagnostics for certain cooling system components. If the Powertrain Control Module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC). For other DTC numbers, refer to **OPERATION** .

REMOVAL

REMOVAL-4.0L

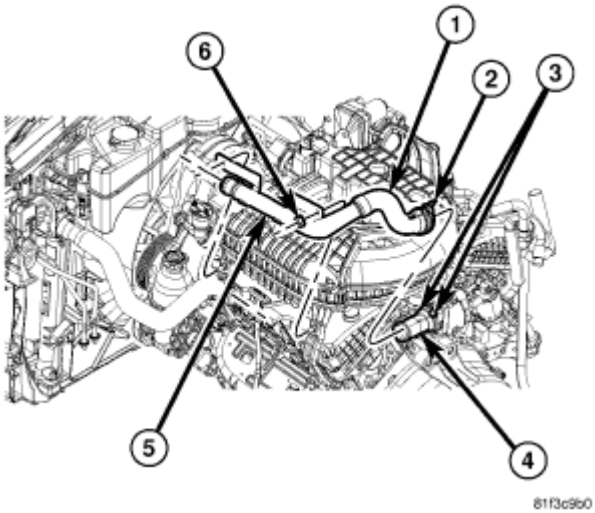


Fig. 65: Thermostat Assembly - 4.0L
Courtesy of CHRYSLER LLC

1 - UPPER RADIATOR HOSE 2 - HOSE CLAMP
3 - THERMOSTAT HOUSING MOUNTING BOLT
4 - THERMOSTAT HOUSING
5 - UPPER RADIATOR HOSE TUBE
6 - UPPER RADIATOR HOSE TUBE MOUNTING NUTS

1. Disconnect and isolate negative battery cable
2. Drain cooling system. See **STANDARD PROCEDURE**.
3. Remove air housing. Refer to **REMOVAL** .
4. Remove upper intake manifold. Refer to **REMOVAL** .
5. Remove radiator tube mounting nuts.
6. Remove radiator hose at thermostat housing.
7. Remove thermostat housing bolts, thermostat housing and thermostat.
8. Clean thermostat housing mating surface on lower intake manifold.

REMOVAL-2.8L DIESEL

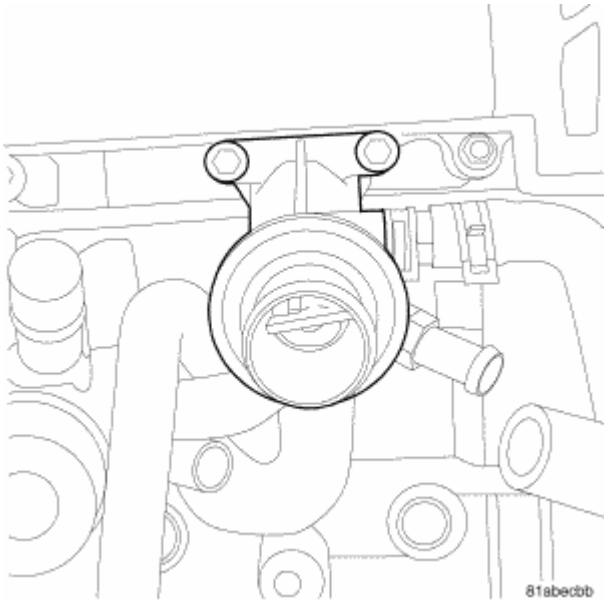


Fig. 66: Identifying Thermostat
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove engine cover. Refer to **REMOVAL** .
3. Partially drain cooling system. See **STANDARD PROCEDURE**.
4. Disconnect upper radiator hose and bypass hoses at thermostat housing (2).
5. Remove thermostat housing retaining bolts, support bracket and housing from cylinder head, discard gasket.

REMOVAL- 3.7L

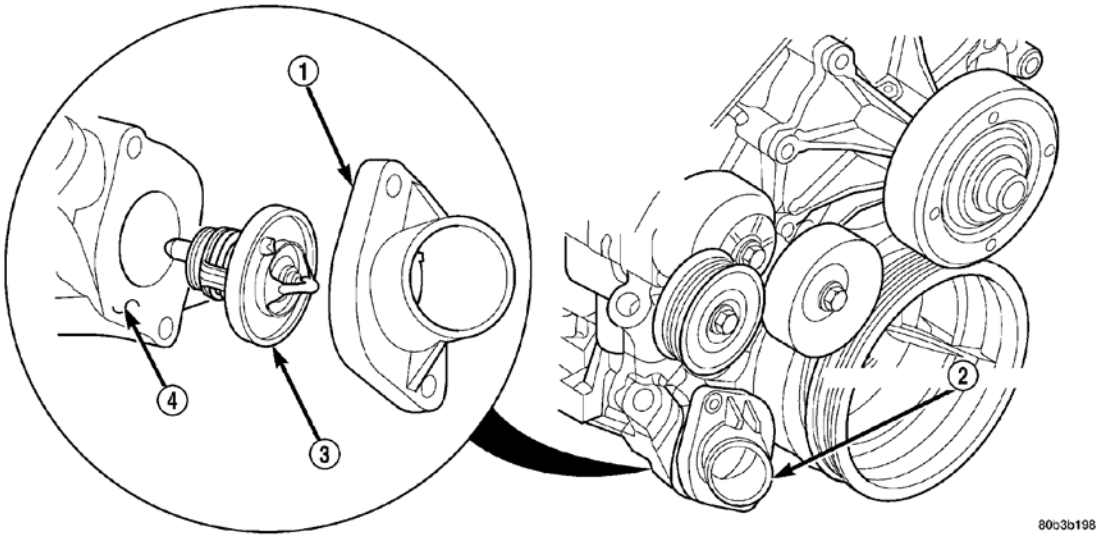


Fig. 67: Thermostat, Thermostat Housing, Gasket, Timing Chain Cover & Thermostat
Courtesy of CHRYSLER LLC

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

WARNING: Do not loosen radiator draincock with system hot and pressurized. Serious burns from coolant can occur.

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

If thermostat (3) is being replaced, be sure that replacement is specified thermostat for vehicle model and engine type.

1. Disconnect negative battery cable at battery.
2. Drain cooling system. See **STANDARD PROCEDURE**.
3. Raise vehicle on hoist.
4. Remove splash shield.
5. Remove lower radiator hose clamp and lower radiator hose at thermostat housing.
6. Remove thermostat housing mounting bolts, thermostat housing and thermostat.

INSTALLATION

INSTALLATION- 3.7L

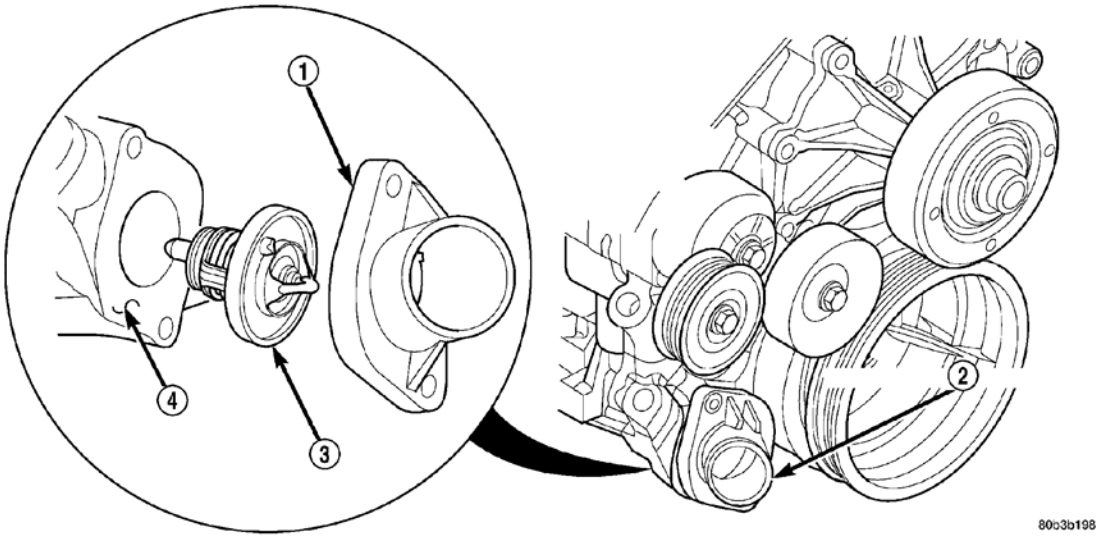


Fig. 68: Thermostat, Thermostat Housing, Gasket, Timing Chain Cover & Thermostat
Courtesy of CHRYSLER LLC

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

1. Clean mating areas of timing chain cover and thermostat housing.
2. Install thermostat (spring side down) into recessed machined groove on housing assembly. Make sure rubber seal locating tab is positioned in the corresponding notch in the housing.
3. Position thermostat housing on timing chain cover.
4. Install two housing-to-timing chain cover bolts. Tighten bolts to 12 N.m (105 in. lbs.) torque.
5. Install lower radiator hose on thermostat housing.
6. Install splash shield.
7. Lower vehicle.
8. Fill cooling system. See **STANDARD PROCEDURE**.
9. Connect negative battery cable to battery.
10. Start and warm the engine. Check for leaks.

INSTALLATION

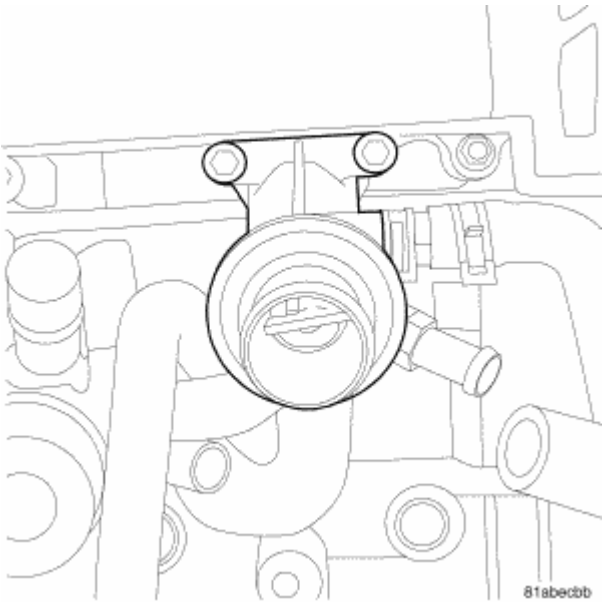


Fig. 69: Identifying Thermostat
Courtesy of CHRYSLER LLC

1. Clean old gasket material from cylinder head and thermostat housing.
2. Install thermostat housing with gasket and support bracket to cylinder head. Torque bolts to 28 N.m. (250 in. lbs.).
3. Connect coolant bypass hose and upper radiator hose to thermostat housing.
4. Refill cooling system. See **STANDARD PROCEDURE**.
5. Install engine cover. Refer to **INSTALLATION** .
6. Connect negative battery cable.

INSTALLATION-4.0L

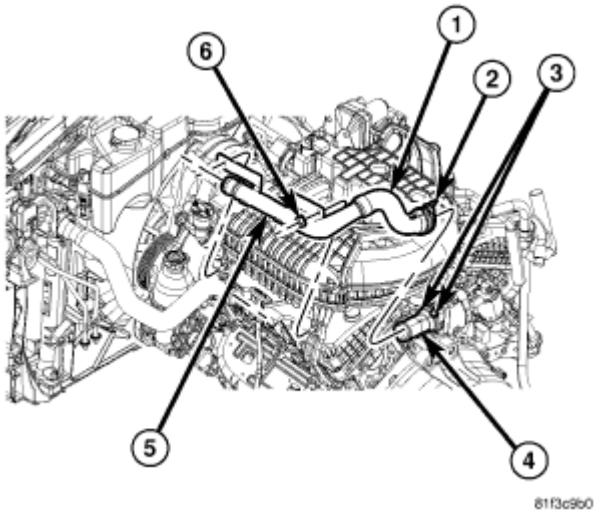


Fig. 70: Thermostat Assembly - 4.0L
Courtesy of CHRYSLER LLC

1 - UPPER RADIATOR HOSE 2 - HOSE CLAMP
3 - THERMOSTAT HOUSING MOUNTING BOLT
4 - THERMOSTAT HOUSING
5 - UPPER RADIATOR HOSE TUBE
6 - UPPER RADIATOR HOSE TUBE MOUNTING NUTS

1. Make sure jiggle pin is at the 12 O'clock position. Position thermostat and thermostat housing lower intake manifold.
2. Install thermostat housing bolts. Tighten bolts to 35 N.m (25 ft. lbs.).
3. Install upper radiator hose onto thermostat housing
4. Position upper radiator hose tube and install mounting nuts. Tighten nuts to 9 N.m, (85 in. lbs.).
5. Install upper intake manifold. Refer to **INSTALLATION** .
6. Install air cleaner housing. Refer to **INSTALLATION** .
7. Fill cooling system. See **STANDARD PROCEDURE**.

RADIATOR

DESCRIPTION

DESCRIPTION

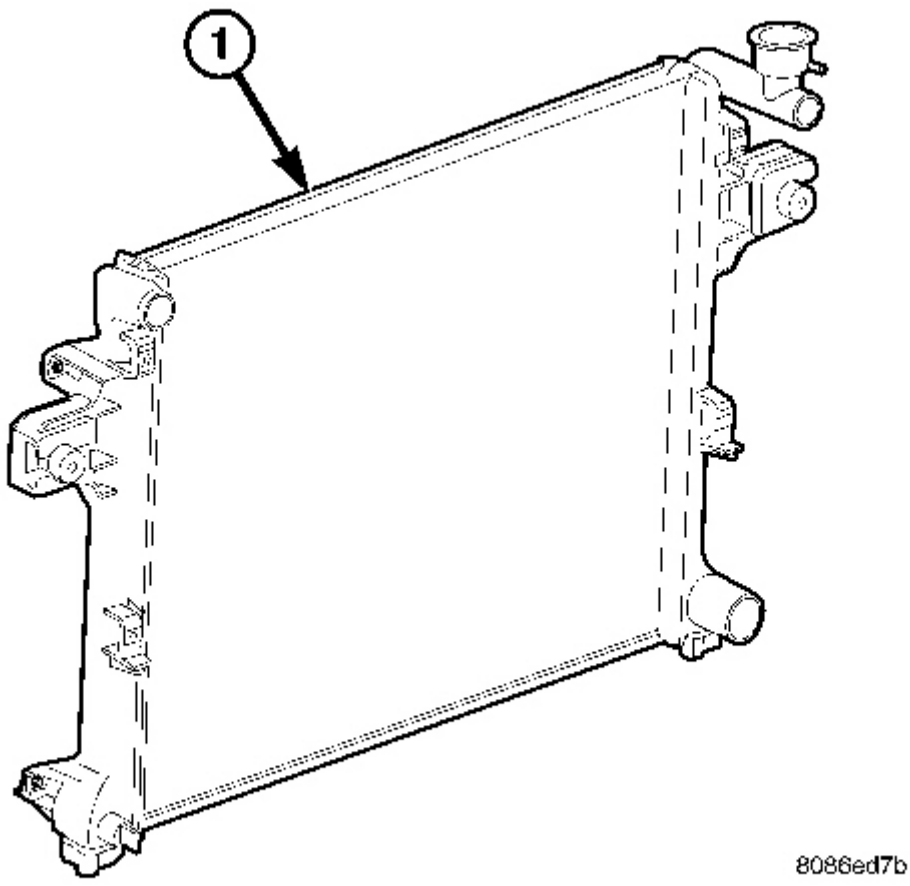


Fig. 71: Cross Flow Radiator - Typical
Courtesy of CHRYSLER LLC

1 - RADIATOR

All vehicles are equipped with a cross flow type radiator (1) with plastic side tanks.

Plastic tanks, while stronger than brass, are subject to damage by impact, such as from tools or wrenches. Handle radiator with care.

REMOVAL

REMOVAL

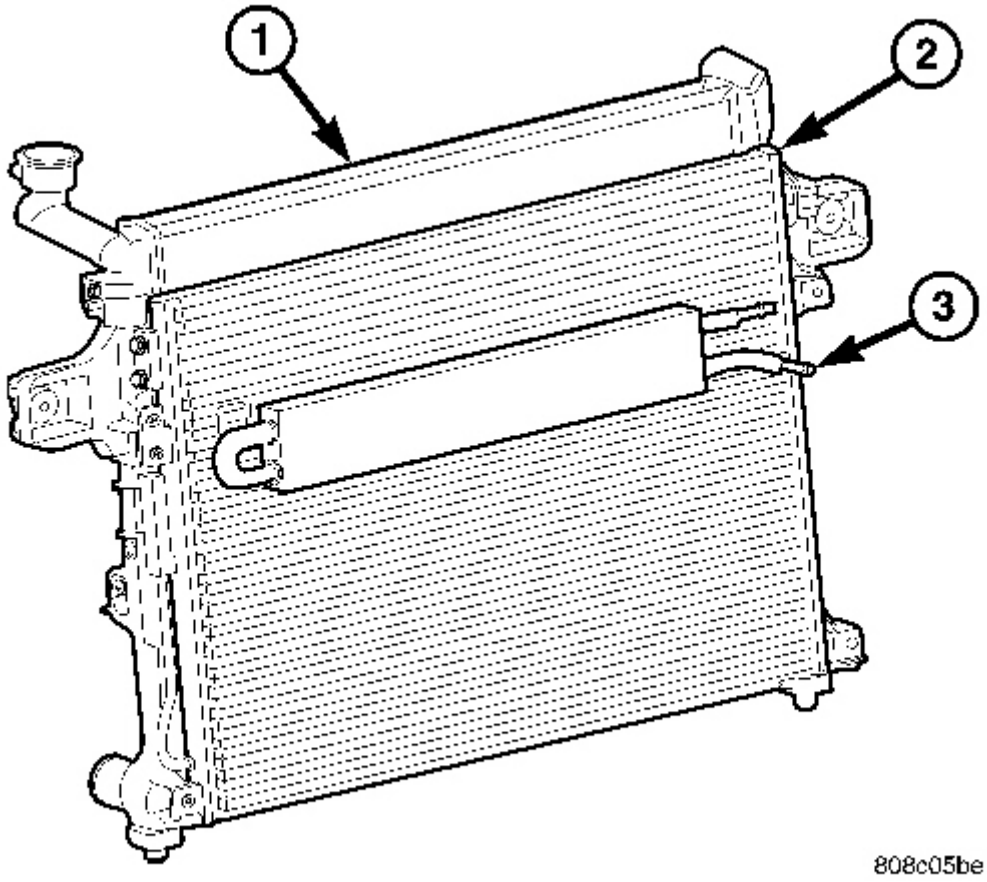


Fig. 72: Identifying Air Dam, Radiator, Air Dam, A/C Condenser & Air Seal
Courtesy of CHRYSLER LLC

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

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. Refer to cooling system draining.

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

CAUTION: When removing the radiator or A/C condenser for any reason, note the location of all radiator-to-body and radiator-to-A/C condenser rubber air seals. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

1. Disconnect the negative battery cable at battery.
2. Drain coolant from radiator. See **STANDARD PROCEDURE**.
3. Remove the front grille. Refer to **REMOVAL** .
4. Remove the cooling fan from the engine, if equipped.
5. Remove the two radiator mounting bolts.
6. Disconnect the connector for the electric fan.
7. Disconnect the power steering cooler line from cooler.
8. Disconnect the radiator upper and lower hoses.
9. Disconnect the overflow hose from radiator (2).

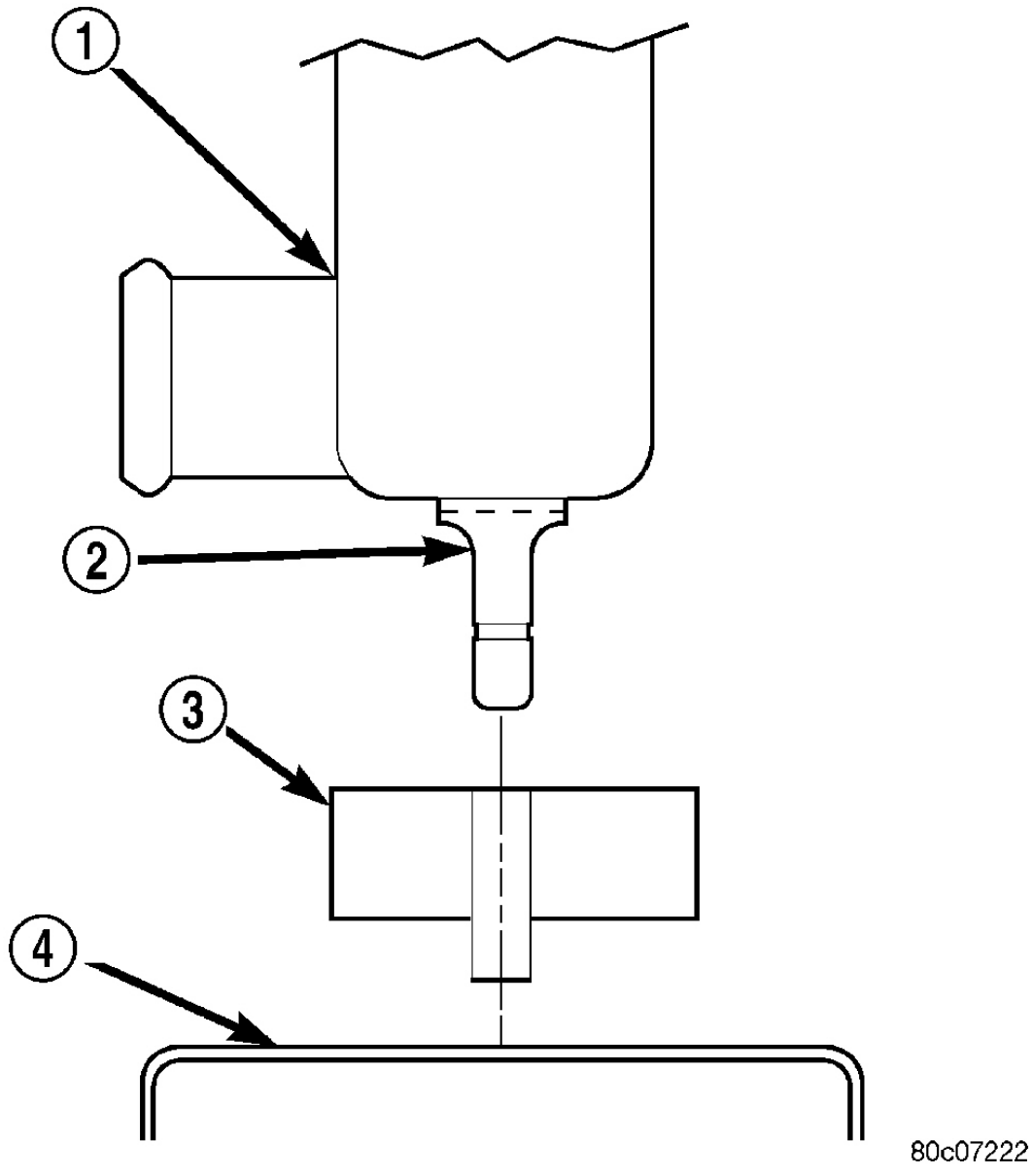


Fig. 73: Identifying Radiator, Alignment Dowel, Radiator Lower Isolator & Radiator Lower Crossmember
Courtesy of CHRYSLER LLC

1 - RADIATOR
2 - ALIGNMENT DOWEL
3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

10. The lower part of radiator is equipped with two alignment dowel pins (2). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

WARNING: The air conditioning system (if equipped) is under a constant pressure even with the engine off. Refer to refrigerant warnings in, heating and air conditioning before handling any air conditioning component.

NOTE: The radiator and radiator cooling fan can be removed as an assembly. It is not necessary to remove the cooling fan before removing or installing the radiator.

11. Gently lift up and remove radiator from vehicle. Be careful not to scrape the radiator fins against any other component. Also be careful not to disturb the air conditioning condenser (if equipped).

CLEANING

CLEANING

Clean radiator fins With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

INSPECTION

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

INSTALLATION

INSTALLATION

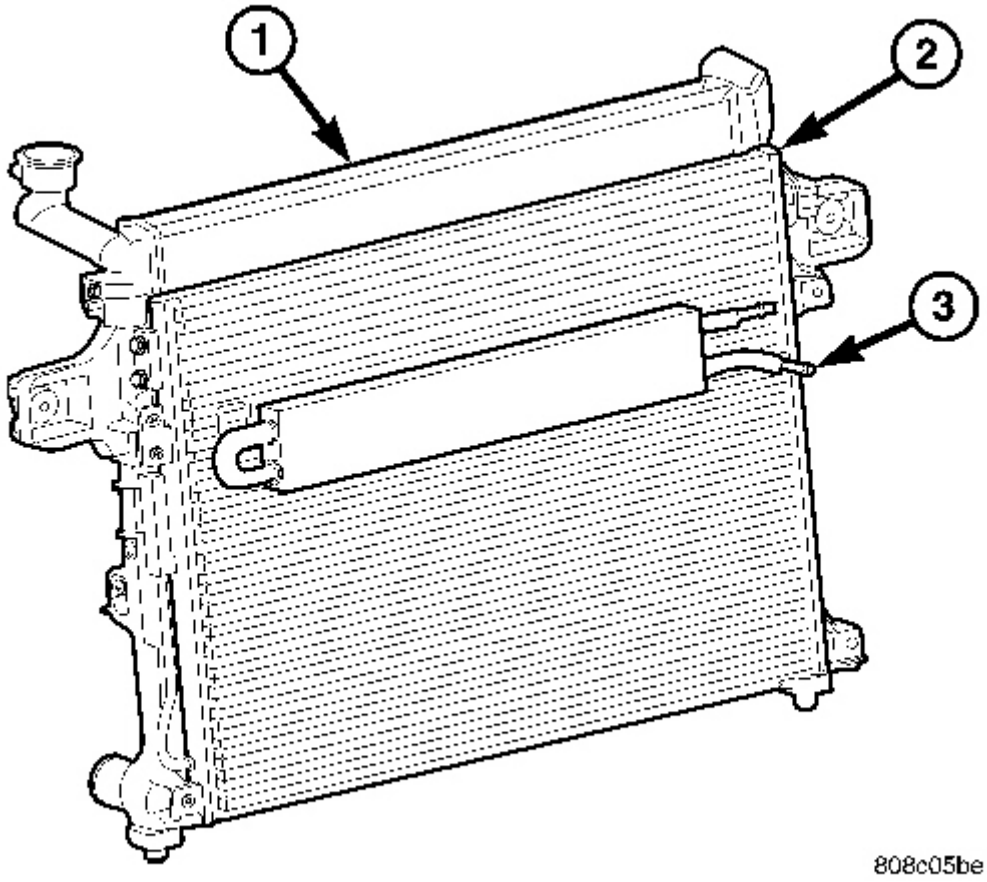


Fig. 74: Identifying Air Dam, Radiator, Air Dam, A/C Condenser & Air Seal
Courtesy of CHRYSLER LLC

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must

be installed to their original positions.

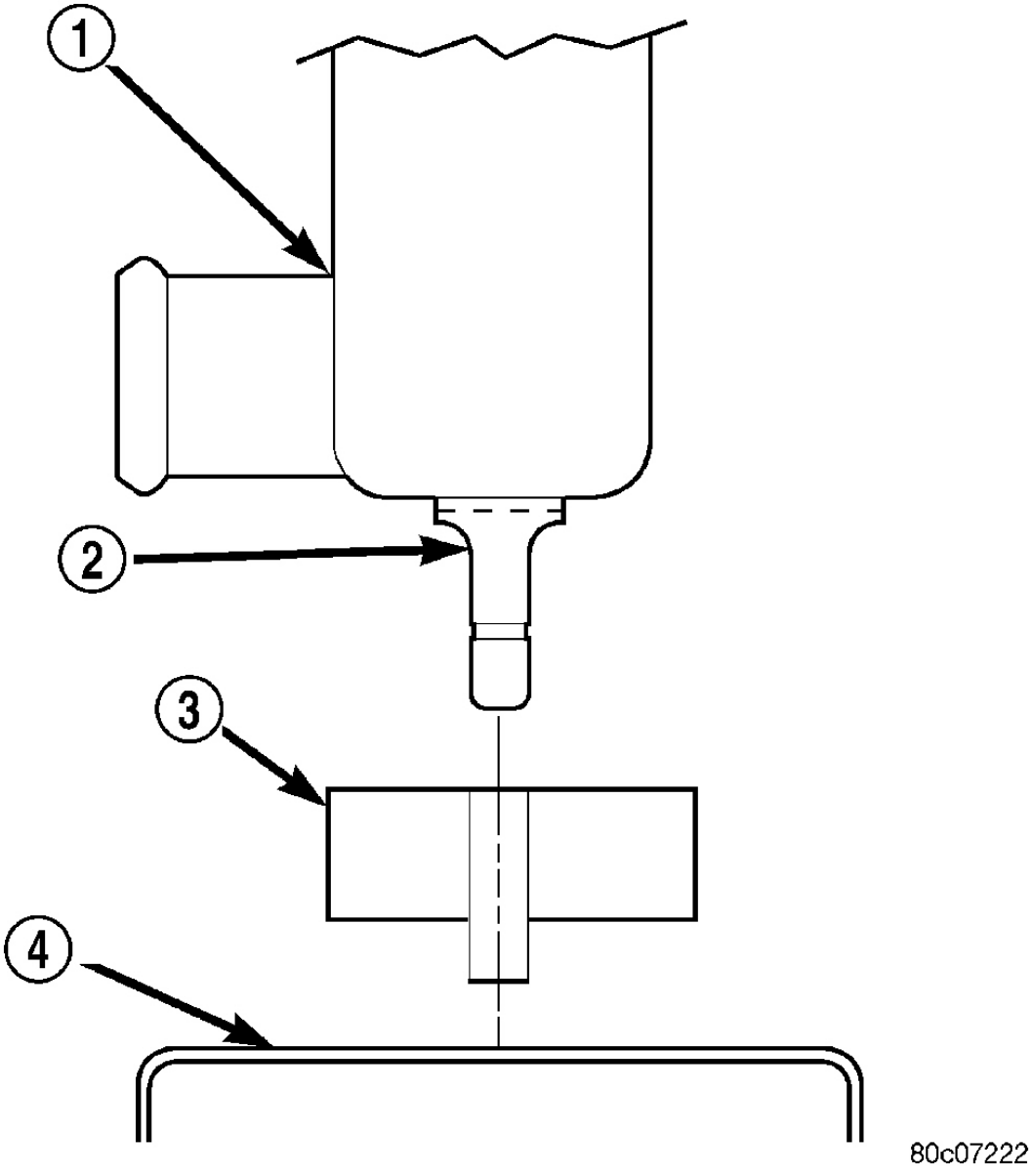


Fig. 75: Identifying Radiator, Alignment Dowel, Radiator Lower Isolator & Radiator Lower Crossmember
Courtesy of CHRYSLER LLC

1 - RADIATOR 2 - ALIGNMENT DOWEL

3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

1. Gently lower the radiator and fan shroud into the vehicle. Guide the two radiator alignment dowels into the rubber grommets located in lower radiator crossmember.
2. Connect the radiator upper and lower hoses and hose clamps to radiator.

CAUTION: The tangs on the hose clamps must be positioned straight down.

3. Install coolant reserve/overflow tank hose at radiator.
4. Install both radiator mounting bolts.
5. Reconnect the electric cooling fan.
6. Install the grille. Refer to **INSTALLATION** .
7. Reinstall the cooling fan to the engine.
8. Rotate the fan blades (by hand) and check for interference at fan shroud.
9. Refill cooling system. See **STANDARD PROCEDURE**.
10. Connect battery cable at battery.
11. Start and warm engine. Check for leaks.

CAP-RADIATOR PRESSURE

DESCRIPTION

DESCRIPTION

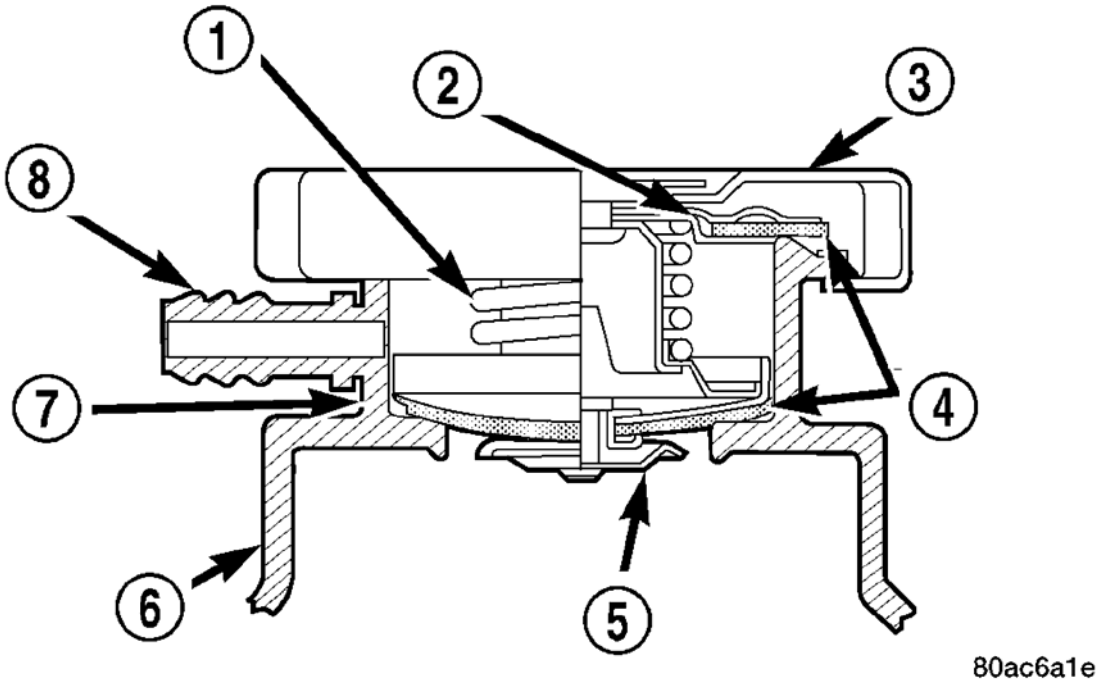


Fig. 76: Identifying Main Spring, Gasket Retainer, Stainless Steel Swivel Top, Rubber Seals, Spring Loaded Valve, Coolant Pressure Bottle, Filler Neck & Overflow Nipple
Courtesy of CHRYSLER LLC

1 - MAIN SPRING
2 - GASKET RETAINER
3 - STAINLESS STEEL SWIVEL TOP
4 - RUBBER SEALS
5 - SPRING LOADED VALVE
6 - COOLANT PRESSURE BOTTLE
7 - FILLER NECK
8 - OVERFLOW NIPPLE

The cooling system cap is located on the coolant pressure bottle for 3.7L/2.8L The cap construction includes; stainless steel swivel top, rubber seals and retainer, main spring (1), and a spring loaded valve (5).

OPERATION

OPERATION

The pressure cap allows the cooling system to operate at higher than atmospheric pressure which raises the coolant boiling point, thus allowing increased radiator cooling capacity. The pressure cap releases pressure at some point within a range of 110 kPa ± 14 kPa (16 psi ± 2 psi).

A spring-loaded vent valve in the center of the cap allows the system to pressurize and depressurize without

creating a vacuum. If the valve is stuck open, coolant will escape to the overflow hose. There is also a gasket in the cap to seal to the top of the filler neck.

CAUTION: Use only the pressure cap specified for this vehicle. Use of other pressure caps can lead to coolant loss and overheating.

DIAGNOSIS AND TESTING

RADIATOR PRESSURE CAP

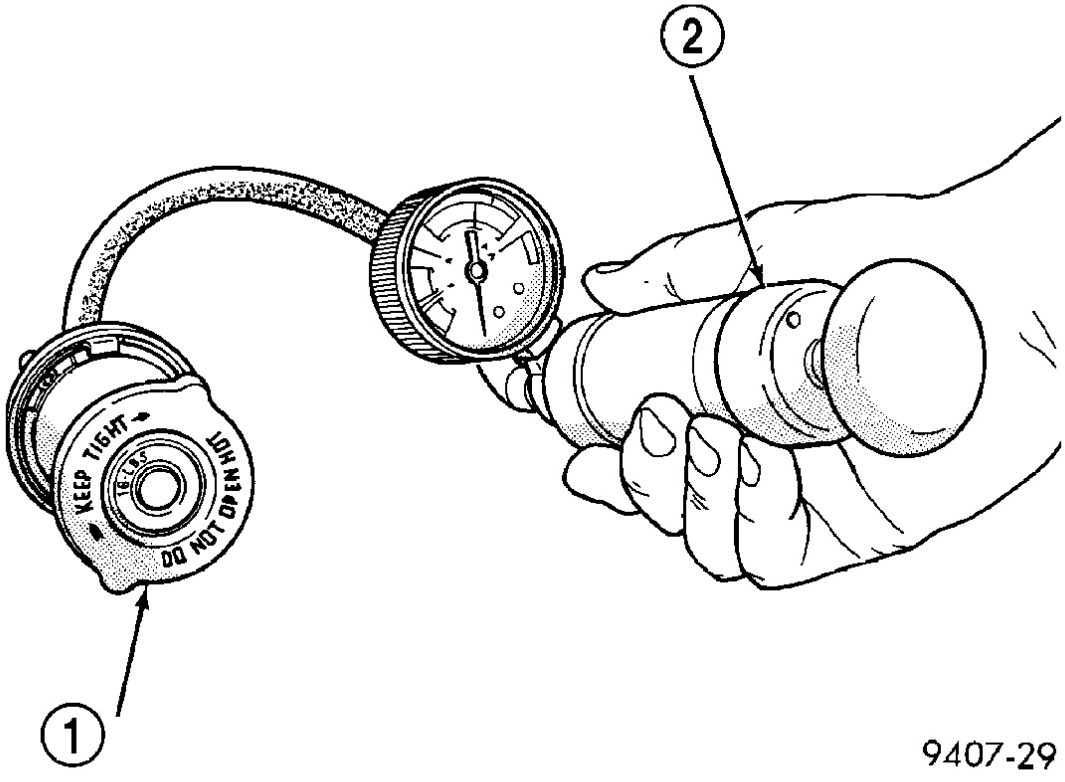


Fig. 77: Testing Cooling System Pressure Cap
Courtesy of CHRYSLER LLC

1 - PRESSURE CAP
2 - PRESSURE TESTER

Dip the pressure cap (1) in water. Clean any deposits off the vent valve or its seat and apply cap to end of the Pressure Cap Test Adaptor that is included with the Pressure Tester 7700. Working the plunger, bring the pressure to 104 kPa (15 psi) on the gauge. If the pressure cap fails to hold pressure of at least 97 kPa (14 psi), replace the pressure cap.

CAUTION: The Cooling System Tester Tool is very sensitive to small air leaks that 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 the tool. Turn tool upside down and recheck pressure cap to confirm that cap is bad.

If the pressure cap tests properly while positioned on Pressure Tester (2), but will not hold pressure or vacuum when positioned on the filler neck. Inspect the filler neck and cap top gasket for irregularities that may prevent the cap from sealing properly.

PRESSURE RELIEF TEST

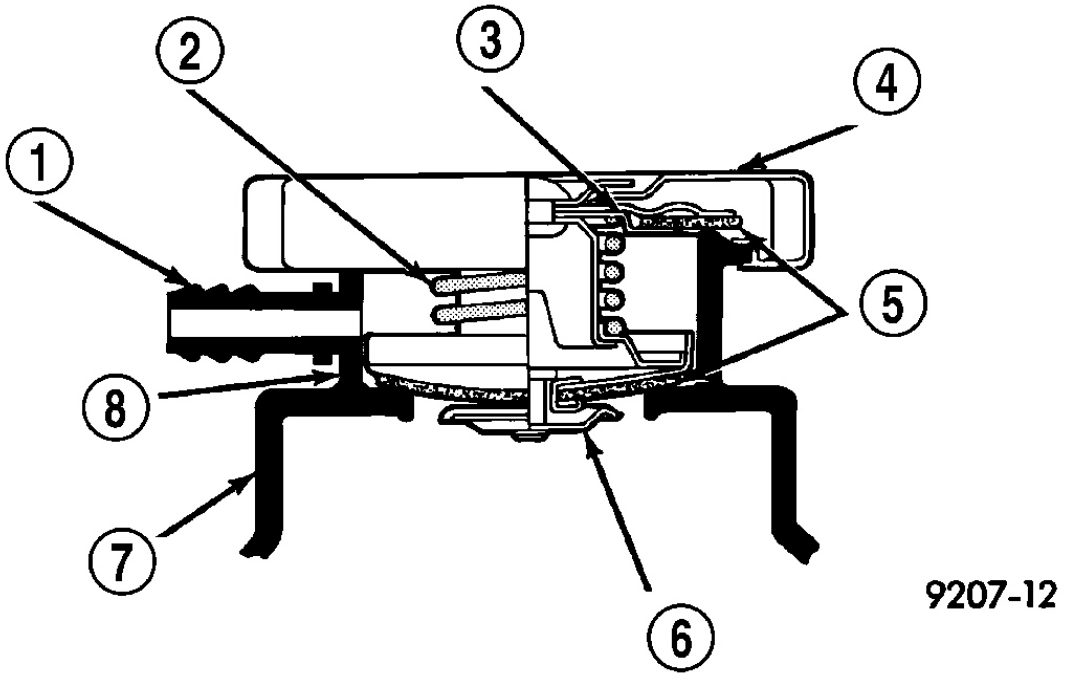


Fig. 78: Identifying Overflow Nipple, Main Spring, Gasket Retainer, Stainless-Steel Swivel Top, Rubber Seals, Vent Valve, Pressure Bottle & Filler Neck
Courtesy of CHRYSLER LLC

1 - OVERFLOW NIPPLE
2 - MAIN SPRING
3 - GASKET RETAINER
4 - STAINLESS-STEEL SWIVEL TOP
5 - RUBBER SEALS
6 - VENT VALVE
7 - PRESSURE BOTTLE

8 - FILLER NECK

The pressure cap upper gasket (seal) pressure relief can be checked by removing the overflow hose at the radiator filler neck nipple. Attach the Pressure Tester 7700 to the filler neck nipple (1) and pump air into the radiator. Pressure cap upper gasket should relieve at 69-124 kPa (10-18 psi) and hold pressure at 55 kPa (8 psi) minimum.

WARNING: The warning words "do not open hot" on the radiator pressure cap is 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 or under pressure.

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

1. Check and adjust coolant freeze point.
2. Refill system with new coolant.
3. Conducting service procedures.
4. Checking for vacuum leaks.

WARNING: If vehicle has been run recently, wait 15 minutes before removing cap. Then place a shop towel over the cap and without pushing down rotate counterclockwise to the first stop. Allow fluids to escape through the overflow tube and when the system stops pushing coolant and steam into the CRS tank and pressure drops push down and remove the cap completely. Squeezing the radiator inlet hose with a shop towel (to check pressure) before and after turning to the first stop is recommended.

CLEANING

CLEANING

Clean the radiator pressure cap using a mild soap and water only.

INSPECTION

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.

PUMP-WATER

DESCRIPTION

DESCRIPTION

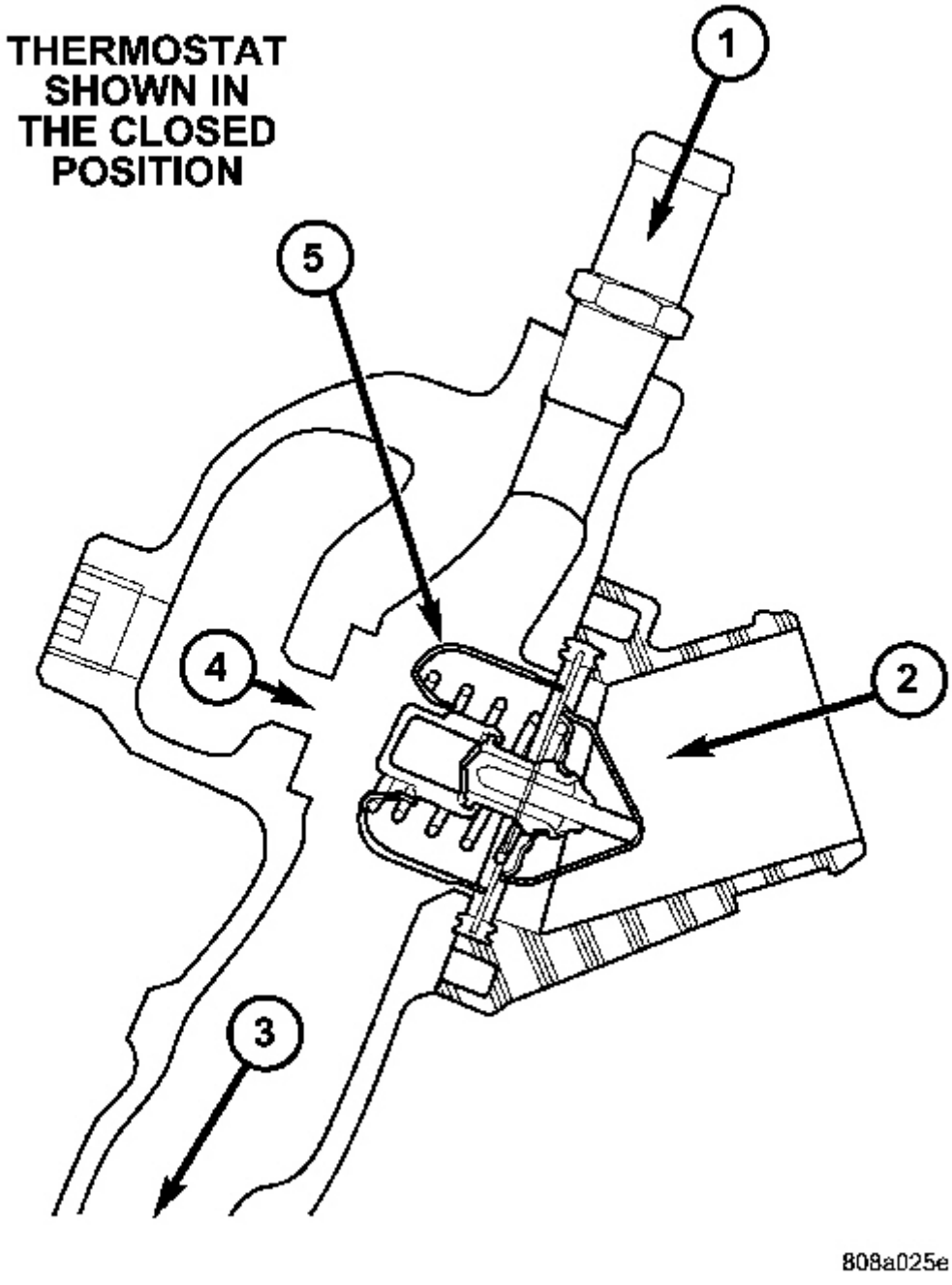


Fig. 79: Cutaway View Of Thermostat & Bypass
Courtesy of CHRYSLER LLC

1 - FROM HEATER 2 - FROM RADIATOR 3 - TO WATER PUMP 4 - ENGINE BYPASS 5 - THERMOSTAT

The 3.7L engine uses an internal water/coolant bypass system. The design uses galleries in the timing chain cover to circulate coolant during engine warm-up preventing the coolant from flowing through the radiator. The thermostat uses a stub shaft located at the rear of the thermostat to control flow through the bypass gallery.

DESCRIPTION-3.7L

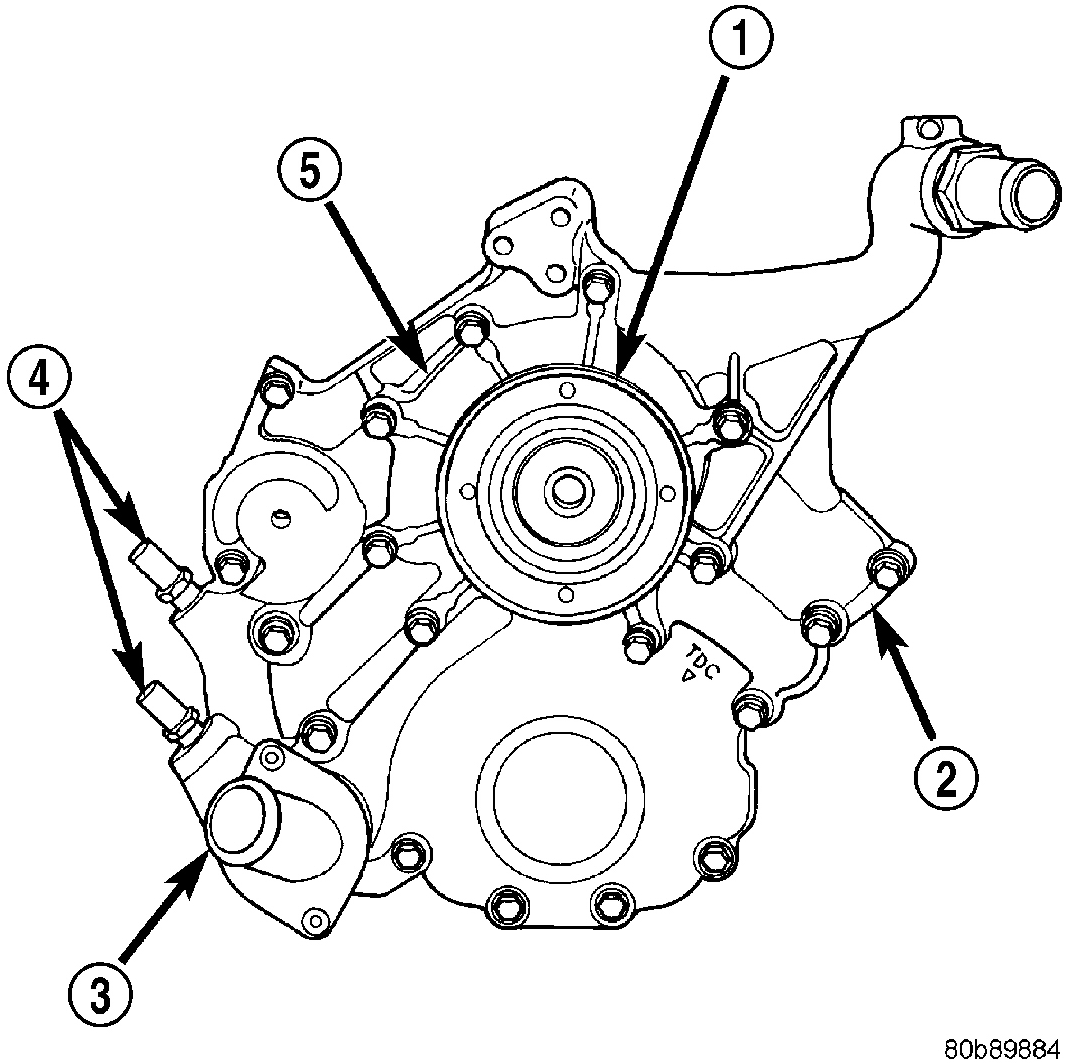


Fig. 80: Identifying Integral Water Pump Pulley, Timing Chain Covering, Thermostat Housing & Water

Pump
Courtesy of CHRYSLER LLC

1 - INTEGRAL WATER PUMP PULLEY
2 - TIMING CHAIN COVER
3 - THERMOSTAT HOUSING
4 - HEATER HOSE FITTINGS
5 - WATER PUMP

A centrifugal water pump (5) 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 single 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 two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

Both heater hoses are connected to fittings on the timing chain front cover. The water pump is also mounted directly to the timing chain cover and is equipped with an integral pulley.

WATER PUMP-DESCRIPTION-2.8L DIESEL

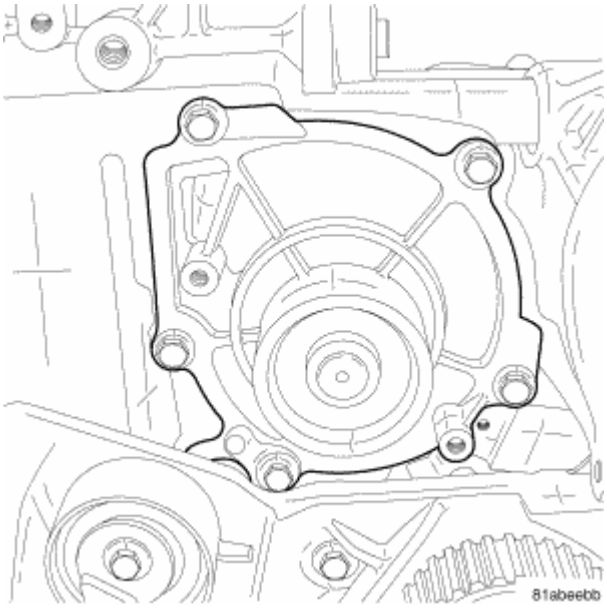


Fig. 81: Identifying Water Pump
Courtesy of CHRYSLER LLC

The water pump on the 2.8L diesel has a die cast aluminum housing. It bolts directly to the engine block.

OPERATION

OPERATION-3.7L

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core, this coolant absorbs the heat generated when the engine is running. The pump is driven by the engine crankshaft via a drive belt.

WATER PUMP-OPERATION-2.8L DIESEL

The water pump is used to circulate coolant through the cooling system. The coolant is pumped through the engine block, cylinder head, heater core, EGR cooler, viscous heater, and radiator.

REMOVAL

REMOVAL-3.7L ENGINE

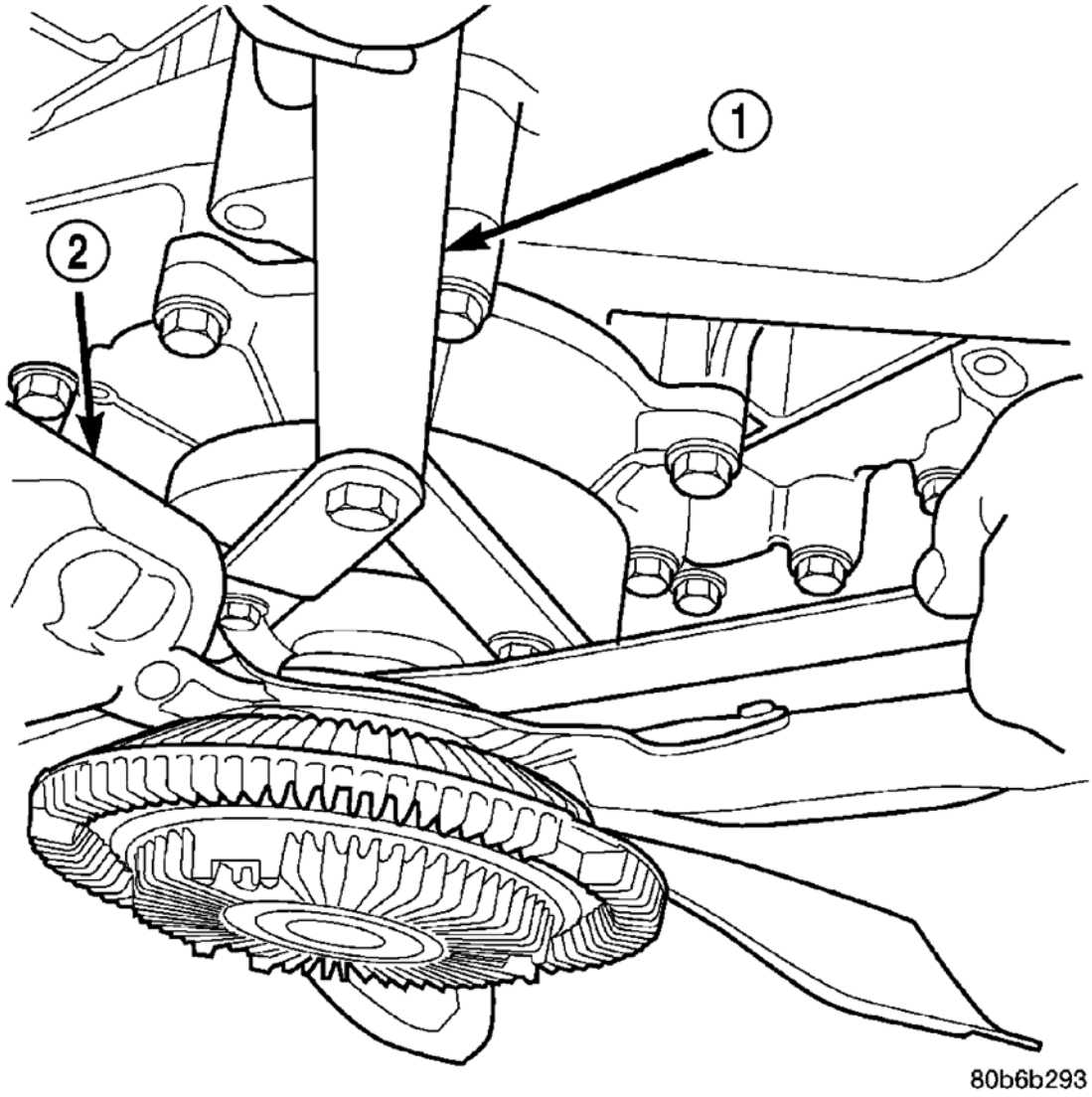


Fig. 82: Identifying Special Tool 6958 Spanner Wrench With Adapter Pins 8346 & Fan
Courtesy of CHRYSLER LLC

1 - SPECIAL TOOL 6958 SPANNER WRENCH WITH ADAPTER PINS 8346
2 - FAN

1. Disconnect negative battery cable.
2. Drain cooling system. See **STANDARD PROCEDURE**.
3. If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.
4. Remove two fan shroud-to-radiator screws. Disconnect the coolant overflow hose.
5. Remove upper fan shroud and fan blade/viscous fan drive assembly from vehicle.
6. 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.

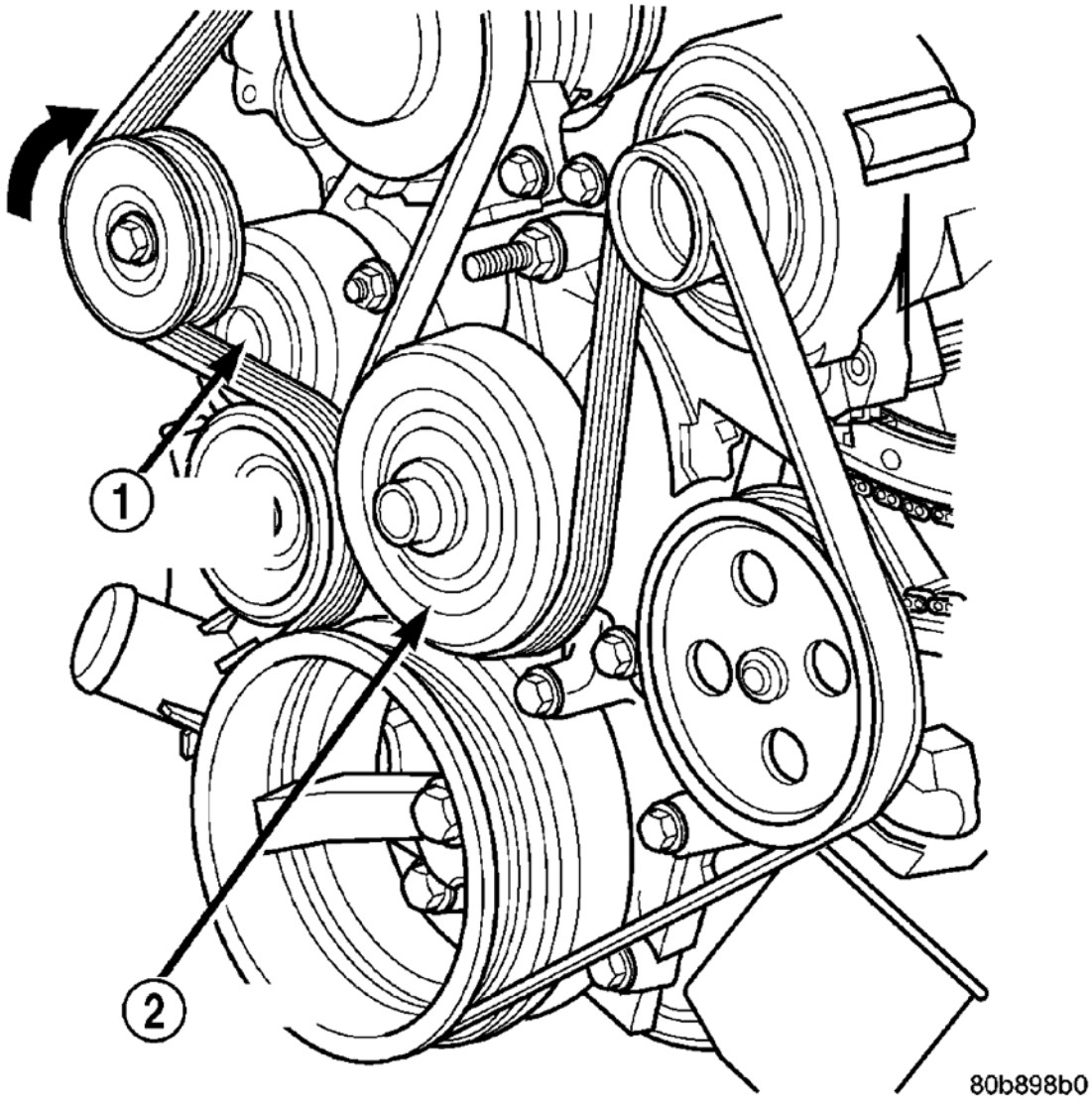


Fig. 83: Identifying Automatic Tensioner & Water Pump Pulley
Courtesy of CHRYSLER LLC

1 - AUTOMATIC TENSIONER
2 - WATER PUMP PULLEY

7. Remove accessory drive belt (1). See **REMOVAL**.
8. Remove lower radiator hose clamp and remove lower hose at water pump.
9. Remove seven water pump mounting bolts and one stud bolt.

CAUTION: Do not pry water pump at timing chain case/cover. The machined surfaces may be damaged resulting in leaks.

10. Remove water pump and gasket. Discard gasket.

WATER PUMP-REMOVAL-2.8L DIESEL ENGINE

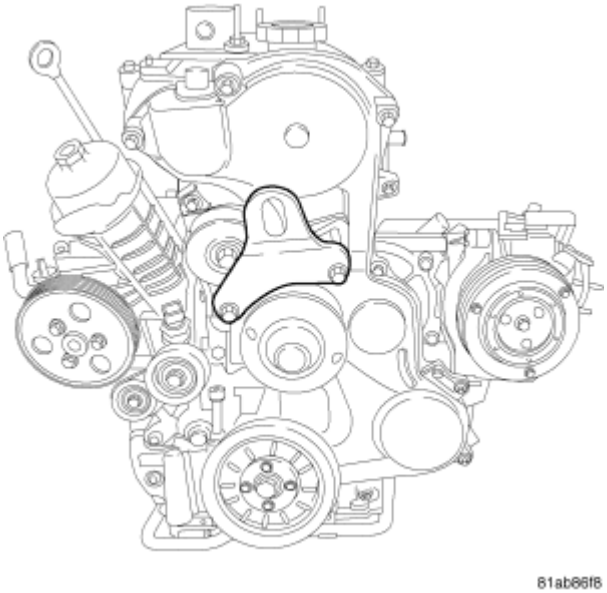


Fig. 84: Front Lifting Bracket
Courtesy of CHRYSLER LLC

1. Remove the radiator fan. See **REMOVAL**.
2. Disconnect negative battery cable.
3. Drain cooling system. See **STANDARD PROCEDURE**.

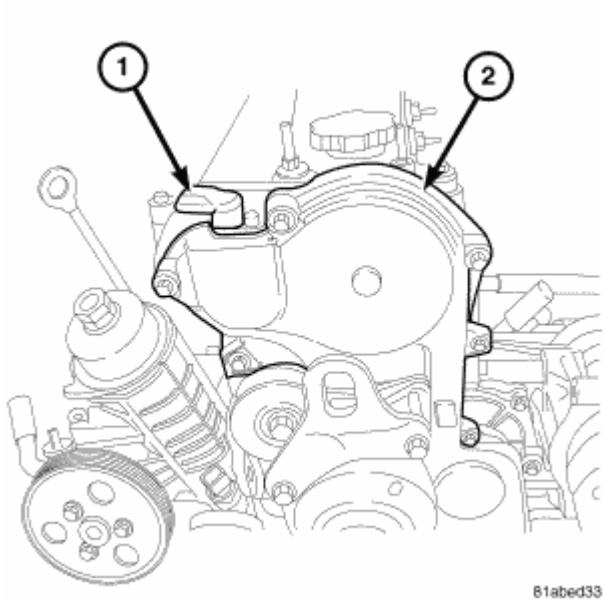


Fig. 85: Identifying Upper Front Cover & Lifting Bracket
Courtesy of CHRYSLER LLC

4. Remove the upper front cover.

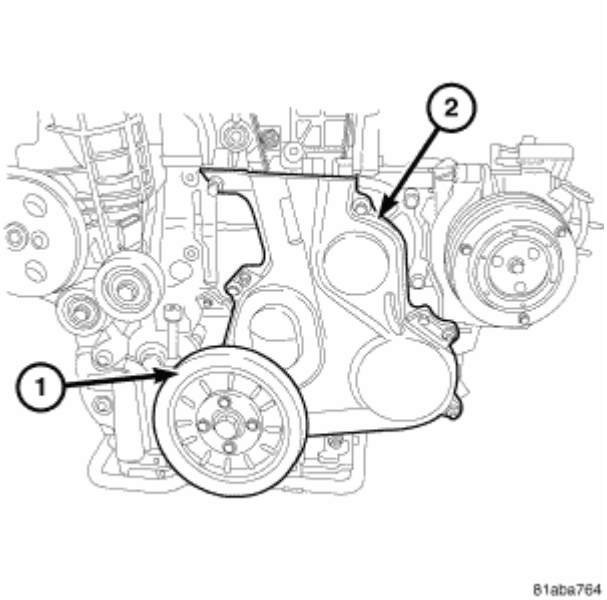


Fig. 86: Identifying Outer Front Cover & Crankshaft Damper
Courtesy of CHRYSLER LLC

5. Remove the crankshaft damper and lower front cover.

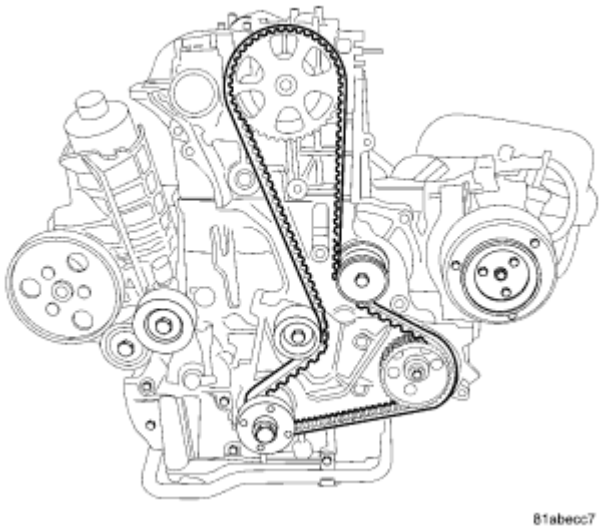


Fig. 87: Identifying Timing Belt
Courtesy of CHRYSLER LLC

6. Remove the timing belt.

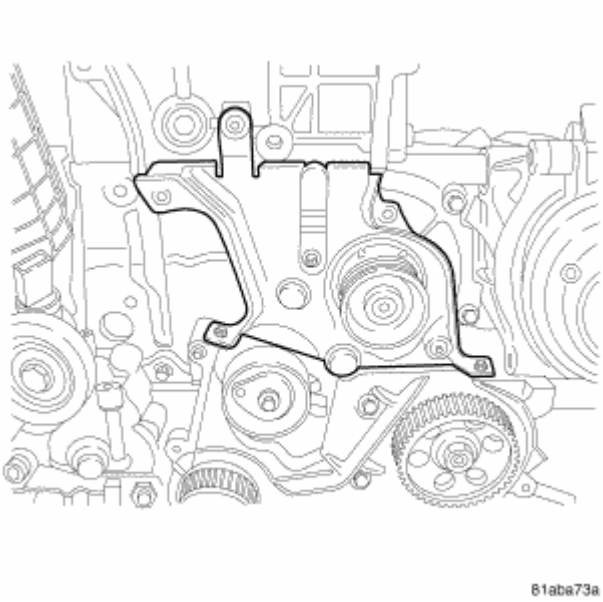


Fig. 88: Identifying Inner Front Cover
Courtesy of CHRYSLER LLC

7. Remove the inner front cover.

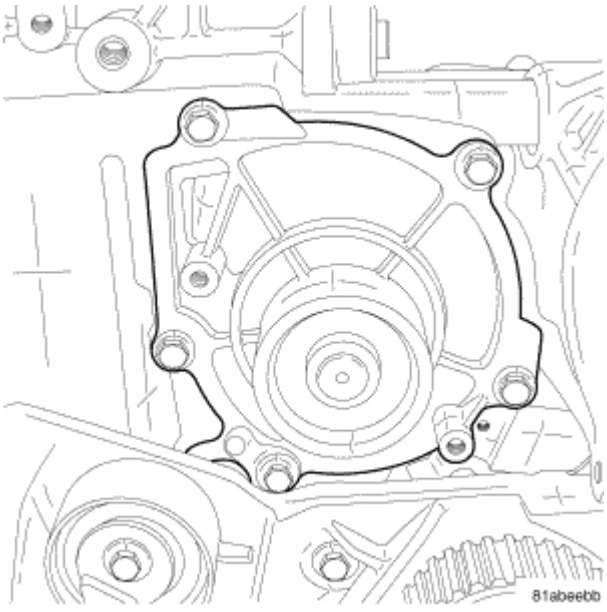


Fig. 89: Identifying Water Pump
Courtesy of CHRYSLER LLC

8. Remove water pump retaining bolts and pump.

REMOVAL-4.0L

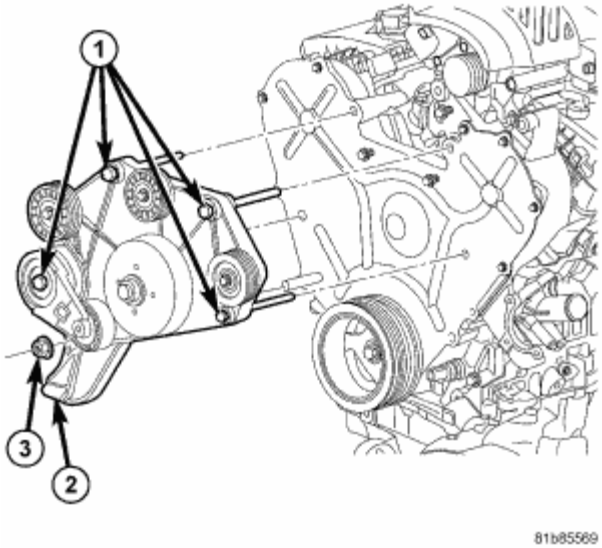


Fig. 90: Removing/Installing A/C Compressor Mounting
Courtesy of CHRYSLER LLC

1. Disconnect negative battery cable.
2. Remove air filter housing. Refer to **REMOVAL** .
3. Drain cooling system. See **STANDARD PROCEDURE**.

4. Remove coolant recover container. See **REMOVAL**.
5. Remove viscous radiator fan. See **REMOVAL**.
6. Remove RH engine mount through bolt.
7. Raise engine assembly.
8. Remove front A/C compressor front mounting nuts and studs
9. Remove accessory drive belt bracket.
10. Remove engine timing belt. Refer to **REMOVAL** .

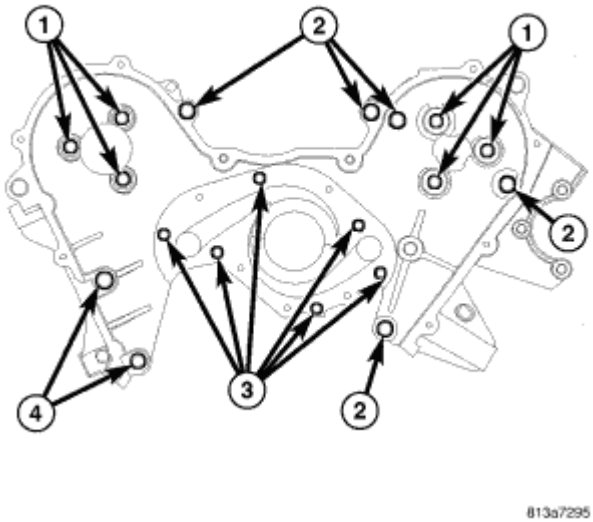


Fig. 91: Timing Belt Rear Cover Fasteners
Courtesy of CHRYSLER LLC

1 - M8 FASTENERS (APPLY THREAD SEALANT)
2 - M10 FASTENERS
3 - M6 FASTENERS
4 - M10 FASTENERS (STUD/NUT)

11. Remove water pump mounting bolts (3).
12. Remove water pump.
13. Clean mounting surface.

CLEANING

WATER PUMP-CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

INSPECTION

WATER PUMP-INSPECTION

Inspect the water pump assembly for cracks in the housing, Water leaks from shaft seal, loose or rough turning bearing or impeller rubbing either the pump body or timing chain case/cover.

INSTALLATION

INSTALLATION-4.0L

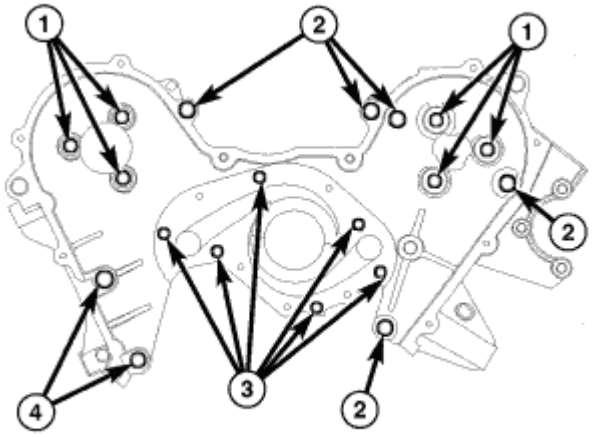


Fig. 92: Timing Belt Rear Cover Fasteners
Courtesy of CHRYSLER LLC

1 - M8 FASTENERS (APPLY THREAD SEALANT)
2 - M10 FASTENERS
3 - M6 FASTENERS
4 - M10 FASTENERS (STUD/NUT)

1. Position water pump and new gasket.
2. Install water pump mounting bolts. Tighten to 54 N.m (40 ft. lbs.).
3. Install engine timing belt. Refer to **INSTALLATION** .
4. Install accessory drive bracket. Tighten bolts to Tighten to 54 N.m (40 ft. lbs.).

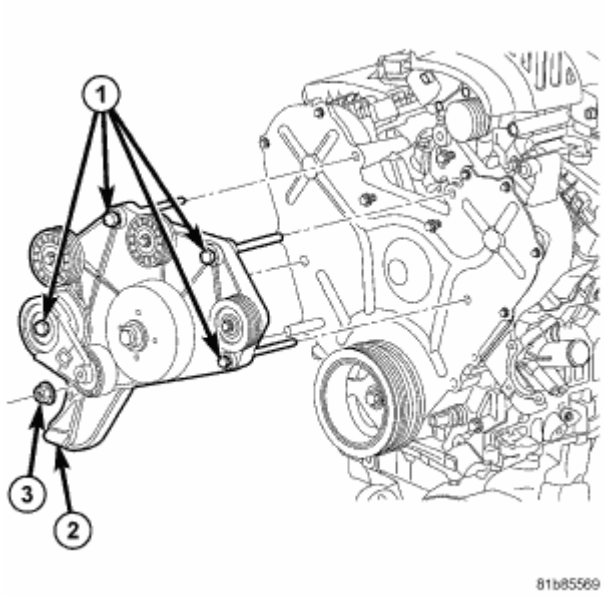


Fig. 93: Removing/Installing A/C Compressor Mounting
Courtesy of CHRYSLER LLC

5. Install front A/C compressor mounting studs and nuts. Tighten studs to
6. Install A/C compressor mounting nuts. Tighten nuts to 28 N.m (21 ft. lbs.).
7. Lower engine and install RH engine mount through bolt. Tighten bolt to 54 N.m (40 lbs. ft.).
8. Install accessory drive belt. See **INSTALLATION**.
9. Install viscous radiator fan. See **INSTALLATION**.
10. Install coolant recover container. See **INSTALLATION**.
11. Install air filter assembly. Refer to **INSTALLATION** .
12. Connect negative battery cable.
13. Fill cooling system. See **STANDARD PROCEDURE**.

WATER PUMP-INSTALLATION-2.8L DIESEL ENGINE

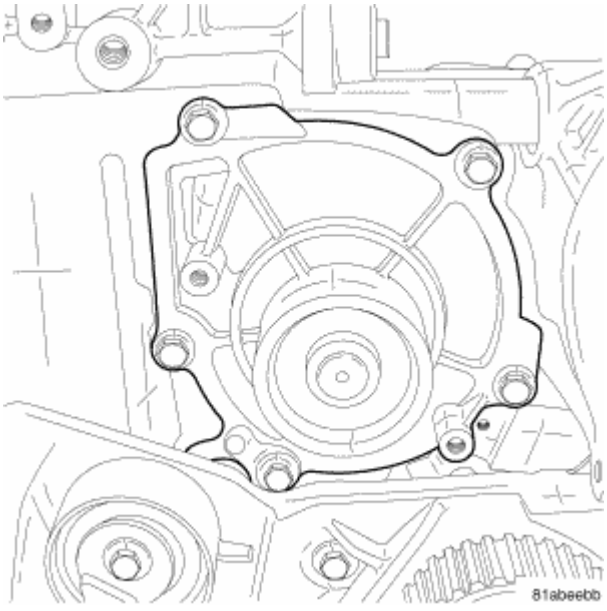


Fig. 94: Identifying Water Pump
Courtesy of CHRYSLER LLC

1. Clean mating surfaces of water pump housing and engine block as necessary.
2. Place new O-ring in groove in water pump housing. Install water pump and retaining bolts. Torque bolts to 24 N.m (212 in. lbs.).
3. Install the water pump torque the water pump bolts to 32 Nm (23 ft. lbs.)

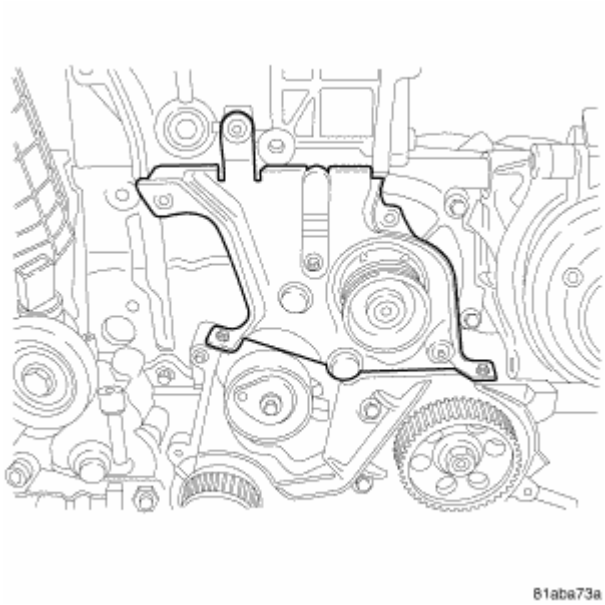


Fig. 95: Removing/Installing Inner Front Cover
Courtesy of CHRYSLER LLC

Install the inner front cover.

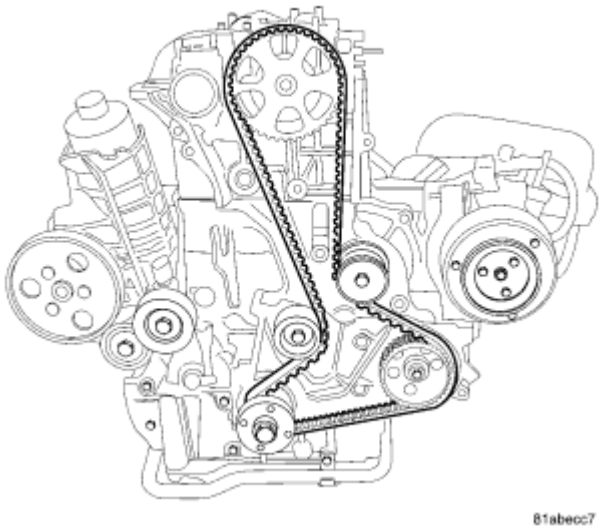


Fig. 96: Removing/Installing Timing Belt
Courtesy of CHRYSLER LLC

Install the timing belt.

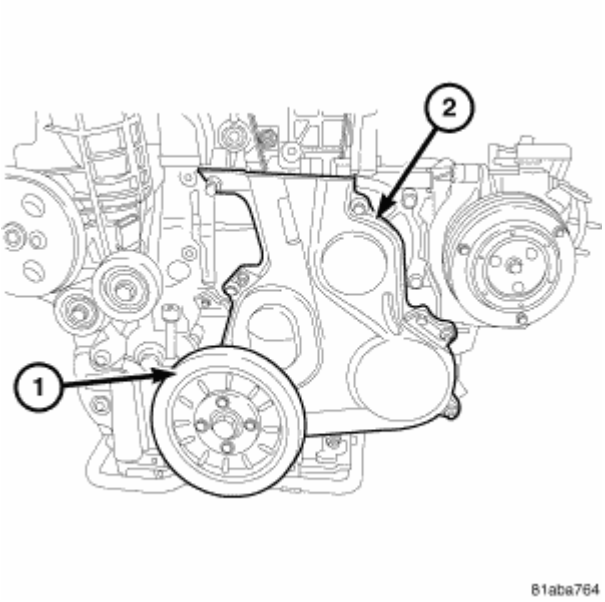


Fig. 97: Identifying Outer Front Cover & Crankshaft Damper
Courtesy of CHRYSLER LLC

Install the outer front cover (2).

4. Install the crankshaft damper (1).

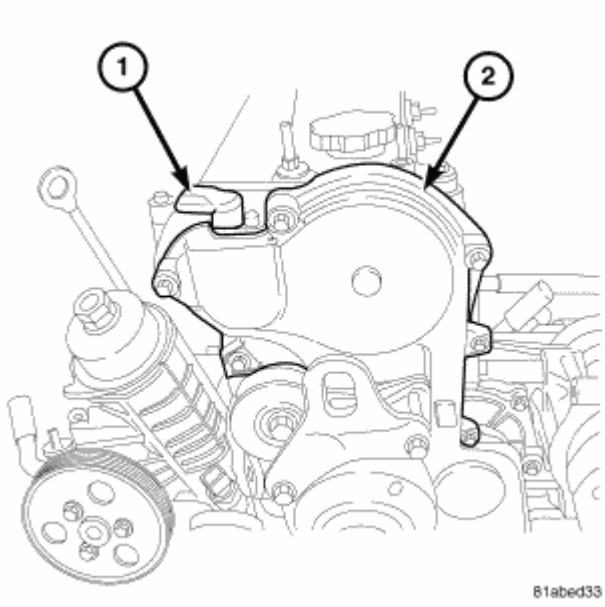


Fig. 98: Identifying Upper Front Cover & Lifting Bracket
Courtesy of CHRYSLER LLC

5. Install the upper front cover.
6. Install the lifting bracket.
7. Install the fan. See **INSTALLATION**.
8. Refill cooling system. See **STANDARD PROCEDURE**.
9. Connect negative battery cable.

INSTALLATION-3.7L ENGINE

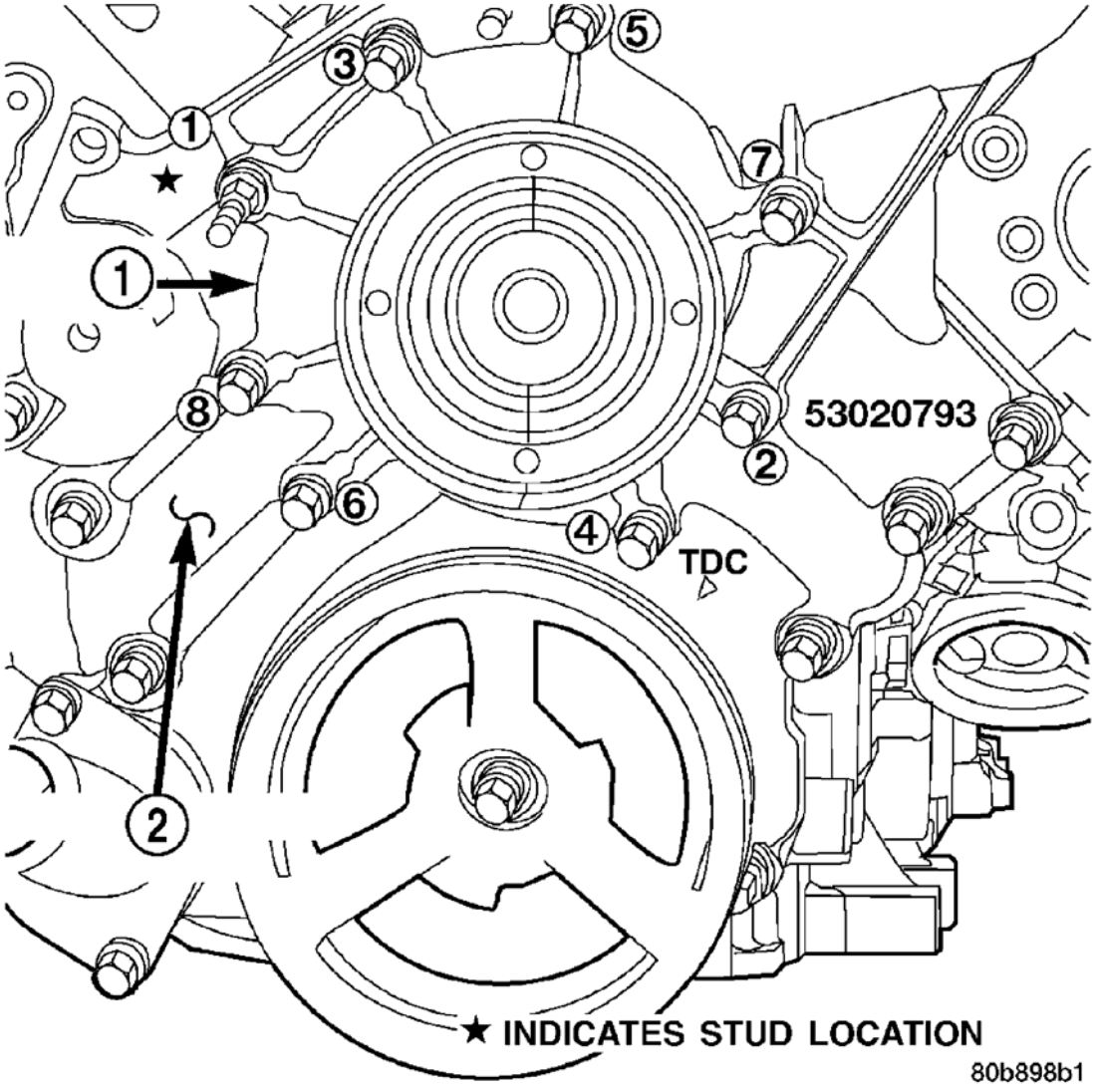


Fig. 99: View Of Water Pump & Bolt Tightening Sequence - 3.7L
Courtesy of CHRYSLER LLC

1 - WATER PUMP
2 - TIMING CHAIN COVER

The water pump (1) on 3.7L engines is bolted directly to the engine timing chain case cover (2).

1. Clean gasket mating surfaces.
2. Using a new gasket, position water pump and install mounting bolts as shown. See **Fig. 99**. Tighten water pump mounting bolts to 54 N.m (40 ft. lbs.) torque.
3. Spin water pump to be sure that pump impeller does not rub against timing chain case/cover.
4. Connect radiator lower hose to water pump.

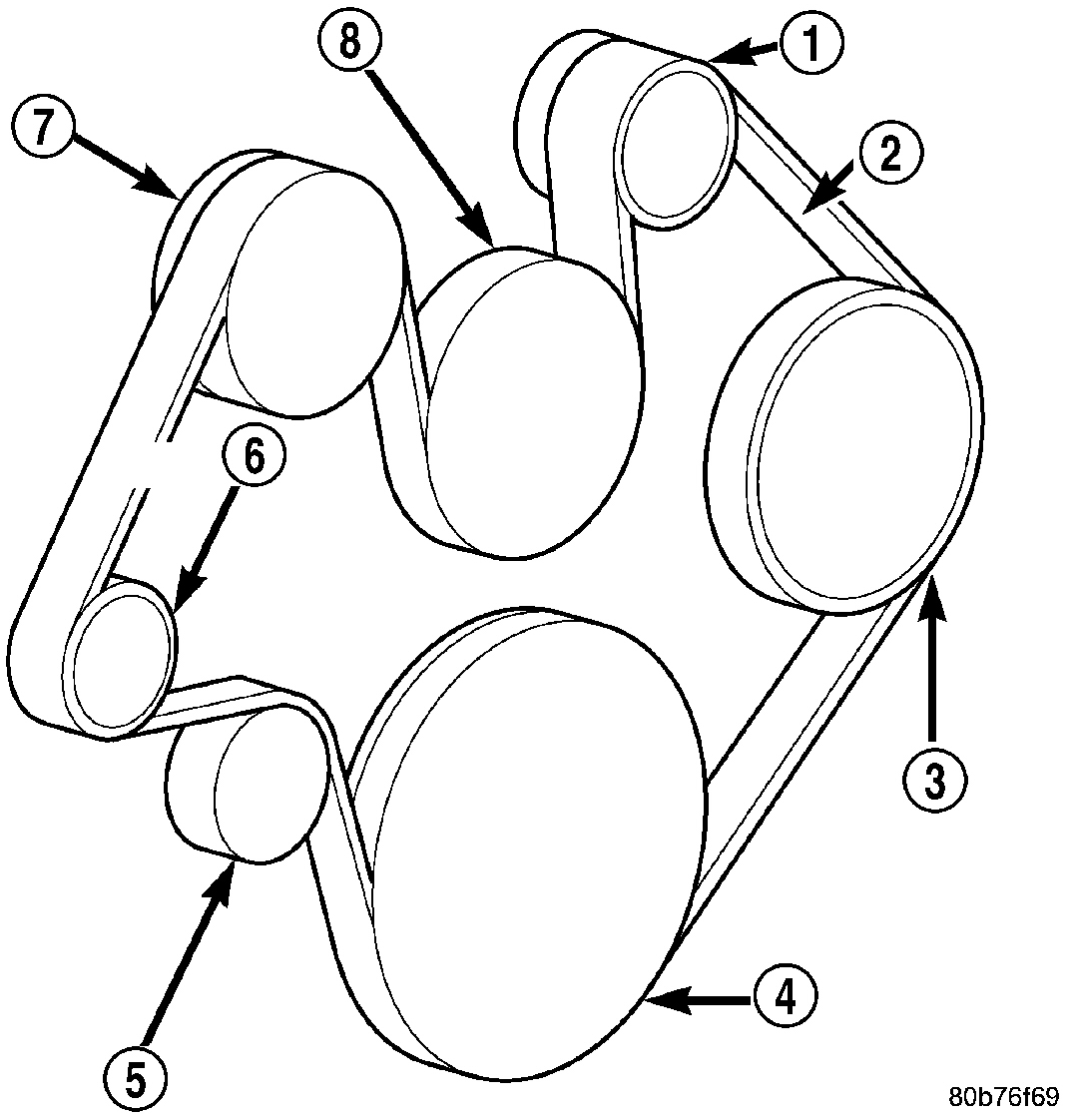


Fig. 100: Identifying Belt Routing - 3.7L
Courtesy of CHRYSLER LLC

1 - GENERATOR PULLEY
2 - ACCESSORY DRIVE BELT
3 - POWER STEERING PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - IDLER PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - WATER PUMP PULLEY

5. Install accessory drive belt (2). See **INSTALLATION**.
6. Position upper fan shroud and fan blade/viscous fan drive assembly.
7. Be sure the upper and lower portions of the fan shroud are firmly connected. All air must flow through the radiator.
8. Install two fan shroud-to-radiator screws.
9. Be sure of at least 25 mm (1.0 inches) between tips of fan blades and fan shroud.
10. Fill cooling system. See **STANDARD PROCEDURE**.
11. Connect negative battery cable.
12. Start and warm the engine. Check for leaks.

TRANSMISSION

STANDARD PROCEDURE

QUICK CONNECT FITTING ASSEMBLY/DISASSEMBLY

DISCONNECT

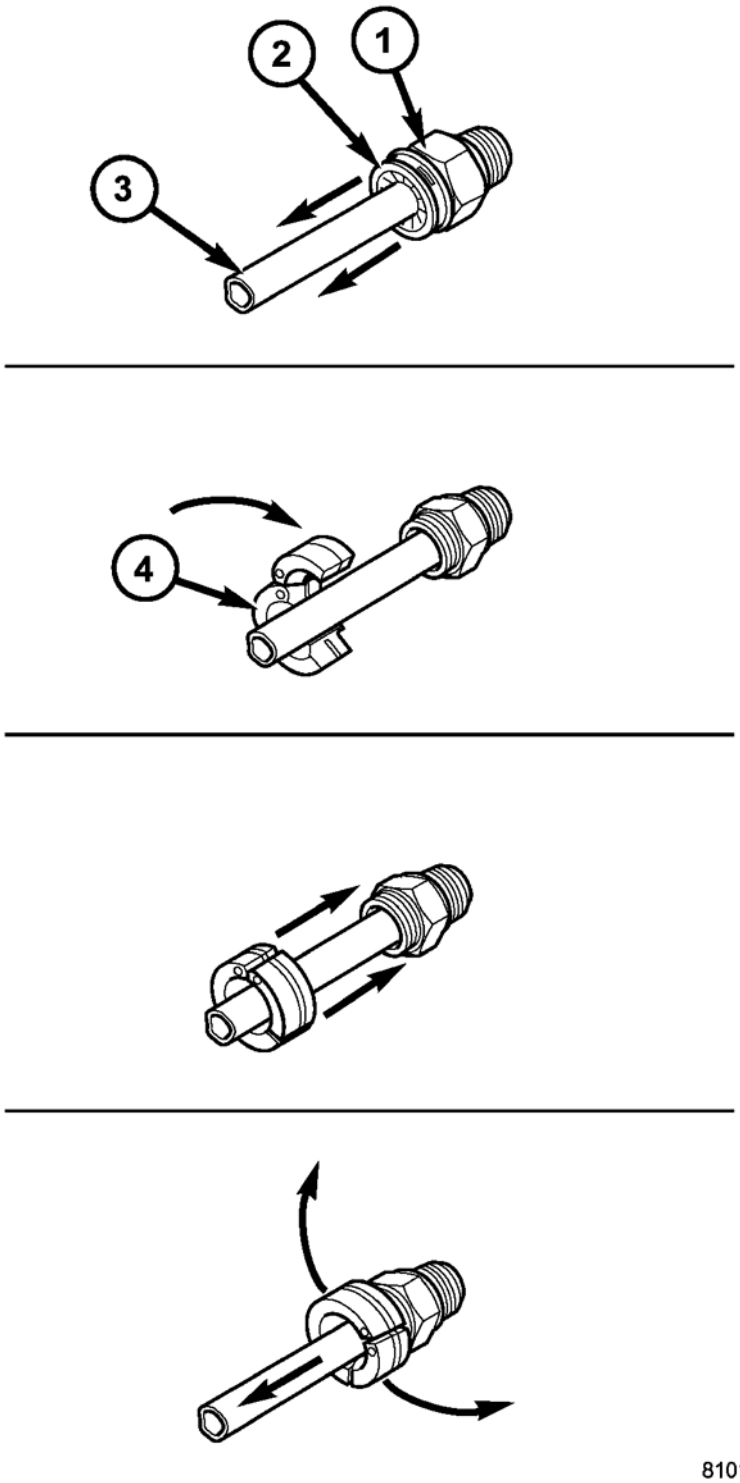


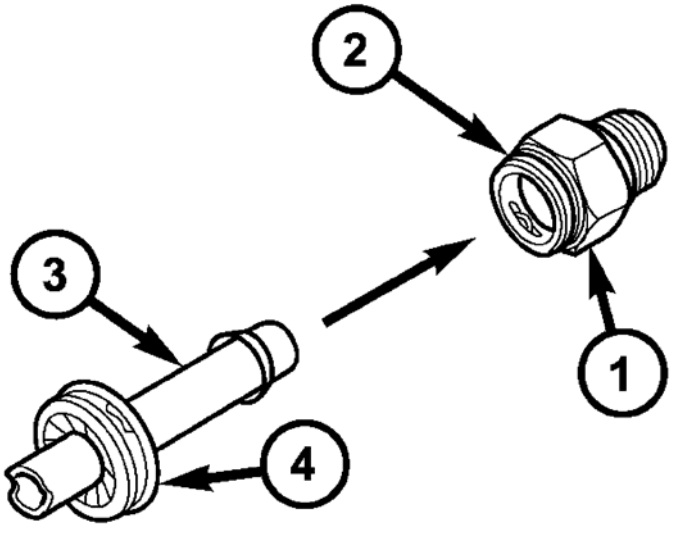
Fig. 101: Oil Cooler Line Quick Connect Fitting - Disassembly
Courtesy of CHRYSLER LLC

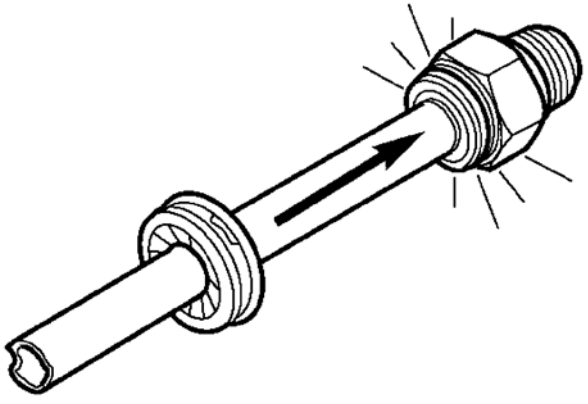
1 - QUICK CONNECT FITTING

2 - DUST CAP
3 - OIL COOLER LINE
4 - SPECIAL TOOL 8875A

1. Remove dust cap by pulling it straight back off of quick connect fitting (1).
2. Place properly sized Release Tool (4) onto transmission cooler line with the fingers of the tool facing the quick connect fitting.
3. Slide Release Tool down the transmission line and engage the fingers of the tool into the retaining clip. When properly engaged in the clip, the tool will fit flush against the quick connect fitting.
4. Rotate the release tool 60° to expand the retaining clip.
5. While holding the release tool against the quick connect fitting, pull back on the transmission cooler line to remove.
6. If quick connect fitting is damaged or leaking at transmission oil cooler or transmission, remove fitting.

CONNECT





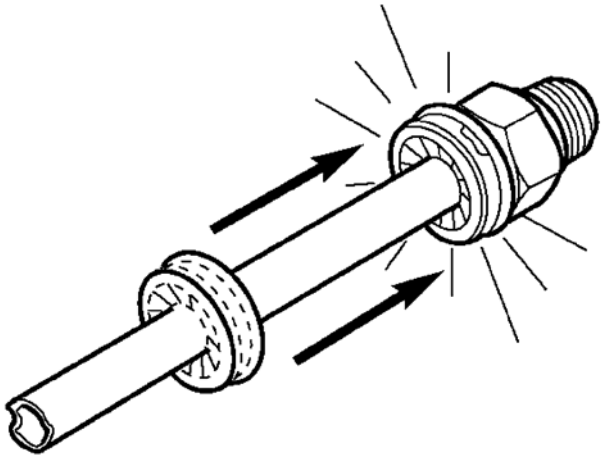


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Fig. 102: Oil Cooler Line Quick Connect Fitting - Assembly
Courtesy of CHRYSLER LLC

1 - QUICK CONNECT FITTING
2 - CLIP
3 - OIL COOLER LINE
4 - DUST CAP

1. If removed, install quick connect fitting into transmission oil cooler or transmission. Tighten fitting to 15 N.m (132 in. lbs.).
2. Align transmission cooler line (3) with quick connect fitting while pushing straight into the fitting.
3. Push in on transmission cooler line until a "click" is heard or felt.
4. Slide dust cap (4) down the transmission cooler line and snap it over the quick connect fitting until it is fully seated and rotates freely. Dust cap will only snap over quick connect fitting when the transmission cooler line is properly installed.

NOTE: If dust cap will not snap into place, repeat assembly step #2.

COOLER-TRANSMISSION

DESCRIPTION

DESCRIPTION

The automatic transmission cooler is located in the front of the condenser and behind the front fascia. The transmission cooler is a heat exchanger that allows heat in the transmission fluid to be transferred to the air passing over the cooler fins.

The transmission oil cooler for the 2.8L Diesel with automatic transmission integrated into the A/C condenser.

The Transmission oil cooler assembly is equipped with quick connect fitting for the transmission oil cooler lines.

REMOVAL

TRANSMISSION OIL COOLER-REMOVAL

1. Remove electric cooling fan. See **REMOVAL**.
2. Position cooling fan out of the way.
3. Remove the transmission cooler line retaining block nut.
4. Remove transmission cooler lines from transmission lines.
5. Using Release Tool 8875A, disconnect transmission cooler tube from the transmission, see **STANDARD PROCEDURE**.
6. Remove the transmission cooler mounting bolts.

7. Remove transmission cooler from vehicle.

INSTALLATION

TRANSMISSION OIL COOLER-INSTALLATION

1. Position transmission cooler in vehicle.
2. Install transmission mounting bolts. Tighten to 14 N.m (123 in. lbs.)
3. Install transmission cooler lines into transmission, see **STANDARD PROCEDURE**.
4. Install locking plate and nut. Tighten nut to 22.5 N.m (200 in. lbs.)
5. Install electric cooling fan. See **INSTALLATION**.

LINES-TRANSMISSION COOLER

STANDARD PROCEDURE

TRANSMISSION COOLER LINES-STANDARD PROCEDURE

DISCONNECT

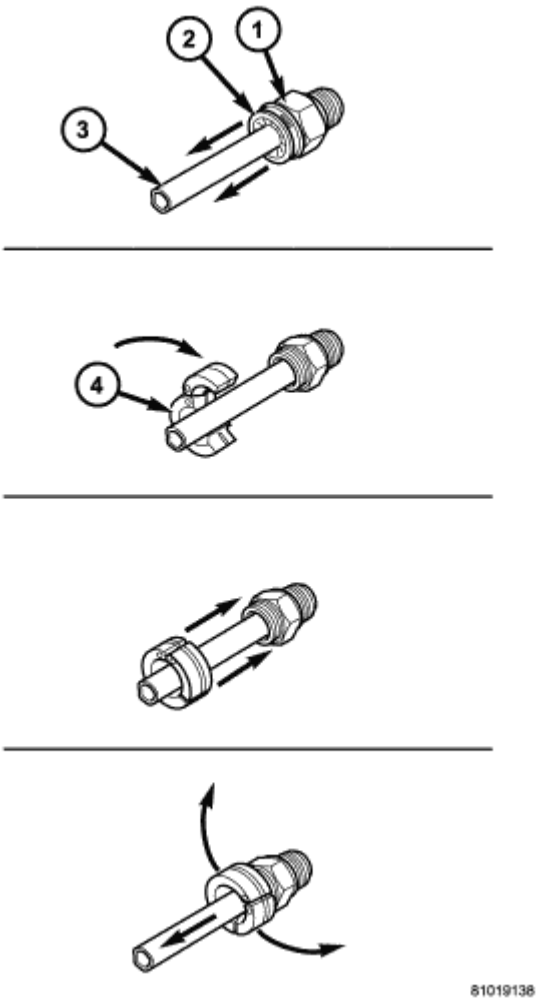

Fig. 103: Oil Cooler Line Quick Connect Fitting - Disassembly
Courtesy of CHRYSLER LLC

1 - QUICK CONNECT FITTING
2 - DUST CAP
3 - OIL COOLER LINE
4 - SPECIAL TOOL 8875A

1. Remove dust cap by pulling it straight back off of quick connect fitting (1).
2. Place Release Tool 8875A (4) onto transmission cooler line with the fingers of the tool facing the quick connect fitting.
3. Slide Release Tool 8875A down the transmission line and engage the fingers of the tool into the retaining clip. When properly engaged in the clip, the tool will fit flush against the quick connect fitting.
4. Rotate the release tool 60° to expand the retaining clip.
5. While holding the release tool against the quick connect fitting, pull back on the transmission cooler line to remove.

6. If quick connect fitting is damaged or leaking at transmission oil cooler or transmission, remove fitting.

CONNECT

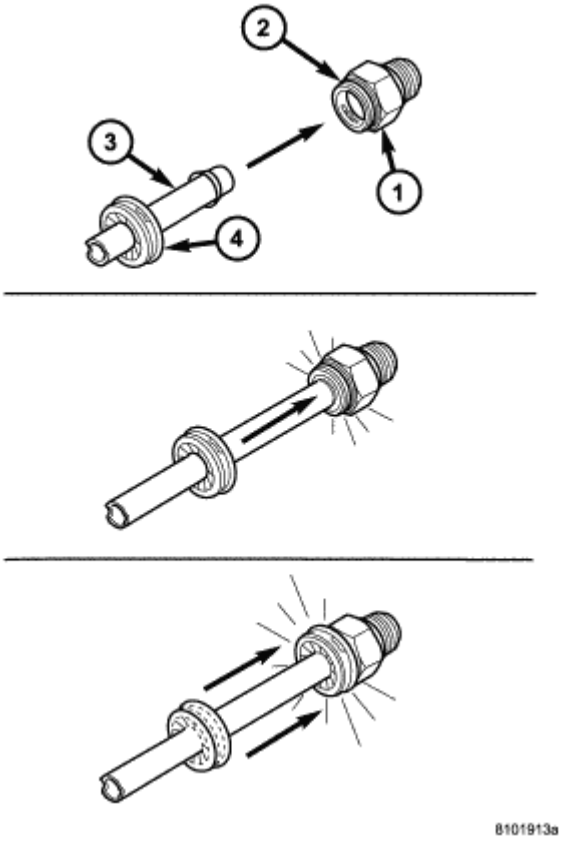

Fig. 104: Oil Cooler Line Quick Connect Fitting - Assembly
Courtesy of CHRYSLER LLC

1 - QUICK CONNECT FITTING
2 - CLIP
3 - OIL COOLER LINE
4 - DUST CAP

1. If removed, install quick connect fitting into transmission oil cooler or transmission. Tighten fitting to 15 N.m (132 in. lbs.).
2. Align transmission cooler line (3) with quick connect fitting while pushing straight into the fitting.
3. Push in on transmission cooler line until a "click" is heard or felt.
4. Slide dust cap (4) down the transmission cooler line and snap it over the quick connect fitting until it is fully seated and rotates freely. Dust cap will only snap over quick connect fitting when the transmission cooler line is properly installed.

NOTE: If dust cap will not snap into place, repeat assembly step #2.