COOLING

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COOLING

DESCRIPTION

2.4L ENGINE

The cooling system consists of the following items:

- Electric cooling fan - Standard.
- Radiator
- Hot bottle pressure cap
- Thermostat
- Coolant reserve/overflow system
- Radiator in-tank transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

3.7L ENGINE

The cooling system consists of the following items:

- 2 Speed electric cooling fan - Standard.
- 2 Speed electric cooling fan and mechanical engine fan with viscous clutch - Heavy duty cooling only
- Radiator
- Thermostat
- Combined coolant pressure bottle/overflow system with pressure cap
- Combination A/C/transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

2.8L DIESEL ENGINE

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
- 2 Speed Electric Cooling Fan with an engine driven fan with viscous clutch
- A aluminum-core radiator with plastic side tanks
- A separate pressurized coolant tank
- Combined coolant pressure bottle with pressure cap.

COOLING (Continued)

- Fan shroud
- Thermostat
- Coolant
- Low coolant warning lamp
- Coolant temperature gauge
- Water pump
- Hoses and hose clamps

COOLING SYSTEM ROUTING - 3.7L ENGINE

For cooling system routing refer to (Fig. 1).

HOSE CLAMPS

The cooling system utilizes spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL NUMBER 6094. (Fig. 2). ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only a original equipment clamp with matching number or letter (Fig. 2).

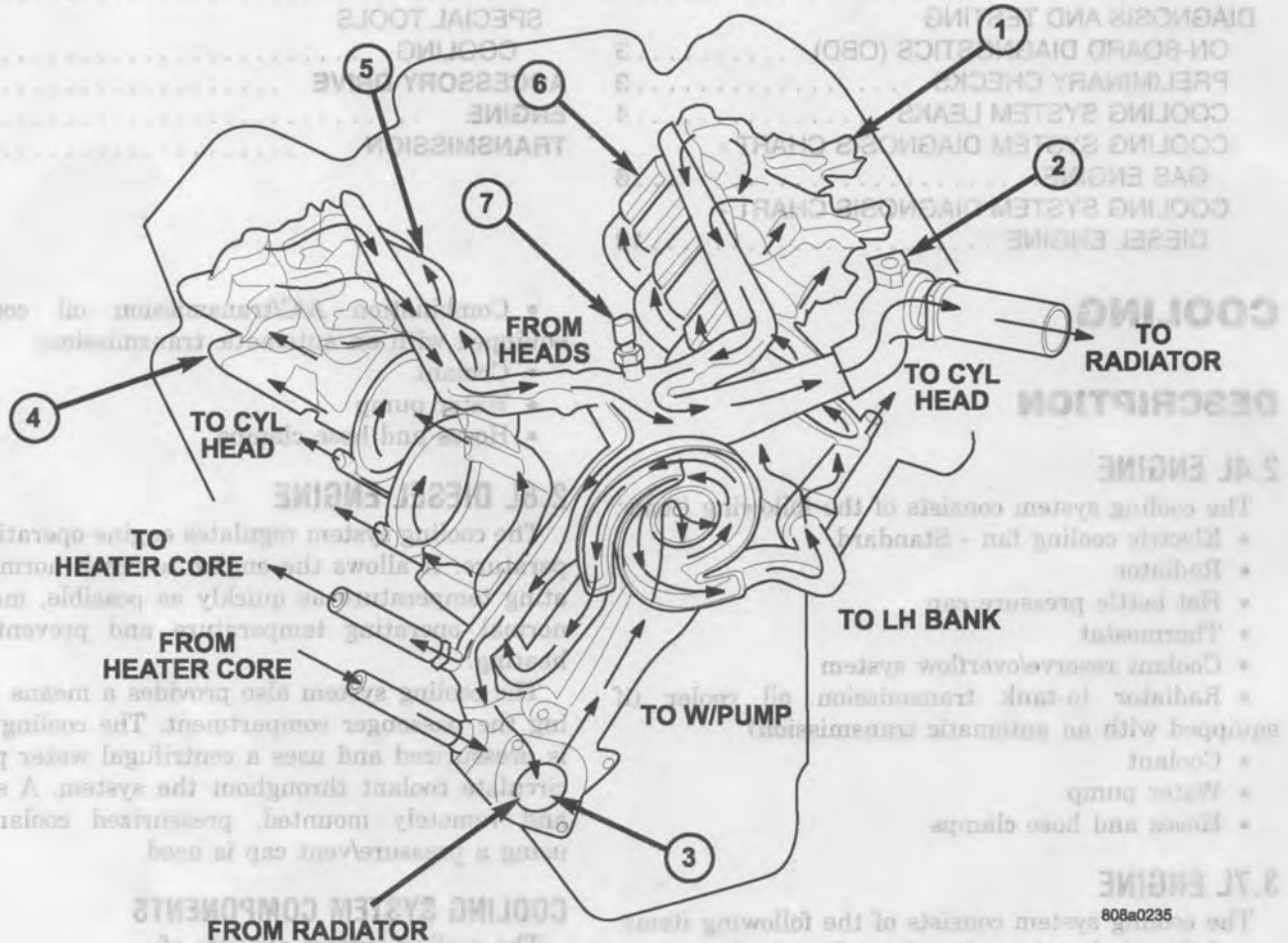


Fig. 1 Engine Cooling System 3.7L Engine

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

COOLING (Continued)

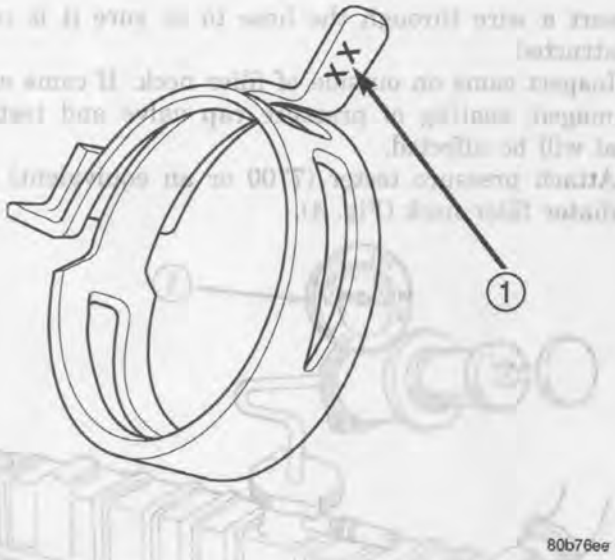


Fig. 2 Spring Clamp Size Location

1 - SPRING CLAMP SIZE LOCATION

OPERATION

COOLING SYSTEM

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.

HOSE CLAMPS

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, only use constant tension clamp pliers designed to compress the hose clamp.

DIAGNOSIS AND TESTING

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 indicated 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 25 - EMISSIONS CONTROL - DESCRIPTION).

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ERASING TROUBLE CODES

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

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
- STEEP GRADES

Driving techniques that avoid overheating are:

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

(1) TRAILER TOWING:

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

(2) RECENT SERVICE OR ACCIDENT REPAIR:

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

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump, or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

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

These charts are to be used as a quick-reference only. Refer to the group text for information.

COOLING (Continued)

COOLING SYSTEM LEAKS

ULTRAVIOLET LIGHT METHOD

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 can be used in conjunction with a pressure tester to determine if any external leaks exist (Fig. 3).

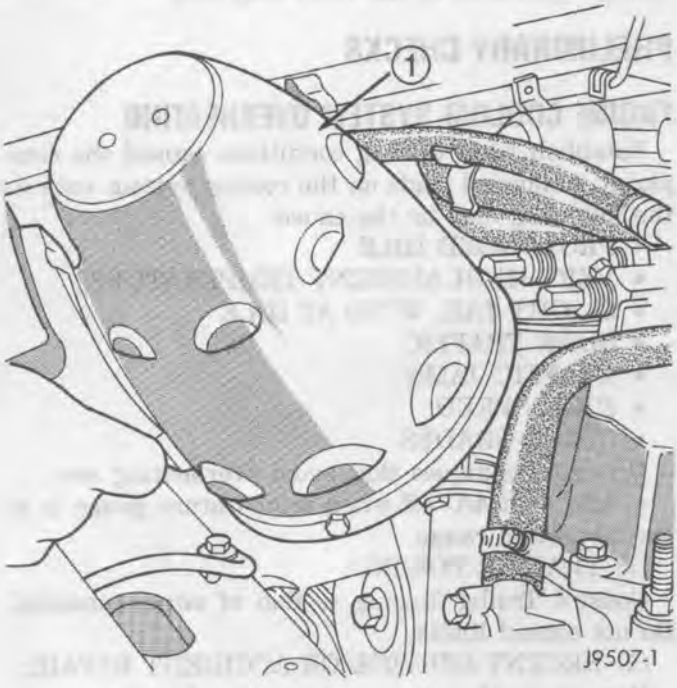


Fig. 3 Leak Detection Using Black Light - Typical

1 - TYPICAL BLACK LIGHT TOOL

PRESSURE TESTER METHOD

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-resevoir/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 (Fig. 4).

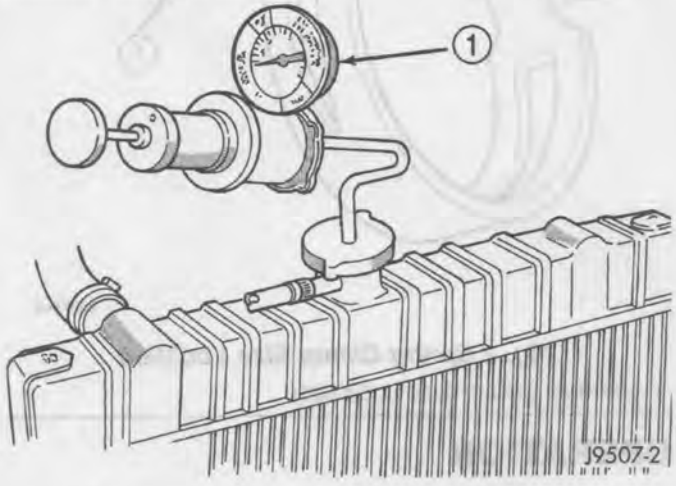


Fig. 4 Pressure Testing Cooling System - Typical

1 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate tester pump 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

COOLING (Continued)

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. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - 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.

COOLING (Continued)

COOLING SYSTEM DIAGNOSIS CHART - GAS ENGINE

COOLING SYSTEM DIAGNOSIS CHART

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 (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for On-Board Diagnostics and DTC information. Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMP SENSOR - 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 accompanied with poor heater performance.	4. Check coolant level in the coolant pressure botttle and the 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 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING)
	6. Electric fan functioning when not required.	6. Inspect electric fan for proper operation. Refer to Electric Cooling Fan in this section. Refer to group 8W for electric cooling fan and relay circuit schematic data.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
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 Group 8J - INSTRUMENT CLUSTER). Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. Check warning lamp operation. (Refer to Group 8J - INSTRUMENT CLUSTER).Repair as necessary.
	4. Coolant low in coolant pressure bottle and radiator?	4. Check for coolant leaks and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	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. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - 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. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). (b) Check condition of radiator vent nipple. If neck is damaged, replace radiator. (c) 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. (d) Check pressure bottle/overflow tank and tanks hoses for blockage. Repair as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	8. Incorrect coolant concentration	8. Check coolant. (Refer to 7 - COOLING/ENGINE/COOLANT - DESCRIPTION) for correct coolant/ water mixture ratio.
	9. Fan installed backwards on viscous drive.	9. Mount fan on drive correctly.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Remove insects and debris. (Refer to 7 - COOLING/ENGINE/ RADIATOR - CLEANING).
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	12. Fuel or ignition system problems.	12. Refer to FUEL and /or IGNITION CONTROL for diagnosis.
	13. Dragging brakes.	13. Check and correct as necessary. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) for correct procedures.
	14. Bug screen or cardboard is being used, reducing airflow.	14. Remove bug screen or cardboard.
	15. Thermostat partially or completely shut.	15. Check thermostat operation and replaces necessary. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - DIAGNOSIS AND TESTING).
	16. Viscous fan drive not operating properly.	16. Check fan drive operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - DIAGNOSIS AND TESTING).
	17. Cylinder head gasket leaking.	17. Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). For repair, (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
	18. Heater core leaking.	18. Check heater core for leaks. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ HEATER CORE - REMOVAL). Repair as necessary.
	19. Electric fan not functioning.	19. Inspect electric fan for proper operation. Refer to Electric Cooling Fan in this section. Refer to Group 8W for electric cooling fan and relay circuit schematic data.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
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 shorted. Also, corroded or loose wiring in this circuit.	2. Check operation of gauge and repair if necessary. Refer to Group 8J, Instrument cluster.
	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 restarting 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 will build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks. (Refer to 7 - COOLING - 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 7 - COOLING - 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. (Refer to 7 - COOLING/ENGINE/WATER PUMP - DIAGNOSIS AND TESTING).
	8. Loose accessory drive belt. (water pump slipping)	8. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - 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 AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/OVERFLOW TANK	1. Pressure relief valve in pressure bottle cap is defective.	1. Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
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. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating. 2. Freeze point of coolant not correct. Mixture is too rich or too lean.	1. Check reason for overheating and repair as necessary. 2. Check coolant concentration. (Refer to 7 - COOLING/ENGINE/ COOLANT - 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. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - 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.
NOISY VISCOUS FAN/DRIVE	1. Fan blades loose. 2. Fan blades striking a surrounding object. 3. Air obstructions at radiator or air conditioning condenser. 4. Thermal viscous fan drive has defective bearing.	1. Replace fan blade assembly. (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - REMOVAL) 2. Locate point of fan blade contact and repair as necessary. 3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser. 4. Replace fan drive. Bearing is not serviceable. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	1. Has a Diagnostic trouble Code (DTC) been set?	1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for correct procedures and replace thermostat if necessary
	2. Coolant level low	2. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	3. Obstructions in heater hose/fittings	3. Remove heater hoses at both ends and check for obstructions
	4. Heater hose kinked	4. Locate kinked area and repair as necessary
	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.	5. (Refer to 7 - COOLING/ENGINE/WATER PUMP - DIAGNOSIS AND TESTING). If a slipping belt is detected, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL). If heater core obstruction is detected, (Refer to 7 - COOLING - STANDARD PROCEDURE) for cooling system reverse flushing.
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL 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 condensor will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator or condensor, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
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. (Refer to 7 - COOLING/ENGINE/COOLANT - 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.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
FAN RUNS ALL THE TIME	1. Fan control sensors inoperative.	1. Check for DTC's. Verify sensor readings.
	2. Fan control solenoid stuck on".	2. Check fan operation speeds. Refer to fan speed operation table.
	3. Fan control solenoid harness damaged.	3. Check for DTC 1499. Repair as required.
	4. Transmission temperature too high.	4. Check for transmission over temp. DTC.
	5. Engine coolant temperature too high.	5. (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.

COOLING SYSTEM DIAGNOSIS CHART - DIESEL ENGINE

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

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

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

(2) TRAILER TOWING:

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

(3) RECENT SERVICE OR ACCIDENT REPAIR:

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

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

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

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

COOLING (Continued)

COOLING SYSTEM DIAGNOSIS-DIESEL ENGINE

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Diesel engines, due to their inherent efficiency are slower to warm up than gasoline powered engines, and will operate at lower temperatures when the vehicle is unloaded.	1. The low gauge reading may be normal. Refer to thermostats in the manual text for information. See Thermostat Diagnosis-Diesel Engine.
	2. Is the temperature gauge connected to the temperature gauge coolant sensor on the engine?	2. Check, the engine temperature sensor connector in the engine compartment.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant tank. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section for WARNINGS and precautions before removing the pressure cap.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. Refer to Heating and Air Conditioning for procedures.
TEMPERATURE GAUGE READS HIGH. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM 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) temperature 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 normal range, determine the cause for the overheating and repair.
	2. Temperature gauge reading incorrectly.	2. Check gauge. Refer to I/P group.
	3. Coolant low in coolant tank and radiator.	3. Check for coolant leaks and repair as necessary.
	4. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered.	4. Tighten cap.
	5. Poor seals at pressure/vent cap.	5. (a) Check condition of cap and cap seals. (b) Check condition of coolant tank filler neck. Make sure it does not leak pressure.
	6. Freeze point of antifreeze not correct. Mixture may be too rich.	6. Check antifreeze. Adjust antifreeze-to-water ratio as needed.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	7. Coolant not flowing through system.	7. Check for coolant flow in coolant tank with engine warm and thermostat open. Coolant should be observed flowing through the tank. If flow is not observed, determine reason for lack of flow and repair as necessary.
	8. Radiator or A/C condenser fins are dirty or clogged.	8. Clean debris from radiator or A/C condenser
	9. Radiator core is corroded or plugged.	9. Have radiator re-cored or replaced.
	10. Aftermarket A/C installed without proper A/C condenser.	10. Install proper A/C condenser.
	11. Dragging Brakes.	11. Check and correct as necessary.
	12. Non-factory bug screen is being used reducing air flow.	12. Only a factory screen should be used.
	13. Thermostat partially or completely shut. This is more prevalent on high mileage vehicles.	13. Check thermostat and replace if necessary.
	14. Cylinder head gasket leaking.	14. Check cylinder head gasket for leaks.
	15. Heater core leaking.	15. Check heater core for leaks. Repair as necessary.
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. Fluctuation is also influenced by loads, outside temperature and extended idle time with diesel engines.	1. A normal condition. No correction is necessary.
	2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	2. Check operation of gauge and repair as necessary.
	3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running).	3. A normal condition. No correction needed. Gauge should return to normal range after vehicle is driven.
	4. Gauge reading high after starting a warm-up (hot) engine.	4. A normal condition. No correction needed. Gauge should return to normal after a few minutes of engine operation.
	5. Coolant level low in the coolant tank (air will build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	6. Cylinder head gasket leaking allowing exhaust gases to enter the cooling system causing the thermostat to open late.	6. (a) Check for cylinder head gasket leaks with a commercially available leak tester. (b) Check for coolant in engine oil. Inspect for white steam emitting from 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 (water pump slipping).	8. Check and correct as necessary.
	9. Air leak on the suction side of the water pump allowing air to build up in the cooling system causing the thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT TANK	1. Pressure relief valve in pressure/vent cap is defective.	1. Check condition of pressure/vent cap and cap seals.
	2. Head gasket leak or cracked cylinder head.	2. Repair as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOW-OFF. GAUGE IS READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump, or engine.	1. Pressure test cooling system and repair as necessary.
HOSE OR HOSES COLLAPSE WHEN ENGINE IS COOLING	1. Vacuum created in cooling system on engine cool-down is not being relieved through pressure/vent cap.	1. Cap relief valve stuck. Replace if necessary.
NOISY FAN	1. Cooling fan blades loose.	1. Replace cooling fan assembly.
	2. Cooling fan blades striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or A/C condenser.	3. Remove obstructions or clean debris from radiator or A/C condenser.
INADEQUATE AIR CONDITIONER PERFORMANCE (COOLING SYSTEM SUSPECTED)	1. Radiator and/or A/C condenser is restricted, obstructed or dirty (insects, leaves, etc.)	1. Remove restriction or clean debris from radiator or A/C condenser.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	2. Engine is overheating (heat may be transferred from radiator to A/C condenser. High Under hood temperatures due to engine overheating may also transfer heat to A/C condenser).	2. Correct overheating condition.
	3. The cooling system is equipped with air seals at the radiator and/or A/C condenser. If these seals are missing or damaged, not enough air flow will be pulled through the radiator and A/C condenser.	3. Check for missing or damaged air seals. Repair as necessary.
	4. Is the Cooling fan operating correctly?	4. Refer to Cooling Fan in this group for diagnosis. Repair as necessary.
INADEQUATE HEATER PERFORMANCE. MAY BE ACCOMPANIED BY LOW GAUGE READING	1. Diesel engines, due to their inherent efficiency are slower to warm up than gasoline powered engines, and will operate at lower temperatures when the vehicle is unloaded.	1. The lower gauge reading may be normal.
	2. Coolant level low.	2. Pressure test cooling system. Repair leaks as necessary.
	3. Obstruction in heater hose fitting at engine.	3. Remove heater hoses and check for obstructions. Repair as necessary.
	4. Heater hose kinked.	4. Locate kinked area. Repair as necessary.
	5. Water pump is not pumping water to heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot the water pump may not be operating correctly. The accessory drive belt may also be slipping causing poor water pump operation.	5. Refer to water pumps in this group. Repair as necessary. If a slipping belt is detected, refer to Engine Accessory Drive Belts in this group. Repair as necessary.
HEAT ODOR	1. Various heat shields are used at certain drive line components. One or more of these shields may be missing.	1. Locate missing shields. Repair or replace as necessary.
	2. Is temperature gauge reading above the normal range?	2. Refer to the previous Temperature Gauge Reads High in these Diagnostic Charts. Repair as necessary.
	3. Has undercoating been applied to any unnecessary components?	3. Clean undercoating as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
STEAM IS COMING FROM FRONT OF VEHICLE NEAR GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice, or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or air flow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT ODOR	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. Refer to Coolant in this group for antifreeze tests. Adjust antifreeze-to-water ratio as necessary.
COOLANT LEVEL CHANGES IN COOLANT 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 HOT and COLD marks at normal engine operating temperature, the level should return to within that range after operation at elevated temperatures.	1. This a normal condition. No repair necessary.

COOLING SYSTEM FLOW CHECK - DIESEL ENGINE

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.

COOLING SYSTEM 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.

STANDARD PROCEDURE

DRAINING COOLING SYSTEM

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS (Fig. 5) 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.

COOLING (Continued)

(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.

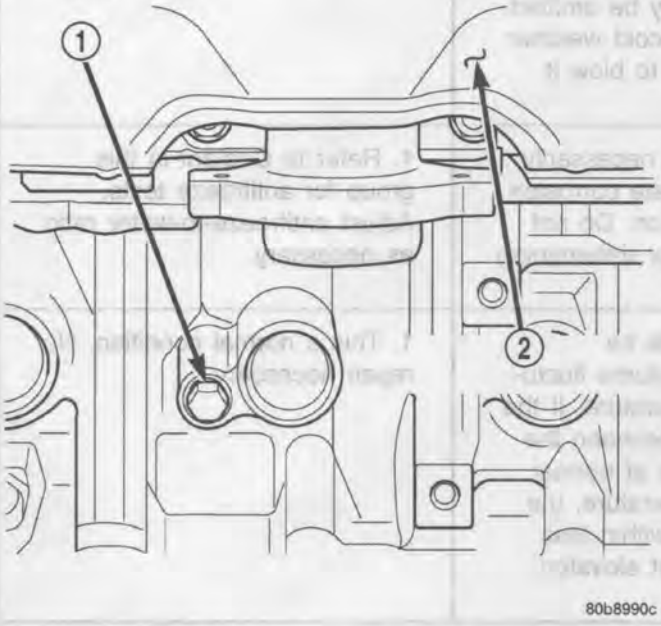


Fig. 5 Drain Plug - 3.7L Engine

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

REFILLING COOLING SYSTEM

(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 LUBRICATION & MAINTENANCE/FLUID TYPES - 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.

COOLING SYSTEM - 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

COOLING (Continued)

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 (Refer to 7 - COOLING - 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 (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Install the thermostat and housing with a replacement gasket (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION). Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture (Refer to 7 - COOLING - STANDARD PROCEDURE).

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

SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
2.4L	9.7 L	9.2 qts.
3.7L	12.8 L	11.8 qts.
2.8L DIESEL	12.5 L	11.8 qts

TORQUE

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			
2.4L	41	30	-
3.7L	41	30	-
Automatic Belt Tensioner Pulley Bolt			
2.4L	61	45	-
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			
2.4L	2	-	17
3.7L	2	-	17
Transmission Oil/Condenser to Radiator Bolts	11.9	-	105
Coolant Overflow Bottle to Plenum mounting bolts - 2.4L only	8.5	-	75
Coolant Pressure Bottle to Plenum mounting bolts -3.7L only	8.5	-	75

* 110 ft. lbs. seems high

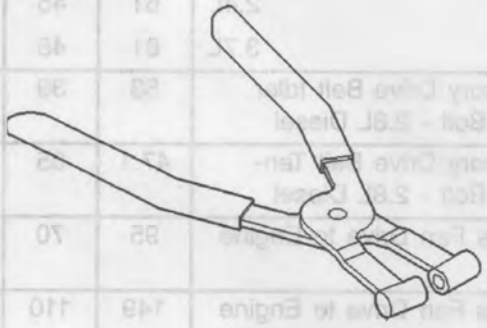
NOTE - fill volume for 2.8L diesel is more likely 13.2qts which is the correct conversion of 12.5L

COOLING (Continued)

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
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	-
2.4L	28	-	250
3.7L	13	-	115
Water Pump Bolts			
2.4L	12	-	105
3.7L	54	40	-
Water Pump Housing Nuts - 2.8L Diesel	24.4	18	-

SPECIAL TOOLS

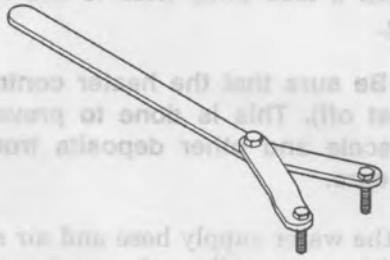
COOLING



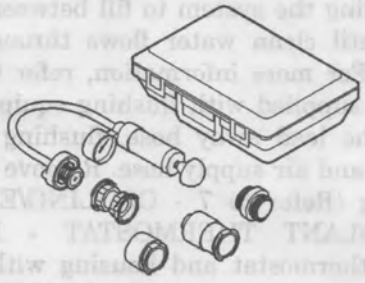
Pliers 6094

RELEASE TOOL 8875A

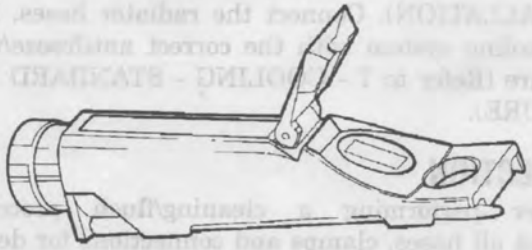
Adapter Pins 8346



Spanner Wrench 6958 with 8346 adapter pins



Pressure Tester 7700–A



Coolant Refractometer 8286

ACCESSORY DRIVE

TABLE OF CONTENTS

ACCESSORY DRIVE

DIAGNOSIS AND TESTING - SERPENTINE DRIVE BELT DIAGNOSIS

When diagnosing serpentine drive belts, small cracks that run across ribbed surface of belt from rib to rib (Fig. 1), 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 (Fig. 1). Also replace belt if it has excessive wear, frayed cords or severe glazing.

Refer to SERPENTINE DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

Noise diagnosis - noise is most noticeable at idle. Before replacing a belt check all the drive pulleys for alignment, glazing, or excessive end (e.g. bearing) play.

On 2.8L diesel check alternator decoupler pulley function.

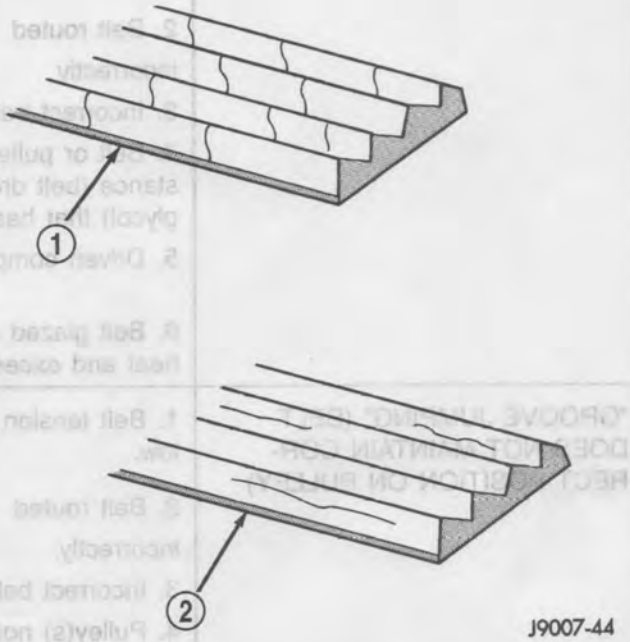


Fig. 1 Serpentine Accessory Drive Belt Wear Patterns

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

ACCESSORY DRIVE (Continued)

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

ACCESSORY DRIVE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension.	1. Replace belt and automatic belt tensioner.
	2. Incorrect belt.	2. Replace belt.
	3. Tensile member damaged during belt installation.	3. Replace belt.
	4. Severe misalignment.	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.	1. Replace belt or automatic belt tensioner.
	2. Bearing noise.	2. Locate and repair.
	3. Belt misalignment.	3. Replace belt.
	4. Belt-to-pulley mismatch.	4. Install correct belt.

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

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

2.4L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove tensioner assembly from engine accessory drive bracket (Fig. 2).

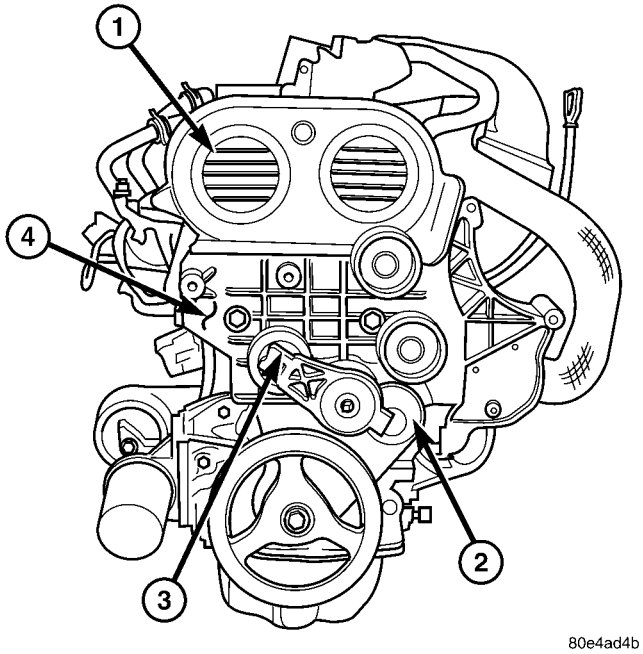


Fig. 2 Accessory Drive Bracket

1- UPPER TIMING BELT COVER
2- LOWER TIMING BELT COVER
3- BELT TENSIONER
4- ACCESSORY DRIVE BRACKET

BELT TENSIONERS (Continued)

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.

3.7L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

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

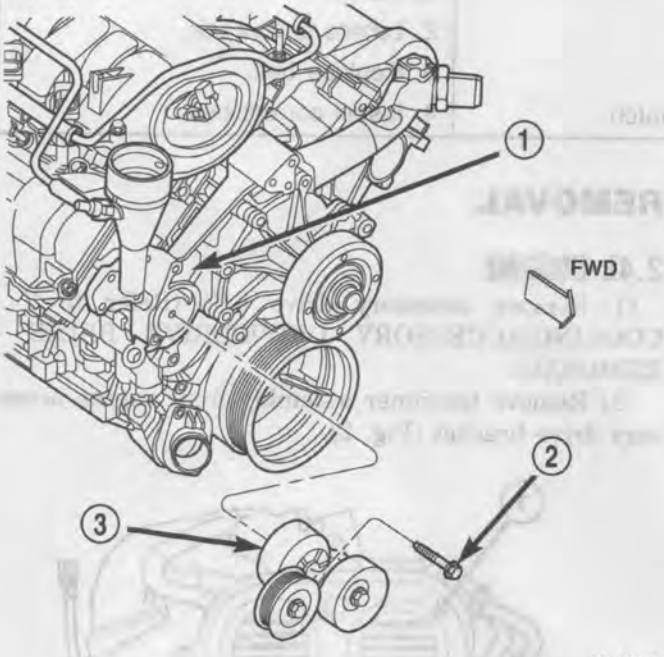


Fig. 3 Automatic Belt Tensioner

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

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.

2.8L DIESEL

(1) Disconnect negative battery cable.

(2) Remove accessory drive belt (Fig. 4) (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove belt tensioner retaining bolt and remove tensioner from bracket (Fig. 5).

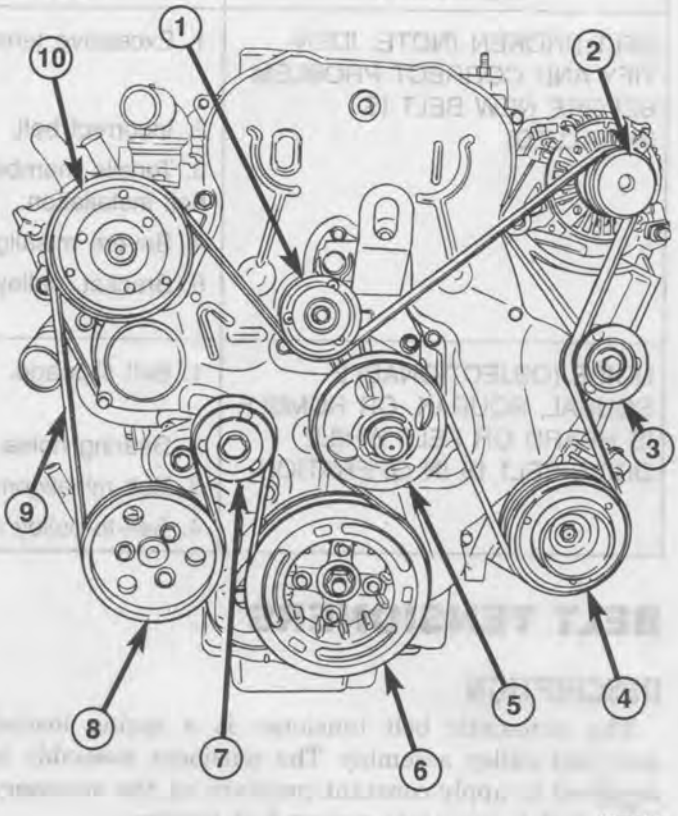


Fig. 4 ACCESSORY BELT ROUTING

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

INSTALLATION

2.4L ENGINE

(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 nut on the front cover. Install the mounting nut on the stud. Tighten stud to 41 N·m (30 ft. lbs.).

(3) Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

BELT TENSIONERS (Continued)

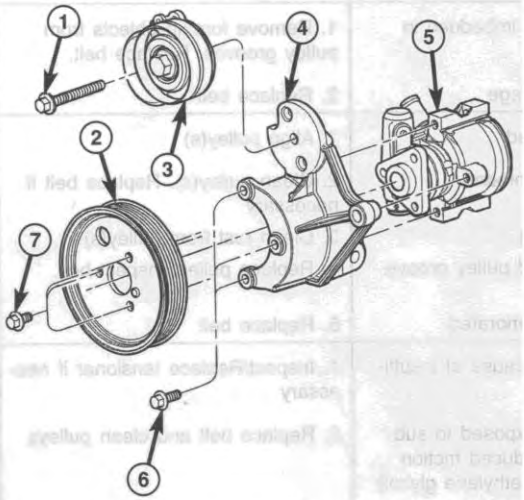


Fig. 5 BELT TENSIONER ASSEMBLY

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

3.7L ENGINE

(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 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

2.8L DIESEL

(1) Install belt tensioner on bracket (Fig. 5). Torque retaining bolt to 47.1N·m.

(2) Install accessory drive belt (Fig. 4) (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(3) Connect negative battery cable.

REDUNDANT BELT DIAGNOSIS TEXT AND TABLE REMOVED

DRIVE BELTS

REMOVAL

2.4L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position.

DRIVE BELTS (Continued)

3.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position. (Fig. 7).

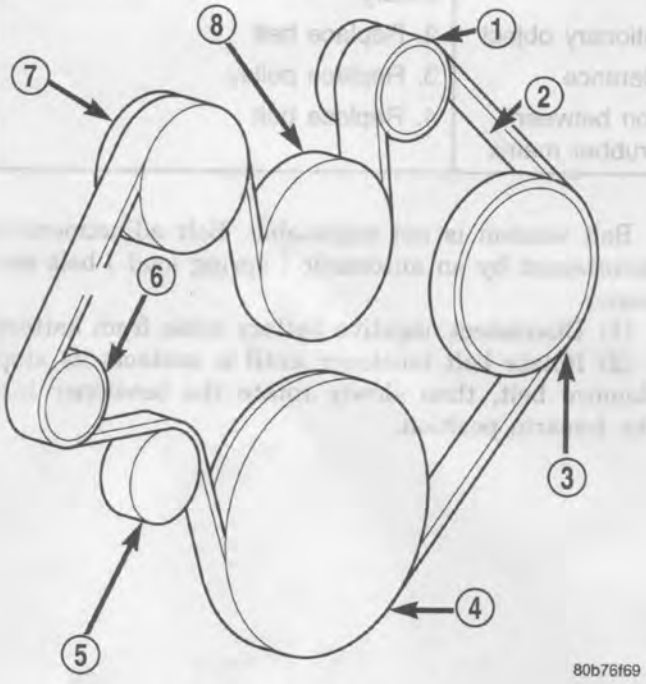


Fig. 7 Belt Routing - 3.7L

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

2.8L DIESEL

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring loaded) belt tensioner.

(1) Disconnect negative battery cable.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position.

INSTALLATION

2.4L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

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

DRIVE BELTS (Continued)

(2) Install new belt (Fig. 8) or (Fig. 9). Route the belt around all pulleys except the idler pulley. 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.

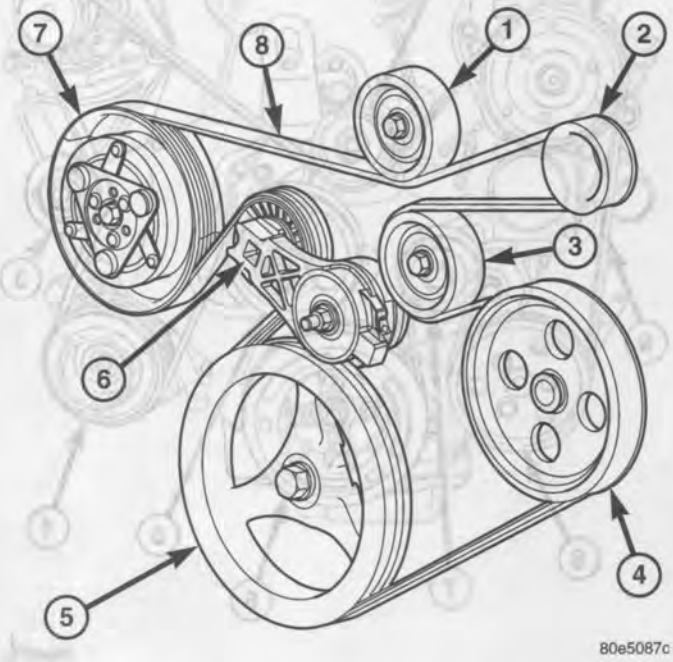


Fig. 8 Belt Routing 2.4L With A/C

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

(3) With the drive belt installed, inspect the belt wear indicator. On 2.4L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches).

3.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

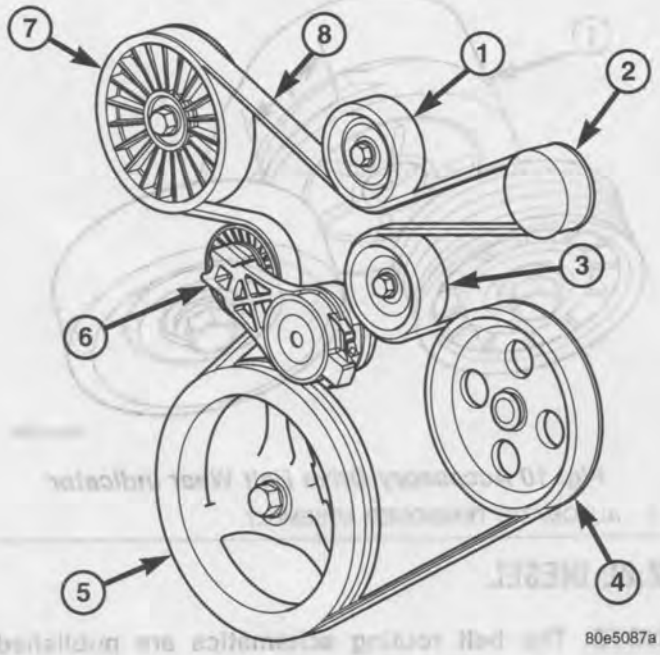


Fig. 9 Belt Routing 2.4L Without A/C

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

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction (Fig. 7).

(2) Install new belt (Fig. 7). Route the belt around all pulleys except the idler pulley. 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.

(3) With the drive belt installed, inspect the belt wear indicator (Fig. 10). On 3.7L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches).

DRIVE BELTS (Continued)

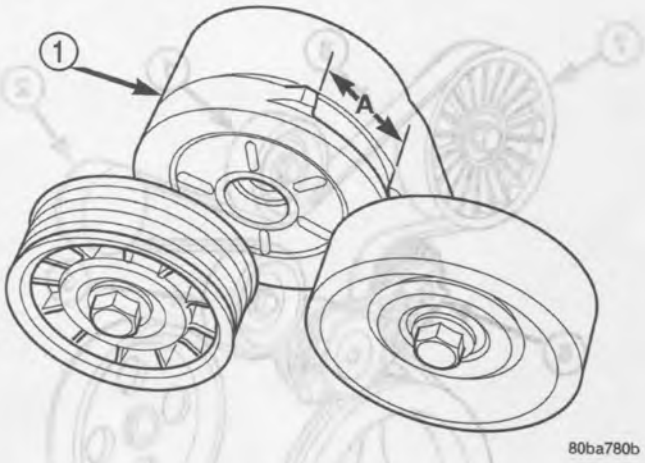


Fig. 10 Accessory Drive Belt Wear Indicator

1 - AUTOMATIC TENSIONER ASSEMBLY

2.8L DIESEL

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

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

(2) Install new belt. Route the belt around all pulleys except the idler pulley (Fig. 11). 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. 11).

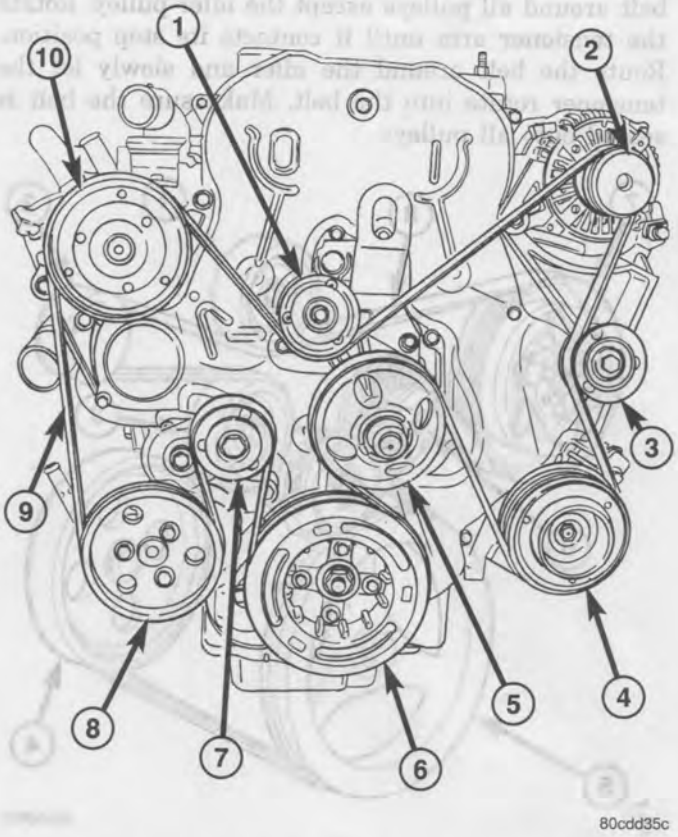


Fig. 11 ACCESSORY BELT ROUTING

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

IDLER PULLEY

REMOVAL

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

(1) Disconnect negative battery cable.
(2) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(3) Remove idler pulley retaining bolts and pulleys (Fig. 12) (Fig. 13).

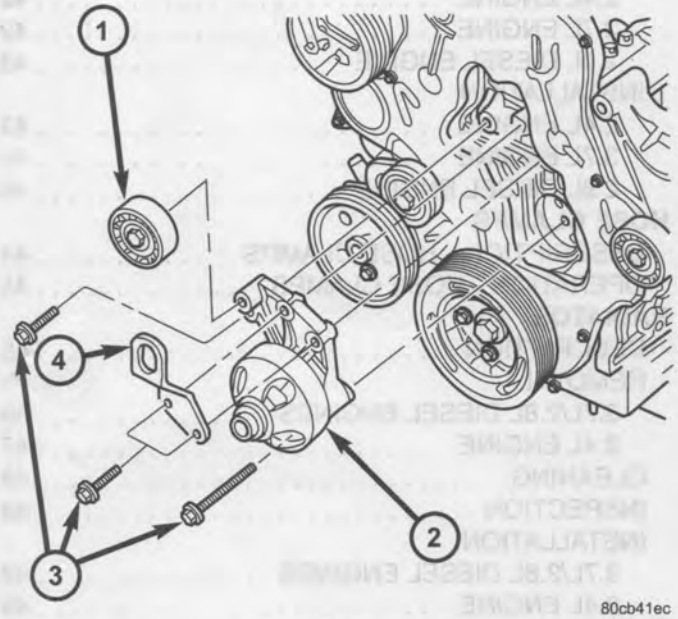


Fig. 12 COOLING FAN SUPPORT

1 - IDLER PULLEY
2 - COOLING FAN SUPPORT
3 - RETAINING BOLTS
4 - ENGINE LIFT HOOK

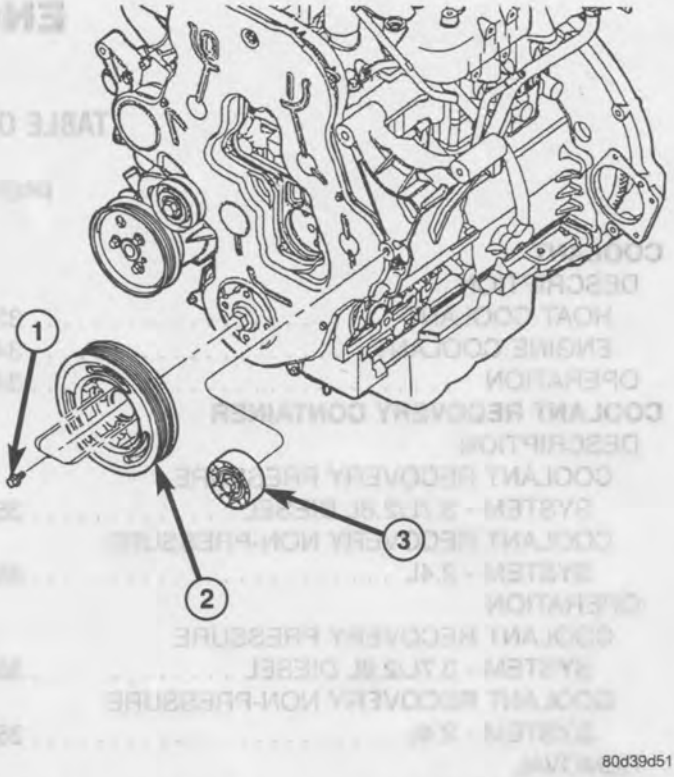


Fig. 13 VIBRATION DAMPER AND IDLER PULLEY

1 - VIBRATION DAMPER/CRANKSHAFT PULLEY RETAINING BOLTS
2 - VIBRATION DAMPER/CRANKSHAFT PULLEY
3 - IDLER PULLEY

INSTALLATION

2.8L DIESEL

(1) Install idler pulleys and retaining bolts (Fig. 12) (Fig. 13). Torque bolts to 53N·m.
(2) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(3) Connect negative battery cable.

ENGINE

TABLE OF CONTENTS

COOLANT

DESCRIPTION

HOAT COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE-GLYCOL BASE 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 BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR 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 corrosion 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 base coolant with 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.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

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

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

100 percent Ethylene-Glycol - The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives

COOLANT (Continued)

form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

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

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

COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain 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.

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

ENGINE COOLANT

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.

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 propylene-glycol coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.

COOLANT RECOVERY CONTAINER

DESCRIPTION

COOLANT RECOVERY PRESSURE SYSTEM - 3.7L/2.8L DIESEL

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 then 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.

COOLANT RECOVERY NON-PRESSURE SYSTEM - 2.4L

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. It is the highest point in the 2.4L.
- 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

COOLANT RECOVERY PRESSURE SYSTEM - 3.7L/2.8L DIESEL

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.

COOLANT RECOVERY NON-PRESSURE SYSTEM - 2.4L

As the engine warms, the coolant in the closed system expands and builds up pressure against the radiator pressure cap. When pressure, on occasion, exceeds the rated pressure of the cap, the coolant forces the lower seal open and allows the expanded coolant volume to flow into the hose leading to the external coolant bottle. The bottle accepts the expanding fluid. This allows the main circuit to remain full of coolant with no air. Then, when the engine is in an environment where it is transferring less heat, or it is shut off and starts to cool down, the coolant also begins to contract. As it contracts, it begins to create a vacuum in the enclosed space of the radiator cap and filler neck that starts to draw coolant back into the radiator from the external coolant bottle. The coolant flows into the radiator through a bleed hole in the lower area of the radiator pressure cap. This method of operation requires that the bottle have a minimum amount of coolant in it at ambient temperatures, as it would be highly undesirable for the radiator vacuum to suck in air from a depleted coolant bottle.

COOLANT RECOVERY CONTAINER (Continued)

The advantage of the coolant recovery bottle is cost. The system is much less sophisticated then a pressurized bottle system but puts a premium on a successful coolant fill that contains no air. The coolant bottle cannot be allowed to run dry. If it does, air could be sucked into the system, the water pump could cavitate and the cooling system be destroyed or severely damaged.

REMOVAL

PRESSURE SYSTEM - 3.7L/2.8L DIESEL

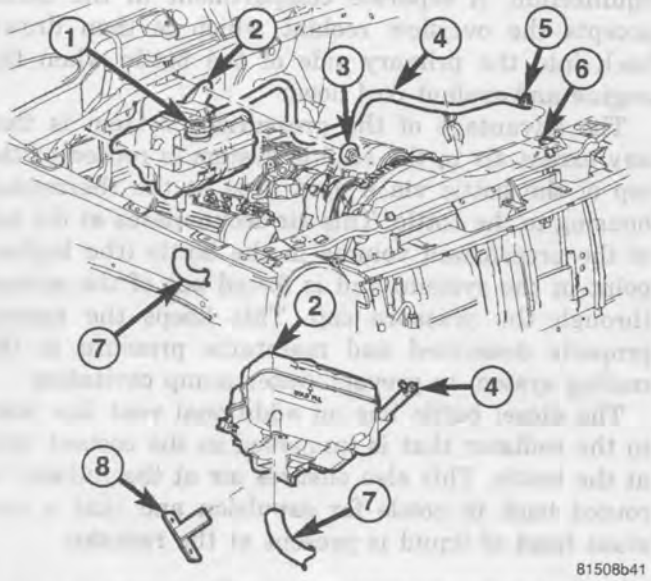


Fig. 1 COOLANT BOTTLE - PRESSURE SYSTEM

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 (Fig. 1).
(2) Siphon coolant from pressure bottle 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.

NON-PRESSURE SYSTEM - 2.4L

(1) Remove mounting nuts. (Fig. 2)
(2) Siphon coolant out of coolant bottle.
(3) Lift coolant bottle and remove coolant bottle to radiator hose at bottom of coolant bottle.

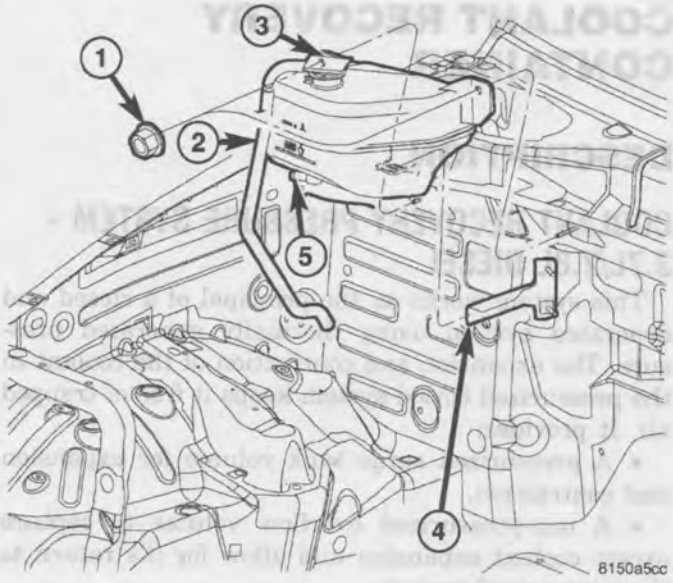


Fig. 2 COOLANT BOTTLE - NON-PRESSURE SYSTEM

1 - NUT
2 - OVERFLOW TUBE
3 - COOLANT BOTTLE
4 - MOUNTING BRACKET
5 - COOLANT BOTTLE TO RADIATOR HOSE

INSTALLATION

PRESSURE SYSTEM - 3.7L/2.8L DIESEL

(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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

NON-PRESSURE SYSTEM - 2.4L

(1) Connect coolant bottle to radiator hose to the bottom of coolant bottle.
(2) Position coolant bottle on mounting bracket.
(3) Install mounting nuts. Tighten to 8.5 N·m (75 in. lbs.).
(4) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE)

COOLANT SYSTEM HOSES- 2.8L DIESEL

REMOVAL

UPPER RADIATOR HOSE - 2.8L DIESEL

(1) Drain cooling system (Refer to 7 - COOLING/ ENGINE/COOLANT - STANDARD PROCEDURE).

(2) Disconnect upper radiator hose from thermostat housing (Fig. 3).

(3) Disconnect upper radiator hose from radiator and remove from vehicle (Fig. 3).

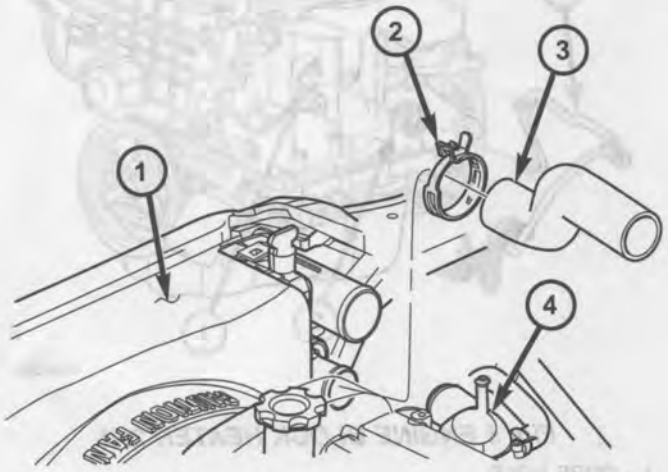


Fig. 3 UPPER RADIATOR HOSE

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

HEATER CORE HOSES - 2.8L DIESEL

(1) Drain cooling system (Refer to 7 - COOLING/ ENGINE/COOLANT - STANDARD PROCEDURE).

(2) Remove engine cover from engine (Refer to 9 - ENGINE COVER - REMOVAL).

(3) Disconnect heater core supply line at heater core and viscous heater (Fig. 4). Remove hose from vehicle.

(4) Disconnect heater core return line from heater core and EGR cooler (Fig. 4). Remove hose from vehicle.

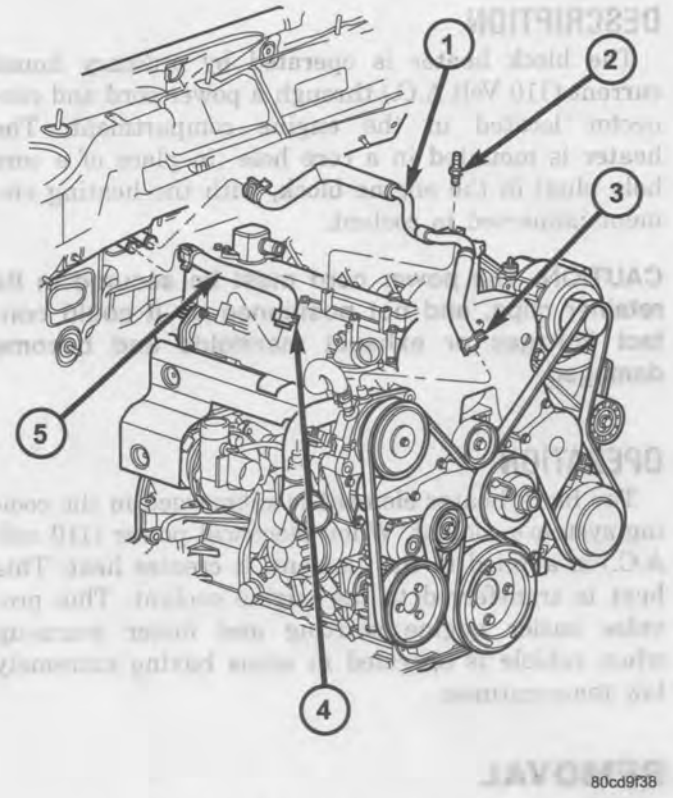


Fig. 4 HEATER CORE COOLANT HOSES

1 - HEATER CORE TO VISCOUS HEATER HOSE
2 - MOUNTING STUD
3 - HOSE CLAMP
4 - HOSE CLAMP
5 - HEATER CORE TO EGR COOLER HOSE

INSTALLATION

UPPER RADIATOR HOSE - 2.8L DIESEL

(1) Install upper radiator hose on radiator and thermostat housing (Fig. 3).

(2) Reposition hose clamps in proper position.

(3) Refill cooling system to proper level (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

HEATER CORE HOSES - 2.8L DIESEL

(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 9 - ENGINE COVER - INSTALLATION).

(4) Refill cooling system to proper level (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

ENGINE BLOCK HEATER

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

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 - 2.4L

(1) Drain cooling system (Refer to 7 - COOLING/ ENGINE - STANDARD PROCEDURE).
(2) Raise vehicle on hoist.
(3) Detach power cord plug from heater.
(4) Loosen screw in center of heater. Remove heater assembly.

REMOVAL - 3.7L

(1) Drain cooling system (Refer to 7 - COOLING - 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 - 2.4L

(1) Thoroughly clean core hole and heater seat.
(2) Insert heater assembly (Fig. 5) with element loop positioned **upward** .

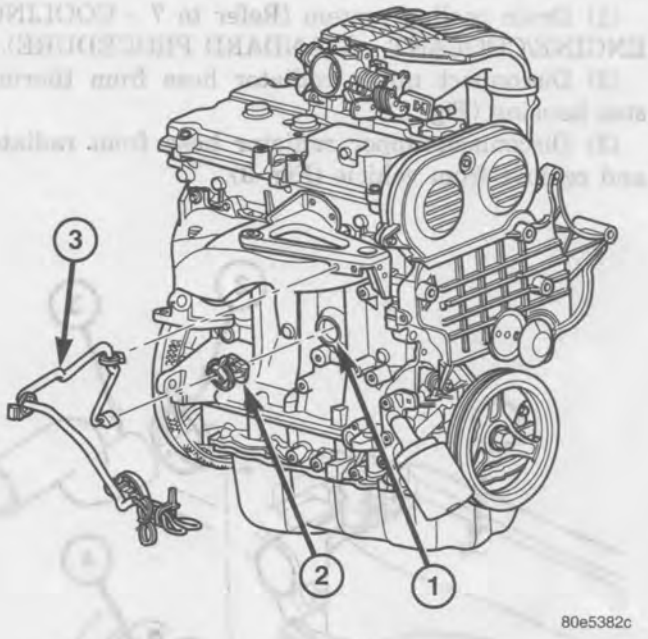


Fig. 5 ENGINE BLOCK HEATER 2.4L

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

(3) With heater seated, tighten center screw securely to assure a positive seal.

CAUTION: To prevent damage, the power cord must be secured in it's 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 (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

ENGINE BLOCK HEATER (Continued)

INSTALLATION - 3.7L

(1) Thoroughly clean core hole and heater seat.
(2) Insert heater assembly (Fig. 6) with element loop positioned **upward** .

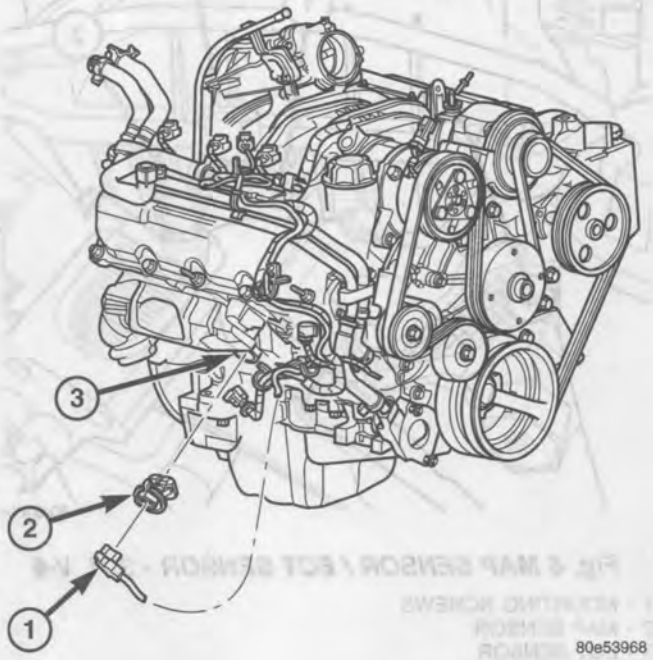


Fig. 6 ENGINE BLOCK HEATER 3.7L

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

(3) With heater seated, tighten center screw securely to assure a positive seal.

CAUTION: To prevent damage, the power cord must be secured in it's 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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

ENGINE COOLANT TEMPERATURE SENSOR

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

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 CCD or PCI (J1850) 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

ENGINE COOLANT TEMPERATURE SENSOR (Continued)

REMOVAL

2.4L ENGINE

The Engine Coolant Temperature (ECT) sensor is installed into a water jacket at left front of cylinder head (Fig. 7).

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 cylinder head.

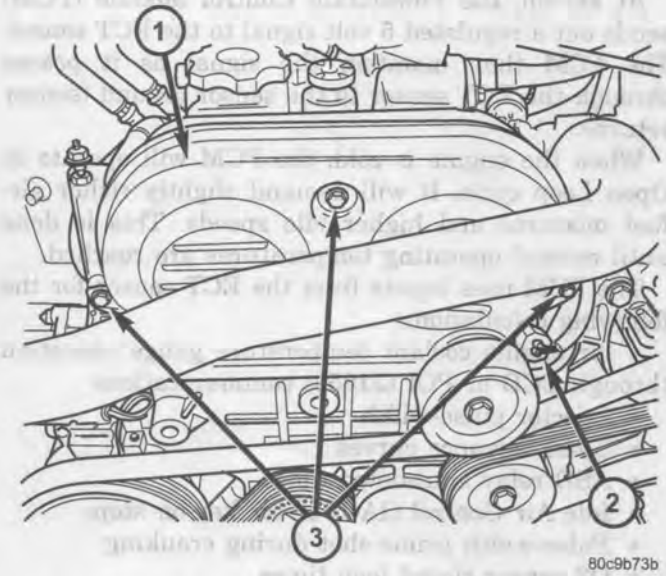


Fig. 7 ECT AND UPPER TIMING BELT COVER/ BOLTS-2.4L

1 - UPPER TIMING BELT COVER
2 - ELECTRICAL CONNECTOR (ECT)
3 - MOUNTING BOLTS (3)

3.7L ENGINE

The Engine Coolant Temperature (ECT) sensor is installed into a water jacket at front of intake manifold near rear of generator (Fig. 8).

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.

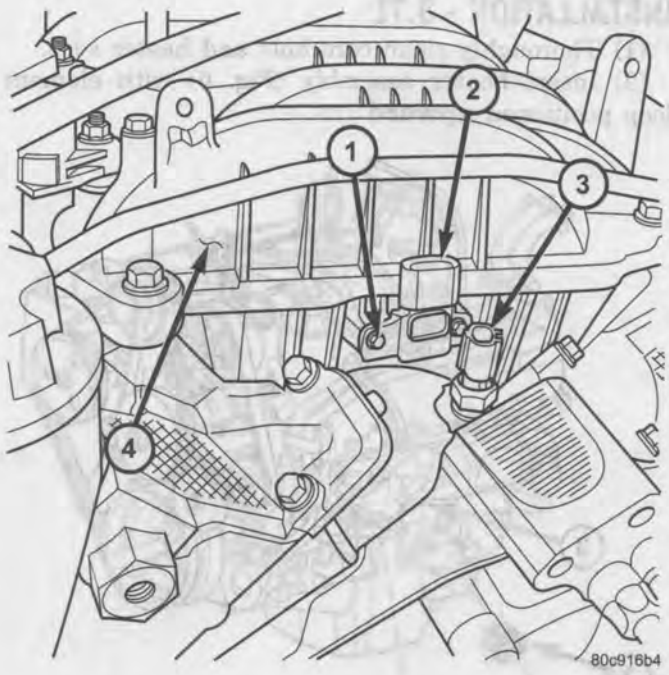


Fig. 8 MAP SENSOR / ECT SENSOR - 3.7L V-6

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

2.8L DIESEL ENGINE

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. (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE)
(3) Disconnect coolant temperature sensor electrical connector at thermostat housing (Fig. 9).
(4) Remove coolant temperature sensor from thermostat housing.

INSTALLATION

2.4L ENGINE

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

ENGINE COOLANT TEMPERATURE SENSOR (Continued)

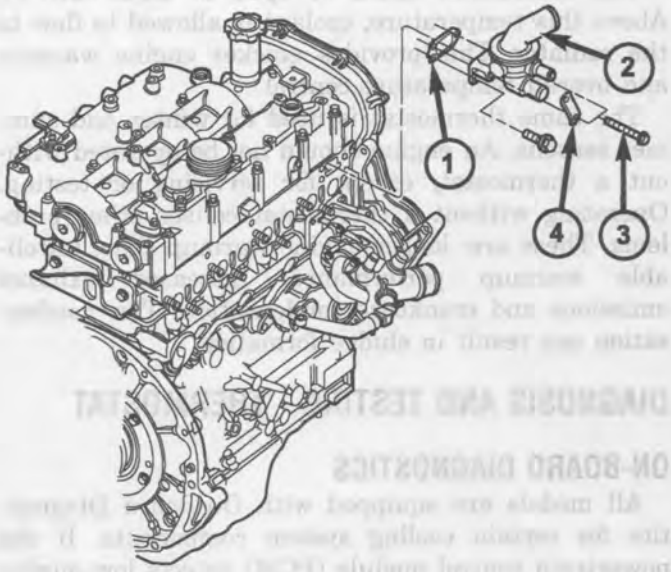


Fig. 9 THERMOSTAT HOUSING

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

3.7L ENGINE

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

2.8L DIESEL ENGINE

(1) Install coolant temperature sensor in thermostat housing (Fig. 9).
(2) Connect coolant temperature sensor electrical connector.
(3) Refill cooling system. (Refer to 7 - COOLING/ ENGINE/COOLANT - STANDARD PROCEDURE)
(4) Connect negative battery cable.

ENGINE COOLANT THERMOSTAT

DESCRIPTION

DESCRIPTION - 3.7L ENGINE

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

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm up and overall temperature control. 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 (Fig. 10).

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 warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

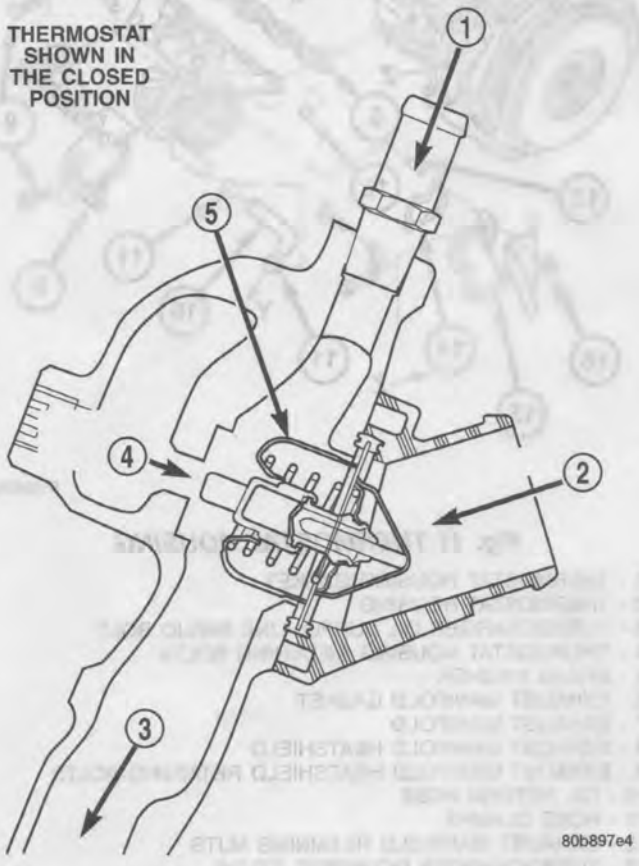


Fig. 10 3.7L Thermostat

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

ENGINE COOLANT THERMOSTAT (Continued)

DESCRIPTION

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator (Fig. 11).

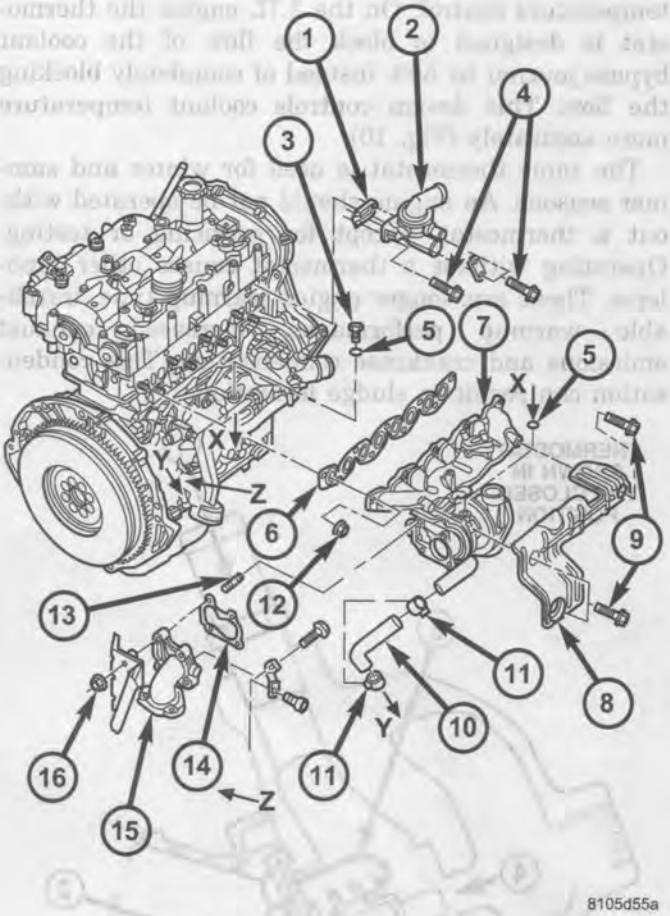


Fig. 11 THERMOSTAT HOUSING

1 - THERMOSTAT HOUSING GASKET
2 - THERMOSTAT HOUSING
3 - TURBOCHARGER OIL SUPPLY LINE BANJO BOLT
4 - THERMOSTAT HOUSING RETAINING BOLTS
5 - BRASS WASHER
6 - EXHAUST MANIFOLD GASKET
7 - EXHAUST MANIFOLD
8 - EXHAUST MANIFOLD HEATSHIELD
9 - EXHAUST MANIFOLD HEATSHIELD RETAINING BOLTS
10 - OIL RETURN HOSE
11 - HOSE CLAMPS
12 - EXHAUST MANIFOLD RETAINING NUTS
13 - TURBOCHARGER DOWNPIPE STUDS
14 - TURBOCHARGER DOWN PIPE GASKET
15 - TURBOCHARGER DOWNPIPE
16 - TURBOCHARGER DOWNPIPE RETAINING NUT

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 warmup and overall temperature control.

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

DIAGNOSIS AND TESTING - 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 25 - EMISSIONS CONTROL - DESCRIPTION).

The DTC can also be accessed through the DRB scan tool.

REMOVAL

2.4L ENGINE

(1) Drain cooling system below thermostat housing level.
(2) Disconnect engine coolant temperature sensor.
(3) Disconnect heater supply hose.
(4) Remove housing attaching bolts (Fig. 12).
(5) Remove housing, gasket and thermostat (Fig. 12).

3.7L ENGINE

WARNING: DO NOT LOOSEN RADIATOR DRAIN-COCK 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 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 (Refer to 7 - COOLING - STANDARD PROCEDURE).
(3) Raise vehicle on hoist.
(4) Remove splash shield.
(5) Remove lower radiator hose clamp and lower radiator hose at thermostat housing.

ENGINE COOLANT THERMOSTAT (Continued)

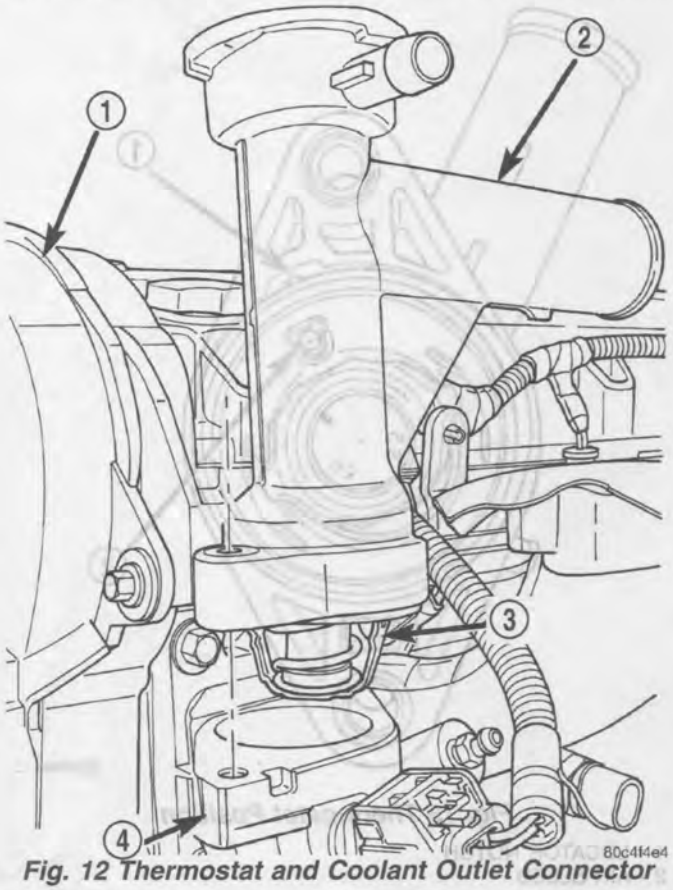


Fig. 12 Thermostat and Coolant Outlet Connector

1 - TIMING BELT COVER
2 - OUTLET CONNECTOR
3 - THERMOSTAT
4 - HOUSING

(6) Remove thermostat housing mounting bolts, thermostat housing and thermostat (Fig. 13).

2.8L DIESEL ENGINE

NOTE: The thermostat is not serviced separately. The thermostat and housing must be replaced as an assembly.

(1) Disconnect negative battery cable.
(2) Remove engine cover (Refer to 9 - ENGINE COVER - REMOVAL).
(3) Partially drain cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).
(4) Disconnect upper radiator hose and bypass hoses at thermostat housing.
(5) Remove thermostat housing retaining bolts, support bracket (2.8L) and housing from cylinder head, discard gasket (Fig. 14).

INSTALLATION

2.4L ENGINE

(1) Clean all gasket sealing surfaces.
(2) Place a new gasket (dipped in clean water) on the coolant outlet connector surface. Position thermostat with air bleed at 12 o'clock position in thermostat housing.

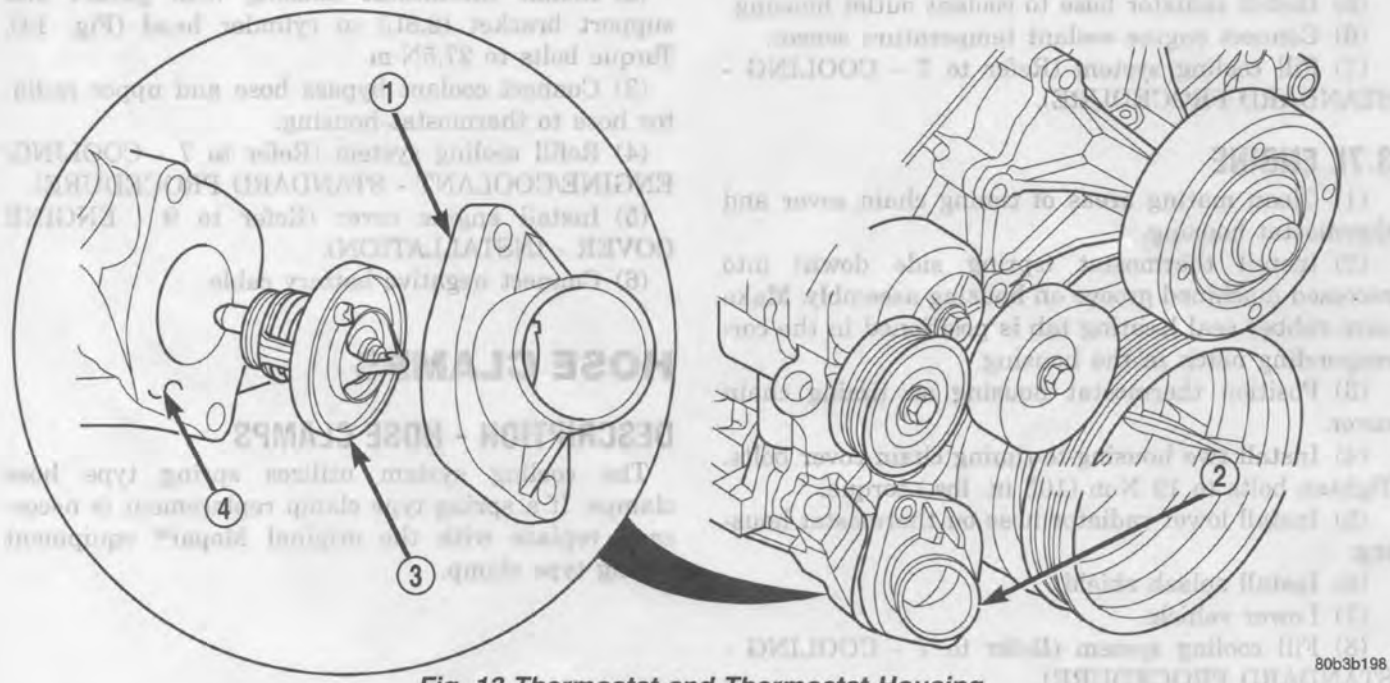


Fig. 13 Thermostat and Thermostat Housing

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

ENGINE COOLANT THERMOSTAT (Continued)

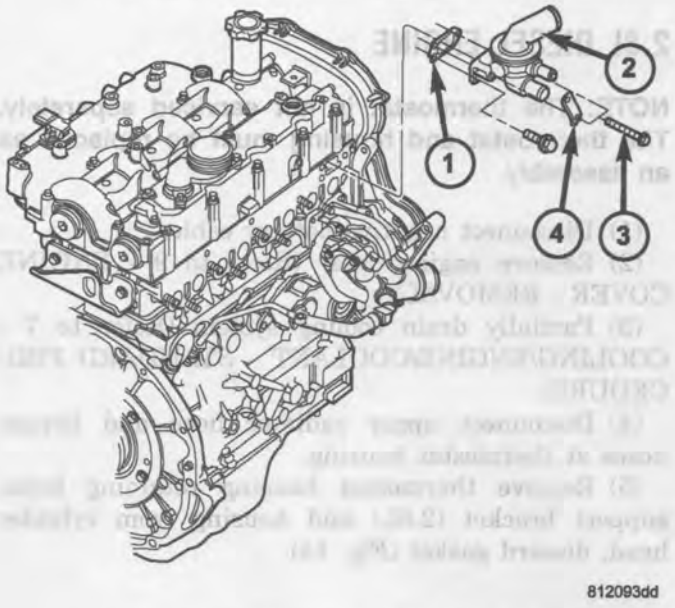


Fig. 14 THERMOSTAT HOUSING

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

(3) Position the coolant outlet connector and gasket over the thermostat, making sure thermostat is seated in the thermostat housing (Fig. 15).

(4) Position outlet connector to thermostat housing and install bolts. Tighten bolts to 28 N·m (20 ft. lbs.).

(5) Install radiator hose to coolant outlet housing.

(6) Connect engine coolant temperature sensor.

(7) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

3.7L ENGINE

(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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

(9) Connect negative battery cable to battery.

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

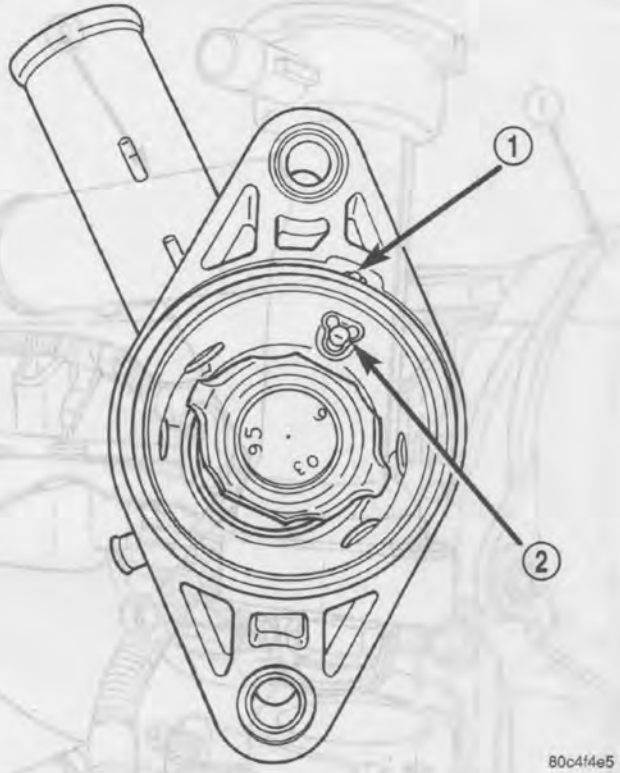


Fig. 15 Thermostat Position

1 - LOCATOR NOTCH
2 - AIR BLEED

2.8L DIESEL ENGINE

(1) Clean old gasket material from cylinder head and thermostat housing.

(2) Install thermostat housing with gasket and support bracket (2.8L) to cylinder head (Fig. 14). Torque bolts to 27.5N·m.

(3) Connect coolant bypass hose and upper radiator hose to thermostat housing.

(4) Refill cooling system (Refer to 7 - COOLING/ ENGINE/COOLANT - STANDARD PROCEDURE).

(5) Install engine cover (Refer to 9 - ENGINE COVER - INSTALLATION).

(6) Connect negative battery cable.

HOSE CLAMPS

DESCRIPTION - HOSE CLAMPS

The cooling system utilizes spring type hose clamps. If a spring type clamp replacement is necessary, replace with the original Mopar® equipment spring type clamp.

HOSE CLAMPS (Continued)

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL NUMBER 6094. (Fig. 16). ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only a original equipment clamp with matching number or letter (Fig. 16).

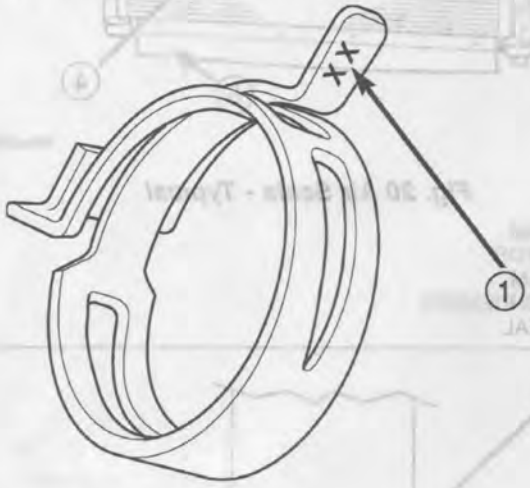


Fig. 16 Spring Clamp Size Location

1 - SPRING CLAMP SIZE LOCATION

OPERATION - HOSE CLAMPS

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, only use constant tension clamp pliers designed to compress the hose clamp.

RADIATOR

DESCRIPTION

All vehicles are equipped with a cross flow type radiator with plastic side tanks (Fig. 17).

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

REMOVAL

3.7L/2.8L DIESEL ENGINES

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.

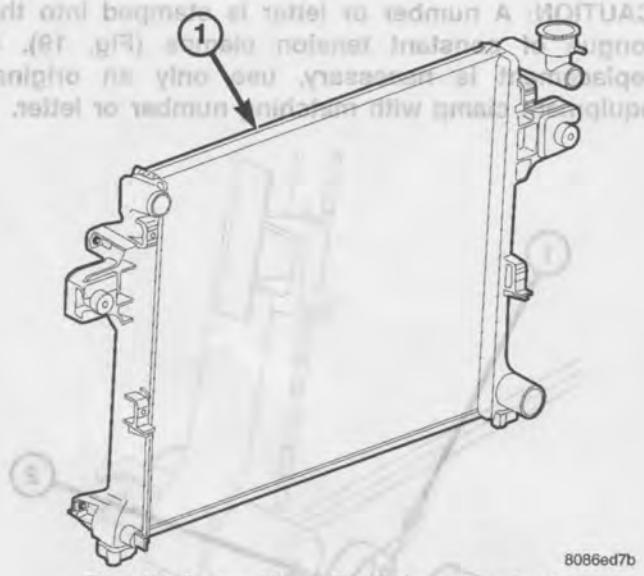


Fig. 17 Cross Flow Radiator - Typical

1 - RADIATOR

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

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL NUMBER 6094 (Fig. 18). ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

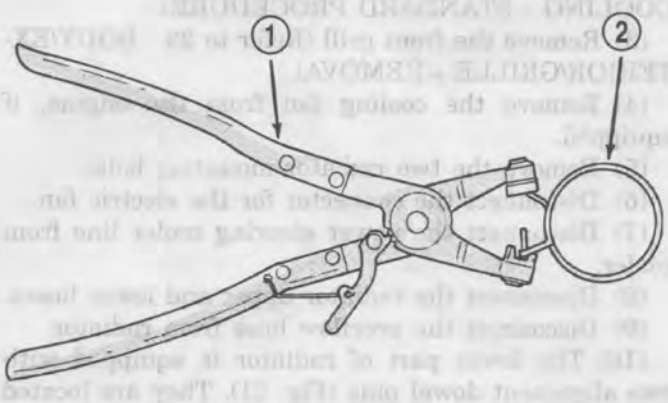


Fig. 18 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

RADIATOR (Continued)

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 19). If replacement is necessary, use only an original equipment clamp with matching number or letter.

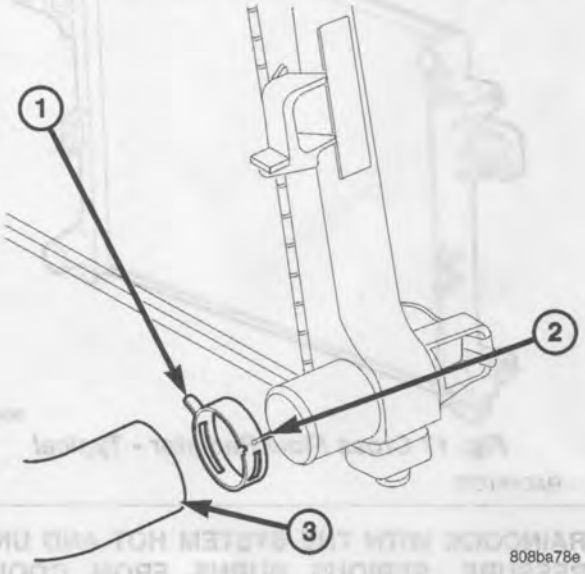


Fig. 19 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

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 (Fig. 20). 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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - 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.

(10) The lower part of radiator is equipped with two alignment dowel pins (Fig. 21). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

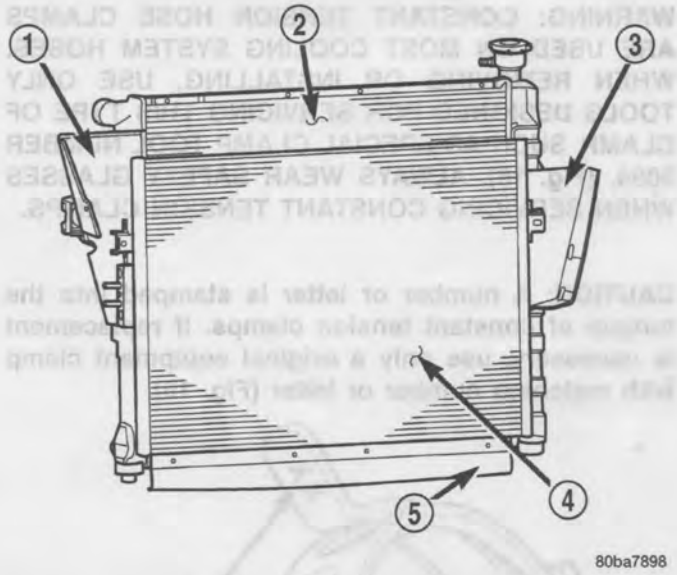


Fig. 20 Air Seals - Typical

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

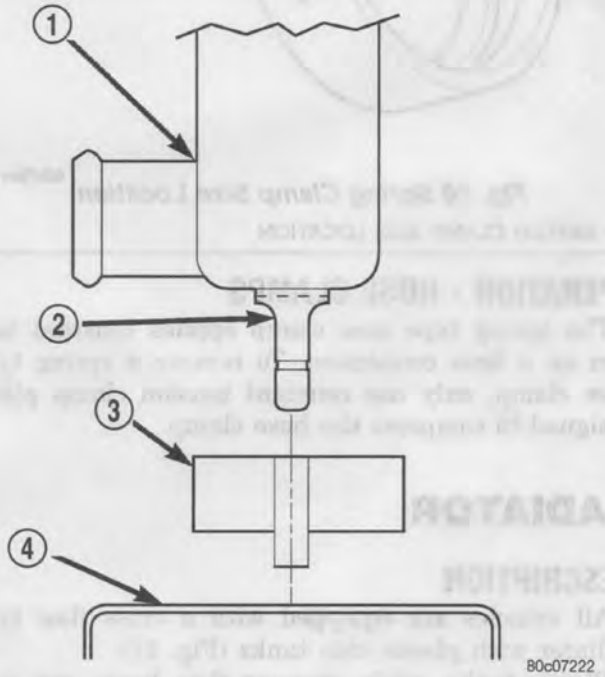


Fig. 21 Radiator Alignment Dowels - Typical

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

RADIATOR (Continued)

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).

2.4L ENGINE

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.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL NUMBER 6094 (Fig. 22). ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 23). If replacement is necessary, use only an original equipment clamp with matching number or letter.

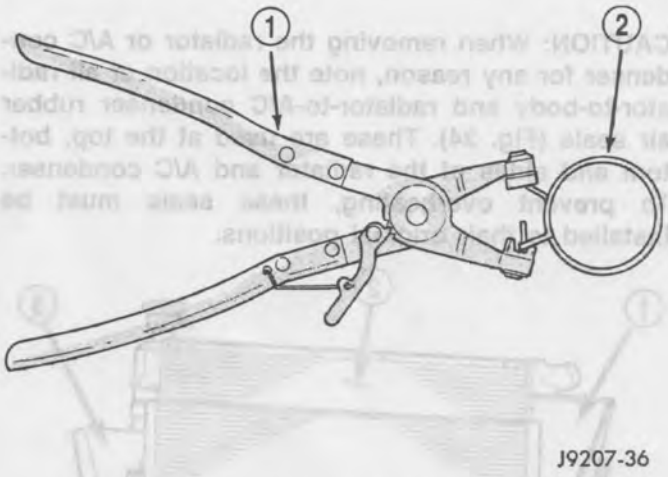


Fig. 22 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

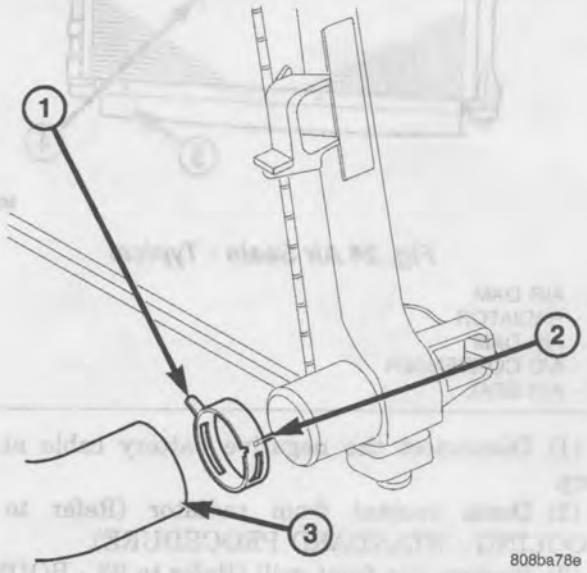


Fig. 23 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

RADIATOR (Continued)

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 (Fig. 24). 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.

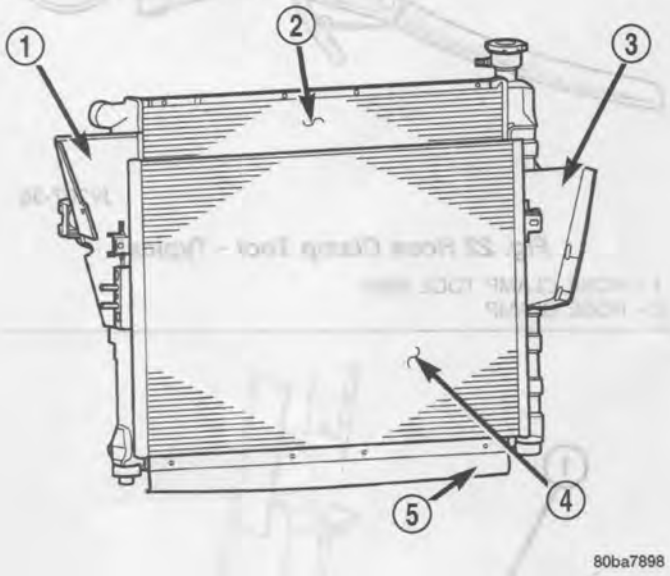


Fig. 24 Air Seals - Typical

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

(1) Disconnect the negative battery cable at battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - 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.

(10) The lower part of radiator is equipped with two alignment dowel pins (Fig. 25). 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.

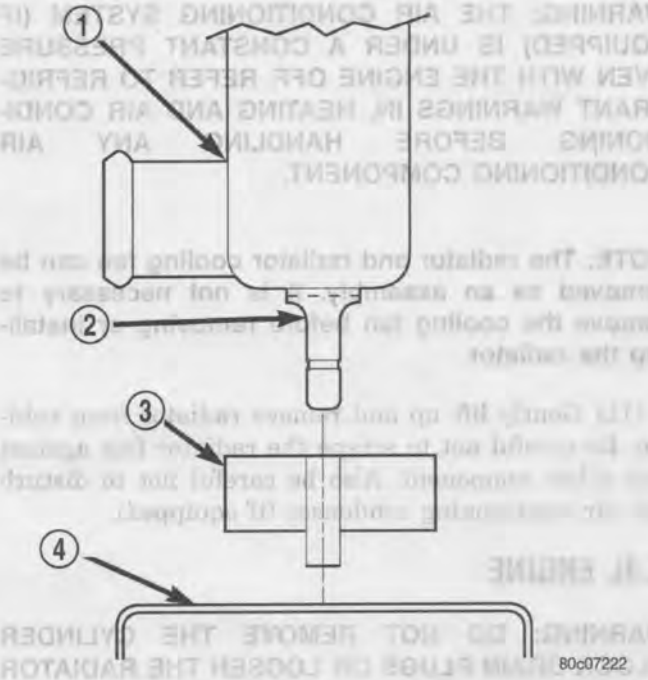


Fig. 25 Radiator Alignment Dowels - Typical

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

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

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

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.

RADIATOR (Continued)

INSTALLATION

3.7L/2.8L DIESEL ENGINES

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.

(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 grill (Refer to 23 - BODY/EXTERIOR/GRILLE - 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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

(10) Connect battery cable at battery.

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

2.4L ENGINE

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.

(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 grill (Refer to 23 - BODY/EXTERIOR/GRILLE - 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 (Refer to 7 - COOLING - STANDARD PROCEDURE).

(10) Connect battery cable at battery.

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

RADIATOR PRESSURE CAP

DESCRIPTION

The cooling system cap is located on the coolant pressure bottle for 3.7L/2.8L Diesel engine and the radiator for the 2.4L engine. The cap construction includes; stainless steel swivel top, rubber seals and retainer, main spring, and a spring loaded valve (Fig. 26).

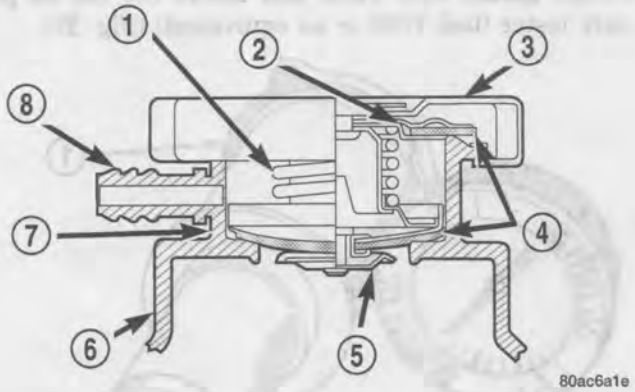


Fig. 26 PRESSURE CAP

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

RADIATOR PRESSURE CAP (Continued)

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 - GAS ENGINES

Remove cap from pressure bottle or radiator as appropriate. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 27).

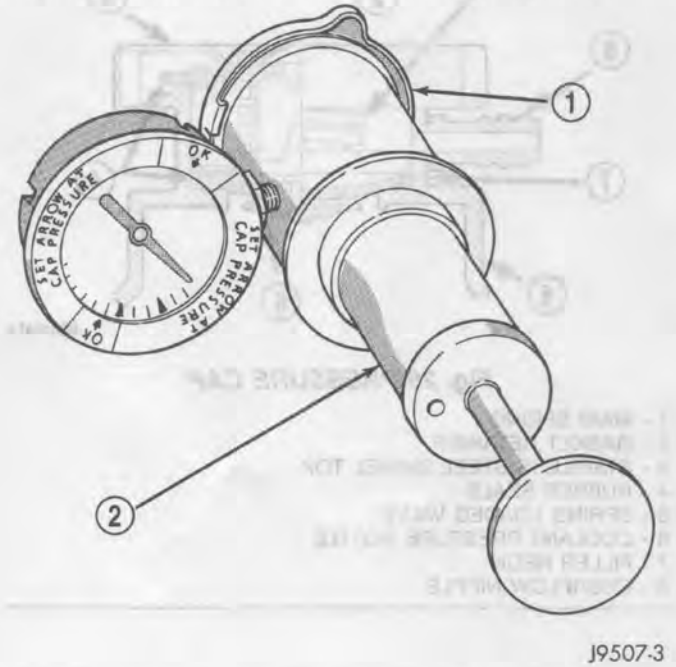


Fig. 27 Pressure Testing Radiator Pressure Cap - Typical

1 - PRESSURE CAP
2 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 124 to 145 kPa (18 to 21 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 124 to 145 kPa (18 to 21 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

RADIATOR PRESSURE CAP - 3.7L/2.8L DIESEL

Dip the pressure cap 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 Cooling System 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 Cooling System Tester (Fig. 28), 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.

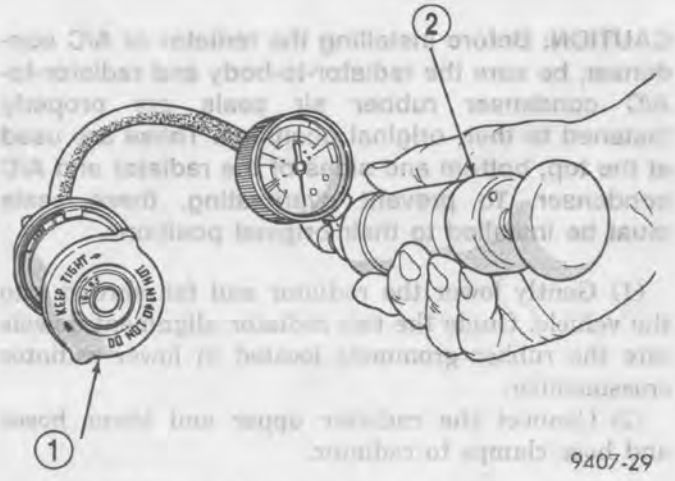


Fig. 28 Testing Cooling System Pressure Cap

1 - PRESSURE CAP
2 - PRESSURE TESTER

RADIATOR PRESSURE CAP (Continued)

PRESSURE RELIEF TEST - 3.7L/2.8L DIESEL

The pressure cap upper gasket (seal) pressure relief can be checked by removing the overflow hose at the radiator filler neck nipple (Fig. 29). Attach the Radiator Pressure Tool to the filler neck nipple 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.

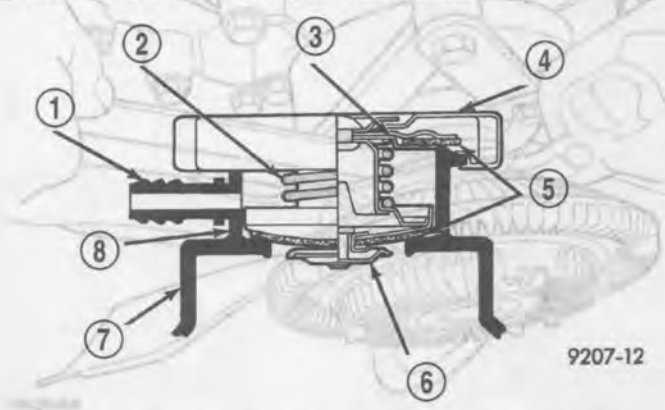


Fig. 29 Radiator Pressure Cap Filler Neck

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

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

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

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.

RADIATOR FAN - ELECTRIC

DESCRIPTION

The fan (Fig. 30) is electrically controlled by the powertrain control module (PCM) through the fan control relays. The relays are located in the power distribution center (PDC) in the engine compartment.

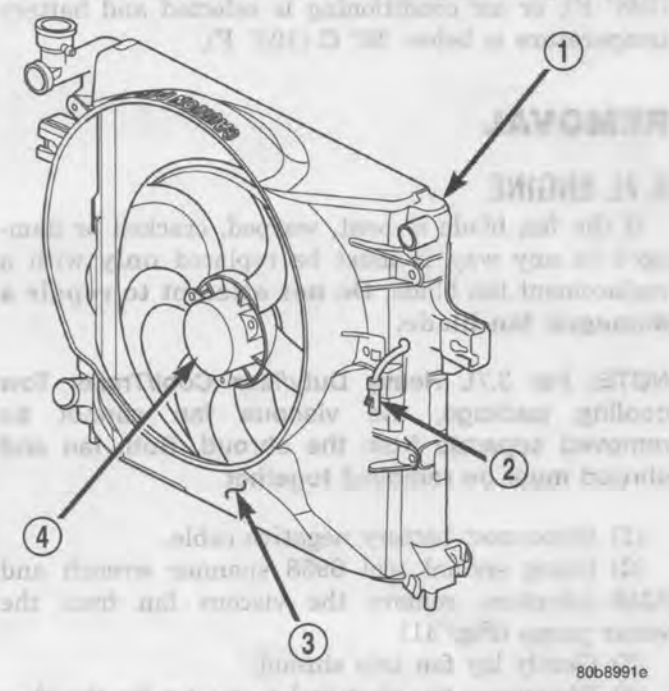


Fig. 30 Radiator Cooling Fan - Typical

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

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.

RADIATOR FAN - ELECTRIC (Continued)

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

3.7L ENGINE

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 (Fig. 31).
(3) Gently lay fan into shroud.
(4) Disconnect the electrical connector for the electric fan, then disconnect connector from shroud.
(5) Remove the two fan shroud mounting bolts connecting the fan shroud to the radiator (Fig. 32).
(6) Remove the shroud and fan from the vehicle.

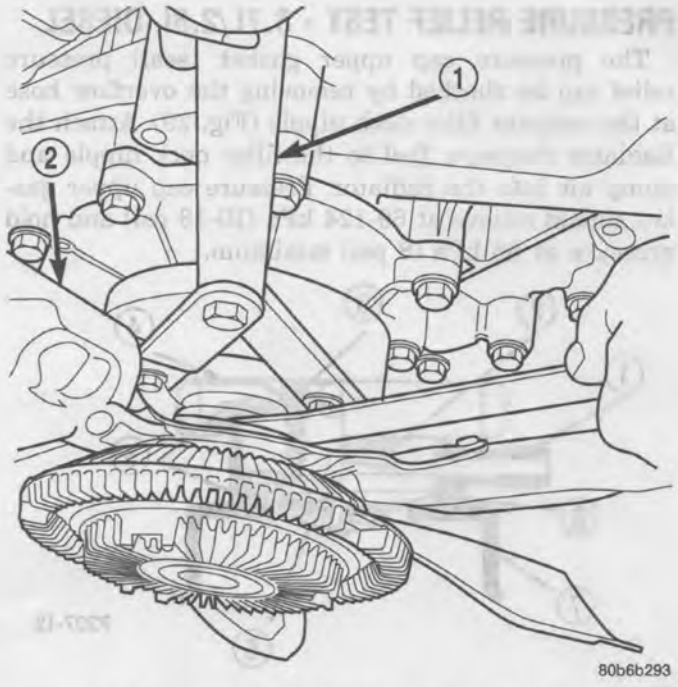


Fig. 31 Viscous Fan and Fan Drive 3.7L

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

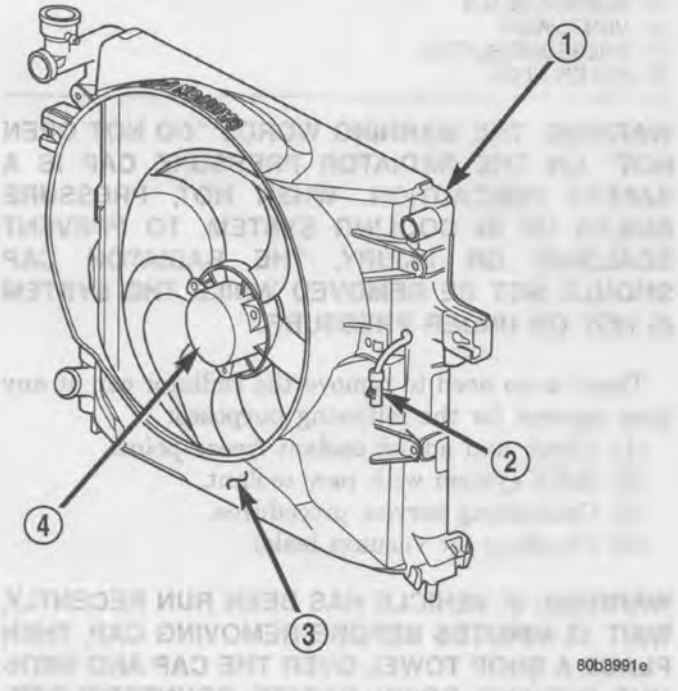


Fig. 32 Radiator Cooling Fan - Typical

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

RADIATOR FAN - ELECTRIC (Continued)

2.4L ENIGNE

(1) Gently lay fan into shroud.
(2) Disconnect the electrical connector for the electric fan, then disconnect connector from shroud.
(3) Remove the two fan shroud mounting bolts connecting the fan shroud to the radiator (Fig. 33).

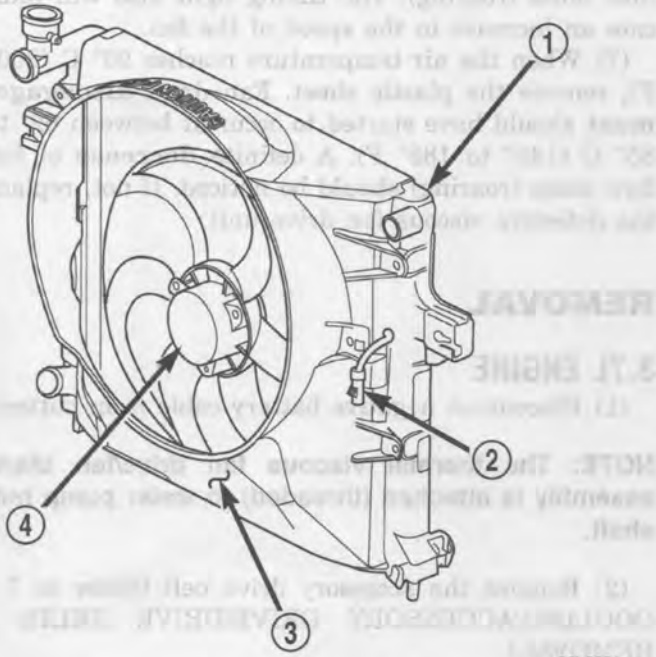


Fig. 33 Radiator Cooling Fan - Typical

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

(4) Remove the shroud and fan from the vehicle.

INSTALLATION

3.7L ENGINE

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

(1) Gently lay viscous fan into shroud.
(2) Install fan shroud assembly into the vehicle. Tighten fan shroud to radiator bolts to (5.5 N·m (50 in. lbs.).
(3) Using special tool 6958 spanner wrench and 8346 adapters, install the viscous fan on the water pump.
(4) Connect fan motor wire connector to harness connector, and attach connector to shroud.
(5) Connect battery negative cable.
(6) Start engine and check fan operation.

2.4L ENGINE

(1) Install fan shroud assembly into the vehicle. Tighten fan shroud to radiator bolts to (5.5 N·m (50 in. lbs.).
(2) Connect fan motor wire connector to harness connector, and attach connector to shroud.
(3) Connect battery negative cable.
(4) Start engine and check fan operation.

RADIATOR - FAN - VISCOUS

DESCRIPTION

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 (Fig. 34) 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.

On the 3.7L engine, an electric fan is standard and the viscous fan is added on for trailer tow packages only.

On the 2.8L diesel engine, the viscous is standard.

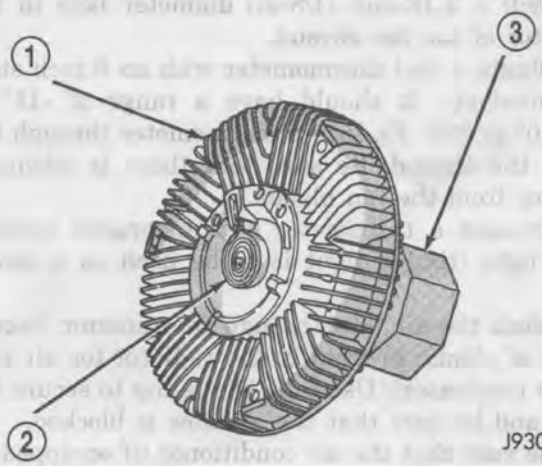


Fig. 34 Viscous Fan Drive - Typical

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

RADIATOR - FAN - VISCOUS (Continued)

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 FAN DRIVE

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

3.7L ENGINE

(1) Disconnect negative battery cable from battery.

NOTE: The thermal viscous fan drive/fan blade assembly is attached (threaded) to water pump hub shaft.

(2) Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove fan blade/viscous fan drive assembly from water pump using special tool 6958 spanner wrench and 8346 adapters, by turning mounting nut counterclockwise as viewed from front (Fig. 35). Threads on viscous fan drive are **RIGHT HAND.**

(4) Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

(5) Do not unbolt fan blade assembly from viscous fan drive at this time.

(6) Remove fan shroud to radiator bolts.

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

(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.

CAUTION: Do not remove water pump pulley-to-water pump bolts. This pulley is under belt tension.

(9) Remove four bolts securing fan blade assembly to viscous fan drive.

2.8L DIESEL

(1) Disconnect negative battery cable.

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

RADIATOR - FAN - VISCOUS (Continued)

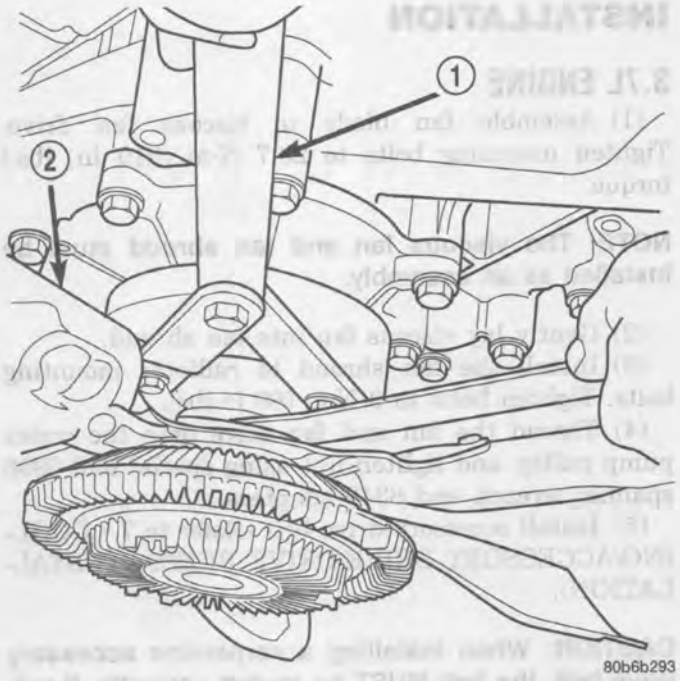


Fig. 35 Viscous Fan and Fan Drive 3.7L

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

(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 (Fig. 36) (Fig. 37). Threads on viscous fan drive are **RIGHT HAND.**

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

(4) Do not unbolt fan blade assembly from fan drive viscous clutch at this time.

(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 from engine block (Fig. 38).

CLEANING

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

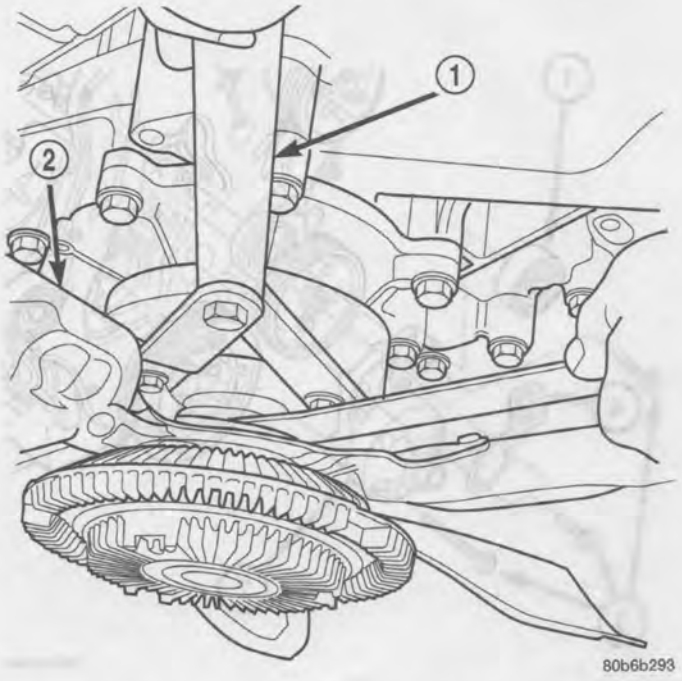


Fig. 36 FAN DRIVE VISCOUS CLUTCH - TYPICAL

1 - SPECIAL TOOL 6958 SPANNER WRENCH
2 - FAN

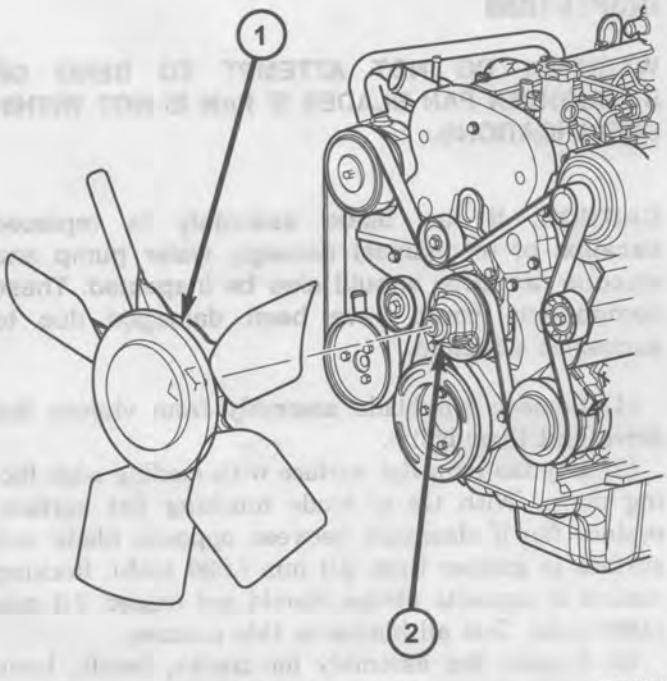


Fig. 37 COOLING FAN AND VISCOUS CLUTCH

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

RADIATOR - FAN - VISCOUS (Continued)

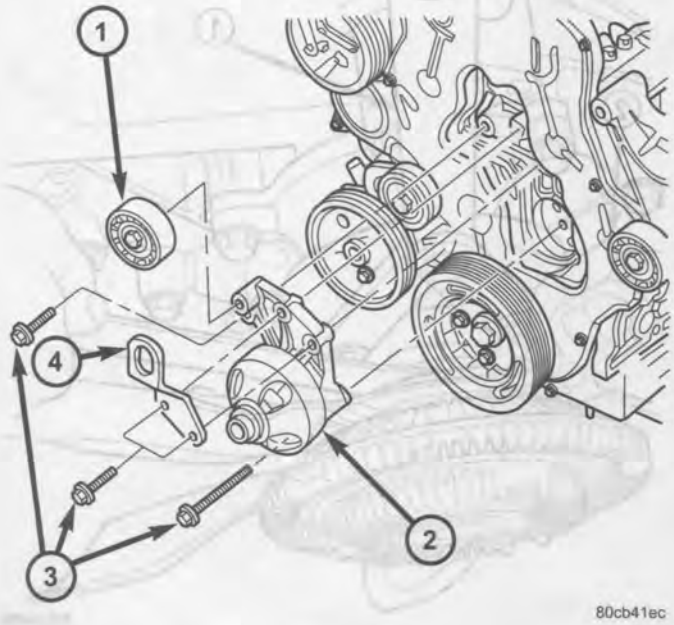


Fig. 38 COOLING FAN SUPPORT

1 - IDLER PULLEY
2 - COOLING FAN SUPPORT
3 - RETAINING BOLTS
4 - ENGINE LIFT HOOK

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

3.7L ENGINE

(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 viscous fan into fan shroud.
(3) Install the fan shroud to radiator mounting bolts. Tighten bolts to 9 N·m (80 in·lbs).
(4) Thread the fan and fan drive onto the water pump pulley, and tighten nut using special tool 6958 spanner wrench and 8346 adapters.
(5) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) for correct belt routing.

2.8L DIESEL

(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.
(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 (Fig. 38). Torque bolts to 149 N·m.(110 ft. lbs.). *
(6) Install fan drive viscous clutch and fan assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).
(7) Connect negative battery cable.

THERMOSTAT HOUSING

REMOVAL

(1) Drain cooling system below thermostat housing level (Refer to 7 - COOLING - STANDARD PROCEDURE).

* Seemes too high

THERMOSTAT HOUSING (Continued)

(2) Remove thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).
(3) Disconnect engine coolant temperature sensor.
(4) Disconnect heater supply hose.
(5) Remove housing attaching bolts (Fig. 39).
(6) Remove housing and gasket (Fig. 39).

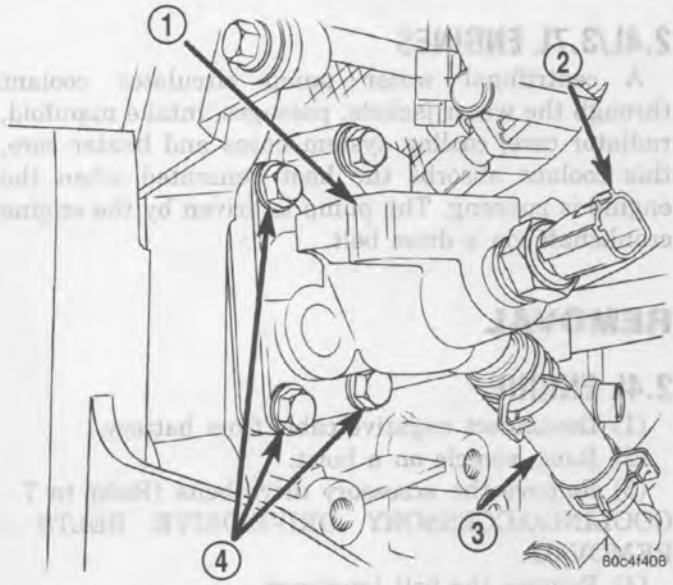


Fig. 39 Thermostat Housing

1 - THERMOSTAT HOUSING
2 - COOLANT TEMPERATURE SENSOR
3 - HOSE-HEATER SUPPLY
4 - BOLTS

INSTALLATION

(1) Clean all gasket sealing surfaces.
(2) Install gasket and housing (Fig. 39). Tighten bolts to 28 N·m (20 ft. lbs.).
(3) Connect engine coolant temperature sensor.
(4) Install thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION).
(5) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

WATER PUMP

DESCRIPTION

3.7L ENGINE

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a 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 a non serviceable integral pulley (Fig. 40).

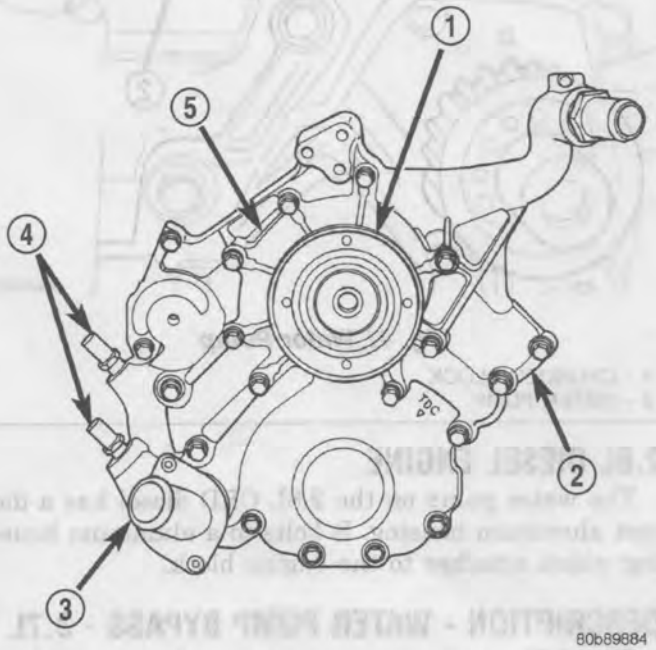


Fig. 40 Water Pump and Timing Chain Cover

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

WATER PUMP (Continued)

2.4L ENGINE

The water pump has a cast aluminum body and housing with a stamped steel impeller. The water pump bolts directly to the block (Fig. 41). The cylinder block to water pump seal is provided by a rubber O-ring. The water pump is driven by the engine timing belt.

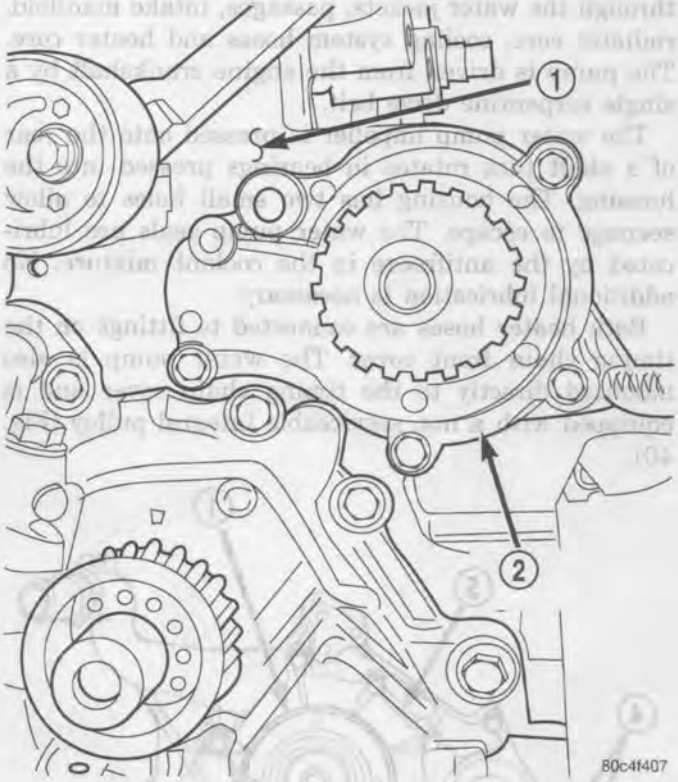


Fig. 41 Water Pump

1 - CYLINDER BLOCK
2 - WATER PUMP

2.8L DIESEL ENGINE

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

DESCRIPTION - WATER PUMP BYPASS - 3.7L

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.

OPERATION

2.8L DIESEL ENGINE

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.

2.4L/3.7L ENGINES

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.

REMOVAL

2.4L ENGINE

(1) Disconnect negative cable from battery.
(2) Raise vehicle on a hoist.
(3) Remove the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(4) Remove the belt tensioner.
(5) Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(6) Remove the generator.
(7) Remove the power steering pump.
(8) Remove the A/C compressor.
(9) Remove the accessory drive bracket.
(10) Remove the timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKET(S) - REMOVAL).
(11) Remove timing belt idler pulley.
(12) Hold camshaft sprocket with Special tool C-4687 and adaptor C-4687-1 while removing bolt. Remove both cam sprockets.
(13) Remove the timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - REMOVAL).
(14) Remove water pump to engine attaching screws (Fig. 42).

3.7L

The water pump on 3.7L engines is bolted directly to the engine timing chain case cover.
(1) Disconnect negative battery cable from battery.
(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(3) Remove fan/viscous fan drive assembly from water pump (Fig. 43) (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL). Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

WATER PUMP (Continued)

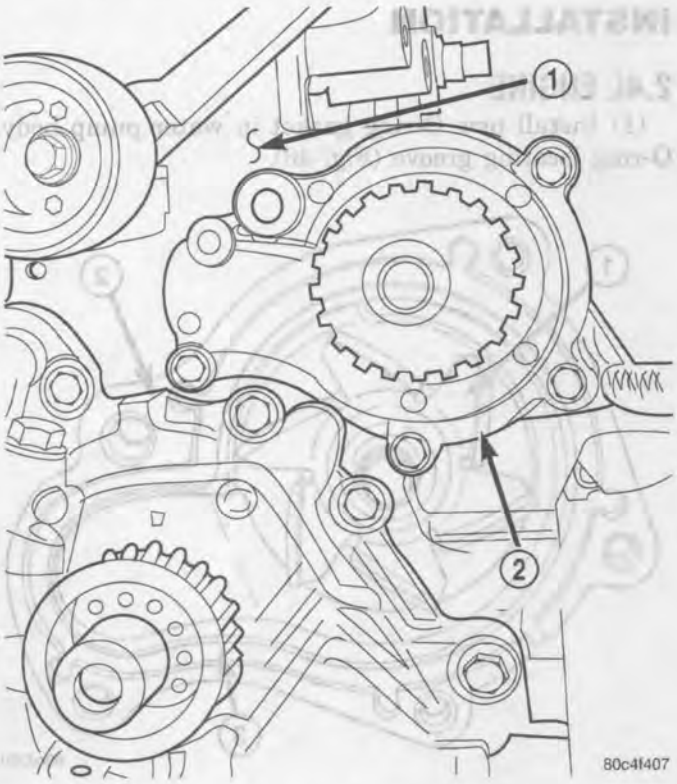


Fig. 42 Water Pump - 2.4L

1 - CYLINDER BLOCK
2 - WATER PUMP

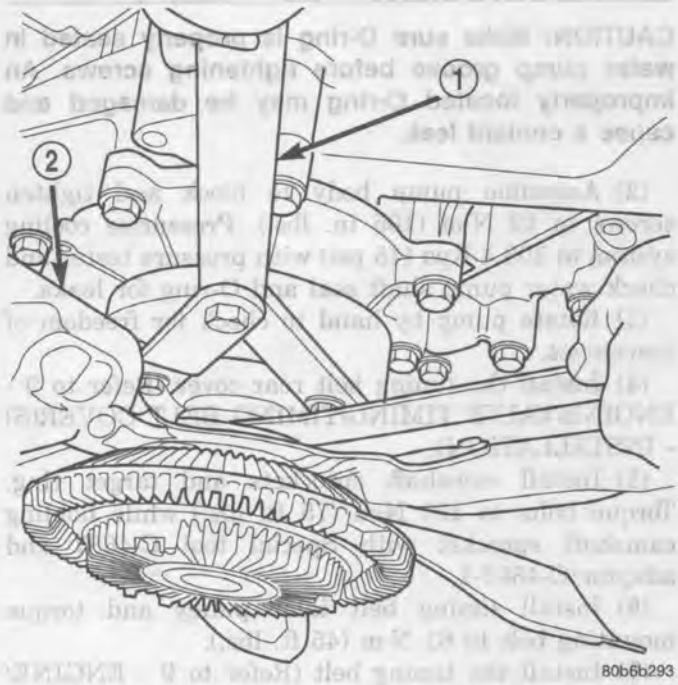


Fig. 43 Viscous Fan and Fan Drive 3.7L

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

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL NUMBER 6094. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

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

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

(5) Remove two fan shroud-to-radiator screws, Disconnect the coolant overflow hose.

(6) Remove upper fan shroud and fan blade/viscous fan drive assembly from vehicle.

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

(8) Remove accessory drive belt (Fig. 44) (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

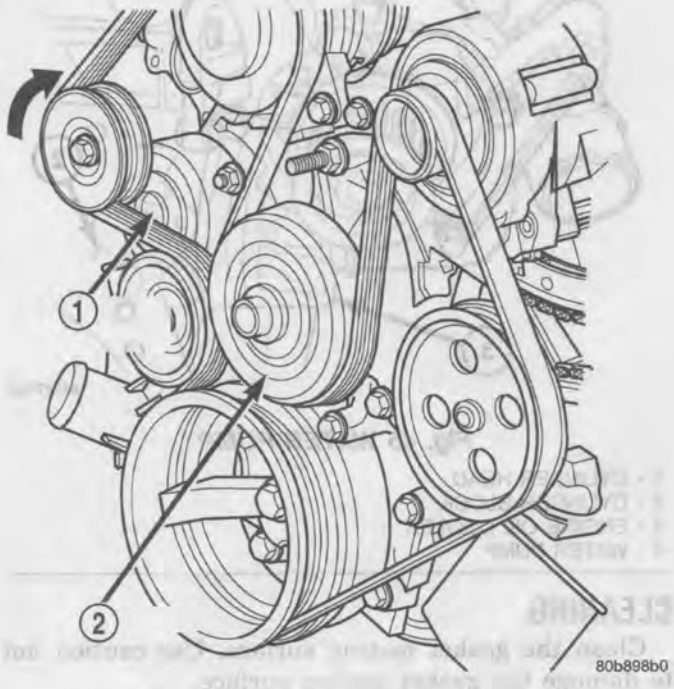


Fig. 44 Automatic Belt Tensioner—3.7L

1 - AUTOMATIC TENSIONER
2 - WATER PUMP PULLEY

(9) Remove lower radiator hose clamp and remove lower hose at water pump.

WATER PUMP (Continued)

(10) 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.

(11) Remove water pump and gasket. Discard gasket.

2.8L DIESEL ENGINE

(1) Disconnect negative battery cable.

(2) Drain cooling system (Refer to 7 - COOLING/ ENGINE/COOLANT - STANDARD PROCEDURE).

(3) Remove timing belt inner and outer covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(4) Remove water pump retaining bolts and pump (Fig. 45).

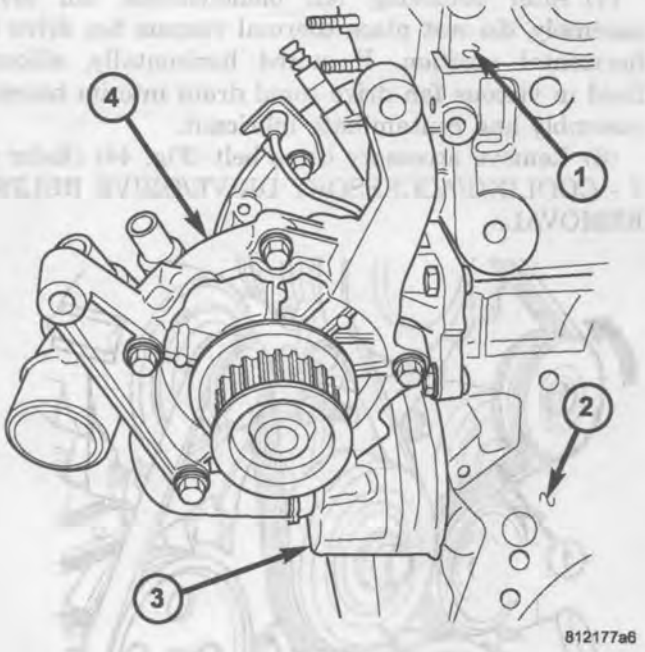


Fig. 45 WATER PUMP

1 - CYLINDER HEAD
2 - CYLINDER BLOCK
3 - ENGINE OIL COOLER
4 - WATER PUMP

CLEANING

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

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

2.4L ENGINE

(1) Install new O-ring gasket in water pump body O-ring locating groove (Fig. 46).

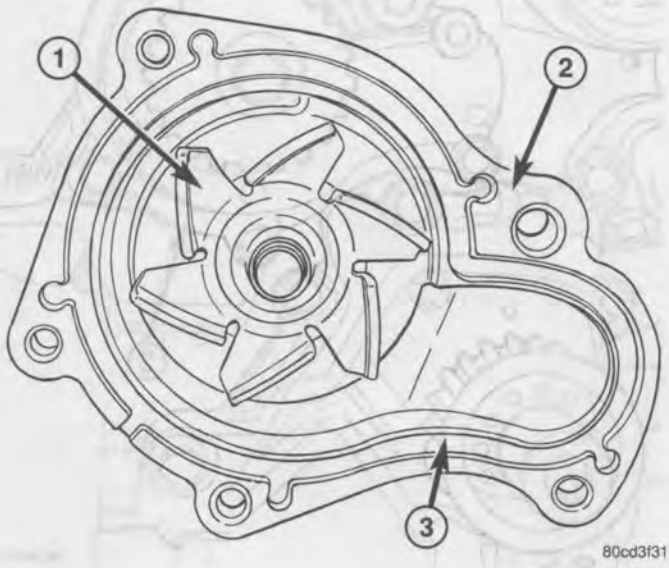


Fig. 46 Water Pump Body

1 - IMPELLER
2 - WATER PUMP BODY
3 - O-RING LOCATING GROOVE

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

(2) Assemble pump body to block and tighten screws to 12 N·m (105 in. lbs.). Pressurize cooling system to 103.4 Kpa (15 psi) with pressure tester and check water pump shaft seal and O-ring for leaks.

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

(4) Install the timing belt rear cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT COVER(S) - INSTALLATION).

(5) Install camshaft sprockets and target ring. Torque bolts to 101 N·m (75 ft. lbs.) while holding camshaft sprocket with Special tool C-4687 and adaptor C-4687-1.

(6) Install timing belt idler pulley and torque mounting bolt to 61 N·m (45 ft. lbs.).

(7) Install the timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT AND SPROCKET(S) - INSTALLATION).

WATER PUMP (Continued)

(8) Install the accessory drive mounting bracket (Fig. 47).

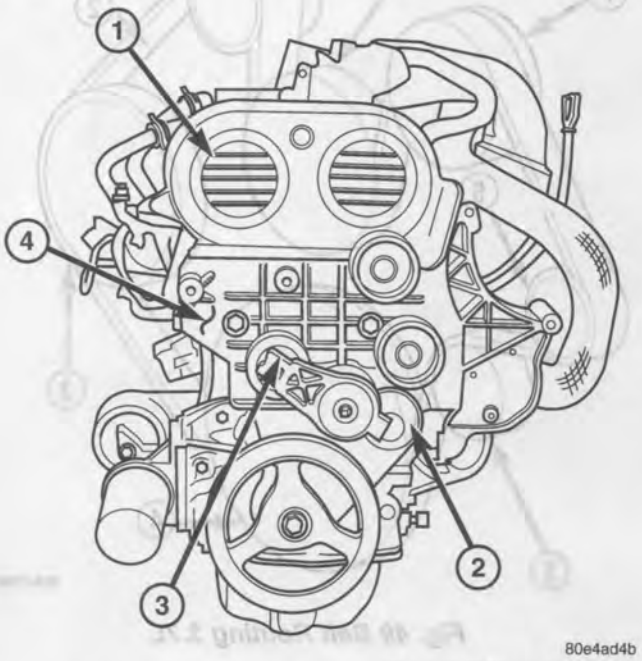


Fig. 47 ACCESSORY DRIVE BRACKET

1- UPPER TIMING BELT COVER
2- LOWER TIMING BELT COVER
3- BELT TENSIONER
4- ACCESSORY DRIVE BRACKET

(9) Install the power steering pump.
(10) Install the generator.
(11) Install the A/C compressor.
(12) Install the belt tensioner.
(13) Install the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(14) Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(15) Lower vehicle and connect battery cable.

3.7L ENGINE

The water pump on 3.7L engines is bolted directly to the engine timing chain case cover.
(1) Clean gasket mating surfaces.
(2) Using a new gasket, position water pump and install mounting bolts as shown. (Fig. 48). Tighten water pump mounting bolts to 54 N·m (40 ft. lbs.) torque.

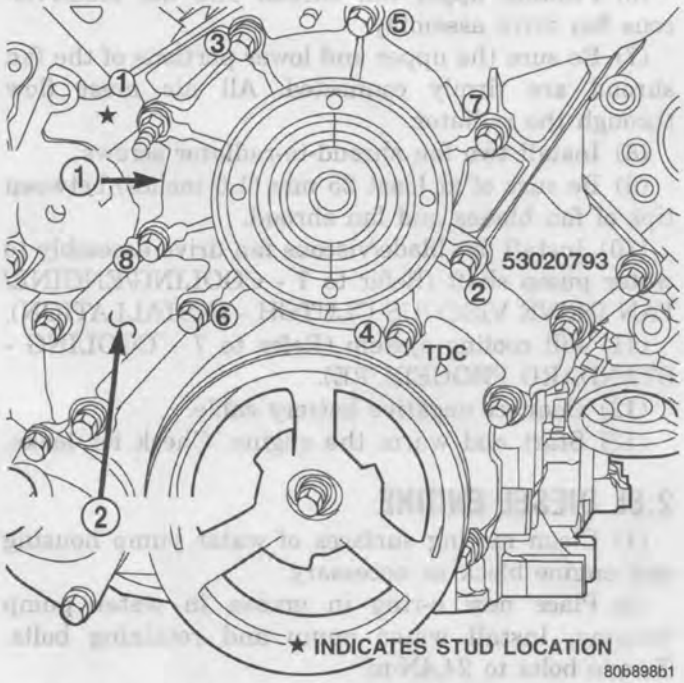


Fig. 48 Water Pump Installation—3.7L

1 - WATER PUMP
2 - TIMING CHAIN COVER

(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.
(5) Relax tension from belt tensioner. Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

WATER PUMP (Continued)

CAUTION: When installing the serpentine accessory drive belt, belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction. Refer to (Fig. 49) for correct belt routing. Or, refer to the Belt Routing Label located in the engine compartment. The correct belt with correct length must be used.

(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) Install fan blade/viscous fan drive assembly to water pump shaft (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).

(11) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(12) Connect negative battery cable.

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

2.8L DIESEL ENGINE

(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 24.4N·m.

(3) Install both inner and outer timing belt covers (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(4) Refill cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

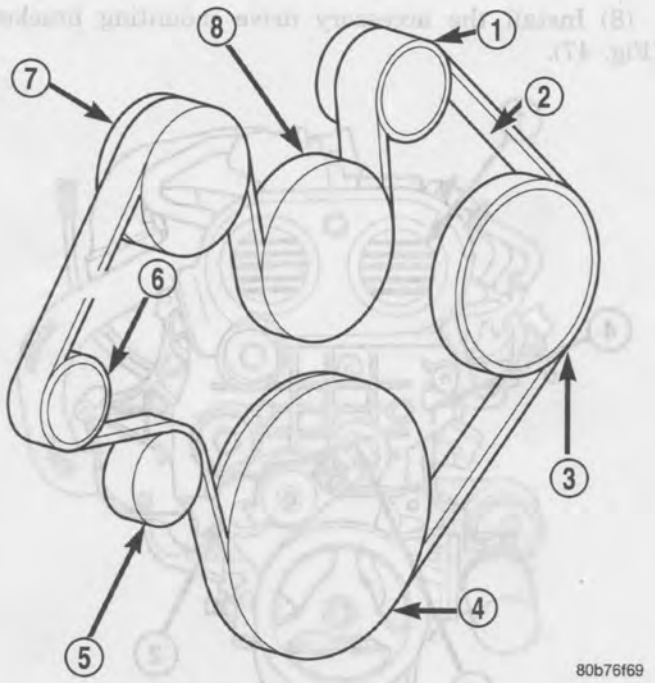


Fig. 49 Belt Routing 3.7L

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) Connect negative battery cable.

TRANSMISSION

TABLE OF CONTENTS

TRANSMISSION

STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING DISASSEMBLY/ASSEMBLY

DISCONNECT

(1) Remove dust cap by pulling it straight back off of quick connect fitting. (Fig. 1)

(2) Place disconnect tool Special Tool 8875A onto transmission cooler line with the fingers of the tool facing the quick connect fitting.

(3) Slide disconnect 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 disconnect tool 60° to expand the retaining clip.

(5) While holding the disconnect tool against the quick connect fitting, pull back on the transmission cooler line to remove.

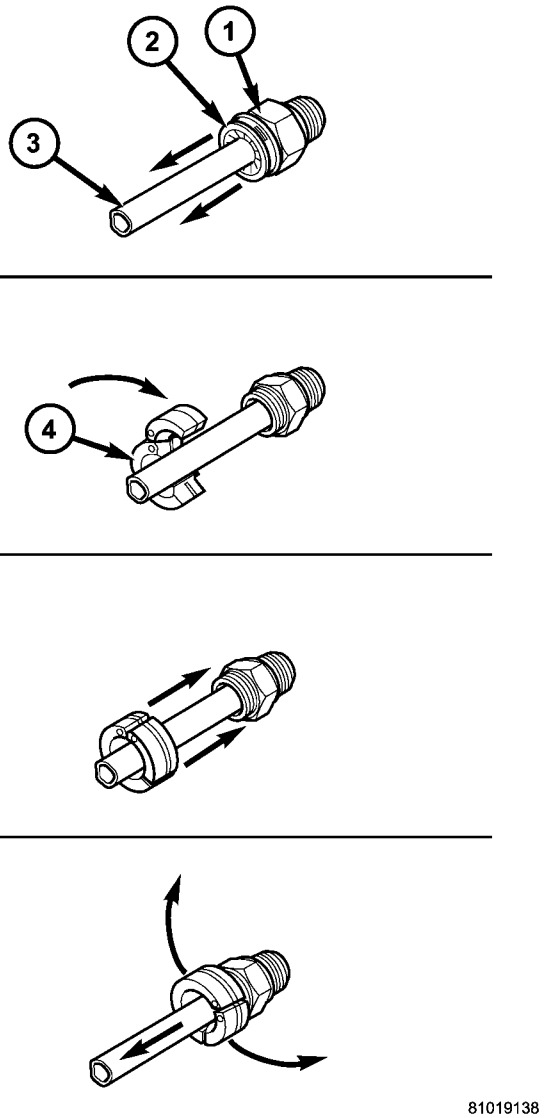


Fig. 1 Oil Cooler Line Quick Connect Fitting - Disassembly

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

TRANSMISSION (Continued)

CONNECT

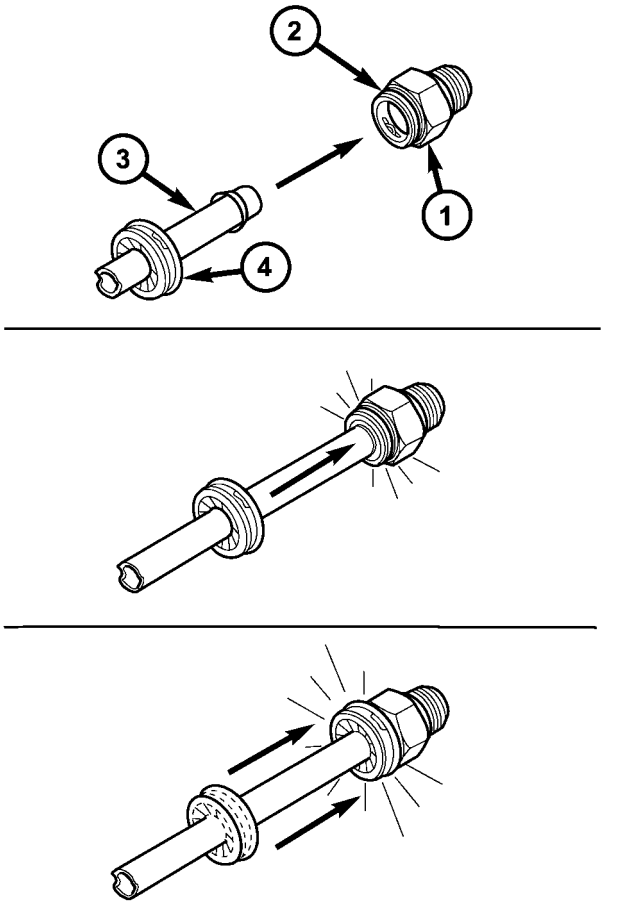


Fig. 2 Oil Cooler Line Quick Connect Fitting - Assembly

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

(1) Align transmission cooler line with quick connect fitting while pushing straight into the fitting.

(2) Push in on transmission cooler line until a "click" is heard or felt (Fig. 2).

(3) Slide dust cap down the transmission cooler line and snap it over the quick connect fitting until it is fully seated and rotates freely (Fig. 2). 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.

TRANS COOLER

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

(1) Remove electric cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(2) Position cooling fan out of the way.

(3) Using Tool 8875A, disconnect transmission cooler tube from the transmission cooler (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE).

(4) Remove the transmission cooler mounting bolts.

(5) Remove transmission cooler from vehicle.

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 cooler (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE).

(4) Install electric cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).