

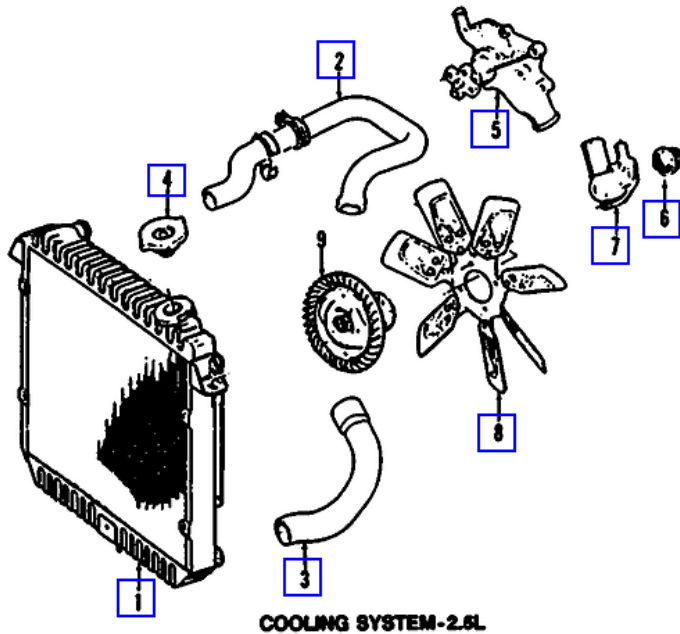
Component Procedures: Cooling System

Table of Contents

1. Exploded Parts Diagram (itype_83)
2. Parts and Labor (itype_189)
3. Components (itype_392)
4. Adding Additional Coolant (Article 2047616)
5. Cleaning and Inspection (Article 2047617)
6. Coolant - Flushing (Article 2047618)
7. Coolant - Routine Level Check (Article 2047619)
8. Coolant - Service Level Check (Article 2047620)
9. Cooling System - Draining and Filling (Article 2047621)
10. Cooling System - Reverse Flushing (Article 2047615)
11. Capacities (itype_30)
12. Fluid Types (itype_31)
13. Fluid Types and Capacities (itype_436)
14. Mechanical (including Torque) (itype_28)
15. Pressure, Vacuum and Temperature (itype_29)
16. Description of On-Board Diagnostics (Article 2047493)
17. Component Tests (Article 2047496)
18. Cooling System Aeration (Article 2047495)
19. Cooling System Deaeration (Article 2047494)
20. Cooling System Flow Check (Article 2047488)
21. Cooling System Leak Checks (Article 2047484)
22. Initial Inspection (Preliminary Checks) (Article 2047608)
23. Diagnosis By Symptom (Article 2036358)
24. Electrical / Mechanical Repair (itype_413)

Component Procedures: Cooling System

Exploded Parts Diagram (itype_83)

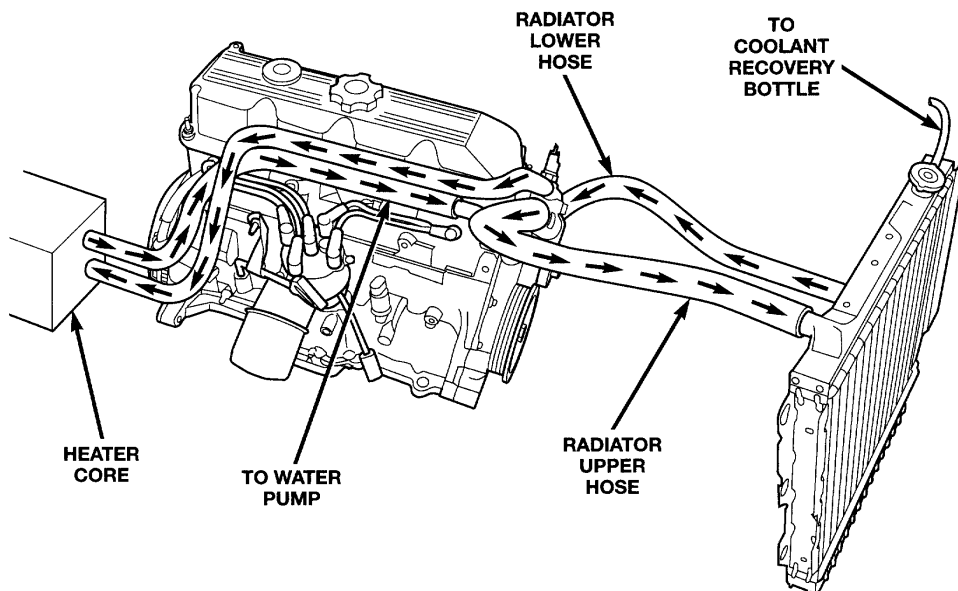


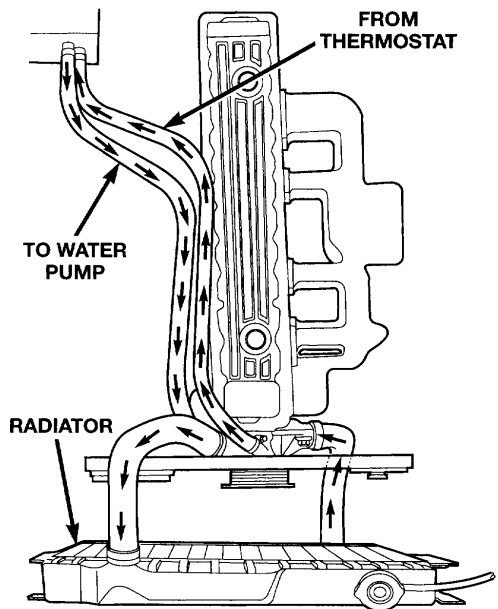
Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Service or Charge	Cooling System, Service	C	1.3	0.0
Diagnose/Test	Cooling System Pressure, Test	C	0.3	0.0

Components (itype_392)





Adding Additional Coolant (Article 2047616)

COOLANT-ADDING ADDITIONAL

Do not remove
radiator cap

to add coolant to system. When adding coolant to maintain correct level, do so at
coolant reserve

/overflow tank. Use a 50/50 mixture of ethylene-glycol antifreeze containing low mineral content water. Remove
radiator

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

Cleaning and Inspection (Article 2047617)

RADIATOR

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

Coolant - Flushing (Article 2047618)

COOLING SYSTEM

CAUTION:

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

radiator

or hoses.

Drain cooling system and refill with water. Run engine with

radiator cap

installed until

upper radiator hose

is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine and

drain system. Repeat until water drains clean.

Coolant - Routine Level Check (Article 2047619)

COOLANT LEVEL-ROUTINE CHECK

NOTE:

Do not remove

radiator cap

for routine coolant level inspections. The coolant level can be checked at

coolant reserve
/overflow tank.

The coolant reserve/overflow system provides a quick visual method for determining coolant level without removing radiator pressure cap

. With engine idling and at normal operating temperature, observe coolant level in reserve/overflow tank. The coolant level should be between ADD and FULL marks.

Coolant - Service Level Check (Article 2047620)

SERVICE COOLANT LEVEL

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

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

When vehicle servicing requires a coolant level check in radiator, drain several ounces of coolant from radiator drain cock. Do this while observing coolant reserve

/overflow system tank. The coolant level in reserve/overflow tank should drop slightly. If not, inspect for a leak between radiator and coolant reserve/overflow system connection. Remove radiator cap

. The coolant level should be to top of radiator. If not and if coolant level in reserve/overflow tank is at ADD mark, check for:

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

Cooling System - Draining and Filling (Article 2047621)

Non Standards

- Draining (2047622)
- Refilling (2047623)

Cooling System - Reverse Flushing (Article 2047615)

COOLING SYSTEM

-REVERSE FLUSHING

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

Reverse Flushing

Radiator

Disconnect the radiator hose

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

CAUTION:

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

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

Reverse Flushing Engine

Drain the cooling system. Remove the thermostat housing

and

thermostat

. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the

water pump

. Attach a lead away hose to the water pump inlet fitting.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water.

When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing and install thermostat. Install the thermostat housing with a replacement gasket. Connect the radiator hoses.

Refill the cooling system with the correct antifreeze/water mixture.

Capacities (itype_30)

Coolant 9.3 liters (9.8 quarts)

NOTES:

- Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerances and refill procedures.

- Capacities shown include vehicles with air conditioning and/or heavy-duty cooling system

s.

Fluid Types (itype_31)

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%, year round, in all climates.

If percentage is lower than 44%, 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% 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.

100 Percent Ethylene-Glycol Should Not Be Used

Use of 100 Percent Ethylene-Glycol will cause formation of additive deposits in the system, as the corrosive inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise 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 % ethylene-glycol freezes at 22° C (-8° F).

Propylene-Glycol Formulations Should Not Be Used

Propylene-glycol formulations do not meet the required specifications.

It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32° C (-26° F), 5 degrees 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 and freeze up. Propylene-Glycol also has a poorer heat transfer characteristics than ethylene-glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-Glycol/Ethylene-Glycol Mixtures Should Not Be Used

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

CAUTION:

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

Fluid Types and Capacities (itype_436)

Fluid Types

Capacities

Mechanical (including Torque) (itype_28)

DESCRIPTION	TORQUE
Auto. Trans. Auxiliary Oil Cooler	
Mtg. Screws	2 N-m (18in. lbs.)
Block Heater	
Mounting Screw	4 N-m (20 in. lbs.)
Condenser-to-Radiator	
Screws	6 N-m (55 in. lbs.)
Electric Cooling Fan	
Mtg. Screws	3 N-m (31 in. lbs.)
Fan Blade Assy to Viscous Fan Drive	
Bolts	24 N-m (18 ft. lbs.)
Fan Shroud (2.5L Engine)	
Mounting Bolts	3 N-m (31 in. lbs.)
Fan Shroud (4.0L Engine)	
Screws	3 N-m (31 in. lbs.)
Generator Pivot	
Bolt	38 N-m (28 ft. lbs.)
Generator Rear Adj.	
Bolt	27 N-m (20 ft. lbs.)
Isolator-to-Crossmember	
Nuts	10 N-m (86 in. lbs.)
Isolator-to-Radiator	
Nuts	5 N-m (47 in. lbs.)
Radiator (4.0L Engine)	
Mounting Bolts	8 N-m (6 ft. lbs.)
Radiator (2.5L Engine)	
Mounting Bolts	6 N-m (55 in. lbs.)
Thermostat Housing	
Bolts	20 N-m (15 ft. lbs.)
Viscous Fan Drive Assy. to Water Pump or Hub Bearing	
Nuts	27 N-m (20 ft. lbs.)
Water Pump	
Bolts	23 N-m (17 ft. lbs.)

Pressure, Vacuum and Temperature (itype_29)

THERMOSTAT

TEMPERATURE OPERATING RANGE:

Opening Temperature 195°F

Full Open Temperature 219°F

Description of On-Board Diagnostics (Article 2047493)

COOLING SYSTEM

RELATED DIAGNOSTICS

The Powertrain Control Module (PCM)

has been programmed to monitor the certain following cooling system components:

^ If the engine has remained cool for too long a period, such as with a stuck open thermostat

, a Diagnostic Trouble Code (DTC)

can be set.

^ If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan

, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicate an actual problem, a DTC is stored.

The DTC will be stored in the PCM memory for eventual display to the service technician..

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, refer to Powertrain Management for proper procedures.

Component Tests (Article 2047496)

Non Standards

- Drive Belt Diagnosis Table (2047500)

Cooling System Aeration (Article 2047495)

COOLANT-LOW LEVEL AERATION

If the coolant level in

radiator

drops below top of radiator core tubes, air will enter

cooling system

.

Low coolant level can cause thermostat

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

Cooling System Deaeration (Article 2047494)

COOLING SYSTEM DEAERATION

As the engine operates, any air trapped in cooling system gathers under the radiator cap

. The next time the engine is operated, thermal expansion of coolant will push any trapped air past radiator cap into the coolant reserve

/overflow tank. Here it escapes to the atmosphere into the tank. When the engine cools down the coolant, it will be drawn from the reserve/ overflow tank into the radiator to replace any removed air.

Cooling System Flow Check (Article 2047488)

RADIATOR COOLANT FLOW CHECK

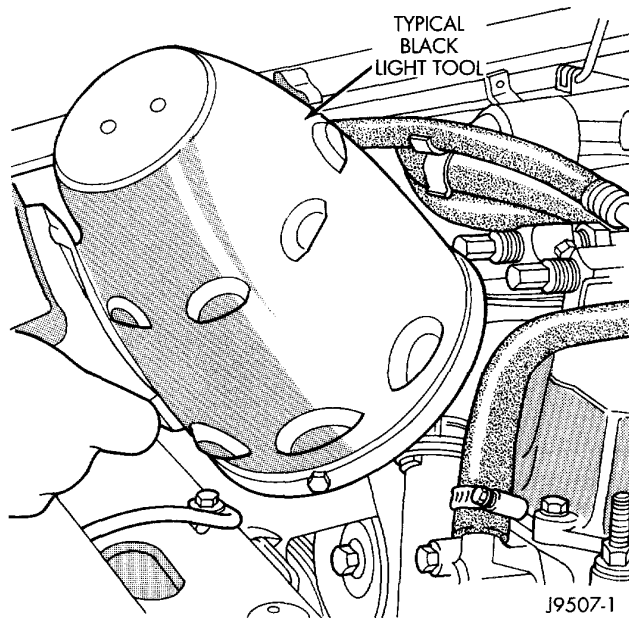
The following procedure will determine if coolant is flowing through the cooling system

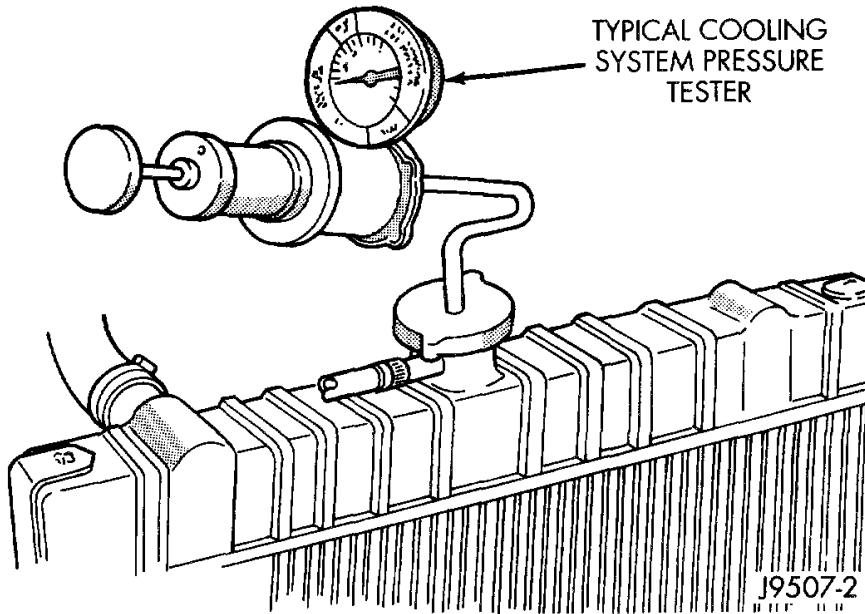
. If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose

. If hose is hot, the thermostat

is open and water is circulating through cooling system.

Cooling System Leak Checks (Article 2047484)





Initial Inspection (Preliminary Checks) (Article 2047608)

ENGINE COOLING SYSTEM OVERHEATING

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

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

Driving techniques that avoid overheating are:

- ^ Idle with A/C off when temperature gauge is at end of normal range.
- ^ Increasing engine speed for more air flow is recommended.

TRAILER TOWING

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

AIR CONDITIONING; ADD-ON OR AFTER MARKET

These models are equipped with a "heavy duty" cooling system and therefore will accommodate add-on or aftermarket air conditioning. No modifications are necessary to the cooling system.

RECENT SERVICE OR ACCIDENT REPAIR:

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

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

NOTE:

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

Diagnosis By Symptom (Article 2036358)

Non Standards

- ** Symptom Charts (2047536)

