

Engine Cooling Systems

COOLING SYSTEM TROUBLE SHOOTING

CONDITION & POSSIBLE CAUSE

<p>Engine Overheats With No Coolant Loss</p> <ul style="list-style-type: none"> • Low coolant level. • Thermostat stuck closed. • Faulty fan clutch. • Water distribution tube clogged. • Radiator air flow passages blocked. • Incorrect coolant concentration. <p>Engine Overheats With External Coolant Loss</p> <ul style="list-style-type: none"> • Broken or slipping fan belt. • Thermostat stuck closed. • Water pump shaft broken. • Leaking freeze plug(s). • Faulty fan clutch. • Faulty radiator pressure cap. • Water distribution tube clogged. <p>Engine Overheats With Internal Coolant Leakage</p> <ul style="list-style-type: none"> • Cracked or warped intake manifold. • Blown cylinder head gasket. • Warped cylinder head or block. • Cracked cylinder head or block. <p>Engine Fails to Reach Normal Operating Temperature</p> <ul style="list-style-type: none"> • Thermostat stuck in open position. • Temperature gauge or light may be defective. • Faulty temperature sending unit. 	<p>Poor Circulation of Coolant</p> <ul style="list-style-type: none"> • Plugged or restricted radiator. • Cylinder head or block water passages clogged or restricted. • Collapsed lower radiator hose. • Faulty water pump. <p>Excessive Foaming in Radiator</p> <ul style="list-style-type: none"> • Incorrect coolant concentration (system must be flushed). <p>Coolant Recovery System Inoperative</p> <ul style="list-style-type: none"> • Low coolant level. • Leak in system. • Radiator pressure cap loose or defective. • Overflow tube clogged or leaking. • Recovery bottle vent plugged. <p>No Coolant Flow Through Heater Core</p> <ul style="list-style-type: none"> • Plugged return pipe in water pump. • Heater hose collapsed or plugged. • Plugged heater core. • Plugged thermostat housing outlet. • Heater bypass hole in cylinder head plugged. • Faulty water valve. <p>Noise</p> <ul style="list-style-type: none"> • Fan contacting shroud. • Loose water pump impeller. • Dry fan belt. • Rough surface on drive pulley. • Water pump bearing worn. • Improper alignment of fan belts.
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GENERAL COOLING SYSTEM SERVICING

DESCRIPTION

The basic liquid cooling system consists of a radiator, water pump, thermostat, cooling fan, pressure cap, heater (if equipped), various connecting hoses, and cooling passages in the block and cylinder head. In addition, many cars use a fan clutch, which may incorporate a thermostatic control, or a flexible fan blade, or both, to reduce noise and power requirements at higher engine speeds. Some models, with exhaust emission control, use a thermostatic vacuum switch to advance ignition timing in the event of overheating. As most newer models require the use of a permanent (ethylene glycol) type anti-freeze, year round. Coolant recovery systems are being used more commonly to prevent coolant loss.

MAINTENANCE

DRAINING

Remove radiator cap, open heater control valve to maximum heat position (if equipped), open drain cocks or remove plugs in bottom of radiator and in engine block. In-line engines usually have one plug or cock, while V-engines will have two, one in each bank of cylinders.

CLEANING

A good cleaning compound will remove most rust and scale. Follow manufacturer's instructions in the use of the cleaner. If

GENERAL COOLING SYSTEM SERVICING (Cont.)

considerable rust and scale will have to be removed, flushing will be necessary. Also, clean radiator air passages by blowing out with compressed air from back to front of radiator.

FLUSHING

Back flushing is a very effective means of removing rust and scale from a cooling system. For best results, the radiator, engine, and heater core should be flushed separately. To flush radiator, connect flushing gun to water outlet of radiator and disconnect water inlet hose. Use a leadaway hose, connected to radiator inlet, to prevent flooding the engine. Use air in short bursts only as a clogged radiator could be easily damaged. Continue flushing until water runs clear. To flush engine, first remove thermostat and replace housing. Connect flushing gun to water outlet of engine. Disconnect heater hoses from engine. Flush using short air bursts until water runs clean. Flush heater core as described for radiator. Make sure heater valve is set to maximum heat position before flushing heater.

REFILLING

Engine should be running while refilling cooling system to prevent air from being trapped in the engine block. After system is full, continue running engine until thermostat is open, then recheck fill level. Do not overfill system. Refer to appropriate article for correct cooling system capacity.

THERMOSTAT

Visually inspect thermostat for corrosion and proper sealing. If this is satisfactory, suspend a thermometer and thermostat in a container of water (AMC recommends 100% anti-freeze). See Fig. 1.

Do not allow either thermostat or thermometer to touch bottom of container as this concentration of heat could cause an incorrect reading. Heat water until thermostat just begins to open.

NOTE — AMC recommends placing a .003" feeler gauge between thermostat valve and seat. When valve begins to open, feeler gauge will slip out easily.

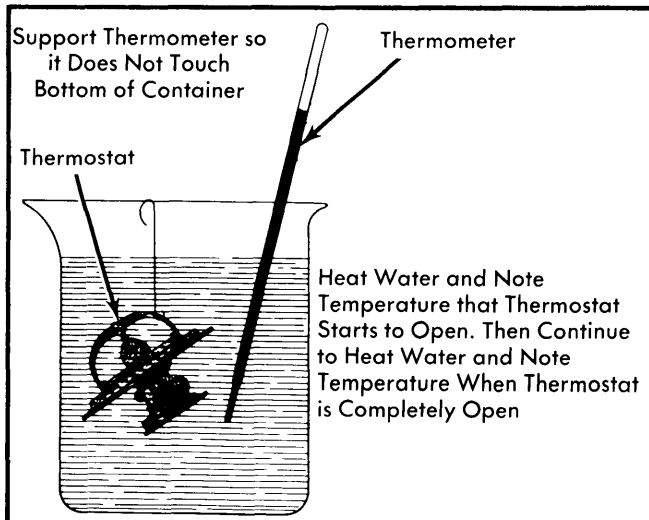


Fig. 1 Thermostat Test

Read temperature on thermometer. This is the initial opening temperature and should be within specifications. Continue heating water until thermostat is fully open and note temperature. This is the fully opened temperature. If either reading is outside of specifications, replace thermostat, as it is not adjustable.

PRESSURE TESTING

A pressure testing tool is used to test both radiator cap and complete cooling system. Test as follows, following tool manufacturer's instructions.

Radiator Cap — Visually inspect radiator cap, dip cap in water and connect to tester. Pump tester to bring pressure to upper limit of cap specifications. If cap fails to hold pressure within specifications, replace cap.

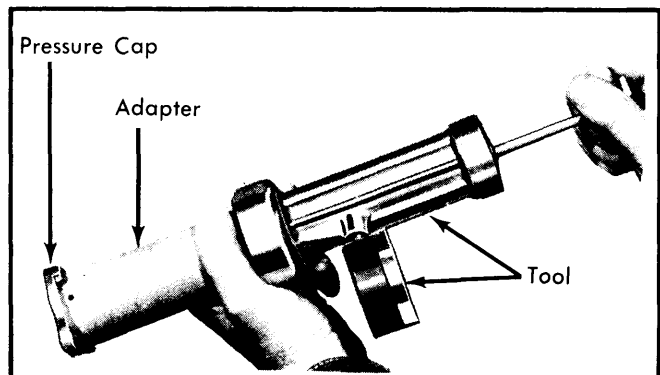


Fig. 2 Testing Pressure Cap

Cooling System — With engine not running, wipe radiator filler neck seat clean. Fill radiator to correct level. Attach tester to radiator and pump until pressure is at upper limit of radiator rating. If pressure drops, inspect for external leaks. If no leaks are apparent, detach tester and run engine until normal operating temperature is obtained. Reattach tester and

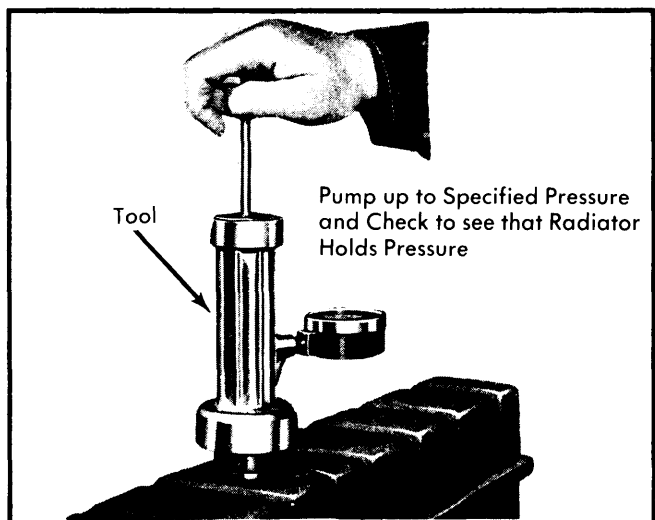


Fig. 3 Pressure Testing Cooling System

Engine Cooling Systems

GENERAL COOLING SYSTEM SERVICING (Cont.)

pump to about seven psi. Race engine, if needle on dial fluctuates it indicates a combustion leak.

CAUTION — Pressure may build up fast. Release any excess pressure above the upper limit of pressure cap specifications or cooling system damage may result.

If needle does not fluctuate, race engine a few more times and check for water at tail pipe. Excessive water would indicate a faulty head gasket, cracked block or cylinder head near ex-

haust ports. Next, remove oil dipstick and if water globules appear in the oil, a serious internal leak is indicated.

ANTI-FREEZE CONCENTRATION

Test anti-freeze concentration using a suitable anti-freeze tester. The tester should have a temperature compensating feature, as failing to take temperature into consideration could cause an error as large as 30°F. Follow tester manufacturer's instructions for correct use of tester.

COOLANT RECOVERY SYSTEMS

American Motors
Chrysler Corp.
Ford Motor Co.
General Motors

DESCRIPTION

A coolant recovery system differs from other cooling systems in that an overflow bottle is connected to the radiator overflow hose. The overflow bottle is transparent or translucent to permit checking of coolant level without removing radiator cap. No adjustment or test is required except keeping vent hole or hose clean and checking pressure relief of radiator cap.

OPERATION

As coolant temperature rises and pressure in system exceeds pressure relief valve of radiator cap, due to expansion of coolant, excess coolant flows into overflow bottle. As engine cools and coolant contracts, vacuum is formed in system, drawing coolant, stored in overflow bottle, back into radiator. As a result, in a properly maintained cooling system, the only coolant losses will be through evaporation.

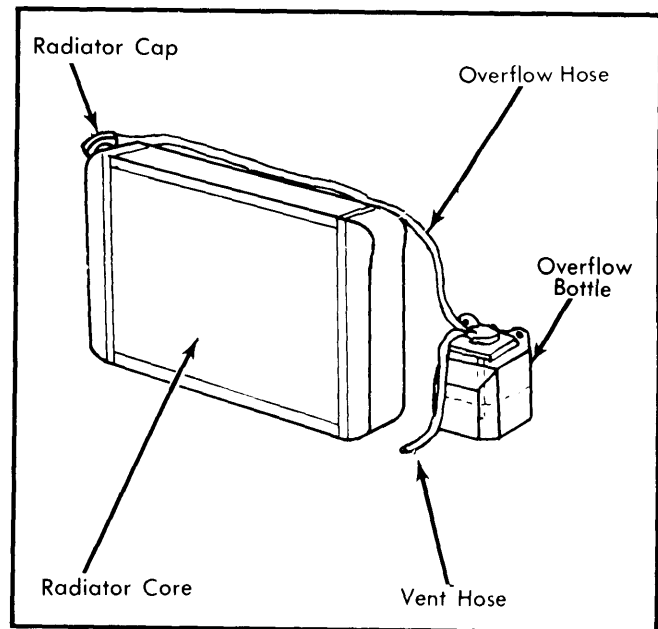


Fig. 4 Coolant Recovery System

THERMOSTATICALLY CONTROLLED ELECTRIC FAN

Chrysler Corp.
Horizon
Omni

DESCRIPTION

The electrically-driven fan is actuated by the radiator fan switch, which automatically shuts off fan motor when it is not needed (on Non-A/C vehicles). On air conditioned vehicles, the switch shuts off the fan when air conditioning is turned off, turns it on when the system is operating.

The 14-inch, 6-bladed fan is driven by either a 5 ampere electric motor (Non A/C) or a 10 ampere motor (A/C vehicles).

The motor runs only when the coolant temperature at the radiator fan switch reaches 193-207° F or whenever the air conditioner is operating. The motor also shuts off when the ignition switch is turned off, regardless of coolant temperature.

TESTING

If fan is not operating properly, disconnect fan motor wire connector, and connect it with 14 gauge wire to a good 12-volt

battery. If fan runs, motor is all right, indicating either car battery may be at fault, radiator fan switch is defective, or electric fan relay (A/C vehicles only) may be inoperative. If fan motor does not run when connected directly to a good battery, replace fan motor.

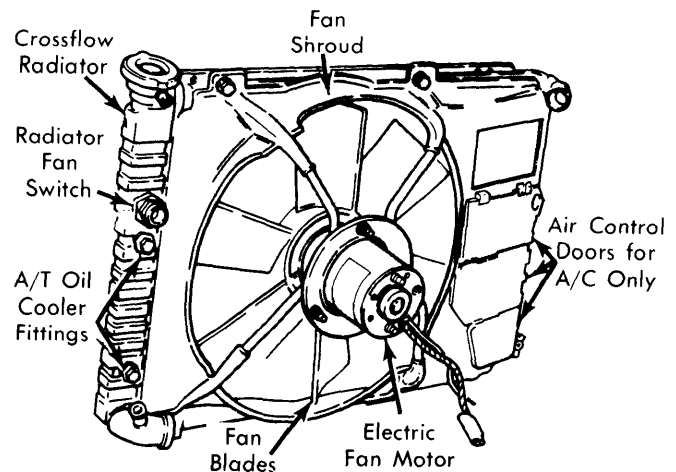


Fig. 5 Thermostatically Controlled Electric Fan