

GENERAL COOLING SYSTEM SERVICING

DESCRIPTION

The basic liquid cooling system consists of a radiator, water pump, thermostat, cooling fan, pressure cap, heater, if equipped, and 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 blade fan, or both, to reduce noise and power requirements at high engine speeds. Some models, with exhaust emission control, use a thermostatic vacuum switch to advance ignition timing in the event of overheating. As most new models require the use of a permanent, year round (ethylene glycol) type anti-freeze, 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 2, 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 considerable rust and scale will have to be removed, flushing will be necessary. Clean radiator air passages by blowing out with compressed air from back to front of radiator.

FLUSHING

1) 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.

2) 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.

3) 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 engine block. After system is full, continue running engine until thermostat is open, then recheck fill level. Do not overfill system. Refer to *Cooling System Capacity tables*, in this section, for correct fill level.

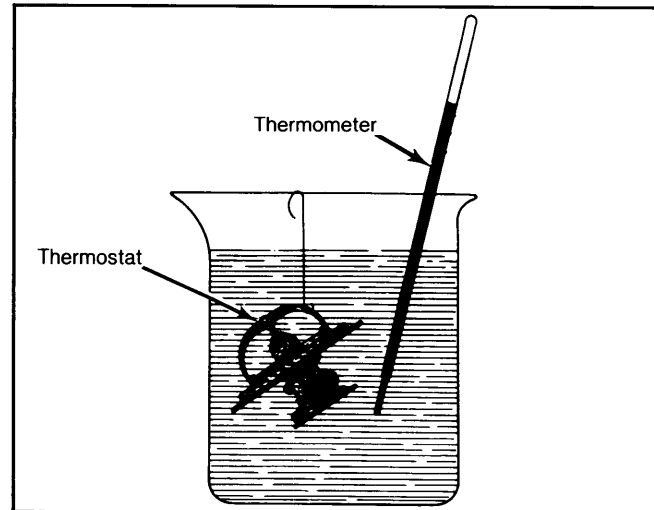
TESTING

THERMOSTAT

Visually inspect thermostat for corrosion and proper sealing. If this is satisfactory, suspend thermostat

and a thermometer in a container of water. 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. If thermostat does not open, replace.

Fig. 1: Testing Thermostat



Thermostat should open as water is heated.

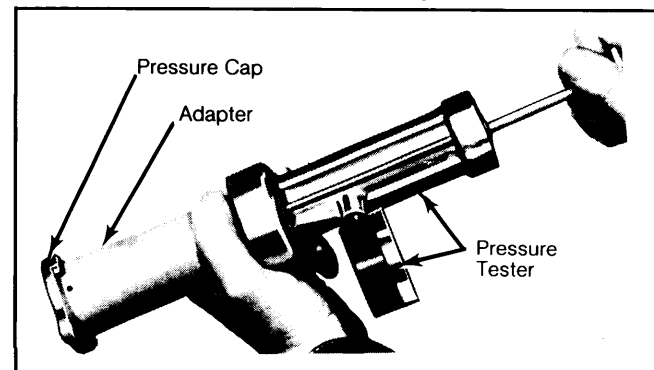
PRESSURE TESTING

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

Radiator Cap

Visually inspect radiator cap, dip in water and connect to tester. Pump tester to bring pressure to upper limit of cap specification. *Pressure cap specifications are given in appropriate manufacturer's article in this section.* If cap fails to hold pressure within given specification, replace cap.

Fig. 2: Testing Radiator Pressure Cap



Attach cap to tester and apply pressure.

Cooling System

1) With engine stopped, wipe radiator filler neck seat clean. Fill radiator to correct level. Attach cooling system tester to radiator and pump until pressure is at upper level of radiator rating. If pressure drops, inspect for internal leaks.

2) If no leaks are apparent, detach tester and run engine until normal operating temperature is reached. Reattach tester and pump until pressure reaches approxi-

Engine Cooling Systems

GENERAL COOLING SYSTEM SERVICING (Cont.)

mately 7 psi (.5 kg/cm²). Race engine. If needle on tester fluctuates, it indicates a combustion leak.

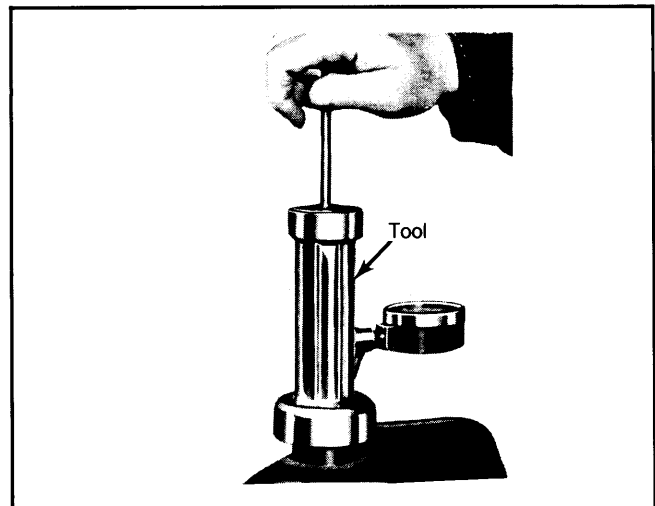
NOTE: Pressure may build up quickly. Release any pressure above the limit of pressure cap specifications or cooling system damage may result.

3) If needle does not fluctuate, race engine a few more times and check for water at tailpipe. Excessive water would indicate a faulty head gasket, cracked block or cylinder head near exhaust ports. Remove oil dipstick and if water globules appear in the oil, a serious internal leak is indicated.

ANTI-FREEZE CONCENTRATION

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

Fig. 3: Pressure Testing Cooling System



Be sure tester has a temperature compensating feature.

COOLANT RECOVERY SYSTEMS

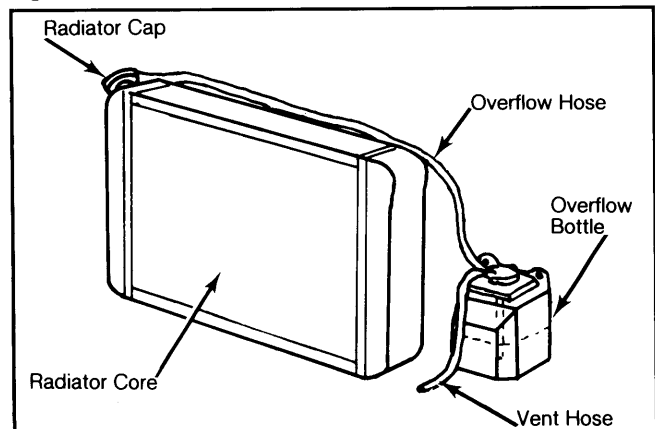
DESCRIPTION

A coolant recovery system differs from a normal cooling system 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 beyond 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, 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. In a properly maintained cooling system, the only coolant losses will be through evaporation.

Fig. 1: Coolant Recovery System



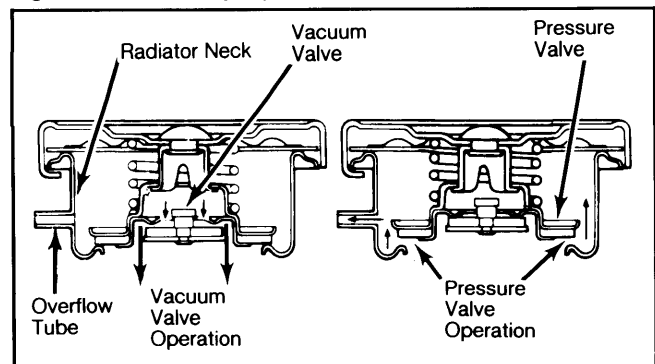
System should eliminate loss of coolant.

RADIATOR CAPS

DESCRIPTION

The radiator cap consists of a pressure valve and a vacuum valve. The cap has several different functions: It prevents coolant loss when vehicle is in motion; prevents impurities from entering cooling system minimizing corrosion; allows atmospheric pressure to eliminate the vacuum that occurs in system during cooldown; and raises coolant boiling point approximately 2°F per psi of pressure by maintaining a constant cooling system pressure. For radiator cap testing specifications, see appropriate manufacturer's article in this section.

Fig. 1: Radiator Cap Operation



Cap should maintain constant cooling pressure in system.