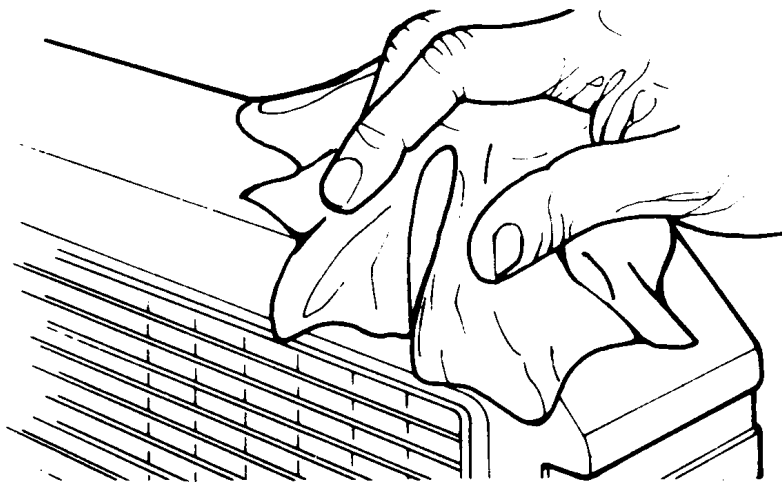




HOW - TO AUTO COOLING SYSTEM



Tool And Material Checklist

- | | |
|--|---|
| <input type="checkbox"/> Thick Cloth | <input type="checkbox"/> Flushing Kit |
| <input type="checkbox"/> Screwdriver | <input type="checkbox"/> Garden Hose |
| <input type="checkbox"/> Pliers | <input type="checkbox"/> Putty Knife or Scraper |
| <input type="checkbox"/> Utility Knife | <input type="checkbox"/> Ratchet Wrench and |
| <input type="checkbox"/> Drain Pan | Sockets |
| <input type="checkbox"/> Gasket Sealer | <input type="checkbox"/> Antifreeze |
| <input type="checkbox"/> Hydrometer | <input type="checkbox"/> Clamps |
| <input type="checkbox"/> Pressure Tester | |

** This How-To Guide is designed as a general overview of a vehicle repair procedure. You should always refer to a service manual designed for your vehicle for detailed instructions. Parts Plus assumes no liability for an incorrect procedure.*

When you realize that temperatures inside your engine routinely exceed 400° F, it's obvious that cooling system maintenance is a must in order to avoid serious and costly engine damage. Most cars overheat because their owners do not take the time to do the simple periodic maintenance the cooling system needs. The procedures in this booklet will show you how easy it is to keep your car's cooling system in top condition.

RELIEVING RADIATOR PRESSURE

There are three methods of relieving radiator pressure, depending on the type of cap used. **Never attempt to remove any type of cap while the engine is operating.** Doing so could damage the cooling system and engine and result in serious personal injury from hot coolant or steam being blown out. Turn off the engine and wait until it is completely cool.

1. If the cap has a pushbutton or lever, push the button or lift the lever to depressurize the system. When the sound of air escaping can no longer be heard, it is safe to remove the cap.

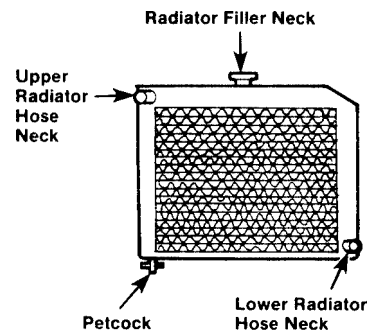
2. If the cap has no visible pressure release, wrap a thick cloth around it and turn it slowly to the first stop. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, press down on the cap with the cloth and turn counterclockwise to remove it.

3. If the cap is a swivel type, relieve pressure by turning the top. The top twists while the valve assembly beneath remains stationary. When pressure is relieved, press down on the cap to remove it.

REPLACING HOSES

Carefully check all radiator and heater hoses at least once each year. Replace hoses when they are worn, cracked, or even partially split. Also, change a hose that feels mushy or brittle when squeezed firmly. To replace a hose, proceed as follows:

1. Drain the cooling system by removing the radiator cap (as previously explained) and loosening the petcock or removing the lower radiator hose.



Petcock location

2. Loosen the clamps and slide them out of the way.
3. If possible, twist and pull the hose. If it is stuck, cut 4" or 5" slit lengthwise from the end and use a screwdriver to pry it off.
4. Clean off the metal connection with a wire brush and coat the surface with sealing compound.
5. Slip a new clamp on each end of the hose.
6. Position the hose on fittings. Remember that the lower radiator hose must be the wire-reinforced type.
7. Slide the clamps into position about 1" from the end of the hose. Tighten securely.
8. Refill the cooling system and replace the radiator cap.
9. Run the engine and check for leaks.

COOLANT CHECK

A hydrometer is used to determine the coolant's freezing point. If the freezing point is not adequate, drain off some solution and replace it with pure, undiluted antifreeze. The table below details the amount of solution that must be drained off and replaced with pure antifreeze

Cooling System Capacity (Qts)	Quarts to Drain and Replace if Hydrometer Reading Is		
	10° F*	0° F	-10° F
10	3	2-1/2	2
12	4	3	2
14	5	3-1/2	2-1/2
16	5-1/2	4	3
18	6	4-1/2	3
20	7	5	3-1/2

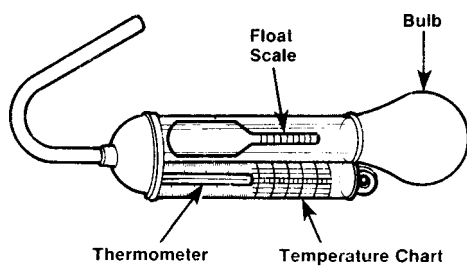
* If hydrometer reads more than 10° F, drain the entire system and replace with a 50:50 solution of coolant and water

to lower the freezing point to -34°F , which will provide more than adequate protection in cold climates. Cooling system capacity can be found in your owner's manual.

1. For best results, operate the engine with the radiator cap loose until the engine reaches normal operating temperature; then remove the cap.

2. Measure the coolant temperature by drawing a sample into the tubes; then return the sample to the radiator. Repeat this step several times until the thermometer reading is stable.

3. Holding the hydrometer in a straight, vertical position, squeeze the bulb and pull enough coolant into the glass tubes to raise the hydrometer float. Make sure

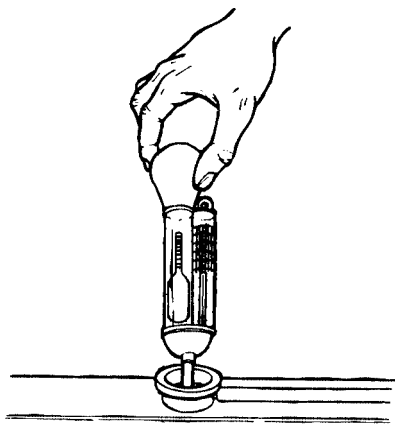


Typical hydrometer

that the float does not touch the sides of the large tube.

4. Note the top letter touched by the coolant on the float scale; then return this sample to the radiator.

5. Refer to the freezing temperature chart above the thermometer. Find the letter noted in the previous step,



Checking the coolant temperature

along with the thermometer reading taken in Step 2. The number found at this location is the degree of freezing protection provided.

6. After adding coolant, let the engine run for five minutes to allow the coolant to mix before checking the freezing point.

PRESSURE CHECK

Test the cooling system for leakage with a pressure tester. Perform this test before draining the coolant, or after replacing any hoses to make sure the system is holding pressure.

1. Loosen the radiator cap and run the engine until it reaches its normal operating temperature. Be especially careful if your car has electric cooling fans; they turn on between 200°F , thus causing a boil-over if the cap is off.

2. Turn off the engine. Slowly remove the cap.

3. Install the special pressure cap over the radiator filler neck, making sure that the cap has seated fully and is tight.

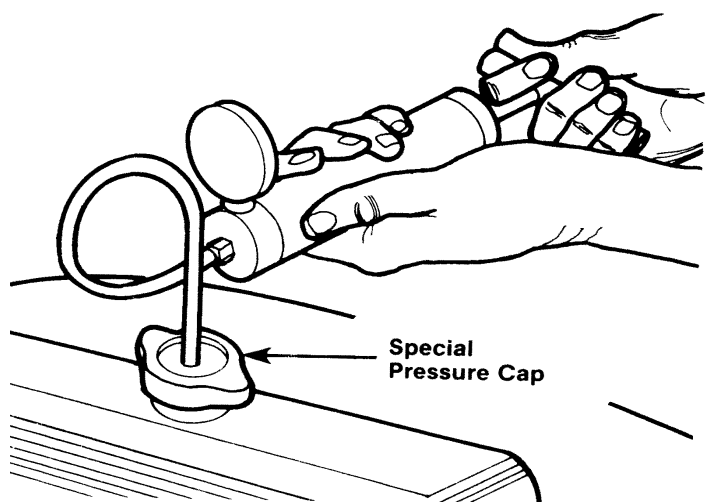
4. With the hand pump, pressurize the system to the amount specified by the manufacturer or the amount stamped on the pressure cap. Usually a system that holds 15 psi is pressure-tight.

5. If the reading on the pump gauge remains stable, with little or no pressure loss, the system has no excessive leakage. If the gauge indicates a sharp or gradual pressure loss, a leak exists.

6. To locate the leak, keep the pressure in the system up to specification using the hand pump. Check carefully for external coolant leakage.

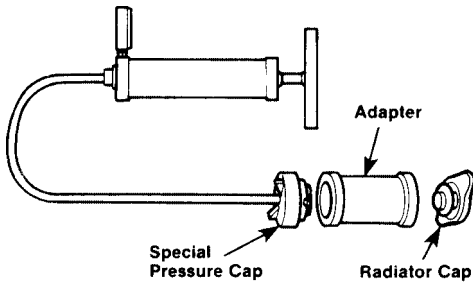
7. Tighten, repair, or replace leaking parts until the test gauge holds the specified pressure.

8. If no external leak is found, the leak may originate from inside the engine. Have the car checked further by a mechanic.



Making a pressure check

The pressure tester can also be used to check the pressure rating and operation of the radiator cap as follows:



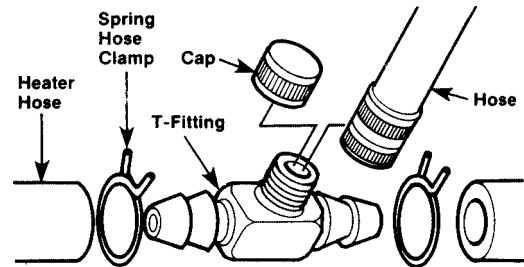
Using an adapter with a pressure tester

1. Attach the special pressure cap to the correct adapter. If the wrong adapter is used, the test results will not be accurate.
2. Connect the special cap assembly, attached to the tester's hose, to the adapter. Connect the other end of the adapter to the radiator cap.
3. Operate the hand pump until the gauge reads the same as the cap's rating.
4. A good cap will hold the pressure at or slightly below the cap's rating for at least 30 seconds; then the pressure might decrease slowly.
5. If the pressure drops too quickly, or if no pressure can be built up, the blow-off valve in the cap is defective. Replace the cap.
6. If the gauge reading does not drop off at all, continue to apply pressure until the cap vents. If the cap does not vent, or vents at a pressure more than 1 psi above its rating, replace the cap.

FLUSHING THE COOLING SYSTEM

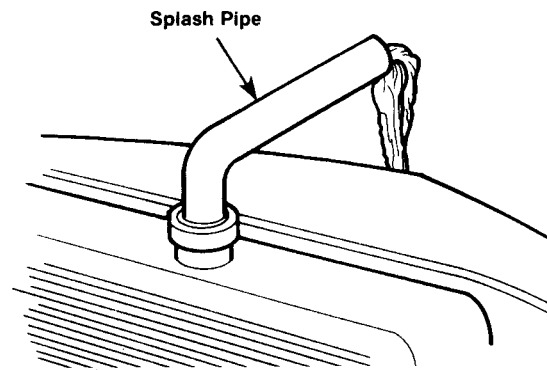
Most carmakers recommend flushing the cooling system every 2 years or 24,000 miles, but doing it once a year is best. This is because the antitrust compound and other additives in antifreeze lose most of their effectiveness within a year. The safest and most practical way to flush the system is to use a flushing kit. This eliminates the need for opening the drain plugs of a hot engine and possibly getting burned. The kit takes about 5 minutes to install and, once installed, it remains in place for future use. To install a flushing kit:

1. Release the pressure at the radiator cap.
2. Locate the heater hose that runs from the firewall to the engine block. There are two such hoses: one to the water pump, the other to the engine block.
3. After making sure you have the right hose, cut it near the firewall using a sharp utility knife.
4. Slide a hose clamp on the end of each cut piece.
5. Insert the T-fitting, provided in the kit, between the two cut pieces. Make sure it fits snugly.



Installing a T-fitting

6. Slide the hose clamps into position, and then tighten them.
7. Remove the radiator cap and insert the splash pipe into the neck.
8. Turn on the dashboard heater control so that the heater is flushed clean also.
9. Screw a garden hose on the T-fitting.
10. Turn on the water full blast and let it run until the water coming out of the splash pipe is clear.
11. Turn off the water and disconnect the hose at the T-fitting. Do not screw the cap on yet.



Flushing the system

12. Remove the splash pipe from the radiator and pour the correct amount of antifreeze into the system; this amount should equal half the system's capacity (listed in the owner's manual). The antifreeze displaces half the water, which then flows out at the T-fitting, resulting in a 50/50 mixture.

13. Screw the cap on the T-fitting.

14. Start the engine; let it run, then turn it off after it reaches its normal operating temperature.

15. Check the coolant level; it should be within 1" of the neck. If more coolant is needed, add pure antifreeze; then replace the radiator cap.

16. Be sure to add a 50/50 mixture of antifreeze and water to the expansion tank.

SERVICING THE THERMOSTAT

The thermostat controls the flow of coolant between the engine block and the radiator. When the engine is cold, the thermostat prevents the flow of coolant to the radiator, thus permitting it to heat up more rapidly. As the engine warms up, it opens, allowing the coolant to flow to the radiator. The thermostat is usually located on the engine block at the top front of the engine.

To make an in-system check of the operation of the thermostat, proceed as follows:

1. With the engine cold, remove the radiator cap. If the coolant level is low, add water to bring it up to the specified level.

2. Insert an accurate thermometer into the radiator filler neck. Again, watch for a boil-over if the car has electric cooling fans.

3. Start the engine and observe the thermometer while the engine is warming up.

4. Watch the coolant that is visible in the neck. As the thermostat opens, steam will rise from the coolant and begin to swirl around.

5. If the thermometer's temperature reading remained nearly the same as the engine warmed up, then rose rapidly to the rating of the thermostat as it opened, and finally remained stationary at this temperature, the thermostat is operating properly.

6. If the temperature on the thermometer was below or above the rating of the thermostat as it opened, the thermostat must be replaced.

7. If the temperature steadily rose as the engine warmed up, then remained stationary somewhere between 120° F and 150° F, the thermostat is either stuck wide open or is missing from the system. In either case, replace the thermostat.

To replace the thermostat:

1. Remove the radiator cap in the manner described earlier, and then loosen the petcock.

2. Drain at least 1 quart of coolant from the system. This lowers the coolant level in the engine block below the thermostat.

3. Tighten the petcock until it is snug.

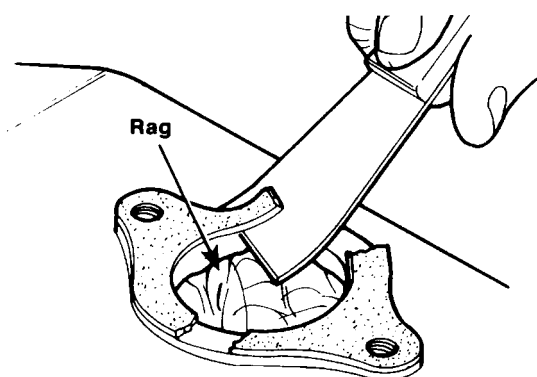
4. Remove the thermostat housing bolts, and then remove the thermostat housing. If it sticks, put a wood block against the housing and tap gently with a hammer until it comes loose.

5. Remove the thermostat and place a clean rag in the opening to keep dirt out.

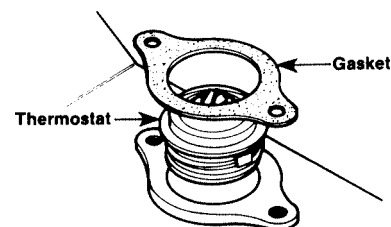
6. Scrape the old gasket and sealer off the engine block and thermostat housing. Remove the rag from the opening.

7. Make sure the new thermostat is rated at the temperature specified by the car's manufacturer.

8. Seat the new thermostat in position on the engine block. Make sure the spring side of the thermostat is pointing down into the engine.



Using a rag to keep dirt out of the engine block



Installing the new gasket

9. Coat both sides of the new gasket with gasket sealing compound for a leak-proof fit. Carefully place the gasket over the thermostat and the mounting surface of the engine block.

10. Place the thermostat housing on the gasket.

11. Install the two bolts and tighten. Do not over-tighten; this can damage the housing.

12. Clamp the upper radiator hose on the thermostat housing. The clamp should be tightened about 1" from the end of the hose.

13. Refill the system with a 50/50 mixture of water and antifreeze; reinstall the radiator cap.

14. Run the engine for 15 to 20 minutes; then check for leaks.

15. Turn off the engine and allow it to cool. Remove the radiator cap as described; recheck the coolant level; then reinstall the cap.