



# Alternative Cooling Systems

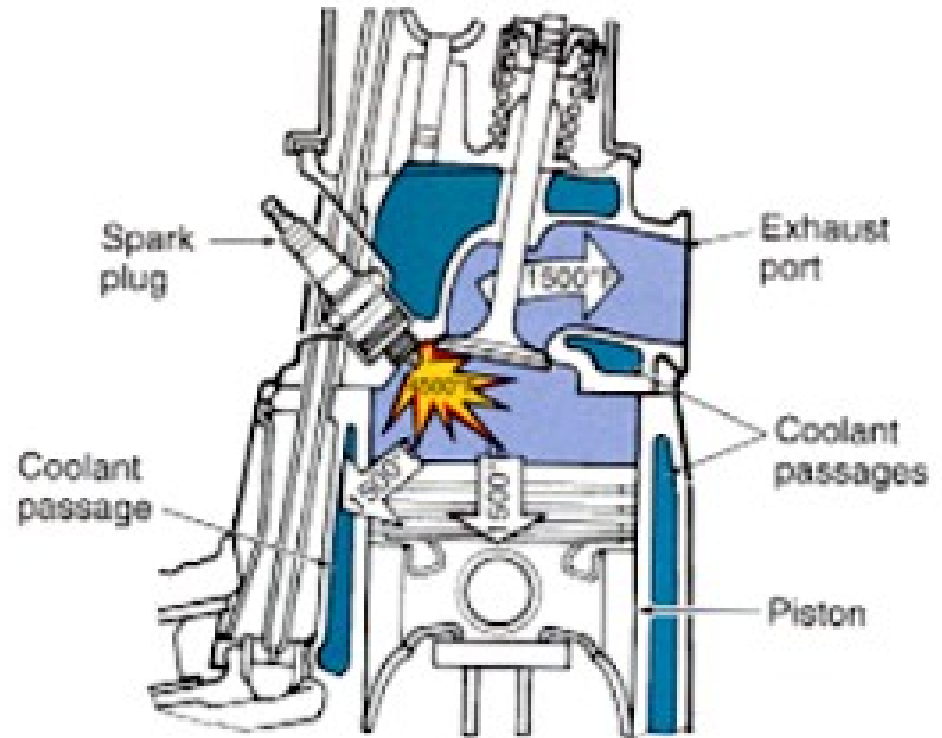


# AUTOMOTIVE COOLING SYSTEMS

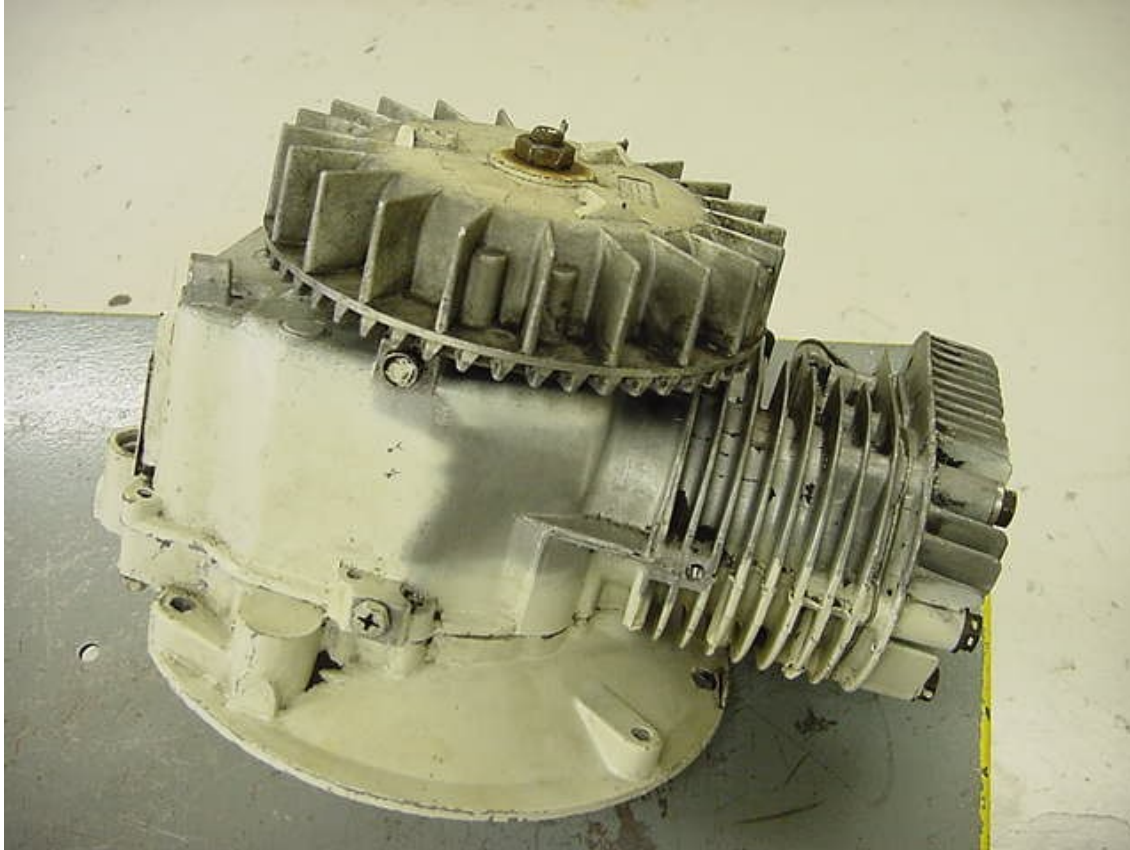


# Purpose of the Cooling system

- Control temperature of hot combustion.
- 4000 degree temps. could seriously damage engine parts.
- Provide Heat for passenger Compartment
- Cool Trans fluid & Oil
- Heat moves from warm to cold



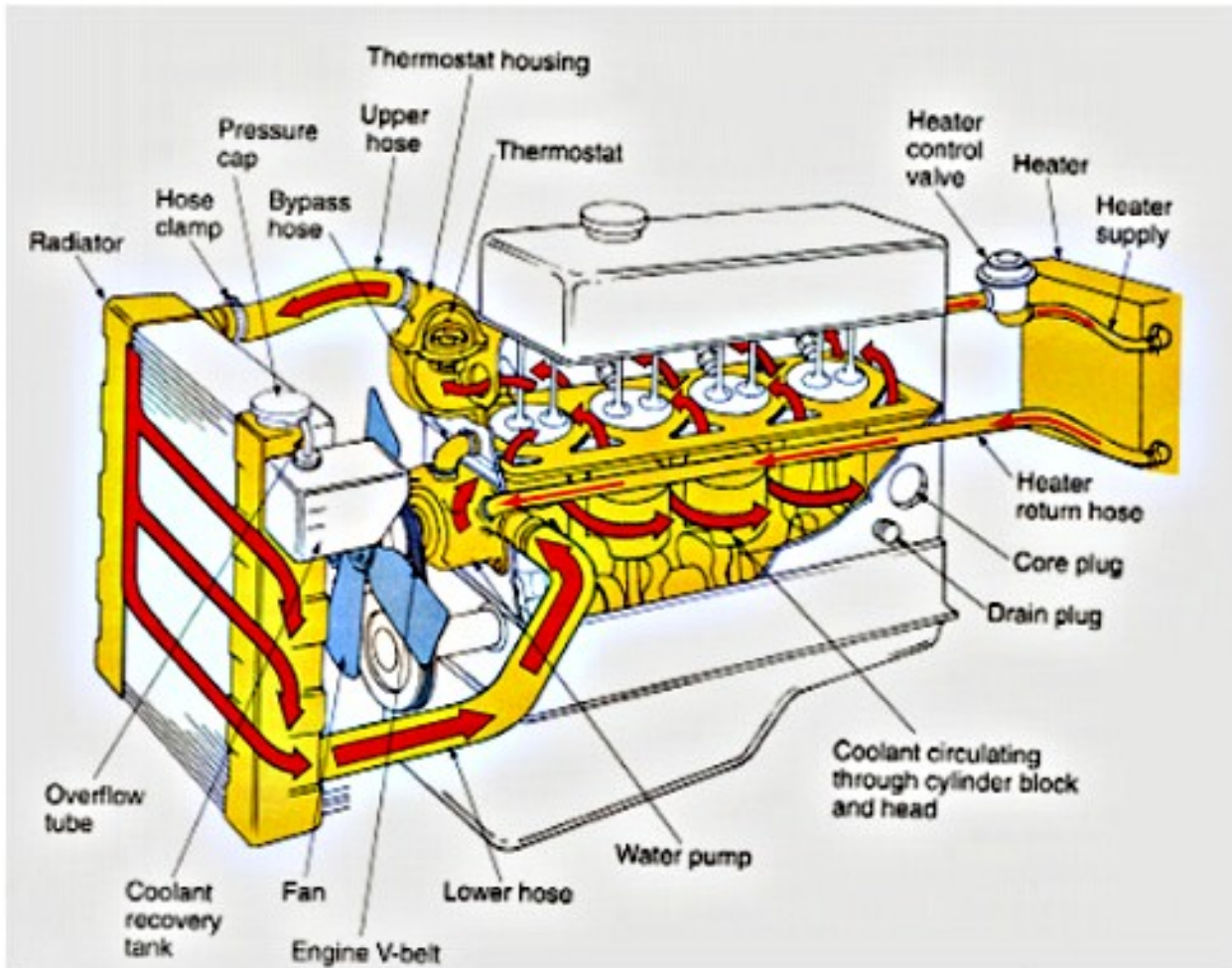
# Cooling System Types



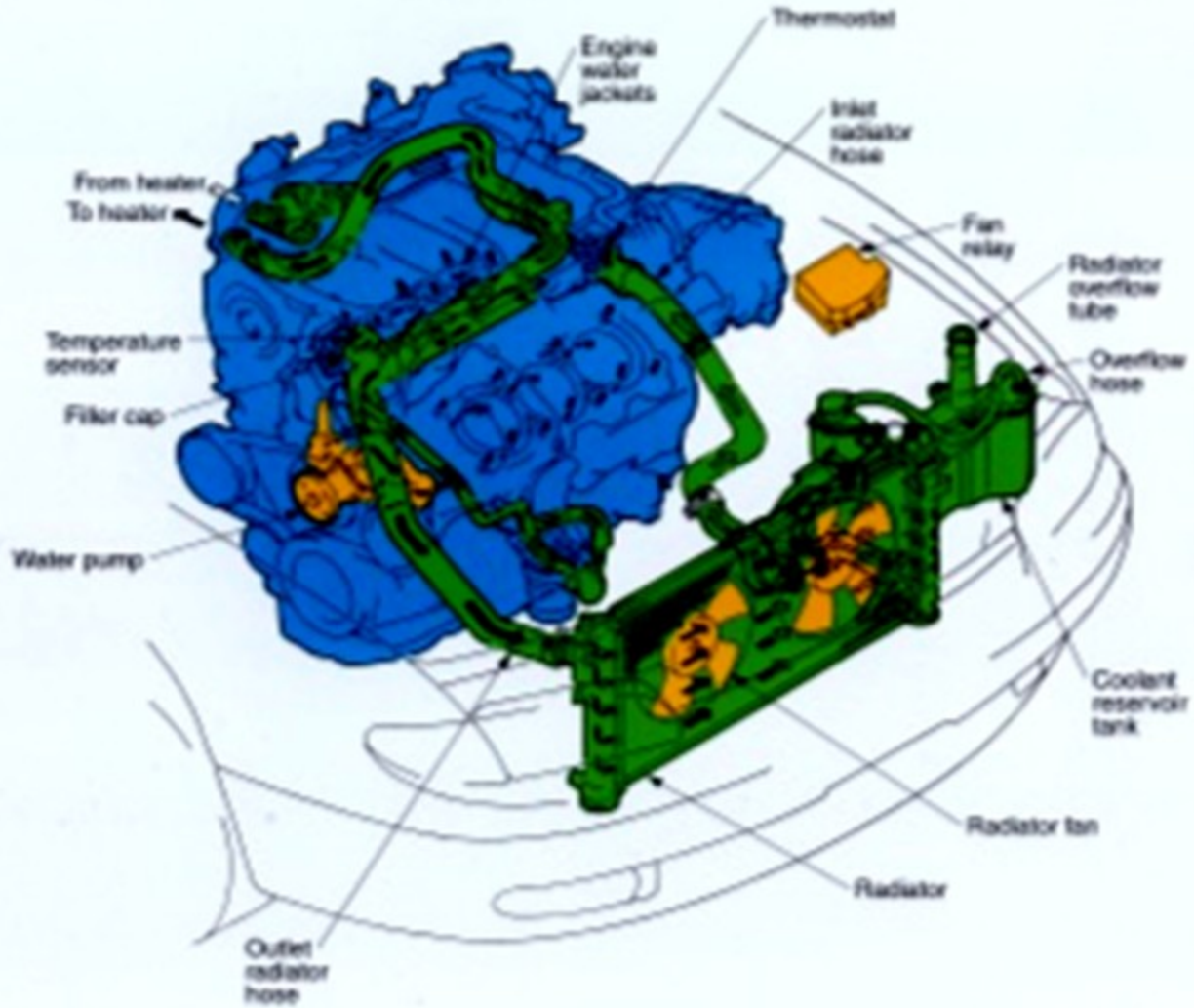
- Air Cooling
- Oil Cooling
- Liquid or Water Cooled



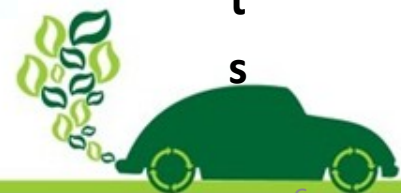
# Cooling System Parts



# Cooling System Components



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# Water Jackets



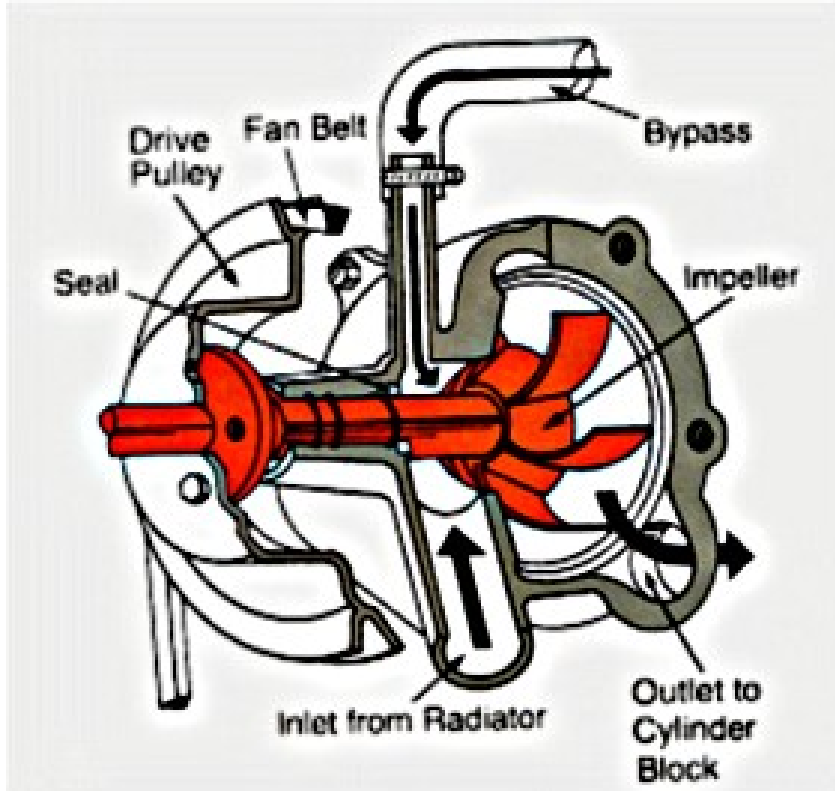
Surrounds the cylinders with water passage.

Absorbs heat from the cylinder wall.

Pump move water to radiator where heat is exchanged to the air.



# Water Pump



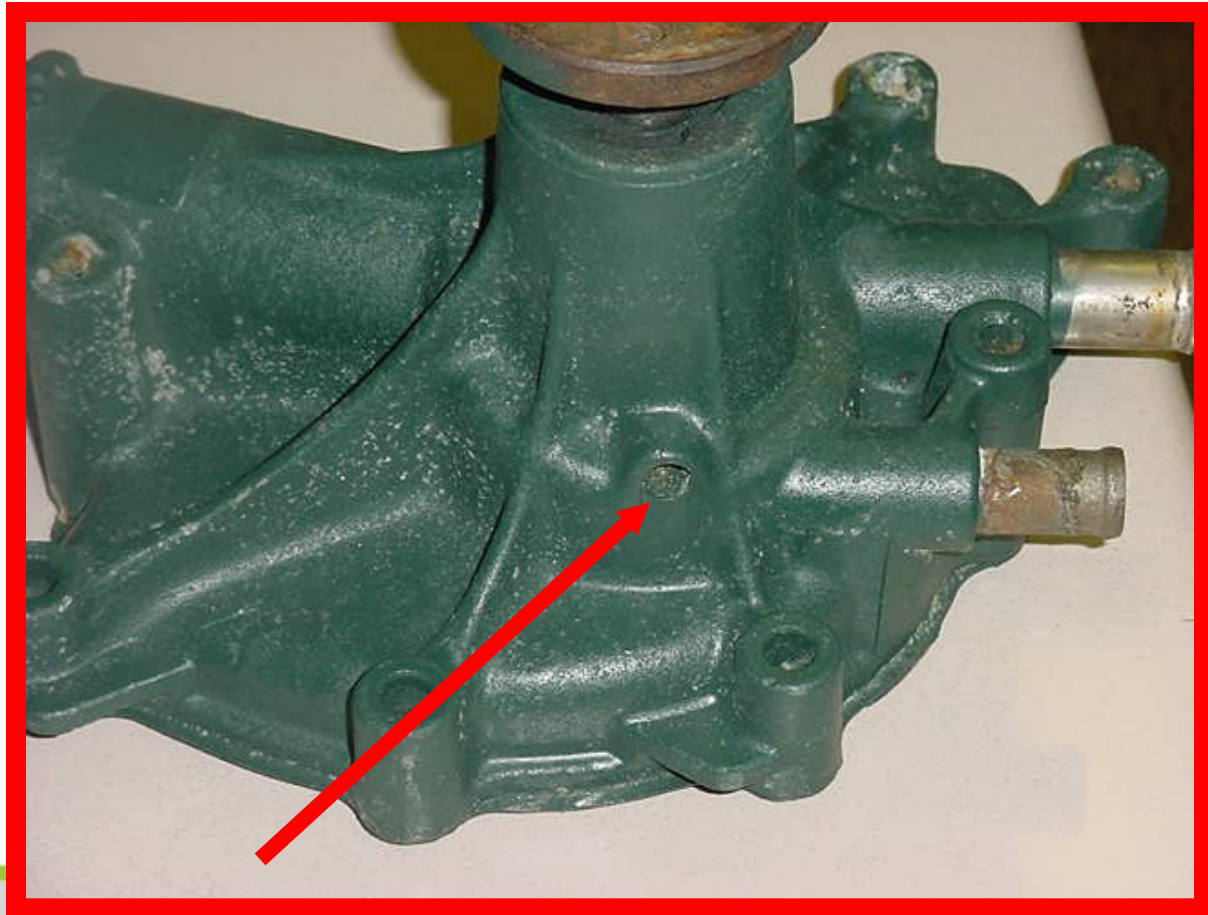
- Non-positive displacement pump which circulates coolant around cooling system.
- Simple impeller design.
- Usually driven by drive belt from crankshaft.



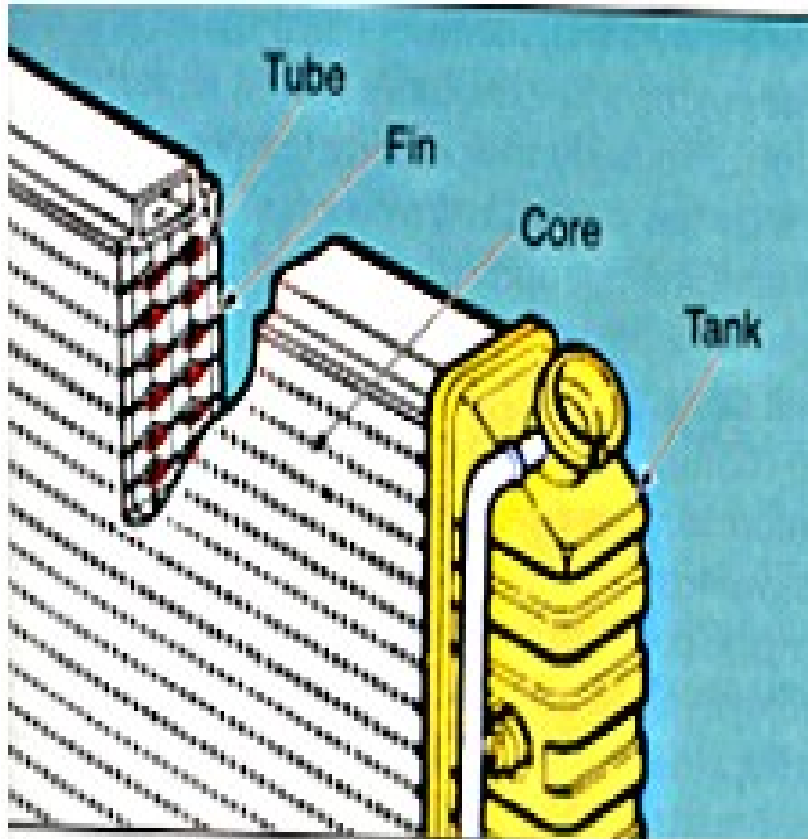


# Water Pump

- Leakage
  - Weep hole
- Noise
  - bearing



# Radiators



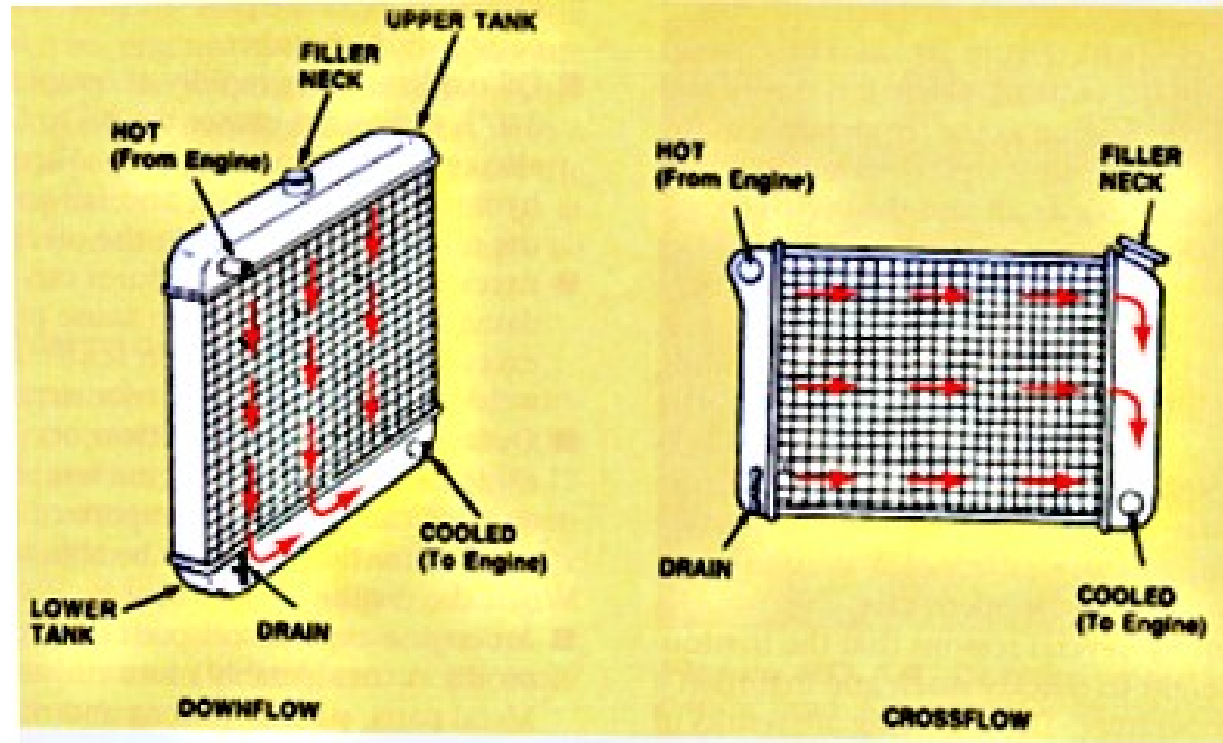
- A radiator is a heat exchanger.
- Tube and fin style the most popular.
- Made of copper and brass or aluminum and plastic.
- 3 (radiator, evaporator, heater core)



# Radiator Types

## Two types of radiator construction.

- Down-flow
  - older
- Cross-flow
  - Aerodynamic
  - Lower hood lines



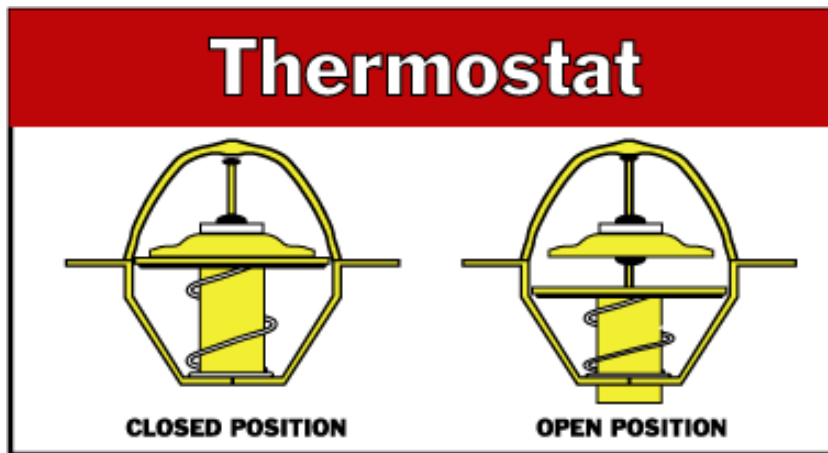
# Radiator Fans

- Keeps air moving through the radiator when the car is not moving.
- Several types:
- rigid,
- flex (not used much anymore),
- viscous clutch and
- electric.



# Thermostat

- Controls coolant temperature.
- Uses a temperature sensor and a valve.
- Usually opens around 195 degrees F.



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# Thermostat Failure

- If it fails in the open position engine runs cold. No heat, poor gas mileage, gunks up motor oil and engine insides.
- If it fails closed: look out! It creates pressure in the engine well beyond normal limits. Many types of damage may occur.



# Radiator Cap

- The cap allows access to the cooling system for filling and testing.
- The cap has two valves: a pressure relief valve set at around 15 PSI and a vacuum valve which is needed when the engine cools down.
- Raises boiling point of fluid
- Able to take on more heat



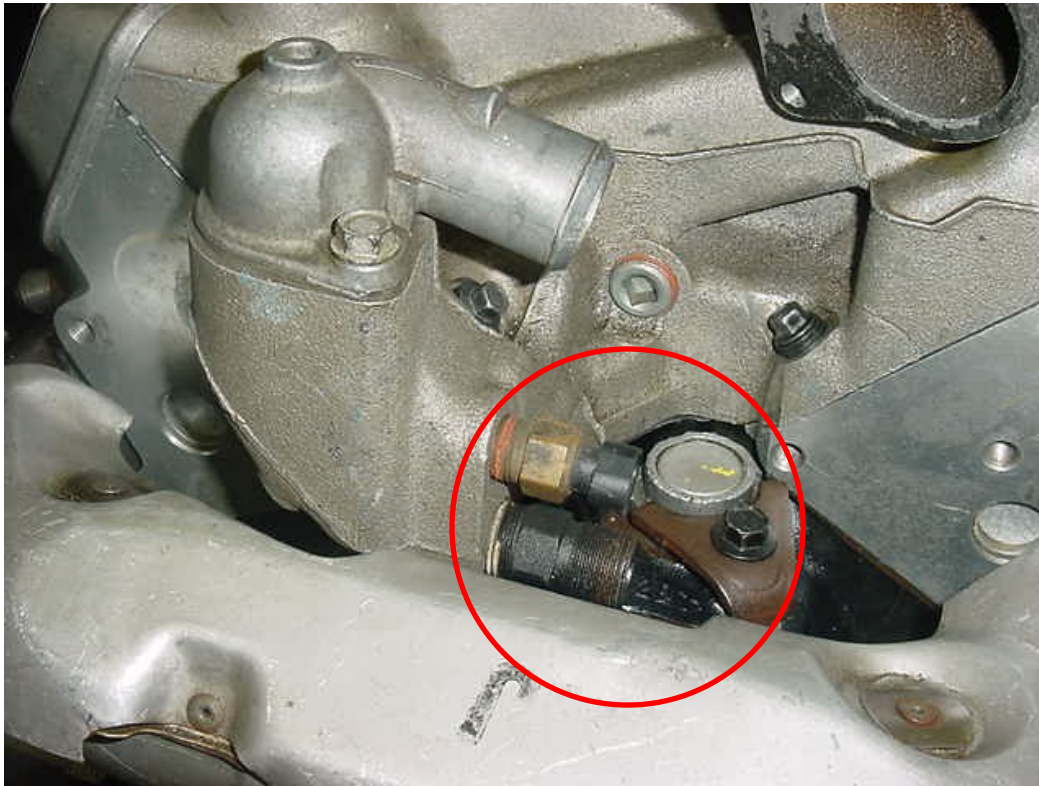
# Coolant Recovery Tank

- Keeps the coolant level full in the system at all times.
- Works in conjunction with the radiator cap.
- When the engine heats up the coolant expands and flows to the recovery tank.
- When the engine coolant the coolant contracts and creates a vacuum and draws the fluid back into the radiator.
- Reduces air in system
- Reduces rust
- Less need to open radiator





# Coolant Temperature Sensor (CTS)



- Reports to computer
- Gauges
- Location
  - Block
  - Head
  - Radiator tank



# Fan Shroud

- Causes the air to be channeled through the radiator. Making the radiator more efficient.
- Also provides safety from the spinning fan blades.



# Heater



- The hot water in the cooling system is used warm the passenger compartment.
- A small radiator called a *heater core* is located in the dash area.
- Heater hoses direct the hot water to and from it.



# Heating System



# Coolant



- Several types of anti-freeze available.
- Ethylene glycol most common. (*it's green*)
- Dexcool (*it's orange and lasts 5 years*)
- Propylene glycol (*non-toxic*)



# Coolant



- 50/50 mix
- Freeze protection -84 F
- Overheat protection 276 F
- Corrosion
- PH test 9.8 – 10.5

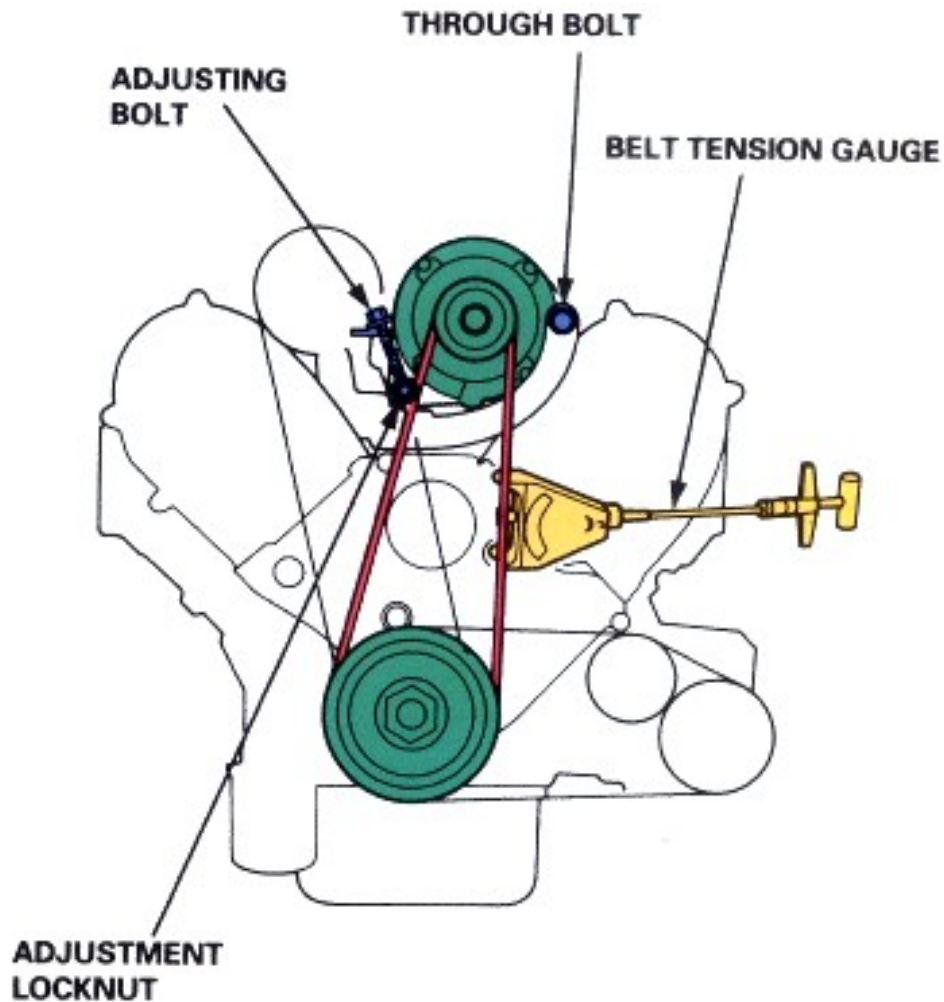


# Radiator Hoses & Heater Hoses

- The upper and lower radiator hoses direct the fluid from the engine to the radiator and back.
- Radiator hoses are a special part for each car.
  - Radiator
  - Heater
  - Bypass
- Heater hoses do the same for the heater core.
- Heater hoses are generic and come in  $\frac{1}{2}$ ",  $\frac{5}{8}$ ", and  $\frac{3}{4}$ " diameter sizes.



# Drive Belts



- V-Belts
- Serpentine Belts





# Alternative uses

- Cool oil
- Cool transmission fluid



# Cooling System Service

- System inspection
- Winterization
- Cooling system flushing



# Cooling System Inspection

- Check belt tension.
- Check belt condition.
- Check hose condition.
- Blow out radiator fins.
- Check thermostat.
- Check radiator fan.
- Check water pump.
- Check coolant level.
- Check anti-freeze protection.
- Check coolant condition.
- Check coolant pH.
- Leak check system.
- Check radiator cap.



# Winterize

- Term used by repair industry. It usually means a cooling inspection plus a coolant flush.



# Cooling System Flushing

- Manual drain and refill.
- Flushing using the *Flush and Fill* machine.
- Flush & Fill w/ Tee
- Recycling coolant.



# Replacing a Water Pump

- Drain cooling system
- Remove hoses
- Remove pump & GASKET
- Install new pump and gasket
- attach hoses and belts
- Refill and check system

