

Air Conditioning System:

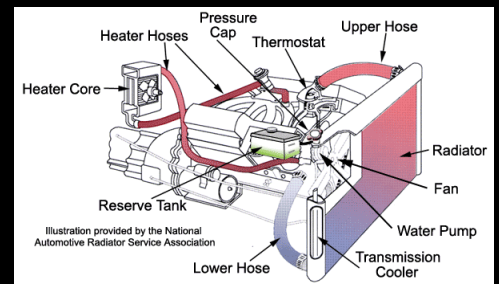
In the refrigeration cycle, heat is transported from the passenger compartment to the environment. A refrigerator is an example of such a system, as it transports the heat out of the interior and into its environment (i.e. the room).

Circulating refrigerant vapor enters the compressor (located in the engine bay) and is compressed to a higher pressure, resulting in a higher temperature as well. The hot, compressed refrigerant vapor is now at a temperature and pressure at which it can be condensed and is routed through a condenser, usually located in front of the car's radiator. Here the refrigerant is cooled by air flowing across the condenser coils and condensed into a liquid. Thus, the circulating refrigerant rejects heat from the system and the heat is carried away by the air.

The condensed and pressurized liquid refrigerant is next routed through an expansion valve where it undergoes an abrupt reduction in pressure. That pressure reduction results in flash evaporation of a part of the liquid refrigerant, lowering its temperature. The cold refrigerant is then routed through the evaporator which is located in the passenger compartment. The air (which is to be cooled) blows across the evaporator, causing the liquid part of the cold refrigerant mixture to evaporate as well, further lowering the temperature. The warm air is therefore cooled.

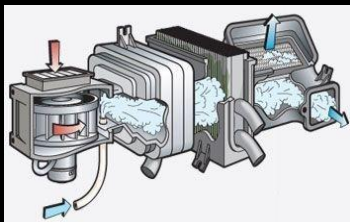
To complete the refrigeration cycle, the refrigerant vapor is routed back into the compressor. The compressor can be driven by the car's engine (e.g. via a belt) or by an electric motor.

Heater System: The internal combustion engine in most cars and trucks is cooled by a water and antifreeze mixture that is circulated through the engine and radiator by a water pump to enable the radiator to give off engine heat to the atmosphere. Some of that water can be diverted through the heater core to give some engine heat to the cabin.



A heater core is a small radiator, located under the dashboard of the vehicle and consists of conductive aluminum or brass tubing with cooling fins to increase surface area. Hot coolant passing through the heater core gives off heat before returning to the engine cooling circuit.

The fan for the vehicle's ventilation system forces air through the heater core to transfer heat from the coolant to the cabin air, which is directed into the vehicle through vents at various points.



HVAC Electrical System:

From the schematic above, you can see a very basic HVAC system. In today's era, they work with a very complex system to control the air conditioning and control the temperature inside of the cabin. This is possible due to the help of the electronic modules that continuously control the temperature automatically. In some cases, the temperature can be controlled manually.

The blower speed can be set to be automatic, depending on the temperature setting. This system is what is called an automatic HVAC System. The fan speed and temperature work together to maintain the temperature set by the driver.

Another variation of the HVAC system is the dual automatic temperature system. This allows passengers to have different temperature settings than the driver. This is made possible because the HVAC system box has 2 blend doors that are commanded separately from each other. This can also be set to be automatic.