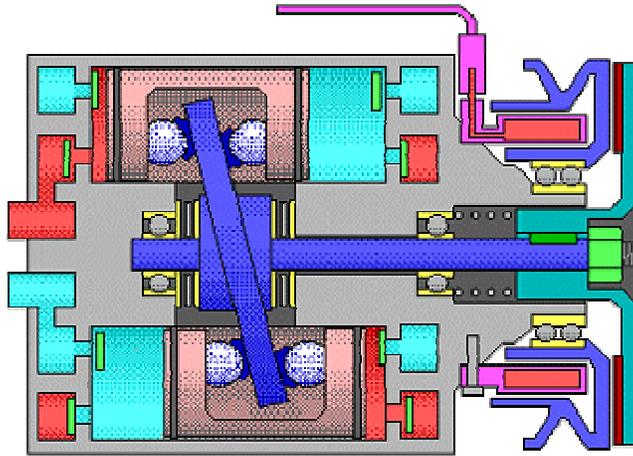


A/C Compressor Operation



Below is an overview of an A/C compressor and its operation

The Compressor

The compressor used to air condition your car works in a similar way to the one in the refrigerator in your kitchen. The job of the compressor is to move liquid refrigerant around in a pipe. The compressor pumps, or forces, the liquid from the evaporator into a condenser and expansion valve, and then back to the evaporator.

There are three common types of compressors:

- Two cylinder reciprocating piston type
- Four cylinder RADIAL type
- Six cylinder AXIAL type

The engine drives the compressor with a belt. In action, the compressor takes the low pressure refrigerant from the evaporator and compresses it according to speed and air temperature. The inlet side is known as the low (pressure) side and the outlet side is known as the high (pressure) side.

The compressor compresses the refrigerant, and raises its temperature higher than that of the surrounding air. Then, the compressor forces the refrigerant into the condenser.

Compressor Clutch

The air conditioning compressor has an electromagnetic clutch that can engage or disengage the compressor pulley. The compressor pulley always turns when the

engine is running, but the compressor only runs when the pulley is engaged to the compressor driving shaft.

When this system is activated, current runs through the electromagnetic coil. The current attracts it to the armature plate. The strong magnetic pull draws the armature plate against the side of the turning pulley. This locks the pulley and the armature plate together; the armature plate drives the compressor.

When the system is deactivated, and current stops running through the electromagnetic coil, flat springs pull the armature plate away from the pulley.

The magnetic coil does not turn since its magnetism is transmitted through the pulley to the armature. The armature plate and hub assembly are fastened to the compressor drive shaft. When it's not driving the compressor, the clutch pulley turns on a double row of ball bearings.

AC Compressor Drive Ring

Inside the air conditioner's refrigerant compressor is a drive ring made of a friction material that is mounted to both sides of the "swash" or "wobble" plate. As the swash plate rotates, the friction material pushes the ball bearings (mounted to the pistons) back and forth.

The Condenser

The condenser is a long tube that goes back and forth through a multitude of cooling fins, quite similar to the evaporator in structure. The condenser is mounted in front of the radiator to take advantage of the forced air provided by the fan and the motion of the car.

As the highly pressurized refrigerant (vapor) flows into the condenser, it gives off heat and warms the condenser. This causes the condenser to be hotter than the forced air coming through the condenser. The condenser hands its heat off to the forced air and turns the refrigerant back into cool liquid in the expansion valve, where it heads back to the evaporator.

The Evaporator

The evaporator is a long tube, or coil, that goes back and forth through a multitude of cooling fins. It is quite similar to the condenser in structure.

The refrigerant is a liquid when it enters the evaporator. A fan blows warm air over the evaporator. The warm air causes the liquid refrigerant to boil. This means that it absorbs the heat from the warm air. Once it has absorbed the heat from the warm air, the warm air isn't warm anymore. The same blower that blows the warm air (that is now "cool" air) over the evaporator, keeps on blowing it into the interior of your car, and you have -- air conditioning!

The evaporator also removes the moisture from the air coming through its fins and turns it into water. The water just drains off.

The temperature of the evaporator coil can go from 33 degrees F to 0 degrees F. If it goes below 32 degrees F, the moisture that's supposed to drain off the coils will freeze. This makes for a very (surprise!) inefficient system, so a thermostatic switch is used to connect and disconnect it to the compressor as necessary.

Expansion Valve

The expansion valve determines the correct amount of refrigerant going into the evaporator, and it lowers the pressure of the refrigerant.

When the compressor starts, the expansion valve opens and the liquid refrigerant flows through a strainer in the high pressure liquid inlet. Once in the expansion valve, the refrigerant is correctly pressurized. As the evaporator calls for more refrigerant, the expansion valve allows the required amount of low pressure liquid refrigerant into the coils.

The expansion valve maintains the delicate balance between the heat load and the cooling efficiency of the evaporator.

Discharge/Suction Service Valves

Discharge and suction service valves allow the air conditioning system to be emptied and filled. These valves also provide places where the system can be checked with pressure gauges.

Note: Some systems use a Schrader valve in place of the discharge and suction valves. This is a spring-loaded valve which looks rather like the valve in a tire.

The Compressor Relay

A capillary tube from a cycling switch lets the switch know what the temperature is in the evaporator. This switch turns the compressor on and off to keep the evaporator temperature at about 32 to 45 degrees F. The relay switch keeps moisture from freezing on the evaporator core.

Electric Air Conditioning Fan

Sometimes an extra electric fan is placed in front of the condenser to provide an extra flow of air during warm weather, or for times when the car has to idle for a long time. You activate and deactivate the air conditioning fan when you turn it on and off at the control panel.

Compressor Belt

The compressor is engine driven by a belt on the front of the crankshaft.