

Automotive Air Conditioning systems

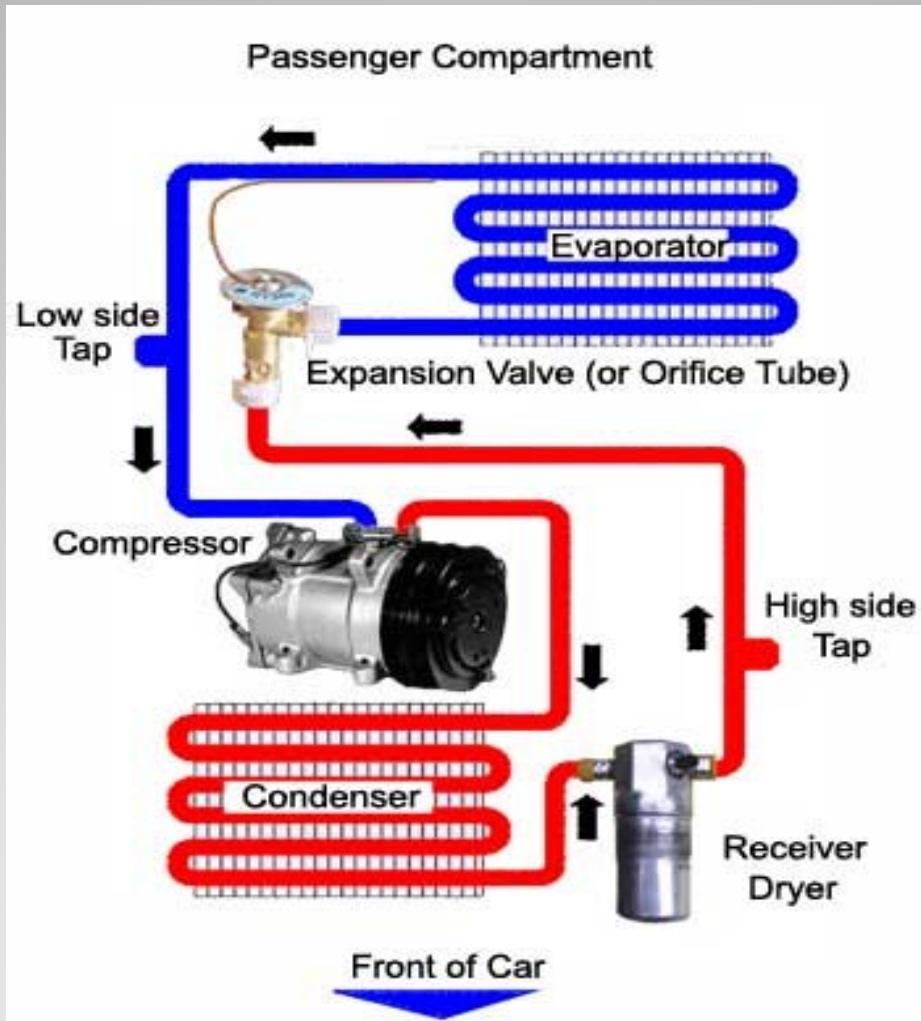
Basic understanding of the system,
the components and the roles they play.

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Understanding the system.

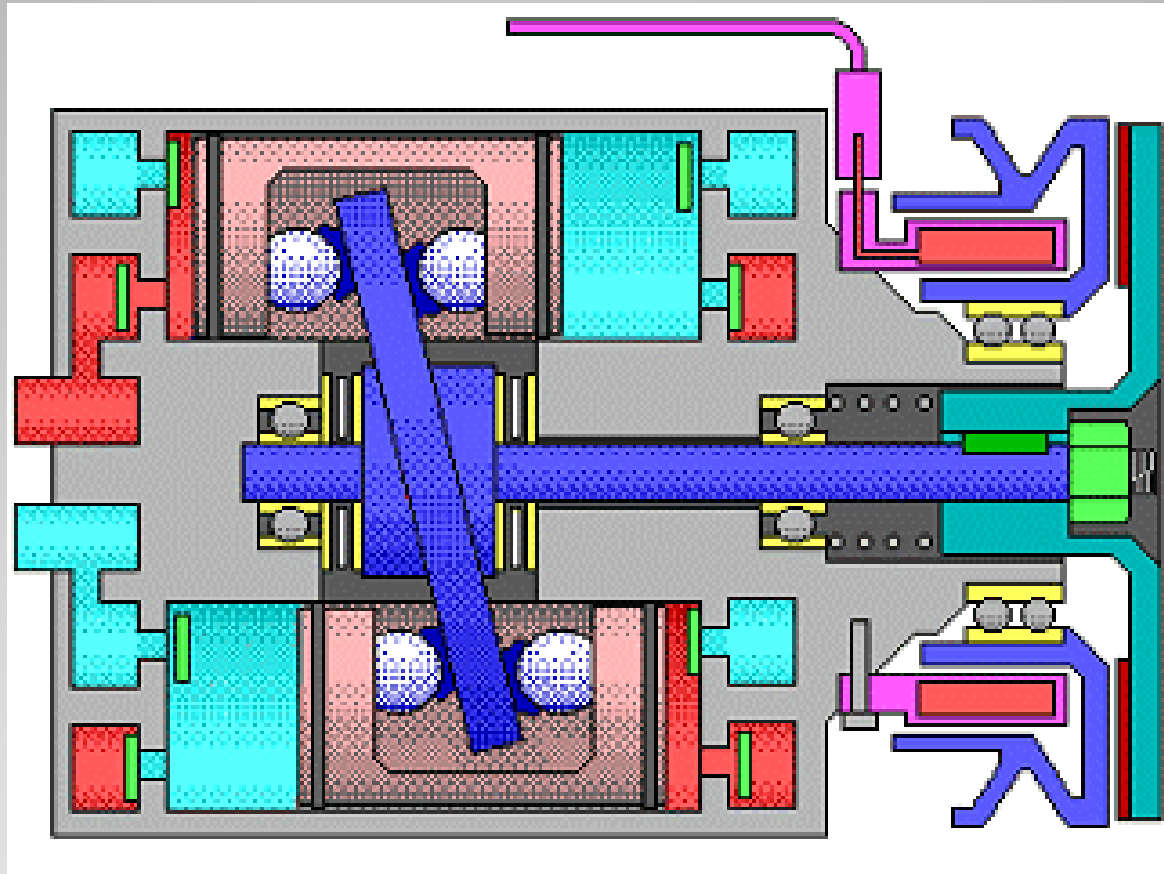
- Your A/C system is nothing more than a heat exchanger. There are only 6 major parts to the system.
- The Compressor
- The Condenser
- The Receiver/Dryer or Accumulator
- The Thermal Expansion Valve or Orifice Tube
- The Evaporator
- The Refrigerant

Typical A/C System and Flow.





The Compressor



The Compressor

- Commonly referred to as the heart of the system, the Compressor is typically a belt driven pump that is fastened to the engine or motor. It is responsible for compressing and transferring refrigerant gas.
- The A/C system is split into two sides, a **High** pressure side and a **Low** pressure side; defined as **Discharge** and **Suction**. Since the Compressor is basically a pump, it must have an intake side and a discharge side.

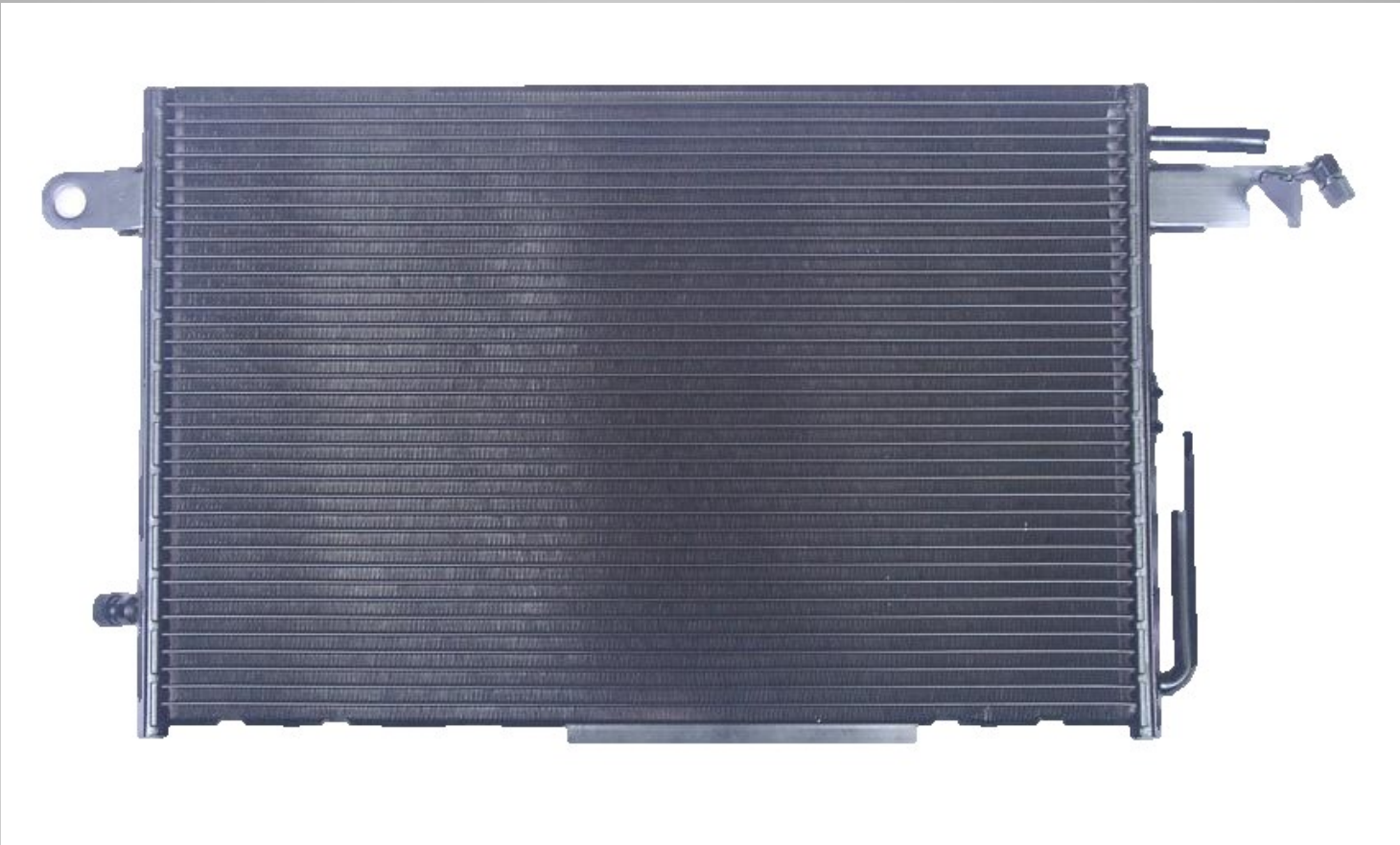
The Compressor Clutch



The Compressor Clutch Assembly

- The compressor Clutch Assembly has 3 major components.
- The Coil
- The Pulley
- The Clutch
- The compressor is an electromagnet Clutch Assembly that can engage and disengage to the compressor drive. The compressor Pulley always turns when the engine or motor is running, but the compressor only runs when the Clutch is magnetically engaged to the Pulley by use of the electromagnetic Coil. The Clutch is attached to the compressor driving shaft.

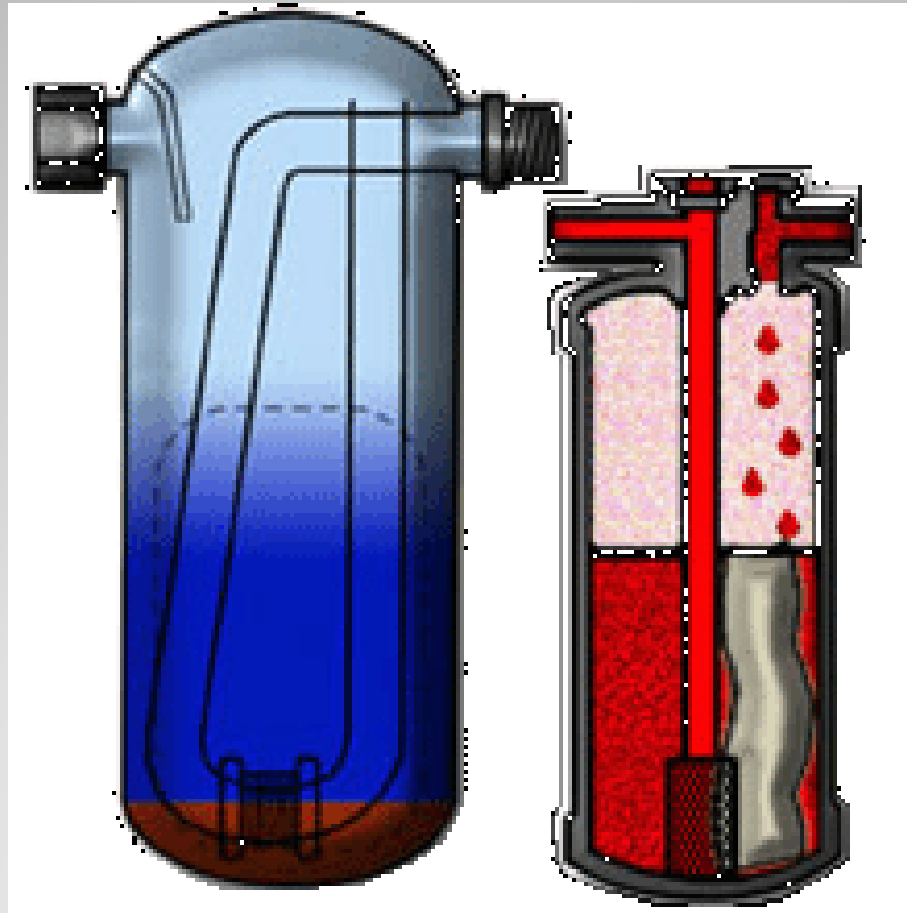
The Condenser



The Condenser

- This is the area in which heat dissipation occurs. The Condenser, in many cases, will have much the same appearance as the radiator in your car as the two have very similar functions. The Condenser is designed to radiate heat. Its location is usually in front of the radiator.
- As hot compressed gasses are introduced into the top of the Condenser, they're cooled off. As the gas cools, it condenses and exits the bottom of the Condenser as a high pressure liquid.

The Receiver/Dryer



The Receiver/Dryer

- The Receiver/Dryer is used on the high side of systems that use a thermal expansion valve. This type of metering valve requires liquid refrigerant. To ensure that the valve gets liquid refrigerant, a receiver is used. The primary function of the Receiver/Dryer is to separate gas and liquid. The secondary purpose is to remove moisture and filter out debris.
- Newer Receiver/Dryers use desiccant type XH-7 and are compatible with both R-12 and R-134a refrigerants. Older Receiver/Dryers are not compatible with R-134a refrigerants.

The T

Valve



The Thermal Expansion Valve

- Thermal Expansion Valve, or TXV. Commonly used on import and aftermarket systems, this type of valve can sense both temperature and pressure. A TXV is very efficient at regulating refrigerant flow to the evaporator.
- These types of valves, although efficient, have some disadvantages over Orifice Tube systems. Like Orifice Tubes these valves can become clogged with debris, but also have small moving parts that may stick and malfunction due to corrosion.

The Orifice Tube



The Orifice Tube

- The Orifice Tube, probably the most commonly used, is located in the inlet tube of the evaporator, or in the liquid line, somewhere between the outlet of the condenser and the inlet of the evaporator.
- Most of the Orifice Tubes in use today measure approximately three inches in length and consist of a small brass tube, surrounded by plastic, and covered with a filter screen at each end.

The Evaporator



The Evaporator

- Located inside the vehicle, the Evaporator serves as the heat absorption component. The Evaporator provides several functions. Its primary duty is to remove heat from the inside of your vehicle. A secondary benefit is dehumidification. On humid days you may have seen this as water dripping from the bottom of your vehicle.
- The ideal temperature of the evaporator is 32° Fahrenheit or 0° Celsius. Refrigerant enters the bottom of the Evaporator as a low pressure liquid. The warm air passing through the Evaporator fins causes the refrigerant to boil (refrigerants have very low boiling points). As the refrigerant begins to boil, it can absorb large amounts of heat.

Refrigerant

- There are two types of refrigerants used in automotive applications.
- R-12
- R-134a

Refrigerants



- There are a few things to consider when trying to retain your A/C system.
- How to drive the compressor.
- How/Where to mount the Compressor.
- How to keep air flow over the Condenser.
- How to evacuate and then recharge the system.
- How/Where to get new lines/hoses made.

Problems with EV's and A/C

Driving the Compressor

- PTO or Power Take Off.
- Separate small electric motor.

Air Flow over the Condenser

- It's very important to keep good air flow over your Condenser.
- No Batteries or Boxes to far up front.