

HEATING AND AIR-CONDITIONING

INTRODUCTION

- Today ventilation, heating and air-conditioning systems are very important elements for providing passenger comfort.
- Ventilation and heating systems are standard equipment on all passenger vehicles and air-conditioning the standard on some and available for nearly all.
- The large number of vehicle with air conditioning plus recent changes in the methods used to cool a vehicle and to service the systems makes a basic knowledge of air-conditioning system.

VENTILATION SYSTEM

- The ventilation system is to provide outside air to the passenger compartment.
- Among the several systems used to vent air to the passenger compartment flow-through system is the most common.
- In this the ram air flows into the car when it is moving.
- When the car is not moving , a steady flow of ram air can be produced by the heater fan.

AUTOMOTIVE HEATING SYSTEM

- It has been designed to handle with cooling system.
- The primary function is to provide comfortable temperature.
- The primary component of the system are Heat core, Heater control valve, The blower motor and the fan.

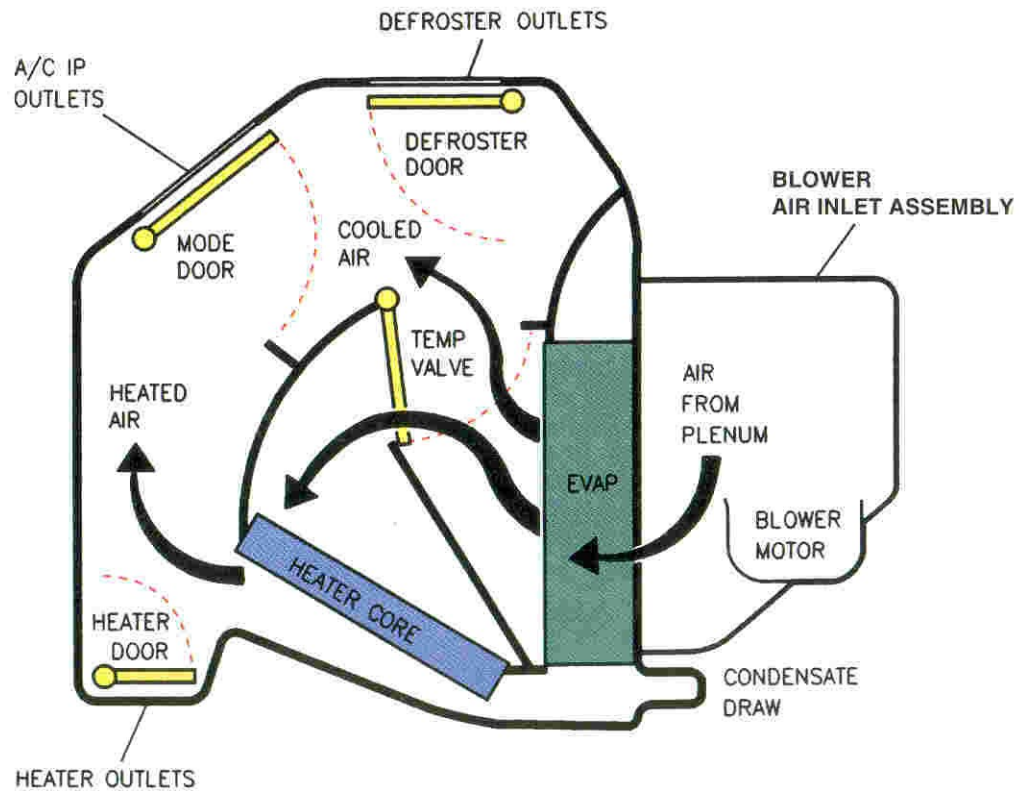


Figure 48-3 Typical HVAC air flow for heater and air conditioning. *Courtesy of General Motors Corporation—Service Operations*

AUTOMOTIVE HEATING SYSTEM

HEATER CONTROL VALVE

- It controls the flow of coolant into the heater core from the engine.
- In a closed position, the valve allows no flow of hot coolant to the heater core, keeping it cool.
- In an open position, the valve allows heated coolant to circulate through the heater core.
- The blower motor is located in the heater housing assembly; it is used to ensure air circulates throughout the system. Its speed is controlled by a multiposition switch.

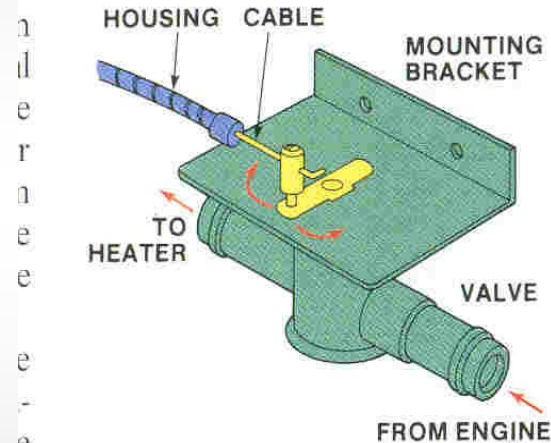


Figure 48-4 Cable-operated heater valve used to control the flow of water or coolant through the heater core.

THEORY OF AIR-CONDITIONING

- All air conditioning systems are based on three fundamental laws of nature.
- **HEAT FLOW** : Greater the temperature difference between the object, greater the heat flow.
- **HEAT ABSORPTION**: When changes from one state to another, absorption or rejection of heat takes place.
- **PRESSURE AND BOILING POINTS**: The greater the pressure on a substance, such as a liquid, changes its boiling point.
- Greater the pressure higher the boiling point and lesser the pressure lower is the boiling point.

REFRIGERANTS IN AIR CONDITIONING SYSTEM

- The substance used to remove heat from the inside of an air conditioned vehicle is called the refrigerant.
- Older refrigerant used in AC was R-12.
- The latest AC system uses R-134a, this refrigerant may also be referred to as SUVA.
- It is an efficient then.

AIR CONDITIONING SYSTEM AND ITS COMPONENT

- COMPRESSOR
- CONDENSER
- EVAPORATOR
- RECEIVER/DRYER

COMPRESSOR

- The compressor is heart of automotive AC system. It separates the high pressure and low pressure sides of the system.
- The primary function is to draw the low pressure and low temperature vapor from the evaporator and compress this vapor into high-temperature, high pressure vapor.
- The secondary function is to circulate the refrigerant through the AC system
- It is driven by the engines crankshaft via a drive belt.

Types of compressor

- **PISTON COMPRESSOR:** This type of compressor can have its piston arranged in an in-line, axial, radial or V-design.
- On the intake stroke, the refrigerant from the low side of the system is drawn into the compressor.
- During compression stroke, the refrigerant is compressed.
- This increase both the pressure and the temperature of the heat carrying refrigerant.

- **ROTARY VANE COMPRESSOR:** It does not have any piston. It consist of a rotor with several vanes and carefully shaped housing
- As the compressor shaft rotates, the vanes and housing foam chamber. The refrigerant is drawn through the suction port in this chimer, which becomes smaller as the rotor runs.
- The discharged port is located at the point where the gas is completely compressed.

CONDENSER

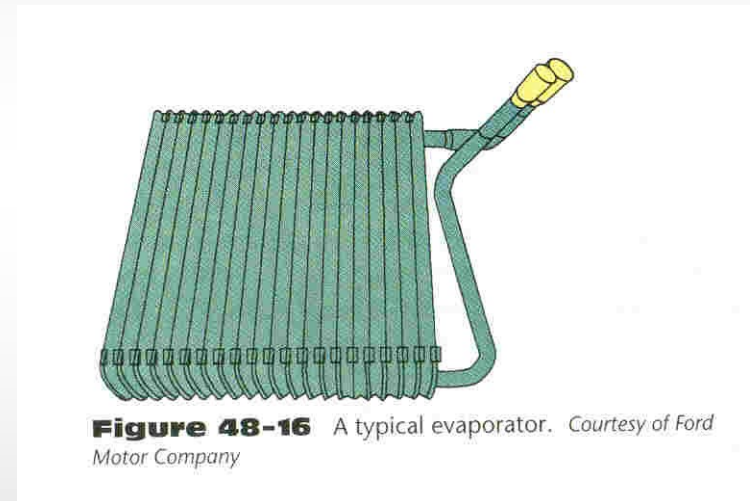
- The condenser consists of coiled refrigerant tubing mounted in series of thin cooling fins.
- The purpose of condenser is to condense the high pressure, high temperature vapor coming from the compressor.
- It is achieved when the refrigerant vapor enters the inlet of condenser and hot vapor passes down to the condenser coil.
- This process causes a large quantity of heat to be transferred to the outside air and the refrigerant to change from a high-pressure hot vapor to high-pressure warm liquid.

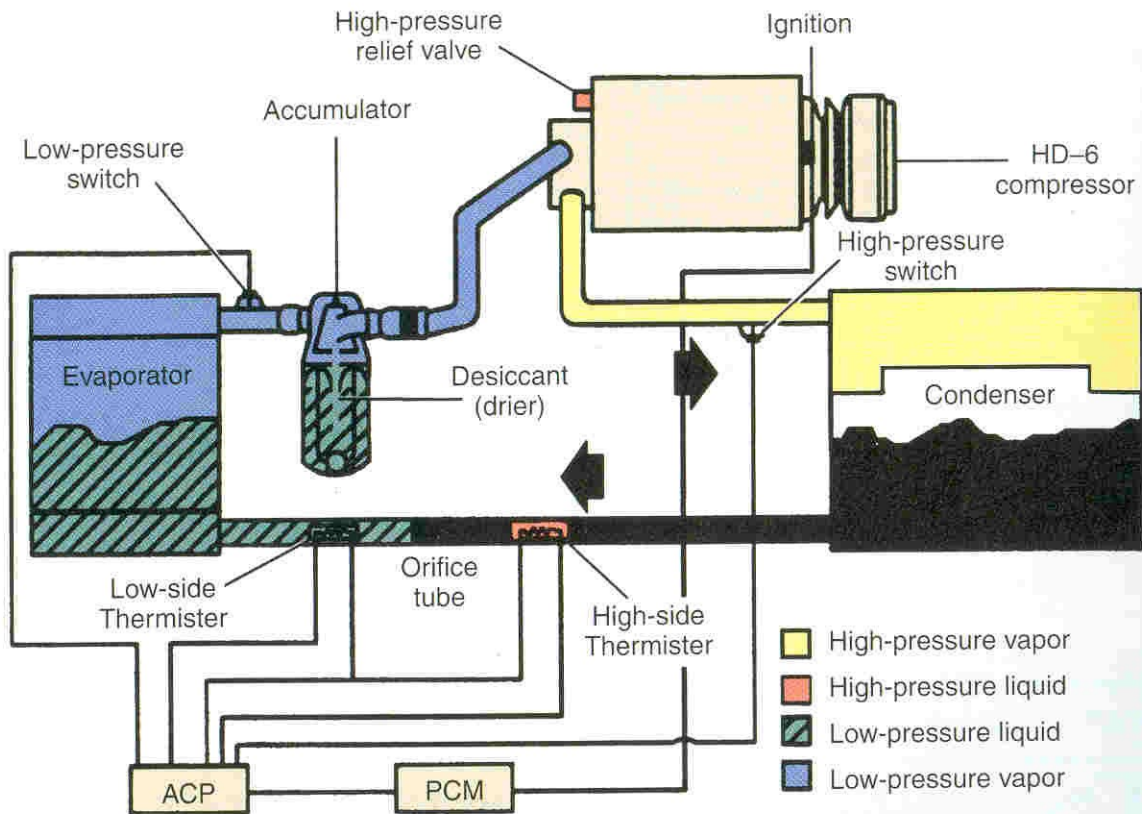
RECEIVER/DRYER

- It is a storage tank for refrigerant from the condenser.
- Its upper part consist of ca bag of DESICCANT.
- The lower portion contains a mesh screen to absorb impurities.

EVAPORATOR

- It consists of a refrigerant coil mounted in a series of thin cooling fins.
- Upon receiving refrigerant from the evaporator, heat from the core surface is lost to the boiling and vaporizing refrigerant, which is cooler than the core, thereby, cooling the core.
- The air passing over the evaporator loses its heat to the cooler surface of the core, thereby cooling the air inside the car.





Refrigerant R-134A capacity—0.91 kg (2.00 lbs)

Component replaced	Compressor	Evaporator	Condenser	Accumulator
Oil distribution	Refer to refrigerant oil distribution	Add 90 ml (3 fl oz.)	Add 30 ml (1 fl oz.)	Add 105 ml (3.5 fl oz.)

Figure 48-8 Basic refrigerant flow cycle. Courtesy of General Motors Corporation—Cadillac Motor Car Division

BASIC REFRIDGERARENT FLOW CYCLE

REFRIGERANT LINES

- Three major refrigerant lines: suction, liquid and discharge.
- Suction lines are located between the outlet side of the evaporator and inlet side of the compressor.
- The liquid lines connect the condenser to the receiver and receiver to the inlet of the expansion valve.

HEAT FROM SUN AND OUTSIDE AIR

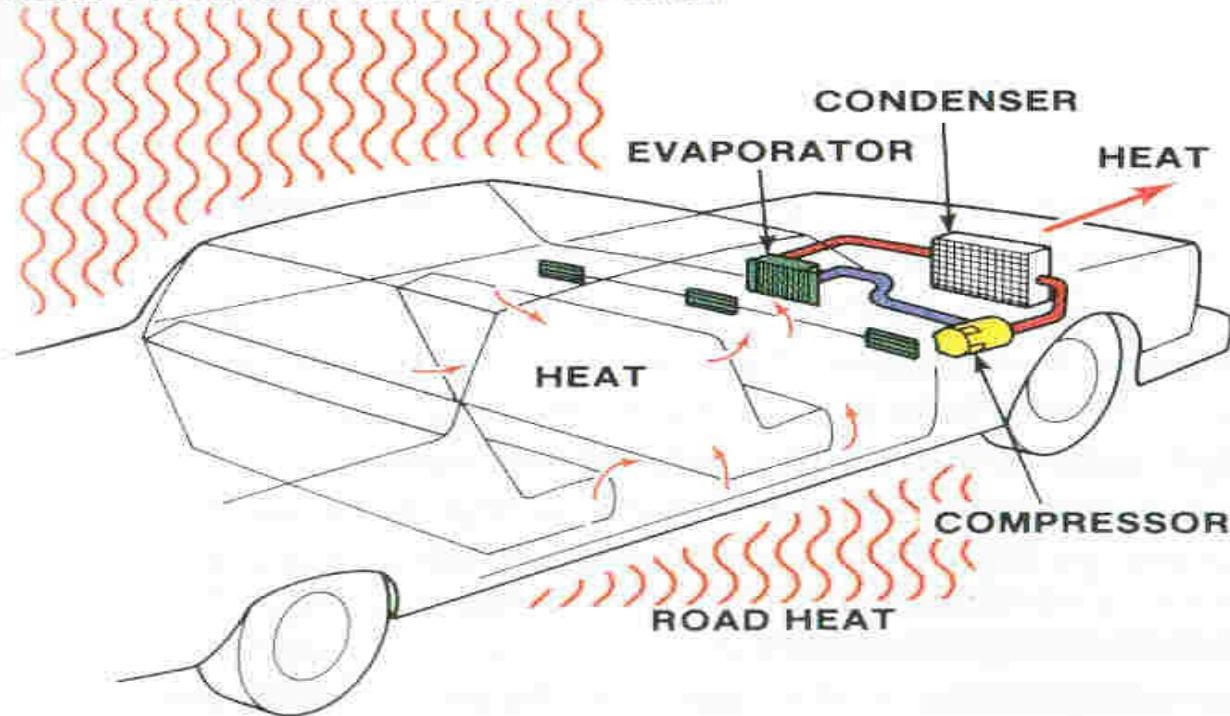


Figure 48-6 Heat flow from inside the car to outside.
Courtesy of Everco Industries, Inc.

CONCLUSION

- In the busy world of today comfort plays a very important role in a man's life.
- In the olden days men had to adjust to the surroundings but in modern life science has developed a lot that surroundings adjust to the men's needs , i. e passenger comfort.

THANK YOU