



HVAC

Matthew Whitten

AUMT 1345 HVAC



HVAC

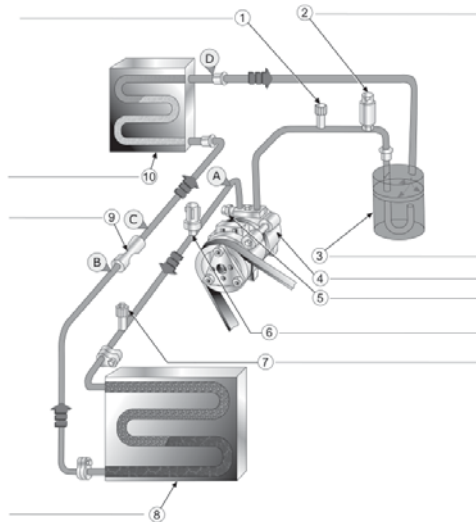
- Heating Ventilation Air Conditioning
- This term encompasses the systems that are designed to increase the comfort of the driver and increase safety .
- Heating is needed for cold ambient temperatures for comfort and defrosting windshields for safety.
- Ventilation is needed for circulation of the heated/cooled air for comfort.
- A/C is needed for hot ambient temperatures for comfort

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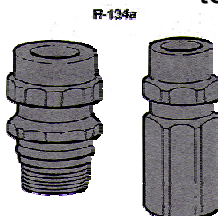
System Components

1. Service Port
2. Pressure Switch
3. Accumulator
4. Compressor
5. Blow-off Valve
6. Pressure Switch
7. Service Port
8. Condenser
9. Orifice
10. Evaporator



Service Ports

- Provide a means of accessing the pressurized refrigerant within the system and not allow the refrigerant to leak.



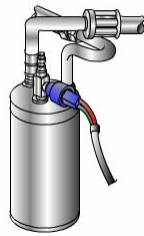
Pressure Switch

- Used to sense the pressure within the system to control temperature and pressure. Can be either a Low pressure or high pressure.



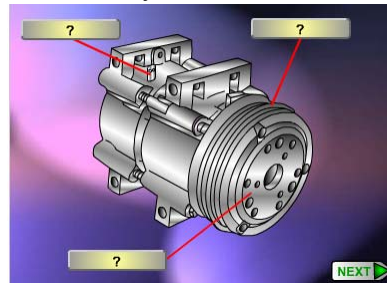
Accumulator Compressor

- A reservoir for excess oil and refrigerant. Also contains the desiccant to remove the moisture from
- Used to pressurize the refrigerant in the system for operation. Driven by the engine via an engine accessory drive belt.



PLAY

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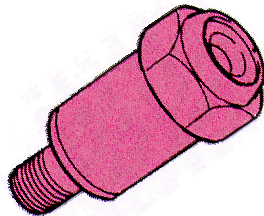


NEXT

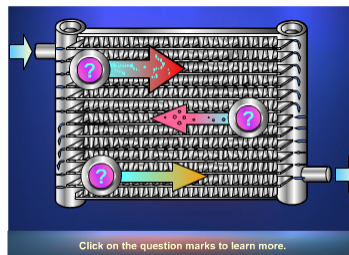


Blow-off Valve Condenser

- Used to prevent system damage caused by excessive pressure. This valve releases pressure above @ 450 psi.
- Refrigerant enters the condenser as a gas and exits as a liquid. It cools the refrigerant by exchanging the heat to the engine cooling air flow.



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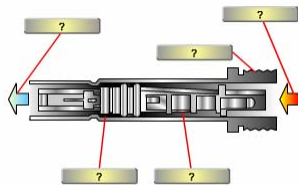


Click on the question marks to learn more.



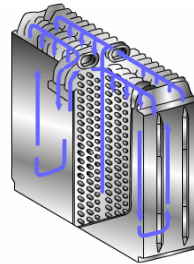
Orifice Tube

- Provides a pressure differential which creates a temperature drop to cool of the incoming air.



Evaporator

- Accepts the incoming cold liquid and heats it with the cabin air. This heat evaporates the refrigerant to a gas.

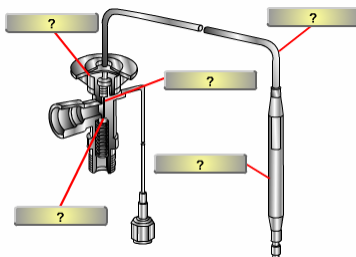


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Expansion Valve

- Acts much like the “orifice tube”, but it dynamically adjusts the pressure differential relative to the temperature of the evaporator.



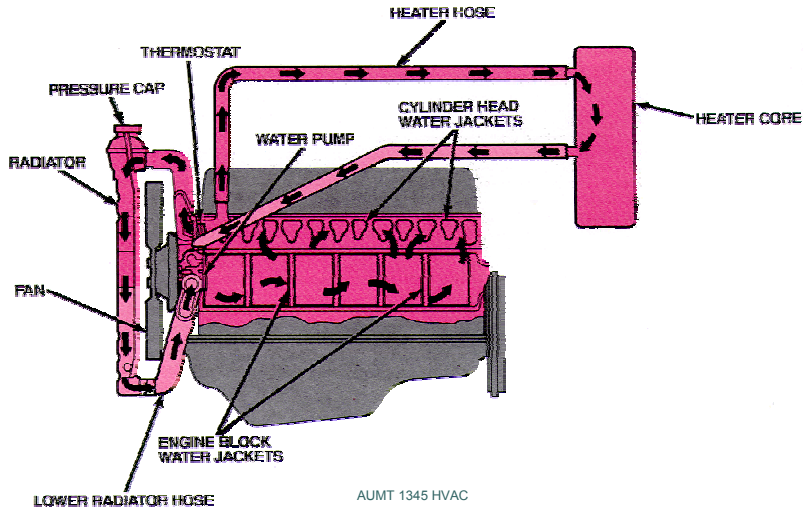
Refrigerant

- A cooling medium which changes states close to ambient temperature (most important vapor point). As it changes state it either accepts or expels heat. It must be chemically stable to prevent deterioration.

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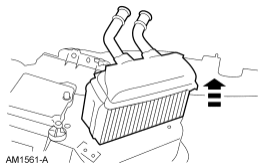


Heating System



Heater Core

- Small radiator that exchanges heat from the hot coolant to the cabin air.



Heater Hoses

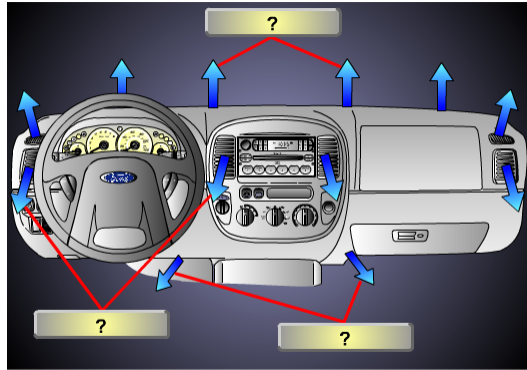
- Connect the coolant flow/passages to the heater core





Air Distribution

- Consists of;
 - Plenum
 - Blower fan
 - Directional doors
 - Blend doors
- Also houses:
 - Evaporator
 - Heater core



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Control Devices

- Vacuum
 - Vacuum actuators are used to control door positions in two or three positions.
- Mechanical
 - Cables are direct connections from the control head to the action.
- Electronic
 - Closed loop servo control motors provide a very precise control of control doors.

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Intakes

- Allows the plenum to accept air from either the outside or inside the passenger cabin.

Plenum

- Houses the control doors, control motors, evaporator, and condenser.

Ducting

- Plastic piping that directs the cooled or heated air to the registers. Can also be ran under the carpet or in the pillars.

Registers

- Provides the customer control over the volume and direction of the air from the HVAC system

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HVAC Operation

- Vent/Panel:
 - Simply circulates outside air throughout the cabin. The intake is outside the car.
- A/C
 - Circulates exterior cooled air throughout the cabin. The intake is outside the cabin.
- Max A/C
 - Circulates interior cooled air throughout the cabin. The intake to the system is from the passenger cabin.
- Defrost
 - Can either direct heated or cooled air onto the windshield to remove or prevent fogging or frost.
- Floor
 - May be able to redirect heated or cooled air to the lowest level for comfort.

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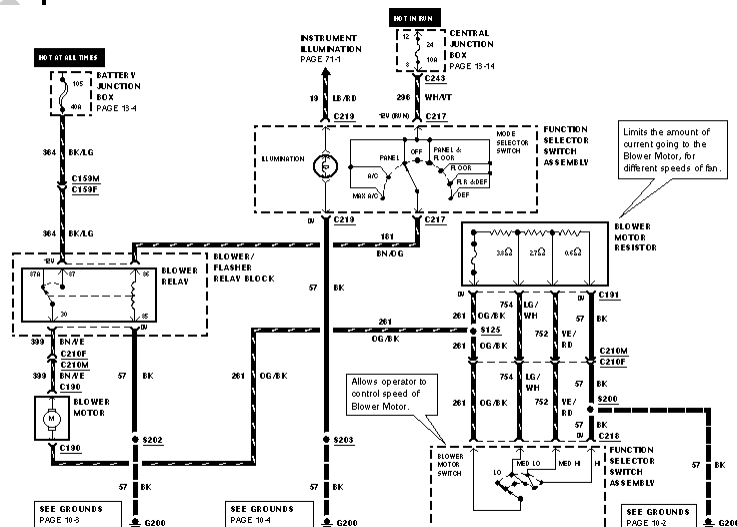


HVAC

- HVAC systems are no longer simple one switch systems with little to no module involvement.
- Early systems may have only used a cycling switch to control the compressor clutch. If these vehicles where under a high load and the compressor engaged the vehicle would have a noticeable loss of power.
- Newer systems have incorporated strategies that prevent the loss of power under high loads.
- What else may prevent the A/C compressor from operating? (malfunction or normal operation)

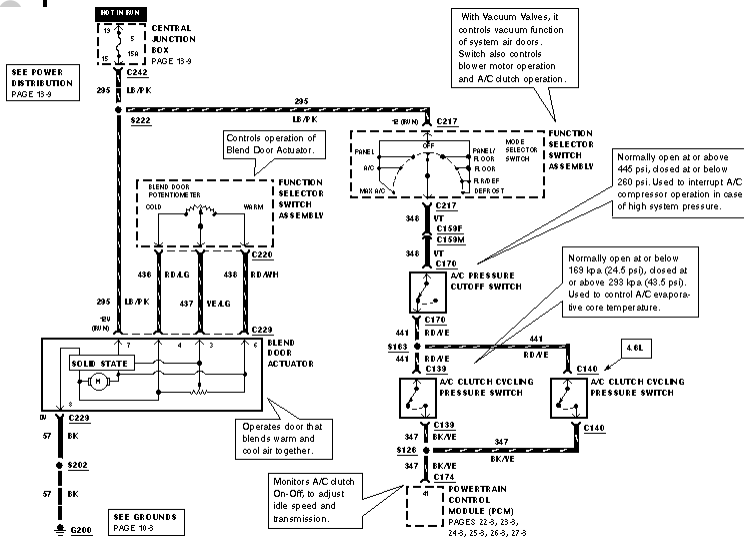
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1999 F-150



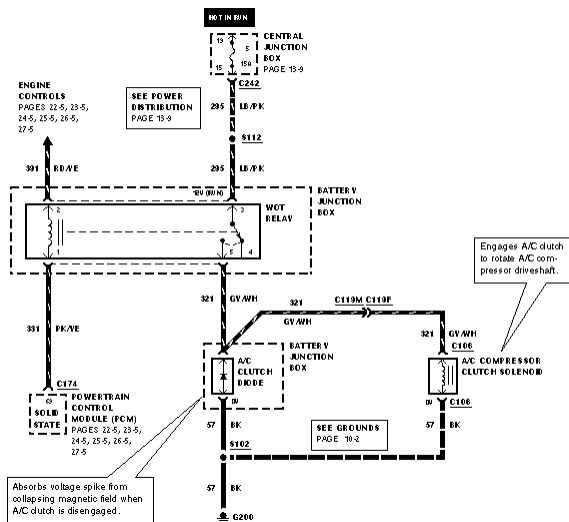
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1999 F-150



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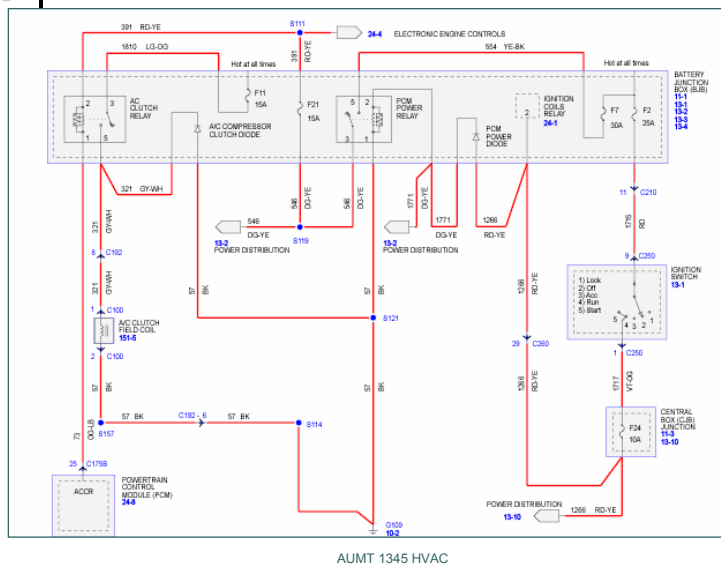
1999 F-150



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2006 Crown Victoria



HVAC Safety

- Use the MSDS if needed.
- SECTION 10 REACTIVITY
 - Stability: Product is STABLE
 - Hazardous Polymerization: Will not occur.
 - Incompatibilities: Strong oxidizers.
 - Decomposition Products: R134A – Highly Toxic decomposition products occur when burned. Lubricant -- Analogous compounds evolve, carbon monoxide, carbon dioxide, and other undefined fragments when burned.



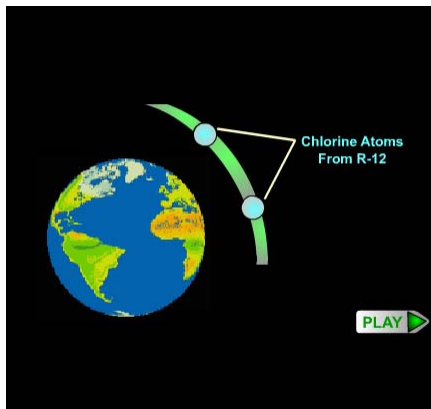
Refrigerant

- Vapor refrigerants can asphyxiate by displacing oxygen.
- Do not allow refrigerant to fall onto hot exhaust manifolds nor allow it to burn in an open flame (leak detectors) this produces Phosgene gas. A delayed reaction poison that causes violent choking and coughing. **DON'T LET BURN.**

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Environmental



- Early A/C systems were equipped with R-12 which is a Chlorofluorocarbon. This chemical is known to react with the ozone and cause a depletion of the ozone.
- Newer systems utilize a non-CFC refrigerant (R-134a) which does not react with the ozone layer.
- Some systems may have been filled with a CFC based refrigerant. If you evacuate it into your machine it will contaminate the recycle bottle.

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