

Refrigeration & Air Conditioning Technology

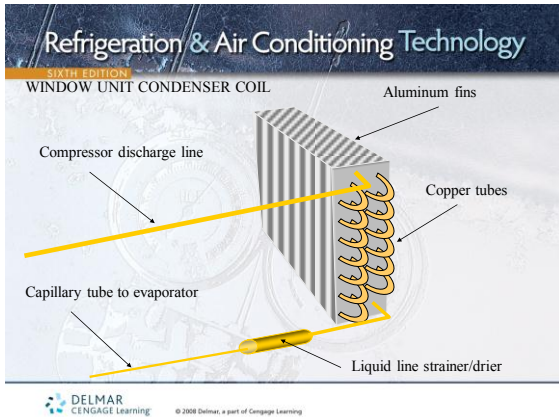
SIXTH EDITION

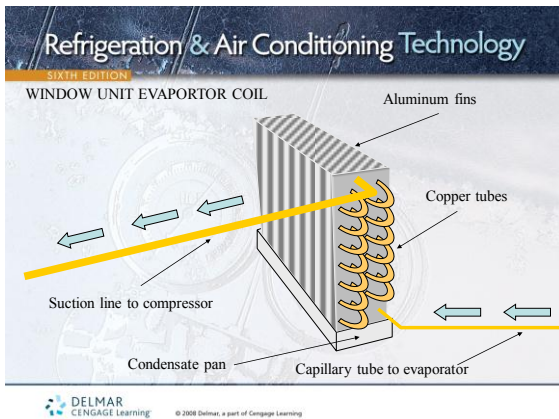
REFRIGERATION CYCLE: COOLING

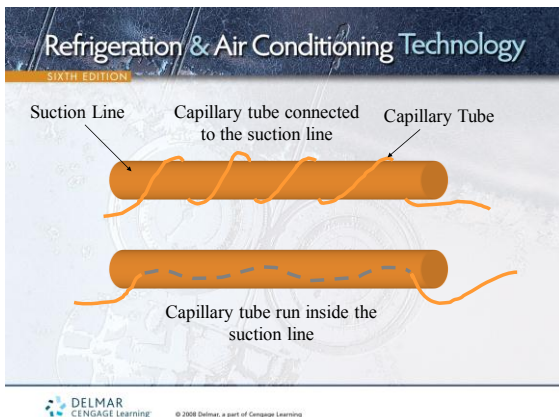
- Most commonly used refrigerant is R-22
- Room units are high temperature appliances
- Units consist of the same four basic components
 - Evaporator
 - Compressor
 - Condenser
 - Metering device

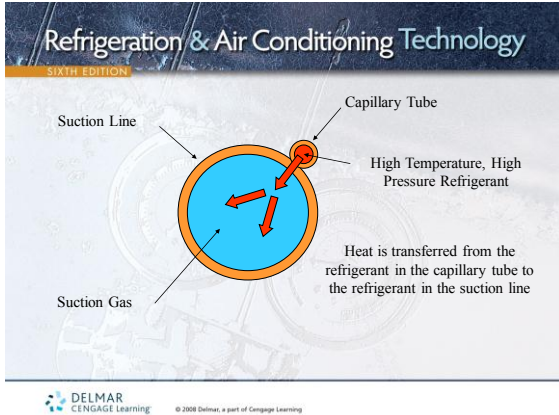
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REFRIGERATION CYCLE: COOLING

- The evaporator absorbs heat from the space
 - The evaporator dehumidifies and cools
 - Made of copper tubes and aluminum fins
 - Fins are in close contact with the tubing
 - Operates below dew point temperature
 - Typical evaporator temperature is about 35 degrees
 - The evaporator coil should not freeze
 - Condensation forms on the coil

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REFRIGERATION CYCLE: COOLING

- Compressor pumps refrigerant through the unit
 - Typically hermetically sealed rotary or reciprocating
- Condenser rejects heat from the system
 - Usually made of copper tubes with aluminum fins
 - Condenses the heat-laden vapor from the compressor
- Capillary tube metering device
 - Controls refrigerant flow to the evaporator

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REFRIGERATION CYCLE: HEATING (HEAT PUMP)

- Reverse-cycle refrigeration (4-way reversing valve)
- Unit can provide heating or cooling
- In the heating mode, the indoor coil functions as the condenser; the outdoor unit as the evaporator
- In the cooling mode, the indoor coil functions as the evaporator; the outdoor unit as the condenser
- Supplementary electric heaters are often used

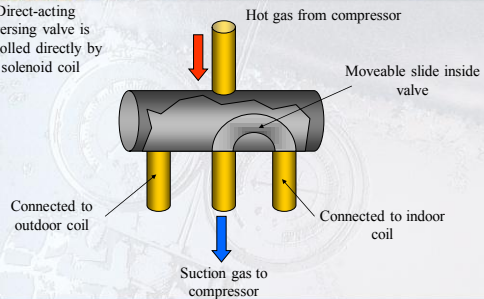
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Direct-acting
reversing valve is
controlled directly by
a solenoid coil



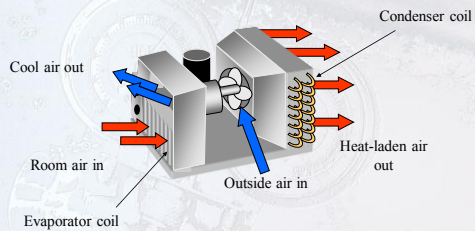
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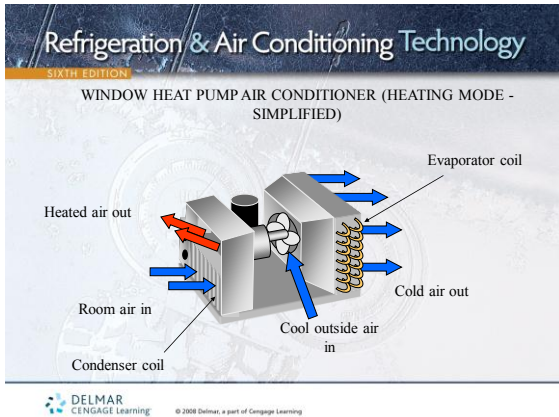
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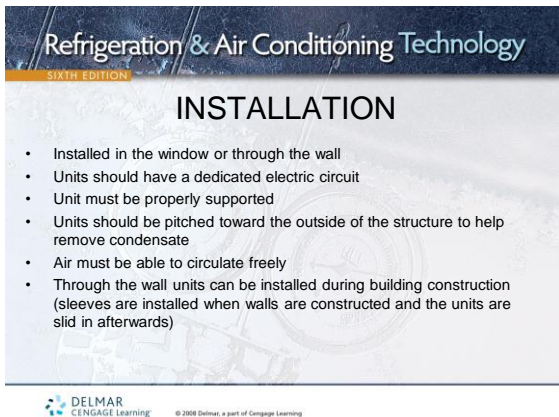
WINDOW HEAT PUMP AIR CONDITIONER (COOLING MODE - SIMPLIFIED)

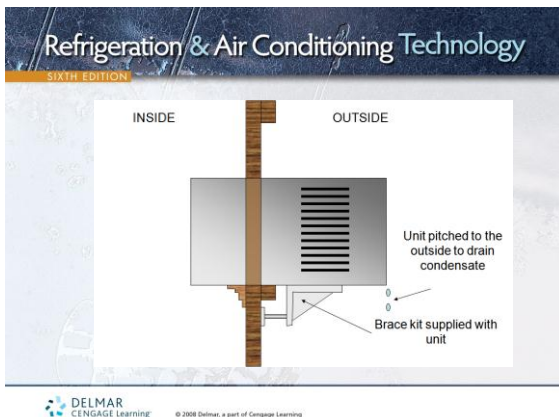


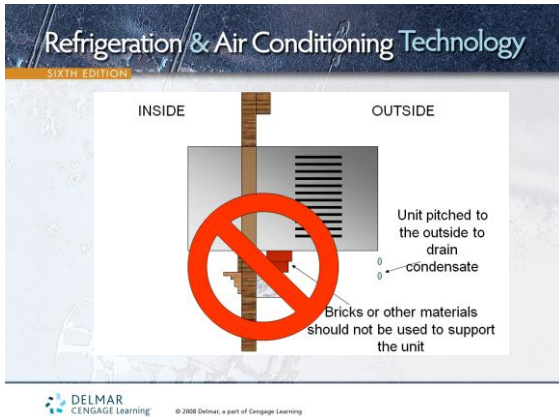
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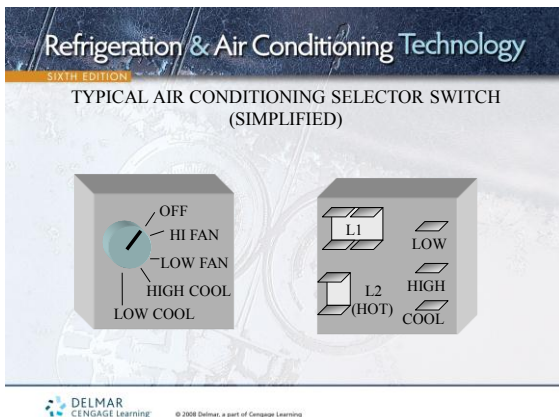


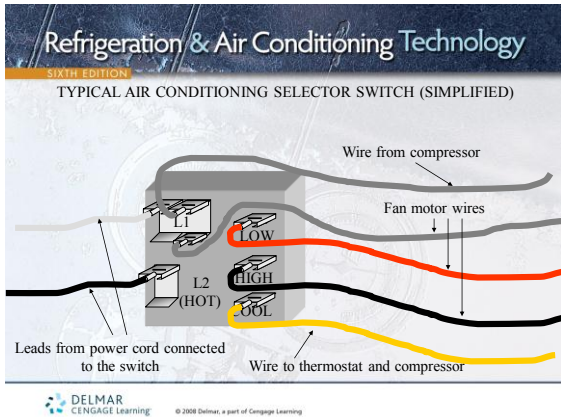
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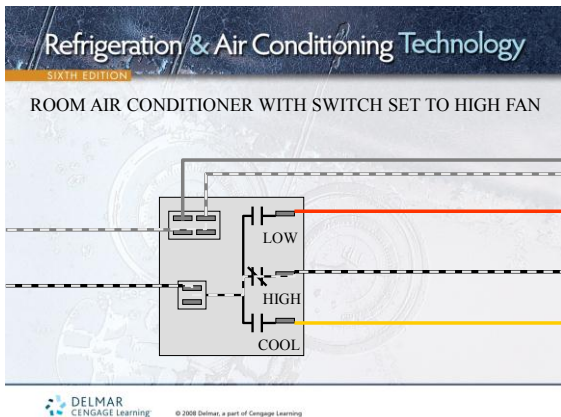
ROOM UNIT CONTROLS: COOLING

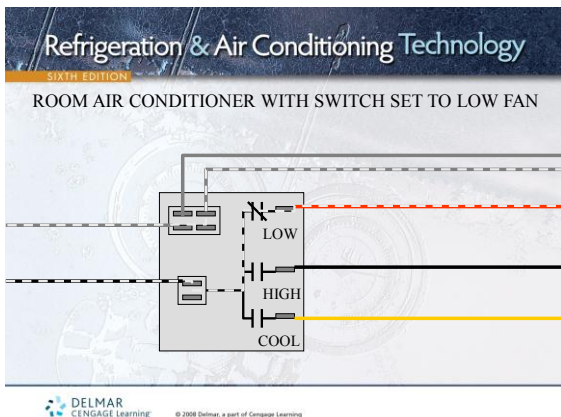
- All controls are located within the unit
- Thermostat sensor is located in the return air stream
- Switch controls fan speed and compressor circuit
- Power cord wired directly to the control switch
- High cool mode operates the compressor and the high speed of the fan motor
- Low cool mode operates the compressor and the low speed of the fan motor

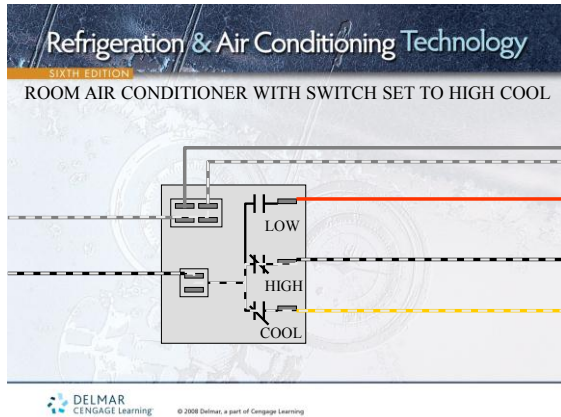
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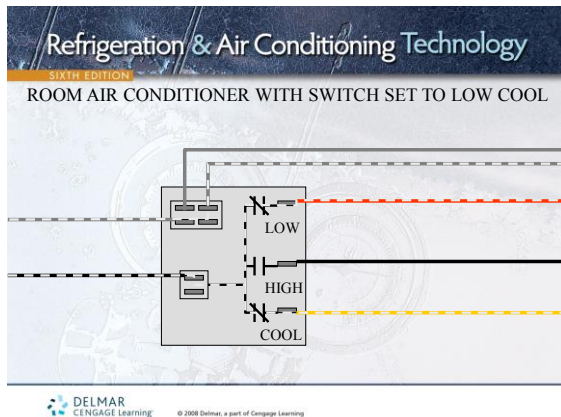












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CONTROLS: COOLING AND HEATING UNITS

- The selector switch changes the unit over between the heating and cooling modes
- Thermostat sensor located in return air stream
- Selector switch controls compressor and fan speeds
- Thermostat controls both the heating and cooling modes of operation
- Some units have electronics and remote controls

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MAINTAINING/SERVICING ROOM UNITS

- Filters and coils should be kept clean
- Motors may need to be lubricated
- Room units are critically charged
- Gages should be installed only when necessary
- Line tap valves may need to be installed (consult valve manufacturer for important information)
- Perform a bench test if a low charge is suspected
- Unit leaks should be located and repaired

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MAINTAINING/SERVICING ROOM UNITS

- Nitrogen or a nitrogen/R-22 mixture can be used for leak detection purposes (trace of R-22)
- Nitrogen or nitrogen/R-22 mixture can be released from the unit after the leak detection process
- System must be properly evacuated after the leak has been located and repaired (triple evacuation)
- If the capillary tube must be replaced, it must be cut and sized properly

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SERVICING ROOM UNITS

- Care should be taken when replacing motors to prevent damage to blowers, fans and coils
- All units must be electrically grounded
- Electrical service must be the correct voltage
- Thermostats can be checked by taking voltage readings across them
 - A reading of 0 volts indicates the thermostat is closed
 - A line voltage reading indicates the thermostat is open

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SERVICING ROOM UNITS

- Some units have energy saver switches that cycle the fan motor on and off with the compressor
- Check power cords for damage, loose connections and overheated or swollen plugs
- Selector switches can be checked with the power on
 - Line voltage readings should be obtained from the common terminals and the individual circuits
 - If power enters the switch but does not leave it, the switch is defective and should be replaced

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SUMMARY - 1

- Room units are self-contained appliances that condition the air in one room
- Cooling only or heating/cooling models
- Units that provide heating can use electric strip heaters or reverse-cycle refrigeration (heat pump)
- Can be window or through-the-wall type units
- Units can be fixed to the case or have a chassis that slides out of the case (sleeve)
- Room units are high temperature appliances

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SUMMARY - 2

- Typical evaporator temperature is about 35 degrees
- Reverse-cycle refrigeration can provide heating or cooling
- In the heating mode, the indoor coil functions as the condenser; the outdoor unit as the evaporator
- Units should have a dedicated electric circuit
- Unit must be properly supported and should be pitched toward the outside of the structure to help remove condensate

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SUMMARY - 3

- All controls are located within the unit
- Switch controls fan speed and compressor circuit
- High cool mode operates the compressor and the high speed of the fan motor
- The selector switch changes the unit over between the heating and cooling modes
- Thermostat sensor located in return air stream
- Room unit maintenance primarily involves filters and motor lubrication

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SUMMARY - 4

- Gages should be installed only when necessary
- Unit leaks should be located and repaired
- System must be properly evacuated after the leak has been located and repaired (triple evacuation)
- Care should be taken when replacing motors to prevent damage to blowers, fans and coils
- Check power cords for damage, loose connections and overheated or swollen plugs

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