Air Conditioning System

HEAT PUMP

An RV heat pump transfers heat from the external air to the internal RV environment. This is just the reverse of the air conditioner. In fact, Appendix (B) describes how the addition of a reversing valve (which changes the flow of refrigerant) and converts the air conditioner to a source of heat for the RV. By activating this valve, the evaporator coils are swapped with the condenser coils so we extract heat from the outside and circulate it inside with the squirrel cage fan. To convert to a heat pump we have to send a signal to the reversing valve, which is illustrated in Figure (21).

The reversing valve is shown at the top, next to the compressor. When you set the CCC to operate the heat pump this sends 12 volts to this valve, which reverses the refrigerant flow. You are now in heat pump mode and your CCC temperature setting determines how long it will run. In this mode, the fan runs continuously to circulate the air and maintain an even temperature. Heat pumps will shut off if the outside air temperature gets below 40 degrees and will turn back on when it goes above 45 degrees.

The advantages include one unit for both heating and cooling, no furnace needed if you live in an area that is always above 40 degrees and when you are using shore power there is no need for extra cost propane.

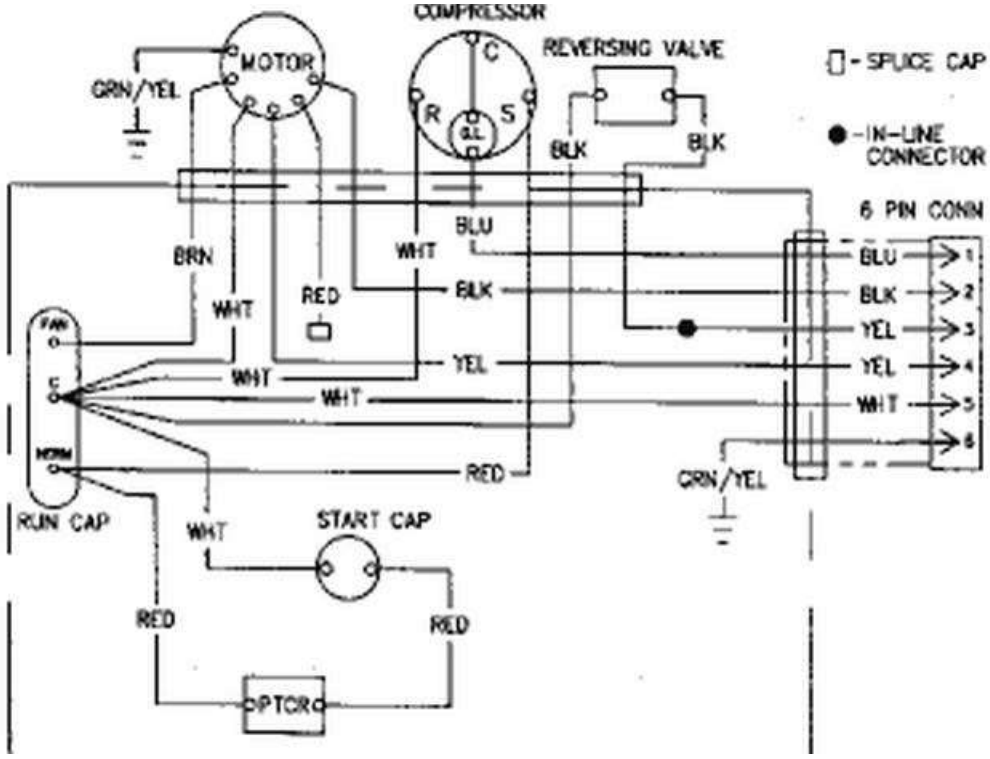


Figure (21) Heat Pump Mode

Is it worth purchasing a combination A-C and Heat Pump? If you live in a part of the country where the temperatures get below 40 degrees than you need a furnace in any case. The cost difference between an AC or an A-C/Heat Pump is around $150 to $175. In over 50 years of camping with trailers and motor homes I cannot remember any time that I used my Heat Pump. When I was connected to shore power and just needed to take the morning chill off I turned on the heat strip. So unless the unit I purchased come with a heat pump I would not replace any failed unit with one.

If you're A-C is working and your heat pump does not function then the most likely failed component is the reversing valve. Replacing this valve requires that the freon be removed, the system be purged and then leak tested and re-charged. This is a job that requires special equipment, test meters and pipe sealing equipment and is best left to a professional.

APPENDIX (B)

PRINCIPLES OF HEAT PUMP OPERATION

HEAT PUMP COOLING AND HEATING MODES:

Cooling Mode: Heat is removed from the **inside** air and released to the **outside** air.

Heating Mode: Heat is removed from the **outside** air and released to the **inside** air.

DEFINITION: A heat pump is one base unit which can operate in two modes, heating or cooling. The travel or flow of the refrigerant is reversed depending on which cycle you choose to operate, the heating cycle or the cooling cycle. The components used to accomplish this are the compressor, evaporator and condenser coils, reversing valve, capillary tubes, air movement system (motor and fan wheel), and refrigerant. The evaporator and condenser act as either the inside coils or the outside coils depending on the cycle of operation chosen.

THE COOLING MODE: To cool the air inside the vehicle, heat is removed from the inside air and released to the outside or ambient air.

To begin the cooling process, the air movement system establishes air flow which passes over both coils, the inside coil which in the cooling mode is the evaporator, and the outside coil, the condenser. Next, the refrigerant cycle is established starting at the compressor. The compressor's function is to take the low pressure vapor, and discharge it as high pressure vapor. As the refrigerant is compressed, it gives off heat causing the discharge line to be quite warm or hot to the touch in hot weather.

The high pressure vapor leaves the compressor through the discharge line and enters the reversing valve. The reversing valve routes the high pressure vapor to the outside or condenser coil. The high pressure vapor enters the outside coil (condenser) where, by passing through the coil, it is cooled and condensed into liquid. The heat is removed from the refrigerant, and expelled to the outside air. The refrigerant which began as a hot vapor, leaves the outside coil as a high pressure cooler liquid.

The high pressure liquid leaves the condenser and passes through the small capillary tube or tubes which will be warm to the touch. The capillary tube is the metering or flow control device in the sealed system. It determines the amount and force of refrigerant which enters the inside coil, or evaporator in the cooling cycle. For optimum efficiency, the capillary tube's length and diameter must never be altered.

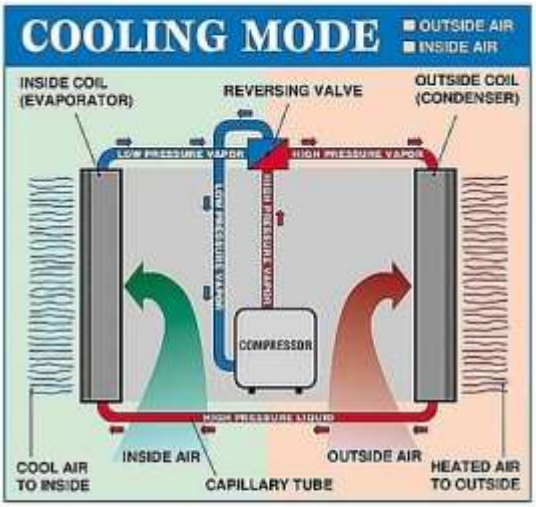
The high pressure liquid refrigerant enters the inside coil/evaporator in a controlled amount from the capillary tube. The liquid enters the low pressure atmosphere of the inside coil and evaporates into vapor. During the evaporative process, heat is removed from the air flowing through the inside coil and the air, which is now cool, is returned to the inside of the vehicle via the air movement system (blower assembly).

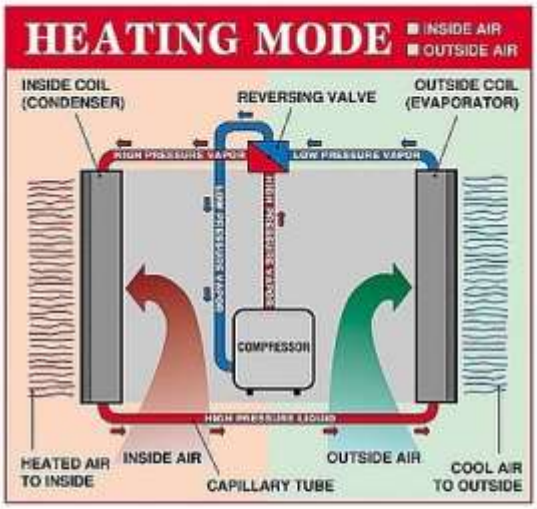
After leaving the inside coil (evaporator), the low pressure refrigerant vapor returns to the reversing valve. The reversing valve routes the low pressure vapor to the compressor through the suction line to start the cooling process all over again.

THE HEATING MODE: To heat the air inside the vehicle, heat is removed from the outside air or ambient temperature, and released to the inside air.

When you heat a vehicle, the air conditioning process is reversed, with the compressor sending the high pressure vapor into the reversing valve which routes the vapor to the inside coil, which in the heating mode is the condenser coil.

The high pressure vapor enters the inside coil (condenser) where it is cooled, and condensed into liquid by passing through the coil. The heat removed from the refrigerant is expelled to the inside air by the air movement system. The refrigerant leaves the inside coil as a high pressure liquid.





As the high pressure liquid leaves the inside coil (condenser) it passes through the small capillary tube or tubes, which act as the metering or flow control device in the sealed system.

The high pressure liquid refrigerant enters the outside coil (evaporator) in the controlled amount from the capillary tube. When the liquid enters the low pressure atmosphere of the outside coil (evaporator) it evaporates into vapor. When the evaporative process takes place, heat is removed from the air flowing through the outside coil (evaporator) and the air, which is now cool, is returned to the outside air (ambient) via the air movement system (blower assembly).

From the outside coil (evaporator), the low pressure refrigerant vapor returns to the reversing valve. The reversing valve routes the low pressure vapor to the compressor through the suction line to start the heating process again.