HEAT PUMP

21

A heat pump is simply an air conditioning system which can work in reverse to heat the house. During the heating mode (or reverse operation) the condenser (located outside the house) functions as an evaporator, and the evaporator (located in the house) functions as the condenser. A **four-way valve** is used to switch the heat pump from the heating to cooling cycle. A heat pump can absorb heat from the air, from the ground or from a body of water **(geothermal).** A **dual-fuel** heat pump is an add-on to an existing oil, gas or propane furnace. A heat pump should be sized for the air conditioning load and not the heating load. It produces about 20% more BTUs (British Thermal Units) per hour for heating than it does for cooling .

AIR-TO-AIR SYSTEM

The evaporator (outside the house) absorbs heat from the outside air, even when the temperature if as low as **20º F** because the refrigerant within the evaporator is at a lower temperature. This unit is economical where winters are relatively mild and the average temperature is above **25º F**. In climates where temperatures below **0º F** are common, **auxiliary heat** (electric, oil, gas or propane system) is needed since the heat pump is not capable of carrying the entire heating load. During periods of freezing temperatures, the outdoor evaporator fin coils become covered with ice and the heat pump goes into reverse (cooling mode) and heat from the house is used to defrost the coils. This is accomplished by either a **demand-defrost** which uses sensors or a **time-temperature defrost** which activates the defrost cycle at preset intervals when the temperature drops below a specified level. During the defrost cycle, the auxiliary heat system is activated to warm the now cool air being provided in the house.

GEOTHERMAL HEAT PUMP SYSTEM

Geothermal heating and cooling units work different from conventional heat pumps that use outdoor air as the heat source (or heat sink). Since the temperature from the ground or groundwater below the surface remains relatively constant throughout the year, these heat pumps use less energy. At about six feet deep the temperature in most areas remains stable between **45º F** and **70º F.** It is easier to capture heat from the ground at a moderate 50º F than from the outside air when the temperature is below 0º F. Geothermal unit use a plastic pipe configuration to extract heat from the ground, groundwater or surface water.

HORIZONTAL GROUND CLOSED LOOP – Is the most cost-effective and consists of a loop of parallel plastic pipes buried in trenches three to six feet deep. A typical loop is **500 feet** long per ton of cooling capacity.

VERTICAL GROUND CLOSED LOOP - This configuration is ideal where there in insufficient space. Vertical holes are bored in the ground **150 to 450 feet** deep. Each hole contains one or more loops of plastic pipe.

POND CLOSED LOOP – The plastic pipe is submerged under the water – and should only be used if the water level never drops below **six to eight feet** at is lowest level to assure sufficient heat-transfer capability.

OPEN LOOP – This system is seldom used and may not be permitted in some jurisdictions. In this system, ground water from an aquifer is piped directly from a well to the building, where it transfers its heat to a heat pump and is then pumped back into the same aquifer via a discharge well.

STANDING COLUMN WELL – Water from the bottom of the well, which is typically six inches in diameter and as deep as 1,500 feet, is drawn and circulated through the heat pump's heat exchanger, and then returned to the to of the water column in the same well.

MAINTENANCE ITEMS :

- **DO NOT OPERATE HEAT PUMP IN COOLING MODE IF TEMPERATURE IS BELOW 65º F**
- **THE OUTDOOR PORTION OF THE HEAT PUMP SHOULD BE FREE OF DEBRIS AND SNOW (AND BE A LEAST 18 INCHES ABOVE THE GROUND AND LEVEL)**
- **CHECK THE BLOWER AND FILTER AND REPLACE THE FILTER MONTHLY WHEN IN USE**
- **CLEAN THE FINS ON THE CONDENSER COILS (EXTERIOR PORTION) AT LEAST TWICE A YEAR**
- **CHECK THE MANUFACTURER'S MANUAL ON WHEN AND HOW TO LUBRICATE AND MAKE ADJUSTMENTS**

For further information contact your local public utilities office, oil supplier, a licensed HVAC contractor or the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) or the Heating, Refrigerating and Air conditioning Institute of Canada (HRAI).

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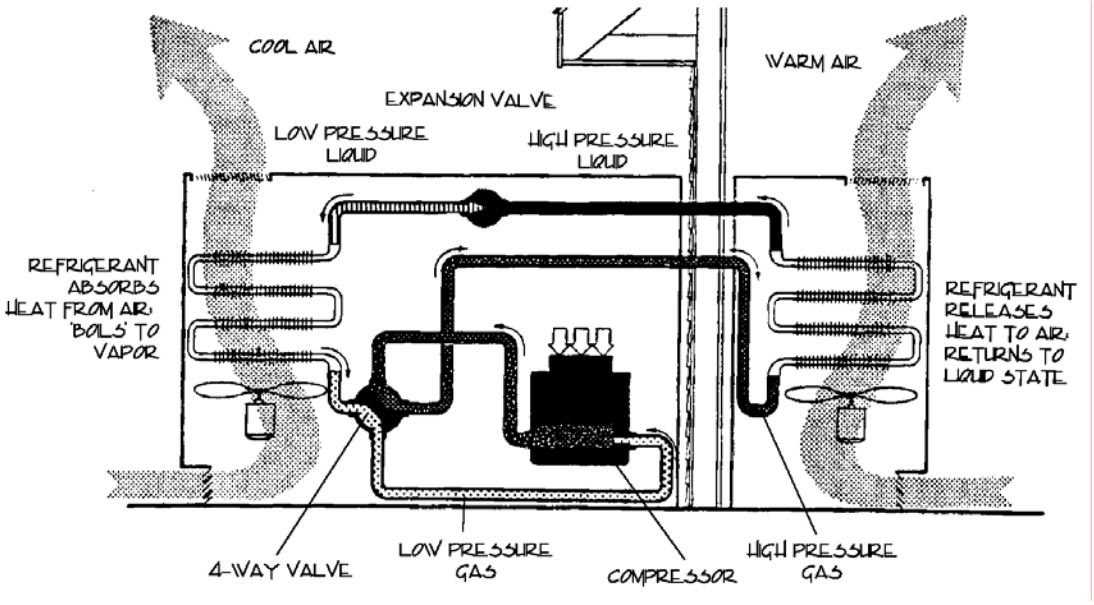
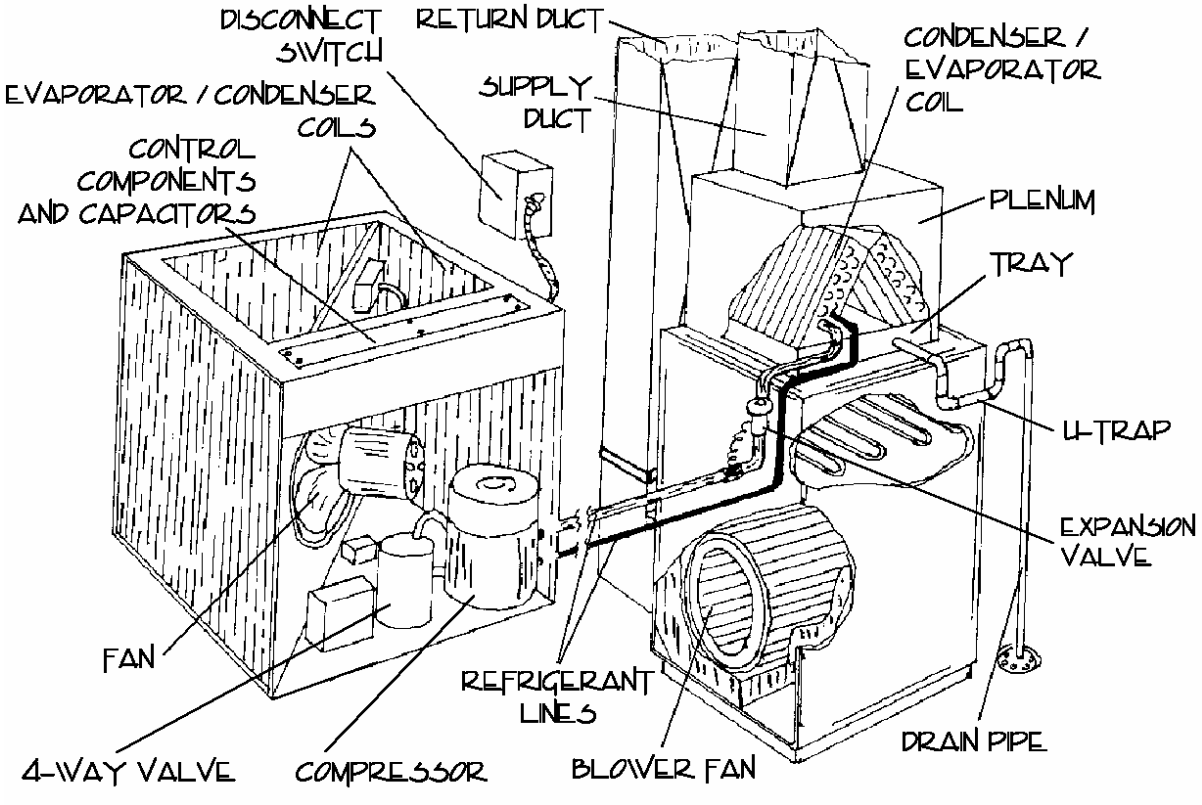


SCHEMATIC OF A TYPICAL HEAT PUMP – HEATING CYCLE



TYPICAL SPLIT AIR -TO-AIR HEAT PUMP SYSTEM