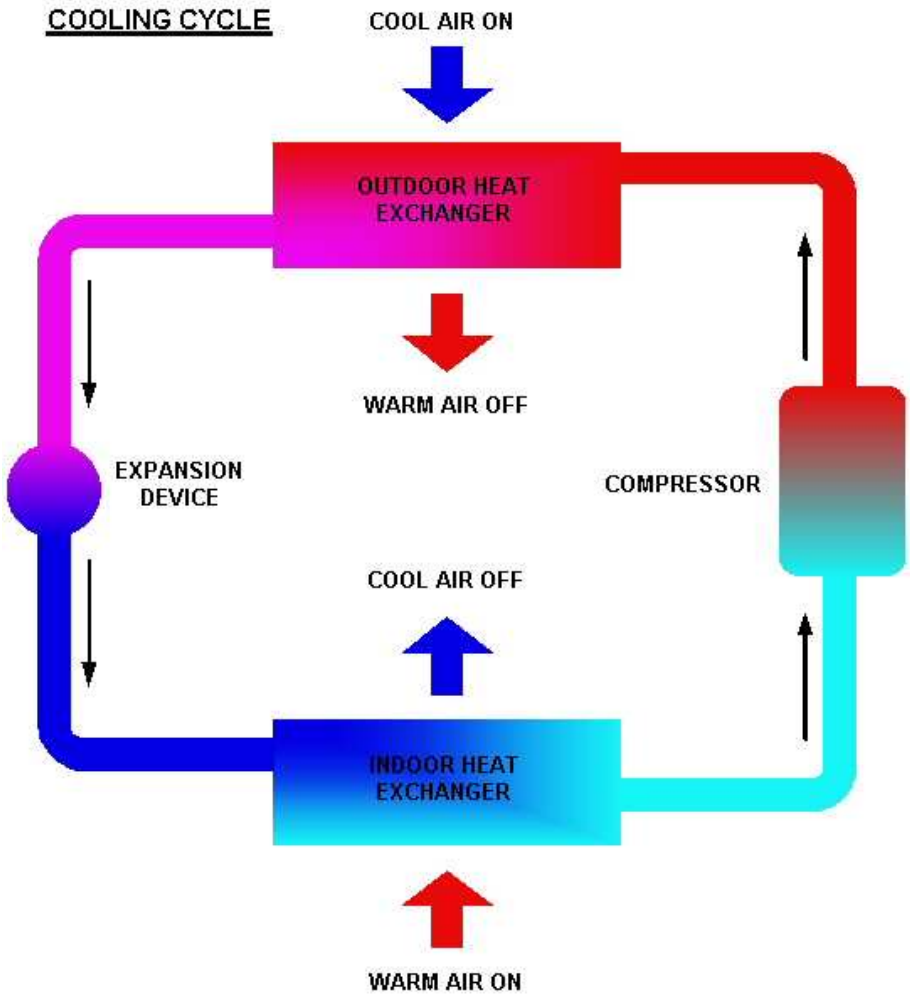
How a reverse heat pump works…

The reverse cycle heat pump is widely used, as a means of absorbing low grade heat from natural sources, such as air, water or ground. The heat pump simply moves heat from one place to another.
The reverse cycle heat pump is based on a simple refrigeration system that can be reversed…

Let us take for example an air source heat pump…

Please view the diagram below…



Imagine the air conditioning system above, shown in the cooling mode…

Refrigerant is circulated through the indoor unit heat exchanger at very low temperatures. Heat is absorbed from the circulating air, into the refrigerant fluid / gas mixture. The mixture then enters the compressor and the heat already extracted is boosted by the heat of compression. This heat is then rejected in the outdoor unit heat exchanger. The liquid refrigerant is then dropped in pressure and temperature by the expansion device and starts the circuit again.

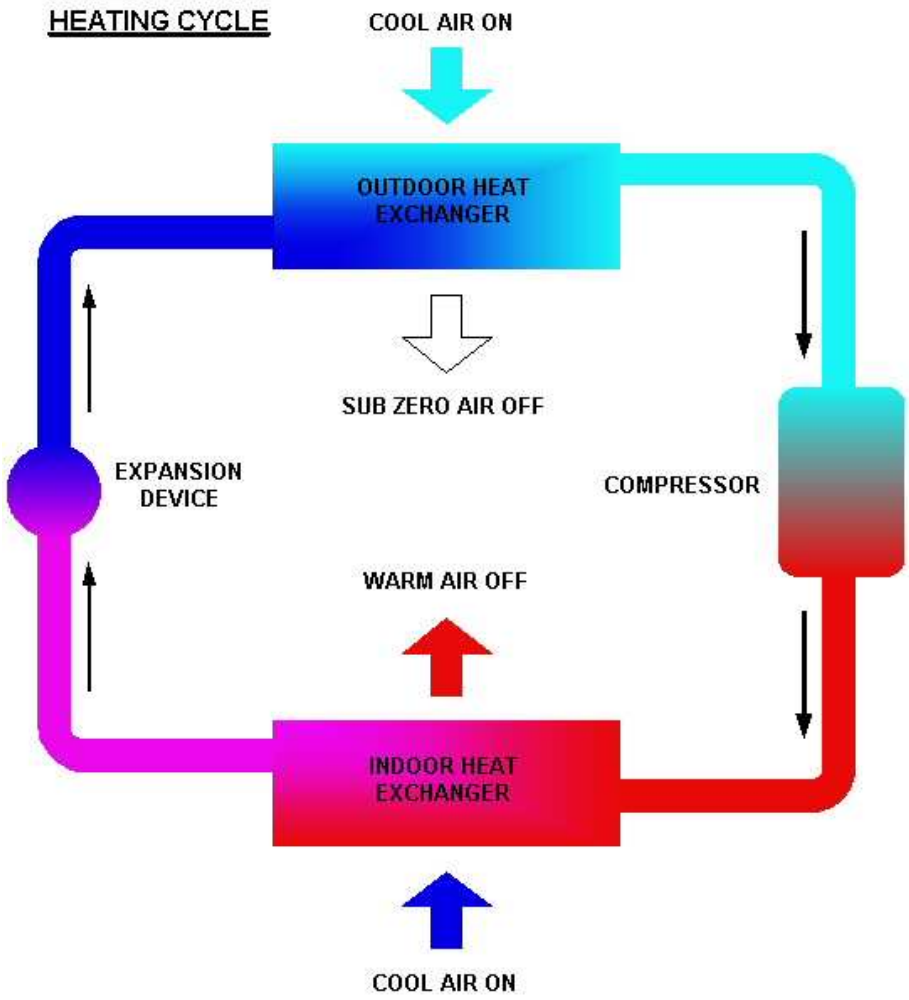
THUS HEAT IS MOVED FROM THE INDOOR AIR TO THE OUTDOOR AIR

The principle is the same for most refrigeration systems…

How a reverse heat pump works…

Now imagine that the cycle was reversed and the indoor heat exchanger became the outdoor heat exchanger…

Please view the diagram below…



Imagine the air conditioning system above, shown in the heating mode…

Refrigerant is circulated through the outdoor unit heat exchanger at very low temperatures. Heat is absorbed from the circulating air, into the refrigerant fluid / gas mixture. The mixture then enters the compressor and the heat already extracted is boosted by the heat of compression. This heat is then rejected in the indoor unit heat exchanger. The liquid refrigerant is then dropped in pressure and temperature by the expansion device and starts the circuit again.

THUS HEAT IS MOVED FROM THE OUTDOOR AIR THE INDOOR AIR

Why is the heating cycle efficient...?

The low temperature of the refrigerant within the outdoor coil (heating mode) causes heat from the circulating air to be absorbed into the refrigerant. In simple terms heat always flows from HOT to COLD. When further heat is added due to the heat of compression generated within the compressor, this heat becomes useful.
Heat can be absorbed from the air using standard refrigerants down to approx minus 15 deg C. Developments with CO2 refrigerants are now allowing useful heat to be absorbed with air temperatures down to minus 25 deg C.
Efficiencies of heat pumps have increased dramatically over the last decade or so. They are now regarded as a sound alternative to fossil fuel heating.
Don't forget the heat pump can also cool allowing two uses from one system…