Mini-Split 101

The descriptions and pictures below are designed to foster a basic understanding of the parts of your ***mini-split*** system. This page will focus on non-ducted split systems such as the Mitsubishi units that have an outside heat pump and a wall unit (or units) and slim ducts that have minimal or no ductwork. For heat pumps with duct work, please visit our Heat Pumps 101 page.

Our brand new Mini-Split Guide is available here! Our Mini-split expert Nick Lucas will be happy to review this information with you if you are in the market for a new mini-split heat pump.

When you call for service, we hope they will help you to identify those parts of your system that may need service. When you receive an invoice from us, we hope the information below will help clarify which parts and systems we worked on during our service visit.

The outside part of the mini-split system is usually powered by a **double pole circuit breaker** in the breaker box. An extremely common cause of no heating or cooling is a circuit breaker in the off position.

The **outside disconnect** is the switch used outside to turn on and off power to the outside heat pump. An extremely common cause of no heating or cooling is having this switch in the off position.

The **outside heat pump unit** houses the compressor, expansion valves, outside coil, condenser fan, and control board.

The outside unit uses a **condenser fan and motor** to pull outside air through the coil to extract heat in winter and reject heat in the summer.

This is a view inside the heat pump unit with its case removed showing the fan and the coil behind it. The compressor is the black cylindrical object in the lower right.

The refrigerant flow is controlled in modern heat pumps in the outside unit with **electronic expansion valves**, one for each inside wall unit or slim duct. This makes sure that refrigerant flow is optimized at all times. When the outside unit is first started up, these electronic expansion valves will tick for a few minutes as they re-index themselves.

To changeover from heating mode to cooling mode, the direction of the refrigerant must by reversed so that the outside unit gets hot and the inside unit gets cold in summer for cooling and vice versa in heating. This is accomplished in the outside unit with a **reversing valve**.

Modern heat pumps are highly sophisticated units that depend on computer programs to operate efficiently and reliably. The **outside control board** performs this task. Unfortunately, this is also the point of greatest vulnerability to the inadequate Vineyard power grid.

The refrigerant pipes are connected to the outside unit at the **service valves** – this is also the point where we can connect our gauges to measure the refrigerant pressures in the system.

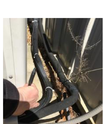
The line set is connected to the outside unit with **flare fittings**. These were originally designed to simplify relocating the mini-split unit (a common practice elsewhere in the world where people take their appliances with them when they move). Unfortunately, the flare fitting is the leading location of leaks in mini-splits.

The control board not only monitors the pressures but also the refrigerant temperatures going to the indoor heads using **temperature sensors.**

The outdoor unit **power wire** is 230 volts AC and is the sole source of power for the entire system.

The indoor units are powered and controlled by **4 wires** from the outside unit. One wire is ground, one wire is communication, and two wires are power.

The outside unit **compressor is variable speed** to precisely control the flow of refrigerant. It is well insulated in sound proofing to reduce noise output.



The copper pipes that carry the refrigerant into the house and back out are called the "**line set**". Both lines are insulated because a heat pump moves heat into the house in the winter and out of the house in the summer line set inside house