

Suction Line Accumulator

tech
tips



Horizontal Model

Purpose & Design

The refrigeration compressor is designed to compress vapor only. A suction line accumulator prevents compressor damage from a sudden surge of liquid refrigerant and oil which could enter the compressor from the suction line. The suction line accumulator is a temporary reservoir for this mixture, designed to meter both the liquid refrigerant and oil back to the compressor at an acceptable rate. This prevents damage to the reed valves, pistons, rods, and crank shafts.

Accumulators have a metering ejector device that picks up liquid, vaporizes it, and returns it to the compressor. This prevents liquid slugging and controls oil return. It is particularly important on hot gas defrost systems, heat pumps, etc., where surges of liquid refrigerant frequently go back down the suction line.

Vertical accumulators (see Fig. 1) use a U-tube or tube within a tube design to draw gaseous refrigerant off the top of the vessel. At the bottom of the U-tube an orifice picks up a small amount of oil and liquid refrigerant and meters it back with

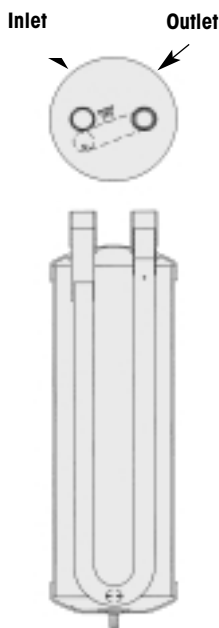


Figure 1
Vertical Model

the gaseous refrigerant. The small amount of liquid refrigerant will boil off in the suction line. The oil will be carried with the gaseous refrigerant back to the compressors.

A vent hole at the top of the accumulator U-tube outlet acts as a vacuum break to prevent an accumulator that has flooded during an off-cycle from slugging upon start up of the system. Vertical accumulators protect the return orifice with a screen assembly, and also feature a 430°F fusible relief device in the S-7000 Series.

ASME Accumulators over 6" diameter are manufactured to ASME Code, Section VIII. A female pipe connection is supplied for a pressure relief device. A pipe plug is installed in this connection for pressure testing and painting at the factory.

Vertical accumulators should have a heat exchanger coil (see Fig. 2) or a Heat Element added on low temperature applications (0°F and below) to help boil off liquid refrigerant and raise the oil temperature to help facilitate oil flow.

The heat exchanger can be used on low-temp. systems to sub-cool the liquid line while helping to boil off liquid refrigerant in the accumulator by passing the liquid line through the heat exchanger coil. This can increase system efficiency while helping oil flow in the suction line.

Do not use discharge gas through the heat exchange coil or there is a risk of overheating the compressors.

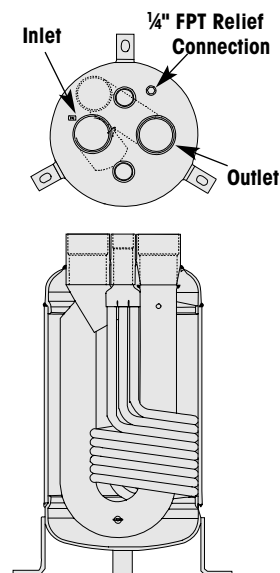
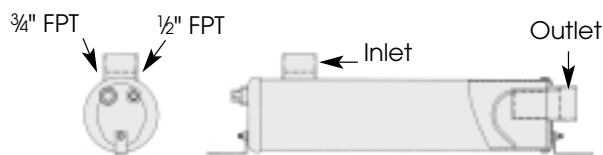


Figure 2
Vertical Model with Heat
Exchanger

Figure 3



Horizontal Accumulators (Fig. 3) should not be used when the temperature of the liquid refrigerant is less than 15°F (9°C) in the accumulator. At temperatures below this point, the oil will become thick and will not draw up the dip tube to be metered back to the compressor.

Heat bands are available to help boil off liquid and aid oil flow. Do not add too much heat or there is a risk of overheating the compressors. Any heat bank that is added should be installed at the bottom of vertical accumulators and the outlet end of horizontal accumulators.

Heat Elements

Catalog No.	Diameter	Wattage	Voltage
S-9101	4" (102 mm)	25W	100V
S-9111	4" (102 mm)	25W	220V
S-9112	6" (152 mm)	50W	220V

Selecting the size of a Suction Line

Accumulator

Selection of a suction line accumulator should be made on the basis of the following three capabilities. The accumulator should have an adequate liquid holding capacity, which can vary with the system. Normally this should not be less than 50% of the system charge. If possible this value should be checked based on actual tests.

A second consideration should be the ability of the accumulator to perform without adding excessive pressure drop to the system. The recommended maximum tonnages shown in the following tables are based on a pressure drop equivalent to 1/2°F. These ratings are those of the accumulator, based on oil return through the accumulator, and will be modified by the length of the suction line and compressor displacement.

Finally, an accumulator should have the capability of returning liquid at the proper rate and under a range of load conditions.

Installation

Install the accumulator after the suction line filter (see Fig. 4), or the orifice in these accumulators may clog if wax or other debris is carried by the oil into the accumulator. This is especially important on systems using POE oil.

Insulate the accumulator to prevent condensation from forming on the outside. Many customers prefer not to insulate the accumulator to gain some heat transfer from the air surrounding it, but some means of catching the condensation formed is necessary in most cases.

On accumulators with heat exchanger coils, the coil should be connected to the liquid line after the receiver (see Fig. 4). Since the heat exchange coil is a closed loop, the heat exchange coil "in" and "out" fittings may be switched.

Vertical Accumulators

Install the accumulator in a vertical position as close to the compressor as possible. **WARNING:** Wrap a wet rag around the base of the copper fittings on the S-7000 Series to prevent damage of the factory installed braze.

Connect the suction line from the evaporator to the inlet of the Accumulator. Connect the outlet of the Accumulator to the suction line of the compressor (Fig. 4).

On systems with a reversing valve and on heat pump systems, the Accumulator should be installed between the compressor and the reversing valve (see Fig. 5). The pumpdown cycle should precede all compressor shutdowns.

Horizontal Accumulators

Install the Accumulator in a horizontal position with the top of inlet being level so that the return tube is at the lowest part of the Accumulator, leaving a smaller pool of liquid in the bottom of the Accumulator (see Fig. 3). The connection size must be the same as the line size.

Connect the suction line from the evaporator to the inlet connection.

Connect from the outlet to the compressor allowing a straight run of 12" minimum to permit full venturi action. Avoid sharp 90° bends wherever possible, use two 45° elbows to encourage laminar flow of returning gas.

These Accumulators have a 1/2" FPT connection for liquid injection and a 3/4" FPT connection for hot gas bypass. These connections can also be used as a relief device as required by UL 207.

The Accumulator should be supported by the use of two angle brackets furnished. These brackets are designed to be fastened to the stud on each end cap.

Figure 4

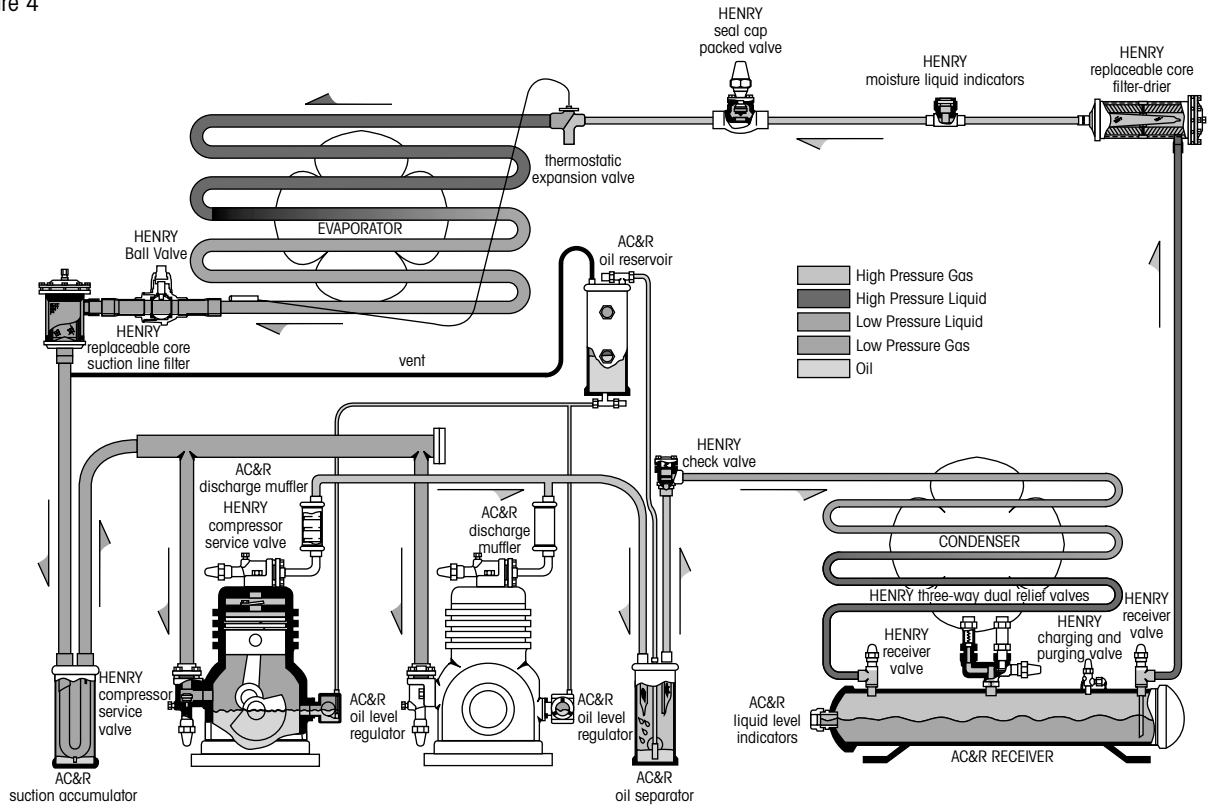
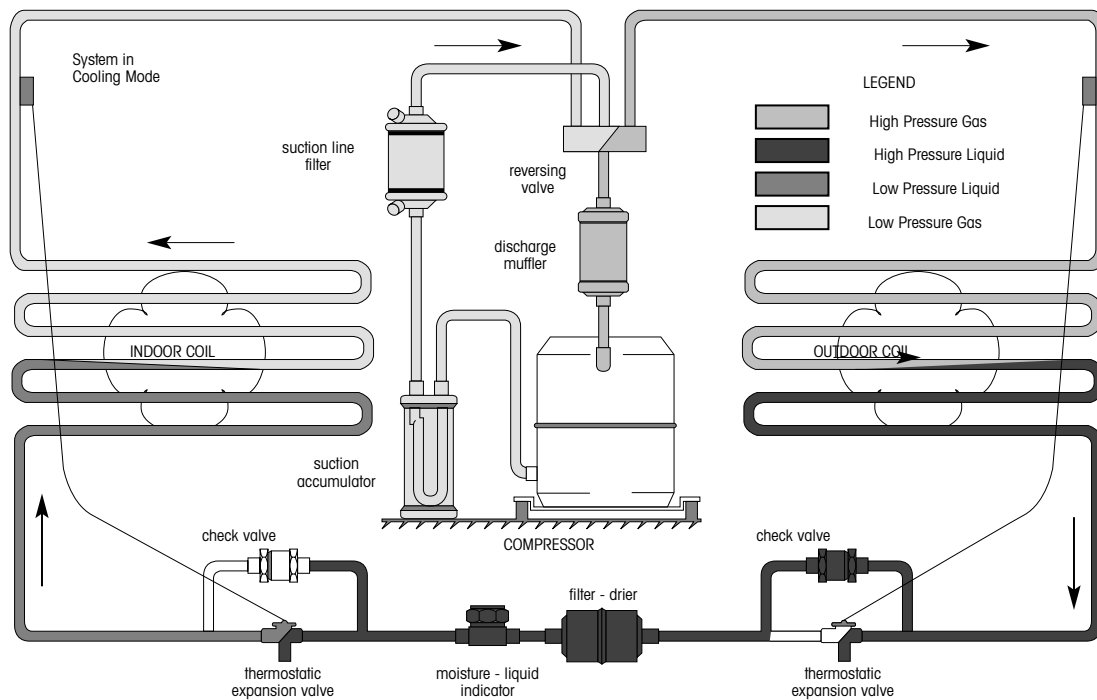


Figure 5



Trouble-shooting

- On accumulators with fusible elements, if the fusible element leaks, the accumulator must be replaced. No field repair of fusible elements is authorized by Henry Technologies. The fusible element is a UL requirement for venting of gas during a fire to prevent rescue personnel from injury due to a tank rupture. Soldering over this connection or in any other way preventing the fusible element from melting out to relieve pressure will void UL listing.
- By removing the insulation on an accumulator it is possible to observe the level of refrigerant in the vessel in most cases by the level of condensation or frost on the exterior. On systems that slugging is suspected, observe the vessel during a variety of conditions, especially during defrost cycles.
- If refrigerant slugging is witnessed on a system with an accumulator there are several possibilities for the cause of the problem:
 1. The accumulator is too small to catch all of the refrigerant. Double check to make sure that the accumulator can hold 50% of the system charge. Also check to make sure that there is sufficient super-heat on each evaporator. Adding a heat band to the accumulator will help boil some refrigerant off, but will not always work if the refrigerant is due to defrost flooding. In this case, insure that each evaporator goes through its defrost cycle at different times with 15 to 20 minutes between evaporators. Otherwise, the only sure fix is to install the proper size accumulator or install an additional accumulator in series with the first.
 2. The accumulator is sized too small to handle the tonnage. This will cause the orifice to meter back more refrigerant due to the increased gas flow past the orifice. Double check the sizing of the accumulator, insuring that the tonnage is not above the maximum capacity. It is necessary to install the correct size accumulator in this case or install a second identical accumulator in parallel.
 3. A standard accumulator should not be used for a heat pump application. The orifice in standard accumulators is larger than those in heat pump accumulators. The smaller orifice prevents excessive liquid refrigerant return during winter heating. The standard accumulator must be removed and replaced by a heat pump model.
- If there is no oil returning from the accumulator and the oil cannot be accounted for by the separator and oil control system, there are a few possibilities for the cause of the problem:
 1. The accumulator is sized too big to handle the tonnage. The orifice will not meter back oil due to the reduced flow through the accumulator. Double check the sizing of the accumulator to insure that the tonnage is above the minimum rating. It is necessary to install the correct size accumulator in this case.
 2. Wax or other debris has clogged the orifice. This occurs more often on vertical accumulator than horizontal due to the difference in size of the metering device diameters. Small orifices are screened to help prevent this, but excessive debris will still clog the screen element. The only cure to this problem is to change the filter elements in the system, especially the suction filter, and to replace the accumulator.
 3. If a horizontal accumulator is used on a system that the evaporator temperature is too low. Oil will not be returned in sufficient quantity due to the sluggish flow at colder temperatures. A heat band may help in this case, but if oil return continues to be a problem, replace the accumulator with a vertical model.
- If too much oil is returning to the compressor from the accumulator, it is possible that the oil separator is not functioning properly or that an oil separator needs to be installed. On certain low-temp or flooded systems, it may be necessary to install a higher efficiency oil separator. If a high pitched whistle from the accumulator is noticed upon initial start up of the system, insure that the accumulator inlet and outlet have been piped correctly.