For Refrigerant Lines Over 75 Feet

Split System Application Guideline

GENERAL

This guideline applies to all NORDYNE residential split system air conditioners and heat pumps with nominal capacities under 65,000 Btu. The installation instructions provided with the equipment specify a maximum equivalent line length of 75 feet. This guideline covers applications with equivalent line lengths up to 175 feet.

REFRIGERANT LINE CONSIDERATIONS

Proper sizing of the refrigerant lines is critical to maintain satisfactory performance and reliability. Many factors are involved in determining refrigerant line size including length of horizontal run, length of vertical risers, number and placement of fittings, placement of the condensing unit relative to the evaporator, and total equivalent line length.

All systems installed in long-line applications must use only 3/8 inch liquid lines. Use of larger liquid lines will significantly increase the system charge and could lead to liquid refrigerant related failures of the compressor. Static head and friction losses in liquid lines must be minimized to avoid refrigerant flashing.

The vapor line must be sized so that refrigerant velocities are high enough to return oil to the compressor. Low refrigerant velocities can result in loss of lubrication failures of the compressor. The ASHRAE Fundamentals recommend a refrigerant velocity under low load conditions of 500 feet per minute in horizontal runs and 1000 feet per minute in vertical risers. The approximate cooling capacity loss for various vapor line sizes and equivalent lengths are shown in **Table 1** below. Equivalent length is the total linear length of vapor line plus additional equivalent lengths for all fittings and elbows.

Use special care to isolate the refrigerant lines from the structure to prevent vibration and/or noise from being transmitted to the structure.

RESTRICTOR SIZING

Long refrigerant line runs result in increased frictional flow losses. In order to compensate for these losses, the restrictor(s) must be re-sized per the following tables. If the total equivalent horizontal length is greater than 100 feet, the restrictor(s) bore must be increased by 0.001 inches over the value shown in **Table 2**.

If the required restrictor size determined from **Table 2** is a non-standard size, round up to the nearest standard restrictor size.

Nominal Unit Capacity (Btuh)	Standard Vapor Line Diameter*	Extended Run Vapor Line Diameter	Percent Nominal Cooling Capacity Versus Equivalent Line Length**				
			75 ft.	100 ft.	125 ft.	150 ft.	175 ft.
18,000	5/8	5/8	96	94	93	91	90
		3/4	99	98	97	96	95
24,000	5/8	5/8	94	91	89	87	85
		3/4	98	97	96	95	94
30,000	3/4	3/4	97	96	95	93	92
		7/8	98	97	96	95	94
36,000	3/4	3/4	96	94	93	91	89
		7/8	98	97	96	95	94
42,000	3/4	3/4	95	93	92	90	88
		7/8	98	97	96	95	94
		1 1/8	99	98	97	96	95
48,000	7/8	7/8	95	93	91	90	88
		1 1/8	97	96	95	94	93
60,000	7/8	7/8	93	91	89	87	85
		1 1/8	97	95	94	92	91

* Vapor line diameter for nominal 20 foot line set.
** Multiply this percentage times the nominal cooling capacity. Vapor line diameter has no effect on heating performance.

Table 1. Approximate Cooling Capacity Loss for Various Vapor Lines and Equivalent Lengths

OUTDOOR UNIT ABOVE INDOOR UNIT

Indoor Restrictor Bore Size Reduction (Air Conditioner and Heat Pump)	
Vertical Separation Feet	**Restrictor Size Change**
75-100	-0.007
101-125	-0.009
126-150	-0.010
151-175	-0.011

Outdoor Restrictor Bore Size Increase (Heat Pump Only)	
Vertical Separation Feet	**Restrictor Size Change**
75-100	+0.006
101-125	+0.008
126-150	+0.010
151-175	+0.011

Table 2. Restrictor Sizing

CHARGING

All split systems are factory shipped with the refrigerant charge noted on the unit nameplate. This charge is for a typical application of 20 feet of equivalent line length. Systems installed with more than 25 feet of refrigerant line should be charged following the charging method described in the installation instructions or the alternate superheat method. No additional oil charge is required for these applications.

ADDITIONAL COMPONENTS

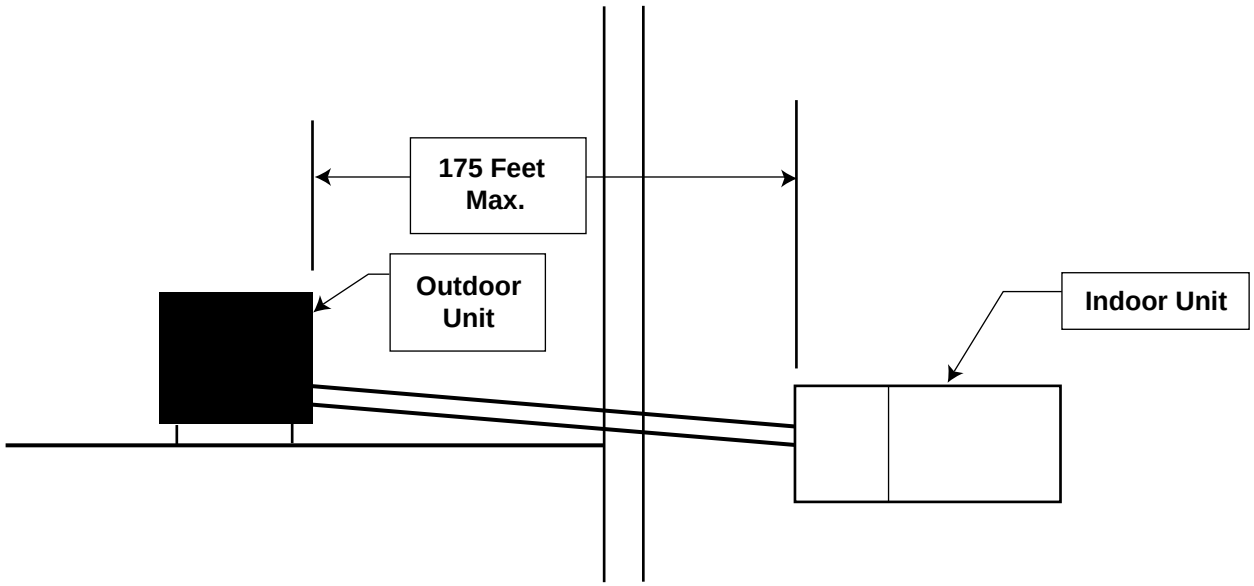
For equivalent line lengths above 100 feet, a compressor crankcase heater is required.

For applications with a vertical separation of more than 50 feet, an oil trap must be installed in the vapor line at the 50 foot elevation and every 40 feet above 50 feet.

For applications with a vertical separation of more than 75 feet between the indoor and outdoor units, a liquid line solenoid kit must be installed within 10 feet of the outdoor unit. A hard start kit should be installed on all single phase reciprocating compressor applications with a liquid line solenoid. No hard start kit is required for three phase reciprocating or scroll compressor applications. An anti-short cycle timer (ASCT) is recommended for all applications with vertical separation above 75 feet. Note that ASCT is standard on all heat pumps.

APPLICATIONS SUMMARY

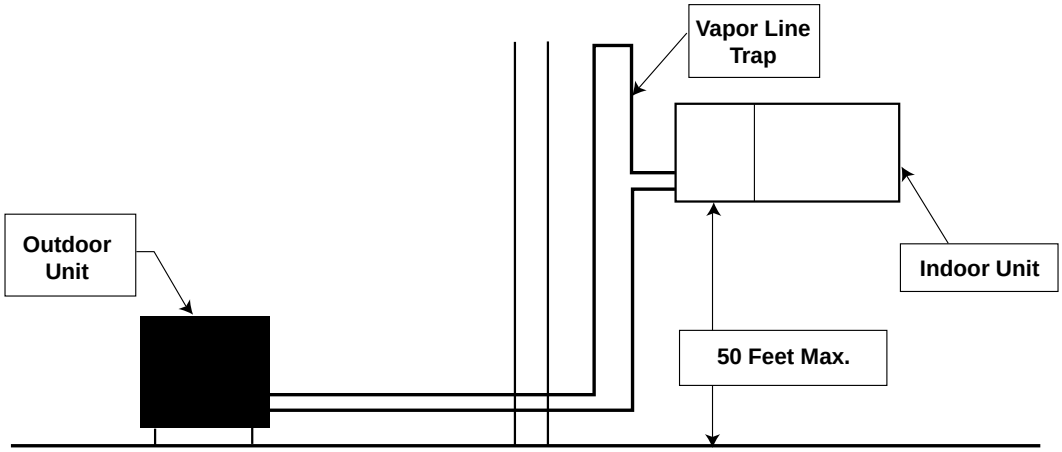
The following **Figures 1, 2 & 3** summarize these guidelines.



Air Conditioner Or Heat Pump – Horizontal Run

- Increase restrictor bore 0.001 inches if total equivalent horizontal length is more than 100 feet.
- Crankcase heater required if total equivalent length is more than 100 feet.
- Vapor line should be sloped towards indoor unit.
- 175 feet maximum equivalent line length.

Figure 1. Air Conditioner Or Heat Pump – Horizontal Run



Air Conditioner Or Heat Pump – Indoor Unit Above Outdoor Unit

- Increase restrictor bore 0.001 inches if total equivalent horizontal length is more than 100 feet.
- Crankcase heater required if total equivalent length is more than 100 feet.
- An inverted vapor line trap must be installed with the top of the trap above the indoor unit.
- 175 feet maximum equivalent line length.
- 50 feet maximum vertical separation.

Figure 2. Air Conditioner Or Heat Pump – Indoor Unit Above Outdoor Unit

Air Conditioner Or Heat Pump – Outdoor Unit Above Indoor Unit

- Adjust restrictor size(s) per table.
- Increase restrictor bore 0.001 inches if total horizontal equivalent length is more than 100 feet.
- Crankcase heater required if total equivalent length is more than 100 feet.
- If vertical separation is greater than 50 feet, install a vapor line oil trap 50 feet above indoor unit and every 40 feet up to outdoor unit elevation.
- 175 feet maximum equivalent line length.
- If vertical separation is greater than 75 feet, install a liquid line solenoid valve within 10 feet of outdoor unit. A hard start kit is also recommended for single phase reciprocating compressor applications. An ASCT is recommended for air conditioners.

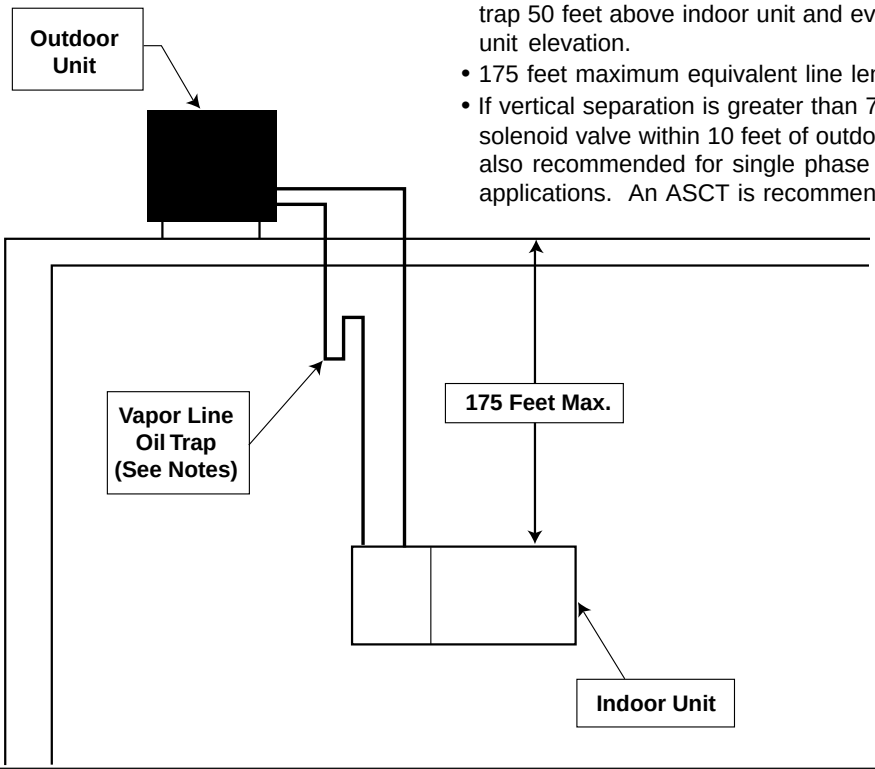


Figure 3. Air Conditioner Or Heat Pump – Outdoor Unit Above Indoor Unit

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