

How to use the Liebert Refrigerant Line Sizing Program

This dialog window is used to enter the data used for the analysis.

At the top of the dialog window the title for the analysis can be entered. The date can also be entered, but the program will default this to the current date if nothing is entered.

You may select English or Metric units for the inputs and results.

The analysis data is entered in the middle of the dialog window.

For the suction, discharge (hot gas), and liquid lines the equivalent length and, optionally, the outside diameter are entered. The required line diameter will be calculated for any of the lines where a length is entered and the diameter is set to 0. You must enter the equivalent length for the type of line you are using. For split systems with condensing units enter the suction and liquid lines. For self contained systems with condensers enter the discharge and liquid line. The program will calculate the size of the line needed based on a maximum refrigerant temperature drop, listed on page 2, and show the details on the output page. As an alternative, you may enter a desired line size in the Outside Diameter boxes. The program will calculate the pressure drops and velocities based on the input diameters.

The appropriate temperatures are entered for the evaporator, condensing and liquid. These should be for the design operating conditions of the system (i.e. 75°F/45 or 50% RH at 95°F ambient). The difference between the condensing temperature and liquid temperature is the system sub-cooling. 10° F is a typical value for sub-cooling. We have chosen typical values but these may be changed if you have more specific values to use.

Finally the cooling capacity is entered. This is the net cooling effect from the compressor. For multiple compressor units, each with their own line sets, enter the capacity per compressor. Values for Liebert systems based on 75°F return air temps, may be found at the blue circle question mark.

Pressing the "Output" button will display the results of the analysis.

Pressing the "Exit" will quit the program without performing any analysis.

Output Screen

The outputs echo the inputs plus the results.

Included: Line size outside diameter, Pressure drop, Temperature drop, Refrigerant velocity and flow rate.

Warnings are also output if the results are beyond accepted values.

For further study please refer to the ASHRAE Refrigeration Handbook. Additional information on refrigerant line sizing may be found in ARI and RSES publications.

SAFM-7820-29
Rev. 7; 08/11/11

Line Sizing Guide

(R22 & R407C)

Typical Design Values:

Suction Line

< 2 degree (1.1C) temperature drop
< 3 psi (20kPa) pressure

Liquid Line

< 1 degree (.6C) temperature drop
< 3 psi (20kPa) pressure drop

Hot Gas (Discharge Line)

Vertical risers may be sized separate from horizontal runs in order to maintain sufficient velocity to move oil up the riser.

< 2 degree (1.1C) temperature drop
< 6 psi (40kPa) pressure drop (6-10 psi (40-70 kPa) drop will experience a loss in capacity)

Equivalent lengths: The equivalent length of a line consists of the linear distance plus the addition of equivalent lengths of fittings and specialty items whose values may be found in Table 1.

Table I: Equivalent Lengths, Feet (m) for Various Pipe Fittings

Copper Pipe	90 Degree Elbow		45 Degree	Tee	Gate	Globe	Angle	Typical
O.D. in.	Copper	Cast	Elbow		Valve	Valve	Valve	Trap
1/2	0.8 (.24)	1.3 (.4)	0.4 (.12)	2.5 (.76)	0.26 (.08)	7.0 (2.1)	4.0 (1.2)	3.2 (.96)
5/8	0.9 (.27)	1.4 (.43)	0.5 (.15)	2.5 (.76)	0.28 (.085)	9.5 (2.9)	5.0 (1.5)	3.6 (1.08)
3/4	1.0 (.3)	1.5 (.46)	0.6 (.18)	2.5 (.76)	0.3 (.09)	12.0 (3.7)	6.5 (2)	4.0 (1.2)
7/8	1.45 (.44)	1.8 (.55)	0.8 (.24)	3.6 (1.1)	0.36 (.11)	17.2 (5.2)	9.5 (2.9)	5.8 (1.76)
1 1/8	1.85 (.56)	2.2 (.67)	1.0 (.3)	4.6 (1.4)	0.48 (.15)	22.5 (6.9)	12.0 (3.7)	7.4 (2.24)
1 3/8	2.4 (.73)	2.9 (.88)	1.3 (.4)	6.4 (2.0)	0.65 (.2)	32.0 (9.8)	16.0 (4.9)	9.6 (2.92)
1 5/8	2.9 (.88)	3.5 (1.0)	1.6 (.49)	7.2 (2.2)	0.72 (.22)	36.0 (11)	19.5 (5.9)	11.6 (3.52)

Limitations Guides and Precautions:

Small Systems and Challenger split systems:

Maximum equivalent length ≈ 200 feet (60m)

Vertical Rise (Condensing unit high, 3, 5 & 8 ton) 50 feet (15m) ♣

Vertical Rise (Condensing unit high, 1, 1.5 & 2 ton) 40 feet (12m)

Condensing units must not be located more than 15 feet (4.5m) below the evaporator ♥

♣ Small system runs over 50 (15m) equivalent feet (vertical) require installation of a Liquid Line solenoid valve. (reference SFA: E7300-01)

♥ When below 15 feet (4.5m) Small Systems require a field installed Suction/Liquid heat exchanger (supplied by others)

Liebert DS and Challenger self contained systems:

Maximum equivalent length (single compr or 2-step) ≈ 280 feet (85m)

Maximum equivalent length (4-step or digital) ≈ 260 feet (79m)

Vertical Rise (Condenser high, single compr or 2-step) 70 feet (21m)

Vertical Rise (Condenser high, 4-step or digital) 60 feet (18m)

- Horizontal suction and hot gas line velocities must be greater than 700 FPM (3.6m/s) and pitched 1/2" (1.3cm) per every 10 feet (3m) of horizontal run
- Vertical lifts (H.G. risers) must exceed 1000 FPM (5m/s) up to 3000 FPM (15m/s) but may be noisy
- Trapping must be practiced at bottom of riser with any rise over 5 feet high. If rise exceeds 25 feet (7.5m), then we require a trap in 20 foot (6m) increments or evenly divided
- Scenarios involving condenser located below evaporator; condenser can not be greater than 15 feet (4.5m) below evaporator with FSC. Condenser with Lee-Temp should be on the same level ♠
- ♠ Additional liquid lift will require the installation of a sub-cooler on Liebert DS and Challenger (Application will be good for 30 feet (9m) with this optional equipment)