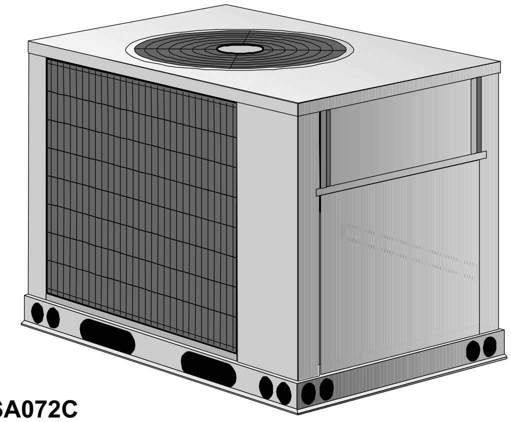
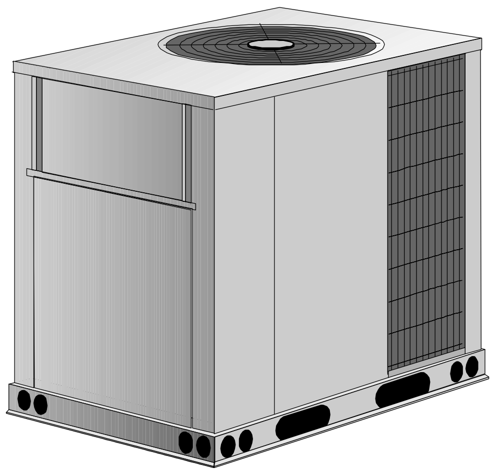
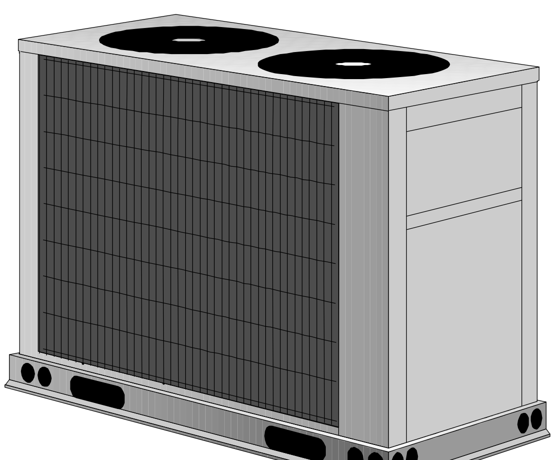


LSA072C



LSA090C



LSA120C

## ⚠ IMPORTANT

**Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer or service agency.**

# INSTALLATION INSTRUCTIONS

# LSA072C (6 TON)
# LSA090C (7.5 TON)
# LSA120C (10 TON)

All units equipped with a scroll compressor

**CONDENSING UNITS**
504,199M
2/2000
Supersedes 503,475M
See unit nameplate for manufacturer and address.

Technical Publications
Litho U.S.A.

## Table of Contents



## Shipping & Packing List

1 - Assembled condensing unit
1 - Filter drier

Check equipment for shipping damage. If you find any damage, immediately contact the last carrier.

## General Information

These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities having jurisdiction before installation.

## ⚠ IMPORTANT

**The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFCs and HCFCs) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.**

## ⚠ IMPORTANT

**Units are shipped with a holding charge of dry air and helium, which must be removed before the unit is evacuated and charged with refrigerant.**

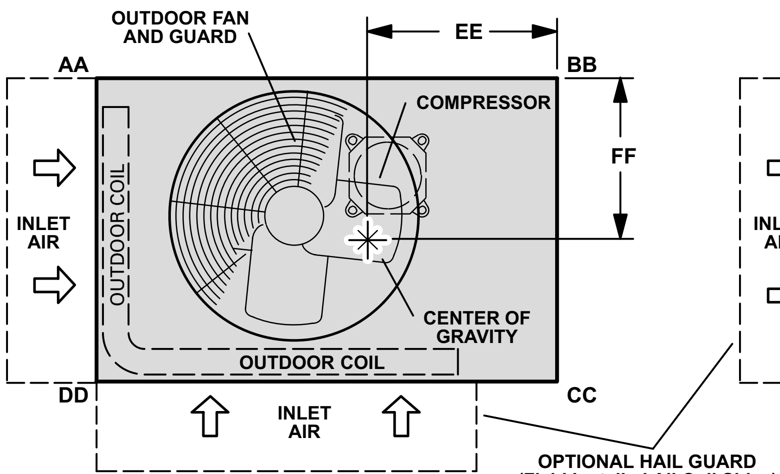
## LSA072C & LSA090C Dimensions - inches (mm)

**CORNER WEIGHT**

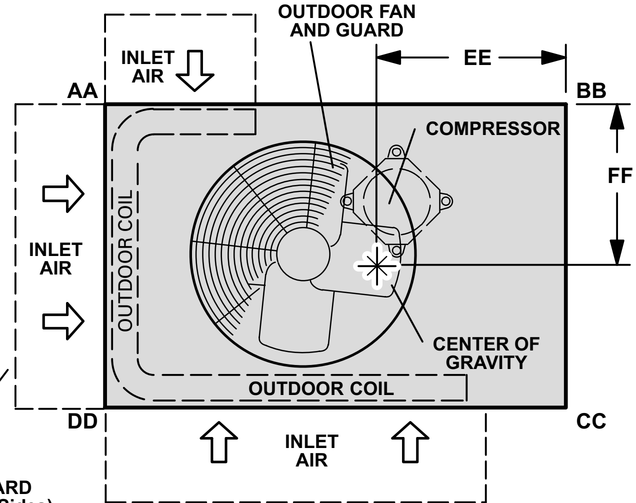
| Model No. | AA | | BB | | CC | | DD | |
|---|---|---|---|---|---|---|---|---|
| | lbs. | kg | lbs. | kg | lbs. | kg | lbs. | kg |
| LSA072C | 79 | 36 | 93 | 42 | 83 | 38 | 70 | 32 |
| LSA090C | 93 | 42 | 109 | 50 | 94 | 43 | 80 | 36 |

**CENTER OF GRAVITY**

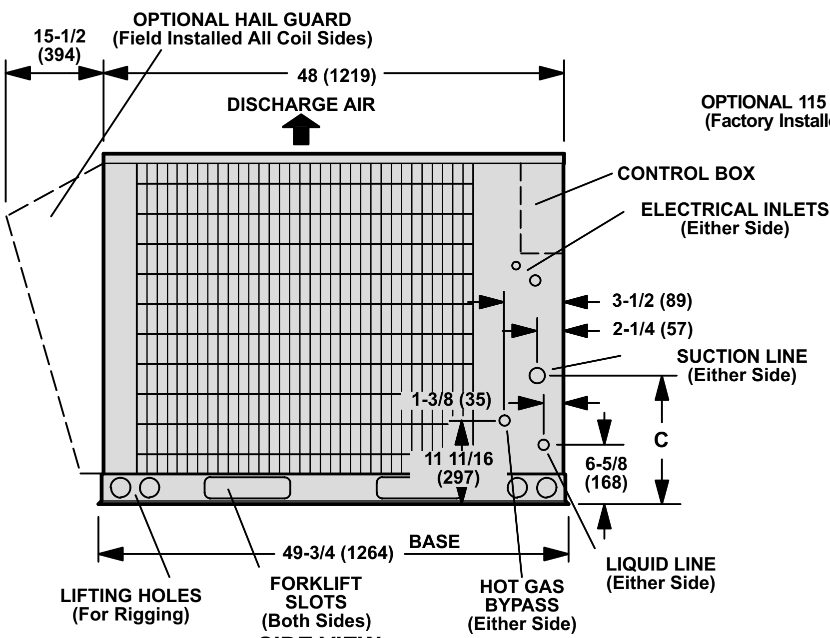
| Model No. | EE | | FF | |
|---|---|---|---|---|
| | inch | mm | inch | mm |
| LSA072C | 22-5/8 | 575 | 16-5/8 | 422 |
| LSA090C | 22-1/8 | 562 | 15-3/4 | 400 |



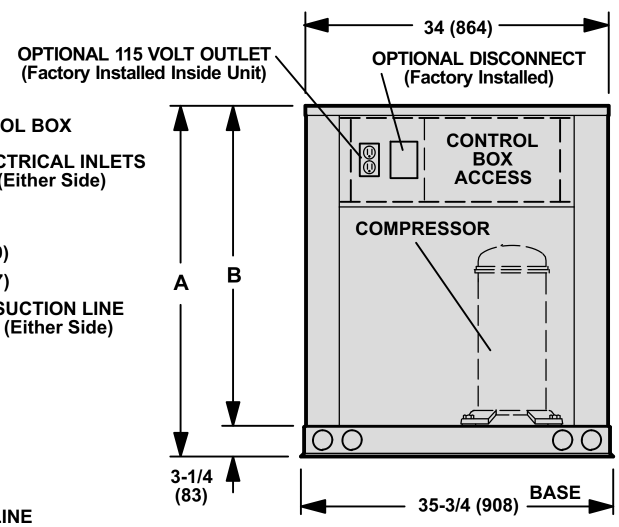

**TOP VIEW (LSA072C)**




**TOP VIEW (LSA090C)**




**SIDE VIEW**




**SERVICE VIEW**

| Model No. | A | | B | | C | |
|---|---|---|---|---|---|---|
| | in. | mm | in. | mm | in. | mm |
| LSA072C | 36-1/4 | 921 | 33 | 838 | 9-1/4 | 235 |
| LSA090C | 36-1/4 | 921 | 33 | 838 | 9 7/8 | 251 |

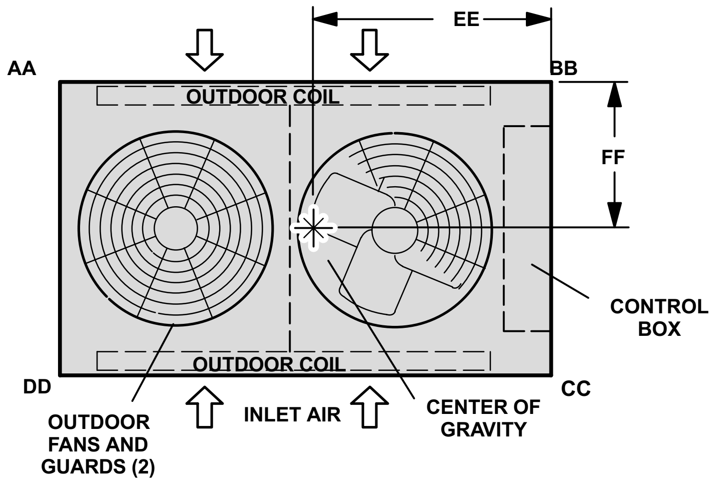
## LSA120C Dimensions - inches (mm)

### CORNER WEIGHT

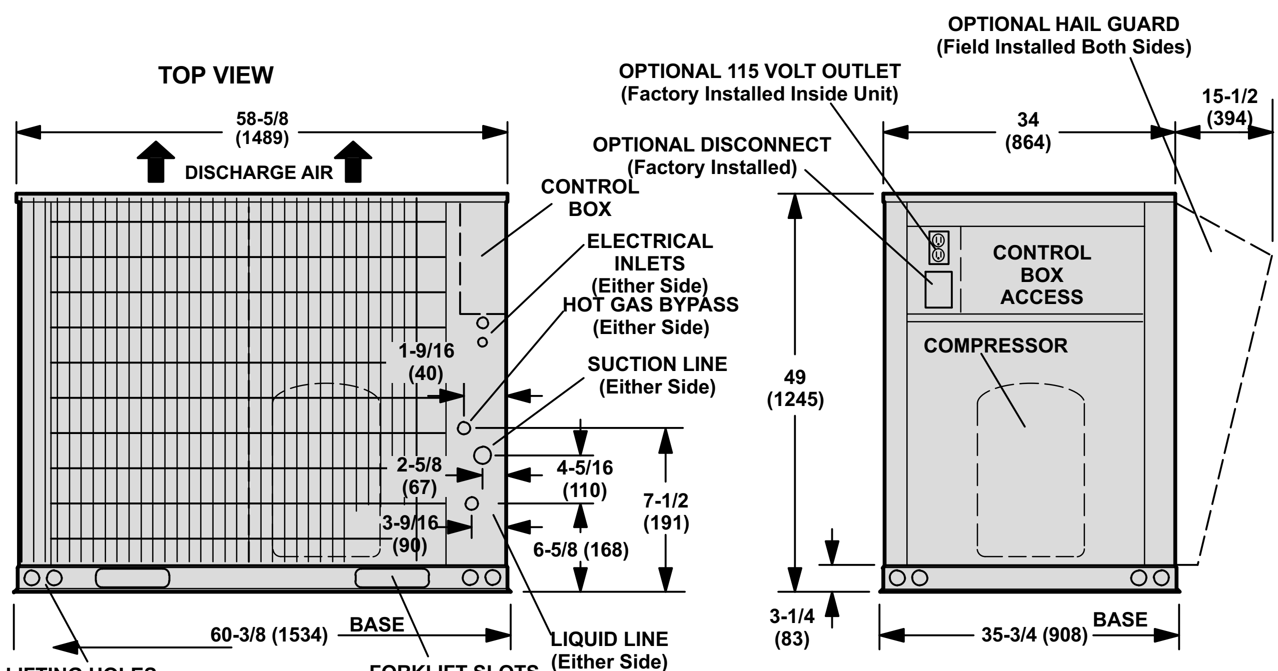
| Model No. | AA | | BB | | CC | | DD | |
|---|---|---|---|---|---|---|---|---|
| | lbs. | kg | lbs. | kg | lbs. | kg | lbs. | kg |
| LSA120C | 128 | 58 | 165 | 75 | 135 | 61 | 119 | 54 |

### CENTER OF GRAVITY

| Model No. | EE | | FF | |
|---|---|---|---|---|
| | inch | mm | inch | mm |
| LSA120C | 27-1/2 | 699 | 16-3/8 | 162 |




TOP VIEW




SIDE VIEW

SERVICE VIEW

## LSA072C, 090C Unit Parts Arrangement

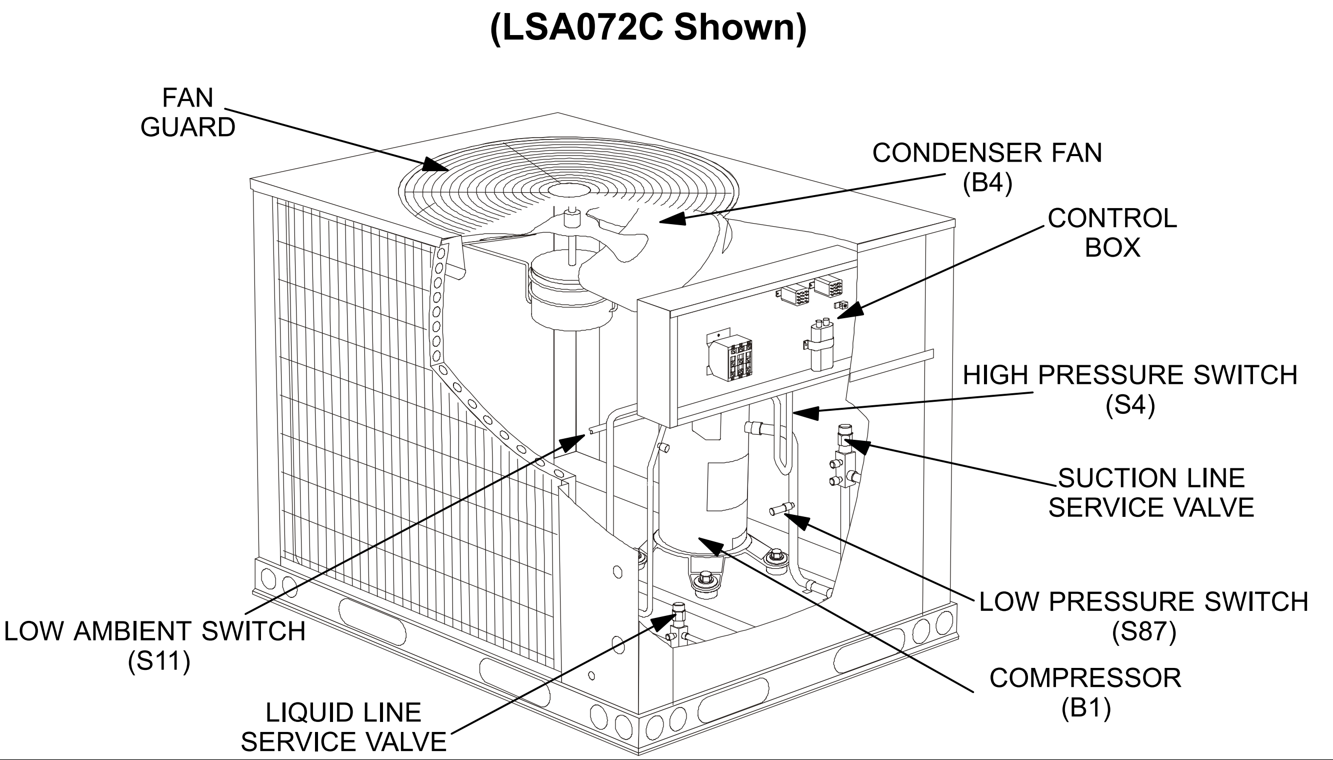



**FIGURE 1**

## LSA120C Unit Parts Arrangement

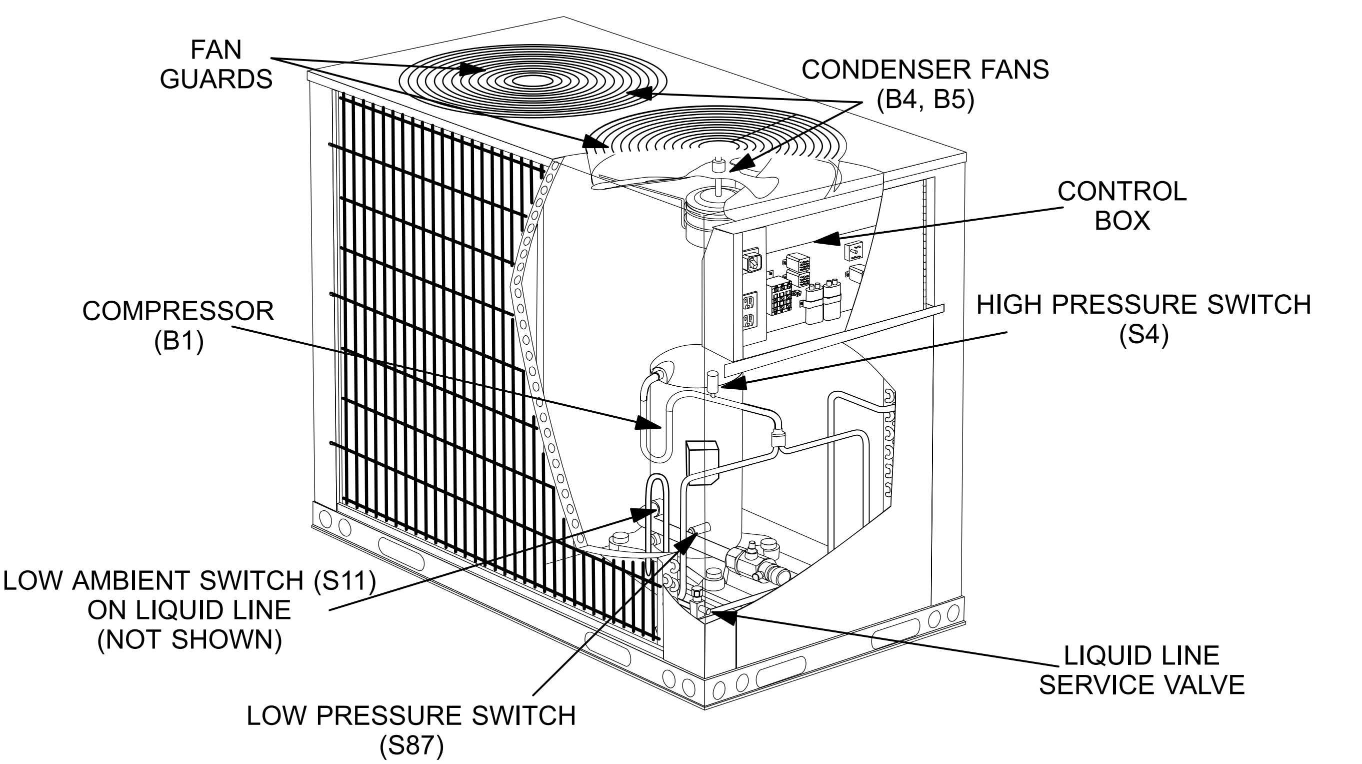



**FIGURE 2**

## LSA072C & LSA090C Control Box Arrangement

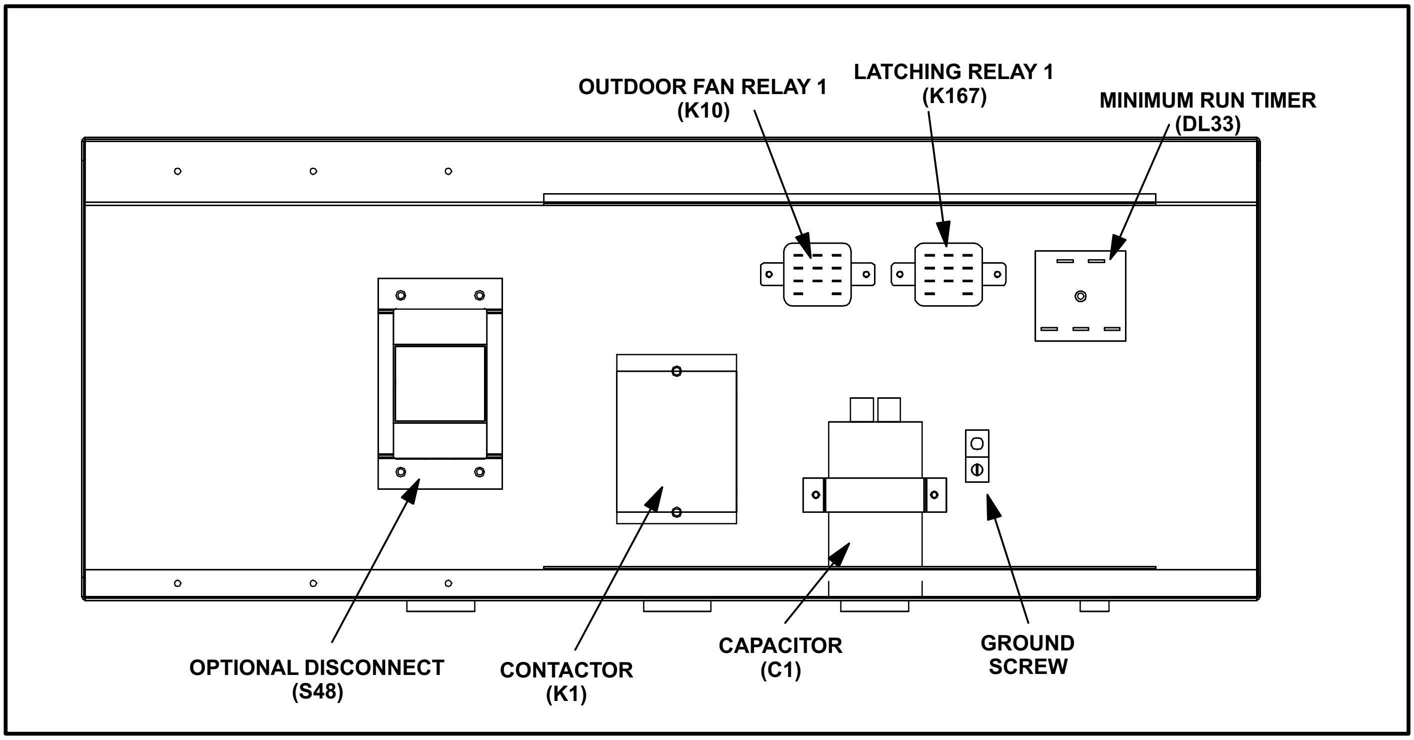



**FIGURE 3**

## LSA120C Control Box Arrangement

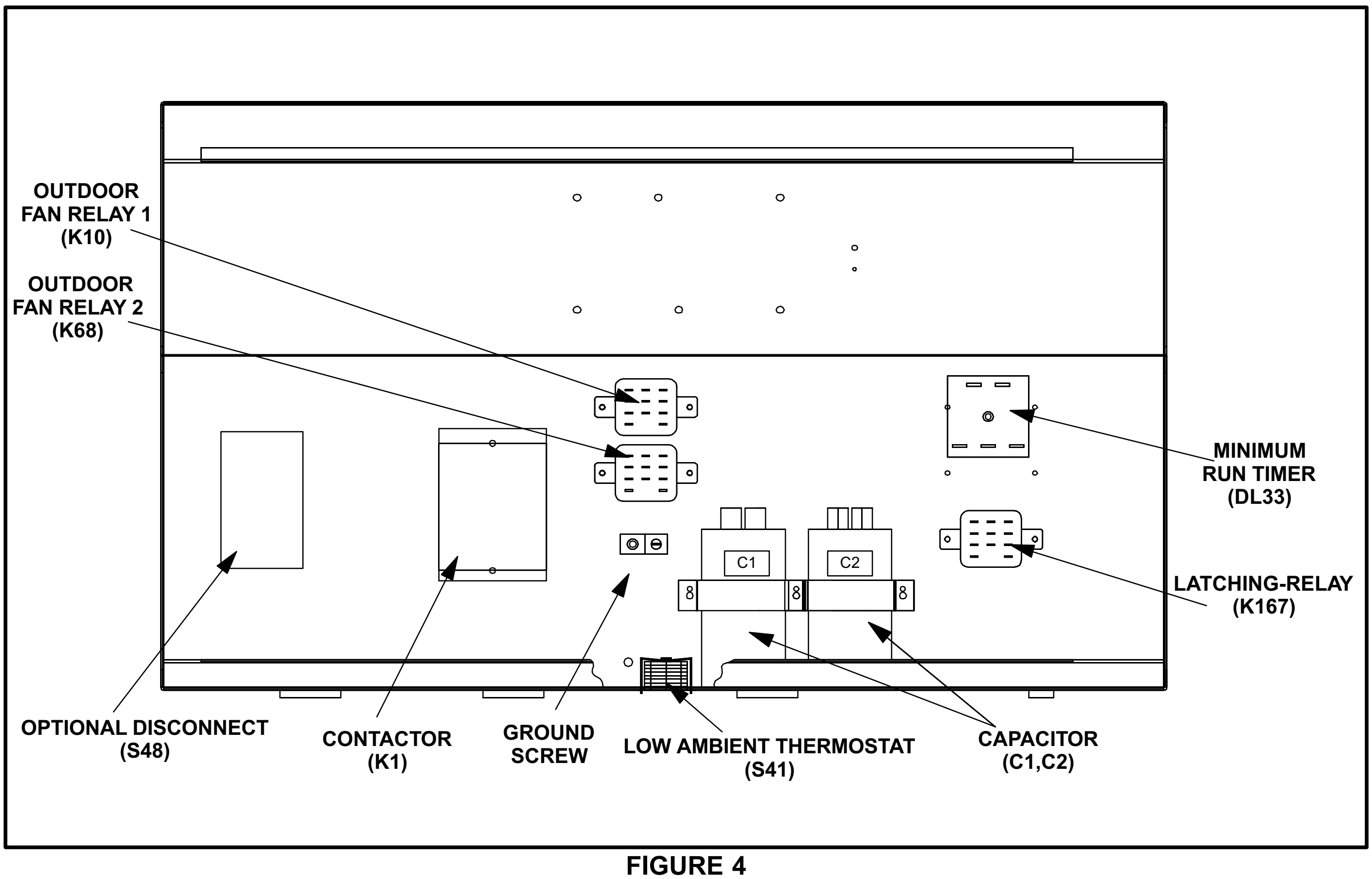



**FIGURE 4**

## ⚠ WARNING

***NOTE - The matching indoor unit contains fiberglass wool.***

**Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool dust. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)**

**Fiberglass wool may also cause respiratory, skin, and eye irritation.**

**To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown below, or contact your supervisor.**

## Setting the Unit

Refer to the unit dimensions for sizing requirements of the mounting slab, platforms, or supports. Refer to figure 5 for installation clearances.

### Slab Mounting

When installing the unit at grade level, install it on a level slab that is high enough above grade to allow water to drain adequately. Locate the top of the slab so that run-off water from higher ground will not collect around the unit.

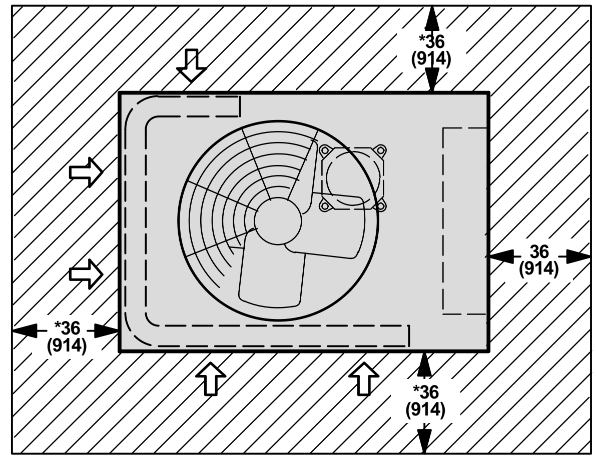
### Roof Mounting

Install the unit at a minimum of 4 inches (102 mm) above the surface of the roof. Ensure that the weight of the unit is properly distributed over roof joists and rafters. Use either redwood or steel supports.

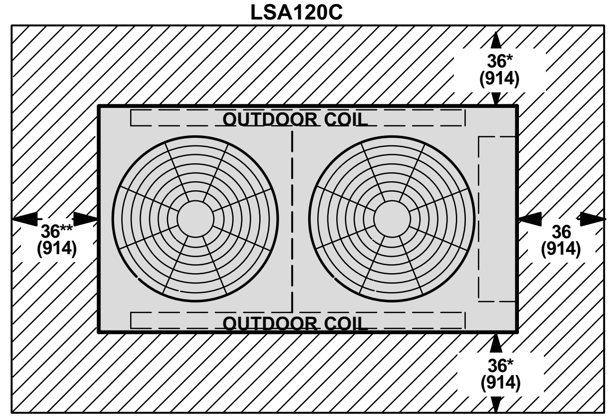
**INSTALLATION CLEARANCES**

**NOTE- 48 in. (1219 mm) CLEARANCE REQUIRED ABOVE TOP OF UNIT.**

**LSA072C, 090C (LSA090C Shown)**



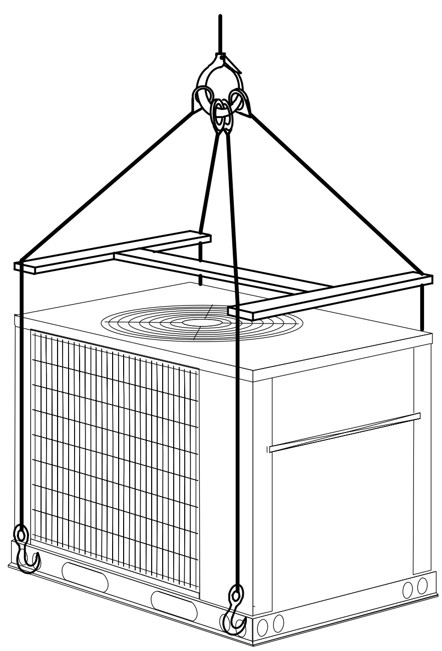

**LSA120C**




***One of these clearance distances may be reduced to 18 inches (457 mm).**
****This clearance may be reduced to 12 inches (305 mm).**

**FIGURE 5**

**RIGGING INSTRUCTIONS**



| UNIT | *WEIGHT | |
|---|---|---|
| | LBS. | KG. |
| LSA072C | 374 | 170 |
| LSA090C | 434 | 197 |
| LSA120C | 587 | 266 |

*Maximum weight with all available factory-installed accessories.

**LIFTING POINT SHOULD BE DIRECTLY ABOVE THE CENTER OF GRAVITY**

**CAUTION - DO NOT WALK ON UNIT.**

*IMPORTANT - ALL PANELS MUST BE IN PLACE FOR RIGGING.*

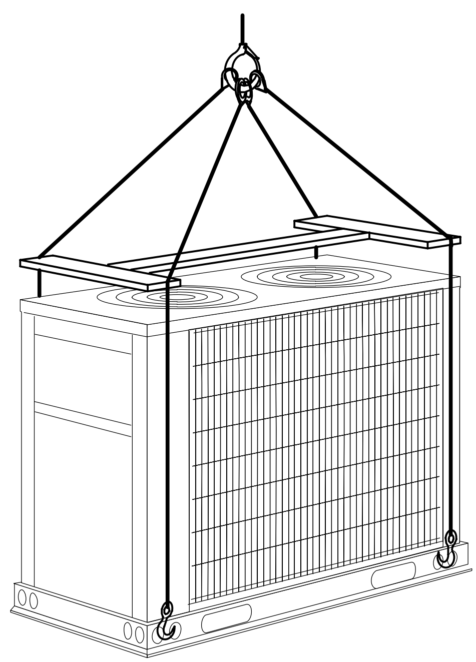


**FIGURE 6**

## Rigging the Unit for Lifting

Rig the unit for lifting by attaching four cables to the holes in the base rail of the unit. See figure 6.

1 - Detach the protective wooden base before rigging the unit for lifting.
2 - Connect the rigging to the holes in each corner of the unit's base.
3 - All panels must be in place for rigging.
4 - Place a field-provided H-style frame just above the top edge of the unit. The frame must be of adequate strength and length. (An H-style frame will prevent the top of the unit from being damaged.)

## Electrical

Wiring must conform to current standards of the National Electric Code (NEC), Canadian Electrical Code (CEC), and local codes. Refer to the furnace or blower coil installation instructions for additional wiring application diagrams. Refer to the unit nameplate for minimum circuit ampacity and maximum overcurrent protection size.

**⚠ WARNING**

**Unit must be grounded in accordance with national and local codes.**
**Electric Shock Hazard.**
**Can cause injury or death.**

### Line Voltage

Knockouts are provided in the cabinet panel so that the wiring conduit can pass through the cabinet. Refer to figure 7 for field wiring diagram.

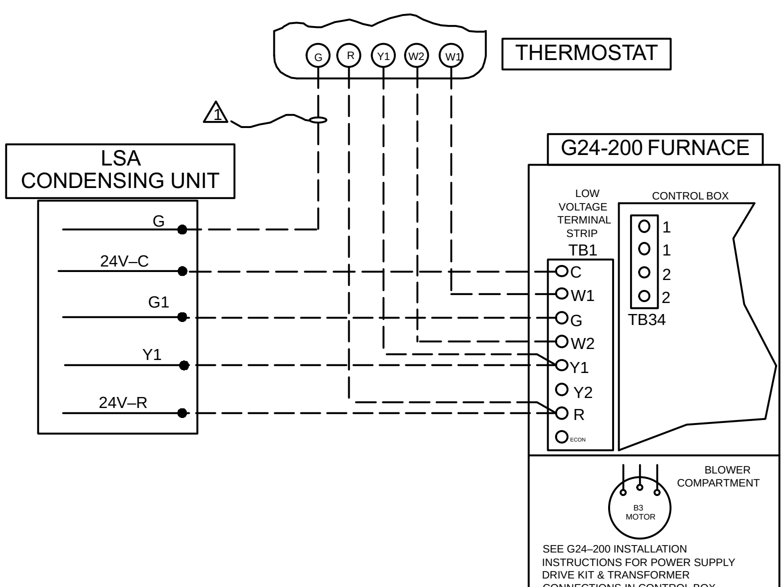
*NOTE - Units are approved to be used only with copper conductors.*

### 24V, Class II Circuit

Make 24V, Class II Circuit connections below the control box. Route the wire through the conduit to the bottom of control box.

*NOTE - A complete unit wiring diagram is located on the inside of the unit access panel.*

**Condensing Unit Field Wiring Diagram with G24-200 Gas Furnace**




***NOTE - "G" and "G1" wires MUST be routed from the Thermostat to the condensing unit as shown, to ensure blower and compressor operation interlock.***

**FIGURE 7**

## TYPICAL UNIT WIRING DIAGRAM
## LSA072C, 090C

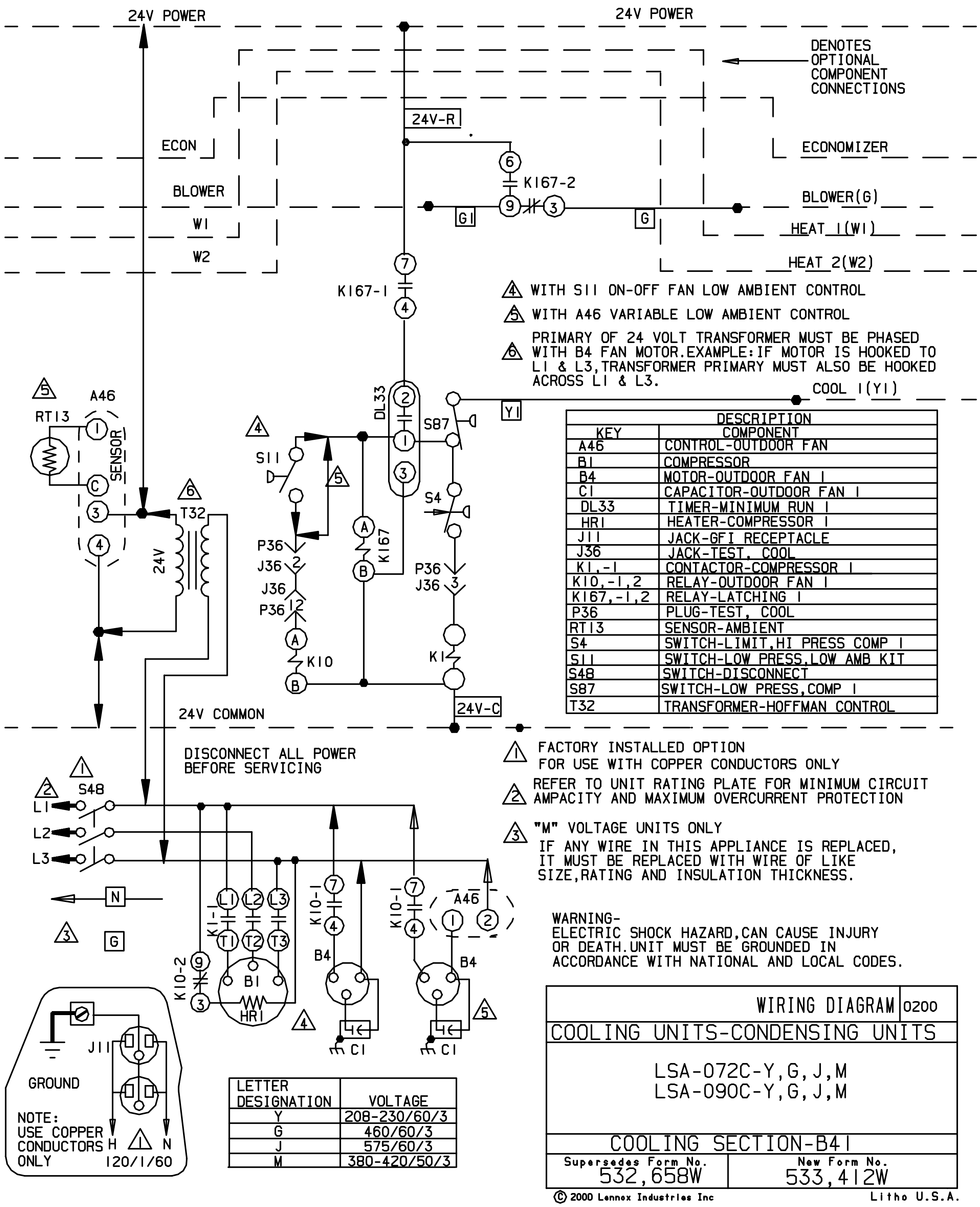



FIGURE 8

## TYPICAL UNIT WIRING DIAGRAM
## LSA120C

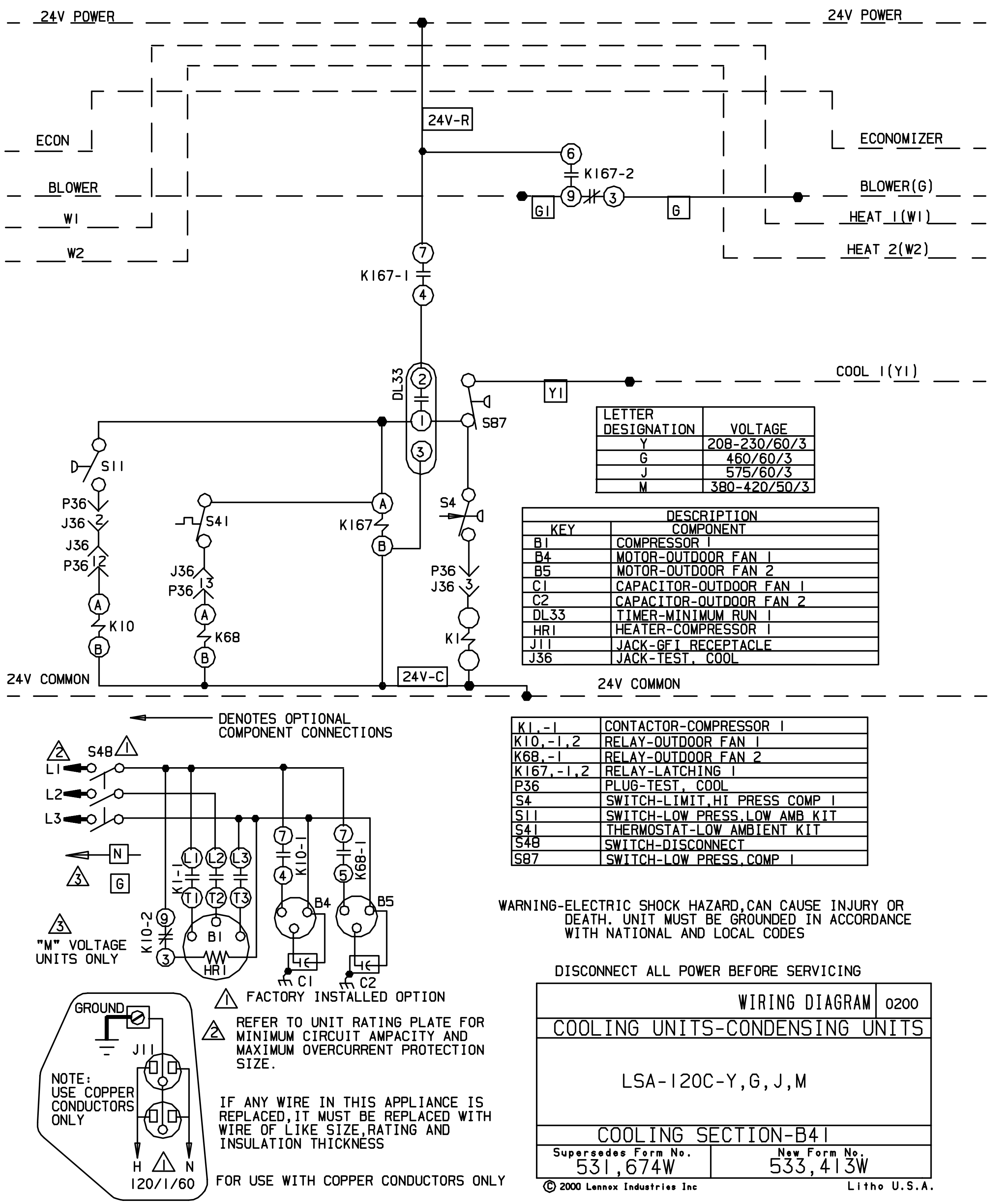



**FIGURE 9**

## Plumbing

Field refrigerant piping consists of liquid and suction lines exiting the condensing unit. You may bring piping into the unit through either side. Remove the knockouts on the mullions and install the provided rubber grommets into the piping holes. Remove the plugs from the liquid and suction lines. Refer to table 1 for field-fabricated refrigerant line sizes for runs up to 50 linear feet (15 m).

**Table 1**
**Refrigerant Line Sizes for Runs Up to 50 Linear Feet**

| LSA Unit | Liquid Line | Suction Line |
|---|---|---|
| 072C | 5/8 in. (16 mm) | 1-1/8 in. (29 mm) |
| 090C | 5/8 in. (16 mm) | 1-3/8 in. (35 mm) |
| 120C | 5/8 in. (16 mm) | 1-3/8 in. (35 mm) |

### Refrigerant Line Brazing Procedure

1 - Cut the end of the refrigerant line square, keep it round, protect it from nicks or dents, and debur it. (I.D. and O.D.)

2 - Wrap a wet cloth around the liquid and suction valve body when brazing to prevent possible heat damage to the valve core and port.

3 - In the liquid line, install the filter drier (provided with the unit) in an accessible area as close as possible to the expansion device.

### Refrigerant Line Limitations

You may install the unit in applications that have line set lengths of up to 50 linear feet (15 m) with refrigerant line sizes as outlined in table 1 (excluding equivalent length of fittings). Size refrigerant lines from 50 to 100 linear feet (15 to 30 m) according to the the following section. Line lengths greater than 100 feet (30 m) are not recommended.

Maximum suction lift must not exceed 70 linear feet (21 m) and the maximum liquid head must not exceed 50 linear feet (15 m).

When line lengths exceed 50 feet (15 m), install a liquid line solenoid at the evaporator coil. In addition, use only expansion valves (RFC and cap-tube expansion devices are not acceptable).

*NOTE - When refrigerant line solenoid valves are installed, velocities should not exceed 300 fpm (1.5 m/s) in order to avoid liquid line hammer.*

Because additional refrigerant is necessary to fill the lines, the likelihood of slugging is greatly increased if the lines are over 50 feet (15 m). An incremental increase in liquid line size results in a 40 to 50 percent increase in liquid refrigerant to fill the line. Therefore, use the smallest liquid line size possible.

All units are equipped with a low ambient (head pressure) control to allow for cooling at an ambient condition of 0°F (-18°C).

### Pipe Sizing, Line Layout, and Design [Line Set Lengths of 50 - 100 Linear Feet (15 - 30 m)]

Create a a sketch of the system that shows the relative locations of the condensing unit and the evaporator as well as the length of the following:

- each piping segment
- elbows
- tees
- valves

Use this information to determine the equivalent length of the piping run. Also, take note of any difference in the elevation between the outdoor and indoor units. You must consider vapor and liquid lift so that you can properly size the pipe.

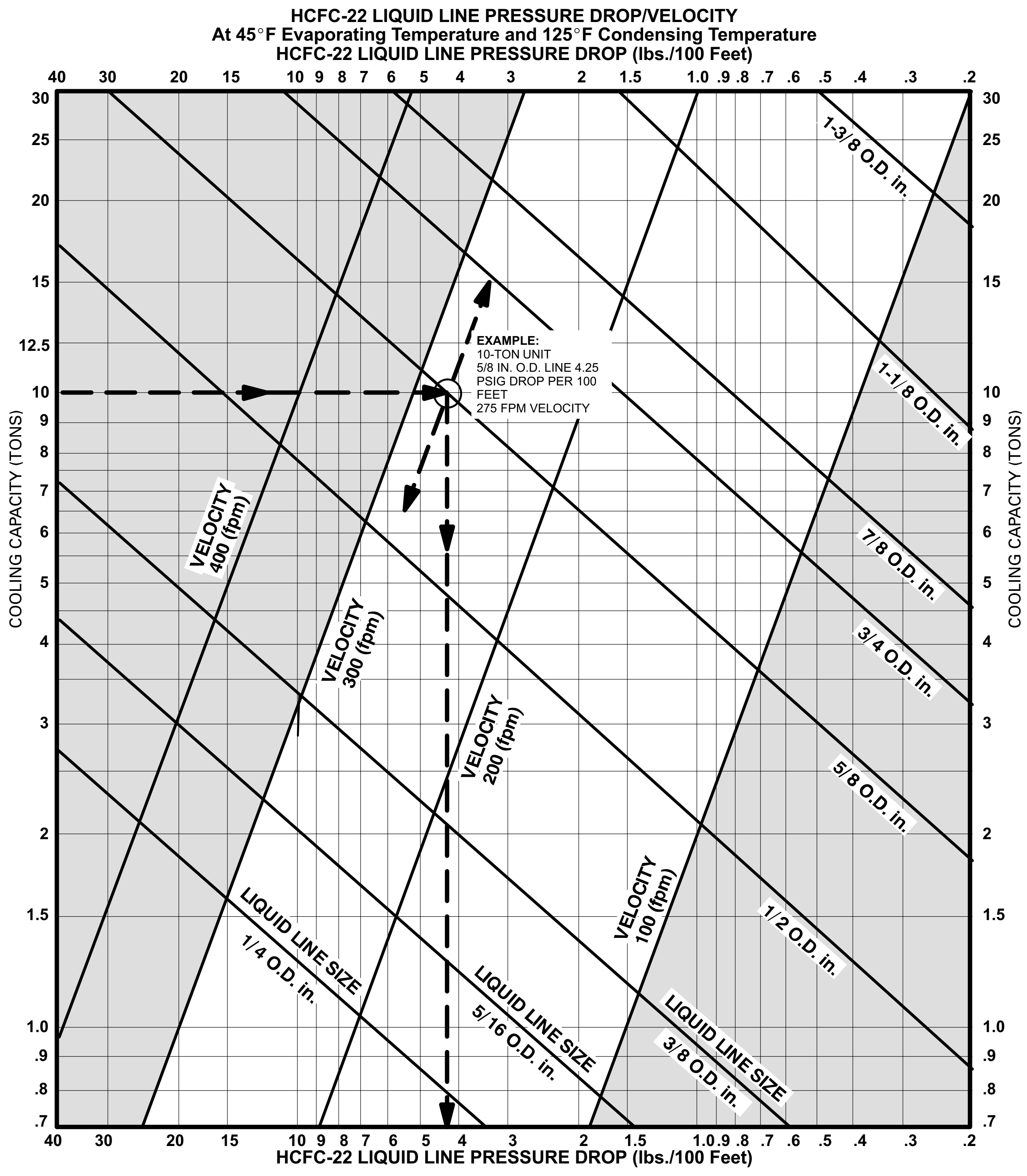
### Liquid Line Function and Design

The liquid line must convey a full column of liquid from the condenser to the metering device at the evaporator coil without flashing. In order to ensure this, you must consider the liquid line pressure drop and the pressure across the expansion device and distributor.

*NOTE - In units over 5 tons, subcooled liquid begins to form flash gas at 245 psig (1689 kPa).*

**Table 2**
**HCFC-22 Saturation Temperatures**
**(Condensing Temperatures at Different Pressures)**

| Temperature °F (°C) | Pressure psig (kPa) | Temperature °F (°C) | Pressure psig (kPa) | Temperature °F (°C) | Pressure psig (kPa) | Temperature °F (°C) | Pressure psig (kPa) | Temperature °F (°C) | Pressure psig (kPa) |
|---|---|---|---|---|---|---|---|---|---|
| -40 (-41) | 0.6 (4.13) | 18 (-8) | 41.1 (283) | 36 (2) | 63.3 (436) | 75 (24) | 133.4 (920) | 120 (49) | 262.5 (1810) |
| -30 (-34) | 4.09 (28.1) | 20 (-7) | 43.3 (299) | 38 (3) | 66.1 (456) | 80 (27) | 145.0 (1000) | 125 (52) | 280.7 (1936) |
| -20 (-28) | 10.2 (70.3) | 22 (-6) | 45.5 (314) | 40 (4) | 69.0 (476) | 85 (29) | 157.2 (1084) | 130 (54) | 299.7 (2066) |
| -10 (-23) | 16.6 (114) | 24 (-4) | 47.9 (330) | 45 (7) | 76.6 (528) | 90 (32) | 170.0 (1172) | 135 (57) | 319.6 (1514) |
| 0 (-18) | 24.1 (166) | 26 (-3) | 50.3 (347) | 50 (10) | 84.7 (584) | 95 (35) | 183.6 (1287) | 140 (60) | 340.3 (2346) |
| 10 (-12) | 32.9 (227) | 28 (-2) | 52.7 (363) | 55 (13) | 93.3 (643) | 100 (38) | 197.9 (1364) | 145 (63) | 362.0 (2496) |
| 12 (-11) | 34.9 (241) | 30 (-1) | 55.2 (381) | 60 (16) | 102.4 (706) | 105 (41) | 212.9 (1468) | 150 (66) | 384.6 (2651) |
| 14 (-10) | 36.9 (254) | 32 (0) | 57.8 (399) | 65 (18) | 112.2 (774) | 110 (43) | 228.6 (1576) | 155 (68) | 406.3 (2801) |
| 16 (-9) | 39.0 (269) | 34 (1) | 60.5 (417) | 70 (21) | 122.5 (841) | 115 (46) | 245.2 (1691) | 160 (71) | 433.3 (2987) |




To use this chart, first find the capacity (tons) on the left side of chart. To find the pipe size, proceed right to the smallest pipe size. You can then determine the pressure drop (vertical at line) and velocity (diagonal lines) for the pipe size you selected. For example, for (2) 7.5 ton units, select 5/8 in. O.D. line.

*NOTE - Shaded area represents unacceptable velocity range.*

**FIGURE 10**

Figure 10 illustrates the relationship between liquid line sizing, pressure drop per 100 feet, velocity range, and tonnage. Remember, when using liquid line solenoid valves, velocities should not exceed 300 fpm (1.5 m/s). Find the cooling capacity on the left side of the chart in figure 10, then proceed right to the smallest tube size that will not exceed 300 fpm (1.5 m/s) velocity.

**Table 3**
**Equivalent Length in Feet of Straight Pipe for Valves and Fittings**

| Line Size O.D. in. | Solenoid/ Globe Valve | Angle Valve | 90° Long* Radius Elbow | 45° Long* Radius Elbow | Tee Line | Tee Branch |
|---|---|---|---|---|---|---|
| 3/8 | 7 | 4 | 0.8 | 0.3 | 0.5 | 1.5 |
| 1/2 | 9 | 5 | 0.9 | 0.4 | 0.6 | 2.0 |
| 5/8 | 12 | 6 | 1.0 | 0.5 | 0.8 | 2.5 |
| 3/4 | 14 | 7 | 1.3 | 0.6 | 0.9 | 3.0 |
| 7/8 | 15 | 8 | 1.5 | 0.7 | 1.0 | 3.5 |
| 1-1/8 | 22 | 12 | 1.8 | 0.9 | 1.5 | 4.5 |
| 1-3/8 | 28 | 15 | 2.4 | 1.2 | 1.8 | 6.0 |
| 1-5/8 | 35 | 17 | 2.8 | 1.4 | 2.0 | 7.0 |
| 2-1/8 | 45 | 22 | 3.9 | 1.8 | 3.0 | 10 |
| 2-5/8 | 51 | 26 | 4.6 | 2.2 | 3.5 | 12 |

*NOTE - Long radius elbow. Multiply factor by 1.5 for short radius elbow equivalent length.*

Equipment that is above five tons in capacity typically operates at a saturated condensing temperature of 125°F (52°C) which corresponds to an operating pressure of 280 psig (1930 kPa). This equipment is designed to hold a charge allowing 10°F (6°C) subcooling at 95°F (53°C) ambient. Use the condensing temperature and the subcooling to calculate the maximum allowable pressure drop as detailed below.

*NOTE - 95°F (53°C) ambient is an arbitrary temperature chosen to represent typical summer operating conditions and the maximum allowable pressure drop. This temperature (and the corresponding subcooling) will vary with regional climate.*

***Example - Calculating maximum allowable pressure drop:*** Find the maximum allowable liquid line pressure drop of a unit operating at 10°F (6°C) subcooling, 125°F (52°C) condensing temperature and operating pressure of 280 psig (1931 kPa). Subtract 10°F (6°C) subcooling temperature from 125°F (52°C) condensing temperature to equal 115°F (46°C) subcooled liquid temperature. This corresponds with operating pressure of 245 psig (1689 kPa), which is the point at which flash gas will begin to form. Subtract 245 psig (1689 kPa) subcooled pressure from 280 psig (1931 kPa) condensing pressure to find a maximum allowable pressure drop of 35 psig (241 kPa).

To calculate the actual pressure drop in the liquid line, calculate the pressure drop due to **friction** and the pressure drop due to **vertical lift,** then add the two:

Pressure drop due to friction
+
Pressure drop due to vertical lift
= Pressure drop in the liquid line

You must consider the pressure drop due to friction in the pipe, fittings, and field-installed accessories such as driers, solenoid valves, or other devices. Pressure drop ratings for different pipe sizes are listed in figure 10. Pressure drop ratings of field-installed devices are typically supplied by the manufacturer.

Pressure drop due to vertical lift (1/2 pound per foot) is typically high and can be a limiting factor in the design of the system.

The liquid refrigerant pressure must be sufficient to produce the required flow through the expansion device. Liquid refrigerant (free of flash gas) should be delivered to the expansion valve at a minimum of 175 psig (1207 kPa) to ensure that the 100 psig (690 kPa) necessary to produce full refrigerant flow is at the rated capacity.

***Example - Liquid Line Pipe Sizing***

**Given:** 10-ton condensing unit on ground level with a 10-ton evaporator on the third level above ground and a total of 96 linear feet of piping. The unit is charged with 10°F (6°C) subcooling at 125°F (52°C) condensing temperature and an operating pressure of 280 psig (1930 kPa). Refer to figure 11.

**Find:** Select tube size from figure 10.

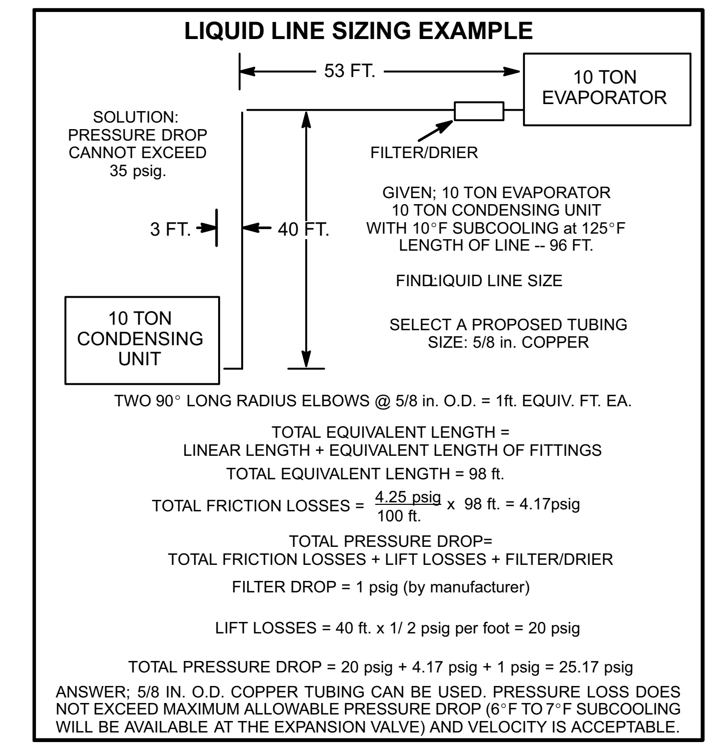



**FIGURE 11**

**Solution:** For a 10-ton system, select a 5/8 inch O.D. line with 4.25 psig (29 kPa) per 100 feet drop (per figure 10). Now, calculate pressure drop due to friction and liquid lift to determine if this is a good selection.

The total friction drop for the application will include 96 feet (29 m) of 5/8 inch O.D. pipe plus 1 equivalent foot per elbow (two elbows) to equal 98 equivalent feet.

In a 10-ton system, expect a 4.25 psig (29 kPa) drop per 100 feet of 5/8 inch O.D. copper (per figure 10). Multiply 4.25/100 by 98 equivalent feet to calculate the total friction loss of 4.17 psig (28 kPa).

Add the pressure drop for vertical lift. HCFC-22 pressure drop is 1/2 psig per foot of vertical lift. In this application which has a 40-foot (12 m) vertical lift, we find that the pressure drop due to lift equals 20 psig (138 kPa).

Finally, add a filter drier to the liquid line which has a 1 psig pressure drop (this number provided by manufacturer).

Add the three components of the pressure drop together to find that the total pressure drop in this 5/8 inch line equals 25.17 psig (172 kPa) which is well within the acceptable range. The 5/8 inch line, therefore, is a good selection because it is well below the maximum allowable pressure drop, is in a satisfactory velocity range, uses minimum refrigerant, and provides sufficient pressure at the expansion valve.

**Alternative Sizing:** Suppose you selected a 3/4 inch O.D. line with 1.6 psig drop per 100 feet. Compute the total equivalent length by adding the length [96 feet (29 m)], plus the equivalent length of the fittings [from table 3, two 90° ells at 1.25 feet .381 m) each]. The total equivalent length is 98.5 (30 M) feet. **The total friction drop would have been 1.6/100 multiplied by 98.5 = 1.57 psig. When you add the pressure drop due to lift (20 psig) and the filter drier (1 psig) the total pressure drop for 3/4 inch line equals 22.57 psig.**

Though the 3/4 inch line provides a lower pressure drop, the larger diameter pipe will require more refrigerant; this larger diameter will increase the risk of refrigerant slugging. In addition, because the smaller line will be less costly, use it instead of the larger line.

## Suction Line Function and Design

The suction line returns refrigerant vapor and oil from the evaporator to the compressor. Therefore, the design of the suction line is critical. The design must minimize the pressure loss in order for the unit to operate at maximum efficiency. The design must also provide adequate oil return to the compressor under any conditions.

Because the oil separates from the refrigerant in the evaporator, the suction velocity must be adequate to sweep the oil along the pipe. Horizontal suction lines require a minimum of **800 fpm velocity for oil entrainment. In order to ensure oil entrainment, suction risers require a minimum velocity of 1200 fpm (1500 fpm is prefe**rred) regardless of the length of the riser.

Figure 14 illustrates the relationship between the suction line sizing, pressure drop, velocity, and cooling capacity. Use this chart to determine suction line pressure drop and velocity. As the pipe size increases, so does the velocity required to ensure oil entrainment.

Vertical lift has no significant effect on system capacity. However, systems lose approximately 1% of capacity for every pound of pressure drop due to friction in the suction line. In order to calculate capacity loss, you must first estimate pressure drop in the total equivalent length of the piping run (refer to figure 14). Capacity ratings include the loss for a 25-foot refrigerant line. Therefore, subtract the pressure loss of 25 feet of piping from the total that you calculated for your particular application. See figure 12.

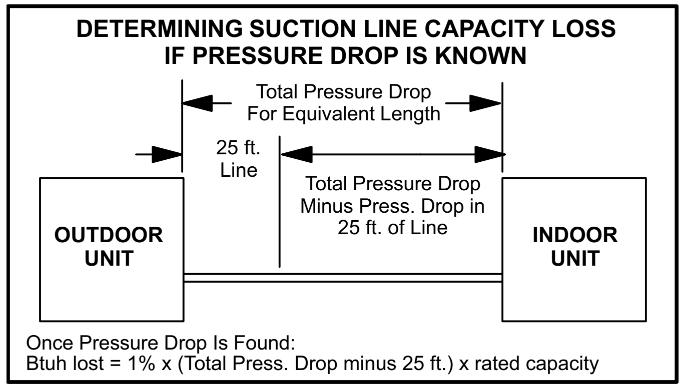



**FIGURE 12**

When an evaporator is located above or on the same level as the condensing unit, the suction line must rise to the top of the evaporator. This helps prevent liquid from migrating to the compressor during the off cycle. Install traps at the bottom of all vertical risers for migration protection during the off cycle. See figure 13.

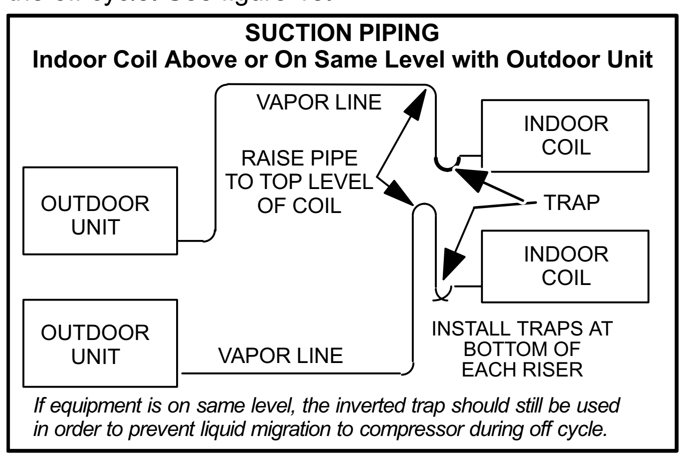
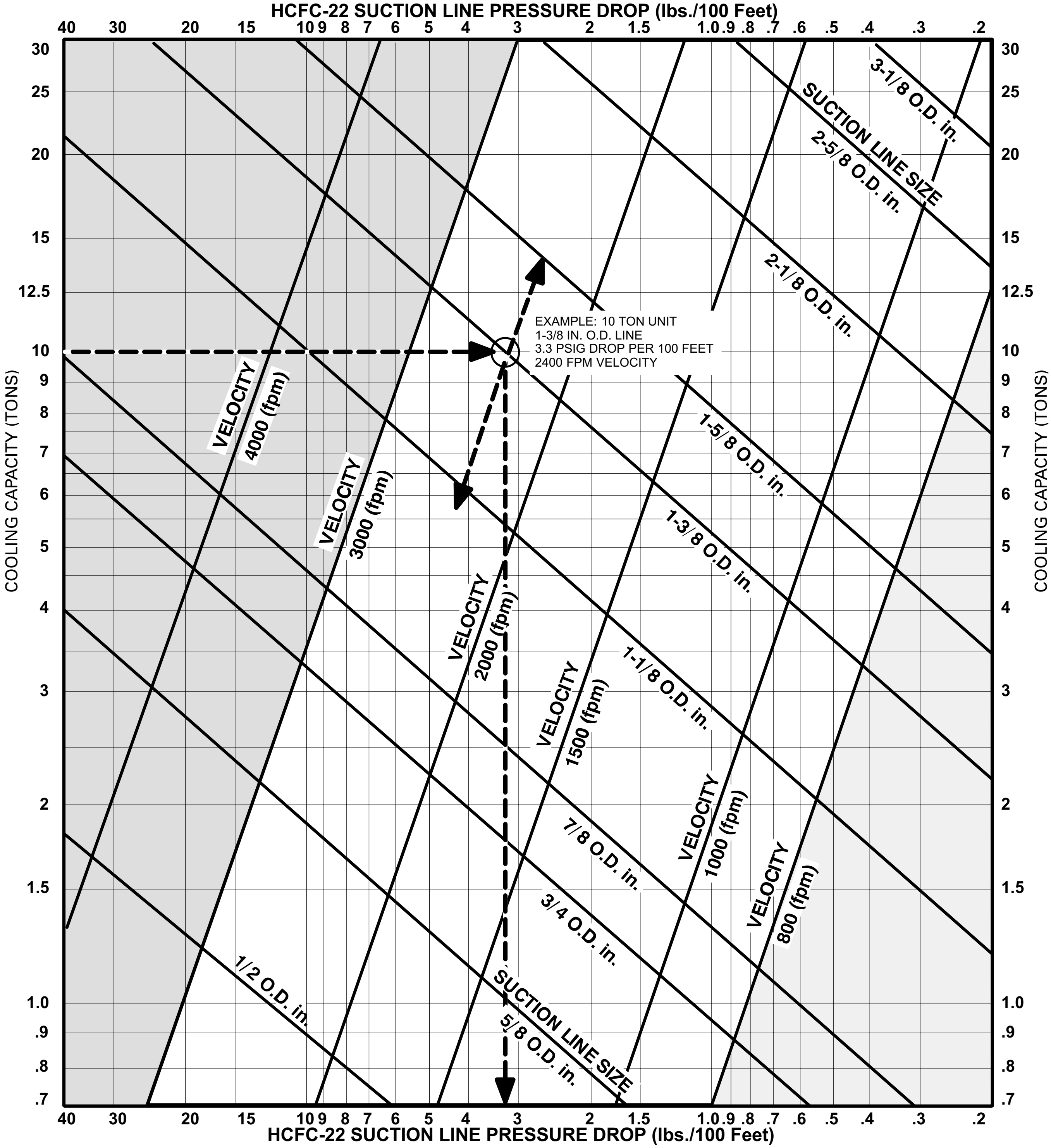



**FIGURE 13**

Horizontal suction lines should be level or slightly sloped toward the condensing unit. The pipe must avoid any dips or low spots that can collect oil. For this reason, use hard copper, especially on long horizontal runs.

As with liquid line sizing, begin by making a sketch of the layout complete with fittings, driers, valves etc. Measure the length of each line and determine the number of ells, tees, valves, driers etc. Add the equivalent length of fittings (table 3) to length of pipe to get the total equivalent length which is used to determine friction loss. Again, refer to manufacturer's data for pressure drop information on accessory components. You must consider the resulting pressure drop.

**HCFC-22 SUCTION LINE PRESSURE DROP/VELOCITY PER 100 FEET OF LINE**
**At 45°F Evaporating Temperature and 125°F Condensing Temperature**




*To use this chart, first find capacity (tons) on left side of chart. To find the pipe size, proceed right to the smallest pipe size. You can then determine the pressure drop (vertical line) and velocity (diagonal lines) for the pipe size you selected. For example, for 10 ton unit, select 1-3/8 in. O.D. line.*

*NOTE - Shaded area denotes unacceptable velocity range.*

**FIGURE 14**

### *Example -- Suction Line Pipe Sizing*

**Given:** 7-1/2 ton condensing unit with evaporator lower than condenser. Application includes 82 linear feet of piping and 4 ells. There is a 20-foot vertical lift and 62 feet of horizontal run. Refer to figure 15.

**Find:** Select tube size from figure 14.

**Solution:** Select a 1-1/8 inch O.D. line with 6 psig per 100 feet pressure drop and 2900 fpm velocity. Now, calculate pressure drop due to the friction to determine if this is a good selection.

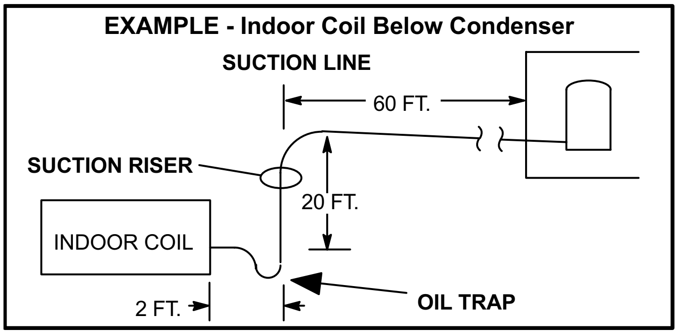



**FIGURE 15**

From table 3, four ells at 1.8 equivalent feet each equals 7.2 equivalent feet. When added to the 82 feet of pipe, the total equivalent feet becomes 89.2 feet (round up to 90 feet).

Multiply 6/100 by 90 equivalent feet to calculate total friction loss of 5.4 psig.

Use figure 14 to calculate the pressure drop in 25 feet of 1-1/8 inch line. Multiply 6/100 by 25 feet to calculate friction loss of 1.5 psig. This loss has already been included in the capacity, so it should be subtracted from the total.

The Btuh capacity lost in the "total equivalent length" of the refrigerant line (using figures 12 and 14) equals 1% X (5.4 - 1.5) X 90,000 = 3510.

Btuh lost = 0.01 x (3.9) x 90,000 = 3510

The capacity loss for the line selected is approximately 3.9%.

The preceding calculation shows that this is a workable system, but the line will lose capacity and efficiency.

***Alternative Sizing:*** Using the same (7-1/2 ton) example, this time select 1-3/8 inch O.D. line. A 1-3/8 inch O.D. line with 2 psig per 100 feet pressure drop has 1760 fpm velocity. Now calculate the pressure drop due to friction loss to determine if this is a better selection.

From figure 3, four ells at 2.4 equivalent feet each equals 9.6 equivalent feet. When added to the 82 feet of pipe, the total equivalent feet becomes 91.6 feet (round up to 92 feet).

Multiply 2/100 by 92 equivalent feet to calculate total friction loss of 1.8 psig.

Use figure 14 to calculate the pressure drop in 25 feet of 1-3/8 inch line. Multiply 2/100 by 25 feet to calculate friction loss of 0.5 psig. This loss has already been included in the capacity, so it should be subtracted from the total.

The Btuh capacity lost in the "total equivalent length" of the refrigerant line (using figures 12 and 14) equals 1% X (1.8 - 0.5) X 90,000 = 1170.

Btuh lost = 0.01 x (1.3) x 90,000 = 1170

The capacity loss for the line selected is approximately 1.3%.

The conditions in this example will allow either 1-1/8 inch or 1-3/8 inch suction line to be used, since capacity loss is minimized and velocity is sufficient to return oil to the compressor.

### Double Suction Risers

If the condensing unit is equipped to run with a capacity reduction of less than 50 percent, suction lines can generally be sized in accordance with the previous sections. If the suction velocity is high enough to entrain oil when the unit is operating at reduced capacity, double suction risers are generally unnecessary.

However, suction-type hot gas bypass kits reduce the unit's capacity and suction line refrigerant velocity, and therefore, double suction risers are required in these cases.

In general, double suction risers are necessary any time the minimum load on the compressor does not create sufficient velocity in vertical suction risers to return oil to the compressor. Double suction risers are also generally required any time the pressure drop or velocity in a single suction riser is excessive.

Figure 16 shows a simplified example of a double suction riser installation. A trap is installed between the two risers as shown. During partial load operation when gas velocity is not sufficient to return oil through both risers, the trap gradually fills with oil until the second riser is sealed off. When this happens, the vapor travels up the first riser only.

With only the first riser being used, there is enough velocity to carry the oil. This trap must be close coupled to limit the oil holding capacity to a minimum. Otherwise, the trap could accumulate enough oil on a partial load to seriously lower the compressor crankcase oil level.

The second suction riser must enter the main suction line from the top to avoid oil draining down the second riser during a partial load.

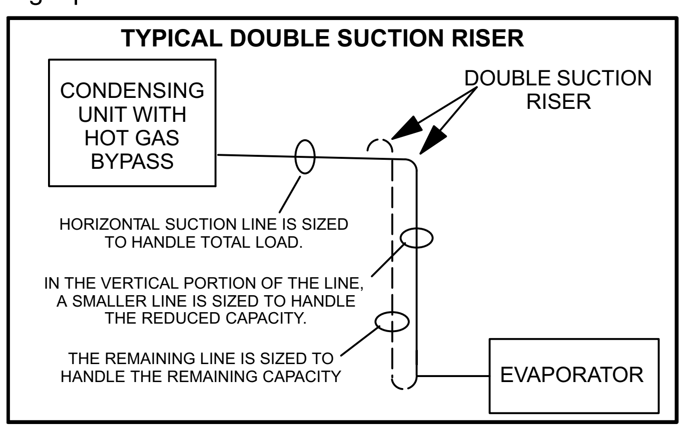



**FIGURE 16**

Figure 17 illustrates a typical double-suction riser construction.

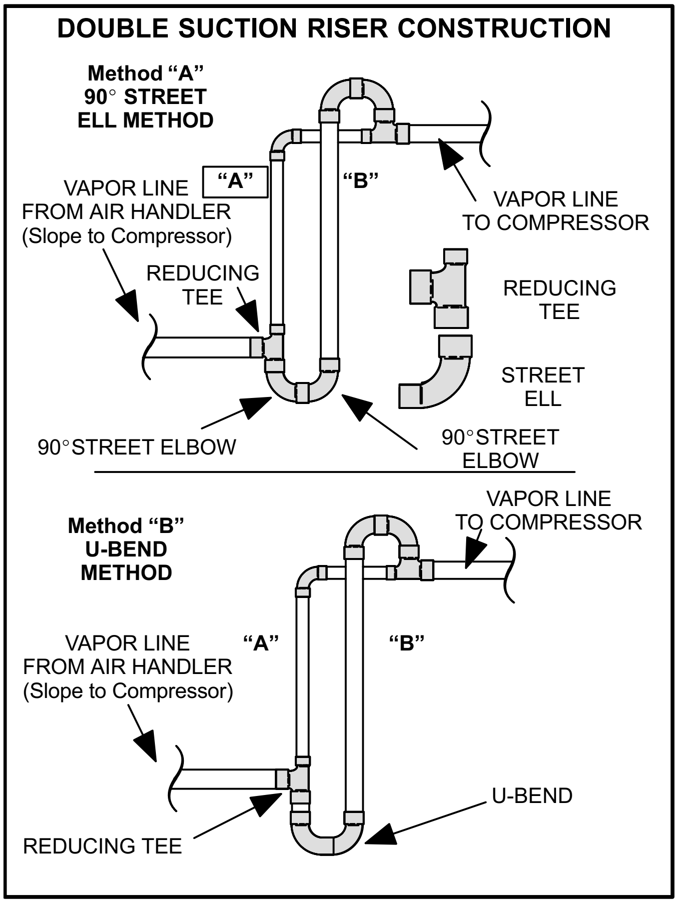



FIGURE 17

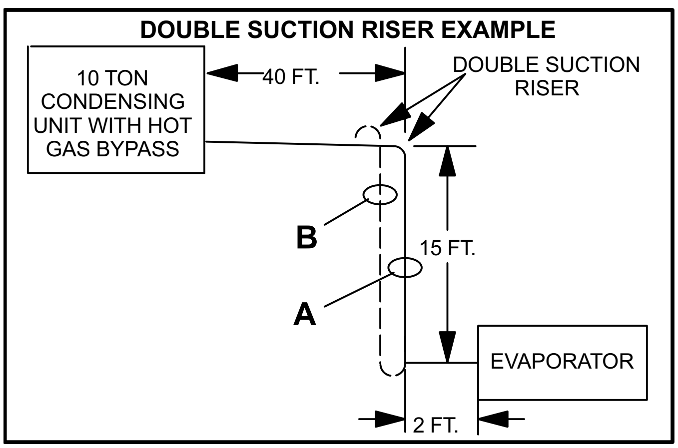



FIGURE 18

***Example -- Double Suction Riser Sizing***

**Given:** 10-ton condensing unit with hot gas bypass (run-around type). Matched evaporator is located below the condensing unit. Piping will require 57 (linear) feet of pipe (figure 18). Construction without double suction risers will only require 2 ells.

**Find:** Select tube sizes for horizontal runs and risers (figure 14). Determine if double suction risers are necessary. Size the double suction riser for proper system performance.

**Solution:** Size each segment based on the tons of refrigerant that will flow in the segment.

Full load capacity = 10 tons. Minimum load capacity is 35% of 10 tons = 3.5 tons. The difference between full capacity and partial load capacity is 6.5 tons.

From figure 14, select a pipe size for full load capacity. A 1-3/8 inch O.D. pipe with 3.3 psig drop per 100 feet and 2400 fpm velocity has been selected. Now, by using figure 14, find the velocity for the selected pipe size at part load capacity. The part load velocity is approximately 850 fpm. 850 fpm is sufficient to return oil in horizontal runs but not in vertical risers.

If you try to size this system by simply reducing the riser size to 1-1/8 inch, you would find the velocity in the riser to be excessive (3800 fpm) when the system is operating at full capacity. As a result of these obstacles, this system will require the construction of double suction risers. Construction of double suction riser will require five ells and two tees total for a system.

***Size small riser***
***(Riser carrying smallest part of load)***

The unit produces 3.5 tons capacity at minimum load. Select from figure 14 a 7/8 inch O.D. line (smallest line with acceptable velocity). When operating at 3.5 tons capacity, this line will operate at 2500 fpm and will produce 6 psig drop per 100 feet.

***Size large riser***
***(Riser carrying largest part of load)***

The larger line carries 6.5 tons capacity at full load. Select from figure 14 a 1-1/8 inch O.D. line (smallest line with acceptable velocity). When operating at 6.5 tons capacity, this line will operate at 2500 fpm and will produce 4.5 psig drop per 100 feet.

***Putting the Segments Together***

Next, you must determine if the line sizes you selected will result in satisfactory pressure drop between the condensing unit and the evaporator.

Start by finding the total equivalent feet of the large (B) riser. See figure 18. Fifteen feet of pipe, plus two tees (branch side of tee at 4.5 equivalent feet each), plus four ells (1.8 equivalent feet each) = 31.2 equivalent feet length:

15 + 9 (two 4.5 foot tees) + 7.2 (four 1.8 foot ells ) = 31.2

Now, find the total equivalent feet of the small (A) riser. See figure 18. Fifteen feet of pipe, plus one ell (1.5 equivalent feet), plus one tee (branch side of tee at 3.5 equivalent feet), plus one tee (line side of tee at 1.0 equivalent feet) = 21.0 equivalent feet length:

15 + 1.5 + 3.5 + 1.0 = 21.0

Use the total equivalent length of each riser to compute the pressure drop of each riser. For the large (B) riser, 1-1/8 inch O.D. suction line with 6.5 tons capacity has 4.5 psig drop per 100 feet. Multiply (4.5/100) by 31.2 equivalent feet to calculate the total friction loss of 1.4 psig.

(4.5 ÷ 100) X 31.2 = 1.4

For the small (A) riser, a 7/8 inch O.D. suction line with 3.5 tons capacity has 6 psig drop per 100 feet. Multiply (6/100) by 21 equivalent feet to calculate the total friction loss of 1.26 psig:

(6 ÷ 100) X 21 = 1.26 psig.

The total pressure drop for the riser is equal to the average of the pressure drop in both risers:

1.4 (B riser drop) + 1.26 (A riser drop) = 2.66

2.66 ÷ 2 = 1.33 (average pressure drop through A and B risers)

Find the pressure drop for the horizontal run of pipe. A 1-3/8 inch pipe at 10 tons capacity and has 3.3 psig drop per 100 feet. Multiply 3.3/100 by 61 equivalent feet to calculate the total friction loss of 2.01 psig:

3.3 ÷ 100 X 61 = 2.01

Add the pressure drop through the risers to the pressure drop through the horizontal run to find the total pressure drop for the system:

2.01 psig (horiz. run) + 1.33 psig (avg. riser) = 3.34

Use figure 14 to calculate the pressure drop in 25 feet of 1-3/8 inch line. Multiply 3.3/100 by 25 feet to calculate the friction loss of 0.825 psig.

3.3 ÷ 100 X 25 = 0.825

***The Btuh capacity lost in the "total equivalent length" of the refrigerant line (using figures 12 and 14) = 1% x (3.34 - 0.825) x 120,000:***

Btuh lost = 0.01 x (2.515) x 120,000 = 3018

Capacity loss for the line selected is approximately 2.5 percent.

## Refrigeration

### Service Valves and Gauge Manifold Attachment

The liquid line and suction line service valves and gauge ports are accessible inside the unit. These gauge ports are used for leak testing, evacuating, charging, and checking the charge. Condensing unit, lines, and evaporator need to be evacuated.

### Liquid Line Service Valve

LSA072, -090C, and -120C units use valves shown in figure 19. A Schrader valve core is factory installed. A service port cap is supplied to protect the Schrader valve from contamination and serve as the primary leak seal.

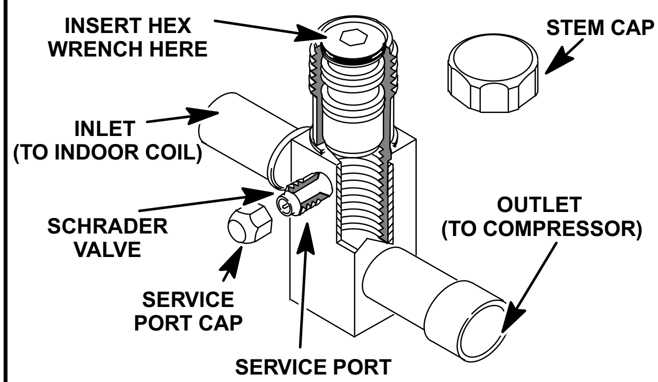
**Accessing the Schrader Port Valve:**

1 - Remove service port cap with an adjustable wrench.

2 - Connect gauge to the service port.

3 - When testing is complete, replace service port cap. Tighten finger tight, then tighten an additional 1/6 turn.

**LIQUID LINE SERVICE VALVE (VALVE OPEN)**




**LIQUID LINE SERVICE VALVE (VALVE CLOSED)**

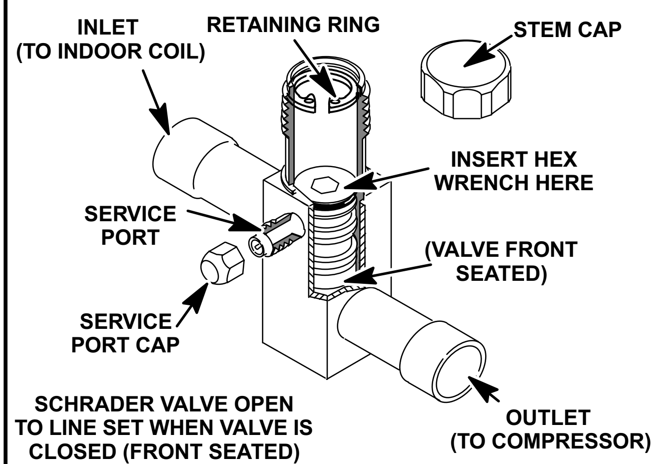



**FIGURE 19**

**Opening the Liquid Line Service Valve:**

1 - Remove stem cap with an adjustable wrench.

2 - Using a service wrench with a hex-head extension, turn the stem counterclockwise until the valve stem just touches the retaining ring.

3 - Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

**⚠ WARNING**

**Do not attempt to backseat this valve. Attempts to backseat this valve will cause the snap ring to explode from valve body under pressure of refrigerant. Personal injury and unit damage will result.**

**Closing the Liquid Line Service Valve:**

1 - Remove stem cap with an adjustable service wrench.

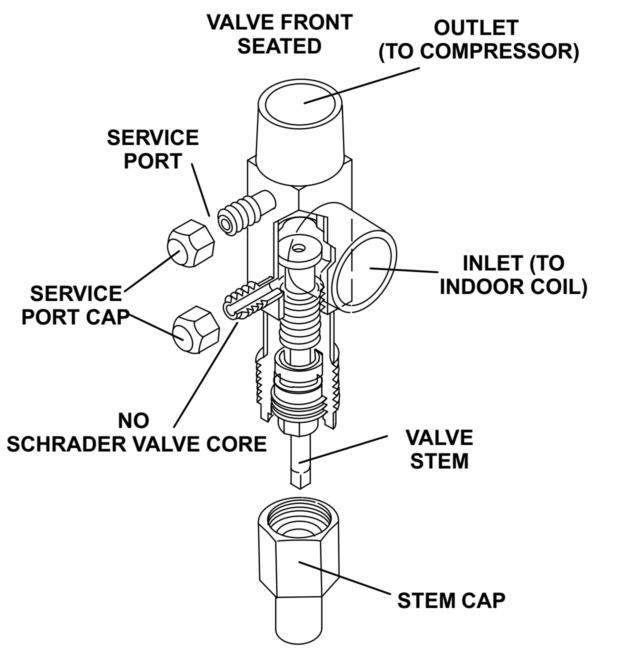
2 - Using a service wrench with a hex-head extension, turn the stem clockwise to seat the valve. Tighten firmly.

3 - Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

### Suction Line Service Valve

The LSA072C unit is equipped with a full service front- and back-seating suction line service valve as shown in figure 20. The valve is equipped with a service port. There is no Schrader valve core installed in the suction line service port. A service port cap is supplied to seal off the port.

**SUCTION LINE SERVICE VALVE (VALVE OPEN) LSA072C VALVE**




**NOTE: WHEN VALVE IS FRONT SEATED, SERVICE PORT IS *NOT* ISOLATED (BLOCKED OFF) FROM SYSTEM**

**FIGURE 20**

**Accessing the Schrader Port:**

1 - Remove the service port cap with an adjustable wrench.
2 - Connect gauge to the service port.
3 - When testing is completed, replace service port cap. Tighten finger tight, then tighten an additional 1/6 turn.

**Opening the Suction Line Service Valve: 072C**

1 - Remove the stem cap with an adjustable wrench.
2 - Using a service wrench with a hex-head extension (part #49A71), turn the stem out counterclockwise until the valve stem just touches the retaining ring.
3 - Replace the stem cap and tighten it firmly. Tighten finger tight, then tighten an additional 1/6 turn.

**Closing the Suction Line Service Valve: 072C**

1 - Remove the stem cap with an adjustable wrench.
2 - Using a service wrench with a hex-head extension (part #49A71), turn the stem clockwise to seat the valve. Tighten firmly.
3 - Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

The LSA090C and the LSA120C units are equipped with a full service ball valve, as shown in figure 21. One service port that contains a Schrader valve core is present in this valve. A cap is also provided to seal off the service port. The valve is not rebuildable so it must always be replaced if failure has occurred.

**Opening the Suction Line Service Valve: 090C and 120C**

1 - Remove the stem cap with an adjustable wrench.
2 - Using a service wrench, turn the stem counterclockwise for 1/4 of a turn.
3 - Replace the stem cap and tighten it firmly.

**Closing the Suction Line Service Valve: 090C and 120C**

1 - Remove the stem cap with an adjustable wrench.
2 - Using a service wrench, turn the stem clockwise for 1/4 of a turn.
3 - Replace the stem cap and tighten firmly.

**SUCTION LINE (BALL TYPE) SERVICE VALVE (VALVE OPEN)**
**USE ADJUSTABLE WRENCH**
**ROTATE STEM CLOCKWISE 90° TO CLOSE**
**ROTATE STEM COUNTERCLOCKWISE 90° TO OPEN**

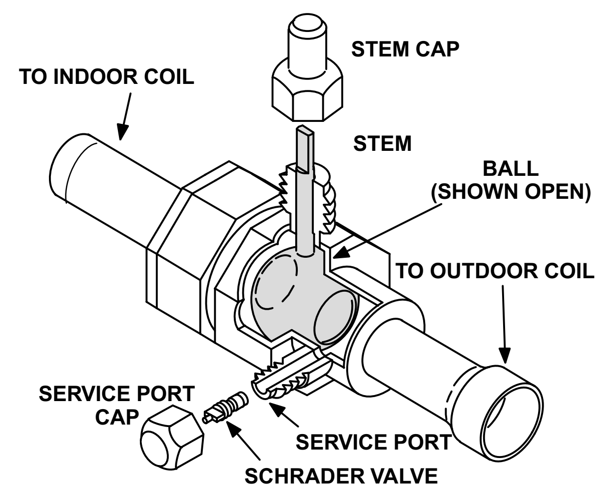



**FIGURE 21**

## Leak Testing

After you have connected the line set to the indoor and outdoor units, check the line set connections and indoor unit for leaks.

## ⚠ WARNING

**Never use oxygen to pressurize refrigeration or air conditioning system. Oxygen will explode on contact with oil and could cause personal injury. When using a high pressure gas such as nitrogen or CO2 for this purpose, be sure to use a regulator that can control the pressure down to range of 1 to 2 psig (6.9 to 13.8 kPa).**

### Using an Electronic Leak Detector or Halide

1 - With both manifold valves closed, open the valve on the HCFC-22 cylinder (vapor only).

2 - Open the high pressure side of the manifold to allow the HCFC-22 into the line set and indoor unit. Weigh in a trace amount of HCFC-22. *[A trace amount is a maximum of 2 ounces (57 g) refrigerant or 3 pounds (31 kPa) pressure]*. Close the valve on the HCFC-22 cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect HCFC-22 cylinder.

3 - Connect a cylinder of nitrogen (that has a pressure regulating valve) to the center port of the manifold gauge set.

4 - Connect the high pressure hose of the manifold gauge set to the service port of the suction valve.

*NOTE - Normally the high pressure hose is connected to the liquid line port. However, connecting it to the suction port more effectively protects the manifold gauge set from high pressure damage.*

5 - Adjust the nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set which will pressurize the line set and indoor unit.

6 - After a few minutes, open a refrigerant port to ensure that the amount of refrigerant you added is large enough to be detected. (Amounts of refrigerant will vary with line lengths.) Check all joints for leaks. Purge the nitrogen and HCFC-22 mixture. Correct any leaks and recheck.

## Evacuation & Dehydration

**⚠ IMPORTANT**

**Units are shipped with a holding charge of dry air and helium which must be removed before the unit is evacuated and charged with refrigerant.**

Evacuating the system of noncondensables is critical for the unit to operate properly. Noncondensables are gases that will not condense under temperatures and pressures which are present while an air conditioning system is operating. Noncondensables and water vapor combine with refrigerant to produce substances that corrode copper piping and compressor parts.

1 -Remove the suction valve actuation/stem cap. Turn the stem unit it is fully open. To open the liquid valve, remove cap and turn the valve stem until it is fully open.

2 -Connect the manifold gauge set to the service valve ports as follows:

- low pressure gauge to *suction* line service valve
- high pressure gauge to *liquid* line service valve

3 -Purge the system of dry air, helium, or nitrogen.

**⚠ IMPORTANT**

**Never use compliant scroll compressors (as with any refrigerant compressor) to evacuate a refrigeration or air conditioning system!**

*NOTE - Use a temperature vacuum gauge, mercury vacuum, or thermocouple gauge. The usual Bourdon tube gauges are inaccurate in the vacuum range.*

4 - Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.

5 - Open both manifold valves and start the vacuum pump.

6 - Evacuate the line set, LSA unit, and the indoor unit to an absolute pressure of 23 mm (23,000 microns) of mercury or approximately 1 inch of mercury. During the early stages of evacuation, close the manifold gauge valve at least once to determine if there is a rapid rise in absolute pressure. A rapid rise in pressure indicates a relatively large leak. If this occurs, repeat the leak test.

*NOTE - The term **absolute pressure** means the total actual pressure within a given volume or system, above the absolute zero of pressure. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.*

7 -When the absolute pressure reaches 23 mm (23,000 microns) of mercury, do the following:

- close the manifold gauge valves
- turn off the vacuum pump
- disconnect the manifold gauge center port hose from the vacuum pump

Attach the manifold center port hose to a nitrogen cylinder with the pressure regulator set to 150 psig (1034 kPa) and purge the hose. Open the manifold gauge valves to break the vacuum in the line set and indoor unit. Close the manifold gauge valves.

**⚠ CAUTION**

**Danger of Equipment Damage.**
**Avoid deep vacuum operation. Do not use compressors to evacuate a system.**
**Extremely low vacuums can cause internal arcing and compressor failure.**
**Damage caused by deep vacuum operation will void warranty.**

8 - Shut off the nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the nitrogen from the line set and the indoor unit.

9 - Reconnect the manifold gauge to the vacuum pump, turn the pump on, and continue to evacuate the line set, indoor unit, and LSA condensing unit. Continue to evacuate the line set until the absolute pressure does not rise above .5 mm of (500 microns) mercury within a 20 minute period after you have turned off the vacuum pump and closed the manifold gauge valves.

10 - When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump. Connect it to an upright cylinder of HCFC-22 refrigerant.

11 - Open the manifold gauge valves to break the vacuum in the line set and indoor unit.

12 - Close manifold gauge valves and shut off the HCFC-22 cylinder and remove the manifold gauge set.

## Start-Up

### Cooling Start-Up

**⚠ IMPORTANT**

**Crankcase heater should be energized 24 hours before unit start-up to prevent damage to the compressor as a result of slugging.**

1 - Verify that the indoor blower is operating.

2 - Rotate the fan to check for frozen bearings or binding.

3 - Inspect all factory and field-installed wiring for loose connections.

4 - Check the voltage supply at the disconnect switch. The voltage must be within the range listed on the unit nameplate. If it is not, do not start the equipment until you have consulted the power company and the voltage condition has been corrected.

5 - To start the unit, set the thermostat for a cooling demand, turn on the power to the blower, and close the condensing unit disconnect switch.

6 - Recheck the unit voltage while the unit is running. The power must be within the range shown on the unit nameplate. Check the amperage draw of the unit, and refer to the unit nameplate for correct running amps.

### Three-Phase Compressor Rotation

Three-phase scroll compressors must be phased sequentially to ensure that the compressor rotates and operates correctly. When the compressor starts, a rise in discharge and drop in suction pressures indicate proper compressor phasing and operation. If discharge and suction pressures do not perform normally, follow the steps below to correctly phase in the unit.

1 - Disconnect the power to the unit.

2 - Reverse any two field power leads to the unit.

3 - Reconnect the power to the unit.

The discharge and suction pressures should operate at their normal start-up ranges.

*NOTE - Compressor noise level will be significantly higher when phasing is incorrect. The unit will not provide cooling when compressor is operating backwards. Continued backward operation will cause the compressor to cycle on internal protector.*

## Charging

**Table 4**

| UNIT MODEL NUMBER | MATCHED INDOOR UNIT | HCFC-22 FOR 25 FEET (7.62 M) OF LINE | LIQUID LINE DIAMETER | ADJUSTMENT PER FOOT (.305 M) OF LINE* |
|---|---|---|---|---|
| LSA072C | CB17/CBH17-95 | 12 lbs. 8 oz. (5.7 Kg) | 1/2 in. (13 mm) | 1.1 oz. (31 g) |
| | | | 5/8 in. (16 mm) | 1.8 oz. (51 g) |
| LSA090C | CB17/CBH17-95 | 16 lbs. (7.5 Kg) | 5/8 in. (16 mm) | 1.8 oz. (51 g) |
| | | | 3/4 in. (19 mm) | 2.6 oz. (74 g) |
| LSA120C | CB17/CBH17-135 | 23 lbs. 8 oz. (10.7 Kg) | 5/8 in. (16 mm) | 1.8 oz. (51 g) |
| | | | 3/4 in. (19 mm) | 2.6 oz. (74 g) |

** If line length is greater than 25 feet (8 m), add this amount. If line length is less than 25 feet (8 m), subtract this amount.*

*NOTE - Refrigerant line sets should not be longer than 100 feet (30 m). Refrigerant line losses deduct from the net capacity of the system. The additional refrigerant required for such systems may also upset the refrigerant to oil ratio.*

**Table 5**
**Normal Operating Pressures**

| Outdoor Coil Entering Air Temperature | LSA072C* Discharge ± 10 psig | LSA072C* Suction ± 5 psig | LSA072C** Discharge ± 10 psig | LSA072C** Suction ± 5 psig | LSA090C** Discharge ± 10 psig | LSA090C** Suction ± 5 psig | LSA120C*** Discharge ± 10 psig | LSA120C*** Suction ± 5 psig |
|---|---|---|---|---|---|---|---|---|
| 65°F (18°C) | 173 | 61 | 180 | 73 | 196 | 71 | 181 | 66 |
| 75°F (24°C) | 199 | 63 | 207 | 75 | 224 | 72 | 206 | 68 |
| 85°F (29°C) | 229 | 65 | 238 | 77 | 254 | 73 | 234 | 69 |
| 95°F (35°C) | 261 | 67 | 271 | 79 | 288 | 74 | 265 | 70 |
| 105°F (40°C) | 298 | 71 | 308 | 82 | 323 | 76 | 300 | 72 |
| 115°F (46°C) | 333 | 72 | 342 | 83 | 363 | 77 | 335 | 73 |

**LSA072C tested with CB30U-65. Pressure shown is with typical 5-ton indoor coil match-up.*
***LSA072C and LSA090C tested with CB17/CBH17-95V.*
****LSA120C tested with CB17/CBH17-135V.*

**Units are shipped with a holding charge of dry air and helium which must be removed before the unit is evacuated and charged with refrigerant.** In new installations, the best and most accurate method of charging is to weigh the refrigerant into the unit as indicated in table 4. Add the weight of the refrigerant or an approximate amount into the unit. If weighing facilities are not available, or if the charge needs to be checked, use the following method:

1 - Attach the gauge manifolds and operate the unit in cooling mode until the system stabilizes (approximately five minutes).

2 - Use a digital thermometer to accurately measure the outdoor ambient temperature.

3 - Apply the outdoor temperature to table 5 to determine normal operating pressures.

4 - Compare the normal operating pressures in table 5 to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. Correct any system problems before proceeding.

5 - Add or remove the charge in increments and allow the system to stabilize each time you add or remove the refrigerant.

6 - Use the approach method to confirm readings.

### Verifying the Charge Using Approach Method for Temperatures > 60°F only

Do not use the approach method if the system pressures do not match the pressures given in table 5. The approach method is not valid for grossly over- or undercharged systems.

1 - Use the same digital thermometer to take the liquid line temperature and the outdoor ambient temperature. Measure the liquid line temperature at the condenser outlet. Then compare the liquid line temperature to the outdoor ambient temperature. The approach temperature equals the liquid line temperature minus the outdoor ambient temperature:

**Approach Temperature** = **Liquid Line °F (°C)** - **Outdoor Ambient °F (°C)**

2 - The approach temperature should match values given in table 6. An approach temperature greater than the value shown indicates an undercharge. An approach temperature that is less than the value shown indicates an overcharge.

**Table 6**
**Approach Method**

| MODEL NO. | LIQUID TEMP. MINUS AMBIENT TEMP. °F (°C) |
|---|---|
| LSA072C* | 12 ± 1 (6.7 ± .5) |
| LSA072C** | 16 ± 1 (8.9 ± .5) |
| LSA090C** | 11 ± 1 (6.0 ± .5) |
| LSA120C*** | 11 ± 1 (6.0 ± .5) |

*Note - For best results, use the same digital thermometer check both outdoor ambient and liquid line temperature at the exit of the condenser.*

**Matched with CB30U-65 or typical 5-ton indoor evaporator coil.*

***Matched with CB17/CBH17-95V.*

****Matched with CB17/CBH17-135V.*

## System Operation

The condensing unit and indoor unit blower operates based on demands from the room thermostat. When the thermostat blower switch is moved to the **ON** position, indoor blower operates continuously.

### Crankcase Heater

LSA072C, 090C, and 120C units are equipped with external, belly-band crankcase heaters. The crankcase heater should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

### Minimum Run Timer Control

All units are equipped with a minimum run time control. This control prevents the compressor from short cycling and ensures that the oil returns to the compressor properly. When a cooling cycle begins, the run time control keeps the compressor operating for a minimum of 4 minutes, regardless of whether the cooling demand has been satisfied or not. Do not bypass this control.

### High Pressure Switch

LSA072C, 090C and 120C units are equipped with a high pressure switch that is located in the discharge line of the compressor. The switch (SPST, manual reset, normally closed) removes power from the compressor when the discharge pressure rises above factory setting at 410 ± 10 psig (2827 ± 69 kPa).

### Low Pressure Switch

LSA072C, 090C, and 120C units are also equipped with a low pressure switch that is located in the suction line of the compressor. The switch (SPST, auto-reset, normally closed) removes power from the compressor when the suction line pressure drops below factory setting at 25 ± 5 psig (172 ± 34 kPa).

## Maintenance

At the beginning of each cooling season, a certified technician should check the system as follows:

**⚠ WARNING**

**Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.**

### Condensing Unit

1 - Clean and inspect the condenser coil. You can flush the coil with a water hose.

2 - The condenser fan motor is prelubricated and sealed. No further lubrication is necessary.

3 - Visually inspect connecting lines and coils for evidence of oil leaks.

4 - Check wiring for loose connections.

5 - Check for correct voltage at the unit while the unit is operating and while it is off.

6 - Check amp-draw of the condenser fan motor.
Unit nameplate _________ Actual ____________ .

Check amp-draw of the compressor.
Unit nameplate _________ Actual ____________ .

*NOTE - If the owner complains of insufficient cooling, gauge the unit and check the refrigerant charge. Refer to section on refrigerant charging in this instruction.*

### Evaporator Coil

1 - If necessary, clean the coil.

2 - Check connecting lines and coils for evidence of oil leaks.

3 - If necessary, check the condensate line and clean it.

### Indoor Unit

1 - Clean or change filters.

2 - Adjust the blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.

3 - On belt drive blowers, check the belt for wear and proper tension.

4 - Check all wiring for loose connections.

5 - Check for correct voltage at the unit (blower operating).

6 - Check amp-draw on blower motor.
Unit nameplate_________ Actual ____________.

## Start-Up & Performance Check List: LSA072C, 090C, & 120C

Job Name ____________________ Job No. ____________________ Date ____________

Job Location ____________________ City ____________________ State ____________

Installer ____________________ City ____________________ State ____________

Unit Model No. ____________________ Serial No. ____________________ Technician ____________

Nameplate Voltage ____________________ Amps: ____________

Minimum Circuit Ampacity ____________ Supply Amps: ______ Condenser Fan Amps: ____________

Maximum Overcurrent Protection Size ____________ Compressor Amps: ____________

Electrical Connections Tight? ☐

Supply Voltage (Unit Off) ____________________

**COOLING SECTION**

Refrigerant Lines:

Leak Checked? ☐

Service Valves Fully Opened? ☐

Properly Insulated? ☐

Condenser Fan Checked? ☐

Liquid Service Valve Caps Tight? ☐

Suction Service Valve Caps Tight? ☐

Voltage With Compressor Operating ____________

Indoor Filter Clean? ☐

Indoor Blower RPM ____________________

Blower interlocked with compressor? ☐

S.P. Drop Over Evaporator (Dry)

Condenser Entering Air Temperature ____________

Discharge Pressure ________ Suction Pressure ______

Refrigerant Charge Checked? ☐

Compressor Rotation Checked? ☐

**THERMOSTAT**

Calibrated? ☐ Properly Set? ☐

Level? ☐