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**THIS MANUAL MUST BE LEFT WITH THE  
HOMEOWNER FOR FUTURE REFERENCE**

### **⚠ WARNING**

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 licensed professional HVAC installer or equivalent, or service agency.

### **⚠ IMPORTANT**

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

# INSTALLATION INSTRUCTIONS

## Merit® Series 16HPX Units

HEAT PUMP  
507876-01  
8/2019

### General

This 16HPX outdoor heat pump is designed for use with HFC-410A refrigerant only. This unit must be installed with an approved indoor air handler or coil. For AHRI Certified system match-ups and expanded ratings, visit [www.LennoxPros.com](http://www.LennoxPros.com). These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities having jurisdiction before installation.

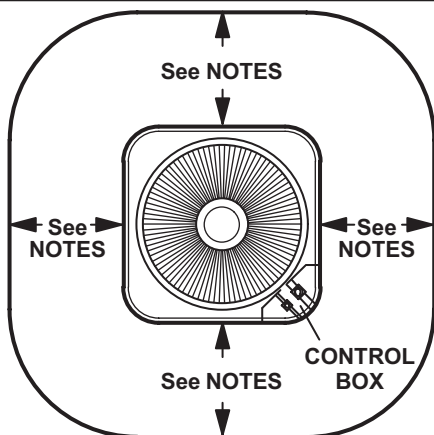
### NOTICE!

Charging information is given on the charging procedure sticker on the unit access panel. For more in-depth information, consult the Installation and Service Procedures manual on [LennoxPros.com](http://LennoxPros.com) or through the Technical Support department at 800-453-6669.

### ⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

## STEP 1 – SETTING THE UNIT – Clearances



### NOTES -

Service clearance of 30 in. (762 mm) must be maintained on one of the sides adjacent to the control box.

Clearance to one of the other three sides must be 36 in. (914 mm).

Clearance to one of the remaining two sides may be 12 in. (305 mm) and the final side may be 6 in. (152 mm).

A clearance of 24 in. must be maintained between two units.

48 in. (1219 mm) clearance required on top of unit.

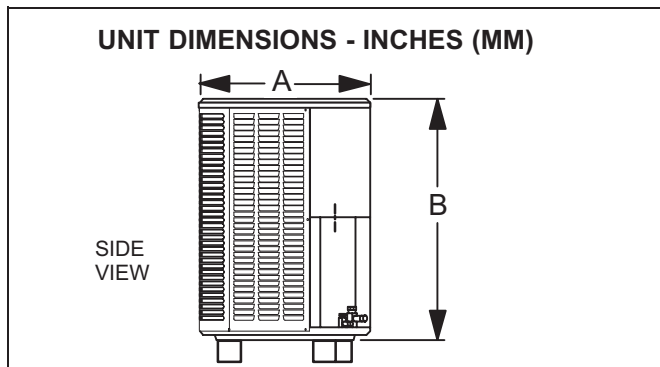


FIGURE 1

TABLE 1 – Unit Dimensions

Model Numbers	A	B
16HPX-024	24-1/4 (616)	32-1/2 (826)
16HPX-036	32-1/4 (819)	32-1/2 (826)
16HPX-048	32-1/4 (819)	42-1/4 (1073)
16HPX-060	32-1/4 (819)	42-1/4 (1073)

### STEP 1 – SETTING THE UNIT (Continued) – Unit Placement

#### NOTICE!

##### Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to degrade. Failure to follow this notice could result in damage to roof surface.

#### ! IMPORTANT

This unit must be matched with an AHRI Certified indoor coil or air handler.

Coils previously charged with HCFC-22 must be flushed.

#### ! WARNING

To prevent personal injury, as well as damage to panels, unit or structure, observe the following:

While installing or servicing this unit, carefully stow all removed panels so that the panels will not cause injury to personnel, objects or nearby structures. Also, take care to store panels where they will not be subject to damage (e.g., being bent or scratched).

While handling or stowing the panels, consider any weather conditions (especially wind) that may cause panels to be blown around and damaged.

#### ! IMPORTANT

Exhaust vents from dryers, water heaters and furnaces should be directed away from the outdoor unit. Prolonged exposure to exhaust gases and the chemicals contained within them may cause condensation to form on the steel cabinet and other metal components of the outdoor unit. This will diminish unit performance and longevity.

#### PLACEMENT

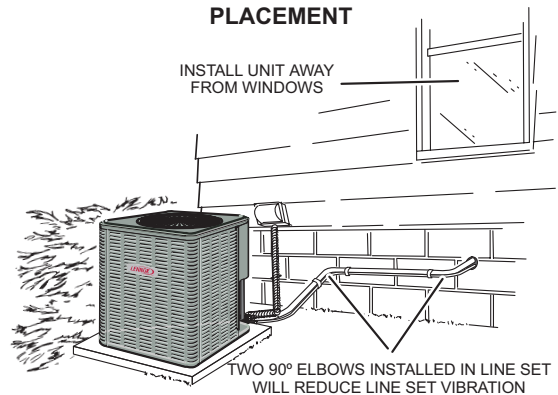


FIGURE 2

#### SLAB MOUNTING

Install unit level or, if on a slope, maintain slope tolerance of 2 degrees (or 2 inches per 5 feet [50 mm per 1.5 m]) away from building structure.

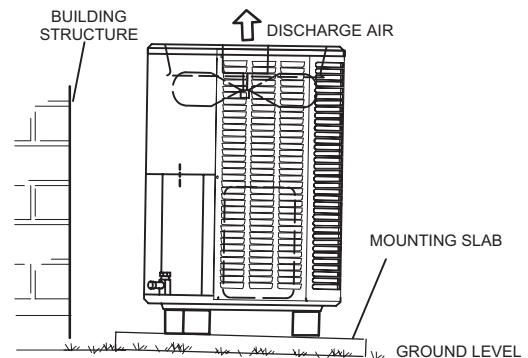


FIGURE 3

#### ! IMPORTANT

This model is designed for use in check / expansion valve systems only. An indoor expansion valve approved for use with HFC-410A refrigerant must be ordered separately and installed prior to operating the system.

**NOTE** - An optional Unit Stand-Off Kit (94J45) is available for this unit. Black high-density polyethylene feet raise unit off of mounting surface away from damaging moisture. Four feet are furnished per order number.

## STEP 2 – REFRIGERANT PIPING

### IMPORTANT

If this unit is being matched with an approved line set or indoor unit coil that was previously charged with mineral oil, or if it is being matched with a coil which was manufactured before January of 1999, the coil and line set must be flushed prior to installation. Take care to empty all existing traps. Polyol ester (POE) oils are used in Lennox units charged with HFC-410A refrigerant. Residual mineral oil can act as an insulator, preventing proper heat transfer. It can also clog the expansion device and reduce system performance and capacity. Failure to properly flush the system per this instruction and the detailed Installation and Service Procedures manual will void the warranty.

Flush the existing line set per the following instructions. For more information, refer to the Installation and Service Procedures manual available on [LennoxPros.com](http://LennoxPros.com). CAUTION - DO NOT attempt to flush and re-use existing line sets or indoor coil when the system contains contaminants (i.e., compressor burn out).

If a new line set is being installed, size the piping per table 1.

TABLE 1

REFRIGERANT LINE SET – INCHES (MM)					
Model	Valve Field Connections		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-018	3/8 in. (10 mm)	3/4 in. (19 mm)	3/8 in. (10 mm)	3/4 in. (19 mm)	L15-41 15 ft. - 50 ft. (4.6 m - 15 m)
-024					
-030					
-036	3/8 in. (10 mm)	7/8 in. (22 mm)	3/8 in. (10 mm)	7/8 in. (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-042					
-048					
-060	3/8 in. (10 mm)	1-1/8 in. (28 mm)	3/8 in. (10 mm)	1-1/8 in. (28 mm)	Field Fabricated

NOTE - Some applications may require a field-provided 7/8" to 1-1/8" adapter.

**NOTE** - When installing refrigerant lines longer than 50 feet, refer to the Refrigerant Piping Design and Fabrication Guidelines manual available on [LennoxPros.com](http://LennoxPros.com) (Corp. 9351-L9), or contact the Technical Support Department Product Application group for assistance.

**NOTE** - For new or replacement line set installation, refer to Service and Application Note - Corp. 9112-L4 (C-91-4).

### WARNING



When using a high pressure gas such as nitrogen to pressurize a refrigeration or air conditioning system, use a regulator that can control the pressure down to 1 or 2 psig (6.9 to 13.8 kPa).

### WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

### WARNING



Fire, Explosion and Personal Safety hazard. Failure to follow this warning could result in damage, personal injury or death.

Never use oxygen to pressurize or purge refrigeration lines. Oxygen, when exposed to a spark or open flame, can cause fire and/or an explosion, that could result in property damage, personal injury or death.

### WARNING

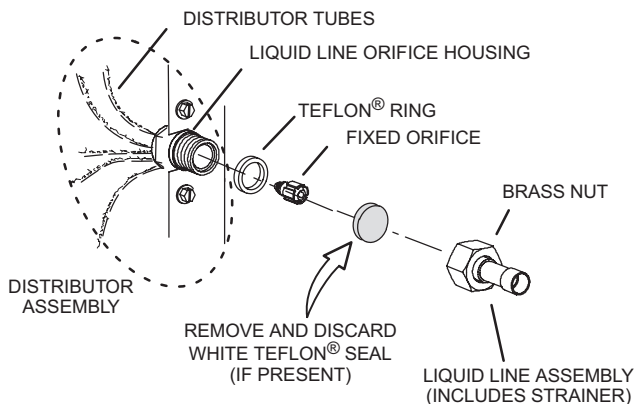
Polyol ester (POE) oils used with HFC-410A refrigerant absorb moisture very quickly. It is very important that the refrigerant system be kept closed as much as possible. DO NOT remove line set caps or service valve stub caps until you are ready to make connections.

### IMPORTANT

Some scroll compressors have an internal vacuum protector that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. Protector will reset when low pressure in system is raised above 40 psig. DO NOT REPLACE COMPRESSOR.

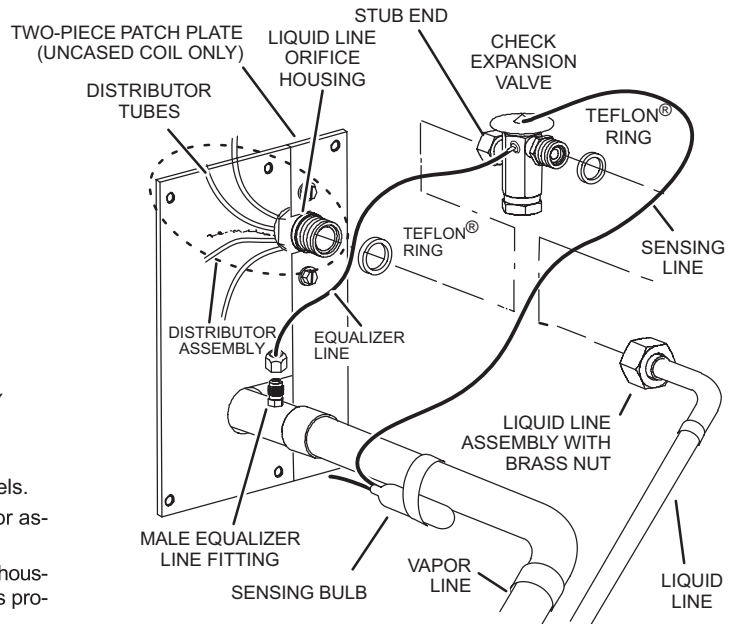
## STEP 2 – REFRIGERANT PIPING – Removing Existing Indoor Metering Device

### 1A TYPICAL EXISTING FIXED ORIFICE REMOVAL PROCEDURE (UNCASED COIL SHOWN)



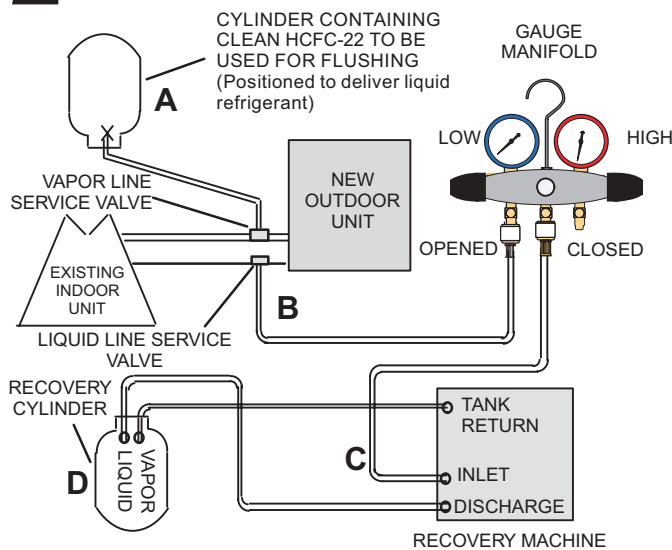
- A - On fully cased coils, remove the coil access and plumbing panels.
- B - Remove any shipping clamps from the liquid line and distributor assembly.
- C - Using two wrenches, disconnect liquid line from liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
- D - Remove and discard fixed orifice, valve stem assembly (if present) and Teflon® washer as illustrated above.
- E - Use a field-provided fitting to temporarily reconnect the liquid line to the indoor unit's liquid line orifice housing.

### OR 1B TYPICAL EXISTING EXPANSION VALVE REMOVAL PROCEDURE (UNCASED COIL SHOWN)



- A - On fully cased coils, remove the coil access and plumbing panels.
- B - Remove any shipping clamps from the liquid line and distributor assembly.
- C - Disconnect the equalizer line from the check expansion valve equalizer line fitting on the vapor line.
- D - Remove the vapor line sensing bulb.
- E - Disconnect the liquid line from the check expansion valve at the liquid line assembly.
- F - Disconnect the check expansion valve from the liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
- G - Remove and discard check expansion valve and the two Teflon® rings.
- H - Use a field-provided fitting to temporarily reconnect the liquid line to the indoor unit's liquid line orifice housing.

### 2 CONNECT GAUGES AND EQUIPMENT FOR FLUSHING PROCEDURE



- A - HCFC-22 cylinder with clean refrigerant (positioned to deliver liquid refrigerant) to the vapor service valve.
- B - HCFC-22 gauge set (low side) to the liquid line valve.
- C - HCFC-22 gauge set center port to inlet on the recovery machine with an empty recovery tank connected to the gauge set.
- D - Connect recovery tank to recovery machine per machine instructions.

### 3 FLUSHING LINE SET

The line set and indoor unit coil must be flushed with at least the same amount of clean refrigerant that previously charged the system. Check the charge in the flushing cylinder before proceeding.

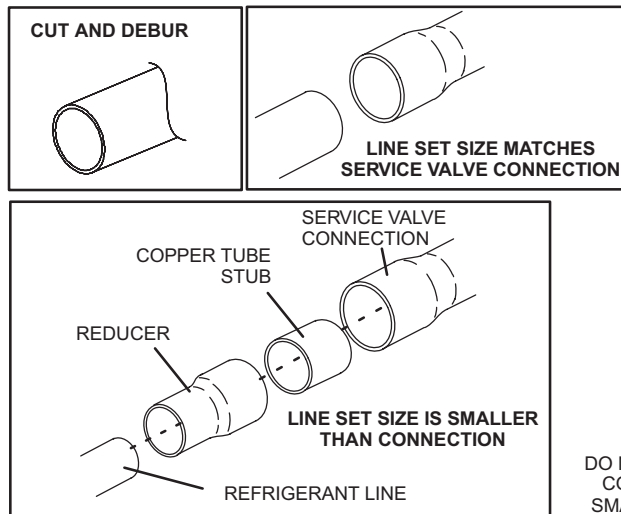
- A - Set the recovery machine for liquid recovery and start the recovery machine. Open the gauge set valves to allow the recovery machine to pull a vacuum on the existing system line set and indoor unit coil.
- B - Position the cylinder of clean HCFC-22 for delivery of liquid refrigerant and open its valve to allow liquid refrigerant to flow into the system through the vapor line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor unit coil before it enters the recovery machine.
- C - After all of the liquid refrigerant has been recovered, switch the recovery machine to vapor recovery so that all of the HCFC-22 vapor is recovered. Allow the recovery machine to pull the system down to 0.
- D - Close the valve on the inverted HCFC-22 drum and the gauge set valves. Pump the remaining refrigerant out of the recovery machine and turn the machine off.

FIGURE 4

## STEP 2 – REFRIGERANT PIPING – Brazing Procedures

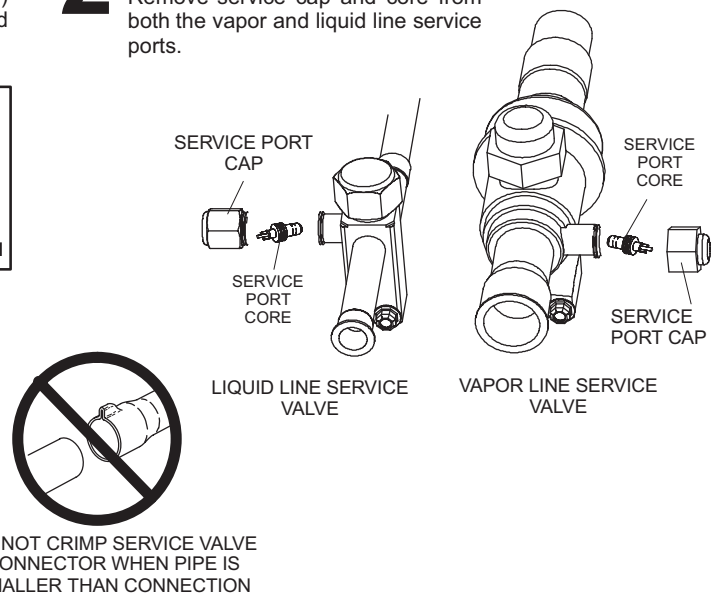
### 1 CUT AND DEBUR

Cut ends of the refrigerant lines square (free from nicks or dents) and debur the ends. The pipe must remain round. Do not crimp end of the line.



### 2 CAP AND CORE REMOVAL

Remove service cap and core from both the vapor and liquid line service ports.



### 3 ATTACH THE MANIFOLD GAUGE SET FOR BRAZING LIQUID AND VAPOR LINE SERVICE VALVES

Flow regulated nitrogen (at 1 to 2 psig) through the low-side refrigeration gauge set into the liquid line service port valve, and out of the vapor line service port valve.

- A - Connect gauge set low pressure side to liquid line service valve (service port).
- B - Connect gauge set center port to bottle of nitrogen with regulator.
- C - Remove core from valve in vapor line service port to allow nitrogen to escape.

VAPOR SERVICE PORT MUST BE OPEN TO ALLOW EXIT POINT FOR NITROGEN

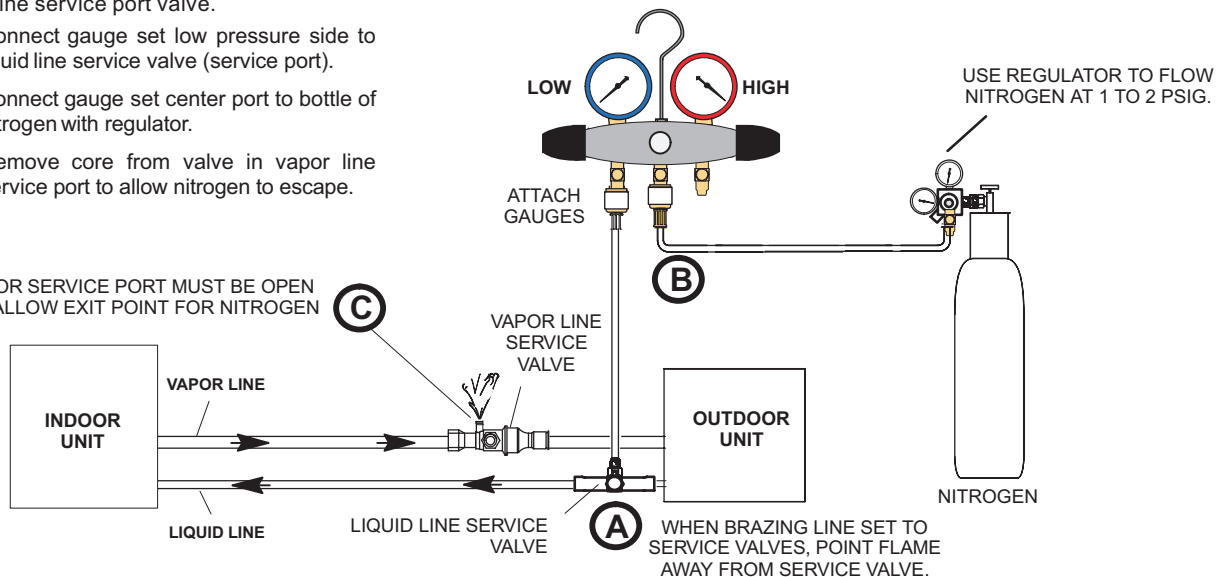


FIGURE 5

### ⚠ CAUTION

Brazing alloys and flux contain materials which are hazardous to your health.

Avoid breathing vapors or fumes from brazing operations. Perform operations only in well-ventilated areas.

Wear gloves and protective goggles or face shield to protect against burns.

Wash hands with soap and water after handling brazing alloys and flux.

### ⚠ WARNING



Danger of fire. Bleeding the refrigerant charge from only the high side may result in pressurization of the low side shell and suction tubing. Application of a brazing torch to a pressurized system may result in ignition of the refrigerant and oil mixture. Check the high and low pressures before applying heat.

## 4 WRAP SERVICE VALVES

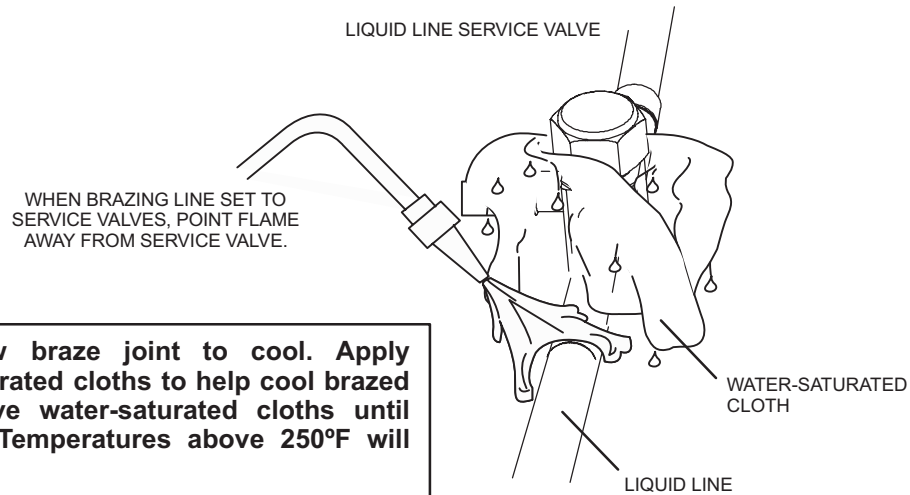
To help protect service valve seals during brazing, wrap water-saturated cloths around service valve bodies and copper tube stubs. Use additional water-saturated cloths underneath the valve body to protect the base paint.

## 5 FLOW NITROGEN

Flow regulated nitrogen (at 1 to 2 psig) through the refrigeration gauge set into the valve stem port connection on the liquid service valve and out of the vapor valve stem port. See steps **3A**, **3B** and **3C** on manifold gauge set connections.

## 6 BRAZE LINE SET

Wrap both service valves with water-saturated cloths as illustrated here and as mentioned in step 4, before brazing to line set. Cloths must remain water-saturated throughout the brazing and cool-down process.

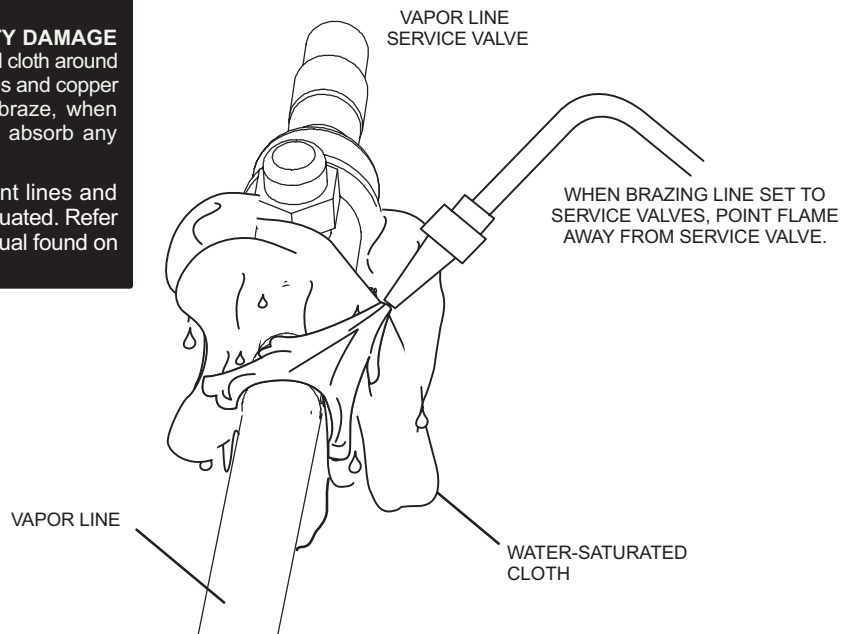


**IMPORTANT — Allow braze joint to cool. Apply additional water-saturated cloths to help cool brazed joint. Do not remove water-saturated cloths until piping has cooled. Temperatures above 250°F will damage valve seals.**

### WARNING

**FIRE, PERSONAL INJURY, OR PROPERTY DAMAGE** may result if you do not wrap a water-saturated cloth around both liquid and suction line service valve bodies and copper tube stub while brazing the line set! The braze, when complete, must be quenched with water to absorb any residual heat.

Do not open service valves until refrigerant lines and indoor coil have been leak-tested and evacuated. Refer to Installation and Service Procedures manual found on [LennoxPros.com](http://LennoxPros.com).



## 7 PREPARATION FOR NEXT STEP

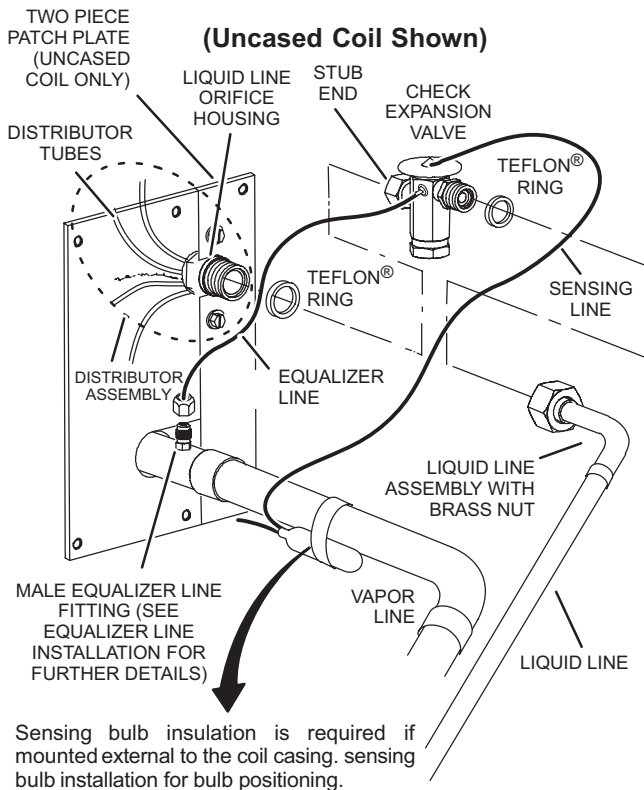
After all connections have been brazed, disconnect manifold gauge set from service ports. Apply additional water-saturated cloths to both services valves to cool piping. Once piping is cool, remove all water-saturated cloths.

FIGURE 6

## STEP 3 – Install Indoor Expansion Valve

This outdoor unit is designed for use in systems that include a check/expansion valve metering device. See the 16HPX Product Specifications bulletin (EHB) for approved check/expansion valve kit match-ups and application information. The check/expansion valve unit can be installed internal or external to the indoor coil. In applications where an uncased coil is being installed in a field-provided plenum, install the check/expansion valve in a manner that will provide access for future field service of the check/expansion valve. Refer to below illustration for reference during installation of check/expansion valve.

### INDOOR EXPANSION VALVE INSTALLATION



- 3 - Install one of the provided Teflon® rings around the stubbed end of the check expansion valve and lightly lubricate the connector threads and expose surface of the Teflon® ring with refrigerant oil.
- 4 - Attach the stubbed end of the check expansion valve to the liquid line orifice housing. Finger tighten and use an appropriately sized wrench to turn an additional 1/2 turn clockwise as illustrated in the figure above, or tighten to 20 ft-lb.
- 5 - Place the remaining Teflon® washer around the other end of the check expansion valve. Lightly lubricate connector threads and expose surface of the Teflon® ring with refrigerant oil.
- 6 - Attach the liquid line assembly to the check expansion valve. Finger tighten and use an appropriately sized wrench to turn an additional 1/2 turn clockwise as illustrated in the figure above or tighten to 20 ft-lb.



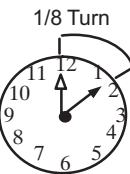
### SENSING BULB INSTALLATION

- 1 - Attach the vapor line sensing bulb in the proper orientation as illustrated to the right using the clamp and screws provided.

**NOTE** - Though it is preferred to have the sensing bulb installed on a horizontal run of the vapor line, installation on a vertical run of piping is acceptable if necessary.

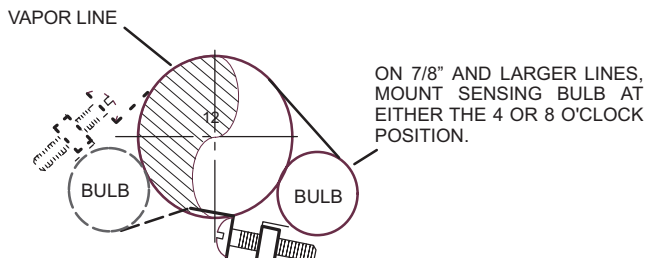
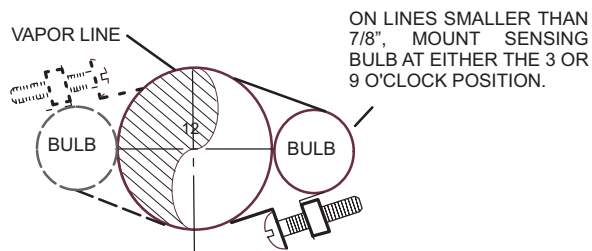
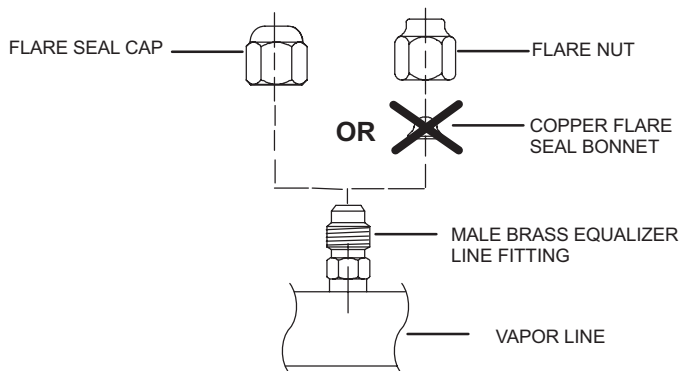
**NOTE** - Confirm proper thermal contact between vapor line and check/expansion bulb before insulating the sensing bulb once installed.

- 2 - Connect the equalizer line from the check expansion valve to the equalizer vapor port on the vapor line. Finger tighten the flare nut plus 1/8 turn (7 ft-lbs) as illustrated below.



### EQUALIZER LINE INSTALLATION

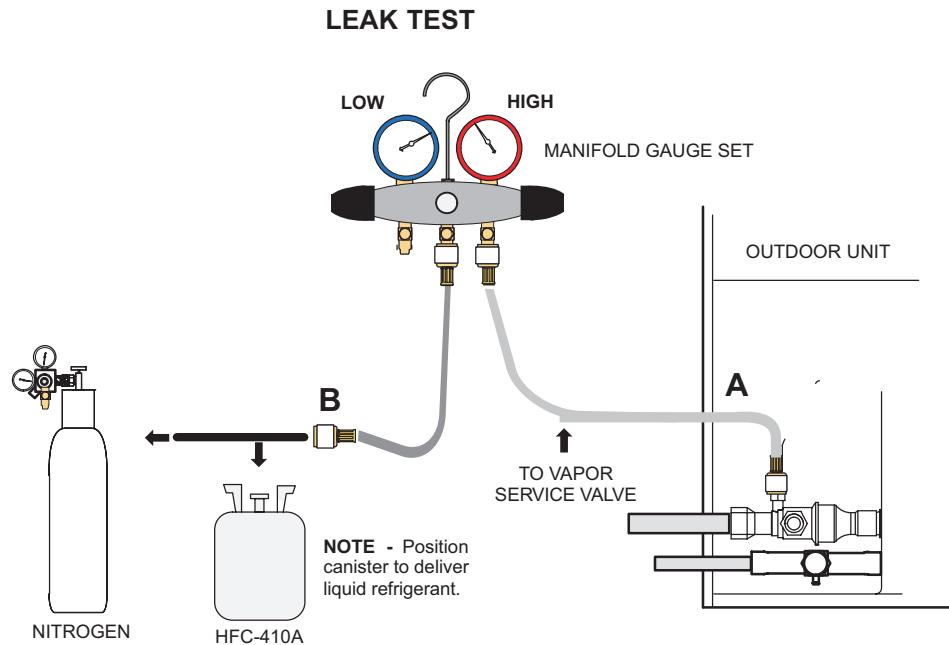
- 1 - Remove and discard either the flare seal cap or flare nut with copper flare seal bonnet from the equalizer line port on the vapor line as illustrated in the figure below.
- 2 - Remove the field-provided fitting that temporarily reconnected the liquid line to the indoor unit's distributor assembly.



**NOTE** - NEVER MOUNT THE SENSING BULB ON BOTTOM OF LINE.

FIGURE 7

## STEP 4 – LEAK TEST AND EVACUATION



### 1 CONNECT GAUGE SET

**A** - Connect the high pressure hose of an HFC-410A manifold gauge set to the vapor valve service port.

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

**B** - With both manifold valves closed, connect the cylinder of HFC-410A refrigerant to the center port of the manifold gauge set.

**NOTE** - Later in the procedure, the HFC-410A container will be replaced by the nitrogen container.

### 2 TEST FOR LEAKS

After the line set has been connected to the indoor and outdoor units, check the line set connections and indoor unit for leaks. Use the following procedure to test for leaks:

**A** - With both manifold valves closed, connect the cylinder of HFC-410A refrigerant to the center port of the manifold gauge set. Open the valve on the HFC-410A cylinder (vapor only).

**B** - Open the high pressure side of the manifold to allow HFC-410A into the line set and indoor unit. Weigh in a trace amount of HFC-410A. [A trace amount is a maximum of two ounces (57 g) refrigerant or three pounds (31 kPa) pressure.] Close the valve on the HFC-410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the HFC-410A cylinder.

**C** - Connect a cylinder of nitrogen with a pressure regulating valve to the center port of the manifold gauge set.

**D** - Adjust nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set in order to pressurize the line set and the indoor unit.

**E** - After a few minutes, open one of the service valve ports and verify that the refrigerant added to the system earlier is measurable with a leak detector.

**F** - After leak testing, disconnect gauges from service ports.

**FIGURE 8**

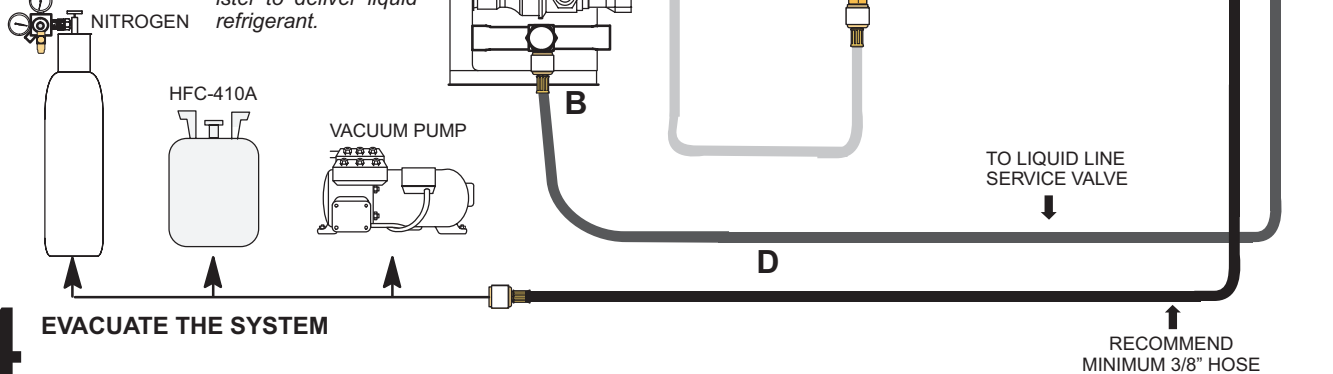
### 3

#### CONNECT GAUGE SET

**NOTE** - Remove cores from service valves (if not already done).

- A - Connect low side of manifold gauge set with 1/4 SAE in-line tee to vapor line service valve
- B - Connect high side of manifold gauge set to liquid line service valve
- C - Connect available micron gauge connector on the 1/4 SAE in-line tee.
- D - Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set. The center port line will be used later for both the HFC-410A and nitrogen containers.

**NOTE** - Position canister to deliver liquid refrigerant.



### 4

#### EVACUATE THE SYSTEM

- A - Open both manifold valves and start the vacuum pump.
- B - Evacuate the line set and indoor unit to an **absolute pressure** of 23,000 microns (29.01 inches of mercury).
 

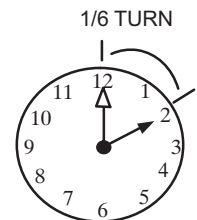
**NOTE** - During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once. A rapid rise in pressure indicates a relatively large leak. If this occurs, **repeat the leak testing procedure**.

**NOTE** - The term **absolute pressure** means the total actual pressure above absolute zero within a given volume or system. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.
- C - When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), perform the following:
  - Close manifold gauge valves.
  - Close valve on vacuum pump.
  - Turn off vacuum pump.
  - Disconnect manifold gauge center port hose from vacuum pump.
  - Attach manifold center port hose to a nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose.
  - Open manifold gauge valves to break the vacuum in the line set and indoor unit.
  - Close manifold gauge valves.
- D - 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 indoor unit.
- E - Reconnect the manifold gauge to the vacuum pump, turn the pump on, and continue to evacuate the line set and indoor unit until the absolute pressure does not rise above 500 microns (29.9 inches of mercury) within a 20-minute period after shutting off the vacuum pump and closing the manifold gauge valves.
- F - When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump and connect it to a cylinder of HFC-410A positioned to deliver liquid refrigerant. Open the manifold gauge valve 1 to 2 psig in order to release the vacuum in the line set and indoor unit.
- G - Perform the following:
  - Close manifold gauge valves.
  - Shut off HFC-410A cylinder.
  - Reinstall service valve cores by removing manifold hose from service valve. Quickly install cores with core tool while maintaining a positive system pressure.
  - Replace stem caps and finger tighten them, then tighten an additional one-sixth (1/6) of a turn as illustrated.

#### WARNING !

**Possible equipment damage.**

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



**FIGURE 9**

## STEP 5 – ELECTRICAL – Circuit Sizing and Wire Routing

In the U.S.A., wiring must conform with current local codes and the current National Electric Code (NEC). In Canada, wiring must conform with current local codes and the current Canadian Electrical Code (CEC).

Refer to the furnace or air handler installation instructions for additional wiring application diagrams and refer to unit nameplate for minimum circuit ampacity and maximum overcurrent protection size.

### 24VAC TRANSFORMER

Use the transformer provided with the furnace or air handler for low-voltage control power (24VAC - 40 VA minimum)

## ⚠ WARNING



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

Line voltage is present at all components when unit is not in operation on units with single-pole contactors. Disconnect all remote electric power supplies before opening access panel. Unit may have multiple power supplies.

## ⚠ WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

## ⚠ WARNING

Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Product Specifications bulletin (EHB) and unit rating plate.

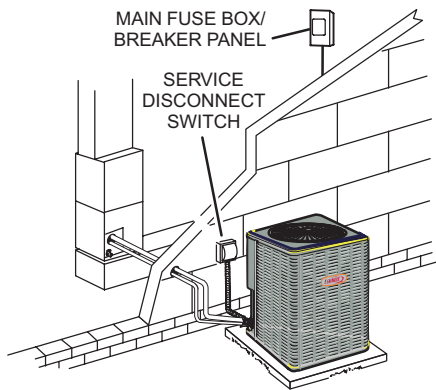
## ⚠ WARNING

ELECTROSTATIC DISCHARGE (ESD)  
Precautions and Procedures

Electrostatic discharge can affect electronic components. Take care during unit installation and service to protect the unit's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the unit, the control and the technician at the same electrostatic potential. Touch hand and all tools on an unpainted unit surface before performing any service procedure to neutralize electrostatic charge.

## 1 SIZE CIRCUIT AND INSTALL SERVICE DISCONNECT SWITCH

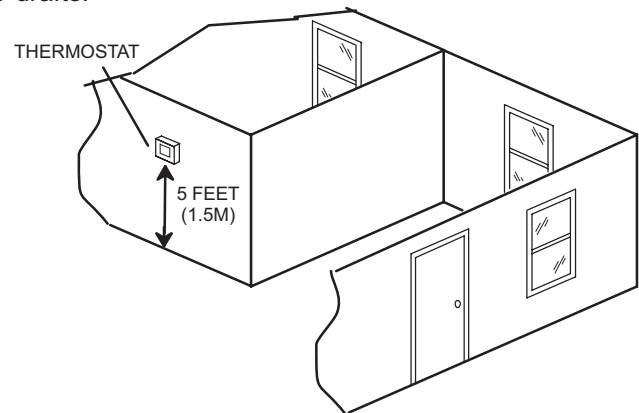
Refer to the unit nameplate for minimum circuit ampacity, and maximum fuse or circuit breaker (HACR per NEC). Install power wiring and properly sized disconnect switch.



**NOTE** - Units are approved for use only with copper conductors. Ground unit at disconnect switch or connect to an earth ground.

## 2 INSTALL THERMOSTAT

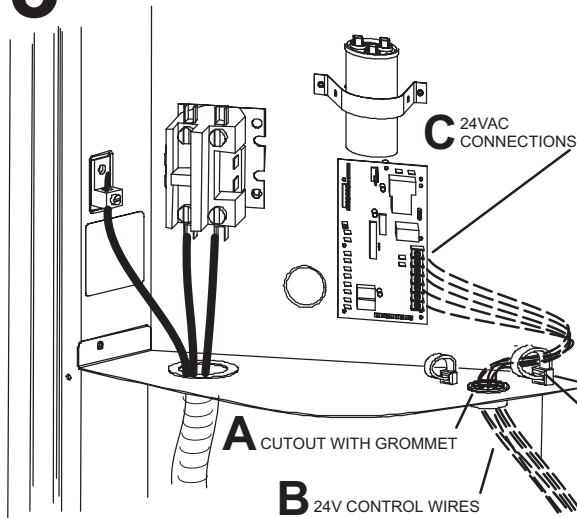
Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight or drafts.



**NOTE** - 24VAC, Class II circuit connections are made in the control panel.

FIGURE 10

### 3 LOW VOLTAGE CONNECTIONS



— HIGH VOLTAGE FIELD WIRING  
 --- LOW VOLTAGE (24V) FIELD WIRING

WIRE RUN LENGTH	AWG#	INSULATION TYPE
LESS THAN 100' (30 METERS)	18	TEMPERATURE RATING
MORE THAN 100' (30 METERS)	16	35°C MINIMUM.

**NOTE** - For proper voltages, select thermostat wire (control wires) gauge per table above.

**NOTE** - Do not bundle any excess 24VAC control wires inside control box.

- A. Run 24VAC control wires through cutout with grommet.
- B. Run 24VAC control wires through wire tie.
- C. Make 24VAC control wire connections.
- D. Tighten wire tie to security 24V control wiring.

**NOTE** - Wire tie provides low voltage wire strain relief and maintains separation of field-installed low and high voltage circuits.

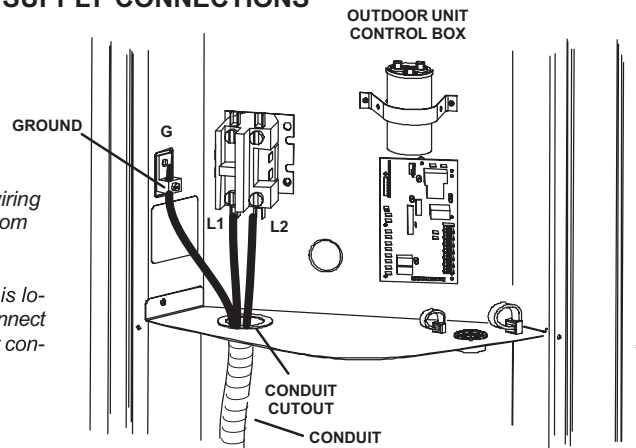
Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated. See figures 14 and 15 for typical field connections when connecting unit to either a CBX32MV or CBX40UHV in non-communicating mode. For connections to other Lennox air handlers or furnaces, see the ComfortSense® 7000 installation instruction for further wiring diagrams.

FIGURE 11

### 4 HIGH VOLTAGE POWER SUPPLY CONNECTIONS

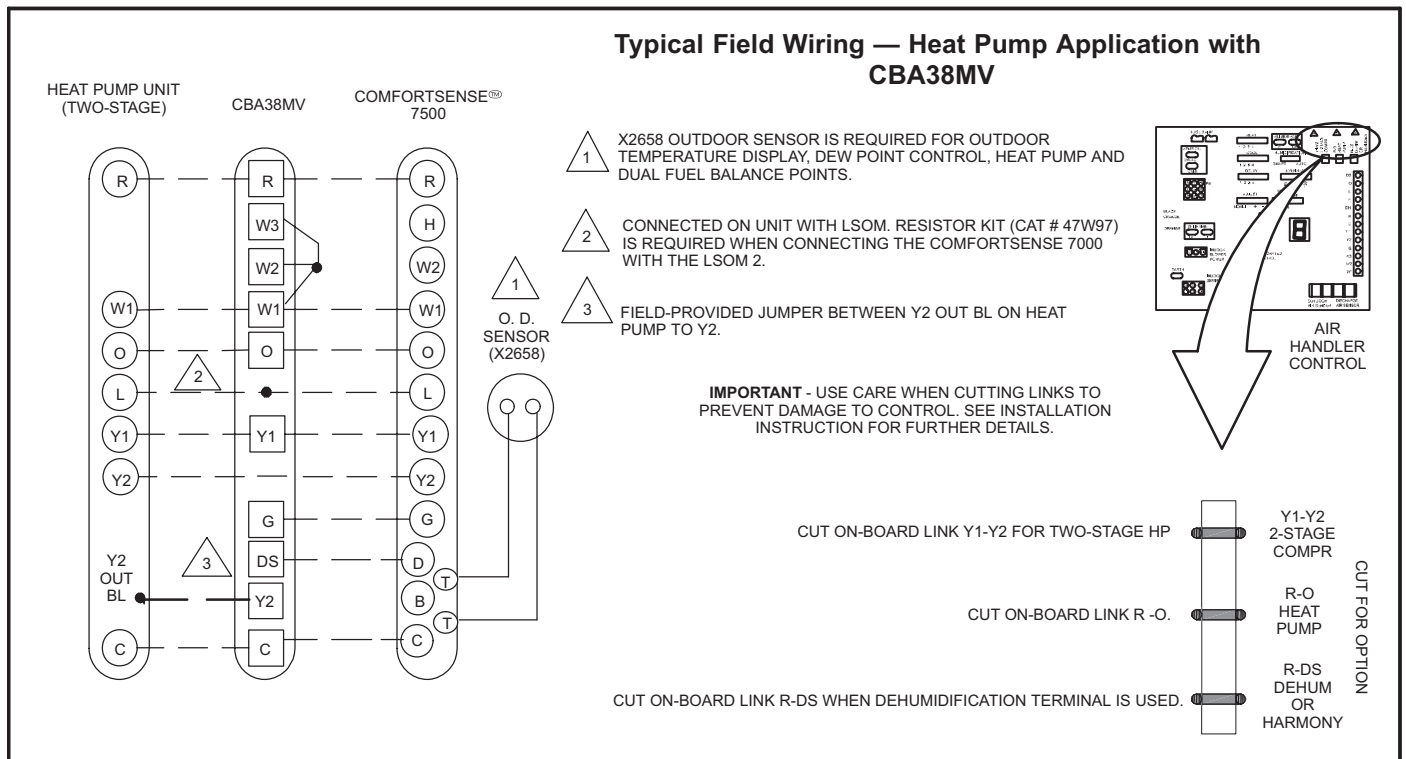
**NOTE** - Any excess high voltage field wiring should be trimmed and secured away from any low voltage field wiring.

**NOTE** - To facilitate a conduit, a cutout is located in the bottom of the control box. Connect conduit to the control box using a proper conduit fitting.

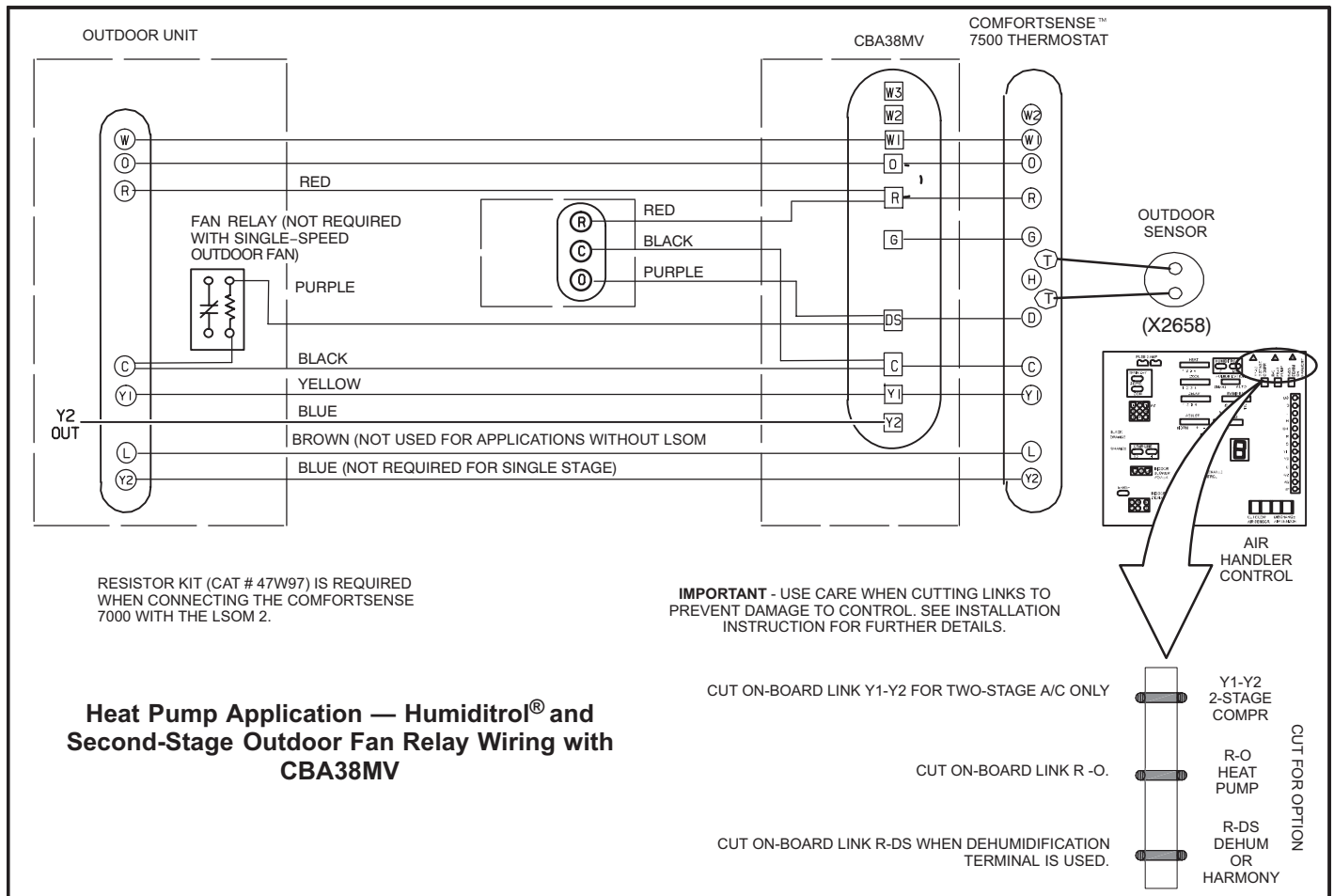


OUTDOOR UNIT  
CONTROL BOX

FIGURE 12



**FIGURE 13**



**FIGURE 14**

## Charging

The 16HPX unit is factory-charged with enough HFC-410A refrigerant to accommodate a 15-foot length of refrigerant piping. Charge should be checked and adjusted using the tables provided on the charging procedure sticker on the unit access panel. Detailed information is given in the 16HPX Installation and Service Procedures manual, which is available on LennoxPros.com.

## System Configuration

This section addresses:

- Unit components (sensors, temperature switch, pressure switches and demand defrost control)
- Second-stage operation

## UNIT COMPONENTS

### Demand Defrost Control (A108)

The demand defrost control measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The control *self-calibrates* when the defrost system starts and after each system defrost cycle. The demand defrost control components are shown in figure 15.

- Demand defrost control connections, jumpers and LED locations are shown in figure 15.
- Demand defrost control connections, jumpers and LED descriptions are listed on table 2.
- Demand defrost control status, fault and lockout LEDs are listed in table 3.

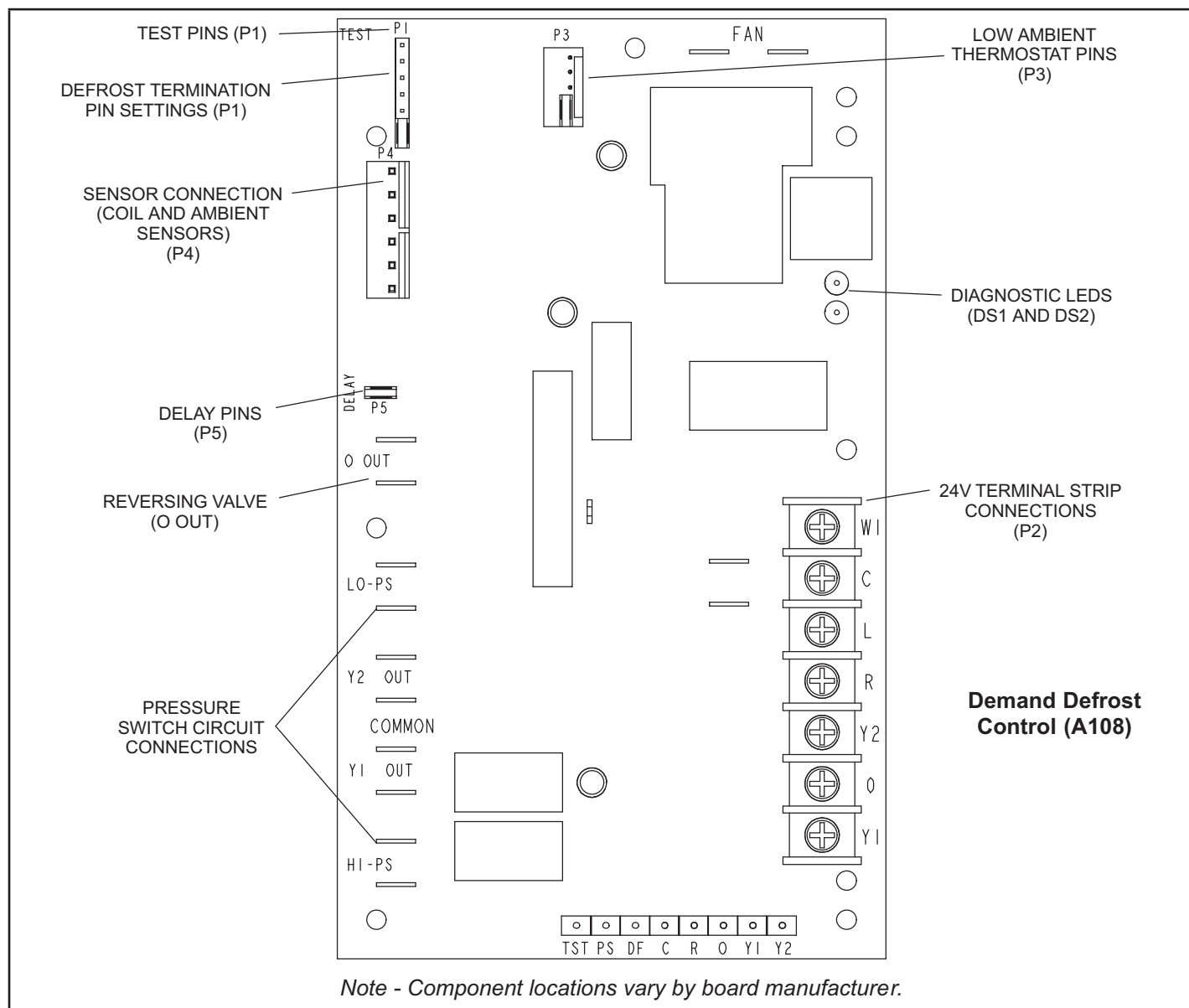


FIGURE 15

**TABLE 2**  
**DEMAND DEFROST CONTROL (A108) INPUTS, OUTPUTS AND CONFIGURABLE SETTINGS**

Control Locations	Control Label or Description	Purpose	Function
P1	50, 70, 90, 100	Defrost Temperature Termination Shunt (Jumper) Pins	The demand defrost control (illustrated in figure 17) has selections which are: 50, 70, 90, and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory-set at 50°F (10°C). If the temperature shunt is not installed, the default termination temperature is 90°F (32°C).
P2	W1	24VAC Thermostat Input / Output	24VAC input / output from indoor thermostat to indoor unit.
	C	24VAC Common	24VAC common.
	L	Thermostat Service Light	Thermostat service light connection.
	R	24VAC	24VAC.
	Y2	Thermostat Input	Controls the second stage operation of the unit.
	O	Thermostat Input	Reversing valve solenoid.
	Y1	Thermostat Input	Controls the operation of the unit.
P3	55, 50, 45, 40	Low Ambient Thermostat Pins	Provides selection of the Y2 compressor lock-in temperature. Valid options are 40, 45, 50 and 55 degrees Fahrenheit.
P4	DIS-YEL	Coil Sensor	(P4-5) Ground connection for outdoor coil temperature sensor. (P4-6) Connection for outdoor coil temperature sensor.
	AMB-BLACK	Ambient Sensor	(P4-3) Ground connection for outdoor ambient temperature sensor. (P4-4) Connection for outdoor ambient temperature sensor.
	COIL-BROWN	Discharge Sensor	<i>No discharge sensor is used; replaced by 10K resistor.</i>
P5	DELAY	Delay Mode	The demand defrost control has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. When a jumper is installed on the DELAY pins, the compressor will be cycled off for 30 seconds going in and out of the defrost mode. Units are shipped with jumper installed on DELAY pins.  <i>NOTE - The 30-second off cycle is NOT functional when TEST pins on P1 are jumpered.</i>
P6	TST, PS DF, C, R, O, Y1, Y2	Factory Test Connectors	No field use.
DS1	RED LED	Diagnostic LED	Demand defrost control LEDs may be OFF, ON, or FLASHING to indicate diagnostic conditions which are described in table 3.
DS2	GREEN LED		
FAN	TWO CONNECTORS	Condenser Fan Operation	These two connections provide power for the condenser fan.
O OUT	O OUT	24 VAC output	24 VAC output connection for reversing valve.
LO-PS	LO-PS	Low-Pressure Switch	When the low pressure switch trips, the demand defrost control will cycle off the compressor, and the strike counter in the demand defrost control will count one strike. The low pressure switch is ignored under the following conditions: <ul style="list-style-type: none"> <li>● during the defrost cycle and 90 seconds after the termination of defrost</li> <li>● when the average ambient sensor temperature is below 0°F (-18°C)</li> <li>● during 90 seconds following the start of the compressor</li> <li>● during TEST mode.</li> </ul>
Y2 OUT	Y2 OUT	24 VAC Output	24 VAC output for second-stage compressor solenoid.
Y1 OUT	Y1 OUT	24 VAC Common Output	24 VAC common output, switched for enabling compressor contactor.
HS-PS	HS-PS	High-Pressure Switch	When the high pressure switch trips, the demand defrost control will cycle off the compressor, and the strike counter in the demand defrost control will count one strike.
L	L	Service Light Output	24VAC service light output.
24V	24V	24 Volt output	24VAC typically used to supply power to the Lennox System Operation Monitor (LSOM). Not used in this system.

## Defrost System

This section addresses:

- Emergency Heat
- Defrost System Overview
- Defrost Control Connections, Jumper Settings and Features
- Operational Mode Overview (Calibration, Normal and Defrost)
- Defrost Cycle Actuation

### EMERGENCY HEAT (AMBER LIGHT)

An emergency heat function is designed into some room thermostats. This feature is applicable when isolation of the outdoor unit is required, or when auxiliary electric heat is staged by outdoor thermostats. When the room thermostat is placed in the emergency heat position, the outdoor unit control circuit is isolated from power and field-provided relays bypass the outdoor thermostats. An amber indicating light simultaneously comes on to remind the homeowner that he is operating in the emergency heat mode.

Emergency heat is usually used during an outdoor unit shutdown, but it should also be used following a power outage if power has been off for over an hour and the outdoor temperature is below 50°F (10°C). System should be left in the emergency heat mode at least six hours to allow the crankcase heater sufficient time to prevent compressor slugging.

### DEFROST SYSTEM OVERVIEW

The control monitors ambient temperature, outdoor coil temperature, and total run time to determine when a defrost cycle is required. The coil temperature probe is designed with a spring clip to allow mounting to the outside coil tubing. The location of the coil sensor is important for proper defrost operation.

**NOTE** – The demand defrost control accurately measures the performance of the system as frost accumulates on the outdoor coil. This typically will translate into longer running time between defrost cycles as more frost accumulates on the outdoor coil before the demand defrost control initiates defrost cycles.

### DEFROST CONTROL CONNECTIONS, JUMPERS SETTINGS AND FEATURES

#### Defrost Temperature Termination Jumper Settings (P1)

The demand defrost control selections are: 50, 70, 90 and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory set at 50°F (10°C). If temperature shunt is not installed, default termination temperature is 90°F (32°C).

#### Test Pins (P1) Function

Placing the jumper on the field test pins (P1) allows the technician to:

- Clear short cycle lockout
- Clear five-strike fault lockout
- Cycle the unit in and out of defrost mode

Place the unit in defrost mode to clear the coil

#### Compressor Delay Mode (P5)

The demand defrost control has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. When a jumper is installed on the **DELAY** pins, the compressor will be cycled off for 30 seconds going in and out of the defrost mode. Units are shipped with jumper installed on **DELAY** pins.

**NOTE** - The 30 second off cycle is NOT functional when jumpering the TEST pins.

#### HIGH PRESSURE SWITCH (S4)

This unit is equipped with a high pressure switch which is located on the liquid line. The SPST, normally closed pressure switch opens when liquid line pressure rises above the factory setting of 590 + 15 psig and automatically resets at 418 + 15 psig.

## DEMAND DEFROST CONTROL (A108) DIAGNOSTIC LEDS

The state (Off, On, Flashing) of two LEDs on the demand defrost control (DS1 [Red] and DS2 [Green]) indicate diagnostics conditions that are described in table 3.

**TABLE 3**  
**DEMAND DEFROST CONTROL (A108) DIAGNOSTIC LEDS**

DS1 and DS2 System Status, Fault and Lockout Codes					
DS2 Green	DS1 Red	Type	Condition/Code	Possible Cause(s)	Solution
OFF	OFF	Status	Power problem	No power (24V) to demand defrost control terminals R and C or demand defrost control failure.	1. Check control transformer power (24V). 2. If power is available to demand defrost control and LED(s) do not light, replace demand defrost control.
Simultaneous SLOW Flash		Status	Normal operation	Unit operating normally or in standby mode.	None required.
Alternating SLOW Flash		Status	5-minute anti-short cycle delay	Initial power up, safety trip, end of room thermostat demand.	None required (jumper <b>TEST</b> pins to override)
Simultaneous FAST Flash		Fault	Ambient Sensor Problem	Sensor being detected open or shorted or out of temperature range. Demand defrost control will revert to time/temperature defrost operation. (System will still heat or cool).	
Alternating FAST Flash		Fault	Coil Sensor Problem	Sensor being detected open or shorted or out of temperature range. Demand defrost control will not perform demand or time/temperature defrost operation. (System will still heat or cool.)	
ON	ON	Fault	Demand Defrost Control Failure	Indicates that demand defrost control has internal component failure. Cycle 24VAC power to demand defrost control. If code does not clear, replace demand defrost control.	
OFF	SLOW Flash	Fault	Low Pressure Fault	<ul style="list-style-type: none"><li>Restricted air flow over indoor or outdoor coil.</li><li>Improper refrigerant charge in system.</li><li>Improper metering device installed or incorrect operation of metering device.</li><li>Incorrect or improper sensor location or connection to system.</li></ul>	<ul style="list-style-type: none"><li>Remove any blockages or restrictions from coils and/or fans. Check indoor and outdoor fan motor for proper current draws.</li><li>Check system charge using subcooling method.</li><li>Check system operating pressures and compare to unit subcooling tables in this instruction or located on unit access panel.</li><li>Make sure all pressure switches and sensors have secure connections to system to prevent refrigerant leaks or errors in pressure and temperature measurements.</li></ul>
OFF	ON	Lockout	Low Pressure Lockout		
SLOW Flash	OFF	Fault	High Pressure Fault		
ON	OFF	Lockout	High Pressure Lockout		
SLOW Flash	ON	Fault	Discharge Line Temperature Fault	This code detects shorted sensor or high discharge temperatures. If the discharge line temperature exceeds a temperature of 285°F (140°C) during compressor operation, the demand defrost control will de-energize the compressor contactor output (and the defrost output if active). The compressor will remain off until the discharge temperature has dropped below 225°F (107°C).	
FAST Flash	ON	Lockout	Discharge Line Temperature Lockout		
OFF	Fast Flash	Fault	Discharge Sensor Fault	The demand defrost control detects open sensor or out of temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the demand defrost control will count one fault. After 5 faults, the demand defrost control will lock out.	
Fast Flash	OFF	Lockout	Discharge Sensor Lockout		
(Each fault adds 1 strike to that code's counter; 5 strikes per code = LOCKOUT)					

## Field Operation Checklist for Two-Stage Modulation Compressors

Unit Readings	Y1 - First-Stage	Expected results during Y2 demand (Toggle switch On)	Y2 - Second-Stage
<b>Compressor</b>			
Voltage		Same	
Amperage		Higher	
<b>Outdoor Unit Fan Motor</b>			
Amperage		Same or Higher	
<b>Temperature</b>			
Ambient		Same	
Outdoor Coil Discharge Air		Higher	
Compressor Discharge Line		Higher	
Indoor Return Air		Same	
Indoor Coil Discharge Air		Lower	
<b>Pressures</b>			
Suction (Vapor)		Lower	
Liquid		Higher	

## Start-Up and Performance Checklist

Customer \_\_\_\_\_ Address \_\_\_\_\_

Indoor Unit Model \_\_\_\_\_ Serial \_\_\_\_\_

Outdoor Unit Model \_\_\_\_\_ Serial \_\_\_\_\_

Notes: \_\_\_\_\_

### START UP CHECKS

Refrigerant Type: \_\_\_\_\_

Rated Load Amps: \_\_\_\_\_ Actual Amps \_\_\_\_\_ Rated Volts \_\_\_\_\_ Actual Volts \_\_\_\_\_

Condenser Fan Full Load Amps \_\_\_\_\_ Actual Amps: \_\_\_\_\_

### COOLING MODE

Suction Pressure: \_\_\_\_\_ Liquid Pressure: \_\_\_\_\_

Supply Air Temperature: \_\_\_\_\_ Ambient Temperature: \_\_\_\_\_ Return Air Temperature: \_\_\_\_\_

System Refrigerant Charge (Refer to manufacturer's information on unit or installation instructions for required subcooling and approach temperatures.)

Subcooling: \_\_\_\_\_ A — B = SUBCOOLING

Saturated Condensing Temperature (A)  
minus Liquid Line Temperature (B)

Approach: \_\_\_\_\_ A — B = APPROACH

Liquid Line Temperature (A)  
minus Outdoor Air Temperature (B)

Indoor Coil Temperature Drop (18 to 22°F) \_\_\_\_\_ A — B = COIL TEMP DROP

Return Air Temperature (A)  
minus Supply Air Temperature (B)

## Homeowners Information

### CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

In order to ensure peak performance, your system must be properly maintained. Clogged filters and blocked airflow prevent your unit from operating at its most efficient level. The system should be inspected and serviced before each cooling and heating season by a licensed professional HVAC service technician (or equivalent).

#### Heat Pump Operation

Your new Lennox heat pump has several characteristics that you should be aware of:

- Heat pumps satisfy heating demand by delivering large amounts of *warm* air into the living space. This is quite different from gas- or oil-fired furnaces or an electric furnace which deliver lower volumes of considerably *hotter* air to heat the space.
- Do not be alarmed if you notice frost on the outdoor coil in the winter months. Frost develops on the outdoor coil during the heating cycle when temperatures are below 45°F (7°C). An electronic control activates a defrost cycle lasting 5 to 15 minutes at preset intervals to clear the outdoor coil of the frost.
- During the defrost cycle, you may notice steam rising from the outdoor unit. This is a normal occurrence. The thermostat may engage auxiliary heat during the defrost cycle to satisfy a heating demand; however, the unit will return to normal operation at the conclusion of the defrost cycle.

#### Homeowner Maintenance

The following maintenance may be performed by the homeowner.

- Contact a licensed professional HVAC technician to schedule inspection and maintenance appointments for your equipment before each heating and cooling season.
- Check the indoor unit filter each month and replace the filter, if necessary.
- Have your Lennox dealer show you where your indoor unit filter is located. It will be either at the indoor unit (installed internal or external to the cabinet) or behind a return air grille in the wall or ceiling. Check the filter monthly and clean or replace it as needed. Disposable filters should be replaced with a filter of the same type and size.
- Check the indoor unit drain line for obstructions monthly. The indoor coil is equipped with a drain pan to collect condensate formed as your system removes humidity from the inside air. Have your dealer show you the location of the drain line and how to check for obstructions. (This would also apply to an auxiliary drain, if installed.)

- Check the area around the outdoor unit monthly and remove any obstructions that may restrict airflow to the outdoor unit. This would include grass clippings, leaves, or papers that may have settled around the unit.
- Trim shrubbery away from the unit and periodically check for debris which collects around the unit.
- During the winter months, keep the snow level below the louvered panels.

**NOTE** - The filter and all access panels must be in place any time the unit is in operation. If you are unsure about the filter required for your system, call your Lennox dealer for assistance.

### IMPORTANT

**Sprinklers and soaker hoses should not be installed where they could cause prolonged exposure to the outdoor unit by treated water. Prolonged exposure of the unit to treated water (i.e., sprinkler systems, soakers, waste water, etc.) will corrode the surface of the steel and aluminum parts, diminish performance and affect longevity of the unit.**

#### Thermostat Operation

See the thermostat homeowner manual for instructions on how to operate your thermostat.

#### Pre-Service Check

If your system fails to operate, check the following before calling for service:

- Verify room thermostat settings are correct.
- Verify that all electrical disconnect switches are ON.
- Check for any blown fuses or tripped circuit breakers.
- Verify unit access panels are in place.
- Verify air filter is clean.

If service is needed, locate and write down the unit model number and have it handy before calling.

#### Extended Power Outage

The heat pump is equipped with a compressor crankcase heater which protects the compressor during cold weather operation.

If power to your unit has been interrupted for several hours or more, set the room thermostat selector to the EMERGENCY HEAT setting to obtain temporary heat without the risk of serious damage to the heat pump.

In EMERGENCY HEAT mode, all heating demand is satisfied by auxiliary heat; heat pump operation is locked out. After a six-hour compressor crankcase warm-up period, the thermostat can be switched to the HEAT setting and normal heat pump operation may resume.