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Dallas, Texas, USA



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

# INSTALLATION INSTRUCTIONS

## Dave Lennox Signature® Collection XP21 System

HEAT PUMPS  
507217-01  
7/2018

### General

This XP21 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. See the Lennox XP21 Product Specifications bulletin (EHB) for approved indoor component match ups.

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

### NOTICE !

For more in-depth information, consult the Installation and Service Procedures manual, available as Corp.1031-L7 on [LennoxPROS.com](http://LennoxPROS.com) or through the Technical Support department at 800-453-6669.

### WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life.

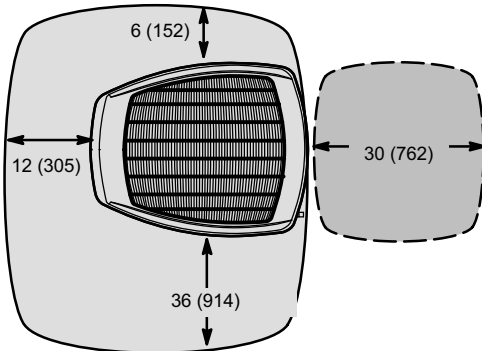
Installation and service must be performed by a licensed professional installer (or equivalent) or service agency.

### CAUTION

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

### STEP 1 -- SETTING THE UNIT -- Clearances

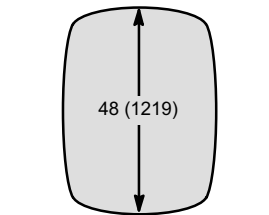
#### CLEARANCE ON ALL SIDES — INCHES (MILLIMETERS)



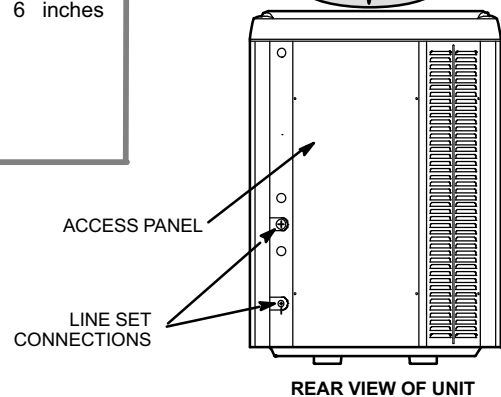
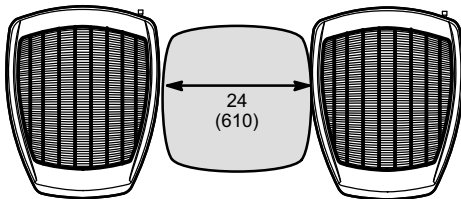
#### NOTES:

- Clearance to access panel must be 30 inches (762mm).
- Clearance to one of the other three sides must be 36 inches (914mm).
- Clearance to one of the remaining two sides may be 12 inches (305mm) and the final side may be 6 inches (152mm).

#### MINIMUM CLEARANCE ABOVE UNIT



#### MINIMUM CLEARANCE BETWEEN TWO UNITS

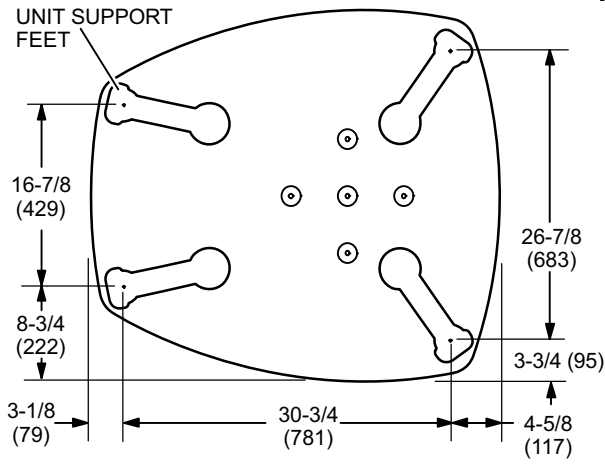
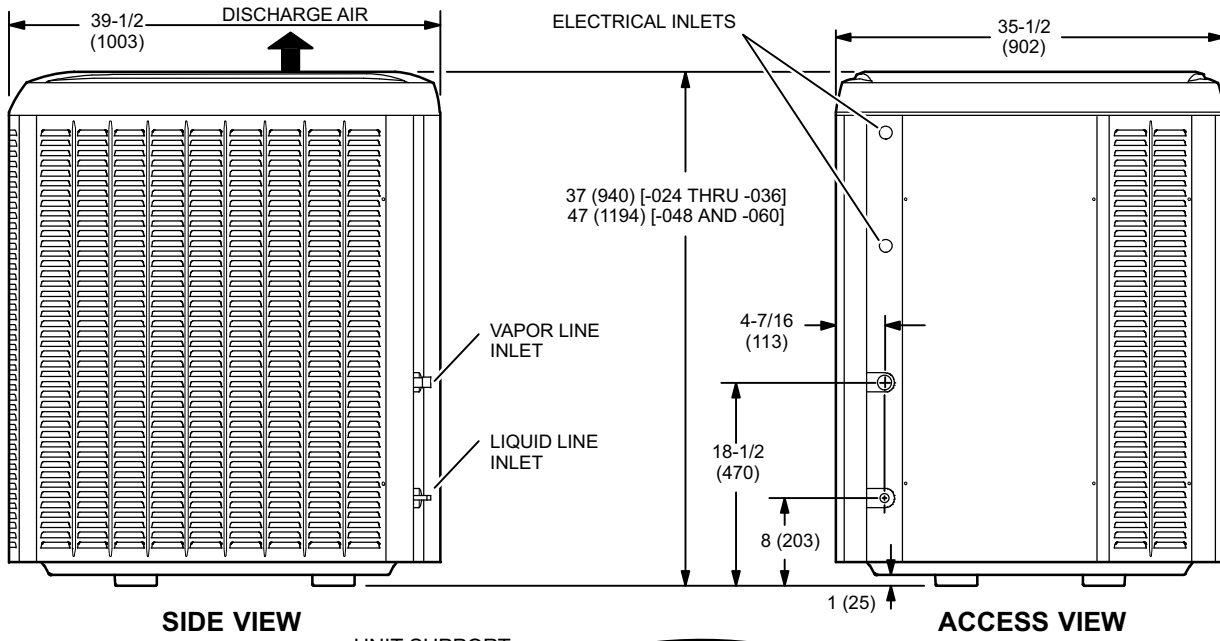


**NOTICE:** Specific applications may require adjustment of the listed installation clearances to provide protection for the unit from physical damage or to avoid conditions which limit operating efficiency. (Example: Clearances may have to be increased to prevent snow or ice from falling on the top of the unit. Additional clearances may also be required to prevent air recirculation when the unit is installed under a deck or in another tight space.)

FIGURE 1



**UNIT DIMENSIONS - INCHES (MM)**



**STEP 1 -- SETTING THE UNIT (Continued)**  
**-- Unit Placement**

**⚠ 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.

**⚠ 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.

**NOTICE !**

**Roof Damage!**

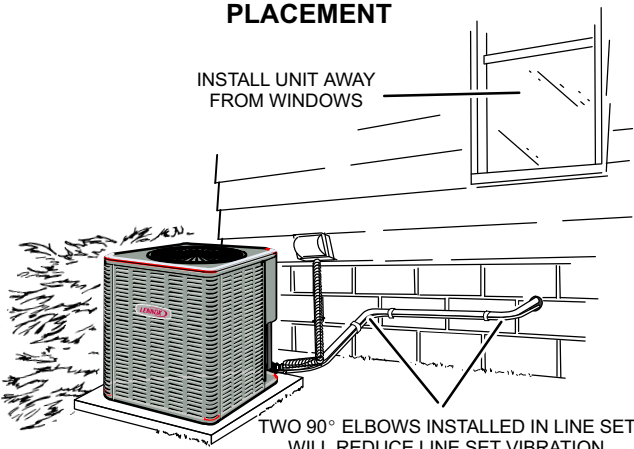
This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to degrade. Failure to follow this notice could result in damage to roof surface.

**IMPORTANT !**

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**

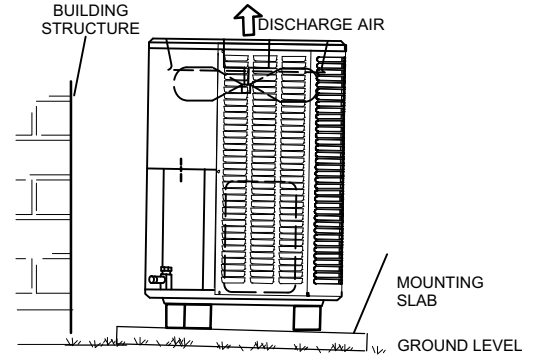
INSTALL UNIT AWAY FROM WINDOWS



**FIGURE 2**

**SLAB MOUNTING**

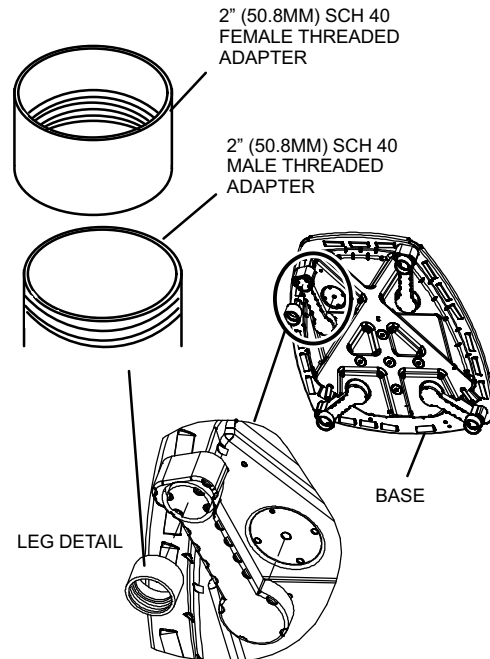
Install unit level or, if on a slope, maintain slope tolerance of 2 degrees (or 2 inches per 5 feet [50 mm per 1.5 m]) away from building structure



**FIGURE 3**

**ELEVATED SLAB MOUNTING USING FEET EXTENDERS**

Use additional 2" SCH 40 male threaded adapters which can be threaded into the female threaded adapters to make additional adjustments to the level of the unit.



**FIGURE 4**

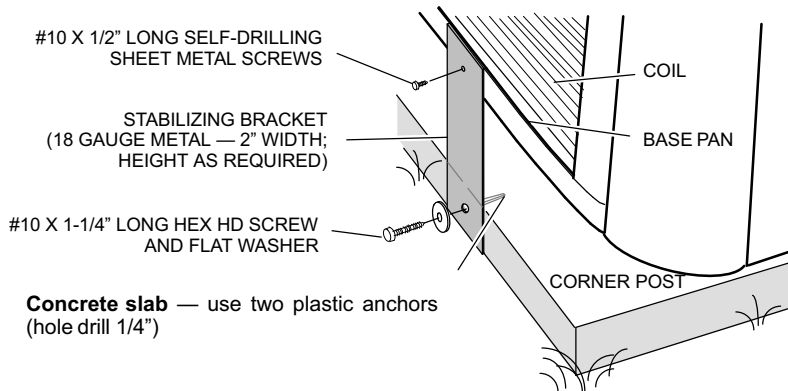
**IMPORTANT !**

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.

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

### STABILIZING UNIT ON UNEVEN SURFACES

#### DETAIL D — Slab Mounting

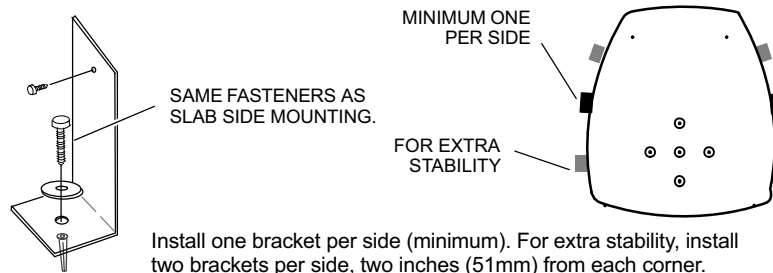


#### IMPORTANT !

**Unit Stabilizer Bracket Use (field-provided):**  
**Always use stabilizers when unit is raised above the factory height. (Elevated units could become unstable in gusty wind conditions.)**  
**Stabilizers may be used on any unit installed on unstable and uneven surfaces.**

#### DETAIL E — Deck Top Mounting

Stabilizing bracket (18 gauge metal — 2" [50.8mm] width; height as required); bend to form right angle as shown below.



#### DETAIL F — Wind Barrier

Install the unit a minimum of six inches (152 mm) above the roof surface to avoid ice build-up around the unit. Locate the unit above a load-bearing wall or area of the roof that can adequately support the unit. Consult local codes for rooftop applications.

If coil must be installed facing prevailing winter winds, a wind barrier should be constructed. Size barrier at least the same height and width as outdoor unit. Install barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds.

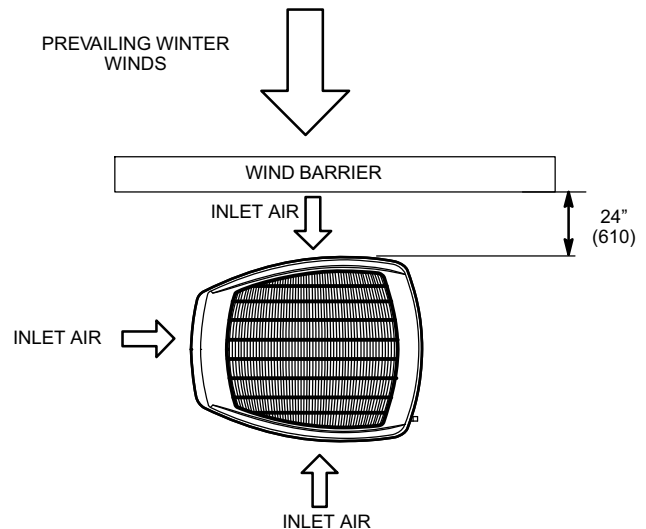


FIGURE 5

## STEP 2 -- 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 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.

### IMPORTANT !

**If unit is equipped with a crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.**

### CAUTION

**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 Disconnect:** Refer to the unit nameplate for minimum circuit ampacity, and maximum fuse or circuit breaker size (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 in the center of the conditioned area and 5 feet (1.5m) from the floor. The thermostat 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 box.

## A. ROUTE CONTROL WIRES — NON-COMMUNICATING

Install low voltage control wiring from outdoor to indoor unit and from thermostat to indoor unit. All low voltage wiring must enter unit through provided field-installed busing installed in electrical inlet.

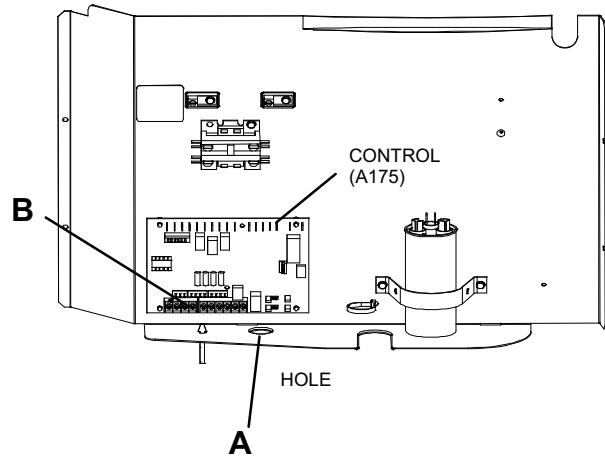
Run 24VAC control wires through hole with grommet.  
Make 24VAC control wire connections to heat pump control (A175).

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

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

**NOTE** — For proper voltages, select control wires gauge per table below.

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

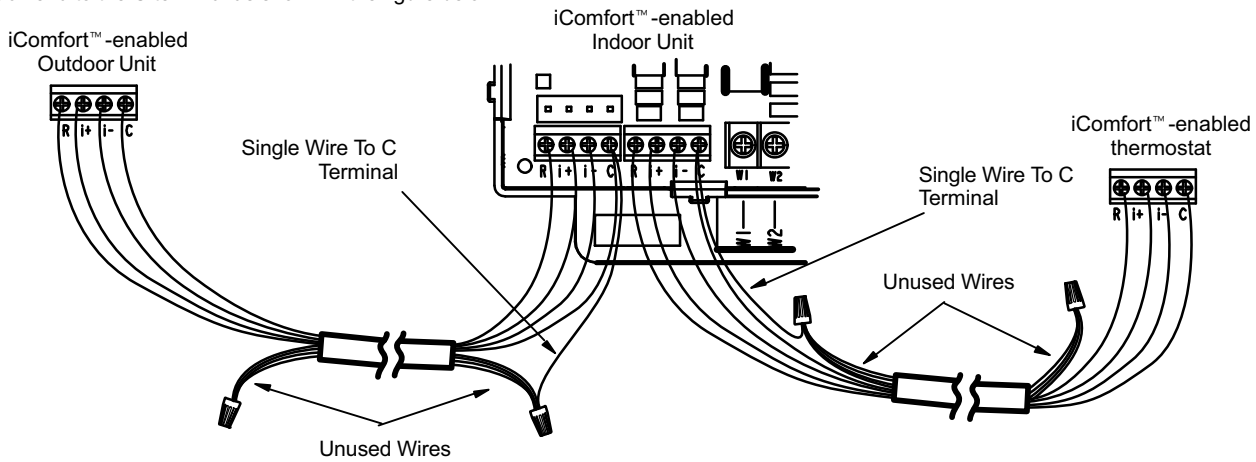


## B. ROUTE CONTROL WIRES — COMMUNICATING

Maximum length of wiring (18 gauge) for all connections on the RSBUS is 1500 feet (457 meters). Wires should be color-coded, with a temperature rating of 95°F (35°C) minimum, and solid-core (Class II Rated Wiring). All low voltage wiring must enter unit through provided field-installed busing installed in electrical inlet.

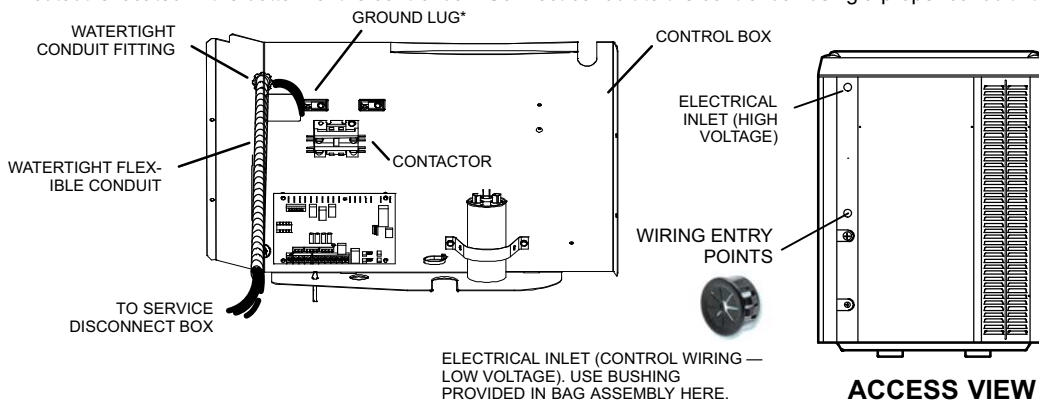
Communicating systems using the iComfort™-enabled thermostat require four thermostat wires between the thermostat and the furnace/air handler control and four wires between the outdoor unit and the furnace/air handler control. When a thermostat cable with more than four wires is used, the extra wires must be properly connected to avoid electrical noise (see illustration below).

Use a wire nut to bundle the four unused wires at each end of the cable. Each bundle should also include an additional wire that should be connected on each end to the C terminal as shown in the figure below.



## ROUTE HIGH VOLTAGE AND GROUND WIRES

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

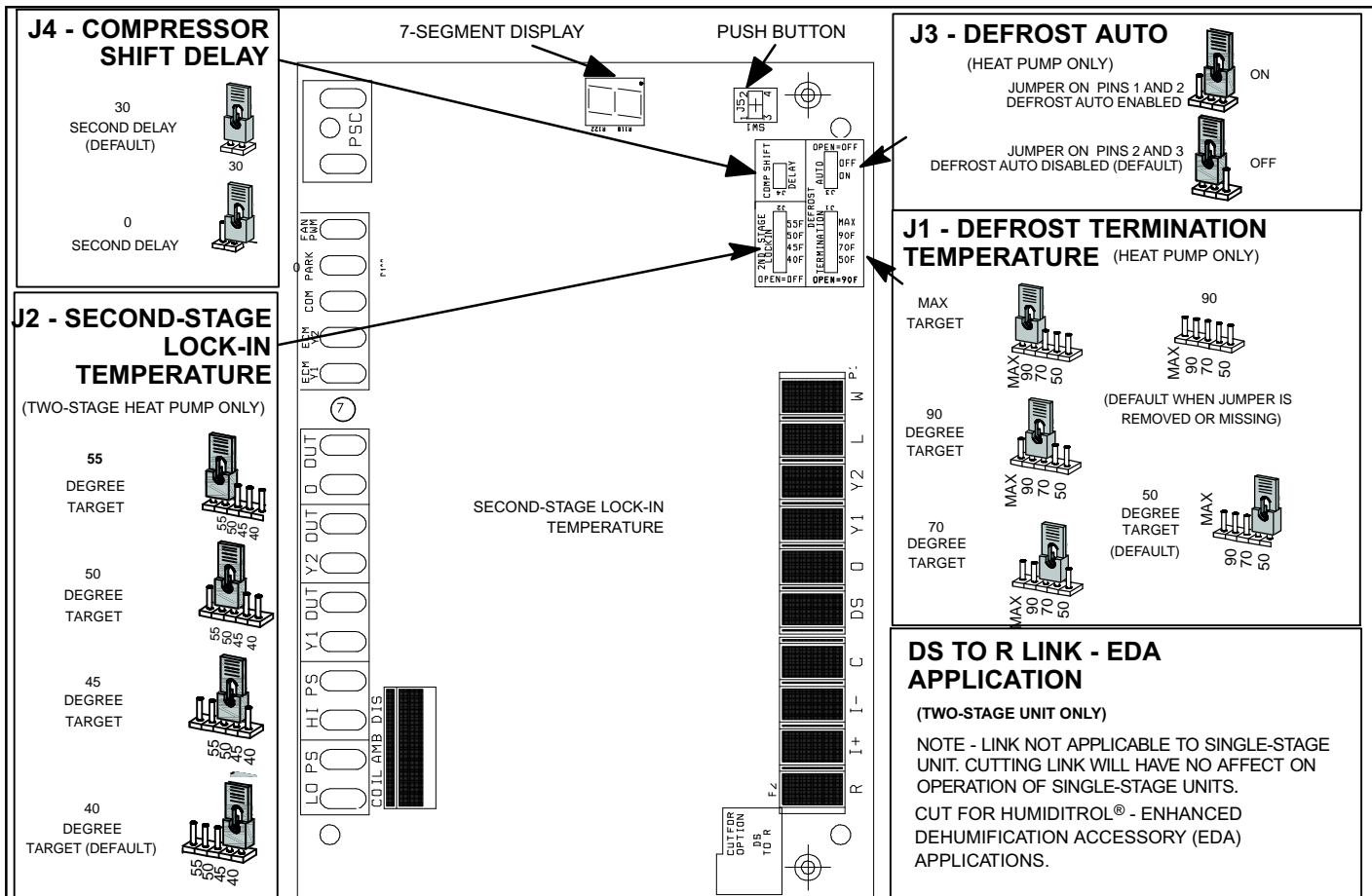


\* Attach field-provided green ground wire to provided ground lug.

**NOTE** - Grounding wire must be a single, continuous wire run from unit ground lug to earth ground. **DO NOT splice wire.**

FIGURE 6

## STEP 2 -- ELECTRICAL (Continued) -- Outdoor Control (A175) Jumpers and Terminals



### J1 - DEFROST TERMINATION TEMPERATURE

- The **J1** jumper is factory set to **50°F (10°C)**. This jumper can also be set to **70°F, 90°F or MAX** (21°C, 32°C and MAX). If a jumper is not present on **J1**, the default termination temperature is **90°F(32°C)**.

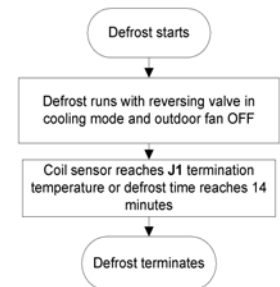
**NOTE** - Colder climates could require a higher defrost termination temperature setting to maintain a clear coil.

- If the **J1** jumper is set to **MAX**, defrost will run **maximum defrost sequence**.

### J3 - DEFROST AUTO

- Defrost Auto** can be set to either **ON** or **OFF**. Factory default setting is **OFF**. **Note: If the jumper is missing the default is OFF.**
- Defrost Auto** is set to **OFF** - Defrost will run and terminate based on **J1** setting.
- Defrost Auto** is set to **ON** - Defrost termination setting may differ from the actual **J1** jumper setting. The actual defrost termination will be determined based on the following rules:
  - The first defrost after the unit is powered up, or the first defrost after cooling call will terminate based on the **J1** setting.
  - The control accumulates heating run-time between defrost cycles:
    - Heating time between defrost is less than 45 minutes** - The defrost termination temperature will be increased for the next defrost cycle based on current termination setting. If current termination setting is at **50°F** or **70°F** then the next defrost termination will be **90°F**. If **J1** is set at **90°F** or **MAX** the next defrost termination will be **MAX**.
    - Heating time between defrosts is longer than 1 hour for 2 consecutive heating cycles** - The defrost termination will be decreased for the next defrost cycle. If the termination is set at **50°F, 70°F, or 90°F**, then defrost termination will follow the **J1** jumper setting. If the **J1** is set to **MAX**, then the next defrost termination will be **90°F**.
  - If **J1** is set to **MAX**, the system will always run at **MAX** when accumulated compressor **OFF** time is longer than **30 minutes** and **ambient temperature is less than 35°F**.
  - When the ambient sensor temperature is **higher than 40°F**, and set to **MAX**, defrost termination will be **90°F**. If **J1** is to **50°F, 70°F, or 90°F**, defrost termination will follow the **J1** setting.

### Normal Defrost Sequence



### Maximum Defrost Sequence

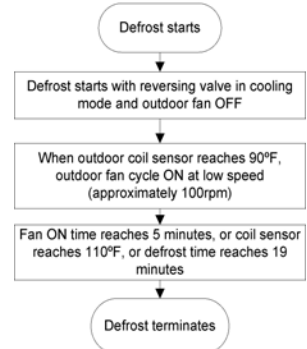


FIGURE 7

## COMMUNICATING SYSTEM

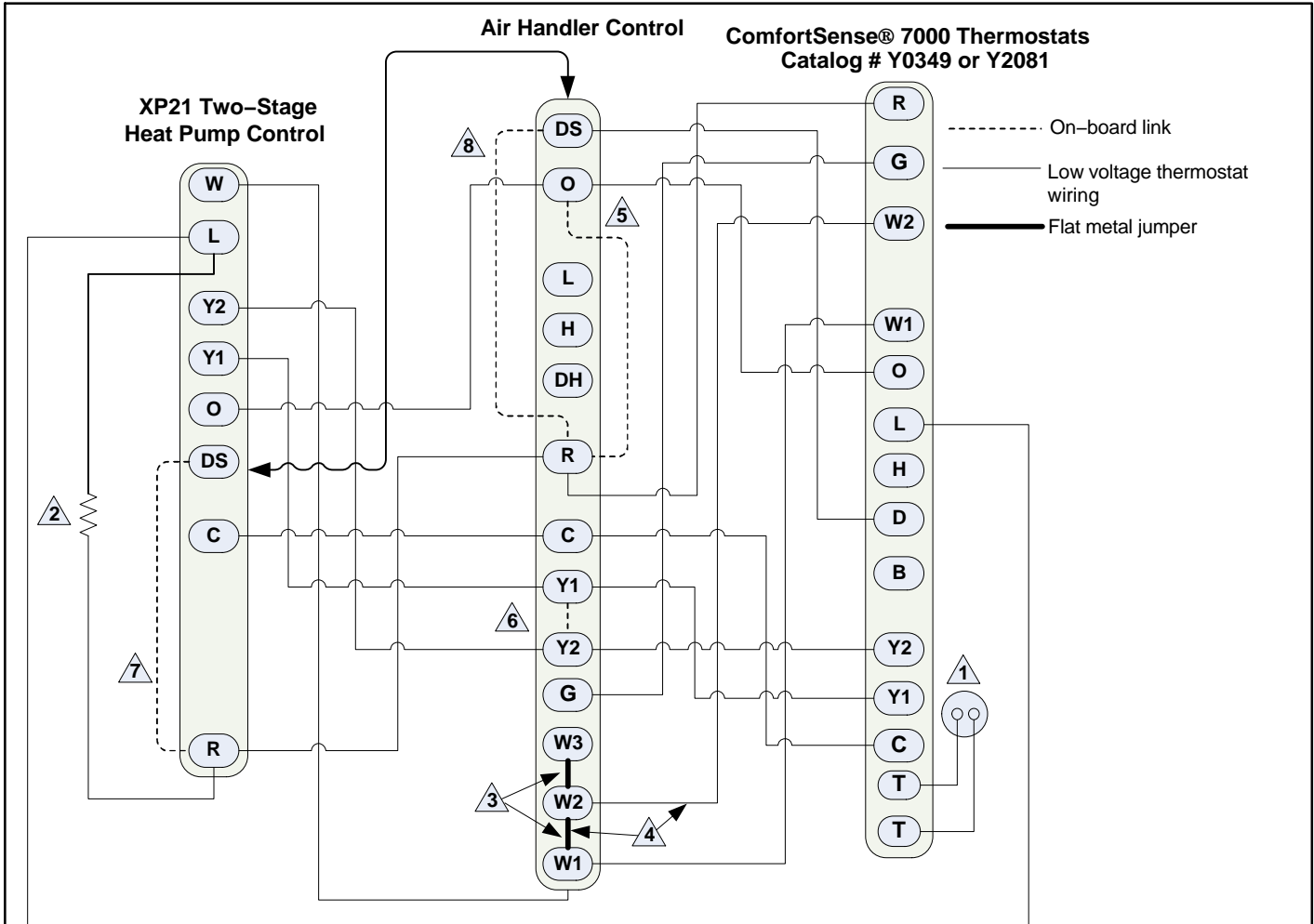
The jumper settings and link are default settings and **ONLY** control system operation if configuration settings in the iComfort® thermostat are not available.

## NON-COMMUNICATING SYSTEM

The unit will operate based on jumper settings and **R TO DS** link on the **MAIN CONTROL**. All unit setting changes must be done at the **MAIN CONTROL**. The Lennox ComfortSense® 7000 thermostat may be used, as well as other non-communicating electronic-only thermostats.

### STEP 2 -- ELECTRICAL (Continued) -- Field Control Wiring

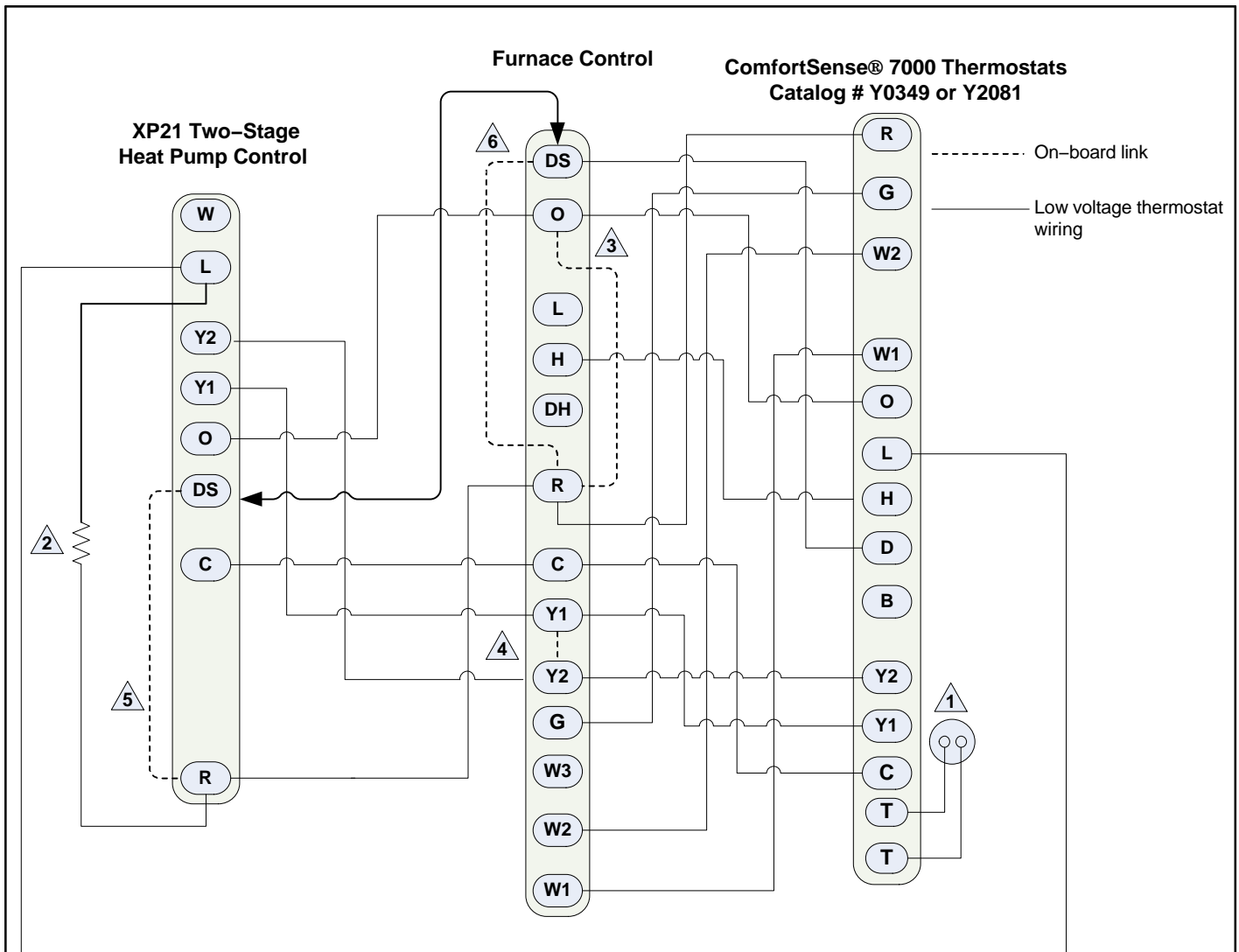
The following two illustrations provide examples of control wiring connections when using a non-communicating thermostat. For examples of control wiring in complete or partial communicating systems, see the iComfort™ -enabled thermostat **Quick Start Guide** which is provided with the thermostat.



1. Thermostat **T** terminals are used for outdoor sensor input. Use for thermostat's outdoor temperature display (optional).
2. **R** to **L** connection is required for this model when using the ComfortSense® 7000 - catalog number Y0349 only. Resistor Kit (catalog number 47W97) required and ordered separately.
3. Air handler control ships from factory with metal jumpers installed across **W1**, **W2** and **W3**. For one-stage electric heat, do not remove factory installed metal jumpers.
4. Air handler control ships from factory with metal jumpers installed across **W1**, **W2** and **W3**. For two-stage electric heat, remove factory installed metal jumper between **W1** to **W2**. Then connect thermostat wire between the air handler control's **W2** and the thermostat's **W2** terminal.
5. Cut on-board link (clippable wire) from **R-O HEAT PUMP** for heat pump applications.
6. Cut on-board link (clippable wire) from **Y1-Y2 2 STAGE COMPR** for two-stage compressor and two-speed fan operation.
7. Cut loop jumper (clippable wire) **Short DS to R** for Humiditrol® applications. This will slow the outdoor unit's fan speed to a specific RPM. A wire must be installed between the **DS** terminals on the air handler and outdoor unit controls.
8. Cut on-board link (clippable wire) **DS-R** for Humiditrol® or Harmony III™ applications. This will slow the indoor blower motor to the lowest speed setting. See air handler installation instruction or Product Specification bulletin for lowest fan speed information.

**FIGURE 8. ComfortSense® 7000 Series Thermostat – Air Handler / Two-Stage Heat Pump**





1. Thermostat **T** terminals are used for outdoor sensor input. Use for thermostat's outdoor temperature display (optional).
2. **R** to **L** connection is required for this model when using the ComfortSense® 7000 - catalog number Y0349 only. Resistor Kit (catalog number 47W97) required and ordered separately.
3. Cut on-board link **W951** (clippable wire) from **R-O HEAT PUMP** for heat pump applications.
4. Cut on-board link **W915** (clippable wire) for two-stage operation.
5. Cut loop jumper (clippable wire) **Short DS to R** for Humiditrol® applications. This will slow the outdoor unit's fan speed to a specific RPM. A wire must be installed between the **DS** terminals on the furnace and outdoor unit controls.
6. Cut on-board link (clippable wire) **DS-R** for Humiditrol® or Harmony III™ applications. This will slow the indoor blower motor to the lowest speed setting. See furnace installation instruction or Product Specification bulletin for lowest fan speed information.

NOTE - For defrost temper with furnace, the optional 67M41 temper kit would be wired between **W** of from the heat pump control (A175) to the **W1** of the furnace control. The kit allows for the furnace to cycle on and off during a defrost. It protects the compressor from high refrigeration pressures during defrost.

**FIGURE 9. ComfortSense® 7000 Series Thermostat – Furnace / Two-Stage Heat Pump**

### STEP 3 -- REFRIGERANT PIPING -- Flushing Existing Line Set & Indoor Coil

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).

**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).

**TABLE 1  
REFRIGERANT LINE SET — INCHES (MM)**

Model	Liquid Line	Vapor Line	L15 Line Sets Feet (Meters)
-024, -036 and -048	3/8" (10)	7/8" (22)	L15 line set sizes are dependent on unit match up. See XP21Engineering Handbook to determine correct line set sizes.
-060	3/8" (10)	1-1/8" (29)	Field Fabricated

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

#### 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.

#### ! 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

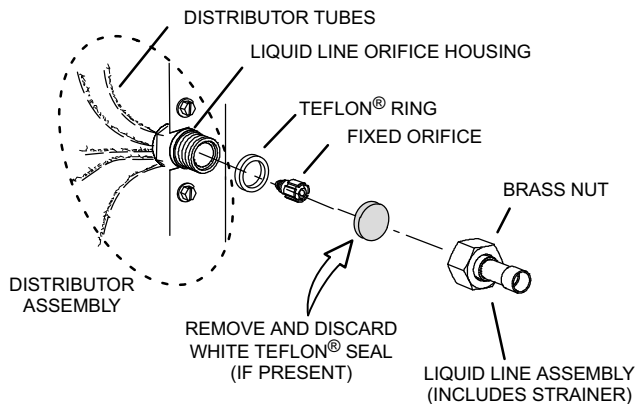
Polyol ester (POE) oils used with HFC-410A refrigerant absorb moisture very quickly. It is very important that the refrigerant system be kept closed as much as possible. **DO NOT** remove line set caps or service valve stub caps until you are ready to make connections.

#### IMPORTANT !

Some scroll compressors have an internal vacuum protection devices that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. The protection device will reset when pressure in system rises above 40 psig. This is normal operation. **DO NOT** replace compressor.

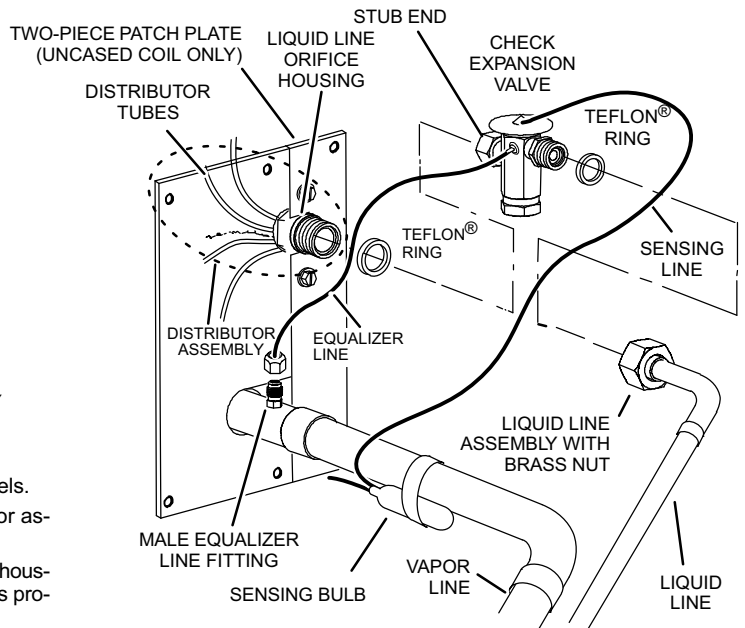
## STEP 4 -- REFRIGERANT PIPING -- Removing Existing Indoor Metering Device

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



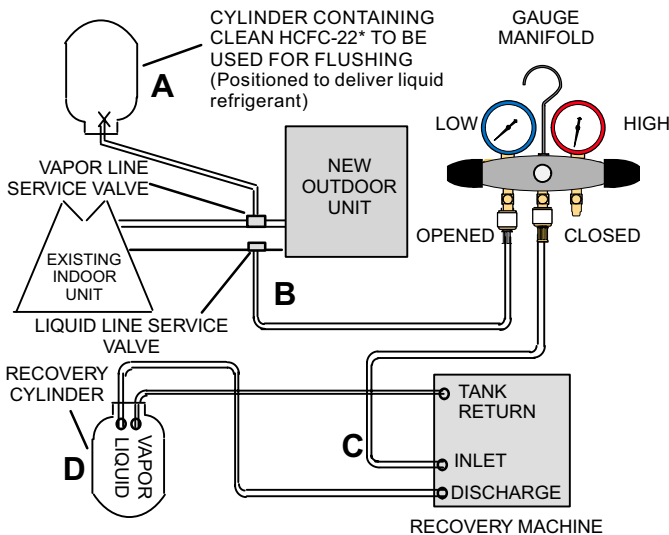
1. On fully cased coils, remove the coil access and plumbing panels.
2. Remove any shipping clamps from the liquid line and distributor assembly.
3. Using two wrenches, disconnect liquid line from liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
4. Remove and discard fixed orifice, valve stem assembly (if present) and Teflon® washer as illustrated above.
5. 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)



1. On fully cased coils, remove the coil access and plumbing panels.
2. Remove any shipping clamps from the liquid line and distributor assembly.
3. Disconnect the equalizer line from the check expansion valve equalizer line fitting on the vapor line.
4. Remove the vapor line sensing bulb.
5. Disconnect the liquid line from the check expansion valve at the liquid line assembly.
6. Disconnect the check expansion valve from the liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
7. Remove and discard check expansion valve and the two Teflon® rings.
8. 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.

**\*IMPORTANT - Clean refrigerant is any refrigerant in a system that has not had compressor burn out. If the system has experienced burn out, it is recommended that the existing line set and indoor coil be replaced.**

### 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.

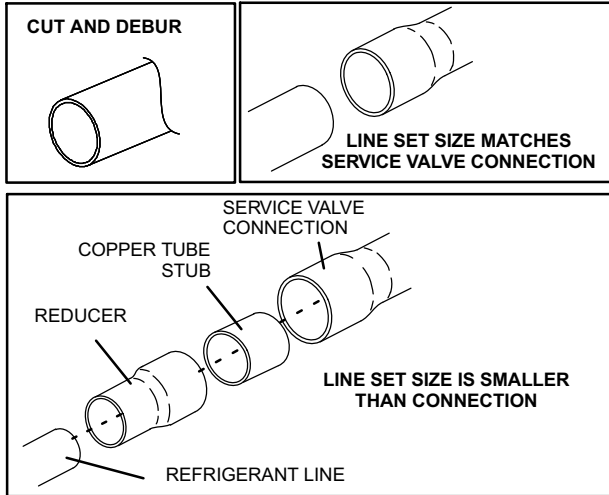
1. Set the recovery machine for liquid recovery and start the recovery machine. Open the gauge set valves to allow the recovery machine to pull a vacuum on the existing system line set and indoor unit coil.
2. Position the cylinder of clean HCFC-22\* for delivery of liquid refrigerant and open its valve 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.
3. 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.
4. 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 10

## STEP 5 -- REFRIGERANT PIPING -- Brazing Procedures

### 1 PIPING PANEL REMOVAL / PREPARING LINE SET

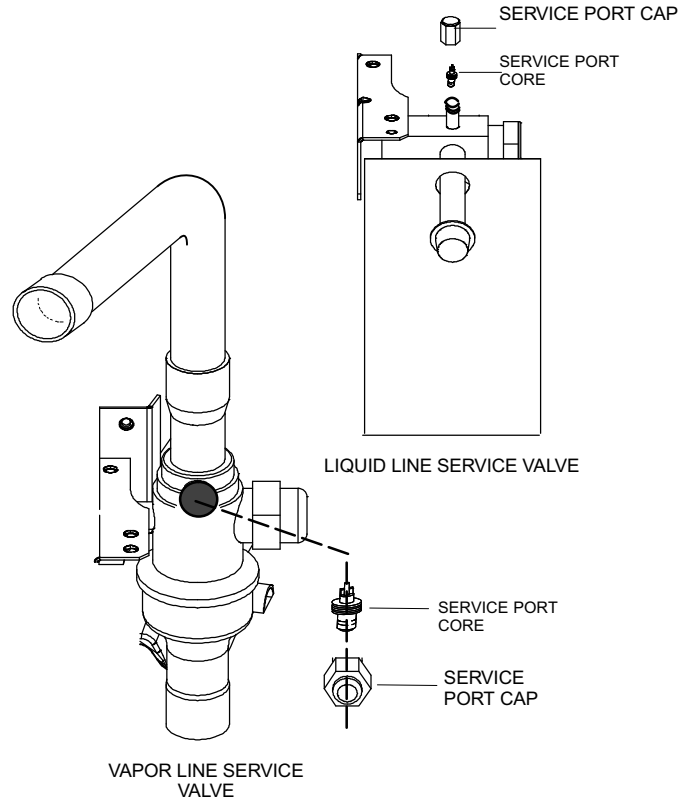
Remove piping panel to access service valves. Cut ends of the refrigerant lines square (free from nicks or dents) and debur the ends. The pipe must remain round. Do not crimp end of the line.



DO NOT CRIMP SERVICE VALVE CONNECTOR WHEN PIPE IS SMALLER THAN CONNECTION

### 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

- 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 With valve core removed from the vapor line service port, nitrogen flow will have an exit point.

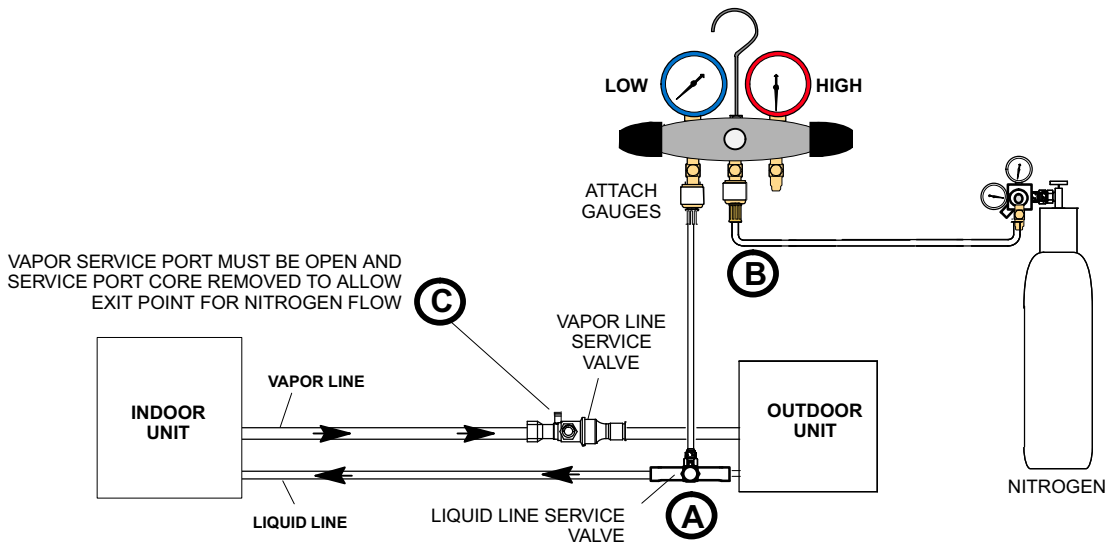


FIGURE 11

## ⚠ 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 under 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 suction / vapor valve stem port. See steps 3A, 3B and 3C on previous page and below for manifold gauge setup.

### 6 BRAZE LINE SET

Cloths must remain water-saturated throughout the brazing and cool-down process.

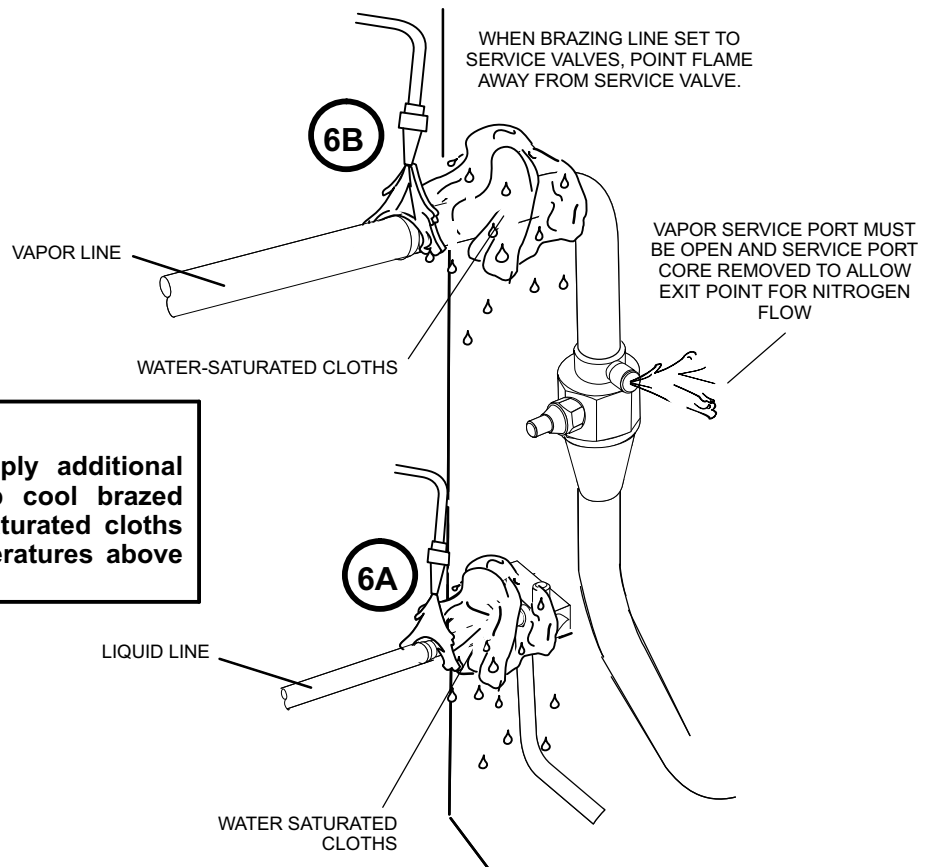
- A. Braze liquid line to liquid line service valve.
- B. Braze vapor line to vapor service valve.



#### 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 DAVENET.



#### IMPORTANT !

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

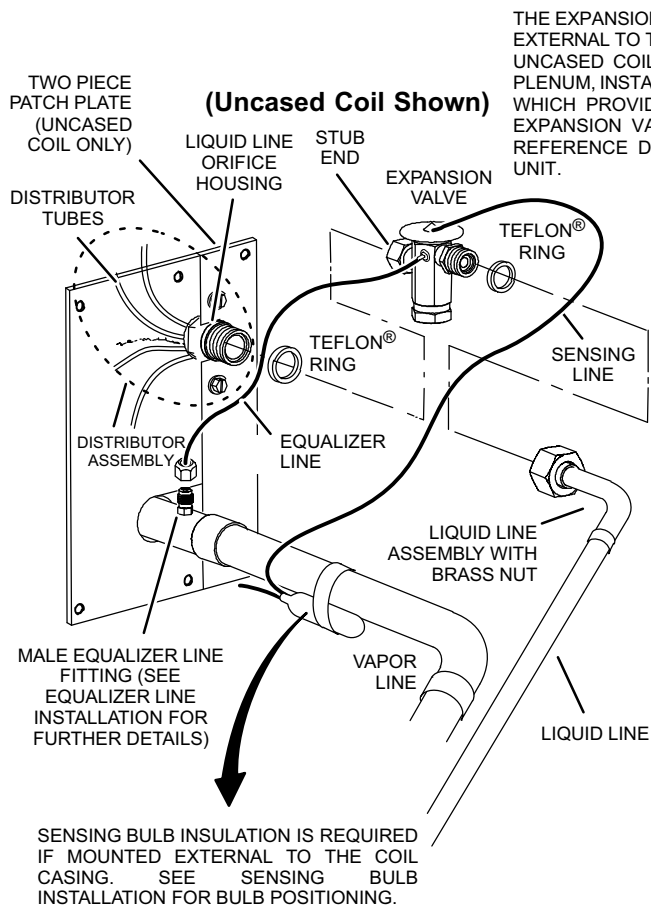
### 7 PREPARATION FOR NEXT STEP

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.

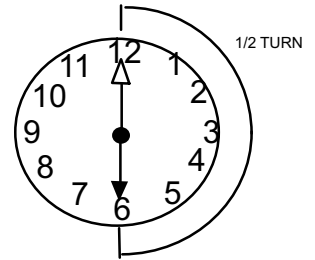
FIGURE 12

## STEP 6 -- INSTALLING INDOOR EXPANSION VALVE

THIS OUTDOOR UNIT IS DESIGNED FOR USE IN SYSTEMS THAT USE A CHECK EXPANSION VALVE METERING DEVICE. SEE THE *LENNOX XP21 PRODUCT SPECIFICATION* FOR APPROVED EXPANSION VALVE KIT MATCH-UPS AND APPLICATION INFORMATION.



THE 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 WHICH PROVIDES ACCESS FOR FIELD SERVICING OF THE EXPANSION VALVE. REFER TO BELOW ILLUSTRATION FOR REFERENCE DURING INSTALLATION OF EXPANSION VALVE UNIT.



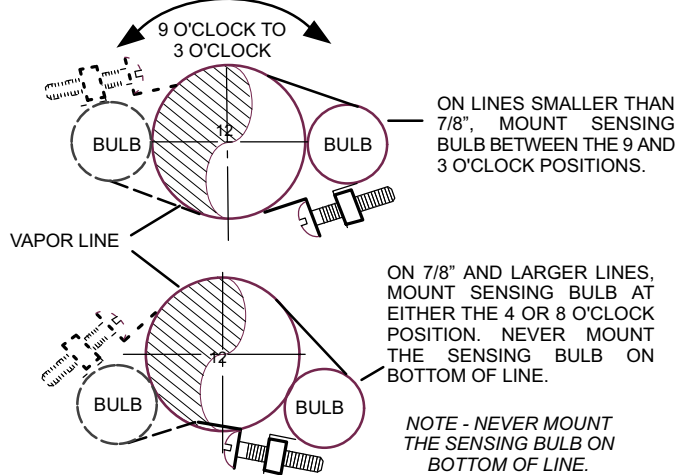
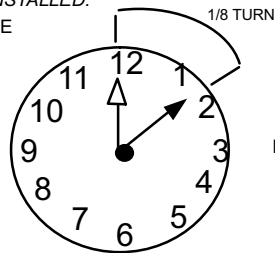
- REMOVE THE FIELD-PROVIDED FITTING THAT TEMPORARILY RECONNECTED THE LIQUID LINE TO THE INDOOR UNIT'S DISTRIBUTOR ASSEMBLY.
- INSTALL ONE OF THE PROVIDED TEFLON® RINGS AROUND THE STUBBED END OF THE EXPANSION VALVE AND LIGHTLY LUBRICATE THE CONNECTOR THREADS AND EXPOSE SURFACE OF THE TEFLON® RING WITH REFRIGERANT OIL.
- ATTACH THE STUBBED END OF THE 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 20 FT-LB.
- PLACE THE REMAINING TEFLON® WASHER AROUND THE OTHER END OF THE EXPANSION VALVE. LIGHTLY LUBRICATE CONNECTOR THREADS AND EXPOSE SURFACE OF THE TEFLON® RING WITH REFRIGERANT OIL.
- ATTACH THE LIQUID LINE ASSEMBLY TO THE 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 20 FT-LB.

### SENSING BULB INSTALLATION

- ATTACH THE VAPOR LINE SENSING BULB IN THE PROPER ORIENTATION AS ILLUSTRATED TO THE RIGHT USING THE CLAMP AND SCREWS PROVIDED.

*NOTE - CONFIRM PROPER THERMAL CONTACT BETWEEN VAPOR LINE AND CHECK EXPANSION BULB BEFORE INSULATING THE SENSING BULB ONCE INSTALLED.*

- CONNECT THE EQUALIZER LINE FROM THE 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

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 TO THE RIGHT.

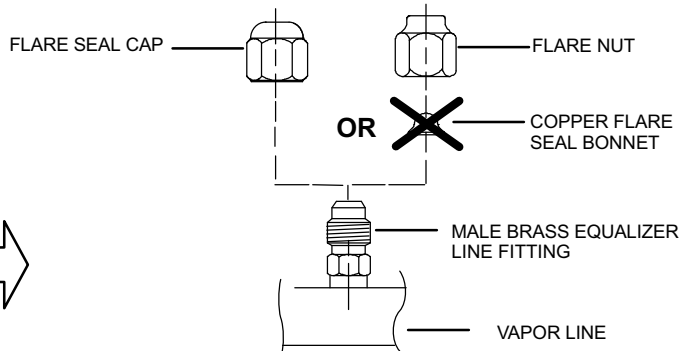
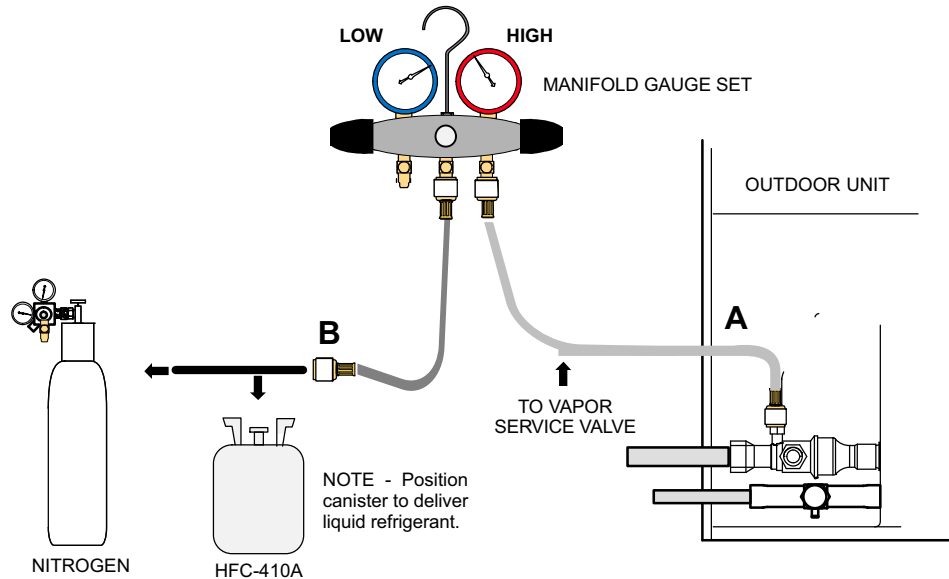


FIGURE 13

## STEP 7 -- LEAK TEST



# 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.

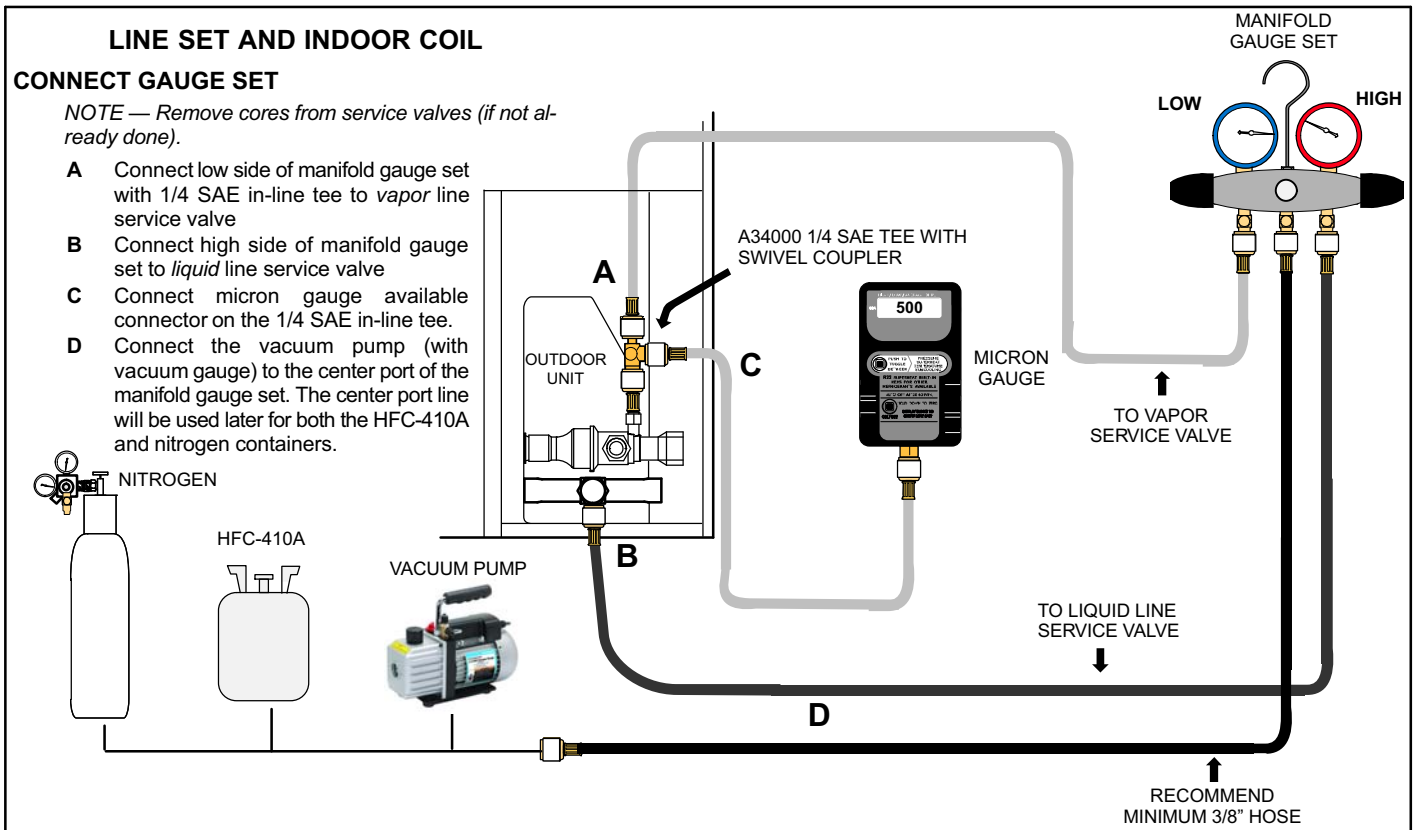
FIGURE 14

## STEP 8 -- EVACUATION

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables and water suction combine with refrigerant to produce substances that corrode copper piping and compressor parts.

### WARNING

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.





## EVACUATE LINE SET AND INDOOR COIL

The unit is shipped with a factory refrigerant charge. The liquid and suction line valves were closed after final testing at the factory. Do not operate these valves until the line set and indoor coil have been evacuated and leak checked, or the charge is lost.

**NOTE** - Do not use any portion of the factory charge for purging or leak testing. The factory charge is for filling the system only after a complete evacuation and leak check has been performed.

Line set and indoor coil should be evacuated using the recommend deep vacuum method of 500 microns. If deep vacuum equipment is not available, the alternate triple evacuation method may be used by following the specified procedure.

If vacuum must be interrupted during the evacuation procedure, always break vacuum with dry nitrogen.

### Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum to 500 microns and a vacuum gauge capable of accurately measuring this vacuum level. The deep vacuum method is the most positive way of assuring a system is free of air and water.

Watch the vacuum gauge as the system is pulling down. The response of the gauge is an indicator of the condition of the system (refer to figure 16).

With no leaks in the system, allow the vacuum pump to run for 30 minutes minimum at the deep vacuum level.

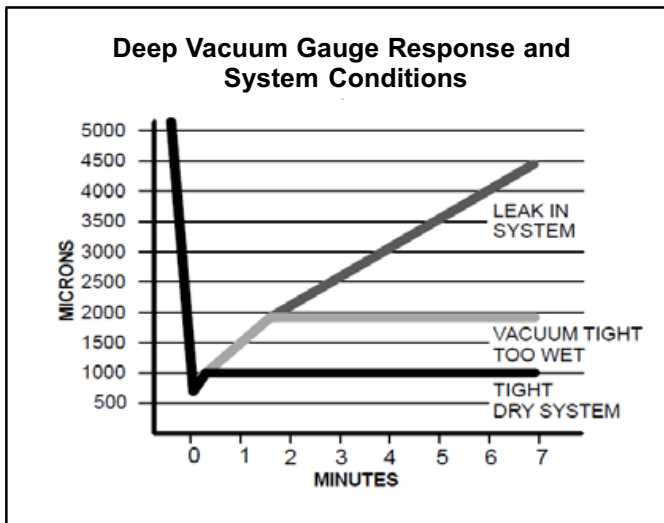


FIGURE 16

### Triple Evacuation Method

The triple evacuation method should only be used when system does not contain any water in liquid form and vacuum pump is only capable of pulling down to 28 inches of mercury (711mm Hg). Refer to figure 17 and proceed as follows:

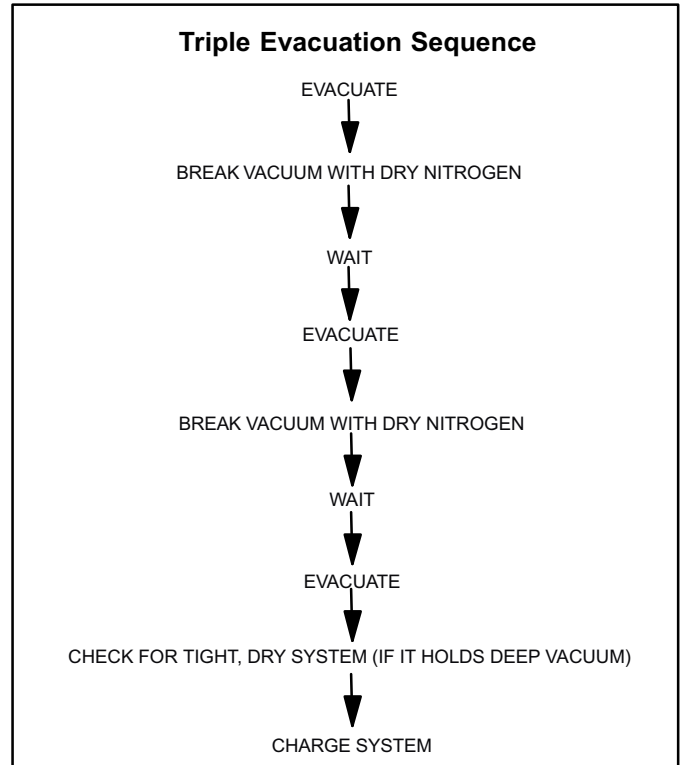


FIGURE 17

1. Pull system down to 28 inches of mercury (711mm Hg) and allow pump to continue operating for an additional 15 minutes.
2. Close manifold valves or valve at vacuum pump and shut-off vacuum pump.
3. Connect a nitrogen cylinder and regulator to system and fill with nitrogen until system pressure is 2 psig.
4. Close nitrogen valve and allow system to stand for one hour. During this time, dry nitrogen will diffuse throughout the system absorbing moisture.
5. Repeat this procedure as indicated in figure 17.
6. After the final evacuate sequence, confirm there are no leaks in the system. If a leak is found, repeat the entire process after repair is made.
7. 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.

8. Disconnect the manifold hose from the vacuum pump and connect it to an inverted 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.
9. Perform the following:
  - Close manifold gauge valves.
  - Shut off HFC – 410A cylinder.
  - Slowly open the service valves.
  - Refer to the charging sticker on the unit to complete the outdoor unit installation.

### Charging

The XP21 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 XP21 Installation and Service Procedures manual, which is available on DaveNet.

### Heat Pump Control -- Defrost Operation

A full description of the heat pump control can be found in the detailed installation and service procedure manual available on DaveNet. The defrost termination pins (E47) must be set on the heat pump control prior to starting the system to ensure proper defrost operation.

The heat pump control (A175) measures differential temperatures to detect when the system is performing poorly because of frost build-up on the outdoor coil. The heat pump control self-calibrates when the defrost system starts and after each system defrost cycle. The heat pump control monitors ambient temperature, outdoor coil temperature, and total run-time to determine when a defrost cycle is required. The coil temperature sensor 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 heat pump 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 heat pump control initiates defrost cycles.

### Homeowner 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 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.

## Professional Maintenance

Your heating and air conditioning system should be inspected and maintained twice each year (before the start of the cooling and heating seasons) by a licensed professional HVAC technician. You can expect the technician to check the following items. **These checks may only be conducted by a licensed professional HVAC technician.**

### Outdoor Unit

1. Inspect component wiring for loose, worn or damaged connections. Also check for any rubbing or pinching of wires. Confirm proper voltage plus amperage of outdoor unit.
2. Check the cleanliness of outdoor fan and blade condition (cracks) and clean or replace them, if necessary.
3. Inspect base pan drains for debris and clean as necessary.
4. Inspect the condition of refrigerant piping and confirm that pipes are not rubbing copper-to-copper. Also, check the condition of the insulation on the refrigerant lines. Repair, correct, or replace as necessary.
5. Test capacitor. Replace as necessary.
6. Inspect contactor contacts for pitting or burn marks. Replace as necessary.
7. Check outdoor fan motor for worn bearings/bushings. Replace as necessary.
8. Inspect and **clean** outdoor coils, if necessary and note any damage to coils or signs of leakage.

### Indoor Unit (Air Handler or Furnace)

1. Inspect component wiring for loose, worn or damaged connections. Confirm proper voltage plus amperage of indoor unit.
2. Inspect and clean or replace air filters in indoor unit.

3. Check the cleanliness of indoor blower and clean blower, if necessary.
4. Inspect the indoor coil drain pans and condensate drains for rust, debris, obstructions, leaks or cracks. Pour water in pans to confirm proper drainage from the pan through to the outlet of the pipe. Clean or replace as necessary.
5. Inspect and clean indoor coil, if necessary.
6. Inspect the condition of the refrigerant lines and confirm that pipes are not rubbing copper-to-copper. Also, ensure that refrigerant pipes are not being affected by indoor air contamination. Check condition of insulation on the refrigerant lines. Repair, correct, or replace as necessary.
7. Inspect the duct system for leaks or other problems. Repair or replace as necessary.
8. Check for bearing/bushing wear on indoor blower motor. Replace as necessary.
9. If your heat pump is matched with a gas- or oil-fired furnace for auxiliary heating, indoor unit service will also include inspection and cleaning of the burners, and a full inspection of the gas valve, heat exchanger and flue (exhaust) system.

### General System Test with System Operating

1. Your technician should perform a general system test. He will turn on the air conditioner to check operating functions such as the start-up and shut-off operation. He will also check for unusual noises or odors, and measure indoor/outdoor temperatures and system pressures as needed. He will check the refrigerant charge per the charging sticker information on the outdoor unit.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.
3. Verify correct temperature drop across indoor coil.

## Start-Up Checklists

Use this procedure to verify part- and full-load capacity operation of the two-stage compressor.

### TOOLS REQUIRED

- Refrigeration gauge set
- Digital volt/amp meter
- Electronic temperature thermometer
- On-off toggle switch

### PROCEDURE

1. Turn main power OFF to outdoor unit.
2. Adjust room thermostat set point 5°F above (heating operation) or 5°F below (cooling operation) the room temperature.
3. Remove control access panel. Install refrigeration gauges on unit. Attach the amp meter to the common (black wire) wire of the compressor harness. Attach thermometer to discharge line as close as possible to the compressor.
4. Turn toggle switch OFF. Install switch in series with Y2 out terminal on the outdoor control.
5. Cycle main power ON.
6. Allow pressures and temperatures to stabilize before taking any reading (may take up to 10 minutes).
7. Record all of the readings for the Y1 demand.
8. Close switch to energize Y2 demand. Verify power is going to compressor solenoid (see note \*\* in the *Field Operational Checklist*).
9. Allow pressures and temperatures to stabilize before taking any reading (may take up to 10 minutes).
10. Record all of the readings with the Y1 and Y2 demand.
11. If temperatures and pressures change in the direction noted in chart, the compressor is properly modulating from low to high capacity. (If no amperage, pressures or temperature readings change when this test is performed, the compressor is not switching between low and high capacity and replacement is necessary.)
12. After testing is complete, return unit to original set up.

# ⚠ IMPORTANT

This performance check is **ONLY** valid on systems that have clean indoor and outdoor coils, proper airflow over coils, and correct system refrigerant charge. All components in the system must be functioning properly to correctly perform compressor operational check. (Accurate measurements are critical to this test as indoor system loading and outdoor ambient can affect variations between low and high capacity readings).

## XP21 Field Operational Checklist

Unit Readings	Cooling***			Heating***		
	Y1 First Stage	Expected results during Y2 demand (toggle switch ON)	Y2 Second Stage	Y1 First Stage	Expected results during Y2 demand (toggle switch ON)	Y2 Second Stage
<b>Compressor</b>						
Voltage		Same			Same	
Amperage		Higher			Higher	
<b>Condenser Fan motor</b>						
Amperage		Same or Higher			Same or Higher	
<b>Temperature</b>						
Ambient		Same			Same	
Outdoor Coil Discharge Air		Higher			Lower	
Compressor Discharge Line		Higher			Higher	
Indoor Return Air		Same			Same	
Indoor Coil Discharge Air		Lower			Higher	
<b>Pressures</b>						
Suction (Vapor)		Lower			Down	
Liquid		Higher			Higher	

Note - Heat pump may have a low ambient control or control that locks in second-stage operation below its set point. It may be necessary to remove a wire from the control when performing this check.

\*\*\* Cooling Mode Operation - Block outdoor coil to maintain a minimum of 375 psig during testing.  
 Heating Mode Operation - Block indoor coil to maintain a minimum of 375 psig during testing.

## XP21 Start-Up and Performance Checklist

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

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

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

Solar Module Mfg and 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

Vapor Pressure: \_\_\_\_\_ Liquid Pressure: \_\_\_\_\_

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

### HEATING MODE

Vapor 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:

$$\text{Saturated Condensing Temperature (A)} - \text{Liquid Line Temperature (B)} = \text{SUBCOOLING}$$

Approach:

$$\text{Liquid Line Temperature (A)} - \text{Outdoor Air Temperature (B)} = \text{APPROACH}$$

Indoor Coil Temp. Drop (18 to 22°F)

$$\text{Return Air Temperature (A)} - \text{Supply Air Temperature (B)} = \text{COIL TEMP DROP}$$