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

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

NOTICE TO INSTALLER

UNIT PLACEMENT
It is critical for proper unit operation to place outdoor unit on an elevated surface as described in Unit Placement section on page 6.

BRAZING LINE SET TO SERVICE VALVES
It is imperative to follow the brazing technique illustrated starting on page 11 to avoid damaging the service valve’s internal seals.

⚠️ CAUTION
Physical contact with metal edges and corners while applying excessive force or rapid motion can result in personal injury. Be aware of, and use caution when working near these areas during installation or while servicing this equipment.

⚠️ WARNING
Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property. Installation and service must be performed by a licensed professional installer (or equivalent) or a 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.

⚠️ IMPORTANT
This unit must be matched with an indoor coil as specified in Lennox Engineering Handbook. Coils previously charged with HCFC-22 must be flushed.
Model Number Identification

- **Nominal SEER**
- **Unit Type**
  - HP = Heat Pump
- **Refrigerant**
  - X = R-410A

<table>
<thead>
<tr>
<th>Minor Revision Number</th>
<th>HP</th>
<th>X</th>
<th>-</th>
<th>230</th>
<th>-</th>
<th>17</th>
</tr>
</thead>
</table>

- **Voltage**
  - 230 = 208/230V -1 phase - 60hz

- **Cooling Capacity** - Tons
  - 018 = 1.5
  - 024 = 2
  - 030 = 2.5
  - 036 = 3
  - 042 = 3.5
  - 048 = 4
  - 060 = 5

Unit Dimensions - inches (mm)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>13HPX-018-230</td>
<td>24-1/4 (616)</td>
<td>33-1/4 (845)</td>
<td>32-1/2 (826)</td>
</tr>
<tr>
<td>13HPX-024-230</td>
<td>24-1/4 (616)</td>
<td>33-1/4 (845)</td>
<td>32-1/2 (826)</td>
</tr>
<tr>
<td>13HPX-036-230</td>
<td>28-1/4 (718)</td>
<td>37-1/4 (946)</td>
<td>36-1/2 (927)</td>
</tr>
<tr>
<td>13HPX-042-230</td>
<td>28-1/4 (718)</td>
<td>43-1/4 (1099)</td>
<td>42-1/4 (1073)</td>
</tr>
<tr>
<td>13HPX-060-230</td>
<td>28-1/4 (718)</td>
<td>37-1/4 (946)</td>
<td>36-1/2 (927)</td>
</tr>
</tbody>
</table>

Optional Unit Standoff Kit (4) (Field Installed)
**Caps and Fasteners Torque Requirements**

**IMPORTANT**

Only use Allen wrenches of sufficient hardness (50Rc - Rockwell Harness Scale minimum). Fully insert the wrench into the valve stem recess.

Service valve stems are factory-torqued (from 9 ft-lbs for small valves, to 25 ft-lbs for large valves) to prevent refrigerant loss during shipping and handling. Using an Allen wrench rated at less than 50Rc risks rounding or breaking off the wrench, or stripping the valve stem recess.

See the Lennox Service and Application Notes #C-08-1 for further details and information.

When servicing or repairing HVAC components, ensure the fasteners are appropriately tightened. Table 1 provides torque values for fasteners.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Recommended Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service valve cap</td>
<td>8 ft.- lb.</td>
</tr>
<tr>
<td>Sheet metal screws</td>
<td>16 in.- lb.</td>
</tr>
<tr>
<td>Machine screws #10</td>
<td>28 in.- lb.</td>
</tr>
<tr>
<td>Compressor bolts</td>
<td>90 in.- lb.</td>
</tr>
<tr>
<td>Gauge port seal cap</td>
<td>8 ft.- lb.</td>
</tr>
</tbody>
</table>
 IMPORTANT

To prevent stripping of the various caps used, the appropriately sized wrench should be used and fitted snugly over the cap before tightening.

OPERATING SERVICE VALVES

The liquid and vapor line service valves are used for refrigerant recovery, flushing, leak testing, evacuating, weighing in refrigerant and optimizing system charge. Each valve is equipped with a service port which has a factory-installed valve core. Figure 2 provides information on how to access and operate both angle- and ball-type service valves.

USING MANIFOLD GAUGE SET

When checking the system charge, only use a manifold gauge set that features low-loss anti-blow back fittings. Manifold gauge set used for HFC-410A refrigerant systems must be capable of handling the higher system operating pressures. The manifold gauges should be rated for:

- **High side** — Pressure range of 0 - 800 pound-force per square inch gauge (psig)
- **Low side** — Use with 30” vacuum to 250 psig with dampened speed to 500 psig
- **Manifold gauge set hoses** must be rated for use to 800 psig of pressure with a 4000 psig burst rating.

![Figure 2. Angle and Ball Service Valves](image-url)
Recovering Refrigerant from Existing System

1. DISCONNECT POWER
   Disconnect all power to the existing outdoor unit at the disconnect switch and/or main fuse box/breaker panel.

2. CONNECT MANIFOLD GAUGE SET
   Connect a manifold gauge set, clean recovery cylinder and a recovery machine to the service ports of the existing unit.
   NOTE — Use the recovery machine instructions to make the correct manifold gauge set connections for recovery refrigerant. The illustration below is a typical connection.

3. RECOVERING REFRIGERANT
   Remove existing refrigerant using one of the following procedures:

   **METHOD 1:**
   Use Method 1 if the existing outdoor unit is not equipped with shut-off valves, or if the unit is not operational and you plan to use the existing to flush the system.
   Recover all refrigerant from the existing system using a recovery machine and clean recovery cylinder. Check gauges after shutdown to confirm that the entire system is completely void of refrigerant.

   **METHOD 2:**
   Use Method 2 if the existing outdoor unit is equipped with manual shut-off valves, and you plan to use new refrigerant to flush the system.
   Perform the following task:
   A. Start the existing system in the cooling mode and close the liquid line valve.
   B. Use the compressor to pump as much of the existing HCFC-22 refrigerant into the outdoor unit until the outdoor system is full. Turn the outdoor unit main power OFF and use a recovery machine to remove the remaining refrigerant from the system.
   NOTE — It may be necessary to bypass the low pressure switches (if equipped) to ensure complete refrigerant evacuation.
   C. When the low side system pressures reach 0 psig, close the vapor line valve.
   D. Check gauges after shutdown to confirm that the valves are not allowing refrigerant to flow back into the low side of the system.

   **METHOD 2 LIMITATIONS**
   NOTE — When using Method 2, the listed devices below could prevent full system charge recovery into the outdoor unit:
   • Outdoor unit’s high or low-pressure switches (if applicable) when tripped can cycle the compressor OFF.
   • Compressor can stop pumping due to tripped internal pressure relief valve.
   • Compressor has internal vacuum protection that is designed to unload the scrolls (compressor stops pumping) when the pressure ratio meets a certain value or when the suction pressure is as high as 20 psig. (Compressor suction pressures should never be allowed to go into a vacuum. Prolonged operation at low suction pressures will result in overheating of the scrolls and permanent damage to the scroll tips, drive bearings and internal seals.)
   Once the compressor can not pump down to a lower pressure due to any of the above mentioned system conditions, shut off the vapor valve. Turn OFF the main power to unit and use a recovery machine to recover any refrigerant left in the indoor coil and line set.

---

**Figure 3. Refrigerant Recovery**

⚠️ **IMPORTANT**
The Environmental Protection Agency (EPA) prohibits the intentional venting of HFC refrigerants during maintenance, service, repair and disposal of appliance. Approved methods of recovery, recycling or reclaiming must be followed.

⚠️ **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.
New Outdoor Unit Placement

**CAUTION**

In order to avoid injury, take proper precaution when lifting heavy objects.

Remove existing outdoor unit prior to placement of new outdoor unit. See *Unit Dimensions* on page 2 for sizing mounting slab, platforms or supports. Refer to figure 4 for mandatory installation clearance requirements.

**POSITIONING CONSIDERATIONS**

Consider the following when positioning the unit:

- Some localities are adopting sound ordinances based on the unit’s sound level registered from the adjacent property, not from the installation property. Install the unit as far as possible from the property line.
- When possible, do not install the unit directly outside a window. Glass has a very high level of sound transmission. For proper placement of unit in relation to a window see the provided illustration in figure 5, detail A.

**PLACING UNIT ON SLAB**

When installing unit at grade level, the top of the slab should be high enough above grade so that water from higher ground will not collect around the unit. The slab should have a slope tolerance as described in figure 5, detail B.

**ROOF MOUNTING**

Install the unit a minimum of 4 inches (102 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. See figure 5, detail C for other roof top mounting considerations.

---

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

![Diagram of clearance on all sides](image)

**NOTES:**

- 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**

![Diagram of minimum clearance above unit](image)

---

**NOTICE**

**Roof Damage!**

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil and cause the rubber to swell when it comes into contact with oil. The rubber will then bubble and could cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.
These units operate under a wide range of weather conditions; therefore, several factors must be considered when positioning the outdoor unit. The unit must be positioned to give adequate clearances for sufficient airflow and servicing.

- 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.
- Install the unit high enough above the ground or roof to allow adequate drainage of defrost water and prevent ice or snow build-up.
- In heavy snow areas, do not locate the unit where drifting will occur. The unit base should be elevated above the depth of average snows. Stand-off kits are available for ordering using either catalog numbers /C0266 94J45 (4 each) or 30K79 (20 each).
- When installed in areas where low ambient temperatures exist, locate unit so winter prevailing winds do not blow directly onto outdoor unit.
- Locate unit away from overhanging roof lines which would allow water or ice to drop on, or in front of, coil or unto unit.

If unit coil cannot be mounted away from prevailing winter winds, a wind barrier should be constructed. Size barrier at least the same height and width as outdoor unit. Mount barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds as illustrated.


**WARNING**

To prevent personal injury, or damage to panels, unit or structure, be sure to observe the following:
While installing or servicing this unit, carefully stow all removed panels out of the way, so that the panels will not cause injury to personnel, nor cause damage to objects or structures nearby, nor will the panels be subjected to damage (e.g., being bent or scratched).
While handling or stowing the panels, consider any weather conditions, especially windy conditions, that may cause panels to be blown around and battered.

When removing the unit panels. Remove panel A first, then B, C and finally D. When reinstalling panels, reverse that order starting with panel D, C, B and finally A.

---

**REMOVAL**

**STEP 1**
To remove panel, remove mounting screws securing panel to the unit.

**STEP 2**
Slightly lift panel A in order to clear side lips of panel from base of unit.

**STEP 3**
Tilt panel out slightly and pull downward to remove.

Repeat steps 1, 2 and 3 to remove panels B, C and finally D.

---

**INSTALLATION**

**STEP 1**
Starting with panel D, insert panel under unit top cap lip and lift slightly to clear side lip of panel from base.

**STEP 2**
Move panel in towards unit. Align left/right side lips of panel with groove inserts along left/right side of unit.

**STEP 3**
Secure panel with mounting screws. Repeat steps 1 and 2 to install panels C, B and finally A.

---

*Figure 6. Louvers*
Line Set Requirements

This section provides information on: installation of new or replacement line set.
- Adding Polyol ester oil requirements
- New or replacement line set installation
- Using existing line set.

ADDING POLYOL ESTER OIL REQUIREMENTS

**IMPORTANT**

Mineral oils are not compatible with HFC-410A. If oil must be added, it must be a Polyol Ester oil.

The compressor is charged with sufficient Polyol Ester oil (POE) for line set lengths up to 50 feet. Recommend adding oil to system based on the amount of refrigerant charge in the system. Systems with 20 pounds or less of refrigerant required no oil to be added.

For systems over 20 pounds - add one ounce for every five (5) pounds of HFC-410A refrigerant.

Recommended topping-off POE oils are Mobil EAL ARCTIC 22 CC or ICI EMKARATE RL32CF.

NEW OR REPLACEMENT LINE SET INSTALLATION

Field refrigerant piping consists of both liquid and vapor lines from the outdoor unit to the indoor coil. Use Lennox L15 (sweat, non-flare) series line set, or field-fabricated refrigerant line sizes as specified in table 2.

If refrigerant lines are routed through a wall, then seal and isolate the opening so vibration is not transmitted to the building. Pay close attention to line set isolation during installation of any HVAC system. When properly isolated from building structures (walls, ceilings, floors), the refrigerant lines will not create unnecessary vibration and subsequent sounds. See figure 7 for recommended installation practices.

**NOTE** — When installing refrigerant lines longer than 50 feet, see the Lennox Refrigerant Piping Design and Fabrication Guidelines, CORP. 9351-L9, or contact Lennox Technical Support Product Applications for assistance. To obtain the correct information from Lennox, be sure to communicate the following information:

- Model (13HPX) and size of unit (e.g. -036).
- Line set diameters for the unit being installed as listed in table 2 and total length of installation.
- Number of elbows vertical rise or drop in the piping.

USING EXISTING LINE SET

Things to consider:
- Liquid line that meter the refrigerant, such as RFC1 liquid line, **must not** be used in this application.
- Existing line set of proper size as listed in table 2 may be reused.
- If system was previously charged with HCFC-22 refrigerant, then existing line set must be flushed (see Flushing Line Set and Indoor Coil on page 14).

If existing line set is being used, then proceed to Brazing Connections on page 11.

**IMPORTANT**

Lennox highly recommends changing line set when converting the existing system from HCFC-22 to HFC-410A. If that is not possible and the line set is the proper size as reference in table 2, use the procedure outlined under Flushing Line Set and Indoor Coil on page 13.

**IMPORTANT**

If this unit is being matched with an approved line set or indoor unit coil which 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 the system performance and capacity.

Failure to properly flush the system per the instructions below will void the warranty.

---

**Table 2. Refrigerant Line Set — Inches (mm)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Field Connections</th>
<th>Recommended Line Set</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid Line</td>
<td>Vapor Line</td>
</tr>
<tr>
<td>13HPX-018-230</td>
<td>3/8 in. (10 mm)</td>
<td>3/4 in. (19 mm)</td>
</tr>
<tr>
<td>13HPX-024-230</td>
<td>3/8 in. (10 mm)</td>
<td>7/8 in. (22 mm)</td>
</tr>
<tr>
<td>13HPX-030-230</td>
<td>3/8 in. (10 mm)</td>
<td>1-1/8 in. (29 mm)</td>
</tr>
<tr>
<td>13HPX-036-230</td>
<td>3/8 in. (10 mm)</td>
<td>3/8 in. (10 mm)</td>
</tr>
</tbody>
</table>

**NOTE** — Some applications may required a field provided 7/8” to 1-1/8” adapter
Line Set Isolation — The following illustrations are examples of proper refrigerant line set isolation:

**REFRIGERANT LINE SET — TRANSITION FROM VERTICAL TO HORIZONTAL**

ANCHORED HEAVY NYLON WIRE TIE OR AUTOMOTIVE MUFFLER-TYPE HANGER

AUTOMOTIVE MUFFLER-TYPE HANGER

WALL STUD

STRAP LIQUID LINE TO VAPOR LINE

LIQUID LINE

VAPOR LINE - WRAPPED IN ARMAFLEX

**REFRIGERANT LINE SET — INSTALLING HORIZONTAL RUNS**

To hang line set from joist or rafter, use either metal strapping material or anchored heavy nylon wire ties.

**REFRIGERANT LINE SET — INSTALLING VERTICAL RUNS (NEW CONSTRUCTION SHOWN)**

NOTE — Insulate liquid line when it is routed through areas where the surrounding ambient temperature could become higher than the temperature of the liquid line or when pressure drop is equal to or greater than 20 psig.

NOTE — Similar installation practices should be used if line set is to be installed on exterior of outside wall.

Figure 7. Line Set Installation
### Brazing Connections

Use the procedures outlined in figures 8 and 9 for brazing line set connections to service valves.

<table>
<thead>
<tr>
<th>IMPORTANT</th>
<th>IMPORTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Allow braze joint to cool before removing the wet rag from the service valve. Temperatures above 250°F can damage valve seals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>When using a high pressure gas such as dry 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).</td>
</tr>
</tbody>
</table>
**ATTACH THE MANIFOLD GAUGE SET FOR BRAZING LIQUID AND SUCTION / 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 suction / vapor line service port.

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 suction / vapor line service port to allow nitrogen to escape.

**Figure 8. Brazing Procedures**
**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.

**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 manifold gauge set connections.

**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. Water saturated cloths must remain water saturated throughout the brazing and cool-down process.

**PREPARATION FOR NEXT STEP**

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

**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 250ºF 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 in 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 procedures provided in this supplement.
Indoor Refrigerant Metering Device Removal and Flushing Line Set and Indoor Coil

Flushing is only required when the existing system used HCFC-22 refrigerant. If the existing system used HFC-410a, then remove the original indoor coil metering device and proceed to Installing New Indoor Metering Device on page .

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

A On fully cased coils, remove the coil access and plumbing panels.
B Remove any shipping clamps holding 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 temporary reconnect the liquid line to the indoor unit’s liquid line orifice housing.

**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 holding 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 temporary reconnect the liquid line to the indoor unit’s liquid line orifice housing.

**2** CONNECT GAUGES AND EQUIPMENT FOR FLUSHING PROCEDURE

A Inverted cylinder with clean refrigerant to the vapor service valve.
B Gauge set (low side) to the liquid line valve.
C Gauge set center port to inlet on the recovery machine with an empty recovery tank to the gauge set.
D Connect recovery tank to recovery machines 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 Invert the cylinder of clean 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 vapor is recovered. Allow the recovery machine to pull down to 0 the system.
D Close the valve on the inverted drum and the gauge set valves. Pump the remaining refrigerant out of the recovery machine and turn the machine off.

Figure 10. Removing Indoor Refrigerate Metering Device and Flushing Procedures
Installing New Indoor Metering Device

This outdoor unit is designed for use in HFC-410A systems that use a check / expansion valve metering device (purchased separately) at the indoor coil.

See the Lennox 13HPX Engineering Handbook for approved check / expansion valve kit match-ups. The check / expansion valve device can be installed either 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 field servicing of the check / expansion valve (see figure 11).

**INDOOR EXPANSION VALVE INSTALLATION**

(Uncased Coil Shown)

A Remove the field-provided fitting that temporarily reconnected the liquid line to the indoor unit's distributor assembly.

B 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.

C 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 fl-lb.

D 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.

E 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 fl-lb.

**SENSING BULB INSTALLATION**

A 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 expansion bulb before insulating the sensing bulb once installed.

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

**EQUALIZER LINE INSTALLATION**

A 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.

B 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 11. Installing Indoor Check / Expansion Valve**
Leak Test Line Set and Indoor Coil

**IMPORTANT**

Leak detector must be capable of sensing HFC refrigerant.

**CONNECT GAUGE SET**

A  Connect an HFC-410A manifold gauge set high pressure hose 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.

---

**Figure 12. Manifold Gauge Set Connections for Leak Testing**

**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:

1. 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).

2. 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.

3. Connect a cylinder of dry nitrogen with a pressure regulating valve to the center port of the manifold gauge set.

4. Adjust dry 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.

5. 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.

6. After leak testing disconnect gauges from service ports.
Evacuating Line Set and Indoor Coil

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.

1 CONNECT GAUGE SET

- **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 micron gauge available 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.

2 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 within a given volume or system, above the absolute zero of pressure. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.

- **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 and turn off vacuum pump
  - Disconnect manifold gauge center port hose from vacuum pump
  - Attach manifold center port hose to a dry 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 dry nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the dry 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 an upright cylinder of HFC-410A 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 secure finger tight, then tighten an additional one-sixth (1/6) of a turn as illustrated.

---

Figure 13. Evacuating Line Set and Indoor Coil
**IMPORTANT**

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument capable of accurately measuring down to 50 microns.

**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.

**Electrical Connections**

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)

**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.

**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 /C0266** Units are approved for use only with copper conductors. Ground unit at disconnect switch or to an earth ground.

**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.
HIGH VOLTAGE / 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 panel. Connect conduit to the control panel using a proper conduit fitting.

CONTROL WIRING

Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated.

A  Run 24VAC control wires through hole with grommet.
B  Make 24VAC thermostat wire connections to CMC1.

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

NOTE — For proper voltages, select thermostat wire (control wires) gauge per table below.

<table>
<thead>
<tr>
<th>WIRE RUN LENGTH</th>
<th>AWG#</th>
<th>INSULATION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LESS THAN 100’</td>
<td>18</td>
<td>TEMPERATURE RATING</td>
</tr>
<tr>
<td>(30 METERS)</td>
<td></td>
<td>35ºC MINIMUM.</td>
</tr>
<tr>
<td>MORE THAN 100’</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>(30 METERS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE /C0266 Wire tie provides low voltage wire strain relief and to maintain separation of field installed low and high voltage circuits.

NOTE /C0266 Do not bundle any excess 24VAC control wires inside control panel.

TYPICAL CONTROL WIRING

Low Voltage Wiring

(SOME CONNECTIONS MAY NOT APPLY. REFER TO SPECIFIC THERMOSTAT AND INDOOR UNIT.)

Figure 14. Connections
Figure 15. Typical Unit Wiring Diagram

NOTE—FOR USE WITH COPPER CONDUCTORS ONLY. REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMOACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.

NOTE—IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZ, RATING, INSULATION THICKNESS AND TERMINATION.

S41 TO BE MOUNTED IN CONTROL BOX AND WIRED IN PARALLEL WITH LOW PRESSURE SWITCH.

S173 SWITCH USED ONLY IN UNITS EQUIPPED WITH COMPRESSORS WHICH DO NOT INCLUDE INTERNAL SWITCH.

<table>
<thead>
<tr>
<th>KEY</th>
<th>COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>COMPRESSOR</td>
</tr>
<tr>
<td>B4</td>
<td>MOTOR-OUTDOOR FAN</td>
</tr>
<tr>
<td>C12</td>
<td>CAPACITOR-DUAL</td>
</tr>
<tr>
<td>CMC1</td>
<td>CONTROL-DEFROST</td>
</tr>
<tr>
<td>HR1</td>
<td>HEATER-COMPRESSOR</td>
</tr>
<tr>
<td>K1-1</td>
<td>CONTACTOR-COMPRESSOR</td>
</tr>
<tr>
<td>L1</td>
<td>VALVE-REVERSING</td>
</tr>
<tr>
<td>S4</td>
<td>SWITCH-HIGH PRESSURE</td>
</tr>
<tr>
<td>S6</td>
<td>SWITCH-DEFROST</td>
</tr>
<tr>
<td>S40</td>
<td>THERMOSTAT-CRANKCASE</td>
</tr>
<tr>
<td>S41</td>
<td>THERMOSTAT-LOW AMBIENT</td>
</tr>
<tr>
<td>S87</td>
<td>SWITCH-LOW PRESS, COMP 1</td>
</tr>
<tr>
<td>S173</td>
<td>SWITCH- THERMAL PROTECTION</td>
</tr>
</tbody>
</table>

DENOTES OPTIONAL COMPONENTS.

---

LINE VOLTAGE FIELD INSTALLED CLASS II VOLTAGE FIELD WIRING.
Figure 16. Typical Unit Factory Wiring
Figure 17. Typical Unit Factory Wiring — Compressor with Thermal Protection Switch (S173)
Unit Start-Up

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.

UNIT START-UP
1. Rotate fan to check for binding.
2. Inspect all factory- and field-installed wiring for loose connections.
3. Verify that the manifold gauge set is connected as illustrated in figure 19. Use a temperature sensor positioned near the liquid line service port as illustrated in figure 19 which will be required later when using the subcooling method for optimizing the system refrigerant charge.
4. Replace the stem caps and tighten to the value listed in table 1.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit’s nameplate. If not, do not start the equipment until you have consulted with the power company and the voltage condition has been corrected.
6. Open both the liquid and vapor line service valves to release the refrigerant charge contained in outdoor unit into the system.
7. Use figure 18 to determine next step in system preparation.

---

Service and Weigh In Refrigerant for Outdoor Units Delivered Void of Charge

The following procedures are only required if it has been determined that the new outdoor unit is void of charge. Skip to the next section if refrigerant charge is present.

LEAK CHECK, REPAIR AND EVACUATE

If the outdoor unit is void of refrigerant, clean the system using the procedure described below.

1. Leak check system using procedures provided on page 16. Repair any leaks discovered during leak test.
2. Evacuate the system using procedure provided in figure 13.
3. Use nitrogen to break the vacuum and install a new filter drier in the system.
4. Evacuate the system again using procedure in figure 13.

CONNECT MANIFOLD GAUGE SET AND WEIGH IN CHARGE

After the evacuation procedure, reconnect the manifold gauge set as illustrated in figure 19.

NOTE - Temperature sensor illustrated in figure 19 is not required for initial system weigh in charging.

1. Close manifold gauge set valves and connect the gauge set as exampled in figure 19.
2. Check that fan rotates freely.
3. Inspect all factory- and field-installed wiring for loose connections.
4. Open the high side manifold gauge valve and weigh in liquid refrigerant. Use figure 20 to calculate the correct weigh-in charge.
5. Close manifold gauge valves.
6. Monitor the system to determine the amount of moisture remaining in the oil. It may be necessary to replace the bi-flow filter drier several times to achieve the required dryness level. If system dryness is not verified, the compressor will fail in the future.
7. Continue to Optimizing System Refrigerant Charge on page 25 to optimize the system charge using subcooling method.

---

Figure 18. Outdoor Unit Factory Charge
A Close manifold gauge set valves and connect the center hose to a cylinder of HFC-410A. Set for liquid phase charging.

B Connect the manifold gauge set’s low pressure side to the true suction port.

C Connect the manifold gauge set’s high pressure side to the liquid line service port.

D Position temperature sensor on liquid line near liquid line service port (use only for subcooling method).

NOTE — Refrigerant tank should be turned right-side-up to deliver vapor during charge optimizing procedure.

NOTE — For simplify the illustration, the line set is not shown connected to service valves.

Figure 19. Typical Gauge Set Connections for Initial Weight-in Charge or Optimizing System Charge

WEIGH-IN CHARGING

CALCULATING SYSTEM CHARGE FOR OUTDOOR UNIT VOID OF CHARGE

If the system is void of refrigerant, first, locate and repair any leaks and then weigh in the refrigerant charge into the unit. To calculate the total refrigerant charge:

Amount specified on nameplate
Adjust amount for variation in line set length listed on line set length table below.

Additional charge specified per match indoor air handler or coil listed in table 3.

Total Charge

Refrigerant Charge per Line Set Length

<table>
<thead>
<tr>
<th>LIQUID LINE SET DIAMETER</th>
<th>OUNCES PER 5 FEET (GRAMS PER 1.5 METERS)</th>
<th>ADJUST FROM 15 FEET (4.6 METERS) LINE SET*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8” (9.5 MM)</td>
<td>3 OUNCE PER 5’ (85 GRAMS PER 1.5 M)</td>
<td></td>
</tr>
</tbody>
</table>

*If line length is greater than 15 feet (4.6 meters), add this amount. If line length is less than 15 feet (4.6 meters), subtract this amount.

NOTE — Insulate liquid line when it is routed through areas where the surrounding ambient temperature could become higher than the temperature of the liquid line or when pressure drop is equal to or greater than 20 psig.

NOTE — The above nameplate is for illustration purposes only. Go to actual nameplate on outdoor unit for charge information.

Figure 20. Using HFC-410A Weigh In Method
**Optimizing System Refrigerant Charge**

This section provides instructions on optimizing the system charge. This section includes:

- Optimizing procedure
- Adjusting indoor airflow
- Using subcooling method
- Approved matched components, targeted subcooling (SC) values and add charge values
- Normal operating pressures
- Temperature pressures

**OPTIMIZING PROCEDURE**

1. Move the low-side manifold gauge hose from the vapor line service valve to the true suction port (see figure 19).

2. Set the thermostat for either cooling or heating demand. Turn on power to the indoor unit and close the outdoor unit disconnect switch to start the unit.

3. Allow unit to run for five minutes to allow pressures to stabilize.

4. Check the airflow as instructed under *Adjusting Indoor Airflow* to verify or adjust indoor airflow for maximum efficiency. Make any air flow adjustments before continuing with the optimizing procedure.

5. Use subcooling method to optimize the system charge (see figure 23). Adjust charge as necessary.

**ADJUSTING INDOOR AIRFLOW**

**Heating Mode Indoor Airflow Check**  
*Only use when indoor unit has electric heat*

Indoor blower airflow (CFM) may be calculated by energizing electric heat and measuring:

- Temperature rise between the return air and supply air temperatures at the indoor coil blower unit,
- Measuring voltage supplied to the unit,
- Measuring amperage being drawn by the heat unit(s).

Then, apply the measurements taken in the following formula to determine CFM:

\[
CFM = \frac{\text{Amps} \times \text{Volts} \times 3.41}{1.08 \times \text{Temperature rise (F)}}
\]

**Cooling Mode Indoor Airflow Check**

Check airflow using the Delta-T (DT) process using figure 22.
1. Determine the desired \( DT \)—Measure entering air temperature using dry bulb (A) and wet bulb (B). \( DT \) is the intersecting value of A and B in the table (see triangle).

2. Find temperature drop across coil—Measure the coil’s dry bulb entering and leaving air temperatures (A and C). Temperature Drop Formula: \( T_{\text{Drop}} = A - C \).

3. Determine if fan needs adjustment—If the difference between the measured \( T_{\text{Drop}} \) and the desired \( DT \) \((T_{\text{Drop}}-DT)\) is within \( +3^\circ \) no adjustment is needed. See examples: Assume \( DT = 15 \) and A temp. = \( 72^\circ \), these C temperatures would necessitate stated actions:

   \[ \begin{align*}
   &53^\circ \quad 19 - 15 = 4 \quad \text{Increase the airflow} \\
   &58^\circ \quad 14 - 15 = -1 \quad (\text{within } +3^\circ \text{ range) no change} \\
   &62^\circ \quad 10 - 15 = -5 \quad \text{Decrease the airflow}
   \end{align*} \]

4. Adjust the fan speed—See indoor unit instructions to increase/decrease fan speed.

   Changing air flow affects all temperatures; recheck temperatures to confirm that the temperature drop and \( DT \) are within \( \pm 3^\circ \).

---

**Figure 22. Checking Airflow over Indoor Coil Using Delta-T Formula**

1. Check liquid and vapor line pressures. Compare pressures with either second-stage heat or cooling mode normal operating pressures listed in table 4. Table 4 is a general guide and expect minor pressures variations. Significant pressure differences may indicate improper charge or other system problem.

2. Decide whether to use cooling or heating mode based on current outdoor ambient temperature:

   - **A**Use COOLING MODE when:
     - Outdoor ambient temperature is \( 60^\circ F \) \( \text{(15.5}^\circ C) \) \text{ and above.}
     - Indoor return air temperature range is between \( 70 \) to \( 80^\circ F \) \( \text{(21-27}^\circ C) \). This temperature range is what the target subcooling values are base upon in table 3. If indoor return air temperature is not within reference range, set thermostat to cooling mode and a setpoint of \( 68^\circ F \) \( \text{(20}^\circ C) \). This should place the outdoor unit into second-stage (high-capacity) cooling mode. When operating and temperature pressures have stabilized, continue to step 3.

   - **B**Use HEATING MODE when:
     - Outdoor ambient temperature is \( 59^\circ F \) \( \text{(15.0}^\circ C) \) \text{ and below.}
     - Indoor return air temperature range is between \( 65-75^\circ F \) \( \text{(18-24}^\circ C) \). This temperature range is what the target subcooling values are base upon in table 3. If indoor return air temperature is not within reference range, set thermostat to heating mode and a setpoint of \( 77^\circ F \) \( \text{(25}^\circ C) \). This should place the outdoor unit into second-stage (high-capacity) heating mode. When operating and temperature pressures have stabilized, continue to step 3.

3. Read the liquid line pressure; then find its corresponding temperature pressure listed in table 5 and record it in the SAT° space to the left.

4. Read the liquid line temperature; record in the LIQ° space to the left.

5. Subtract LIQ° temperature from SAT° temperature to determine subcooling; record it in SC° space to the left.

6. Compare SC° results with table 3 (either Heating or Cooling mode column), also consider any additional charge required for line set lengths longer than 15 feet and/or unit matched component combinations (Add Charge column).

7. If subcooling value is:
   - **AGREAT**er than shown for the applicable unit match component, REMOVE refrigerant;
   - **BLESS** shown for the applicable unit match component, ADD refrigerant.

8. If refrigerant is added or removed, repeat steps 3 through 6 to verify charge.

9. Close all manifold gauge set valves and disconnect gauge set from outdoor unit.

10. Replace the stem and service port caps and tighten as specified in Operating Service Valves on page 2.

11. Recheck voltage while the unit is running. Power must be within range shown on the nameplate.

---

**Figure 23. Using HFC-410A Subcooling Method — Second Stage (High Capacity) — Optimizing Charge**
Listed below are the approved matched system components (air handlers and indoor coils), targeted subcooling and add charge values for the 13HPX. This information is also listed on the unit charging sticker located on the outdoor unit access panel.

### Table 3 - Indoor Unit Matches, Targeted Subcooling and Add Charge Values

<table>
<thead>
<tr>
<th>Size</th>
<th>Indoor Coil or Air Handler</th>
<th>Subcooling</th>
<th>*Additional Charge</th>
<th>Size</th>
<th>Indoor Coil or Air Handler</th>
<th>Subcooling</th>
<th>*Additional Charge</th>
<th>Size</th>
<th>Indoor Coil or Air Handler</th>
<th>Subcooling</th>
<th>*Additional Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBX26UH-018</td>
<td>11 8 0 0</td>
<td>-030 (continued)</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX27UH-024</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX28UH-030</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX29UH-036</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX30UH-042</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX31UH-048</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX26UH-018</td>
<td>11 8 0 0</td>
<td>-030 (continued)</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX27UH-024</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX28UH-030</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX29UH-036</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX30UH-042</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBX31UH-048</td>
<td>11 14 1 1</td>
<td>CBX40UHV-036</td>
<td>9 22 1 0</td>
<td>CHS3-34B</td>
<td>10 7 0 0</td>
<td>CBX4-34A</td>
<td>8 14 1 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Amount of charge required in addition to charge shown on unit nameplate.

### Table 4. Normal Operating Pressures - Liquid +10 and Vapor +5 PSIG

**IMPORTANT**

Use table 4 as a general guide when performing maintenance checks. This is not a procedure for charging the unit (Refer to Charging / Checking Charge section). Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system.

#### Vapor Line Pressures

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Heating Mode</th>
<th>Cooling Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F (°C)*</td>
<td>20 (-7)</td>
<td>30 (-1)</td>
</tr>
<tr>
<td>13HPX-018</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 147</td>
</tr>
<tr>
<td>13HPX-024</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
<tr>
<td>13HPX-030</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
<tr>
<td>13HPX-036</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
<tr>
<td>13HPX-042</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
<tr>
<td>13HPX-048</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
<tr>
<td>13HPX-060</td>
<td>136 138 138 139 140</td>
<td>141 142 144 145 146</td>
</tr>
</tbody>
</table>

*Temperature of the air entering the outside coil.*
## Liquid Line Pressures

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Heating Mode</th>
<th>Cooling Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>°F (°C)</strong></td>
<td>20 (−7)</td>
<td>30 (−1)</td>
</tr>
<tr>
<td>13HPX-018</td>
<td>275</td>
<td>289</td>
</tr>
<tr>
<td>13HPX-024</td>
<td>267</td>
<td>283</td>
</tr>
<tr>
<td>13HPX-030</td>
<td>267</td>
<td>279</td>
</tr>
<tr>
<td>13HPX-036</td>
<td>289</td>
<td>309</td>
</tr>
<tr>
<td>13HPX-042</td>
<td>275</td>
<td>288</td>
</tr>
<tr>
<td>13HPX-048</td>
<td>274</td>
<td>286</td>
</tr>
<tr>
<td>13HPX-060</td>
<td>275</td>
<td>287</td>
</tr>
</tbody>
</table>

*Temperature of the air entering the outside coil.

### Table 5. HFC-410A Temperature — Pressure (Psig)

<table>
<thead>
<tr>
<th>°F</th>
<th>°C</th>
<th>Psig</th>
<th>°F</th>
<th>°C</th>
<th>Psig</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>-40.0</td>
<td>11.6</td>
<td>60</td>
<td>15.6</td>
<td>170</td>
</tr>
<tr>
<td>-35</td>
<td>-37.2</td>
<td>14.9</td>
<td>65</td>
<td>18.3</td>
<td>185</td>
</tr>
<tr>
<td>-30</td>
<td>-34.4</td>
<td>18.5</td>
<td>70</td>
<td>21.1</td>
<td>201</td>
</tr>
<tr>
<td>-25</td>
<td>-31.7</td>
<td>22.5</td>
<td>75</td>
<td>23.9</td>
<td>217</td>
</tr>
<tr>
<td>-20</td>
<td>-28.9</td>
<td>26.9</td>
<td>80</td>
<td>26.7</td>
<td>235</td>
</tr>
<tr>
<td>-15</td>
<td>-26.1</td>
<td>31.7</td>
<td>85</td>
<td>29.4</td>
<td>254</td>
</tr>
<tr>
<td>-10</td>
<td>-23.3</td>
<td>36.8</td>
<td>90</td>
<td>32.2</td>
<td>274</td>
</tr>
<tr>
<td>-5</td>
<td>-20.6</td>
<td>42.5</td>
<td>95</td>
<td>35.0</td>
<td>295</td>
</tr>
<tr>
<td>0</td>
<td>-17.8</td>
<td>48.6</td>
<td>100</td>
<td>37.8</td>
<td>317</td>
</tr>
<tr>
<td>5</td>
<td>-15.0</td>
<td>55.2</td>
<td>105</td>
<td>40.6</td>
<td>340</td>
</tr>
<tr>
<td>10</td>
<td>-12.2</td>
<td>62.3</td>
<td>110</td>
<td>43.3</td>
<td>365</td>
</tr>
<tr>
<td>15</td>
<td>-9.4</td>
<td>70.0</td>
<td>115</td>
<td>46.1</td>
<td>391</td>
</tr>
<tr>
<td>20</td>
<td>-6.7</td>
<td>78.3</td>
<td>120</td>
<td>48.9</td>
<td>418</td>
</tr>
<tr>
<td>25</td>
<td>-3.9</td>
<td>87.3</td>
<td>125</td>
<td>51.7</td>
<td>446</td>
</tr>
<tr>
<td>30</td>
<td>-1.1</td>
<td>96.8</td>
<td>130</td>
<td>54.4</td>
<td>476</td>
</tr>
<tr>
<td>35</td>
<td>1.7</td>
<td>107</td>
<td>135</td>
<td>57.2</td>
<td>507</td>
</tr>
<tr>
<td>40</td>
<td>4.4</td>
<td>118</td>
<td>140</td>
<td>60.0</td>
<td>539</td>
</tr>
<tr>
<td>45</td>
<td>7.2</td>
<td>130</td>
<td>145</td>
<td>62.8</td>
<td>573</td>
</tr>
<tr>
<td>50</td>
<td>10.0</td>
<td>142</td>
<td>150</td>
<td>65.6</td>
<td>608</td>
</tr>
<tr>
<td>55</td>
<td>12.8</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
System Operation

UNIT COMPONENTS

**IMPORTANT**

Some scroll compressors have 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.**

The outdoor unit and indoor blower cycle on demand from the room thermostat. If the thermostat blower switch is in the ON position, the indoor blower operates continuously.

**Bi-Flow Liquid line Filter Drier**

The unit is equipped with a large-capacity bi-flow filter drier which keeps the system clean and dry. If replacement is necessary, order another of the same design and capacity. The replacement filter drier must be suitable for use with HFC-410A refrigerant.

**Low Pressure Switch (S87)**

The 13HPX is equipped with an auto-reset low pressure switch which is located on the vapor line. The switch shuts off the compressor when the vapor pressure falls below the factory setting. This switch, which is ignored during defrost operation, closes at pressures at or above 40 ± 5 psig (276 ± 34 kPa) and opens at 25 ± 5 psig (172 ± 34 kPa). It is not adjustable.

**Low Pressure Switch Bypass (S41) (Optional)**

For use in applications where the heat pump is operated in outdoor ambient temperatures below 15°F.

- Prevents nuisance trips from the low pressure switch
- Wired in parallel with the low pressure switch

**High Pressure Switch (S4)**

The 13HPX is equipped with an auto-reset high pressure switch (single-pole, single-throw) which is located on the liquid line. The switch shuts off the compressor when discharge pressure rises above the factory setting. The switch is normally closed and is permanently adjusted to trip (open) at 590 ± 15 psig (4068 ± 103 kPa).

**NOTE** — A Schrader core is under the pressure switches.

**Defrost Thermostat (S6)**

The defrost thermostat is located on the liquid line between the check/expansion valve and the distributor. When defrost thermostat senses 42°F (5.5°C) or cooler, the thermostat contacts close and send a signal to the defrost control to start the defrost timing. It also terminates defrost when the liquid line warms up to 70°F (21°C).

**Crankcase Heater (HR1) and Thermostat Switch (S40) (-60 model only)**

All models sizes are equipped with a belly band type crankcase heater. HR1 prevents liquid from accumulating in the compressor. The HR1 is controlled by a single pole, single throw thermostat switch (S40) located on the liquid line (see figure 1 for location). On all other units, the heater is on when there is no compressor operation.

**Thermal Protection Switch (S173) — Compressor Mounted**

Some XC13 units are equipped with a compressor mounted normally closed temperature switch that prevents compressor damage due to overheating caused by internal friction. The switch is located on top of the compressor casing (see figure 1). This switch senses the compressor casing temperature and opens at 239-257°F (115°C-125°C) to shut off compressor operation. The auto-reset switch closes when the compressor casing temperature falls to 151-187°F (66°C-86°C), and the compressor is re-energized. This single-pole, single-throw (SPST) bi-metallic switch is wired in series with the 24V Y input signal to control compressor operation.

**Defrost System**

The defrost system includes a defrost thermostat (S6) and a defrost control (CMC1).

**DEFROST CONTROL (CMC1)**

This defrost control includes the combined functions of a time/temperature defrost control, defrost relay, time delay, diagnostic LEDs, and a terminal strip for field wiring connections.

**Figure 24. Defrost Control (CMC1)**

The defrost control provides automatic switching from normal heating operation to defrost mode and back. When the defrost thermostat is closed, the control accumulates compressor run time at 30, 60 or 90 minute field adjustable intervals. When the selected compressor run time interval is reached, the defrost relay is energized and defrost begins.

**Defrost Control Timing Pins (P1)**

Each timing pin selection provides a different accumulated compressor run time period for one defrost cycle. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30 (T1), 60 (T2), or 90 (T3) minutes (see figure 24). The maximum defrost period is 14 minutes and cannot be adjusted.
NOTE — Defrost control part number is listed near the P1 timing pins.

- Units with defrost control 100269-02: Factory default is 60 minutes
- Units with defrost control 100269-04: Factory default is 90 minutes

If the timing selector jumper is missing, the defrost control defaults to a 90-minute defrost interval.

Compressor Delay (P5)
The 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.

- Units with defrost control 100269-02: The compressor will be cycled off for 30 seconds going in and out of the defrost mode when the compressor delay jumper is removed.
- Units with defrost control 100269-04: The compressor will be cycled off for 30 seconds going in and out of the defrost mode when the compressor delay jumper is installed.

NOTE — The 30-second compressor feature is ignored when jumpering the TEST pins.

Time Delay
The timed-off delay is five minutes long. The delay helps to protect the compressor from short-cycling in case the power to the unit is interrupted or a pressure switch opens. The delay is bypassed by placing the timer select jumper across the TEST pins for 0.5 seconds.

Test Mode (P1)
A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in the heating mode and the defrost thermostat is closed or jumpered. If the jumper is in the TEST position at power-up, the defrost control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the defrost control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost thermostat opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

Service Light Connection
The defrost control includes terminal connections for a service light which provides a signal that activates the room thermostat service light during periods of inefficient operation.

Defrost Control Diagnostic LEDs
The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the condition.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Green LED (DS2)</th>
<th>Red LED (DS1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No power to control</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Normal operation / power to control</td>
<td>Simultaneous Slow FLASH</td>
<td></td>
</tr>
<tr>
<td>Anti-short cycle lockout</td>
<td>Alternating Slow FLASH</td>
<td></td>
</tr>
<tr>
<td>High pressure switch fault</td>
<td>Slow FLASH</td>
<td>OFF</td>
</tr>
<tr>
<td>High pressure switch lockout</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Maintenance

Outdoor Unit
1. Clean and inspect outdoor coil (may be flushed with a water hose). Ensure power is off before cleaning.
2. Outdoor unit fan motor is pre-lubricated and sealed. No further lubrication is needed.
3. Visually inspect all connecting lines, joints and coils for evidence of oil leaks.
4. Check all wiring for loose connections.
5. Check for correct voltage at unit (unit operating).
6. Check amp draw on outdoor fan motor.

Motor Nameplate:_________ Actual:_________.

7. Inspect drain holes in coil compartment base and clean if necessary.

NOTE - If insufficient heating or cooling occurs, the unit should be gauged and refrigerant charge should be checked.

Outdoor Coil
It may be necessary to flush the outdoor coil more frequently if it is exposed to substances which are corrosive or which block airflow across the coil (e.g., pet urine, cottonwood seeds, fertilizers, fluids that may contain high levels of corrosive chemicals such as salts)

- Outdoor Coil — The outdoor coil may be flushed with a water hose.
- Outdoor Coil (Sea Coast) — Moist air in ocean locations can carry salt, which is corrosive to most metal. Units that are located near the ocean require frequent inspections and maintenance. These inspections will determine the necessary need to wash the unit including the outdoor coil. Consult your installing contractor for proper intervals/procedures for your geographic area or service contract.

Indoor Unit
1. Clean or change filters.
2. Lennox blower motors are prelubricated and permanently sealed. No more lubrication is needed.
3. Adjust blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
4. Belt Drive Blowers - Check belt for wear and proper tension.
5. Check all wiring for loose connections.
6. Check for correct voltage at unit. (blower operating)
7. Check amp draw on blower motor.
   Motor Nameplate:_______ Actual:__________

   Indoor Coil
   1. Clean coil if necessary.
   2. Check connecting lines, joints and coil for evidence of oil leaks.
   3. Check condensate line and clean if necessary.

   HOMEOWNER
   Cleaning of the outdoor unit’s coil should be performed by a trained service technician. Contact your dealer and set up a schedule (preferably twice a year, but at least once a year) to inspect and service your outdoor unit. The following maintenance may be performed by the homeowner.

   ! CAUTION
   Physical contact with metal edges and corners while applying excessive force or rapid motion can result in personal injury. Be aware of, and use caution when working near these areas during installation or while servicing this equipment.

   ! 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 and diminish performance and longevity of the unit.

   Outdoor Coil
   The outdoor unit must be properly maintained to ensure its proper operation.
   - Please contact your dealer to schedule proper inspection and maintenance for your equipment.
   - Make sure no obstructions restrict airflow to the outdoor unit.
   - Grass clippings, leaves, or shrubs crowding the unit can cause the unit to work harder and use more energy.
   - Keep shrubbery trimmed away from the unit and periodically check for debris which collects around the unit.

   Routine Maintenance
   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.
   1. Air Filter — Ask your Lennox dealer to show you where your indoor unit’s 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.
   2. Disposable Filter — Disposable filters should be replaced with a filter of the same type and size.
   NOTE — If you are unsure about the filter required for your system, call your Lennox dealer for assistance.
   3. Reusable Filter — Many indoor units are equipped with reusable foam filters. Clean foam filters with a mild soap and water solution; rinse thoroughly; allow filter to dry completely before returning it to the unit or grille.
   NOTE — The filter and all access panels must be in place any time the unit is in operation.
   4. Indoor Unit — The indoor unit’s evaporator 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.)

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

   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.

   Extended Power Outage
   The heat pump is equipped with a compressor crankcase heater which protects the compressor from refrigerant slugging 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.

   Preservice 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.

Accessories
For update-to-date information, see any of the following publications:
- Lennox 13HPX Engineering Handbook
- Lennox Product Catalog
- Lennox Price Book

### Start-Up and Performance Checklist

<table>
<thead>
<tr>
<th>Job Name __________________________</th>
<th>Job no. _______</th>
<th>Date ________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Location ______________________</td>
<td>City _______</td>
<td>State ________</td>
</tr>
<tr>
<td>Installer __________________________</td>
<td>City _______</td>
<td>State ________</td>
</tr>
</tbody>
</table>
| Unit Model No. _______ Serial No. __________________________ | Service Technician _______
| Nameplate Voltage __________________________ |
| Rated Load Ampacity ______ | Compressor ______ | Outdoor Fan ______ |
| Maximum Fuse or Circuit Breaker ______ |
| Electrical Connections Tight? ✔ | Indoor Filter clean? ✔ | Supply Voltage (Unit Off) ______ |
| Indoor Blower RPM ______ | S.P. Drop Over Indoor (Dry) ______ | Outdoor Coil Entering Air Temp. ______ |
| Discharge Pressure ______ | Vapor Pressure ______ | Refrigerant Charge Checked? ✔ |
| Refrigerant Lines: - Leak Checked? ✔ | Properly Insulated? ✔ | Outdoor Fan Checked? ✔ |
| Service Valves: - - - Fully Opened? | Caps Tight? | | Thermostat
| Voltage With Compressor Operating | Calibrated? ✔ | Properly Set? ✔ | Level? ✔ |

Page 32