LENNOX®

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

⚠ 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.

⚠ 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

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

⚠ IMPORTANT

This unit must be matched with an indoor coil as specified in Lennox XP16 Engineering Handbook. Coils previously charged with HCFC-22 must be flushed.

INSTALLATION INSTRUCTIONS

Elite® Series XP16 Units

HEAT PUMPS
506130-01
06/09
Supersedes 05/09

Technical Publications
Litho U.S.A.

Table of Contents

Shipping and Packing List

Check unit for shipping damage. Consult last carrier immediately if damage is found.

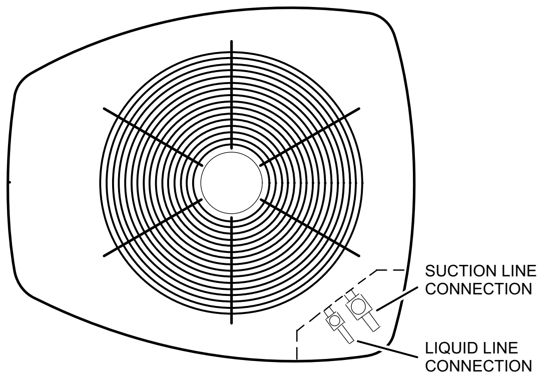
1 - Assembled XP16 outdoor unit

XP16 Heat Pumps

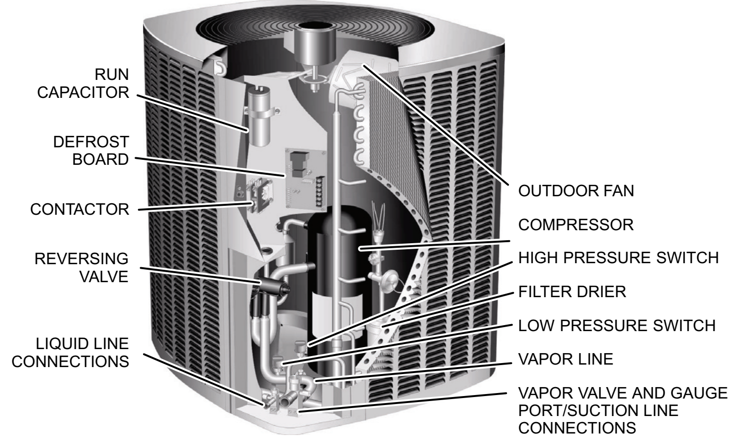
The XP16 Heat Pumps, which will be referred to in this instruction as the outdoor unit, uses HFC-410A refrigerant. This outdoor unit must be installed with a matching indoor unit and line set as outlined in the *Lennox XP16 Engineering Handbook*.

This outdoor unit is designed for use in systems that use check thermal expansion valve (CTXV) refrigerant metering devices.

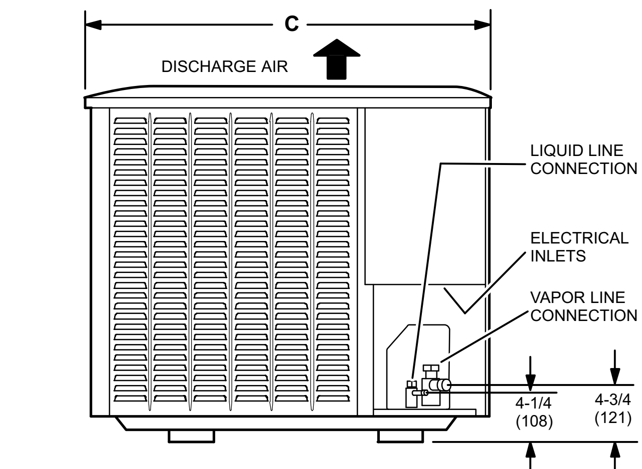
Unit Dimensions - inches (mm)



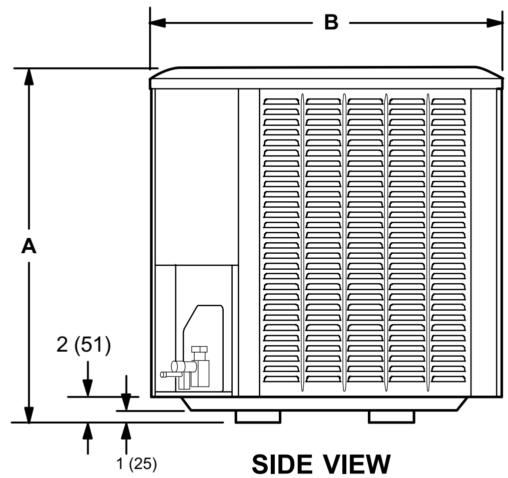
TOP VIEW



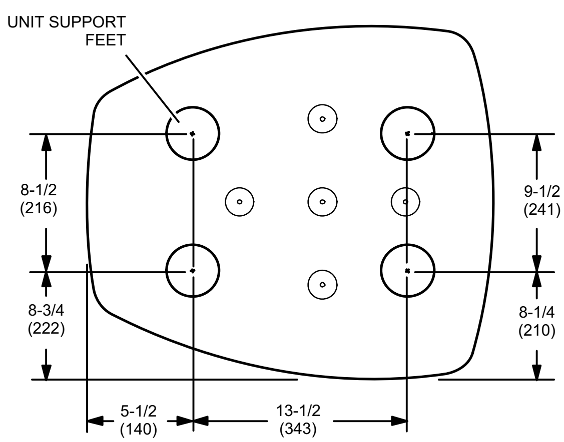
XP16 PARTS ARRANGEMENT



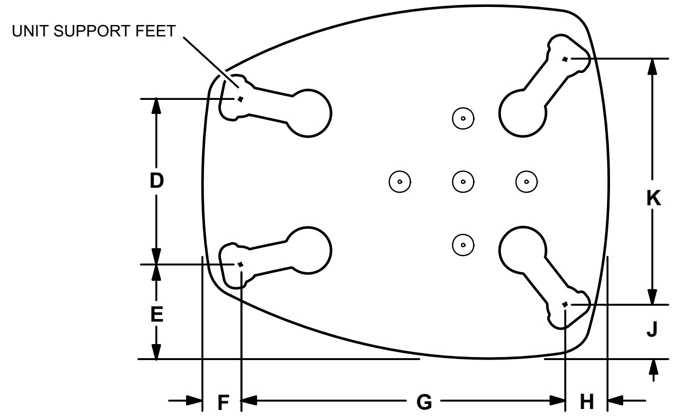
SIDE VIEW



SIDE VIEW



XP16-024 BASE SECTION



XP16 BASE WITH ELONGATED LEGS

Model/Capacity	A	B	C	D	E	F	G	H	J	K
XP16-024	31 (787)	27 (686)	28 (711)	-	-	-	-	-	-	-
XP16-036	35 (889)	30-1/2 (775)	35 (889)	13-7/8 (352)	7-3/4 (197)	3-1/4 (83)	27-1/8 (689)	3-5/8 (92)	4-1/2 (114)	20-5/8 (524)
XP16-048	45 (1143)	30-1/2 (775)	35 (889)							
XP16-060	39 (991)	30-1/2 (775)	35 (889)	16-7/8 (429)	8-3/4 (222)	3-1/8 (79)	30-3/4 (781)	4-5/8 (117)	3-3/4 (95)	26-7/8 (683)

⚠ WARNING

This product and/or the indoor unit it is matched with may contain fiberglass wool.

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

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

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

Lennox Industries Inc.
P.O. Box 799900
Dallas, TX 75379-9900

General Information

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

⚠ IMPORTANT

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

⚠ 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.

TORQUE AND TIGHTENING REQUIREMENTS

When servicing or repairing HVAC components, ensure the fasteners are appropriately tightened. Table 1 shows torque values for fasteners and figure 1 shows cap tightening distances.

Table 1. Torque Requirements

Parts	Recommended Torque	
Service valve cap	8 ft.- lb.	11 NM
Sheet metal screws	16 in.- lb.	2 NM
Machine screws #10	28 in.- lb.	3 NM
Compressor bolts	90 in.- lb.	10 NM
Gauge port seal cap	8 ft.- lb.	11 NM

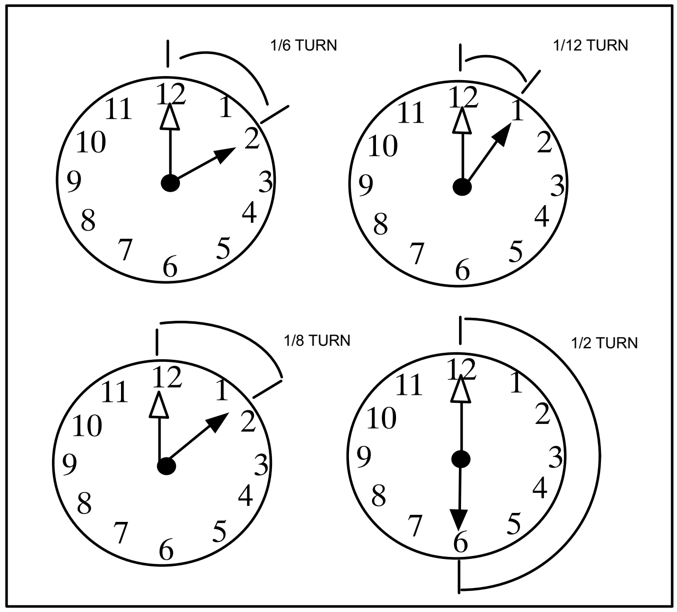


Figure 2. Tightening Distance

USING MANIFOLD GAUGE SETS

When checking the system charge, it is highly recommend that a manifold gauge set that features low-loss anti-blow back fittings is used.

Manifold gauge sets used with HFC-410A refrigerant systems must be capable of handling the higher system operating pressures. The gauges should be rated for use with pressures of 0 - 800 on the high side and a low side of 30” vacuum to 250 psi with dampened speed to 500 psi. Gauge hoses must be rated for use at up to 800 psi of pressure with a 4000 psi burst rating.

OPERATING SERVICE VALVES

The liquid and vapor line service valves are used for removing refrigerant, flushing, leak testing, evacuating, checking charge and charging.

Each valve is equipped with a service port which has a factory-installed valve stem.

To Access Angle-Type Service Port:

A service port cap protects the service port core from contamination and serves as the primary leak seal.

1. Remove service port cap with an appropriately sized wrench.
2. Connect gauge to the service port.
3. When testing is completed, replace service port cap and tighten as follows:
   - *With Torque Wrench*: Finger tighten and then tighten per table 1.
   - *Without Torque Wrench*: Finger tighten and use an appropriately sized wrench to turn an additional 1/6 turn clockwise as illustrated in figure 2.

To Open and Close Angle-Type Service Valve:

A valve stem cap protects the valve stem from contamination and assures a leak-free seal.

1. Remove stem cap with an appropriately sized wrench.
2. Use a service wrench with a hex-head extension (3/16” for liquid-line valve sizes and 5/16” for vapor-line valve sizes) to back the stem out counterclockwise as far as it will go.

3. Replace the stem cap and tighten as follows:
   - With Torque Wrench: Tighten finger tight and then tighten per table 1.
   - Without Torque Wrench: Finger tighten and use an appropriately sized wrenched to turn an additional 1/12 turn clockwise as illustrated in figure 2.

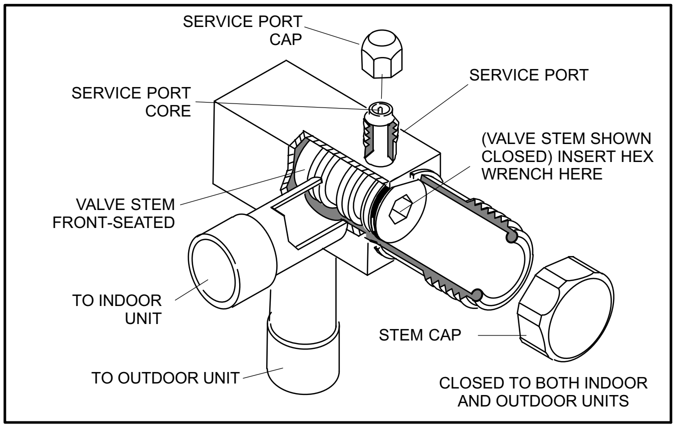


Figure 3. Angle-Type Service Valve (Font-Seated Closed)

NOTE - A label with specific torque requirements may be affixed to the stem cap. If the label is present, use the specified torque.

NOTE- To prevent stripping of the cap, the wrench should be appropriately sized and fit snugly over the cap before tightening the cap.

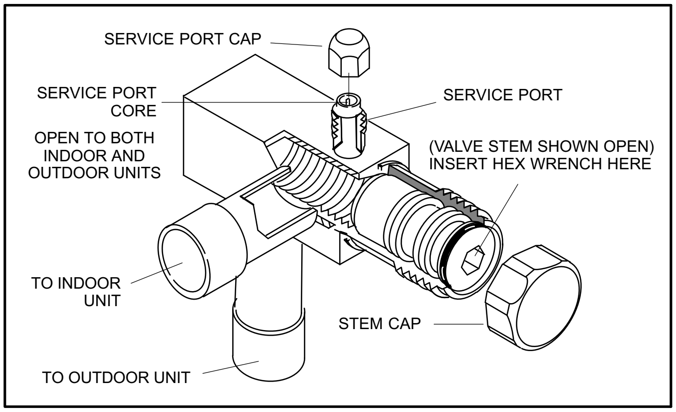


Figure 4. Angle-Type Service Valve (Back-Seated Opened)

To Access Ball-Type Service Port:

A service port cap protects the service port core from contamination and serves as the primary leak seal.

1. Remove service port cap with an appropriately sized wrench.
2. Connect gauge to the service port.
3. When testing is completed, replace service port cap and tighten as follows:
   - *With Torque Wrench*: Finger tighten and then tighten per table 1.
   - *Without Torque Wrench*: Finger tighten and use an appropriately sized wrench to turn an additional 1/6 turn clockwise as illustrated in figure 2.

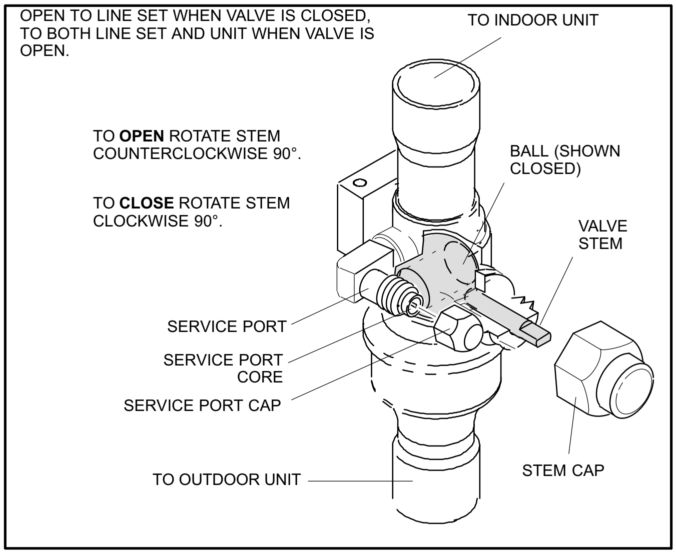


Figure 5. Ball-Type Service Valve

To Open and Close Ball-Type Service Valve:

A valve stem cap protects the valve stem from contamination and assures a leak-free seal.

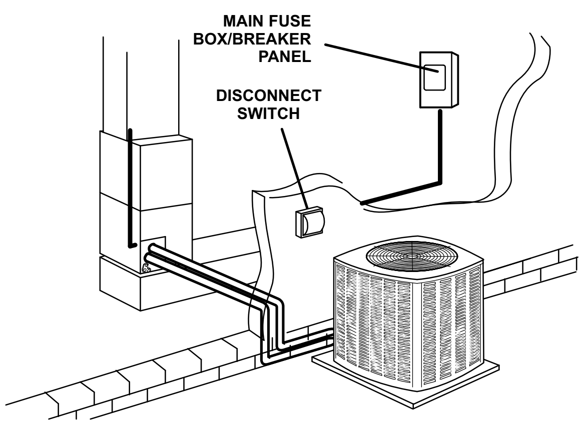
1. Remove stem cap with an appropriately sized wrench.
2. Use an appropriately sized wrenched to open. To open valve, roate stem counterclockwise 90°. To close rotate stem clockwise 90°.
3. Replace the stem cap and tighten as follows:
   - *With Torque Wrench*: Finger tighten and then tighten per table 1.
   - *Without Torque Wrench*: Finger tighten and use an appropriately sized wrench to turn an additional 1/12 turn clockwise as illustrated in figure 2.

NOTE - A label with specific torque requirements may be affixed to the stem cap. If the label is present, use the specified torque.

Recovering Refrigerant from Existing System

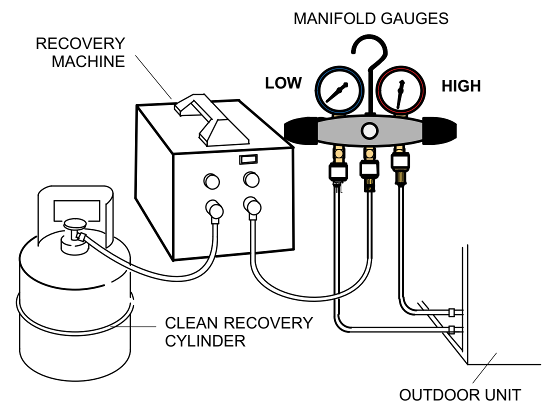
CONNECTING MANIFOLD GAUGE SET AND EQUIPMENT

1 DISCONNECT POWER



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

2 CONNECT MANIFOLD GAUGE SET



Connect to the existing unit a gauge set, clean recovery cylinder and a recovery machine. Use the instructions provided with the recovery machine on how to setup the connections.

Remove existing HCFC-22 refrigerant using one of the following procedures:

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 HCFC-22 to flush the system.

Remove all HCFC-22 refrigerant from the existing system. Check gauges after shutdown to confirm that the entire system is completely void of refrigerant.

METHOD 2:

Use this method if the existing outdoor unit is equipped with manual shut-off valves, and plan on using new HCFC-22 refrigerant to flush the system.

IMPORTANT: Some system configurations may contain higher than normal refrigerant charge due to either large internal coil volumes, and/or long line sets. The following conditions may cause the compressor to stop functioning:

The following devices could prevent full system charge recovery into the outdoor unit:

- Outdoor unit's high or low-pressure switches (if applicable) when tripped can cycled 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 one of the above system conditions, shut off the suction 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.

Perform the following task:

4. Start the existing HCFC-22 system in the cooling mode and close the liquid line valve.
5. Pump as much of the existing HCFC-22 refrigerant with the compressor back into the outdoor unit until you have reached the limitations of the outdoor system. Turn the outdoor unit main power **OFF** and use a recovery machine to remove the remaining refrigerant in the system.

NOTE - It may be necessary to bypass the low pressure switches if equipped to ensure complete refrigerant evacuation.

6. When the low side system pressures reach 0 psig, close the suction line valve.
7. Check gauges after shutdown to confirm that the valves are not allowing refrigerant to flow back into the low side of the system.

Removing Existing Outdoor Unit

Perform the following task at the existing outdoor unit:

- Disconnect line set at the service valves.
- Disconnect electrical service at the disconnect switch.
- Remove old outdoor unit.

Positioning New Outdoor Unit

⚠ CAUTION

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

See *Unit Dimensions* on page 3 for sizing mounting slab, platforms or supports. Refer to figure 6 for mandatory installation clearance requirements.

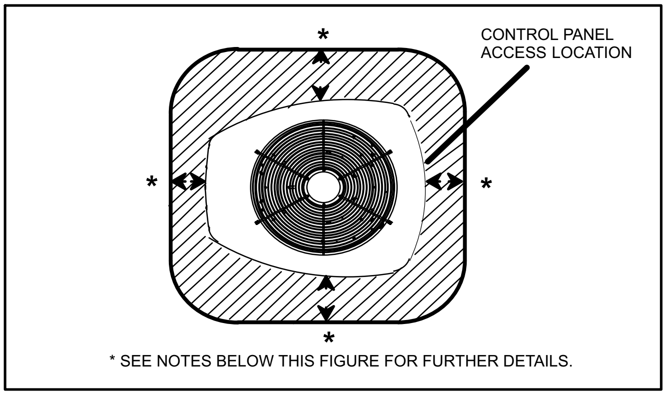


Figure 6. Installation Clearances

NOTES:

- Service clearance of 30 in. (762 mm) must be maintained on one of the sides adjacent to the control box.
- Clearance to one of the other three sides must be 36 in. (914 mm)·
- Clearance to one of the remaining two sides may be 12 in. (305 mm) and the final side may be 6 in. (152 mm)·
- 48 in. (1219 mm) clearance required on top of unit.
- A clearance of 24 in. (610 mm) must be maintained between two units.

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 7.

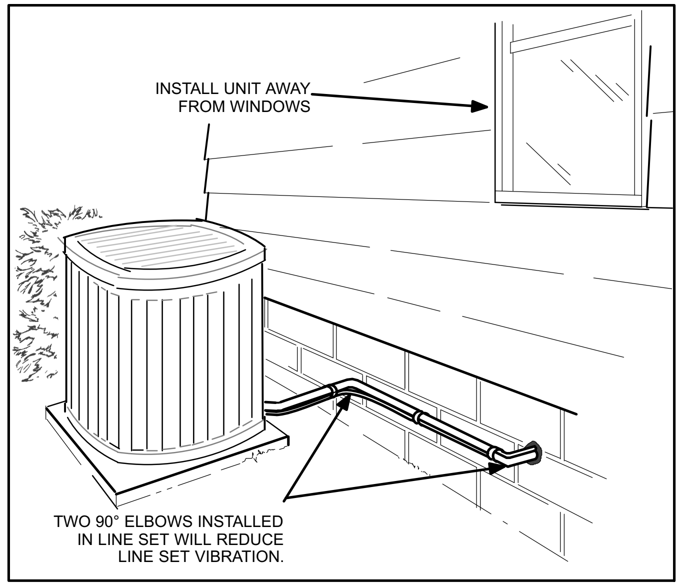


Figure 7. Outside Unit Placement

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 8.

NOTE - If necessary for stability, anchor unit to slab as described in Stabilizing Unit on Uneven Surfaces on page 7.

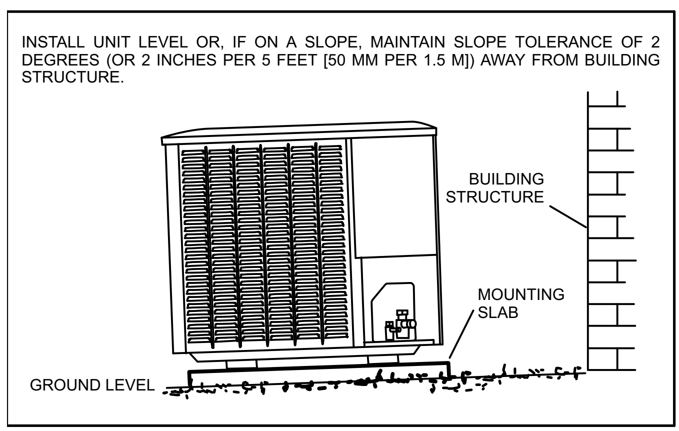


Figure 8. Slab Mounting at Ground Level

ELEVATING THE UNIT (SMALL-BASE UNITS)

If additional elevation is necessary, raise the unit by extending the length of the unit support feet. This may be done by cutting four equal true-cut lengths of Schedule (SCH) 40, 4” (101.6mm) piping to the height required as illustrated in figure 9.

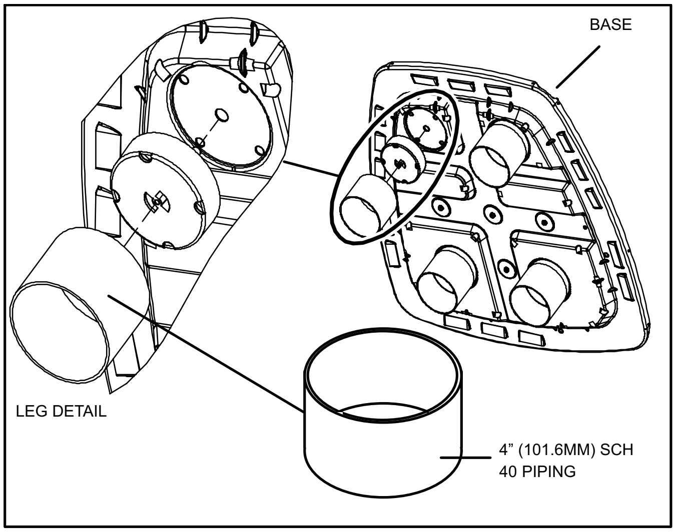


Figure 9. Elevated Slab Mounting using Feet Extenders (Small Base Units)

NOTE - Keep the height of extenders short enough to ensure a sturdy installation. If it is necessary to extend further, consider a different type of field-fabricated framework that is sturdy enough for greater heights.

The inside diameter of the 4” (101.6mm) piping is approximately 0.25” (6.35mm) greater than the pre-installed feet on the unit. Devise a shim that will take up the space and hold the extenders onto the feet during this procedure. Small strips of 0.125” (3.175mm) thick adhesive foam may be used. One or two small 1” (25.4mm) square strips should be adequate to hold the extender in place.

ELEVATING THE UNIT (LARGER-BASE UNITS)

Unlike the small-base units which use round support feet, the larger-base units are outfitted with elongated support feet as illustrated in figure 10 which uses a similar method for elevating the unit.

If additional elevation is necessary, raise the unit by extending the length of the unit support feet. This may be achieved by using a 2” SCH 40 female threaded adapter.

The specified coupling will fit snuggly into the recessed portion of the feet. Use additional 2” SCH 40 male threaded adaptors which can be threaded into the female threaded adaptors to make additional adjustments to the level of the unit.

NOTE - Keep the height of extenders short enough to ensure a sturdy installation. If it is necessary to extend further, consider a different type of field-fabricated framework that is sturdy enough for greater heights.

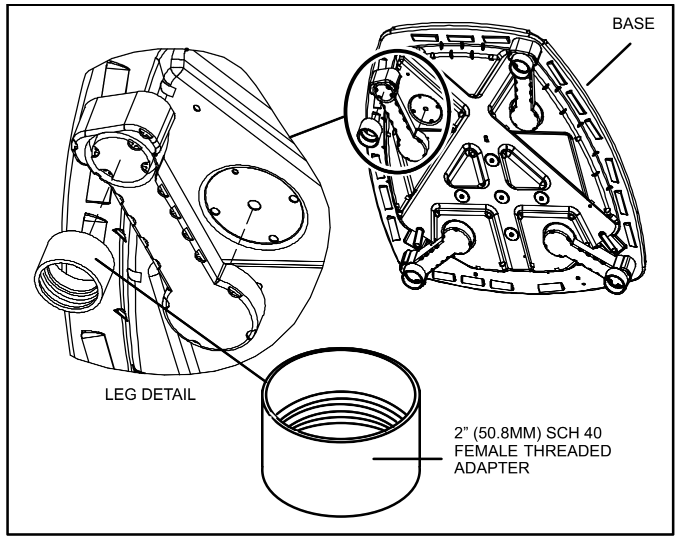


Figure 10. Elevated Slab Mounting using Feet Extenders (Larger Base Units)

ROOF MOUNTING

Install unit at a minimum of four inches above the surface of the roof. Care must be taken to ensure weight of unit is properly distributed over roof joists and rafters. Either redwood, steel supports, or roofed in equipment platform is recommend.

Removing and Installing Panels

⚠ CAUTION

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.

REMOVING PANELS

Remove the louvered panels as follows:

1. Remove two screws, allowing the panel to swing open slightly as illustrated in figure 11.

NOTE - Hold the panel firmly throughout this procedure

2. Rotate bottom corner of panel away from hinge corner post until lower three tabs clear the slots as illustrated in figure 11, detail B.
3. Move panel down until lip of upper tab clears the top slot in corner post as illustrated in figure 11, detail A.

INSTALLING PANEL

Install the louvered panels as follows:

1. Position the panel almost parallel with the unit as illustrated in figure 12, detail D with the screw side as close to the unit as possible.
2. With a continuous motion slightly rotate and guide the lip of top tab inward as illustrated in figure 11, details

A and C, then upward into the top slot of the hinge corner post.

3. Rotate panel to vertical to fully engage all tabs.
4. Holding the panel's hinged side firmly in place, close the right-hand side of the panel, aligning the screw holes.
5. When panel is correctly positioned and aligned, insert the screws and tighten.

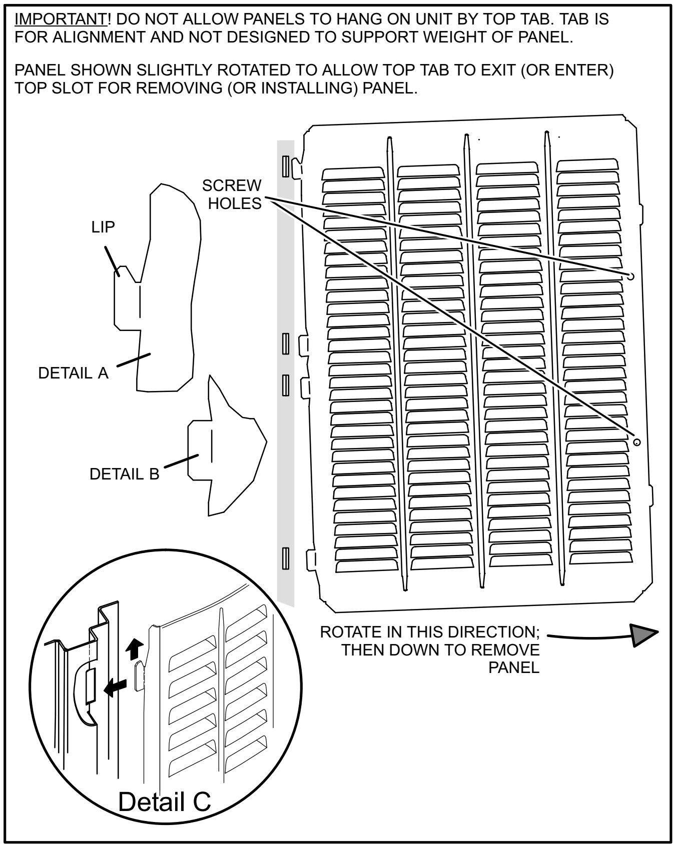


Figure 11. Removing/Installing Louvered Panels (Details A, B and C)

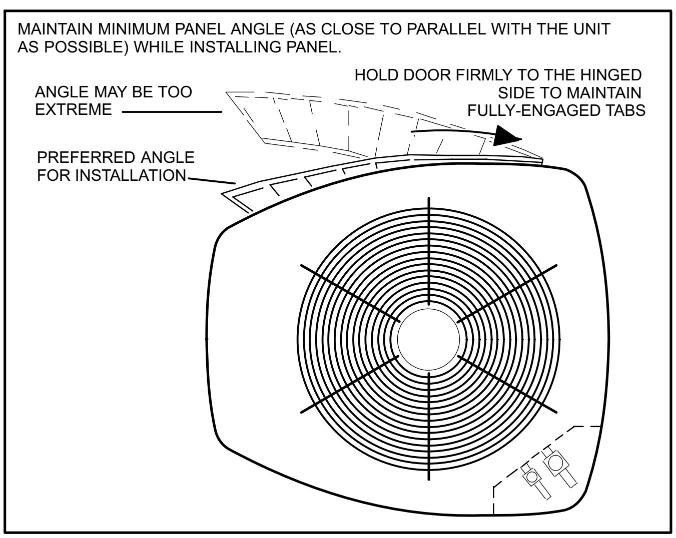


Figure 12. Removing/Installing Louvered Panels (Detail D)

STABILIZING UNIT ON UNEVEN SURFACES

To help stabilize an outdoor unit, some installations may require strapping the unit to the pad using brackets and anchors commonly available in the marketplace.

With unit positioned at installation site, remove two side louvered panels to expose the unit base pan. Install the brackets as illustrated in figure 13 and using conventional practices; replace the panels after installation is complete.

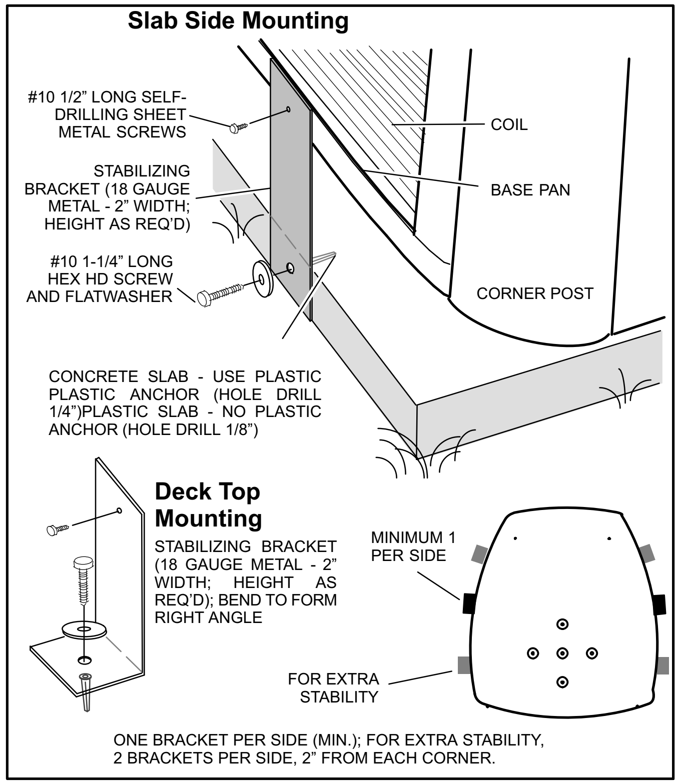


Figure 13. Installing Stabilizer Brackets

⚠ 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 factory height units when mounted on unstable an uneven surface.

New or Replacement Line Set

This section provides information on installation or replacement of existing line set. If line set are not being installed then proceed to *Brazing Connections* on page on page 10.

If refrigerant lines are routed through a wall, 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. Also, consider the following when placing and installing a high-efficiency air conditioner.

REFRIGERANT LINE SET

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

Table 2. Refrigerant Line Set

Model	Field Connections		Recommended Line Set		
	Liquid Line	Suction Line	Liquid Line	Suction Line	L15 Line Set
-024	3/8”. (10 mm)	3/4” (19 mm)	3/8” (10 mm)	3/4” (19 mm)	L15-41 15 ft. - 50 ft. (4.6m - 15 m)
-036 -048	3/8”. (10 mm)	7/8” (22 mm)	3/8” (10 mm)	7/8” (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-060	3/8”. (10 mm)	1-1/8”. (29 mm)	3/8” (10 mm)	1-1/8” (29 mm)	Field Fabricated

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

- Model (XP16) and size of unit (e.g. -060).
- Line set diameters for the unit being installed as listed in table 2 and total length of installation.
- Number of elbows and if there is a rise or drop of the piping.

MATCHING WITH NEW OR EXISTING INDOOR COIL AND LINE SET

The RFC1-metering line consisted of a small bore copper line that ran from condenser to evaporator coil. Refrigerant was metered into the evaporator by utilizing temperature/pressure evaporation effects on refrigerant in the small RFC line. The length and bore of the RFC line corresponded to the size of cooling unit.

If the XP16 is being used with either a new or existing indoor coil which is equipped with a liquid line which served as a metering device (RFCI), the liquid line must be replaced prior to the installation of the XP16 unit. Typically a liquid line used to meter flow is 1/4” in diameter and copper.

INSTALLING LINE SET

Line Set Isolation—This reference illustrates procedures, which ensure proper refrigerant line set isolation:

- Installation of **line set on horizontal runs** is illustrated in figure 14.
- Installation of **line set on vertical runs** is illustrated in figure 15.
- Installation of a **transition from horizontal to vertica**l is illustrated in figure 16.

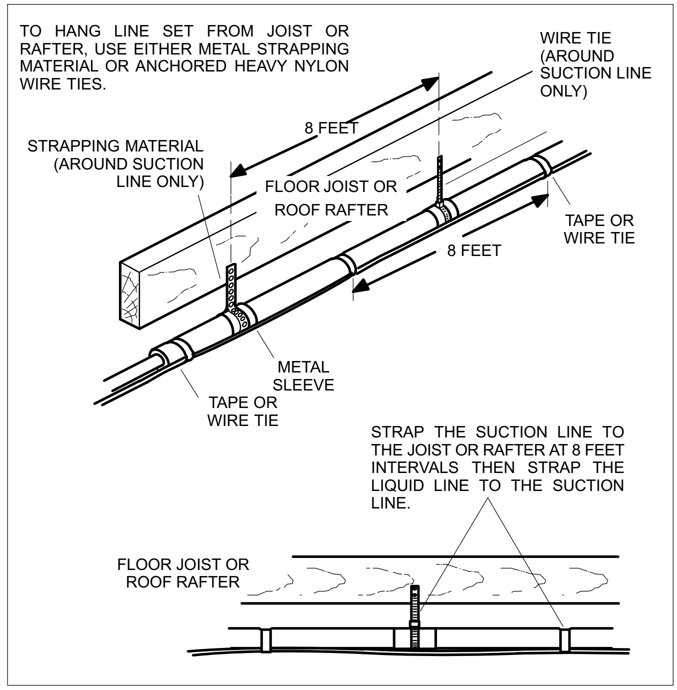


Figure 14. Refrigerant Line Set: Installing Horizontal Runs

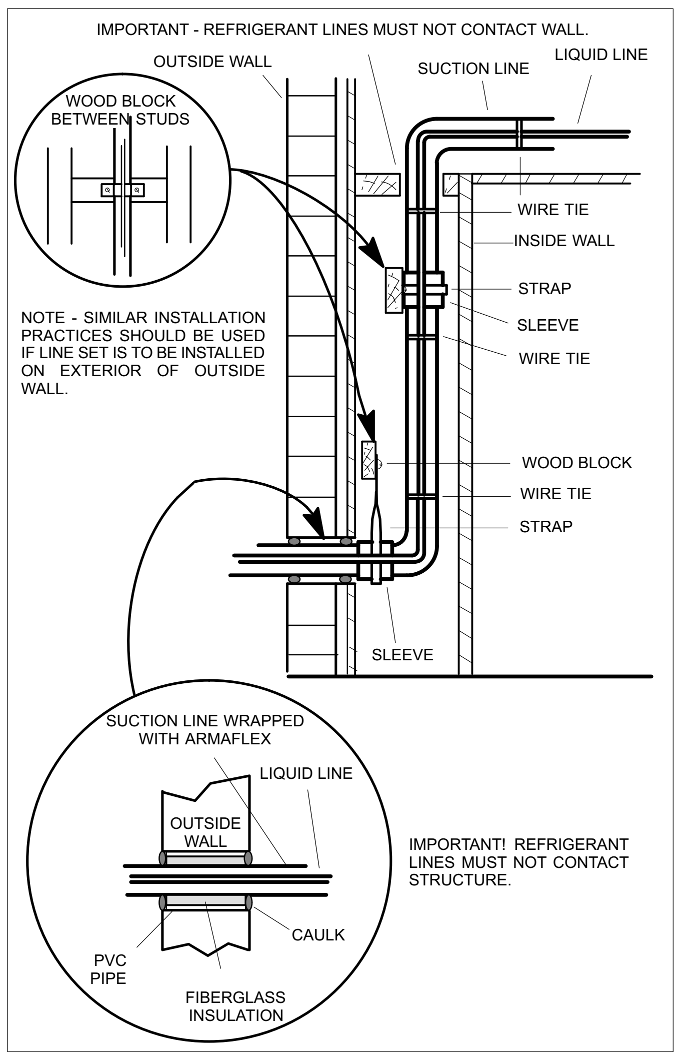


Figure 15. Refrigerant Line Set: Installing Vertical Runs (New Construction Shown)

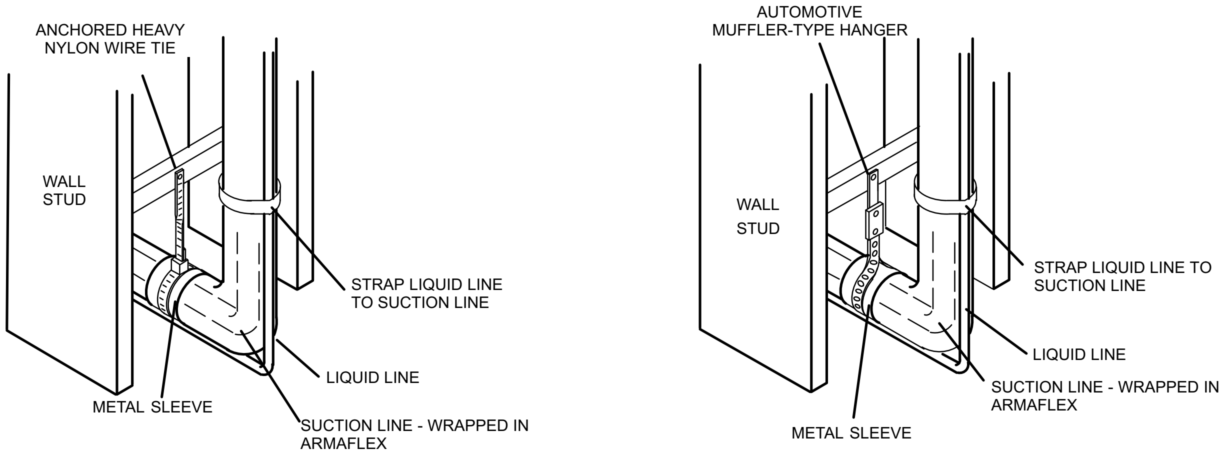


Figure 16. Refrigerant Line Set: Transition from Vertical to Horizontal

Brazing Connections

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.

WARNING

Danger of fire. Bleeding the refrigerant charge from only the high side may result in the low side shell and suction tubing being pressurized. Application of a brazing torch while pressurized may result in ignition of the refrigerant and oil mixture - check the high and low pressures before unbrazing.

WARNING

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).

CAUTION

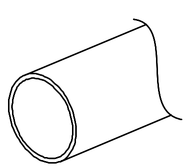
Brazing alloys and flux contain materials which are hazardous to your health.

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.

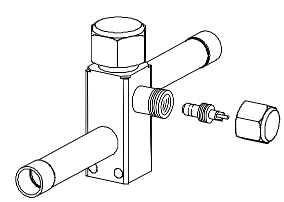
Wash hands with soap and water after handling brazing alloys and flux.

1 CUT AND DEBUR



Cut ends of the refrigerant lines square (free from nicks or dents). Debur the ends. The pipe must remain round, do not pinch end of the line.

2 CAP AND CORE REMOVAL

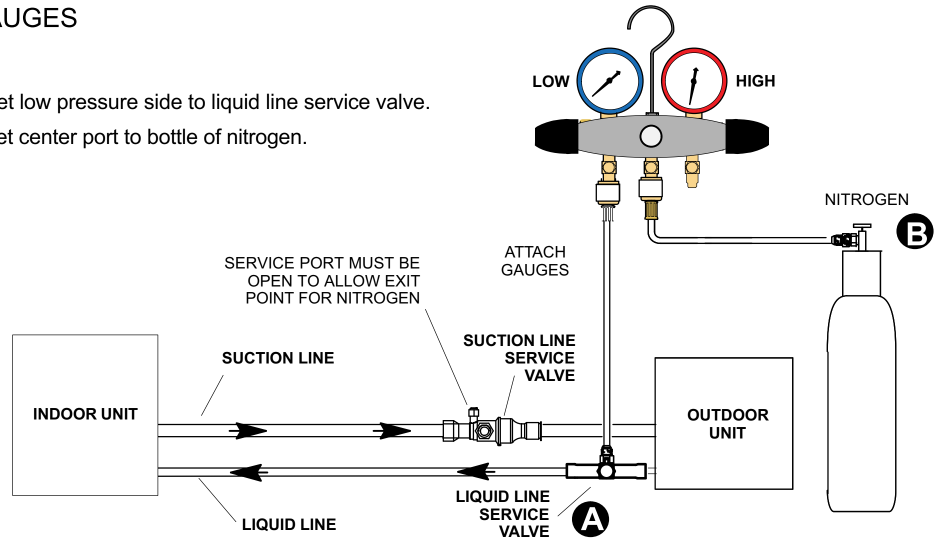


Remove service cap and core from both the suction and liquid line service ports.

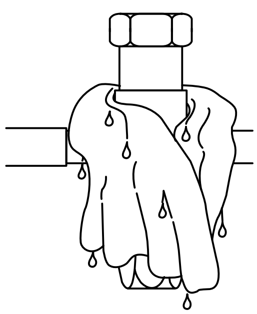
3 ATTACHED GAUGES

A Connect gauge set low pressure side to liquid line service valve.

B Connect gauge set center port to bottle of nitrogen.

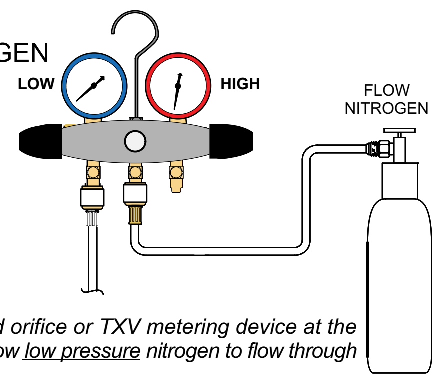


4 WRAP SERVICE VALVE



To protect components during brazing, wrap a wet cloth around the liquid line service valve body and copper tube stub and use another wet cloth underneath the valve body to protect the base paint. Also, shield the light maroon R-410A sticker.

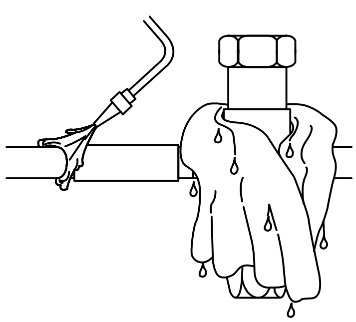
5 FLOW NITROGEN



NOTE - The fixed orifice or TXV metering device at the indoor unit will allow <u>low pressure</u> nitrogen to flow through the system.

Flow regulated nitrogen (at 1 to 2 psig) through the refrigeration gauge set into the valve stem port connection on the liquid line service valve and out of the valve stem port connection on the suction service valve.

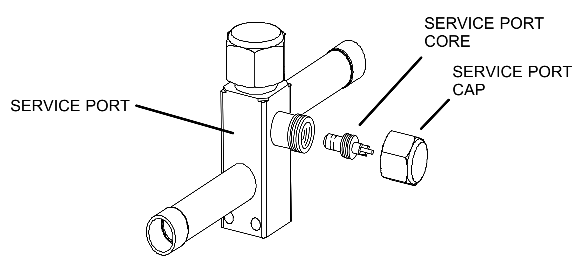
6 BRAZE LINE SET



Braze the liquid line to the liquid line service valve. Turn off nitrogen flow.

IMPORTANT - Repeat procedure starting at paragraph 4 for brazing the suction line to service port valve.

7 INSTALL SERVICE PORT CAPS ONLY



After all connections have been brazed, disconnect manifold gauge set from service ports, cool down piping with wet rag and remove all wrappings. Do not reinstall cores until after evacuation procedure. Reinstall service caps if desired to close off refrigerant ports.

Removing Indoor Unit Metering Device

Remove the existing HCFC-22 refrigerant flow control orifice or thermal expansion valve from the indoor coil. The existing indoor unit HCFC-22 metering device is not approved for use with HFC-410A refrigerant and may prevent proper flushing.

TYPICAL FIXED ORIFICE REMOVAL PROCEDURE

1. On fully cased coils, remove the coil access and plumbing panels.
2. Remove any shipping clamps holding 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 in figure 17.
5. Use a field-provided fitting to temporary reconnect the liquid line to the indoor unit's liquid line orifice housing.

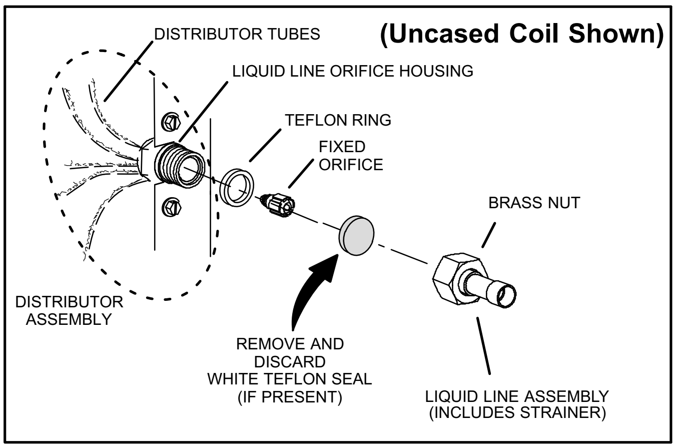


Figure 17. Typical Fixed Orifice Removal

TYPICAL TXV REMOVAL PROCEDURE

1. On fully cased coils, remove the coil access and plumbing panels.
2. Remove any shipping clamps holding the liquid line and distributor assembly.
3. Disconnect the equalizer line from the TXV equalizer line fitting on the suction line.

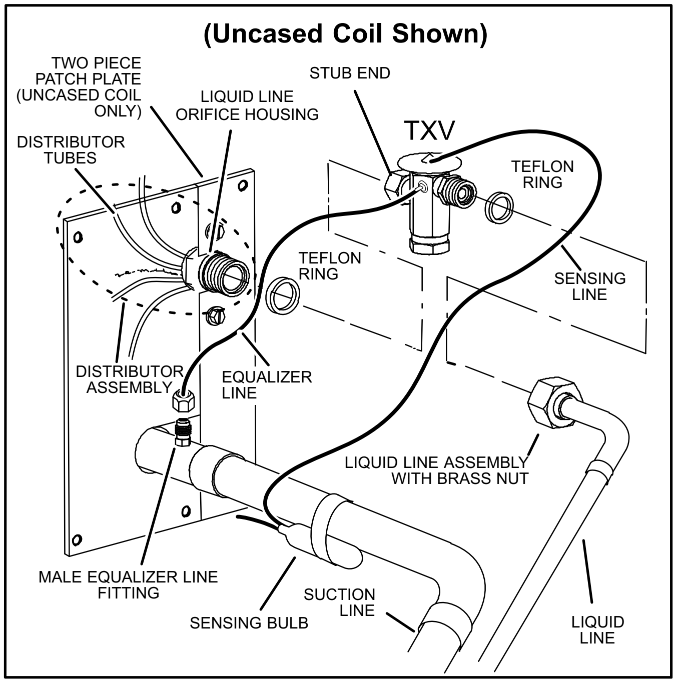


Figure 18. Typical TXV Removal

4. Remove the suction line sensing bulb.
5. Disconnect the liquid line from the TXV at the liquid line assembly.
6. Disconnect the TXV from the liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
7. Remove and discard TXV and the two Teflon rings as illustrated.
8. Use a field-provided fitting to temporary reconnect the liquid line to the indoor unit's liquid line orifice housing.

Flushing the System

If the original system used:

- HCFC-22 refrigerant, then flush the system using the procedure provided in this section.
- HFC-410A refrigerant, then proceed to *Installing New Refrigerant Metering Device*.

IMPORTANT

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.

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.

⚠ IMPORTANT

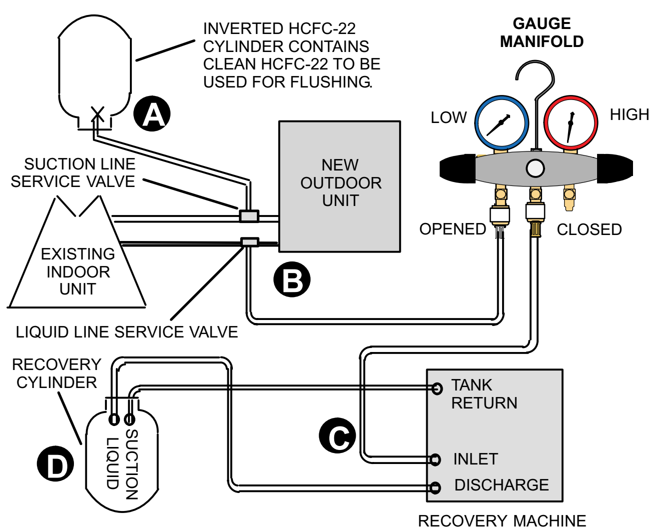
If this unit is being matched with an approved line set or indoor unit coil which was previously charged with mineral oil, or if it is being matched with a coil which was manufactured before January of 1999, the coil and line set must be flushed prior to installation. Take care to empty all existing 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.

REQUIRED EQUIPMENT

Equipment required to flush the existing line set and indoor unit coil:

- Two clean HCFC-22 recovery bottles,
- Oilless recovery machine with pump-down feature,
- Two gauge sets (one for HCFC-22; one for HFC-410A).



A	Inverted HCFC-22 cylinder with clean refrigerant to the suction 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 to the gauge set.
D	Connect recovery tank to recovery machines per machine instructions.

NOTE - The inverted HCFC-22 cylinder must contain at least the same amount of refrigerant as was recovered from the existing system.

Figure 19. Typical Flushing Connection

⚠ CAUTION

This procedure should not be performed on systems which contain contaminants (Example: compressor burn out).

PROCEDURE

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. Invert the cylinder of clean HCFC-22 and open its valve to allow liquid refrigerant to flow into the system through the suction 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 suction recovery so that all of the HCFC-22 suction is recovered. Allow the recovery machine to pull a vacuum on the system.
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.

Refrigerant Metering Device Kits and Replacement Parts

This outdoor unit is designed for use in systems that use a check thermal expansion valve (CTXV).

REPLACEMENT PARTS

If replacement parts are necessary for the indoor unit, order kit 69J46. The kit includes the following parts:

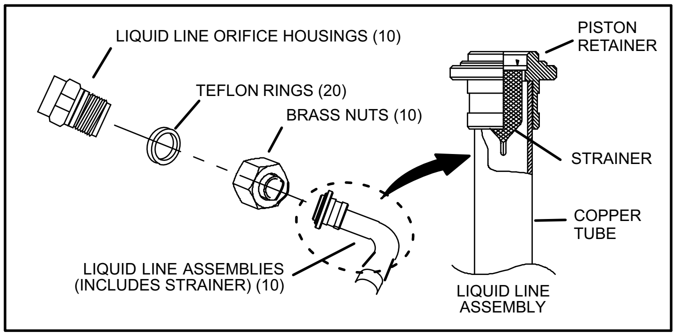


Figure 20. 69J46 Kit Components

See the *Lennox XP16 Engineering Handbook* for approved CTXV kit match-ups and application information.

The CTXV kit includes the following parts:

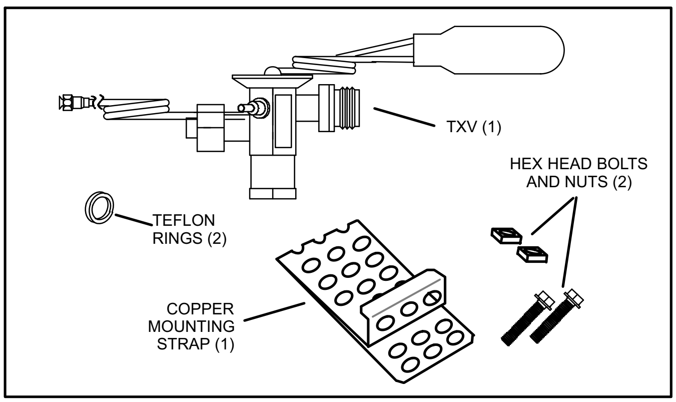


Figure 21. CTXV Kit Components

Installing New Indoor Metering Device

This section provides instructions on installing CTXV refrigerant metering device.

TYPICAL CTXV INSTALLATION PROCEDURE

The CTXV 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 CTXV in a manner that will provide access for field servicing of the CTXV. Refer to Figure 22 for reference during installation of CTXV unit.

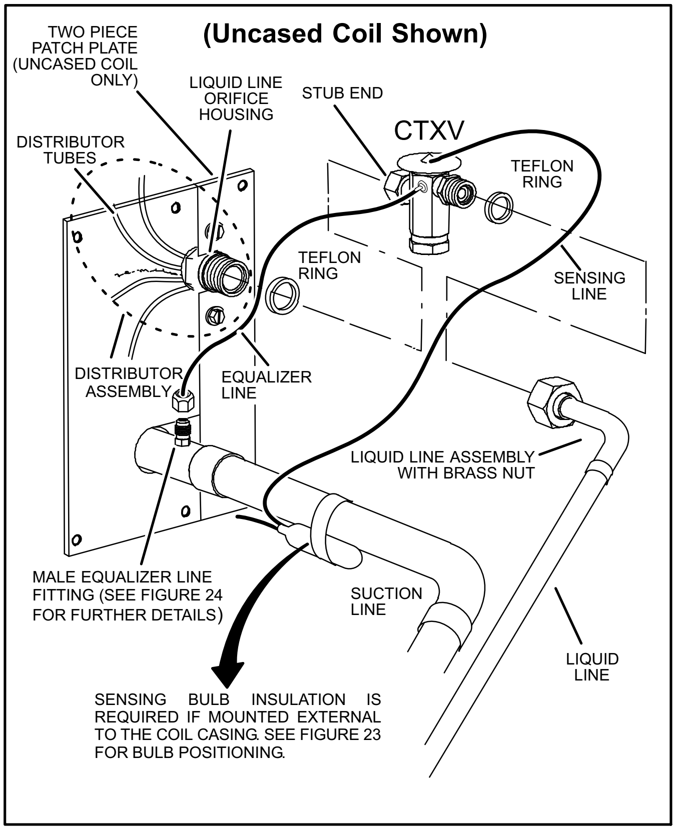


Figure 22. Typical CTXV Installation

1. Remove the field-provided fitting that temporary reconnected the liquid line to the indoor unit's distributor assembly.
2. Install one of the provided Teflon rings around the stubbed end of the CTXV and lightly lubricate the connector threads and expose surface of the Teflon ring with refrigerant oil.
3. Attach the stubbed end of the CTXV 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 figure 2, or 20 ft-lb.
4. Place the remaining Teflon washer around the other end of the CTXV. Lightly lubricate connector threads and expose surface of the Teflon ring with refrigerant oil.
5. Attach the liquid line assembly to the CTXV. Finger tighten and use an appropriately sized wrench to turn an additional 1/2 turn clockwise as illustrated in figure 2, or 20 ft-lb.
6. Attach the suction line sensing bulb in the proper orientation as illustrated in figure 23 using the clamp and screws provided.

NOTE - Insulating the sensing bulb once installed may be required when the bulb location is external to the coil casing.

7. Remove and discard either the flare seal cap or flare nut with copper flare seal bonnet from the equalizer line port on the suction line as illustrated in figure 24.

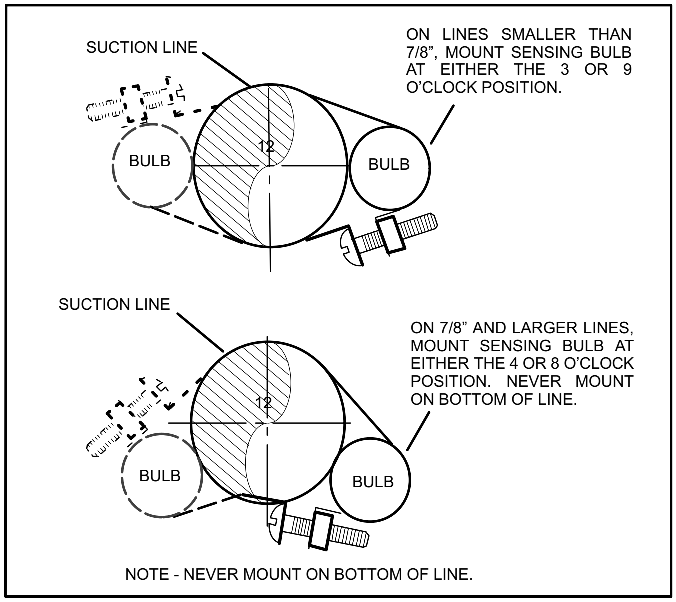


Figure 23. TXV Sensing Bulb Installation

⚠ IMPORTANT

When removing the flare nut, ensure that the copper flare seal bonnet is removed.

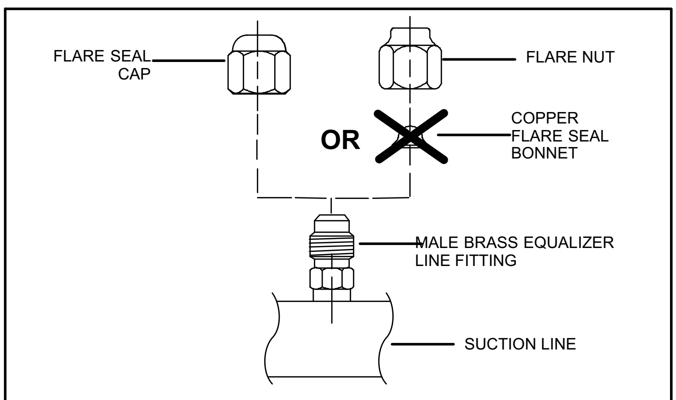


Figure 24. Copper Flare Seal Bonnet Removal

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

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 replace by the nitrogen container.

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

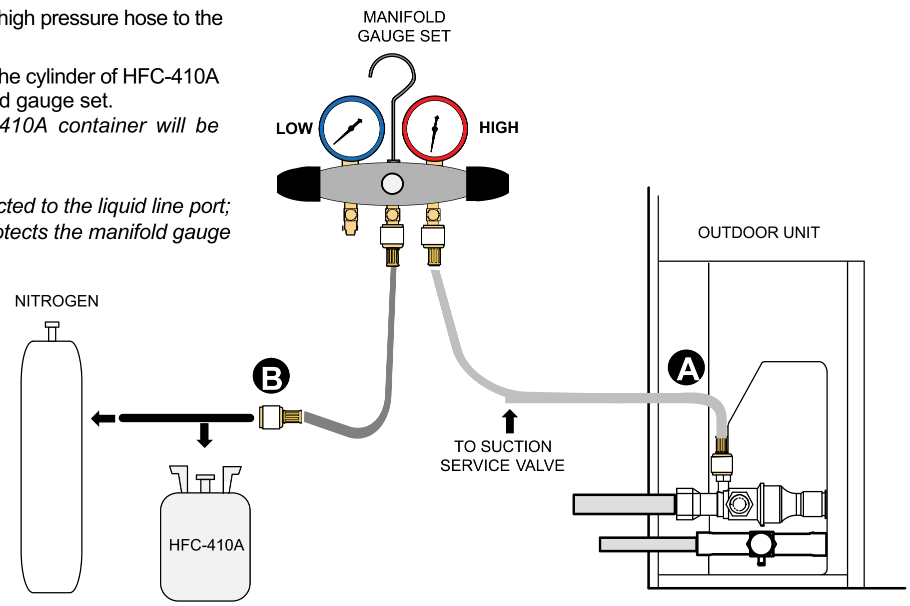


Figure 25. Typical Leak Testing Manifold Gauge Set Connections

8. Connect the equalizer line from the CTXV to the equalizer suction port on the suction line. Finger tighten the flare nut plus 1/8 turn (7 ft-lbs) as illustrated in figure 2.

NOTE - To prevent any possibility of water damage, properly insulate all parts of the CTXV assembly that may sweat due to temperature differences between the valve and its surrounding ambient temperatures.

Leak Testing the System

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

IMPORTANT

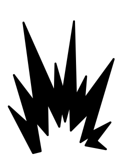
Leak detector must be capable of sensing HFC refrigerant.

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



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).

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 damage by fire and/or an explosion, that could result in personal injury or death.

1. Connect an HFC-410A manifold gauge set high pressure hose to the suction valve service port as illustrated in figure 25.

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

2. 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 (suction only).
3. 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.

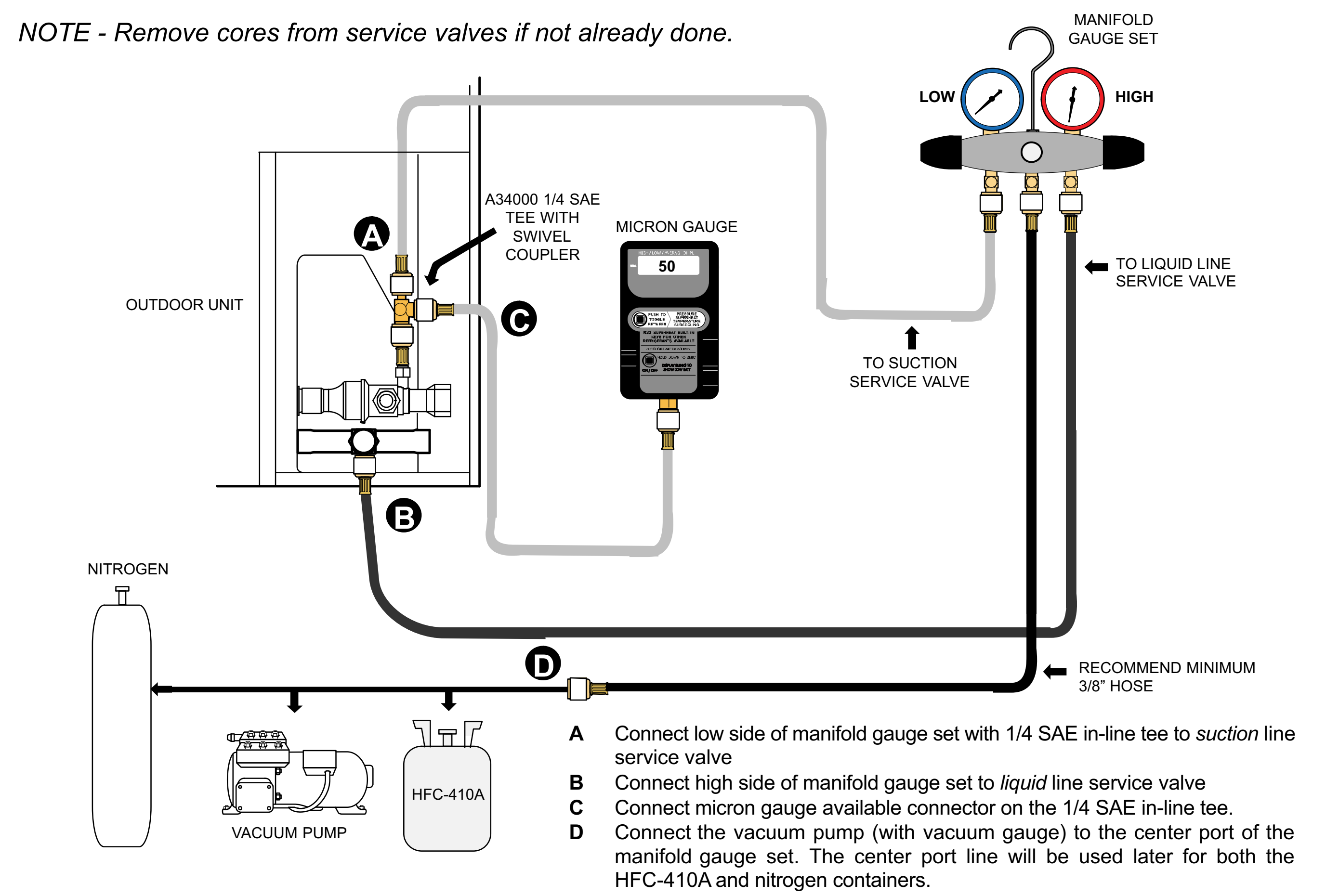


Figure 26. Typical Evacuation Manifold and Micron Gauges Connections

4. Connect a cylinder of dry nitrogen with a pressure regulating valve to the center port of the manifold gauge set.
5. 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.
6. 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.
7. After leak testing disconnect gauges from service ports.

Evacuating the System

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.

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.

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

1. Open both manifold valves and start the vacuum pump.
2. 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 to determine if there is a rapid rise in sure 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.*

3. When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), close the manifold gauge valves, turn off the vacuum pump and disconnect the manifold gauge center port hose from vacuum pump. Attach the manifold center port hose to a dry nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose. Open the manifold gauge valves to break the vacuum in the line set and indoor unit. Close the manifold gauge valves.
4. 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.
5. 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.
6. 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.
7. Perform the following:
   - **A** Close manifold gauge valves.
   - **B** Shut off HFC-410A cylinder.
   - **C** Reinstall service valve cores by removing manifold hose from service valve. Quickly install cores with core tool while maintaining a positive system pressure.
   - **D** Replace the stem caps and secure finger tight, then tighten an additional one-sixth (1/6) of a turn as illustrated in figure 2.

Servicing Units Delivered Void of Charge

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

1. Use nitrogen to pressurize the system and check for leaks. Repair all leaks.
2. Evacuate the system to remove as much of the moisture as possible.
3. Use nitrogen to break the vacuum and install a new filter drier in the system.
4. Evacuate the system again. Then, weigh the appropriate amount of HFC-410A refrigerant as listed on unit nameplate into the system.
5. Monitor the system to determine the amount of moisture remaining in the oil. It may be necessary to replace the filter drier several times to achieve the required dryness level. **If system dryness is not verified, the compressor will fail in the future.**

Electrical

⚠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.

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 blower coil installation instructions for additional wiring application diagrams and refer to unit nameplate for minimum circuit ampacity and maximum overcurrent protection size.

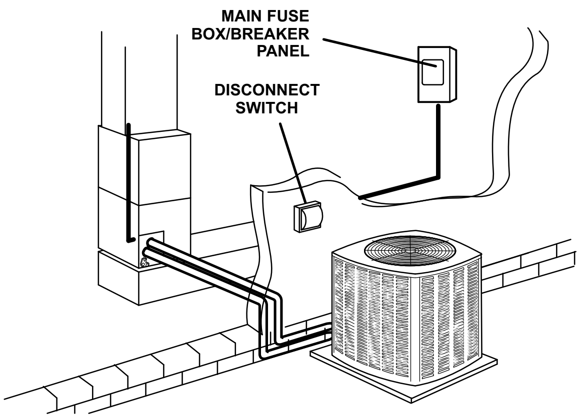
230VAC SUPPLY VOLTAGE

The XP16 outdoor unit is rated for 230VAC applications only. A hard-start kit is required for applications where the supply voltage is less than 230VAC.

24VAC TRANSFORMER

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

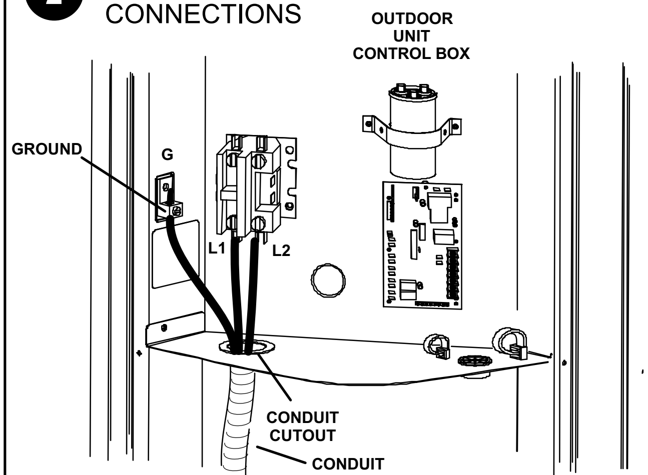
1 CIRCUIT SIZING AND DISCONNECT SWITCH



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

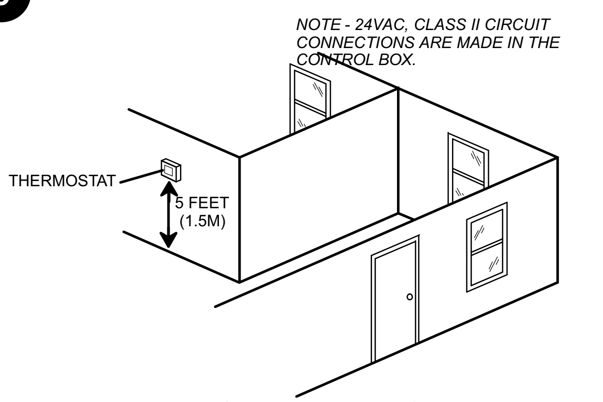
NOTE - Units are approved for use only with copper conductors. Ground unit at disconnect switch or to an earth ground.

2 HIGH VOLTAGE POWER SUPPLY CONNECTIONS



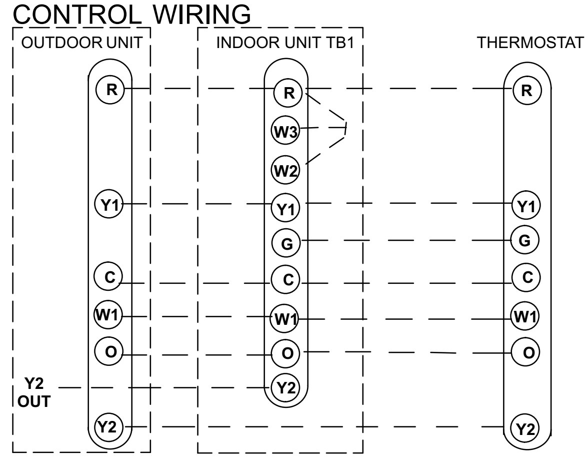
NOTE - Any excess high voltage field wiring should be trimmed and secured away from any low voltage field wiring.
NOTE - To facilitate a conduit, a cutout is located in the bottom of the control box. Connect conduit to the control box using a proper conduit fitting.

3 INSTALL THERMOSTAT



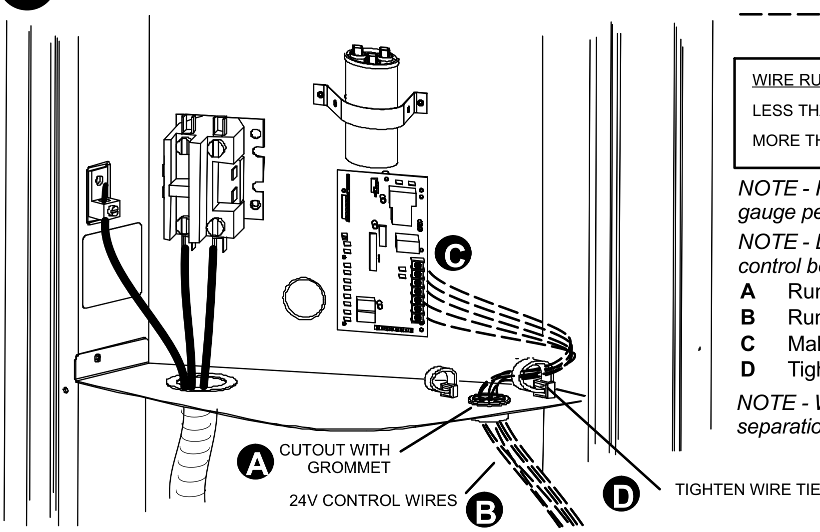
Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight, drafts or vibrations.

4 CONTROL WIRING



Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated.
NOTE - See figure28 for additional furnace and blower coil application diagrams.

5 LOW VOLTAGE CONNECTIONS



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

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

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

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

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

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

506130-01 06/09

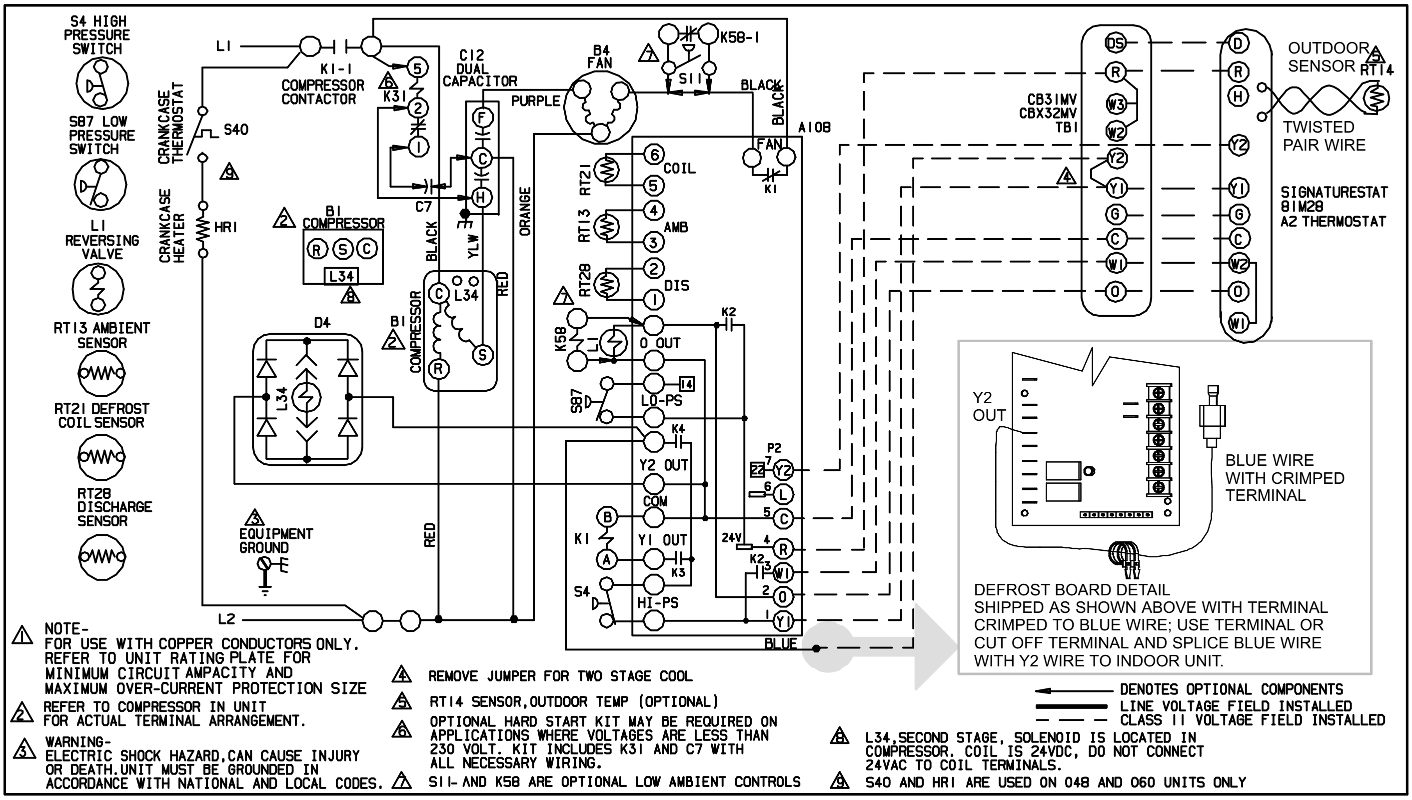


Figure 27. XP16 Wiring

NOTE - The addition of accessories to the system could exceed the 40 VA power requirement of the factory-provided transformer. Measure the system's current and voltage after installation is complete to determine transformer loading. If loading exceeds the factory-provided transformer capacity, a larger field-provided transformer will need to be installed in the system.

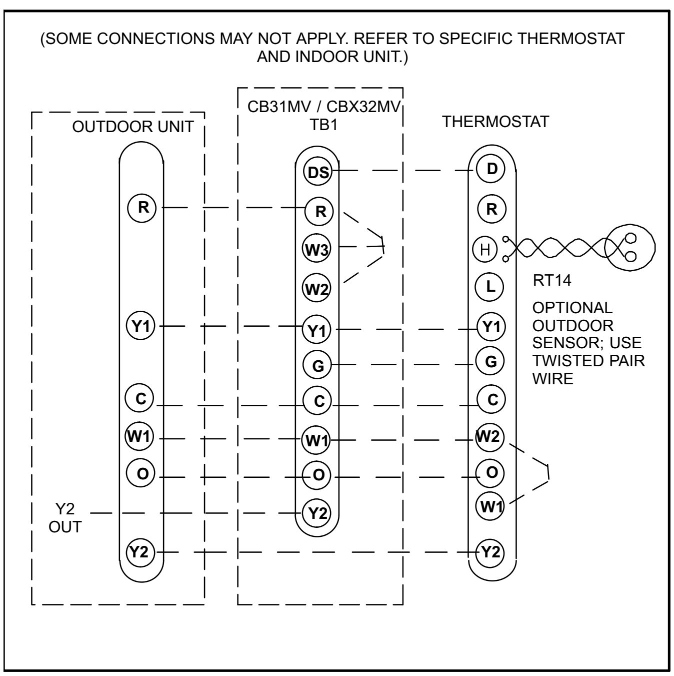


Figure 28. Outdoor Unit and CB31MV/CBX32MV Thermostat Designations

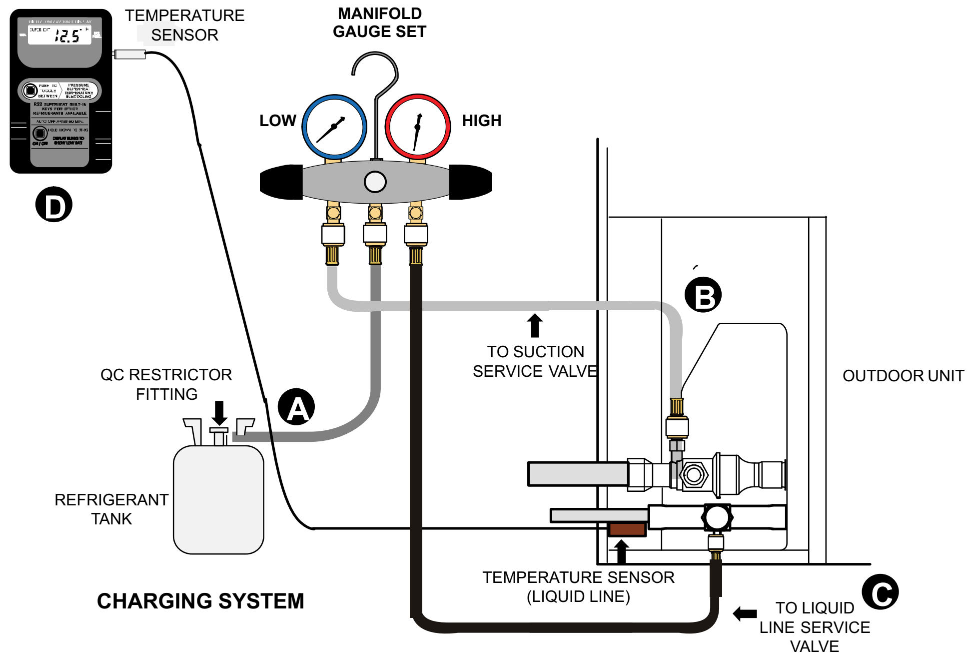
Start-Up

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.

1. Rotate fan to check for binding.
2. Inspect all factory- and field-installed wiring for loose connections.
3. After evacuation is complete, open both the liquid and vapor line service valves to release the refrigerant charge contained in outdoor unit into the system.
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. Set the thermostat for a cooling demand. Turn on power to the indoor indoor unit and close the outdoor unit disconnect switch to start the unit.
7. Recheck voltage while the unit is running. Power must be within range shown on the nameplate.
8. Check system for sufficient refrigerate by using the procedures listed under *Testing and Charging System*.

Testing Charge



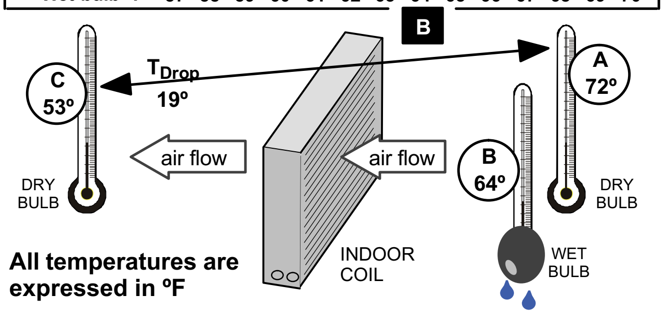
A Close manifold gauge set valves and connect the center hose to an upright cylinder of HFC-410A.
B Connect the manifold gauge set's low pressure side to the suction line service port.
C Connect the manifold gauge set's high pressure side to the liquid line service port.
D Position temperature sensor on liquid line near liquid line service port.

Figure 29. Connecting Gauge Set for Testing and Charging

DT

Temp. of air entering indoor coil °F (Dry-bulb)	57	58	59	60	61	62	63	64	65	66	67	68	69	70
80	24	24	24	23	23	22	22	22	20	19	18	17	16	15
78	23	23	23	22	22	21	21	20	19	18	17	16	15	14
76	22	22	22	21	21	20	19	19	18	17	16	15	14	13
74	21	21	21	20	19	19	18	17	16	16	15	14	13	12
A 72	20	20	19	18	17	17	16	15	15	14	13	12	11	10
70	19	19	18	18	17	17	16	15	15	14	13	12	11	10

Wet-bulb °F (B)



All temperatures are expressed in °F

Step 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).

Step 2. Find temperature drop across coil—Measure the coil's dry bulb entering and leaving air temperatures (**A** and **C**). Temperature Drop Formula: (T_{Drop}) = **A** minus **C**.

Step 3. Determine if fan needs adjustment—If the difference between the measured T_{Drop} and the desired **DT** (T_{Drop}–**DT**) is within ±3º, no adjustment is needed. See examples: Assume **DT** = 15 and **A** temp. = 72º, these **C** temperatures would necessitate stated actions:

Cº	T_{Drop}	–	DT	=	ºF	ACTION
53º	19	–	15	=	4	*Increase the airflow*
58º	14	–	15	=	-1	*(within ±3º range) no change*
62º	10	–	15	=	-5	*Decrease the airflow*

Step 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 ±3º.

Figure 30. Checking Indoor Airflow over Evaporator Coil using Delta-T Chart

Charging

TESTING AND CHARGING SYSTEM

This system uses HFC-410A refrigerant which operates at much higher pressures than HCFC-22. The pre-installed liquid line filter drier is approved for use with HFC-410A only. Do not replace it with components designed for use with HCFC-22. This unit is NOT approved for use with coils which use capillary tubes as a refrigerant metering device.

COOLING MODE INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process using the illustration in figure 30.

HEATING MODE INDOOR AIRFLOW CHECK

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 following formula to determine CFM:

$$CFM = \frac{\text{Amps x Volts x 3.41}}{\text{1.08 x Temperature rise (F)}}$$

CALCULATING 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:

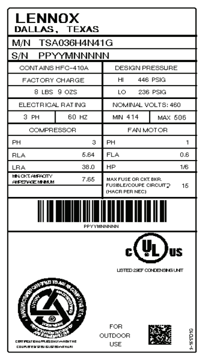
Amount specified on nameplate		Adjust amount. for variation in line set length listed on table in figure 31.		Additional charge specified per indoor unit match-up listed in tables 3 through 6.		Total charge
______	±	______	+	______	=	______

WEIGH IN

Refrigerant Charge per Line Set Length

Liquid Line Set Diameter	Ounces per 5 feet (g per 1.5 m) adjust from 15 feet (4.6 m) line set*
3/8” (9.5 mm)	3 ounce per 5’ (85 g per 1.5 m)

*NOTE - *If line length is greater than 15 ft. (4.6 m), add this amount. If line length is less than 15 ft. (4.6 m), subtract this amount.*

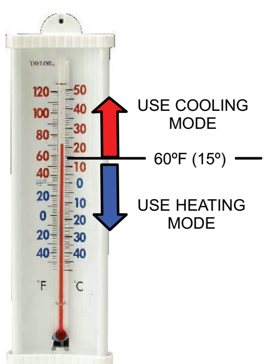


1. Check Liquid and suction line pressures
2. Compare unit pressures with tables 7 and 8, *Normal Operating Pressures.*
3. Conduct leak check; evacuate as previously outlined.
4. Weigh in the unit nameplate charge plus any charge required for line set differences over feet.

This nameplate is for illustration purposes only. Go to actual nameplate on outdoor unit for charge information.

Figure 31. Using Weigh In Method

SUBCOOLING



SAT° ______
LIQ° – ______
SC° = ______

1 Check the airflow as illustrated in figure 30 to be sure the indoor airflow is as required. (Make any air flow adjustments before continuing with the following procedure.)

2 Measure outdoor ambient temperature; determine whether to use **cooling mode** or **heating mode** to check charge.

3 Connect gauge set.

4 Check liquid and vapor line pressures. Compare pressures with either heat or cooling mode normal operating pressures in tables 7 and 8 (second stage - high capacity),

NOTE - The reference table is a general guide. Expect minor pressure variations. Significant differences may mean improper charge or other system problem.

5 Set thermostat for heat/cool demand, depending on mode being used:

Using cooling mode—When the outdoor ambient temperature is 60°F (15°C) and above. Target subcooling values (second stage - high capacity) in table 7 are based on 70 to 80°F (21-27°C) indoor return air temperature; if necessary, operate heating to reach that temperature range; then set thermostat to cooling mode setpoint to 68ºF (20ºC) which should call for second stage (high capacity) cooling. When pressures have stabilized, continue with step 6.

Using heating mode—When the outdoor ambient temperature is below 60°F (15°C). Target subcooling values (second stage - high capacity) in table 8 are based on 65-75°F (18-24°C) indoor return air temperature; if necessary, operate cooling to reach that temperature range; then set thermostat to heating mode setpoint to 77ºF (25ºC) which should call for second stage (high capacity) heating. When pressures have stabilized, continue with step 6.

6 Read the liquid line temperature; record in the LIQ° space.

7 Read the liquid line pressure; then find its corresponding temperature in the temperature/ pressure chart listed in table 9 and record it in the SAT° space.

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

9 Compare SC° results with tables 3 through 6, being sure to note any additional charge for line set and/or match-up.

10 If subcooling value is greater than shown in tables 3 through 6 for the applicable unit, remove refrigerant; if less than shown, add refrigerant.

11 If refrigerant is added or removed, repeat steps 4 through 10 to verify charge.

12 Disconnect gauge set and re-install both the liquid and suction service valve caps.

Figure 32. Using Subcooling Method — Second Stage (High Capacity)

Table 3. XP16–024

INDOOR MATCHUP HEAT PUMP	Target Subcooling Heat (±5ºF)	Cool (±1ºF)	**Add charge lb	oz
XP16–024			**lb**	**oz**
CBX26UH–018	20	8	1	5
CBX26UH–024	20	8	1	5
CB27UH-024	12	6	0	12
CB27UH-030	13	9	1	12
CB30U–21/26	12	6	0	12
CB30U–31	13	9	1	12
CBX32M–018/024	12	6	0	12
CBX32M–030	13	9	1	12
CBX32MV–024/030	13	9	1	12
CBX32MV–036	12	9	0	10
CBX40UHV-024, -030	13	9	1	12
CBX40UHV-036	12	9	0	10
CH33–25B	17	4	0	0
CH33–36A–2F	12	6	0	10
CH33–36B–2F	17	4	0	0
CH33–36C–2F	12	7	1	2
CR33–24A/B–F	20	4	0	0
CR33–30/36A/B/C–F	20	8	1	6
CR33–48	21	9	0	3
CX34–25A/B–6F	12	6	0	12
CX34–31A/B–6F	20	9	1	12
CX34–36A/B/C–6F	17	5	0	5
CX34–38A/B–6F *Serial No# before 6007K*	31	7	0	8
CX34–38A/B–6F *Serial No# 6007K and after*	10	8	0	11
CX34–19	18	4	0	1

Table 4. XP16–036

INDOOR MATCHUP HEAT PUMP	Target Subcooling Heat (±5ºF)	Cool (±1ºF)	**Add charge lb	oz
XP16–036			**lb**	**oz**
C33–44C	17	8	1	14
CH23–51	17	7	0	13
CH23–65	12	8	1	10
CBX26UH–030	25	8	1	14
CBX26UH–036	25	8	1	14
CB27UH-036	17	8	2	4
CB27UH-042	17	8	2	4
CB30U–31	17	6	0	0
CB30U–41/46	17	8	2	4
CBX32M–030	17	6	0	0
CBX32M–036	17	8	2	4
CBX32MV–024/030	17	6	0	0
CBX32MV–036	17	8	2	4
CBX40UHV-024, -030	17	6	0	0
CBX40UHV-036, -042	17	8	2	4
CH33–42B–2F	17	7	0	13
CH33–44/48B–2F	12	8	1	8
CH33–48C–2F	10	8	1	6
CH33–43B	9	10	1	6
CH33–49C	9	10	1	6
CR33–48B/C–F	25	8	2	0
CR33–50/60C–F	25	9	0	14
CX34–38A/B–6F *Serial No# before 6007K*	31	7	1	5
CX34–38A/B–6F *Serial No# 6007K and after*	10	8	1	12
CX34–43B/C–6F	10	8	1	6
CX34–60D	9	9	0	14

**Amount of charge required in additional to charge shown on unit nameplate. (Remember to consider line set length difference.)

Table 5. XP16–048

INDOOR MATCHUP HEAT PUMP	Target Subcooling Heat (±5ºF)	Cool (±1ºF)	**Add charge lb	oz
XP16–048			**lb**	**oz**
CH23–68	15	13	0	7
CB27UH-048	17	7	0	0
CB27UH-060	17	7	0	0
CB30U–51, –65	17	7	0	0
CBX32M–048, –060	17	7	0	0
CBX32MV–048, –060	17	7	0	0
CBX32MV–068	16	10	0	3
CBX40UHV–048, –060	17	7	0	0
CH33–60D–2F	18	4	0	2
CH33–62D–2F	15	10	0	4
CR33–60	40	4	0	2
CX34–60D–6F	18	4	0	2
CX34–62D–6F	16	8	0	2

Table 6. XP16–060

INDOOR MATCHUP HEAT PUMP	Target Subcooling Heat (±5ºF)	Cool (±1ºF)	**Add charge lb	oz
XP16XP16–060			**lb**	**oz**
CH23–68	13	14	3	3
CH23–65	18	2	0	0
CBX26UH–060	13	14	3	5
CB27UH-060	13	10	2	1
CBX32M–060	13	10	2	1
CBX32MV–060	13	10	2	1
CBX32MV–068	13	12	2	9
CH33–60D–2F	15	6	1	3
CH33–62D–2F	13	12	2	10
CR33–50/60C–F	30	6	1	3
CR33–60D–F	30	6	1	3
CX34–49C–6F	13	9	1	14
CX34–60D–6F	15	6	1	3
CX34–62C–6F	13	11	2	6
CX34–62D–6F	13	11	2	5

Table 7. Normal Operating Pressures - Cooling[1]

XP16	-024		-036		-048		-060	
°F (°C)[2]	Liq	Vap	Liq	Vap	Liq	Vap	Liq	Vap
First Stage (Low Capacity) Pressure[3]								
65 (18.3)	232	146	225	144	235	144	225	138
75 (23.9)	264	148	261	147	268	145	264	141
85 (29.4)	307	149	302	149	310	147	305	142
95 (35.0)	353	151	349	151	356	148	352	146
105 (40.6)	403	153	397	153	407	150	405	148
115 (46.1)	460	155	461	157	466	152	459	150
Second Stage (High Capacity) Pressure[3]								
65 (18.3)	240	143	239	139	244	140	241	134
75 (23.9)	279	145	278	141	283	141	280	136
85 (29.4)	322	147	322	143	326	144	324	137
95 (35.0)	371	149	367	146	374	147	373	138
105 (40.6)	423	151	426	148	427	148	425	142
115 (46.1)	485	154	489	151	491	151	486	146

[1]*Use tables 7 and 8 to perform maintenance checks; it is not a procedure for charging the system. Minor variations in these pressures may be due to differences in installations. Significant deviations could mean that the system is not properly charged or that a problem exists with some component in the system.*

Table 8. Normal Operating Pressures - Heating[1]

XP16	-024		-036		-048		-060	
°F (°C)[2]	Liq	Vap	Liq	Vap	Liq	Vap	Liq	Vap
First Stage (Low Capacity) Pressure[3]								
40 (4.4)	314	88	304	89	324	92	341	89
50 (10)	333	116	318	116	354	115	365	113
Second Stage (High Capacity) Pressure[3]								
20 (-7.0)	286	59	289	63	305	61	318	59
30 (-1.0)	303	74	303	77	322	70	335	73
40 (4.4)	321	89	314	88	345	92	348	86
50 (10)	346	109	333	110	370	110	369	107

1 Most-popular-match-up pressures. Indoor match up, indoor air quality, and indoor load cause pressures to vary.
2 Temperature of the air entering the outdoor coil.
3 Liquid ±10 & Vapor ±5 psig.

Table 9. HFC-410A Temperature (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig
32	100.8	63	178.5	94	290.8	125	445.9
33	102.9	64	181.6	95	295.1	126	451.8
34	105.0	65	184.3	96	299.4	127	457.6
35	107.1	66	187.7	97	303.8	128	463.5
36	109.2	67	190.9	98	308.2	129	469.5
37	111.4	68	194.1	99	312.7	130	475.6
38	113.6	69	197.3	100	317.2	131	481.6
39	115.8	70	200.6	101	321.8	132	487.8
40	118.0	71	203.9	102	326.4	133	494.0
41	120.3	72	207.2	103	331.0	134	500.2
42	122.6	73	210.6	104	335.7	135	506.5
43	125.0	74	214.0	105	340.5	136	512.9
44	127.3	75	217.4	106	345.3	137	519.3
45	129.7	76	220.9	107	350.1	138	525.8
46	132.2	77	224.4	108	355.0	139	532.4
47	134.6	78	228.0	109	360.0	140	539.0
48	137.1	79	231.6	110	365.0	141	545.6
49	139.6	80	235.3	111	370.0	142	552.3
50	142.2	81	239.0	112	375.1	143	559.1
51	144.8	82	242.7	113	380.2	144	565.9
52	147.4	83	246.5	114	385.4	145	572.8
53	150.1	84	250.3	115	390.7	146	579.8
54	152.8	85	254.1	116	396.0	147	586.8
55	155.5	86	258.0	117	401.3	148	593.8
56	158.2	87	262.0	118	406.7	149	601.0
57	161.0	88	266.0	119	412.2	150	608.1
58	163.9	89	270.0	120	417.7	151	615.4
59	166.7	90	274.1	121	423.2	152	622.7
60	169.6	91	278.2	122	428.8	153	630.1
61	172.6	92	282.3	123	434.5	154	637.5
62	175.4	93	286.5	124	440.2	155	645.0

System Operation

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

THERMOSTAT OPERATION

Some indoor thermostats incorporate isolating contacts and an emergency heat function (which includes an amber indicating light). The thermostat is not included with the unit and must be purchased separately.

EMERGENCY HEAT (AMBER LIGHT)

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

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

FILTER DRIER

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

Defrost System

DEFROST SYSTEM DESCRIPTION

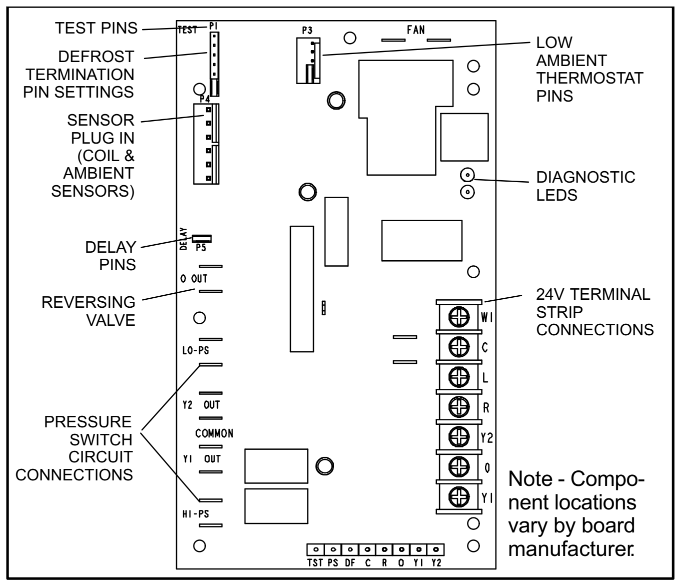


Figure 33. Defrost Control Board

The demand defrost controller measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller *self-calibrates* when the defrost system starts and after each system defrost cycle. The defrost control board components are shown in figure 33.

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

NOTE - The demand defrost board 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 board initiates defrost cycles.

DEFROST BOARD DIAGNOSTIC LEDS

The state (Off, On, Flashing) of two LEDs on the defrost board (DS1 [Red] and DS2 [Green]) indicate diagnostics conditions that are described in table 11.

DEFROST BOARD PRESSURE SWITCH CONNECTIONS

The unit's automatic reset pressure switches (LO PS - S87 and HI PS - S4) are factory-wired into the defrost board on the LO-PS and HI-PS terminals, respectively.

Low Pressure Switch (LO-PS)—When the low pressure switch trips, the defrost board will cycle off the compressor, and the strike counter in the board will count one strike. The low pressure switch is ignored under the following conditions:

- During the defrost cycle and 90 seconds after the termination of defrost
- When the average ambient sensor temperature is below 15° F (-9°C)
- For 90 seconds following the start up of the compressor
- During *test* mode

High Pressure Switch (HI-PS)—When the high pressure switch trips, the defrost board will cycle off the compressor, and the strike counter in the board will count one strike.

DEFROST BOARD PRESSURE SWITCH SETTINGS

High Pressure (auto reset) - trip at 590 psig, reset at 418.

Low Pressure (auto reset) - trip at 25 psig; reset at 40.

PRESSURE SWITCH 5-STRIKE LOCKOUT

The internal control logic of the board counts the pressure switch trips only while the Y1 (Input) line is active. If a pressure switch opens and closes four times during a Y1 (Input), the control logic will reset the pressure switch trip counter to zero at the end of the Y1 (Input). If the pressure switch opens for a fifth time during the current Y1 (Input), the control will enter a lockout condition.

The 5-strike pressure switch lockout condition can be reset by cycling OFF the 24-volt power to the control board or by shorting the TEST pins between 1 to 2 seconds. All timer functions (run times) will also be reset.

If a pressure switch opens while the Y1 Out line is engaged, a 5-minute short cycle will occur after the switch closes.

DEFROST SYSTEM SENSORS

Sensors connect to the defrost board through a field-replaceable harness assembly that plugs into the board as illustrated in figure 35. Through the sensors, the board detects outdoor ambient, coil, and discharge temperature fault conditions. As the detected temperature changes, the resistance across the sensor changes. Sensor resistance values can be checked by ohming across pins shown in table 10.

Table 10. Sensor Temperature /Resistance Range

Sensor	Temperature Range °F (°C)	Resistance values range (ohms)	Pins/Wire Color
Outdoor	-35 (-37) to 120 (48)	280,000 to 3750	3 & 4 (Black)
Coil	-35 (-37) to 120 (48)	280,000 to 3750	5 & 6 (Brown)
Discharge (if applicable)	24 (-4) to 350 (176)	41,000 to 103	1 & 2 (Yellow)
Note: Sensor resistance increases as sensed temperature decreases.			

Figure 34 shows how the resistance varies as the temperature changes for both type of sensors.

NOTE - When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is not within the range shown in table 10, may be performing as designed. However, if a shorted or open circuit is detected, then the sensor may be faulty and the sensor harness will need to be replaced.

Ambient Sensor—The ambient sensor considers outdoor temperatures below -35°F (-37°C) or above 120°F (48°C) as a fault. If the ambient sensor is detected as being open, shorted or out of the temperature range of the sensor, the board will not perform demand defrost operation. The board will revert to time/temperature defrost operation and will display the appropriate fault code. Heating and cooling operation will be allowed in this fault condition.

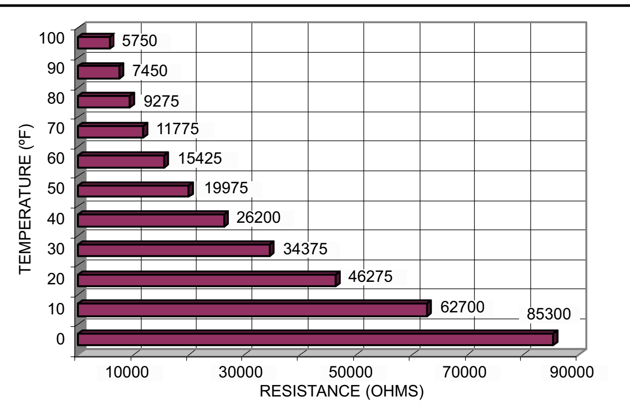


Figure 34. Temperature/Resistance Chart (Ambient and Coil Sensors)

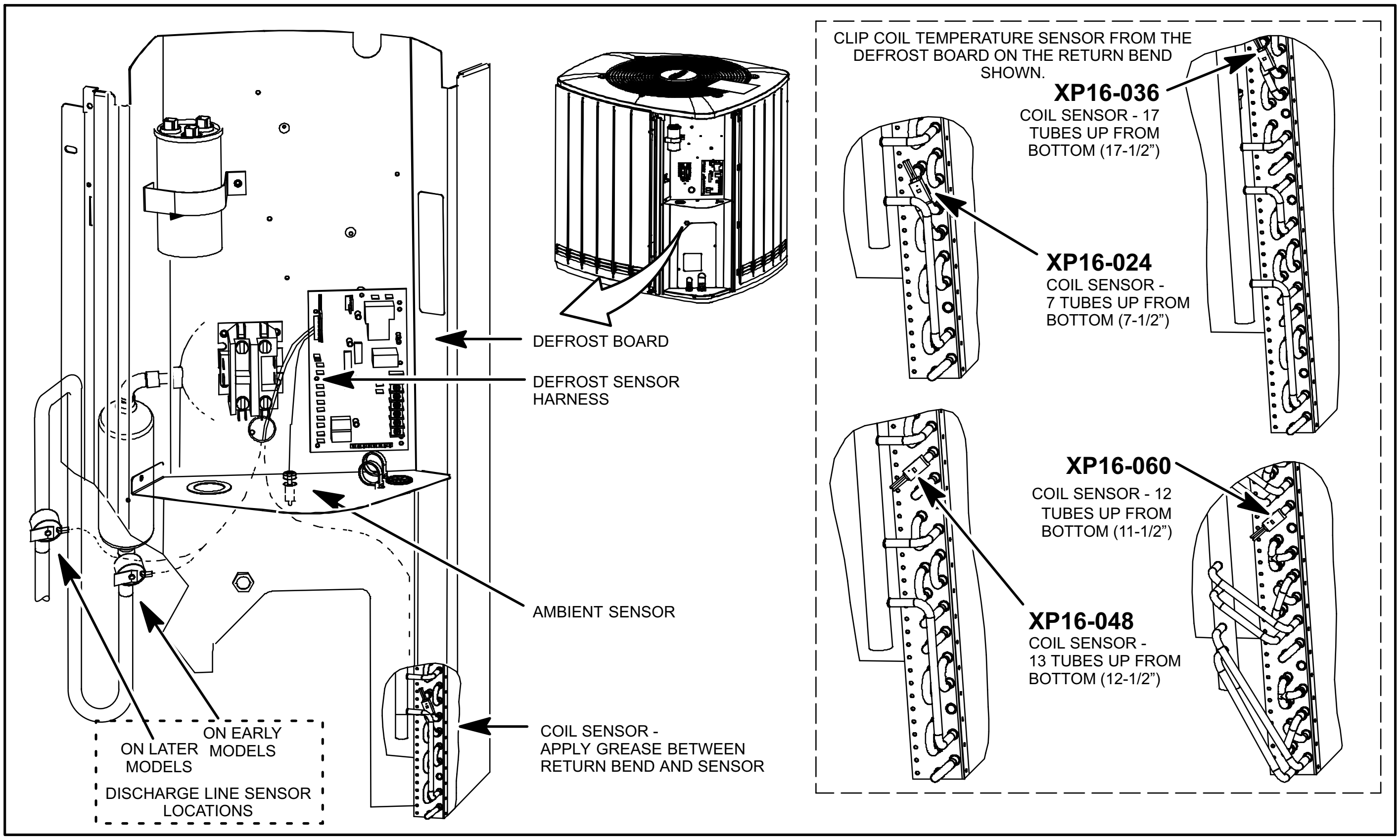


Figure 35. Sensor Locations

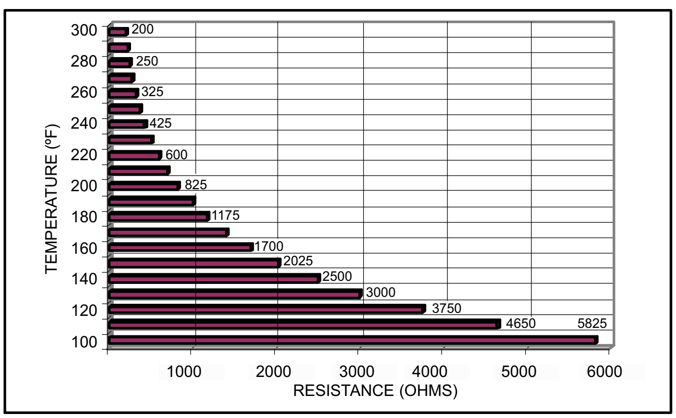


Figure 36. Temperature/Resistance Chart (Discharge Sensor)

Coil Sensor—The coil temperature sensor considers outdoor temperatures below -35°F (-37°C) or above 120°F (48°C) as a fault. If the coil temperature sensor is detected as being open, shorted or out of the temperature range of the sensor, the board will not perform demand or time/temperature defrost operation and will display the appropriate fault code. Heating and cooling operation will be allowed in this fault condition.

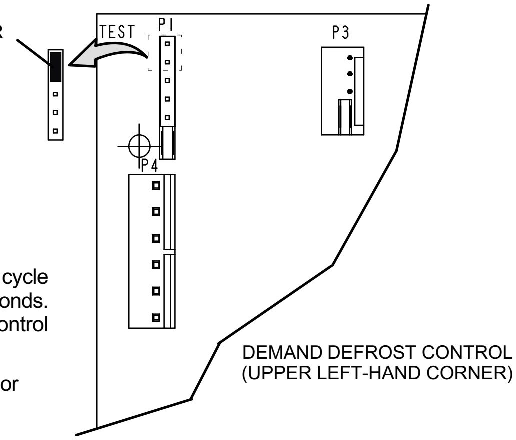
Discharge Line Sensor—If the discharge line temperature exceeds a temperature of 300°F (148°C) during compressor operation, the board will de-energize the compressor contactor output (and the defrost output, if active). The compressor will remain off until the discharge temperature has dropped below 225°F (107°C) and the 5-minute anti-short cycle delay has been satisfied. This sensor has two fault and lockout codes:

1. If the board recognizes five high discharge line temperature faults during a single (Y1) compressor demand, it reverts to a lockout mode and displays the appropriate code. This code detects shorted sensor or high discharge temperatures. Code on board is *Discharge Line Temperature Fault and Lockout*.
2. If the board recognizes five temperature sensor range faults during a single (Y1) compressor demand, it reverts to a lockout mode and displays the appropriate code. The board detects open sensor or out-of-temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the board will count one fault. After five faults, the board will lockout. Code on board is *Discharge Sensor Fault and Lockout*.

The discharge line sensor, which covers a range of 150°F (65°C) to 350°F (176°C), is designed to mount on a ½" refrigerant discharge line.

NOTE - Within a single room thermostat demand, if 5-strikes occur, the board will lockout the unit. Defrost board 24 volt power R must be cycled OFF or the TEST pins on board must be shorted between 1 to 2 seconds to reset the board.

TEST



Placing the jumper on the test pins allows the technician to:

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

When Y1 is energized and 24V power is being applied to the Demand Defrost Control, a test cycle can be initiated by placing a jumper on the Demand Defrost Control's TEST pins for 2 to 5 seconds. If the jumper remains on the TEST pins for longer than five seconds, the Demand Defrost Control will ignore the jumpered TEST pins and revert to normal operation.

The control will initiate one test event each time a jumper is placed on the TEST pins. For each TEST the jumper must be removed for at least one second and then reapplied.

Y1 Active

Place a jumper on TEST pins for **longer than one second but less than two seconds.**

Clears any short cycle lockout and five strike fault lockout function, if applicable. No other functions will be executed and unit will continue in the mode it was operating.

Place a jumper on TEST pins for **more than two seconds**.

Clears any short cycle lockout and five strike fault lockout function, if applicable.

O Line Status

ACTIVE

If in **COOLING** Mode

No further test mode operation will be executed until the jumper is removed from the TEST pins and reapplied.

If in **DEFROST** Mode

The unit will terminate defrost and enter HEAT MODE uncalibrated with defrost timer set for 30 minute test.

INACTIVE

If in **HEATING** Mode

If no ambient or coil sensor ault exist, unit will go into DEFROST MODE.

If ambient or coil faults exist (open or shorted), unit will remain in HEAT MODE.

If jumper on TEST pins remains in place for more than five seconds.

The unit will return to HEAT MODE un–calibrated with defrost timer set for 30 minutes.

If jumper on TEST pins is removed before a maximum of five seconds.

The unit will remain in DEFROST MODE until termination on time or temperature.

NOTE — Placing a jumper on the TEST pins will not bring the unit out of inactive mode. The only way manually activate the heat pump from an inactive mode is to cycle the 24VAC power to the Demand Defrost Control.

Figure 37. Test Mode

Second-Stage Operation—If the board receives a call for second-stage compressor operation Y2 in heating or cooling mode and the first-stage compressor output is active, the second-stage compressor solenoid output will be energized.

If first-stage compressor output is active in heating mode and the outdoor ambient temperature is below the selected compressor lock-in temperature, the second-stage compressor solenoid output will be energized without the Y2 input. If the jumper is not connected to one of the temperature selection pins on P3 (40, 45, 50, 55°F), the default lock-in temperature of 40°F (4.5°C) will be used.

The board de-energizes the second-stage compressor solenoid output immediately when the Y2 signal is removed or the outdoor ambient temperature is 5°F above the selected compressor lock-in temperature, or the first-stage compressor output is de-energized for any reason.

Defrost Temperature Termination Shunt (Jumper) Pins—The defrost board selections are: 50, 70, 90, and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory set at 50°F (10°C). If temperature shunt is not installed, default termination temperature is 90°F (32°C).

DELAY MODE

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

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

OPERATIONAL DESCRIPTION

The defrost control board has three basic operational modes: normal, defrost, and calibration.

- **Normal Mode**—The demand defrost board monitors the O line, to determine the system operating mode (heat/cool), outdoor ambient temperature, coil temperature (outdoor coil) and compressor run time to determine when a defrost cycle is required.
- **Calibration Mode—**The board is considered uncalibrated when power is applied to the board, after cool mode operation, or if the coil temperature exceeds the termination temperature when it is in heat mode.

  Calibration of the board occurs after a defrost cycle to ensure that there is no ice on the coil. During calibration, the temperature of both the coil and the ambient sensor are measured to establish the temperature differential which is required to allow a defrost cycle.
- **Defrost Mode**—The following paragraphs provide a detailed description of the defrost system operation.
- **Test Mode**—When Y1 is energized and 24V power is being applied to the board, a test cycle can be initiated by placing the termination temperature jumper across the TEST pins for 2 to 5 seconds. If the jumper remains across the TEST pins longer than five seconds, the control will ignore the test pins and revert to normal operation. The jumper will initiate one cycle per test.

  Enter the TEST mode by placing a shunt (jumper) across the TEST pins on the board **after** power-up. (The TEST pins are ignored and the test function is locked out if the shunt is applied on the TEST pins before power-up). Board timings are reduced, the low-pressure switch is ignored and the board will clear any active lockout condition.

Each test pin shorting will result in one test event. For each TEST the shunt (jumper) must be removed for at least one second and reapplied. Refer to flow chart (figure 37) for TEST operation.

Note: The Y1 input must be active (ON) and the O room thermostat terminal into board must be inactive.

DETAILED DEFROST SYSTEM OPERATION

The demand defrost control board initiates a defrost cycle based on either frost detection or time.

Frost Detection—If the compressor runs longer than 30 minutes and the actual difference between the clear coil and frosted coil temperatures exceeds the maximum difference allowed by the control, a defrost cycle will be initiated.

IMPORTANT - The demand defrost control board will allow a greater accumulation of frost and will initiate fewer defrost cycles than a time/temperature defrost system.

Time—If six hours of heating mode compressor run time has elapsed since the last defrost cycle while the coil temperature remains below 35°F (2°C), the demand defrost control will initiate a defrost cycle.

Actuation—When the reversing valve is de-energized, the Y1 circuit is energized, and the coil temperature is below 35°F (2°C), the board logs the compressor run time. If the board is not calibrated, a defrost cycle will be initiated after 30 minutes of heating mode compressor run time. The control will attempt to self-calibrate after this (and all other) defrost cycle(s).

Calibration success depends on stable system temperatures during the 20-minute calibration period. If the board fails to calibrate, another defrost cycle will be initiated after 45 minutes of heating mode compressor run time. Once the defrost board is calibrated, it initiates a demand defrost cycle when the difference between the clear coil and frosted coil temperatures exceeds the maximum difference allowed by the control or after six hours of heating mode compressor run time has been logged since the last defrost cycle.

Termination—The defrost cycle ends when the coil temperature exceeds the termination temperature or after 14 minutes of defrost operation. If the defrost is terminated by the 14-minute timer, another defrost cycle will be initiated after 30 minutes of run time.

DEFROST BOARD DIAGNOSTICS

See table 11 to determine defrost board operational conditions and to diagnose cause and solution to problems.

Table 11. Defrost Control Board Diagnostic LEDs

DS2 Green	DS1 Red	Condition/Code	Possible Cause(s)	Solution
OFF	OFF	Power problem	No power (24V) to board terminals R and C or board failure.	1 Check control transformer power (24V). 2 If power is available to board and LED(s) do not light, replace board.
Simultaneous SLOW Flash		Normal operation	Unit operating normally or in standby mode.	None required.
Alternating SLOW Flash		5-minute anti-short cycle delay	Initial power up, safety trip, end of room thermostat demand.	None required (Jumper TEST pins to override)
Simultaneous FAST Flash		Ambient Sensor Problem	Sensor being detected open or shorted or out of temperature range. Board will revert to time/temperature defrost operation. (System will still heat or cool).	
Alternating FAST Flash		Coil Sensor Problem	Sensor being detected open or shorted or out of temperature range. Board will not perform demand or time/temperature defrost operation. (System will still heat or cool).	
ON	ON	Circuit Board Failure	Indicates that board has internal component failure. Cycle 24VAC power to board. If code does not clear, replace board.	

Table 12. Defrost Control Board Diagnostic Fault and Lockout Codes

DS2 Green	DS1 Red	Condition/Code	Possible Cause(s)	Solution
(Each fault adds 1 strike to that code's counter; 5 strikes per code = LOCKOUT)				
OFF	SLOW Flash	Low Pressure Fault	1 Restricted air flow over indoor or outdoor coil. 2 Improper refrigerant charge in system. 3 Improper metering device installed or incorrect operation of metering device. 4 Incorrect or improper sensor location or connection to system.	1 Remove any blockages or restrictions from coils and/or fans. Check indoor and outdoor fan motor for proper current draws. 2 Check system charge using approach and subcooling temperatures. 3 Check system operating pressures and compare to unit charging charts. 4 Make sure all pressure switches and sensors have secure connections to system to prevent refrigerant leaks or errors in pressure and temperature measurements.
OFF	ON	Low Pressure ***LOCKOUT***		
SLOW Flash	OFF	High Pressure Fault		
ON	OFF	High Pressure ***LOCKOUT***		
SLOW Flash	ON	Discharge Line Temperature Fault	This code detects shorted sensor or high discharge temperatures. If the discharge line temperature exceeds a temperature of 300ºF (148ºC) during compressor operation, the board will de-energize the compressor contactor output (and the defrost output if active). The compressor will remain off until the discharge temperature has dropped below 225ºF (107ºC).	
FAST Flash	ON	Discharge Line Temperature ***LOCKOUT***		
OFF	Fast Flash	Discharge Sensor Fault	The board detects open sensor or out of temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the board will count one fault. After 5 faults, the board will lockout.	
Fast Flash	OFF	Discharge Sensor ***LOCKOUT***		

Maintenance

⚠WARNING

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

Before the start of each heating and cooling season, the following service checks should be performed by a qualified service technician. First, turn off electrical power to the unit prior to performing unit maintenance.

- Inspect and clean the outdoor and indoor coils. The outdoor coil may be flushed with a water hose.

  NOTE - 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, etc.)

- Visually inspect the refrigerant lines and coils for leaks.
- Check wiring for loose connections.
- Check voltage at the indoor and outdoor units (with units operating).
- Check the amperage draw at the outdoor fan motor, compressor, and indoor blower motor. Values should be compared with those given on unit nameplate.
- Check, clean (or replace) indoor unit filters.
- Check the charge and gauge the system pressures.
- Check the condensate drain line for free and unobstructed flow; clean, if necessary.
- 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.
- Check drive belt for wear and proper tension.

NOTE - If owner reports insufficient cooling, the unit should be gauged and refrigerant charge checked. Refer to section on refrigerant charging in this instruction.

Two-Stage Modulation Compressors Checks

⚠ 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 proper to correctly perform compressor modulation 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).

Use this checklist on page 31 to verify part-load and full-load capacity operation of two-stage modulation compressors.

TOOLS REQUIRED

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

PROCEDURE

NOTE - Block outdoor coil to maintain a minimum of 375 psig during testing).

1. Turn main power OFF to outdoor unit.
2. Adjust room thermostat set point 5ºF above 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 and install switch in series with Y2 wire from room thermostat.
5. Cycle main power ON.
6. Allow pressures and temperatures to stabilize before taking measurements (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.
9. Allow pressures and temperatures to stabilize before taking measurements (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 modulating between low and high capacity and replacement is necessary).
12. After testing is complete, return unit to original set up.

Homeowner Information

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.

⚠ IMPORTANT

Turn off electrical power to the unit at the disconnect switch before performing any maintenance. The unit may have multiple power supplies.

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. **Electronic Air Cleaner—**Some systems are equipped with an electronic air cleaner, designed to remove airborne particles from the air passing through the cleaner. If your system is so equipped, ask your dealer for maintenance instructions.
5. **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.)

⚠ 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.

6. **Outdoor Unit—**Make sure no obstructions restrict airflow to the outdoor unit. Leaves, trash or shrubs crowding the unit cause the outdoor 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.

When removing debris from around the unit, be aware of metal edges on parts and screws. Although special care has been taken to keep exposed edges to a minimum, physical contact with metal edges and corners while applying excessive force or rapid motion can result in personal injury.

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 air conditioning or heat pump system.

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.

THERMOSTAT OPERATIONS

Though your thermostat may vary somewhat from the description below, its operation will be similar.

Temperature Setting Levers

Most heat pump thermostats have two temperature selector levers: one for heating and one for cooling. Set the levers or dials to the desired temperature setpoints for both heating and cooling. Avoid frequent temperature adjustment; turning the unit off and back on before pressures equalize puts stress on the unit compressor.

Fan Switch

In AUTO or INT (intermittent) mode, the blower operates only when the thermostat calls for heating or cooling. This mode is generally preferred when humidity control is a priority. The ON or CONT mode provides continuous indoor blower operation, regardless of whether the compressor or auxiliary heat are operating. This mode is required when constant air circulation or filtering is desired.

System Switch

Set the system switch for heating, cooling or auto operation. The auto mode allows the heat pump to automatically switch from heating mode to cooling mode to maintain predetermined comfort settings. Many heat pump thermostats are also equipped with an emergency heat mode which locks out heat pump operation and provides temporary heat supplied by the auxiliary heat.

Indicating Light

Most heat pump thermostats have an amber light which indicates when the heat pump is operating in the emergency heat mode.

Temperature Indicator

The temperature indicator displays the actual room temperature.

PROGRAMMABLE THERMOSTATS

Your Lennox system may be controlled by a programmable thermostat. These thermostats provide the added feature of programmable time-of-day setpoints for both heating and cooling. Refer to the user's information manual provided with your particular thermostat for operation details.

PRESERVICE CHECK

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

- Check to see that all electrical disconnect switches are ON.
- Make sure the room thermostat temperature selector is properly set.
- Make sure the room thermostat system switch is properly set.
- If you discover any blown fuses or tripped circuit breakers, call your Lennox dealer for assistance.
- Make sure unit access panels are in place.
- Make sure air filter is clean.
- Locate unit model number and have it handy before calling.

OPTIONAL ACCESSORIES

Refer to the *Lennox XP16 Engineering Handbook* for optional accessories that may apply to this unit.

506130-01 06/09

Checklists

Two-Stage Modulation Compressors Field Operational Checklist

Unit Readings	Y1 - First-Stage	Expected results during Y2 demand (Toggle switch On)	Y2 - Second-Stage
COMPRESSOR			
Voltage		Same	
Amperage		Higher	
OUTDOOR UNIT FAN MOTOR			
Amperage		Same or Higher	
TEMPERATURE			
Ambient		Same	
Outdoor Coil Discharge Air		Higher	
Compressor Discharge Line		Higher	
Indoor Return Air		Same	
Indoor Coil Discharge Air		Lower	
PRESSURES			
Suction (Vapor)		Lower	
Liquid		Higher	

XP16 Start-Up and Performance Checklist

Customer ____________________ Address ____________________

Indoor Unit Model ____________________ Serial ____________________

Outdoor Unit Model ____________________ Serial ____________________

Notes: ____

____

START UP CHECKS

Refrigerant Type: ____________________

1st Stage: Rated Load Amps ________ Actual Amps ________ Rated Volts ________ Actual Volts ________

2nd Stage: Rated Load Amps ________ Actual Amps ________ Rated Volts ________ Actual Volts ________

Outdoor Unit Fan Full Load Amps ________ Actual Amps: 1st Stage ________ 2nd Stage ________

COOLING MODE

Suction Pressure: 1st Stage: ____________ 2nd Stage: ____________

Liquid Pressure: 1st Stage: ____________ 2nd Stage: ____________

Supply Air Temperature: 1st Stage: ____________ 2nd Stage: ____________

Temperature: Ambient: ____________ Return Air: ____________

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

	A		B		
Subcooling: Saturated Condensing Temperature (A) *minus* Liquid Line Temperature (B)	A	—	B	=	SUBCOOLING
Approach: Liquid Line Temperature (A) *minus* Outdoor Air Temperature (B)	A	—	B	=	APPROACH
Indoor Coil Temperature Drop (18 to 22°F) Return Air Temperature (A) *minus* Supply Air Temperature (B)	A	—	B	=	COIL TEMP DROP