RETAIN THESE INSTRUCTIONS
FOR FUTURE REFERENCE

⚠ WARNING

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

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

⚠ IMPORTANT

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

INSTALLATION INSTRUCTIONS

Dave Lennox *Signature*® Collection XP15 Units

HEAT PUMP UNITS
505,328M
04/08
Supersedes 03/08

Technical Publications
Litho U.S.A.

Table of Contents

XP15 Outdoor Unit

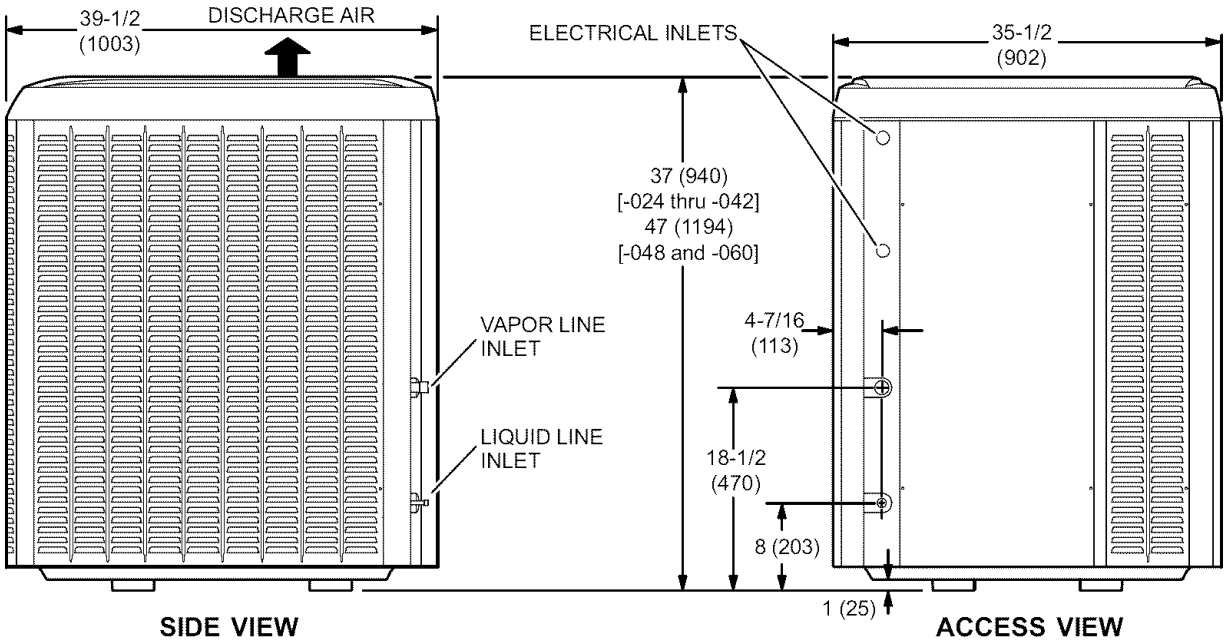
The Lennox XP15 outdoor units use HFC-410A refrigerant. This unit must be installed with a matching indoor coil and line set as outlined in the Lennox Engineering Handbook. XP15 series outdoor units are designed for use in check expansion valve (CTXV) systems only, and are not designed to be used with other refrigerant flow control devices. The Lennox Engineering Handbook lists compatible indoor CTXV kits which are ordered separately.

Shipping and Packing List

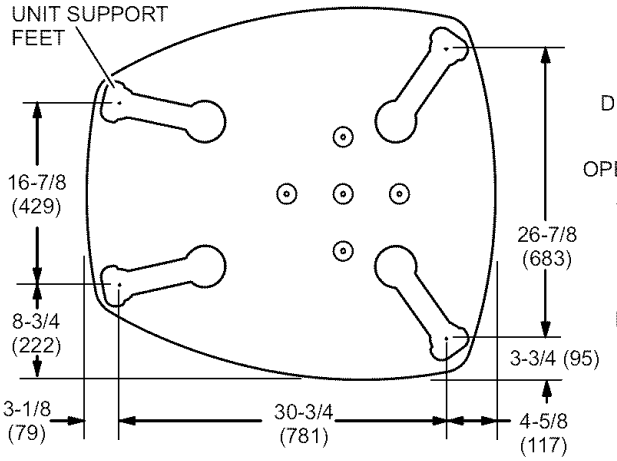
1 - Assembled XP15 outdoor unit
1 - Bushing (for low voltage wiring)
2 - Grommets (for liquid and vapor lines)

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

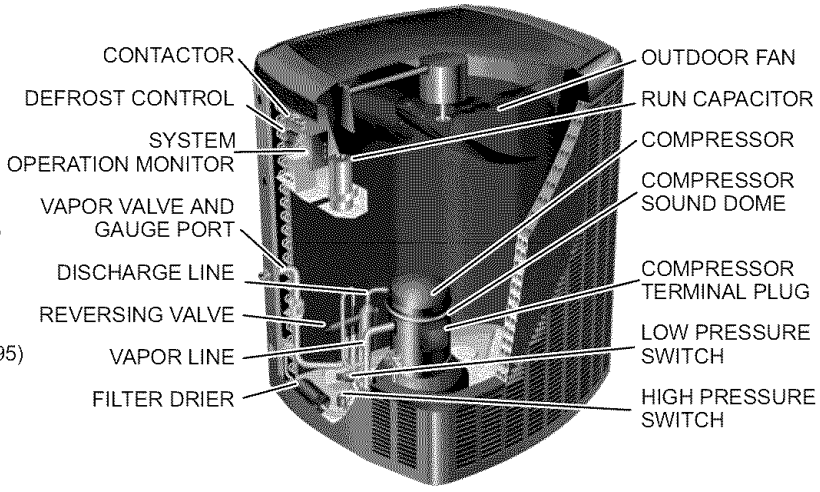
Unit Dimensions -- Inches (mm)



SIDE VIEW **ACCESS VIEW**



BASE WITH ELONGATED LEGS



XP15 Parts Arrangement

⚠ 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.

When servicing or repairing HVAC components, ensure caps and fasteners are appropriately tightened. Table 1 lists torque values for typical service and repair items.

Table 1. Torque Requirements

Part	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

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USING MANIFOLD GAUGE SETS

HFC-410A refrigerant manifold gauge sets must be capable of handling higher system operating pressures. The gauge set shall be rated for use with pressures of 0 - 800 psig on the high side, and a low side of 30 inches of vacuum (Hg) to 250 psig, which retards when opened to 500 psig. Gauge hoses must be rated for use up to 800 psig of pressure with a 4000 psig burst rating.

OPERATING SERVICE VALVES

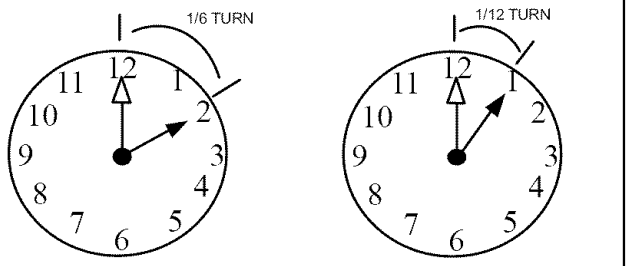
⚠ IMPORTANT

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.

The liquid and vapor lines service valves with gauge ports as illustrated in figures 2 and 3 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.



This illustrates how to use a wrench to tighten caps an additional 1/6 or 1/12 turn clockwise.

Figure 1. Cap Tightening Distances

⚠ IMPORTANT

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

Operating Angle-Type Service Valve

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 using 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 on page 2.
   - *Without Torque Wrench*: Finger tighten and with an appropriately sized wrench to turn an additional 1/6 turn clockwise as illustrated in figure 1.

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 a 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 on page 2.
   - *Without Torque Wrench*: Finger tighten and with an appropriately sized wrench to turn an additional 1/12 turn clockwise as illustrated in figure 1.

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

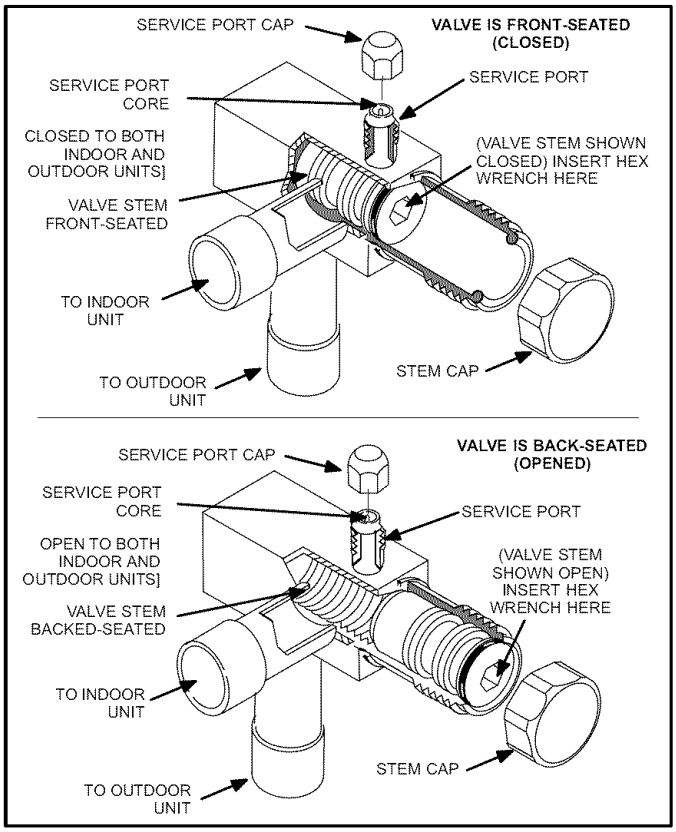


Figure 2. Angle -Type Service Valve

Operating Ball-Type Service Valve

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 using 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 table 1 on page 2.
   - *Without Torque Wrench*: Finger tighten and use an appropriately sized wrench to turn an additional 1/6 turn clockwise as illustrated in figure 1.

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 a wrench.
2. Use an adjustable wrench to open. To open valve, rotate 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 on page 2.
   - *Without Torque Wrench*: Finger tighten and use an appropriately sized wrench to turn an additional 1/12 turn clockwise as illustrated in figure 1.

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

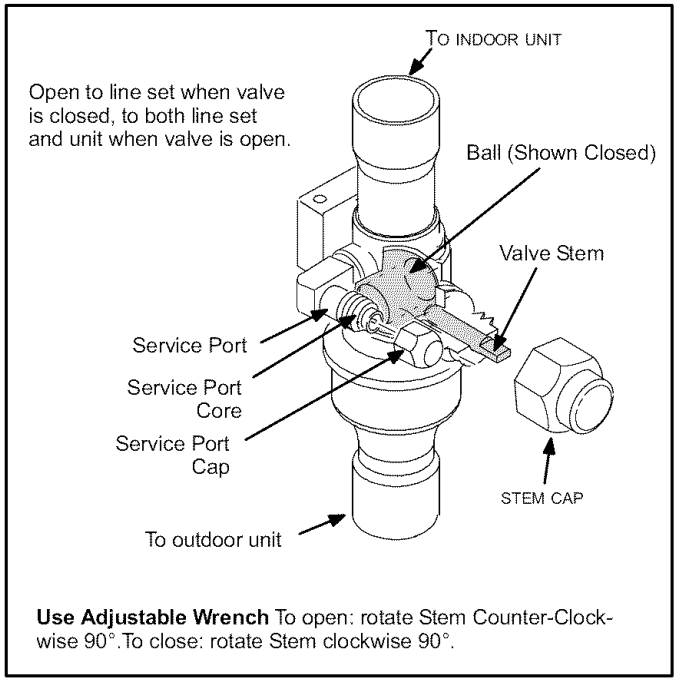


Figure 3. Ball-Type Service Valve

Recovering Refrigerant from Existing HCFC-22 System

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

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 or refrigerant to flush the system:

1. Disconnect all power to the existing outdoor unit.
2. Connect to the existing unit a gauge set, clean recovery cylinder and a recovery machine. Use the instructions provided with the recover machine on how to setup the connections.
3. Remove all HCFC-22 refrigerant from the existing system. Check gauges after shutdown to confirm that the entire system is completely void of refrigerant.
4. Disconnect the liquid and vapor lines from the existing outdoor unit.
5. Remove the existing outdoor unit.

NOTE - Use recovery machine instructions for specific setup requirements.

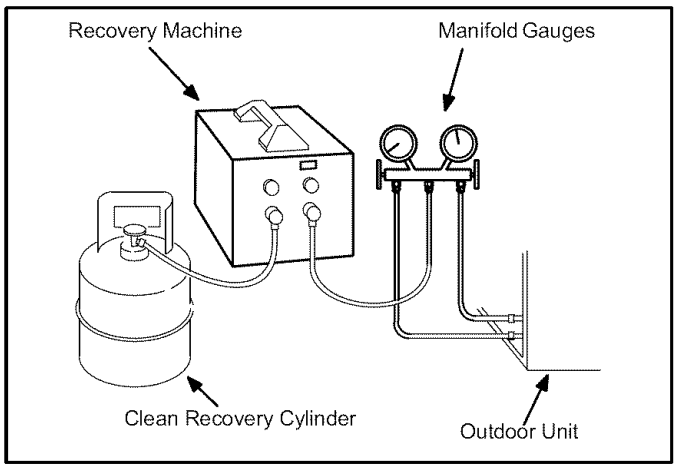


Figure 4. Typical Refrigerant Recovery (Method 1)

METHOD 2:

If the existing outdoor unit is equipped with manual shut-off valves and you plan to use new HCFC-22 refrigerant to flush the system -

1. Start the existing HCFC-22 system in the cooling mode and close the liquid line valve.
2. Pump all of the existing HCFC-22 refrigerant back into the outdoor unit.

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

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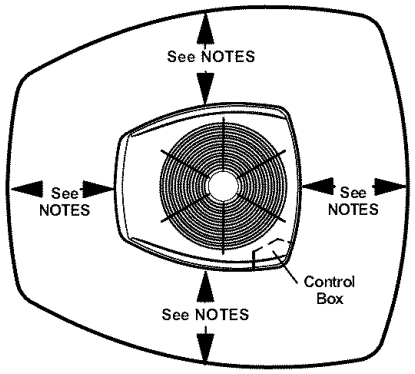
3. When the low side system pressures reach 0 psig, close the vapor line valve.
4. Disconnect all power to the existing outdoor unit. Check gauges after shutdown to confirm that the valves are not allowing refrigerant to flow back into the low side of the system.
5. Disconnect the liquid and vapor lines from the existing outdoor unit.
6. Remove the existing outdoor unit.

Positioning New Outdoor Unit

⚠ CAUTION

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

See *Unit Dimensions* on page 2 for sizing mounting slab, platforms or supports. Refer to figure 5 for mandatory installation clearance requirements.



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

Figure 5. Installation Clearances

POSITIONING CONSIDERATIONS

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 6.

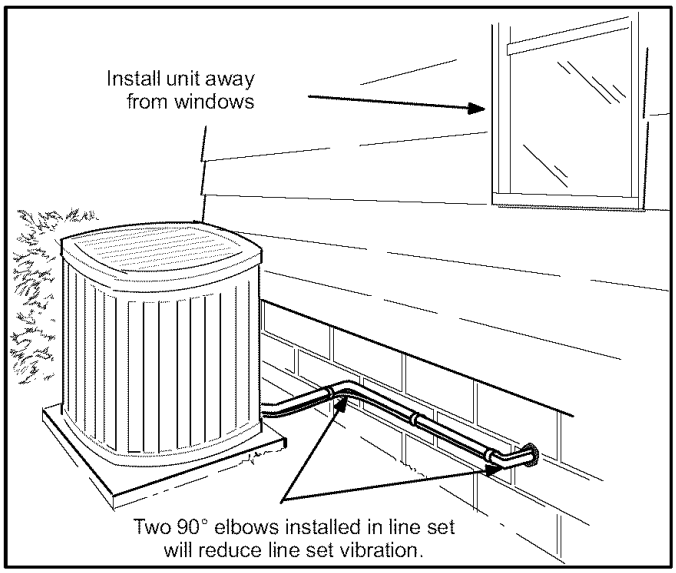


Figure 6. Outside Unit Placement

PLACING UNIT ON SLAB

When installing a unit at grade level, the top of the slab should be high enough above the grade so that water from higher ground would not collect around the unit as illustrated in figure 7. Slab may be level or have a slope tolerance away from the building of not more than two degrees, or 2 inches per 5 feet (51 mm per 1524 mm).

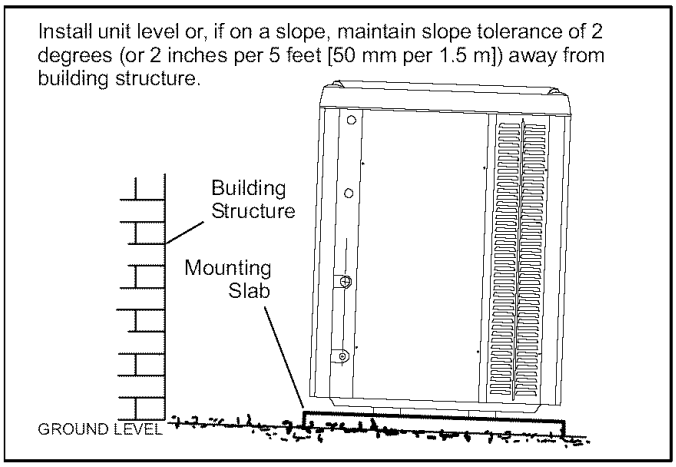


Figure 7. Ground Level Slab Mounting

INSTALLING UNIT ON ROOF

Install the unit a minimum of 6 inches (152 mm) above the roof surface to avoid ice build-up around the unit. Locate the unit above a load bearing wall or area of the roof that can adequately support the unit. Consult local codes for rooftop applications.

If unit coil cannot be mounted away from prevailing winter winds, a wind barrier should be constructed as illustrated in figure 8. Size barrier at least the same height and width as outdoor unit. Mount barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds.

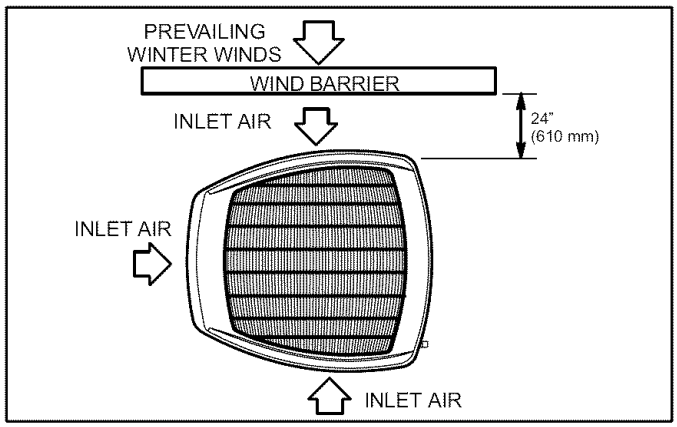


Figure 8. Rooftop Application and Wind Barrier

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

ELEVATING THE UNIT

These units are outfitted with elongated-shaped feet as illustrated in figure 9.

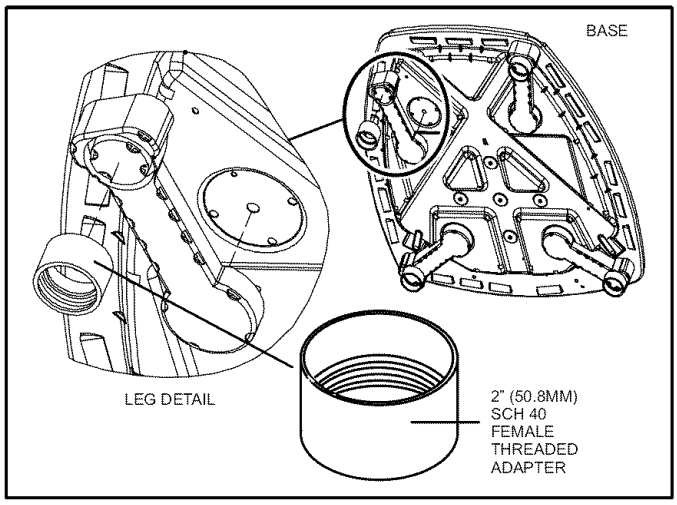


Figure 9. Elevated Slab Mounting using Feet Extenders (Larger Base Units)

If additional elevation is necessary, raise the unit by extending the height of the unit support feet. This may be done with 2" SCH 40 female threaded adapter. The specified coupling will fit snuggly into the recess portion of the feet. Use additional 2" SCH 40 male threaded adapters which can be threaded into the female threaded adapters to make additional adjustments to the level of the unit.

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.

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 10 using conventional practices; replace the panels after installation is complete.

⚠ IMPORTANT

Using field-provided stabilizer brackets:

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 an unstable or uneven surface.

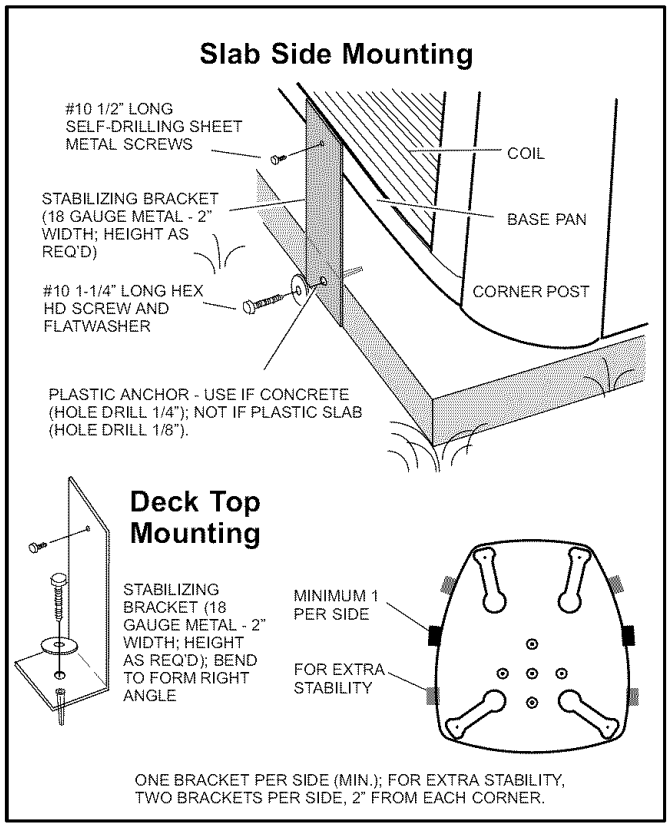


Figure 10. Installing Stabilizer Brackets

Removing 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.

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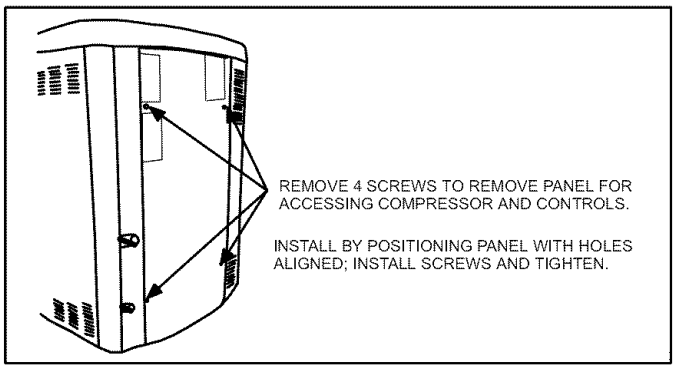

Figure 11. Access Panel

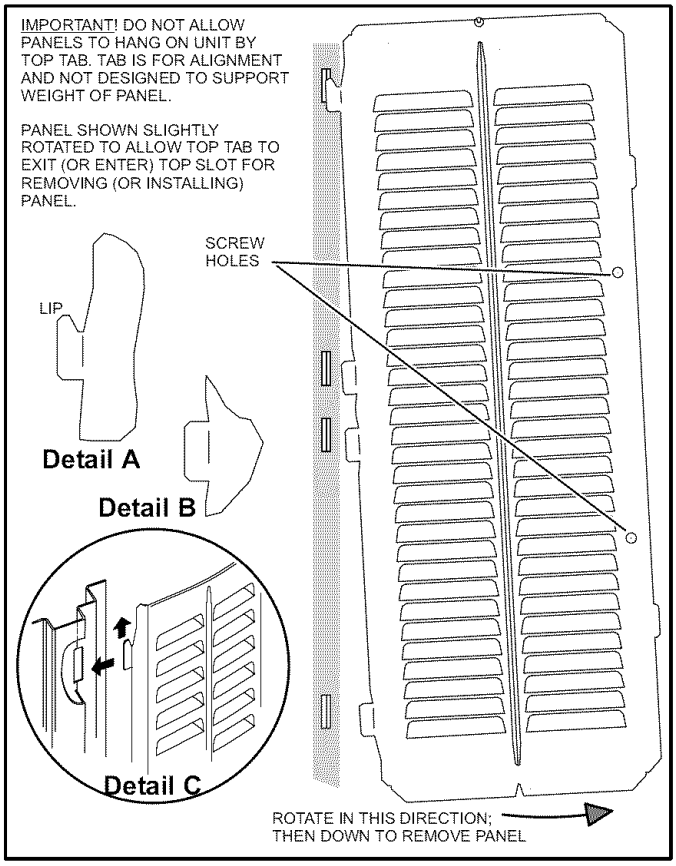

Figure 12. Removing/Installing Louvered Panels (Detail A, B and C)

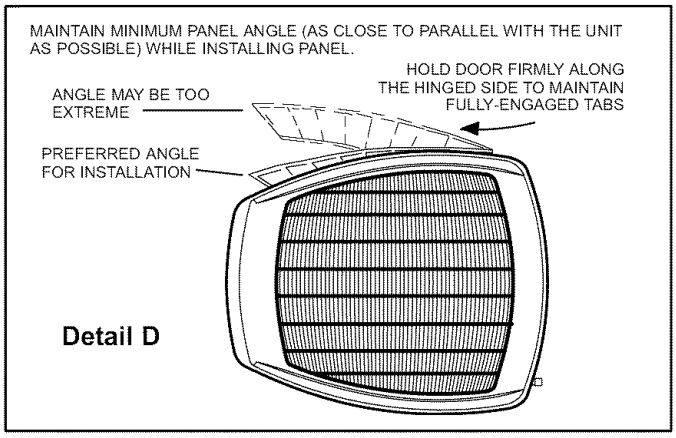

Figure 13. Removing/Installing Louvered Panels (Detail D)

ACCESS PANEL

Removal and reinstallation of the access panel is illustrated in figure 11.

LOUVERED PANELS

Remove the louvered panels as follows:

1. Remove two screws, allowing the panel to swing open slightly.
2. **Hold the panel firmly throughout this procedure.** Rotate bottom corner of panel away from hinged corner post until lower three tabs clear the slots as illustrated in figure 12, detail B.
3. Move panel down until lip of upper tab clears the top slot in corner post as illustrated in figure 12, detail A.

Position and Install Panel—Position the panel almost parallel with the unit as illustrated in figure 13, detail D with the screw side as close to the unit as possible. Then, in a continuous motion:

- Slightly rotate and guide the lip of top tab inward as illustrated in figure 12, details A and C; then upward into the top slot of the hinge corner post.
- Rotate panel to vertical to fully engage all tabs.
- Holding the panel's hinged side firmly in place, close the right-hand side of the panel, aligning the screw holes.

When panel is correctly positioned and aligned, insert the screws and tighten.

Electrical Connections

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

ELECTRICAL AND CONTROL CONNECTIONS

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.

NOTE - Connect conduit to the unit using a proper conduit fitting. Units are approved for use only with copper conductors. A complete unit wiring diagram is located on the back side of the unit's access panel.

NOTE - For proper voltages, select thermostat wire gauge per the following chart:

⚠WARNING

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

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.

Table 2. Wire Run Length

Wire Run Length	AWG #	Insulation Type
less than 100' (30m)	18	color-coded, temperature rating 35°C minimum
more than 100' (30m)	16	

1. Install room thermostat (ordered separately) on an inside wall approximately in the center of the area and 5 feet (1.5 m) from the floor. Do not install on an outside wall or where sunlight, drafts or vibrations affect it.
2. Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated in figure 14.
3. Install line voltage power supply to unit from a properly sized disconnect switch as illustrated in figure 15.
4. Ground unit from ground lug as illustrated in figure 15 to unit disconnect switch, or to an earth ground.

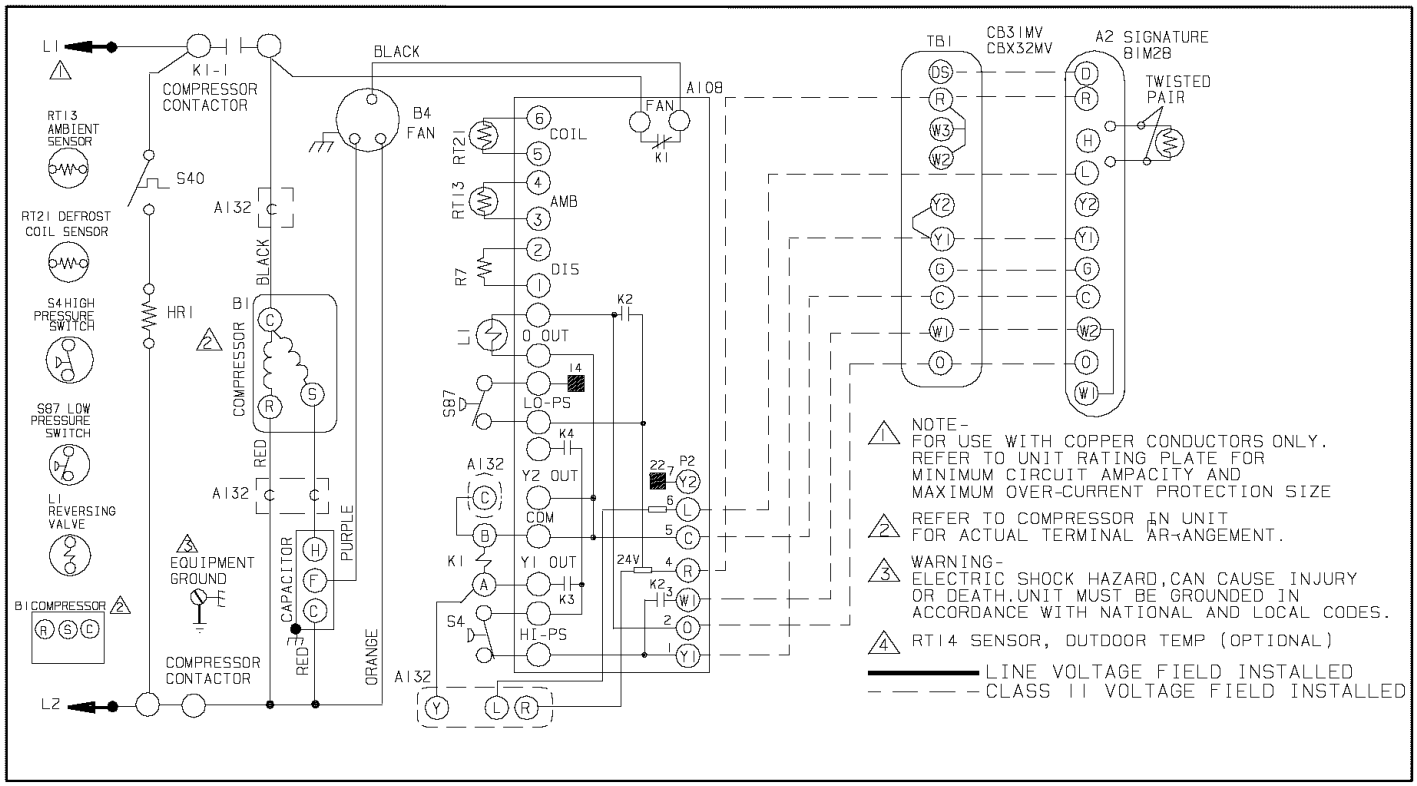

Figure 14. Typical Low-Voltage Field Wiring

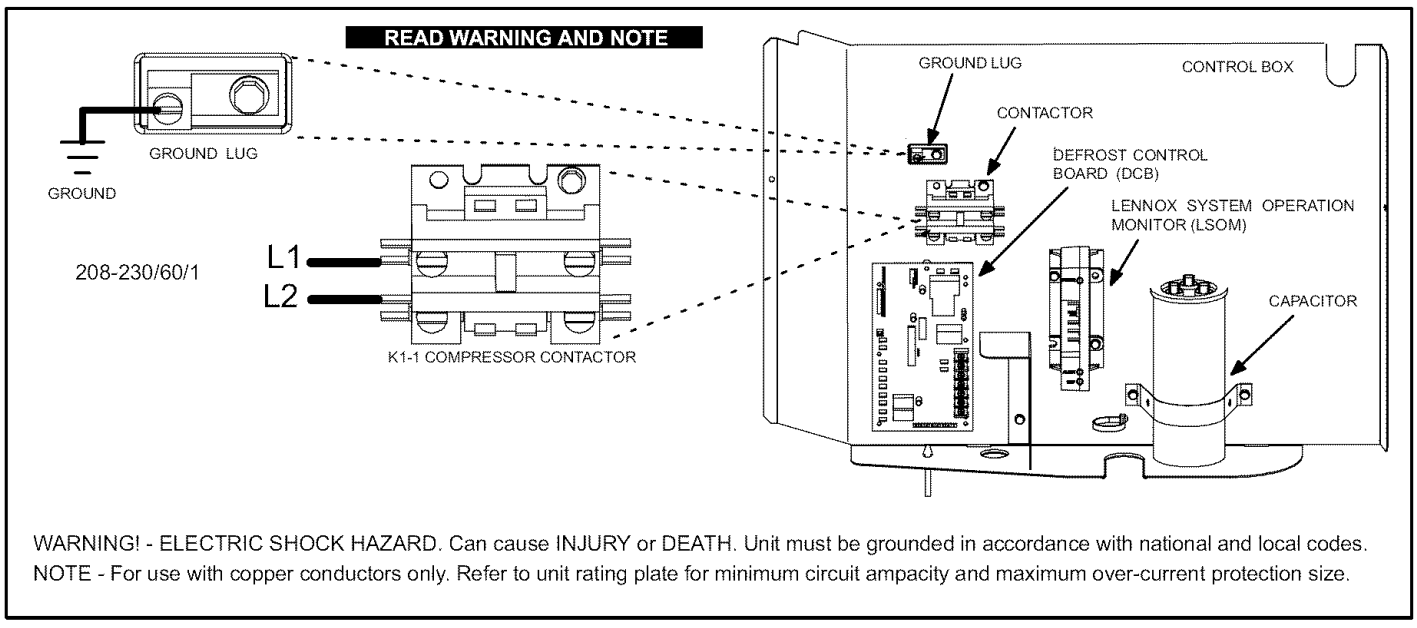

Figure 15. Typical High-Voltage Field Wiring (Unit Panel)

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New or Replacement Line Set

This section provides information on installation or replacement of existing line sets. If line sets are not being installed or replace, then proceed to *Brazing Connections* on page 11.

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.

REFRIGERANT LINE SET

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections) to the indoor unit coil (flare or sweat connections). Use Lennox L15 (sweat, non-flare) series line sets, or use field-fabricated refrigerant lines as listed in table 3.

MATCHING WITH NEW OR EXISTING INDOOR COIL AND LINE SET

⚠ IMPORTANT

Matching XP15 with a New Indoor Coil and Line Set—If installing a new indoor coil and reusing the existing line set that included a RFCI liquid line (small bore liquid line used as a metering device) then you must change to a standard size liquid line.

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 (XP15) and size (e.g. -060) of unit.*
- *Line set diameters for the unit being installed (from table 3)*
- Number of elbows and if there is a rise or drop of the piping.

Line sets for heat pump applications can not be installed underground. For more information see the *Lennox Refrigerant Piping Design and Fabrication Guidelines*, or contact Lennox Technical Support Product Applications for assistance.

Table 3. Refrigerant Line Sets

Model	Valve Sizes		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-024 -030 -036	3/8 in. (10 mm)	3/4 in. (19 mm)	3/8 in (10 mm)	3/4 in. (19 mm)	L15-41 15 - 50 ft. (5 - 15 m)
-042 -048	3/8 in. (10 mm)	7/8 in (22 mm)	3/8 in. (10 mm)	7/8in (22 mm)	L15-65 15 - 50 ft. (5 - 15m)
-060	3/8 in. (10 mm)	1-1/8 in. (29 mm)	3/8 in. (10 mm)	1-1/8 in. (29 mm)	Field Fabricated

INSTALLING LINE SET

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

- Installation of **line sets on horizontal runs** is illustrated in figure 16.
- Installation of **line sets on vertical runs** is illustrated in figure 17 on page 10 .
- Installation of a **transition from horizontal to vertica**l is illustrated in figure 18 on page 10.

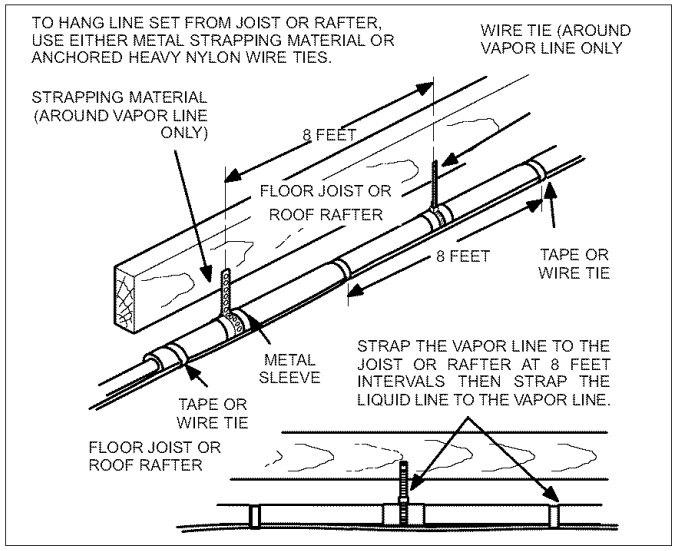


Figure 16. Refrigerant Line Sets: Installing Horizontal Runs

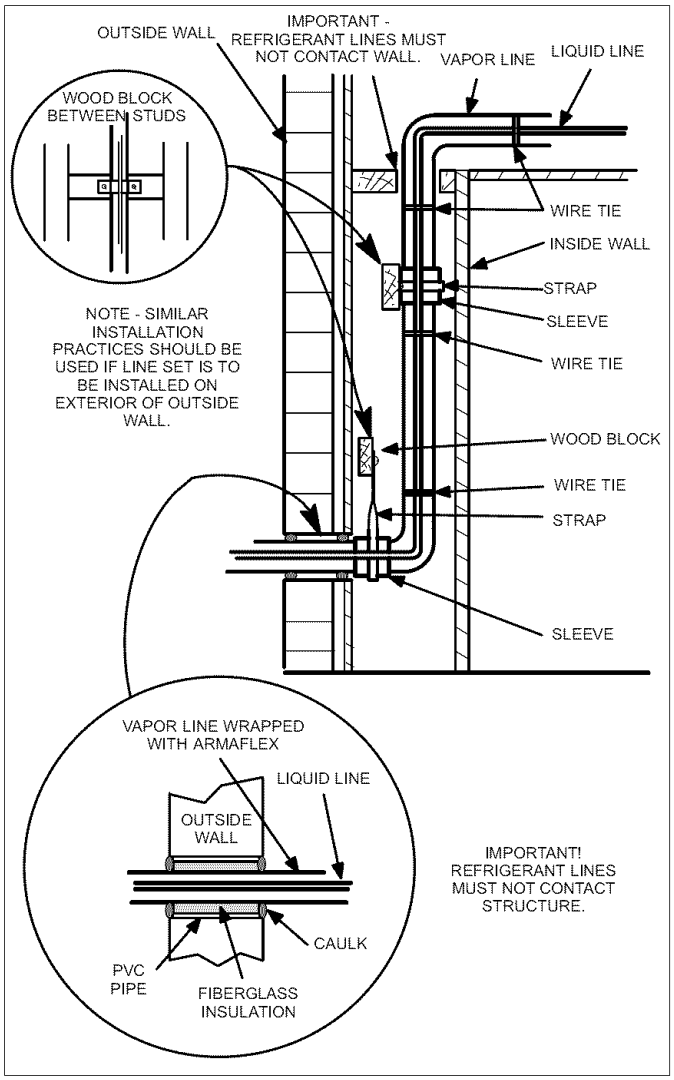


Figure 17. Refrigerant Line Sets: Installing Vertical Runs (New Construction Shown)

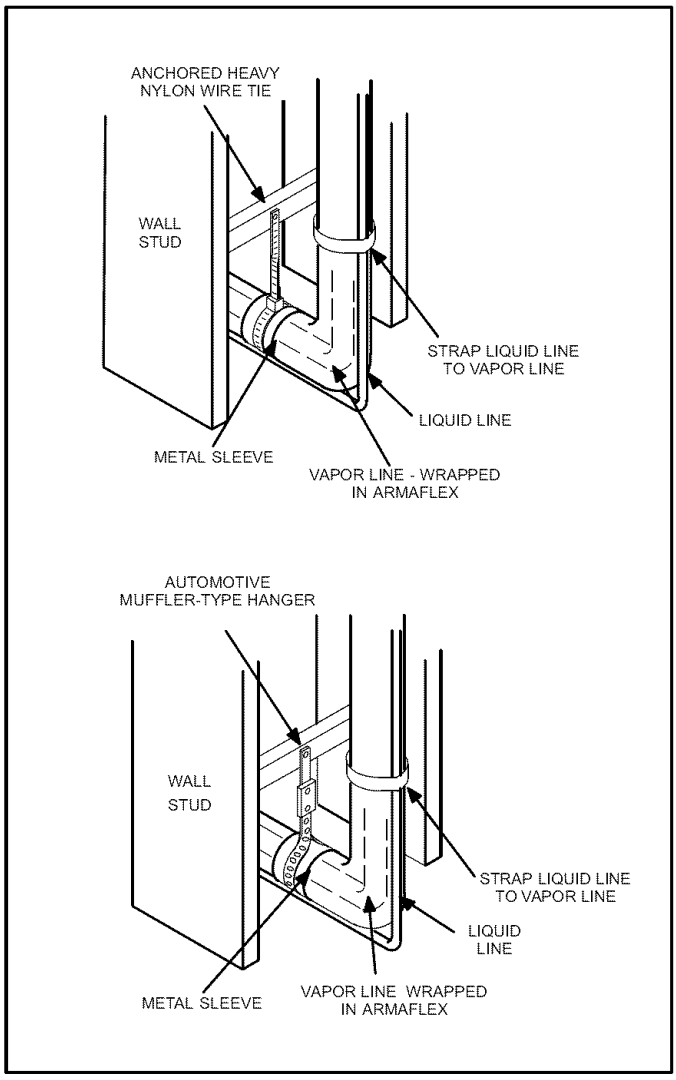


Figure 18. Refrigerant Line Sets: Transition from Vertical to Horizontal

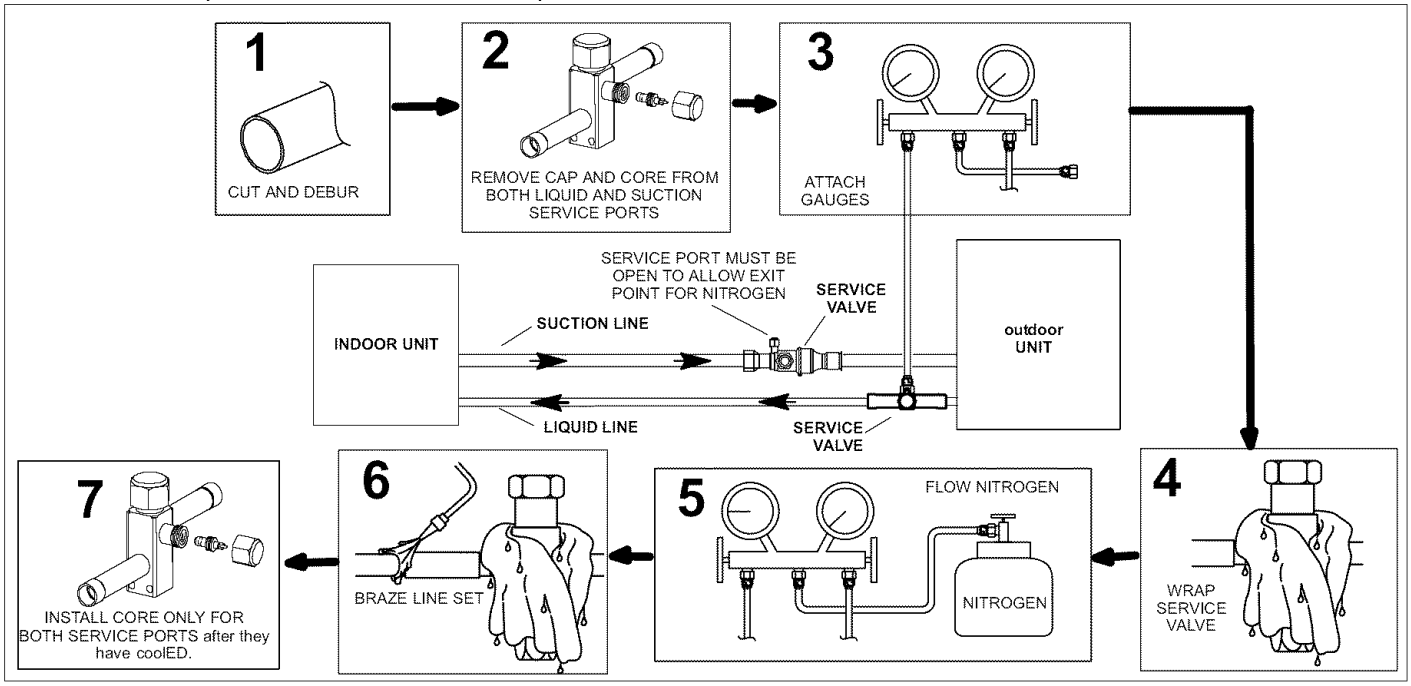


Figure 19. Brazing Connections

ISOLATION GROMMETS

Locate the provided isolation grommets. Slide grommets onto vapor and liquid lines. Insert grommets into mullion to isolate refrigerant lines from sheet metal edges.

Brazing Line Set Connections

Use the following procedure to braze the line set to the new outdoor unit. Figure 19 is provided as a general guide for preparing to braze the line sets to the outdoor unit.

Before brazing, remove the access panel as illustrated in figure 11; then remove the narrow piping panel to prevent burning off the paint as illustrated in figure 20.

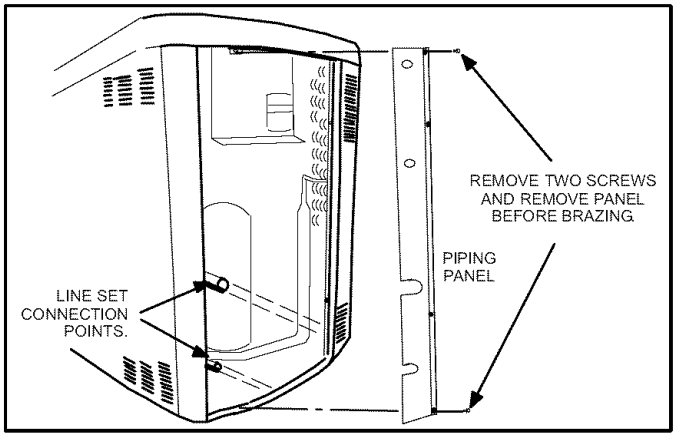


Figure 20. Piping Panel Removal

⚠ 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.

1. 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. Remove service cap and core from both the vapor and liquid line service ports.
3. Connect gauge low pressure side to liquid line service valve.
4. 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 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 vapor service valve. The CTXV metering device at the indoor unit coil will allow low pressure nitrogen to flow through the system.)

Note: Use silver alloy brazing rods with five or six percent minimum silver alloy for copper-to-copper brazing or 45 percent silver alloy for copper-to-brass or copper-to-steel brazing.

6. Braze the line set to the liquid line service valve. Turn off nitrogen flow. Repeat procedure starting at paragraph 4 for brazing the vapor line set to service valve.

After brazing the vapor line set to the service valve, disconnect gauge from service port, remove wrapping and replace service port cores.

Removing Existing Refrigerant Metering Device

Remove the existing HCFC-22 refrigerant flow control orifice or thermal expansion valve from the indoor coil. Existing devices are not approved for use with HFC-410A refrigerant and may prevent proper flushing. Use a field-provided fitting to reconnect lines. See figure 23 on page 13 for disassembly and typical removal instructions.

Testing for Leaks

After the line set has been connected to both the indoor and outdoor units, check the line set connections at both the indoor and outdoor units 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 vapor valve service port. *(Normally, the high pressure hose is connected to the liquid line port; however, connecting it to the vapor port better protects the manifold gauge set from high pressure damage.)*
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 (vapor only).
3. Open the high pressure side of the manifold to allow HFC-410A into the line set and indoor unit.
4. 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].*
5. Close the valve on the HFC-410A cylinder and the valve on the high pressure side of the manifold gauge set.
6. Disconnect the HFC-410A cylinder.
7. Connect a cylinder of dry nitrogen with a pressure regulating valve to the center port of the manifold gauge set.
8. Adjust dry nitrogen pressure to 150 psig (1034 kPa).
9. Open the valve on the high side of the manifold gauge set in order to pressurize the line set and the indoor unit.
10. 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.
11. After leak testing disconnect gauges from service ports.

Removing Service Valve Port Core

Remove both of the outdoor unit's service port cores (liquid and vapor) as illustrated in figure 21.

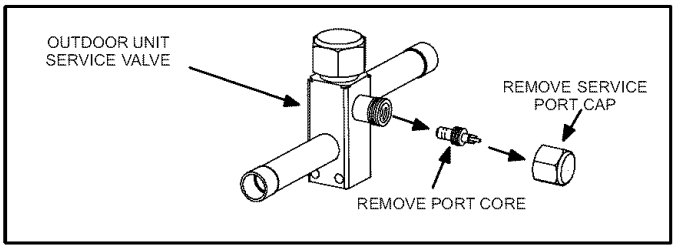


Figure 21. Typical Service Valve Port Core Removal

Flushing Existing System

⚠ 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

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.

⚠ CAUTION

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

⚠ IMPORTANT

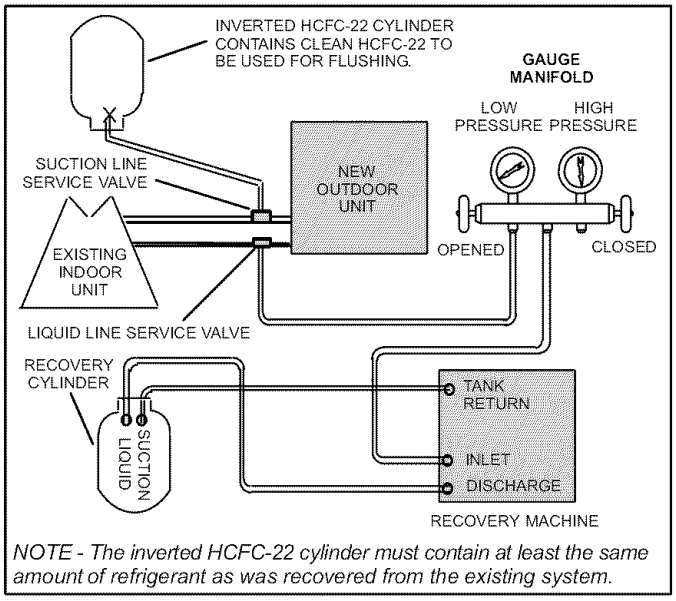
The Environmental Protection Agency (EPA) prohibits the intentional venting of HFC refrigerants during maintenance, service, repair and disposal of appliance. Approved methods of recovery, recycling or reclaiming must be followed.

If new lines are used then proceed to *Installing New Refrigerant Metering Device.* Otherwise proceed with the following procedure.

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).



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

Figure 22. Typical Flushing Connection

PROCEDURE

1. Verify that the existing HCFC-22 refrigerant flow control device has been removed before continuing with flushing procedures. Existing devices are not approved for use with HFC-410A refrigerant and may prevent proper flushing.
2. Connect an HCFC-22 cylinder with clean refrigerant to the vapor service valve. Connect the HCFC-22 gauge set to the liquid line valve. Connect a recovery machine with an empty recovery tank to the gauge set as illustrated in figure 22.
3. 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.
4. Invert the cylinder of clean HCFC-22 and open its valve to allow liquid refrigerant to flow into the system through the vapor line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor unit coil before it enters the recovery machine.
5. After all of the liquid refrigerant has been recovered, switch the recovery machine to vapor recovery so that all of the HCFC-22 vapor is recovered. Allow the recovery machine to pull a vacuum on the system.

NOTE - A single system flush should remove all of the mineral oil from the existing refrigerant lines and indoor unit coil. A second flushing may be done (using clean refrigerant) if insufficient amounts of mineral oil were removed during the first flush. Each time the system is flushed, you must allow the recovery machine to pull a vacuum on the system at the end of the procedure.

6. 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.

Installing New Refrigerant Metering Device

XP15 units are used in check thermal expansion valve (CTXV) systems only. See the indoor unit coil installation instructions and the Lennox Engineering Handbook for approved CTXV match-ups and application information. Table 3 on page 9 lists liquid and vapor line sizes and corresponding line sets.

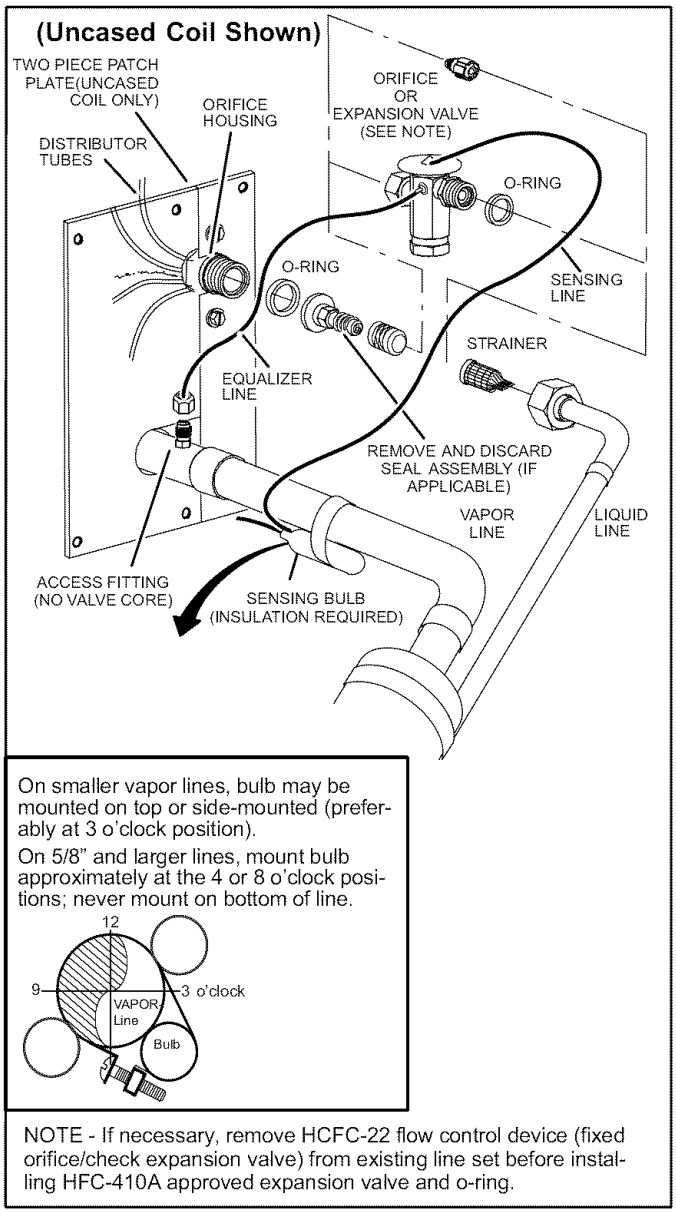


Figure 23. Typical Metering Device Installation

The thermostatic expansion valve or check / thermostatic expansion valve, 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 and provide an access for field servicing of the CTXV. Refer to Figure 23 for reference during installation of CTXV.

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 distributor. Take care not to twist or damage distributor tubes during this process.
4. Remove and discard RFC bullet and Teflon washer.
5. Remove and discard cap from the equalizer line port on the vapor line. Check for valve core in port fitting and if installed, remove from port.
6. Install one of the provided Teflon washers around the stubbed end of the CTXV.
7. Attach the stubbed end of the kit valve to the distributor assembly.
8. Place the remaining Teflon washer around the other end of the CTXV.
9. Attach the liquid line to the CTXV.
10. Attach the sensing bulb of the CTXV in the proper orientation to the vapor line using the clamp an screws provided with the CTXV.
11. Connect the equalizer line from the CTXV to the equalizer vapor port on the vapor line.
12. To prevent against any possibility of water damage, properly insulate all parts of the CTXV assemble that may sweat due to temperature differences between the valve and its surrounding ambient temperatures.
13. The expansion/check valve can be installed internally in coil blowers, or external or internal to indoor coil only applications.

Expansion valves equipped with Chatleff type fittings are available from Lennox. Refer to the Engineering Handbook for CTXV kits for use with specific match-ups.

Table 4. Indoor CTXV Kits

Model	Kit Number
XP15-024 and -036	49L24
XP15-048 and -060	91M02

⚠ IMPORTANT

Failure to remove a fixed orifice when installing an expansion valve to the indoor coil will result in improper operation and damage to the system.

If the indoor unit being installed came with a fixed orifice type metering device, remove that orifice and install the CTXV as illustrated in figure 23.

Installing Service Valve Port Core

Re-install both of the outdoor unit's service port cores (liquid and vapor) as illustrated in figure 24.

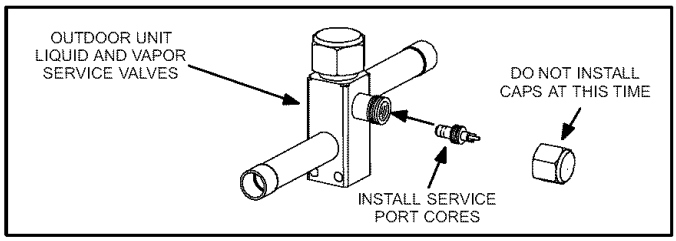


Figure 24. Typical Service Valve Port Core Installation

Evacuating the System

⚠ 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.

⚠ 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.

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 vapor combine with refrigerant to produce substances that corrode copper piping and compressor parts.

1. Connect manifold gauge set to the service valve ports as follows:
   - low pressure gauge to *vapor* line service valve
   - high pressure gauge to *liquid* line service valve
2. Connect micron gauge.
3. Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.
4. Open both manifold valves and start the vacuum pump.
5. 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.*

6. 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.

7. 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.
8. 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.
9. 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.
10. Close manifold gauge valves and shut off the HFC-410A cylinder and remove the manifold gauge set.

SERVICING UNITS DELIVERED VOID OF CHARGE

If the system 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.**

Start-Up Procedures

⚠ 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 frozen bearings or binding.
2. Inspect all factory- and field-installed wiring for loose connections.
3. After evacuation is complete, open the liquid line and vapor line service valves to release the refrigerant charge (contained in outdoor unit) into the system.
4. Replace the stem caps and tighten as specified in *Operating Service Valves* on page 3.
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 refrigerant by using the procedures listed under *Testing and Charging System.*

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 liquid line filter drier with components designed for use with HCFC-22.

NOTE - This unit is NOT approved for use with coils which use capillary tubes as a refrigerant metering device.

SETTING UP TO CHECK CHARGE

1. Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HFC-410A.
2. Connect the manifold gauge set to the unit's service ports as illustrated in figure 25.
   - low pressure gauge to ***vapor service port***
   - high pressure gauge to ***liquid service port***

COOLING MODE INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process as illustrated in figure 26 on page 16.

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,
- voltage supplied to the unit,
- amperage being drawn by the heat unit(s).

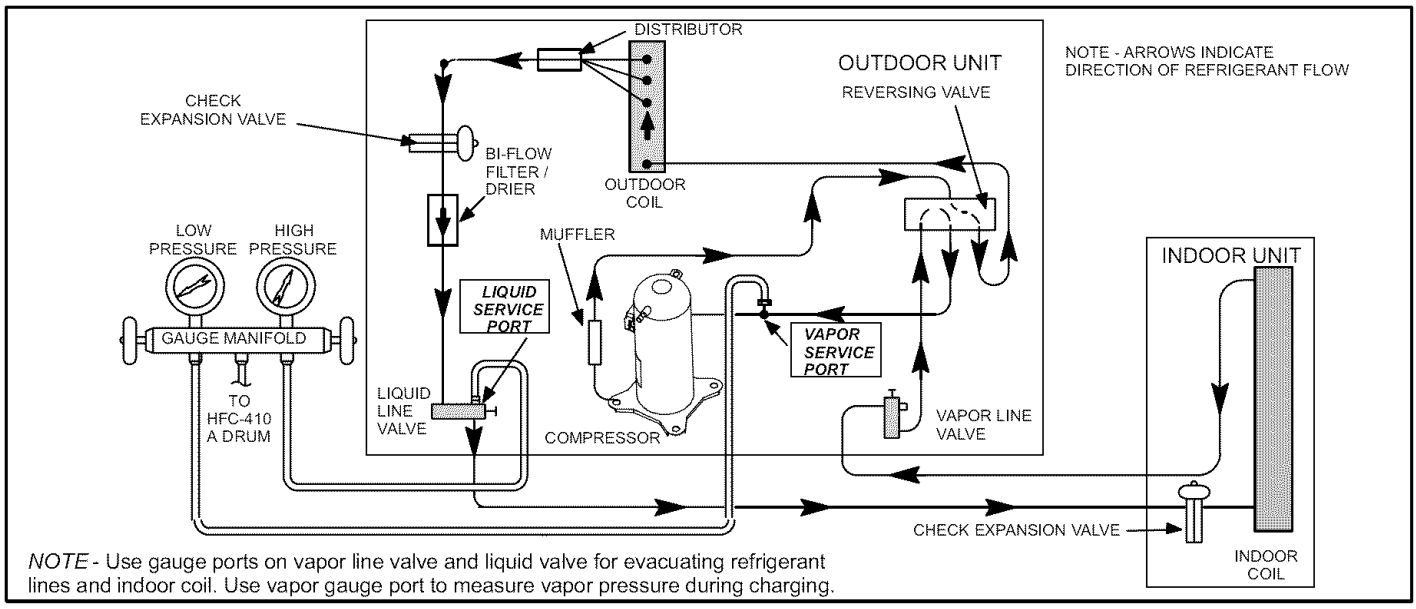
Then, apply the measurements taken in following formula to determine CFM:

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

CALCULATING CHARGE

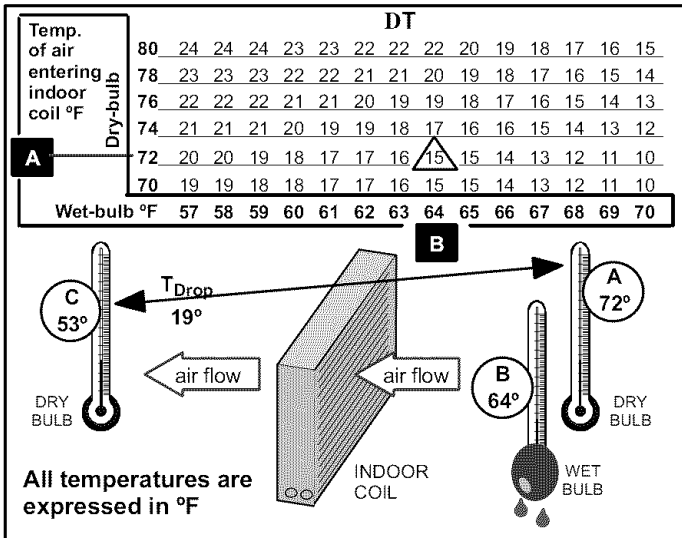
If the system is void of refrigerant, first, locate and repair any leaks and then weigh in the refrigerant charge into the unit. To calculate the total refrigerant charge:

Amount specified on nameplate		Adjust amount for variation in line set length (table in figure 27)		Additional charge specified per indoor unit match-up (tables 6 through 11)		Total charge
_____	±	_____	+	_____	=	_____



NOTE - Use gauge ports on vapor line valve and liquid valve for evacuating refrigerant lines and indoor coil. Use vapor gauge port to measure vapor pressure during charging.

Figure 25. XP15 Cooling Cycle (Showing Gauge Manifold Connections)



1. Determine the desired DT—Measure entering air temperature using dry bulb (**A**) and wet bulb (**B**). **DT** is the intersecting value of **A** and **B** in the table (see triangle).

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

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

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

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 ±3°.

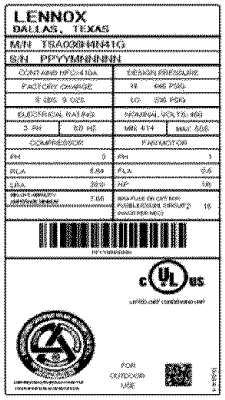
Figure 26. Checking Indoor Airflow over Evaporator Coil using Delta-T Chart

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.*

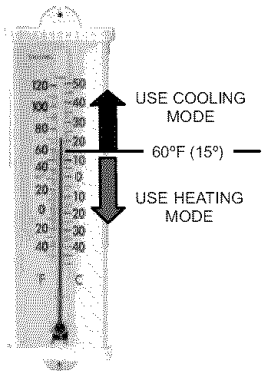


1. Check Liquid and suction line pressures
2. Compare unit pressures with table 5, *Normal Operating Pressures.*
3. Conduct leak check; evacuate as previously outlined.
4. Weigh in the unit nameplate charge plus any charge required for line set differences over feet.

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

Figure 27. Using Weigh In Method

SUBCOOLING



SAT° _____
LIQ° – _____
SC° = _____

1 Check the airflow as illustrated in figure 26 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 Normal Operating Pressures table 5, (*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 in table below 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 68°F (20°C). 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 in table below 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 77°F (25°C). 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 12 and record it in the SAT° space.

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

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

10 If subcooling value is greater than shown in tables 6 through 11 for the applicable unit, remove refrigerant; if less than shown, add refrigerant.

11 If refrigerant is added or removed, repeat steps 6 through 10 to verify charge.

Figure 28. Using Subcooling Method

Table 5. Normal Operating Pressure - Liquid ±10 and Vapor ±5 PSIG*

⚠ IMPORTANT

Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system.

	XP15-024		XP15-030		XP15-036		XP15-042		XP15-048		XP15-060	
°F (°C)**	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor
HEATING OPERATION												
20 (-7.0)	315	65	308	62	284	59	293	58	312	62	349	61
30 (-1.0)	340	81	317	76	296	71	312	71	332	76	375	74
40 (4.4)	364	97	339	89	313	87	321	82	353	92	384	88
50 (10)	394	115	359	107	326	106	337	103	374	110	406	107
COOLING OPERATION												
65 (18.3)	237	141	250	141	260	139	265	141	242	139	255	136
75 (23.9)	274	143	292	143	298	141	309	144	279	140	297	138
85 (29.4)	319	145	336	145	344	143	360	147	322	142	343	140
95 (35.0)	364	147	385	147	393	145	408	149	370	144	392	142
105 (40.6)	415	149	438	148	446	148	462	151	423	147	447	145
115 (49.0)	469	152	497	151	506	150	522	154	479	149	510	148

**These are most-popular-match-up pressures. Indoor match up, indoor air quality, and indoor load cause pressures to vary.*
***Temperature of the air entering the outdoor coil.*

Table 6. XP15-024

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CH23-51	14	6	0	14
CBX27UH-030-230	13	6	2	4
CB30U-31	15	5	0	1
CBX32M-030	15	5	0	1
CBX32M-036	13	6	2	4
CBX32MV-024/030	15	5	0	0
CBX32MV-036	13	6	2	4
CH33-42	14	6	0	14
CR33-48	38	7	3	1
CX34-31	15	5	0	1
CX34-38 SN# 6007 and after	6	6	1	15
CX34-38 before SN# 6007	13	6	1	15

Table 7. XP15-030

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CH23-51	13	5	0	4
CBX27UH-030-230	12	5	0	10
CBX27UH-036-230	13	5	0	8
CB30U-31	14	5	0	0
CB30U-41/46	12	5	0	10
CBX32M-030	14	5	0	0
CBX32M-036	12	5	0	10
CBX32MV-024/030	14	5	0	0
CBX32MV-036	12	5	0	10
CR33-48	31	4	0	13
CX34-38 SN# 6007 and after	5	5	0	8
CX34-38 before SN# 6007	13	5	0	8
CX34-43	9	5	1	4
CX34-49	6	5	2	0
CX34-50/60C	9	5	1	4

Table 8. XP15-036

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CBX27UH-036-230	13	4	0	3
CBX27UH-042-230	5	5	0	12
CB30U-41/46	13	4	0	3
CB30U-51	5	5	0	12
CBX32M-042	13	4	0	3
CBX32M-048	5	5	0	12
CBX32MV-036	13	4	0	3
CBX32MV-048	5	5	0	12
C33-44C	13	4	0	3
CH33-42	14	4	0	1
CH33-44/48B	9	4	0	7
CH33-48C	7	5	0	7
CH33-49C	5	5	0	12
CH33-62D	5	7	0	14
CR33-48C	37	4	0	5
CR33-50/60	32	5	0	10
CX34-31	15	4	0	0
CX34-38 SN# 6007 and after	4	4	0	3
CX34-38 before SN# 6007	13	4	0	3
CX34-43	7	5	0	7
CX34-44/48	13	4	0	3
CX34-49	6	5	0	11

Table 9. XP15-042

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CH33-62D	7	7	0	13
CBX27UH-042-230	9	4	0	11
CBX27UH-048-230	9	4	0	11
CB30U-51*P	9	4	0	11
CBX32M-048	9	4	0	11
CBX32MV-048	9	4	0	11
C33-44C	13	4	0	0
CH33-44/48B, -48C	12	4	0	5
CH33-49C	9	4	0	12
CR33-48	35	3	0	2
CX34-38 SN# 6007 and after	4	4	0	0
CX34-38 before SN# 6007	13	4	0	0
CX34-43	12	4	0	5
CX34-44/48B	13	4	0	0
CX34-50/60C	12	4	0	5

Table 10. XP15-048

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CH23-68	21	4	0	12
CBX27UH-048-230	22	4	0	3
CBX27UH-060-230	12	4	0	11
CB30U-51*P	22	4	0	3
CB30U-65*P	12	4	0	3
CBX32M-048	22	4	0	3
CBX32M-060	12	4	0	3
CBX32MV-048	22	4	0	3
CBX32MV-060	12	4	0	3
CBX32MV-068	12	4	0	7
CH33-62D	12	4	0	8
CX34-49C	13	4	0	2
CX34-60D	14	4	0	0
CX34-62D	12	4	0	5

Table 11. XP15-060

INDOOR MATCHUPS	Target Subcooling Heat (±5°F)	Target Subcooling Cool (±1°F)	*Add charge lb	*Add charge oz
CH23-68	28	6	0	0
CBX27UH-060-230	17	6	0	0
CB30U-51*P, -65*P	19	6	0	2
CBX32M-048*P, -060*P	19	6	0	2
CBX32MV-048*P, -060*P	19	6	0	2
CH33-62D	18	6	0	1

**Amount of charge required in addition to charge shown on unit nameplate. (Remember to consider lineset length difference.)*

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Table 12. 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

INSTALLING SERVICE VALVE CAPS

Disconnect gauge set and re-install all service valve caps.

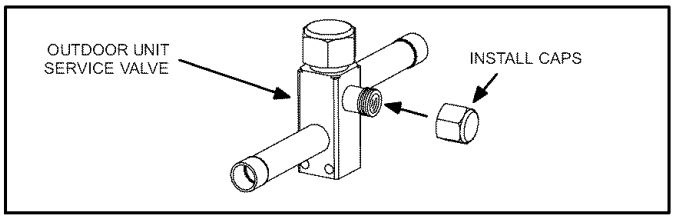


Figure 29. Installing Service Valve Port Caps

System Operations

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 the unit 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). The system should be left in the emergency heat mode at least six hours to allow the crankcase heater sufficient time to prevent compressor slugging.

HIGH-PRESSURE SWITCH

XP15 units are equipped with a high-pressure switch that is located in the liquid line to the compressor. The normally closed SPST auto-reset switch opens at 590 psi.

LOW-PRESSURE SWITCH

XP15 units are equipped with a low-pressure switch that is located in the vapor line to the compressor. The normally closed SPST auto-reset switch opens at 25 psi and closes at 55 psi.

SINGLE-SPEED CONDENSER FAN MOTOR

The XP15 is equipped with a single-speed condenser fan motor. The compressor contactor and defrost control board (DCB) controls the operation of the motor.

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.

Replacement filter driers must be suitable for use with HFC-410A refrigerant.

Lennox System Operation Monitor (LSOM)

The LSOM detects the most common fault conditions in the system. When an abnormal condition is detected, the LSOM communicates the specific condition through its ALERT and TRIP lights. The LSOM is capable of detecting both mechanical and electrical system problems. See figure 30 for LSOM LED locations.

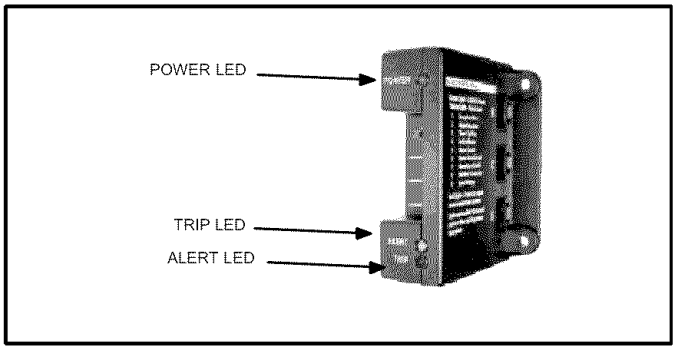


Figure 30. LSOM

Table 13. LSOM LED Troubleshooting Codes

Status LED Condition	Status LED Description	Status LED Troubleshooting Information
Green Power LED ON	LSOM has power	24VAC control power is present at the LSOM terminal.
Green Power LED OFF	LSOM not powering up	Determine/verify that both R and C LSOM terminals are connected and voltage is present at both terminals.
Red Trip LED ON	System and compressor check out OK Thermostat demand signal Y1 is present, but compressor not running *NOTE - During 5-minute delay in LSOM the red trip LED will be on.*	[1] Verify Y terminal is connected to 24VAC at contactor coil. [2] Verify voltage at contactor coil falls below 0.5VAC when off. [3] Verify 24VAC is present across Y and C when thermostat demand signal is present; if not present, R and C wires are reversed. [1] Compressor protector is open. [2] Outdoor unit power disconnect is open. [3] Compressor circuit breaker or fuse(s) is open. [4] Broken wire or connector is not making contact. [5] Low pressure switch open if present in the system. [6] Compressor contactor has failed to close.
Red Trip and Yellow Alert LEDs Flashing	Simultaneous flashing.	Indicates that the control circuit voltage is too low for operation.
Yellow Alert Flash Code 1*	**Long Run Time** - Compressor is running extremely long run cycles	[1] Low refrigerant charge. [2] Evaporator blower is not running. [3] Evaporator coil is frozen. [4] Faulty metering device. [5] Condenser coil is dirty. [6] Liquid line restriction (filter drier blocked if present). [7] Thermostat is malfunctioning.
Yellow Alert Flash Code 2*	**System Pressure Trip** - Discharge or vapor pressure out of limits or compressor overloaded	[1] Check high head pressure or discharge line sensor. [2] Condenser coil poor air circulation (dirty, blocked, damaged). [3] Condenser fan is not running. [4] Return air duct has substantial leakage. [5] If low pressure switch is present, see Flash Code 1 information.
Yellow Alert Flash Code 3*	**Short Cycling** - Compressor is running only briefly	[1] Thermostat demand signal is intermittent. [2] Time delay relay or DCB is defective. [3] If high pressure switch is present, see Flash Code 2 information. [4] If low pressure switch is present, see Flash Code 2 information.
Yellow Alert Flash Code 4*	**Locked Rotor**	[1] Run capacitor has failed. [2] Low line voltage (contact utility if voltage at disconnect is low). [3] Excessive liquid refrigerant in the compressor. [4] Compressor bearings are seized.
Yellow Alert Flash Code 5*	**Open Circuit**	[1] Outdoor unit power disconnect is open. [2] Unit circuit breaker or fuse(s) is open. [3] Unit contactor has failed to close. [4] High pressure switch is open and requires manual reset. [5] Open circuit in compressor supply wiring or connections. [6] Unusually long compressor protector reset time due to extreme ambient temperature. [7] Compressor windings are damaged.
Yellow Alert Flash Code 6*	**Open Start Circuit** - Current only in run circuit	[1] Run capacitor has failed. [2] Open circuit in compressor start wiring or connections. [3] Compressor start winding is damaged.
Yellow Alert Flash Code 7*	**Open Run Circuit** - Current only in start circuit	[1] Open circuit in compressor start wiring or connections. [2] Compressor start winding is damaged.
Yellow Alert Flash Code 8*	**Welded Contactor** - Compressor always runs	[1] Compressor contactor failed to open. [2] Thermostat demand signal not connected to LSOM.
Yellow Alert Flash Code 9*	**Low Voltage** - Control circuit <17VAC	[1] Control circuit transformer is overloaded. [2] Low line voltage (contact utility if voltage at disconnect is low).

**Flash code number corresponds to a number of LED flashes, followed by a pause, and then repeated. Reset ALERT flash code by removing 24VAC power from LSOM; last code will display for 1 minute after LSOM is powered on.*

Note: If the unit is equipped with a two-stagged compressor, upon Y2 signal detection and after five seconds, the LSOM will send 24 VAC to the solenoid. Once the solenoid is fully energized, the LSOM reduces voltage to between 4 to 18 VDC . Every 15 minutes the solenoid voltage will be increase to 24 volts for a few seconds to ensure solenoid valve is engaged until Y2 signal is no longer present.

LSOM—LED Functions

⚠ IMPORTANT

This monitor does not provide safety protection. The monitor is a monitoring device only and cannot control or shut down other devices.

See table 13 on page 20 for the complete explanation of troubleshooting codes.

LED Color	Function	Description
Green	Power	Indicates voltage within the range of 19-28VAC is present at LSOM connection.
Yellow	Alert	Communicates an abnormal system condition through a unique flash code. The alert LED flashes a number of times consecutively; then pauses; then repeats the process. This consecutive flashing correlates to a particular abnormal condition.
Red	Trip	Indicates there is a demand signal from the thermostat but no current to the compressor is detected by the LSOM.

Resetting Alert Codes

Alert codes can be reset manually or automatically:

Manual	Cycle the 24VAC power to LSOM off and on. After power up, existing code will display for one minute and then clear.
Automatic	After an alert is detected, the LSOM continues to monitor the compressor and system. When/if conditions return to normal, the alert code is turned off automatically.

LSOM—L Terminal Connection

The L connection is used to communicate alert codes to the room thermostat. On selected *Lennox SignatureStat™* thermostats, a blinking check LED will display on the room thermostat and on select White-Rodgers room thermostats, an icon on the display will flash. Either will flash at the same rate as the LSOM yellow alert LED.

NOTE - ROOM THERMOSTATS WITH SERVICE OR CHECK LIGHT FEATURE—The room thermostat may blink the Check or Service LED or it may come on solid. Confirm fault by observing and interpreting the code from the LSOM yellow alert LED at the unit.

LSOM—Installation Verification

To verify correct LSOM installation, two functional tests can be performed.

TEST 1:

1. Disconnect power from the compressor and force a thermostat call for cooling.
2. The red trip LED should turn on indicating a compressor trip as long as 24VAC is measured at the Y terminal. If the red LED does not function as described, refer to table 13 on page 20 to verify the wiring.

TEST 2:

1. Disconnect power from the compressor and 24VAC power from the LSOM.
2. Remove the wire from the Y terminal of LSOM and reapply power to the compressor, allowing the compressor to run. The yellow alert LED will begin flashing a code 8 indicating a welded contactor.
3. While the LSOM is off, reattach the wire to the Y terminal.
4. Reapply power to the compressor and 24VAC power to the LSOM; the yellow alert LED will flash the previous code 8 for one minute and then turn off. If the yellow LED does not function as described, refer to table 13 on page 20 to verify the wiring.

Defrost System

DEFROST CONTROL BOARD (DCB) FUNCTION

The DCB measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The DCB self-calibrates when the defrost system starts and after each system defrost cycle. The DCB components are illustrated in figure 31.

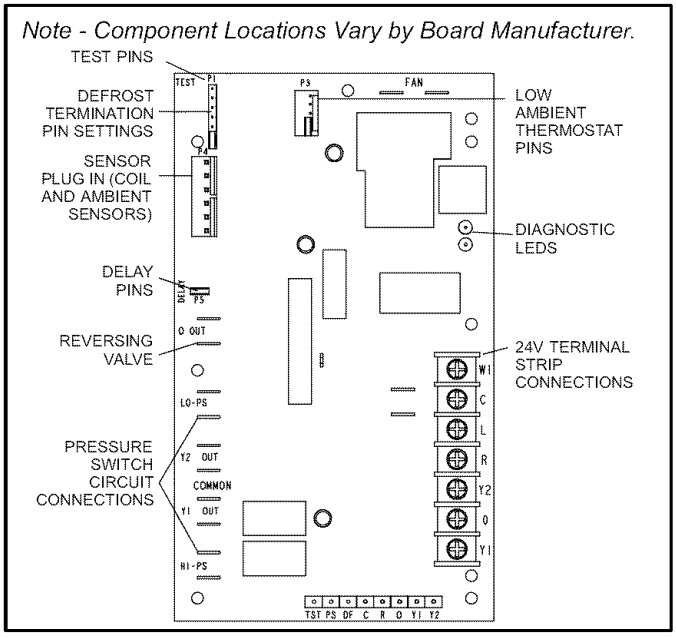


Figure 31. Defrost Control Board (DCB)

The DCB 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 DCB 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 DCB initiates defrost cycles.

Pressure Switch Connections

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

Pressure Switch Event Settings

The following are the auto reset event values for low and high pressures thresholds:

- **High Pressure** (auto reset) - trip at 590 psig, reset to 418 psig.
- **Low Pressure** (auto reset) - trip at 25 psig, reset to 55 psig.

Five-Strike Lockout Safety Function

The five-strike lockout safety function is designed to protect the unit's compressor from damage. The DCB monitors for an active state on the DCB's Y1 input as referenced in figure 31 on page 21. When the Y1 input is active the internal control logic of the DCB will do the following:

- Count any HI-PS and LO-PS pressure switch trips (open and close).
- If a pressure switch trips four times during the current active state on the Y1 input, then the DCB's control logic will reset the pressure switch trip counter to zero at the end of currently active Y1 input state.
- If the pressure switch opens for a fifth time during the current Y1 input state, the DCB will enter a lockout condition.

The system will require servicing to determine the cause of the pressure switch condition. Once the condition has been rectified, use the following procedure to reset the DCB.

DEFROST SYSTEM SENSORS

Sensors connect to the DCB through a field-replaceable harness assembly that plugs into the DCB. Through the sensors, the DCB detects outdoor ambient and coil 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 14.

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 14, 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.

Table 14. 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 and 4 (Black)
Coil	-35 (-37) to 120 (48)	280,000 to 3750	5 and 6 (Brown)
Note: Sensor resistance increases as sensed temperature decreases.			

Ambient Sensor—The ambient sensor as illustrated in figure 32 on page 24 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 DCB will not perform demand defrost operation. The DCB 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.

Coil Sensor—The coil temperature sensor as illustrated in figure 32 on page 24, 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 DCB 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.

NOTE - Within a single room thermostat demand, if five-strikes occur, the DCB will lock out the unit. The DCB's 24 volt power R must be cycled OFF, or the TEST pins on DCB must be shorted between 1 to 2 seconds to reset the DCB.

DCB OPERATIONAL MODES

The DCB has four basic operational modes which are TEST, NORMAL CALIBRATION and DEFROST.

TEST

1. When Y1 is energized and 24V power is being applied to the DCB, a test cycle can be initiated by: placing the termination temperature jumper across the Test pins (P1) for 2 to 5 seconds.
2. If the jumper remains across the Test pins longer than five seconds, the DCB will ignore the test pins and revert to normal operation.
3. The jumper will initiate one cycle per test.
4. Enter the TEST MODE by placing a jumper across the TEST pins on the DCB 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.
5. DCB timings are reduced, the low-pressure switch is ignored and the DCB will clear any active lock out condition.
6. Each test pin shorting will result in one test event. For each TEST the jumper must be removed for at least one second and reapplied. Refer to flow chart illustrated in figure 33 on page 24 for TEST operation.

NOTE - The Y1 input must be active (ON) and the O room thermostat terminal into DCB must be inactive

NORMAL

The DCB 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

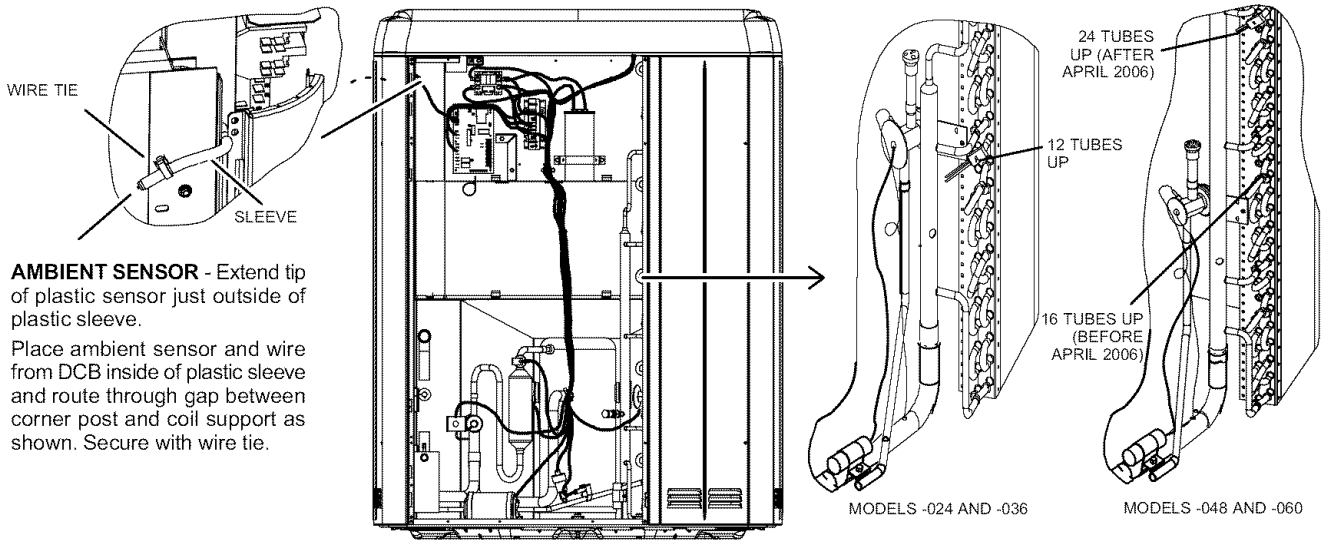
The DCB is considered uncalibrated when power is applied to the DCB, after cool mode operation, or if the coil temperature exceeds the termination temperature when it is in heat mode.

DEFROST

For detail information on DEFROST MODE, see *Detail Defrost Mode Operation* on page 26.

Table 15. Defrost Control Board (DCB) Inputs, Outputs and Configurable Settings

DCB Location	DCB Label or Description	Purpose	Function
P1	TEST	Test Mode	*See Test Mode on page 22 for further details.*
P1	50, 70, 90, 100	Defrost Temperature Termination Shunt (Jumper) Pins	The DCB as illustrated in figure 31 on page 21 has valid selections which are: 50, 70, 90, and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory set at 50°F (10°C). If the temperature shunt is not installed, the default termination temperature is 90°F (32°C).
P2	W1	24VAC Thermostat Input / Output	24VAC input/output from indoor thermostat to indoor unit.
	C	24VAC Common	24VAC common
	L	Thermostat Service Light	Thermostat service light connection.
	R	24VAC	24VAC
	Y2	Thermostat Input	Controls the second stage operation of the unit.
	O	Thermostat Input	Reversing valve solenoid.
	Y1	Thermostat Input	Controls the operation of the unit.
P3	55, 50, 45, 40	Low Ambient Thermostat Pins	Provides selection of the Y2 compressor lock-in temperature. Valid options are 40, 45, 50 and 55 degrees Fahrenheit.
P4	DIS-YEL	Coil Sensor	(P4-5) Ground connection for outdoor coil temperature sensor. (P4-6) Connection for outdoor coil temperature sensor.
	AMB-BLACK	Ambient Sensor	(P4-3) Ground connection for outdoor ambient temperature sensor. (P4-4) Connection for outdoor ambient temperature sensor.
	COIL-BROWN	Discharge Sensor	*No discharge sensor is used; replaced by 10K resistor.*
P5	DELAY	Delay Mode	The DCB 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 on P1.*
P6	TST, PS DF, C, R, O, Y1, Y2	Factory Test Connectors	No field use.
DS1	RED LED	Diagnostic LED	Valid states for DCB's two LEDs are OFF, ON and FLASHING which indicate diagnostics conditions that are described in table 16 on page on page 25.
DS2	GREEN LED		
FAN	TWO CONNECTORS	Condenser Fan Operation	These two connections provide power for the condenser fan.
O OUT	O OUT	24 VAC output	24 VAC output connection for reversing valve.
LO-PS	LO-PS	Low-Pressure Switch	When the low pressure switch trips, the DCB will cycle off the compressor, and the strike counter in the DCB 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 0°F (-18°C) • for 90 seconds following the start up of the compressor • during TEST mode
Y2 OUT	Y2 OUT	24 VAC Output	24 VAC output for second stage compressor solenoid.
Y1 OUT	Y1 OUT	24 VAC Common Output	24 VAC common output, switched for enabling compressor contactor.
HS-PS	HS-PS	High-Pressure Switch	When the high pressure switch trips, the DCB will cycle off the compressor, and the strike counter in the DCB will count one strike.
L	L	Line output	24VAC service light output.
24V	24V	24 Volt output	24VAC typically used to supply power to the Lennox System Operation Monitor (LSOM)



AMBIENT SENSOR - Extend tip of plastic sensor just outside of plastic sleeve.

Place ambient sensor and wire from DCB inside of plastic sleeve and route through gap between corner post and coil support as shown. Secure with wire tie.

NOTE - No discharge sensor used; replaced by 10K resistor.

COIL SENSOR - Clip coil temperature sensor from the DCB on the return bend shown on models as follows:

Model -024 and -036: 12 tubes up from **bottom** (11-1/2");
Model -048 and -060 (before April 2006): 16 tubes up from **bottom** (15-1/2")
Model -048 and -060 (after April 2006): 24 tubes up from **bottom** (23-1/2")

Figure 32. Heat Pump Unit Sensor Locations

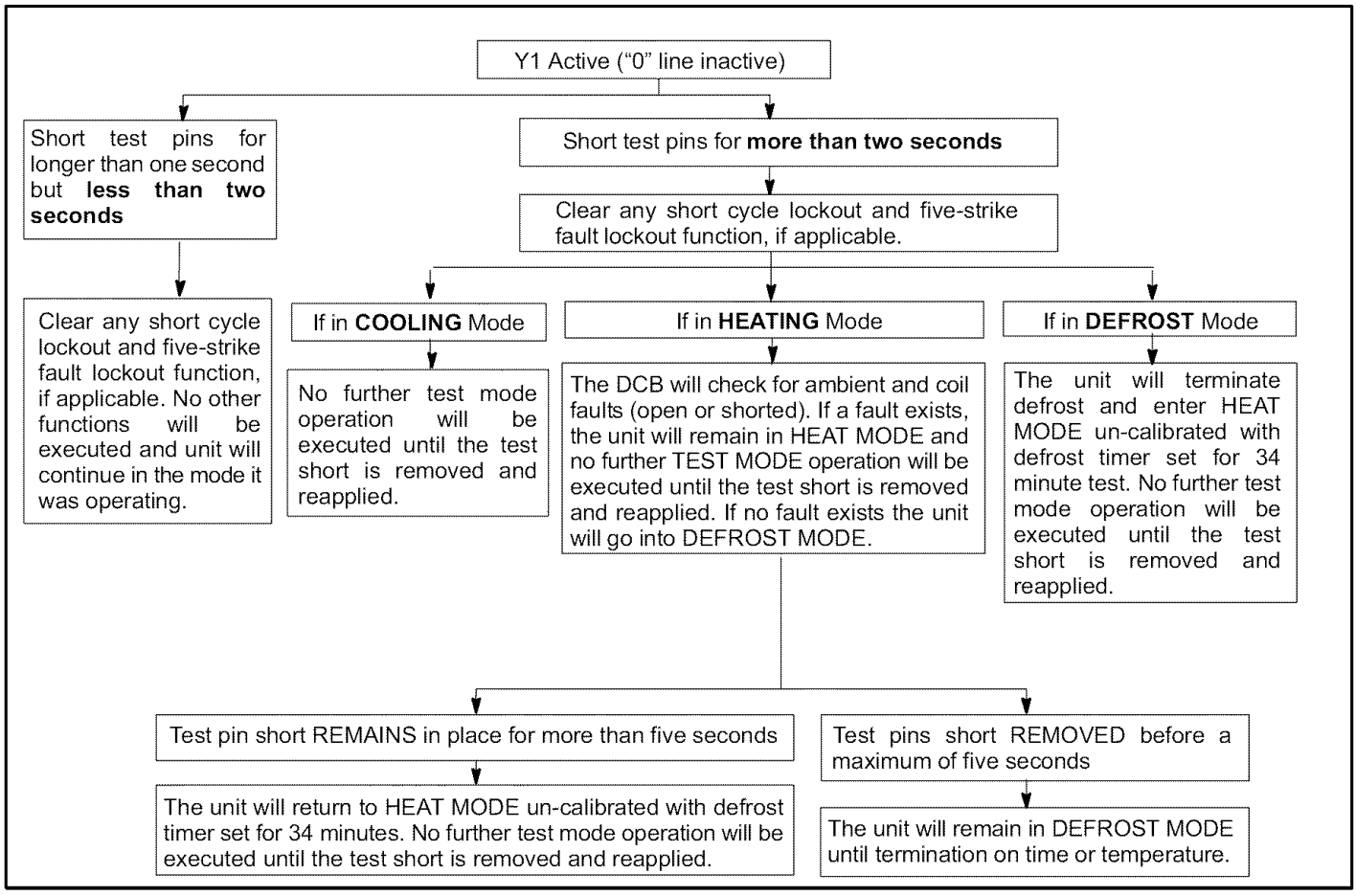


Figure 33. Test Mode

Table 16. DCB Diagnostic LEDs

DS2 Green	DS1 Red	Condition	Possible Cause(s)	Solution
OFF	OFF	Power problem	No power (24V) to DCB terminals R and C or DCB failure.	[1] Check control transformer power (24V). [2] If power is available to DCB and LED(s) do not light, replace DCB.
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. DCB 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. DCB will not perform demand or time/temperature defrost operation. (System will still heat or cool).	
ON	ON	DCB failure	Indicates that DCB has internal component failure. Cycle 24 volt power to DCB. If code does not clear, replace DCB.	
FAULT and LOCKOUT CODES (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		
Units WITH Discharge Line Sensor				
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 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).	
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 five faults, the board will lockout.	
FAST FLASH	OFF	Discharge sensor lockout		
Units WITHOUT Discharge Line Sensor				
SLOW FLASH	ON	Discharge line temperature fault	Some heat pump units do not use a defrost line sensor. Therefore this code is not applicable.	
FAST FLASH	ON	Discharge line temperature lockout		
OFF	FAST FLASH	Discharge sensor fault	Some heat pump units do not use a defrost line sensor. However, on these units a resistor is installed across pins P4-1 and P4-2. If the resistor is missing or damaged then this fault code will be displayed.	
FAST FLASH	OFF	Discharge sensor lockout	Some heat pump units do not use a defrost line sensor. Therefore this code is not applicable.	

DETAILED DEFROST MODE OPERATION

The defrost mode has three basic operational modes which are defrost cycles, actuation and termination. These modes are described as follows:

Defrost Cycles—The demand DCB initiates a defrost cycle based on either *frost detection* or *time.*

Event	Description
Frost Detection	If the compressor runs longer than 34 minutes and the actual difference between the clear coil and frosted coil temperatures exceeds the maximum difference allowed by the DCB, a defrost cycle will be initiated. *IMPORTANT - The DCB 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 DCB 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 DCB logs the compressor run time. If the DCB is not calibrated, a defrost cycle will be initiated after 34 minutes of heating mode compressor run time. The DCB 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 DCB fails to calibrate, another defrost cycle will be initiated after 90 minutes of heating mode compressor run time. Once the DCB 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 DCB or after six hours of heating mode compressor run time has been logged since the last defrost cycle.

NOTE - If ambient or coil fault is detected, the DCB will not execute the TEST mode.

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 34 minutes of run time.

DCB DIAGNOSTICS

See table 16 on page 25 to determine DCB operational conditions and to diagnose cause and solution to problems.

Maintenance

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.

⚠ 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.

- 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 refrigerant charge and gauge the system pressures.
- Check the condensate drain line for free and unobstructed flow; clean, if necessary.
- Outdoor unit fan motor is prelubricated and sealed. No further lubrication is needed.

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

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 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 RESTART PROCEDURE

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 OPERATION

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 and system switch (HEAT, COOL and AUTO) are properly set.
- Check for any blown fuses or tripped circuit breakers.
- Make sure unit access panels are in place.
- Make sure air filter is clean.
- If service is needed, locate and write down the unit model number and have it handy before calling.

OPTIONAL ACCESSORIES

Optional accessories for the XP15 include the following (also, see Engineering Handbook for more details):

- Compressor starter kit
- Low ambient kit
- Vapor line drier
- Wire tie kit

Start-Up and Performance Checklist

Customer _____ Address _____

Indoor Unit Model _____ Serial _____

Outdoor Unit Model _____ Serial _____

Notes: _____

START-UP CHECKS

Refrigerant Type: ___

Rated Load Amps ___ Actual Amps _____ Rated Volts _____ Actual Volts _____

Condenser Fan Full Load Amps _____ Actual Amps: _____

COOLING MODE

Vapor Pressure: ___ Liquid Pressure: _____

Supply Air Temperature: _____ Ambient Temperature: _____ Return Air Temperature: _____

HEATING MODE

Vapor Pressure: ___ Liquid Pressure: _____

Supply Air Temperature: _____ Ambient Temperature: _____ Return Air Temperature: _____

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

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

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