INSTALLATION INSTRUCTIONS

HPXA16 Series Units

HEAT PUMP UNITS
504,954M
08/06
Supersedes 03/06

Technical Publications
Litho U.S.A.

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

⚠ WARNING

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

Installation and service must be performed by a 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 (CFC's, HFC's, and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

Table of Contents

HPXA16 Outdoor Unit

Lennox HPXA16 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. Elite® Series HPXA16 outdoor units are designed for use in check expansion valve (CTXV) systems only and must not be used with other refrigerant flow control devices.

See Lennox Engineering Handbook list of indoor expansion valve kits (ordered separately).

Shipping and Packing List

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

1 - Assembled HPXA16 outdoor unit

2 - Grommets (for liquid and vapor lines)

General Information

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

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

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

⚠ 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.)

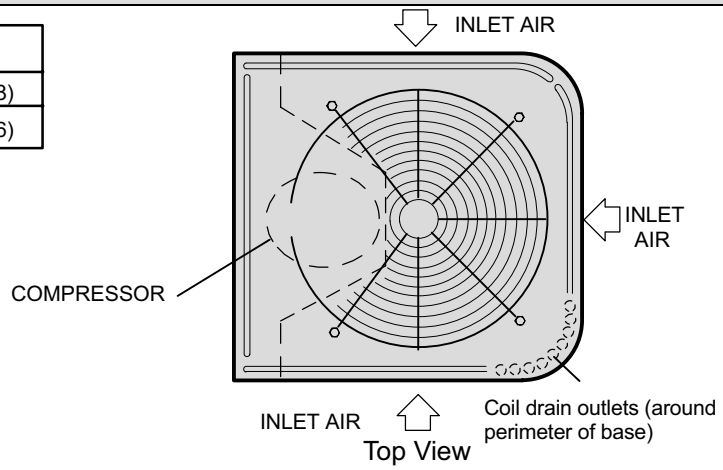
Fiberglass wool may also cause respiratory, skin, and eye irritation.

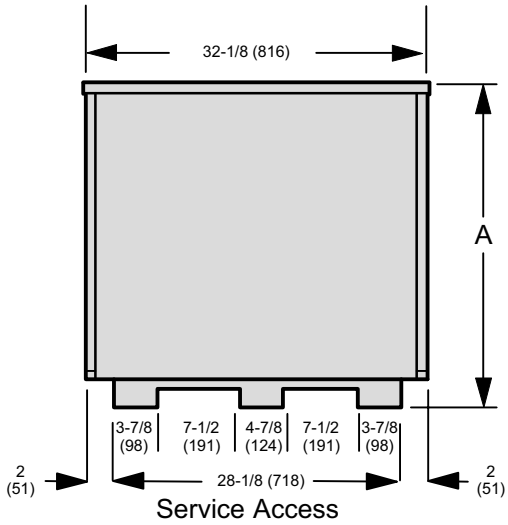
To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown below, or contact your supervisor.

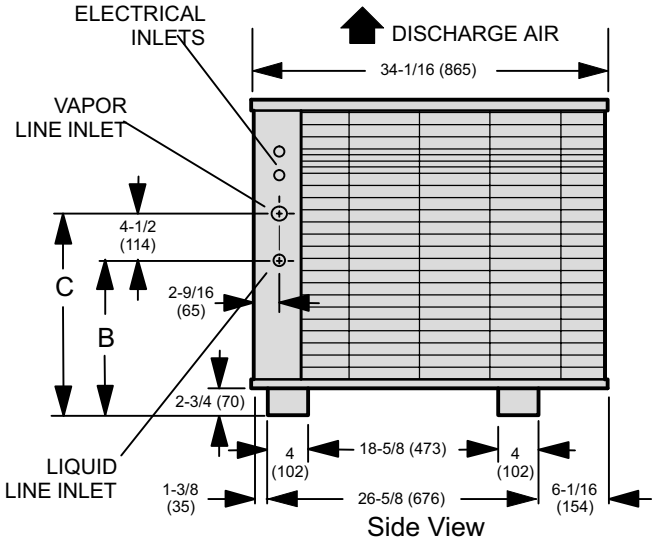
Lennox Industries Inc.
P.O. Box 799900
Dallas, TX 75379-9900

Unit Dimensions - inches (mm)

Model	A	B	C
HPXA16-024, -036	30-7/8 (784)	12-3/4 (324)	17-1/4 (438)
HPXA16-048, -060	44-7/8 (1140)	14-1/4 (362	18-3/4 (476)







504954M 08/06

Parts Arrangement

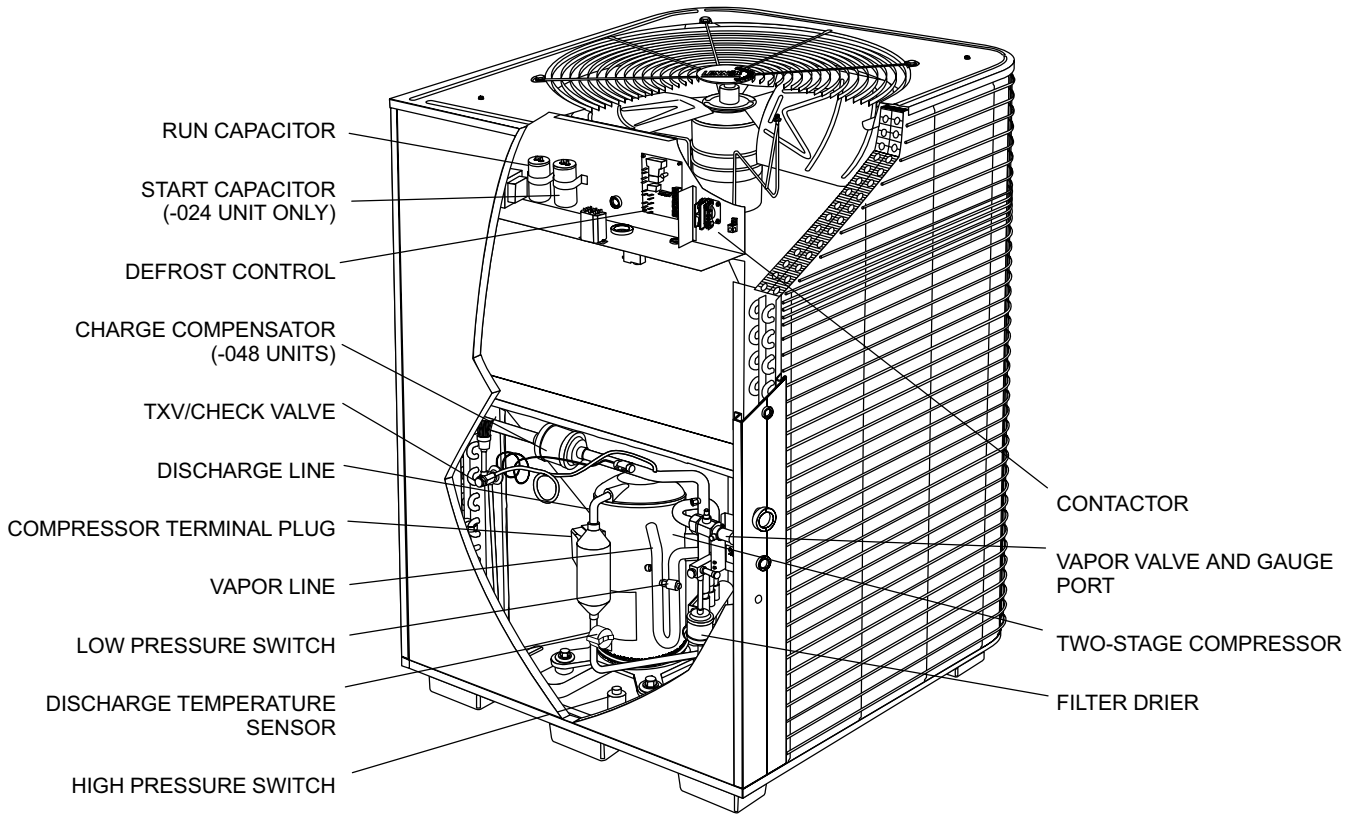


Figure 1

Setting the Unit

⚠ CAUTION

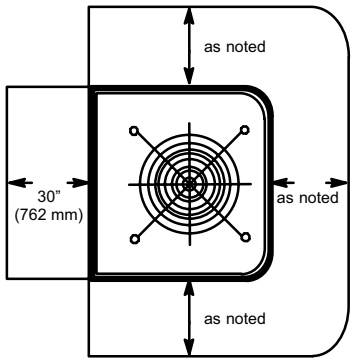
In order to avoid injury, take proper precaution when lifting heavy objects.

These units operate under a wide range of weather conditions; therefore, several factors must be considered when positioning the outdoor unit. The unit must be positioned to give adequate clearances for sufficient airflow and servicing. Refer to figure 2 for installation clearances.

1. Place a sound-absorbing material, such as Isomode, under the unit if it will be installed in a location or position that will transmit sound or vibration to the living area or adjacent buildings.
2. Mount unit high enough above ground or roof to allow adequate drainage of defrost water and prevent ice build-up.
3. In heavy snow areas, do not locate unit where drifting will occur. The unit base should be elevated above the depth of average snows.

   NOTE - Elevation of the unit may be accomplished by constructing a frame using suitable materials. If a support frame is constructed, it must not block drain holes in unit base.

Installation Clearances



NOTE - A service access clearance of 30" (762 mm) must be maintained in front of the service access panel. Clearance to one side must be 36" (914 mm). Clearance to one of the remaining two sides may be 12" (305 mm) and the final side may be 6" (152 mm).

NOTE - A clearance of 24" (610 mm) must be maintained between two units.

NOTE - 48" (1219 mm) clearance required on top of unit. Maximum soffit overhang is 36" (914 mm).

Figure 2

4. When installed in areas where low ambient temperatures exist, locate unit so winter prevailing winds do not blow directly into outdoor coil.
5. Locate unit away from overhanging roof lines which would allow water or ice to drop on, or in front of, coil or into unit.

Slab Mounting

When installing unit at grade level, top of slab should be high enough above the grade so that water from higher ground will not collect around unit. See figure 3. Slab should have a slope tolerance away from the building of 2 degrees or 2 inches per 5 feet (51 mm per 1.5 m). This will prevent ice build-up under unit during a defrost cycle. Refer to roof mounting section for barrier construction if unit must face prevailing winter winds.

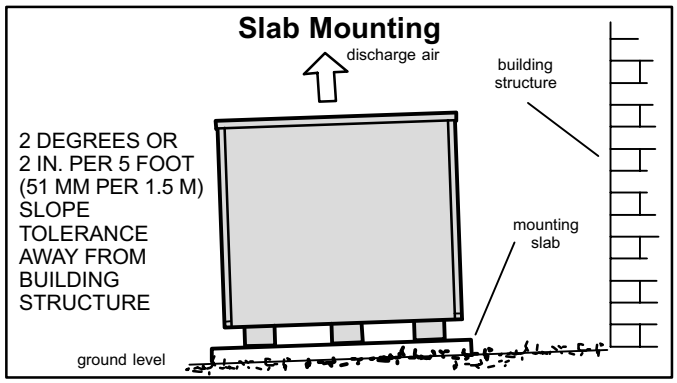


Figure 3

Roof Mounting

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. See figure 4. 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.

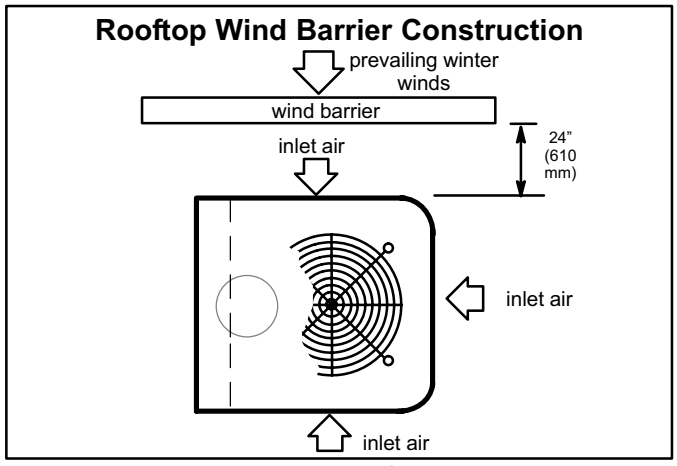


Figure 4

Electrical

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

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

⚠ WARNING

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

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

1. Install line voltage power supply to unit from a properly sized disconnect switch.
2. Ground unit at unit disconnect switch or to an earth ground.

   NOTE - Connect conduit to the unit using a proper conduit fitting. Units are approved for use only with copper conductors. Refer to figure 5 for high voltage field wiring diagram. A complete unit wiring diagram is located on the back side of the unit's access panel.

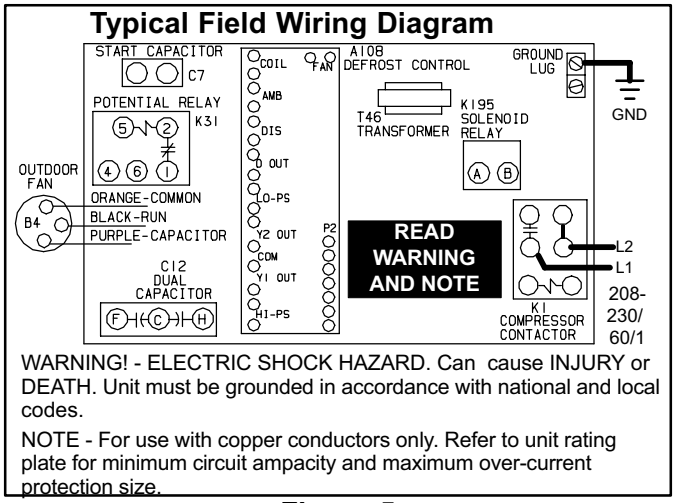


Figure 5

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

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

3. Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5 m) from the floor. It should not be installed on an outside wall or where it can be effected by sunlight, drafts or vibrations.
4. Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit. See figures 6 through 8.

   NOTE - 24V, Class II circuit connections are made in the low voltage junction box.

HPXA16 Outdoor Unit and Blower Unit Thermostat Designations

(Some connections may not apply. Refer to specific thermostat and indoor unit.)

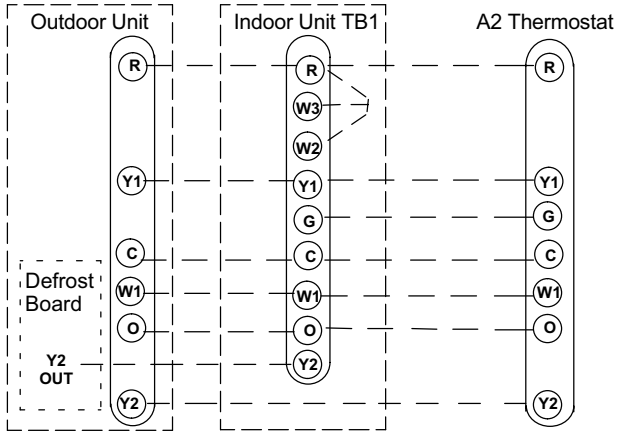


Figure 6

HPXA16 Outdoor Unit and CB31MV/CB32MV Thermostat Designations

(Some connections may not apply. Refer to specific thermostat and indoor unit.)

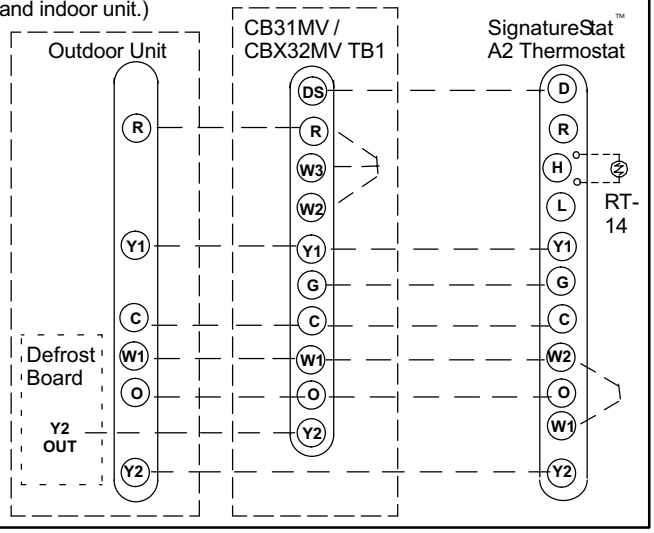


Figure 7

HPXA16 Wiring Diagram

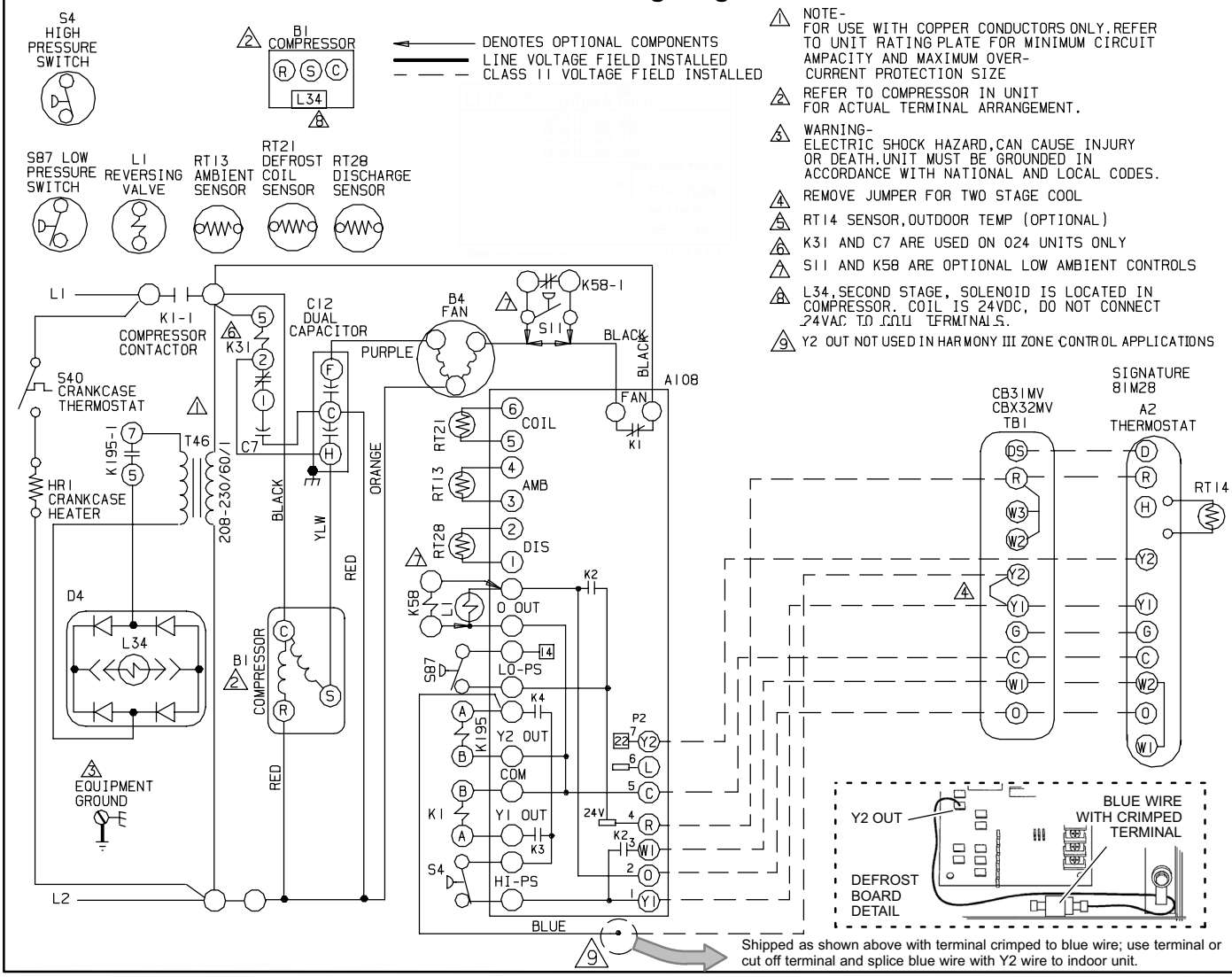


Figure 8

Refrigerant Piping

If the HPXA16 unit is being installed with a new indoor coil and line set, the refrigerant connections should be made as outlined in this section. If an existing line set and/or indoor coil is going to be used to complete the HPXA16 system, refer to the following section which includes flushing procedures.

Field refrigerant piping consists of liquid and vapor lines from the outdoor unit (sweat connections) to the indoor coil (flare or sweat connections). Use Lennox L15 (sweat, non-flare) series line sets as shown in table 2 or use field-fabricated refrigerant lines. Valve sizes are also listed in table 2.

Refrigerant Connections - HPXA16 Matched with New Indoor Coil and Line Set

If an existing indoor coil which was equipped with an RFCI metering device is being replaced, the liquid line must also be replaced prior to the installation of the HPXA16 unit.

Table 2

Refrigerant Line Sets					
	Field Connections		Recommended Line Set		
Model	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-024 -036 -048	3/8 in. (10 mm)	7/8 in (22 mm)	3/8 in. (10 mm)	7/8 in (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-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

NOTE - Units are designed for line sets of up to fifty feet (15m).

Installing Refrigerant Line

Pay close attention to line set isolation during installation of any heat pump or a/c system. When properly isolated from building structures (walls, ceilings. floors), the refrigerant lines will not create unnecessary vibration and subsequent noises. Also, consider the following when placing and installing a high-efficiency outdoor unit:

1. **Placement**—Be aware some localities are adopting sound ordinances based on how noisy the unit is at the neighbors' home, not at the original installation. Install the unit as far as possible from the property line. When possible, do not install the unit directly outside a bedroom window. Glass has a very high level of sound transmission. Figure 9 shows how to place the outdoor unit and line set.

Outside Unit Placement and Installation

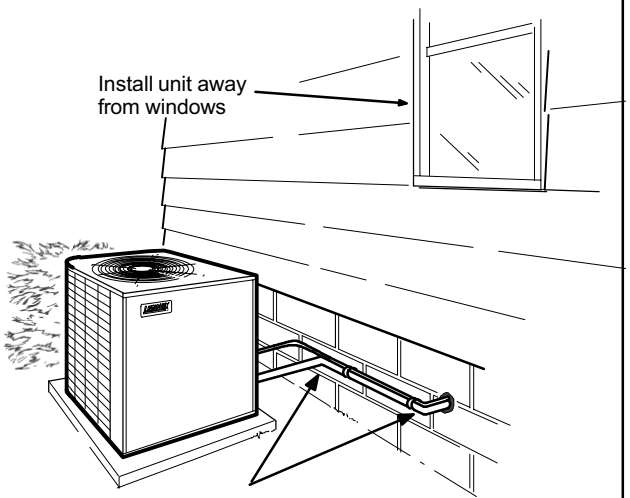


Figure 9

2. **Line Set Isolation**—The following illustrations demonstrate procedures which ensure proper refrigerant line set isolation. Figure 10 shows how to make a transition from horizontal to vertical. Figure 11 shows how to install line sets on vertical runs. Figure 12 shows how to install line sets on horizontal runs.

Refrigerant Line Sets: Transition From Vertical To Horizontal

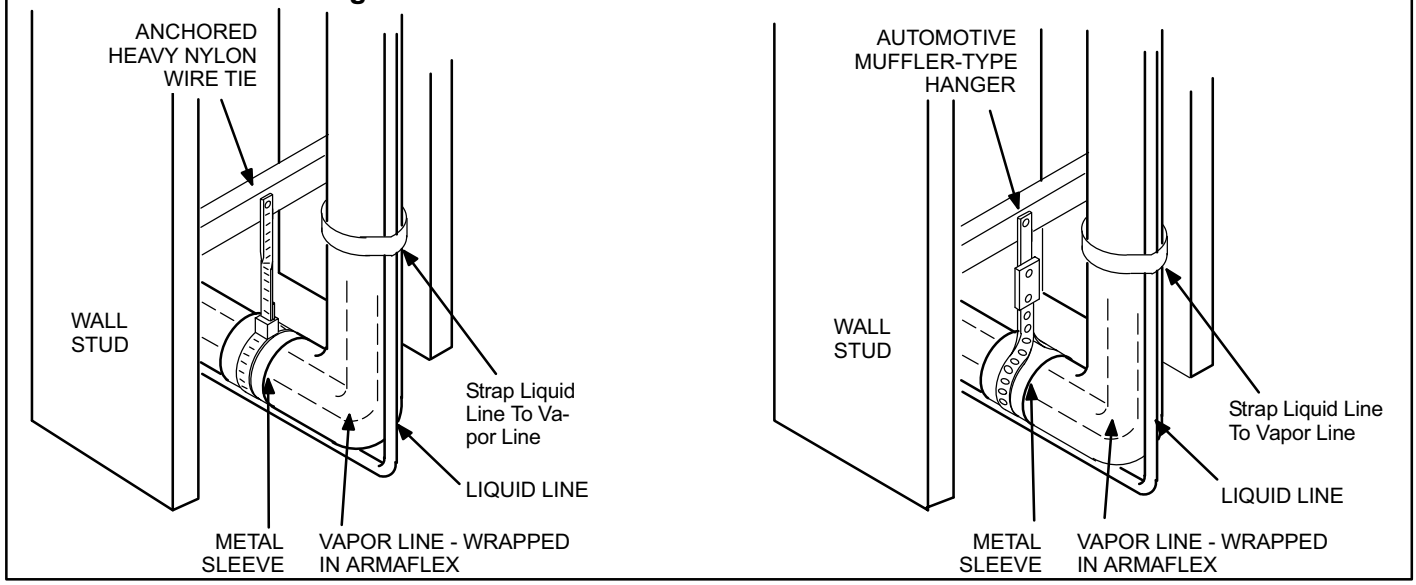


Figure 10

Refrigerant Line Sets: Installing Vertical Runs (new construction shown)

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

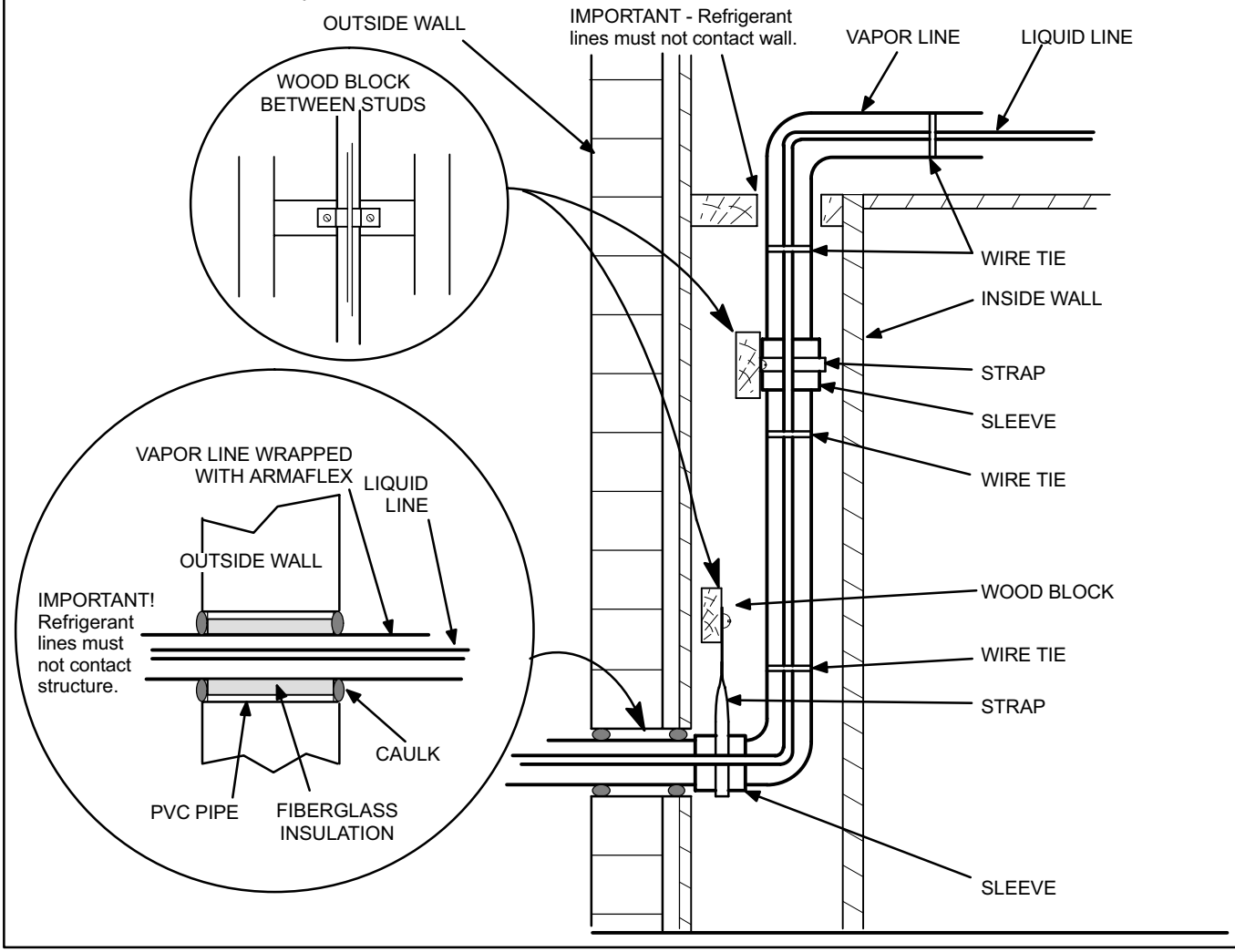


Figure 11

Refrigerant Line Sets: Installing Horizontal Runs

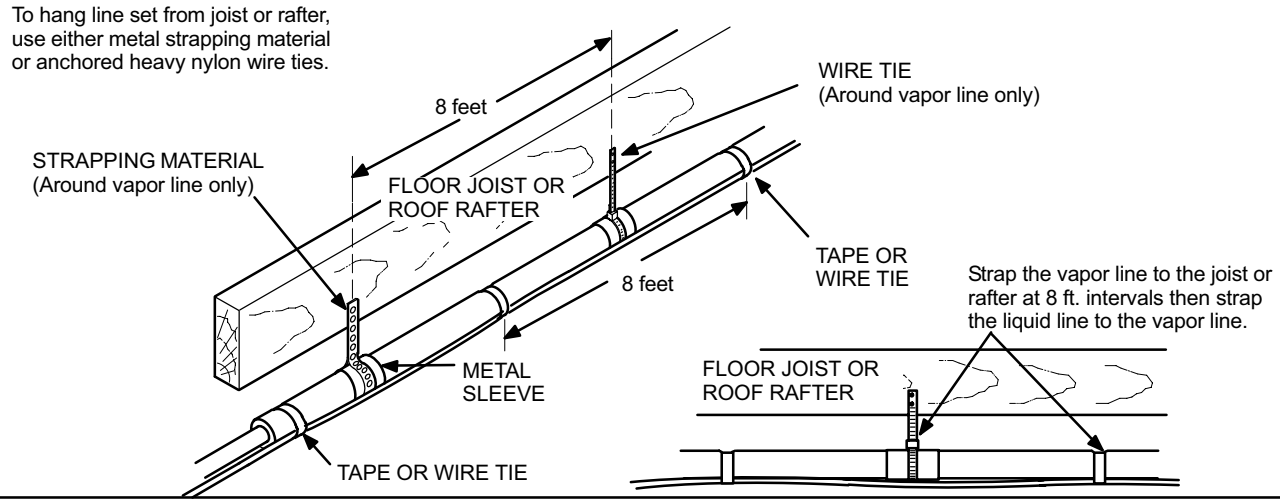


Figure 12

Isolation Grommets

Locate the provided isolation grommets. Use a knife to slit the webbing on each grommet. Slide larger grommet onto vapor line and smaller grommet onto liquid line. Insert grommets into mullion to isolate refrigerant lines from sheet metal edges.

⚠ 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.

Brazing Connection Procedure

1. The end of the refrigerant line must be cut square and its internal shape must remain round. The line must be free of nicks or dents and must be deburred (I.D. and O.D.)
2. Before making line set connections, use dry nitrogen to purge the refrigerant piping. This will help to prevent oxidation and the introduction of moisture into the system.
3. Use silver alloy brazing rods (5 or 6 percent ***minimum*** silver alloy for copper-to-copper brazing or 45 percent silver alloy for copper-to-brass or copper-to-steel brazing). Wrap a wet cloth around the valve body and the copper tube stub. Remove light maroon washers from service valves and shield light maroon stickers in order to protect them during brazing. Braze the line set to the service valve.
4. Quench the joint with water or a wet cloth to prevent heat damage to the valve core and opening port.

   NOTE - The tube end must stay bottomed in the fitting during final assembly to ensure proper seating, sealing and rigidity.

Refrigerant Metering Device

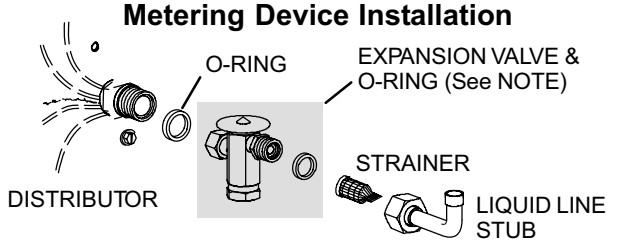
HPXA16 units may be used in check expansion valve (CTXV) systems only. See indoor coil installation instructions and the Lennox engineering handbook for approved HFC-410A TXV match-ups and application information.
NOTE - HFC-410A systems will not operate properly with an HCFC-22 valve.

Check Expansion Valve Systems

Check expansion valves equipped with either Chatleff or flare-type fittings are available from Lennox. Refer to the Engineering Handbook for applicable expansion valves for use with specific match-ups.

If you install a check expansion valve with an indoor coil that includes a fixed orifice, remove the orifice before the check expansion valve is installed. See figure 13 for installation of the check expansion valve.

Metering Device Installation



NOTE - If necessary, remove HCFC-22 flow control device (fixed orifice/check expansion valve) from existing line set before installing HFC-410A approved expansion valve and o-ring.

Figure 13

⚠ IMPORTANT

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

Flushing Existing Line Set & Indoor Coil

NOTE - If the indoor unit line and set are new, skip this section and go on to the Manifold Gauge Set section.

⚠ 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.

⚠ IMPORTANT

If this unit is being matched with an approved line set or indoor coil which was previously charged with HCFC-22 refrigerant, 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 check expansion valve, reducing system performance and capacity.

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

⚠ IMPORTANT

The Environmental Protection Agency 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.

⚠ CAUTION

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

Required Equipment

You will need the following equipment in order to flush the existing line set and indoor coil: two clean HCFC-22 recovery bottles, an oilless recovery machine with a pump down feature, and two sets of gauges (one for use with HCFC-22 and one for use with the HFC-410A).

Flushing Procedure

1. Remove existing HCFC-22 refrigerant using the appropriate procedure below.

   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 refrigerant to flush the system -

   - Disconnect all power to the existing outdoor unit.
   - Connect to the existing unit, a **clean** recovery cylinder and the recovery machine according to the instructions provided with the recovery machine.
   - Remove all HCFC-22 refrigerant from the existing system. Check gauges after shutdown to confirm that the entire system is completely void of refrigerant.
   - Disconnect the liquid and vapor lines from the existing outdoor unit.

   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 -

   - Start the existing HCFC-22 system in the cooling mode and close the liquid line valve.
   - Pump all of the existing HCFC-22 refrigerant back into the outdoor unit. (It may be necessary to bypass the low pressure switches to ensure complete refrigerant evacuation.)
   - When the low side system pressures reach 0 psig, close the vapor line valve.
   - 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.
   - Disconnect the liquid and vapor lines from the existing outdoor unit.

2. Remove the existing outdoor unit. Set the new HFC-410A unit and follow the brazing connection procedure (see page 8) to make line set connections. DO NOT install metering device at this time.
3. Make low voltage and line voltage connections to the new outdoor unit. **DO NOT turn on power to the unit or open the outdoor unit service valves at this time.**

⚠ IMPORTANT

The line set and indoor 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.

4. Remove the existing refrigerant flow control orifice or thermal expansion/check valve before continuing with flushing procedures. The existing devices are not approved for use with HFC-410A refrigerant and may prevent proper flushing. Use a field-provided fitting to reconnect the lines.

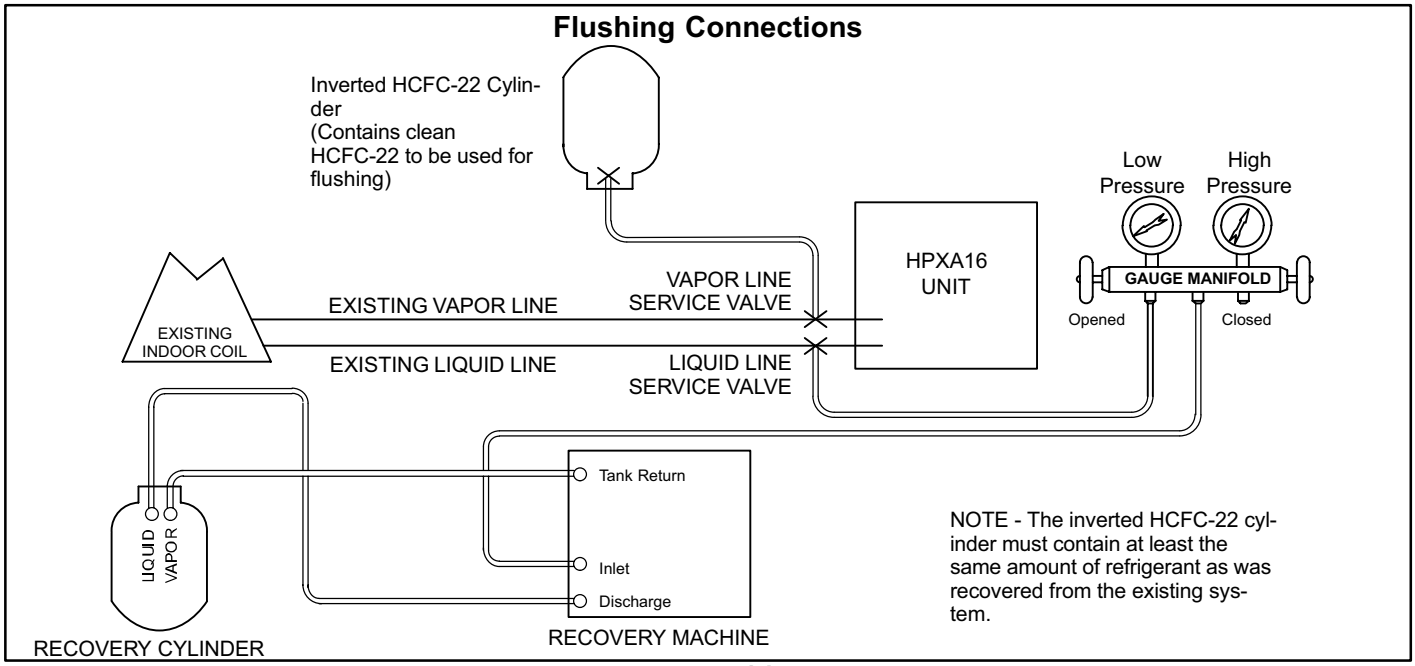


Figure 14

5. Remove the pressure tap valve cores from the HPXA16 unit's service valves. Connect an HCFC-22 cylinder with clean refrigerant to the vapor service valve. Connect the HCFC-22 gauge set to the liquid line valve and connect a recovery machine with an empty recovery tank to the gauge set.
6. 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 coil.
7. 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 coil before it enters the recovery machine.
8. 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.

   NOTE - A single system flush should remove all of the mineral oil from the existing refrigerant lines and indoor 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.***
9. 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.
10. Use dry nitrogen to break the vacuum on the refrigerant lines and indoor coil before removing the recovery machine, gauges and HCFC-22 refrigerant drum. Reinstall pressure tap valve cores into HPXA16 service valves.
11. Install the provided check expansion valve (approved for use with HFC-410A refrigerant) in the liquid line at the indoor coil.

Manifold Gauge Set

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

Service Valves

The liquid line and vapor line service valves (figures 15 and 16) and gauge ports are used for leak testing, evacuating, charging, and checking charge. See table for torque requirements.

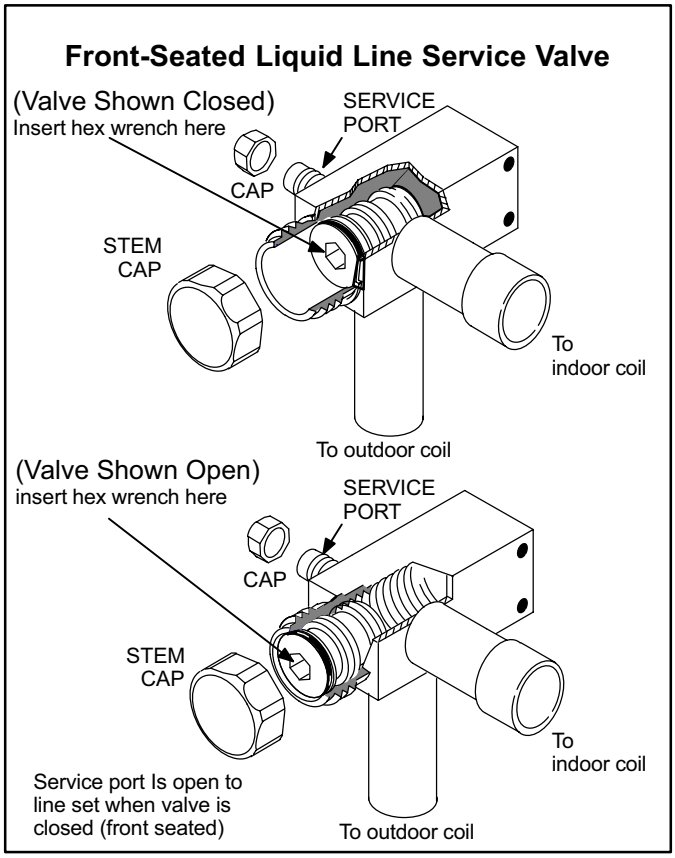


Figure 15

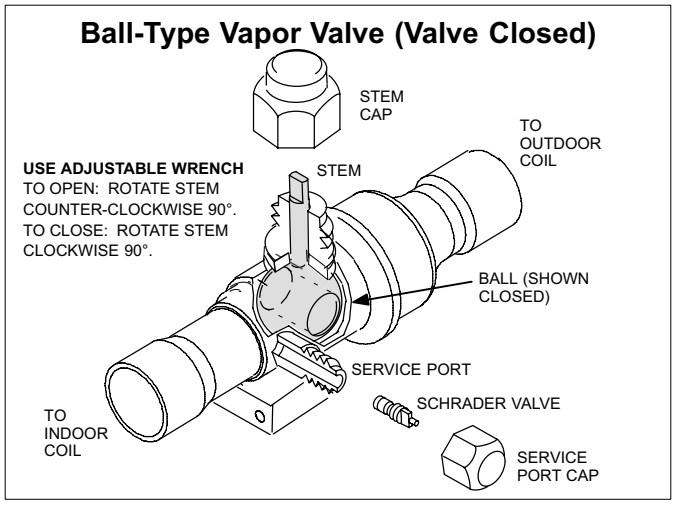


Figure 16

Each valve is equipped with a service port which has a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary leak seal.

⚠ IMPORTANT

Service valves are closed to the outdoor unit and open to line set connections. Do not open until refrigerant lines have been leak tested and evacuated. All precautions should be exercised in keeping the system free from dirt, moisture and air.

To Access Schrader Port:

1. Remove service port cap with an adjustable wrench.
2. Connect gauge to the service port.
3. When testing is completed, replace service port cap. Replace the stem cap. Tighten finger tight; then torque per table 1 (Page 2).

To Open Front-Seated Service Valves:

1. Remove stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension (3/16" for liquid-line valve sizes; 5/16" for vapor-line valve sizes) to back the stem out counterclockwise as far as it will go.
3. Replace the stem cap. Tighten finger tight; then torque per table 1 (Page 2).

To Close Front-Seated Service Valves:

1. Remove the stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension (3/16" for liquid-line valve sizes; 5/16" for vapor-line valve sizes) to turn the stem clockwise to seat the valve. Tighten it firmly.
3. Replace the stem cap. Tighten finger tight; then torque per table 1 (Page 2).

Ball-Type Service Valve (Vapor Line)

Ball-type service valves function the same way as the other valves; the difference is in the construction. These valves are not rebuildable. If a valve has failed, you must replace it. A ball valve is illustrated in figure 16.

The ball valve is equipped with a service port with a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and assures a leak-free seal.

Leak Testing

After the line set has been connected to the indoor and outdoor units, the line set connections and indoor unit must be checked for leaks.

⚠ WARNING

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

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

⚠ WARNING

Fire, Explosion and Personal Safety Hazard.

Failure to follow this warning could result in damage, personal injury or death.

Never use oxygen to pressurize or purge refrigeration lines. Oxygen, when exposed to a spark or open flame, can cause damage by fire and/or an explosion, that could 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).

Using an Electronic Leak Detector

1. Connect a cylinder of HFC-410A to the center port of the manifold gauge set.
2. With both manifold valves closed, open the valve on the HFC-410A cylinder (vapor only).
3. Open the high pressure side of the manifold to allow the HFC-410A into the line set and indoor unit. Weigh in a trace amount of HFC-410A . [A trace amount is a maximum of 2 ounces (57 g) or 3 pounds (31 kPa) pressure.] Close the valve on the HFC-410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the HFC-410A cylinder.
4. Connect a cylinder of dry nitrogen with a pressure regulating valve to the center port of the manifold gauge set.
5. Connect the 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.)*
6. Adjust the dry nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set which will pressurize line set and indoor unit.
7. After a few minutes, open a refrigerant port to ensure the refrigerant you added is adequate to be detected. (Amounts of refrigerant will vary with line lengths.) Check all joints for leaks. Purge dry nitrogen and HFC-410A mixture. Correct any leaks and recheck.

⚠ IMPORTANT

Leak detector must be capable of sensing HFC refrigerant.

Evacuation

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

⚠ IMPORTANT

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument that reads from 50 microns to at least 23,000 microns.

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; 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). 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 **absolute pressure**. A rapid rise in pressure indicates a relatively large leak. If this occurs, repeat the leak testing procedure.

   *NOTE - The term **absolute pressure** means the total actual pressure within a given volume or system, above the absolute zero of pressure. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.*
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.

⚠ 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.

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 valves to break the vacuum from 1 to 2 psig positive pressure in the line set and indoor unit. Close manifold gauge valves and shut off the HFC-410A cylinder and remove the manifold gauge set.

Start-Up

⚠ IMPORTANT

If unit is equipped with 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 (counterclockwise) to release refrigerant charge (contained in outdoor unit) into the system.
4. Replace stem caps and secure finger tight, then tighten an additional (1/6) one-sixth of a turn.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit nameplate. If not, do not start the equipment until the power company has been consulted and the voltage condition has been corrected.
6. Set the thermostat for a cooling demand. Turn on power to indoor blower unit and close the outdoor unit disconnect to start the unit.
7. Recheck voltage while the unit is running. Power must be within range shown on the nameplate.

Refrigerant Charging

This system is charged with HFC-410A refrigerant which operates at much higher pressures than HCFC-22. The field-provided check expansion valve for the indoor unit must be approved for use with HFC-410A. This unit is NOT approved for use with coils which include metering orifices or capillary tubes.

Factory Charge

The unit is factory-charged with the amount of HFC-410A refrigerant indicated on the unit rating plate. This charge is based on a matching indoor coil and outdoor coil with a 15 foot (4.6 m) line set. For varying lengths of line set, refer to table 3 for refrigerant charge adjustment.

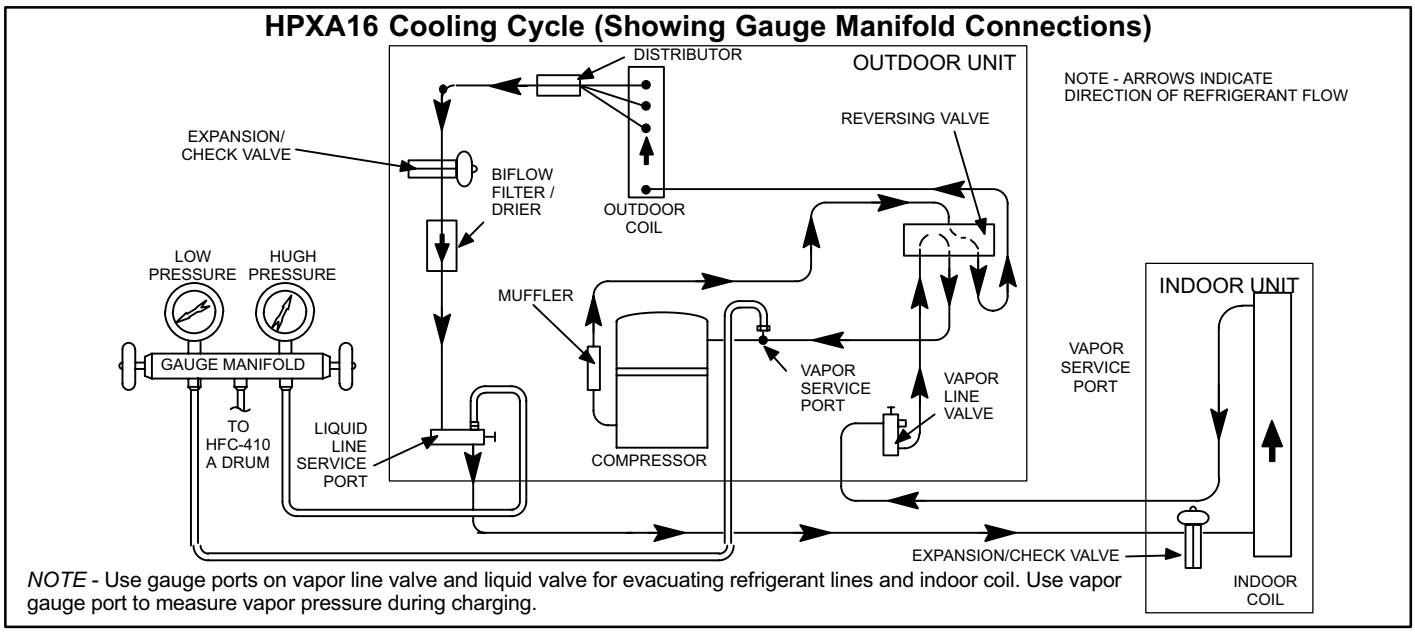


Figure 17

Table 3

Refrigerant Charge per Line Set Lengths	
Liquid Line Set Diameter	**Ounces per 5 feet (grams per 1.52 meter) adjust from 15 ft. (4.57m) line set***
3/8 in. (9.5mm)	3 ounces per 5 feet (85 grams per 1.52 meter)
*Add the amount shown if line length is greater than 15' (4.57m), subtract the amount shown if less than 15'.	

⚠ IMPORTANT

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

The compressor is charged with sufficient polyol ester oil for approved line set lengths.

Checking Charge

The outdoor unit should be charged during warm weather. However, applications arise in which charging must occur in the colder months. *The method of charging is determined by the outdoor ambient temperature.*

Measure the liquid line temperature and the outdoor ambient temperature as outlined below:

1. Connect the manifold gauge set to the service valves:
   - low pressure gauge to *vapor* valve service port
   - high pressure gauge to *liquid* valve service port

   Close manifold gauge set valves. Connect the center manifold hose to an upright cylinder of HFC-410A. See figure 17.
2. Set the room thermostat to call for heat. This will create the necessary load for properly charging the system in the cooling cycle.
3. Record outdoor ambient temperature using a digital thermometer.
4. When the heating demand has been satisfied, switch the thermostat to cooling mode with a set point of 68°F (20°C). When pressures have stabilized, use a digital thermometer to record the liquid line temperature.
5. The outdoor temperature will determine which charging method to use. Proceed with whichever of the following charging procedure deemed appropriate for the situation.

Charge Using the Weigh-in Method – Outdoor Temperature < 65°F (18°C)

If the system is void of refrigerant, or if the outdoor ambient temperature is cool, first, locate and repair any leaks and then weigh in the refrigerant charge into the unit.

1. Recover the refrigerant from the unit.
2. Conduct leak check; evacuate as previously outlined.
3. Weigh in the unit nameplate charge. If weighing facilities are not available or if charging the unit during warm weather, use one of the following procedures.

Charge Using the Subcooling Method – Outdoor Temperature < 65°F (18°C)

When the outdoor ambient temperature is below 65°F (18°C), use the subcooling method to charge the unit. It may be necessary to restrict the air flow through the outdoor coil to achieve pressures in the 325-375 psig (2240-2585 kPa) range. These higher pressures are necessary for checking the charge. Block equal sections of air intake panels and move obstructions sideways until the liquid pressure is in the 325-375 psig (2240-2585 kPa) range. See figure 18.

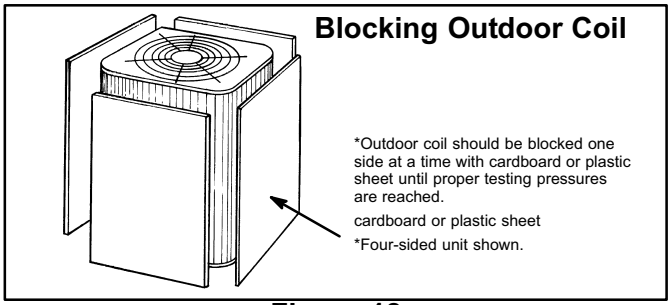


Figure 18

1. With the manifold gauge hose still on the liquid service port and the unit operating stably, use a digital thermometer to record the liquid line temperature.
2. At the same time, record the liquid line pressure reading.
3. Use a temperature/pressure chart for HFC-410A to determine the saturation temperature for the liquid line pressure reading. See table 4.

Table 4

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

4. Subtract the liquid line temperature from the saturation temperature (according to the chart) to determine subcooling. **(Saturation temperature - Liquid line temperature = Subcooling)**
5. Compare the subcooling value with those in table 5. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant. Be aware of the HFC-410A refrigerant cylinder. It will be light maroon-colored. Refrigerant should be added through the vapor line valve in the liquid state.

NOTE - Some HFC-410A cylinders are equipped with a dip tube that allows you to draw liquid refrigerant from the bottom of the cylinder without turning the cylinder upside-down. The cylinder will be marked if it is equipped with a dip tube.

Table 5

Subcooling Values for Charging	
Model Number	**Second Stage (High Capacity) Subcooling Values Conversion Temp. - Liquid Line Temp. °F (°C)**
HPXA16-024	11.0 ± 1 (6 ± .5)
HPXA16-036	8.5 ± 1 (4.7 ± .5)
HPXA16-048	7.5 ± 1 (4.1 ± .5)
HPXA16-060	7.0 ± 1 (3.9 ± .5)

Charge Using the Approach Method – Outdoor Temperature ≥ 65°F (18°C)

The following procedure is intended as a general guide and is for use on expansion valve systems only. For best results, indoor temperature should be 70°F (21°C) to 80°F (26°C). Monitor system pressures while charging.

1. Record outdoor ambient temperature using a digital thermometer.
2. Attach high pressure gauge set and operate unit for several minutes to allow system pressures to stabilize.
3. Compare stabilized pressures with those provided in tables 6 and 7, “Normal Operating Pressures.”

⚠ IMPORTANT

Use tables 6 & 7 as a general guide when performing maintenance checks. This is not a procedure for charging the unit.

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.

Pressures higher than those listed indicate that the system is overcharged. Pressures lower than those listed indicate that the system is undercharged. Continue to check adjusted charge using approach values.

Table 6

HPXA16 Normal Operating Pressures COOLING (Liquid ±10 & Vapor ±5 psig)*								
°F (°C)**	-024		-036		-048		-060	
	Liq	Vap	Liq	Vap	Liq	Vap	Liq	Vap
First Stage (Low Capacity)								
65 (18.3)	217	143	227	142	222	140	225	140
75 (23.9)	250	145	262	145	258	143	259	142
85 (29.4)	291	147	305	146	298	145	293	146
95 (35.0)	336	149	352	148	343	147	356	147
105 (40.6)	386	151	403	152	402	147	408	147
115 (49.0)	440	153	458	155	452	152	455	151
Second Stage (High Capacity)								
65 (18.3)	222	143	244	136	232	134	249	126
75 (23.9)	256	145	282	139	266	136	289	134
85 (29.4)	302	145	325	142	309	139	330	140
95 (35.0)	349	147	377	144	359	142	378	143
105 (40.6)	403	149	428	146	410	144	433	146
115 (49.0)	464	152	488	148	468	147	492	149

**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 outside coil.*

Table 7

HPXA16 Normal Operating Pressures HEATING (Liquid ±10 & Vapor ±5 psig)								
°F (°C)**	-024		-036		-048		-060	
	Liq	Vap	Liq	Vap	Liq	Vap	Liq	Vap
First Stage (Low Capacity)								
40 (4.4)	321	99	296	95	315	97	319	93
50 (10)	340	120	310	112	330	114	335	111
Second Stage (High Capacity)								
20 (-7.0)	273	68	277	60	294	60	300	57
30 (-1.0)	296	80	296	74	303	75	312	70
40 (4.4)	321	95	321	88	314	90	323	83
50 (10)	341	115	341	104	325	106	339	97

**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 outside coil.*

4. Use the same digital thermometer used to check outdoor ambient temperature to check liquid line temperature. Verify the unit charge using the approach method.
5. The difference between the ambient and liquid temperatures should match values given in table 8. If the values don't agree with the those in table 8, add refrigerant to lower the approach temperature or recover refrigerant from the system to increase the approach temperature.

Table 8

Approach Values for Charging	
Model Number	**Second Stage (High Capacity) Approach Temperature Liquid Line Temp. - Outdoor Ambient °F (°C)**
HPXA16-024	4.0 ± 1 (2.2 ± .5)
HPXA16-036	7.0 ± 1 (3.9 ± .5)
HPXA16-048	8.0 ± 1 (4.4 ± .5)
HPXA16-060	10.0 ± 1 (5.6 ± .5)

System Operation

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

Thermostat Operation

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

Emergency Heat (Amber Light)

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

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

Filter Drier

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

Defrost System

Defrost System Description

The demand defrost controller measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller "self-calibrates" when the defrost system starts and after each system defrost cycle. The defrost control board components are shown in figure 19.

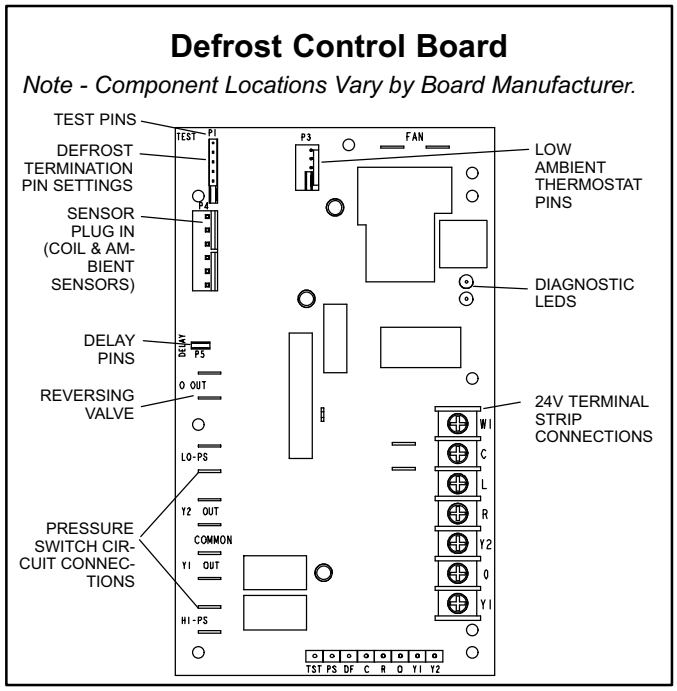


Figure 19

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

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

Defrost Board Diagnostic LEDs

The state (Off, On, Flashing) of two LEDs on the defrost board (DS1 [Red] and DS2 [Green]) indicate diagnostics conditions that are described in table 10 (on page 20).

Defrost Board Pressure Switch Connections

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

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

- during the defrost cycle and 90 seconds after the termination of defrost
- when the average ambient sensor temperature is below 15° F (-9°C)
- for 90 seconds following the start up of the compressor
- during "test" mode

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

Defrost Board Pressure Switch Settings

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

Low Pressure (auto reset) - trip at 25 psig; reset at 55 psig.

Pressure Switch 5-Strike Lockout

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

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

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

Defrost System Sensors

Sensors connect to the defrost board through a field-replaceable harness assembly that plugs into the board (see figure 21). Through the sensors, the board detects outdoor ambient, coil, and discharge temperature fault conditions. As the detected temperature changes, the resistance across the sensor changes. Figure 20 shows how the resistance varies as the temperature changes for both type of sensors. Sensor resistance values can be checked by ohming across pins shown shown in table 9.

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 9, 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.

NOTE - Under certain ambient conditions, the internal cabinet temperature of the HPXA16-036 cabinet will affect the temperature that is sensed by the coil sensor. This can set up a condition where the defrost board may not initiate a defrost cycle. To overcome this issue, the coil sensor should be moved to the alternate location on the other side of the cabinet to the coil hairpin shown in figure 21.

Table 9

Sensor Temperature / Resistance Range			
Sensor	**Temperature Range °F (°C)**	**Resistance values range (ohms)**	**Pins/Wire Color**
Outdoor	-35 (-37) to 120 (48)	280,000 to 3750	3 & 4 (Black)
Coil	-35 (-37) to 120 (48)	280,000 to 3750	5 & 6 (Brown)
Discharge (if applicable)	24 (-4) to 350 (176)	41,000 to 103	1 & 2 (Yellow)
Note: Sensor resistance decreases as sensed temperature increases (see figure 20).			

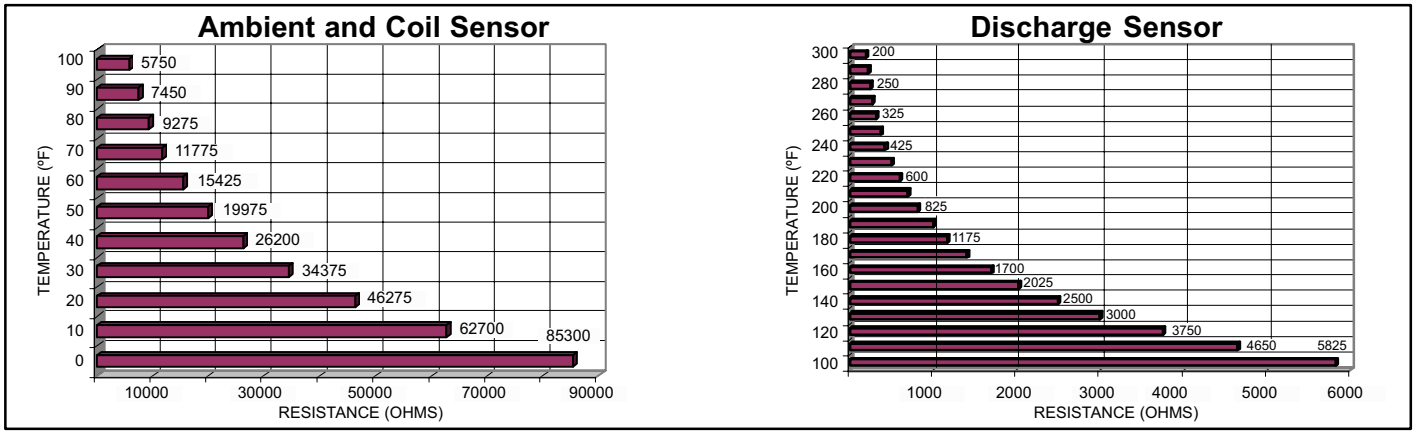


Figure 20

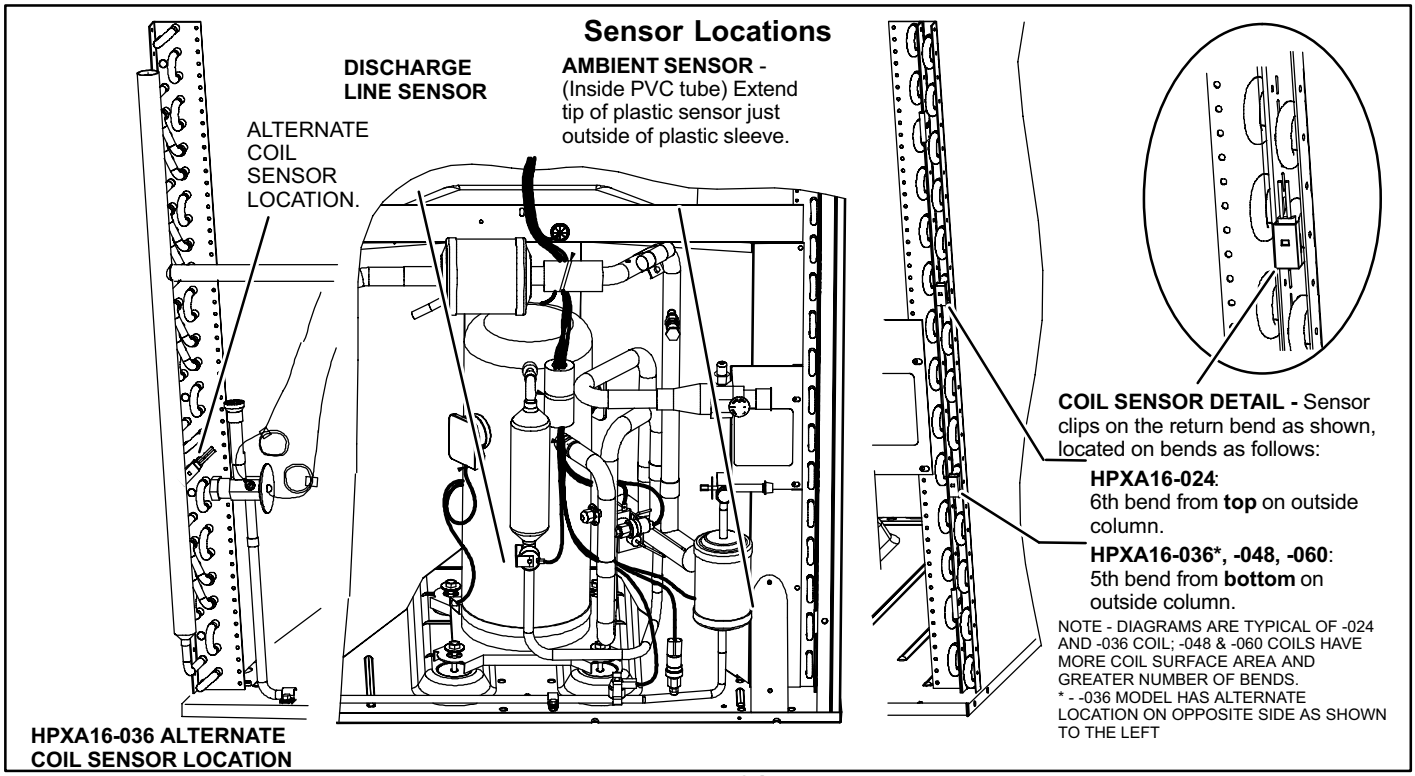


Figure 21

Defrost System Sensors

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

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

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

1. If the board recognizes five high discharge line temperature faults during a single (Y1) compressor demand, it reverts to a lockout mode and displays the appropriate code. This code detects shorted sensor or high discharge temperatures. (Code on board is “Discharge Line Temperature Fault and Lockout”).
2. If the board recognizes five temperature sensor range faults during a single (Y1) compressor demand, it reverts to a lockout mode and displays the appropriate code. The board detects open sensor or out-of-temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the board will count one fault. After 5 faults, the board will lockout. (Code on board is “Discharge Sensor Fault and Lockout”).

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

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

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

NOTE - Figure 8 on page 5 shows the correct Y2 field wiring.

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

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

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

Delay Mode

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

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

Operational Description

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

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

  Calibration of the board occurs after a defrost cycle to ensure that there is no ice on the coil. During calibration, the temperature of both the coil and the ambient sensor are measured to establish the temperature differential which is required to allow a defrost cycle.
- **Defrost Mode**—The following paragraphs provide a detailed description of the defrost system operation.

Detailed Defrost System Operation

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

Frost Detection—If the compressor runs longer than 34 minutes and the actual difference between the clear coil and frosted coil temperatures exceeds the maximum difference allowed by the control, a defrost cycle will be initiated.

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

Time—If 6 hours of heating mode compressor run time has elapsed since the last defrost cycle while the coil temperature remains below 35°F (2°C), the demand defrost control will initiate a defrost cycle.

Actuation—When the reversing valve is de-energized, the Y1 circuit is energized, and the coil temperature is below 35°F (2°C), the board logs the compressor run time. If the board is not calibrated, a defrost cycle will be initiated after 34 minutes of heating mode compressor run time. The control will attempt to self-calibrate after this (and all other) defrost cycle(s).

Calibration success depends on stable system temperatures during the 20-minute calibration period. If the board fails to calibrate, another defrost cycle will be initiated after 90 minutes of heating mode compressor run time. Once the defrost board is calibrated, it initiates a demand defrost cycle when the difference between the clear coil and frosted coil temperatures exceeds the maximum difference allowed by the control OR after 6 hours of heating mode compressor run time has been logged since the last defrost cycle.

Termination—The defrost cycle ends when the coil temperature exceeds the termination temperature or after 14 minutes of defrost operation. If the defrost is terminated by the 14-minute timer, another defrost cycle will be initiated after 34 minutes of run time.

Test Mode—[NOTE - Coil sensor temperature must be below 35ºF before the defrost board will initiate a "test" defrost.] When Y1 is energized and 24V power is being applied to the board, a test cycle can be initiated by placing the termination temperature jumper across the "Test" pins for 2 to 5 seconds. If the jumper remains across the "Test" pins longer than 5 seconds, the control will ignore the test pins and revert to normal operation. The jumper will initiate one cycle per test.

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

Each test pin shorting will result in one test event. For each "TEST" the shunt (jumper) must be removed for at least 1 second and reapplied. Refer to flow chart (figure 22) for "TEST" operation.

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

Defrost Board Diagnostics

See table 10 to determine defrost board operational conditions and to diagnose cause and solution to problems.

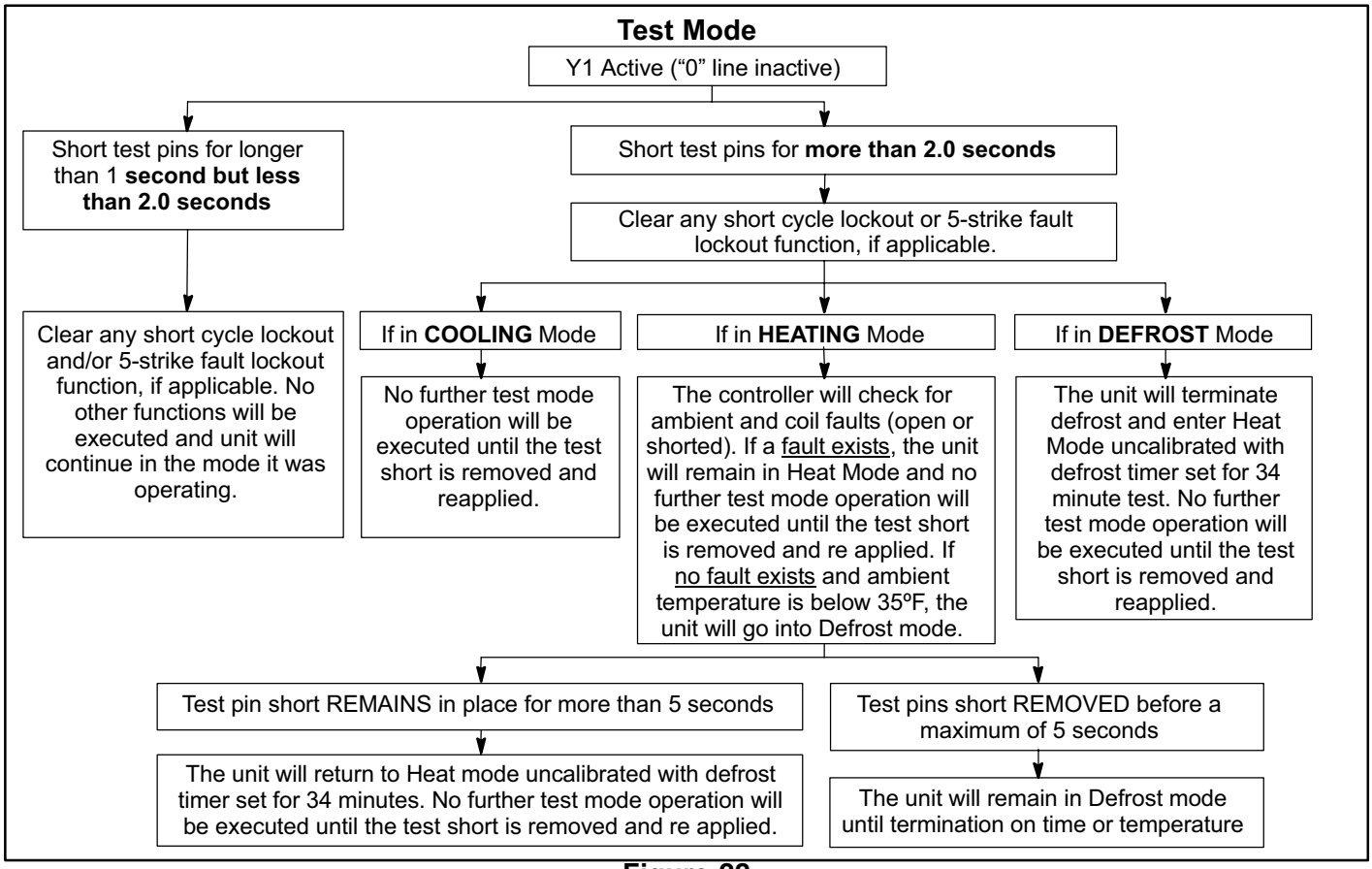


Figure 22

Table 10

Defrost Control Board Diagnostic LEDs				
DS2 Green	**DS1 Red**	**Condition/Code**	**Possible Cause(s)**	**Solution**
OFF	OFF	Power problem	No power (24V) to board terminals R & C or board failure.	[1] Check control transformer power (24V). [2] If power is available to board and LED(s) do not light, replace board.
Simultaneous SLOW Flash		Normal operation	Unit operating normally or in standby mode.	None required.
Alternating SLOW Flash		5-minute anti-short cycle delay	Initial power up, safety trip, end of room thermostat demand.	None required (Jumper TEST pins to override)
Simultaneous FAST Flash		Ambient Sensor Problem	Sensor being detected open or shorted or out of temperature range. Board will revert to time/temperature defrost operation. (System will still heat or cool).	
Alternating FAST Flash		Coil Sensor Problem	Sensor being detected open or shorted or out of temperature range. Board will not perform demand or time/temperature defrost operation. (System will still heat or cool).	
ON	ON	Circuit Board Failure	Indicates that board has internal component failure. Cycle 24 volt power to board. If code does not clear, replace board.	
FAULT & 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 & subcooling temperatures. [3] Check system operating pressures and compare to unit charging charts. [4] Make sure all pressure switches and sensors have secure connections to system to prevent refrigerant leaks or errors in pressure and temperature measurements.
OFF	ON	Low Pressure ***LOCKOUT***		
SLOW Flash	OFF	High Pressure Fault		
ON	OFF	High Pressure ***LOCKOUT***		
SLOW Flash	ON	Discharge Line Temperature Fault	This code detects shorted sensor or high discharge temperatures. If the discharge line temperature exceeds a temperature of 300ºF (148ºC) during compressor operation, the board will de-energize the compressor contactor output (and the defrost output if active). The compressor will remain off until the discharge temperature has dropped below 225ºF (107ºC).	
FAST Flash	ON	Discharge Line Temperature ***LOCKOUT***		
OFF	Fast Flash	Discharge Sensor Fault	The board detects open sensor or out of temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the board will count one fault. After 5 faults, the board will lockout.	
Fast Flash	OFF	Discharge Sensor ***LOCKOUT***		

Maintenance

⚠ WARNING

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

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

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

  NOTE - It may be necessary to flush the outdoor coil more frequently if it is exposed to substances which are corrosive or which block airflow across the coil (e.g., pet urine, cottonwood seeds, etc.)
- Visually inspect the refrigerant lines and coils for leaks.
- Check wiring for loose connections.
- Check voltage at the indoor and outdoor units (with units operating).
- Check the amperage draw at the outdoor fan motor, compressor, and indoor blower motor. Values should be compared with those given on unit nameplate.
- Check, clean (or replace) indoor unit filters.
- Check the refrigerant charge and gauge the system pressures.
- Check the condensate drain line for free and unobstructed flow; clean, if necessary.
- Adjust blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
- Check drive belt for wear and proper tension.

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

Optional Accessories

Refer to the Engineering Handbook for optional accessories that may apply to this unit. The following may or may not apply:

- Loss of charge kit
- High pressure switch kit
- Compressor monitor
- Compressor crankcase heater
- Hail guards
- Mounting bases
- Timed-off control
- Stand-off Kit
- Sound cover
- Low ambient kit
- Monitor kit
- Dave Lennox *SignatureStat*™ Room Thermostat

Start-Up and Performance Check List

Job Name _____ Job no. _____ Date _____

Job Location _____ City _____ State _____

Installer _____ City _____ State _____

Unit Model No. _____ Serial No. _____ Service Technician _____

Nameplate Voltage _____

Rated Load Ampacity _____ Compressor Amperage: 1st Stage _____ 2nd Stage: _____

Maximum Fuse or Circuit Breaker _____

Electrical Connections Tight? ❑ Indoor Filter clean? ❑ Supply Voltage (Unit Off) _____

Indoor Blower RPM _____ S.P. Drop Over Indoor (Dry) _____ Outdoor Coil Entering Air Temp. _____

COOLING (2ND STAGE)

Liquid Line Pressure: _____ Vapor Pressure: _____ Refrigerant Charge Checked? ❑

HEATING (2ND STAGE)

Liquid Line Pressure: _____ Vapor Pressure: _____ Refrigerant Charge Checked? ❑

Vapor Pressure; 1st Stage: _____ 2nd Stage: _____

Refrigerant Lines: - Leak Checked? ❑ Properly Insulated? ❑ Outdoor Fan Checked? ❑

Service Valves: --- Fully Opened? ❑ Caps Tight? ❑ Voltage With Compressor Operating _____

SEQUENCE OF OPERATION

Heating Correct? ❑ Cooling Correct? ❑

THERMOSTAT

Calibrated? ❑ Properly Set? ❑ Level? ❑

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Homeowner Information - Maintenance

In order to ensure peak performance, your system must be properly maintained. Clogged filters and blocked airflow prevent your unit from operating at its most efficient level.

1. 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 filters should be replaced with a filter of the same type and size.

   NOTE - If you are unsure about the filter you need 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. Many indoor units are equipped with reusable foam filters. These filters can be cleaned with a mild soap and water solution. Rinse the filter thoroughly and let it dry completely before it is returned to the unit or grille.

   *NOTE - **The filter and all access panels must be in place any time the unit is in operation.***
4. Some systems are equipped with an electronic air cleaner, designed to remove the majority of airborne particles from the air passing through the cleaner. If your system is so equipped, ask your dealer for maintenance instructions.
5. Inspect and clean indoor coil. The indoor 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.

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.

In case of extended power outage...

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

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

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

Thermostat Operation - 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 is properly set.
- Make sure the room thermostat system switch is properly set.
- Replace any blown fuses, or reset circuit breakers.
- Make sure unit access panels are in place.
- Make sure air filter is clean.
- Locate unit model number and have it handy before calling.