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Dallas, Texas, USA

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 (CFCs, HFCs, and HCFCs) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

INSTALLATION INSTRUCTIONS

HP13 Series Units

HEAT PUMP UNITS
505,076M
06/07
Supersedes 07/06

Technical Publications
Litho U.S.A.

Table of Contents

HP13 Outdoor Units

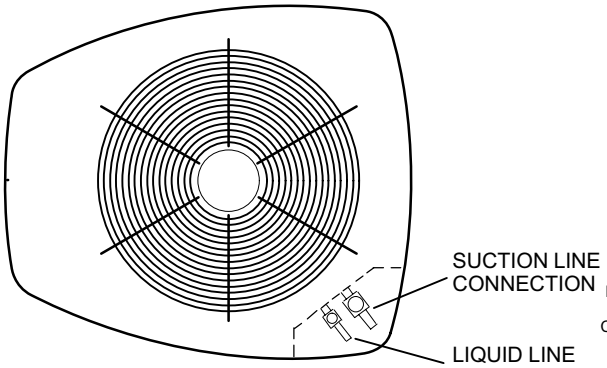
Lennox Elite® Series HP13 outdoor units are approved and warranted only for installation with specially matched indoor coils, line sets, and refrigerant control devices aC designated by Lennox. Refer to Lennox engineering handbook for check expansion valve (CTXV) kits which may need to be ordered separately.

Shipping and Packing List

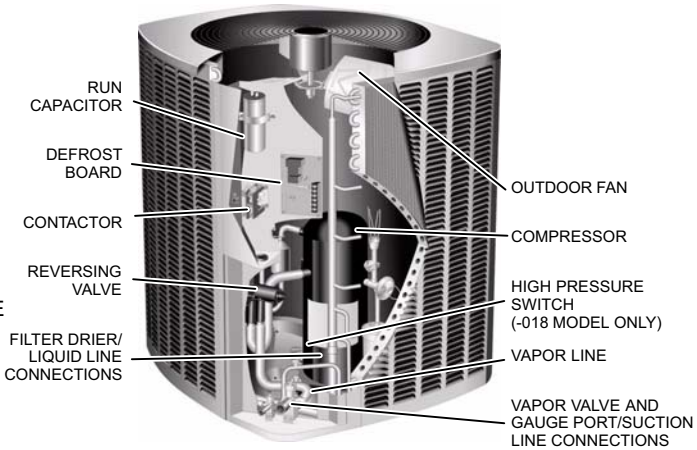
1 - Assembled HP13 outdoor unit

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

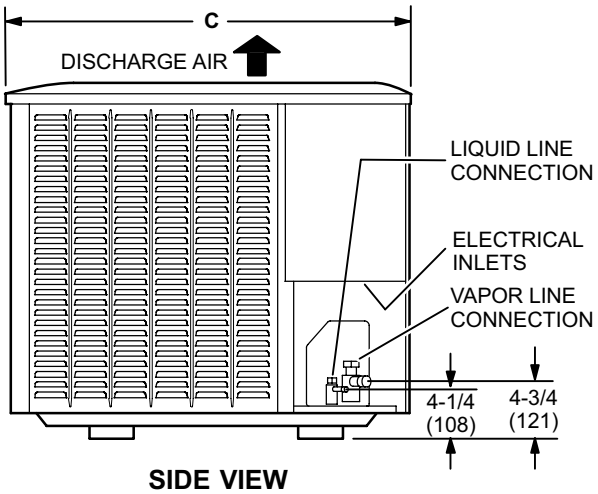
Unit Dimensions - inches (mm)



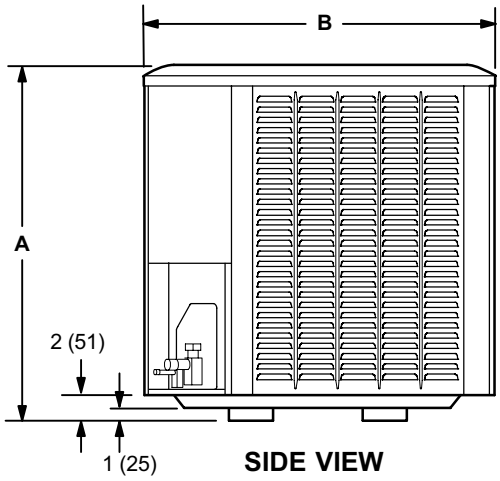
TOP VIEW



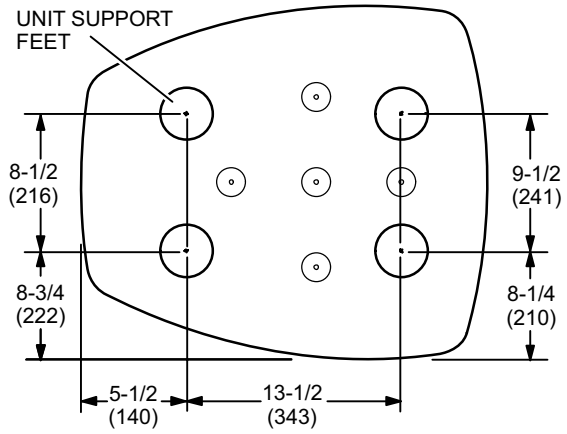
HP13 PARTS ARRANGEMENT



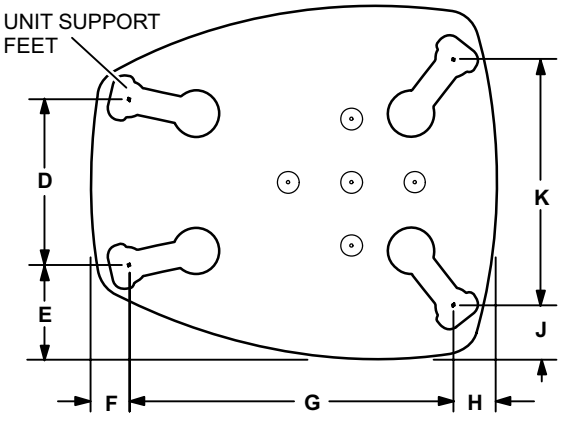
SIDE VIEW



SIDE VIEW



HP13-018, -024, -030, AND -036 BASE SECTIONS



HP13 BASE WITH ELONGATED LEGS

HP13	A	B	C	D	E	F	G	H	J	K
-018	35 (889)	27 (686)	28 (711)	-	-	-	-	-	-	-
-024	35 (889)	27 (686)	28 (711)							
-030	31 (787)	27 (686)	28 (711)							
-036	35 (889)	27 (686)	28 (711)							
-042	35 (889)	30-1/2 (775)	35 (889)	13-7/8 (352)	7-3/4 (197)	3-1/4 (83)	27-1/8 (689)	3-5/8 (92)	4-1/2 (114)	20-5/8 (524)
-048	39 (991)	30-1/2 (775)	35 (889)							
-060	39 (991)	35-1/2 (902)	39-1/2 (1003)	16-7/8 (429)	8-3/4 (222)	3-1/8 (79)	30-3/4 (781)	4-5/8 (117)	3-3/4 (95)	26-7/8 (683)

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⚠ 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 national or local codes in any way. Authorities having jurisdiction should be consulted before installation.

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

Table 1. Torque Requirements

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

Setting the Unit

⚠ CAUTION

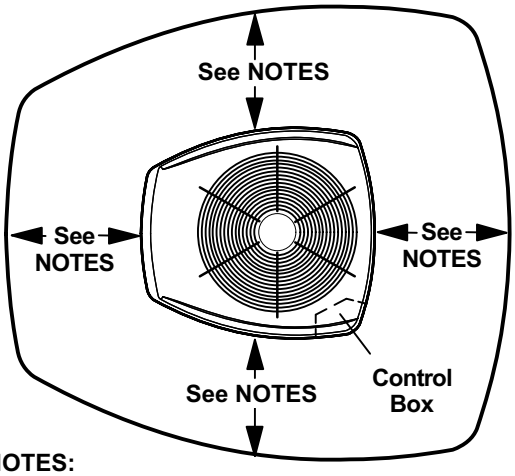
In order to avoid injury, take proper precaution when lifting heavy objects.

Outdoor units operate under a wide range of weather conditions; therefore, several factors must be considered when positioning the outdoor unit.

Position the unit to allow adequate airflow and servicing clearance. Maintain a minimum clearance of 24 inches (610 mm) between multiple units as illustrated in figure 1.

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. Install the 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 the where snowdrifts will likely build. 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.
4. Locate the unit so prevailing winter winds will not blow into the 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.



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).

A clearance of 24 in. (610 mm) must be maintained between two units.

48 in. (1219 mm) clearance required on top of unit.

Figure 1. Installation Clearances

SLAB MOUNTING

When installing unit at grade level, the top of the slab should be high enough above grade so that water from higher ground will not collect around the unit. The slab should have a slope tolerance away from the building of 2 degrees or 2 inches per 5 feet (50 mm per 1500 mm) to prevent ice build-up under the unit during a defrost cycle.

NOTE - If necessary for stability, anchor unit to slab as described in “Stabilizing unit on uneven surfaces”.

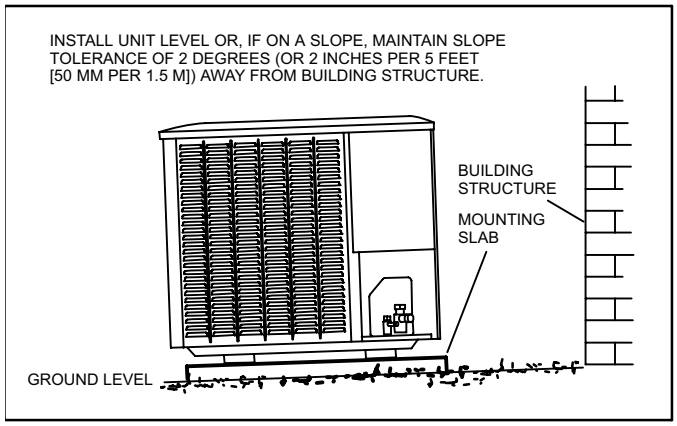


Figure 2. Slab Mounting Options

ELEVATING THE UNIT (SMALL-BASE UNITS)

If additional elevation is necessary, raise the unit by extending the length of the unit support feet. This may be done by cutting four equal true-cut lengths of Schedule (SCH) 40, 4" (101.6mm) piping to the height required as illustrated in figure 3.

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

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

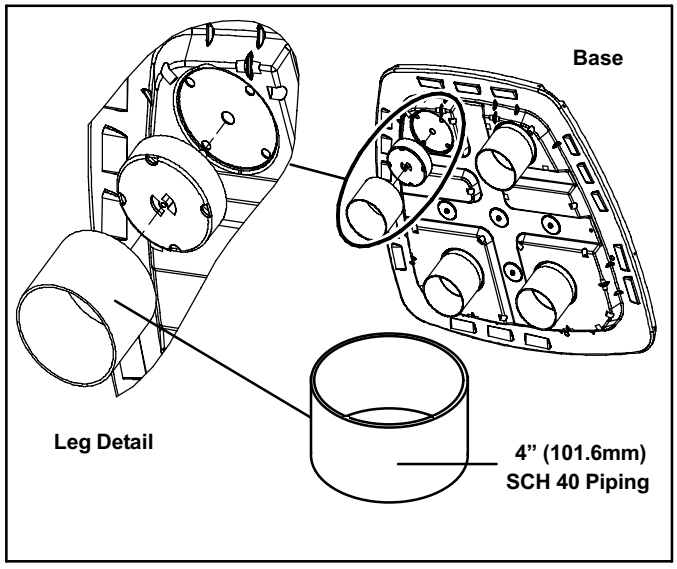


Figure 3. Elevated Slab Mounting using Feet Extenders (Small-Base Units)

ELEVATING THE UNIT (LARGER-BASE UNITS)

Unlike the small-base units which use round feet, the larger-base units are outfitted with elongated feet as illustrated in figure 4. which uses a similar method for elevating the unit height.

If additional elevation is necessary, raise the unit by extending the length 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. Additional couplers can be used to make additional adjustments to the level of the unit.

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

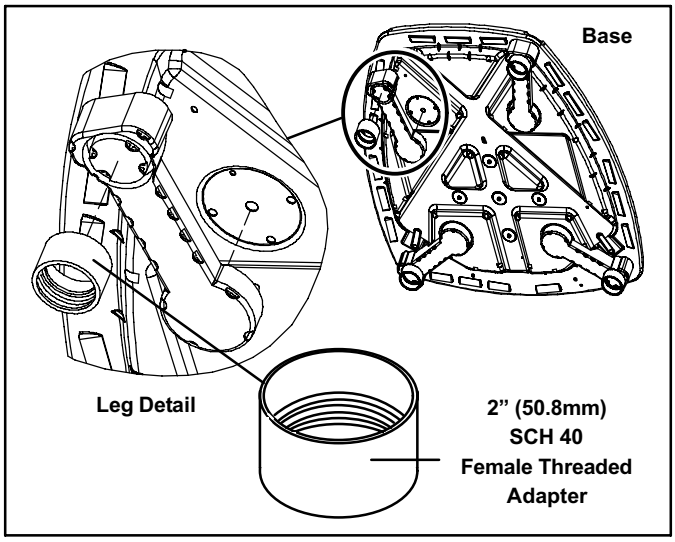


Figure 4. Elevated Slab Mounting using Feet Extenders (Larger-Base Units)

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.

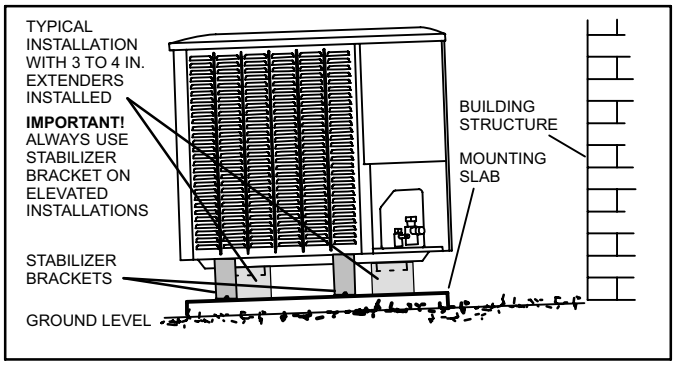


Figure 5. Elevated Slab Mounting using Feet Extenders

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⚠ IMPORTANT

Unit Stabilizer Bracket Use (field-provided):

Always use stabilizers when unit is raised above the factory height. (Elevated units could become unstable in gusty wind conditions).

Stabilizers may be used on factory height units when mounted on unstable or uneven surface.

With unit positioned at installation site, remove two side louvered panels to expose the unit base pan. Install the brackets as illustrated in figure 6 using conventional practices; replace the panels after installation is complete.

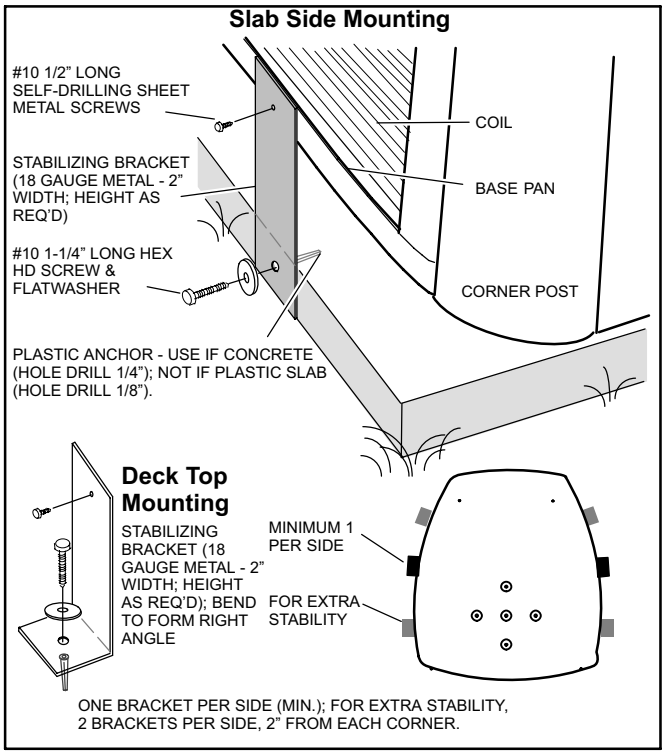


Figure 6. Installing Stabilizer Brackets

ROOF MOUNTING

Install unit 6" (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 cannot be located away from prevailing winter winds, construct a wind barrier sized at least the same height and width as outdoor unit. Position barrier 24" (610 mm) from the sides of the unit in direction of prevailing winds as illustrated in figure 7.

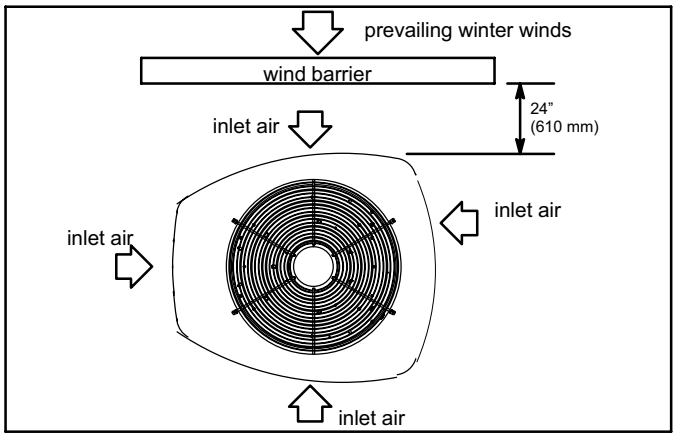


Figure 7. Rooftop Application with Wind Barrier

If unit cannot be located away from prevailing winter winds, construct a wind barrier sized at least the same height and width as outdoor unit. Position barrier 24" (610 mm) from the sides of the unit in direction of prevailing winds (fig. 7).

Removing Panels

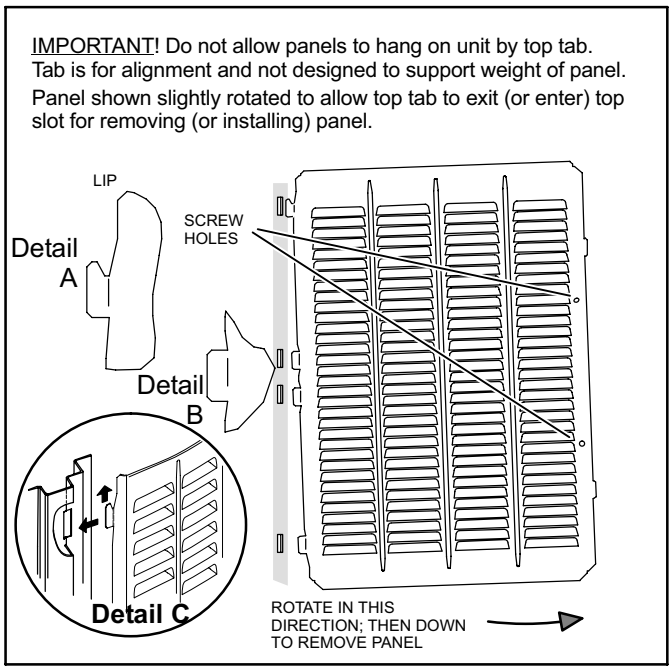


Figure 8. Removing/Installing Louvered Panels (Details A, B and C)

Remove the louvered panels as follows:

1. Remove 2 screws, allowing the panel to swing open slightly (see figure 8).
2. **Hold the panel firmly throughout this procedure.** Rotate bottom corner of panel away from hinge corner post until lower 3 tabs clear the slots (see figure 8, Detail B).

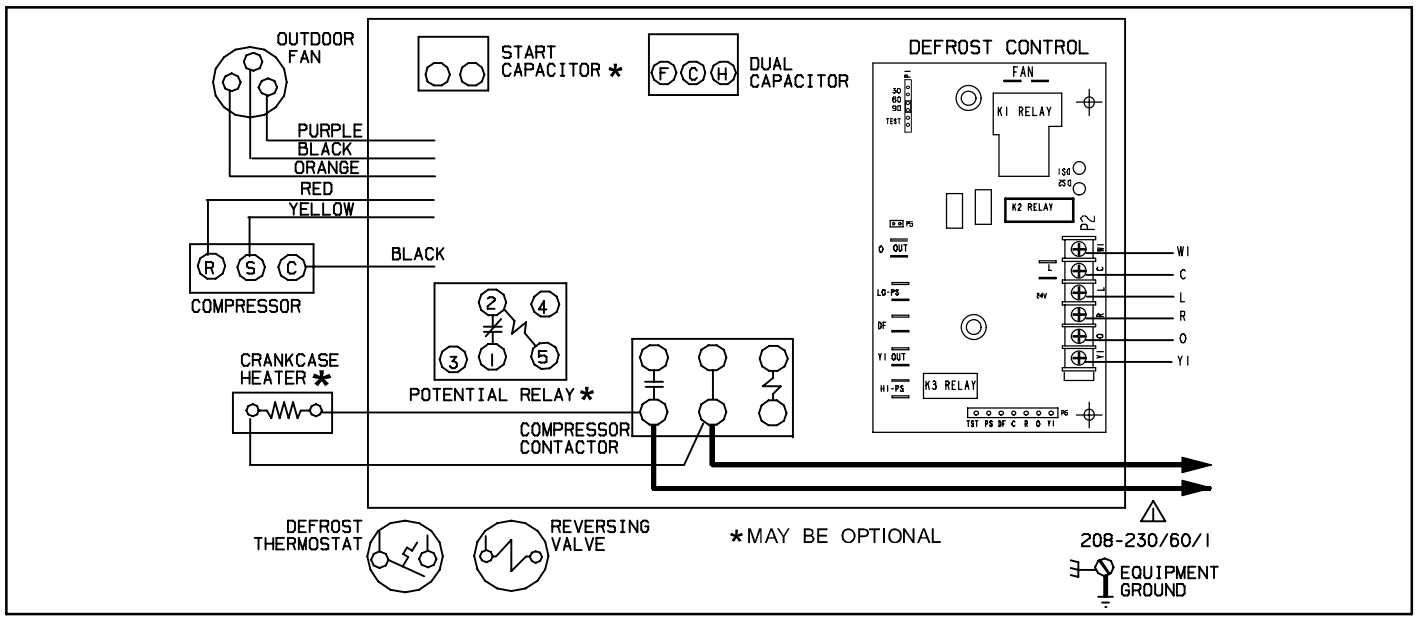


Figure 9. Typical Field Wiring Diagram

3. Move panel down until lip of upper tab clears the top slot in corner post (see figure 8, Detail A).

⚠ 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.

Position and Install Panel—Position the panel almost parallel with the unit (figure 8, 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 (figure 8, 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.

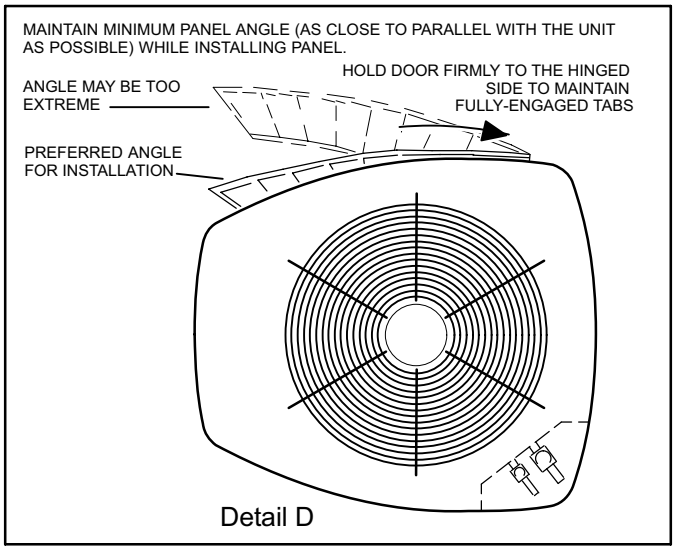


Figure 10. Removing/Installing Louvered Panels (Detail D)

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 - To facilitate conduit, a hole is in the bottom of the control box. Connect conduit to the control box using a proper conduit fitting.

   NOTE - Units are approved for use only with copper conductors. 24V, Class II circuit connections are made in the low voltage junction box. Refer to figure 9 for field wiring diagram.

   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	

   NOTE - A complete unit wiring diagram is located inside the unit control box cover.
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 11 and 12.

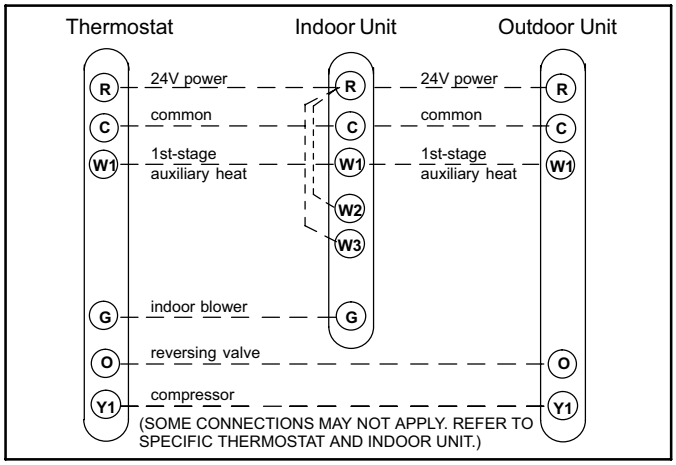


Figure 11. Outdoor Unit and Blower Unit Thermostat Designations

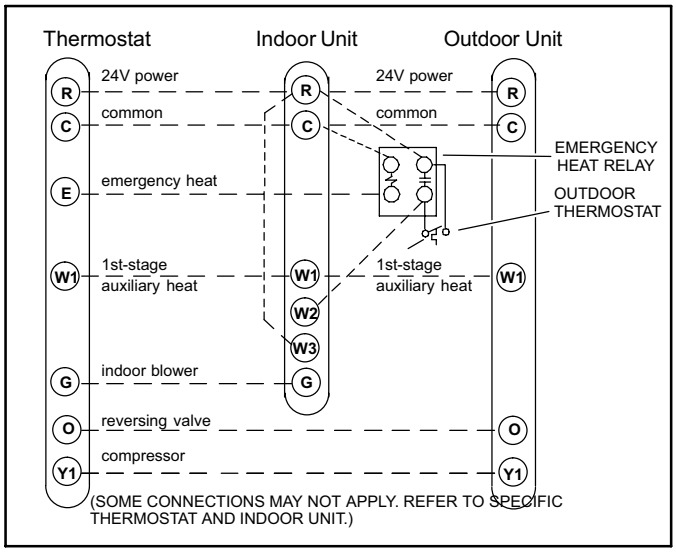


Figure 12. Outdoor Unit and Blower Unit Thermostat Designations (with Emergency Heat)

Refrigerant Piping

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. Refer to Refrigerant Piping Guide (Corp. 9351-L9) for proper size, type, and application of field-fabricated lines. Field connection sizes are also listed in table 2.

Table 2. Refrigerant Line Sets

Model	Field Connections		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-018 -024 -030	3/8 in. (10 mm)	3/4 in (19 mm)	3/8 in. (10 mm)	3/4 in (19 mm)	L15-41 15 ft. - 50 ft. (4.6 m - 15 m)
-036 -042 -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 (15 m). For applications longer than fifty feet, consult the Lennox Refrigerant Piping Guide (Corp. 9351-L9). Select line set diameters from table 2 to ensure that oil returns to the compressor.

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**—Some localities are adopting sound ordinances based on the unit's noise level observed 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. Figure 13 shows how to place the outdoor unit and line set.

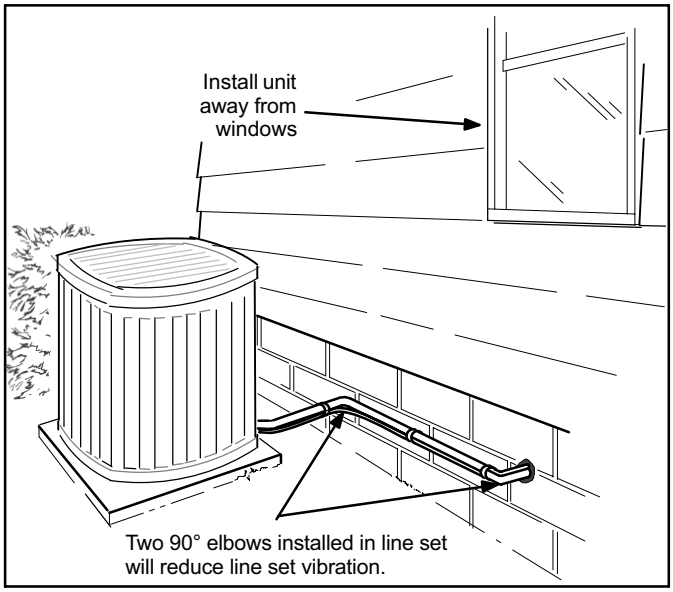


Figure 13. Outside Unit Placement and Installation

2. **Line Set Isolation**—The following illustrations demonstrate procedures which ensure proper refrigerant line set isolation. Figure 14 shows how to install line sets on horizontal runs. Figure 15 shows how to install line sets on vertical runs. Figure 16 shows how to make a transition from horizontal to vertical.

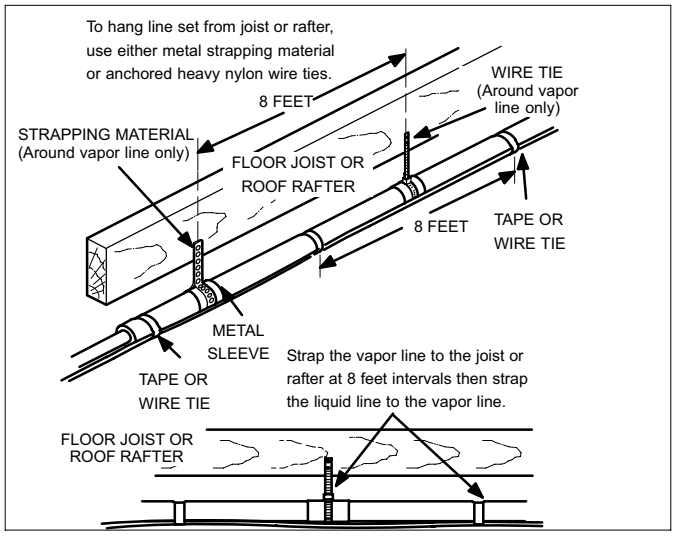


Figure 14. Refrigerant Line Sets: Installing Horizontal Runs

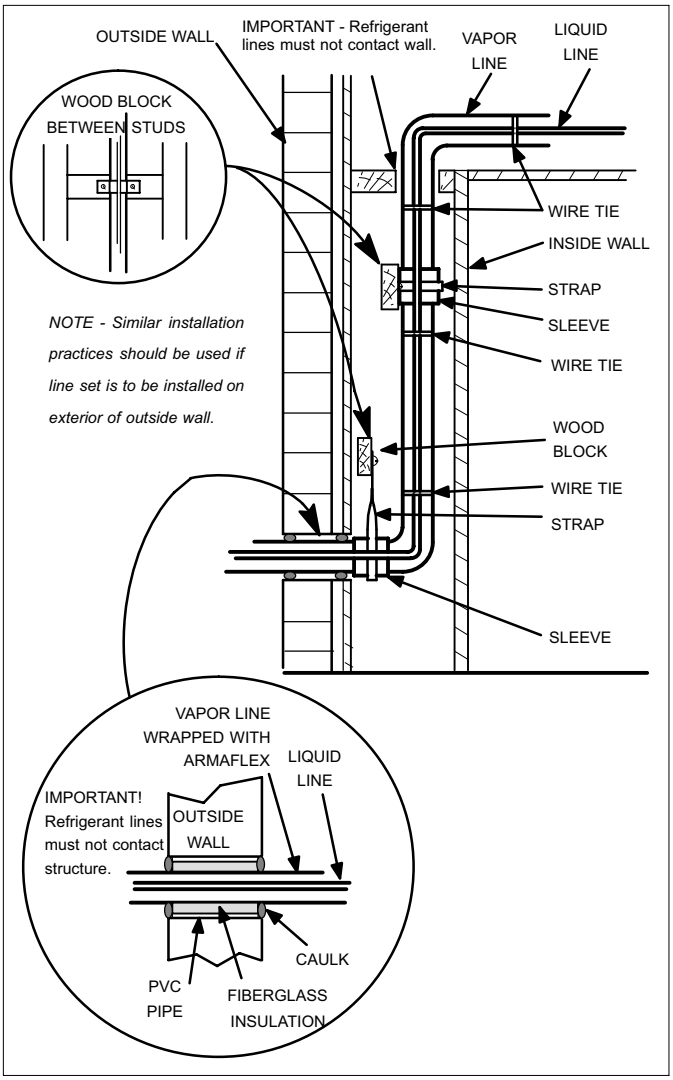


Figure 15. Refrigerant Line Sets: Installing Vertical Runs (New Construction Shown)

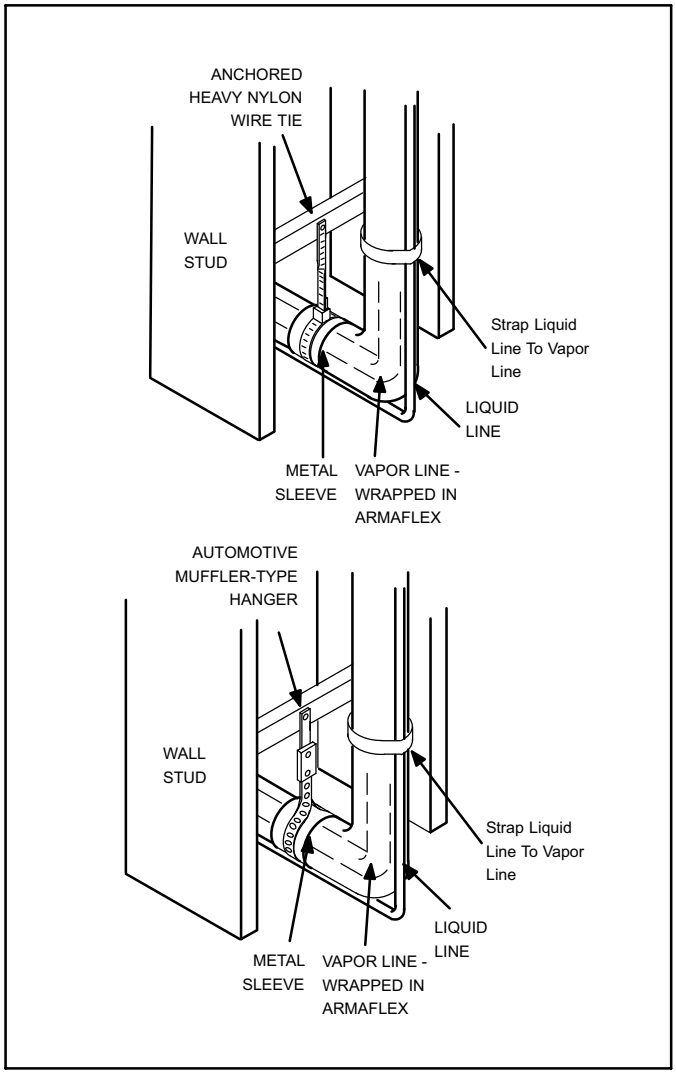


Figure 16. Refrigerant Line Sets: Transition from Vertical to Horizontal

BRAZING CONNECTION PROCEDURE

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. 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) which are rated for use with HCFC-22 refrigerant. Wrap a wet cloth around the valve body and the copper tube stub. Braze the line set to the service valve.
4. Wrap a wet cloth around the valve body and copper tube stub to protect it from heat damage during brazing. Wrap another wet cloth underneath the valve body to protect the base paint.

   NOTE - The tube end must stay bottomed in the fitting during final assembly to ensure proper seating, sealing and rigidity.
5. If required, install a field-provided check expansion valve (approved for use with HCFC-22 refrigerant) in the liquid line at the indoor coil.

Refrigerant Metering Device

HP13 units are used in check expansion valve (CTXV) systems only. See the Lennox Engineering Handbook for approved expansion valve match-ups and application information.

Check expansion valves equipped with Chatleff fittings are available from Lennox. Refer to the Engineering Handbook for applicable check expansion valves for use with specific match-ups. See table 3 for valve kits.

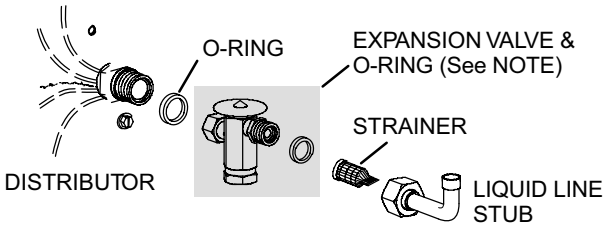
Table 3

Indoor Check Expansion Valve Kits	
Model	**Kit Number**
HP13-018, -024, -030, -036	LB-85759F
HP13-042, -048	LB-85759G
HP13-060	100188-01

⚠ 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.

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 17 for installation of the check expansion valve.



NOTE - If installing expansion valve with an indoor coil that includes a fixed orifice, remove orifice before installing valve.

Figure 17. Metering Device Installation

Manifold Gauge Set

When checking the unit charge, use a manifold gauge set that is equipped with “low loss” hoses. Do not use a manifold gauge set with anything other than a “low loss” hose. See figure 18 for manifold gauge connections.

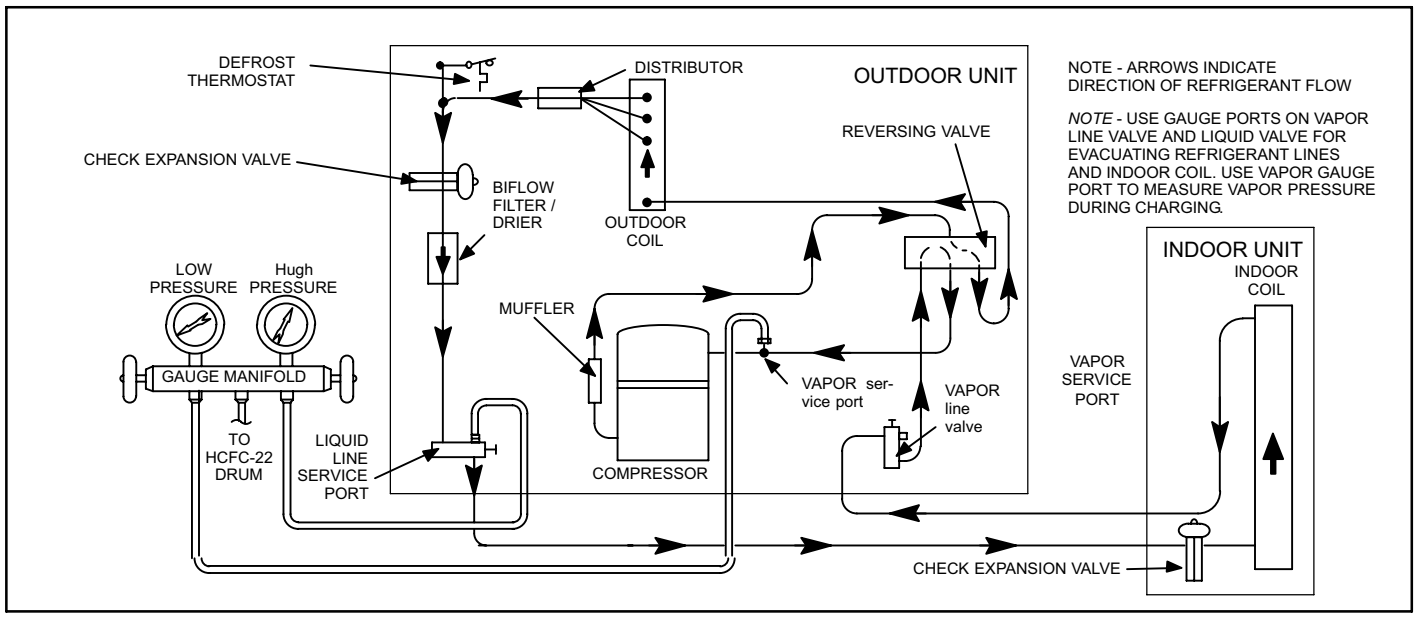


Figure 18. HP13 Cooling Cycle (Showing Gauge Manifold Connections)

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Service Valves

The liquid line and vapor line service valves (figures 19 and 20) and gauge ports are used for leak testing, evacuating, charging and checking charge.

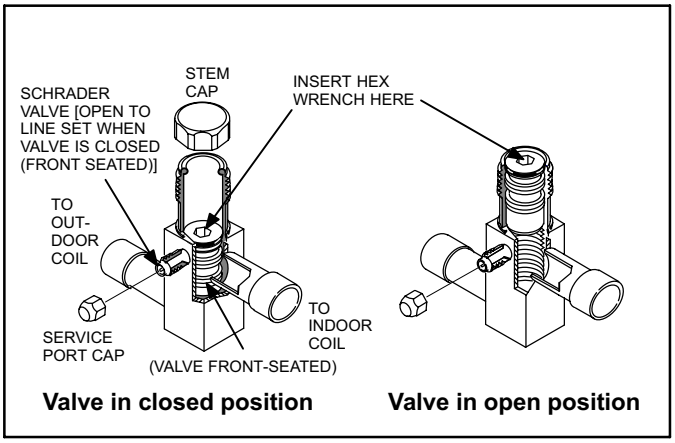

Figure 19. Front-Seated Liquid Line Service Valve

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. After accessing, opening, closing valves, be sure to appropriately tighten the components [see table 1 (on Page 3) for torque requirements].

FRONT-SEATED SERVICE VALVE (LIQUID LINE)

The front-seated service valve is shown in figure 19. When this valve is closed, the service port is open to the line set. Access the service port and open and close valves as described in the following paragraphs.

⚠ 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. Tighten finger tight; then torque per table 1 (Page 3).

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 3).

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 3).

Vapor Line Ball Valve

Ball-type service valves (see figure 20) function the same way as the other valves but cannot be rebuilt; if one fails, replace with a new valve. 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.

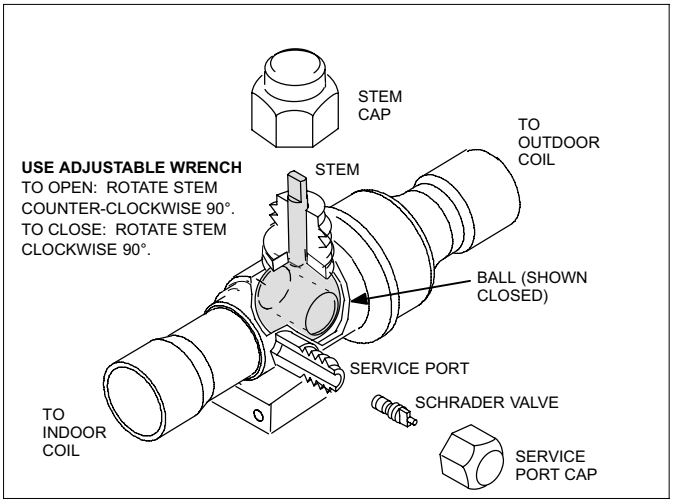

Figure 20. Ball-Type Vapor Valve (Valve Closed)

Leak Testing

After the line set has been connected to the indoor and outdoor units, check the line set connections and indoor unit 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 OR HALIDE

1. Connect a cylinder of HCFC-22 to the center port of the manifold gauge set.
2. With both manifold valves closed, open the valve on the HCFC-22 cylinder (vapor only).
3. Open the high pressure side of the manifold to allow the HCFC-22 into the line set and indoor unit. Weigh in a trace amount of HCFC-22. [A trace amount is a maximum of 2 ounces (57 g) or 3 pounds (31 kPa) pressure.] Close the valve on the HCFC-22 cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the HCFC-22 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 HCFC-22 mixture. Correct any leaks and recheck.

Evacuation

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables and water 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 HCFC-22 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 HCFC-22 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

The unit is factory charged with the amount of HCFC-22 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 4 for refrigerant charge adjustment.

Table 4. Refrigerant Charge per Line Set Lengths

Liquid Line Set Diameter	**Oz. per 5 ft. (g per 1.5m) adjust from 15 ft. (4.6m) line set***
3/8 in. (9.5mm)	3 ounce per 5 ft. (85g per 1.5m)
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.	

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 unit's* ***refrigerant metering device*** *and the* ***outdoor ambient temperature****.*

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

1. Close manifold gauge set valves. 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
2. Connect the center manifold hose to an upright cylinder of HCFC-22.
3. Set the room thermostat to call for heat. This will create the necessary load for properly charging the system in the cooling cycle.
4. Use a digital thermometer to record the outdoor ambient temperature.
5. 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.
6. The outdoor temperature will determine which charging method to use. Proceed with the appropriate charging procedure.

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 200-250 psig (1379-1724 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 200-250 psig (1379-1724 kPa) range. See figure 21.

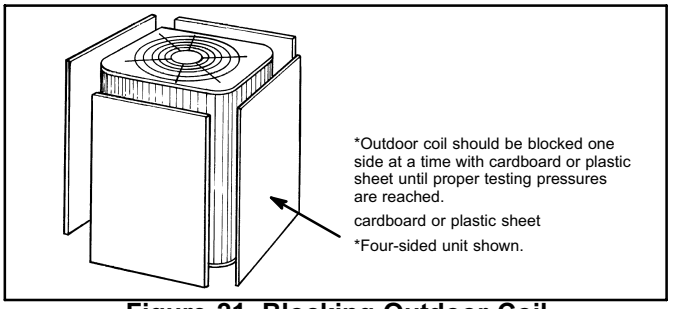

Figure 21. Blocking Outdoor Coil

1. With the manifold gauge hose still on the liquid service port and the unit's pressure stabilized, 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 HCFC-22 to determine the saturation temperature for the liquid line pressure reading.
4. Subtract the liquid line temperature from the saturation temperature (according to the chart) to determine subcooling.
5. Compare the subcooling value results with those in table 5. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant.

Table 5. HP13 Subcooling Values

	____°	**Saturation Temperature °F (°C)**
—	____°	**Liquid Line Temperature °F (°C)**
=	____°	**Subcooling Value °F (°C)**

Model	**-018**	**-024**	**-030**	**-036**	**-042**	**-048**	**-060**
°F (°C)*	6 (3.3)	11 (6)	8 (4.4)	6 (3.3)	6 (3.3)	4 (2.2)	9 (5)

NOTE - For best results, use the same electronic thermometer to check both outdoor-ambient and liquid-line temperatures.
*F: +/-1.0°; C: +/-0.5°

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 table 7, "Normal Operating Pressures." 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. Verify adjusted charge using the approach method.
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 the approach values given in table 6. If the values do not agree with the those in table 6, add refrigerant to lower the approach temperature or recover refrigerant from the system to increase the approach temperature.

Table 6. HP13 Approach Values

	___°	**Liquid Line Temperature °F (°C)**
—	___°	**Outdoor Temperature °F (°C)**
=	___°	**Approach Temperature °F (°C)**

Model	-018	-024	-030	-036	-042	-048	-060
°F (°C)*	7 (3.9)	8 (4.4)	9 (5)	13 (7.2)	7 (3.9)	9 (5)	6 (3.3)

NOTE - For best results, use the same electronic thermometer to check both outdoor-ambient and liquid-line temperatures.

*F: + / -1.0°; C: + / -0.5°

⚠ IMPORTANT

Use table 7 as a general guide when performing maintenance checks. This is not a procedure for charging the unit (Refer to Charging / Checking Charge section). Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system.

Table 7. HP13 Normal Operating Pressures - Liquid ±10 & Vapor ±5 PSIG*

°F (°C)**	HP13-018 Liquid / Vapor	HP13-024 Liquid / Vapor	HP13-030 Liquid / Vapor	HP13-036 Liquid / Vapor	HP13-042 Liquid / Vapor	HP13-048 Liquid / Vapor	HP13-060 Liquid / Vapor
Cooling							
65 (18)	141 / 81	148 / 80	146 / 78	154 / 78	139 / 67	146 / 75	139 / 74
75 (24)	163 / 82	176 / 82	171 / 79	180 / 80	163 / 74	171 / 77	164 / 77
85 (29)	191 / 84	206 / 83	201 / 80	216 / 81	191 / 81	198 / 78	193 / 78
95 (35)	222 / 85	240 / 84	233 / 81	246 / 81	220 / 84	229 / 79	230 / 79
105 (41)	256 / 87	277 / 86	271 / 81	284 / 82	256 / 85	268 / 81	262 / 82
115 (45)	296 / 89	322 / 87	313 / 83	328 / 85	294 / 87	308 / 81	300 / 84
Heating							
50(10)	192 / 64	185 / 60	198 / 58	196 / 58	204 / 59	197 / 39	213 / 58
40 (4)	180 / 53	176 / 50	188 / 47	185 / 47	195 / 49	189 / 31	200 / 46
30 (-1)	172 / 43	165 / 49	175 / 35	176 / 37	184 / 39	181 / 25	189 / 37
20 (-7)	164 / 34	162 / 31	163 / 26	170 / 30	178 / 32	175 / 18	177 / 32

**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.*

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.

FILTER DRIER

The unit is equipped with a bi-flow filter drier. See figure 18. If replacement is necessary, order another of like design.

CRANKCASE HEATER

⚠ 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.

EMERGENCY HEAT FUNCTION (ROOM THERMOSTAT)

An emergency heat function is designed into some room thermostats. This feature is applicable when isolation of 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 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.

Defrost System

The HP13 defrost system includes two components: a defrost thermostat and a defrost control.

DEFROST THERMOSTAT

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

DEFROST CONTROL

The defrost control board includes the combined functions of a time/temperature defrost control, defrost relay, diagnostic LEDs and terminal strip for field wiring connections. See figure 22.

The control provides automatic switching from normal heating operation to defrost mode and back. During compressor cycle (call for defrost), the control accumulates compressor run times at 30-, 60-, or 90-minute field-adjustable intervals. If the defrost thermostat is closed when the selected compressor run time interval ends, the defrost relay is energized and defrost begins.

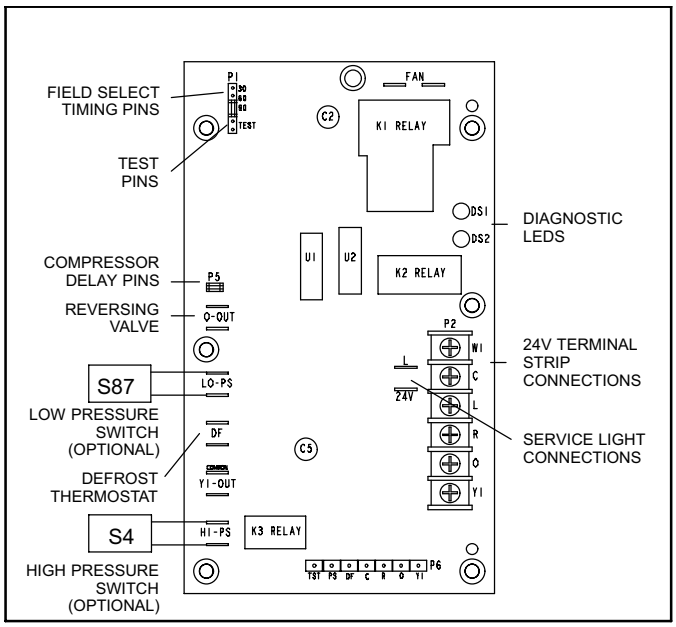

Figure 22. HP13 Outdoor Unit Defrost Control Board

DEFROST CONTROL TIMING PINS

Each timing pin selection provides a different accumulated compressor run time period for one defrost cycle. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30 (T1), 60 (T2), or 90 (T3) minutes (see figure 22). The defrost timing jumper is factory-installed to provide a 90-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval. The maximum defrost period is 14 minutes and cannot be adjusted.

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

COMPRESSOR DELAY

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. The compressor will be cycled off for 30 seconds going in and out of the defrost mode when the compressor delay jumper is removed.

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

TIME DELAY

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

Pressure Switch Circuit

The defrost control incorporates two pressure switch circuits. The optional high pressure switch (S4) connects to the board's HI PS terminals. The board also includes connections for an optional low pressure, or loss-of-charge-pressure, switch (S87). Switches are shown in figure 22.

During a single demand cycle, the defrost control will lock out the unit after the fifth time that the circuit is interrupted by any pressure switch wired to the control board. In addition, the diagnostic LEDs will indicate a locked-out pressure switch after the fifth occurrence of an open pressure switch (see Table 8). The unit will remain locked out until power to the board is interrupted, then re-established or until the jumper is applied to the TEST pins for 0.5 seconds.

NOTE - The defrost control board ignores input from the low-pressure switch terminals as follows:

- *during the TEST mode,*
- *during the defrost cycle,*
- *during the 90-second start-up period,*
- *and for the first 90 seconds each time the reversing valve switches heat/cool modes.*

Diagnostic LEDs

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

Table 8

Defrost Control Board Diagnostic LED		
Mode	**Green LED (DS2)**	**Red LED (DS1)**
No power to control	OFF	OFF
Normal operation / power to control	Simultaneous Slow FLASH	
Anti-short cycle lock-out	Alternating Slow FLASH	
Low pressure switch fault (Optional)	OFF	Slow FLASH
Low pressure switch lockout (Optional)	OFF	ON
High pressure switch fault (Optional)	Slow FLASH	OFF
High pressure switch lockout (Optional)	ON	OFF

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.

  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
- Mild Weather Kit
- Compressor Monitor
- Compressor Crankcase Heater
- Mounting Bases
- Sound Cover
- Low Ambient Kit
- Monitor Kit
- Dave Lennox *Signature Stat*™ Room Thermostat

Homeowner Information

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

1. **Air Filter—**Ask your Lennox dealer to show you where your indoor unit's filter is located. It will be either at the indoor unit (installed internal or external to the cabinet) or behind a return air grille in the wall or ceiling. Check the filter monthly and clean or replace it as needed.
2. **Disposable Filter—**Disposable filters should be replaced with a filter of the same type and size.

   NOTE - If you are unsure about the filter required for your system, call your Lennox dealer for assistance.

⚠ IMPORTANT

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

3. **Reusable Filter—**Many indoor units are equipped with reusable foam filters. Clean foam filters with a mild soap and water solution; rinse thoroughly; allow filter to dry completely before returning it to the unit or grille.

   NOTE - The filter and all access panels must be in place any time the unit is in operation.
4. **Electronic Air Cleaner—**Some systems are equipped with an electronic air cleaner, designed to remove airborne particles from the air passing through the cleaner. If your system is so equipped, ask your dealer for maintenance instructions.
5. **Indoor Unit—**The indoor unit's evaporator coil is equipped with a drain pan to collect condensate formed as your system removes humidity from the inside air. Have your dealer show you the location of the drain line and how to check for obstructions. (This would also apply to an auxiliary drain, if installed.)

⚠ IMPORTANT

Sprinklers and soaker hoses should not be installed where they could cause prolonged exposure to the outdoor unit by treated water. Prolonged exposure of the unit to treated water (i.e., sprinkler systems, soakers, waste water, etc.) will corrode the surface of steel and aluminum parts and diminish performance and longevity of the unit.

6. **Outdoor Unit—**Make sure no obstructions restrict airflow to the outdoor unit. Leaves, trash or shrubs crowding the unit cause the outdoor unit to work harder and use more energy. Keep shrubbery trimmed away from the unit and periodically check for debris which collects around the unit.

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

   Cleaning of the outdoor unit's coil should be performed by a trained service technician. Contact your dealer and set up a schedule (preferably twice a year, but at least once a year) to inspect and service your air conditioning or heat pump system.

HEAT PUMP OPERATION

Your new Lennox heat pump has several characteristics that you should be aware of:

- Heat pumps satisfy heating demand by delivering large amounts of *warm* air into the living space. This is quite different from gas- or oil-fired furnaces or an electric furnace which deliver lower volumes of considerably *hotter* air to heat the space.
- Do not be alarmed if you notice frost on the outdoor coil in the winter months. Frost develops on the outdoor coil during the heating cycle when temperatures are below 45°F (7°C). An electronic control activates a defrost cycle lasting 5 to 15 minutes at preset intervals to clear the outdoor coil of the frost.
- During the defrost cycle, you may notice steam rising from the outdoor unit. This is a normal occurrence. The thermostat may engage auxiliary heat during the defrost cycle to satisfy a heating demand; however, the unit will return to normal operation at the conclusion of the defrost cycle.

IN CASE OF EXTENDED POWER OUTAGE...

If the outdoor temperature is below 50°F (10°C) and power to your outdoor unit has been interrupted for 6 hours or longer, observe the following when restoring power to your heat pump system.

- Set the room thermostat selector to the "Emergency Heat" setting to obtain temporary heat for a minimum of 6 hours. This will allow system refrigerant pressures and temperatures enough time to return to a stabilized condition.
- In Emergency Heat mode, all heating demand is satisfied by auxiliary heat; heat pump operation is locked out. After a six-hour "warm-up" period, the thermostat can then 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 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.

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: _____ Outdoor Fan _____

Maximum Fuse or Circuit Breaker _____

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

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

COOLING

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

HEATING

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

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? ❑