LENNOX®

INSTALLATION INSTRUCTIONS

HP27 SERIES UNITS

HEAT PUMP UNITS
504,712M
06/04
Supersedes 12/03

Technical Publications
Litho U.S.A.

Table of Contents

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

HP27 Outdoor Unit

HP27 outdoor units are designed for expansion valve systems only. They are not designed for RFC systems. Refer to Lennox engineering handbook for expansion valve kits which you must order separately.

Shipping & Packing List

1 - Assembled HP27 outdoor unit

2 - Grommets (for liquid and vapor lines)

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

⚠ WARNING

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

⚠ IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC'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.

General Information

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

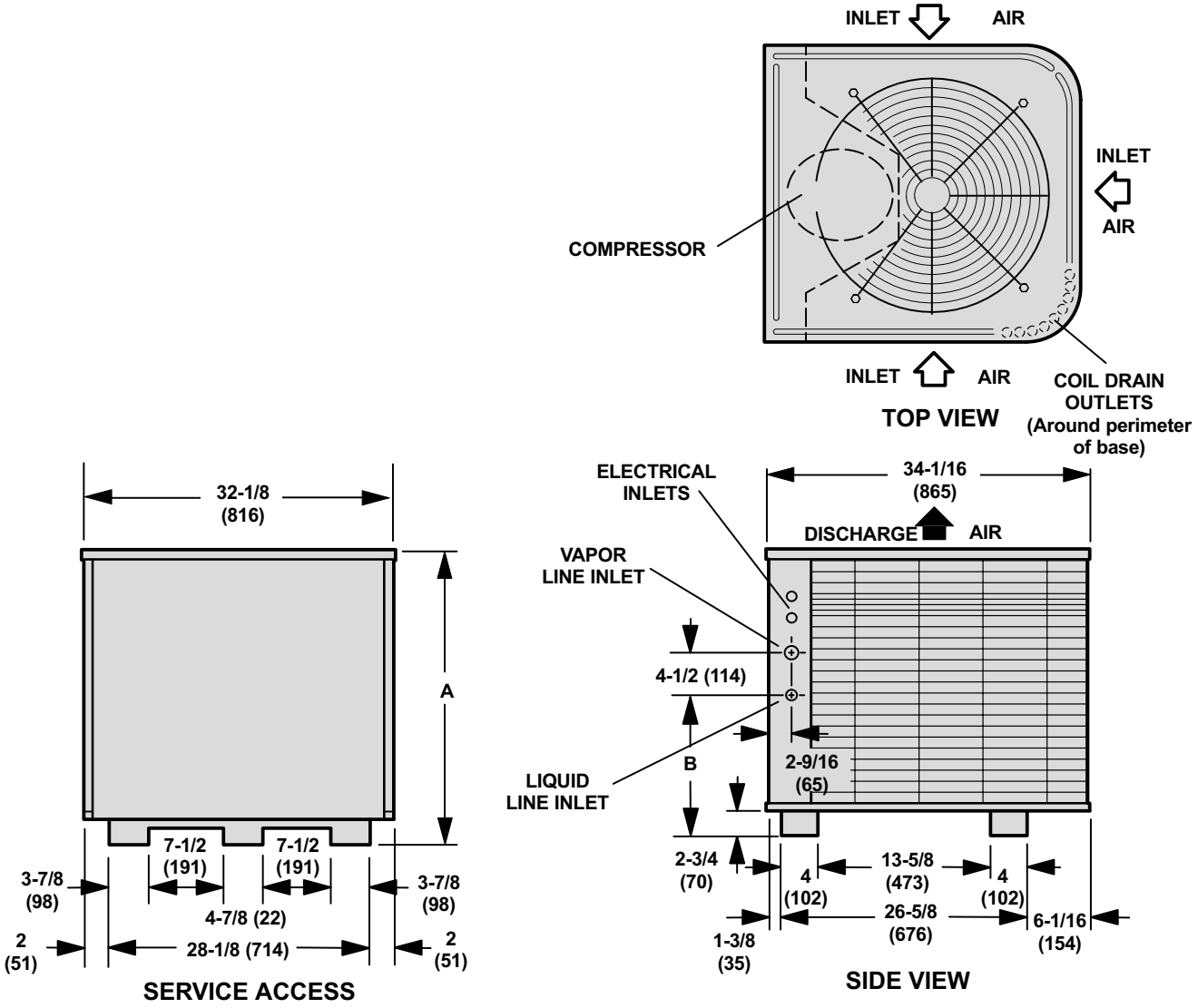
Fiberglass wool may also cause respiratory, skin, and eye irritation.

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 No.		A	B
HS27-024 HP27-030	in.	40-7/8	19-13/16
	mm	1038	503
HP27-036 HP27-042	in.	44-7/8	14-1/4
	mm	1140	362

Parts Arrangement

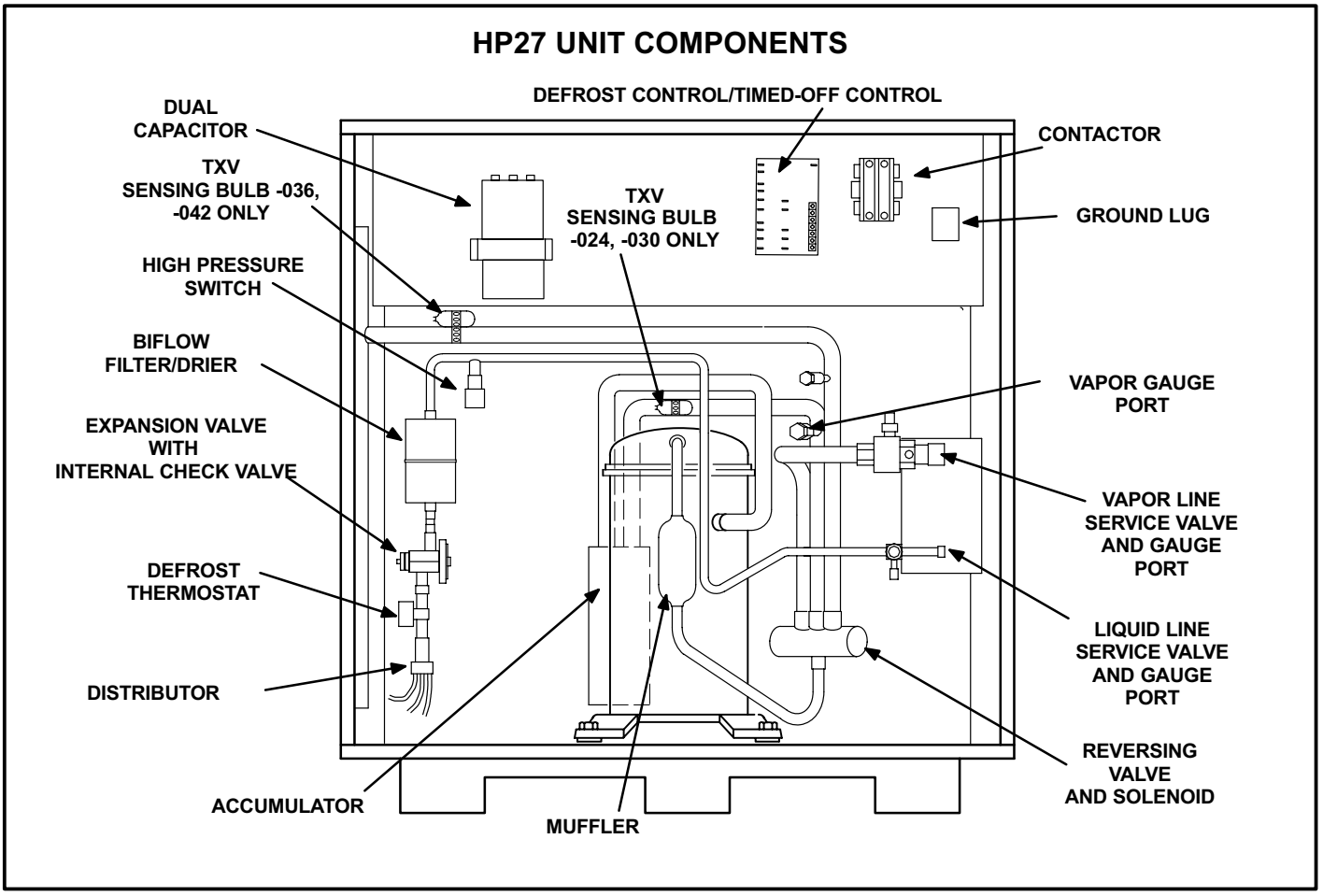


Figure 1

Setting the Unit

⚠CAUTION

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

⚠CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

The outdoor 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. A minimum clearance of 24inches (610 mm) between multiple units must be maintained. Refer to figure 2 for installation clearances.

1 - Place a sound-absorbing material, such as Isomode, under the unit if you intend to install it in a location or a 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 prevent ice build-up and to allow adequate drainage of defrost water.

3 - In areas that receive heavy snow, do not locate the unit where drifting will occur. Ensure that the unit base is elevated above the depth of average snows.

NOTE - Elevate the unit by constructing a frame using suitable materials. If you construct a support frame, it must not block drain holes in the base of the unit.

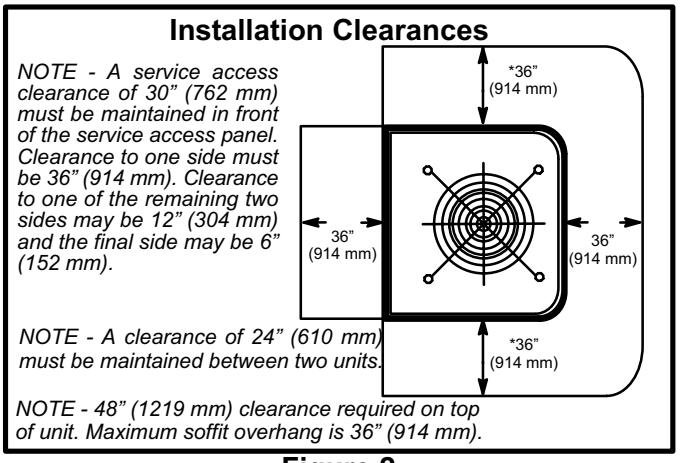


Figure 2

4 - When you install the unit in areas where low ambient temperatures exist, locate the unit so winter prevailing winds do not blow directly into outdoor coil.

5 - Locate the unit away from overhanging roof lines which would allow water or ice to drop on, or in front of, the coil or into the unit.

Slab Mounting

When installing the unit at grade level, the top of the slab should be high enough above the grade so that water from higher ground will not collect around the unit. See figure 3. The 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 from building up under the unit during a defrost cycle. Refer to the roof mounting section for barrier construction if the unit must face prevailing winter winds.

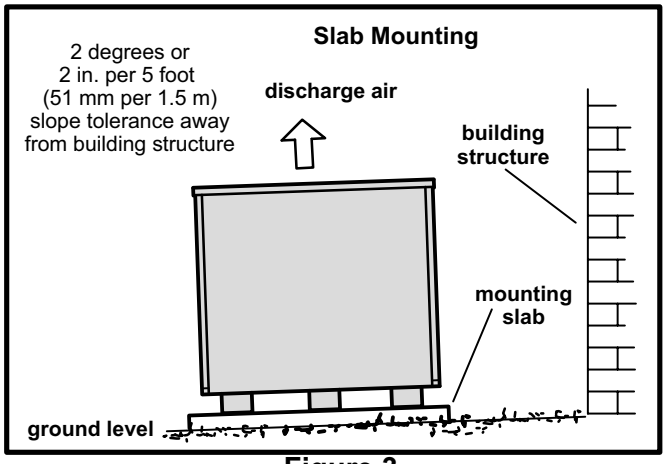


Figure 3

Roof Mounting

If you are unable to mount the unit coil away from prevailing winter winds, construct a wind barrier. See figure 4. Size the barrier at least the same height and width as the outdoor unit. Mount the barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds.

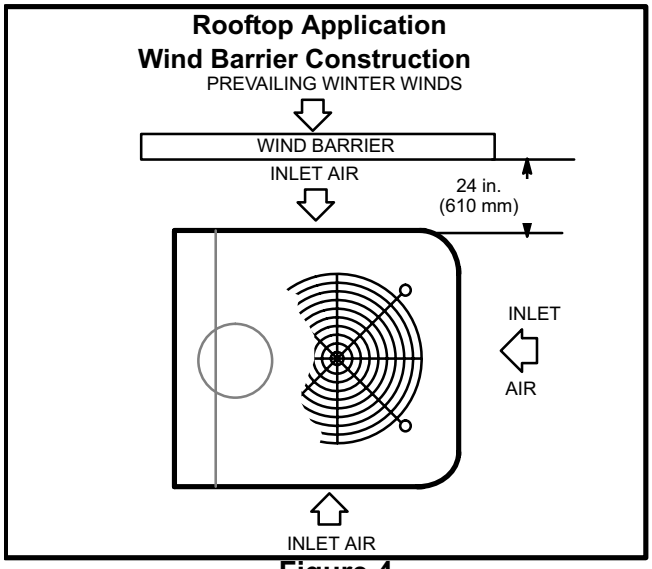


Figure 4

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

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

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 us ing 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 5 for field wiring diagram.

NOTE - A complete unit wiring diagram is located in side 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 voltage wiring from outdoor to indoor unit and from thermostat to indoor unit. See figures 6 and 7.

Typical Field Wiring Diagram

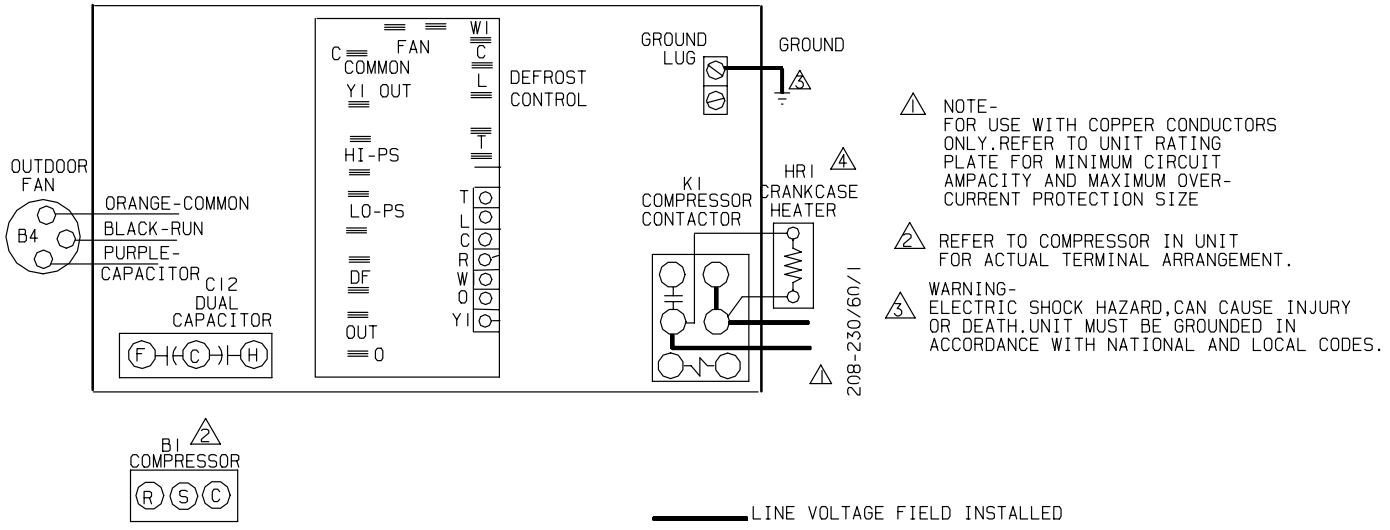


Figure 5

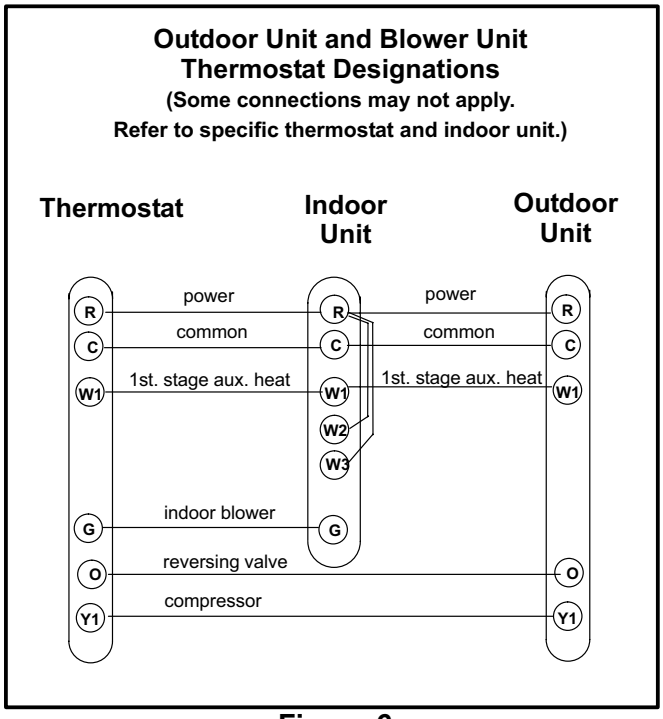


Figure 6

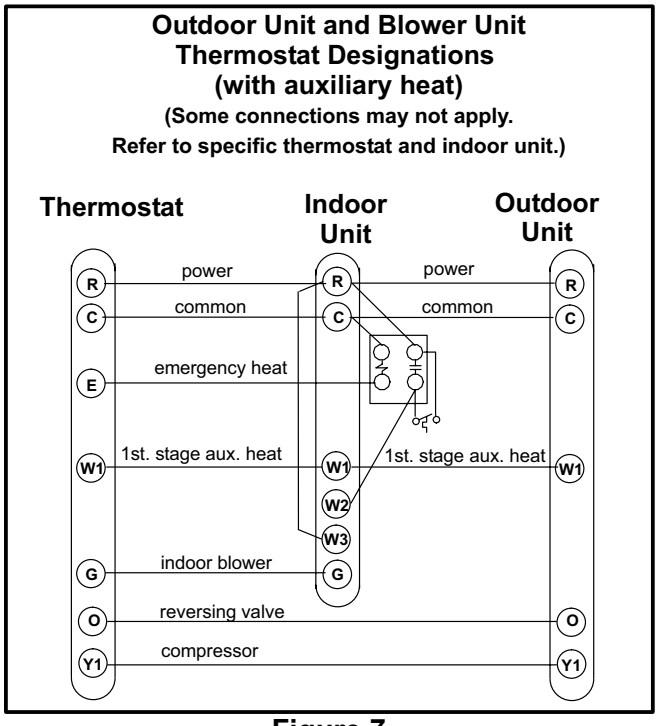


Figure 7

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 1 or use field-fabricated refrigerant lines. Refer to Refrigerant Piping Guide (Corp. 9351-L9) for proper size, type, and application of field-fabricated lines. Valve sizes are also listed in table 1.

Table 1
Refrigerant Line Sets

Model	Valve Field Size Connections		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-024 -030	3/8 in. 9.5 mm	3/4 in. 19.1 mm	3/8 in. 9.5 mm	3/4 in. 19.1 mm	L15-41 15 ft.-50 ft. 4.6 m-15.2 m
-036 -042	3/8 in. 9.5 mm	7/8 in. 22.2 mm	3/8 in. 9.5 mm	7/8 in. 22.2 mm	L15-41 15 ft.-50 ft. 4.6 m-15.2 m

Installing Refrigerant Line

During the installation of any heat pump or a/c system, it is important to properly isolate the refrigerant lines to prevent unnecessary vibration. Line set contact with the structure (wall, ceiling or floor) causes some objectionable noise when vibration is translated into sound. As a result, more energy or vibration can be expected. Closer attention to line set isolation must be observed.

Following are some points to consider 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 from the adjacent property 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 window. Glass has a very high level of sound transmission.

2- **Line Set Isolation -** The following illustrations demonstrate procedures which ensure proper refrigerant line set isolation. Figure 8 shows how to install line sets on vertical runs. Figure 9 shows how to install line sets on horizontal runs. Figure 10 shows how to make a transition from horizontal to vertical. Finally, figure 11 shows how to place the outdoor unit and line set.

Refrigerant Line Sets
How To Install Vertical Runs
(new construction shown)

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

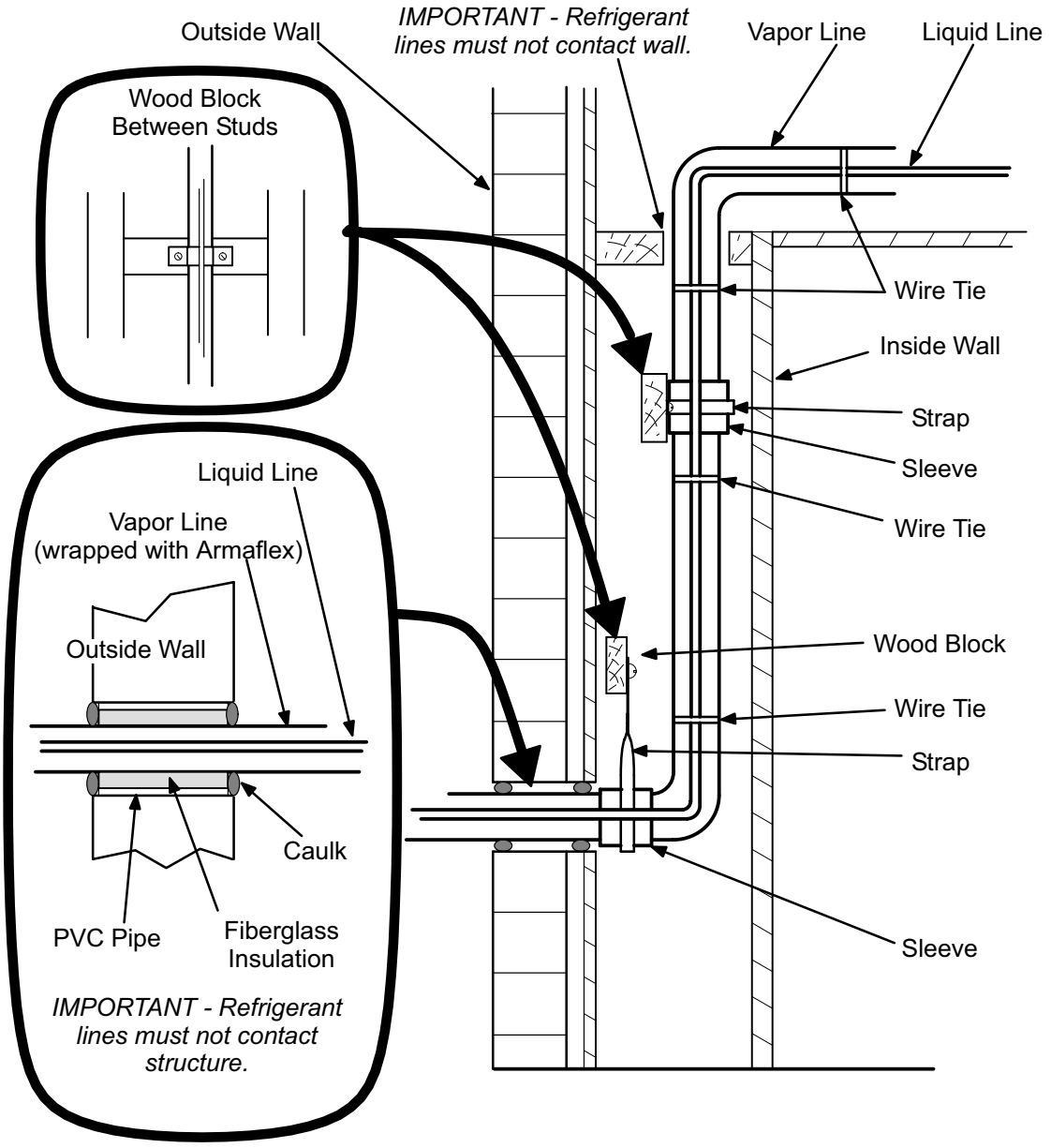


Figure 8

Refrigerant Line Sets:
Installing Horizontal Runs

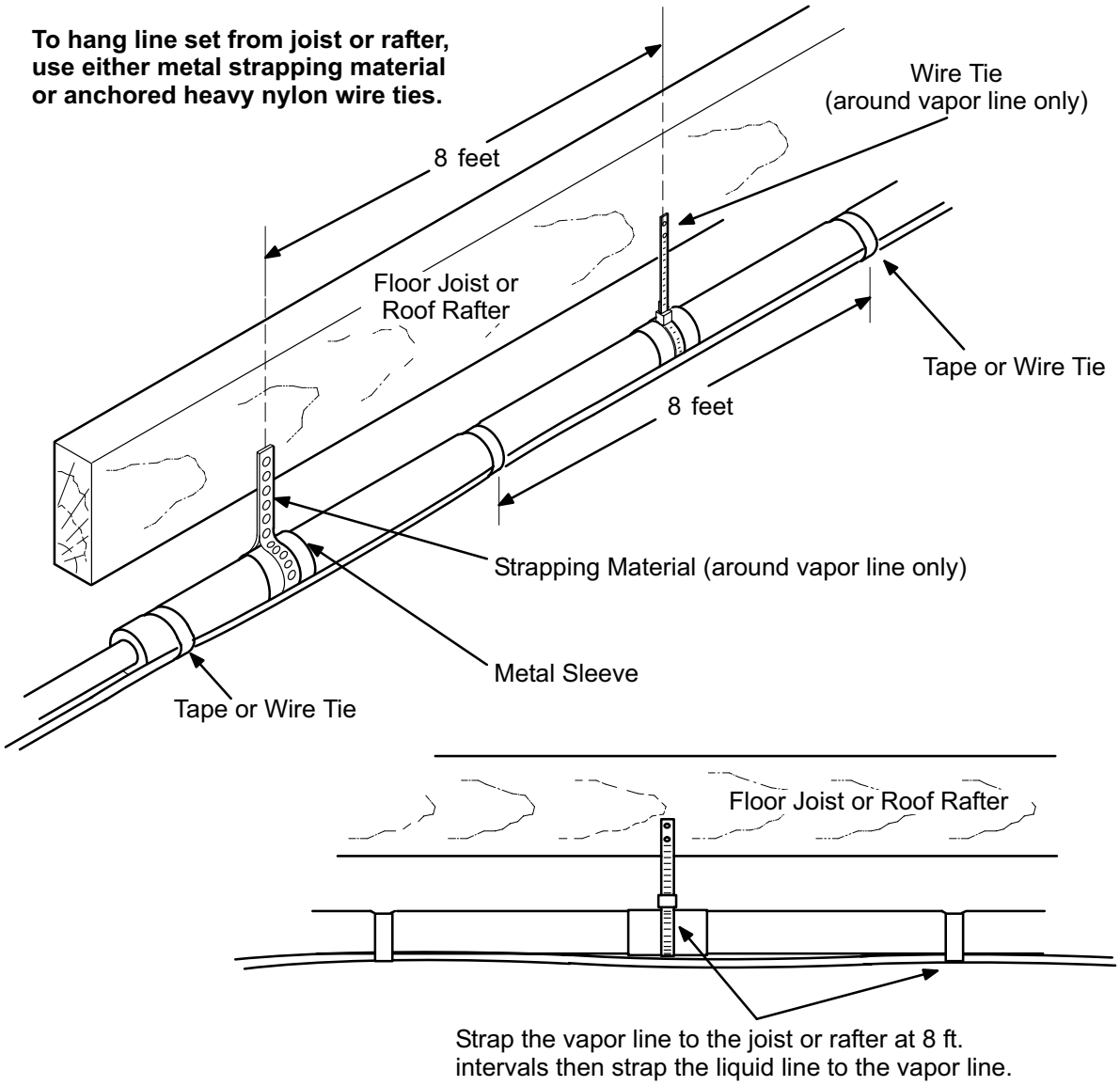


Figure 9

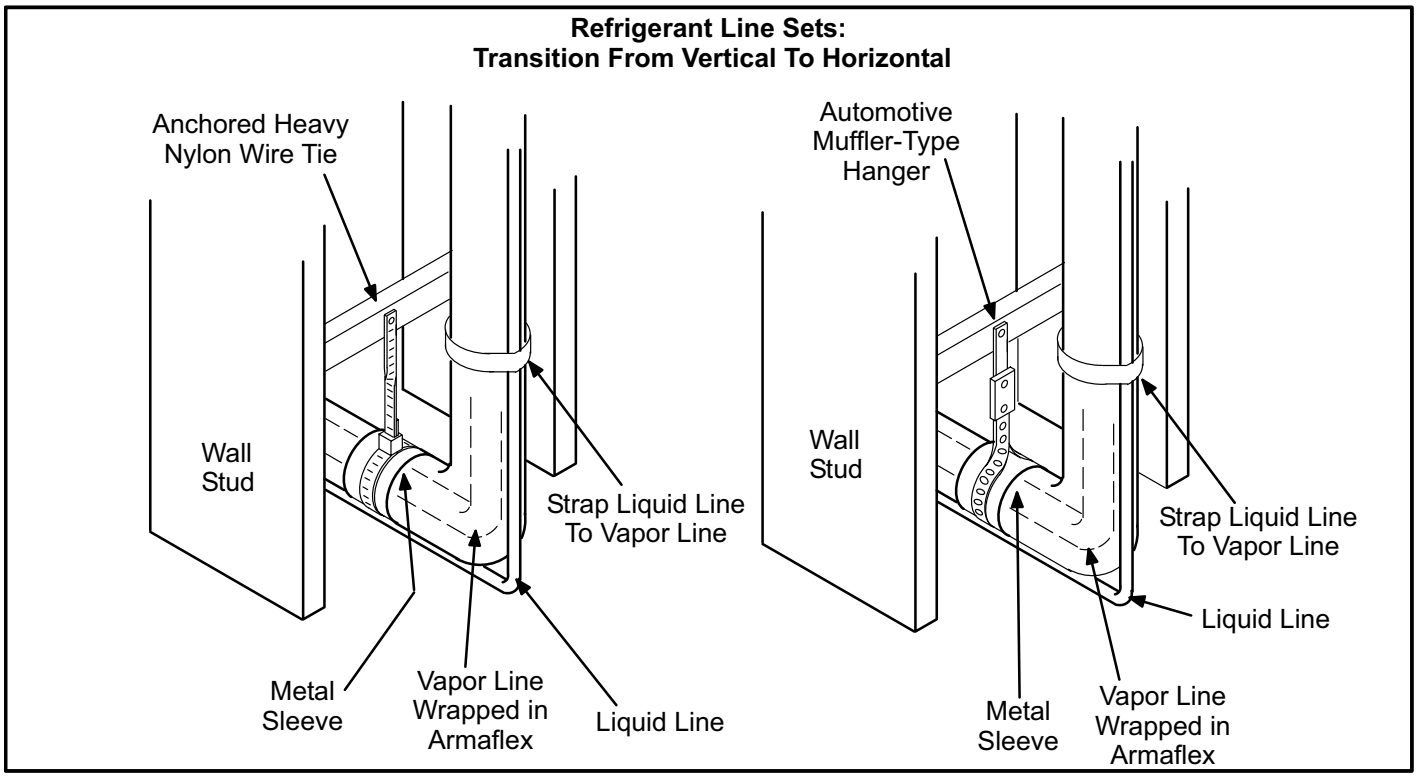


Figure 10

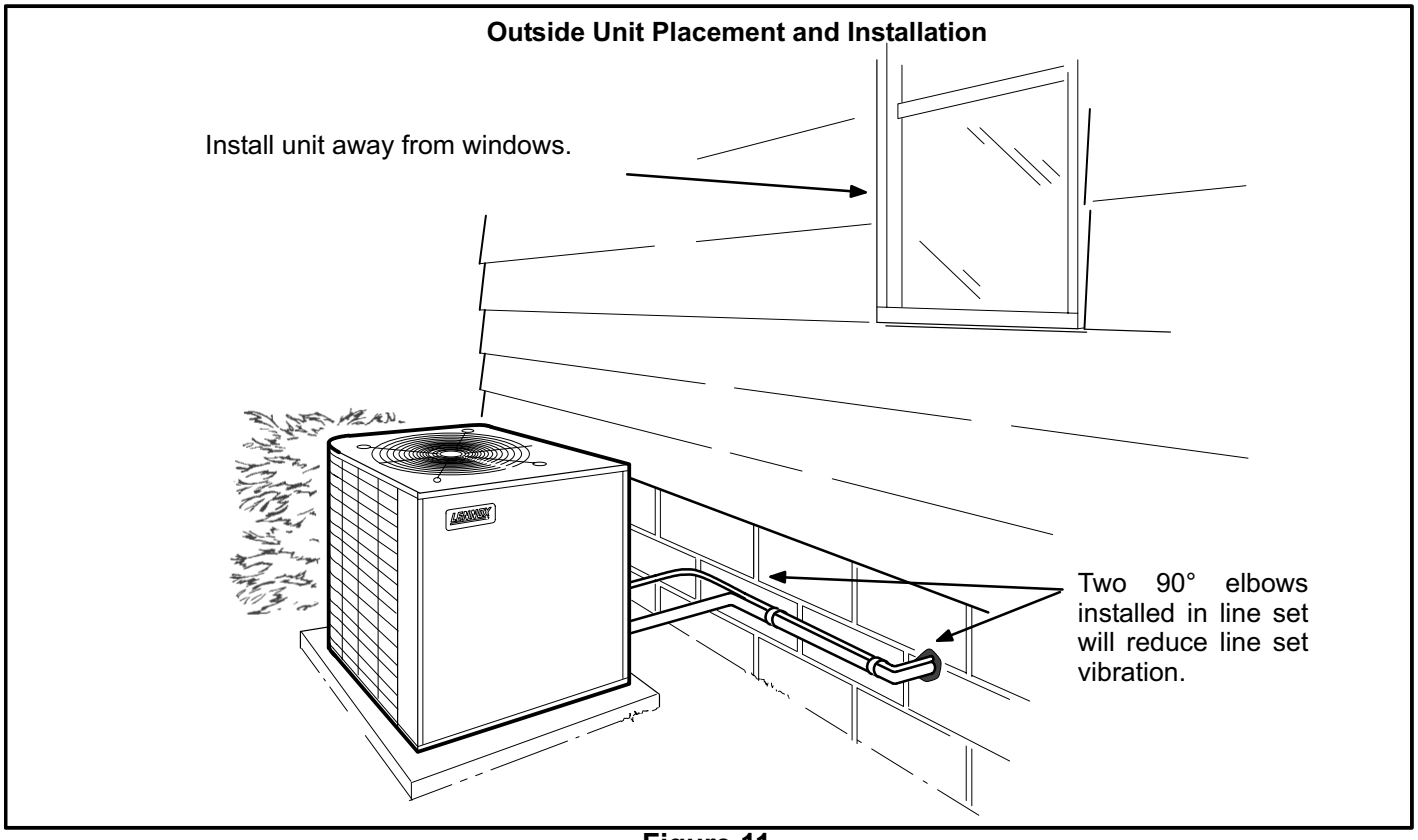


Figure 11

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.

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 HCFC22 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 - Install a field-provided thermal expansion valve (approved for use with HCFC22 refrigerant) in the liquid line at the indoor coil.

Refrigerant Metering Device

HP27 units are used in check expansion valve systems only. See the Lennox Engineering Handbook for approved TXV match-ups and application information.

Check expansion valves equipped with Chatleff 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 installing the check expansion valve.

⚠ IMPORTANT

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

See figure 12 for installation of the check expansion valve.

Metering Device Installation

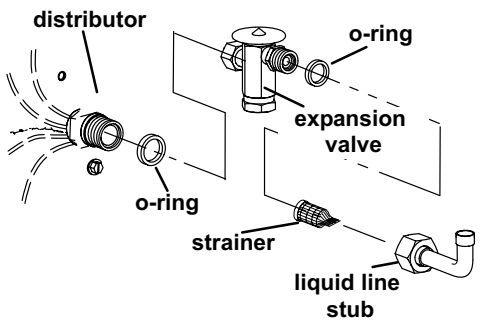


Figure 12

Service Valves

Access the liquid line and vapor line service valves (figures 13 and 14) and gauge ports are used for leak testing, evacuating, charging and checking charge. See table 2 for torque requirements.

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.

Table 2
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

⚠ IMPORTANT

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

To Access Schrader Port:

1 - Remove the service port cap with an adjustable wrench.
2 - Connect the gauge to the service port.
3 - When testing is complete, replace the service port cap. Tighten finger tight, then an additional 1/6 turn.

To Open Service Valve:

1 - Remove the stem cap with an adjustable wrench.
2 - Use a service wrench with a hex head extension to back the stem out counterclockwise as far as it will go.
NOTE - Use a 3/16" hex head extension for liquid line sizes or a 5/16" extension for vapor line sizes.

3 - Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

To Close Service Valve:

1 - Remove the stem cap with an adjustable wrench.

2 - Use a service wrench with a hex head extension to turn the stem clockwise to seat the valve. Tighten firmly.

NOTE - Use a 3/16" hex head extension for liquid line sizes or a 5/16" extension for vapor line sizes.

3 - Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

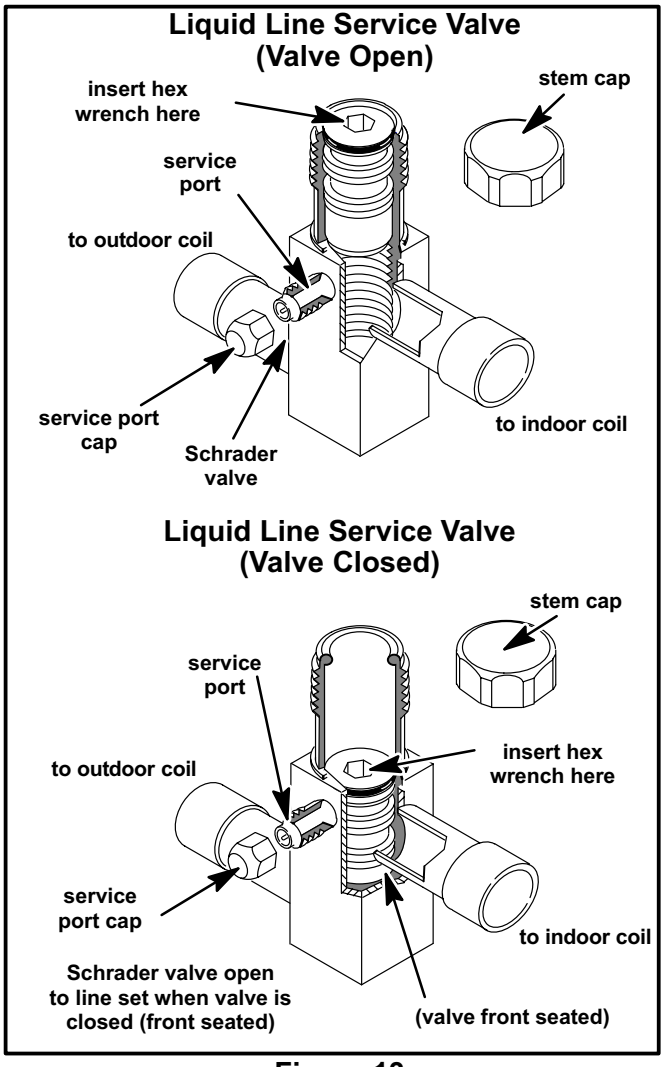


Figure 13

Ball-Type Vapor Line Service Valve

Vapor line 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 valve is illustrated in figure 14.

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.

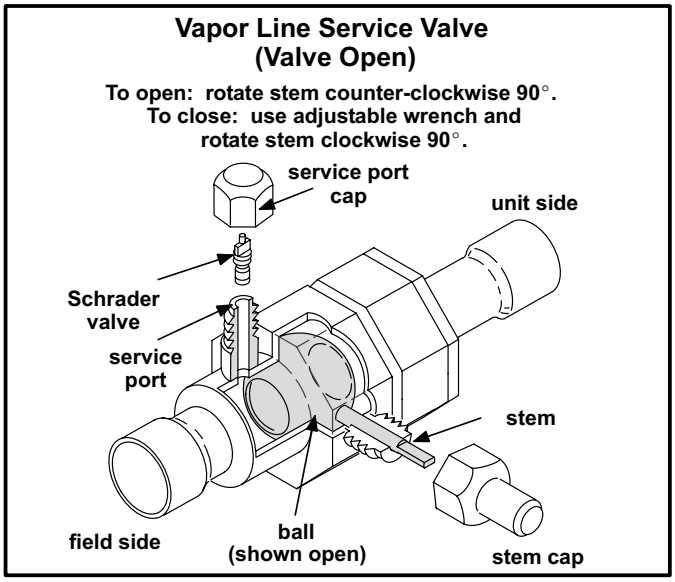


Figure 14

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

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

⚠WARNING

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

Danger of explosion: Can cause equipment damage, injury or death. Never use oxygen to pressurize a refrigeration or air conditioning system. Oxygen will explode on contact with oil and could cause personal injury.

⚠ WARNING

Danger of explosion: Can cause equipment damage, injury or death. 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 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 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 nitrogen and HCFC-22 mixture. Correct any leaks and recheck.

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 10,000 microns.

1 - Connect manifold gauge set to the service valve ports as follows:
- low pressure gauge to *vapor* service port
- high pressure gauge to *liquid* line service valve

2 - Connect micron gauge.

3 - Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set.

4 - Open both manifold valves and start the vacuum pump.

5 - Evacuate the line set and indoor unit to an **absolute pressure** of 23,000 microns (29.01 inches of mercury). 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 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.

⚠ CAUTION

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 nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the 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

Cooling 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.

Manifold Gauge Set

When checking the unit charge, use a manifold gauge set equipped with “low loss” hoses. Do not use a manifold gauge set that has anything other than a “low loss” hose.

Charging

The unit is factory-charged with the amount of HCFC-22 refrigerant that is 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.

Table 3

Liquid Line Set Diameter	Oz. per 5 ft. (g per 1.5 m) adjust from 15 ft. (4.6 m) line set*
3/8 in. (9.5 mm)	3 ounces per 5 ft. (88.05 g per 1.5 m)

**If line set length is greater than 15 ft. (4.6 m), add this amount. If line set 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 manifold gauge set to service valves as shown in figure 16.
- low pressure gauge to *vapor* valve service port
- high pressure gauge to *liquid* valve service port

Connect the center manifold hose to an upright cylinder of HCFC-22.

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 - Use a digital thermometer to record the outdoor ambient temperature.

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 the appropriate charging procedure.

Weighing in the Charge TXV Systems – Outdoor Temp < 65°F (18°C)

If the system is void of refrigerant, or if the outdoor ambient temperature is cool, the refrigerant charge should be weighed into the unit. Do this after any leaks have been repaired.

1 - Recover the refrigerant from the unit.

2 - Conduct a leak check, then evacuate as previously outlined.

3 - Weigh in the unit nameplate charge.

If weighing facilities are not available or if you are charging the unit during warm weather, follow one of the other procedures outlined below.

Subcooling Method Outdoor Temp. < 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 nec-

essary 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 15.

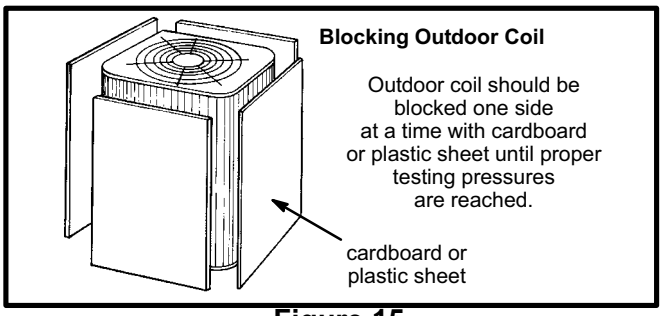


Figure 15

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 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. **(Saturation temperature - Liquid line temperature = Subcooling)**

5 - Compare the subcooling value with those in table 4. If subcooling is greater than shown, recover some refrigerant. If subcooling is less than shown, add some refrigerant.

Table 4
Subcooling Values

Model	Subcooling °F (°C)
HP27-024	8 ± 2 (4.4 ± 1)
HP27-030	7 ± 2 (3.9 ± 1)
HP27-036	8 ± 2 (4.4 ± 1)
HP27-042	7 ± 2 (3.9 ± 1)

Charging Using Normal Operating Pressures and the Approach Method
Outdoor Temp. ≥ 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 6, “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.

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 values given in table 5. If the values don’t agree with the those in table 5, add refrigerant to lower the approach temperature or recover refrigerant from the system to increase the approach temperature.

Table 5
Approach Values

Model	Liquid Temp. Minus Ambient Temp. °F (°C)
HP27-024	8 + 1 (4.4 + .5)
HP27-030	5 + 1 (2.8 + .5)
HP27-036	5 + 1 (2.8 + .5)
HP27-042	8 + 1 (4.4 + .5)

⚠ IMPORTANT

Use table 6 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 6

Normal Operating Pressures									
Mode	Outdoor Coil Air Entering Temperature °F	HP27-024		HP27-030		HP27-036		HP27-042	
		liq. ± 10 psig	vapor ± 5 psig.	liq. ± 10 psig	vapor ± 5 psig.	liq. ± 10 psig	vapor± 5 psig.	liq. ± 10 psig	vapor ± 5 psig.
Cooling (TXV Only)	65°	134	82	136	80	137	80	134	75
	75°	159	83	161	81	163	81	167	76
	85°	186	84	188	82	190	82	199	77
	95°	216	83	217	83	222	83	232	78
	105°	248	86	251	85	257	85	257	80
Heating	20°	179	36	173	36	177	33	184	29
	30°	188	49	192	49	195	40	194	39
	40°	203	58	205	58	208	47	205	48
	50°	228	65	218	65	217	58	216	58

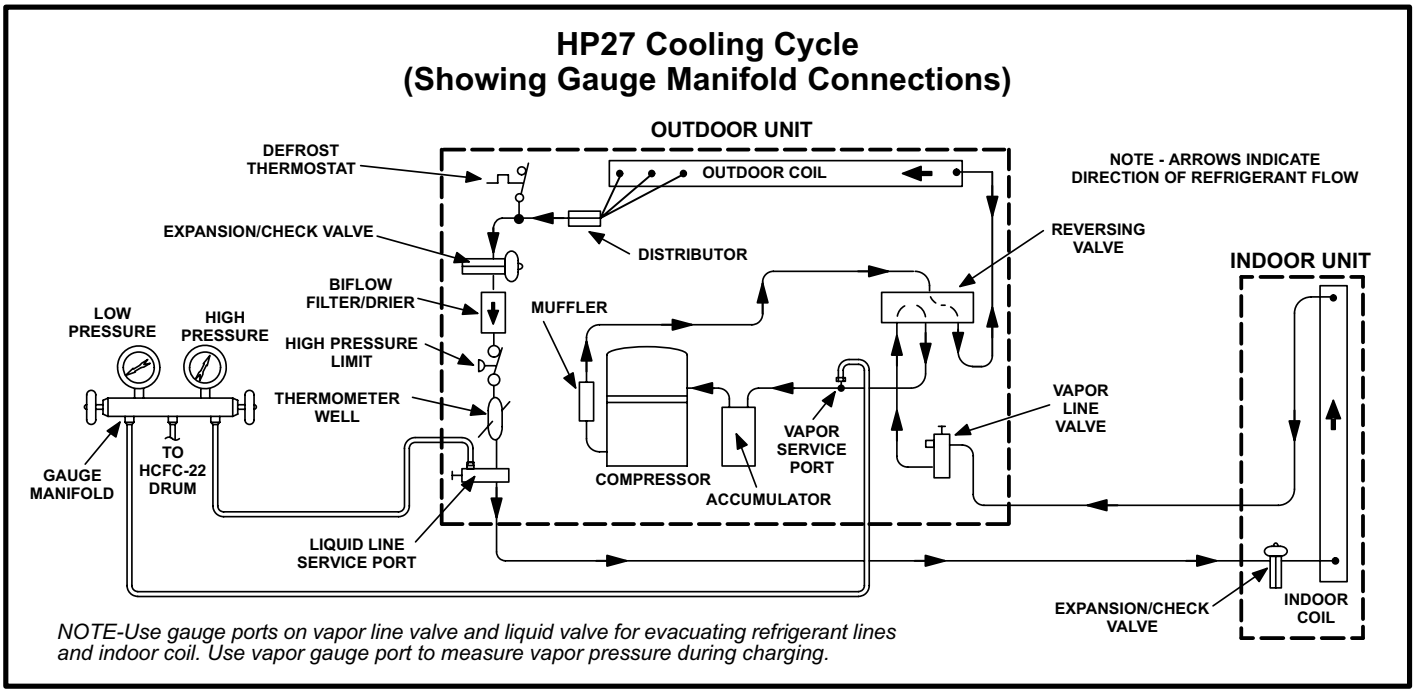


Figure 16

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.

⚠ CAUTION

Danger of Equipment Damage.
Do not bypass the discharge thermostat.

Filter Drier

The drier is equipped with an internal check valve for correct refrigerant flow (Refer to figure 16). If replacement is necessary, order another of the same design and capacity. A liquid line strainer gives additional compressor protection.

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.

High Pressure Switch

The HP27 is equipped with an auto-reset high pressure switch (single-pole, single-throw) which is located on the liquid line. The switch shuts off the compressor if the discharge pressure rises above the factory setting. The switch is normally closed and is permanently adjusted to trip (open) at 410 ± 10 psig (2827 ± 69 kPa). The switch resets (closes) when the pressure drops below 210 ± 20 psig (1448 ± 138 kPa).

Defrost System

The defrost system includes two components:

- a defrost thermostat
- a defrost control

Defrost Thermostat

The defrost thermostat is located on the liquid line between the check/expansion valve and the distributor. When the defrost thermostat senses 42°F (5.5°C) or cooler, its 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, time delay, diagnostic LEDs, and a terminal strip for field wiring connections. See figure 17.

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.

Defrost Control Timing Pins

Each timing pin selection provides a different accumulated compressor run time period during one thermostat run 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 17. 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.

Time Delay

The timed-off delay is five minutes long. The delay helps 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 Circuits

The defrost control includes two pressure switch circuits. The high pressure switch (S4) is factory-connected to the board's HI PS terminals. The board also includes LO PS terminals to accommodate the addition of a field-provided low pressure or loss of charge pressure switch. See figure 17. This feature is available on all units.

During a single demand cycle, the defrost control will lock out the unit after the third time that the circuit is interrupted by any pressure switch that is wired to the control board. In addition, the diagnostic LEDs will indicate a locked out pressure switch after the third occurrence of an open pressure switch. See table 7. The unit will remain locked out until power is broken then remade to the control 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 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. ***If the TEST pins are jumpered and the 5-minute delay is being bypassed, the LO PS terminal signal is not ignored during the 90-second start-up period.***

Ambient Thermistor & Service Light Connection

The defrost control board provides terminal connections for the ambient thermistor and a service light. The thermistor compensates for changes in ambient temperature which might cause thermostat droop. The service light thermostat provides a signal which activates the room thermostat service light during periods of inefficient operation.

Diagnostic LEDs

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

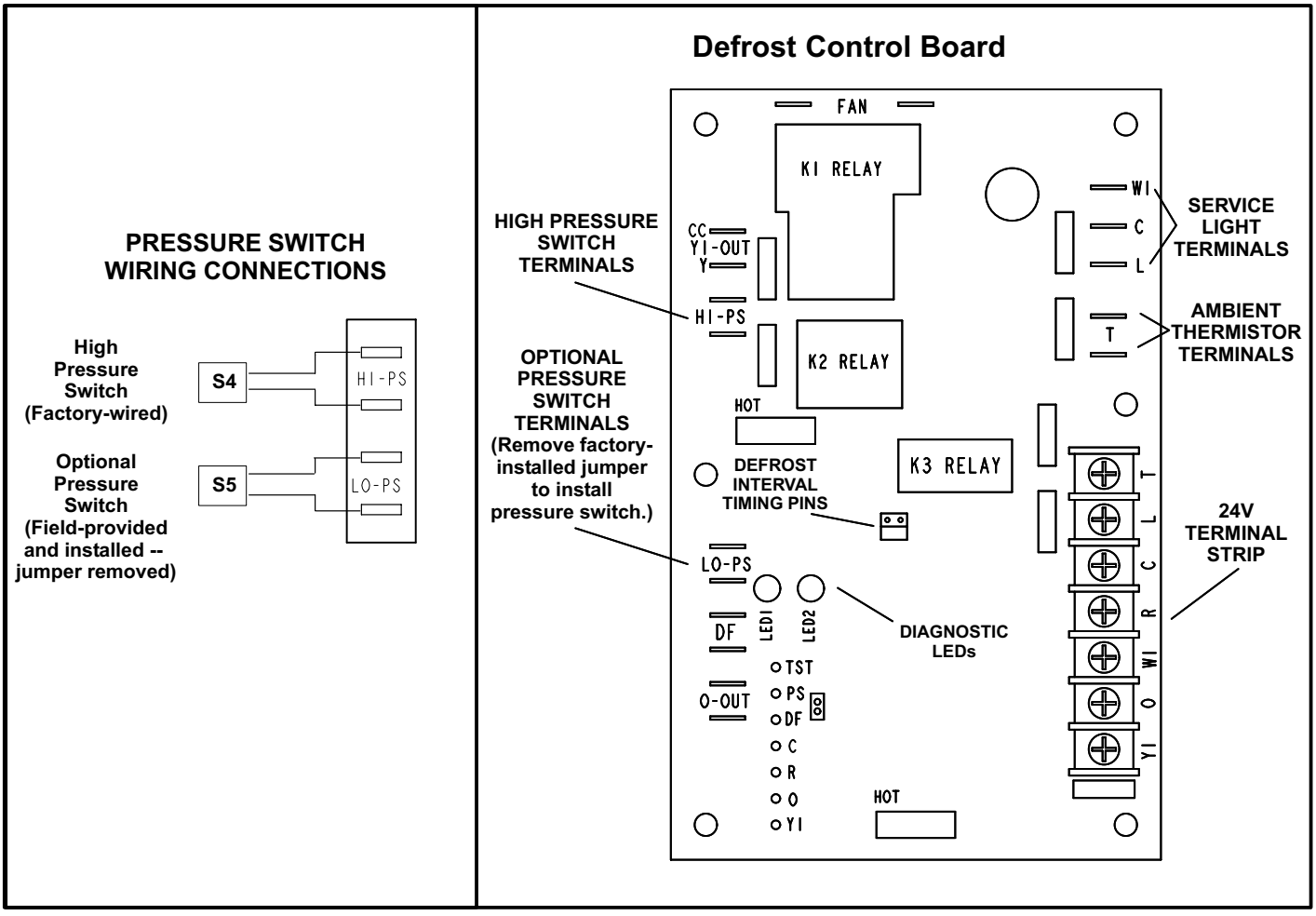


FIGURE 17

Table 7

Defrost Control Board Diagnostic LED		
Mode	**LED 1**	**LED 2**
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure or no power	Off	Off
Board failure	On	On
High pressure switch open	Flash	On
Low pressure switch open	On	Flash
Pressure switch lockout	On	Off
Anti-short-cycle / 5-minute delay	Alternating Flash with LED 2	Alternating Flash with LED 1

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.

Maintenance and service must be performed by a qualified installer or service agency. At the beginning of each cooling or heating season, the system should be checked as follows:

Outdoor Unit

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

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

Indoor Coil

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

Indoor Unit

1 - Clean or change the filters.

2 - Lennox blower motors are prelubricated and permanently sealed. No more lubrication is needed.

3 - Adjust blower speed for cooling. Check the pressure drop over the coil to determine the correct blower CFM. Refer to the Lennox Engineering Handbook for indoor unit blower CFM tables.

4 - *Belt Drive Blowers* - Check belt for wear and proper tension.

5 - Check all wiring for loose connections.

6- Check for correct voltage at unit. (blower operating)

7 - Check amp-draw on blower motor.
Motor nameplate_____Actual_____.

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

HP27 Check Points

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 _____ 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? ☐ Service Valve Caps Tight? ☐ Voltage With Compressor Operating _____

Sequence of Operation **Thermostat**

Heating Correct ☐ Cooling Correct ☐ Calibrated? ☐ Properly Set? ☐ Level? ☐