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Dallas, Texas, USA



THIS MANUAL MUST BE LEFT WITH THE HOMEOWNER FOR FUTURE REFERENCE

⚠ WARNING

The State of California has determined that this product may contain or produce a chemical or chemicals, in very low doses, which may cause serious illness or death. It may also cause cancer, birth defects, or reproductive harm.

General

This SPB*H4 outdoor heat pump is designed for use with HFC-410A refrigerant only. This unit must be installed with an approved indoor air handler or coil. See the Lennox SPB*H4 Product Specifications bulletin (EHB) for approved indoor component match-ups.

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

INSTALLATION INSTRUCTIONS

Elite® Series SPB*H4 Units

HEAT PUMP
507197-01
7/2013

TPD Technical
Publications
Litho U.S.A.

⚠ 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 licensed professional installer (or equivalent) or service agency.

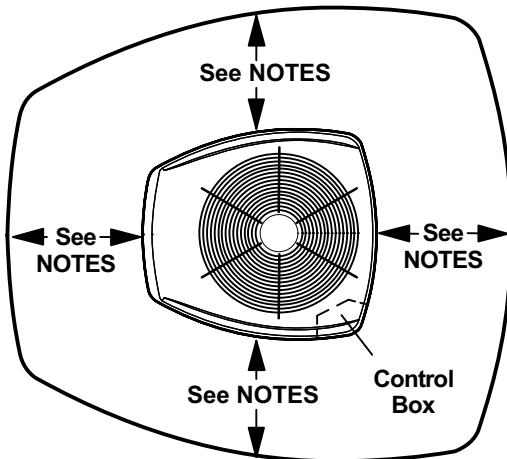
⚠ CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

NOTICE !

For more in-depth information, consult the Installation and Service Procedures manual, available as Corp. 0626-L5 on DaveNet or through the Technical Support department at 800-453-6669.

STEP 1 -- SETTING THE UNIT -- Clearances



NOTES:

Service clearance of 30 in. 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.

Clearance to one of the remaining two sides may be 12 in. and the final side may be 6 in.

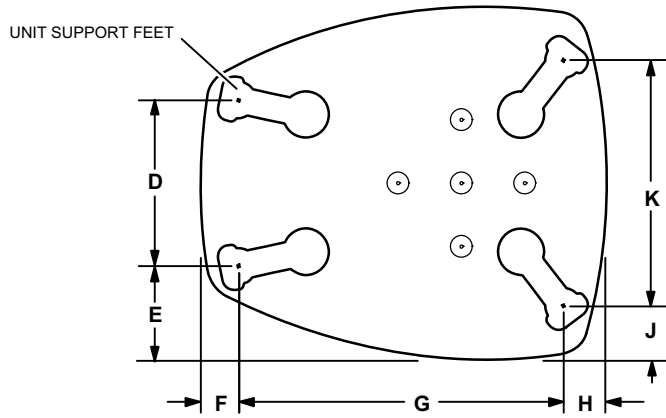
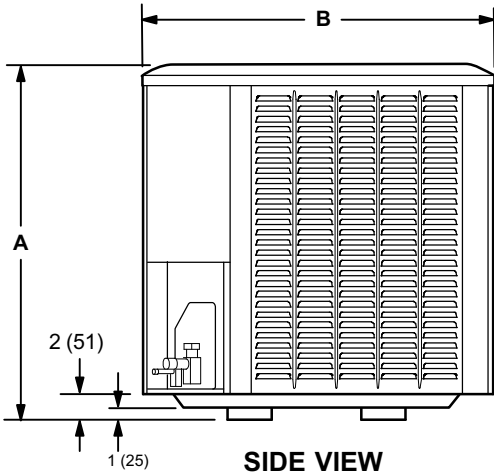
A clearance of 24 in. must be maintained between two units.

48 in. clearance required on top of unit.

FIGURE 1



UNIT DIMENSIONS - INCHES (MM)



SPB*H4-036 to -060 BASE WITH LEGS

Mode Number	A	B	C	D	E	F	G	H	J	K
SPB036H4	35 (889)	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)
SPB048H4	35 (889)	35-1/2 (902)	39-1/2 (1003)							
SPB060H4	45 (1143)	35-1/2 (902)	39-1/2 (1003)							

**STEP 1 -- SETTING THE UNIT (Continued)
-- Unit Placement**

NOTICE !

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to degrade. Failure to follow this notice could result in damage to roof surface.

⚠ WARNING

To prevent personal injury, as well as damage to panels, unit or structure, observe the following:

While installing or servicing this unit, carefully stow all removed panels so that the panels will not cause injury to personnel, objects or nearby structures. Also, take care to store panels where they will not be subject to damage (e.g., being bent or scratched).

While handling or stowing the panels, consider any weather conditions (especially wind) that may cause panels to be blown around and damaged.

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment.

IMPORTANT !

Exhaust vents from dryers, water heaters and furnaces should be directed away from the outdoor unit. Prolonged exposure to exhaust gases and the chemicals contained within them may cause condensation to form on the steel cabinet and other metal components of the outdoor unit. This will diminish unit performance and longevity.

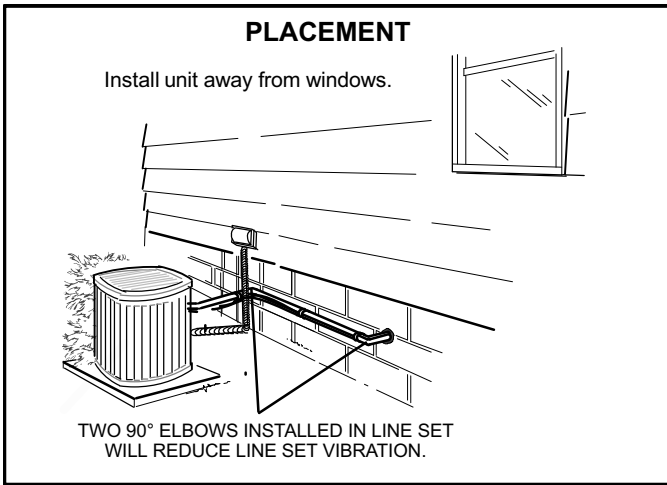


FIGURE 2

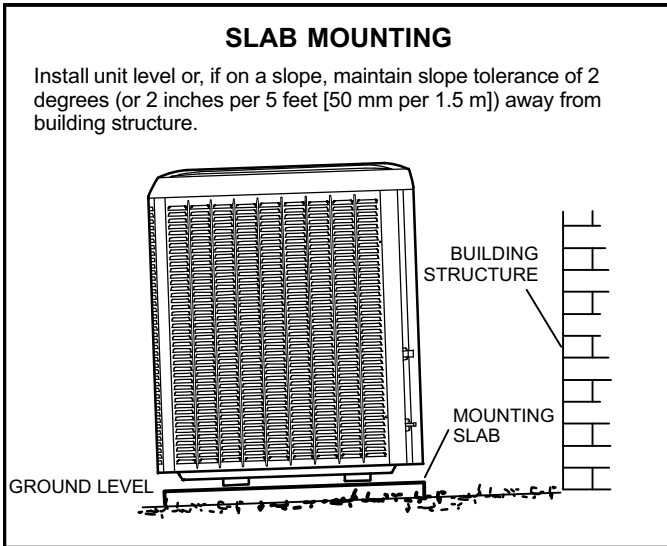


FIGURE 3

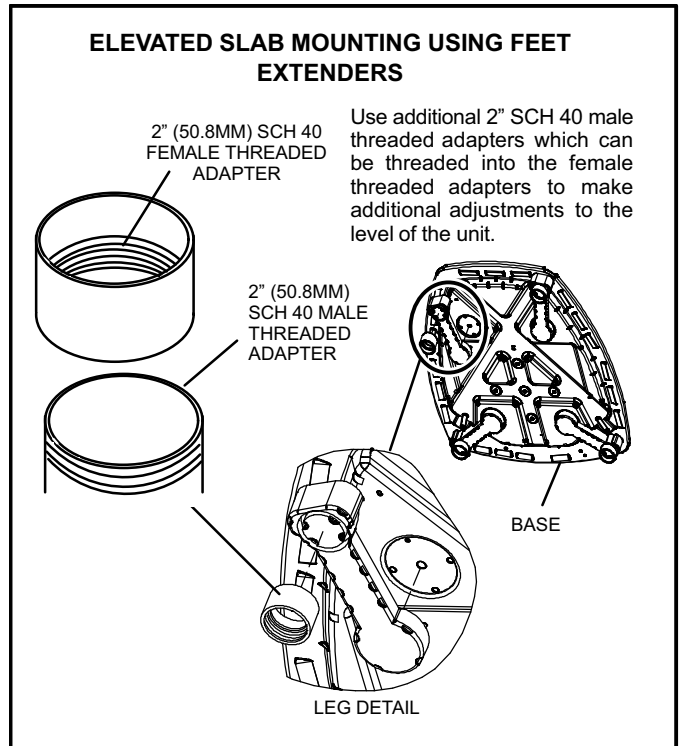
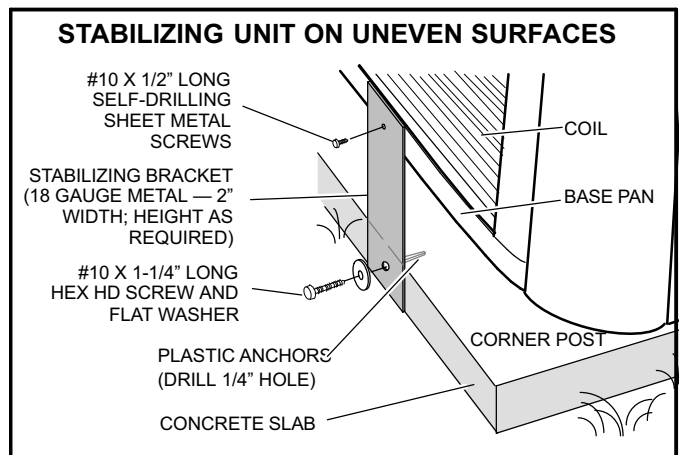


FIGURE 4



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 any unit installed on unstable and uneven surfaces.

FIGURE 5

**STEP 2 — REFRIGERANT PIPING —
Flushing Existing Line Set & Indoor Coil**

Flush the existing line set per the following instructions. For more information, refer to the Installation and Service Procedures manual available on DaveNet. **CAUTION -DO NOT** attempt to flush and re-use existing line sets or indoor coil when the system contains contaminants (i.e., compressor burn out).

NOTE - When installing refrigerant lines longer than 50 feet, refer to the Refrigerant Piping Design and Fabrication Guidelines manual available on DaveNet (Corp. 9351-L9), or contact the Technical Support Department Product Application group for assistance.

NOTE - For new or replacement line set installation, refer to Service and Application Note - Corp. 9112-L4 (C-91-4).

**TABLE 1
REFRIGERANT LINE SET — INCHES (MM)**

Model	Field Connections		Recommended Line Set		
	Liquid Line	Suction Line	Liquid Line	Suction Line	L15 Line Set
-036	3/8" (10 mm)	7/8" (22 mm)	3/8" (10 mm)	7/8" (22 mm)	L15-65 15 ft. - 50 ft. (4.6 m - 15 m)
-048			3/8" (10 mm)	1-1/8" (29 mm)	

NOTE - Some applications may require a field-provided 7/8" to 1-1/8" adapter.

IMPORTANT !

If this unit is being matched with an approved line set or indoor unit coil that was previously charged with mineral oil, or if it is being matched with a coil which was manufactured before January of 1999, the coil and line set must be flushed prior to installation. Take care to empty all existing traps. Polyol ester (POE) oils are used in Lennox units charged with HFC-410A refrigerant. Residual mineral oil can act as an insulator, preventing proper heat transfer. It can also clog the expansion device and reduce system performance and capacity.

Failure to properly flush the system per this instruction and the detailed Installation and Service Procedures manual will void the warranty.

! WARNING



When using a high pressure gas such as nitrogen to pressurize a refrigeration or air conditioning system, use a regulator that can control the pressure down to 1 or 2 psig (6.9 to 13.8 kPa).

! WARNING

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

! WARNING

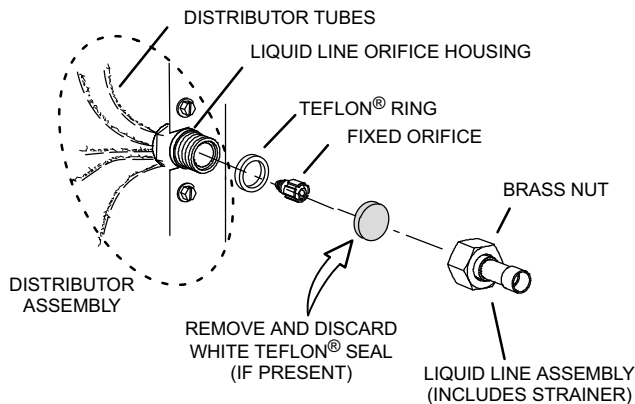
Polyol ester (POE) oils used with HFC-410A refrigerant absorb moisture very quickly. It is very important that the refrigerant system be kept closed as much as possible. **DO NOT** remove line set caps or service valve stub caps until you are ready to make connections.

IMPORTANT !

Some scroll compressors have an internal vacuum protector that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. Protector will reset when low pressure in system is raised above 40 psig. **DO NOT REPLACE COMPRESSOR.**

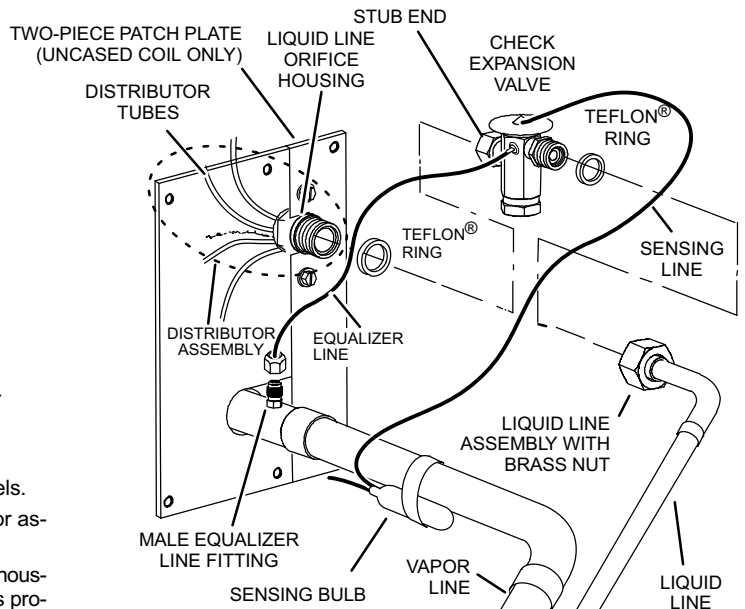
STEP 2 -- REFRIGERANT PIPING -- Removing Existing Indoor Metering Device

1A TYPICAL EXISTING FIXED ORIFICE REMOVAL PROCEDURE (UNCASED COIL SHOWN)



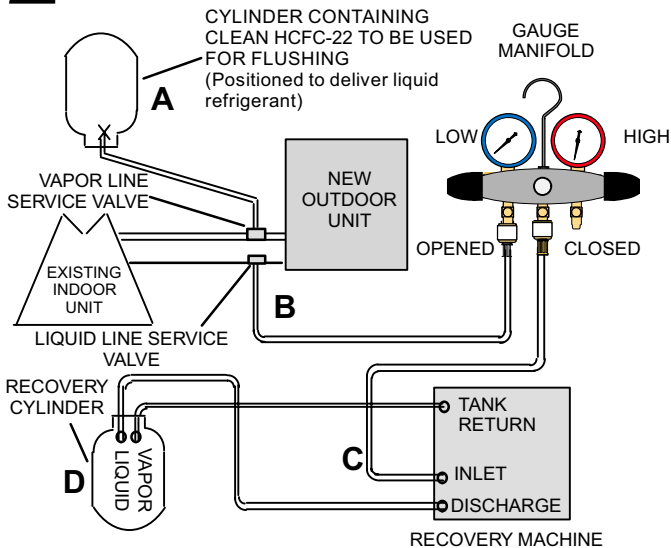
- On fully cased coils, remove the coil access and plumbing panels.
- Remove any shipping clamps from the liquid line and distributor assembly.
- Using two wrenches, disconnect liquid line from liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
- Remove and discard fixed orifice, valve stem assembly (if present) and Teflon® washer as illustrated above.
- Use a field-provided fitting to temporarily reconnect the liquid line to the indoor unit's liquid line orifice housing.

OR 1B TYPICAL EXISTING EXPANSION VALVE REMOVAL PROCEDURE (UNCASED COIL SHOWN)



- On fully cased coils, remove the coil access and plumbing panels.
- Remove any shipping clamps from the liquid line and distributor assembly.
- Disconnect the equalizer line from the check expansion valve equalizer line fitting on the vapor line.
- Remove the vapor line sensing bulb.
- Disconnect the liquid line from the check expansion valve at the liquid line assembly.
- Disconnect the check expansion valve from the liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
- Remove and discard check expansion valve and the two Teflon® rings.
- Use a field-provided fitting to temporarily reconnect the liquid line to the indoor unit's liquid line orifice housing.

2 CONNECT GAUGES AND EQUIPMENT FOR FLUSHING PROCEDURE



- HCFC-22 cylinder with clean refrigerant (positioned to deliver liquid refrigerant) to the vapor service valve.
- HCFC-22 gauge set (low side) to the liquid line valve.
- HCFC-22 gauge set center port to inlet on the recovery machine with an empty recovery tank connected to the gauge set.
- Connect recovery tank to recovery machine per machine instructions.

3 FLUSHING LINE SET

The line set and indoor unit coil must be flushed with at least the same amount of clean refrigerant that previously charged the system. Check the charge in the flushing cylinder before proceeding.

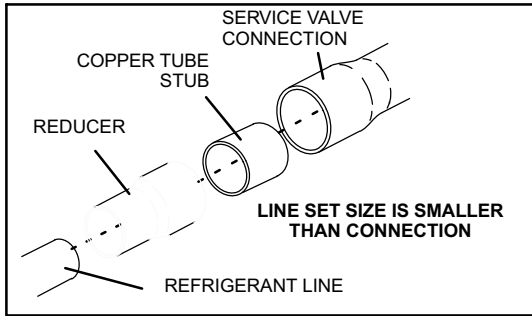
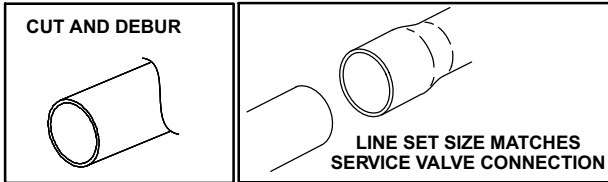
- Set the recovery machine for liquid recovery and start the recovery machine. Open the gauge set valves to allow the recovery machine to pull a vacuum on the existing system line set and indoor unit coil.
- Position the cylinder of clean HCFC-22 for delivery of liquid refrigerant and open its valve to allow liquid refrigerant to flow into the system through the vapor line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor unit coil before it enters the recovery machine.
- After all of the liquid refrigerant has been recovered, switch the recovery machine to vapor recovery so that all of the HCFC-22 vapor is recovered. Allow the recovery machine to pull the system down to 0.
- Close the valve on the inverted HCFC-22 drum and the gauge set valves. Pump the remaining refrigerant out of the recovery machine and turn the machine off.

FIGURE 6

STEP 2 -- REFRIGERANT PIPING -- Brazing Procedures

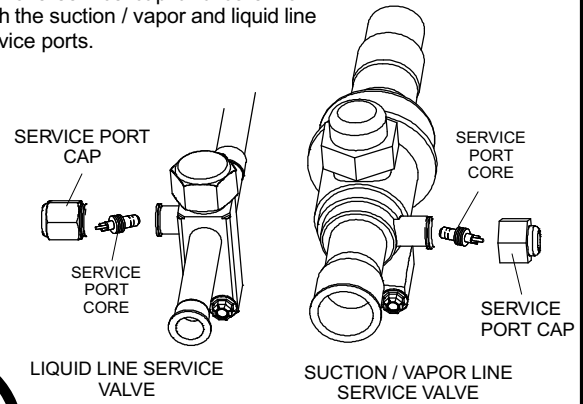
1 CUT AND DEBUR

Cut ends of the refrigerant lines square (free from nicks or dents) and debur the ends. The pipe must remain round. Do not crimp end of the line.



2 CAP AND CORE REMOVAL

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



DO NOT CRIMP SERVICE VALVE CONNECTOR WHEN PIPE IS SMALLER THAN CONNECTION

3 ATTACH THE MANIFOLD GAUGE SET FOR BRAZING LIQUID AND SUCTION / VAPOR LINE SERVICE VALVES

Flow regulated nitrogen (at 1 to 2 psig) through the low-side refrigeration gauge set into the liquid line service port valve, and out of the suction / vapor line service port valve.

- Connect gauge set low pressure side to liquid line service valve (service port).
- Connect gauge set center port to bottle of nitrogen with regulator.
- Remove core from valve in suction / vapor line service port to allow nitrogen to escape.

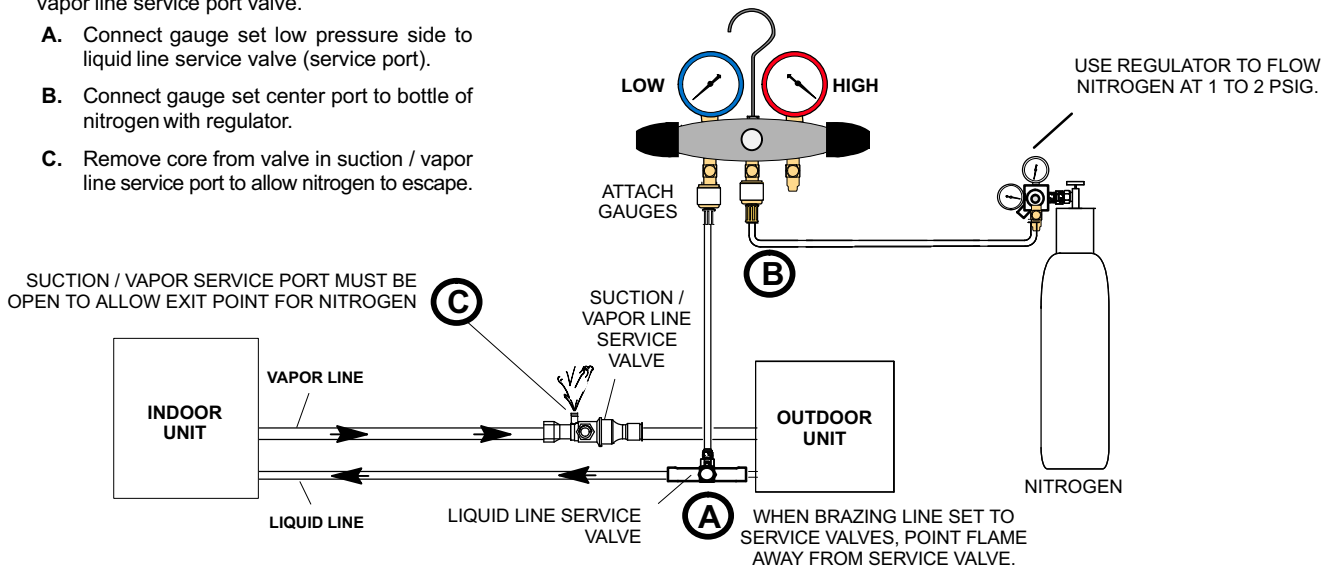


FIGURE 7

⚠ CAUTION

Brazing alloys and flux contain materials which are hazardous to your health. Avoid breathing vapors or fumes from brazing operations. Perform operations only in well-ventilated areas. Wear gloves and protective goggles or face shield to protect against burns. Wash hands with soap and water after handling brazing alloys and flux.

⚠ WARNING



Danger of fire. Bleeding the refrigerant charge from only the high side may result in pressurization of the low side shell and suction tubing. Application of a brazing torch to a pressurized system may result in ignition of the refrigerant and oil mixture. Check the high and low pressures before applying heat.

4 WRAP SERVICE VALVES

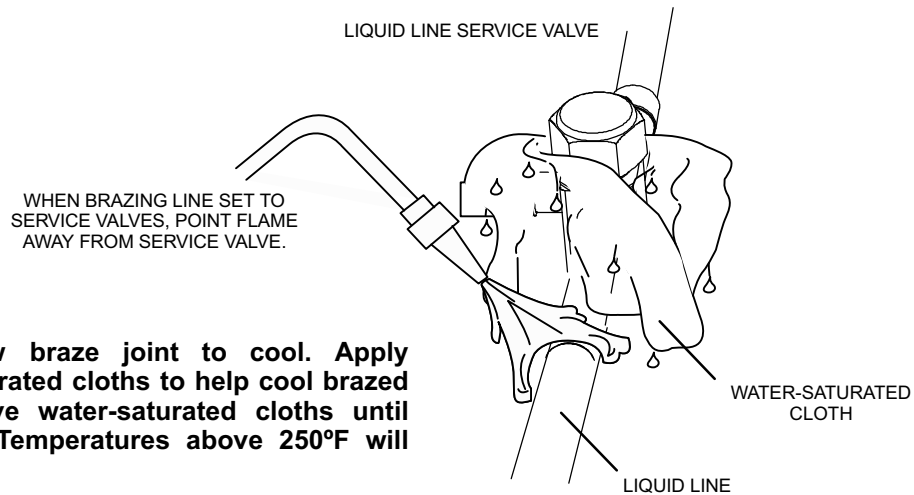
To help protect service valve seals during brazing, wrap water-saturated cloths around service valve bodies and copper tube stubs. Use additional water-saturated cloths underneath the valve body to protect the base paint.

5 FLOW NITROGEN

Flow regulated nitrogen (at 1 to 2 psig) through the refrigeration gauge set into the valve stem port connection on the liquid service valve and out of the suction / vapor valve stem port. See steps **3A**, **3B** and **3C** on manifold gauge set connections.

6 BRAZE LINE SET

Wrap both service valves with water-saturated cloths as illustrated here and as mentioned in step 4, before brazing to line set. Cloths must remain water-saturated throughout the brazing and cool-down process.

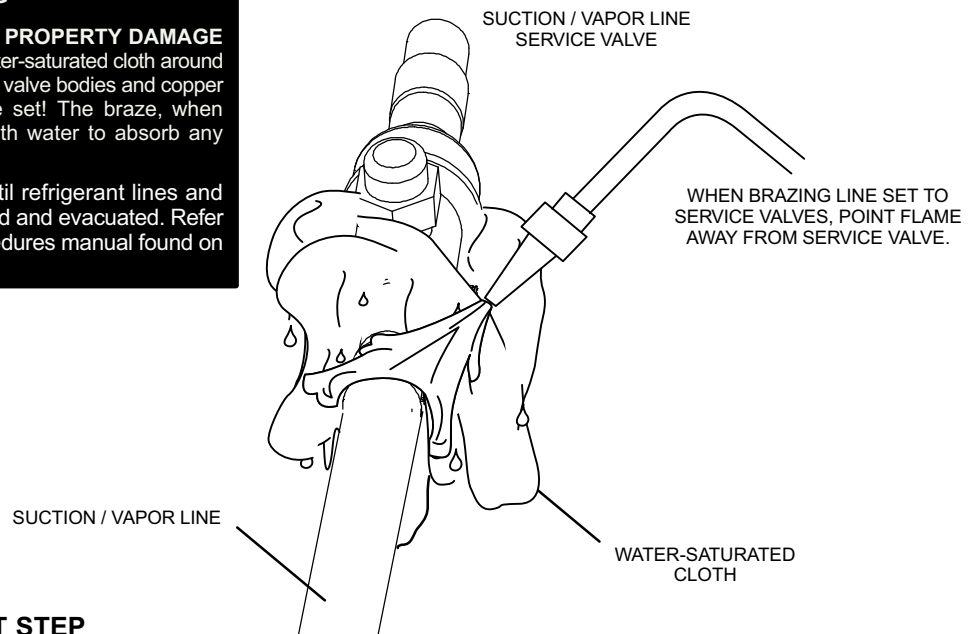


IMPORTANT — Allow braze joint to cool. Apply additional water-saturated cloths to help cool brazed joint. Do not remove water-saturated cloths until piping has cooled. Temperatures above 250°F will damage valve seals.

WARNING

FIRE, PERSONAL INJURY, OR PROPERTY DAMAGE may result if you do not wrap a water-saturated cloth around both liquid and suction line service valve bodies and copper tube stub while brazing the line set! The braze, when complete, must be quenched with water to absorb any residual heat.

Do not open service valves until refrigerant lines and indoor coil have been leak-tested and evacuated. Refer to Installation and Service Procedures manual found on DAVENET.



7 PREPARATION FOR NEXT STEP

After all connections have been brazed, disconnect manifold gauge set from service ports. Apply additional water-saturated cloths to both services valves to cool piping. Once piping is cool, remove all water-saturated cloths.

FIGURE 8 (BRAZING CONTINUED)

STEP 3 -- INSTALLING INDOOR EXPANSION VALVE

This outdoor unit is designed for use in systems that include an check/expansion valve metering device. See the *SPB*H4 Product Specifications bulletin (EHB)* for approved check/expansion valve kit match-ups and application information. The check/expansion valve can be installed internal or external to the indoor coil. In applications where an uncased coil is being installed in a field-provided plenum, install the check/expansion valve in a manner that will provide access for future field service of the check/expansion valve. Refer to below illustration for reference during installation of check/expansion valve.

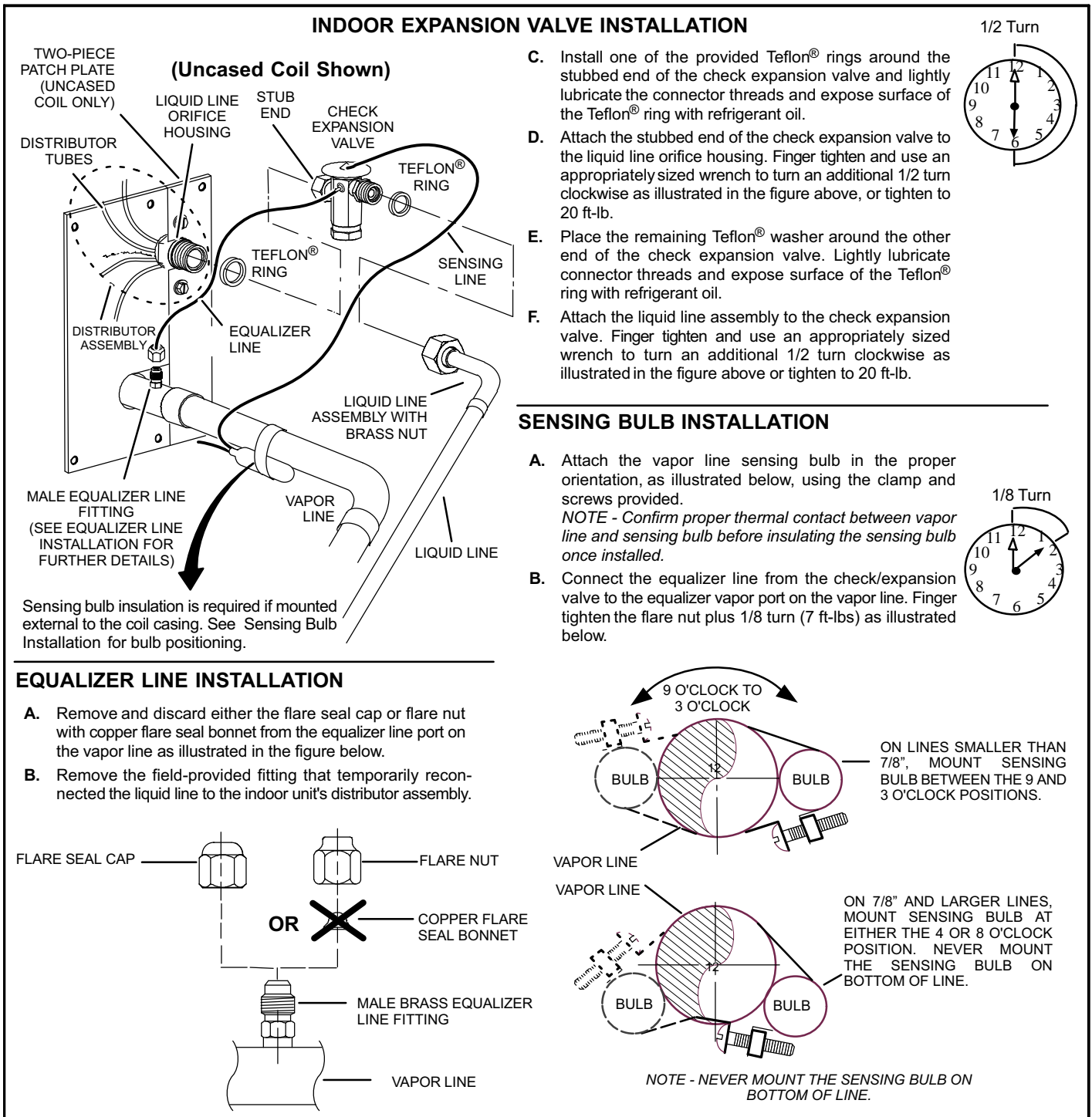
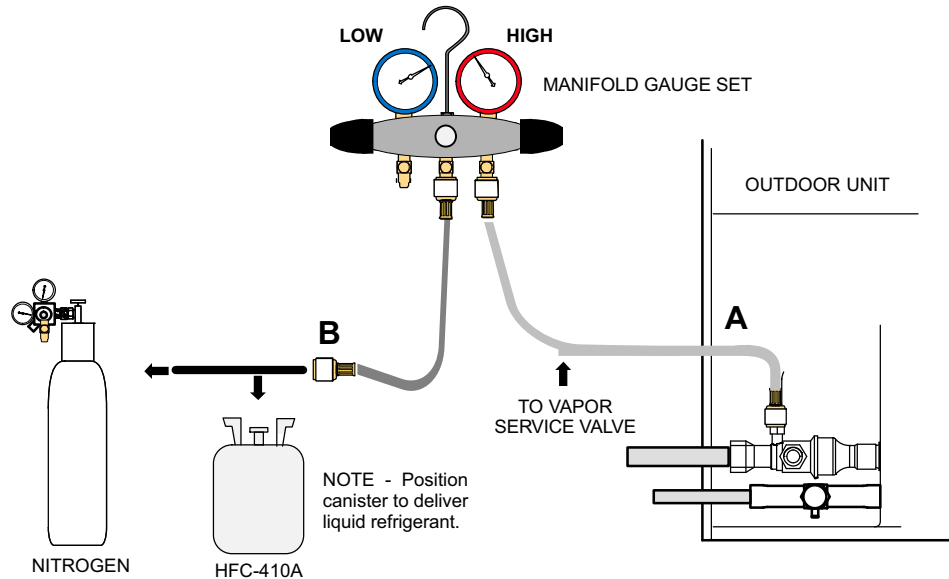


FIGURE 9

STEP 4 -- LEAK TEST AND EVACUATION



1

CONNECT GAUGE SET

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

B. With both manifold valves closed, connect the cylinder of HFC-410A refrigerant to the center port of the manifold gauge set.

NOTE - Later in the procedure, the HFC-410A container will be replaced by the nitrogen container.

2

TEST FOR LEAKS

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

A. With both manifold valves closed, connect the cylinder of HFC-410A refrigerant to the center port of the manifold gauge set. Open the valve on the HFC-410A cylinder (vapor only).

B. Open the high pressure side of the manifold to allow HFC-410A into the line set and indoor unit. Weigh in a trace amount of HFC-410A. [A trace amount is a maximum of two ounces (57 g) refrigerant or three pounds (31 kPa) pressure.] Close the valve on the HFC-410A cylinder and the valve on the high pressure side of the manifold gauge set. Disconnect the HFC-410A cylinder.

C. Connect a cylinder of nitrogen with a pressure regulating valve to the center port of the manifold gauge set.

D. Adjust nitrogen pressure to 150 psig (1034 kPa). Open the valve on the high side of the manifold gauge set in order to pressurize the line set and the indoor unit.

E. After a few minutes, open one of the service valve ports and verify that the refrigerant added to the system earlier is measurable with a leak detector.

F. After leak testing, disconnect gauges from service ports.

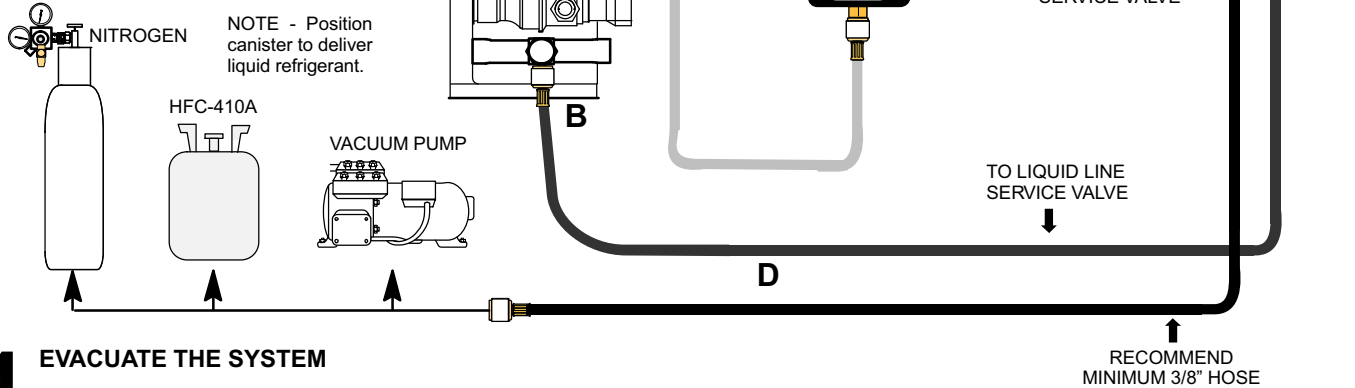
FIGURE 10

STEP 4 -- LEAK TEST AND EVACUATION (Continued)

3 CONNECT GAUGE SET

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

- Connect low side of manifold gauge set with 1/4 SAE in-line tee to vapor line service valve
- Connect high side of manifold gauge set to liquid line service valve
- Connect available micron gauge connector on the 1/4 SAE in-line tee.
- Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set. The center port line will be used later for both the HFC-410A and nitrogen containers.



4 EVACUATE THE SYSTEM

- Open both manifold valves and start the vacuum pump.
- Evacuate the line set and indoor unit to an **absolute pressure** of 23,000 microns (29.01 inches of mercury).
NOTE - During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once. 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 above absolute zero within a given volume or system. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.
- When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), perform the following:
 - Close manifold gauge valves.
 - Close valve on vacuum pump.
 - Turn off vacuum pump.
 - Disconnect manifold gauge center port hose from vacuum pump.
 - Attach manifold center port hose to a nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose.
 - Open manifold gauge valves to break the vacuum in the line set and indoor unit.
 - Close manifold gauge valves.
- 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.
- 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.
- When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump and connect it to a cylinder of HFC-410A positioned to deliver liquid refrigerant. Open the manifold gauge valve 1 to 2 psig in order to release the vacuum in the line set and indoor unit.
- Perform the following:
 - Close manifold gauge valves.
 - Shut off HFC-410A cylinder.
 - Reinstall service valve cores by removing manifold hose from service valve. Quickly install cores with core tool while maintaining a positive system pressure.
 - Replace stem caps and finger tighten them, then tighten an additional one-sixth (1/6) of a turn as illustrated.

WARNING !

Possible equipment damage.

Avoid deep vacuum operation. Do not use compressors to evacuate a system. Extremely low vacuum can cause internal arcing and compressor failure. Damage caused by deep vacuum operation will void warranty.

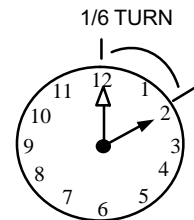


FIGURE 11

STEP 5 -- ELECTRICAL -- Circuit Sizing and Wire Routing

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

24VAC TRANSFORMER

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

⚠ 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.

IMPORTANT !

If unit is equipped with a crankcase heater, it should be energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

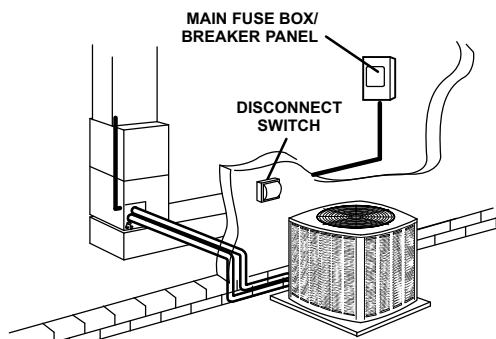
⚠ CAUTION

ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures

Electrostatic discharge can affect electronic components. Take care during unit installation and service to protect the unit's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the unit, the control and the technician at the same electrostatic potential. Touch hand and all tools on an unpainted unit surface before performing any service procedure to neutralize electrostatic charge.

1 SIZE CIRCUIT AND INSTALL DISCONNECT SWITCH

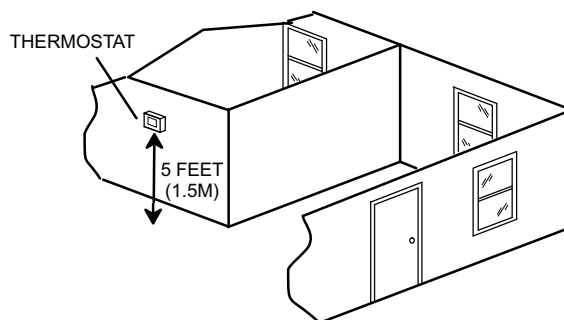
Refer to the unit nameplate for minimum circuit ampacity, and maximum fuse or circuit breaker (HACR per NEC). Install power wiring and properly sized disconnect switch.



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

2 INSTALL THERMOSTAT

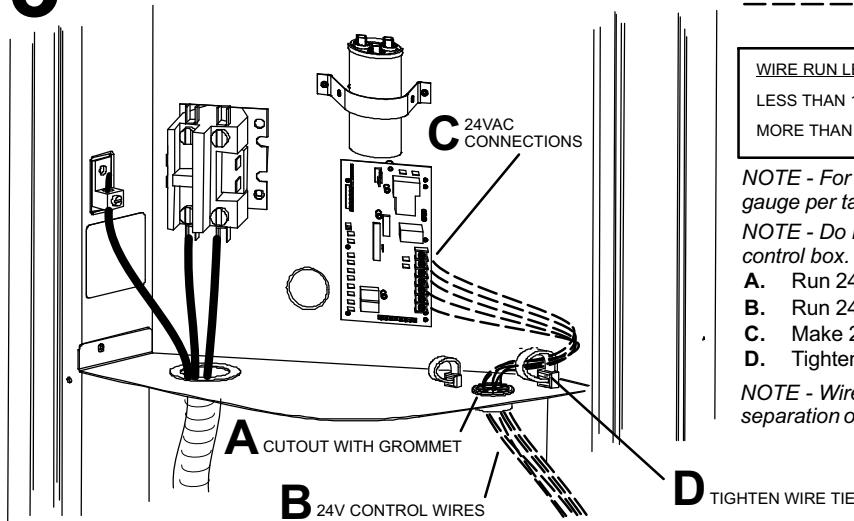
Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight or drafts.



NOTE - 24VAC, Class II circuit connections are made in the control panel.

FIGURE 12

3 LOW VOLTAGE CONNECTIONS



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

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

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

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

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

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

Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated. See figures 15 and 16 for typical field connections when connecting unit to either a CBX32MV or CBX40UHV in non-communicating mode. For connections to other Lennox air handlers or furnaces, see the ComfortSense® 7000 installation instruction for further wiring diagrams.

FIGURE 13

4 HIGH VOLTAGE POWER SUPPLY CONNECTIONS

NOTE - Any excess high voltage field wiring should be trimmed and secured away from any low voltage field wiring.

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

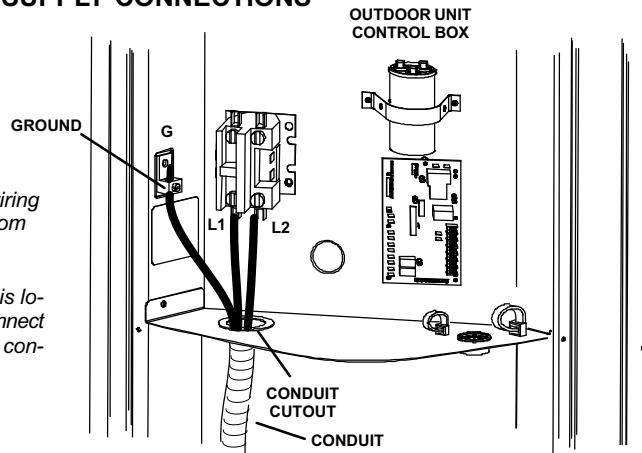


FIGURE 14

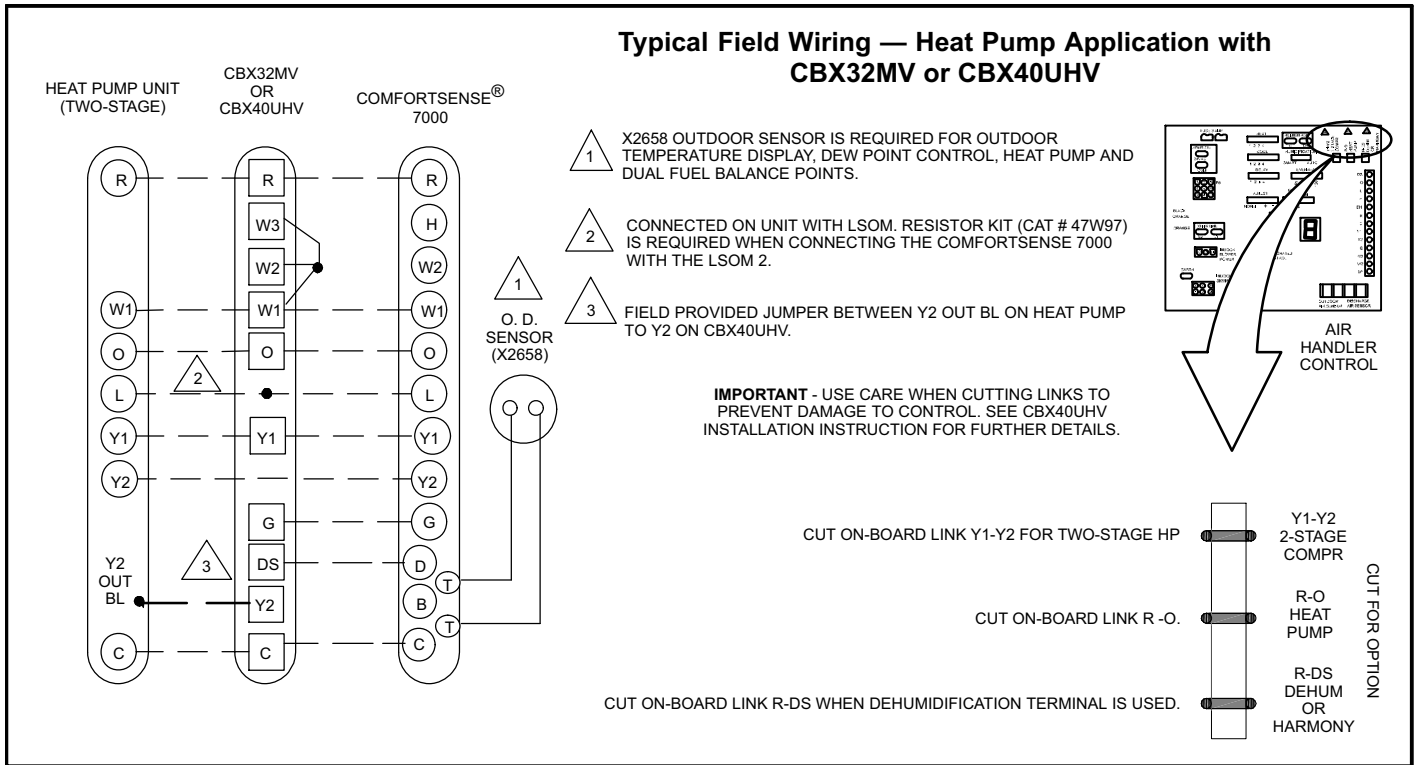


FIGURE 15

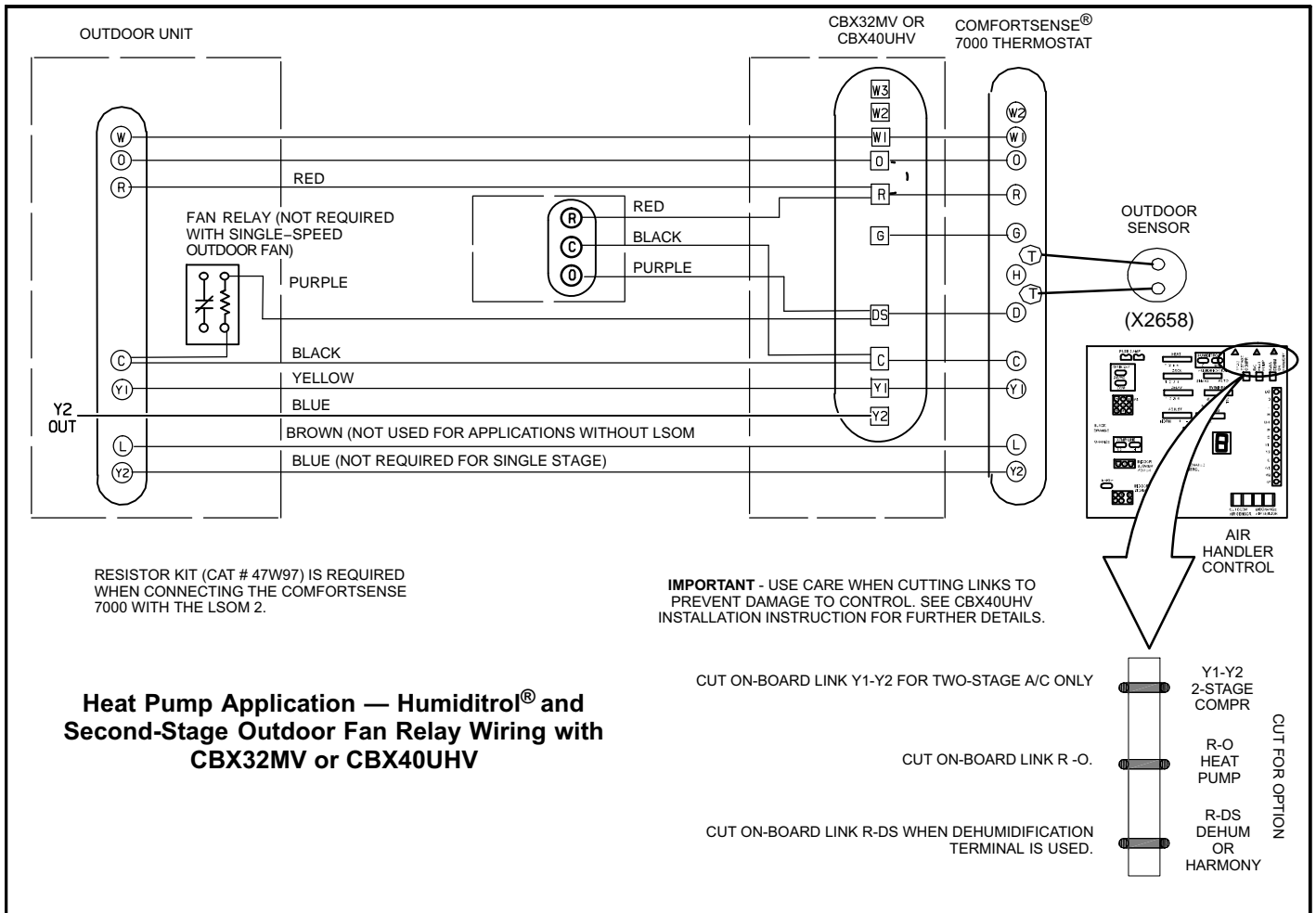


FIGURE 16

Charging

The SPB*H4 unit is factory-charged with enough HFC-410A refrigerant to accommodate a 15-foot length of refrigerant piping. Charge should be checked and adjusted using the tables provided on the charging procedure sticker on the unit access panel. Detailed information is given in the SPB*H4 Installation and Service Procedures manual, which is available on Dave-Net.

Adding refrigerant for long line sets


Use the charging formula listed in figure 17 to calculate liquid line charge required for long line sets.

WEIGH-IN

CHARGING METHOD FOR LONG LINE SETS
64°F (17.7°C) and Below

Amount specified on nameplate Adjust amount for variation in line set length and liquid line diameter using table below. Total charge

_____ ± _____ = _____



Liquid Line Set Diameter	HFC-410A (ounces per foot)
5/16"	0.40
3/8"	0.60
1/2"	1.00

NOTE - Insulate liquid line when it is routed through areas where the surrounding ambient temperature could become higher than the temperature of the liquid line or when pressure drop is equal to or greater than 20 psig.

NOTE - The nameplate shown is for illustration purposes only. Go to actual nameplate on outdoor unit for charge information.

Charging Formula for Liquid Line Charge Adjustments
 [(Line set oz./ft. x total length) - (factory charge for line set)] = charge adjustment

Example: Units are factory-charged for 15 feet (4.6 meters) of 3/8" line set. Factory charge for 3/8" is 0.60 oz/ft x 15 = 9.0 ounces.

FIGURE 17. Using HFC-410A Weigh-In Charging Method

System Configuration

This section addresses:

- Unit components (sensors, temperature switch, pressure switches and demand defrost control)
- Second-stage operation

UNIT COMPONENTS

Demand Defrost Control (A108)

The demand defrost control measures differential temper-

atures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The control *self-calibrates* when the defrost system starts and after each system defrost cycle. The demand defrost control components are shown in figure 18.

- Demand defrost control connections, jumpers and LED locations are shown in figure 18.
- Demand defrost control connections, jumpers and LED descriptions are listed on table 2.
- Demand defrost control status, fault and lockout LEDs are listed in table 3.

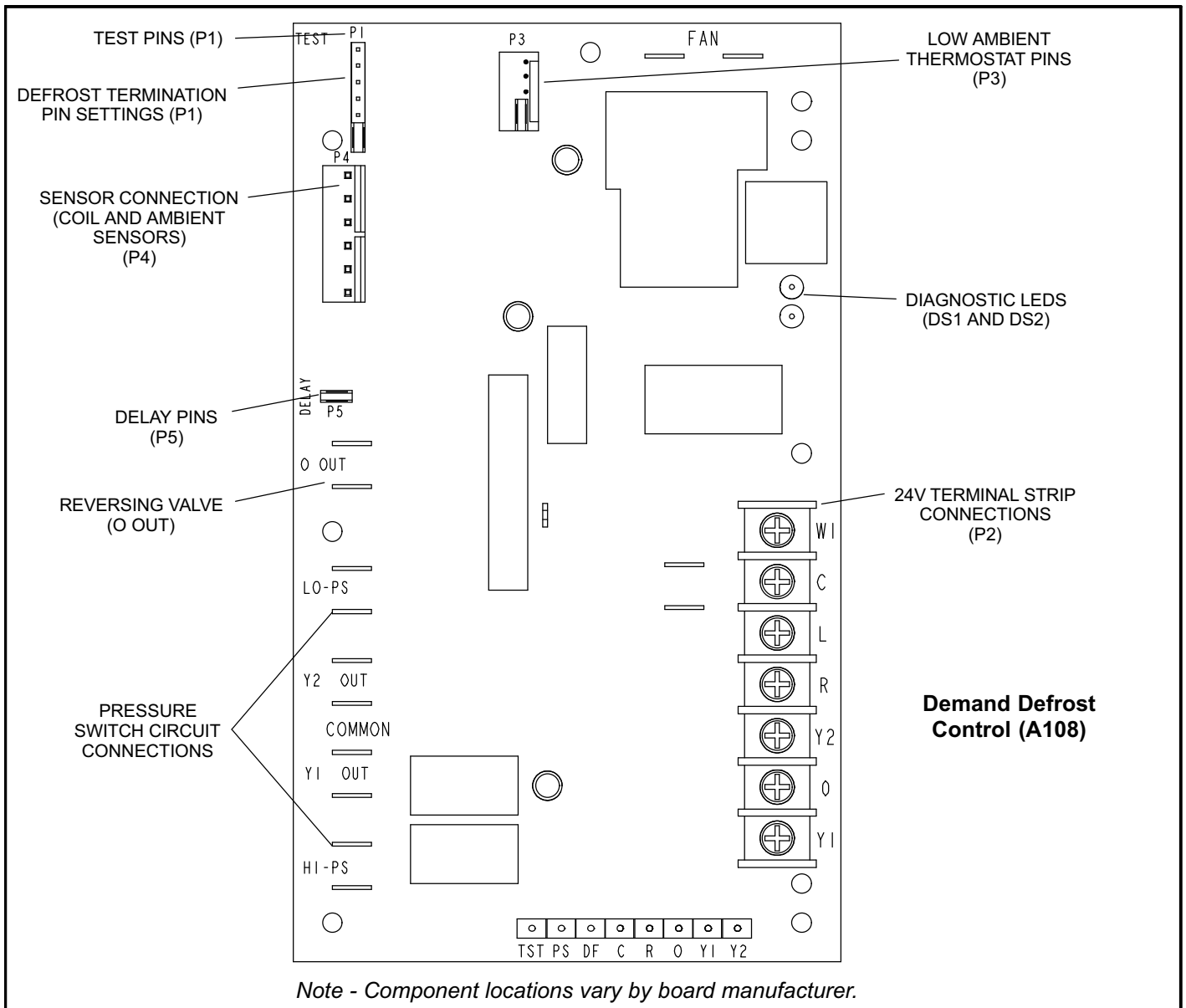


FIGURE 18

**TABLE 2
DEMAND DEFROST CONTROL (A108) INPUTS, OUTPUTS AND CONFIGURABLE SETTINGS**

Control Locations	Control Label or Description	Purpose	Function
P1	50, 70, 90, 100	Defrost Temperature Termination Shunt (Jumper) Pins	The demand defrost control (illustrated in figure 18) has selections which are: 50, 70, 90, and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory-set at 50°F (10°C). If the temperature shunt is not installed, the default termination temperature is 90°F (32°C).
P2	W1	24VAC Thermostat Input / Output	24VAC input / output from indoor thermostat to indoor unit.
	C	24VAC Common	24VAC common.
	L	Thermostat Service Light	Thermostat service light connection.
	R	24VAC	24VAC.
	Y2	Thermostat Input	Controls the second stage operation of the unit.
	O	Thermostat Input	Reversing valve solenoid.
	Y1	Thermostat Input	Controls the operation of the unit.
P3	55, 50, 45, 40	Low Ambient Thermostat Pins	Provides selection of the Y2 compressor lock-in temperature. Valid options are 40, 45, 50 and 55 degrees Fahrenheit.
P4	DIS-YEL	Coil Sensor	(P4-5) Ground connection for outdoor coil temperature sensor. (P4-6) Connection for outdoor coil temperature sensor.
	AMB-BLACK	Ambient Sensor	(P4-3) Ground connection for outdoor ambient temperature sensor. (P4-4) Connection for outdoor ambient temperature sensor.
	COIL-BROWN	Discharge Sensor	<i>No discharge sensor is used; replaced by 10K resistor.</i>
P5	DELAY	Delay Mode	The demand defrost control has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. When a jumper is installed on the DELAY pins, the compressor will be cycled off for 30 seconds going in and out of the defrost mode. Units are shipped with jumper installed on DELAY pins. <i>NOTE - The 30-second off cycle is NOT functional when TEST pins on P1 are jumpered.</i>
P6	TST, PS DF, C, R, O, Y1, Y2	Factory Test Connectors	No field use.
DS1	RED LED	Diagnostic LED	Demand defrost control LEDs may be OFF, ON, or FLASHING to indicate diagnostic conditions which are described in table 3.
DS2	GREEN LED		
FAN	TWO CONNECTORS	Condenser Fan Operation	These two connections provide power for the condenser fan.
O OUT	O OUT	24 VAC output	24 VAC output connection for reversing valve.
LO-PS	LO-PS	Low-Pressure Switch	When the low pressure switch trips, the demand defrost control will cycle off the compressor, and the strike counter in the demand defrost control will count one strike. The low pressure switch is ignored under the following conditions: <ul style="list-style-type: none"> ● during the defrost cycle and 90 seconds after the termination of defrost ● when the average ambient sensor temperature is below 0°F (-18°C) ● during 90 seconds following the start of the compressor ● during TEST mode.
Y2 OUT	Y2 OUT	24 VAC Output	24 VAC output for second-stage compressor solenoid.
Y1 OUT	Y1 OUT	24 VAC Common Output	24 VAC common output, switched for enabling compressor contactor.
HS-PS	HS-PS	High-Pressure Switch	When the high pressure switch trips, the demand defrost control will cycle off the compressor, and the strike counter in the demand defrost control will count one strike.
L	L	Service Light Output	24VAC service light output.
24V	24V	24 Volt output	24VAC typically used to supply power to the Lennox System Operation Monitor (LSOM). Not used in this system.

Defrost System

This section addresses:

- Emergency Heat
- Defrost System Overview
- Defrost Control Connections, Jumper Settings and Features
- Operational Mode Overview (Calibration, Normal and Defrost)
- Defrost Cycle Actuation

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.

DEFROST SYSTEM OVERVIEW

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

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

DEFROST CONTROL CONNECTIONS, JUMPERS SETTINGS AND FEATURES

Defrost Temperature Termination Jumper Settings (P1)

The demand defrost control selections are: 50, 70, 90 and 100°F (10, 21, 32 and 38°C). The shunt termination pin is factory set at 50°F (10°C). If temperature shunt is not installed, default termination temperature is 90°F (32°C).

Test Pins (P1) Function

Placing the jumper on the field test pins (P1) allows the technician to:

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

Compressor Delay Mode (P5)

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

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

HIGH PRESSURE SWITCH (S4)

This unit is equipped with a high pressure switch which is located on the liquid line. The SPST, normally closed pressure switch opens when liquid line pressure rises above the factory setting of 590 ± 15 psig and automatically re-sets at 418 ± 15 psig.

DEMAND DEFROST CONTROL (A108) DIAGNOSTIC LEDS

The state (Off, On, Flashing) of two LEDs on the demand defrost control (DS1 [Red] and DS2 [Green]) indicate diagnostics conditions that are described in table 3.

TABLE 3
DEMAND DEFROST CONTROL (A108) DIAGNOSTIC LEDS

DS1 and DS2 System Status, Fault and Lockout Codes					
DS2 Green	DS1 Red	Type	Condition/Code	Possible Cause(s)	Solution
OFF	OFF	Status	Power problem	No power (24V) to demand defrost control terminals R and C or demand defrost control failure.	1-Check control transformer power (24V). 2: If power is available to demand defrost control and LED(s) do not light, replace demand defrost control.
Simultaneous SLOW Flash		Status	Normal operation	Unit operating normally or in standby mode.	None required.
Alternating SLOW Flash		Status	5-minute anti-short cycle delay	Initial power up, safety trip, end of room thermostat demand.	None required (jumper TEST pins to override)
Simultaneous FAST Flash		Fault	Ambient Sensor Problem	Sensor being detected open or shorted or out of temperature range. Demand defrost control will revert to time/temperature defrost operation. (System will still heat or cool).	
Alternating FAST Flash		Fault	Coil Sensor Problem	Sensor being detected open or shorted or out of temperature range. Demand defrost control will not perform demand or time/temperature defrost operation. (System will still heat or cool.)	
ON	ON	Fault	Demand Defrost Control Failure	Indicates that demand defrost control has internal component failure. Cycle 24VAC power to demand defrost control. If code does not clear, replace demand defrost control.	
OFF	SLOW Flash	Fault	Low Pressure Fault	<ul style="list-style-type: none"> Restricted air flow over indoor or outdoor coil. Improper refrigerant charge in system. Improper metering device installed or incorrect operation of metering device. Incorrect or improper sensor location or connection to system. 	<ul style="list-style-type: none"> Remove any blockages or restrictions from coils and/or fans. Check indoor and outdoor fan motor for proper current draws. Check system charge using subcooling method. Check system operating pressures and compare to unit subcooling tables in this instruction or located on unit access panel. Make sure all pressure switches and sensors have secure connections to system to prevent refrigerant leaks or errors in pressure and temperature measurements.
OFF	ON	Lockout	Low Pressure Lockout		
SLOW Flash	OFF	Fault	High Pressure Fault		
ON	OFF	Lockout	High Pressure Lockout		
SLOW Flash	ON	Fault	Discharge Line Temperature Fault	This code detects shorted sensor or high discharge temperatures. If the discharge line temperature exceeds a temperature of 285°F (140°C) during compressor operation, the demand defrost control will de-energize the compressor contactor output (and the defrost output if active). The compressor will remain off until the discharge temperature has dropped below 225°F (107°C).	
FAST Flash	ON	Lockout	Discharge Line Temperature Lockout		
OFF	Fast Flash	Fault	Discharge Sensor Fault	The demand defrost control detects open sensor or out of temperature sensor range. This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the demand defrost control will count one fault. After 5 faults, the demand defrost control will lock out.	
Fast Flash	OFF	Lockout	Discharge Sensor Lockout		

(Each fault adds 1 strike to that code's counter; 5 strikes per code = LOCKOUT)

Field Operation Checklist for Two-Stage Modulation Compressors			
Unit Readings	Y1 - First-Stage	Expected results during Y2 demand (Toggle switch On)	Y2 - Second-Stage
Compressor			
Voltage		Same	
Amperage		Higher	
Outdoor Unit Fan Motor			
Amperage		Same or Higher	
Temperature			
Ambient		Same	
Outdoor Coil Discharge Air		Higher	
Compressor Discharge Line		Higher	
Indoor Return Air		Same	
Indoor Coil Discharge Air		Lower	
Pressures			
Suction (Vapor)		Lower	
Liquid		Higher	

Start-Up and Performance Checklist

Customer _____ Address _____

Indoor Unit Model _____ Serial _____

Outdoor Unit Model _____ Serial _____

Notes: _____

START UP CHECKS

Refrigerant Type: _____

Rated Load Amps: _____ Actual Amps _____ Rated Volts _____ Actual Volts _____

Condenser Fan Full Load Amps _____ Actual Amps: _____

COOLING MODE

Suction Pressure: _____ Liquid Pressure: _____

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

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

Subcooling: _____ A — B = SUBCOOLING

Saturated Condensing Temperature (A)
minus Liquid Line Temperature (B)

Approach: _____ A — B = APPROACH

Liquid Line Temperature (A)
minus Outdoor Air Temperature (B)

Indoor Coil Temperature Drop (18 to 22°F) _____ A — B = COIL TEMP DROP

Return Air Temperature (A)
minus Supply Air Temperature (B)

Homeowners Information

CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

Cleaning of the outdoor unit's coil should be performed by a licensed professional service technician (or equivalent). Contact your dealer and set up a schedule (preferably twice a year, but at least once a year) to inspect and service your outdoor unit. The following maintenance may be performed by the homeowner.

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, diminish performance and affect longevity of the unit.

Outdoor Coil

The outdoor unit must be properly maintained to ensure its proper operation.

- Please contact your dealer to schedule proper inspection and maintenance for your equipment.
- Make sure no obstructions restrict airflow to the outdoor unit.
- Grass clippings, leaves, or shrubs crowding the unit can cause the 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.
- Keep snow level below the louvered panels to ensure proper performance.

Routine Maintenance

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

NOTE - The filter and all access panels must be in place any time the unit is in operation. If you are unsure about the filter required for your system, call your Lennox dealer for assistance.

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

3. The indoor evaporator coil is equipped with a drain pan to collect condensate formed as your system removes humidity from the inside air. Have your dealer show you the location of the drain line and how to check for obstructions. (Also check the auxiliary drain for obstructions if one is installed.)

Thermostat Operation

See the thermostat homeowner manual for instructions on how to operate your thermostat.

Heat Pump Operation

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

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

Extended Power Outage

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

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

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

Preservice Check

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

- Verify room thermostat settings are correct.
- Verify that all electrical disconnect switches are ON.
- Check for any blown fuses or tripped circuit breakers.
- Verify unit access panels are in place.
- Verify air filter is clean.
- If service is needed, locate and write down the unit model number and have it handy before calling.