

EL22XPV (HFC-410A) SERIES OUTDOOR UNITS



⚠ 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 HVAC installer or equivalent, service agency, or the gas supplier.

⚠ IMPORTANT

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

⚠ IMPORTANT

This unit must be matched with an indoor coil as specified in Lennox Product Specification bulletin. Coils previously charged with HCFC-22 must be flushed.

⚠ CAUTION

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

⚠ WARNING

To prevent serious injury or death:

1. Lock-out/tag-out before performing maintenance.
2. If system power is required (e.g., smoke detector maintenance), disable power to blower, remove fan belt where applicable, and ensure all controllers and thermostats are set to the "OFF" position before performing maintenance.
3. Always keep hands, hair, clothing, jewelry, tools, etc. away from moving parts.

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General Information

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

The EL22XPV is a high-efficiency split system air conditioner **with all-aluminum coil**, designed for use with HFC-410A refrigerant only.

The EL22XPV-024 and EL22XPV-036 models feature a variable capacity rotary compressor. The EL22XPV-048 and EL22XPV-060 models feature a variable capacity scroll compressor.

WARNING



Electric Shock Hazard. Can cause injury or death. Unit must be properly 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.

This unit must be installed with an approved indoor air handler or coil. See the Lennox EL22XPV 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.

This outdoor unit is designed for use in systems that use the following refrigerant metering device:

- Check thermal expansion valve (CTXV)

IMPORTANT: Special procedures are required for cleaning the all-aluminum coil in this unit.

WARNING

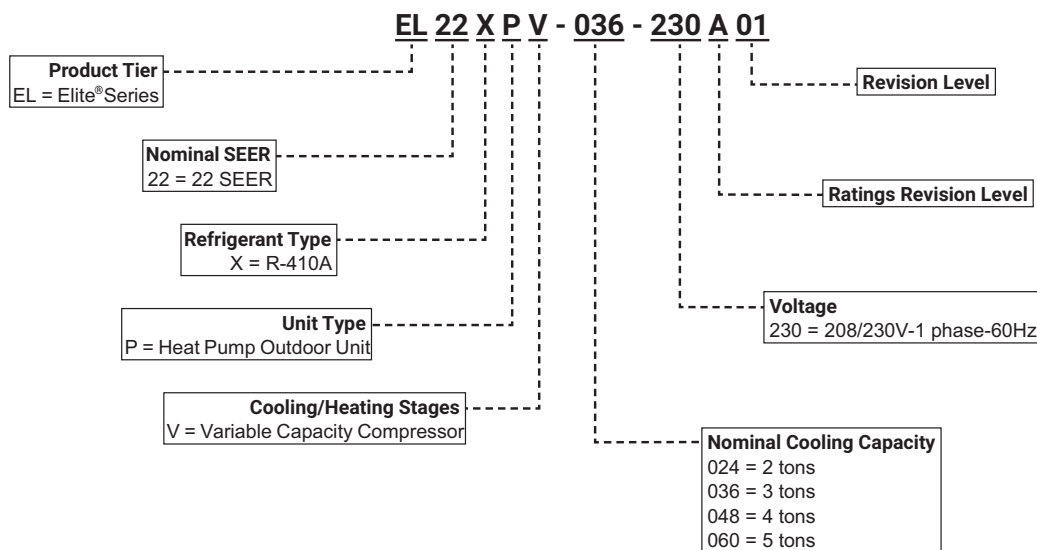


Electrical Hazard
High Voltage
Wait 7 Minutes

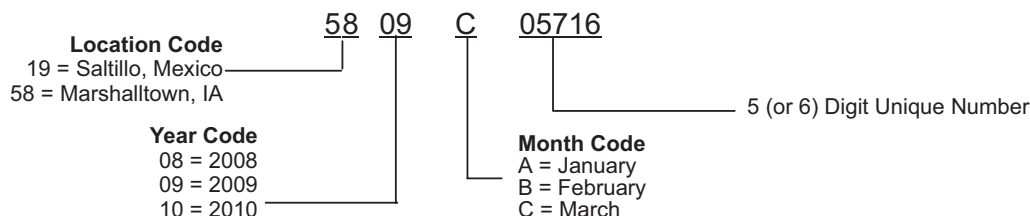
Electrical components may hold charge. Do not remove this panel or service this area for 5 minutes after the power has been removed.

Model Number Identification

MODEL NUMBER IDENTIFICATION



Typical Serial Number Identification



Specifications

General Data			Model No.	EL22XPV-024	EL22XPV-036	EL22XPV-048	EL22XPV-060
Nominal Tonnage				2	3	4	5
Connections (sweat)	Liquid line (o.d.) - in.			3/8	3/8	3/8	3/8
	Vapor line (o.d.) - in.			3/4	7/8	7/8	1-1/8
Refrigerant			¹ R-410A charge furnished	12 lbs. 5 oz.	12 lbs. 7 oz.	13 lbs. 7 oz.	13 lbs. 2 oz.
Outdoor Coil	Net face area - sq. ft.	Outer coil		21.00	21.00	27.22	27.22
		Inner coil		20.27	20.27	26.36	26.36
		Tube diameter - in.		5/16	5/16	5/16	5/16
		No. of rows		2	2	2	2
		Fins per inch		22	22	22	22
Outdoor Fan	Diameter - in.			26	26	26	26
	No. of blades			3	3	3	3
	Motor hp			1/3	1/3	1/3	1/3
	Cfm			2580	3650	3860	4550
	Rpm			720	765	805	970
	Watts			69	155	169	263
	Shipping Data - lbs. 1 package				250	250	358

Electrical Data

Line voltage data - 60 Hz			208/230V-1ph	208/230V-1ph	208/230V-1ph	208/230V-1ph
² Maximum Overcurrent Protection (MOCP) amps			20	30	40	50
³ Minimum Circuit Ampacity (MCA)			13.4	19.9	24.6	33.5
Compressor	Input amps		8.6	13.9	17.6	24.7
Outdoor Fan Motor	Full load amps		2.6	2.6	2.6	2.6
CONTROLS						
S40 Smart Wi-Fi Thermostat		22V24	•	•	•	•
E30 Smart Wi-Fi Thermostat		20A65	•	•	•	•
⁴ Discharge Air Temperature Sensor		88K38	•	•	•	•
OPTIONAL ACCESSORIES - ORDER SEPARATELY						
Freezestat	3/8 in. tubing	93G35	•	•	•	•
Indoor Blower Off Delay Relay		58M81	•	•	•	•
Refrigerant Line Sets (Liq. x Suc. OD x Insulation Thickness - Length)	3/8 x 3/4 x 3/8 - 20 ft.	89J56	•			
	3/8 x 3/4 x 3/8 - 30 ft.	89J57				
	3/8 x 3/4 x 3/8 - 40 ft.	89J58				
	3/8 x 3/4 x 3/8 - 50 ft.	89J59				
	3/8 x 7/8 x 3/8 - 30 ft.	89J60				
	3/8 x 7/8 x 3/8 - 40 ft.	89J61	•	•		
	3/8 x 7/8 x 3/8 - 50 ft.	89J62				
		3/8 x 1-1/8 x 3/8 - 30 ft.	X0570			
	3/8 x 1-1/8 x 3/8 - 50 ft.	73P91				
Snow Guard	39 1/2 x 35 5/8 in.	Y1033	•	•	•	•

NOTE - Extremes of operating range are plus 10% and minus 5% of line voltage.

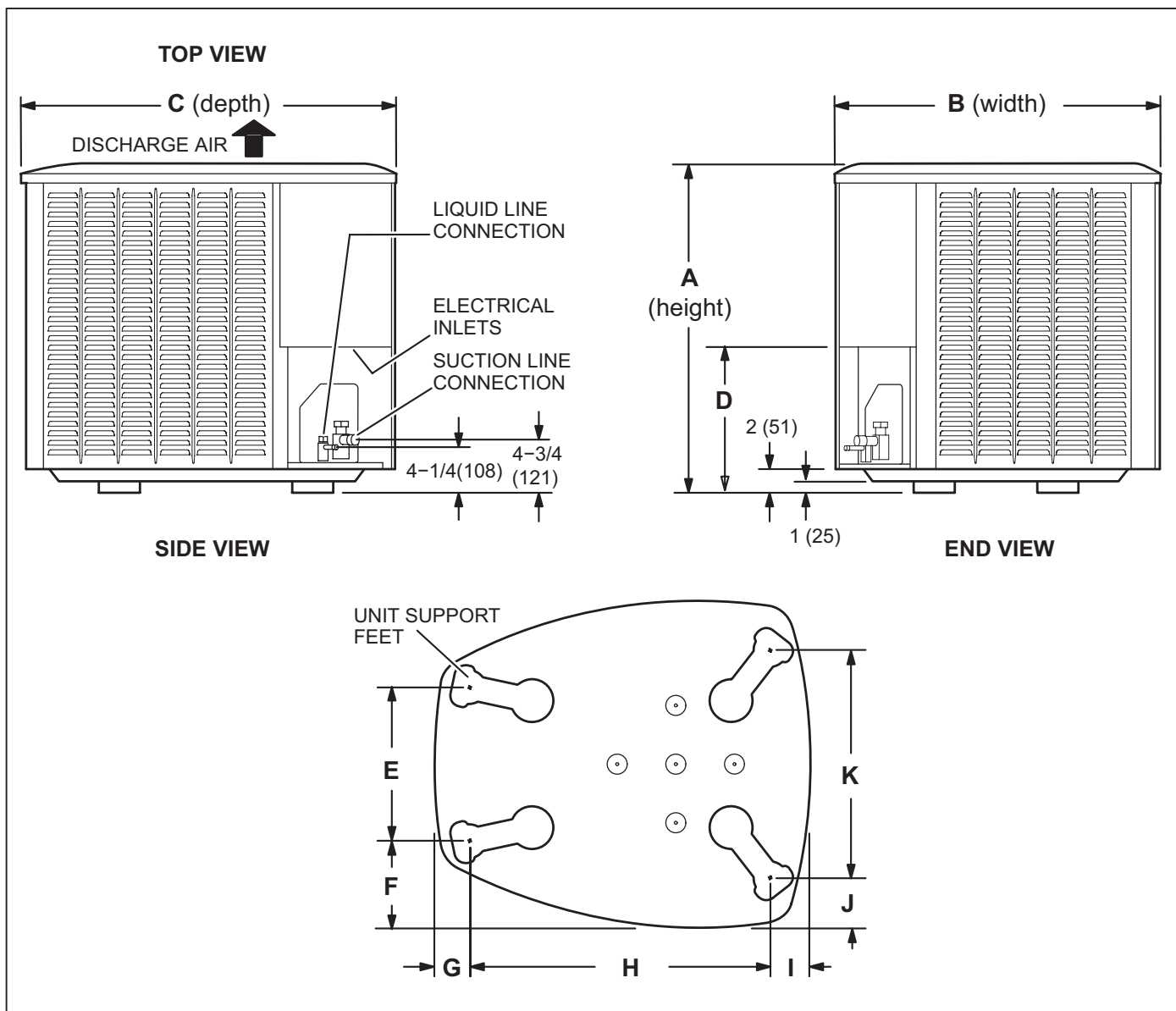
¹ Refrigerant charge sufficient for 15 ft. length of refrigerant lines. For longer line set requirements see the Installation Instructions for information about line set length and additional refrigerant charge required.

² HACR type breaker or fuse.

³ Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

⁴ Used with the S40 Smart Wi-Fi Thermostat for optional service diagnostics.

Unit Dimensions – Inches (mm)



Model Number	A	B	C	D	E	F	G	H	J	K
EL22XPV-024	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)
EL22XPV-036										
EL22XPV-048	45 (1143)	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)
EL22XPV-060										

Typical Unit Parts Arrangement

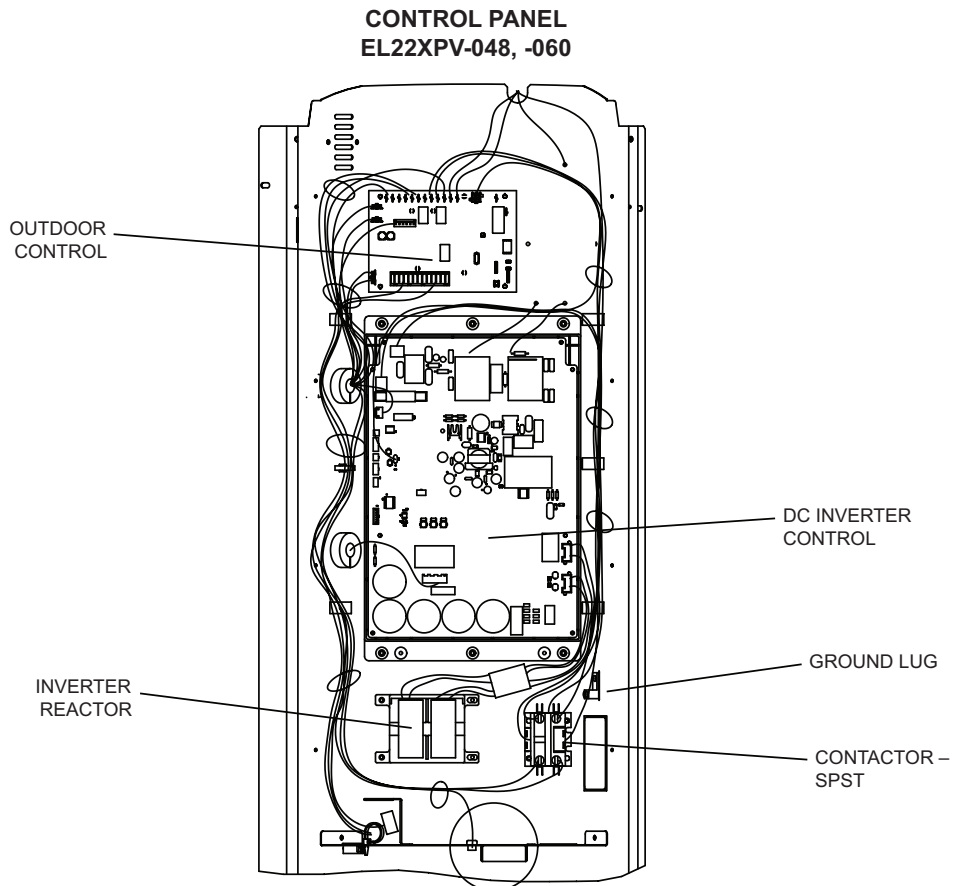
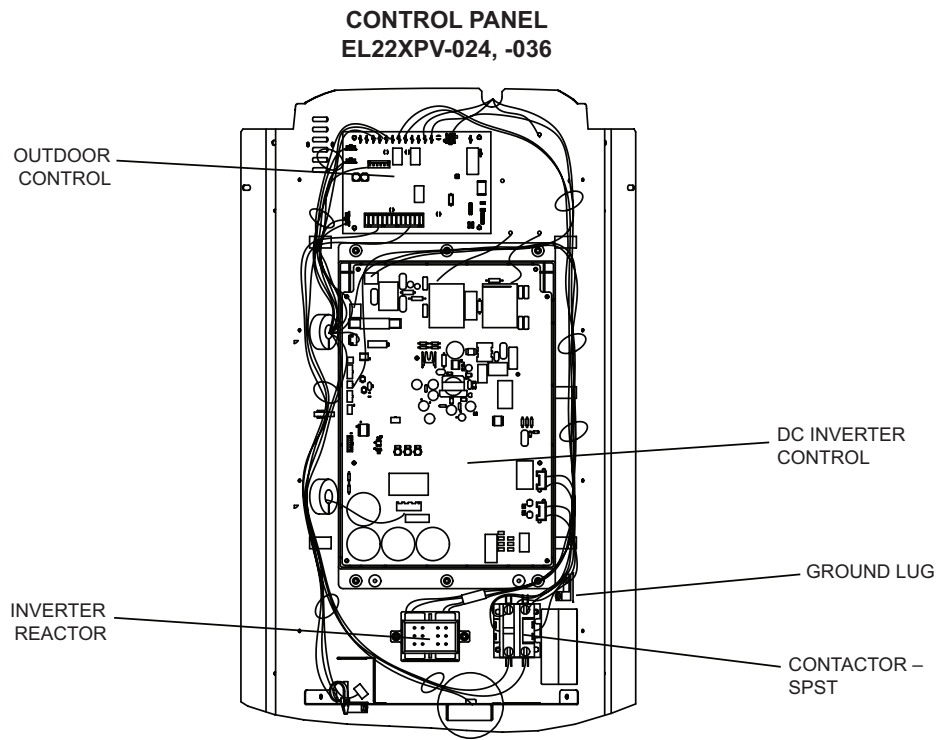
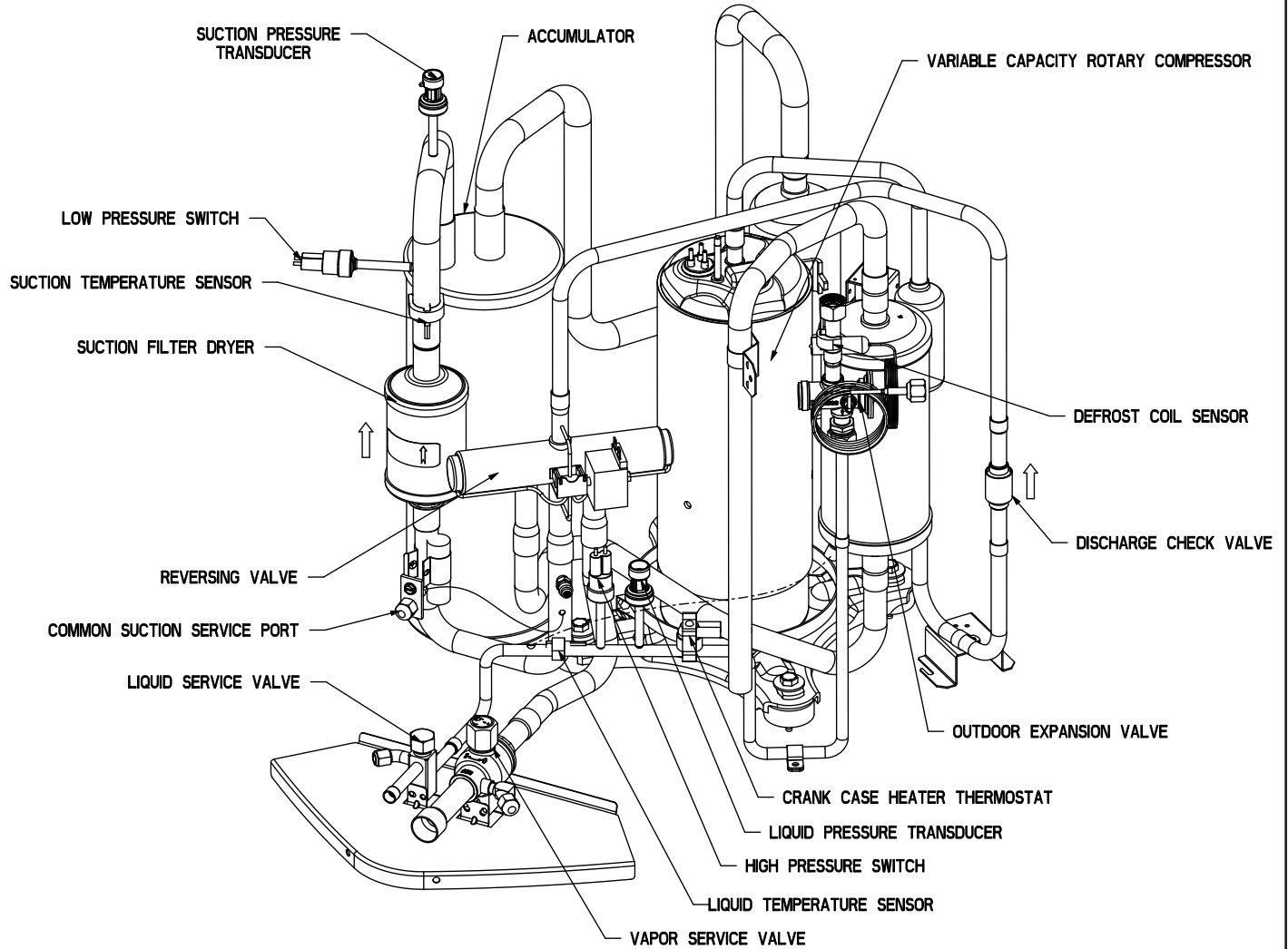


FIGURE 1. Control Panel Components

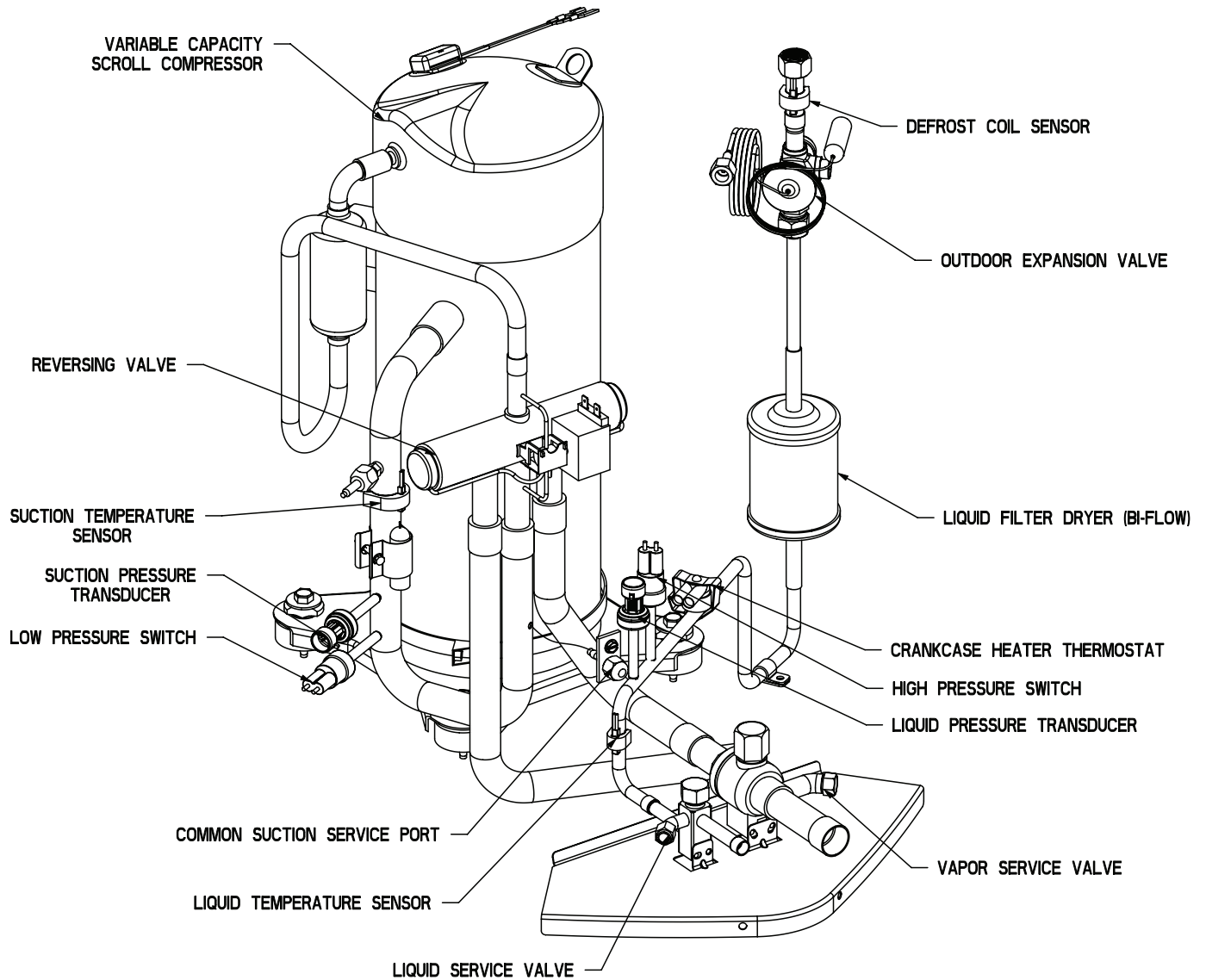
TYPICAL PLUMBING COMPONENTS



EL22XPV-24 & 36 MODEL

FIGURE 2. Component Locations – EL22XPV-024 and -036

TYPICAL PLUMBING COMPONENTS



EL22XPV-48 & 60 MODEL

FIGURE 3. Component Locations EL22XPV-048 and -060 (Scroll Compressor Models)

Operating Gauge Set and Service Valves

TORQUE REQUIREMENTS

When servicing or repairing heating, ventilating, and air conditioning components, ensure the fasteners are appropriately tightened. Table 1 lists torque values for fasteners.

IMPORTANT

Only use Allen wrenches of sufficient hardness (50Rc - Rockwell Harness Scale minimum). Fully insert the wrench into the valve stem recess.

Service valve stems are factory-torqued (from 9 ft-lbs for small valves, to 25 ft-lbs for large valves) to prevent refrigerant loss during shipping and handling. Using an Allen wrench rated at less than 50Rc risks rounding or breaking off the wrench, or stripping the valve stem recess.

See the Lennox Service and Application Notes #C-08-1 for further details and information.

IMPORTANT

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

TABLE 1. Torque Requirements

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

USING MANIFOLD GAUGE SET

When checking the system charge, only use a manifold gauge set that features low loss anti-blow back fittings.

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

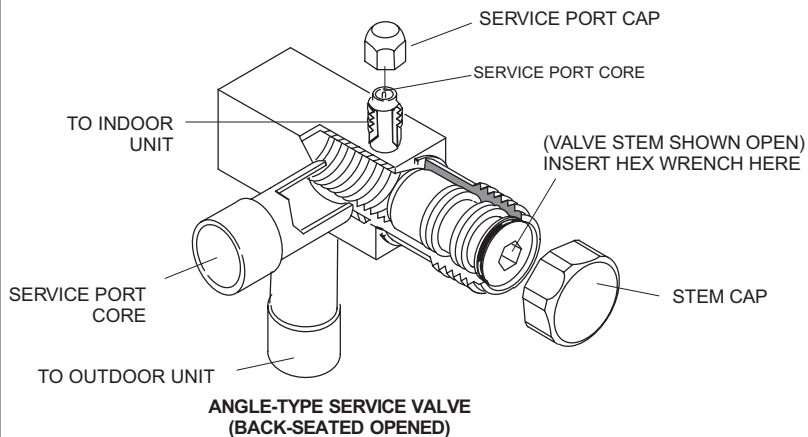
OPERATING SERVICE VALVES

The liquid and vapor line service valves are used for removing refrigerant, flushing, leak testing, evacuating, checking charge and charging. Each valve is equipped with a service port which has a factory-installed valve stem. Figure 4 provides information on access and operation of both angle and ball service valves

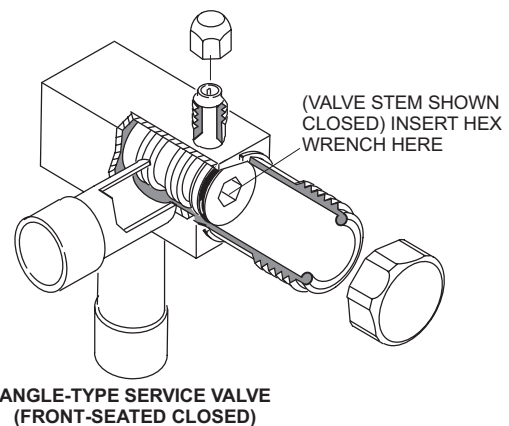
SERVICE VALVES ANGLE AND BALL

Operating Angle Type Service Valve:

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



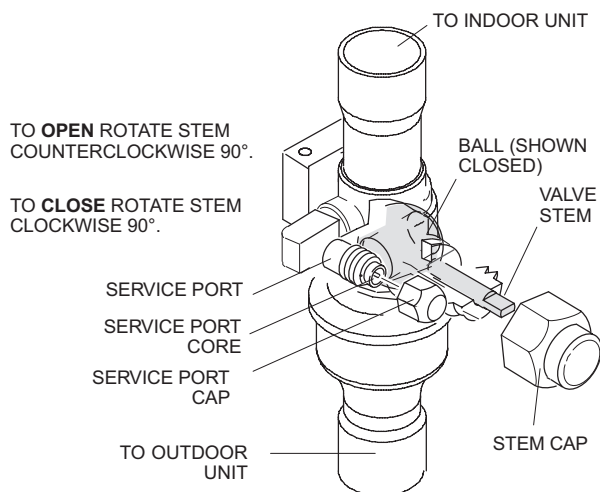
When service valve is **OPEN**, the service port is open to line set, indoor and outdoor unit.



WHEN SERVICE VALVE IS **CLOSED**, THE SERVICE PORT IS OPEN TO THE LINE SET AND INDOOR UNIT.

Operating Ball Type Service Valve:

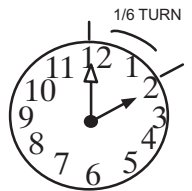
1. Remove stem cap with an appropriately sized wrench.
2. Use an appropriately sized wrench to open. To open valve, rotate stem counterclockwise 90°. To close rotate stem clockwise 90°.



To Access Service Port:

A service port cap protects the service port core from contamination and serves as the primary leak seal.

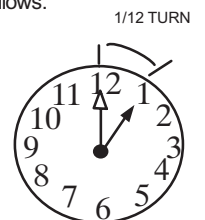
1. Remove service port cap with an appropriately sized wrench.
2. Connect gauge set to service port.
3. When testing is completed, replace service port cap and tighten as follows:
 - With torque wrench: Finger tighten and torque cap per table 3.
 - Without torque wrench: Finger tighten and use an appropriately sized wrench to turn an additional 1/6 turn clockwise.



Reinstall Stem Cap:

Stem cap protects the valve stem from damage and serves as the primary seal. Replace the stem cap and tighten as follows:

- With Torque Wrench: Finger tighten and then torque cap per table 3.
- Without Torque Wrench: Finger tighten and use an appropriately sized wrench to turn an additional 1/12 turn clockwise.



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

FIGURE 4. Angle and Ball Service Valves

Installation

Unit Placement

See Unit Dimensions on page 4 for sizing mounting slab, platforms or supports.

CAUTION

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

POSITIONING CONSIDERATIONS

Consider the following when positioning the unit:

- Some localities are adopting sound ordinances based on the unit's sound level registered from the adjacent property, not from the installation property. Install the unit as far as possible from the property line.
- When possible, do not install the unit directly outside a window. Glass has a very high level of sound transmission. For proper placement of unit in relation to a window see the provided illustration in figure 6, detail A.

PLACING UNIT ON SLAB

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 as described in figure 6, detail B.

NOTE – If necessary for stability, anchor unit to slab as described in figure 6, detail D.

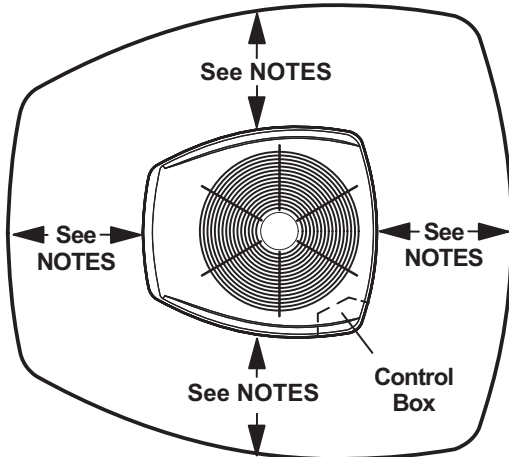
ELEVATING THE UNIT

Units are outfitted with elongated support feet as illustrated in figure 6, detail C.

If additional elevation is necessary, raise the unit by extending the height of the unit support feet. Use a 2-inch (50.8mm) Schedule 40 female threaded adapter to raise the height of the unit.

The specified coupling will fit snugly into the recessed portion of the feet. Use additional 2-inch (50.8mm) Schedule 40 male threaded adaptors which can be threaded into the female threaded adaptors 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 the height further than what is stable, consider a different type of field-fabricated framework that is sturdy enough for greater heights.



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.

NOTICE: Specific applications may require adjustment of the listed installation clearances to provide protection for the unit from physical damage or to avoid conditions which limit operating efficiency. (Example: Clearances may have to be increased to prevent snow or ice from falling on the top of the unit. Additional clearances may also be required to prevent air recirculation when the unit is installed under a deck or in another tight space.)

FIGURE 5. Installation Clearances

STABILIZING UNIT ON UNEVEN SURFACES

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 an uneven surface..

- 1 - Remove the louvered panel from each side to expose the unit base.
- 2 - Install the brackets as illustrated in figure 6, detail D using conventional practices.
- 3 - Replace the panels after installation is complete.

ROOF MOUNTING

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.

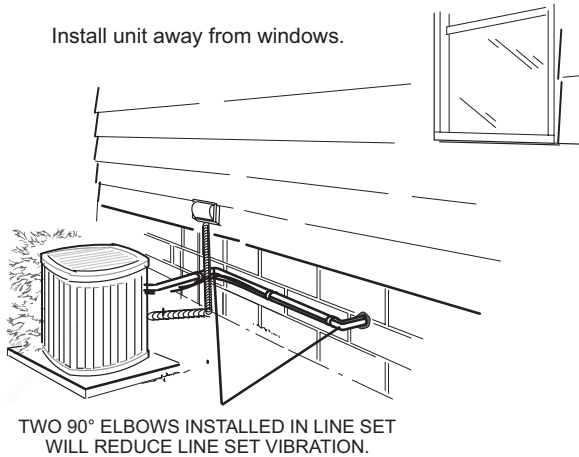
NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

DETAIL A

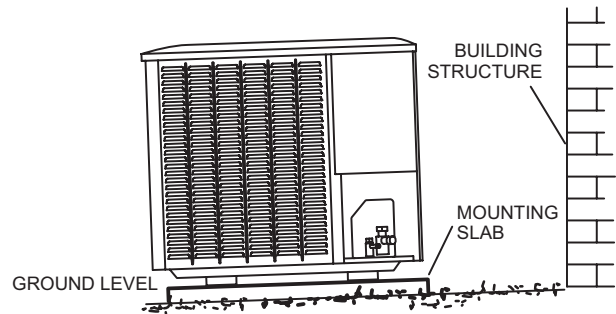
Install unit away from windows.



Outside Unit Placement

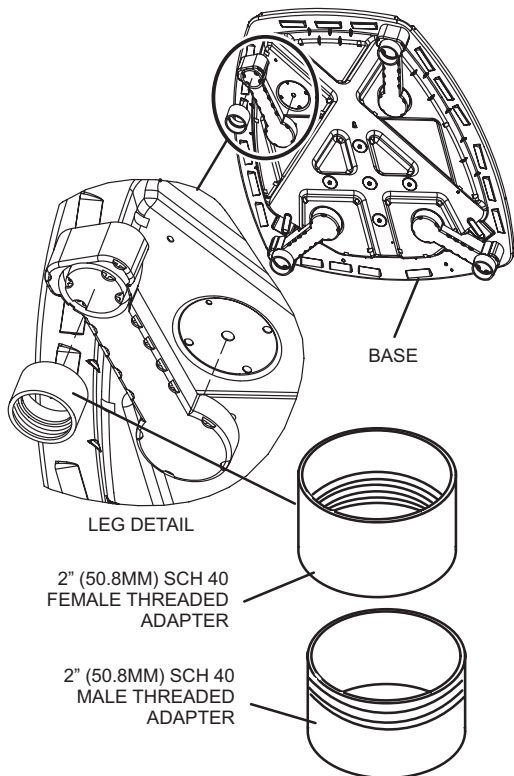
DETAIL B

INSTALL UNIT LEVEL OR, IF ON A SLOPE, MAINTAIN SLOPE TOLERANCE OF 2 DEGREES (OR 2 INCHES PER 5 FEET [50 MM PER 1.5 M]) AWAY FROM BUILDING STRUCTURE.



Slab Mounting at Ground Level

DETAIL C



USE ADDITIONAL 2" SCH 40 MALE THREADED ADAPTERS WHICH CAN BE THREADED INTO THE FEMALE THREADED ADAPTERS TO MAKE ADDITIONAL ADJUSTMENTS TO THE LEVEL OF THE UNIT.

Elevated Slab Mounting using Feet Extenders

DETAIL D

Slab Side Mounting

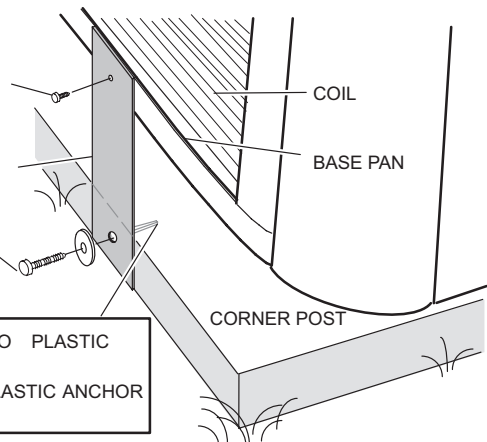
#10 1/2" LONG SELF-DRILLING SHEET METAL SCREWS

STABILIZING BRACKET (18 GAUGE METAL — 2" WIDTH; HEIGHT AS REQUIRED)

#10 1-1/4" LONG HEX HEAD SCREW AND FLAT WASHER

CONCRETE SLAB — USE TWO PLASTIC ANCHORS (HOLE DRILL 1/4")

WOOD OR PLASTIC SLAB — NO PLASTIC ANCHOR (HOLE DRILL 1/8")



Deck Top Mounting

STABILIZING BRACKET (18 GAUGE METAL — 2" (50.8MM) WIDTH; HEIGHT AS REQUIRED); BEND TO FORM RIGHT ANGLE

SAME FASTENERS AS SLAB SIDE MOUNTING.

MINIMUM ONE PER SIDE

FOR EXTRA STABILITY

ONE BRACKET PER SIDE (MIN.); FOR EXTRA STABILITY, TWO BRACKETS PER SIDE, 2" (50.8MM) FROM EACH CORNER.

Stabilizing Unit on Uneven Surfaces

IMPORTANT - 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 6. Placement and Slab Mounting

Removing and Installing Panels

LOUVERED PANEL REMOVAL

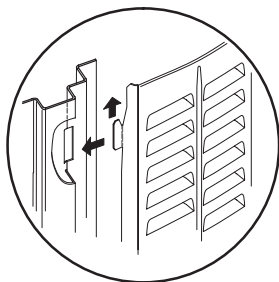
Remove the louvered panels as follows:

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

LOUVERED PANEL INSTALLATION

Position the panel almost parallel with the unit as illustrated in **Detail D** with the screw side as close to the unit as possible. Then, in a continuous motion:

1. Slightly rotate and guide the lip of the top tab inward as illustrated in **Detail A** and **C**; then upward into the top slot of the hinge corner post.
2. Rotate the panel until it is completely vertical to fully engage all of the tabs.
3. Holding the panel's hinged side firmly in place, close the right-hand side of the panel, aligning the screw holes.
4. When panel is correctly positioned and aligned, insert the screws and tighten.



Detail C

MAINTAIN MINIMUM PANEL ANGLE (AS CLOSE TO PARALLEL WITH THE UNIT AS POSSIBLE) WHILE INSTALLING PANEL.

IMPORTANT! DO NOT ALLOW PANELS TO HANG ON UNIT BY TOP TAB. TAB IS FOR ALIGNMENT AND NOT DESIGNED TO SUPPORT WEIGHT OF PANEL.
PANEL SHOWN SLIGHTLY ROTATED TO ALLOW TOP TAB TO EXIT (OR ENTER) TOP SLOT FOR REMOVING (OR INSTALLING) PANEL.

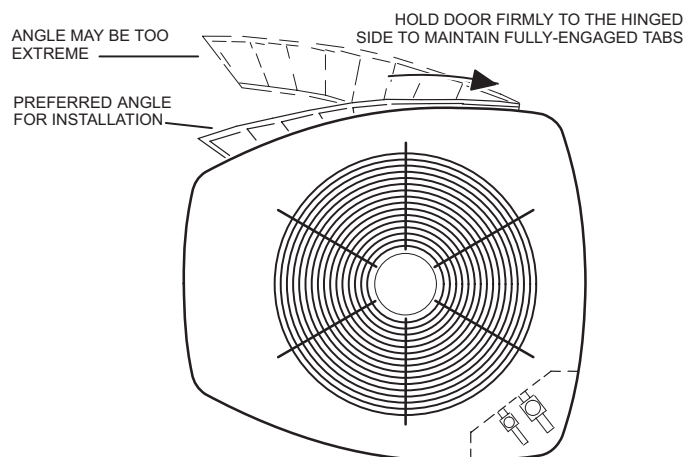
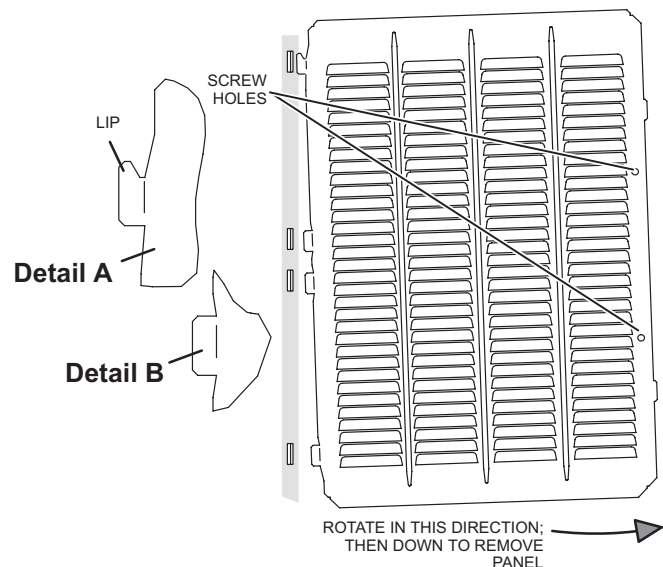


FIGURE 7. Removing and Installing Panels

New or Replacement Line Set

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. Polyvinyl ether (PVE) and polyol ester (POE) oils are used in Lennox variable-capacity 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.

Flush the existing line set per the following instructions. For more information, refer to the Installation and Service Procedures manual available on LennoxPros.com. **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).

Polyvinyl ether (PVE) oil is used in the EL22XPV-024 and -036 units with rotary compressors. For installations of the EL22XPV-024 and -036 units with refrigerant lines or coils previously charged with R410A and POE oil, Lennox recommends flushing the existing lines and coil with R410A refrigerant to remove excess POE oil that may be in the system. The EL22XPV-048 and -060 heat pumps have variable capacity scroll compressors that use POE oil. EL22XPV-048 and -060 units with refrigerant lines or coils previously charged with R410A and POE oil, do not need to be flushed to remove the POE oil.

If a new line set is being installed, size the piping per table 2.

TABLE 2

REFRIGERANT LINE SET – INCHES (MM)					
Model	Valve Field Connections		Recommended Line Set		
	Liquid Line	Vapor Line	Liquid Line	Vapor Line	L15 Line Sets
-024	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	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)
-048					
-060	3/8 in. (10 mm)	1-1/8 in. (28 mm)	3/8 in. (10 mm)	1-1/8 in. (28 mm)	Field Fabricated

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

NOTE - When installing refrigerant lines longer than 50 feet, refer to the Refrigerant Piping Design and Fabrication Guidelines manual available on LennoxPros.com (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).

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

Polyvinyl ether (PVE) 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.

The EL22XPV is a variable-capacity cooling system utilizing variable speed compressor technology. With the variable speed compressor and variable pumping capacity, additional consideration must be given to refrigerant piping sizing and application. The guidelines below are to be used exclusively for the EL22XPV systems.

COOLING SYSTEM (HFC410A)

- Total equivalent length equals 180 feet (piping and all fittings included).

NOTE – Length is general guide. Lengths may be more or less, depending on remaining system design factors.

- Maximum linear (actual) length = 150 feet.
- Maximum linear liquid lift = 60 feet.

NOTE – Maximum lifts are dependent on total length, number of elbows, etc. that contribute to total pressure drop.

- Maximum length vapor riser = 60 feet.

- **Up to 50 Linear Feet:** Use rated line sizes listed in table 3.
- **Between 51 and 150 Linear Feet:** Crankcase heater and nonbleed port TXV factory installed. No additional components required. Vertical vapor riser must be sized to the vapor riser listed in the table 5 on systems with line sets longer than 51 feet. Use table 4 to determine the correct liquid and vapor line sizes.

- **Over 150 Linear Feet:** not recommended.
- Additional oil is not required for systems with line lengths up to 150 feet.

SUCTION TRAPS

For systems with the outdoor unit 5 - 60 feet above the indoor unit, one trap must be installed at the bottom of the suction riser.

TABLE 3. Standard Refrigerant Line Set – Up to 50 Linear Feet in Length

Inches (mm)					
EL22XPV*	Valve Size Connections		Recommended Line Sets		
	Liquid Line	Suction Line	L15 Line Set Model	Line Set Length	Catalog Number
-024	3/8" (10 mm)	3/4" (19 mm)	L15-41-20	20 feet (6.1 m)	89J56
-036 -048	3/8" (10 mm)	7/8" (22 mm)	L15-65-30	30 feet (12.2 m)	89J57
			L15-65-40	40 feet (15.2 m)	89J58
			L15-65-50	50 feet (15.2 m)	89J59
-060	3/8" (10 mm)	1-1/8" (29 mm) **	Field-fabricated		

* Applicable to all minor revision numbers unless otherwise specified.

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

TABLE 4. EL22XPV Line Set Guidelines – 51 to 150 Linear Feet in Length

Model	Maximum Total Equivalent Length (ft)	Maximum Linear (actual) Length (ft)	Maximum Vapor Riser (ft)	Maximum Linear Liquid Lift (ft)	Preferred Vapor Line Sizes for Horizontal Runs	Required Vapor Riser Size
-024	180	150	60	60	7/8"	5/8"
-036	180	150	60	60	7/8"	3/4"
-048	180	150	60	60	7/8"	7/8"
-060	180	150	60	60	7/8"	7/8"

TABLE 5. Liquid Line Diameter Selection Table

Unit	Line Size	Total Linear Length (feet)						Max. Elevation (ft)
		25	50	75	100	125	150	
-024	5/16"	25	50	55	48	40	33	
	3/8"	25	50	60	60	60	60	
-036	3/8"	25	50	60	56	51	45	
	1/2"	25	50	60	60	60	60	
-048	3/8"	25	50	50	41	31	22	
	1/2"	25	50	60	60	60	60	
-060	3/8"	25	50	36	22	8	NR	
	1/2"	25	50	60	60	60	59	

NOTE - Shaded rows indicate rated liquid line size

- Find your unit on the left side of the table.
- Start with the rated liquid line size (shaded row) on the outdoor unit
- Select the actual Total Linear Length of your system shown at the top of the table.
- The elevation listed in the table is the maximum allowed for the liquid line listed.
- Select or consider the larger liquid line size shown in the table if the elevation does not meet your requirements.

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

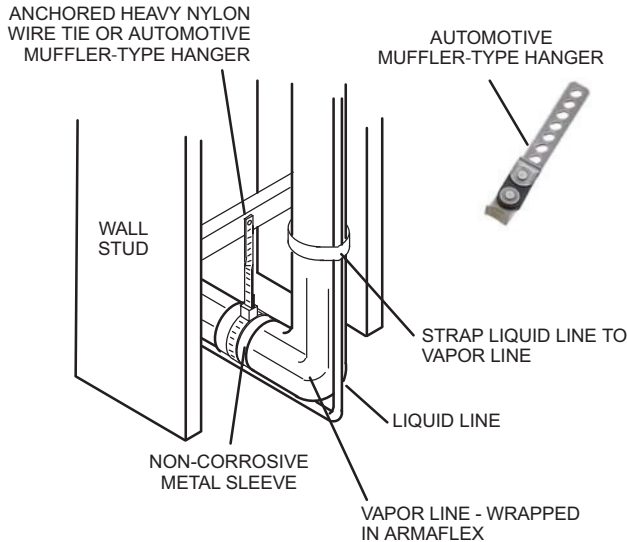
LINE SET

IMPORTANT — Refrigerant lines must not contact structure.

INSTALLATION

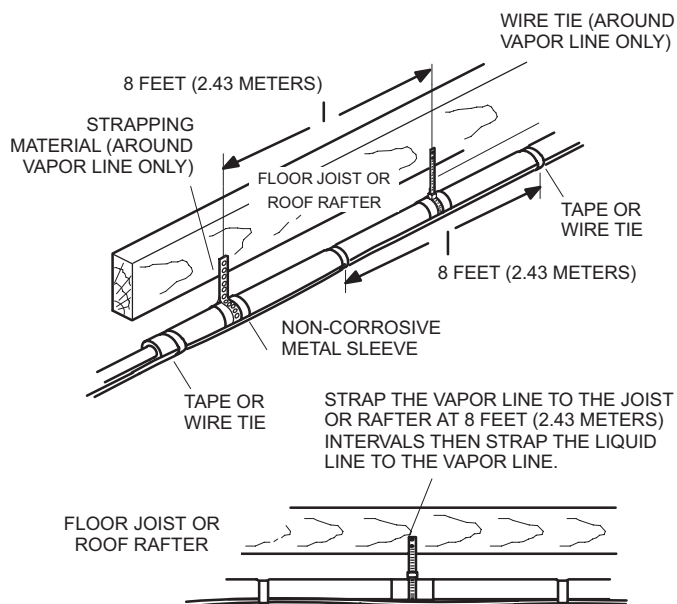
Line Set Isolation — The following illustrations are examples of proper refrigerant line set isolation:

REFRIGERANT LINE SET — TRANSITION FROM VERTICAL TO HORIZONTAL



REFRIGERANT LINE SET — INSTALLING HORIZONTAL RUNS

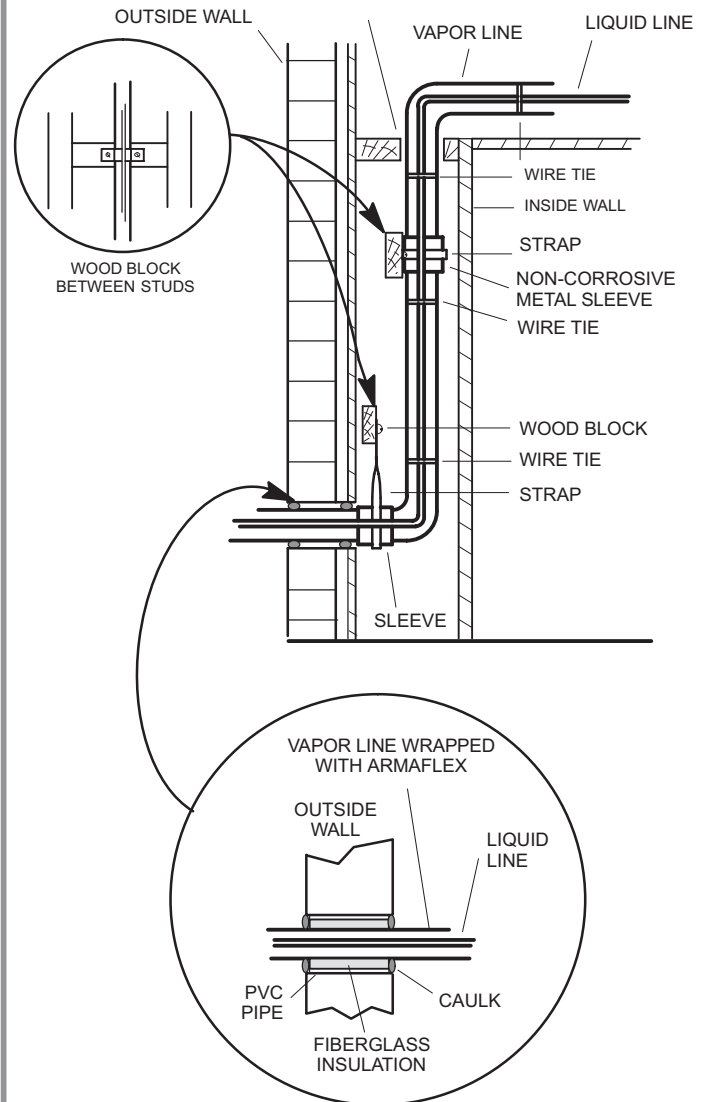
To hang line set from joist or rafter, use either metal strapping material or anchored heavy nylon wire ties.



REFRIGERANT LINE SET — INSTALLING VERTICAL RUNS (NEW CONSTRUCTION SHOWN)

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.

IMPORTANT — Refrigerant lines must not contact wall



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

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.

FIGURE 8. Line Set Installation

Brazing Connections

Use the procedures outlined in figures 9 and 10 for brazing line set connections to service valves.

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.

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).

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.

IMPORTANT

Allow braze joint to cool before removing the wet rag from the service valve. Temperatures above 250°F can damage valve seals.

IMPORTANT

Use silver alloy brazing rods with 5% minimum silver alloy for copper-to-copper brazing. Use 45% minimum alloy for copper-to-brass and copper-to-steel brazing.

WARNING

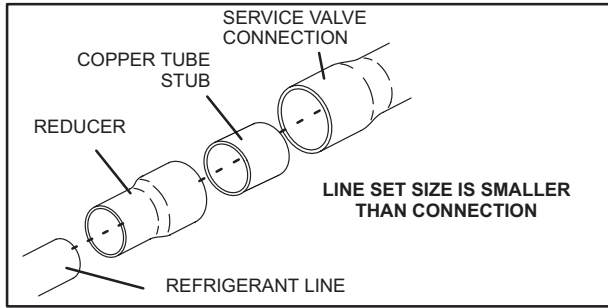
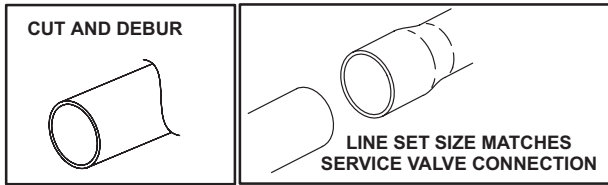


Fire, Explosion and Personal Safety hazard. Failure to follow this warning could result in damage, personal injury or death.

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.

1 PIPING PANEL REMOVAL AND LINE SET PREPARATION

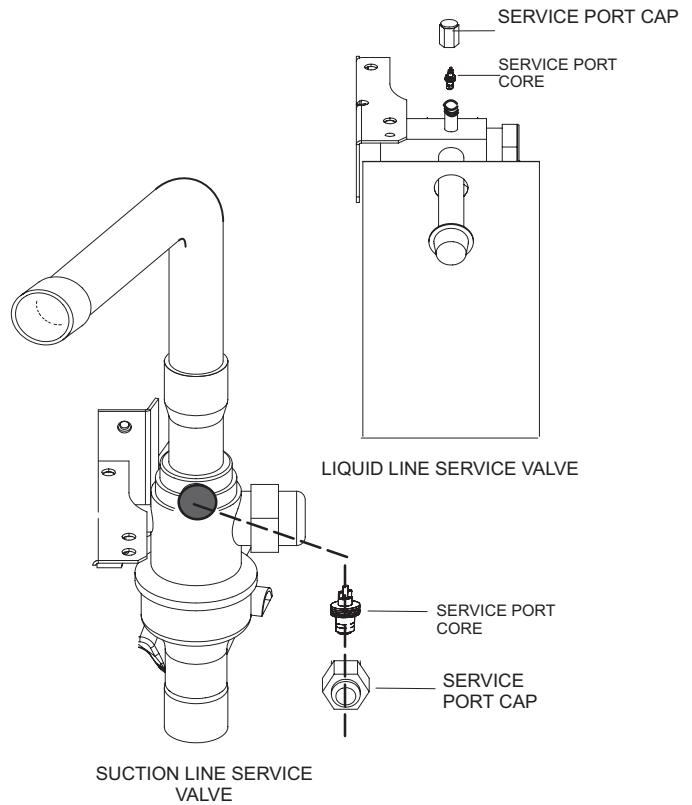
Remove piping panel for easier access to service valves. Cut ends of the refrigerant lines square (free from nicks or dents) and debur the ends. The pipe must remain round. Do not crimp end of the line.



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

2 CAP AND CORE REMOVAL

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



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

- Connect gauge set low pressure side to liquid line service valve (service port).
- Connect gauge set center port to bottle of nitrogen with regulator.
- With valve core removed from the suction line service port, nitrogen flow will have an exit point.

SUCTION SERVICE PORT MUST BE OPEN AND SERVICE PORT CORE REMOVED TO ALLOW EXIT POINT FOR NITROGEN FLOW

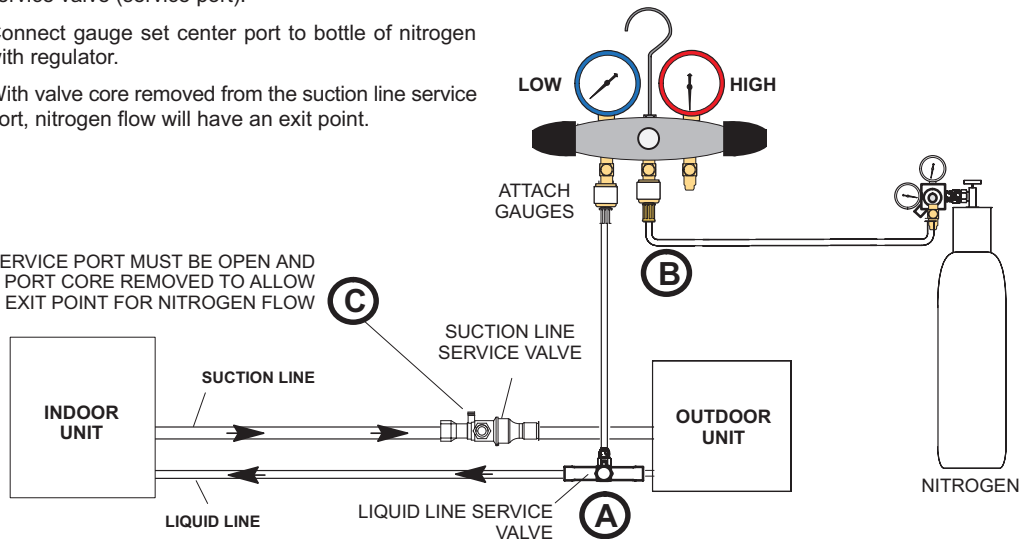


FIGURE 9. Brazing Procedures

4 WRAP SERVICE VALVES

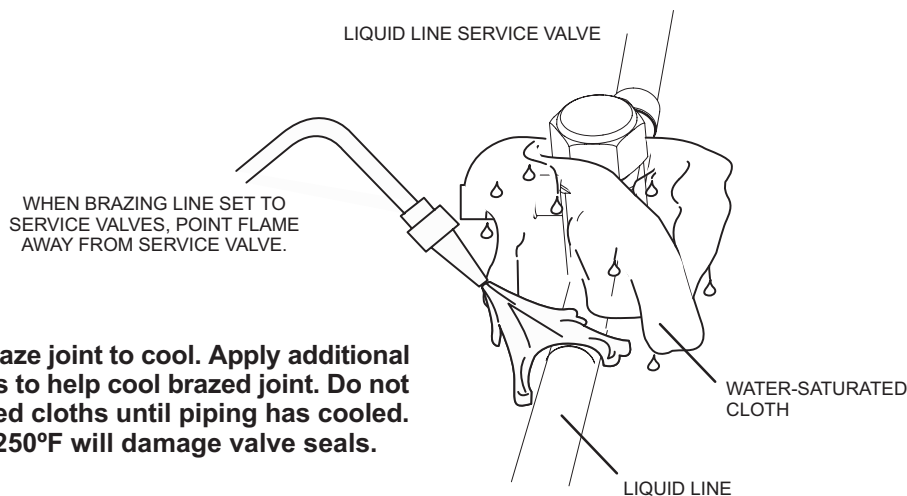
To help protect service valve seals during brazing, wrap water-saturated cloths around service valve bodies and copper tube stubs. Use additional water-saturated cloths underneath the valve body to protect the base paint.

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.

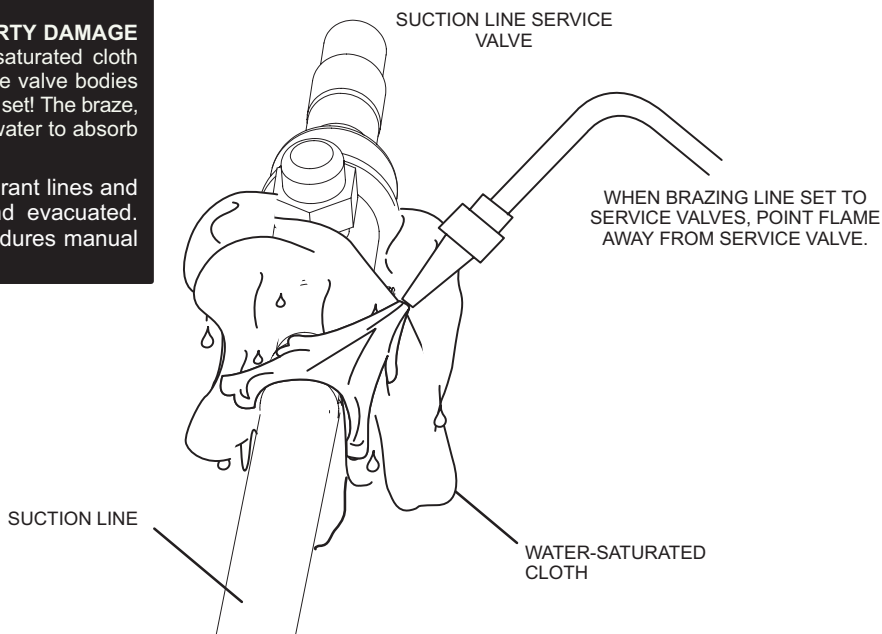


IMPORTANT - Allow braze joint to cool. Apply additional water-saturated cloths to help cool brazed joint. Do not remove water-saturated cloths until piping has cooled. Temperatures above 250°F will damage valve seals.

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 LennoxPros.com.



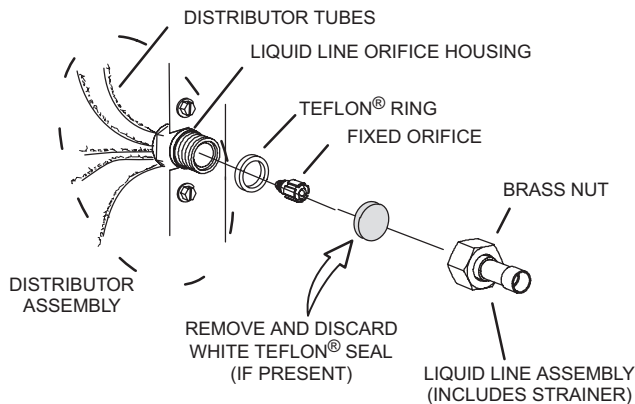
7 PREPARATION FOR NEXT STEP

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

FIGURE 10. Brazing Procedures (Cont'd)

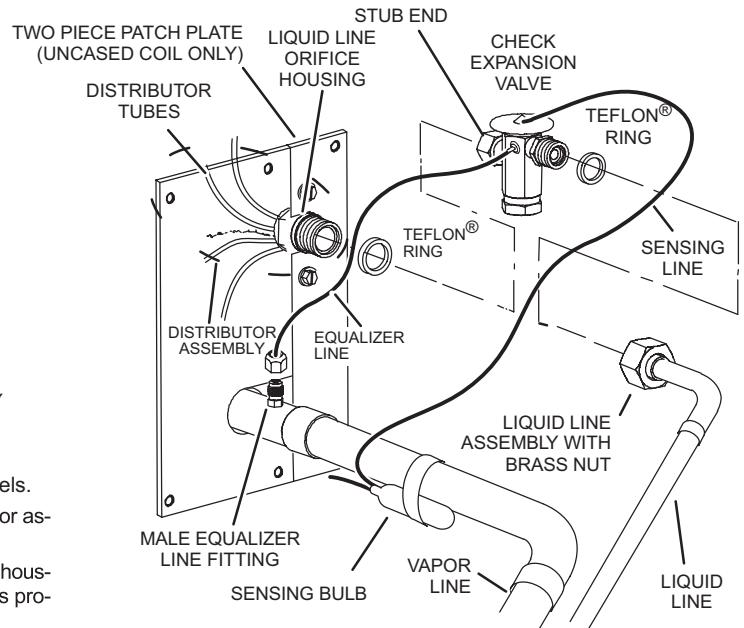
Flushing Line Set and Indoor Coil

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



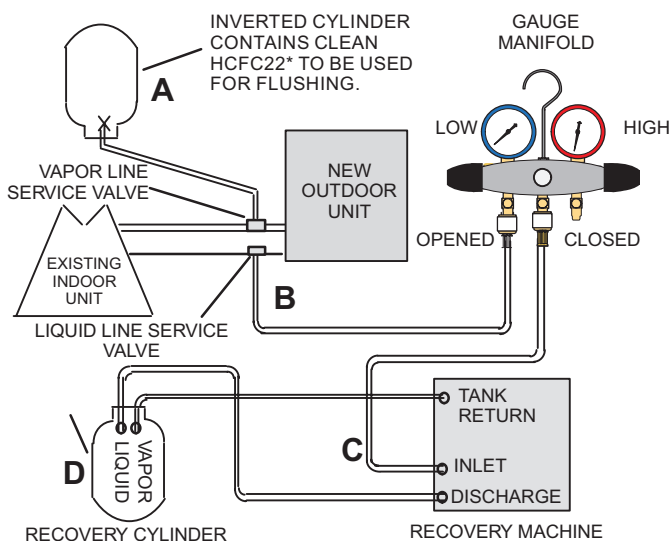
- A On fully cased coils, remove the coil access and plumbing panels.
- B Remove any shipping clamps holding the liquid line and distributor assembly.
- C Using two wrenches, disconnect liquid line from liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.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

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



- A On fully cased coils, remove the coil access and plumbing panels.
- B Remove any shipping clamps holding the liquid line and distributor assembly.
- C Disconnect the equalizer line from the check expansion valve equalizer line fitting on the vapor line.
- D Remove the vapor line sensing bulb.
- E Disconnect the liquid line from the check expansion valve at the liquid line assembly.
- F Disconnect the check expansion valve from the liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
- G Remove and discard check expansion valve and the two Teflon® rings.
- H 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



- A Inverted HCFC-22 cylinder with clean refrigerant* to the vapor service valve.
- B HCFC-22 gauge set (low side) to the liquid line valve.
- C HCFC-22 gauge set center port to inlet on the recovery machine with an empty recovery tank to the gauge set.
- D Connect recovery tank to recovery machines per machine instructions.

***IMPORTANT - Clean refrigerant is any refrigerant in a system that has not had compressor burn out. If the system has experienced burn out, it is recommended that the existing line set and indoor coil be replaced.**

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.

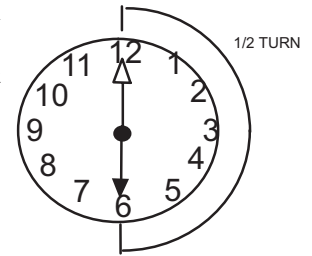
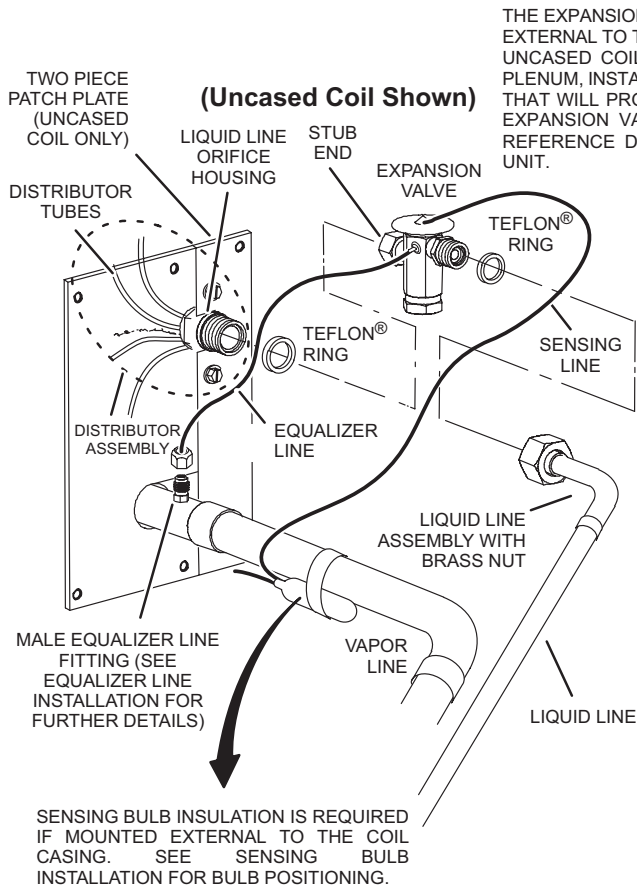
- A Set the recovery machine for liquid recovery and start the recovery machine. Open the gauge set valves to allow the recovery machine to pull a vacuum on the existing system line set and indoor unit coil.
- B Invert the cylinder of clean HCFC-22* and open its valve to allow liquid refrigerant to flow into the system through the vapor line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor unit coil before it enters the recovery machine.
- C 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.
- D 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 11. Removing Metering Device and Flushing

FLUSHING LINE SET AND INDOOR COIL (2 OF 2)

4 TYPICAL NEW CHECK EXPANSION VALVE INSTALLATION PROCEDURE

THIS OUTDOOR UNIT IS DESIGNED FOR USE IN SYSTEMS THAT USE A CHECK EXPANSION VALVE METERING DEVICE. SEE THE UNIT PRODUCT SPECIFICATIONS FOR APPROVED EXPANSION VALVE KIT MATCH-UPS AND APPLICATION INFORMATION.



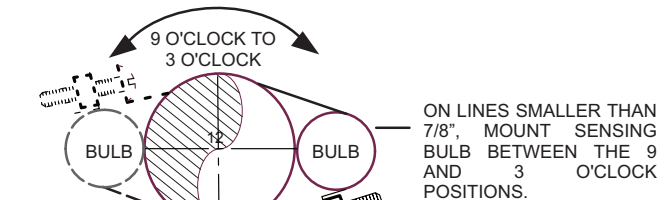
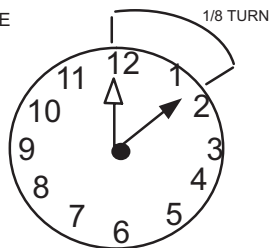
- REMOVE THE FIELD-PROVIDED FITTING THAT TEMPORARILY RECONNECTED THE LIQUID LINE TO THE INDOOR UNIT'S DISTRIBUTOR ASSEMBLY.
- INSTALL ONE OF THE PROVIDED TEFLON® RINGS AROUND THE STUBBED END OF THE EXPANSION VALVE AND LIGHTLY LUBRICATE THE CONNECTOR THREADS AND EXPOSE SURFACE OF THE TEFLON® RING WITH REFRIGERANT OIL.
- ATTACH THE STUBBED END OF THE EXPANSION VALVE TO THE LIQUID LINE ORIFICE HOUSING. FINGER TIGHTEN AND USE AN APPROPRIATELY SIZED WRENCH TO TURN AN ADDITIONAL 1/2 TURN CLOCKWISE AS ILLUSTRATED IN THE FIGURE ABOVE, OR 20 FT-LB.
- PLACE THE REMAINING TEFLON® WASHER AROUND THE OTHER END OF THE EXPANSION VALVE. LIGHTLY LUBRICATE CONNECTOR THREADS AND EXPOSE SURFACE OF THE TEFLON® RING WITH REFRIGERANT OIL.
- ATTACH THE LIQUID LINE ASSEMBLY TO THE EXPANSION VALVE. FINGER TIGHTEN AND USE AN APPROPRIATELY SIZED WRENCH TO TURN AN ADDITIONAL 1/2 TURN CLOCKWISE AS ILLUSTRATED IN THE FIGURE ABOVE OR 20 FT-LB.

SENSING BULB INSTALLATION

- ATTACH THE VAPOR LINE SENSING BULB IN THE PROPER ORIENTATION AS ILLUSTRATED TO THE RIGHT USING THE CLAMP AND SCREWS PROVIDED.

NOTE - CONFIRM PROPER THERMAL CONTACT BETWEEN VAPOR LINE AND CHECK EXPANSION BULB BEFORE INSULATING THE SENSING BULB ONCE INSTALLED.

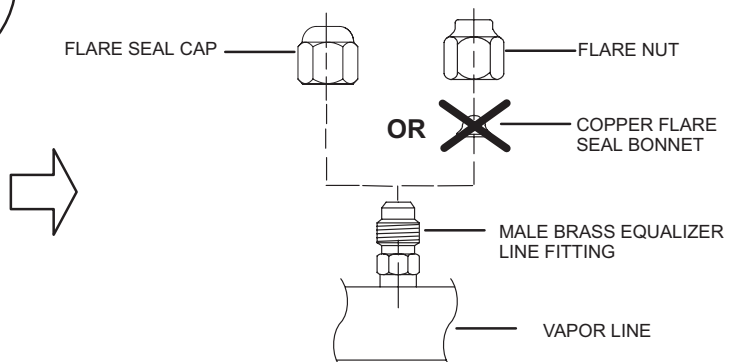
- CONNECT THE EQUALIZER LINE FROM THE EXPANSION VALVE TO THE EQUALIZER VAPOR PORT ON THE VAPOR LINE. FINGER TIGHTEN THE FLARE NUT PLUS 1/8 TURN (7 FT-LBS) AS ILLUSTRATED BELOW.



NOTE - NEVER MOUNT THE SENSING BULB ON BOTTOM OF LINE.

EQUALIZER LINE INSTALLATION

REMOVE AND DISCARD EITHER THE FLARE SEAL CAP OR FLARE NUT WITH COPPER FLARE SEAL BONNET FROM THE EQUALIZER LINE PORT ON THE VAPOR LINE AS ILLUSTRATED IN THE FIGURE TO THE RIGHT.



IMPORTANT

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

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. Polyvinyl ether (PVE) oils are used in Lennox variable-capacity 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.

Leak Testing the System

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).

IMPORTANT

Leak detector must be capable of sensing HFC refrigerant.

WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly. Failure to follow this warning may result in personal injury or death.

LEAK TEST

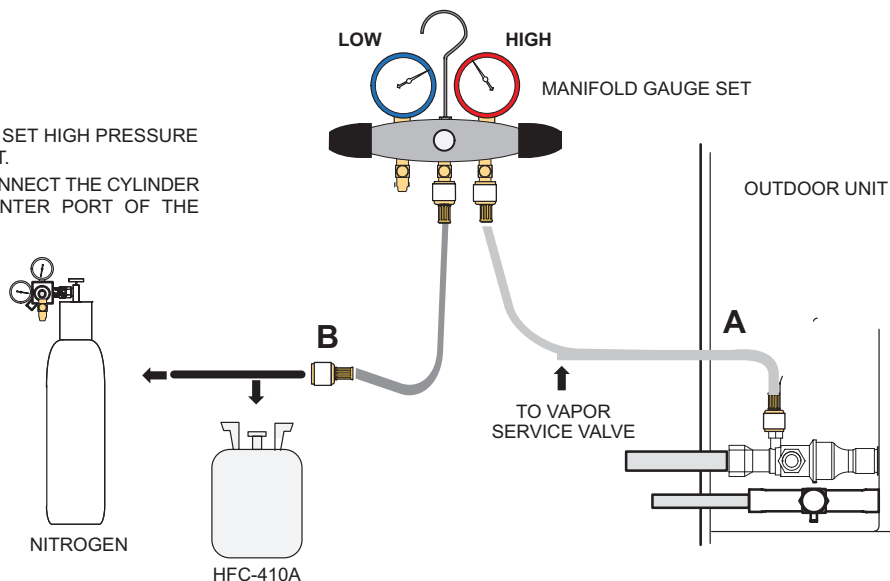
LINE SET AND INDOOR COIL

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.

1 CONNECT GAUGE SET

- A. CONNECT AN HFC-410A MANIFOLD GAUGE SET HIGH PRESSURE HOSE TO THE VAPOR VALVE SERVICE PORT.
- 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 DRY NITROGEN WITH A PRESSURE REGULATING VALVE TO THE CENTER PORT OF THE MANIFOLD GAUGE SET.
- D. ADJUST DRY 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.

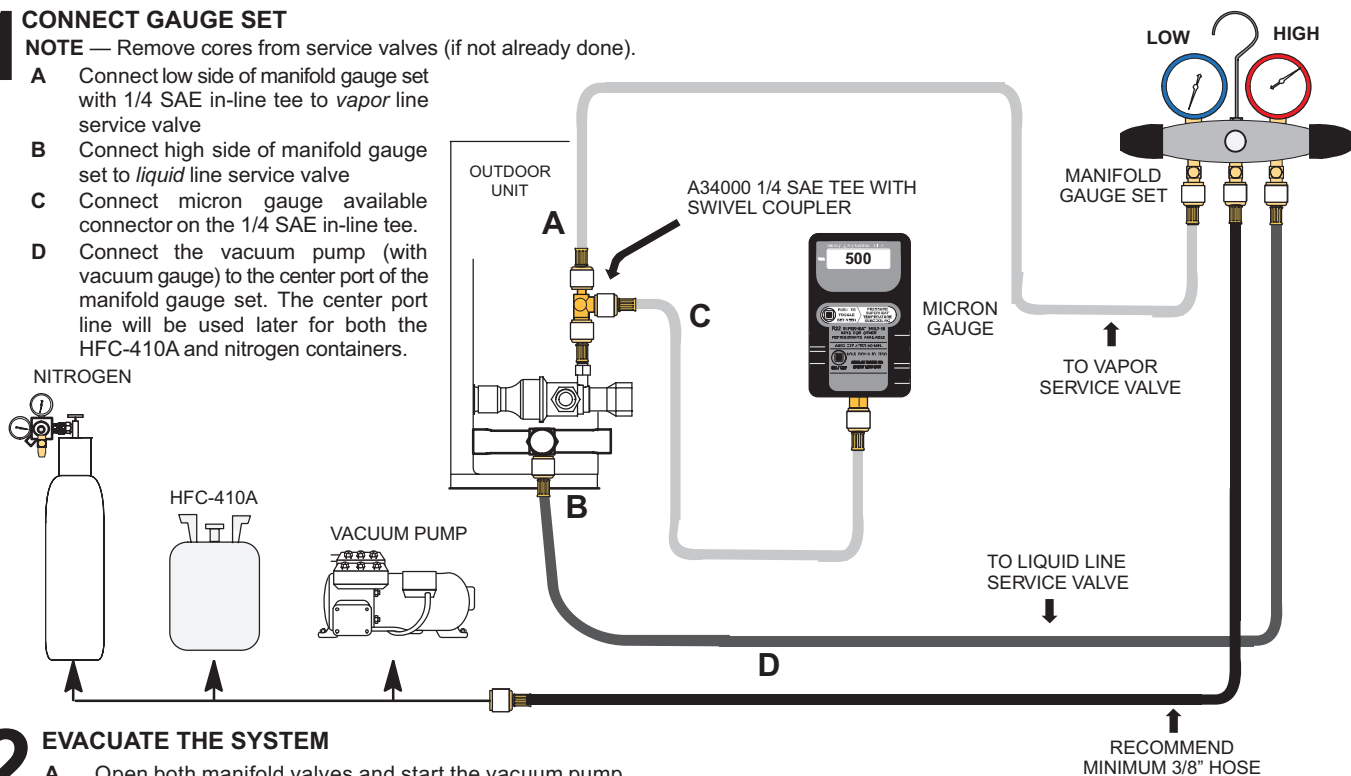
FIGURE 12. System Leak Test

Evacuating Line Set and Indoor Coil

1 CONNECT GAUGE SET

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

- A** Connect low side of manifold gauge set with 1/4 SAE in-line tee to vapor line service valve
- B** Connect high side of manifold gauge set to liquid line service valve
- C** Connect micron gauge available connector on the 1/4 SAE in-line tee.
- D** 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.



2 EVACUATE THE SYSTEM

- A** Open both manifold valves and start the vacuum pump.
- B** 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 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.
- C** 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 dry 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.
- D** 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.
- E** 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.
- F** When the absolute pressure requirement above has been met, disconnect the manifold hose from the vacuum pump and connect it to an upright cylinder of HFC-410A refrigerant. Open the manifold gauge valve 1 to 2 psig in order to release the vacuum in the line set and indoor unit.
- G** 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 secure finger tight, then tighten an additional one-sixth (1/6) of a turn as illustrated.

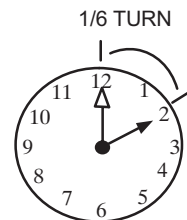


FIGURE 13. Evacuating the System

IMPORTANT

Use a thermocouple or thermistor electronic vacuum gauge that is calibrated in microns. Use an instrument capable of accurately measuring down to 50 microns.

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.

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

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).

Thermostat Control and Low Voltage Control Wiring

EL22XPV Thermostat Control Options

The EL22XPV variable capacity units provide two thermostat control options to provide application and installation flexibility.

S40 Communicating Thermostat Control

The EL22XPV variable capacity unit may be installed as a fully communicating system consisting of an S40 Smart Communicating Thermostat, a communicating indoor unit and the EL22XPV variable capacity outdoor unit wired with (4) communication wires (R, I+, I- and C) connected to the EL22XPV Outdoor Unitary Control.

The EL22XPV variable capacity unit when wired as a fully communicating system will take full advantage of the advanced diagnostics and control, Wi-Fi accessibility and system operation parameters. Refer to the EL22XPV field wiring diagram for an S40 communicating thermostat.

Conventional 24VAC Non-Communicating Thermostat Control

The EL22XPV variable capacity unit may be installed using a conventional 24VAC non-communicating two-stage heat pump or single-stage heat pump thermostat.

NOTE – The conventional 24VAC non-communicating thermostat must have a compressor minimum on time of three minutes to prevent compressor short cycling. The Lennox M30, ComfortSense 7500, ComfortSense 3000 and many other commercially available electronic thermostats provide this feature.

The EL22XPV unit will provide full variable capacity operation when installed with a conventional 24VAC non-communicating two stage heat pump or single-stage heat pump thermostat. The EL22XPV outdoor control has advanced control algorithms using the EL22XPV suction pressure sensor to provide true variable capacity operation in the cooling mode. In the heat pump heating mode, the advanced control algorithms uses the EL22XPV liquid pressure sensor to provide true variable capacity operation.

When utilizing a two-stage conventional 24VAC non-communicating heat pump thermostat, six wires are required to control the outdoor unit (R, C, Y1, Y2, O and W). Refer to the EL22XPV field wiring diagram for a conventional 24VAC non-communicating 2-stage heat pump thermostat.

When utilizing a single-stage conventional 24VAC non-communicating heat pump thermostat, five wires are required to control the outdoor unit (R, C, Y1, O and W) and Y1 is jumpered to Y2 in the outdoor unit. Note that the published performance data is based upon the use of a two-stage thermostat. Refer to the EL22XPV field wiring diagram for a conventional 24VAC non-communicating single-stage heat pump thermostat.

EL22XPV Low Voltage Control Wiring Connections

The EL22XPV variable capacity units are provided with (2) RAST 6-Pin connections in the installation instruction bag for connecting the field low voltage control wiring to the EL22XPV harnesses in the low voltage control make-up box. One RAST 6-pin connector is labeled with terminals TST, DF, R, I+, I- and C. The second RAST 6-pin connector is labeled with terminals DS, O, Y1, Y2, L and W.

WARNING



Electric Shock Hazard. Can cause injury or death. Unit must be properly 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.

WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

⚠ WARNING

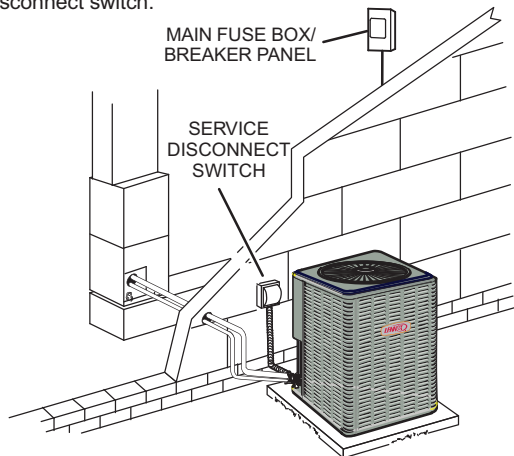
Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Product Specifications bulletin (EHB) and unit rating plate.

EL22XPV Thermostat Control Options

Thermostat Type	Indoor Unit Type	Qty. of Wires to EL22XPV	EL22XPV Terminal Strip Connections	Unit Operation	Field Wiring Diagram
S40 Communicating Thermostat	Communicating Gas Furnace or Air Handler	4	R, I+, I-, C	Fully Communicating Variable Capacity Operation Based Upon Thermostat Demand	Figure 14
Conventional 24VAC 2-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating or communicating)	6	R, C, Y1, Y2, O, W	Full Variable Capacity Operation Controlled by EL22XPV Unitary Control Using Suction Pressure in Cooling Mode and Liquid Pressure in Heating Mode	Figure 16
Conventional 24VAC Single-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating or communicating)	5	R, C, Y1, O, W (Jumper Y1 to Y2)	Full Variable Capacity Operation Controlled by EL22XPV Unitary Control Using Suction Pressure in Cooling Mode and Liquid Pressure in Heating Mode	Figure 16

SIZE CIRCUIT AND INSTALL SERVICE DISCONNECT SWITCH

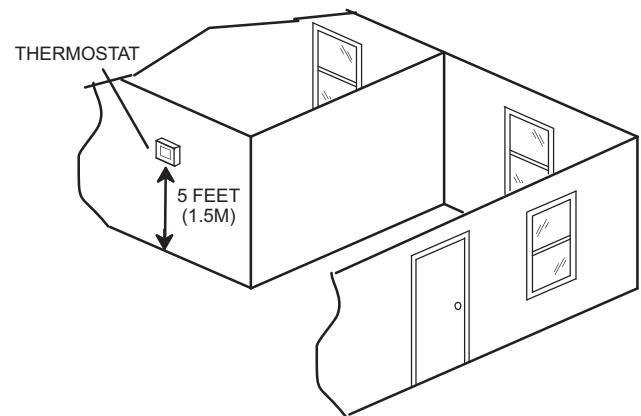
Refer to the unit nameplate for minimum circuit ampacity, and maximum fuse or circuit breaker (HACR per NEC). Install power wiring and properly sized disconnect switch.



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

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.

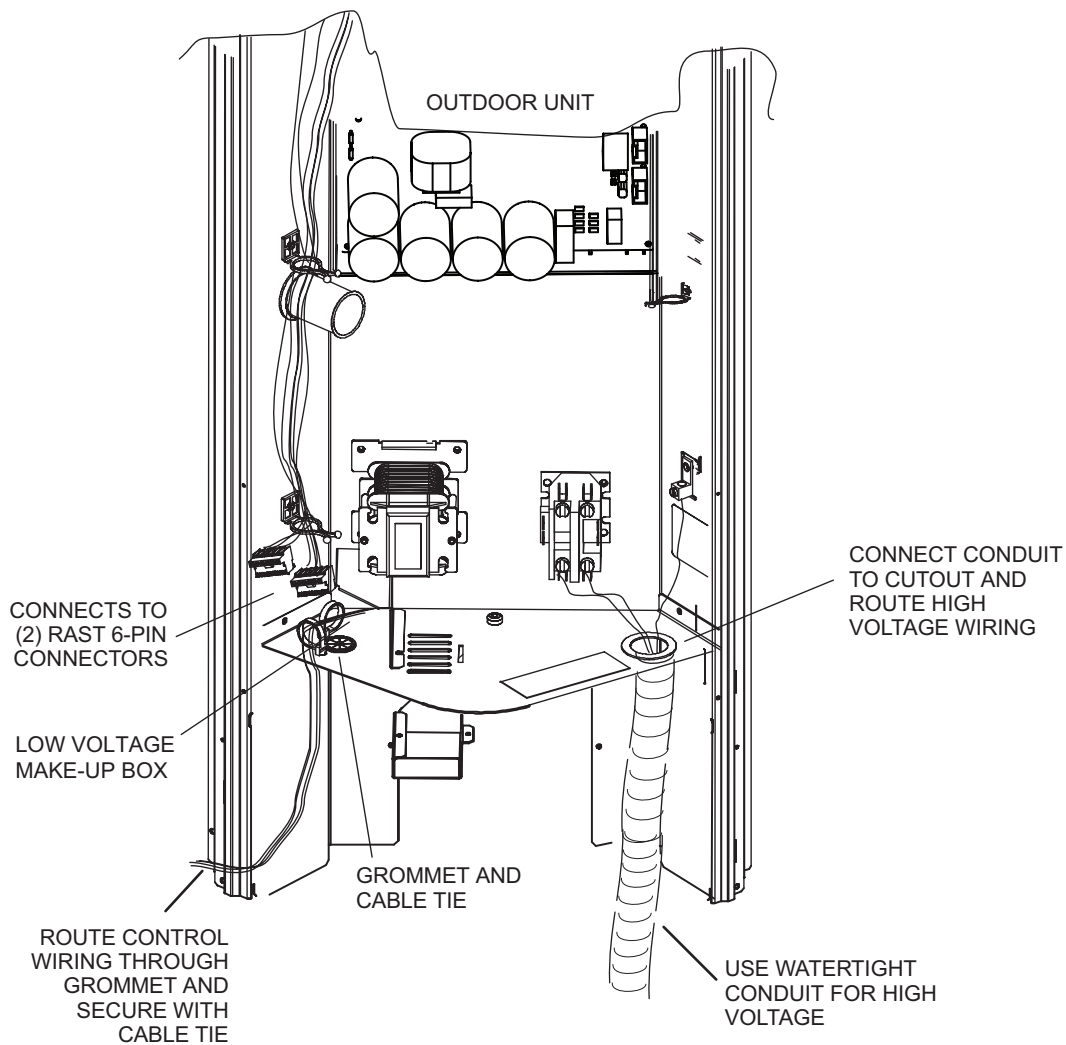
3 ROUTE CONTROL WIRES

Communicating Thermostat Wiring

Maximum length of wiring (18 gauge) for all connections on the RSBus is 1500 feet (457 meters). Wires should be color-coded, with a temperature rating of 95°F (35°C) minimum, and solid-core (Class II Rated Wiring). All low voltage wiring must enter unit through field-provided field-installed grommet installed in electrical inlet.

Conventional 24VAC Non-Communicating Thermostat Wiring

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



4 ROUTE HIGH VOLTAGE AND GROUND WIRES

Any excess high voltage field wiring should be trimmed and secured away from any low voltage field wiring. To facilitate a conduit, a cutout is located on the bottom of the control box. Connect conduit to the control box using a proper conduit fitting.

Connect the 208/230 high voltage power supply from the disconnect to the EL18XPV contactor as shown. Connect the ground wire from the power supply to the unit ground lug connection.

FIGURE 14. Typical Control Wiring

Indoor Unit Communicating Control (Using Non-Shielded Wiring)

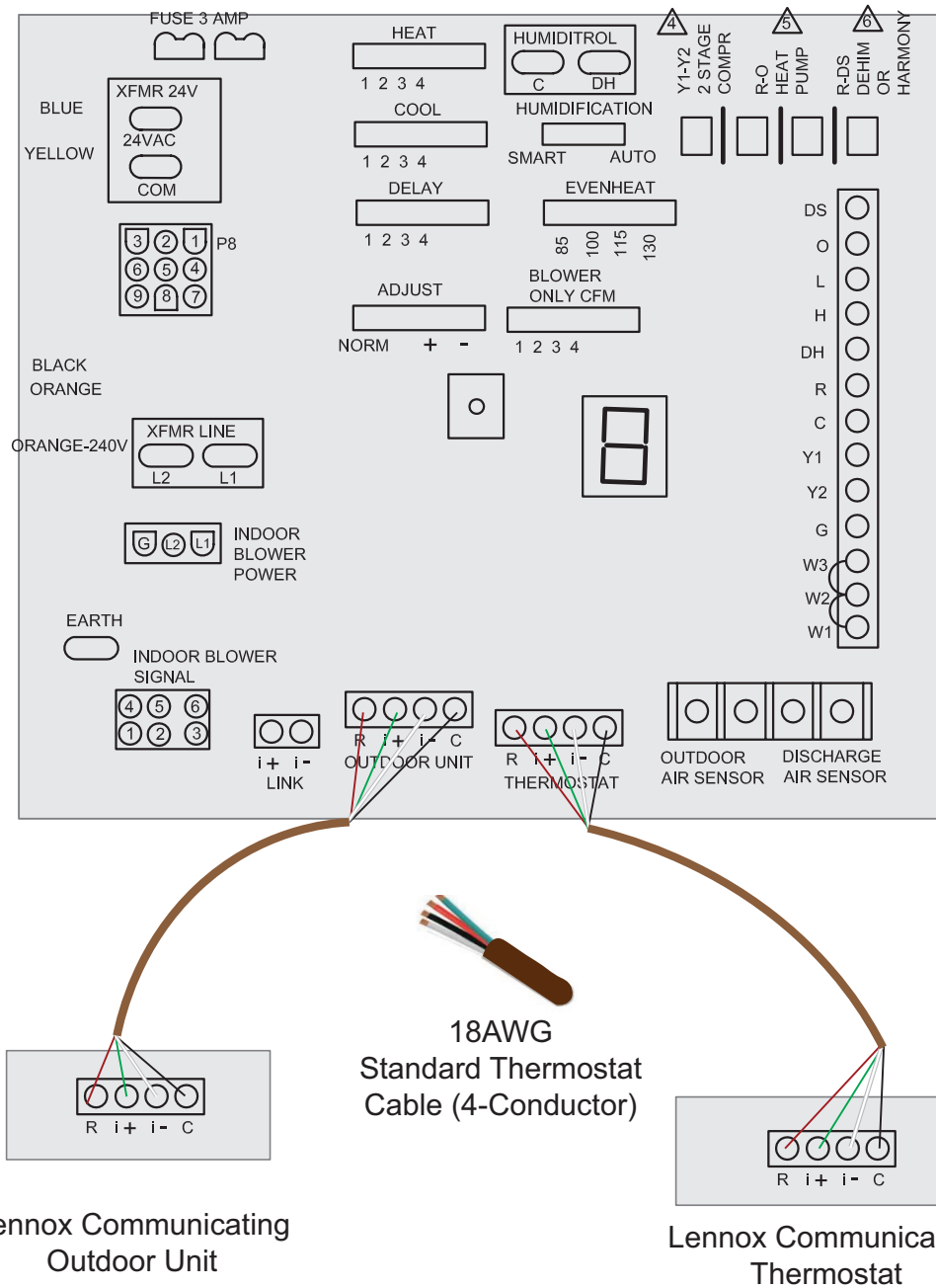
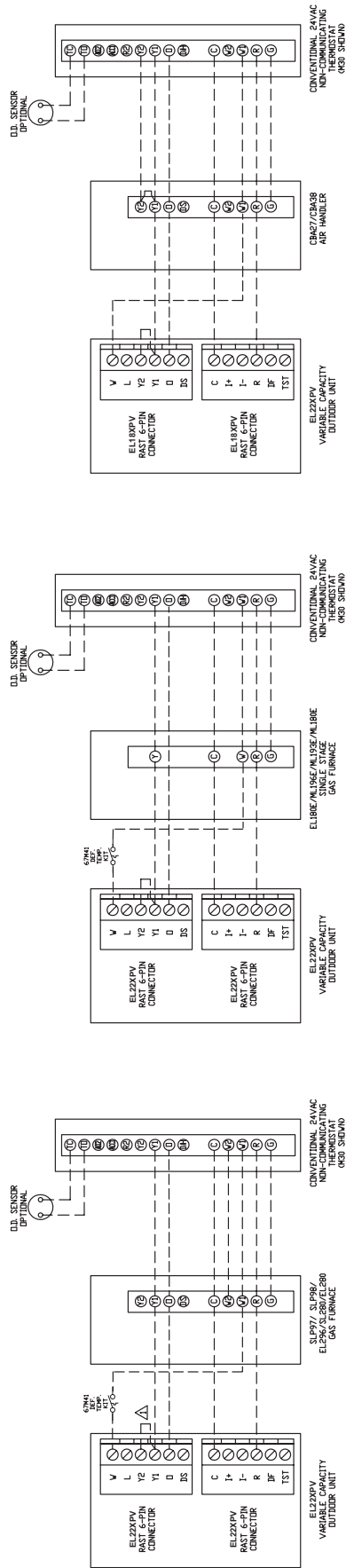


FIGURE 15. Communicating System Wiring Connections

SINGLE STAGE

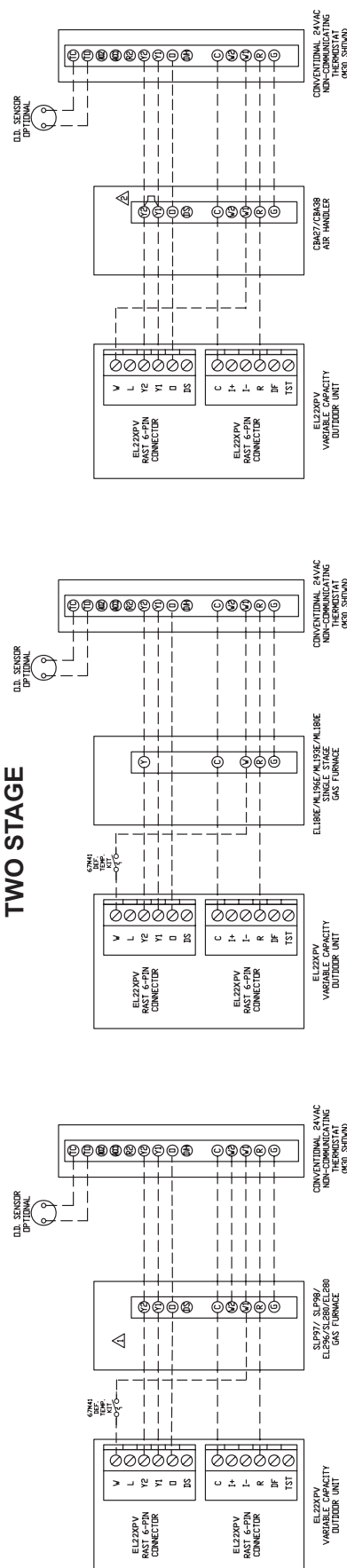


△ FOR SINGLE STAGE COOLING,
JUMPER FROM Y1 TO Y2 ON THE
EL18XPV
TERMINAL STRIP

△ FOR SINGLE STAGE COOLING,
JUMPER FROM Y1 TO Y2 ON THE
EL18XPV
TERMINAL STRIP

△ FOR SINGLE STAGE COOLING,
JUMPER FROM Y1 TO Y2 ON THE
EL18XPV
TERMINAL STRIP

TWO STAGE

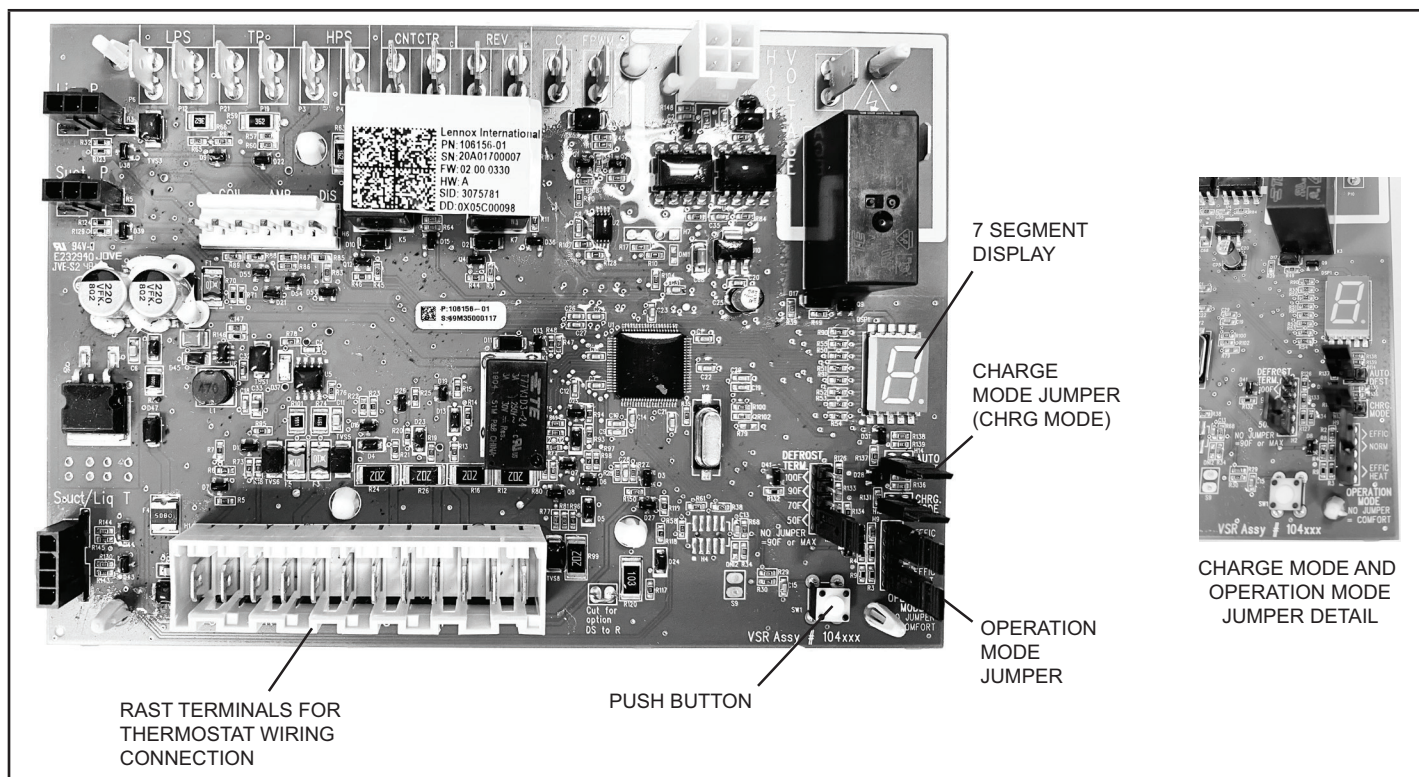


△ FOR 2-STAGE COOLING,
JUMPER FROM Y1 TO Y2
ON THE EL18XPV
TERMINAL STRIP

△ FOR 2-STAGE COOLING CUT
THE JUMPER FROM Y1 TO Y2
ON THE EL18XPV
TERMINAL STRIP

FIGURE 16. Conventional 24VAC Heat Pump Non-Communicating Thermostat Wiring

5 – Outdoor Unitary Control - Jumpers and Terminals



Outdoor Control 7 Segment Display and Push Button

Information concerning the outdoor control 7-segment display and push button operations are available on the unit access panel.

Alarms

Alarm information is provided on the unit access panel.

Charge Mode Jumper

To initiate the EL22XPV Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

EL22XPV Charge Mode Operation with a S40 Communicating Thermostat

Installing a jumper on the Charge Mode Pins will initiate compressor operation in the cooling mode and outdoor fan motor at 100% capacity and will provide a signal to the indoor unit to initiate indoor blower operation at the maximum cooling air volume. To exit the charge mode, remove the Charge Mode Jumper. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

EL22XPV Charge Mode Operation with a Conventional 24VAC Non-Communicating Heat Pump Thermostat

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 compressor demand to the EL22XPV to initiate the Charge Mode. When using the Charge Mode in the cooling mode, the “O” must also be provided with a 24V signal to place the reversing valve in the cool position. In the heating mode only a Y1 compressor demand is required along with the blower demand for the full cooling air volume. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 Cooling demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

Cooling Operation Mode Jumper

The Cooling Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump thermostat, the compressor capacity is controlled to maintain the target suction pressure setpoint. The Cooling Operation Mode Jumper has three selectable cooling modes. The three modes are Efficiency (Jumper installed on Pins 1 & 2), Normal Mode (Jumper installed on Pins 2 & 3) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode.

The Efficiency mode has a variable suction pressure setpoint that will vary with the outdoor temperature; as the outdoor temperature increases the suction pressure setpoint will decrease. When the Cooling Operation Mode jumper is installed in the "Normal Mode" the suction pressure setpoint is 135 psig.

When the Cooling Operation Mode jumper is installed in the "Comfort Mode" the suction pressure setpoint is 125 psig.

Heating Operation Mode Jumper

The Heating Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump thermostat, the compressor capacity is controlled to maintain the target liquid pressure setpoint. The Heating Operation Mode Jumper has two selectable heating modes. The two modes are Efficiency (Jumper installed on Pins 1 & 2) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode. The Efficiency mode has a variable liquid pressure setpoint that will vary with the outdoor temperature; as the outdoor temperature decreases, the liquid pressure setpoint will increase. When the Operation Mode jumper is installed in the "Comfort Mode" the liquid pressure setpoint is 425 psig.

Unit Operation

EL22XPV Unit Operation with a S40 Communicating Thermostat

When the EL22XPV unit is installed with a S40 Communicating Thermostat and communicating indoor unit, the unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity based upon thermostat demand in both the cooling and heat pump heating mode. The indoor air volume will be controlled to match compressor capacity throughout the capacity range.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat – Cooling Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. The Y2 second stage cooling demand will initiate second stage blower operation. Increased air volume will increase the load on the indoor coil and increase the suction pressure. The EL22XPV compressor capacity will continue to be controlled based upon the suction pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat - Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 first stage compressor demand will initiate compressor operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The Y2 second stage compressor demand will initiate second stage blower operation. Increased air volume will increase heat transfer on the indoor coil and decrease the liquid pressure. If the liquid pressure drops below the target setpoint, the compressor capacity will be increased. The EL22XPV compressor capacity will continue to be controlled based upon the liquid pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating Single-Stage Heat Pump Thermostat – Cooling Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and cooling indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. If the cooling demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity.

If the compressor demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

Defrost Function

The outdoor unit control measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller self-calibrates (see figure 33) when the defrost system starts and after each system defrost cycle. The outdoor unit control monitors ambient temperature, outdoor coil temperature, and total run-time to determine when a defrost cycle is required. The coil temperature sensor is designed with a spring clip to secure the sensor to the outdoor TXV distributor. The location of the coil sensor is important for proper defrost operation (see figures 2 and 3 on pages 6 and 7 for the proper location of the coil sensor).

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

DEFROST OPERATING MODES

The outdoor control has three operational modes:

- Defrost calibration
- Operation

- Defrost test

DEFROST TERMINATION TEMPERATURES

The defrost termination temperature setting selections (50, 70, 80, 90, and 100°F) are available through the thermostat interface. The factory default setting is **50°F (10°C)**.

NOTE - Colder climates may require a higher defrost termination temperature setting to maintain a clear coil.

Defrost Test

The EL22XPV defrost cycle can be tested for defrost diagnostic purposes or during service procedures to initiate a defrost cycle to clear the outdoor coil of frost or ice. The EL22XPV may be placed into a forced defrost mode by using the Outdoor Unitary Control push button.

To Initiate a Forced Defrost Cycle Using the Unitary Control Push Button

- 1 - While the EL22XPV is operating in the heating mode, press push button until solid "-" is displayed to enter Field Test Mode and then release the button.
- 2 - Press and hold the button until "d" is displayed for forced defrost cycle, then release the button. Press the button again while the display is flashing "d" to select the forced defrost mode.
- 3 - The EL22XPV will enter a forced defrost cycle and "d" + "F" will be displayed on the 7-segment display.
- 4 - The 30-second Shift Delay will be observed. The compressor and outdoor fan will cycle off. After a 4-second delay, the reversing valve will be energized and will shift to the "cool" position. After a 26-second delay, the compressor will restart and will run at the maximum cooling speed in the defrost cycle to defrost the coil.
- 5 - Coil "c" and Ambient "A" temperature will be displayed on the 7-segment display.

The Forced Defrost Cycle will end when any of the following conditions are met:

- The defrost cycle will terminate upon reaching the defrost termination temperature setting set on Unitary Control/
- Defrost cycle will terminate at the maximum allowable defrost time of 14 minutes has been reached.
- The defrost cycle will terminate after 10 seconds if the outdoor ambient temperature is 65°F or greater to prevent opening of the the high pressure switch.
- The unitary control push button is pressed to terminate the forced defrost cycle test.

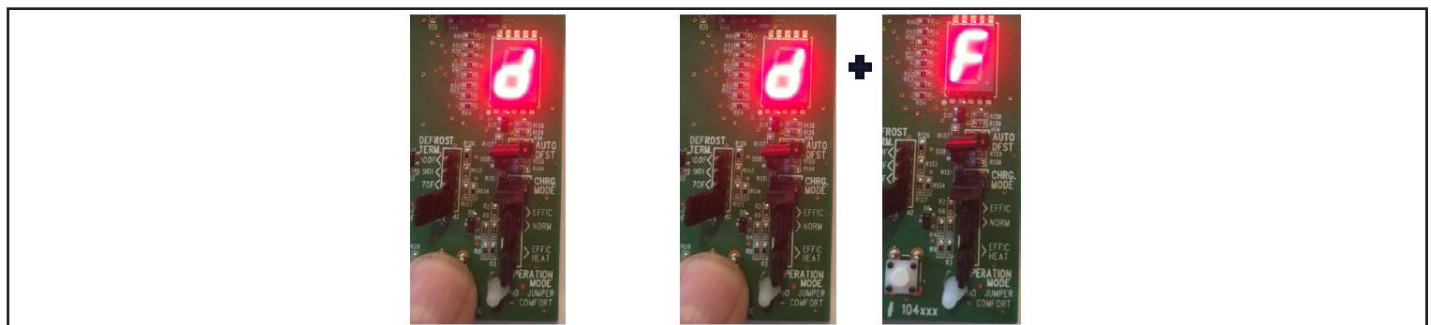


TABLE 6

Outdoor Control Terminal Designations and Input /Outputs (see figure 15 for terminal locations)				
Designator	Description	Input	Output	Common
O	O Reversing Valve Input (24VAC conventional Heat Pump Thermostats only)	24VAC	Switched 24VAC nominal	N/A
REV	Reversing valve output	N/A	Switched 24VAC nominal	24VAC common
LPS	Low pressure switch	N/A	24VAC nominal	N/A
LPS	Low pressure switch sensing connection	24VAC Nominal	N/A	N/A
HPS	High pressure switch	N/A	24VAC nominal	N/A
HPS	High pressure switch sensing connection	24VAC nominal	N/A	N/A
TP	Top cap thermostat switch (in series with the HPS)	N/A	24VAC nominal	N/A
TP	Top cap thermostat switch sensing connection	24VAC nominal	N/A	N/A
Cntctr	Control (inverter power) contactor switched output (in series with the HPS and TC)	N/A	Switched 24VAC nominal	N/A
Cntctr	Contactor common	N/A		24VAC common
FPWM	PWM fan output	N/A	10-97% duty cycle, 19-23 VDC peak	
C	PWM fan common connection	N/A	N/A	Fan PWM common
P10 (PSC Fan 1/4" QC)	1/4" QC terminals - Switched output for PSC outdoor fan control (not used on EL22XPV heat pumps)	N/A	Switched 230VAC Nominal	N/A
RAST Connector Terminal Designations				
W	24VAC Output for defrost auxiliary heat output	N/A	24VAC nominal	N/A
L	24VAC input to initiate load shed	24VAC nominal from load shed N.O. contacts (close to initiate load shed)	N/A	N/A
Y2	Y2 second stage cooling input when a conventional 24VAC non-communicating thermostat is used. Must be jumpered to Y1 if a single stage cooling thermostat is used	24VAC nominal from thermostat	N/A	N/A
Y1	Y1 first stage cooling input when a conventional 24VAC non-communicating thermostat is used	24VAC nominal from thermostat	N/A	N/A
O	O Reversing Valve Input (24VAC conventional Heat Pump Thermostats only)	24VAC nominal from thermostat	N/A	N/A
DS	Dehumidification input - not used	N/A	N/A	N/A
C	24VAC nominal power return	N/A	N/A	24VAC common
I-	Low data line	Data	Data	N/A
I+	High data line	Data	Data	N/A
R	24VAC nominal power input	24VAC nominal board main power input	N/A	N/A
DF	OEM test	N/A	N/A	N/A
TST	OEM test pin	24VAC nominal	N/A	N/A

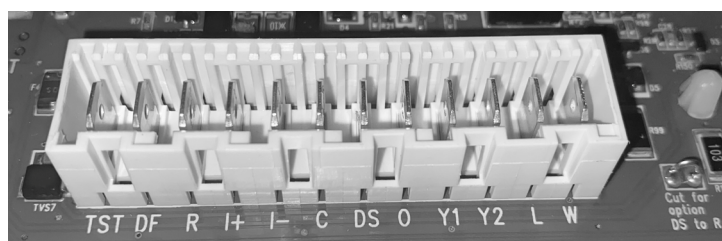


Table 6 continued

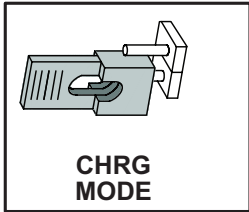
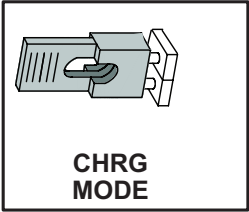
Outdoor Control Terminal Designations and Inputs / Outputs				
WARNING - Electric Shock Hazard. Can cause injury or death. Unit must be grounded in accordance with national and local codes. The 4 pins in P6 have the potential of transferring up to 250 volts to the unit cabinet ground.				
Designator		Description	Input	Output
P6 - Pin 1	Tx	Transmit data to inverter, connects to Rx of inverter	Outdoor control communication transmit pin	– Pin 1 to pin 2 should read 4.5 to 5.55 VDC when not communicating – Pin 3 to pin 2 should read 4.5 to 5.55 VDC when not communicating – Pin 4 to pin 2 should read 4.5 to 5.5 VDC NOTE - Communication signals switch off and on rapidly. This may cause volt meter readings to fluctuate. This is normal. Communication signals will switch between this 5V and common (Pin 2).
P6 - Pin2	Inverter Common	Inverter common NOTE – This is a signal reference point and not an earth ground.	Inverter common	
P6 - Pin 3	Rx	Receive data from the inverter Connects to Tx of inverter	Outdoor control communication receive pin	
P6 - Pin 4	Inv 5V	Inverter 5VDC volts	Inverter 5VDC volts	
DIS		Discharge Line temperature sensor - not used (10K ohm resistor installed)	N/A	N/A
DIS		Discharge Line temperature sensor - not used (10K ohm resistor installed)	N/A	N/A
AMB		Outdoor ambient temperature sensor supply	N/A	N/A
AMB		Outdoor ambient temperature sensor return	N/A	N/A
COIL		Outdoor coil temperature sensor	N/A	N/A
COIL		Outdoor coil temperature sensor	N/A	N/A
CHRG MODE		Charge Mode function. Can be used when charging, checking charge, pump down or checking unit operation. Unit will run at 100% capacity. Conventional 24VAC heat pump thermostat - Cooling mode 1. Provide a Y1 compressor demand and a O Reversing Valve signal to the EL22XPV 2. Install the Charge Mode jumper (after the Y1 demand) 3. A blower demand must be provided to the indoor unit for 100% of the cooling air volume. 4. Remove the charge mode jumper to end the charge mode Conventional 24VAC Heat Pump Thermostat - Heating Mode 1. Provide a Y1 compressor heating demand (without an O demand) 2. Install the Charge Mode jumper (after the Y1 demand) 3. A blower demand must be provided to the indoor unit for 100% of the heating air volume. 4. Remove the charge mode jumper to end the charge mode. S40 Communicating Thermostat 1. Install the Charge Mode jumper 2. Unit will start and run at 100% capacity and communicate to the indoor unit to bring on the blower at 100% of the cooling air volume. 4. Remove the charge mode jumper to end the charge mode NOTE - If the charge mode jumper is in the ON position during power-up, it is ignored. NOTE - If the charge mode is left in place, it will be ignored after 60 minutes.	Charge Mode Disabled  Charge Mode Enabled 	

Table 6 continued

Designator	Description	Input	Output	Common
Suction Pressure Out	Pressure transducer Supply Voltage Pin 1 of 3		5 VDC	
Suction Pressure In	Pressure transducer output voltage Pin 2 of 3	0.5-4.5 VDC		
Suction Pressure GND	Pressure transducer GND Pin 3 of 3			VDC Com
Liquid Pressure Out	Pressure transducer Supply Voltage Pin 1 of 3		5 VDC	
Liquid Pressure In	Pressure transducer Supply Voltage Pin 2 of 3	0.5-4.5 VDC		
Liquid Pressure GND	Pressure transducer GND Pin 3 of 3			VDC Com
SUCT1	Suction Line Temperature Sensor Supply - Pin 1 of 4	2.680k ohms to 327.3k ohms		
SUCT2	Suction Line Temperature Sensor Supply - Pin 2 of 4	2.680k ohms to 327.3k ohms		
LIQ1	Liquid Line Temperature Sensor Supply - Pin 3 of 4	2.680k ohms to 327.3k ohms		
LIQ2	Liquid Line Temperature Sensor Supply - Pin 4 of 4	2.680k ohms to 327.3k ohms		

Servicing Units Delivered Void of Charge

If the outdoor unit is void of refrigerant, clean the system using the procedure described below.

- 1 - Leak test the system using the procedure outlined on page 22.
- 2 - Evacuate the system using procedure outlined on page 24.
- 3 - Use nitrogen to break the vacuum and install a new filter drier in the system.
- 4 - Evacuate the system again using procedure outlined on page 24.
- 5 - Weigh in refrigerant using procedure outlined in figure 53.
- 6 - Monitor the system to determine the amount of moisture remaining in the oil. It may be necessary to replace the filter drier several times to achieve the required dryness level. **If system dryness is not verified, the compressor will fail in the future.**

Unit Start-Up

IMPORTANT

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

- 1 - Rotate fan to check for binding.
- 2 - Inspect all factory- and field-installed wiring for loose connections.
- 3 - After evacuation is complete, open both the liquid and vapor line service valves to release the refrigerant charge contained in outdoor unit into the system.
- 4 - Replace the stem caps and tighten to the value listed in table 1.
- 5 - Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit's nameplate. If not, do not start the equipment until you have consulted with the power company and the voltage condition has been corrected.
- 6 - Set the thermostat for a cooling demand. Turn on power to the indoor unit and close the outdoor unit disconnect switch to start the unit.
- 7 - Recheck voltage while the unit is running. Power must be within range shown on the nameplate.
- 8 - Check system for sufficient refrigerant by using the procedures listed in the System Refrigerant section on page 84.

System Operation and Service

7-SEGMENT ALERT AND SYSTEM STATUS CODES

Alert codes are displayed using the 7-segment display located on the outdoor control.

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification).

The 7-segment will display an abnormal condition (error code) when detected in the system. A list of the codes are shown in table 6.

Resetting Alert Codes

Alert codes can be reset manually or automatically:

1 - Manual Reset

Manual reset can be achieved by one of the following methods:

- Disconnecting R wire from the outdoor control R terminal.
- Turning the indoor unit off and back on again

After power up, all currently displayed codes are cleared.

2 - Automatic Reset

After an alert is detected, the outdoor control continues to monitor the unit's system and compressor operations. When/if conditions return to normal, the alert code is turned off automatically.

NOTE - Error codes can be recalled by following information shown in the table on page 37.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
N/A	N/A	ON	OFF	N/A	EL22XPV-024, -036 only: Indicates inverter is operating normally.	
N/A	N/A	ON	OFF	N/A	EL22XPV-048, -060 only: Indicates inverter is operating normally.	
N/A	N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.	
E105	N/A	N/A	N/A	Service Soon	Wiring issue	- - -
E120	N/A	N/A	N/A	Service Soon	There is a delay in the outdoor unit responding to the system.	Typically, this alarm/code does not cause any issues and clears on its own. The alarm/code is usually caused by a delay in the outdoor unit responding to the thermostat. Check all wiring connections. Cleared after unresponsive device responds to any inquiry.
E124	N/A	N/A	N/A	Service Urgent	The S40 thermostat has lost communication with the outdoor unit for more than 3 minutes.	Equipment lost communication with the thermostat. Check the wiring connections and resistance, then cycle the system power. This alarm stops all associated HVAC operations and waits for a signal from the non-communicating unit. The alarm / fault clears after communication is re-established.
E125	N/A	N/A	N/A	Service Urgent	There is a hardware problem with the outdoor control.	There is a control hardware problem. Replace the outdoor control if the problem prevents operation and is persistent. The alarm / fault is cleared 300 seconds after the fault recovers.
E131	N/A	N/A	N/A	Service Urgent	The outdoor unit control parameters are corrupted.	Reconfigure the system. Replace the control if heating or cooling is not available.
E132	N/A	N/A	N/A	Service Urgent	Internal software error.	Replace outdoor control.
E180	N/A	N/A	N/A	Service Urgent	The outdoor unit ambient temperature sensor has malfunctioned. As a result the outdoor unit control will not perform low ambient cooling.	Valid temperature reading is lost during normal operation and after outdoor control recognized sensors. Compare outdoor sensor resistance to temperature/ resistance charts in unit installation instructions. Replace sensor pack if necessary. At the beginning of (any) configuration, furnace or airhandler control detects the presence of the sensor(s). If detected (reading in range), appropriate feature is shown in the S40 thermostat About screen. The alarm / fault clears upon configuration, or when normal values are sensed.
E181	N/A	N/A	N/A	Service Soon	Suction pressure transducer fault.	Suction pressure transducer is out of range. The signal should be between 0.5 VDC and 4.5 VDC between blue and black. The error code will be cleared when proper signal is provided. System controlled by a conventional 24VAC heat pump thermostat will operate in the staged mode.
E182	N/A	N/A	N/A	Service Soon	Suction temperature sensor has malfunctioned.	Check temperature sensor in the applicable installation and service procedure. Nominal resistance is 10K Ohms at 77F.
E183	N/A	N/A	N/A	Service Soon	Liquid Pressure Transducer Fault	Liquid pressure transducer is out of range. The signal should be between 0.5 VDC and 4.5 VDC between Blue and Black. The error code will be cleared when the proper signal is provided. Systems controlled by a conventional 24VAC heat pump thermostat will operate in stage mode.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E345	N/A	N/A	N/A	Service Urgent	Heat Pump or Air Conditioner Alert Code - The "O" relay on the outdoor board has failed.	Either the pilot relay contacts did not close, the relay coil did not energize the circuit that confirms this operational sequence is not sensing properly.
E409	N/A	N/A	N/A	Service Soon	Outdoor control secondary voltage is 18VAC or less.	Secondary voltage is below 18VAC. After 10 minutes, operation is discontinued. Check the indoor line voltage and transformer output voltage. The alarm clears after the voltage is higher than 20VAC for 2 seconds or after a power reset.
E410	N/A	N/A	N/A	Service Soon	The outdoor unit cycled off due to low suction pressure.	Unit pressure is below the lower limit. The system is shut down. The suction pressure transducer emulates a low pressure switch, the unit does not have a low pressure switch. The cut-out is set at 40 PSIG and the cut-in set at 90 PSIG. Confirm that the system is properly charged with refrigerant. Check TXV, indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after the pressure rises above 90 PSIG.
E411	N/A	N/A	N/A	Service Urgent	The low pressure fault has occurred 5 times within one hour. As a result, the outdoor unit is locked out.	Low pressure fault error count reached 5 strikes. The low pressure cut-out is at 40PSIG and resets at 90PSIG. Confirm that the system is properly charged with refrigerant. Check for clogged TXV, blockage to indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after a power reset.
E412	N/A	N/A	N/A	Service Soon	The outdoor unit high pressure switch has opened.	Unit pressure is above the upper limit. System is shut down. The high pressure switch opens at 590PSIG and closes at 418PSIG. Confirm that the system is properly charged with refrigerant. Check for clogged TXV, blockage to indoor unit blower motor, clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after the pressure switch closes or a power reset. For heating, indoor CFM may be set too low. For zoning system, zone CFM may be set too low.
E413	N/A	N/A	N/A	Service Urgent	The high pressure switch has opened 5 times within one hour. As a result, the outdoor unit is locked out.	Open high pressure switch error count reached 5 strikes. System is shut down. The high pressure switch for HFC410A opens at 590PSIG and closes at 418PSIG. Confirm that the system is properly charged with refrigerant. Check condenser fan motor, for clogged TXV, for blockage to indoor unit blower motor, for stuck reversing valve or clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after a power reset. For heating, indoor CFM may be set too low. For zoning system, zone CFM may be set too low.
E416	N/A	N/A	N/A	Service Soon / Service Urgent	The outdoor coil sensor has malfunctioned.	EL22XPV has a fixed 10K ohm resistor installed on the harness connector between pins 5 & 6. Check connections on pins 5 & 6 and check for resistance of 10K ohms. Error code will occur on open or shorted circuit
E422	N/A	N/A	N/A	Service Soon	Compressor top cap switch exceeding thermal limit.	The top of the compressor is hot. Refrigerant charge may be low, or low mass flow of refrigerant. Check TXV, clogged filter drier, condenser fan motor, indoor blower motor, confirm indoor coil is clean.
E423	40	4 flashes	OFF	Service Soon / Service Urgent	The inverter has detected a circuit problem.	Control locks out after 10 strikes within an hour. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E424	N/A	N/A	N/A	Service Soon	The liquid line temperature sensor has malfunctioned.	Check connections between pin 3 and 4 of the four pin liquid/suction temperature plug on the bottom left corner of the control. Check resistance of resistor. Nominal 10K Ohms at 77°F. Error code occurs if sensor is open or shorted.
E425	N/A	N/A	N/A	Dealer Info Only	Outdoor control has increased minimum compressor speed to allow for proper oil return due to low ambient temperature. NOTE - Minimum speed adjustments begin at 45°F and increase to 100% minimum at 17°F.	Outdoor ambient temperature is below system limit. Control attempts to run at lowest allowed compressor speed to allow for proper oil return. Automatically clears when outdoor ambient temperature rises above limit for more than 5 minutes.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E426	N/A	N/A	N/A	Service Urgent	Excessive inverter alarms	After ten faults within one hour, control is locked out, indicating poor system operation. Review history of alarms to resolve system setup. Check condenser fan motor, TXV, indoor unit blower motor, over-charge, undercharge, or clogged refrigerant filter. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power. Inverter alarms 12 to 14 and 53 do not count toward this lock out condition.
E427	21	2 flashes	1 flash	Service Soon / Service Urgent	The inverter has detected a DC peak fault condition. If condition (55A or higher) is detected, outdoor unit compressor and fan stop. Anti-short cycle is initiated. If peak current (55A or higher) occurs 10 times within an hour, system is locked out. Indicates high pressure, condenser fan failure, locked compressor rotor or overcharge. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.	
E428	22	2 flashes	2 flashes	Service Soon / Service Urgent	The inverter has detected a high main input current condition.	If condition is detected, is detected, outdoor unit compressor and fan stop. Antishort cycle is initiated. If condition occurs 5 times within an hour, system is locked out. Indicates high pressure, condenser fan failure or overcharge. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E429	23	2 flashes	3 flashes	Service Soon / Service Urgent	On a call for compressor operation, if DC link power in inverter does not rise above 180 VDC for 2 and 3 ton models, 250 VDC for 4 and 5 ton models, within 30 seconds, the control will display a moderate code. If condition is detected, outdoor unit will stop (Compressor and fan). Antishort cycles is initiated. If condition occurs 10 times within a 60 minute rolling time period, system will lock out and display a critical code.	Issues: (1) If DC link power in inverter does not rise above 180 VDC for 2- and 3-ton models, 250 VDC for 4- and 5-ton models, within 30 seconds, the outdoor control will display a moderate code. (2) Capacitors on inverter do not properly charge. Corrective Actions: (1) Check for proper main power to outdoor unit and for any loose electrical connections.
E430	26	2 flashes	6 flashes	Service Soon / Service Urgent	Compressor start failure	If condition is detected, outdoor unit compressor and fan stop. Antishort cycle is initiated. If condition occurs 10 times within an hour, system is locked out. Indicates poor connection at compressor harness, improper winding resistance, locked compressor rotor, or flooded compressor. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E431	27	2 flashes	7 flashes	Service Soon / Service Urgent	Error occurs when PFC detects an over-current condition of 100A, the control will display a moderate code. If condition is detected, outdoor unit will stop (Compressor and fan). Anti-short cycle is initiated. Inverter is unavailable to communicate with the outdoor control for 3 minutes. If condition occurs 10 times within a 60 minute rolling time period, system will lock out and display a critical code.	Issues: (1) Indicates power interruption, brownout, poor electrical connection or loose inverter input wire. (2) System testing was set up and code was generated when the reversing valve is de-energized coming out of defrost (code appears with or without 30 compressor delay). Corrective Actions: (1) Check for proper main power to outdoor unit and for any loose electrical connections. (2) To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E432	28	2 flashes	8 flashes	Service Soon / Service Urgent	The inverter has detected a DC link high voltage condition	Error occurs when the DC link capacitor voltage is greater than 480VDC. If condition is detected, outdoor unit compressor and fan stop. Anti-short cycle is initiated. If condition occurs 10 times within an hour, system is locked out. System stops. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E433	29	2 flashes	9 flashes	Service Soon / Service Urgent	The inverter has detected a compressor over-current condition.	Error occurs when compressor peak phase current is greater than 28A. Inverter issues code 14 first and slows down to try to reduce the current. If the current remains high, outdoor unit compressor and fan stop. Anti-short cycle is initiated. If condition occurs five times within an hour, system is locked out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E434	53	5 flashes	3 flashes	Service Soon / Service Urgent	Outdoor control has lost communications with the inverter for greater than 3 minutes. Outdoor unit will stop all compressor demand. Outdoor control will attempt to establish communication multiple times and will automatically clear when the error clears. Unit will lock out after 60 minutes if communication is not established and will display a critical error code.	Issues: (1) Outdoor disconnect is off or outdoor power is off, when indoor power is on (source for 24VAC) (2) Loose electrical power connections (3) interruption of main power to the inverter (4) Generator powers indoor unit, but not the outdoor unit. Corrective Actions: (1) To reset, cycle the indoor power off (source of 24VAC to outdoor unit) and back on. This will de-energize outdoor control and inverter by cycling the contactor. (2) Make sure the disconnect is on (3) check electrical power supply connections (4) Check for proper main 230V power supply
E435	60	6 flashes	OFF	Service Soon / Service Urgent	Inverter internal error	When this error occurs, the outdoor control cycles power to the inverter by opening the contactor for two minutes. Check that the EEPROM is properly seated. After power is cycled to the inverter 3 times, the outdoor unit is locked out. If problem persists, replace the inverter.
E436	62	6 flashes	2 flashes	Service Soon / Service Urgent	Inverter heat sink temperature exceeded limit. Occurs when the heat sink temperature exceeds the inverter limit. Inverter issues code 13 first, then slows down to allow the heat sink to cool. If temperature remains high, outdoor unit stops (compressor and fan). Anti-short cycle is initiated. If condition occurs 5 times within an hour, system is locked out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.	Issue: This error may occur if the outdoor fan fails to operate or the inverter heat sink is obstructed with debris. Feedback from supplier tear down of inverter indicates that the screws that hold the inverter to the inverter board were loose causing poor contact between these two components. Corrective Action: Tighten screws that hold the heat sink to the inverter control board. NOTE: Wait five minutes to allow capacitor to discharge before checking screws.
E437	65	6 flashes	5 flashes	Service Soon / Service Urgent	Heat sink temperature sensor fault has occurred (temperature less than 4°F or greater than 264°F after 10 minutes of operation).	Occurs when the temperature sensor detects a temperature less than 0.4°F or greater than 264°F after 10 minutes of operation. If condition is detected, outdoor unit will stop (compressor and fan). Anti-short cycle is initiated. If condition occurs 5 times within an hour, system will lock out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power. If problem persists, replace inverter.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E438	73	7 flashes	3 flashes	Service Soon / Service Urgent	The inverter has detected a PFC over current condition. This would be caused by a high load condition, high pressure, or outdoor fan failure. Outdoor control will display the code when the inverter has the error. After 3 minutes, the inverter will reset and the compressor will turn on again. If it happens 10 times within a 60 minute rolling time period, the OD control will lock out operation of the outdoor unit and display a critical code.	Issue: Possible issue is system running at high pressures. Check for high pressure trips or other alert codes in room thermostat and outdoor control. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E439	12	1 flash	2 flashes	Dealer Info Only	Compressor slowdown due to high input current.	This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the input current and will then resume normal operation.
E440	13	1 flash	3 flashes	Dealer Info Only	Heat sink temperature is approaching limit. The compressor speed automatically slows to reduce heat sink temperature. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared.	This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110°F) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occurs frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 167°F and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 150°F. The heat sink temperature, compressor speed in Hertz and the Inverter Compressor Speed Reduction status ("On" or "Off ") notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center on units installed with an S40 thermostat.
E441	14	1 flash	4 flashes	Dealer Info Only	Compressor slowdown due to high compressor current. Compressor current is approaching limit. The compressor speed automatically slows. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared.	This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor as the currently increases rapidly during startup. The inverter will reduce the compressor speed by 4 hz and slow the compressor ramp up speed to the requested compressor demand (capacity). This is normal and expected operation of the inverter to control the compressor within design parameters. In most cases the alert code 441 does not require any additional service or diagnostic procedures. E441 may also occur if the system is operating at high pressures.
E442	N/A	N/A	N/A	Service Urgent	The top cap switch has opened five times within one hour. As a result, the outdoor unit is locked out.	When compressor thermal protection sensor opens five times within one hour, outdoor stops working. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E443	N/A	N/A	N/A	Service Urgent	Incorrect appliance unit size code selected.	Check for proper configuring of unit size codes for outdoor unit in configuration guide or in installation instructions. If replacing inverter, verify inverter model matches unit size. The alarm/fault clears after the correct match is detected following a reset. Remove the thermostat from the system while applying power and reprogramming.
E600	N/A	N/A	N/A	Dealer Info Only	Compressor has been cycled OFF on utility load shedding.	Load shedding function: Provides a method for a local utility company to limit the maximum power level usage of the outdoor unit. The feature is activated by applying 24 volts AC power to the L and C terminals on the outdoor control.

TABLE 7. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE – System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E601	N/A	N/A	N/A	Dealer Info Only	Outdoor unit has been cycled OFF on low temperature protection.	Low temperature protection: Outdoor unit will not operate when the outdoor temperature is at or below -4°F (-20°C). If the unit is operating and the outdoor temperature drops below -4°F (-20°C), the unit continues to operate until the room thermostat is satisfied or the outdoor temperature drops to -15°F (-26°C). Outdoor unit ambient sensor provides temperature readings.

POWER-UP / RESET:

7-SEGMENT POWER-UP DISPLAY STRING

FIRMWARE VERSION: During initial power-up or reset, the first item displayed is the outdoor control firmware version. Example to the right shows firmware version 2.3.

→ 2 . 3

UNIT TYPE: The next item displayed is the self discovery unit type. AC = air conditioner and HP = heat pump. If the unit type cannot be determined, three bars appear.

→ A C OR H P OR ≡

UNIT NOMINAL CAPACITY: The next item to be displayed is the self-discovery unit nominal capacity. Valid capacities are 24 for 2-ton, 36 for 3-ton, 48 for 4-ton and 60 for 5-ton units. If the unit type cannot be determined, three bars appear.

→ 2 4 OR ≡

UNIT CODE: The next item to be displayed is the self discovery unit code. (may be a single character or two characters). If the unit code cannot be determined, three bars appear.

→ 6 4 THROUGH 6 7 OR ≡

(These are just examples of firmware version, unit type, unit nominal capacity and unit codes.)

UNIT CODE	UNIT TYPE, SIZE AND MODEL	
≡	NOT PROGRAMMED	
6 4	2-TON HEAT PUMP	EL22XPV-024
6 5	3-TON HEAT PUMP	EL22XPV-036
6 6	4-TON HEAT PUMP	EL22XPV-048
6 7	5-TON HEAT PUMP	EL22XPV-060

7-SEGMENT POWER-UP DISPLAY STRING EXAMPLE

2 . 3	A C	2 4	6 4	.
FIRMWARE VERSION	UNIT TYPE	UNIT CAPACITY	UNIT CODE	IDLE MODE

FIGURE 17. Outdoor Control 7-Segment Unit Status Displays

TABLE 8. Outdoor Control 7-Segment Unit Status Displays

Description	Example of Display
Idle Mode: Decimal point flashes at 1 Hz.	Idle Mode: Decimal point flashes at 1 Hz (0.5 second on, 0.5 second off). Display OFF.
Soft Disable Mode: Top and bottom horizontal line and decimal point flash at 1 Hz. If indoor or outdoor control displays Soft Disable code: 1) Confirm proper wiring between all devices (thermostat, indoor and outdoor). 2) Cycle power to the control that is displaying the Soft Disable code. 3) Put the room thermostat through Setup. 4) Go to Setup/System Devices/Thermostat/Edit/push Reset. 5) Go to Setup/System Devices/Thermostat/Edit/push Reset All. If the room thermostat detects a new device or a device that is not communicating, it sends a Soft Disable. When this occurs, Alarm 10 is activated and the room thermostat sends a Soft Disable command to the offending device on the bus (outdoor control, IFC, AHC, EIM or Damper Control Module).	Soft Disable Mode: Top and bottom horizontal line and decimal point flash at 1 Hz (0.5 second on, 0.5 second off). The control in Soft Disable Mode is indicated by the following: • On AHC, IFC and outdoor controls, Soft Disable Mode is indicated by flashing double horizontal lines on the 7-segment display. • On the Damper Control Module and EIM, the green LED will blink 3 seconds on and 1 second off.
O.E.M. Test Mode	All segments flashing at 2 Hz (unless error is detected). NOTE - Control should be replaced.
Anti-Short-Cycle Delay	The middle line flashes at 1 Hz for 2 seconds, followed by a 2-second display of the number of minutes left on the timer (value is rounded up: 2 min. 1 sec. is displayed as 3). If activated, the anti-short cycle delay time remaining is displayed (default is 300 sec./5 min.).
Cooling Capacity: Shows cooling stage C1 or C2 operating if non-communicating. Shows cooling capacity percentage i.e. C70 operating if installed with a S40 communicating thermostat. Example to the right indicates a cooling demand of 50 percent.	Cooling compressor capacity (1second on, 0.5 second off) followed by ambient temperature. Non-Communicating thermostat with second stage cooling active and ambient of 95F : C 2 pause A 9 5 repeat. S40 communicating thermostat with 70% demand and ambient of 95F: C 7 0 pause A 9 5 Repeat C 5 0 pause A 7 6
Diagnostic recall: Shows the last 10 stored diagnostic error codes.	If first error is E 2 5 0, second E 2 3 1 pause E 2 5 0 pause E 2 3 1 Next codes (up to 10) are shown using same method.
Fault memory clears	If there are no error codes stored: E pause 0 0 0. After the fault memory is cleared, the following string flashes every 0.5 seconds: 0 0 0 0 pause
Active error in outdoor control Idle mode: Show all active error(s) codes.	Following display string is repeated if Error E 125 and E 201 are present: E 1 2 5 pause E 2 0 1
Active error in run mode: Show current status and all active error(s) codes.	Following display string is repeated if Error E 440 is present while cooling demand is 80 percent: C 8 0 pause E 4 4 0
Outdoor Ambient Temperature (OAT): Any time OAT is within operating range, value is displayed if unit is in diagnostic and non-diagnostic modes.	Following display string is repeated if cooling is active and OAT is 104°F: C 3 5 pause A 1 0 4 pause
Liquid Line Temperature (LIQ): Any time LIQ is sensed in operating range, value is displayed if unit is in diagnostic mode or manually enabled for non-diagnostic modes.	Following display string is repeated if cooling is active and LIQ is 105°F: C 3 1 pause L 1 0 5 pause
Charge Mode: When unit is in the charge mode, Suction pressure (SPxxx), Suction Temp (Stxx.x), Superheat (SHxx.x), Liquid pressure (LPxxx), Liquid Temp (Ltxx.x) and subcooling (SCxx.x) will be scrolled on the 7-segment display	The following string is repeated: S P 1 3 5 pause S t 6 2 pause S H 1 5 pause L P 3 4 5 pause L t 9 6 pause S C 1 0 Repeat

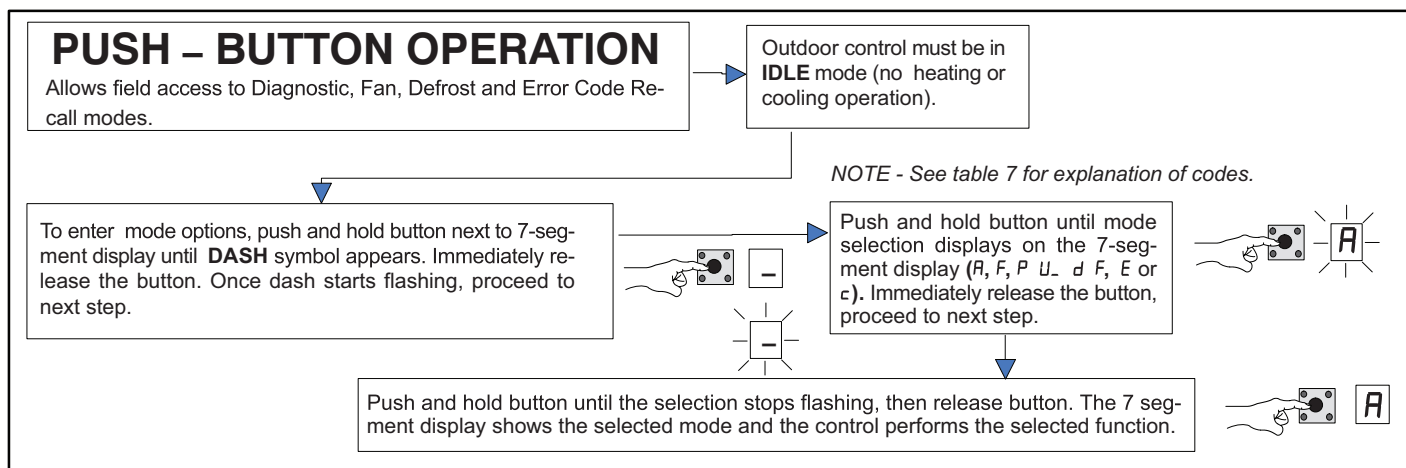


FIGURE 18. Push-Button Operation

Unit Selection Code for Outdoor Control

If the single-character display shows three (3) horizontal lines, the unit selection code needs to be programmed. Press and hold the button until the **P U** menu option is displayed, release button. The single-character display displays the selected mode per example in figure 15 on page 36. When the desired unit selection code appears, press and hold the button until it stops flashing, then release.

Unit Code	Unit Type	Unit Model
64	2-ton heat pump	EL22XPV-024
65	3-ton heat pump	EL22XPV-036
66	4-ton heat pump	EL22XPV-048
67	5-ton heat pump	EL22XPV-060

Idle mode – System is energized with no demand – Decimal flashes at 1 Hertz > 0.5 second ON. 0.5 second OFF		
Display Symbol or Character	Display	Test and Display String Option
Displayed during start-up or power recycling	Display string shows outdoor control firmware version <i>I</i> <i>L</i> <i>B</i> > pause > <i>R</i> <i>C</i> or <i>H</i> <i>P</i> unit > pause > unit capacity in BTUs > pause > unit code. If 3 horizontal bars are displayed during any sequence of this display string, it indicates that the specific parameter is not configured.	
.	Idle mode — decimal flashes at 1 Hertz > 0.5 second ON, 0.5 second OFF	
<i>C</i>	Indicates cooling Capacity. C1 or C2 if conventional 24VAC thermostat or demand percentage if S40 communicating thermostat is used i.e. C 9 0	
<i>F</i>	Indicates you are in the outdoor fan test mode	Control must be in Idle mode: To enter fan test option - <i>F</i> mode, push and hold button until solid — appears, release button. Display begins flashing. Within 10 seconds, push and hold button until required symbol <i>F</i> displays, release button. Display begins flashing. Within 10 seconds, push and hold button until display stops flashing, release button. Control will initiate outdoor fan operation. Outdoor fan cycles ON for 10 minutes at the highest speed. To exit test — Push and hold button until three horizontal bars display. Release button, outdoor fan cycles OFF .
<i>R</i>	<i>R</i> in the display string represents the ambient temperature in °F at the sensor on the outdoor unit.	Control can be in Idle or demand mode: To enter display configuration option - <i>R</i> mode, push and hold button until solid — appears, release button. Display begins flashing. Within 10 seconds, push and hold button until required symbol <i>R</i> displays, release button. Display begins flashing. Within 10 seconds, push and hold button until display stops flashing, release button. Display shows error (E) code(s) and ambient (<i>R</i>), outdoor coil (<i>c</i>) and liquid (<i>L</i>) temperatures in Fahrenheit. NOTE - If button is not pushed in the 10-second time period, the control exits the test mode. If this occurs, test mode must be repeated.
<i>d F</i>	<i>d F</i> in the display indicates Forced Defrost Mode	Enters Forced Defrost Mode. While the EL22XPV is running in the heating mode, press Push Button until a Solid "-" is displayed to Enter the Field Test Mode. Press and Hold the button until "d" is displayed for Forced Defrost Mode, the release the button. Press the button again while the display is flashing "d" to select the Forced Defrost Mode. See Defrost Test on page 32.

Error Code Recall Mode (NOTE – control must be in idle mode)	
<i>E</i>	To enter error code recall mode, push and hold button until solid <i>E</i> appears, then release button. Control displays up to 10 error codes stored in memory. If <i>E</i> <i>0</i> <i>0</i> <i>0</i> <i>0</i> is displayed, there are no stored error codes.
≡	To exit error code recall mode, push and hold button until solid three horizontal bars appear, then release button. Note - Error codes are not cleared.
<i>c</i>	To clear error codes stored in memory, continue to hold button while the 3 horizontal bars are displayed. Release button when solid <i>c</i> is displayed.
<i>c</i>	Push and hold for one (1) second, release button. 7-Segment displays 0 0 0 0 and exits error recall mode.

FIELD TEST MODE OPERATION

The field test mode allows the unit to be put into diagnostic mode and allows the installer to perform multiple tests on the control / unit.

Diagnostic Mode

Diagnostic mode is only available when the system is idle or during an active / suspended call for heating or cooling. Diagnostic mode is terminated when the exit command is given, the button is pressed and released without entering the diagnostic menu or 10 minutes has passed, whichever comes first.

When this mode is selected all installed temperature sensor valves (non-open and non-short) are shown on the 7-segment display. The following system status codes are displayed:

- Cooling
- Cooling stage or cooling percentage demand operation
- Active error codes

Outdoor Fan Mode

Diagnostic mode is only available while the system is in idle mode. This mode can be exited with the proper command or after 10 minutes has passed.

In diagnostic mode, the control energizes the outdoor fan at the highest speed.

Forced Defrost Test

EL22XPV Defrost Cycle can be tested for defrost diagnostic purposes or during service procedures to initiate a defrost cycle to clear the outdoor coil of frost or ice. The Forced Defrost Mode is initiated by the Outdoor Unitary Control push button. See Defrost Testing on page 32.

CHARGE MODE OPERATION

To initiate the EL22XPV Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

EL22XPV Charge Mode Operation with a S40 Communicating Thermostat

Installing a jumper on the Charge Mode Pins will initiate compressor operation in the cooling mode and outdoor fan motor at 100% capacity and will provide a signal to the indoor unit to initiate indoor blower operation at the maximum cooling air volume.

To exit the charge mode, remove the Charge Mode Jumper. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes if the charge mode jumper is left in place.

EL22XPV Charge Mode Operation with a Conventional 24VAC Non-Communicating Heat Pump Thermostat – Cooling Mode

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 compressor demand to the EL22XPV to initiate the Charge Mode. When using the Charge Mode in the cooling mode, the “O” must also be provided with a 24V signal to place the

reversing valve in the cool position. In the heating mode only a Y1 compressor demand is required along with the blow-er demand for the full cooling air volume. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 compressor demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes if the charge mode jumper is left in place.

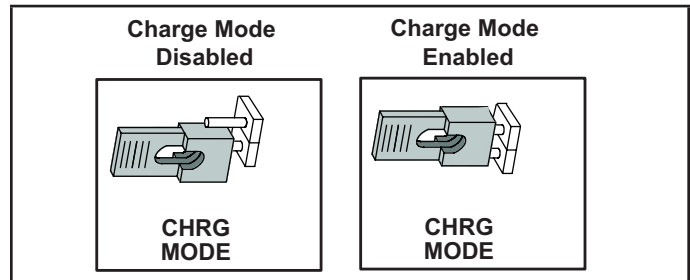


TABLE 9. Field Test, Diagnostic Recall and Program Menu Options

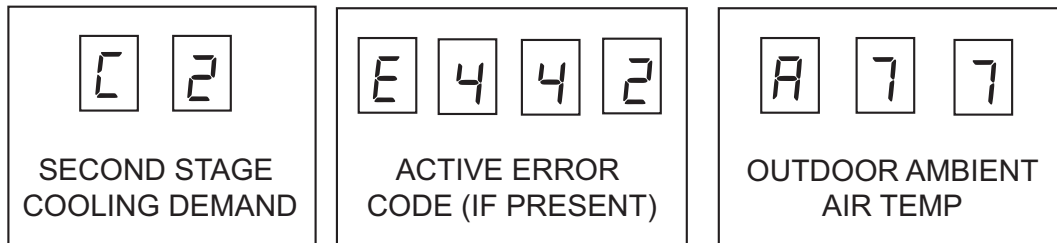
Display	Display and action (normal operation)
No Change - idle (*)	No Change - idle (*)
Solid .	Enter or exit field test and program mode.
Solid <i>A</i>	Puts unit in diagnostic mode. (Displays ambient temperatures and any active error codes.)
Solid <i>c</i>	Clears error history (**)
Solid <i>E</i>	Enter diagnostic recall mode. Displays up to 10 error codes in memory.
Solid <i>F</i>	Starts outdoor fan.
String <i>P U</i>	Enter unit code programming.
String <i>d F</i>	Enters Forced Defrost Mode (Provides Defrost Test: Initiates a Forced Defrost to Defrost the outdoor coil) See Defrost Test on page 32.

*No change indicates the display will continue to show whatever is currently being displayed for normal operations.

**Note once the error history is deleted it cannot be recovered. After the history is deleted, the unit will reset itself.

Display	Display and action (normal operation)
.	Idle mode — decimal flashes at 1 Hertz > 0.5 second ON, 0.5 second OFF
<i>c</i>	Cooling operation. Shows cooling stage C1 or C2 operating if non-communicating. Shows cooling capacity percentage i.e. <i>c 7 0</i> operating if installed with a S40 communicating thermostat. Example: <i>c 2 0</i> pause <i>A 7 5</i>
<i>E</i>	<i>E</i> in the display string represents the active error code(s) in the outdoor unit. Example: <i>c 5 0</i> pause <i>E 4 4</i> pause <i>E 4 4 2</i> pause <i>A 7 5</i> pause
<i>A</i>	<i>A</i> in the display string represents the outdoor ambient temperature in °F at the outdoor sensor on the outdoor unit. Example: <i>c 5 0</i> pause <i>A 7 5</i>
Scrolling	When unit is in the charge mode, Suction pressure (SPxxx), Suction Temp (Stxx.x), Superheat (SHxx.x), Liquid pressure (LPxxx), Liquid Temp (Ltxx.x) and subcooling (SCxx.x) will be scrolled on the 7-segment display. Example: <i>5 P 1 3 5</i> pause <i>5 t 6 2</i> pause <i>5 H 1 5</i> pause <i>L P 3 4 5</i> pause <i>L t 9 6</i> pause <i>5 c 1 0</i> Repeat

TYPICAL 7-SEGMENT ACTIVE COOLING DEMAND DISPLAY STRING



BY DEFAULT, COOLING DEMAND, ACTIVE ERROR CODES
AND OUTDOOR AMBIENT TEMPERATURE ARE DISPLAYED.

FIGURE 19. Typical 7-Segment Demand Display String

Configuring Unit

When installing a replacement outdoor control, the unit selection code may have to be manually assigned using the 7-segment display and push button on the control. The unit code sets unit type, capacity and outdoor fan profile.

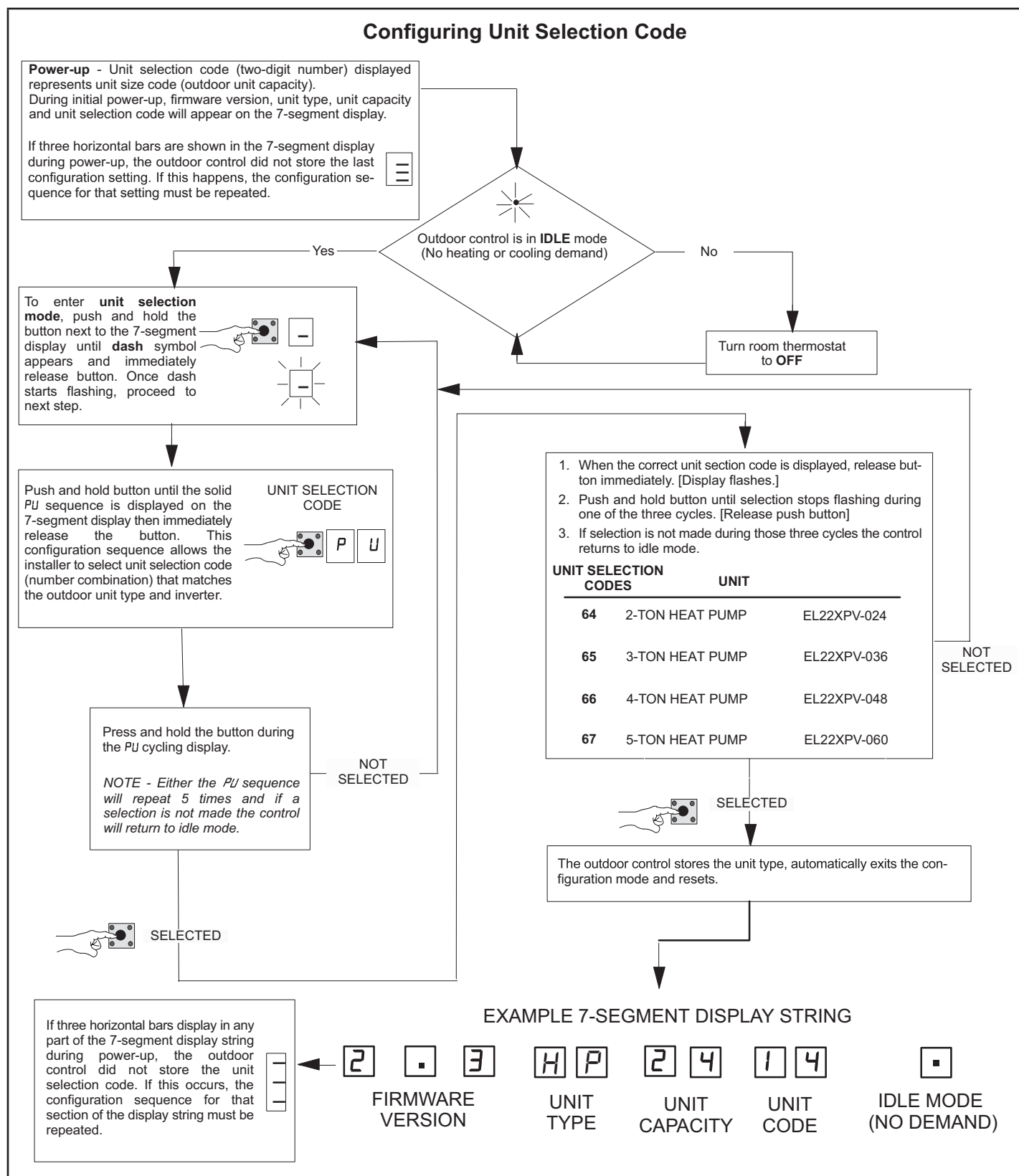


FIGURE 20. Configuring Unit Selection Code

Reconfiguring Outdoor Control using S30 or S40 Thermostat

Reconfiguring only applied to EL22XPV units installed as a fully communicating system with an S30 or S40 thermostat and communicating indoor unit.

If any component of the HVAC system is changed, e.g. replacing an outdoor sensor, reconfiguring the system is required. To begin reconfiguring a system, select the Set-up tab.

System Overview

Refer to the applicable Thermostat Installer Setup Guide for configuration procedures.

The outdoor control provides the following functions:

- Internal switching of outputs.
- Compressor anti-short-cycle delay (adjustable through the thermostat interface).
- Five-strike lockout function.
- High Pressure protection using the High Pressure Switch (S4) and Low Pressure Pressure protection using the Low Pressure Switch (S87).
- Ambient (RT13), liquid line (RT36) and suction line (RT41) temperatures for monitoring and protection.
- Suction Pressure Transducer (A168) and Liquid Pressure Transducer (A188) for monitoring and control.

COMPRESSOR PROTECTION – FIVE-STRIKE LOCK-OUT

The five-strike lockout function is designed to protect the compressor from damage. The five-strike feature is used for both high (S4) and low (S87) pressure switches.

Resetting Five-Strike Lockout

Once the condition has been rectified, power to the outdoor control R terminal must be cycled OFF.

Diagnostic Information - Installations with S40 Thermostat

The following diagnostic information is available through the thermostat's user interface. Refer to the applicable Installer System Setup Guide.

- Compressor anti-short-cycle delay timer status
- Cooling stage or cooling rate
- Compressor shift delay timer status
- High pressure switch status
- Low pressure switch status
- Suction pressure
- Liquid pressure
- Compressor top cap switch status
- Liquid line and suction line temperature
- Outdoor ambient temperature
- Compressor active alarm
- Compressor Hz

- Inverter compressor short cycle
- Heat sink temperature

Installer Test - Installations with S30 or S40 Thermostat

Verify the proper operation of the system by running the Installer Test feature through the thermostat interface. Refer to the applicable Installer System Setup Guide.

COMPRESSOR SHORT CYCLING DELAY

The outdoor control protects the compressor from:

- Short cycling (five minutes) during initial power-up.
- Interruption in power to the unit.
- Pressure or sensor trips.
- Delay after demand is removed.

The delay is set by default for 300 seconds (five minutes) but can be changed through the thermostat interface (S40 thermostat installations only).

Available settings are 60, 120, 180, 240 and 300 seconds.

CRANKCASE HEATER (HR1)

Compressors in all units are equipped with a 40-watt bellyband- type crankcase heater. HR1 prevents liquid from accumulating in the compressor. HR1 is controlled by the crankcase heater thermostat.

CRANKCASE HEATER THERMOSTAT (S40)

Thermostat S40 controls the crankcase heater in all units. S40 is located on the liquid line. When liquid line temperature drops below 50°F, thermostat S40 closes, energizing HR1. The thermostat opens, de-energizing HR1, once liquid line temperature reaches 70°F.

Defrost Function

The outdoor unit control uses a time dependent frost accumulation duration demand defrost control algorithm to provide a demand defrost when the system falls below optimum levels. The demand defrost control algorithm is reactive based upon the previous heat pump run time between defrost cycles (frost accumulation time) and the time spend in defrost (defrost time). The outdoor unit control monitors ambient temperature, outdoor coil temperature along with the compressor run time in heating mode and defrost cycle time. The outdoor unit control monitors compressor run time in the heating mode when the outdoor coil temperature is below 35°F and accumulates the frost accumulation time. Once the frost accumulation time is met the unit control will initiate a defrost cycle. The unit will run in the defrost mode until the coil temperature reaches the defrost termination temperature setpoint. The maximum length of defrost cycle is 14 minutes and the defrost cycle will automatically be terminated if the defrost cycle exceeds 14 minutes.

Two consecutive low pressure switch trips while operating in the heat pump heating mode will initiate a defrost cycle to defrost that may occur during a weather related event such as freezing rain.

Frost Accumulation Time

The frost accumulation time is the amount of time the heat pump runs in the heating mode when the outdoor coil temperature is below 35°F. The initial target frost accumulation time is 90 minutes, but the control will adjust the frost accumulation time higher or lower based upon the previous defrost cycle time history. If the defrost cycle time is short (80% or less of the defrost cycle time) the defrost accumulation time will be increased by 30 minutes. If the defrost cycle time is long (120% or more of the target defrost cycle time) the defrost accumulation time will be decreased by 30 minutes. If the defrost accumulation time is significantly longer (200% or more of the target defrost cycle time) or if the defrost terminates at the 14-minute maximum time, the frost accumulation time is set to 30 minutes. No change in the frost accumulation time is made if the frost accumulation time is close to the target defrost cycle time (between 80% and 120% of the target defrost cycle time).

Defrost Cycle Time

The defrost cycle time is the amount of time the unit operates in the defrost mode from the point the defrost cycle was initiated until the coil temperature reaches 50°F regardless of defrost termination temperature setpoint. The demand defrost control target defrost cycle time is unique for each EL22XPV heat pump model. The target defrost cycle time of EL22XPV-024 is 100s, EL22XPV-036 is 133s, EL22XPV-048 is 105s, EL22XPV-060 is 102s.

Defrost Termination Temperature

The defrost termination temperature is adjustable on the unit control using the jumper pins. If an S40 thermostat is used, this parameter may be selected at the thermostat using the dealer control center under the heat pump or remotely using the Service Dashboard on LennoxPros.

The defrost termination setting selections are 50, 70, 90 and 100°F. The factory default setting is 50°F (10°C). The defrost termination temperature is monitored by the coil sensor which is located at the outlet of the outdoor expansion valve. See coil sensor figure location below for details.

NOTE – Colder climates may require a higher defrost termination temperature setting to ensure the outdoor coil is cleared of frost during defrost. If the outdoor coil is not adequately cleared of frost, the heat pump may experience reduced heating performance or damage to the outdoor coil from the buildup of ice on the coil.

Additional Adjustable Defrost Parameters – S40 Thermostat Only

EL22XPV systems installed with an S40 Smart Thermostat have additional adjustable defrost parameters that may be set by the technician.

- Defrost Time Adder – Range 5 – 60 minutes – default 30 minutes
- Defrost Time Reducer – Range 5 – 60 minutes – default 30 minutes
- Default Frost Accumulation Time – Range 30 – 360 minutes – default 90 minutes
- Defrost Time Increase Value – Range 0% to 100% – default 80%
- Defrost Time Decrease Value – Range 100% to 200% – default 120%
- Defrost Time Reset Limit – Range 150% to 400% – default 200%
- Nominal Defrost Time – Range 20 – 840 seconds – default EL22XPV-024 – 100s, 036 – 133s, 048 – 105s, 060 – 102s

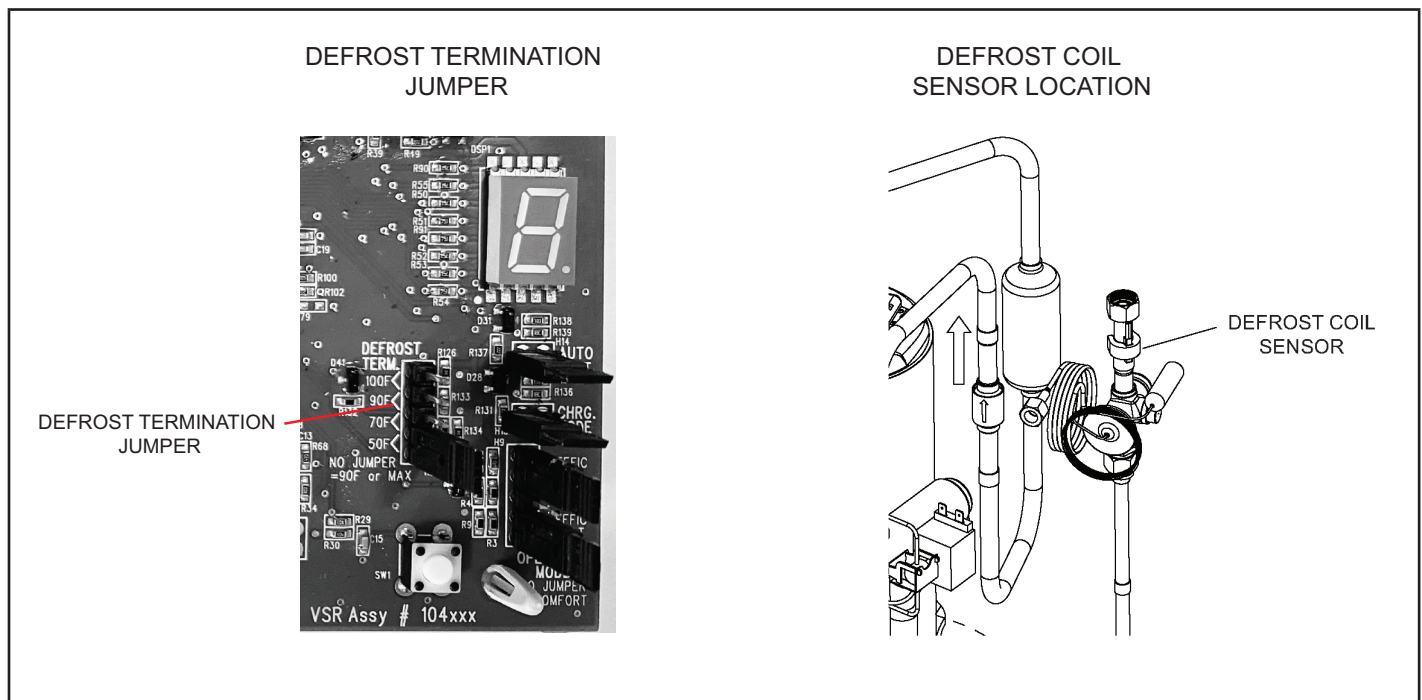


FIGURE 21. Defrost Components

Maintenance

Outdoor Unit

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

- 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 factory-lubricated 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.
- 7 - Inspect drain holes in coil compartment base and clean if necessary.

NOTE - *If insufficient heating or cooling occurs, the unit should be gauged and refrigerant charge should be checked.*

Outdoor Coil

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, fertilizers, fluids that may contain high levels of corrosive chemicals such as salts).

- Outdoor Coil — The outdoor coil may be flushed with a water hose.
- Outdoor Coil (Coastal Area) — Moist air in ocean locations can carry salt, which is corrosive to most metal. Units that are located near the ocean require frequent inspections and maintenance. These inspections will determine the necessary need to wash the unit including the outdoor coil. Consult your installing contractor for proper intervals/procedures for your geographic area or service contract.

Indoor Unit

- 1 - Clean or change filters.
- 2 - Lennox blower motors are factory-lubricated and permanently sealed. No more lubrication is needed.
- 3 - 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.
- 4 - Check all wiring for loose connections.
- 5 - Check for correct voltage at unit. (blower operating)
- 6 - Check amp draw on blower motor.

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.

Unit Wiring Diagrams

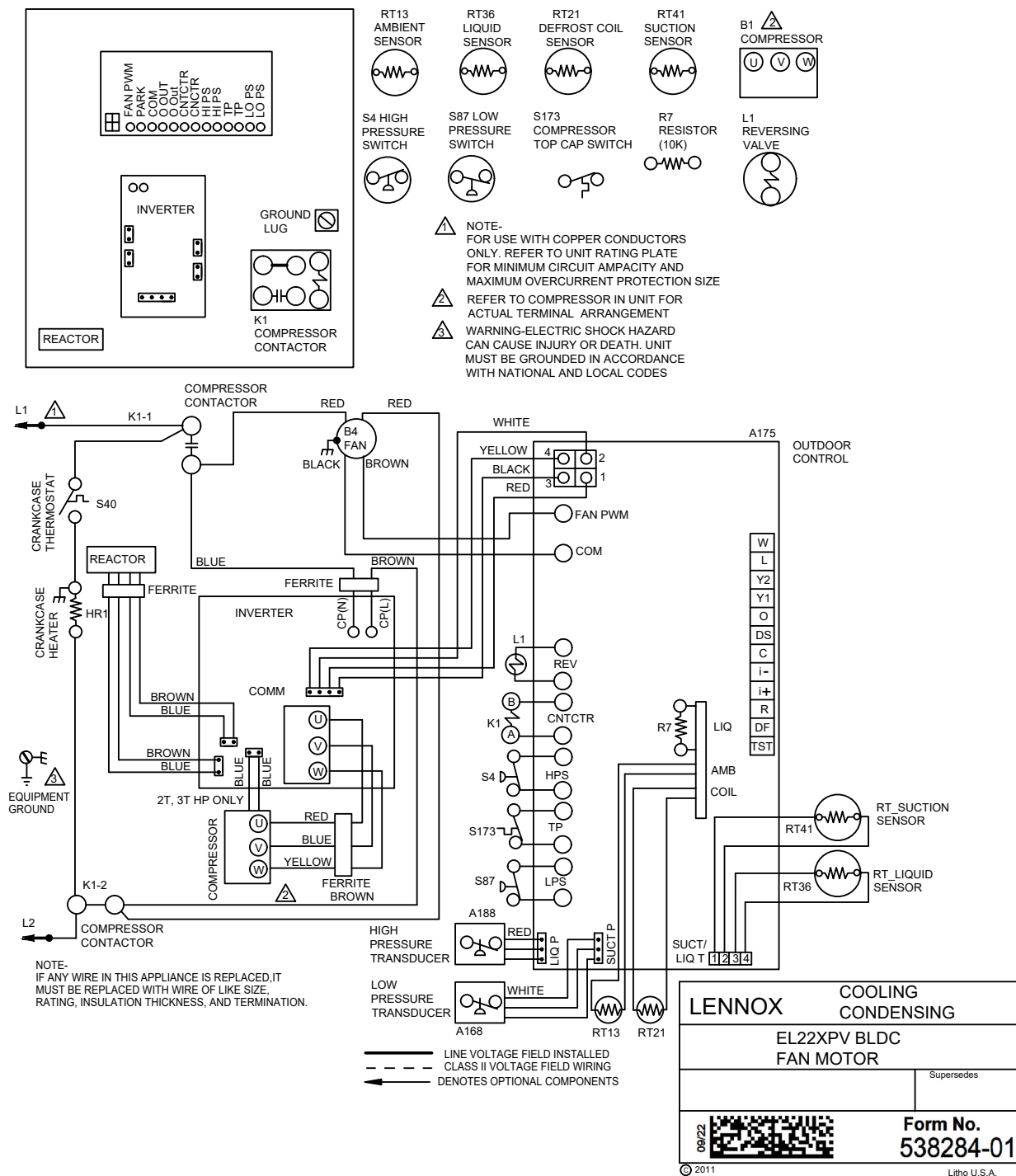


FIGURE 22. Typical Unit Wiring (EL22XPV)

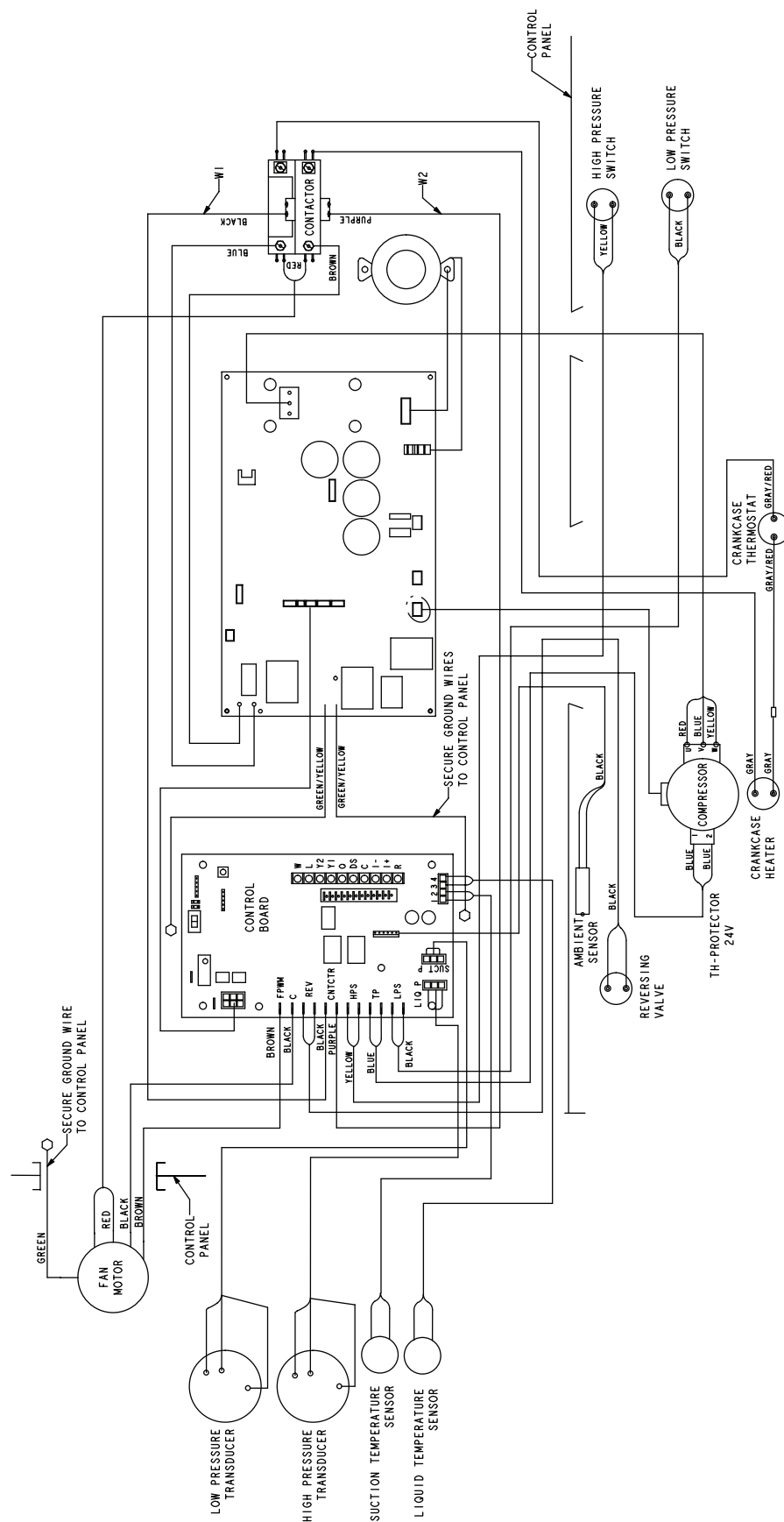


FIGURE 23. Typical Factory Wiring (EL22XPV-024, -036)

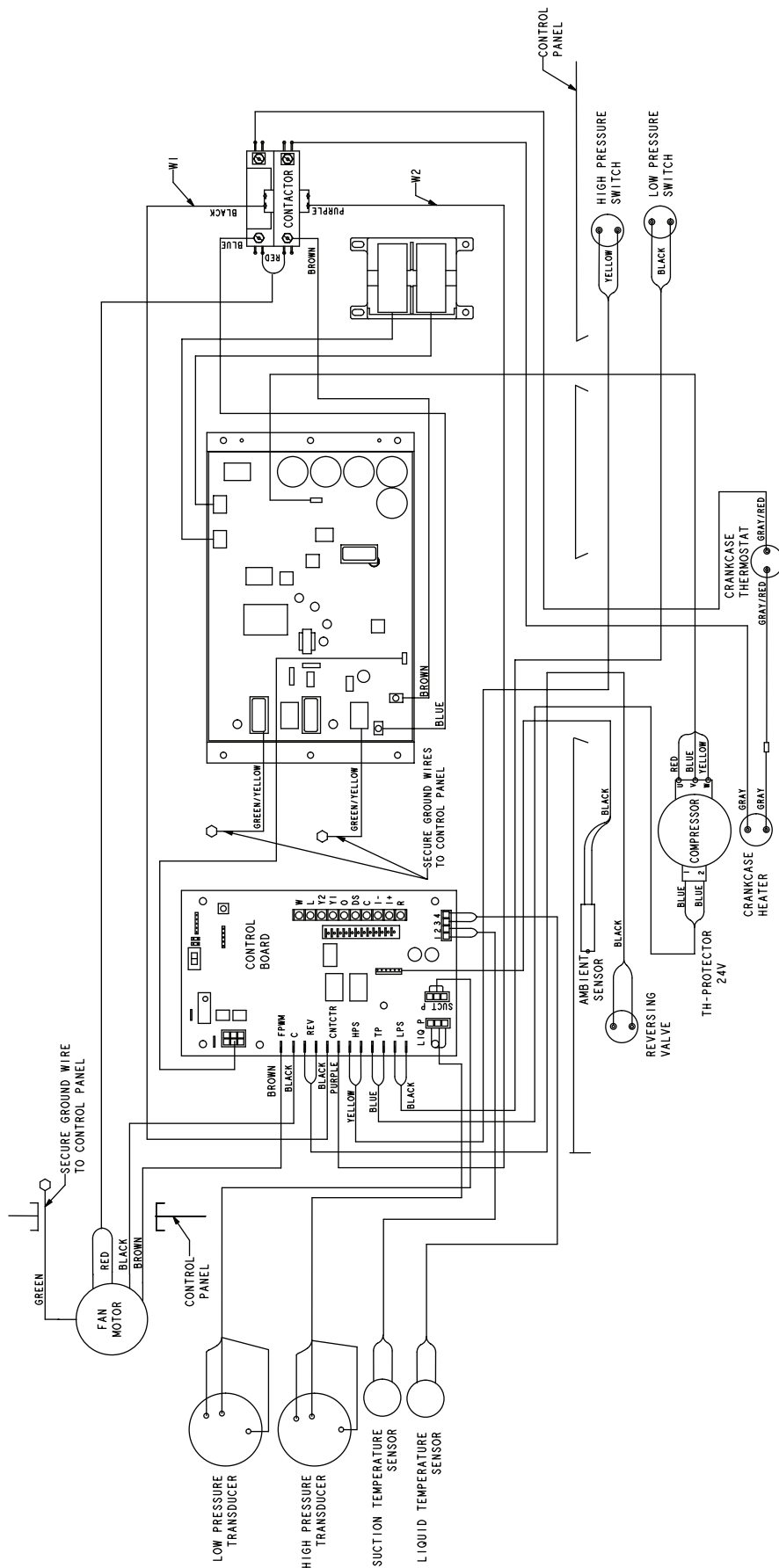


FIGURE 24. Typical Factory Wiring (EL22XPV-048, -060 with Scroll Compressor)

Unit Sequence of Operation

The following figures illustrate the overall unit sequence of operation along with the operation of various pressure switches and temperature sensors. The figures also illustrate the use of the compressor anti-short-cycle function in relation to unit Status, unit Fault and lockout LED Codes and unit system operation interactions.

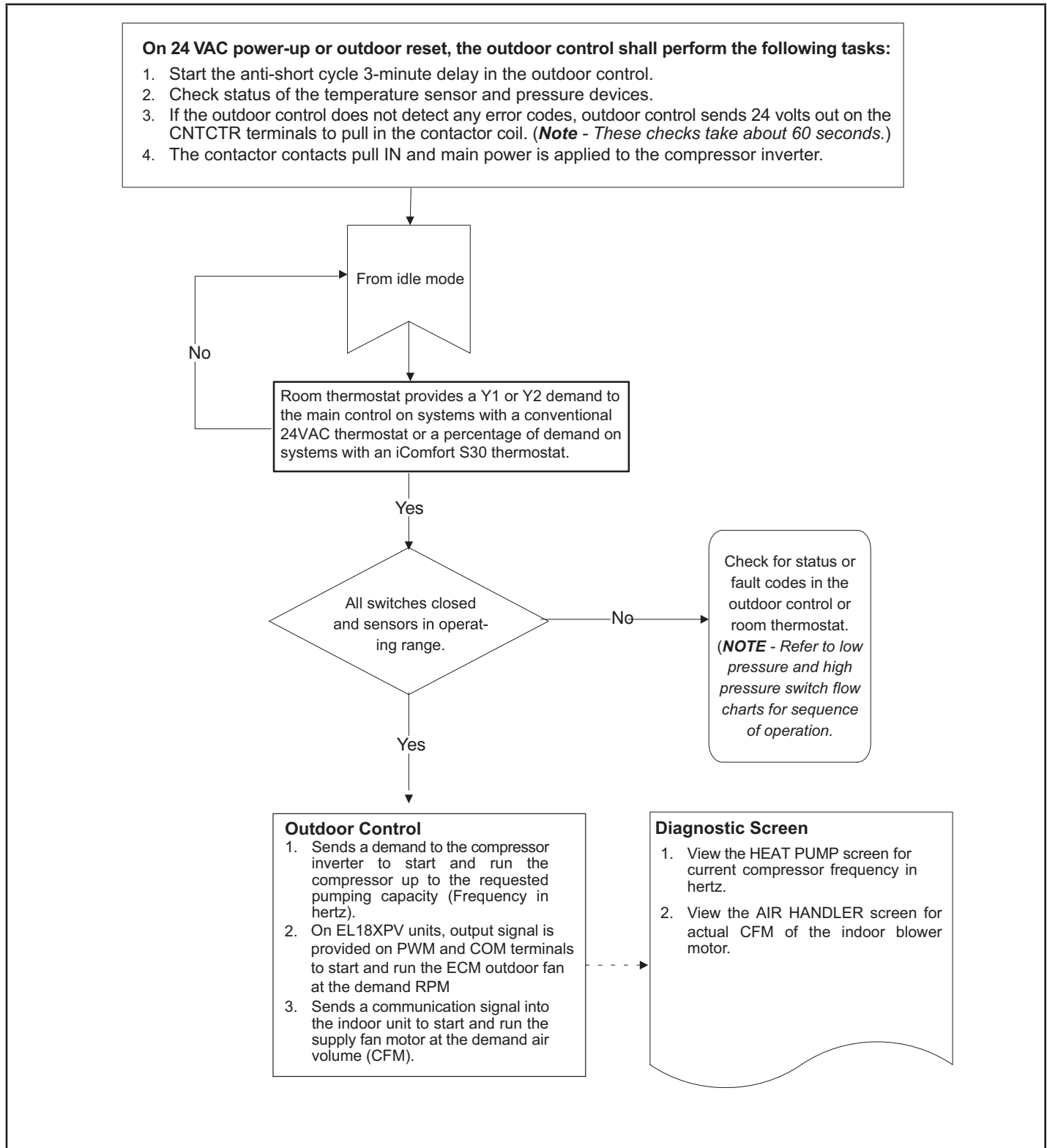


FIGURE 25. 24 Volt Power-Up or Outdoor Reset

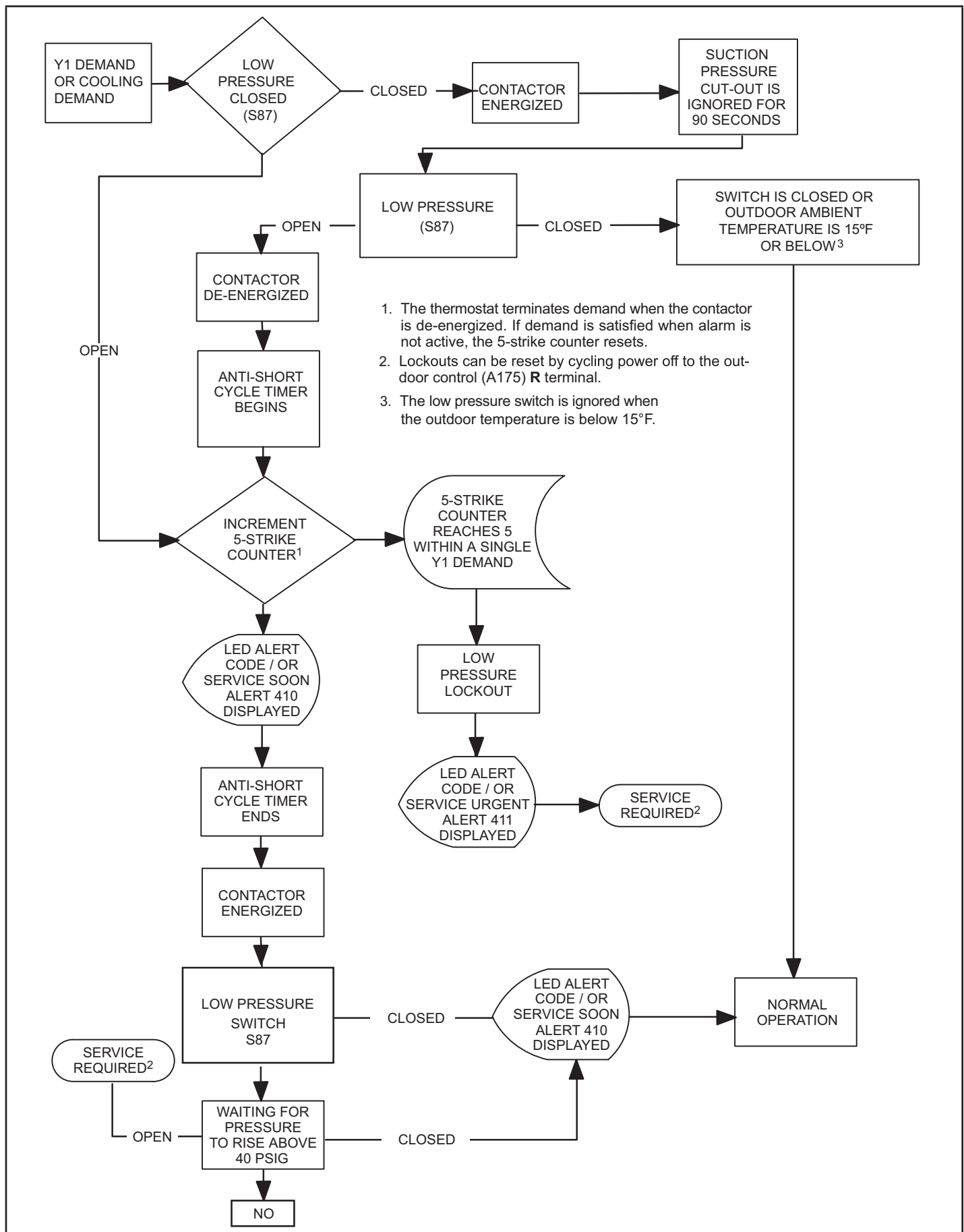


FIGURE 26. Low Pressure Switch (S87) Sequence of Operation (All Units)

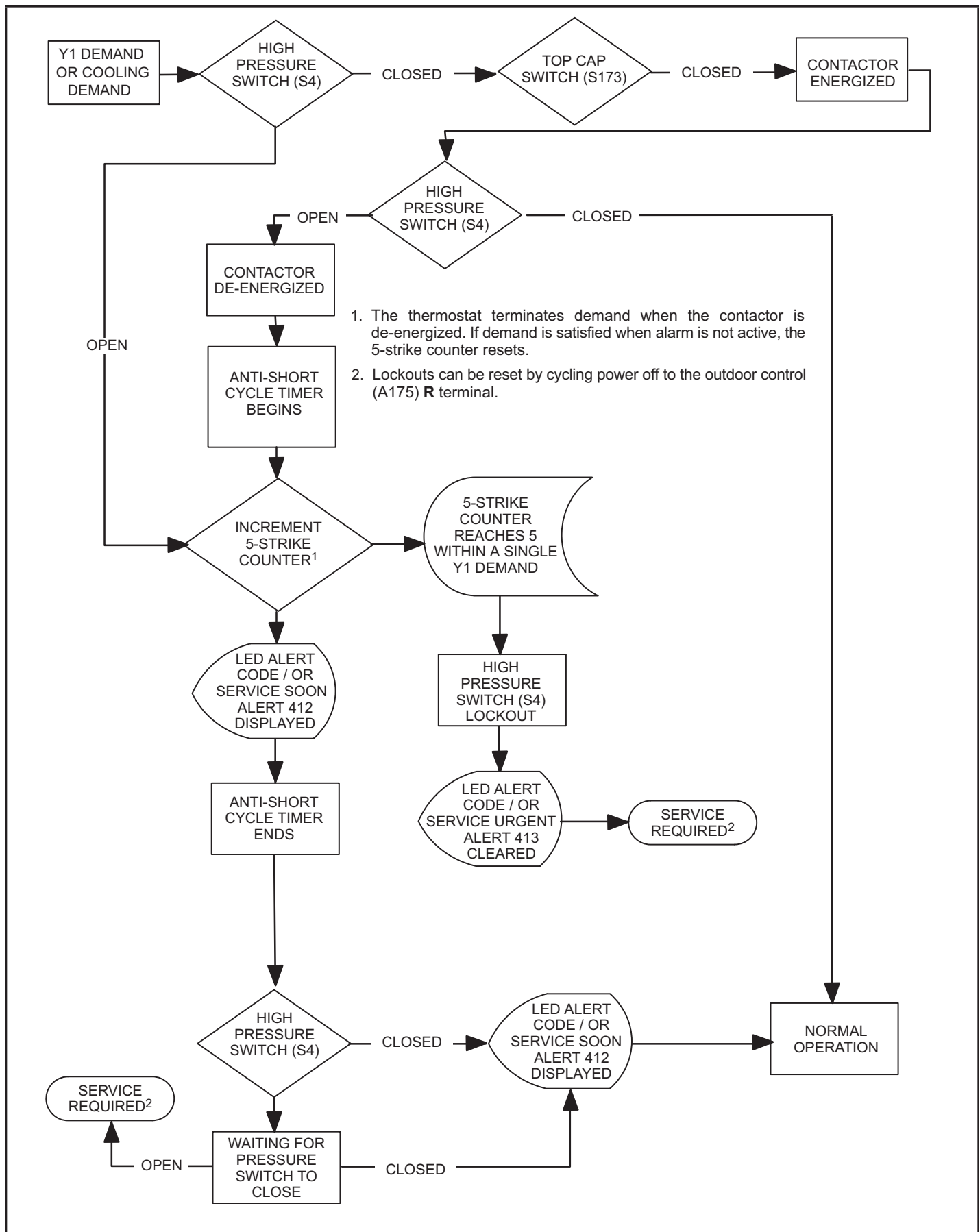


FIGURE 27. High Pressure Switch (S4) Sequence of Operation (All Versions)

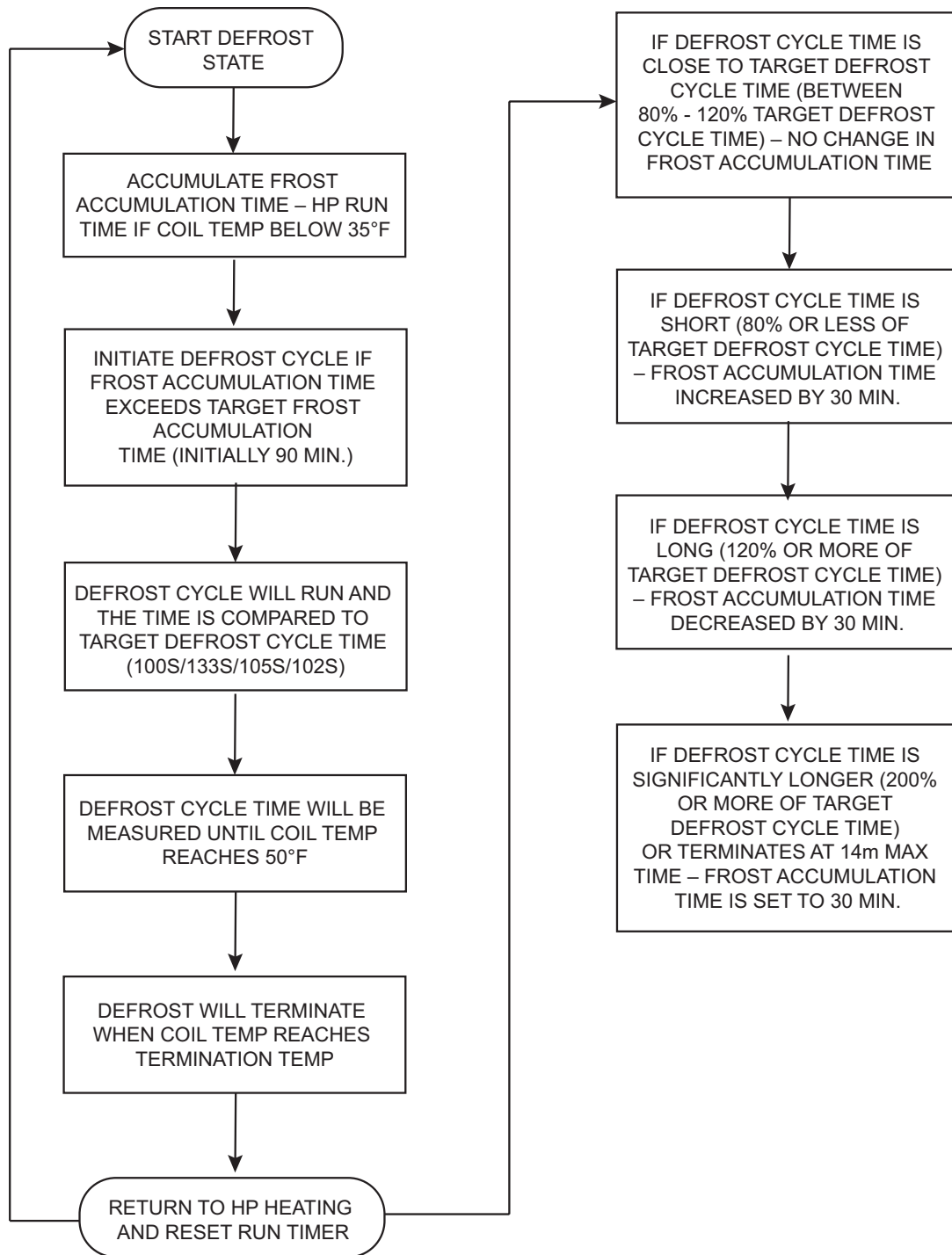


FIGURE 28. Demand Defrost Cycle – Sequence of Operation

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Compressor Sound Cover	68	Outdoor Control Operation	72
Suction Line Filter Drier	68	Unit Sensor Operations	76
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Verifying High Pressure Switch and Low Pressure Protection Operation

OPERATION:

The unit's pressure switches (HPS - S4 and LPS-S87) are wired into the the control HPS and LPS terminals, respectively.

NOTE – The EL22XPV does not have a low pressure switch and LPS terminals are not jumpered. The unit has a suction pressure transducer that emulates the low pressure switch with a cut-out of 40 PSIG and a cut-in of 90 PSIG. This provide the same protection as a tradition low pressure switch. If the event the suction pressure transducer fails, back up protection is provided by the suction temperature sensor and will open at 25°F.

Low Suction Pressure Switch (LPS) – See figure 32 for low suction pressure protection sequence of operation.

High Pressure Switch (HPS) – See figure 33 for high pressure switch sequence of operation.

Pressure Switch Event Settings

The following pressures are the auto-reset event value triggers for low and high pressure thresholds:

- High Pressure (auto-reset) - trip at 590 psig; reset at 418.
- Low Pressure (auto-reset) – trip at 25 psig; reset at 40.

CHECKOUT – S4 High Pressure Switch

Using a multimeter set to ohms with the terminals disconnected from the control board, check the resistance between the two terminals of the pressure switch. If the resistance reading is 0 ohms, the switch is closed.

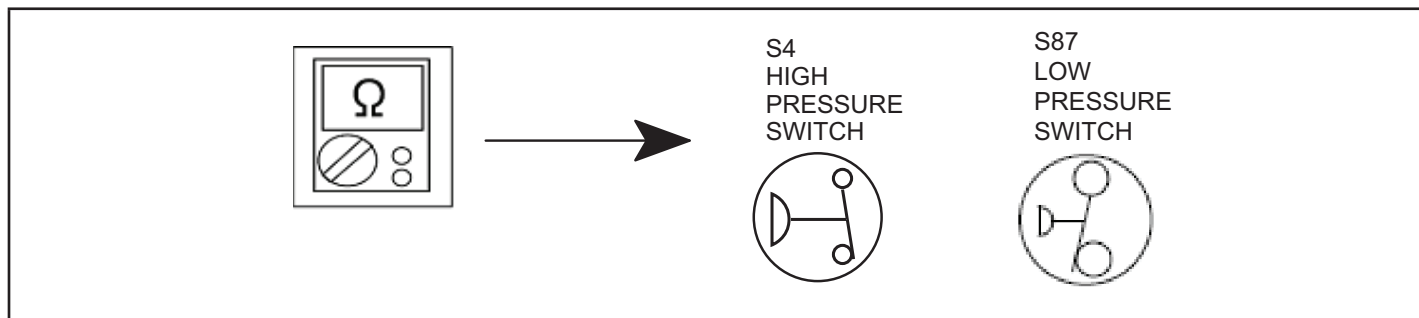


FIGURE 29. Verifying High and Low Pressure Switch Operation

Verifying Suction Pressure Transducer Operation

Using a multimeter set to VDC with the Suction Pressure Transducer connected to the "Suct P" 3-pin connector on the control board. Pin 1 (Red wire +5VDC) to Pin 3 (Black wire - GND) should read 5 VDC continuous. Pin 2 (Blue wire output from transducer) to Pin 3 (Black - GND) should read 0.5 to 4.5 VDC and will vary depending on suction pressure measured. See Table 10.

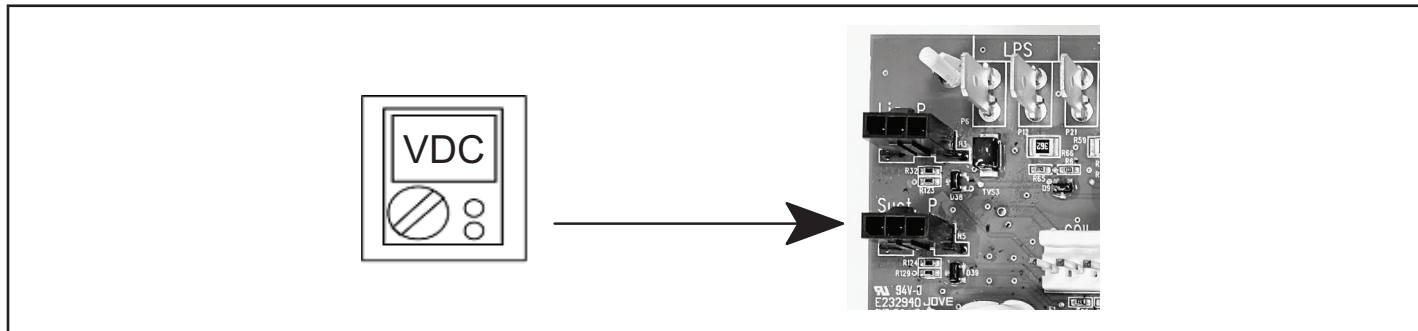


FIGURE 30. Suction Pressure Transducer Voltage

TABLE 10. Suction Pressure Transducer Output Voltage

Suction Pressure (PSIG)	DC Voltage Output (Pin 2 to Pin 3)	Suction Pressure (PSIG)	DC Voltage Output (Pin 2 to Pin 3)
0	0.49	110	2.69
10	0.69	120	2.89
20	0.89	130	3.09
30	1.09	140	3.29
40	1.29	150	3.49
50	1.49	160	3.69
60	1.69	170	3.89
70	1.89	180	4.09
80	2.09	190	4.29
90	2.29	200	4.49
100	2.49	210	4.50

Verifying Liquid Pressure Transducer Operation

Using a multimeter set to VDC with the Liquid Pressure Transducer connected to the "Liq P" 3-pin connector on the control board. Pin 1 (Red wire +5VDC) to Pin 3 (Black wire - GND) should read 5 VDC continuous. Pin 2 (Blue wire output from transducer) to Pin 3 (Black - GND) should read 0.5 to 4.5 VDC and will vary depending on liquid~ pressure measured. See Table 11.

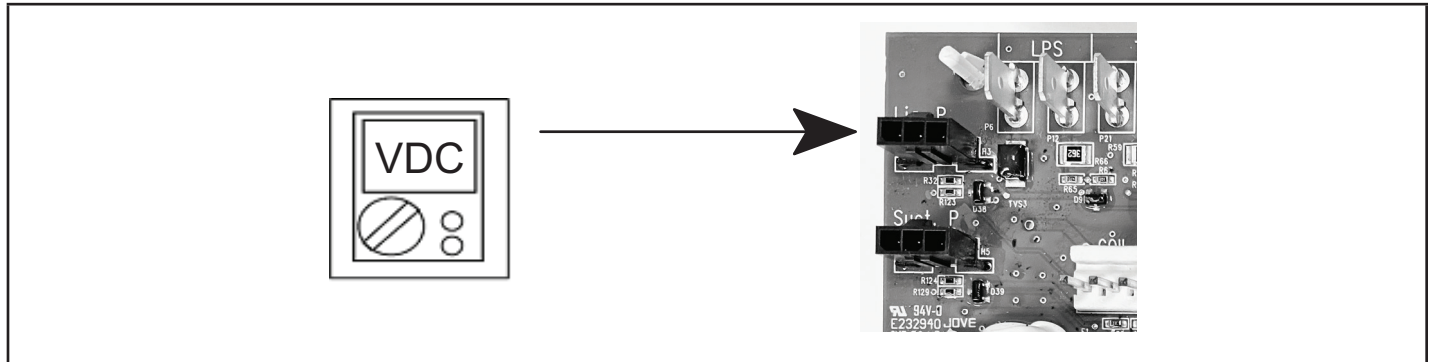


FIGURE 31. Liquid Pressure Transducer Voltage

TABLE 11. Liquid Pressure Transducer Output Voltage			
Liquid Pressure (PSIG)	DC Voltage Output (Pin 2 to Pin 3)	Liquid Pressure (PSIG)	DC Voltage Output (Pin 2 to Pin 3)
0	0.50	260	2.58
10	0.58	270	2.66
20	0.66	280	2.74
30	0.74	290	2.82
40	0.82	300	2.90
50	0.90	310	2.98
60	0.98	320	3.06
70	1.06	330	3.14
80	1.14	340	3.22
90	1.22	350	3.30
100	1.30	360	3.38
110	1.38	370	3.46
120	1.46	380	3.54
130	1.54	390	3.62
140	1.62	400	3.70
150	1.70	410	3.78
160	1.78	420	3.86
170	1.86	430	3.94
180	1.94	440	4.02
190	2.02	450	4.10
200	2.10	460	4.18
210	2.18	470	4.26
220	2.26	480	4.34
230	2.34	490	4.42
240	2.42	500	4.50
250	2.50		

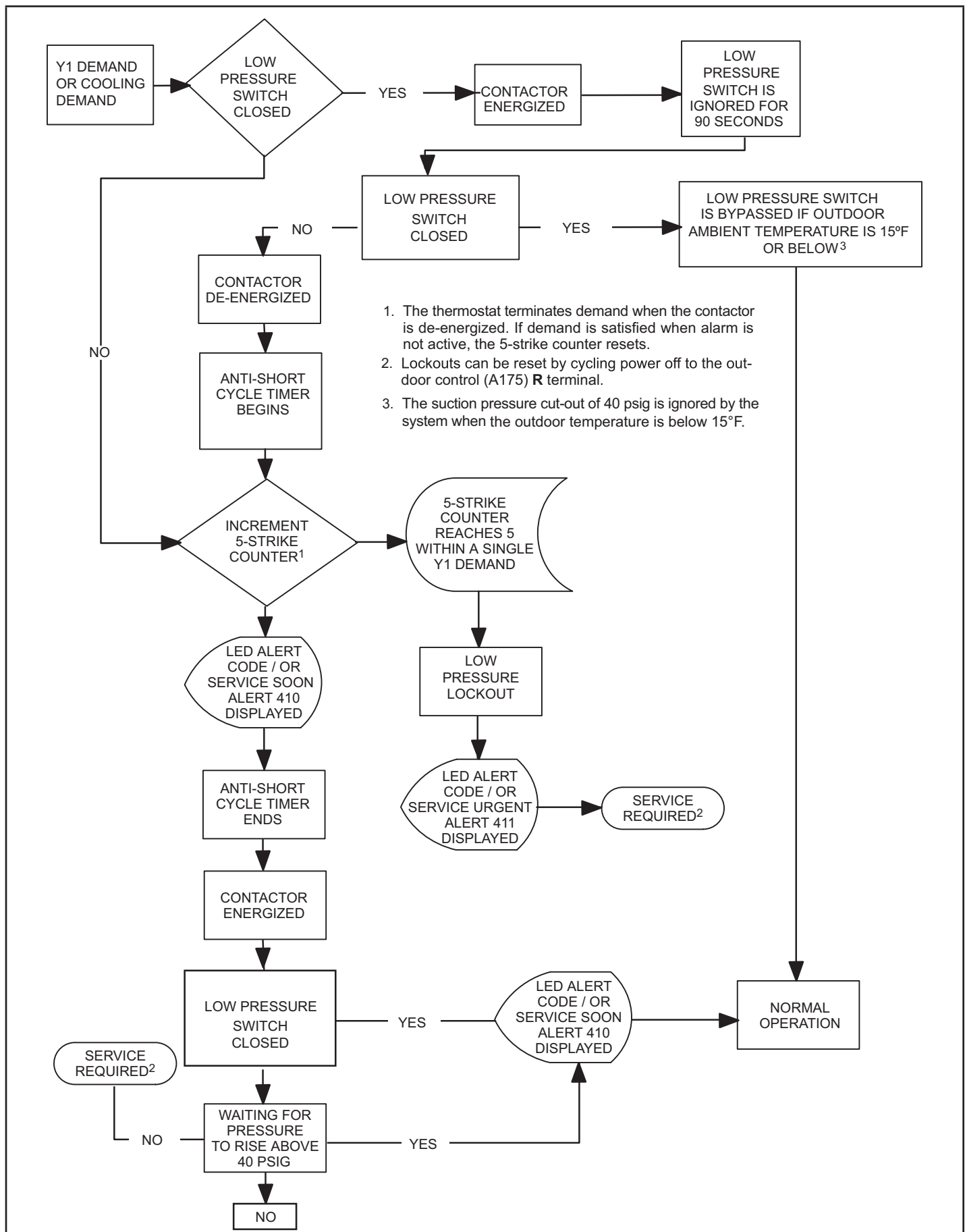


FIGURE 32. Low Pressure Switch (S87) Sequence of Operation (All Units)

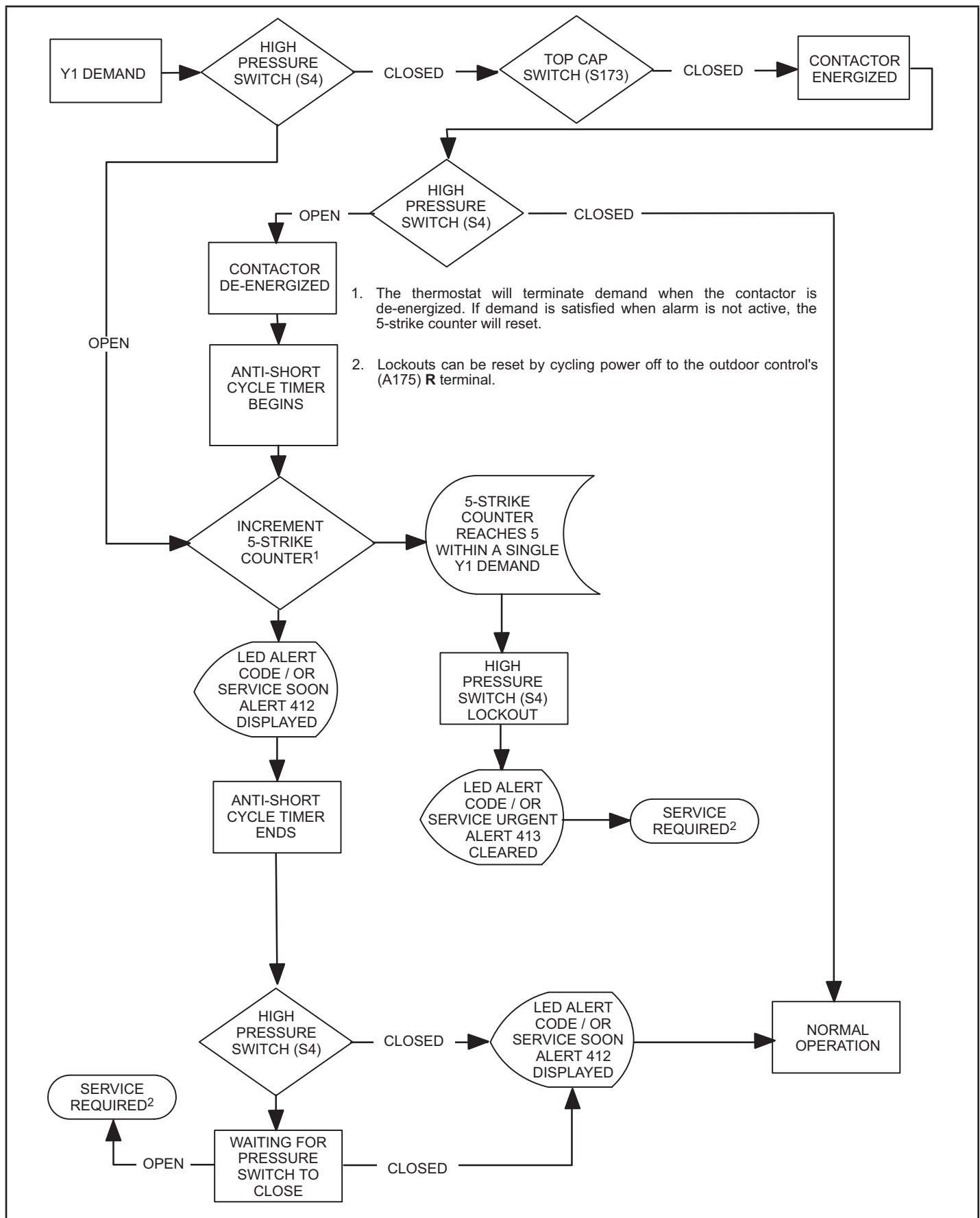


FIGURE 33. High Pressure Switch (S4) Sequence of Operation (All Units)

High Pressure Switch and Low Pressure Protection Errors

TABLE 12. Outdoor Control 7-Segment Display Alert Codes

System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the communicating thermostat.			
Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 410	Service Soon	The outdoor unit cycled off due to low pressure switch opening.	Unit pressure is below the lower limit. The system is shutdown. The low pressure switch closes above 40PSIG and opens below 25PSIG. Confirm that the system is properly charged with refrigerant. Check TXV, indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after the pressure switch opens or after a power reset.
E 411	Service Urgent	The low pressure switch has opened 5 times within one hour. As a result, the outdoor unit is locked out.	Low pressure switch error count reached 5 strikes. The low pressure switch for HFC410A opens at 25PSIG and resets at 40PSIG. Confirm that the system is properly charged with refrigerant. Check for clogged TXV, blockage to indoor unit blower motor, dirty filters or clogged refrigerant filter. Confirm that the evaporator coil is clean. The alarm clears after a power reset.
E 412	Service Soon	The outdoor unit high pressure switch has opened.	Unit pressure is above the upper limit. System is shut down. The high pressure switch opens at 590PSIG and closes at 418PSIG. Confirm that the system is properly charged with refrigerant. Check for clogged TXV, blockage to indoor unit blower motor, clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after the pressure switch closes or a power reset. For heating, indoor CFM may be set too low. For zoning system, zone CFM may be set too low.
E 413	Service Urgent	The high pressure switch has opened 5 times within one hour. As a result, the outdoor unit is locked out.	Open high pressure switch error count reached 5 strikes. System is shut down. The high pressure switch for HFC410A will open at 590PSIG and close at 418PSIG. Confirm that the system is properly charged with refrigerant. Check condenser fan motor, clogged TXV, blockage to indoor unit blower motor, stuck reversing valve or clogged refrigerant filter. Confirm that the outdoor unit is clean. The alarm clears after indoor power reset (24VAC power source to Outdoor Control)

Compressor Operation, Checkout and Status / Error Codes

OPERATION:

The EL22XPV uses two different types of compressor, depending on the specific model. The EL22XPV-024 and -036 use a 380VAC three phase variable capacity rotary compressor specifically designed for unitary splits system and is approved for use with HFC 410A refrigerant. The EL22XPV-048 and -060 units use a 380VAC three phase variable capacity scroll compressor that is approved for use with HFC 410A refrigerant. The compressor, when connected to an inverter, is capable of operating in a running frequency range from 20 hertz up to a maximum of 76 hertz. (maximum hertz is dependent on compressor size). The compressor speed is determined by thermostat demand and suction pressure when installed with a conventional 24VAC non-communicating thermostat and by thermostat demand when installed with an S40 thermostat.

CHECKOUT:

NOTE - The compressor motor winding resistance is the nominal resistance at 77°F. When measuring compressor motor winding resistance, the primary concern is the winding resistance between the different sets of terminals is within 10% of each other. The actual winding resistance is impacted by temperature, refrigerant and oil. Do not automatically condemn a compressor because the measured resistance is slightly higher or lower than the nominal resistance. Check for shorted/open windings and for shorts to ground during testing.

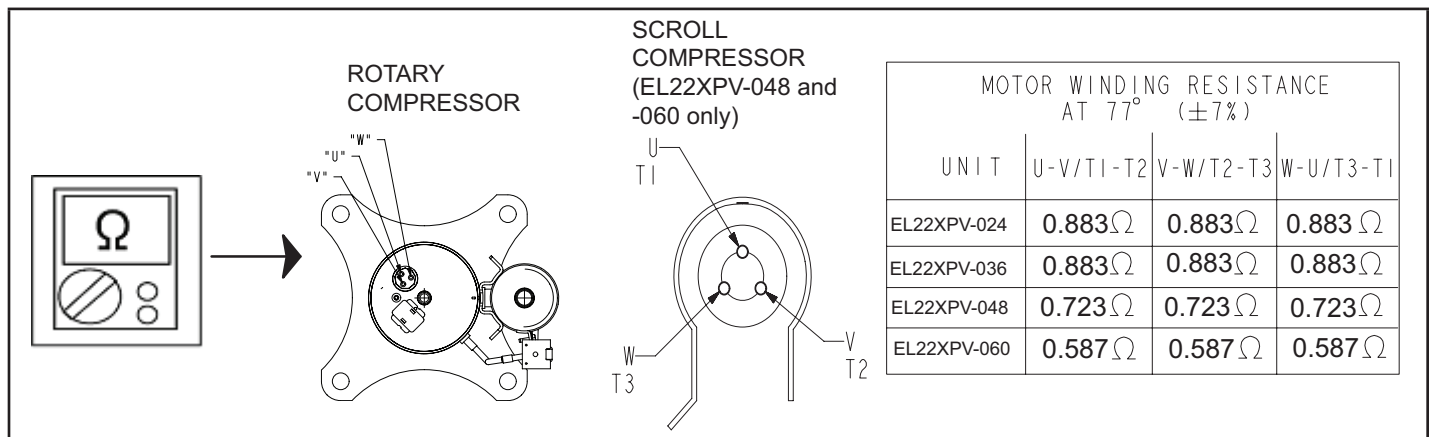


FIGURE 34. Compressor Operation, Checkout and Status/Error Codes

IMPORTANT: If compressor replacement is required, remove the compressor through the top of the unit. Removal through the access panel is not possible.

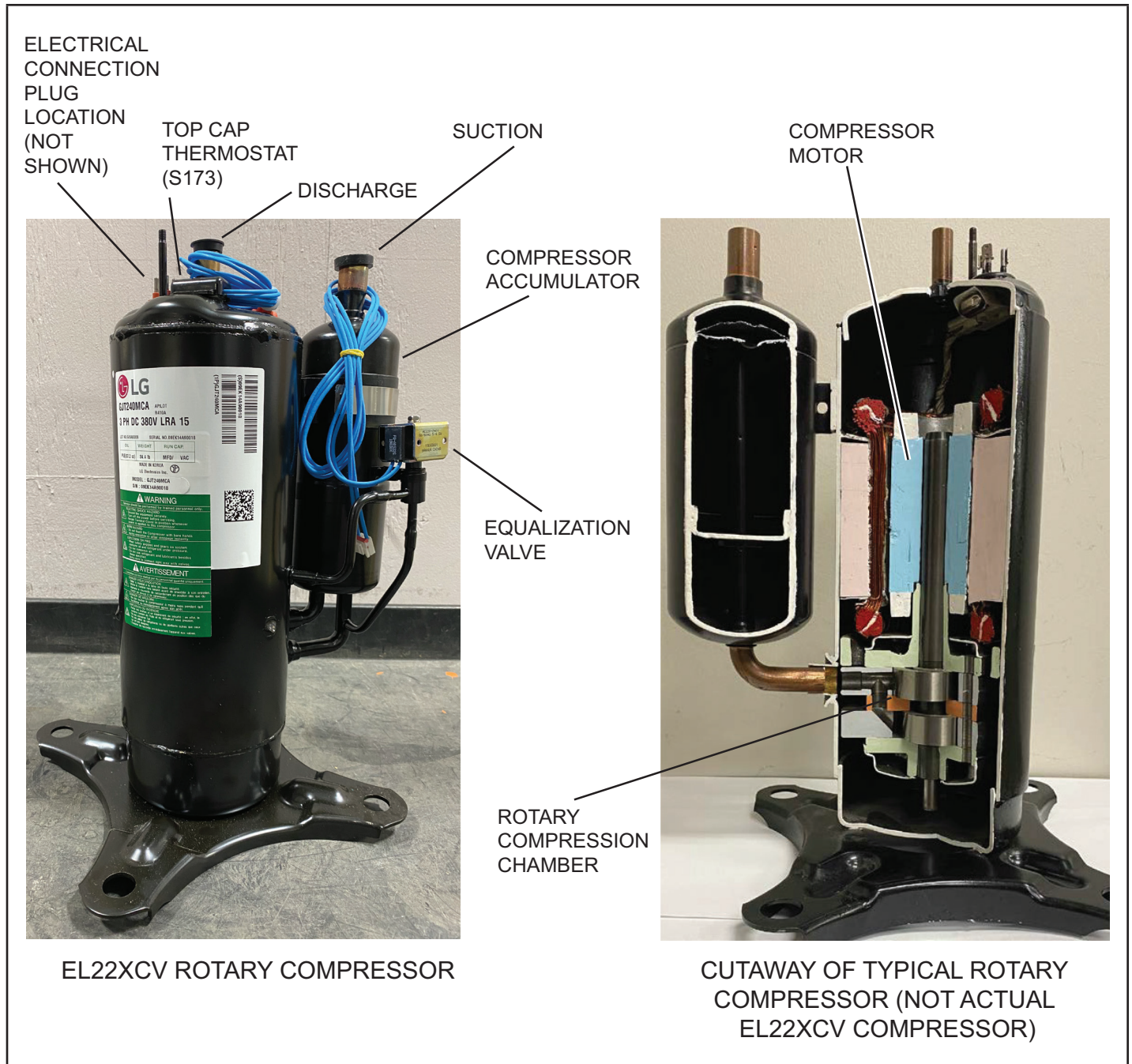


FIGURE 35. EL22XPV Rotary Compressor Detail (Models EL22XPV-024 and -036)

Compressor Equalization Valve

The compressor equalization valve equalization solenoid equalizes the pressure across the rotary compression chamber allowing the compressor to start unloaded. The 240 VAC solenoid coil is controlled by the inverter.

The solenoid coil is powered when the compressor is off to equalize the pressure and is de-energized when the compressor is operating

STATUS CODES:

When the compressor is running, the 7-segment display will show the compressor capacity. When the EL22XPV unit is installed with a conventional 24VAC non-communicating thermostat the display will show C 1 or C 2. When the EL22XPV unit is installed with a S40 communicating thermostat the display will show the demand as a percentage. i.e. C 5 0.

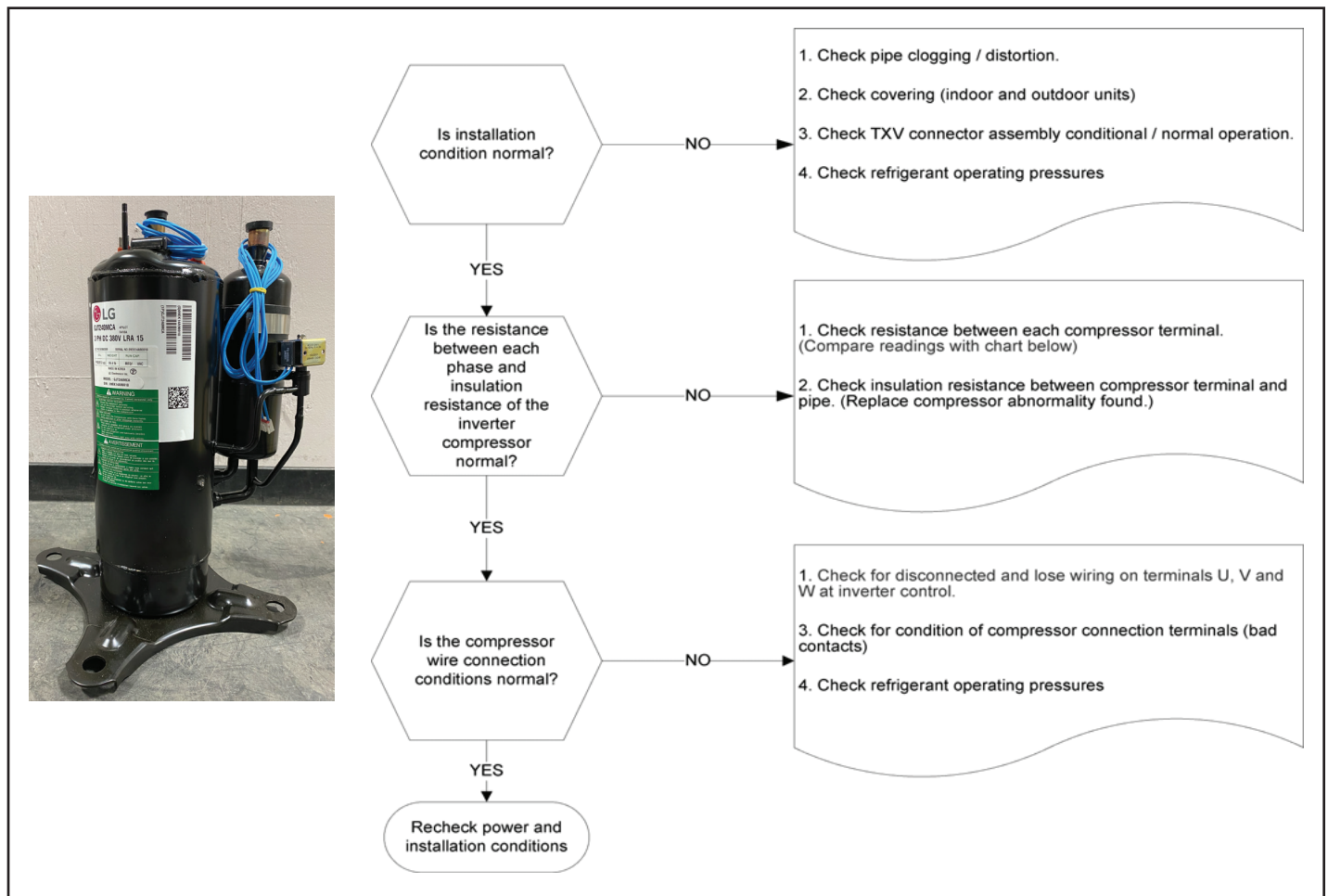


FIGURE 36. Compressor Operation, Checkout and Status/Error Codes

ERROR CODES:

TABLE 13. Outdoor Control 7-Segment Display Alert Codes - Compressor

System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat on systems installed with the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 430	26	2 flashes	6 flashes	Service Soon / Service Urgent	Compressor start failure	If condition is detected, outdoor unit compressor and fan stop. Antishort cycle is initiated. If condition occurs 10 times within an hour, system is locked out. Indicates poor connection at compressor harness, improper winding resistance, locked compressor rotor, or flooded compressor. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.

TABLE 13. Outdoor Control 7-Segment Display Alert Codes - Compressor

System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat on systems installed with the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 433	29	2 flashes	9 flashes	Service Soon / Service Urgent	The inverter has detected a compressor over-current condition.	Error occurs when compressor peak phase current is greater than 28A. Inverter issues code 14 first and slows down to try to reduce the current. If the current remains high, outdoor unit compressor and fan stop. Antishort cycle is initiated. If condition occurs 5 times within an hour, system is locked out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 439	12	1 flash	2 flashes	Service Soon	Compressor slowdown due to high input current.	Input current is approaching a high limit. Compressor speed automatically slows. The control continues sending the inverter speed demanded by the thermostat. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically clear.
E 440	13	1 flash	3 flashes	Dealer Info Only	Heat sink temperature is approaching limit. The compressor speed automatically slows to reduce heat sink temperature. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared.	This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110°F) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occurs frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 167°F and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 150°F. The heat sink temperature, compressor speed in Hertz & the Inverter Compressor Speed Reduction status ("On" or "Off") notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center on units installed with an S40 thermostat.
E 441	14	1 flash	4 flashes	Dealer Info Only	Compressor slowdown due to high compressor current. Compressor current is approaching limit. The compressor speed automatically slows. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared	This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor as the currently increases rapidly during startup. The inverter will reduce the compressor speed by 4 hz and slow the compressor ramp up speed to the requested compressor demand (capacity). This is normal and expected operation of the inverter to control the compressor within design parameters. In most cases the alert code 441 does not require any additional service or diagnostic procedures. E441 may also occur if the system is operating at high pressures.
E 600	N/A	N/A	N/A	Service Urgent	Compressor has been cycled OFF by utility load-shedding function.	Load-shedding function: Provides a method for a local utility company to limit the maximum power level usage of the outdoor unit. The feature is activated by applying 24 volts AC power to the L and C terminals on the outdoor control.

Crankcase Heater, Checkout and Status / Error Codes

OPERATION:

CRANKCASE HEATER (HR1)

Compressors in all units are equipped with a 40 watt belly-band type crankcase heater. The heater prevents liquid from accumulating in the compressor. The heater is controlled by the crankcase heater thermostat.

CRANKCASE HEATER THERMOSTAT (S40)

Crankcase heater thermostat S40 controls the crankcase heater in all units and is located on the liquid line (see figures 2 and 3 for locations).

1. When liquid line temperature drops below 50°F the thermostat closes which results in the heater being energized.
2. When liquid line temperature rises above 70°F the thermostat opens which results in the heater being de-energized.

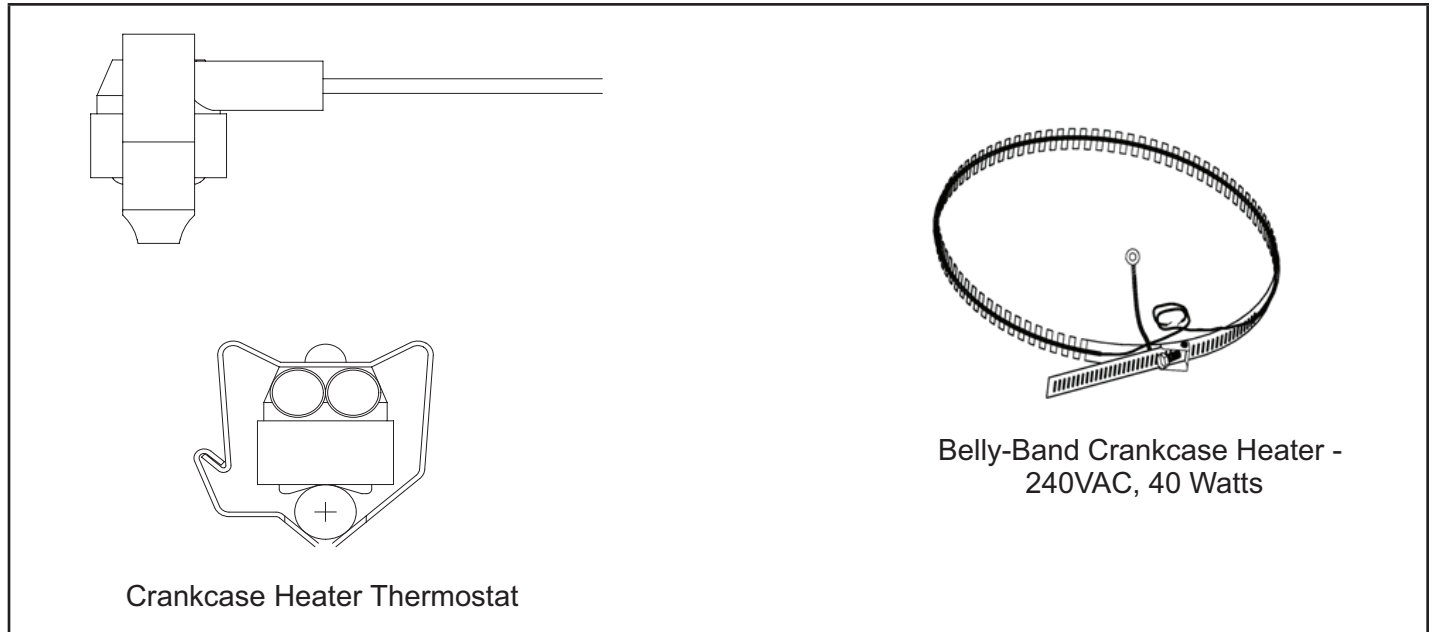


FIGURE 37. Belly-Band Crankcase Heater Thermostat

CHECKOUT:

Belly-Band Crankcase Heater: Using meter set on ohms, check crankcase heater resistance. If resistance is 0 ohms or infinite, replace the crankcase heater.

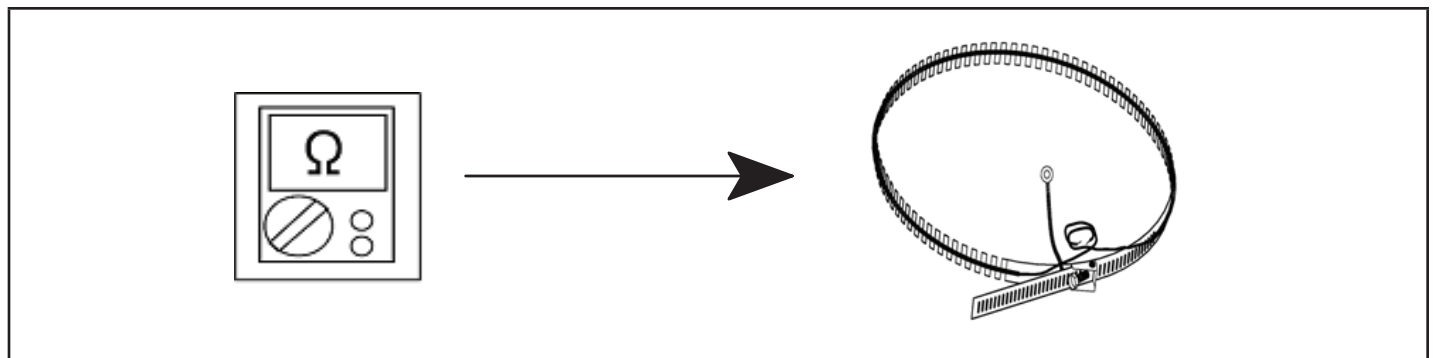


FIGURE 38. Checking Belly-Band Crankcase Heater

Crankcase Heater Thermostat: As the detected temperature changes, the resistance across the sensor changes. Table 17 on page 77 shows how the resistance varies as the temperature changes for this sensor.

NOTE – When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is not within the range shown in figure 34, may be performing as designed. However, if a shorted or open circuit is detected, the sensor is faulty; the sensor needs to be replaced.

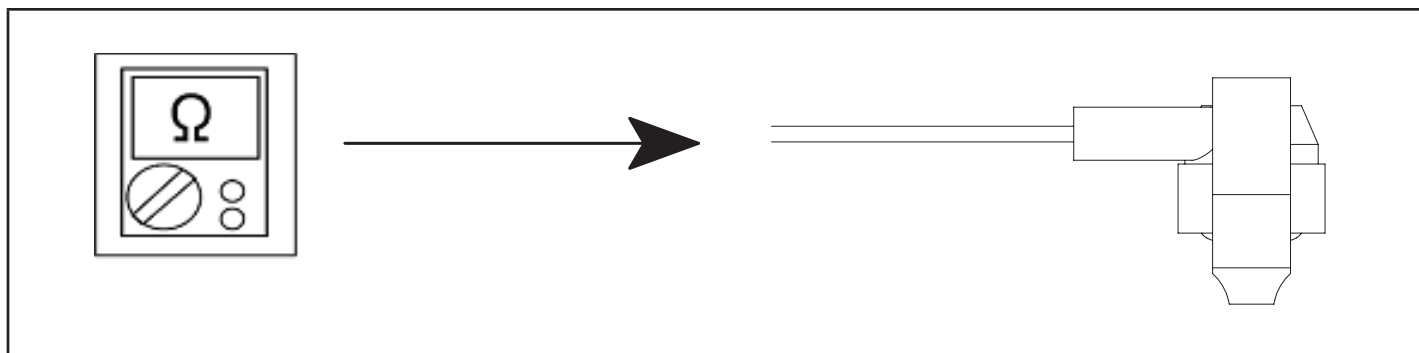


FIGURE 39. Checking Crankcase Heater Thermostat

STATUS CODE:

None

ERROR CODES:

None

Compressor Sound Cover

All units come with a soft-sided polyethylene molded outer shell compressor sound cover. The cover helps reduce any unwanted operating sounds from the compressor. The cover features a hook/loop closure system for ease of installation on the compressor.

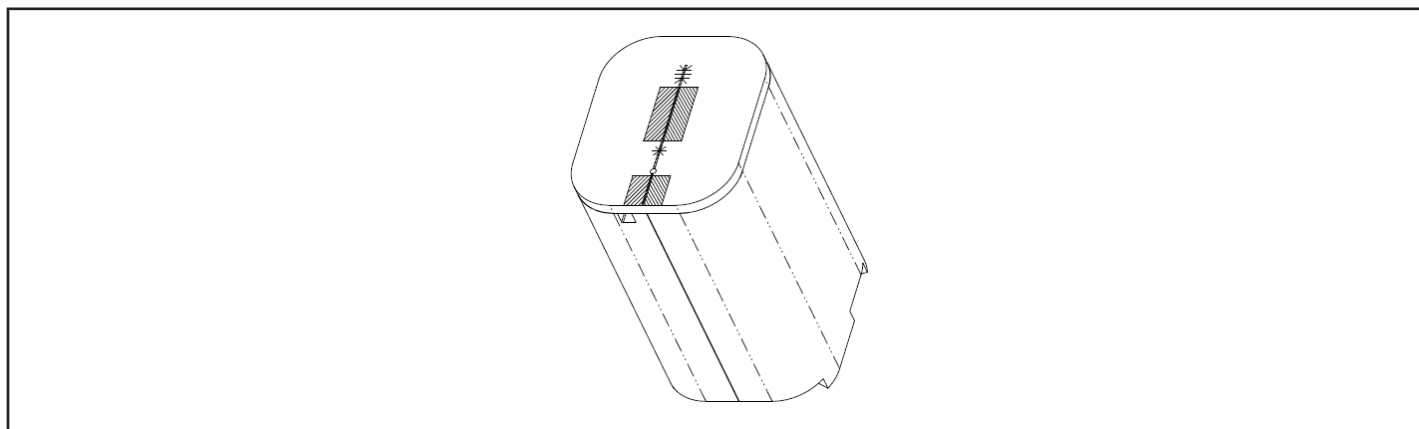


FIGURE 40. Compressor Sound Cover

Suction Line Filter Drier (Rotary Compressor Models Only)

The EL22XPV-024 and -036 units have a rotary compressor and have a factory installed suction line filter drier installed in the suction line. Liquid drier is not required, but may be field installed. The filter drier is designed to remove moisture and foreign matter, which can lead to compressor failure.

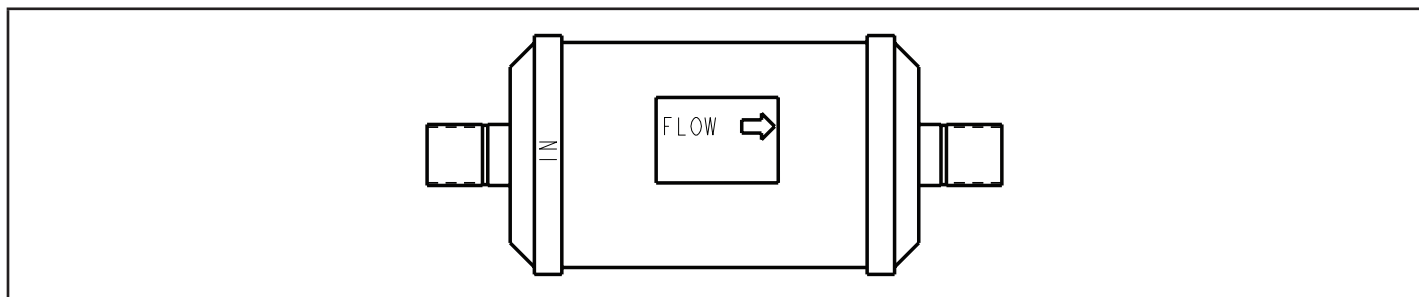


FIGURE 41. Suction line filter drier

Liquid Line Filter Drier (EL22XPV-048 and -060 Scroll Compressor Models Only)

The EL22XPV-048 and -060 have a scroll compressor and have a liquid line filter drier that is factory-installed in the liquid line. The filter drier is designed to remove moisture and foreign matter, which can lead to compressor failure.

The EL22XPV models with a rotary compressor do not have a factory installed filter drier and it is not required on these models. A liquid line filter drier on the rotary compressor models may be field installed if desired.

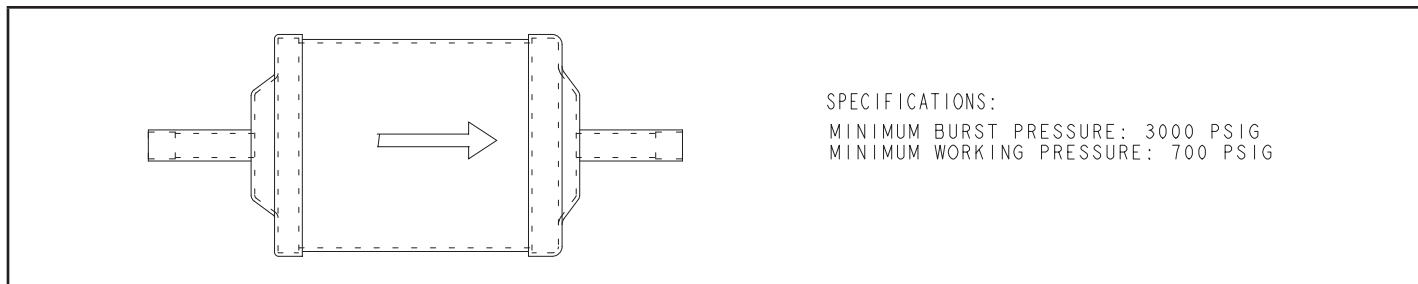


FIGURE 42. Liquid Line Filter Drier

Top Cap Switch Operation, Checkout and Status / Error Codes

OPERATION:

Top Cap Thermal Sensor Switch (S173)

Some units are equipped with a compressor-mounted normally closed temperature switch that prevents compressor damage due to overheating caused by internal friction. The switch is located on top of the compressor casing. This switch senses the compressor casing temperature and opens at 221 - 239°F on the EL22XPV-024 and 036 and 239 - 257°F on the EL22XPV-048 and 060 to shut off compressor operation. The auto-reset switch closes when the compressor casing temperature falls to 140 - 176°F on the EL22XPV-024 and 036 and 151 - 187°F on the EL22XPV-048 and 060, and the compressor is re-energized. This is a single-pole, single-throw (SPST) bi-metallic switch.

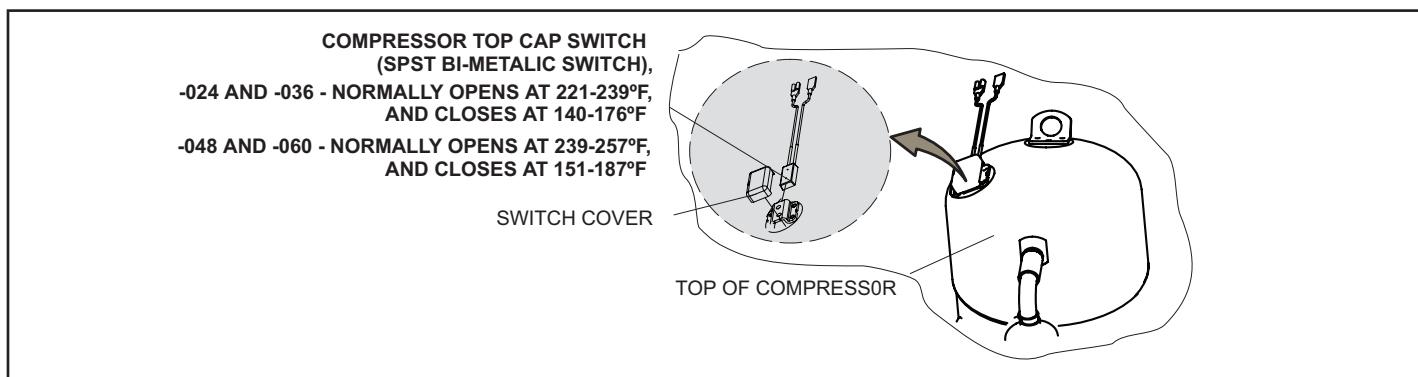


FIGURE 43. Top Cap Thermal Sensor Switch

CHECKOUT:

Using a multimeter set to ohms, with the terminals disconnected from the system, check the resistance between the two terminals of the top cap switch. If the meter display goes to infinite, the switch is open. If the meter display goes to zero ohms, the switch is closed.

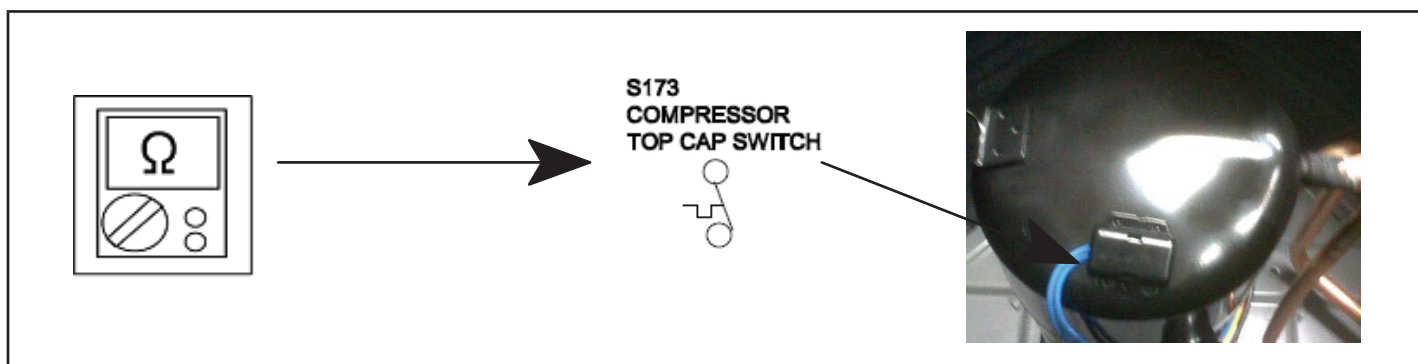


FIGURE 44. Verifying Top Cap Thermal Sensor Switch

STATUS:

None

ERROR:

TABLE 14. Outdoor Control 7-Segment Display Alert Codes - Top Cap Switch			
<i>NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or de-frost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the communicating thermostat.</i>			
Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 422	Service Soon	Compressor top cap switch exceeding thermal limit.	The top of the compressor is hot. Refrigerant charge may be low, or low mass flow of refrigerant. Check TXV, clogged filter drier, condenser fan motor, indoor blower motor, confirm indoor coil is clean. Check to make sure the blue wires from the top thermostat did not get pulled off one of the TP terminal on the outdoor control board.
E 442	Service Urgent	The top cap switch has opened 5 times within one hour. As a result, the outdoor unit is locked out.	When compressor thermal protection sensor opens 5 times within 1 hour, outdoor stops working. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.

Reactor Operations, Checkout and Status / Error Codes

OPERATION:

Reactor (Inductor or choke) is a passive two-terminal electrical component that stores energy in its magnetic field. Reactors are one of the basic components used in electronics where current and voltage change with time, due to the ability of inductors to delay and reshape alternating currents.

CHECKOUT:

Main Power ON – Voltage IN reactor should be the same as the voltage OUT. With main power OFF and reactor disconnected from system; resistance between leads should be the same

STATUS CODES:

None

ERROR CODES:

None

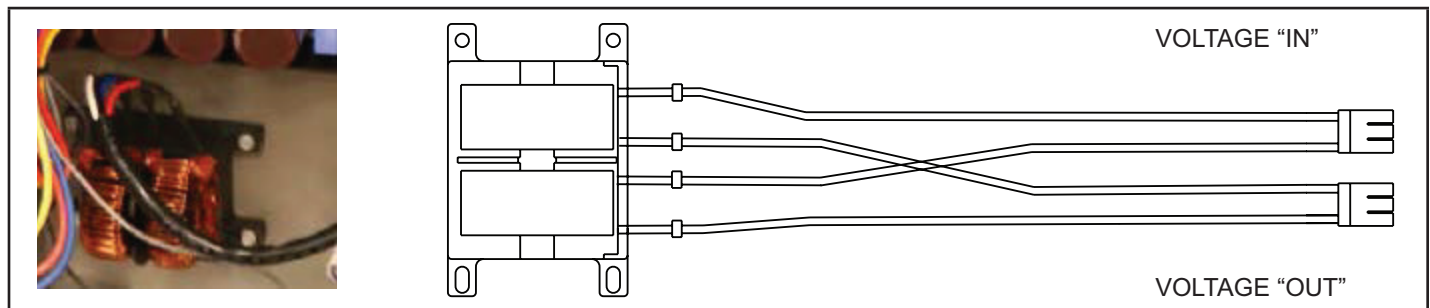


FIGURE 45. EL22XPVS/E18XCV Reactor

Outdoor Fan Operation and Checkout

OPERATION:

The EL22XPV units have a variable speed ECM fan motor. The variable speed ECM fan motor is controlled by PWM fan output when the compressor is running and will vary the fan speed to match the compressor capacity.

LOW AMBIENT OPERATION:

The EL22XPV units have factory installed low ambient cooling mode operation that will control the condenser fan motor based upon liquid line temperature.

The EL22XPV units have a variable speed ECM fan motor. The outdoor control will begin to modulate the outdoor fan motor speed is below 65°F to maintain a liquid line sensor temperature between 58°F and 70°F. If the liquid line sensor drops below 55°F the control will cycle the fan off until liquid temperature rises above 58°F.

CHECKOUT:

VAC Voltage Check

Check for 208/240 VAC power at inverter contactor (red wires) (see figure 46).

Units with ECM Motor

1. With the unit running, check for 230VAC at the red outdoor fan motor wires at the contactor. If no voltage is present check main power at the contactor.
2. Perform a DC voltage check between the FPWM and Fan C terminal.
3. Using the push button on the control, enter the "fan test mode" in the "field test mode" by pushing and holding the button until solid "-" appears, release the button. Display will start flashing, within 10 seconds, push and hold the button until the "F" symbol displays then release the button. Display will begin to flash "F", within 10 seconds, push and hold the button until it stops flashing, release the button. Outdoor fan motor will cycle on for 10 minutes. To exit, push and hold the button until three horizontal bars display. Release the button and the outdoor fan will cycle off.

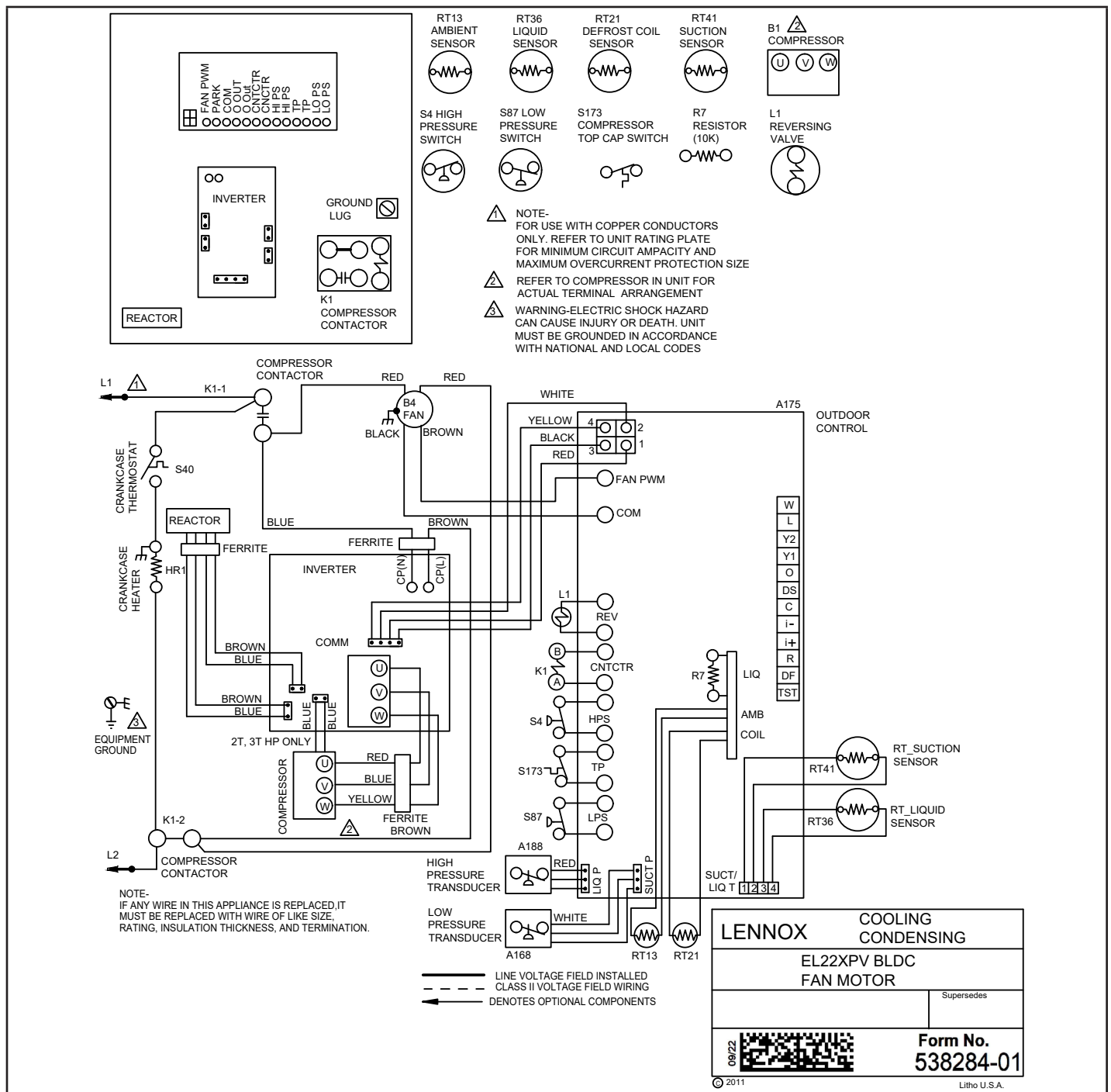


FIGURE 46. VAC Voltage Check

Outdoor Control Operation, Checkout and Status / Error Codes

OPERATION:

The outdoor control is a microprocessor-based device for use with variable-capacity compressors up to 5-tons in capacity operating on 24VAC residential power. The outdoor control integrates the functionality of maintaining compressor speed, and outdoor fan control of ECM motors. The outdoor control is self-configuring. During start-up the outdoor control selects one of two configurations variable-capacity air conditioner or variable-capacity heat pump.

The EL22XPV outdoor control provides application flexibility. The EL22XPV may be installed with an S40 communicating thermostat in a fully communicating system or with a conventional 24VAC non-communicating single or two stage heat pump thermostat.

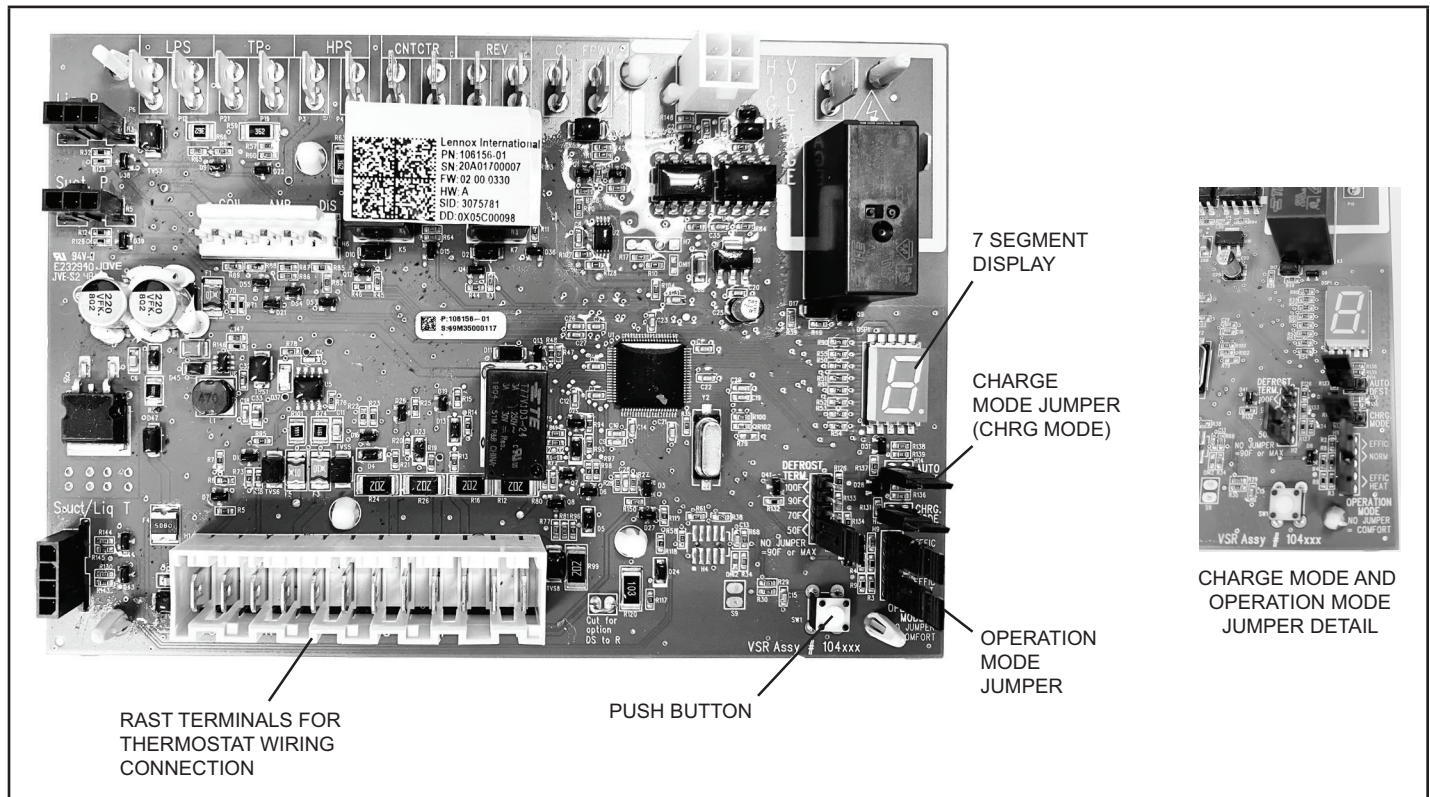


FIGURE 47. Outdoor Control Unit

STATUS CODES:

TABLE 15. Outdoor Control 7-Segment Display Alert Codes - Outdoor Control Status

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 600	Service Urgent	Compressor has been cycled OFF on utility load shedding	Load shedding function: Provides a method for a local utility company to limit the maximum power level usage of the outdoor unit. The feature is activated by applying 24 volts AC power to the L and C terminals on the outdoor control.
E 601	Service Urgent	Outdoor unit has been cycled OFF on low temperature protection.	Low temperature Protection: Outdoor unit will not operate when the outdoor temperature is at or below -4° F (-20°C). If the unit is operating and the outdoor temperature drops below -4°F (-20°C), the unit will continue to operate until the room thermostat is satisfied or the outdoor temperature drops to -15°F (-26°C). (Outdoor unit ambient sensor provides temperature readings.)

System Configuration

EL22XPV Thermostat Control Options

The EL22XPV variable capacity units provide two thermostat control options to provide application and installation flexibility.

S30 or S40 Communicating Thermostat Control

The EL22XPV variable capacity unit may be installed as a fully communicating system consisting of an S30 or S40 Smart Communicating Thermostat, a communicating indoor unit and the EL22XPV variable capacity outdoor unit wired with (4) communication wires (R, I+, I- and C) connected to the EL22XPV Outdoor Unitary Control.

The EL22XPV variable capacity unit when wired as a fully communicating system will take full advantage of the advanced diagnostics and control, Wi-Fi accessibility and system operation parameters. Refer to the EL22XPV field wiring diagram for an S40 communicating thermostat.

Conventional 24VAC Non-Communicating Heat Pump Thermostat Control

The EL22XPV variable capacity unit may be installed using a conventional 24VAC non-communicating two-stage cooling or single-stage heat pump thermostat.

NOTE – The conventional 24VAC non-communicating thermostat must have a compressor minimum on time of

three minutes to prevent compressor short cycling. The Lennox M30, ComfortSense 7500, ComfortSense 3000 and many other commercially available electronic thermostats provide this feature.

The EL22XPV unit will provide full variable capacity operation when installed with a conventional 24VAC non-communicating two stage or single-stage heat pump thermostat. The EL22XPV outdoor control has advanced control algorithms using the EL22XPV suction pressure sensor in the cooling mode and liquid pressure sensor in the heating mode to provide true variable capacity compressor operation.

When utilizing a two-stage conventional 24VAC non-communicating heat pump thermostat, six wires are required to control the outdoor unit (R, C, Y1, Y2, O and W). Refer to the EL22XPV field wiring diagram for a conventional 24VAC non-communicating 2-stage heat pump thermostat.

When utilizing a single-stage conventional 24VAC non-communicating heat pump thermostat, five wires are required to control the outdoor unit (R, C, Y1, O and W) and Y1 is jumpered to Y2 in the outdoor unit. Note that the published performance data is based upon the use of a two-stage thermostat. Refer to the EL22XPV field wiring diagram for a conventional 24VAC non-communicating single-stage heat pump thermostat.

EL22XPV Thermostat Control Options

Thermostat Type	Indoor Unit Type	Qty. of Wires to EL22XPV	EL22XPV Terminal Strip Connections	Unit Operation	Field Wiring Diagram
S40 Communicating Thermostat	Communicating Gas Furnace or Air Handler	4	R, I+, I-, C	Fully Communicating Variable Capacity Operation Based Upon Thermostat Demand	Figure 15
Conventional 24VAC 2-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating or communicating)	6	R, C, Y1, Y2, O, W	Full Variable Capacity Operation Controlled by EL22XPV Unitary Control Using Suction Pressure in Cooling Mode and Liquid Pressure in Heating Mode	Figure 16
Conventional 24VAC Single-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating or communicating)	5	R, C, Y1, O, W (Jumper Y1 to Y2)	Full Variable Capacity Operation Controlled by EL22XPV Unitary Control Using Suction Pressure in Cooling Mode and Liquid Pressure in Heating Mode	Figure 16

Cooling Operation Mode Jumper

The Cooling Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump thermostat, the compressor capacity is controlled to maintain the target suction pressure setpoint. The Cooling Operation Mode Jumper has three selectable cooling modes. The three modes are Efficiency (Jumper installed on Pins 1 & 2), Normal Mode (Jumper installed on Pins 2 & 3) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode. The Efficiency mode has a variable suction pressure setpoint that will vary with the outdoor temperature; as the

outdoor temperature increases the suction pressure setpoint will decrease. When the Cooling Operation Mode jumper is installed in the "Normal Mode" the suction pressure setpoint is 135 psig.

When the Cooling Operation Mode jumper is installed in the "Comfort Mode" the suction pressure setpoint is 125 psig.

Cooling Operation Mode Jumper (Conventional 24VAV Thermostats Only)

Operation Mode Jumper	Jumper Position	Target Suction Pressure Setting
Efficiency (default)	Pin 1 to Pin 2	Variable based on OAT
Normal	Pin 2 to Pin 3	135 PSIG
Comfort	Jumper Off	125 PSIG

Heating Operation Mode Jumper

The Heating Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump thermostat, the compressor capacity is controlled to maintain the target liquid pressure setpoint. The Heating Operation Mode Jumper has two selectable heating modes. The two modes are Efficiency (Jumper installed on Pins 1 & 2) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode. The Efficiency mode has a variable liquid pressure setpoint that will vary with the outdoor temperature; as the outdoor temperature decreases, the liquid pressure setpoint will increase. When the Operation Mode jumper is installed in the "Comfort Mode" the liquid pressure setpoint is 425 psig.

Heating Operation Mode Jumper (Conventional 24VAV Thermostats Only)

Operation Mode Jumper	Jumper Position	Target Liquid Pressure Setting
Efficiency (default)	Pin 4 to Pin 5	Variable based on OAT
Comfort	Jumper Off	425 PSIG

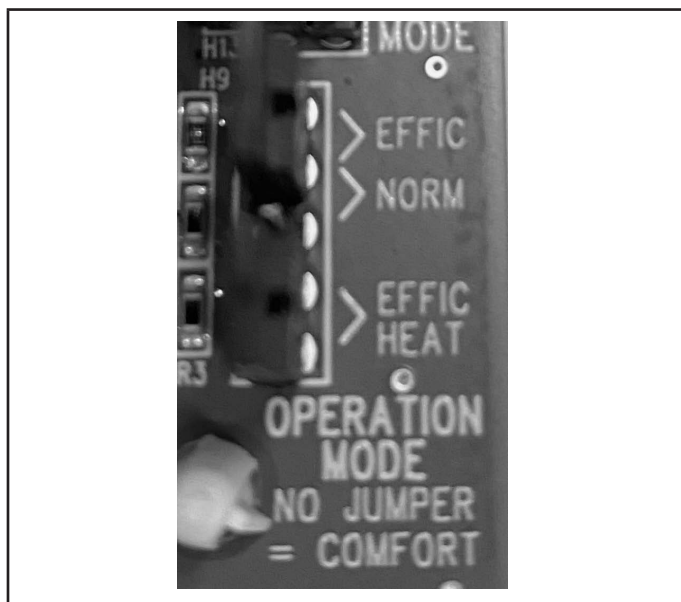


FIGURE 48. Operation Mode Jumper

Unit Operation

EL22XPV Unit Operation with an S30 or S40 Communicating Thermostat

When the EL22XPV unit is installed with an S30 or S40 Communicating Thermostat and a communicating indoor unit, the unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity based upon thermostat demand in both the cooling and heat pump heating mode. The indoor air volume will be controlled to match compressor capacity throughout the capacity range.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat – Cooling Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. The Y2 second stage cooling demand will initiate second stage blower operation. Increased air volume will increase the load on the indoor coil and increase the suction pressure. The EL22XPV compressor capacity will continue to be controlled based upon the suction pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat - Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 first stage compressor demand will initiate compressor operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The Y2 second stage compressor demand will initiate second stage blower operation. Increased air volume will increase heat transfer on the indoor coil and degrease the liquid pressure. If the liquid pressure drops below the target setpoint, the compressor capacity will be increased. The EL22XPV compressor capacity will continue to be controlled based upon the liquid pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating Single-Stage Heat Pump Thermostat – Cooling Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and cooling indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. If the cooling demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

EL22XPV Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the EL22XPV unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the EL22XPV outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the EL22XPV control will begin to ramp up the compressor capacity until maximum capacity is achieved. The EL22XPV unit will cycle off once the thermostat demand is satisfied.

Defrost Function

The outdoor unit control measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller self-calibrates (see figure 33) when the defrost system starts and after each system defrost cycle. The outdoor unit control monitors ambient temperature, outdoor coil temperature, and total run-time to determine when a defrost cycle is required. The coil temperature sensor is designed with a spring clip to secure the sensor to the outdoor TXV distributor. The location of the coil sensor is important for proper defrost operation (see figures 2 and 3 on pages 6 and 7 for location of the coil sensor).

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

DEFROST OPERATING MODES

The outdoor control has three operational modes:

- Defrost calibration
- Operation
- Defrost test

DEFROST TERMINATION TEMPERATURES

The defrost termination temperature setting selections (50, 70, 80, 90, and 100°F) are available through the thermostat interface. The factory default setting is **50°F (10°C)**.

NOTE - *Colder climates may require a higher defrost termination temperature setting to maintain a clear coil.*

ERROR CODES:

TABLE 16. Outdoor Control 7-Segment Display Alert Codes - Outdoor Control Errors

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 105	Service Soon	The outdoor control has lost communication with either the thermostat or indoor unit.	Equipment is unable to communicate. Indicates numerous message errors. In most cases errors are related to electrical noise. Make sure high voltage power is separated from RSBus. Check for miswired and/or loose connections between the stat, indoor unit and outdoor unit. Check for a high voltage source of noise close to the system. Fault clears after communication is restored.
E 120	Service Soon	Unresponsive device	There is a delay in the system component responding to the system. Typically this alert code does not cause any operational issues and will clear on its own. • This alert code is usually caused by a delay in the outdoor unit responding to the thermostat. • Leaking voltage from strands within the bundle. > Land only the R wire on the R terminal to load the bundle with 24VAC. ▶ Typically only the R wire needs to be landed to identify if voltage is leaking. ▶ If voltage is present checking the other wires is informational only but not needed. ▶ If voltage is not present checking the other wires one at a time would be needed. > Check each loose wire in AC mode to C on circuit board. ▶ Good voltage is .03 -.3VAC leaking voltage is not the issue. ▶ Acceptable can be up to .7VAC with moderate success. ▶ Some units have worked with up to 1.2VAC with occasional success. ▶ Voltage over 1.2VAC needs to be addressed.
E 124	Service Urgent	Equipment lost communication	The thermostat has lost communication with a system component for more than three minutes. System component has lost communication with the thermostat. • Check the wiring connections between components. • Ohm wires. • Cycle power. • Any component that is miss-wired may cause a false component code to be shown on system component. • Disconnect all wiring to other system components and check communication one at a time. NOTE: When using a float switch, use isolation relay to break common wire to outdoor unit. For testing purposes, remove float switch from the circuit This alert code stops all associated system operations and waits for a heartbeat message from the system component that is not communicating.
E 125	Service Urgent	There is a hardware problem with the outdoor control.	There is a control hardware problem. Replace the outdoor control if the problem prevents operation and is persistent. The alarm / fault is cleared 300 seconds after the fault recovers
E 131	Service Urgent	The outdoor unit control parameters are corrupted	Reconfigure the system. Replace the control if heating or cooling is not available.
E 132	Service Urgent	Internal software error	Replace outdoor control.

Unit Sensor Operation, Checkout and Status /Error Codes

OPERATION:

6-Pin Sensor Harness (LIQ, AMB, COIL)

Liquid Sensor (R7 - No Sensor)

There is no sensor located on positions 5 and 6 of the connector. A 10K Ohm resistor installed between pins 5 and 6 on the cable harness provides continuity for this circuit.

Ambient Temperature Sensor (RT13)

Ambient temperatures, as read by the ambient temperature sensor connected to pin 3 and pin 4, which are below -35°F (-37°C) or above 120°F (48°C) trigger a fault condition. If the ambient sensor is open, shorted, or out of the temperature range of the sensor, the control displays the appropriate alert code. Heating and cooling operation is allowed in this fault condition

Coil Temperature Sensor (RT21)

The liquid temperature sensor located on the outlet of the outdoor TXV is connected to pins 5 and 6.

4-Pin Suction Temperature Sensor / Liquid Temperature Sensor Harness

Suction Line Sensor (RT41)

Suction line temperature is read by the suction line temperature sensor between Pins 1 and Pin 2 of the 4-pin sensor harness. Nominal Resistance of the sensor is 10K ohms at 77F. The control will display are E182 error code if the sensor reads open or shorted for 24 hours. Cooling operation is allowed with this fault.

Liquid Line Temperature Sensor (RT36)

Liquid line temperature is read by the liquid line temperature sensor between Pins 3 and Pin 4 of the 4-pin sensor harness. Nominal Resistance of the sensor is 10K ohms at 77F. The control will display are E184 error code if the sensor reads open or shorted for 24 hours. Cooling operation is allowed with this fault.

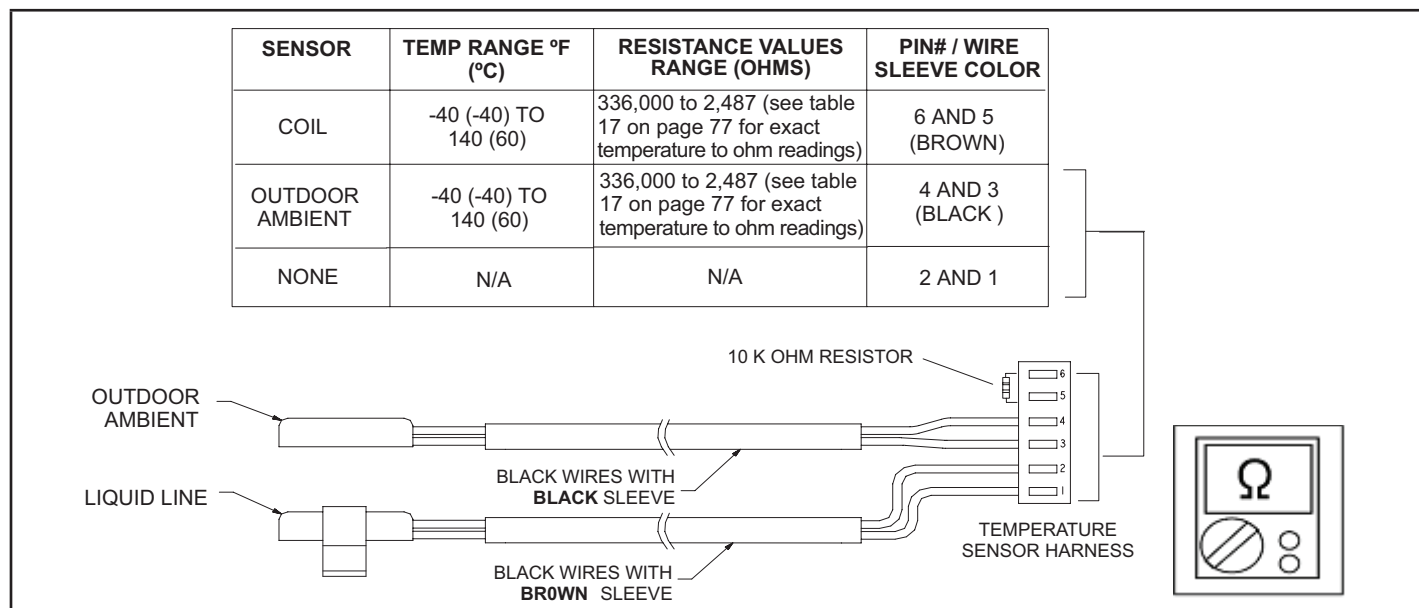


FIGURE 49. Temperature Sensor Specification

CHECKOUT:

Sensors connect to the outdoor control through a field-replaceable harness assembly that plugs into the outdoor control. Through the sensors, the control detects outdoor ambient, coil and liquid temperature fault conditions. As the detected temperature changes, the resistance across the sensor changes. Check sensor operation by reading ohms across pins shown in figure 49.

NOTE – When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is not within the range shown in figure 49, may be performing as designed. However, if a shorted or open circuit is detected, then the sensor may be faulty and the sensor harness will need to be replaced.

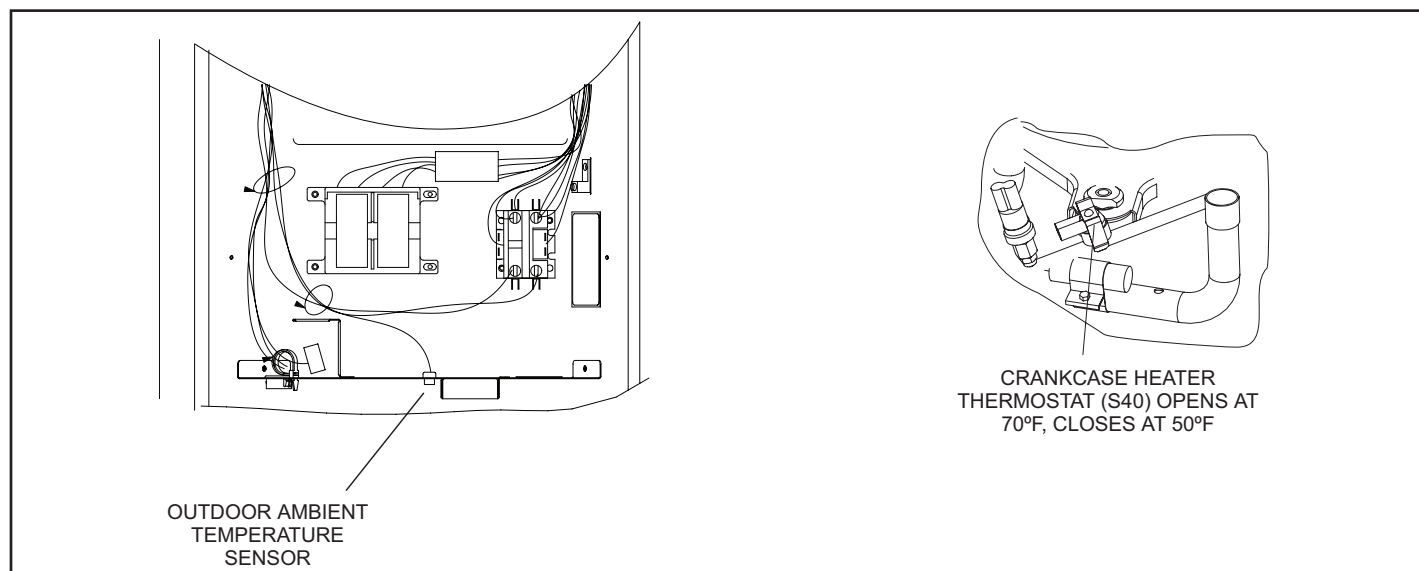


FIGURE 50. Temperature Sensor Locations

TABLE 17. Ambient and Liquid Line Sensors Temperature / Resistance Range

Degrees Fahr- enheit	Resistance	Degrees Fahr- enheit	Resistance	Degrees Fahr- enheit	Resistance	Degrees Fahr- enheit	Resistance
136.3	2680	56.8	16657	21.6	44154	-11.3	123152
133.1	2859	56.0	16973	21.0	44851	-11.9	125787
130.1	3040	55.3	17293	20.5	45560	-12.6	128508
127.3	3223	54.6	17616	20.0	46281	-13.2	131320
124.7	3407	53.9	17942	19.4	47014	-13.9	134227
122.1	3592	53.2	18273	18.9	47759	-14.5	137234
119.7	3779	52.5	18607	18.4	48517	-15.2	140347
117.5	3968	51.9	18945	17.8	49289	-15.9	143571
115.3	4159	51.2	19287	17.3	50074	-16.5	146913
113.2	4351	50.5	19633	16.8	50873	-17.2	150378
111.2	4544	49.9	19982	16.3	51686	-17.9	153974
109.3	4740	49.2	20336	15.7	52514	-18.6	157708
107.4	4937	48.5	20695	15.2	53356	-19.3	161588
105.6	5136	47.9	21057	14.7	54215	-20.1	165624
103.9	5336	47.3	21424	14.1	55089	-20.8	169824
102.3	5539	46.6	21795	13.6	55979	-21.5	174200
100.6	5743	46.0	22171	13.1	56887	-22.3	178762
99.1	5949	45.4	22551	12.5	57811	-23.0	183522
97.6	6157	44.7	22936	12.0	58754	-23.8	188493
96.1	6367	44.1	23326	11.5	59715	-24.6	193691
94.7	6578	43.5	23720	11.0	60694	-25.4	199130
93.3	6792	42.9	24120	10.4	61693	-26.2	204829
92.0	7007	42.3	24525	9.9	62712	-27.0	210805
90.6	7225	41.7	24934	9.3	63752	-27.8	217080
89.4	7444	41.1	25349	8.8	64812	-28.7	223677
88.1	7666	40.5	25769	8.3	65895	-29.5	230621
86.9	7890	39.9	26195	7.7	67000	-30.4	237941
85.7	8115	39.3	26626	7.2	68128	-31.3	245667
84.5	8343	38.7	27063	6.7	69281	-32.2	253834
83.4	8573	38.1	27505	6.1	70458	-33.2	262482
82.3	8806	37.5	27954	5.6	71661	-34.1	271655
81.2	9040	37.0	28408	5.0	72890	-35.1	281400
80.1	9277	36.4	28868	4.5	74147	-36.1	291774
79.0	9516	35.8	29335	3.9	75431	-37.1	302840
78.0	9757	35.2	29808	3.4	76745	-38.2	314669
77.0	10001	34.7	30288	2.8	78090	-39.2	327343
76.0	10247	34.1	30774	2.3	79465		
75.0	10496	33.5	31267	1.7	80873		
74.1	10747	33.0	31766	1.2	82314		
73.1	11000	32.4	32273	0.6	83790		
72.2	11256	31.9	32787	0.0	85302		
71.3	11515	31.3	33309	-0.5	86852		
70.4	11776	30.7	33837	-1.1	88440		
69.5	12040	30.2	34374	-1.7	90068		
68.6	12306	29.6	34918	-2.2	91738		
67.7	12575	29.1	35471	-2.8	93452		
66.9	12847	28.6	36031	-3.4	95211		
66.0	13122	28.0	36600	-4.0	97016		
65.2	13400	27.5	37177	-4.6	98870		
64.4	13681	26.9	37764	-5.2	100775		
63.6	13964	26.4	38359	-5.7	102733		
62.8	14251	25.8	38963	-6.3	104746		
62.0	14540	25.3	39577	-6.9	106817		
61.2	14833	24.8	40200	-7.5	108948		
60.5	15129	24.2	40833	-8.2	111141		
59.7	15428	23.7	41476	-8.8	113400		
59.0	15730	23.2	42130	-9.4	115727		
58.2	16036	22.6	42794	-10.0	118126		
57.5	16345	22.1	43468	-10.6	120600		

ERROR CODES:

TABLE 18. Outdoor Control 7-Segment Display Alert Codes – Outdoor Control Errors

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 180	Service Soon / Service Urgent	The S40 thermostat has found a problem with the outdoor unit's ambient temperature sensor.	During normal operation, after the outdoor control recognizes sensors, the alarm will be sent only if valid temperature reading is lost. Compare outdoor sensor resistance to temperature/resistance charts in unit installation instructions. Replace sensor pack if necessary. At the beginning of (any) configuration, furnace or air-handler control will detect the presence of the sensor(s). If detected (reading in range), appropriate feature will be set as 'installed' and shown in the S40 thermostat 'About' screen. The alarm / fault will clear upon configuration, or sensing normal values.
E 182	Service Soon	Suction Temperature Sensor has malfunctioned	Sensor is open or shorted. Replace the Sensor
E 183	Service Soon	Liquid Pressure Transducer Fault	Liquid pressure transducer is out of range. The signal should be between 0.5 VDC and 4.5 VDC between Blue and Black. The error code will be cleared when the proper signal is provided. Systems controlled by a conventional 24VAC heat pump thermostat will operate in stage mode.
E 184	Service Soon	Faulty outdoor liquid line sensor	Sensor is open or shorted. Replace the sensor.

DC Inverter Control Operation, Checkout, Status / Error Codes

OPERATION OF COMPONENTS:

Electromagnetic compatibility circuit (EMC): EMC ensures the correct operation of different equipment items which use or respond to electromagnetic phenomena. It also helps to negate the effects of interference.

CONVERTER:

Converts AC (alternating current) to DC (direct current).

POWER FACTOR CORRECTION (PFC) CIRCUIT:

The PFC module is an integrated part of the outdoor inverter that monitors the DC bus for high, low and abnormal voltage conditions. If any of these conditions are detected, the PFC function and compressor will stop.

INTELLIGENT (INVERTER) POWER MODULE (IPM):

The IPM converts DC power into AC power. The control method is known as pulse width modulation (PWM). This means the DC is switched on and off very quickly (chopped) by the transistor switches to make simulated AC at required frequency and voltage.

COMMUNICATION CONTROL CIRCUIT:

Receives and sends message between the inverter and the outdoor control.

STATUS CODES:

TABLE 19. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
	Red LED	Green LED			
N/A	ON	OFF	N/A	EL22XPV-024, -036 only: Indicates inverter is operating normally.	
N/A	ON	OFF	N/A	EL22XPV-048, -060 only: Indicates inverter is operating normally.	
N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.	

ERROR CODES:

TABLE 20. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 423	40	4 flashes	OFF	Service Soon / Service Urgent	The inverter has detected a circuit problem.	Control will lock out after 10 strikes within an hour. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 426	N/A	N/A	N/A	Service Urgent	Excessive inverter alarms	After ten faults within one hour, control will lock out. Indicates poor system operation. Review history of alarms to resolve system setup. Check condenser fan motor, TXV, indoor unit blower motor, stuck reversing valve, overcharge, undercharge, and clogged refrigerant filter. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power. Inverter alarms 12 to 14 and 53 do not count towards this lock out condition.
E 427	21	2 flashes	1 flash	Service Soon / Service Urgent	The inverter has detected a DC peak fault condition.	If condition (55A or higher) is detected, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If peak current (55A or higher) occurs 10 times within an hour, system will lock out. Indicates high pressure, condenser fan failure, locked compressor rotor or overcharge. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 428	22	2 flashes	2 flashes	Service Soon / Service Urgent	The inverter has detected a high main input current condition	If condition is detected, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If condition occurs 5 times within an hour, system will lock out. Indicates high pressure, condenser fan failure or overcharge. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 429	23	2 flashes	3 flashes	Service Soon / Service Urgent	On a call for compressor operation, if DC link power in inverter does not rise above 180 VDC for 2 and 3 ton models, 250 VDC for 4 and 5 ton models, within 30 seconds, the control will display a moderate code. If condition is detected, outdoor unit will stop (Compressor and fan). Antishort cycles is initiated. If condition occurs 10 times within a 60 minute rolling time period, system will lock out and display a critical code.	Issues: (1) If DC link power in inverter does not rise above 180 VDC for 2- and 3-ton models, 250 VDC for 4- and 5-ton models, within 30 seconds, the outdoor control will display a moderate code. (2) Capacitors on inverter do not properly charge. Corrective Actions: (1) Check for proper main power to outdoor unit and for any loose electrical connections.

TABLE 20. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 430	26	2 flashes	6 flashes	Service Soon / Service Urgent	Compressor start failure.	If condition is detected, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If condition occurs 10 times within an hour, system will lock out. Indicates poor connection at compressor harness, improper winding resistance, locked compressor rotor, or flooded compressor. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 431	27	2 flashes	7 flashes	Service Soon / Service Urgent	Error occurs when PFC detects an over-current condition of 100A, the control will display a moderate code. If condition is detected, outdoor unit will stop (Compressor and fan). Anti-short cycle is initiated. Inverter is unavailable to communicate with the outdoor control for 3 minutes. If condition occurs 10 times within a 60 minute rolling time period, system will lock out and display a critical code.	Issues: (1) Indicates power interruption, brownout, poor electrical connection or loose inverter input wire. (2) System testing was set up and code was generated when the reversing valve is de-energized coming out of defrost (code appears with or without 30 compressor delay). Corrective Actions: (1) Check for proper main power to outdoor unit and for any loose electrical connections.
E 432	28	2 flashes	8 flashes	Service Soon / Service Urgent	The inverter has detected a DC link high voltage condition.	Error occurs when the DC link capacitor voltage is greater than 480VDC. If condition is detected, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If condition occurs 10 times within an hour, system will lock out. System will stop. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 433	29	2 flashes	9 flashes	Service Soon / Service Urgent	The inverter has detected a compressor over-current condition	Error occurs when compressor peak phase current is greater than 28A. Inverter will issue code 14 first and slow down to try to reduce the current. If the current remains high, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If condition occurs 5 times within an hour, system will lock out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.

TABLE 20. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 434	53	5 flashes	3 flashes	Service Soon / Service Urgent	Outdoor control has lost communications with the inverter for greater than 3 minutes. Outdoor unit will stop all compressor demand. Outdoor control will attempt to establish communication multiple times and will automatically clear when the error clears. Unit will lock out after 60 minutes if communication is not established and will display a critical error code.	Issues: (1) Outdoor disconnect is off or outdoor power is off, when indoor power is on (source for 24VAC) (2) Loose electrical power connections (3) Interruption of main power to the inverter (4) Generator powers indoor unit, but not the outdoor unit. Corrective Actions: (1) To reset, cycle the indoor power off (source of 24VAC to outdoor unit) and back on. This will de-energize outdoor control and inverter by cycling the contactor. (2) Make sure the disconnect is on (3) Check electrical power supply connections (4) Check for proper main 230V power supply
E 435	60	6 flashes	OFF	Service Soon / Service Urgent	Inverter internal error.	When this error occurs, the outdoor control will cycle power to the inverter by opening the contactor for 2 minutes. Check that the EEPROM is properly seated. After power is cycled to the inverter 3 times, the outdoor unit is locked out.
E 436	62	6 flashes	2 flashes	Service Soon / Service Urgent	Inverter heat sink temperature exceeded limit. Occurs when the heat sink temperature exceeds the inverter limit. Inverter issues code 13 first, then slows down to allow the heat sink to cool. If temperature remains high, outdoor unit stops (compressor and fan). Anti-short cycle is initiated. If condition occurs 5 times within an hour, system is locked out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.	Issue: Feedback from supplier tear down of inverter indicates that the screws that hold the inverter to the inverter board were loose causing poor contact between these two components. Corrective Action: Tighten screws that hold the heat sink to the inverter control board. NOTE: Wait five minutes to all capacitor to discharge before checking screws.
E 437	65	6 flashes	5 flashes	Service Soon / Service Urgent	Heat sink temperature sensor fault has occurred (temperature less than 4 °F or greater than 264°F after 10 minutes of operation).	This occurs when the temperature sensor detects a temperature less than 0.4°F or greater than 264°F after 10 minutes of operation. If condition is detected, outdoor unit will stop (compressor and fan). Antishort cycle is initiated. If condition occurs 5 times within an hour, system will lock out. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.

TABLE 20. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 438	73	7 flashes	3 flashes	Service Soon / Service Urgent	The inverter has detected a PFC over current condition. This would be caused by a high load condition, high pressure, or outdoor fan failure. Outdoor control will display the code when the inverter has the error. After 3 minutes, the inverter will reset and the compressor will turn on again. If it happens 10 times within a 60 minute rolling time period, the OD control will lock out operation of the outdoor unit and display a critical code.	Issue: Possible issue is system running at high pressures. Check for high pressure trips or other alert codes in room thermostat and outdoor control. To clear, disconnect power to the indoor unit (24VAC power source to the outdoor control) which will power off the outdoor control and will open the outdoor unit contactor, which interrupts power to the inverter and then re-apply power.
E 439	12	1 flash	2 flashes	Dealer Info Only	Compressor slowdown due to high input current.	This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the input current and will then resume normal operation.
E 440	13	1 flash	3 flashes	Dealer Info Only	Heat sink temperature is approaching limit. The compressor speed automatically slows to reduce heat sink temperature. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared.	This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110°F) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occur frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 167°F and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 150°F. The heat sink temperature, compressor speed in Hertz & the Inverter Compressor Speed Reduction status (“On” or “Off”) notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center on units installed with an S40 thermostat.

TABLE 20. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

NOTE - System fault and lockout codes take precedence over system status codes (cooling, heating operating percentages or defrost/dehumidification). Only the latest active fault or lockout codes are displayed (if present). If no fault or lockout codes are active, then system status codes are displayed. Alert codes are also displayed on the S40 thermostat.

Alert Codes	Inverter Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 441	14	1 flash	4 flashes	Dealer Info Only	Compressor slowdown due to high compressor current. Compressor current is approaching limit. The compressor speed automatically slows. The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically cleared..	This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor as the currently increases rapidly during startup. The inverter will reduce the compressor speed by 4 hz and slow the compressor ramp up speed to the requested compressor demand (capacity). This is normal and expected operation of the inverter to control the compressor within design parameters. In most cases the alert code 441 does not require any additional service or diagnostic procedures. E441 may also occur if the system is operating at high pressures. This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor as the currently increases rapidly during startup. The inverter will reduce the compressor speed by 4 hz and slow the compressor ramp up speed to the requested compressor demand (capacity). This is normal and expected operation of the inverter to control the compressor within design parameters. In most cases the alert code 441 does not require any additional service or diagnostic procedures. E441 may also occur if the system is operating at high pressures.

System Refrigerant

IMPORTANT

The system must be operating at full capacity during charging. Using the Charge Mode Jumper on the outdoor control ensures the unit is running at 100% capacity. Confirm outdoor unit running capacity.

This section outlines the procedures to:

- 1 - Connect a gauge set for testing and charging as illustrated in figure 51.
- 2 - Check and adjust indoor airflow as described in figure 52.
- 3 - Add or remove refrigerant using the weigh-in method shown in figure 53.
- 4 - Verify the charge using the subcooling method described in figure 54.

IMPORTANT: Unit must be operating at 100% capacity to be charged properly.

ADDING OR REMOVING REFRIGERANT

This system uses HFC-410A refrigerant which operates at much higher pressures than HCFC-22.

INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process using the illustration in figure 52.

The diagnostic screen on the S30 or S40 thermostat displays the indoor CFMs on systems installed with the S30 or S40 communicating thermostat.

On systems installed with the S30 or S40 thermostat, the Cooling - Maximum Rate Test located in the Test section of the Dealer Control Center of the thermostat or the Dealer Setup App may be used to operate the unit at maximum capacity during charging.

Charge Mode Jumper

To initiate the EL22XPV Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

EL22XPV Charge Mode Operation with a S30 or S40 Communicating Thermostat

Installing a jumper on the Charge Mode Pins will initiate compressor operation in the cooling mode and outdoor fan motor at 100% capacity and will provide a signal to the indoor unit to initiate indoor blower operation at the maximum cooling air volume. To exit the charge mode, remove the Charge Mode Jumper. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

EL22XPV Charge Mode Operation with a Conventional 24VAC Non-Communicating Heat Pump Thermostat

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 compressor demand to the EL22XPV to initiate the Charge Mode. When using the Charge Mode in the cooling mode, the "O" must also be provided with a 24V signal to place the reversing valve in the cool position. In the heating mode only a Y1 compressor demand is required along with the blower demand for the full cooling air volume. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 Cooling demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

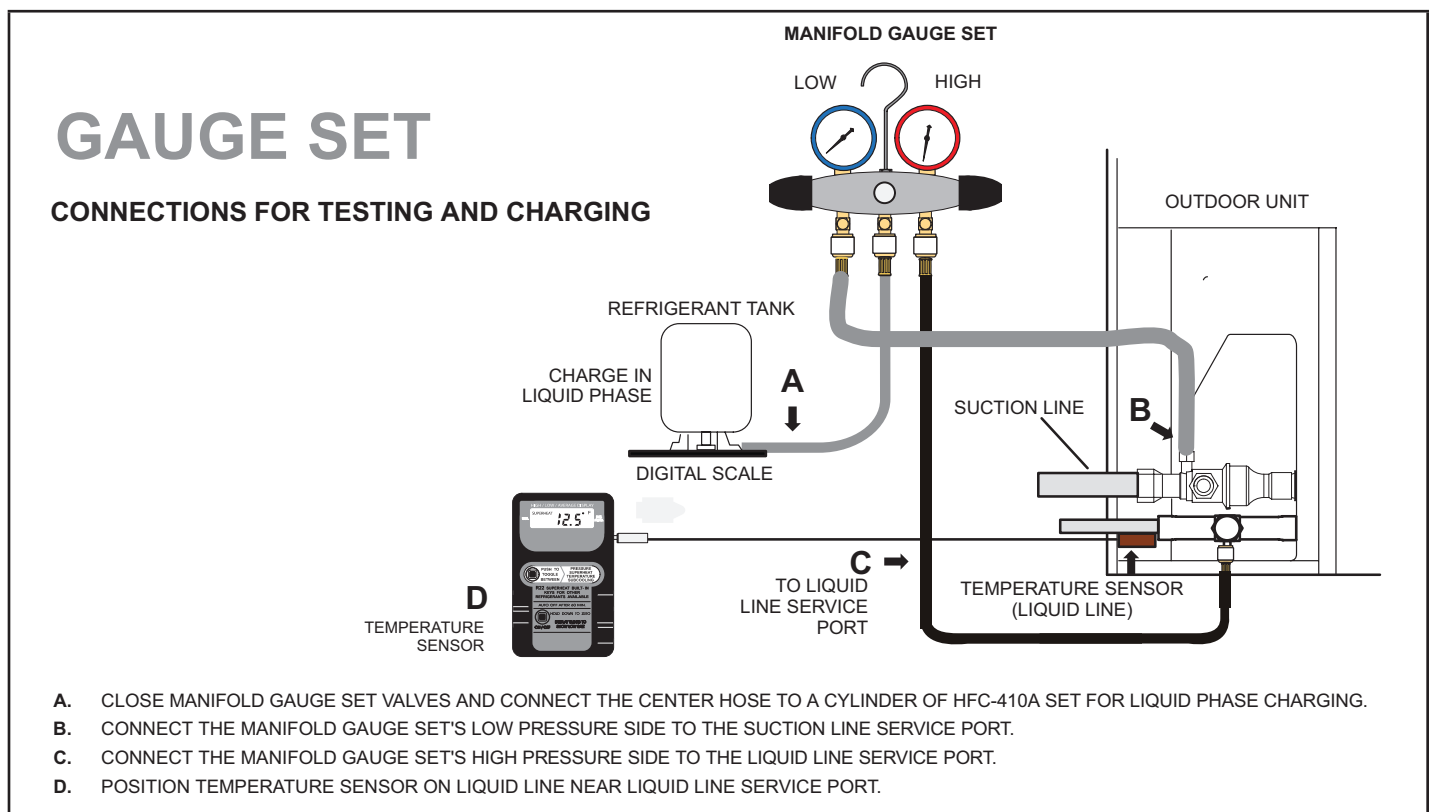


FIGURE 51. Gauge Set Connections

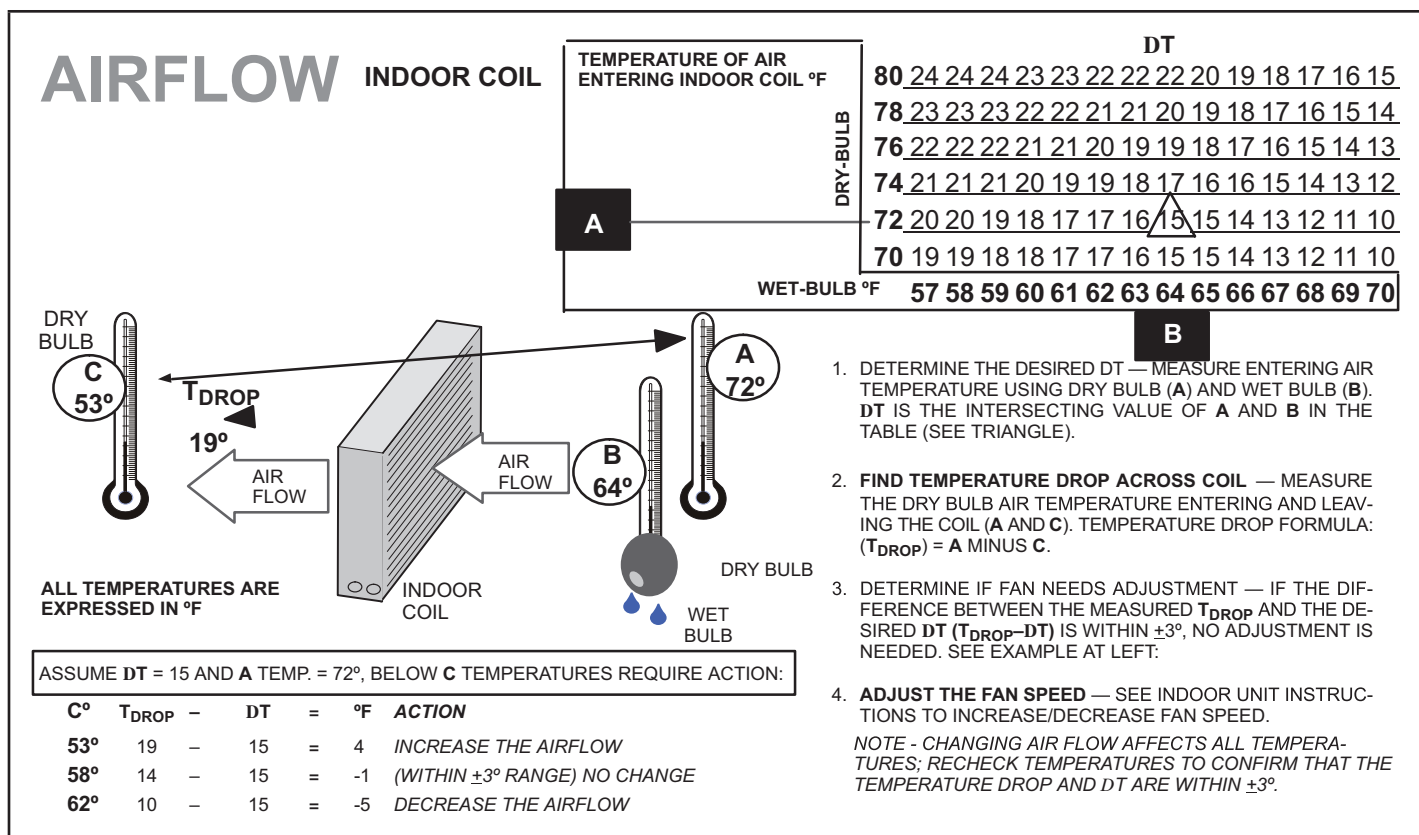


FIGURE 52. Checking Indoor Airflow over Evaporator Coil using Delta-T Chart

Use the WEIGH-IN method for adding initial refrigerant charge, and then use SUBCOOLING method for for verifying refrigerant charge.

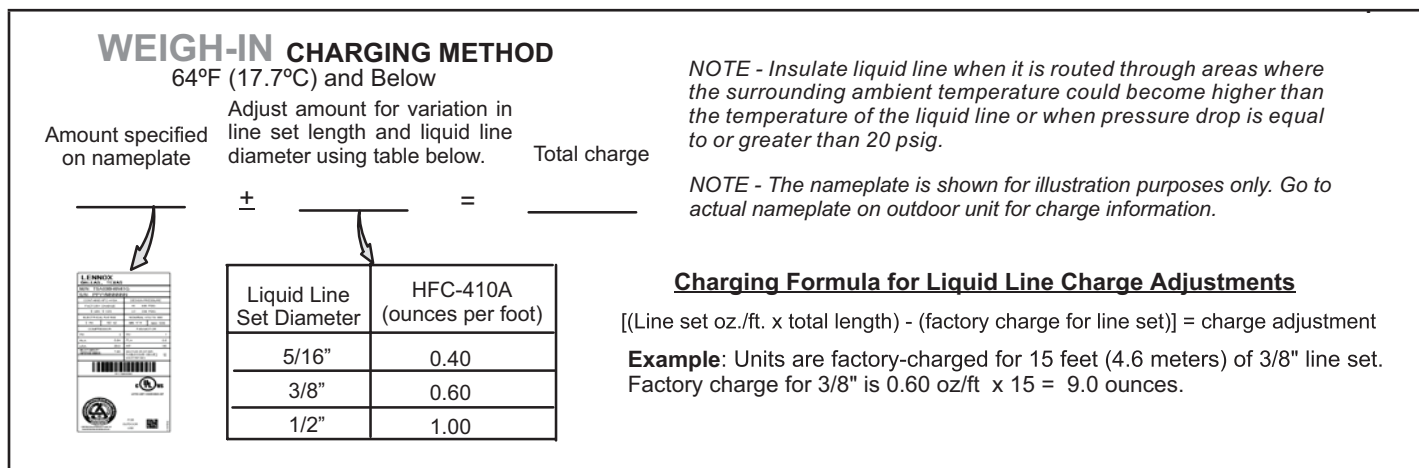
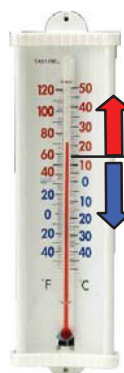


FIGURE 53. Using HFC-410A Weigh-In Method

SUBCOOLING CHARGING METHOD

(All charging **MUST** be performed while system is operating either at maximum speed or 100% demand.)

1. THE DIAGNOSTIC SCREEN ON THE THERMOSTAT OR OUTDOOR CONTROL 7-SEGMENT DISPLAY WILL SHOW INDOOR AND OUTDOOR MOTOR CFMS OR RPMs.
2. MEASURE OUTDOOR AMBIENT TEMPERATURE.
3. CONNECT GAUGE SET.
4. CHECK LIQUID AND VAPOR LINE PRESSURES. COMPARE PRESSURES WITH COOLING MODE NORMAL OPERATING PRESSURES IN THE APPLICABLE CHARGING STICKER, NORMAL OPERATING PRESSURES AT MAXIMUM CAPACITY.
NOTE - THE REFERENCE TABLE IS A GENERAL GUIDE. EXPECT MINOR PRESSURE VARIATIONS. SIGNIFICANT DIFFERENCES MAY MEAN IMPROPER CHARGE OR OTHER SYSTEM PROBLEM.
5. SET THERMOSTAT FOR HEAT/COOL DEMAND, DEPENDING ON MODE BEING USED:



USE
COOLING
MODE
60°F
(15°C)
USE
HEATING
MODE

USING COOLING MODE — WHEN THE OUTDOOR AMBIENT TEMPERATURE IS 60°F (15°C) AND ABOVE. TARGET SUBCOOLING VALUES (MAXIMUM / 100% CAPACITY) IN APPLICABLE CHARGING STICKER ARE BASED ON 70 TO 80°F (21-27°C) INDOOR RETURN AIR TEMPERATURE; IF NECESSARY, OPERATE HEATING TO REACH THAT TEMPERATURE RANGE; THEN SET THE INITIAL COOLING DEMAND AT MAXIMUM CAPACITY. THE PREFERRED METHOD IS TO USE THE "CHARGE MODE" JUMPER ON THE OUTDOOR CONTROL. SEE CHARGE MODE JUMPER SECTION ON PAGE 80. WHEN PRESSURES HAVE STABILIZED, CONTINUE WITH STEP 6.

6. READ THE LIQUID LINE TEMPERATURE; RECORD IN THE LIQ° SPACE.
7. READ THE LIQUID LINE PRESSURE; THEN FIND ITS CORRESPONDING TEMPERATURE IN THE TEMPERATURE/ PRESSURE CHART LISTED IN THE APPLICABLE CHARGING STICKER AND RECORD IT IN THE SAT° SPACE.
8. SUBTRACT LIQ° TEMPERATURE FROM SAT° TEMPERATURE TO DETERMINE SUBCOOLING; RECORD IT IN SC° SPACE.
9. COMPARE SC° RESULTS WITH APPLICABLE CHARGING STICKER, BEING SURE TO NOTE ANY ADDITIONAL CHARGE FOR LINE SET AND/OR MATCH-UP.
10. IF SUBCOOLING VALUE IS GREATER THAN SHOWN IN APPLICABLE CHARGING STICKER FOR THE APPLICABLE UNIT, REMOVE REFRIGERANT; IF LESS THAN SHOWN, ADD REFRIGERANT.
11. IF REFRIGERANT IS ADDED OR REMOVED, REPEAT STEPS 6 THROUGH 10 TO VERIFY CHARGE.
12. DISCONNECT GAUGE SET AND RE-INSTALL BOTH THE LIQUID AND SUCTION SERVICE VALVE CAPS.

SAT° _____
LIQ° - _____
SC° = _____

FIGURE 54. Using HFC-410A Subcooling Method - High Speed (High Capacity)

TABLE 21. HFC-410A Temperature (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig
32	100.8	48	137.1	63	178.5	79	231.6	94	290.8	110	365.0	125	445.9	141	545.6
33	102.9	49	139.6	64	181.6	80	235.3	95	295.1	111	370.0	126	451.8	142	552.3
34	105.0	50	142.2	65	184.3	81	239.0	96	299.4	112	375.1	127	457.6	143	559.1
35	107.1	51	144.8	66	187.7	82	242.7	97	303.8	113	380.2	128	463.5	144	565.9
36	109.2	52	147.4	67	190.9	83	246.5	98	308.2	114	385.4	129	469.5	145	572.8
37	111.4	53	150.1	68	194.1	84	250.3	99	312.7	115	390.7	130	475.6	146	579.8
38	113.6	54	152.8	69	197.3	85	254.1	100	317.2	116	396.0	131	481.6	147	586.8
39	115.8	55	155.5	70	200.6	86	258.0	101	321.8	117	401.3	132	487.8	148	593.8
40	118.0	56	158.2	71	203.9	87	262.0	102	326.4	118	406.7	133	494.0	149	601.0
41	120.3	57	161.0	72	207.2	88	266.0	103	331.0	119	412.2	134	500.2	150	608.1
42	122.6	58	163.9	73	210.6	89	270.0	104	335.7	120	417.7	135	506.5	151	615.4
43	125.0	59	166.7	74	214.0	90	274.1	105	340.5	121	423.2	136	512.9	152	622.7
44	127.3	60	169.6	75	217.4	91	278.2	106	345.3	122	428.8	137	519.3	153	630.1
45	129.7	61	172.6	76	220.9	92	282.3	107	350.1	123	434.5	138	525.8	154	637.5
46	132.2	62	175.4	77	224.4	93	286.5	108	355.0	124	440.2	139	532.4	155	645.0
47	134.6			78	228.0			109	360.0			140	539.0		

FIGURE 55. EL22XPV Charging Label

HFC-410A CHARGING INFORMATION – FOR COMPLETE CHARGING DETAILS, REFER TO THE OUTDOOR UNIT INSTALLATION AND SERVICE PROCEDURE

Maintenance checks using the Normal Operating Pressures table

Table 2 may be used to help perform maintenance checks. This table is not a procedure for charging the system and any minor variations in the pressures may be expected due to differences in installations. However, significant deviations could mean that the system is not properly charged or that a problem exists with some component in the system.

Charge Using the Subcooling Method

Cooling Mode – When the outdoor ambient temperature is 60°F (15°C) and above, use the cooling mode to adjust the charge using the subcooling method. Target subcooling values in table 1 are based on 70 to 80°F (21-27°C) indoor return air temperature.

Heating Mode – When the outdoor ambient temperature is below 60°F (15°C), use the heating mode to adjust the charge using the subcooling charge levels (table). Target subcooling values in table 1 are based on 65-75°F (18-24°C) indoor return air temperature.

Matchups/Charge Levels and Line Set Lengths

Table 2 lists all the Lennox recommended indoor unit matchups along with the charge levels for the various sizes of outdoor units. **Charge levels on the unit nameplate are based on installations with 15ft. (4.6m) line sets; on line sets with 3/8" (9.5mm) liquid line, add 3oz. additional refrigerant for every 5ft. longer than 15ft. If line length is less than 15ft., subtract this amount (see Installation Instructions for more details).**

Charge Using the Weigh-in Method

If the system is void of refrigerant, locate and repair any leaks and then weigh in the refrigerant charge into the unit. For charge adjustments, be sure to consider line set length differences and, referring to table 1, adjust for the matchup difference.

- 1 - Recover the refrigerant from the unit.
- 2 - Conduct leak check; evacuate as previously outlined.
- 3 - Weigh in the unit nameplate charge, adjusting for matchup and line set length differences. If weighing facilities are not available use the Subcooling method.

Table 1 – Normal Operating Pressures (Liquid ±10 and Vapor ±5 psig)

Temperature	Cooling Operation – Liquid Line Pressure / Vapor Line Pressure			
°F (°C)*	-024	-036	-048	-060
65 (18.3)	237/142	228/132	241/137	235/130
75 (23.9)	276/145	283/134	281/137	275/132
85 (29.4)	322/145	327/136	326/139	318/136
95 (35.0)	370/148	378/138	374/140	368/135
105 (40.6)	425/150	432/141	430/143	421/137
115 (46.1)	487/151	493/144	490/146	481/140
Temperature	Heating Operation – Liquid Line Pressure / Vapor Line Pressure			
20 (-7.0)	300/64	293/57	293/63	308/57
30 (-1.0)	318/78	311/75	308/75	327/70
40 (4.4)	337/93	325/87	328/88	344/83
50 (10)	356/108	339/105	342/104	359/99
60 (15.5)	371/127	360/124	359/123	387/111

Table 2 – Indoor Unit Matches and Subcooling Charge Levels and Additional Charge**

Indoor Matchup	Target Subcooling		**Additional Charge	
	Heating (±5°F)	Cooling (±1°F)	lb	oz
EL22XPV-024				
CBA25UH-024 / CBA25UHV-024	20.5	10.5	0	10
CBA25UH-030 / CBA25UHV-030	18.5	11	0	11
CBA27UHE-030 / CBA38MV-030	15	11	0	13
CBA27UHE-024 / CBA38MV-018/024	23	12	2	0
C35-24 / CX35-24	33	10	0	0
C35-30 / CX35-30	21	13	1	7
EL22XPV-036				
CBA25UH-036 / CBA25UHV-036	11	14	1	10
CBA25UH-042 / CBA25UHV-042	11	14	1	10
CBA27UHE-036 / CBA38MV-036	13	13.5	1	0
CBA27UHE-042 / CBA38MV-042	14	22	3	5
C35-30 / CX35-30	13	12	0	0
C35-36 / CX35-36	19	17	2	1
C35-48 / CX35-48	11	14.5	1	5
CHX35-30A	23	17	1	10
CHX35-30B	18	16	1	13
CHX35-36C	20	16	0	8
CHX35-42C	13	17	1	15
CHX35-48B	13	16	1	6

Indoor Matchup	Target Subcooling		**Additional Charge	
	Heating (±5°F)	Cooling (±1°F)	lb	oz
CR33-30 / 36	26	11.5	0	1
CR33-48B	27	17	2	2
EL22XPV-048				
CBA25UH-048 / CBA25UHV-048	34	9	2	11
CBA25UH-060 / CBA25UHV-060	28	10.5	3	9
CBA27UHE-048 / CBA38MV-048	23	10	3	4
CBA27UHE-060 / CBA38MV-060	20	12.5	4	1
C35-60C, CX35-60C	22.5	13	4	0
CHX35-48B	33	8.5	0	0
CHX35-48C	33	8.5	1	14
CHX35-51/61C	27	10.5	2	13
CR33-50 / 60	30	13	5	0
EL22XPV-060				
CBA25UH-060 / CBA25UHV-060	16	10.5	0	12
CBA27UHE-060 / CBA38MV-060	13	10	0	3
C35-60C / CX35-60C	17	10	0	11
C35-60D / CX35-60D	18	10	0	7
CHX35-60D	16	9	0	9
CR33-50 / 60	18	10	0	0
CR33-60	18	10	0	0

The values in this table are most popular match-up pressures; indoor match-up, indoor air quantity, and indoor load will cause the pressures to vary.

**Amount of charge required in addition to charge shown on unit nameplate.



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