LENNOX
Service Literature

INSTALLATION AND SERVICE PROCEDURE

XP25

Corp. 1252-L11
July 24, 2013 (Revised on Dec. 14, 2016)

Dave Lennox *Signature*® Collection XP25 Series Units

iComfort.
So simple. So smart. So comfortable.

SUNSOURCE®

TABLE OF CONTENTS

⚠ IMPORTANT

This unit has refrigerant piping requirements that are unique to this this model. Size and install the refrigerant piping per table 2 (page 14) to ensure proper unit operation.

IMPORTANT: Before applying any power (main, solar or low voltage) to the outdoor unit, confirm iComfort Wi-Fi® thermostat has Version 2.1 or higher software. (Reference iComfort Wi-Fi® thermostat manual.)

This unit is an integral component of a system that requires an iComfort Wi-Fi® thermostat and iComfort®-enabled air handler or furnace.

XP25 Heat Pump

iComfort Wi-Fi® Thermostat

iComfort™-enabled air handler or furnace

⚠ WARNING

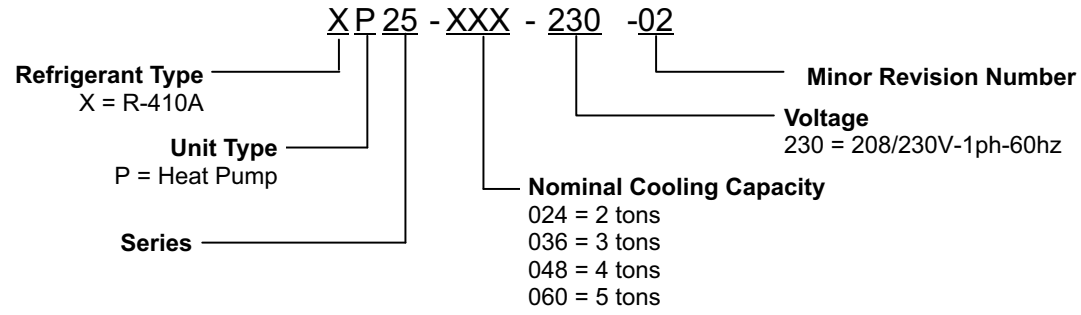
Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property. Installation and service must be performed by a licensed professional installer (or equivalent) or a service agency.

⚠ IMPORTANT

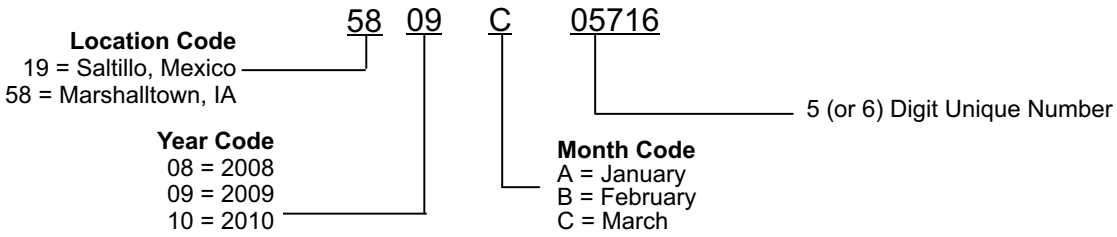
The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFCs, HCFCs AND HFCs) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

I. OVERVIEW

Model Number identification



Typical Serial Number Identification



Specifications

Model Number	Unit			Outdoor Fan	
	Sound Rating Number (dB)[1]		Factory Refrigerant Charge[2]	Number of Blades	Diameter - inches.
	Maximum	Minimum			
XP25-024-230-01	68	58	11 lbs., 5 oz.	3	26

Model Number	Unit			Outdoor Fan	
	Sound Rating Number (dB)[1]		Factory Refrigerant Charge[2]	Number of Blades	Diameter - inches.
	Maximum	Minimum			
XP25-036-230-01	73	58	11 lbs., 8 oz.	3	26

Model Number	Unit			Outdoor Fan	
	Sound Rating Number (dB)[1]		Factory Refrigerant Charge[2]	Number of Blades	Diameter - inches.
	Maximum	Minimum			
XP25-048-230-01	74	64	13 lbs., 14 oz.	3	26

Model Number	Unit			Outdoor Fan	
	Sound Rating Number (dB)[1]		Factory Refrigerant Charge[2]	Number of Blades	Diameter - inches.
	Maximum	Minimum			
XP25-060-230-01	74	64	13 lbs., 0 oz.	3	26

[1] Tested according to AHRI Standard 270-2008 test conditions.

[2] Factory charge is sufficient for refrigerant line lengths up to 15 feet.

Electrical Data

208/230V-60 Hz-1 Ph

Model Number	Unit		Compressor		Outdoor Fan (RPM varies with compressor RPM)							
	Maximum Over-current Protection (amps)[1]	Minimum Circuity Ampacity[2]	Rated Load Amps (RLA)	Locked Rotor Amps (LRA)	Motor HP	CFM		RPM		WATTS		Full Load Amps (FLA)
						MAX	MIN	MAX	MIN	MAX	MIN	
XP25-024-230-01	25	15.7	10.30	18.00	1/3	2580	1845	723	515	70	32	2.80

208/230V-60 Hz-1 Ph

Model Number	Unit		Compressor		Outdoor Fan (RPM varies with compressor RPM)							
	Maximum Over-current Protection (amps)[1]	Minimum Circuity Ampacity[2]	Rated Load Amps (RLA)	Locked Rotor Amps (LRA)	Motor HP	CFM		RPM		WATTS		Full Load Amps (FLA)
						MAX	MIN	MAX	MIN	MAX	MIN	
XP25-036-230-01	25	20.3	14.00	18.00	1/3	4130	1865	850	390	214	40	2.80

208/230V-60 Hz-1 Ph

Model Number	Unit		Compressor		Outdoor Fan (RPM varies with compressor RPM)							
	Maximum Over-current Protection (amps)[1]	Minimum Circuity Ampacity[2]	Rated Load Amps (RLA)	Locked Rotor Amps (LRA)	Motor HP	CFM		RPM		WATTS		Full Load Amps (FLA)
						MAX	MIN	MAX	MIN	MAX	MIN	
XP25-048-230-01	40	33.7	24.70	29.00	1/3	4040	3315	805	658	172	98	2.80

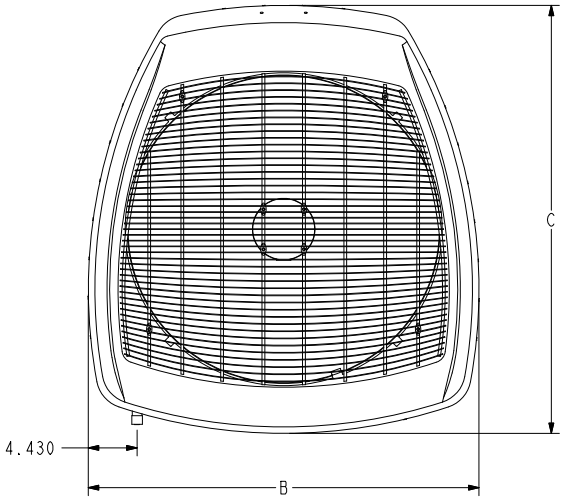
208/230V-60 Hz-1 Ph

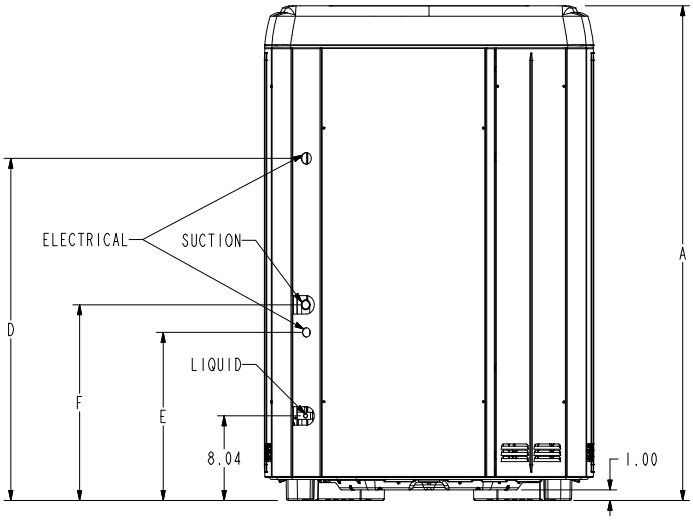
Model Number	Unit		Compressor		Outdoor Fan (RPM varies with compressor RPM)							
	Maximum Over-current Protection (amps)[1]	Minimum Circuity Ampacity[2]	Rated Load Amps (RLA)	Locked Rotor Amps (LRA)	Motor HP	CFM		RPM		WATTS		Full Load Amps (FLA)
						MAX	MIN	MAX	MIN	MAX	MIN	
XP25-060-230-01	40	34.9	25.70	29.00	1/3	4240	3025	845	600	198	76	2.80

[1] HACR type circuit breaker or fuse.

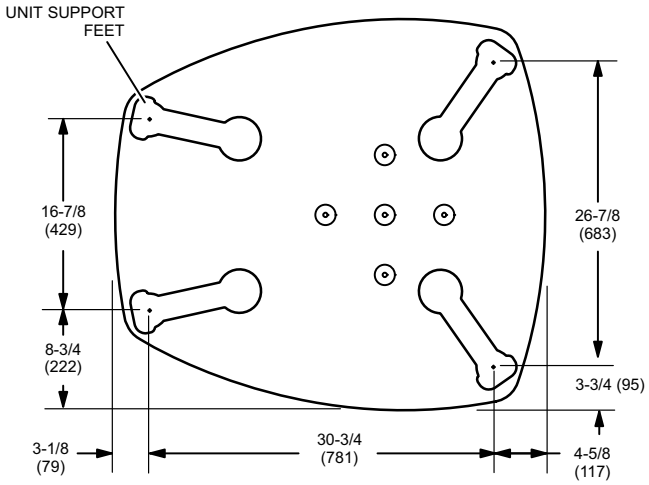
[2] Refer to National or Canadian Electrical Code manual to determine wire, fuse and disconnect size requirements.

Unit Dimensions -- Inches (mm)





UNIT	DIM A	DIM B	DIM C	DIM D	DIM E	DIM F
XP25-024	37.00	35.50	39.40	28.88	12.69	16.68
XP25-036	37.00	35.50	39.40	28.88	12.69	16.68
XP25-048	47.00	35.50	39.40	32.50	15.97	18.59
XP25-060	47.00	35.50	39.40	32.50	15.97	18.59



BASE WITH ELONGATED LEGS

⚠ 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

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

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

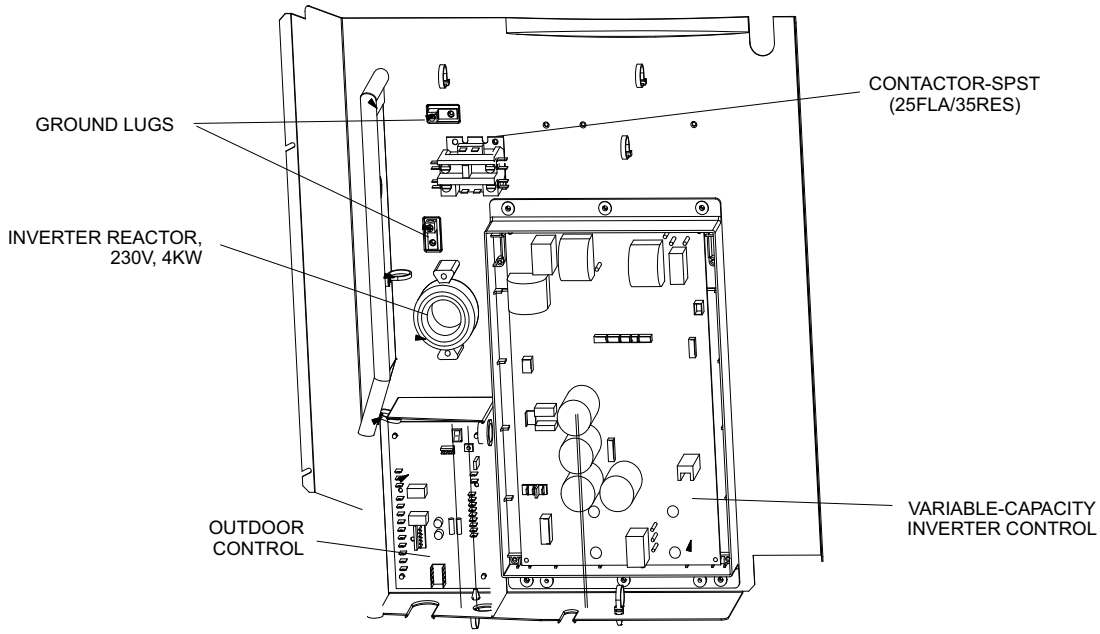
⚠ WARNING

Electrical Hazard
High Voltage
Wait 5 Minutes

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

Typical Unit Parts Arrangement

CONTROL PANEL FOR XP25-024 AND -036



CONTROL PANEL FOR XP25-048 AND -060

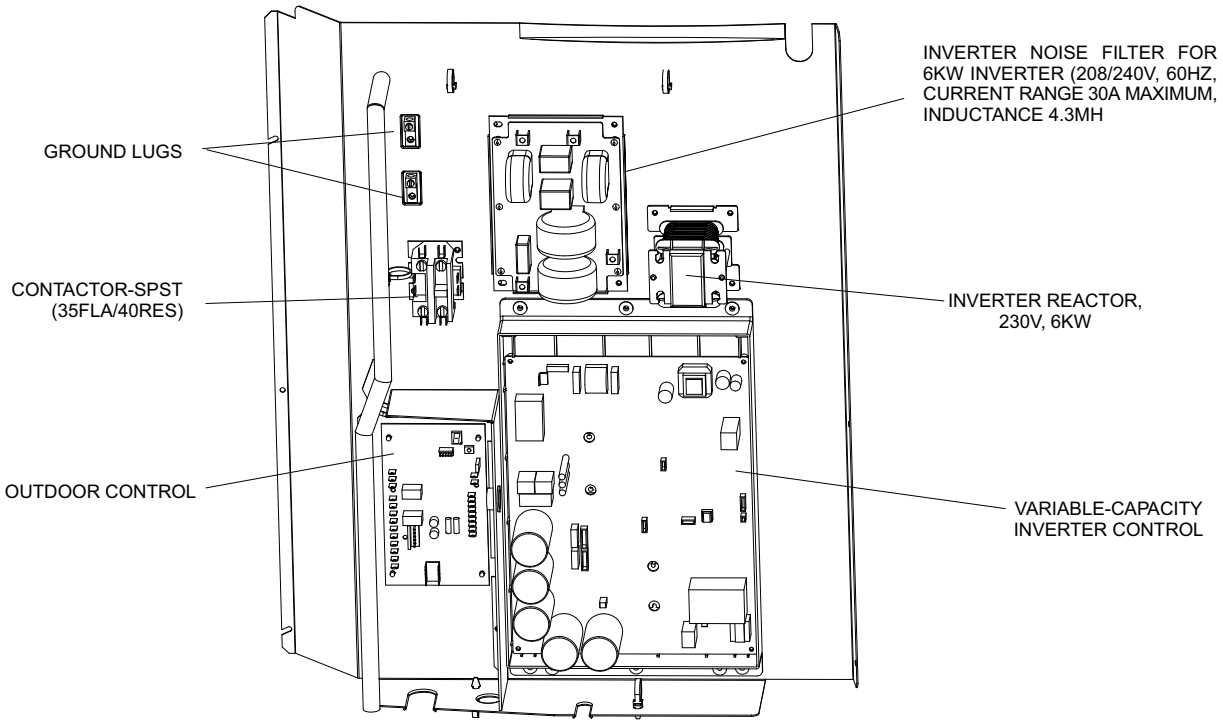
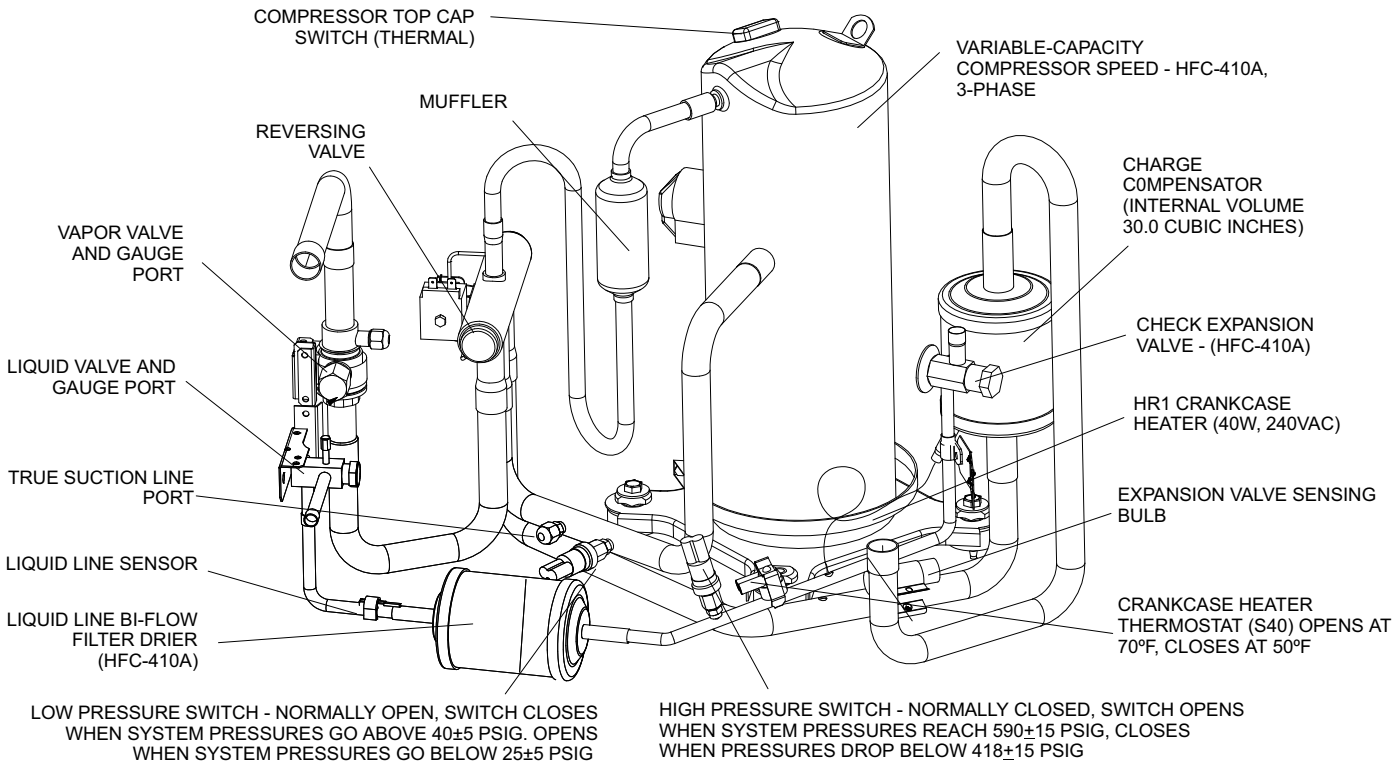


Figure 1. Control Panel Components

Typical Plumbing Components (-024 and -048)



Typical Plumbing Components (-036 and -060)

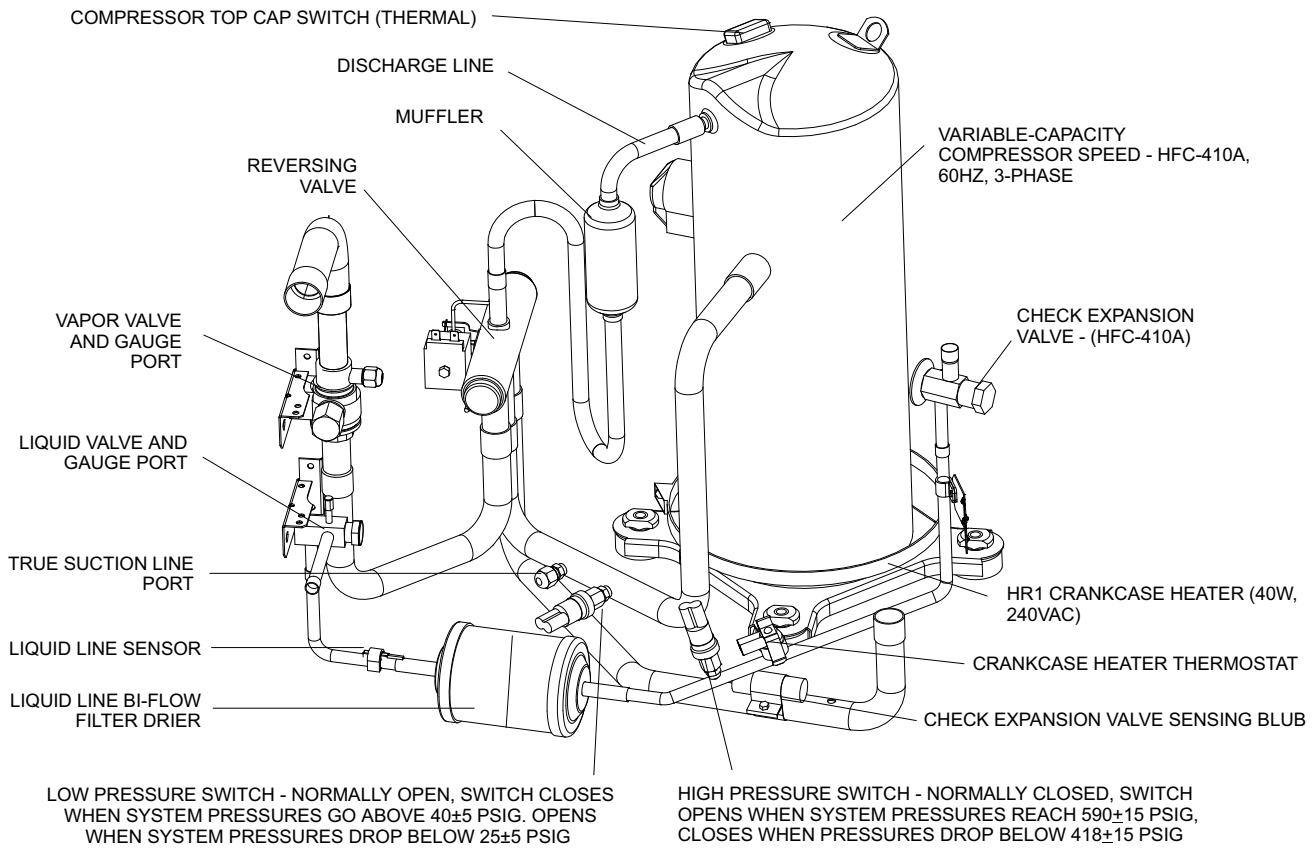


Figure 2. Plumbing (Component Locations and Specifications)

⚠ 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.

⚠ WARNING

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

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

General

The XP25 is a high-efficiency residential split-system heat pump unit, which features a variable-capacity scroll compressor and HFC-410A refrigerant. Units are available in 2, 3, 4 and 5-ton sizes. The series is designed for use with a check expansion valve (approved for use with HFC-410A) in the indoor unit only.

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

TORQUE REQUIREMENTS

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

⚠ IMPORTANT

Only use hex 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 a hex 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 in.- lb.	2 NM
Machine screws #10	28 in.- lb.	3 NM
Compressor bolts	90 in.- lb.	10 NM
Gauge port seal cap	8 ft.- lb.	11 NM

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 sets used with HFC-410A refrigerant systems must be capable of handling 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 or up to 800 psig of pressure with a 4000 psig burst rating.

Operating Service Valves

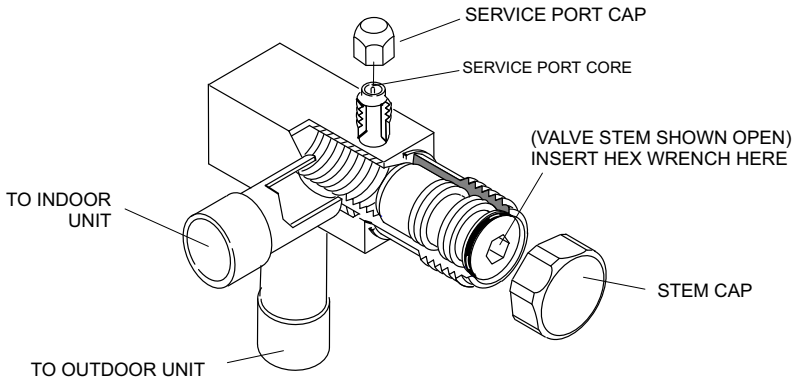
The liquid and vapor line service valves are used for removing refrigerant, flushing, leak testing, evacuating, checking charge and charging.

Each valve is equipped with a service port which has a factory-installed valve stem. Figure 3 provides information on how to access and operate both angle and ball-type service valves.

SERVICE VALVES ANGLE AND BALL-TYPE

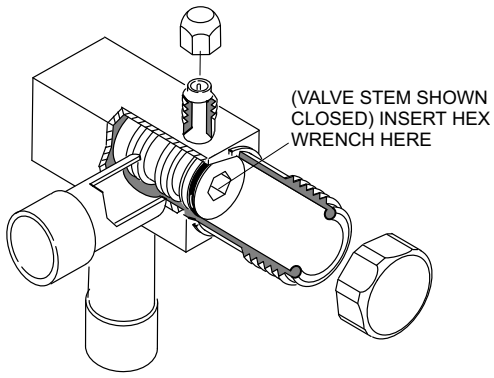
Operating Angle-Type Service Valve:

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.



ANGLE-TYPE SERVICE VALVE (BACK-SEATED OPENED)

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

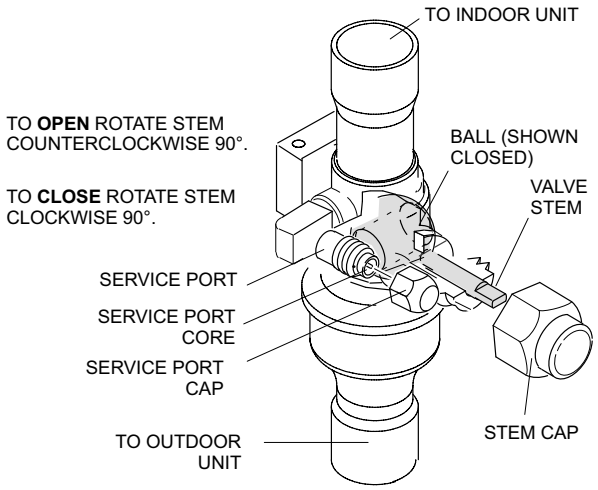


ANGLE-TYPE SERVICE VALVE (FRONT-SEATED CLOSED)

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

Operating Ball-Type Service Valve:

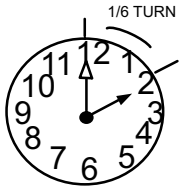
1. Remove stem cap with an appropriately sized wrench.
2. Use an appropriately sized wrenched to open. To open valve, rotate stem counterclockwise 90°. To close, rotate stem clockwise 90°.



To Access Service Port:

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

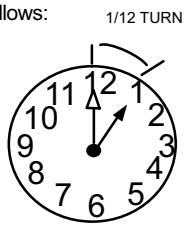
1. Remove service port cap with an appropriately sized wrench.
2. Connect gauge set to service port.
3. When testing is completed, replace service port cap and tighten as follows:
   - With torque wrench: Finger tighten and torque cap per table 1.
   - Without torque wrench: Finger tighten and use an 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 1.
- 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 3. Angle- and Ball-Type Service Valves

II. INSTALLATION

Unit Placement

⚠ CAUTION

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

See *Unit Dimensions* on page 3 for sizing mounting slab, platforms or supports. Refer to figure 4 for mandatory installation clearance requirements.

POSITIONING CONSIDERATIONS

Consider the following when positioning the unit:

- Some localities are adopting sound ordinances based on the unit 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 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 fits 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.

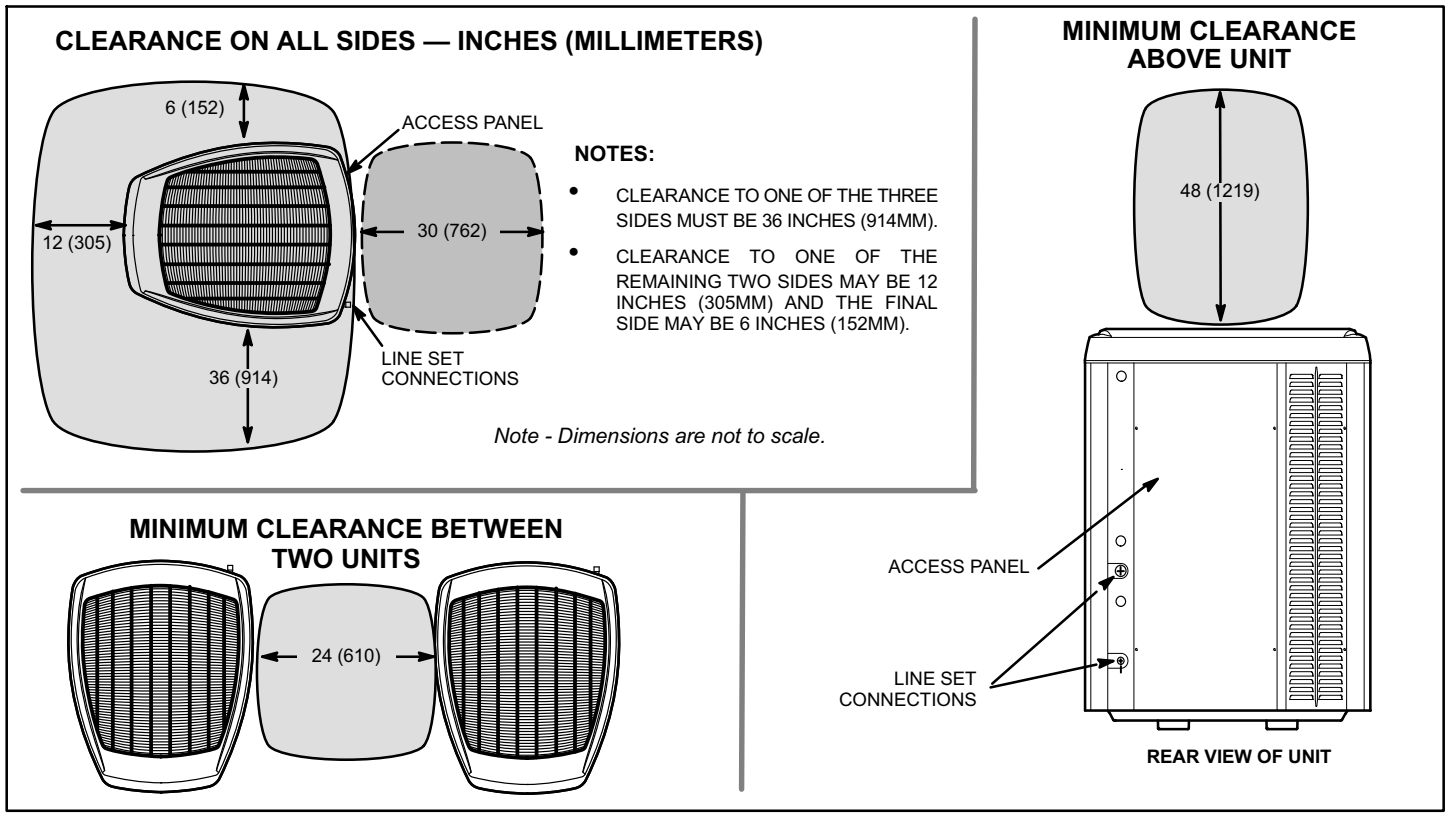


Figure 4. Installation Clearances

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

NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil and cause the rubber to swell when it comes into contact with oil. The rubber will then bubble and could 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.

Install the unit a minimum of six inches (152 mm) above the roof surface to avoid ice build-up around the unit. Locate the unit above a load-bearing wall or area of the roof that can adequately support the unit. Consult local codes for rooftop applications.

If unit coil cannot be mounted away from prevailing winter winds, a wind barrier should be constructed. Size barrier at least the same height and width as outdoor unit. Mount barrier 24 inches (610 mm) from the sides of the unit in the direction of prevailing winds.

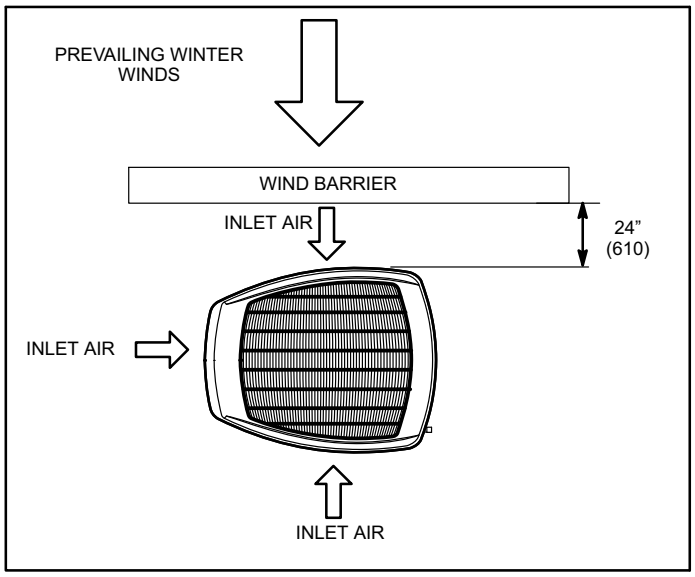
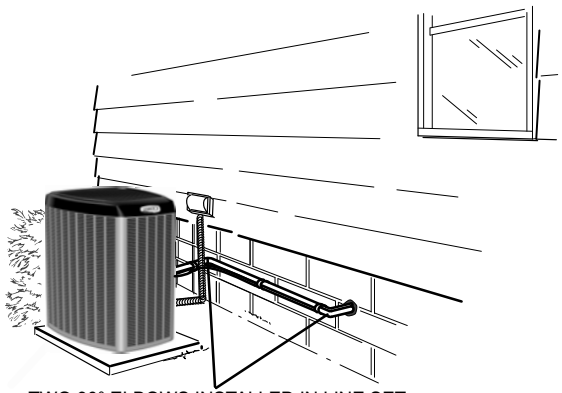


Figure 5. Wind Barrier (Rooftop or Ground Application)

DETAIL A

INSTALL UNIT AWAY FROM WINDOWS

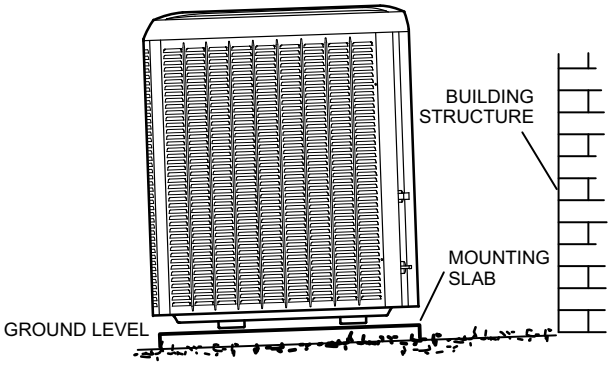


TWO 90° ELBOWS INSTALLED IN LINE SET REDUCES LINE SET VIBRATION.

Outside Unit Placement

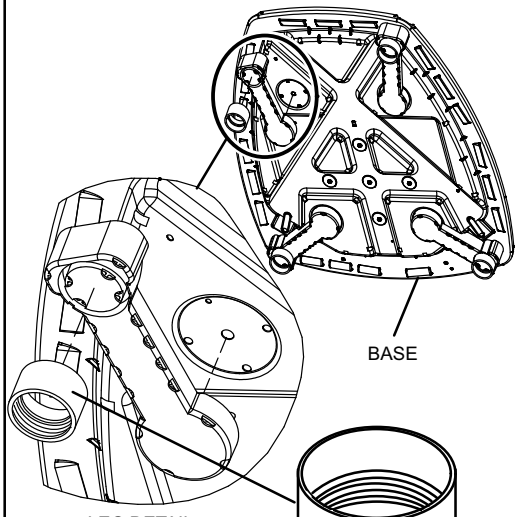
DETAIL B

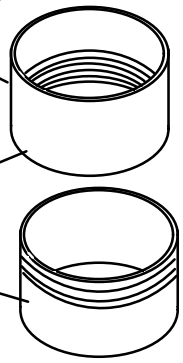
INSTALL UNIT LEVEL OR, IF ON A SLOPE, MAINTAIN SLOPE TOLERANCE OF 2 DEGREES (OR 2 INCHES PER 5 FEET [50 MM PER 1.5 M]) AWAY FROM BUILDING STRUCTURE.



Slab Mounting at Ground Level

DETAIL C



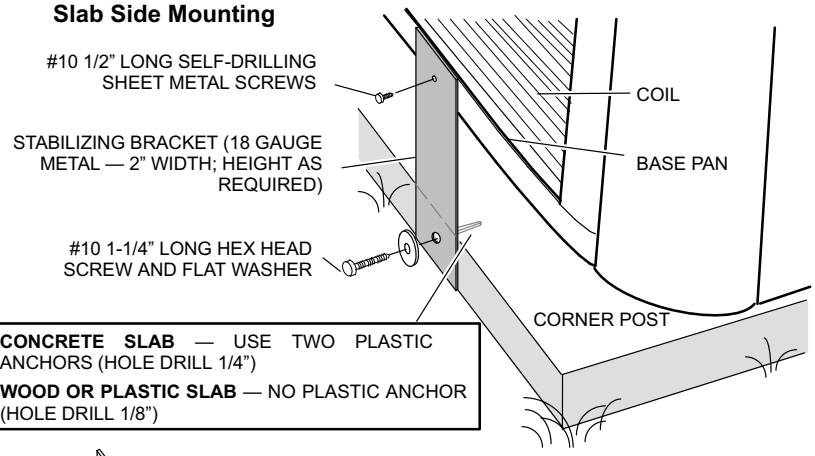


USE ADDITIONAL 2” SCH 40 MALE THREADED ADAPTERS WHICH CAN BE THREADED INTO THE FEMALE THREADED ADAPTERS TO MAKE ADDITIONAL ADJUSTMENTS TO THE LEVEL OF THE UNIT.

Elevated Slab Mounting using Feet Extenders

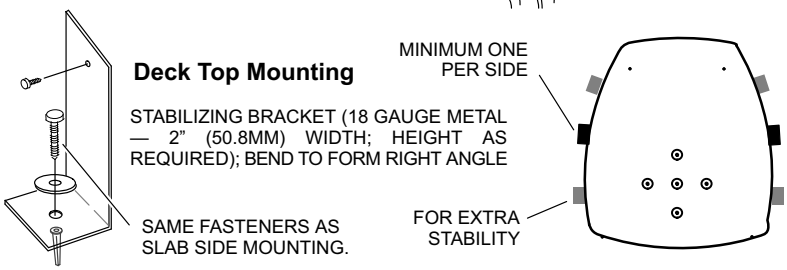
DETAIL D

Slab Side Mounting



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

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



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.

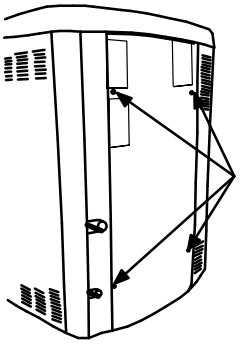
Figure 6. Placement and Slab Mounting

PANELS

ACCESS AND LOUVERED

ACCESS PANEL REMOVAL

REMOVE AND INSTALL THE ACCESS PANEL AS ILLUSTRATED.



REMOVE 4 SCREWS TO REMOVE PANEL FOR ACCESSING COMPRESSOR AND CONTROLS.

ALIGN PANEL WITH SCREW HOLES. INSTALL SCREWS AND TIGHTEN.

⚠ WARNING

To prevent personal injury, or damage to panels, unit or structure, be sure to observe the following:

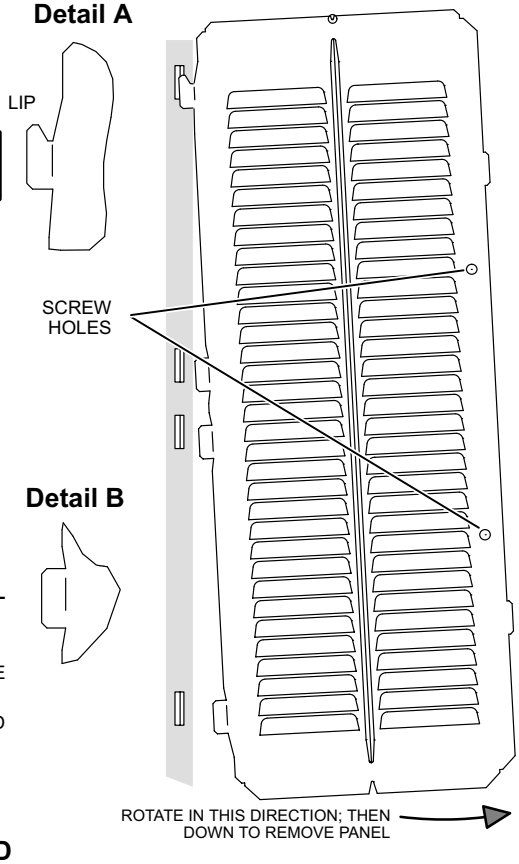
While installing or servicing this unit, carefully stow all removed panels out of the way, so that the panels will not cause injury to personnel, nor cause damage to objects or structures nearby, nor will the panels be subjected to damage (e.g., being bent or scratched).

While handling or stowing the panels, consider any weather conditions, especially windy conditions, that may cause panels to be blown around and battered.

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.

Detail A



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**.

Detail B

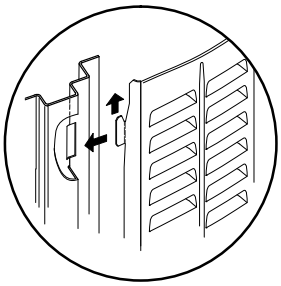
LOUVERED PANEL INSTALLATION

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 TOP TAB INWARD AS ILLUSTRATED IN **DETAIL A** AND **C**; THEN UPWARD INTO THE TOP SLOT OF THE HINGE CORNER POST.
2. ROTATE PANEL TO VERTICAL TO FULLY ENGAGE ALL 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.



Detail D

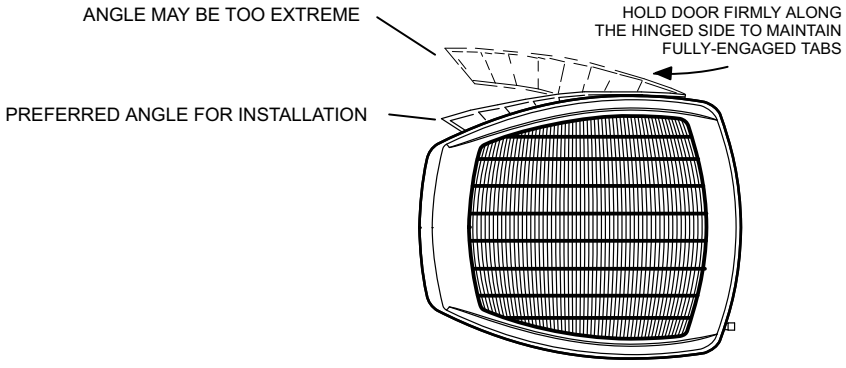


Figure 7. Removing and Installing Panels

New or Replacement Line Set

REFRIGERANT LINE SET

This section provides information on installation or replacement of existing line set. If new or replacement line set is not being installed, then proceed to *Brazing Connections* on page 16.

⚠ IMPORTANT

Lennox highly recommends changing line set when converting the existing system from HCFC-22 to HFC-410A If that is not possible and the line set is the proper size as reference in table 2, use the procedure outlined under *Flushing the System* on page 19.

If refrigerant lines are routed through a wall, seal and isolate the opening so vibration is not transmitted to the building. Pay close attention to line set isolation during installation of any HVAC system. When properly isolated from building structures (walls, ceilings, floors), the refrigerant lines will not create unnecessary vibration and subsequent sounds. See figure 8 for recommended installation practices. Also, consider the following when placing and installing a high-efficiency outdoor unit.

Liquid lines that meter the refrigerant, such as RFC1 liquid lines, must not be used in this application. Existing line set of proper size (as listed in table 3) may be reused. If system was previously charged with HCFC-22 refrigerant, the existing line set must be flushed (see *Flushing the System* on page 19).

⚠ IMPORTANT

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

Recommended topping-off POE oils are Mobil EAL ARCTIC 22 CC or ICI EMKARATE™ RL32CF.

⚠ WARNING

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

⚠ WARNING

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

⚠ IMPORTANT

If this unit is being matched with an approved line set or indoor unit coil that was previously charged with mineral oil, or if it is being matched with a coil which was manufactured before January of 1999, the coil and line set must be flushed prior to installation. Take care to empty all existing traps. Polyol ester (POE) oils are used in Lennox units charged with HFC-410A refrigerant. Residual mineral oil can act as an insulator, preventing proper heat transfer. It can also clog the expansion device and reduce system performance and capacity.
Failure to properly flush the system per the XP25 Installation and Service Procedures will void the warranty.

⚠ 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

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

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

The XP25 is a variable-capacity cooling and heat pump 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 following guidelines are to be used exclusively for the XP25 systems.

COOLING SYSTEM (HFC-410A)

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

NOTE - This is a 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, and other factors that contribute to total pressure drop.

- Maximum linear length of vapor riser = 60 feet.
- Size vertical vapor riser per table 3.
- **Line set lengths up to 50 linear feet:** Use rated line sizes listed in table 2.
- **Line set lengths between 51 - 150 linear feet**: Crankcase heater and non-bleed port TXV factory-installed. No additional components required. Vertical vapor riser must be sized per table 3 on systems with line sets longer than 51 feet. Use tables 3 and 4 to determine the correct liquid and vapor line sizes.

NOTE - See figure 65 on page 87 to calculate required refrigerant charge.

- **Line set lengths over 150 linear feet**: Not recommended.
- Additional oil is not required for systems with line lengths up to 150 feet except for the XP25-048 and XP25-060. These units require 2 ounces of oil for every 10 feet beyond 100 feet.

NOTE - Recommended POE oils are Mobil EAL ARCTIC 22 CC or ICI EMKARATE® RL32CF.

SUCTION TRAPS

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

Table 2. Standard Refrigerant Line Set — Up to 50 Linear Feet

Inches (mm)					
Model Number (-xx*)	Valve Size Connections		Recommended Line Sets		
	Liquid Line	Suction Line	L15 Line Set Model	Line Set Length	Catalog Number
XP25-024-230-XX XP25-036-230-XX XP25-048-230-XX	3/8” (10 mm)	7/8” (22 mm)	L15-65-30	30 feet (9.1 m)	89J60
			L15-65-40	40 feet (12.2 m)	89J61
			L15-65-50	50 feet (15.2 m)	89J62
XP25-060-230-XX	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 3. XP25 Piping Guidelines

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 4. Liquid Line Diameter Selection Table

Unit	Line Size	Total Linear Length (feet)						
		25	50	75	100	125	150	
-024	5/16”	25	50	55	48	40	33	Max. Elevation (ft)
	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.*

1. Find your unit on the left side of the table.
2. Start with the rated liquid line size (shaded row) for the outdoor unit.
3. Select the actual total linear length of your system shown at the top of the table.
4. The elevation listed in the table is the maximum allowed for the liquid line listed.
5. Consider the larger liquid line size shown in the table if the elevation does not meet your requirements.

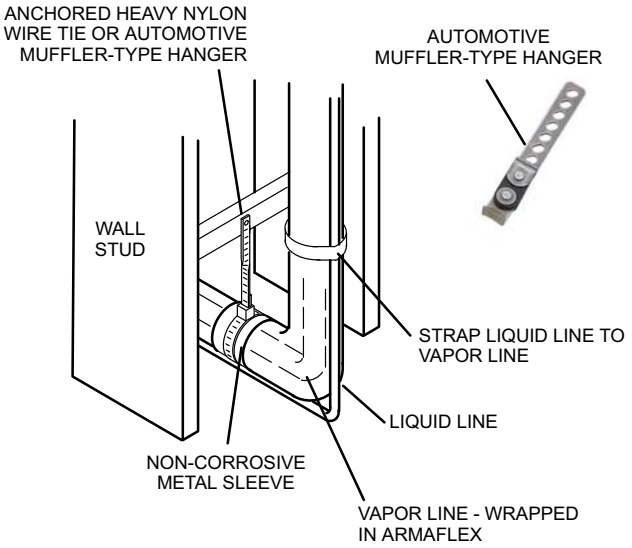
LINE SET

IMPORTANT - Refrigerant lines must not contact structure.

INSTALLATION

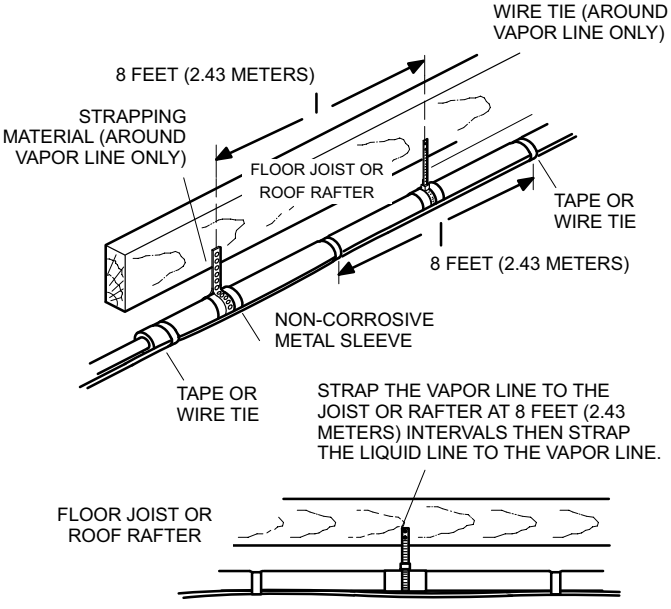
Line Set Isolation — The following illustrations are examples of proper refrigerant line set isolation:

REFRIGERANT LINE SET — TRANSITION FROM VERTICAL TO HORIZONTAL



REFRIGERANT LINE SET — INSTALLING HORIZONTAL RUNS

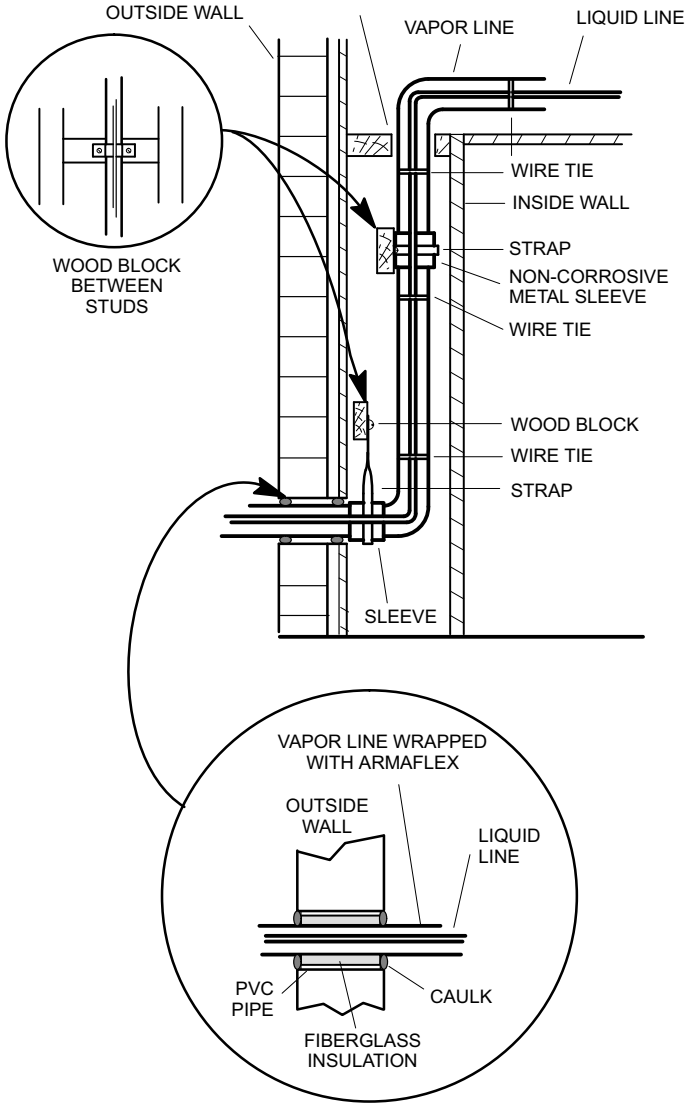
TO HANG LINE SET FROM JOIST OR RAFTER, USE EITHER METAL STRAPPING MATERIAL OR ANCHORED HEAVY NYLON WIRE TIES.



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

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

⚠ CAUTION

Brazing alloys and flux contain materials which are hazardous to your health.

Avoid breathing vapors or fumes from brazing operations. Perform operations only in well-ventilated areas.

Wear gloves and protective goggles or face shield to protect against burns.

Wash hands with soap and water after handling brazing alloys and flux.

⚠ WARNING

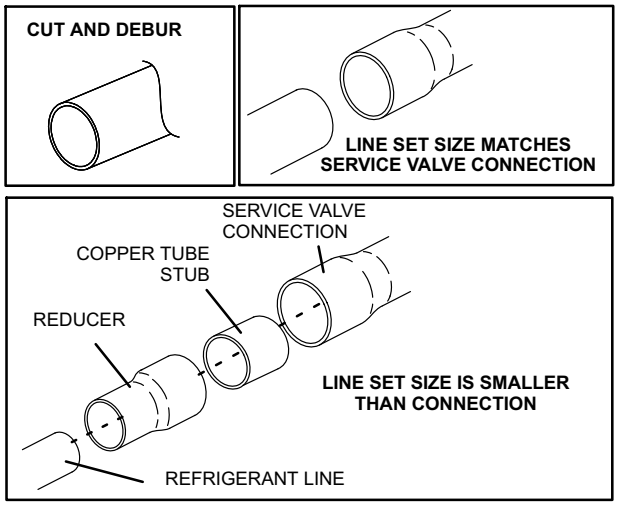
Fire, Explosion and Personal Safety Hazard.

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

1 PIPING PANEL REMOVAL AND LINE SET PREPARATION

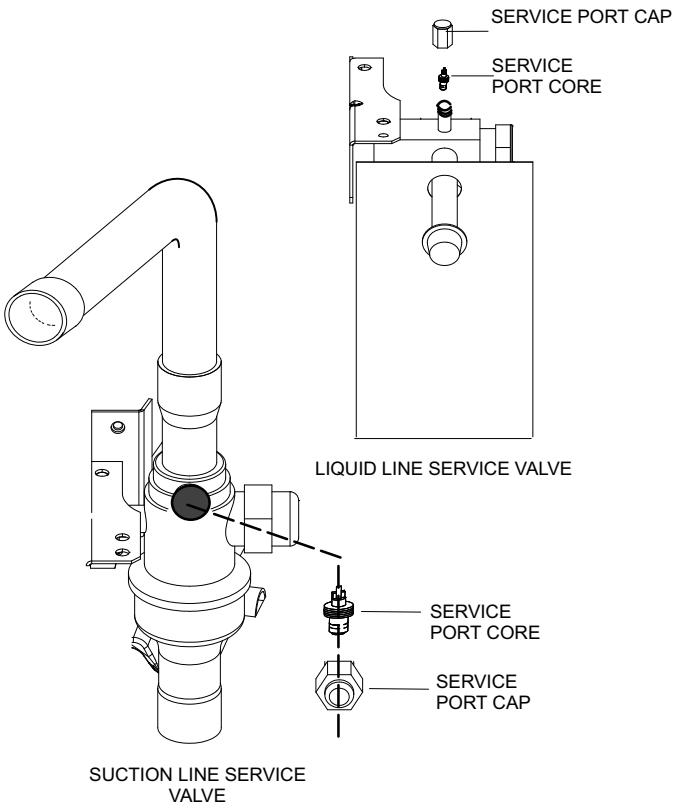
Remove piping panel for easier access to service valves. Cut ends of the refrigerant lines square (free from nicks or dents) and debur the ends. The pipe must remain round. Do not crimp end of the line.



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

A Connect gauge set low pressure side to liquid line service valve (service port).

B Connect gauge set center port to bottle of nitrogen with regulator.

C Remove the valve core from the suction line to provide an exit point for the nitrogen flow.

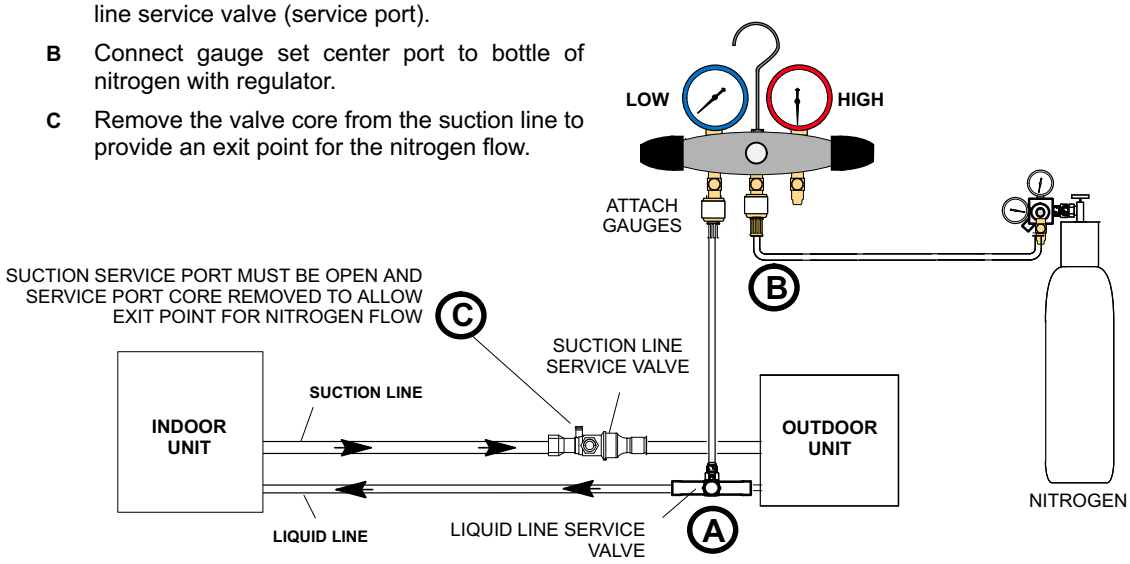


Figure 9. Brazing Procedures

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 previous page and below for manifold gauge setup.

6 BRAZE LINE SET

Cloths must remain water-saturated throughout the brazing and cool-down process.

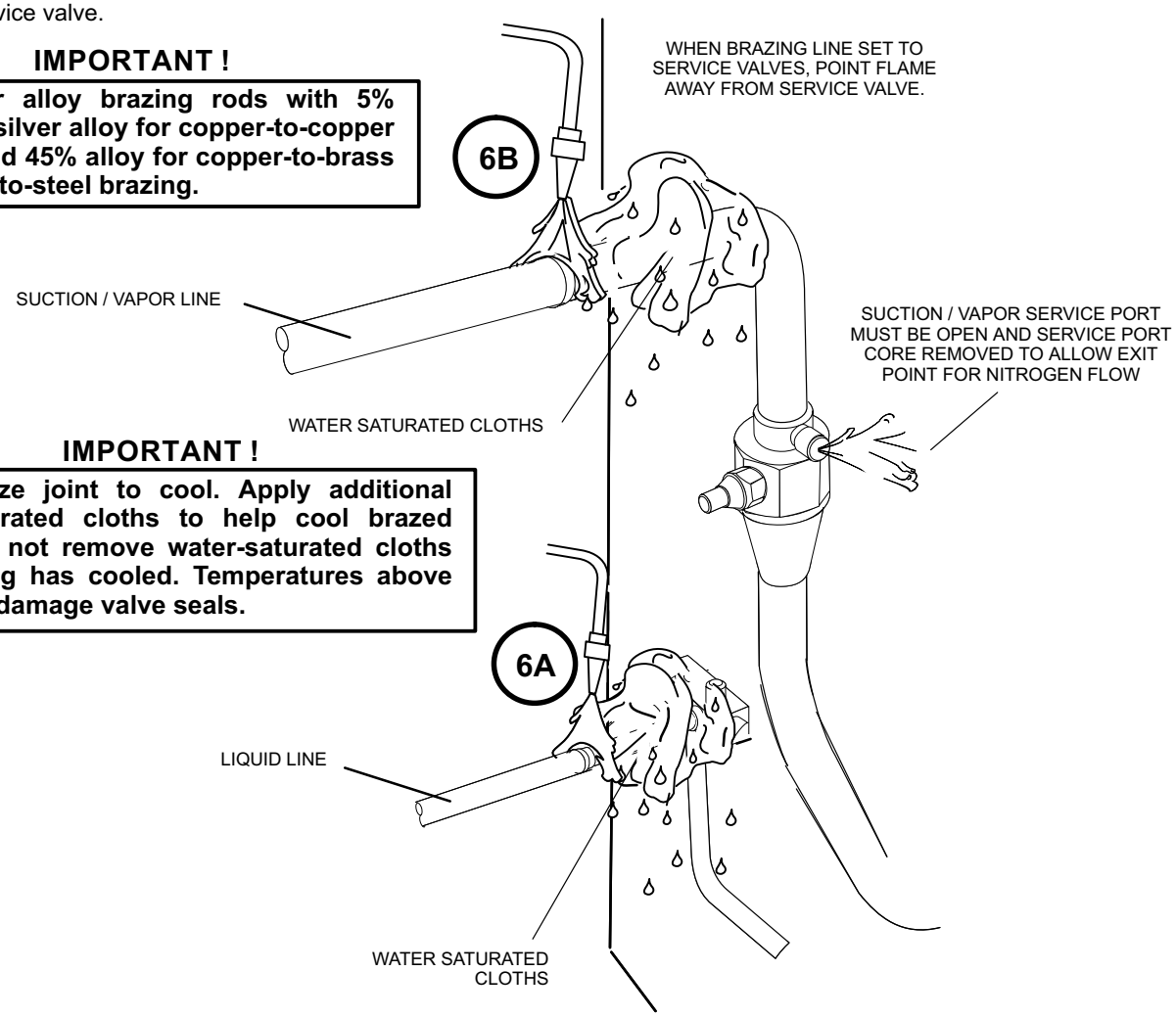
- **A** Braze liquid line to liquid line service valve.
- **B** Braze suction / vapor line to suction / vapor service valve.

WARNING

1. **FIRE, PERSONAL INJURY, OR PROPERTY DAMAGE** will 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 in the line set! The braze, when complete, must be quenched with water to absorb any residual heat.
2. Do not open service valves until refrigerant lines and indoor coil have been leak-tested and evacuated. Refer to procedures provided in this supplement.

IMPORTANT !

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



IMPORTANT !

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

7 PREPARATION FOR NEXT STEP

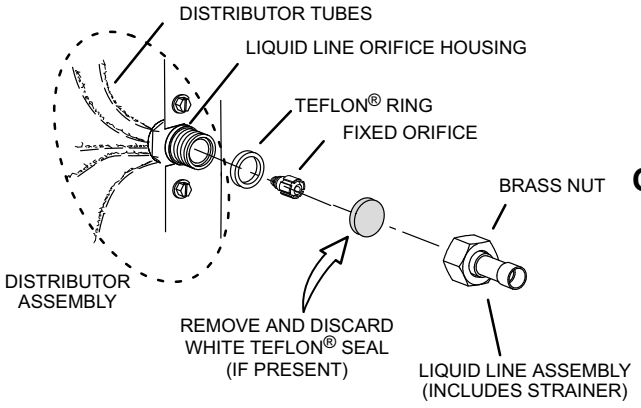
After all connections have been brazed, disconnect manifold gauge set from service ports. Apply additional water-saturated cloths to both services valves to cool piping. Once piping is cool, remove all water-saturated cloths. Refer to the unit installation instructions for the next step in preparing the unit.

Figure 10. Brazing Procedures (Continued)

Flushing the System

LINE SET AND INDOOR COIL (1 OF 2)

1A TYPICAL EXISTING FIXED ORIFICE 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.

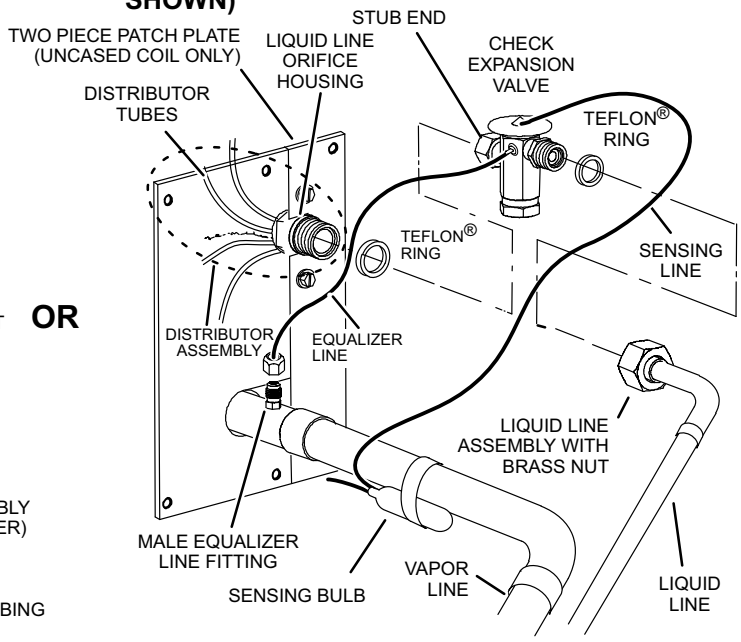
C USING TWO WRENCHES, DISCONNECT LIQUID LINE FROM LIQUID LINE ORIFICE HOUSING. TAKE CARE NOT TO TWIST OR DAMAGE DISTRIBUTOR TUBES DURING THIS PROCESS.

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.

OR

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.

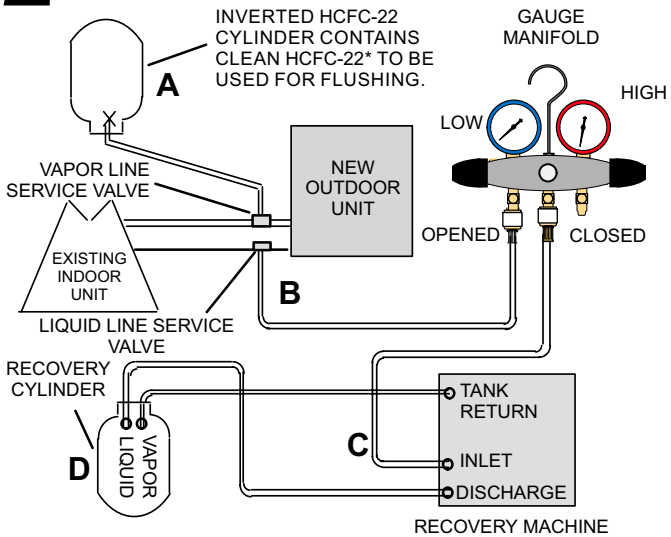
E DISCONNECT THE LIQUID LINE FROM THE CHECK EXPANSION VALVE AT THE LIQUID LINE ASSEMBLY.

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.

3 FLUSHING LINE SET

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

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 SYSTEM DOWN TO 0.

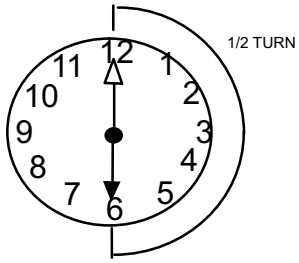
D CLOSE THE VALVE ON THE INVERTED HCFC-22 DRUM AND THE GAUGE SET VALVES. PUMP THE REMAINING REFRIGERANT OUT OF THE RECOVERY MACHINE AND TURN OFF THE MACHINE.

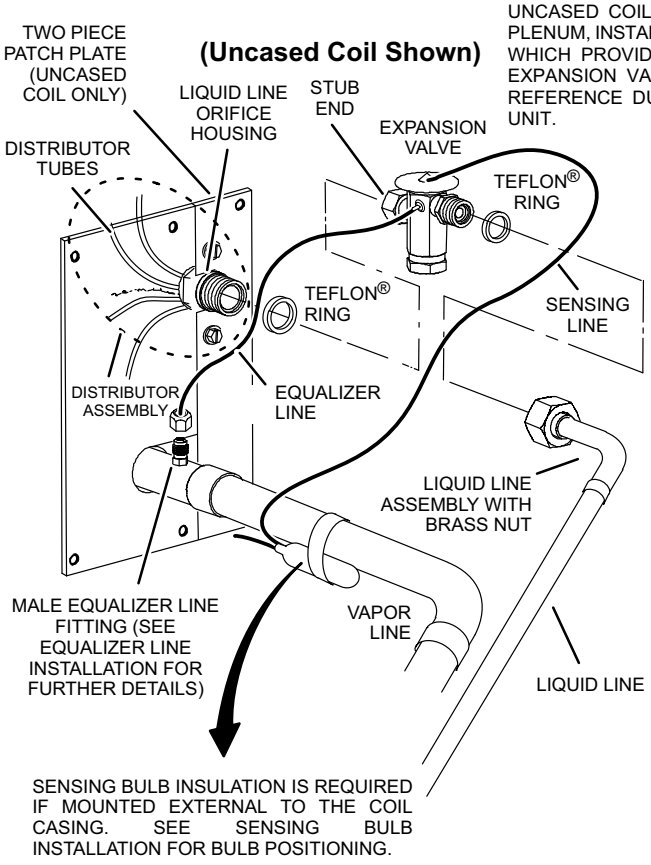
***IMPORTANT - Clean refrigerant is any refrigerant in a system that has not had compressor burn out. If the system has experienced burn out, it is recommended that the existing line set and indoor coil be replaced.**

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 *LENNOX XP25 PRODUCT SPECIFICATION* FOR APPROVED EXPANSION VALVE KIT MATCH-UPS AND APPLICATION INFORMATION.

THE EXPANSION VALVE UNIT CAN BE INSTALLED INTERNAL OR EXTERNAL TO THE INDOOR COIL. IN APPLICATIONS WHERE AN UNCASED COIL IS BEING INSTALLED IN A FIELD-PROVIDED PLENUM, INSTALL THE CHECK EXPANSION VALVE IN A MANNER WHICH PROVIDES ACCESS FOR FIELD SERVICING OF THE EXPANSION VALVE. REFER TO BELOW ILLUSTRATION FOR REFERENCE DURING INSTALLATION OF EXPANSION VALVE UNIT.





A REMOVE THE FIELD-PROVIDED FITTING THAT TEMPORARILY RECONNECTED THE LIQUID LINE TO THE INDOOR UNIT'S DISTRIBUTOR ASSEMBLY.

B 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.

C 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.

D 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.

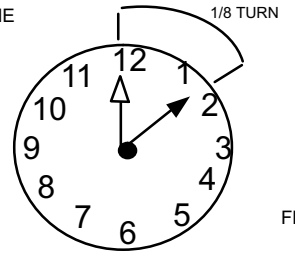
E ATTACH THE LIQUID LINE ASSEMBLY TO THE EXPANSION VALVE. FINGER TIGHTEN AND USE AN APPROPRIATELY SIZED WRENCH TO TURN AN ADDITIONAL 1/2 TURN CLOCKWISE AS ILLUSTRATED IN THE FIGURE ABOVE OR 20 FT-LB.

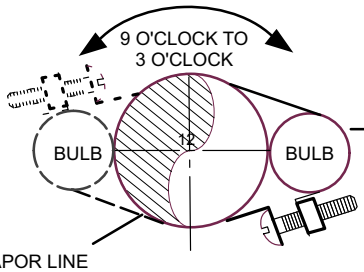
SENSING BULB INSTALLATION

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

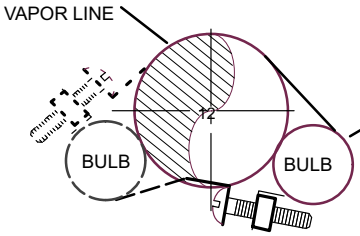
NOTE - CONFIRM PROPER THERMAL CONTACT BETWEEN VAPOR LINE AND CHECK EXPANSION BULB BEFORE INSULATING THE SENSING BULB ONCE INSTALLED.

B 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.





ON LINES SMALLER THAN 7/8", MOUNT SENSING BULB BETWEEN THE 9 AND 3 O'CLOCK POSITIONS.

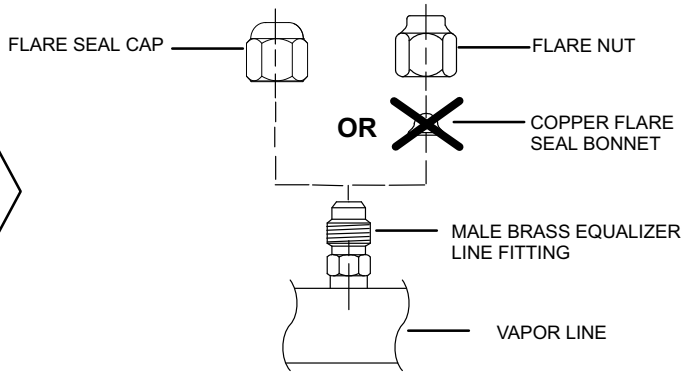


ON 7/8" AND LARGER LINES, MOUNT SENSING BULB AT EITHER THE 4 OR 8 O'CLOCK POSITION. NEVER MOUNT THE SENSING BULB ON BOTTOM OF LINE.

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.



INSTALLING ISOLATION GROMMETS

Locate the isolation grommets (provided). Slide grommets onto vapor and liquid lines. Insert grommets into piping panel to isolate refrigerant lines from sheet metal edges.

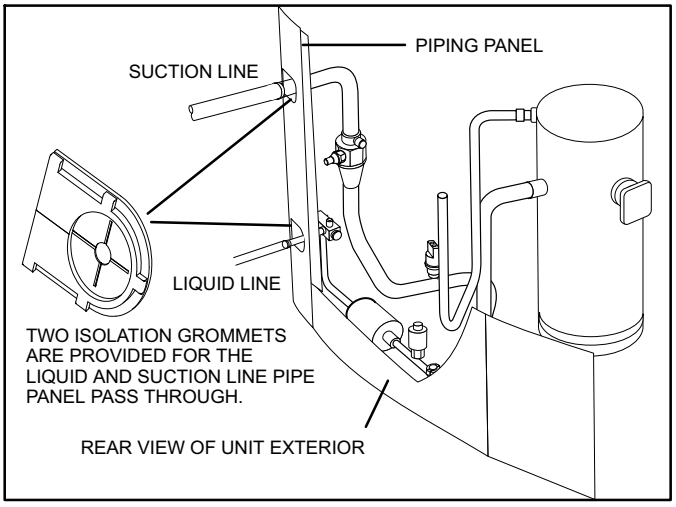


Figure 11. Isolation Grommets

⚠ 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

Leak detector must be capable of sensing HFC refrigerant.

Leak Testing the System

⚠ WARNING

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

⚠ IMPORTANT

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

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

⚠ 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

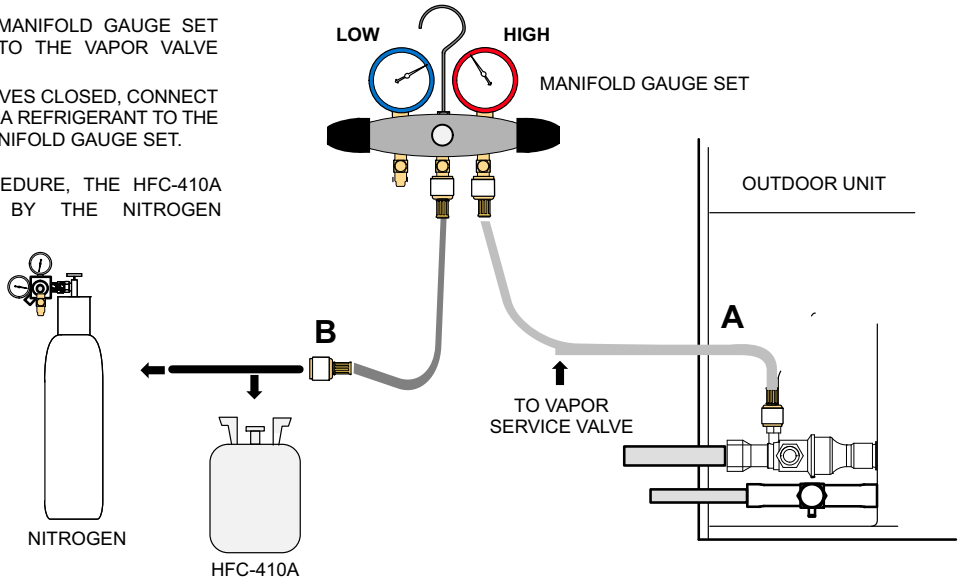
NOTE - NORMALLY, THE HIGH PRESSURE HOSE IS CONNECTED TO THE LIQUID LINE PORT. HOWEVER, CONNECTING IT TO THE VAPOR PORT BETTER PROTECTS THE MANIFOLD GAUGE SET FROM HIGH PRESSURE DAMAGE.

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 IS 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 the System

LINE SET AND INDOOR COIL

1 CONNECT GAUGE SET

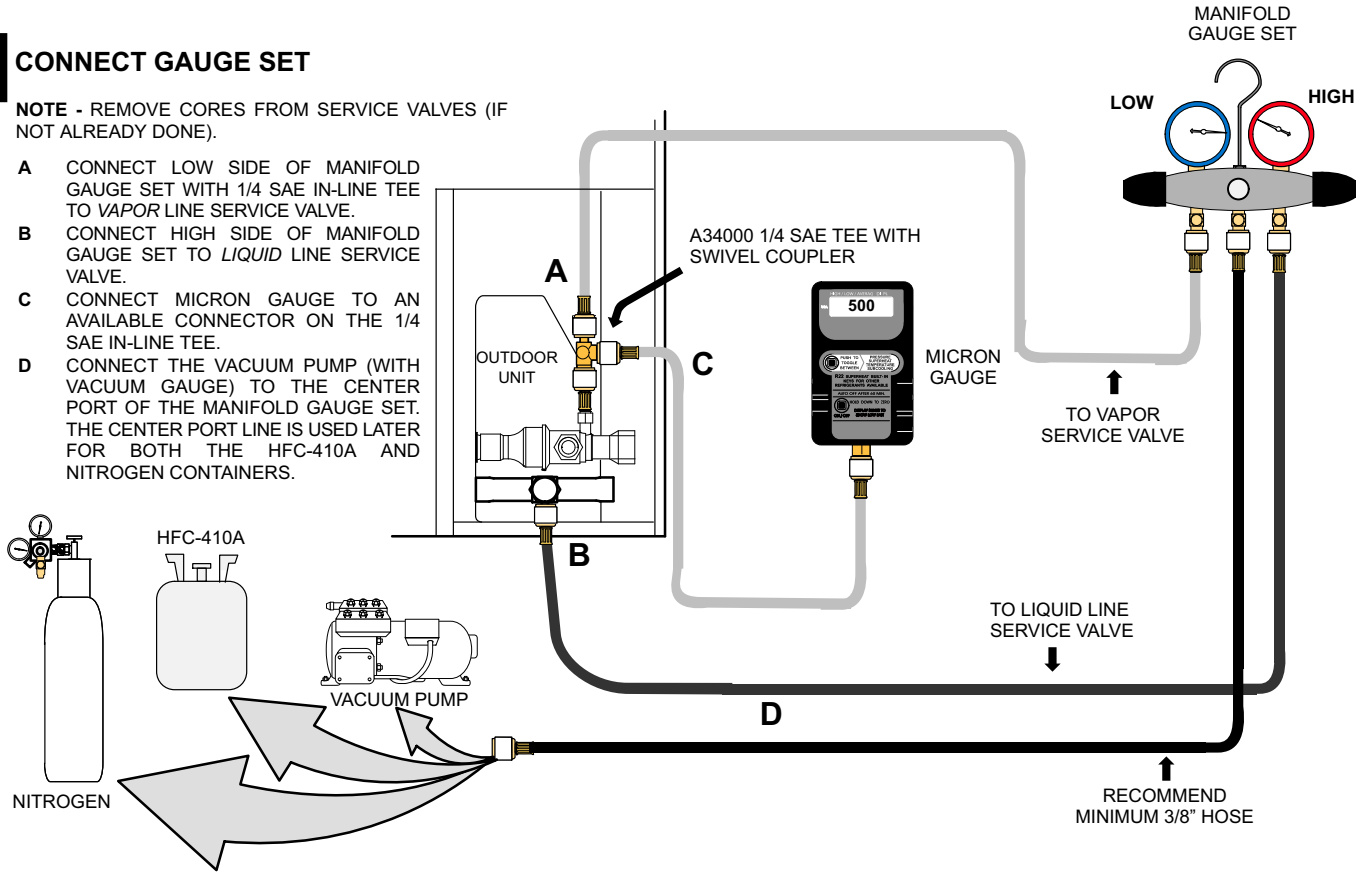
NOTE - REMOVE CORES FROM SERVICE VALVES (IF NOT ALREADY DONE).

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 TO AN 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 IS 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** REFERS TO THE TOTAL ACTUAL PRESSURE (ABOVE ABSOLUTE ZERO) WITHIN A GIVEN VOLUME OR SYSTEM. ABSOLUTE PRESSURE IN A VACUUM IS EQUAL TO ATMOSPHERIC PRESSURE MINUS VACUUM PRESSURE.

C WHEN THE ABSOLUTE PRESSURE REACHES 23,000 MICRONS (29.01 INCHES OF MERCURY), CLOSE THE MANIFOLD GAUGE VALVES, TURN OFF THE VACUUM PUMP AND DISCONNECT THE MANIFOLD GAUGE CENTER PORT HOSE FROM VACUUM PUMP. ATTACH THE MANIFOLD CENTER PORT HOSE TO A DRY NITROGEN CYLINDER WITH PRESSURE REGULATOR SET TO 150 PSIG (1034 KPA) AND PURGE THE HOSE. OPEN THE MANIFOLD GAUGE VALVES TO BREAK THE VACUUM IN THE LINE SET AND INDOOR UNIT. CLOSE THE MANIFOLD GAUGE VALVES.

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:

1. Close manifold gauge valves.
2. Shut off HFC-410A cylinder.
3. Reinstall service valve cores by removing manifold hose from service valve. Quickly install cores with core tool while maintaining a positive system pressure.
4. Replace the stem caps and secure finger tight, then tighten an additional one-sixth (1/6) of a turn as illustrated.

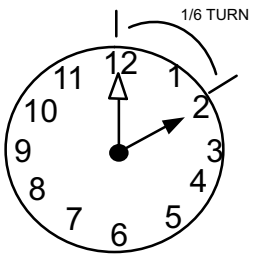


Figure 13. System Evacuation

⚠ 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

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

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

Electrical

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

Refer to the furnace or air handler installation instructions for additional wiring application diagrams. See unit nameplate for minimum circuit ampacity and maximum over-current protection size.

24VAC TRANSFORMER

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

LOAD SHEDDING

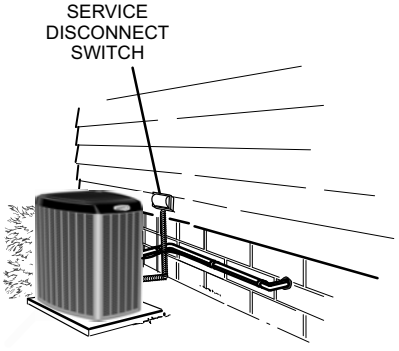
Utility Load Shedding Mode ACTIVATED – The normally closed set of contacts in the utility load shedding control receiver **OPEN**. This removes 24VAC from the coil of the field-provided relay (catalog # 69J79). The relay contacts close (terminal **7** to terminal **2**), completing the circuit between terminals **R** and **L** on the outdoor control. The 24VAC input to terminal **L** activates the load shedding mode in the outdoor control, cycling the outdoor unit **OFF**. The 7-Segment display on the outdoor control displays a load shedding alert code (**E600**) and an alert appears on the display of the iComfort Wi-Fi® thermostat. The customer receives email notifications when the alert occurs, if the option to receive notifications is selected.

Utility Load Shedding Mode DEACTIVATED (Normal Equipment Operation) – When load shedding is not required, the contacts in the utility load control receiver are closed. This provides 24VAC to the coil of the field-provided relay (catalog # 69J79).The relay contacts **OPEN** (terminal **7** to terminal **2**) removing 24VAC from the **L** terminal on the outdoor control. This deactivates the load shedding mode in the outdoor control. The outdoor unit returns to normal operation and alert code clears once load shedding mode is deactivated.

For more information, see the Load Shedding Feature Wiring Diagram on page 48.

1 SIZE CIRCUIT AND INSTALL DISCONNECT SWITCH

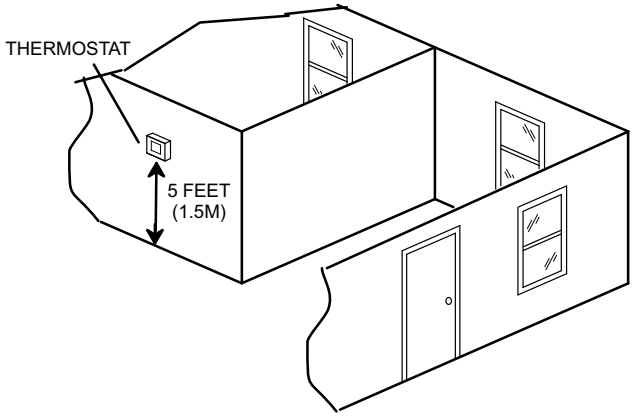
REFER TO THE UNIT NAMEPLATE FOR MINIMUM CIRCUIT AMPACITY, AND MAXIMUM FUSE OR CIRCUIT BREAKER (HACR PER NEC). INSTALL POWER WIRING AND PROPERLY SIZED DISCONNECT SWITCH.



NOTE - UNITS ARE APPROVED FOR USE ONLY WITH COPPER CONDUCTORS. GROUND UNIT AT DISCONNECT SWITCH OR TO AN EARTH GROUND.

2 INSTALL THERMOSTAT

INSTALL ROOM THERMOSTAT (ORDERED SEPARATELY) ON AN INSIDE WALL APPROXIMATELY IN THE CENTER OF THE CONDITIONED AREA AND 5 FEET (1.5M) FROM THE FLOOR. IT SHOULD NOT BE INSTALLED ON AN OUTSIDE WALL OR WHERE IT CAN BE AFFECTED BY SUNLIGHT OR DRAFTS.



NOTE - 24VAC, CLASS II CIRCUIT CONNECTIONS ARE MADE IN THE CONTROL BOX.

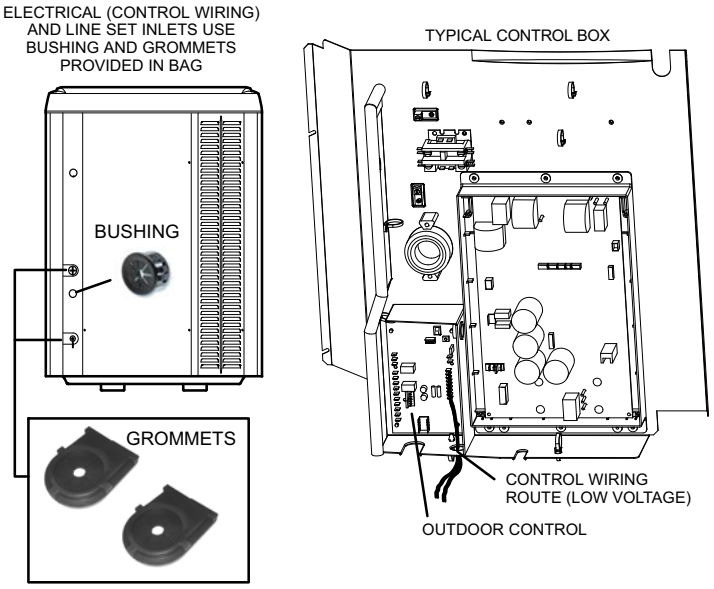
Figure 14. Electrical

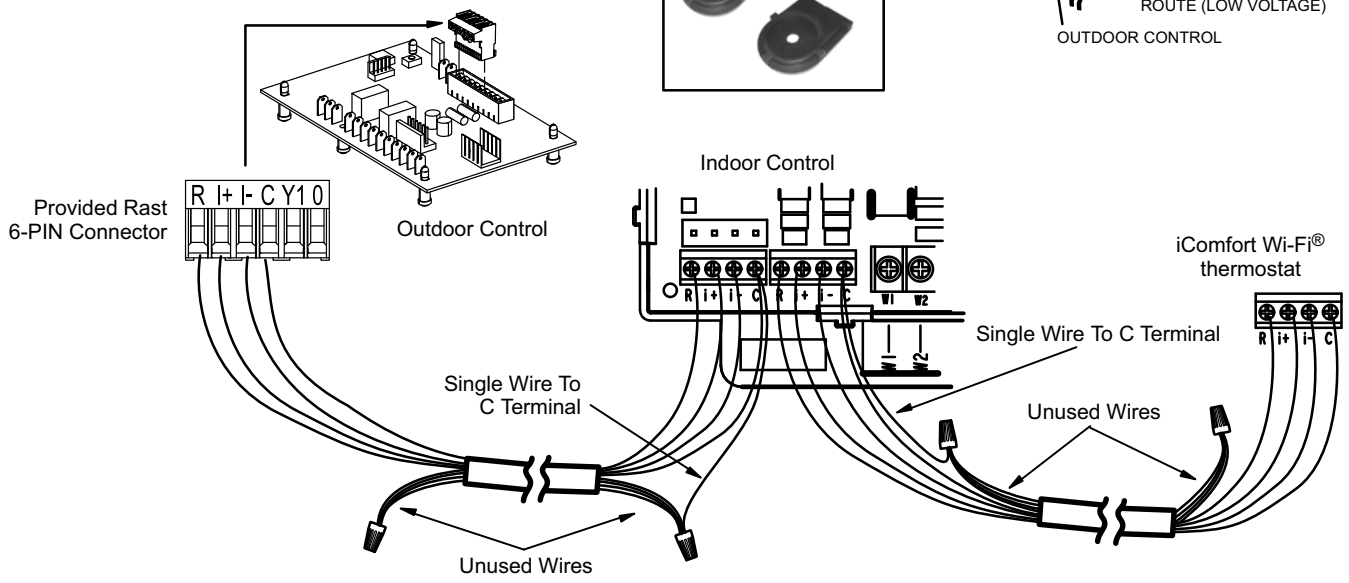
3 ROUTE CONTROL WIRES

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 the provided field-installed busing installed in the electrical inlet.

The iComfort Wi-Fi® thermostat requires four thermostat wires between the thermostat and the furnace / air handler iComfort® control and four wires between the outdoor unit and the furnace/air handler iComfort® control. When a thermostat cable with more than four wires is used, the extra wires must be properly connected to avoid electrical noise (see below).

Use a wire nut to bundle the four unused wires at each end of the cable. Each bundle should also include an additional wire that should be connected on each end to the C terminal as shown in the figure below.





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 in the side panel of the control box. Connect conduit to the control box using a proper conduit fitting.

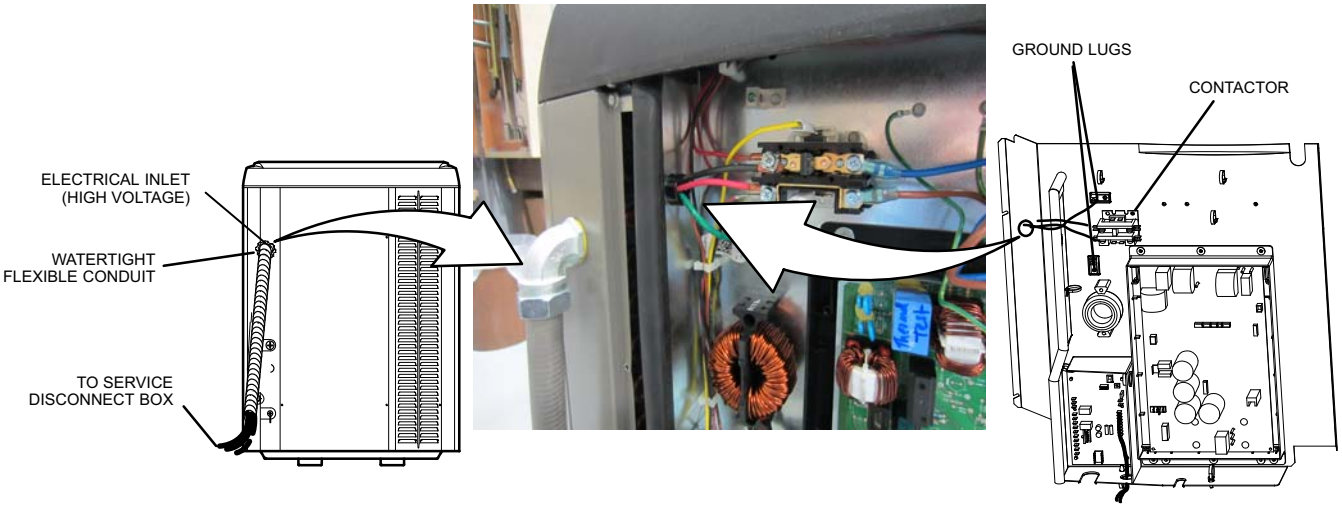
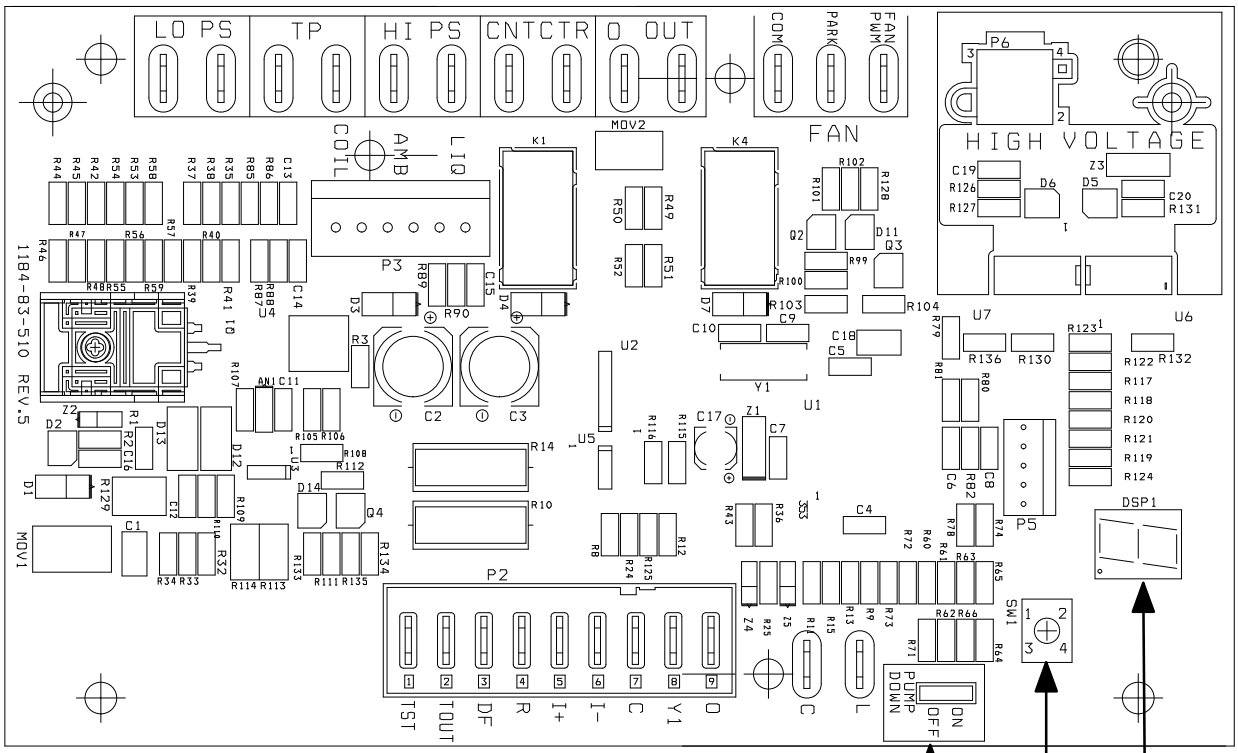


Figure 15. Electrical (Continued)

⚠ CAUTION

ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures	Electrostatic discharge can affect electronic components. Take precautions during unit installation and service to protect the unit's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the unit, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface before performing any service procedure



PUMP DOWN - WHEN UNIT IS IN PUMP DOWN MODE, *Pd* IS SHOWN ON THE 7-SEGMENT DISPLAY.

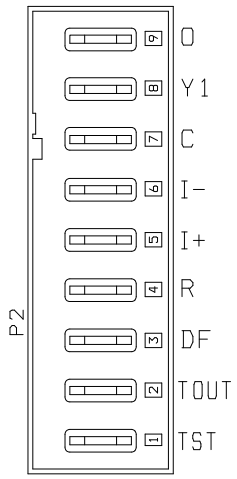
TO ACTIVATE MODE, REFER TO PUMP DOWN CYCLE SEQUENCE ON PAGE 39.

NOTE - The green LED located on the outdoor control flashes when communication occurs between the outdoor control and either the thermostat or the inverter.

Figure 16. Outdoor Unit Control

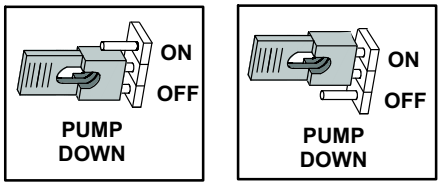
TABLE 5

Outdoor Control Terminal Designations and Input /Outputs (see figure 16 for terminal locations)				
Designator	**Description**	**Input**	**Output**	**Common**
O OUT	Reversing valve switched output	N/A	Switched 24VAC nominal	N/A
O	Reversing valve return	N/A	N/A	24VAC common
LO PS	Low Pressure switch	N/A	5ma @18VAC	N/A
LO PS	Low Pressure switch sensing connection	5ma @18VAC	N/A	N/A
Hi PS	High Pressure switch	N/A	24VAC nominal	N/A
Hi PS	High pressure switch sensing connection	24VAC nominal	N/A	N/A
TP	Top cap thermostat switch (in series with the HI PS)	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 HI PS and TC)	N/A	Switched 24VAC Nominal	N/A
Cntctr	Contactor common	N/A		24VAC common
Fan PWM	PWM fan output	N/A	10-97% duty cycle, 19-23 VDC peak	N/A
COM	PWM Fan common connection	N/A	N/A	Fan PWM common
Fan Park	PWM Fan Parking spot for unused terminal, not connected.	N/A	N/A	N/A
P2 Terminals				
O	O (reversing valve) emergency input	24VAC nominal from thermostat and loaded to draw 17ma at 30VAC	N/A	N/A
Y1	Y1 emergency input	24VAC nominal from thermostat and loaded to draw 17ma at 30VAC	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	Factory test	N/A	N/A	N/A
TOUT	26Vdc transistor output to Lennox factory OEM tester	N/A	N/A	N/A
TST	Factory test pin. In each terminal box: P2 - Terminal 1 - TEST P2 - Terminal 2 - TOUT P2 - Terminal 3 - DF P2 - Terminal 4 - R	24VAC nominal 17ma @ 30VAC	N/A	N/A



XP25

Table 5 continued.

Outdoor Control Terminal Designations and Input /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**	**Common**
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 5.5 VDC when not communicating. • Pin 3 to pin 2 should read 4.5 to 5.5 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 - Pin 2	**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		
LIQ		Liquid line temperature sensor supply.	N/A	N/A	N/A
LIQ		Liquid line temperature sensor return.	N/A	N/A	N/A
AMB		Outdoor ambient temperature sensor supply.	N/A	N/A	N/A
AMB		Outdoor ambient temperature sensor return.	N/A	N/A	N/A
COIL		Outdoor coil temperature sensor supply.	N/A	N/A	N/A
COIL		Outdoor coil temperature sensor return.	N/A	N/A	N/A
Pump Down		To initiate pump down function, place jumper in the **ON** position. (See *Pump Down Mode Operation* on Page 39.) 1. Place the jumper in the **ON** position to activate pump down mode. 2. Place the jumper in the **OFF** position to deactivate pump down mode. *NOTE - If the pump down jumper is in the ON position during power-up, it is ignored.* *NOTE - The outdoor control stays in pump down mode for five minutes, after which the outdoor control initiates a compressor shutdown sequence.*			
L		Load shedding input.	24VAC input to **L** energizes load shedding feature.	N/A	N/A
C		Load shedding input reference. Refer to wiring of load shedding terminals in the *Unit Wiring Diagram* section of this manual on page 46.	N/A	N/A	24VAC common

Servicing Units Delivered Void of Charge

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

1. Leak check system using procedure outlined on page 21.
2. Evacuate the system using procedure outlined on page 23.
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 23.
5. Weigh in refrigerant using procedure outlined in figure 65 on page 87.
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 under *System Refrigerant.*

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 display shows 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**

   Use one fo the following methods to manually reset the system:

   - 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 system and compressor operations. When/if conditions return to normal, the alert code turns off automatically.

NOTE - Error codes can be recalled by following information in tables on page 34.

Table 6. 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 iComfort Wi-Fi® 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	XC/XP 25-024 and -036 only: Indicates inverter is operating normally.	
N/A	N/A	ON	ON	N/A	XC/XP 25-048 and -060 only: Indicates inverter is operating normally.	
N/A	N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.	
E 105	N/A	N/A	N/A	Moderate	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 mis-wired 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	N/A	N/A	N/A	Moderate	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.
E 124	N/A	N/A	N/A	Critical	The iComfort Wi-Fi® 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.
E 125	N/A	N/A	N/A	Critical	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	N/A	N/A	N/A	Critical	The outdoor unit control parameters are corrupted.	Reconfigure the system. Replace the control if heating or cooling is not available.
E 132	N/A	N/A	N/A	Critical	Internal software error.	Replace outdoor control.
E 180	N/A	N/A	N/A	Critical	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 air-handler control detects the presence of the sensor(s). If detected (reading in range), appropriate feature is shown in the iComfort Wi-Fi® thermostat About screen. The alarm / fault clears upon configuration, or when normal values are sensed.

Table 6. 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 iComfort Wi-Fi® 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 345	N/A	N/A	N/A	Critical	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 or the circuit that confirms this operational sequence is not sensing properly.	**Issue:** Broken R50 will make the control board think reversing valve output is always off regardless of state of relay. (Supplier issue - We have found our functional test fixture can bend over MOV2 and crush it into R50.There are cut-outs in the plate of the fixture to let the two relays pass through as the plate with pogo pins is moved to the board to make contact with the terminals. There is a pocket milled out in the plate to let MOV2 pass, but if MOV2 is not straight up, it could catch the plate outside the pocket and be bent down to the board. Lennox is enlarging the cut-outs in the plate so MOV2 will clear the fixture. Corrective action completed on August 29,2013. **Corrective Actions**: Short term fix: Converted the system back to a 24 volt system to get unit operating. Long term: Replace outdoor control.
E 409	N/A	N/A	N/A	Moderate	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.
E 410	N/A	N/A	N/A	Moderate	The outdoor unit cycled off due to low pressure switch opening.	Unit pressure is below the lower limit. The system is shut down. The low pressure switch for HFC-410A closes above 90PSIG and opens below 40PSIG. 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 closes or after a power reset.
E 411	N/A	N/A	N/A	Critical	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 opens 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.
E 412	N/A	N/A	N/A	Moderate	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	N/A	N/A	N/A	Critical	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 HFC-410A 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.

Table 6. 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 iComfort Wi-Fi® 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 416	N/A	N/A	N/A	Moderate / Critical	The outdoor coil sensor has malfunctioned. As a result the outdoor unit control will not perform defrost.	Coil sensor being detected open or shorted, or temperature is out of coil sensor range. Outdoor unit control will not perform demand or time/temperature defrost operation. System is still able heat and cool. Check the resistance of the coil sensor and compare to temperature resistance chart. Replace coil sensor if needed. The alarm clears when outdoor unit control detects proper coil sensor readings or after a power reset.
E 422	N/A	N/A	N/A	Moderate	Compressor top cap switch exceeding thermal limit.	**Issue**: One of the wires from the top cap switch had pulled off one of the TP terminals on the outdoor control board. **Corrective Action**: Reconnected wire onto top cap terminal.
E 423	40	4 flashes	OFF	Moderate / Critical	The inverter has detected a circuit problem.	Control locks out after 10 strikes within an hour. To clear, disconnect power to outdoor unit and restart.
E 424	N/A	N/A	N/A	Moderate	The liquid line temperature sensor has malfunctioned.	In normal operation, after outdoor control recognizes sensors, the alarm is sent if valid temperature reading is lost. Compare liquid line 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 detects the presence of the sensor(s). If detected (reading in range), appropriate feature is shown in the iComfort Wi-Fi® thermostat About screen. The alarm / fault clears upon configuration, or when normal values are sensed.
E 425	N/A	N/A	N/A	Minor	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.
E 426	N/A	N/A	N/A	Critical	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 error, disconnect power to outdoor unit and restart. Inverter alarms 12 to 14 and 53 do not count toward this lock out condition.
E 427	21	2 flashes	1 flash	Moderate / Critical	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 outdoor unit and restart.	
E 428	22	2 flashes	2 flashes	Moderate / Critical	The inverter has detected a high main input current condition.	If condition is detected, is detected, outdoor unit compressor and fan stop. Anti-short 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 outdoor unit and restart.

Table 6. 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 iComfort Wi-Fi® 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 429	23	2 flashes	3 flashes	Moderate / Critical	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). Anti-short 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. (2) Outdoor control boards with part # 103686-03 have software update to delay the de-energizing of the reversing valve by four seconds when coming out of defrost.
E 430	26	2 flashes	6 flashes	Moderate / Critical	Compressor start failure.	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. Indicates poor connection at compressor harness, improper winding resistance, locked compressor rotor, or flooded compressor. To clear, disconnect power to outdoor unit and restart.
E 431	27	2 flashes	7 flashes	Moderate / Critical	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) Outdoor control boards with part # 103686-03 have software update to delay the de-energizing of the reversing valve by four seconds when coming out of defrost.
E 432	28	2 flashes	8 flashes	Moderate / Critical	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 outdoor unit and restart.
E 433	29	2 flashes	9 flashes	Moderate / Critical	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 outdoor unit and restart.

Table 6. 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 iComfort Wi-Fi® 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	Moderate / Critical	Outdoor control has lost communications with the inverter for greater than 3 minutes. Outdoor control will stop all compressor demands, recycle power to the inverter by de-energizing the contactor for 2 minutes. If this occurs 3 time in one thermostat call, the outdoor unit will locked out and display a critical code.	**Issues**: (1) Loose electrical connections. (2) Interruption of main power to inverter. **Corrective Actions**: (1) Check all electrical connections. (2) Check for proper main power to inverter.
E 435	60	6 flashes	OFF	Moderate / Critical	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.
E 436	62	6 flashes	2 flashes	Moderate / Critical	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 outdoor unit and restart.	**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	Moderate / Critical	Heat sink temperature sensor fault has occurred (temperature less than 4ºF or greater than 264ºF after 10 minutes of operation).	Occurs when the temperature sensor detects a temperature less than 0.4ºF or greater than 264ºF 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 outdoor unit and restart. If problem persists, replace inverter.
E 438	73	7 flashes	3 flashes	Moderate / Critical	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.
E 439	12	1 flash	2 flashes	Moderate	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 cleared.

Table 6. 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 iComfort Wi-Fi® 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 440	13	1 flash	3 flashes	Moderate	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.	**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 5 minutes to all capacitor to discharge before checking screws.
E 441	14	1 flash	4 flashes	Moderate	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..	**Issue**: Possible issue is system running at high pressures. Check for high pressure trips or other alert codes in room thermostat and outdoor control.
E 442	N/A	N/A	N/A	Critical	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 outdoor unit and restart.
E 443	N/A	N/A	N/A	Critical	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.
E 600	N/A	N/A	N/A	Critical	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	N/A	N/A	N/A	Critical	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:

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.

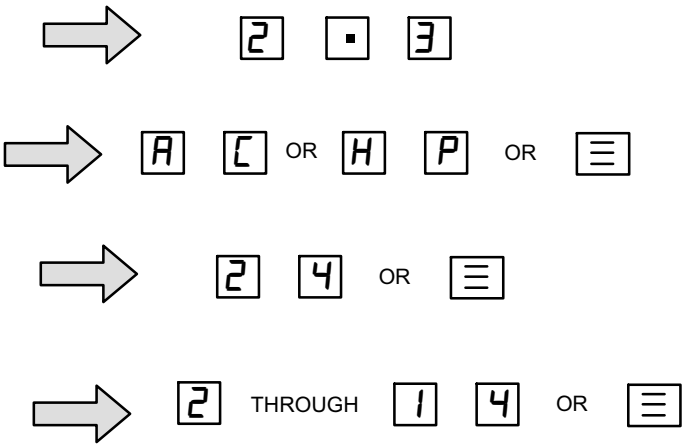
UNIT TYPE: The next item displayed is the self discovery unit type. AC = air conditioner and HP = heat pump. If the unit type cannot be determined, three bars appear.

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.

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.

UNIT CODE	UNIT TYPE, SIZE AND MODEL
☰	NOT PROGRAMMED
2	2-TON HEAT PUMP, XP25-024
4	3-TON HEAT PUMP, XP25-036
6	4-TON HEAT PUMP, XP25-048
7	5-TON HEAT PUMP, XP25-060
9	2-TON AIR CONDITIONER, XC25-024
11	3-TON AIR CONDITIONER, XC25-036
13	4-TON AIR CONDITIONER, XC25-048
14	5-TON AIR CONDITIONER, XC25-060

7-SEGMENT POWER-UP DISPLAY STRING



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

7-SEGMENT POWER-UP DISPLAY STRING EXAMPLE

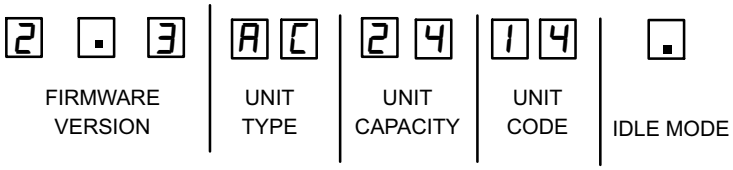


Figure 17. Outdoor Control 7-Segment Unit Status Displays

Table 7. 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 Disabled: Top and bottom horizontal line and decimal point flash at 1 Hz.	Soft Disabled: Top and bottom horizontal line and decimal point flash at 1 Hz (0.5 second on, 0.5 second off). Note - Control should be replaced.
Factory 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 Cycle: Shows current percentage of maximum cooling capacity. Example to the right indicates a cooling demand of 50 percent and a outdoor fan speed of 700 RPM.	The demand percentage is displayed first, followed by a pause, then the outdoor fan speed and the ambient temperature. C 5 0 pause F 7 0 0 pause A 7 6
Heating Pump Cycle: Shows current percentage of maximum heating capacity. Example to the right indicates a heating demand of 33 percent and an outdoor fan speed of 600 RPM.	Following string is repeated if heat pump is active with outdoor fan speed set at 600 RPM. Note - A - If available, displays outdoor ambient temperature. H 3 3 pause F 6 0 0 pause A 7 6
Defrost Mode: Shown only while in an active defrost.	Following string is repeated if defrost is active. d F pause
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 show 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 is displayed with 0.5 seconds character ON / OFF time: 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 outdoor fan speed at 700RPM: F 7 0 0 pause E 4 4 0
Outdoor Ambient Temperature (OAT): Any time OAT is sensed in operating range, value is displayed if unit is in diagnostic and non-diagnostic modes.	Following display string is repeated if cooling is active with outdoor fan speed set at 650 RPM and OAT is 104°F: C 3 5 pause F 6 5 0 pause A 1 0 4 pause
Outdoor Coil Temperature (OCT): Any time OCT 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 heat is active with outdoor fan speed set at 550 RPM and OCT is 25°F: H 3 5 pause F 5 5 0 pause c 7 7 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 with outdoor fan speed set at 650 RPM and LIQ is 105°F: C 3 1 pause F 6 5 0 pause L 1 0 5 pause
Pump Down Mode: While the unit is in pump down mode, P d is displayed repeatedly. Errors are shown if they exist.	Following display string is repeated: P d pause P d P d pause E 4 4 0 pause P d pause E 4 4 0

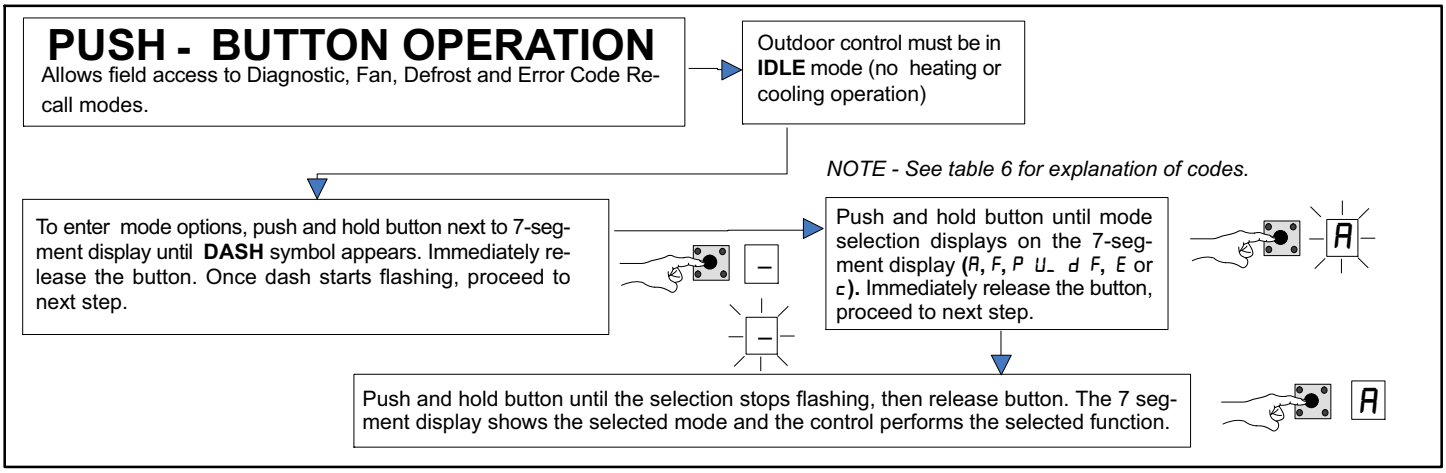


Figure 18. Push-Button Operation

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 17 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**
2	2-ton heat pump	XP25-024
4	3-ton heat pump	XP25-036
6	4-ton heat pump	XP25-048
7	5-ton heat pump	XP25-060
9	2-ton air conditioner	XC25-024
11	3-ton air conditioner	XC25-036
13	4-ton air conditioner	XC25-048
14	5-ton air conditioner	XC25-060

Idle mode — decimal flashes at 1 Hertz > 0.5 second ON, 0.5 second OFF. Idle mode is when the system is energized but no demand.		
Display Symbol or Character	**Display**	**Fan Test and Display String Option**
Displayed during start-up or power recycling.	Display string shows outdoor control firmware version 1 _ 6 > pause> A C or H P 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.	
C or H	Indicates either cooling (C) or heating (H) mode and demand percentage.	
d F	Code displays when system is in defrost mode. To enter defrost mode, unit must be running in heating mode, outdoor ambient must be below 65°F and outdoor coil temperature must be below defrost termination temperature.	
F	Indicates outdoor fan RPM speed.	**Control must be in Idle mode:** To enter fan test option - F mode, push and hold button until solid – appears, release button. Display begins flashing. Within 10 seconds, push and hold button until required symbol F displays, release button. Display begins flashing. Within 10 seconds, push and hold button until display stops flashing, release button. Control outputs DC voltage on PWM and COM terminals. Outdoor fan cycles **ON** for 10 minutes at 490 RPM. To exit test – Push and hold button until three horizontal bars display. Release button, outdoor fan cycles **OFF**.
A	A indicates that the display is showing the ambient temperature in °F (at the outdoor unit sensor). A displayed during configuration mode, indicates the option to display coil and liquid line temperatures is enabled.	**Control can be in Idle or demand mode**: To enter display configuration option - A mode, push and hold button until solid – appears, release button. Display begins flashing. Within 10 seconds, push and hold button until required symbol A 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), ambient (A), outdoor coil (c) and liquid (L) 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.*

Error Code Recall Mode (Note - control must be in idle mode)	
E	To enter error code recall mode, push and hold button until solid E appears, then release button. Control displays up to 10 error codes stored in memory. If E 0 0 0 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.*
c	To clear error codes stored in memory, continue to push button while the 3 horizontal bars are displayed. Release button when solid c is displayed.
c	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.

Forced Defrost Mode

This mode is available for **heat pump units only**. This mode can only be selected when the unit is in heating mode and the ambient sensor is reading a temperature below 65ºF.

- When in this mode, the coil and ambient sensor readings are shown on the 7-segment display.
- The control indicates an active defrost state.
- The menu mode automatically exits when forced defrost is selected. The appropriate values are shown on the 7-segment display.
- The 7-segment display indicates defrost mode as described in table 7.
- Forced defrost mode exits under the following conditions:
  - **A** Defrost period expired
  - **B** Defrost termination temperature reached
  - **C** Heating demand satisfied
  - **D** Push button is pressed and released without entering the menus

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 push 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) is shown on the 7-segment display. The following system status codes are displayed:

- Heating / Cooling
- Defrost Status
- Percentage demand operation
- Outdoor fan RPM
- Active error codes

Outdoor Fan Mode

This 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 this mode, the control energizes the outdoor fan at the highest speed. The control continuously displays the fan RPM on the 7-segment display.

PUMP DOWN MODE OPERATION

1. Turn room thermostat **OFF**.
2. Install a set of refrigerant gauges on the system to monitor the pressure.

***NOTE** - All operation monitoring devices: high pressure switch, low pressure switch and compressor internal vacuum protection remain active in the system. This prevents the compressor from recovering all the system refrigerant into the outdoor unit.*

***NOTE** - If the pump down jumper is in the ON position during power-up, it is ignored.*

3. Move the **Pump Down** jumper (see page Page 75 for location) from the **OFF** position to the **ON** position.

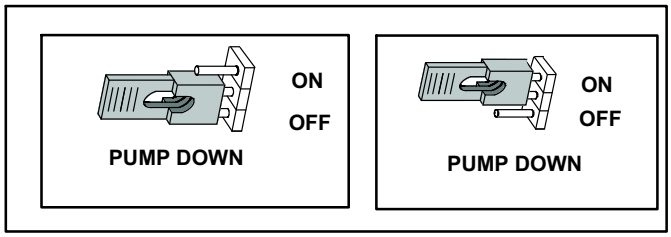


Figure 19. Pump Down Jumper

4. Shut off the liquid line service valve to stop the flow of refrigerant into the indoor coil.
5. After a three-second delay, the compressor and outdoor fan increases speed up to 100% capacity. (Indoor fan remains **OFF.**)
6. Monitor the low-side pressure at the outdoor unit. The internal vacuum protection in the compressor and/or one of the pressure switches prevent full recovery of all of the refrigerant into the outdoor unit. When the system reaches this condition,close the suction line service valve and move the **Pump Down Jumper** to the **OFF** position.

***NOTE** - The outdoor control stays in pump down mode for five minutes, after which the outdoor control initiates a compressor shutdown sequence.*

7. Use a refrigerant recovery machine to recover the remaining refrigerant on the indoor side of the system.

Table 8. 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 A	Puts unit in diagnostic mode. (Displays ambient, coil, liquid sensor temperatures and any active error codes.)
Solid c	Clears error history (**)
Solid E	Enter diagnostic recall mode. Displays up to 10 error codes in memory.
Solid d	Start forced defrost test
Solid F	Starts outdoor fan.
String P U	Enter unit code programming.

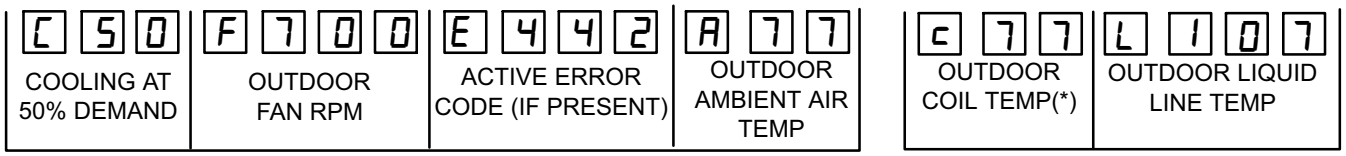
**No change indicates the display continues to show whatever is currently being displayed for normal operations.*

***Note - Once the error history is deleted, it cannot be recovered. After the history is deleted, the unit resets itself.*

Table 9. Normal Operation Character Display String

Display	Display and action (normal operation)	Display and action (configuration and test mode)
.	Idle mode — decimal flashes at 1 Hertz > 0.5 second ON, 0.5 second OFF	
C	Cooling operation. Shows C and the cooling demand percentage. Example: C 5 0 pause F 7 0 0 pause A 7 5	
F	Fan RPM. Shows F and the current fan RPM. Example: H 5 0 pause F 6 0 0 pause A 4 5	
E	E in the display string represents the active error code or codes in the outdoor unit. Example: C 5 0 pause F 7 0 0 pause E 4 4 1 pause E 4 4 2 pause A 7 5 pause	
A	A in the display string represents the outdoor ambient temperature in °F at the outdoor sensor on the outdoor unit. Example: C 5 0 pause F 7 0 0 pause A 7 5	
c	If enabled, c in the display string represents the outdoor coil temperature in °F at the sensor on the outdoor unit. Example: C 5 0 pause F 7 0 0 pause A 7 5 pause c 4 5 pause. Air conditioning units do not require an outdoor coil sensor. A 10K resistor, across pins 5 and 6 on the outdoor control sensor harness, prevents false outdoor coil sensor codes. The 10K resistor causes the 7-segment display to show a constant **77ºF** coil (c) temperature value.	
L	If enabled, L in the display string represents the outdoor liquid line temperature in °F at the sensor on the outdoor unit. Example: C 5 0 pause F 7 0 0 pause A 7 5 pause c 4 5 pause pause L 1 0 5 pause	
P d	P d displays when system is in pump down mode.	

TYPICAL 7-SEGMENT ACTIVE COOLING OR HEATING DEMAND DISPLAY STRING



BY DEFAULT, COOLING OR HEATING, DEMAND, OUTDOOR FAN RPM, ACTIVE ERROR CODES AND OUTDOOR AMBIENT TEMPERATURE ARE DISPLAYED.

OUTDOOR COIL AND LIQUID LINE TEMPERATURES CAN BE MANUALLY ENABLED. IF SYSTEM POWER IS RECYCLED, DISPLAY STRING REVERTS BACK TO DEFAULT (SEE FIGURE 21 TO ENABLE)

* Air conditioning units do not require an outdoor coil sensor. A 10K resistor, across pins 5 and 6 on the outdoor control sensor harness, prevents false outdoor coil sensor codes. The 10K resistor causes the 7-segment display to show a constant **77ºF** coil (c) temperature value.

Figure 20. Typical 7-Segment Demand Display String

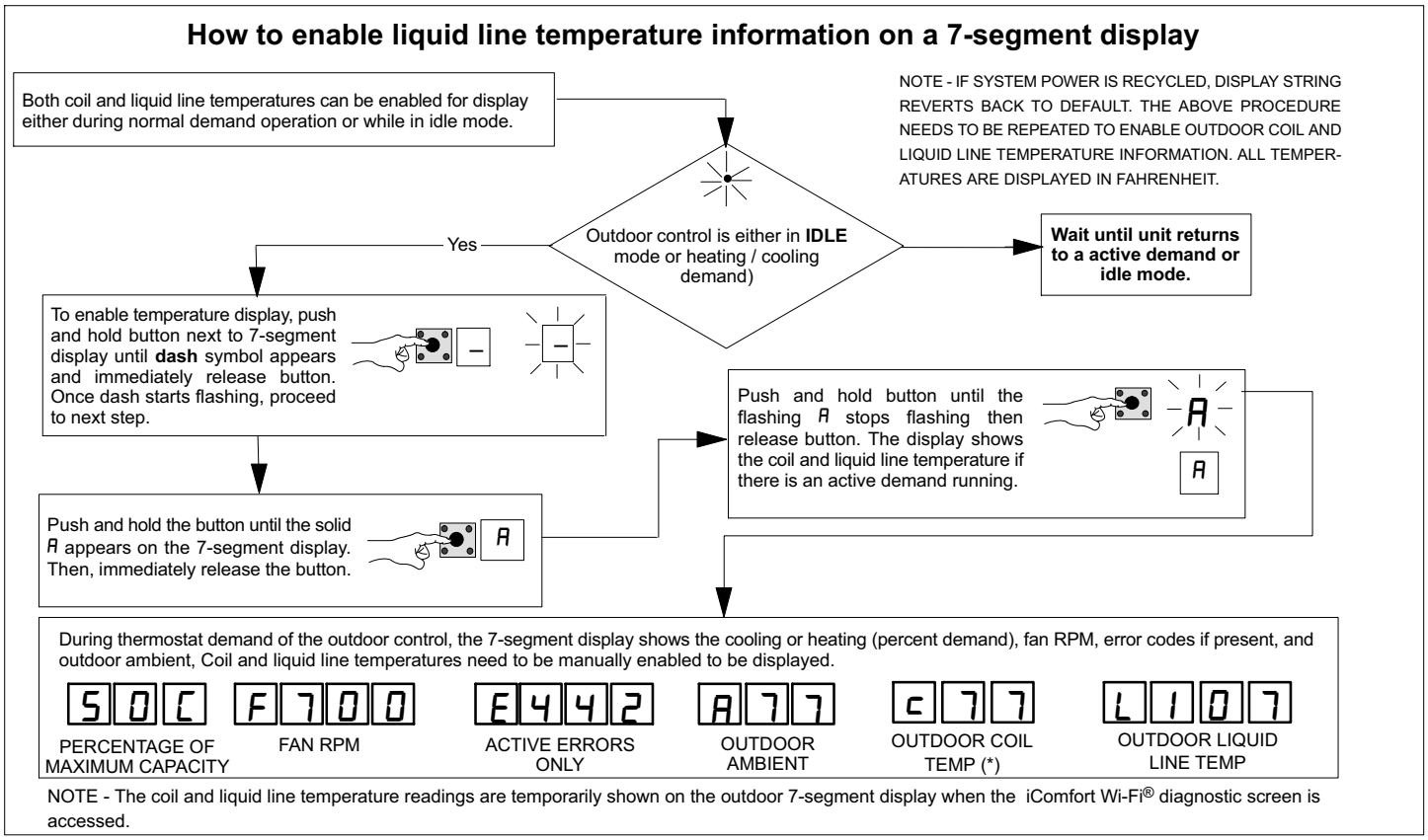


Figure 21. Enabling Liquid Line Temperature Information

Configuring Unit

When installing a new or 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 RPM.

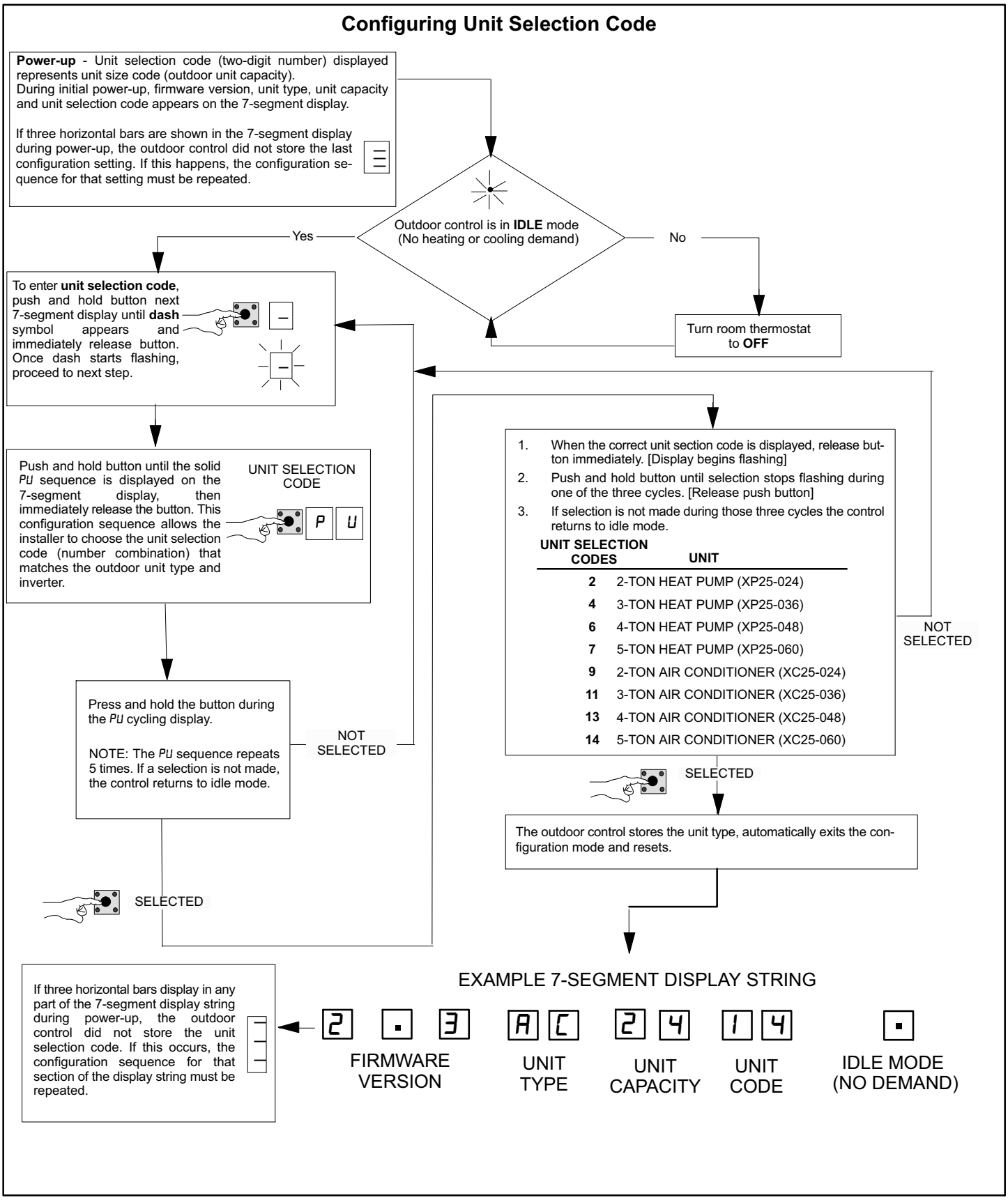


Figure 22. Configuring Unit Selection Code

Reconfiguring Outdoor Control using iComfort Wi-Fi® Thermostat

If any component of the HVAC system is changed, (e.g. an outdoor sensor is replaced), reconfigure the system. To begin reconfiguring a system, select the **Setup** tab.

System Overview

Refer to the iComfort Wi-Fi® Thermostat Installer Guide for configuration procedures.

⚠ IMPORTANT

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

The outdoor control provides the following functions:

- Demand defrost algorithm
- Field-selectable defrost termination temperatures through the thermostat interface
- Internal switching of outputs
- Anti-short-cycle delay (adjustable through the thermostat interface
- Five-strike lockout function
- Ambient (RT13), coil (RT21) and liquid line (RT36) temperatures monitoring and protection

COMPRESSOR PROTECTION — FIVE-STRIKE LOCKOUT FUNCTION

The five-strike lockout function is designed to protect the unit's compressor from damage. The five-strike feature is used for high (S4) and low (S87) pressure switch trips.

Resetting Five-Strike Lockout

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

Diagnostic Information

The following diagnostic information is available through the thermostat user interface. Refer to the Wi-Fi® Installer System Setup Guide.

- Compressor anti-short cycle delay timer status
- Cooling rate
- Heating rate
- Compressor shift delay timer status
- Defrost status
- High pressure switch status
- Low pressure switch status
- Compressor top cap switch status
- Liquid line temperature
- Outdoor ambient temperature
- Coil temperature
- Time since last defrost
- Calibration delta T
- Current delta T
- Outdoor fan RPM
- Compressor active alarm
- Compressor Hz
- Inverter compressor short cycle
- Heat sink temperature

Installer Test

Verify the proper operation of the system by running the Installer Test feature through the thermostat interface. Refer to the iComfort Wi-Fi® Installer's System Setup Guide.

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 outside coil tubing. The location of the coil sensor is important for proper defrost operation (see figure 59 on page 77 for location of 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 (see figure 33)
- 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 discharge termination temperature setting to maintain a clear coil.

COMPRESSOR SHORT-CYCLING DELAY

The outdoor control protects the compressor from:

- Short-cycling (five minutes) when there is 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.

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

COMPRESSOR SHIFT DELAY

The outdoor control has a field-selectable option (**ON** or **OFF**), selected through the thermostat interface, which reduces sounds that occur while the unit is cycling in and out of the defrost mode.

* When enabled, there is a 30-second compressor shift delay which de-energizes the contactor output and ECM fan outputs. After the delay expires, the contactor and ECM, fan outputs are energized.
* When disabled, the reversing valve is shifted by de-energizing the outputs.

Outdoor Temperature Operational Range

Use the chart below to determine the operational limits in reference to outdoor temperatures.

Table 10. Heat Pump Cooling Operational Range

Temperature		Event
C°	F°	
Above (-) 20°C	Above (-) 4°F	Room thermostat controls operation of outdoor unit. NOTE - Below 65°F (18.3°C) the liquid line temperature sensor controls the outdoor fan speed (RPM) to maintain a liquid line temperature between 58°F (14.4°C) and 55°F (12.8°C). NOTE - Minimum fan RPM is 300.
At or Below (-) 20°C	At or Below (-) 4°F	Outdoor unit cooling operation stopped by low ambient temperature protection (Status Code 601).

Table 11. Heat Pump Heating Operational Range

Temperature		Event
C°	F°	
Above (-) 26°C	Above (-) 15°F	Room thermostat controls operation of outdoor unit. NOTE - If the outdoor unit is operating and the outdoor ambient temperature drops below -4°F (-20°C), the unit continues to operate until the room thermostat demand is satisfied or the outdoor temperature drops to -15°F (-26°C). If the outdoor unit stops running while the temperature is below -4°F (-20°C), the unit remains OFF until outdoor temperature rises above -4°F (-20°C),
At or Below (-) 26°C	At or Below (-) 15°F	Outdoor unit heating operation stopped by low ambient temperature protection (Status Code 601). NOTE - Room thermostat "Low Balance Point" minimum setting is -15°F (-26°C).

NOTE - If system conditions are outside the specified ranges, the outdoor control may reduce, terminate, or prevent system operation.

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 (Sea Coast) — 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 determine the 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.

Locations with Possibility of Heavy Snow or Freezing Rain Accumulation

Heavy snow and/or freezing rain can interfere with the performance of the outdoor fan assembly. Lennox recommends use of the optional snow guard (X8782) in these areas.

Figure 23. Snow Guard Top Cover — X8782

SunSource® Home Energy System

This Dave Lennox *Signature*® Collection heat pump is factory-equipped with components that make it SunSource® Solar-Ready. These units can be matched with solar modules and other optional equipment so that they can become part of a SunSource® Home Energy System.

Units can be upgraded for use with solar equipment at the time of installation or in the future.

Solar energy is first used to meet cooling/heating demands. When the outdoor unit is not operating, the system powers lighting, appliances and other electronic devices in the home. Any surplus power is sent back to the utility company for a possible credit. Check with your local utility company for availability.

Typical Unit Wiring Diagrams

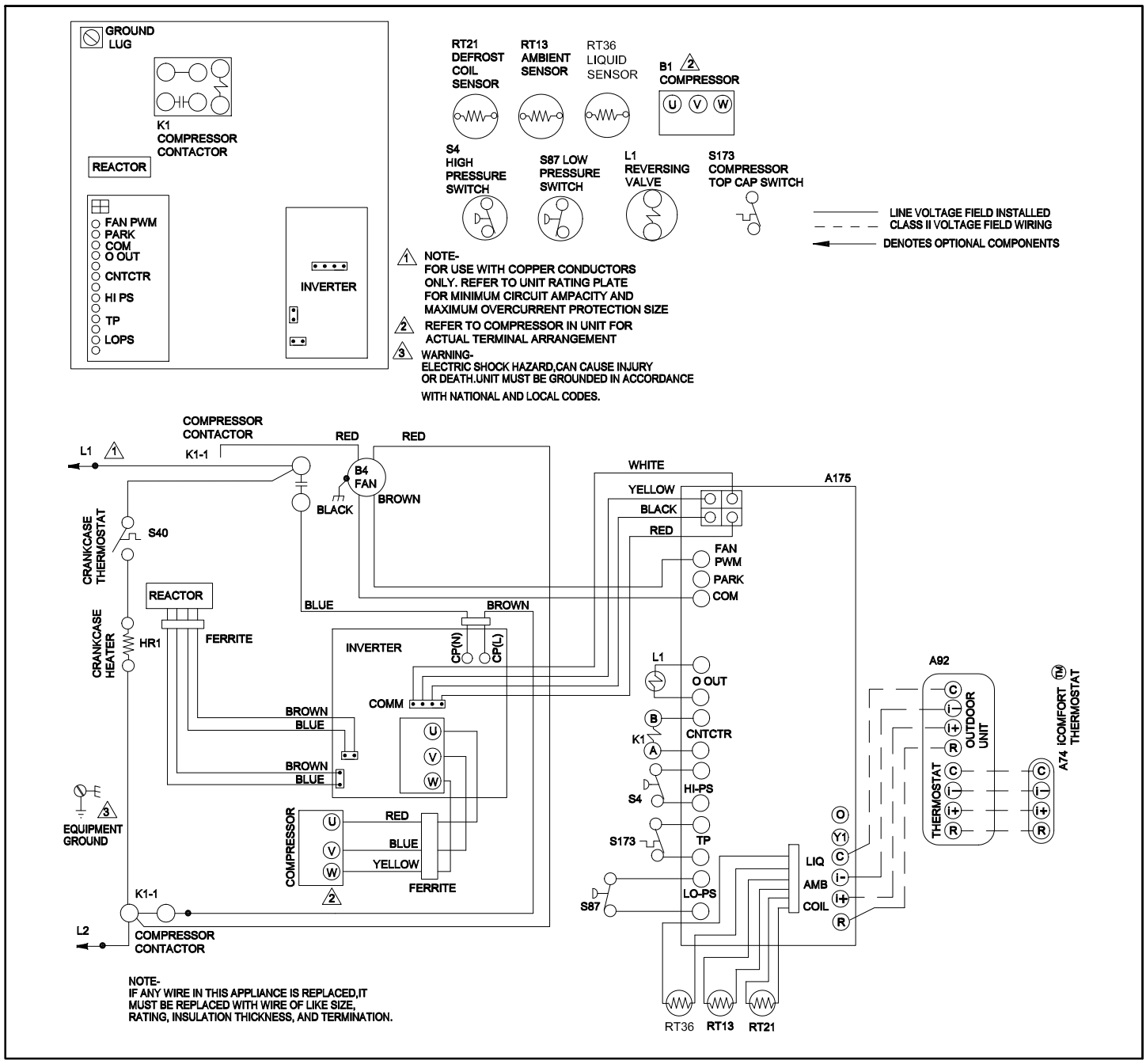


Figure 24. Typical Unit Wiring (XP25-024 and -036)

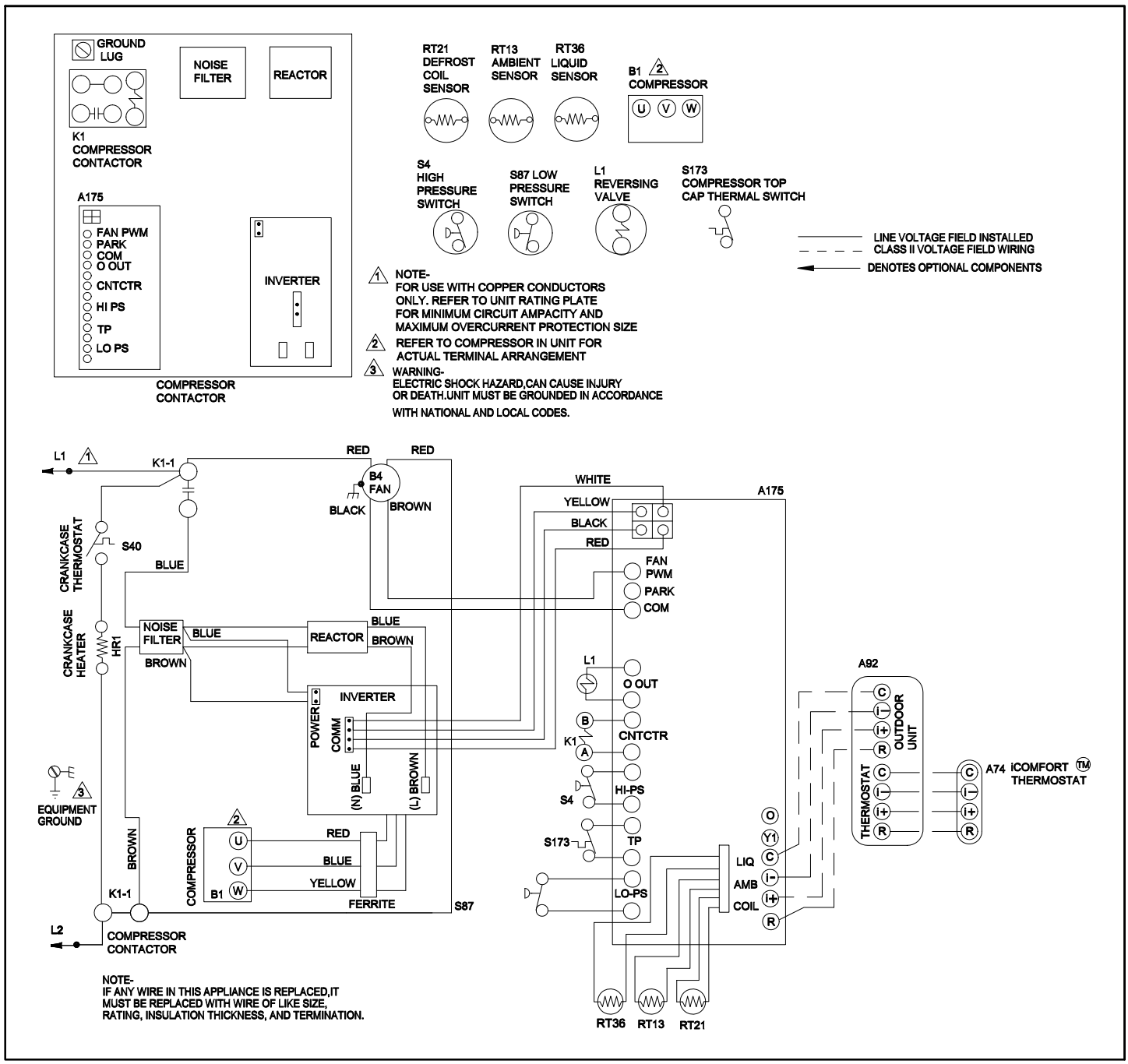
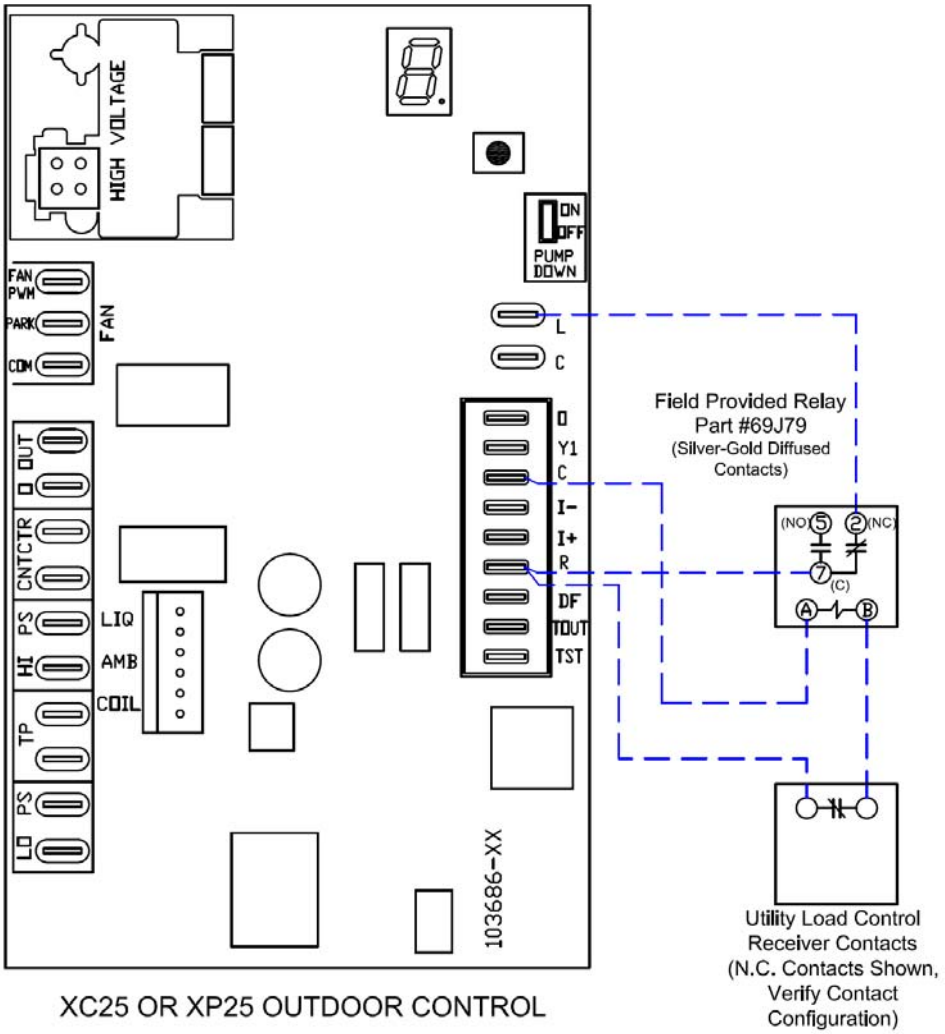


Figure 25. Typical Unit Wiring (XP25-048 and -060)

XC25 or XP25 icomfort Outdoor Unit
Wiring Detail w/ Utility Load Shedding



NOTE *- For more information on Load Shedding, see* Electrical *on page 24.*

Figure 26. Load Shedding Feature Wiring Diagram

Factory Wiring Diagrams

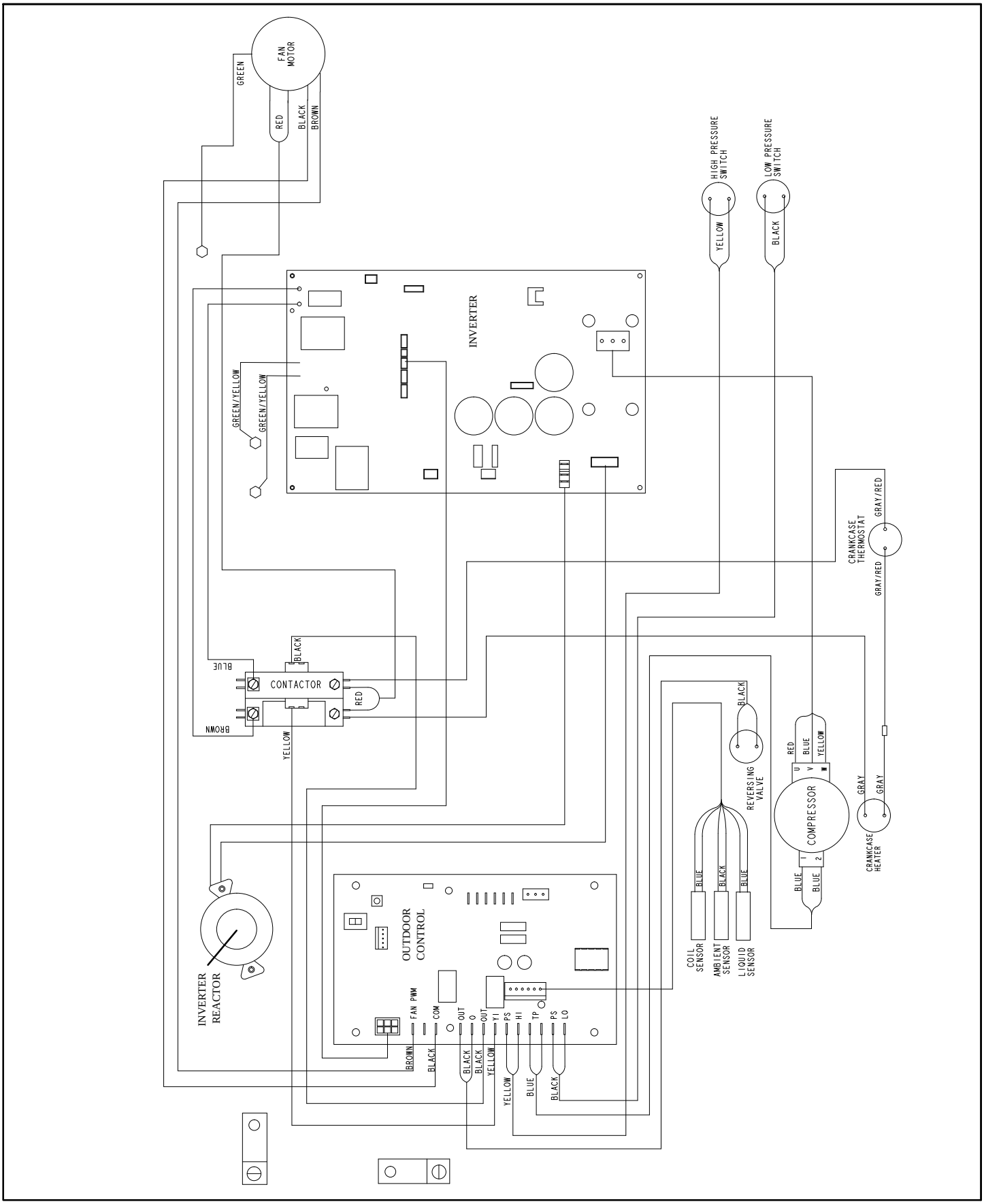


Figure 27. Typical Factory Wiring (XP25-024 and -036)

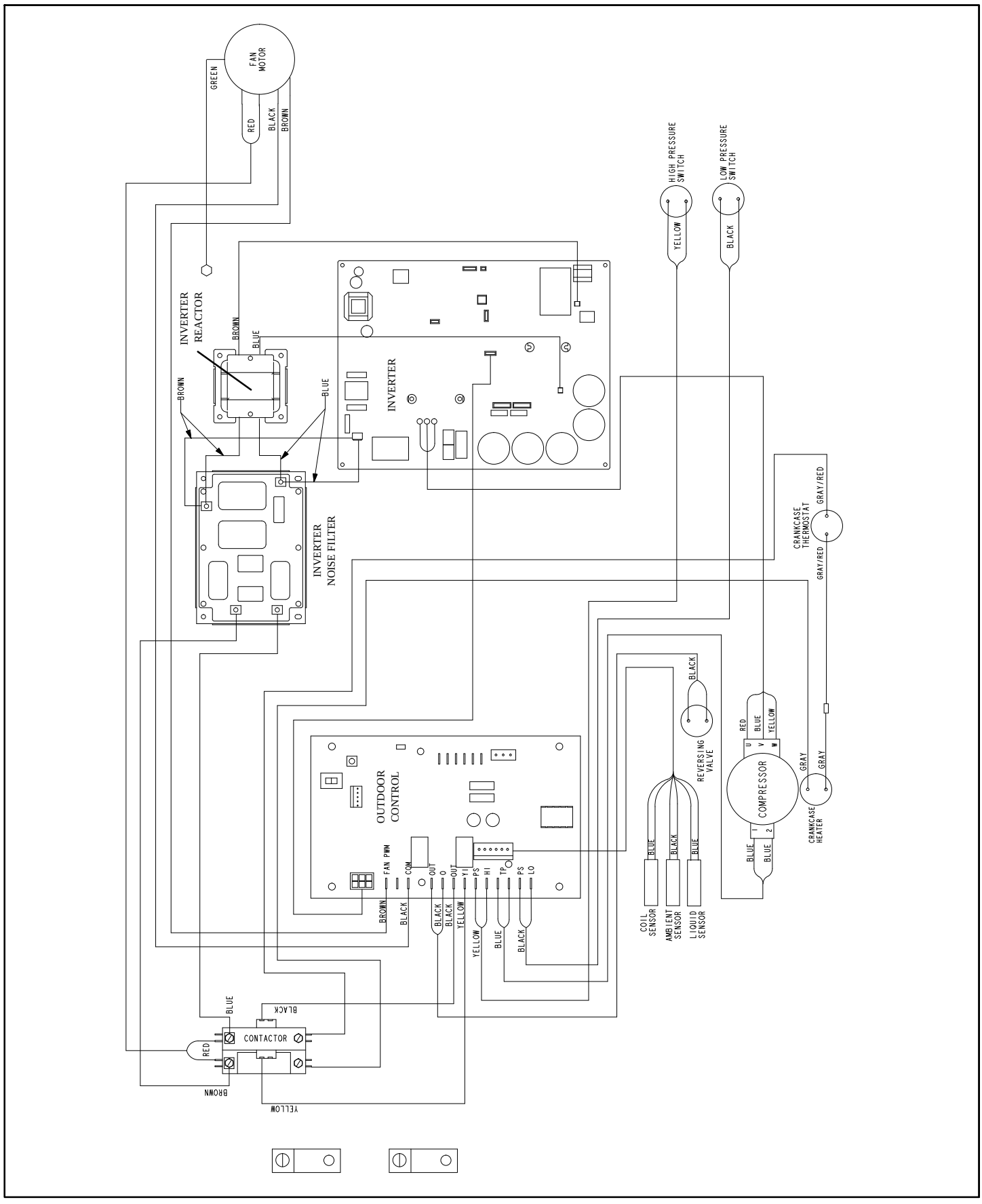


Figure 28. Typical Factory Wiring (XP25-048 and -060)

Unit Sequence of Operations

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 lock out LED Codes and unit system operation interactions.

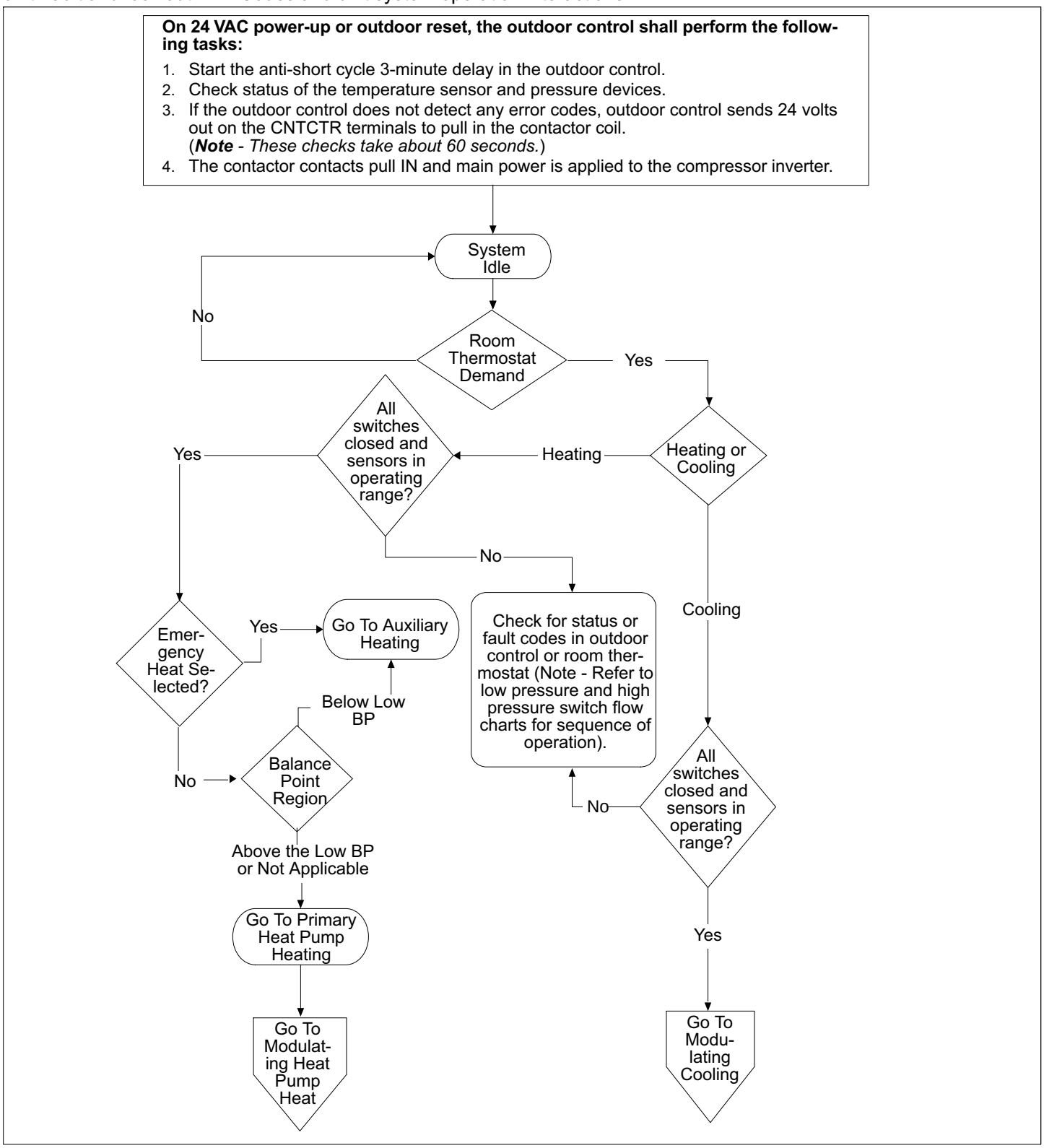


Figure 29. 24 VAC Power-Up or Outdoor Reset

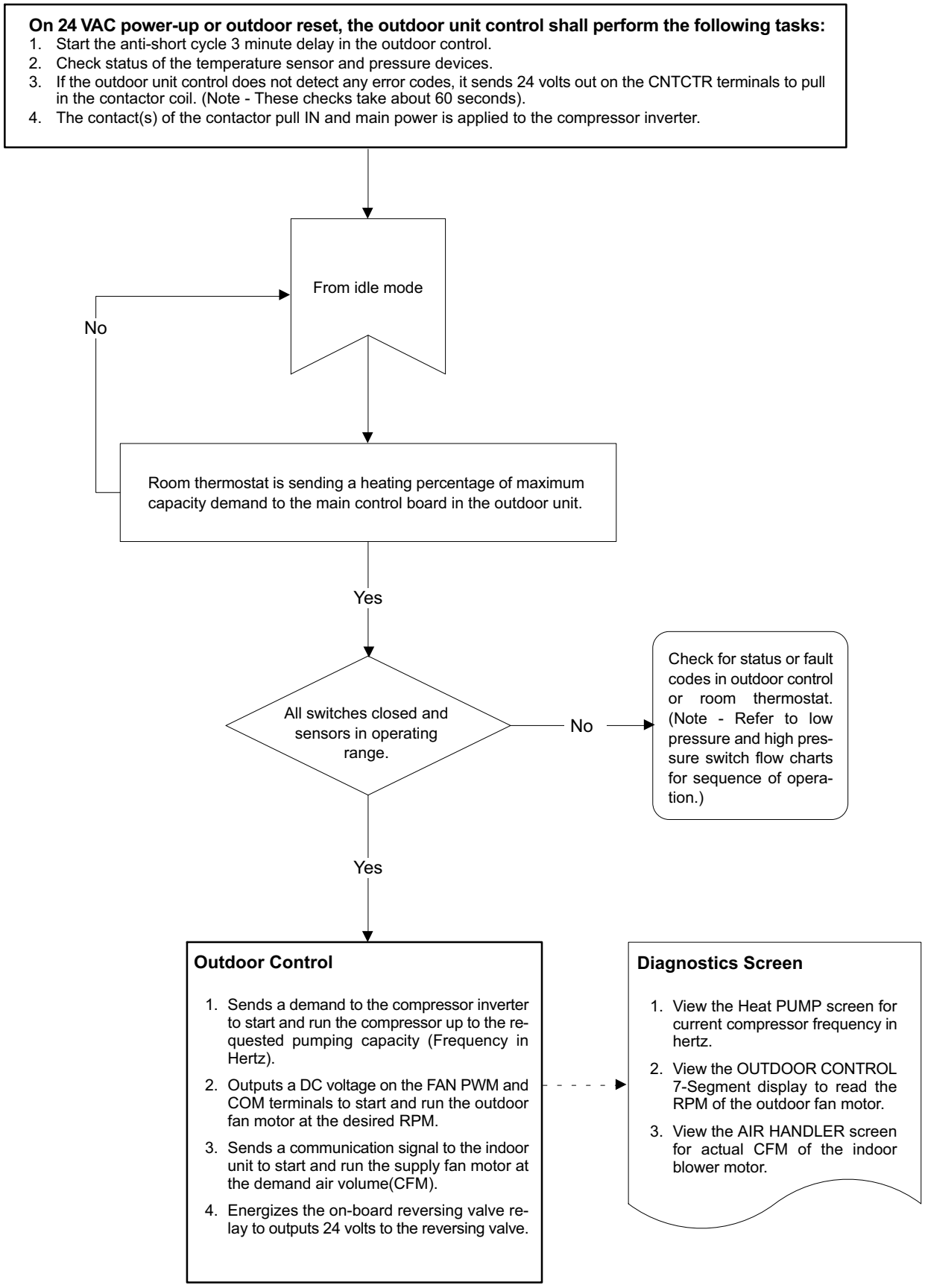


Figure 30. Heat Pump Mode

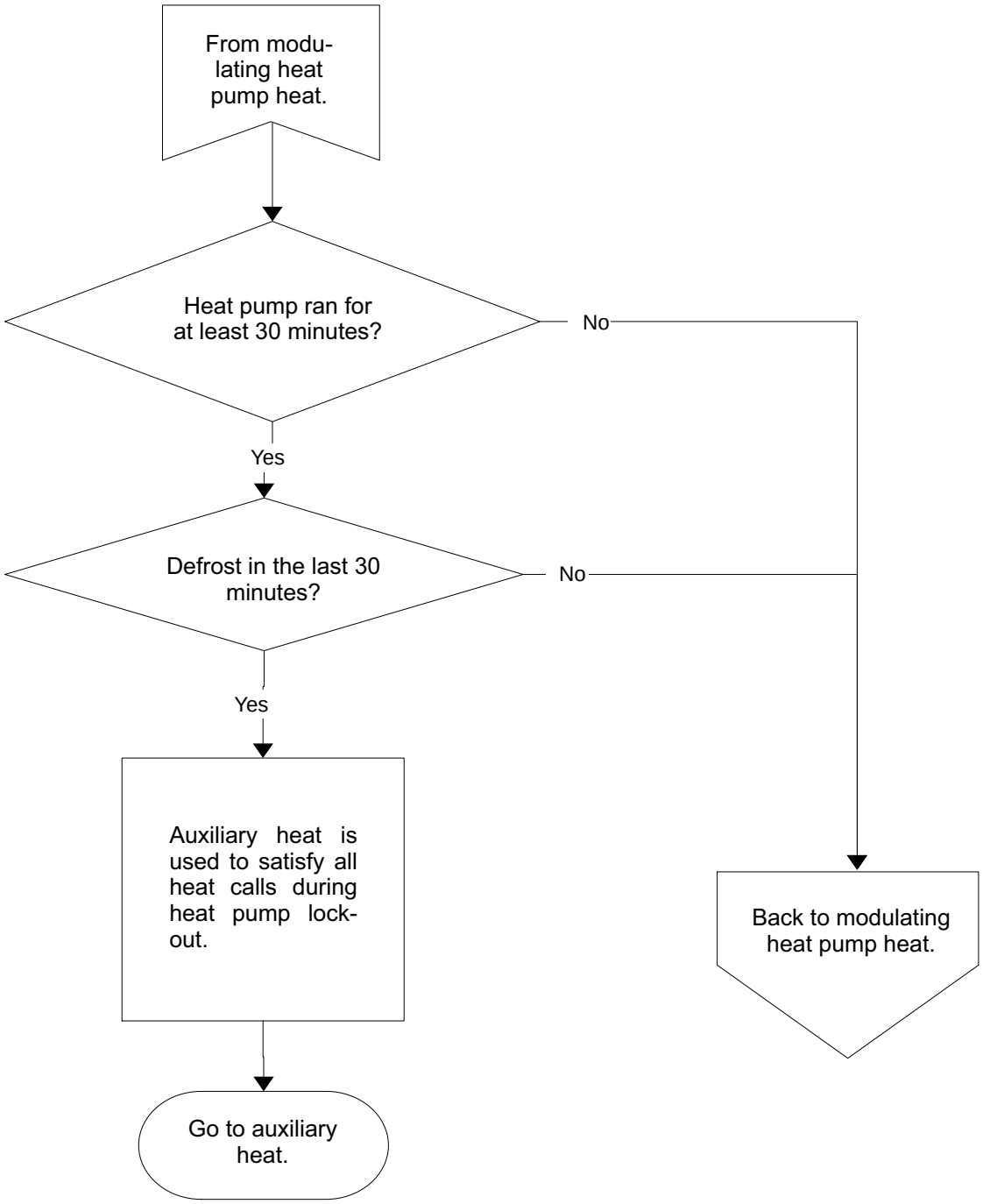


Figure 31. Transition to Auxiliary Heat

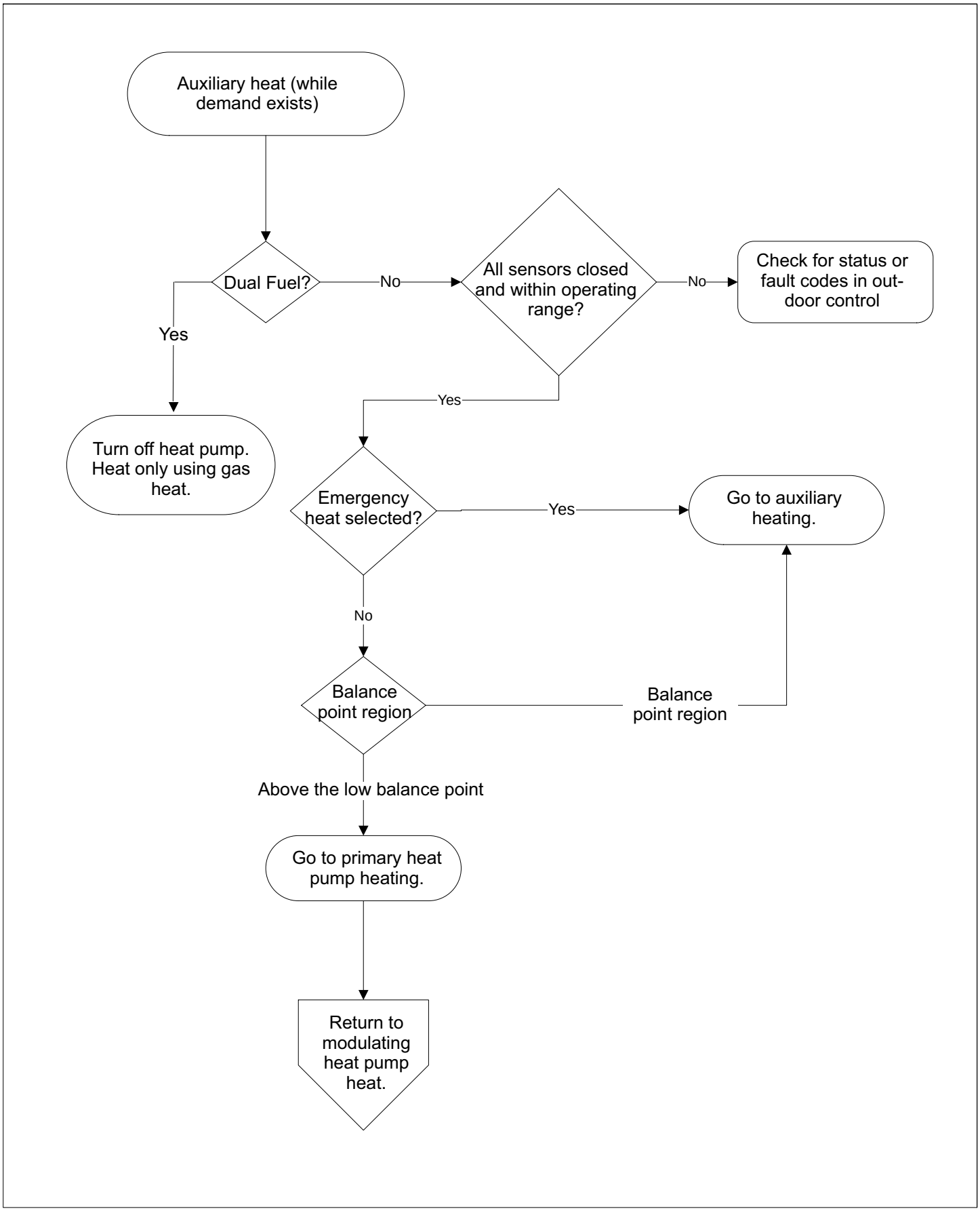


Figure 32. Auxiliary Heat

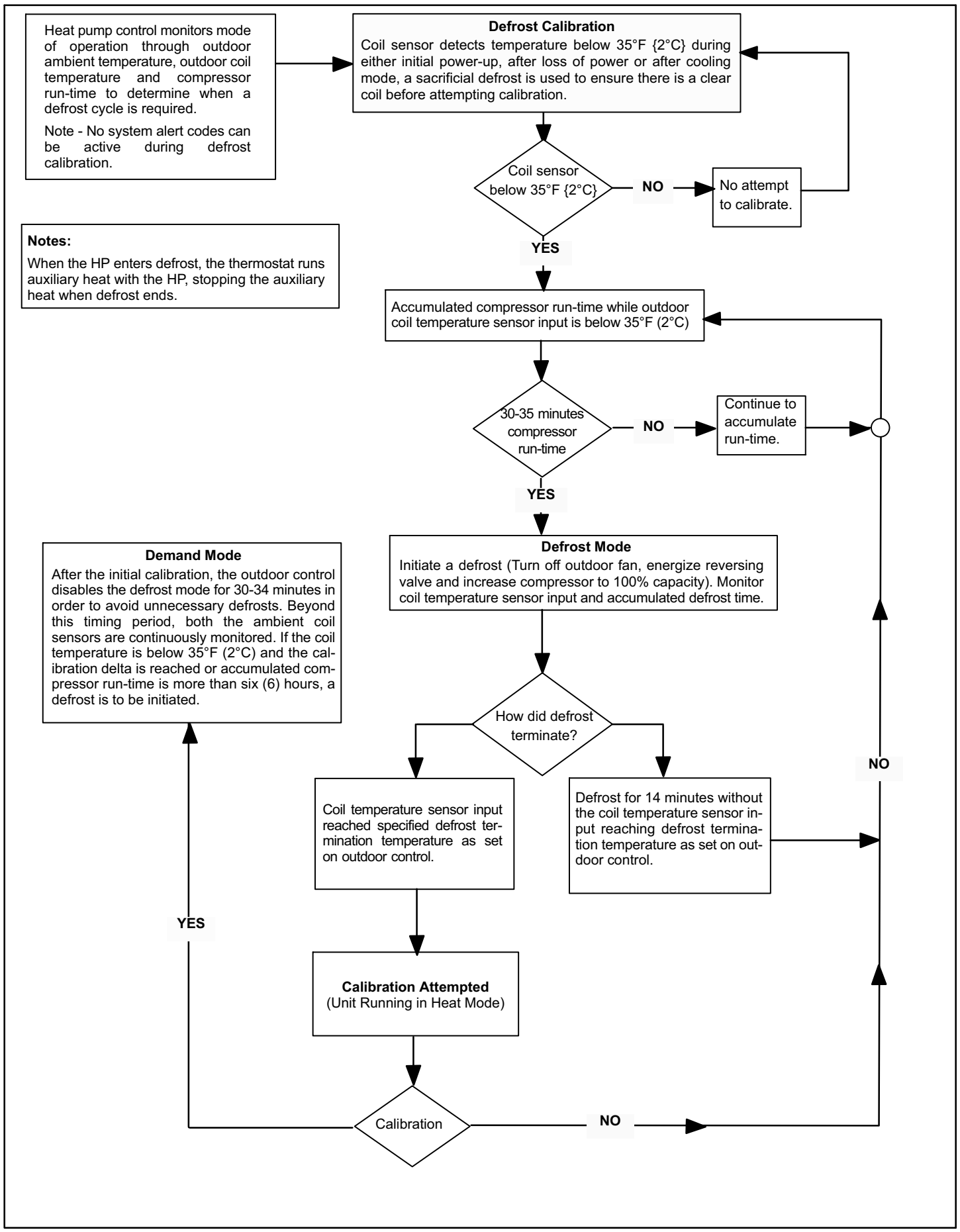


Figure 33. Defrost Calibration and Defrost Mode Sequence of Operations (All Versions)

Component Testing

Section Table of Contents

High and Low Pressure Switch Operation, Checkout and Status / Error Codes

OPERATION :

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

Low Pressure Switch (LO-PS) — See figure 35 for low pressure switch sequence of operation.

High Pressure Switch (HI-PS) — See figure 36 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 40 psig; reset at 90.

CHECKOUT

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.

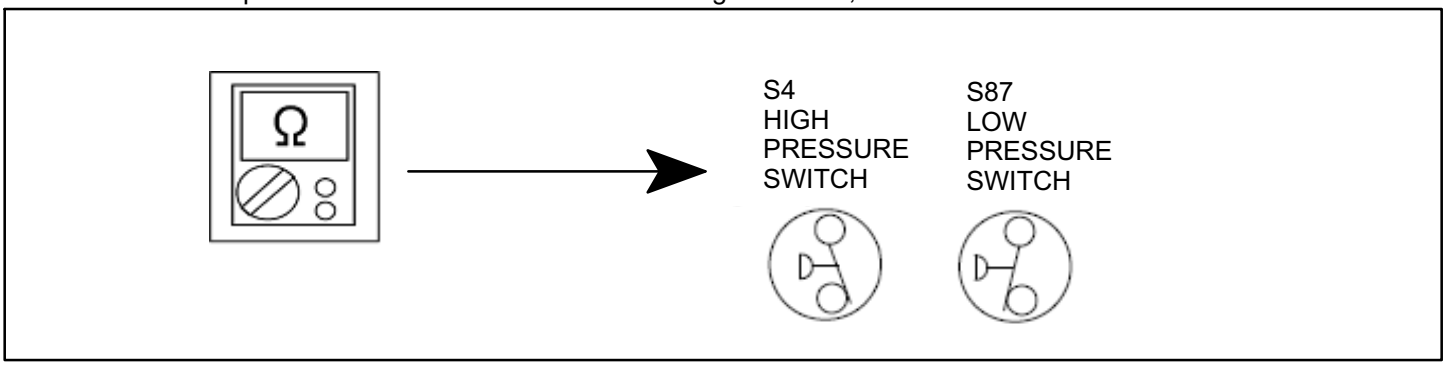


Figure 34. Verifying High Pressure and Low Pressure Switch Operation

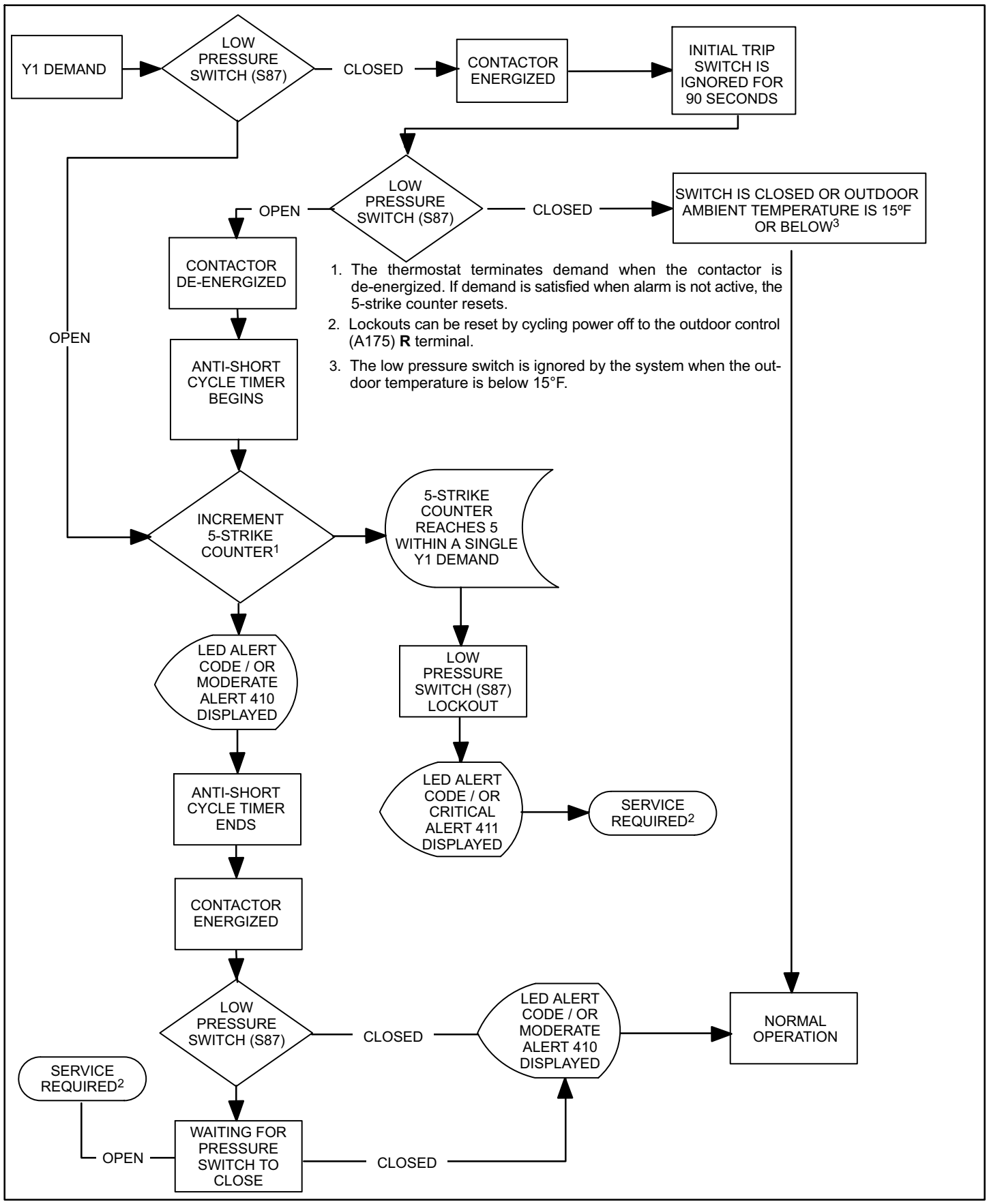


Figure 35. Low Pressure Switch (S87) Sequence of Operation (All Versions)

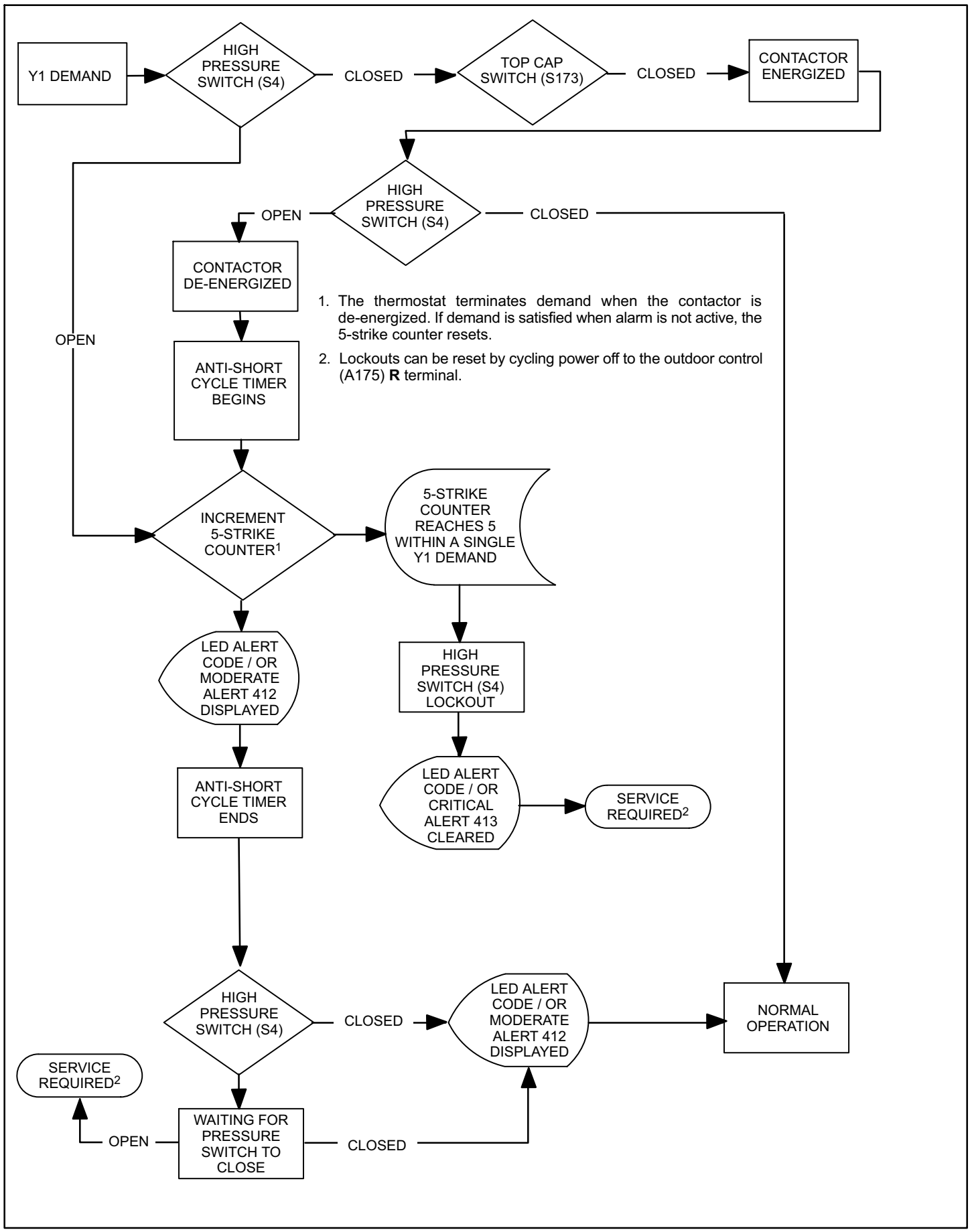


Figure 36. High Pressure Switch (S4) Sequence of Operation (All Versions)

High and Low Pressure Switch Errors

Table 12. Outdoor Control 7-Segment Display Alert Codes - High and Low Pressure Switches

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 iComfort Wi-Fi® thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 410	Moderate	The outdoor unit low pressure switch has tripped.	Unit pressure is below the lower limit. The system is shutdown. The low pressure switch opens at 25PSIG and closes at 40PSIG. 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	Critical	The low pressure switch has tripped 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 opens 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.
E 412	Moderate	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	Critical	The high pressure switch has opened 5 times within one hour. As a result, the outdoor unit is locked out.	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.

Reversing Valve Operation, Checkout and Status / Error Codes

OPERATION:

The reversing valve switches the system between cooling and heating modes. By switching the flow of refrigerant, the heat pump can incorporate the functions of cooling in the summer and heating in the winter. The valve consists of a main body and a solenoid coil.

Note - The reversing valve solenoid is energized in the cooling mode.

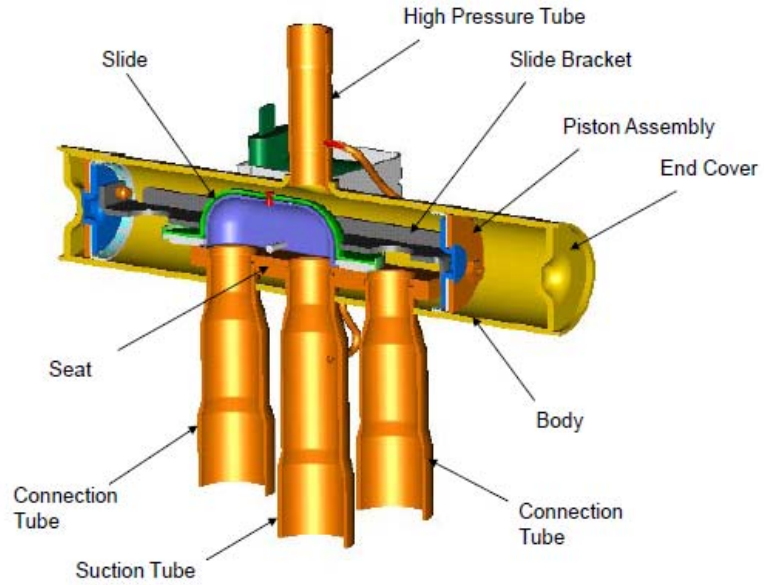


Figure 37. Reversing Valve (L1)

CHECKOUT:

Using a multimeter set to ohms, with the solenoid terminals disconnected from the outdoor unit's control, check the resistance between the two terminals of the reversing valve solenoid. If the resistance reading is 0 ohms or infinite, replace solenoid coil.

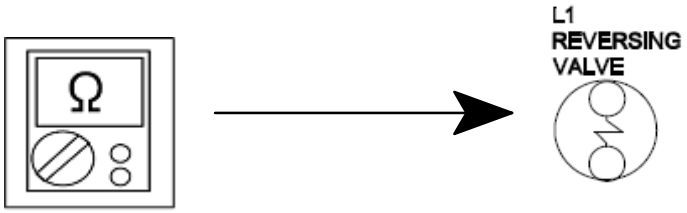


Figure 38. Reversing Valve Checkout

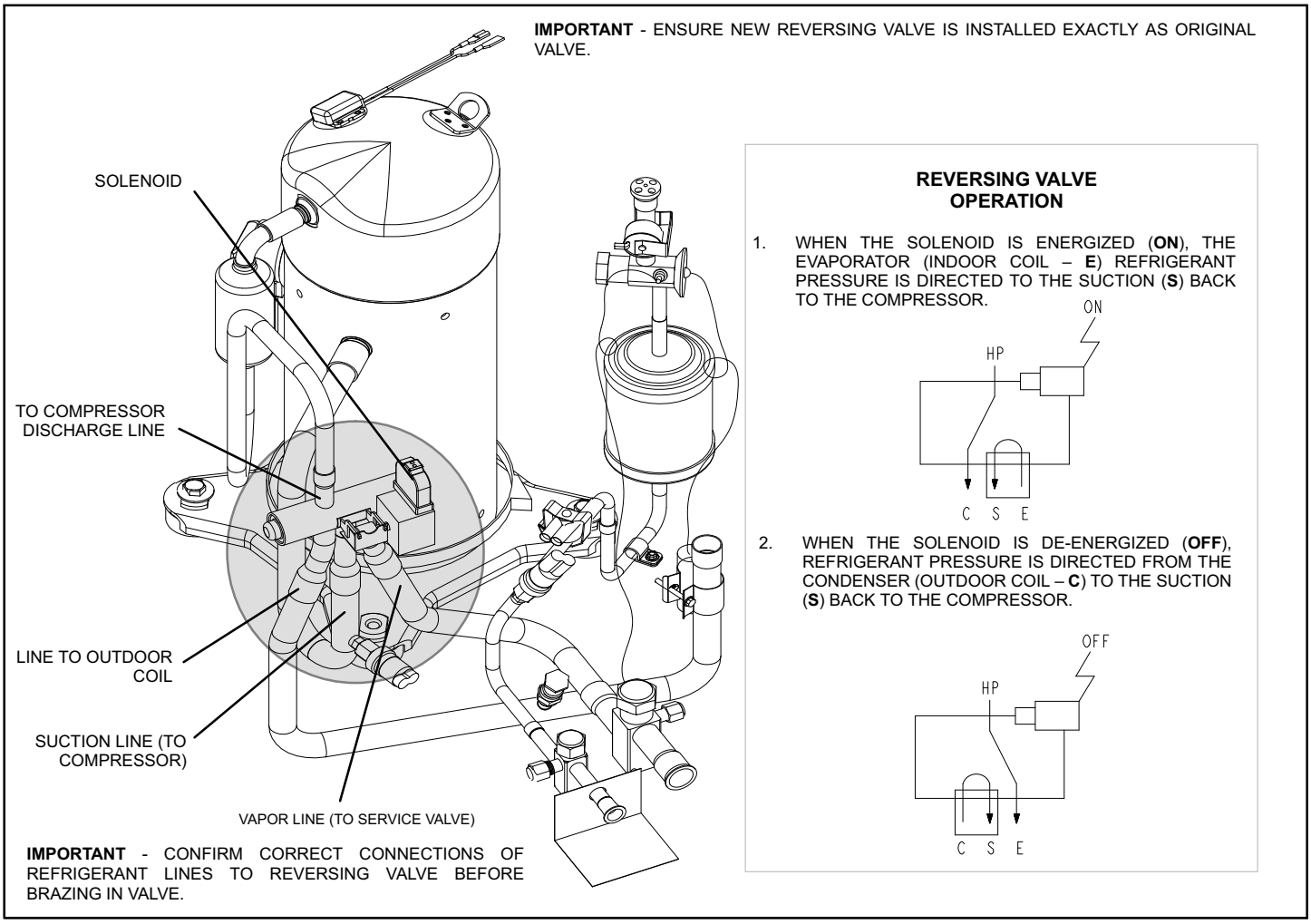


Figure 39. Typical Reversing Valve Components and Operation

STATUS CODE:

Diagnostic screen in room thermostat indicates when reversing valve is **ON**.

ERROR CODES:

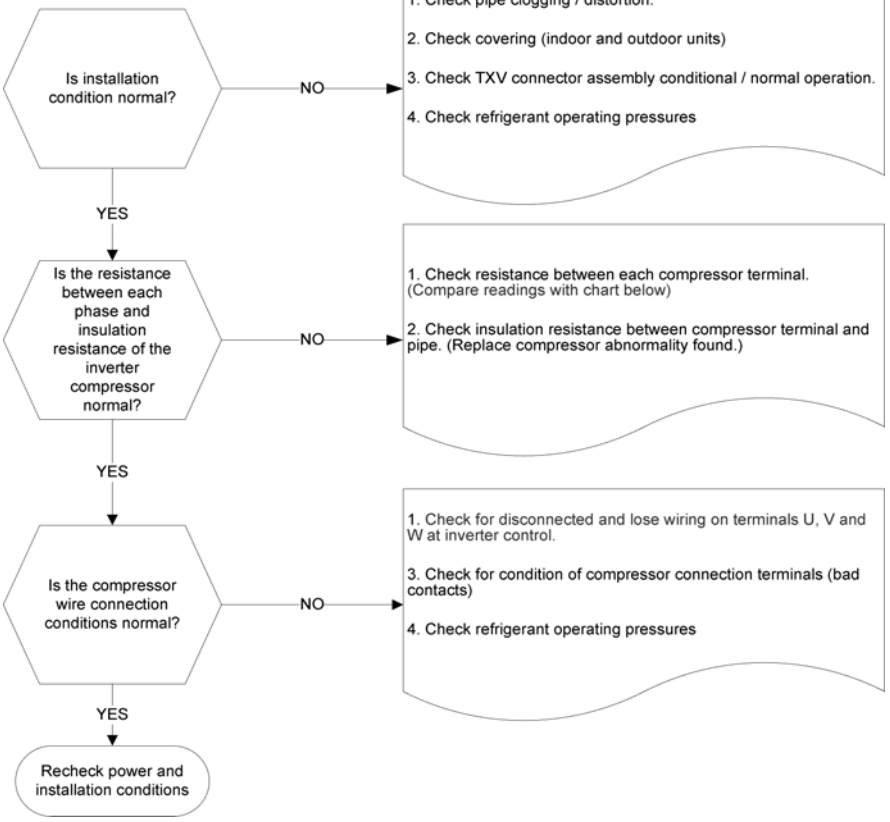
There is no feedback from the reversing valve to the outdoor control therefore no error codes is displayed on the outdoor control or iComfort Wi-Fi® room thermostat. (*NOTE - If the reversing valve does not operate as designed, the system is shut down by other controls.*)

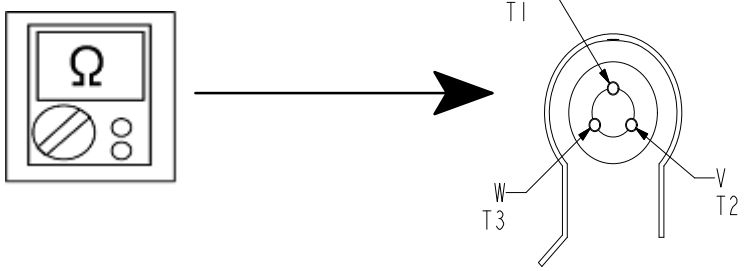
Compressor Operation, Checkout and Status / Error Codes

OPERATION:

The compressor is 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 22 hertz up to a maximum of 70 Hertz (maximum hertz is dependent on compressor size). The compressor speed is determined by demand from the room thermostat.

CHECKOUT:





MOTOR WINDING RESISTANCE AT 77° (±7%)

UNIT	U-V/T1-T2	V-W/T2-T3	W-U/T3-T1
-024	1.050Ω	1.043Ω	1.050Ω
-036	0.617Ω	0.625Ω	0.625Ω
-048	0.704Ω	0.700Ω	0.700Ω
-060	0.620Ω	0.616Ω	0.616Ω

Figure 40. 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.

STATUS CODES:

When the compressor is running, the 7-segment display on the outdoor control displays (strings) the room thermostat demand to the compressor as a percentage. (Example: **C 5 0** – compressor is running at 50% of maximum speed.)

ERROR CODES:

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

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 iComfort Wi-Fi® 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	Moderate / Critical	Compressor start failure.	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. Indicates poor connection at compressor harness, improper winding resistance, locked compressor rotor, or flooded compressor. To clear, disconnect power to outdoor unit and restart.
E 433	29	2 flashes	9 flashes	Moderate / Critical	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 5 times within an hour, system is locked out. To clear disconnect power to outdoor unit and restart.
E 439	12	1 flash	2 flashes	Moderate	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 cleared.
E 440	13	1 flash	3 flashes	Moderate	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.	**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 5 minutes to all capacitor to discharge before checking screws.
E 441	14	1 flash	4 flashes	Moderate	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..	**Issue**: Possible issue is system running at high pressures. Check for high pressure trips or other alert codes in room thermostat and outdoor control.
E 600	N/A	N/A	N/A	Critical	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.

Crankcase Heater, Checkout and Status / Error Codes

OPERATION:

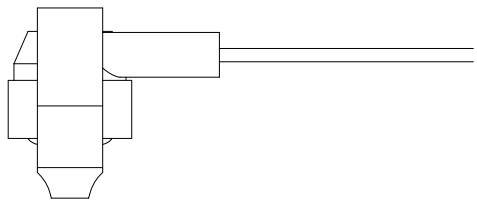
CRANKCASE HEATER (HR1)

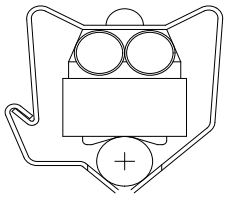
Compressors in all units are equipped with a 40 or 70 watt (depending on unit size) belly-band type crankcase heater. The heater prevents liquid from accumulating in the compressor. The heater is controlled by the crankcase heater thermostat.

CRANKCASE HEATER THERMOSTAT (S40)

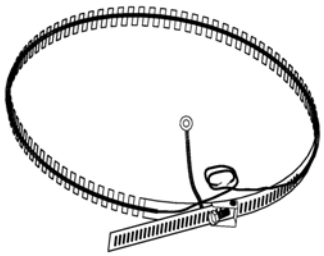
Crankcase heater thermostat S40 controls the crankcase heater in all units and is located on the liquid line (see figure 2 on page 6 for location).

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.





Crankcase Heater Thermostat



Belly-Band Crankcase Heater - 240VAC, Watts 40 or 70

Figure 41. 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.

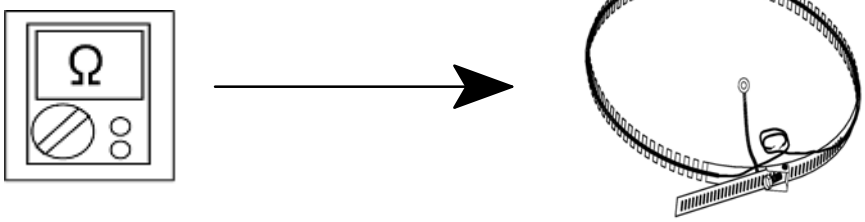


Figure 42. Checking Belly-Band Crankcase Heater

Crankcase Heater Thermostat: As the detected temperature changes the resistance across the sensor changes. Table 18 on page 78 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 <u>not</u> within the range shown in table 18 on page 78, may be performing as designed. However, if a shorted or open circuit is detected, the sensor is faulty; the sensor needs to be replaced.

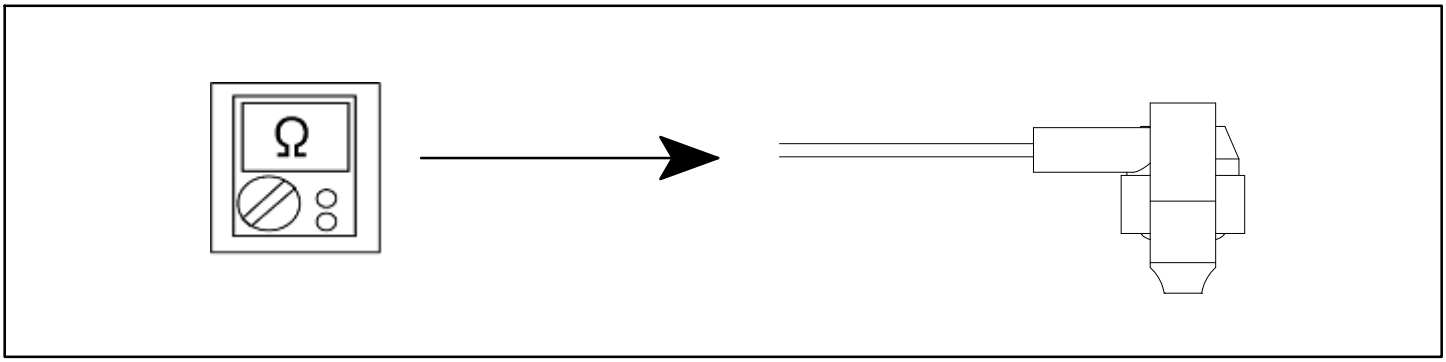


Figure 43. Checking Crankcase Heater Thermostat

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.

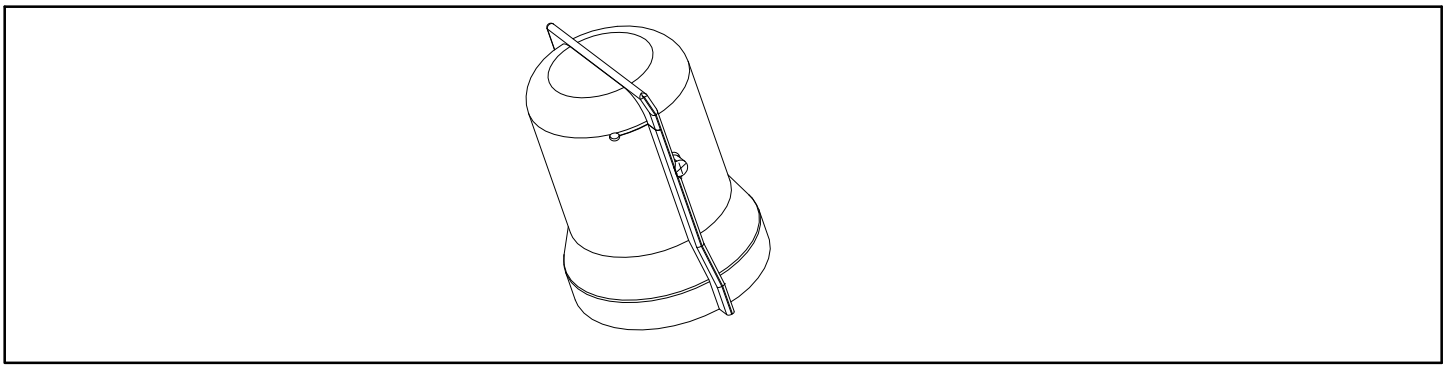


Figure 44. Compressor Sound Cover

Charge Compensator (XP25-024-230-XX and XP25-048-230-XX only)

The XP25-024 and XP25-048 units come with a factory-installed refrigerant charge compensator. The compensator helps manage the refrigerant charge in the heating and cooling modes.

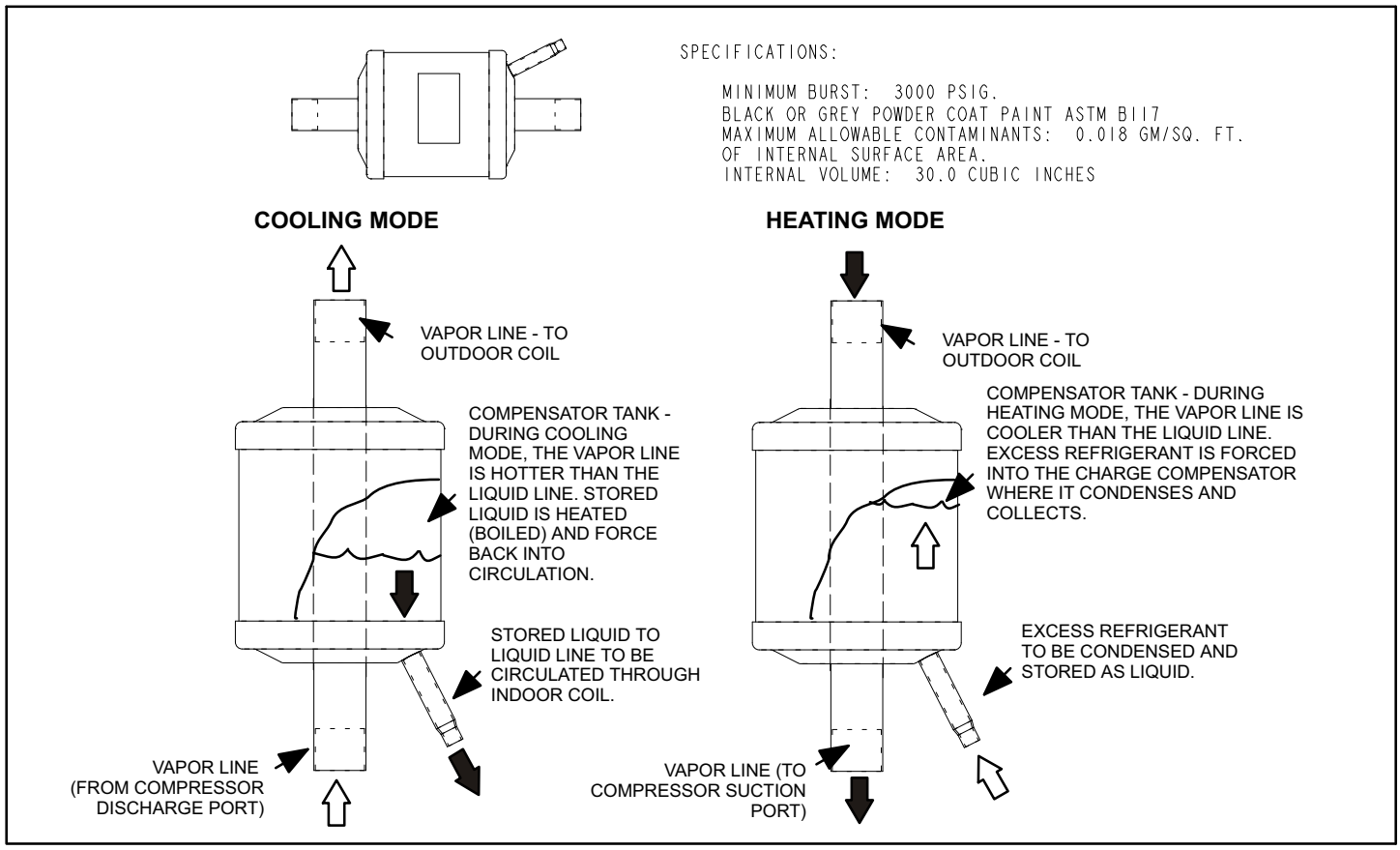


Figure 45. Charge Compensator

Discharge Muffler (Heat Pumps only)

The discharge muffler absorbs unwanted harmonic resonance from the compressor.

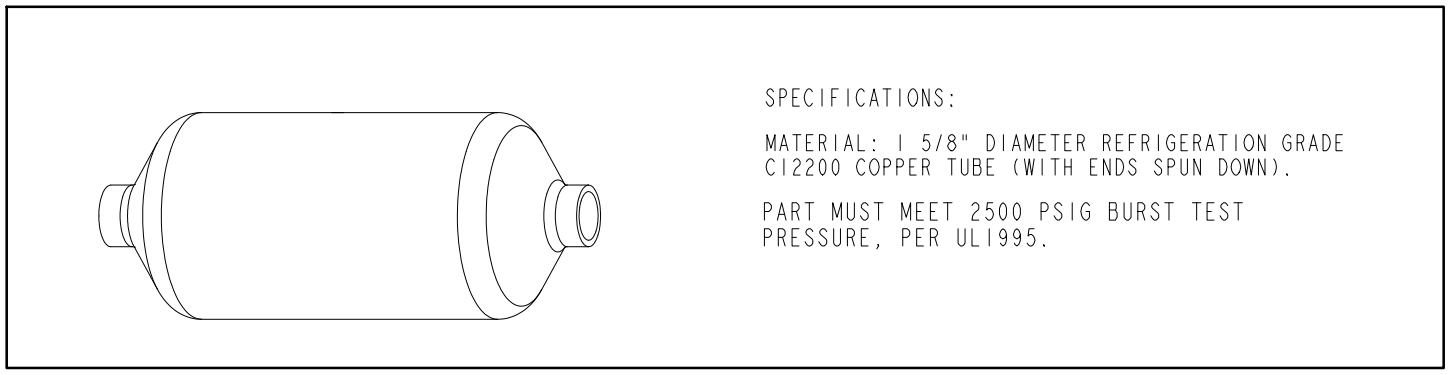


Figure 46. Top Discharge Muffler

Liquid Line Bi-Flow Filter Drier (Heat Pumps only)

Filter-driers come in a variety of sizes, connection types, and materials of construction, but they essentially perform the same function. All filter-driers contain the same functional parts. They contain desiccants to remove the water and acids, and they contain a filtration system to remove the solid contaminants.

CHECKOUT:

If the filter drier becomes filled with debris, contaminants, or non-condensables, it restricts refrigerant flow. If the filter drier is restricted, the outlet side of the filter drier is cooler than the inlet side. Some filter driers have an access port which allows you to measure the pressure drop with a pressure gauge. If it is restrictive (Greater than 3 psig pressure difference), remove it from the system and replace it.

Perform a moisture test on the system. If the test indicates moisture levels above what the moisture kit recommends, replace the drier.

Note - Recommended practice is to replace the filter drier every time you open the system.

STATUS CODES:

None

ERROR CODES:

None

NOTE - If the drier is not operating correctly, the system is shut down by other controls, such as the high and low pressure switches, which will generate a code.

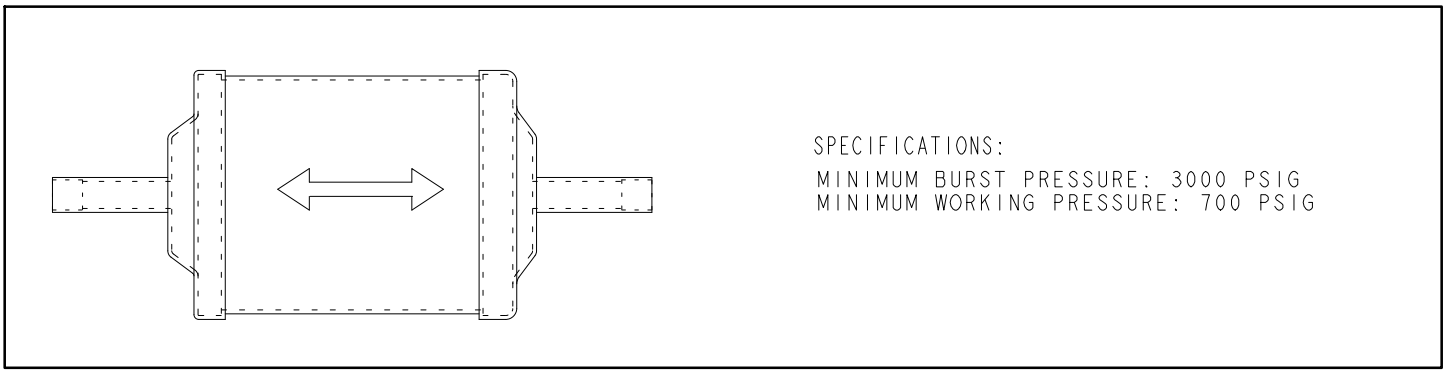


Figure 47. Top Bi-Flow Filter Drier

Check Expansion Valve (Heat Pumps only)

The thermostatic expansion valve (TEV) controls the flow of liquid refrigerant by maintaining superheat of the refrigerant vapor at the outlet of the outdoor coil during heating mode.

CHECKOUT:

Table 14. Expansion Valve Checks

Problem	Symptoms	Causes	Corrective Action
Superheat is too low - valve feeds too much	1. Liquid slugging 2. Low superheat 3. Suction pressure normal or high	1. Oversized valve 2. Incorrect superheat setting 3. Moisture 4. Dirt or foreign material 5. Incorrect charge selection 6. Incorrect bulb location 7. Incorrect equalizer location 8. Plugged equalizer (balanced ported valve)	1. Replace with correct size valve 2. Adjust the superheat to correct setting 3. Replace the filter / driers 4. Evacuate the system and replace the refrigerant 5. Clean out the material or replace the valve 6. Select proper charge based on refrigerant type 7. Relocate the bulb to proper location 8. Relocate the equalizer to proper location 9. Remove any restriction in the equalizer tube
Superheat is too high - Valve does not feed or does not feed enough	1. Evaporator temperature too high 2. High superheat 3. Low suction pressure	1. Low on refrigerant 2. High superheat 3. Flash gas in liquid line 4. Low or lost bulb charge 5. Moisture 6. Plugged equalizer (conventional valve) 7. Insufficient pressure drop or valve to small 8. Dirt or foreign material 9. Incorrect charge selection 10. Incorrect bulb location 11. Incorrect equalizer location 12. Charge migration 13. wax 14. Wrong equalizer type valve 15. Rod leakage (balanced port valve) 16. Heat damaged power head	1. Add correct amount refrigerant 2. Change superheat setting 3. Remove source of restriction 4. Replace power element or valve 5. Replace driers or evacuate the system and replace refrigerant 6. Remove any restriction in the equalizer tube 7. Replace existing valve with properly sized valve 8. Clean out the material or replace the valve 9. Select the correct charge 10. Move the bulb to the correct location 11. Move equalizer to correct location 12. Move valve to a warmer location or apply heat tape to the power head 13. Use charcoal drier 14. Use externally equalized valve 15. Replace power head or valve
No superheat at start-up only - valve feeds too much at start-up	1. Liquid slugging 2. Zero super heat 3. Suction pressure higher than normal	1. Refrigerant drainage 2. Compressor or suction line in a cold location 3. Partially restricted or plugged external equalizer (balance port valve) 4. Liquid line solenoid will not completely shut	1. Use Pump Down Control 2. Install a trap at the top of the Evaporator 3. Install Crankcase Heater 4. Install Suction Solenoid 5. Remove restriction 6. Disassemble/Clean Valve 7. Replace valve
Superheat is erratic or hunts - system hunts or cycles	1. Suction pressure hunts 2. Superheat hunts 3. Erratic valve feeding	1. Bulb location Incorrect 2. Too large a valve 3. Incorrect superheat setting 4. System design	1. Reposition bulb 2. Replace existing valve with correct sized valve 3. Adjust superheat to correct setting 4. Redesign system

Table 14 Continued

Problem	Symptoms	Causes	Corrective Action
Superheat appears normal - system performs poorly - valve does not feed properly	1. Poor system performance 2. Low or normal superheat 3. Low suction pressure	1. Unequal circuit loading 2. Flow from one coil effecting another coil 3. Low load 4. Mismatched coil / compressor 5. Incorrect distributor 6. Evaporator oil-logged	1. Make necessary modification to balance the load 2. Correct piping 3. Correct conditions causing the condition 4. Correct match 5. Hot gas bypass 6. Add unloaded to compressor (if possible) 7. Install correct distributor 8. Increase gas velocity through the coil
Superheat is too low - TEV feeds to much - valve feeds too much	1. Liquid slugging 2. Low superheat 3. Suction pressure normal or high	1. Oversized valve 2. Incorrect superheat setting 3. Moisture 4. Dirt or foreign material 5. Incorrect charge selection 6. Incorrect bulb location 7. Incorrect equalizer location 8. Plugged equalizer (balance port valve)	1. Replace with correct size valve 2. Adjust the superheat to correct setting 3. Replace the filter / driers 4. Evacuate the system and replace the refrigerant 5. Clean out the material or replace the valve 6. Select proper charge based on refrigerant type 7. Relocate the bulb to proper location 8. Relocate the equalizer to proper location 9. Remove any restriction in the equalizer tube

STATUS CODES:

None

ERROR CODES:

None

NOTE - If the drier is not operating correctly, the system is shut down by other controls, such as the high and low pressure switches, which will generate a code.

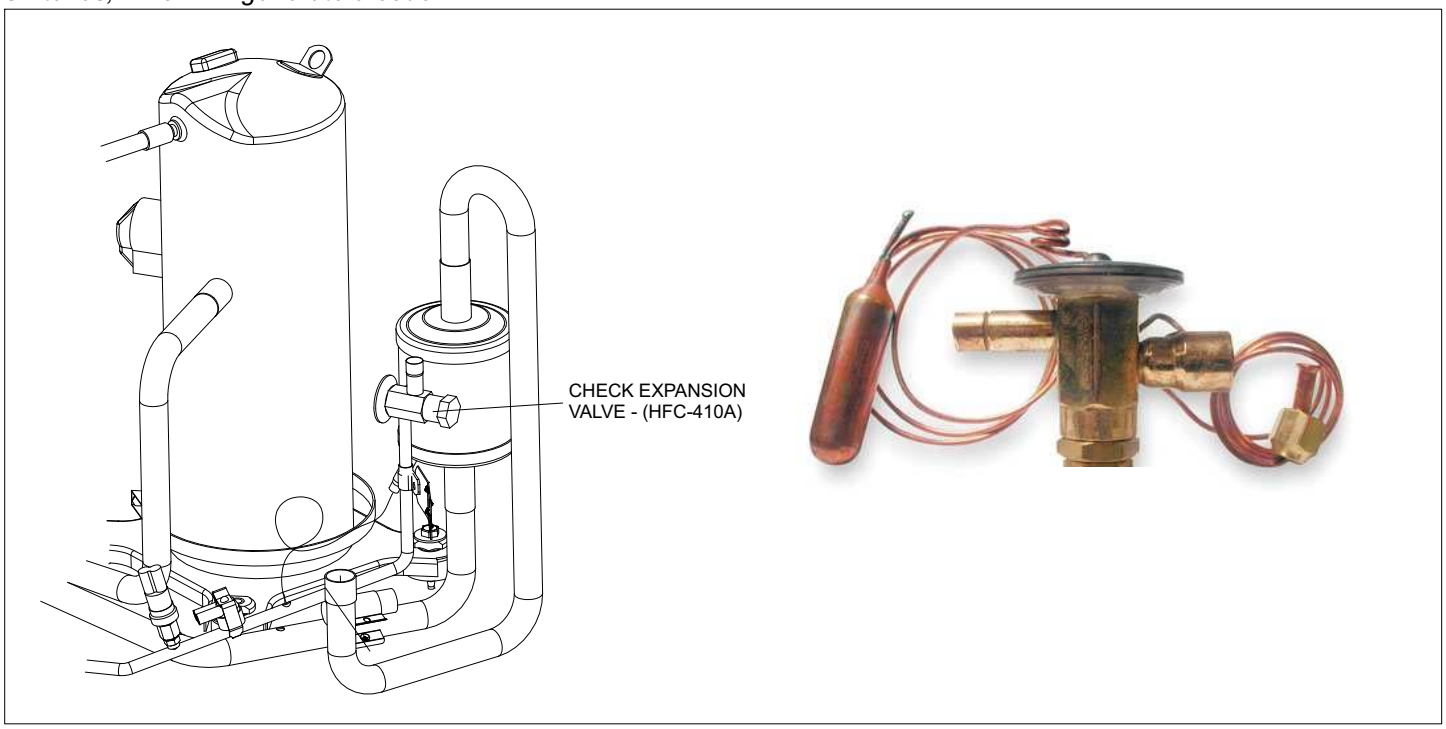


Figure 48. Plumbing (Component Locations and Specifications)

Top Cap Switch Operation, Checkout and Status / Error Codes

OPERATION:

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 239-257°F to shut off compressor operation. The auto-reset switch closes when the compressor casing temperature falls to 151-187°F, and the compressor is re-energized. This single-pole, single-throw (SPST) bi-metallic switch.

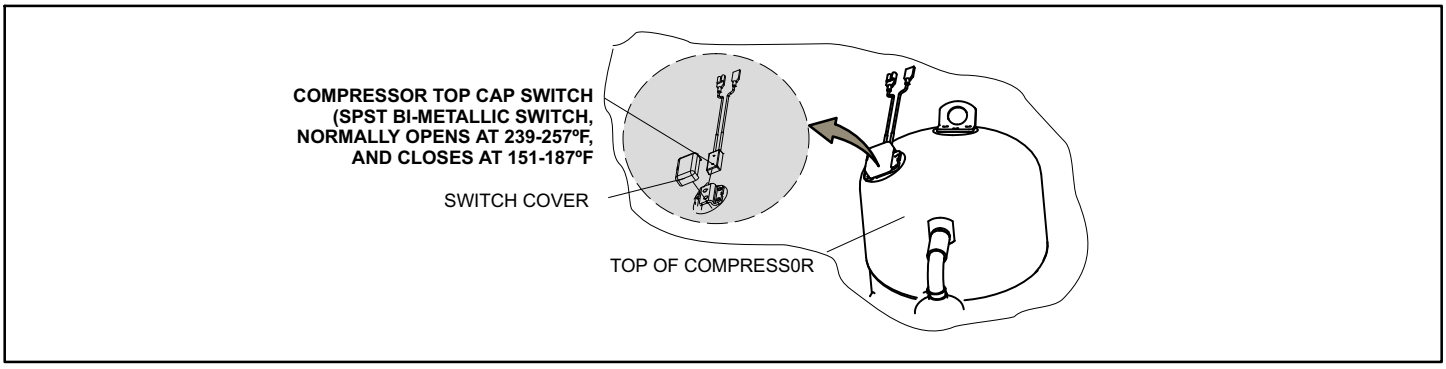


Figure 49. Top Cap Thermal Sensor Switch Operation

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 resistance reading is 0 ohms, the switch is closed.

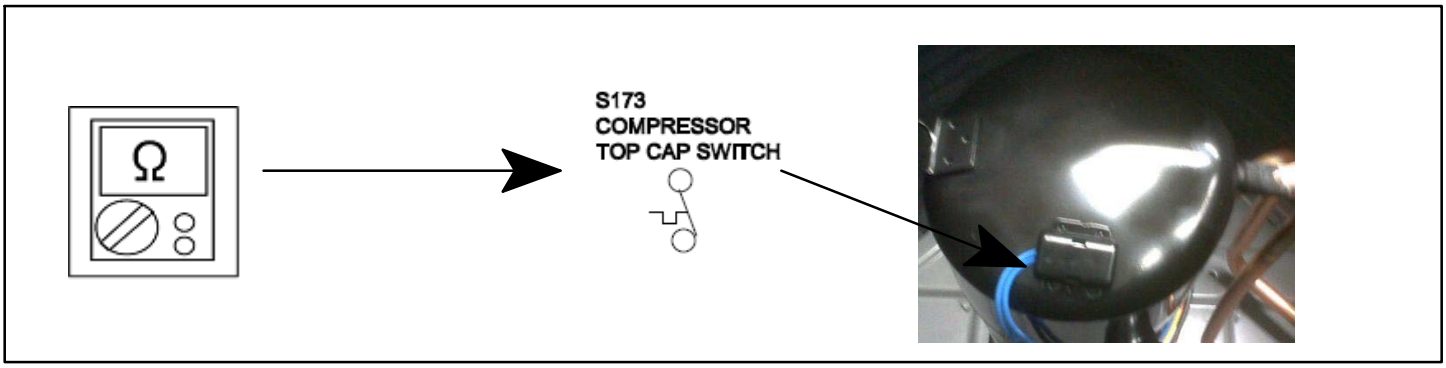


Figure 50. Top Cap Thermal Sensor Switch Checkout (S173)

STATUS:

None

ERROR:

Table 15. Outdoor Control 7-Segment Display Alert Codes - Top Cap Switch

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 iComfort Wi-Fi® thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 422	Moderate	Compressor top cap switch exceeding thermal limit.	Check condenser fan motor, TEV, indoor unit blower motor, stuck reversing valve, clogged refrigerant filter or undercharge. When error occurs with inverter slowdown errors, check for system overcharge. Automatically clears when error is corrected.
E 442	Critical	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 outdoor unit and restart.

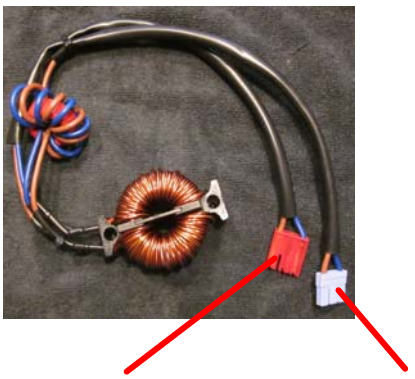
Reactor Operations, Checkout and Status / Error Codes

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 (brown **IN** to brown **OUT**, blue **IN** to blue **OUT**).



Voltage “IN” same as Voltage “OUT”

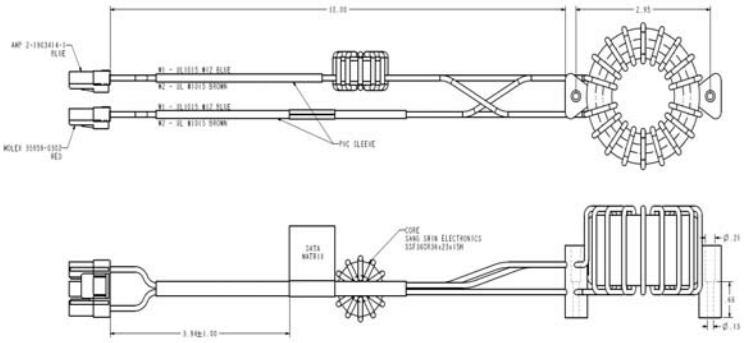


Figure 51. XC/XP 25-024 and -036 Reactor

208/240
Voltage “IN”

208/240
Voltage
“OUT”

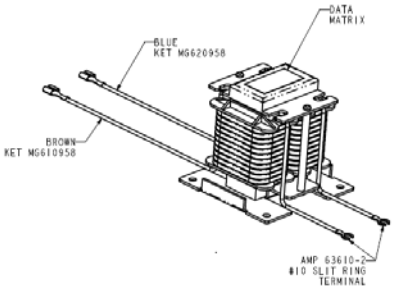


Figure 52. XC/XP 25-048 and -060 Reactor

STATUS CODES:

None

ERROR CODES:

None

Line Filter (Electromagnetic Compatibility Circuit - EMC) Operations, Checkout and Status / Error Codes

OPERATION:

The line filter is being used to reduce the unintentional conducted emission from the equipment to a level sufficiently to minimize electrical interference.

The filter is rated at 208/230 volt, 30 amp maximum, 60 Hertz.

NOTE - The 2- and 3-ton inverters have the EMC built-in. The 4- and 5-ton units have an external device (see illustration below).

NOTE - A line filter is an electronic filter which is placed between electronic equipment and an external power source in order to attenuate conducted radio frequency interference (RFI). RFI is also known as electromagnetic interference (EMI).

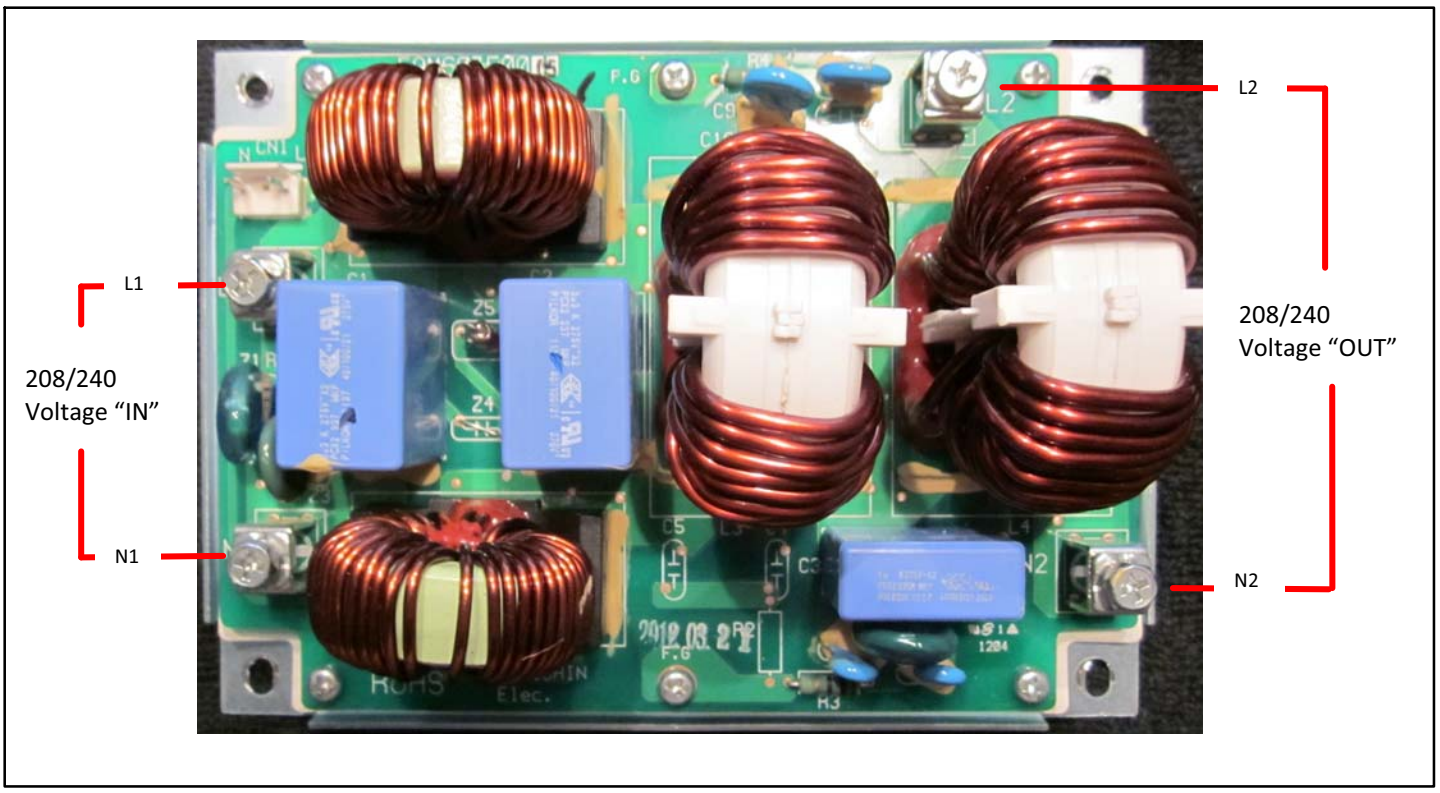


Figure 53. XP25 4- and 5-ton filter board (EMC)

CHECKOUT:

Voltage **IN** should read the same value as the Voltage **OUT**. With filter isolated from system, resistance between **L1** and **L2** should be the same as resistance between **N1** and **N2**.

STATUS CODES:

None

ERROR CODES:

None

Outdoor Fan Operation and Checkout

OPERATION:

These units use an integrated control and motor that is programmed for variable-capacity operation. The fan speed is controlled by the iComfort Wi-Fi® thermostat.

CHECKOUT:

VAC Voltage Check

Check for 208/240 VAC power at inverter contactor (red wires) (see figure 54).

With unit operating, check for main VAC to motor and outdoor control VDC output to motor:

1. No voltage present – Check main power
2. Voltage present – Perform DC volt checks (19 -23 VDC between FAN PWM and COM) (see figure 54).

Perform DC volt checks (19 -23 VDC between FAN PWM and COM).

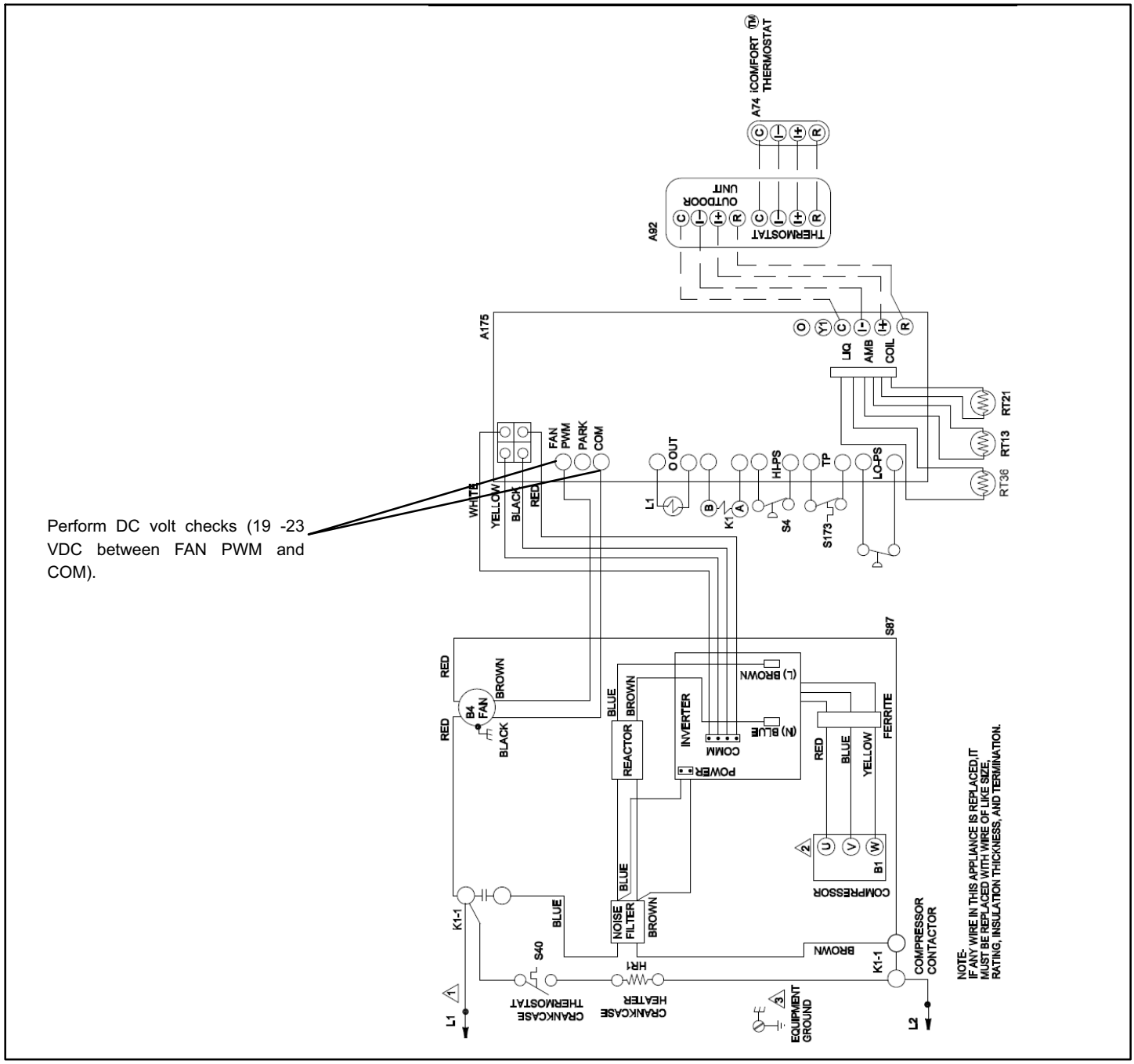


Figure 54. VAC Voltage Check

VDC Voltage Check: Check for VDC out of Fan PWM and COM. VDC output reading is determined by the percentage of room thermostat demand (see figure 55).

1. No voltage present – Remove wires from control and check for VDC. If there is no voltage present then replace outdoor control.
2. Voltage present – Perform a 9-volt battery test (see below) on motor.

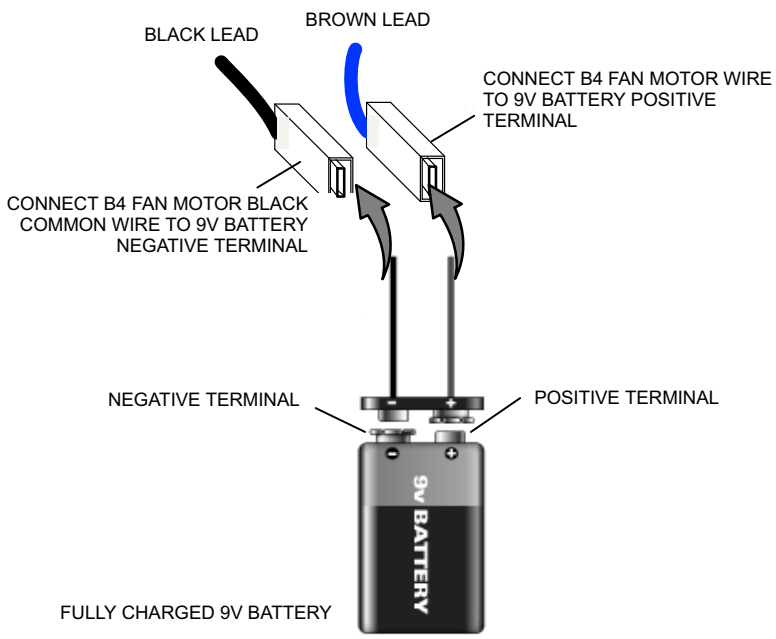


Figure 55. VDC Voltage Check

STATUS CODES:

None

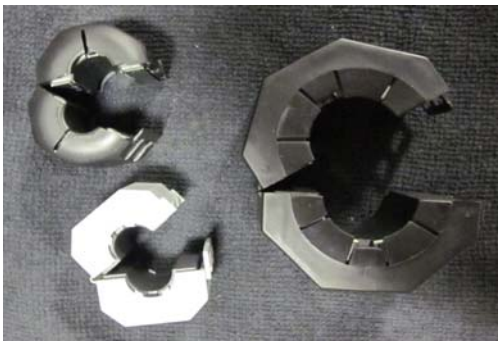
ERROR CODES:

None

NOTE - If the outdoor fan does not operate at the correct RPM, or does not start, the system is be down by other protection components such as the high and low pressure switches which generate error code(s).

Ferrites

Electronic cabling and wires, by virtue of their length-to-width ratios, are perfect natural antennas. In the presence of high-speed microprocessor signals, cables will conduct, radiate, and receive unwanted high-frequency signals. Use an insertion-loss device, such as a ferrite suppressor as shown below, to control radio-frequency (RF) interference.



Ferrites are consistently stable over time and over wide temperature ranges, and provide RF suppression without causing large current losses.

Figure 56. Ferrites

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, demand, defrost and fan PWM controls. 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.

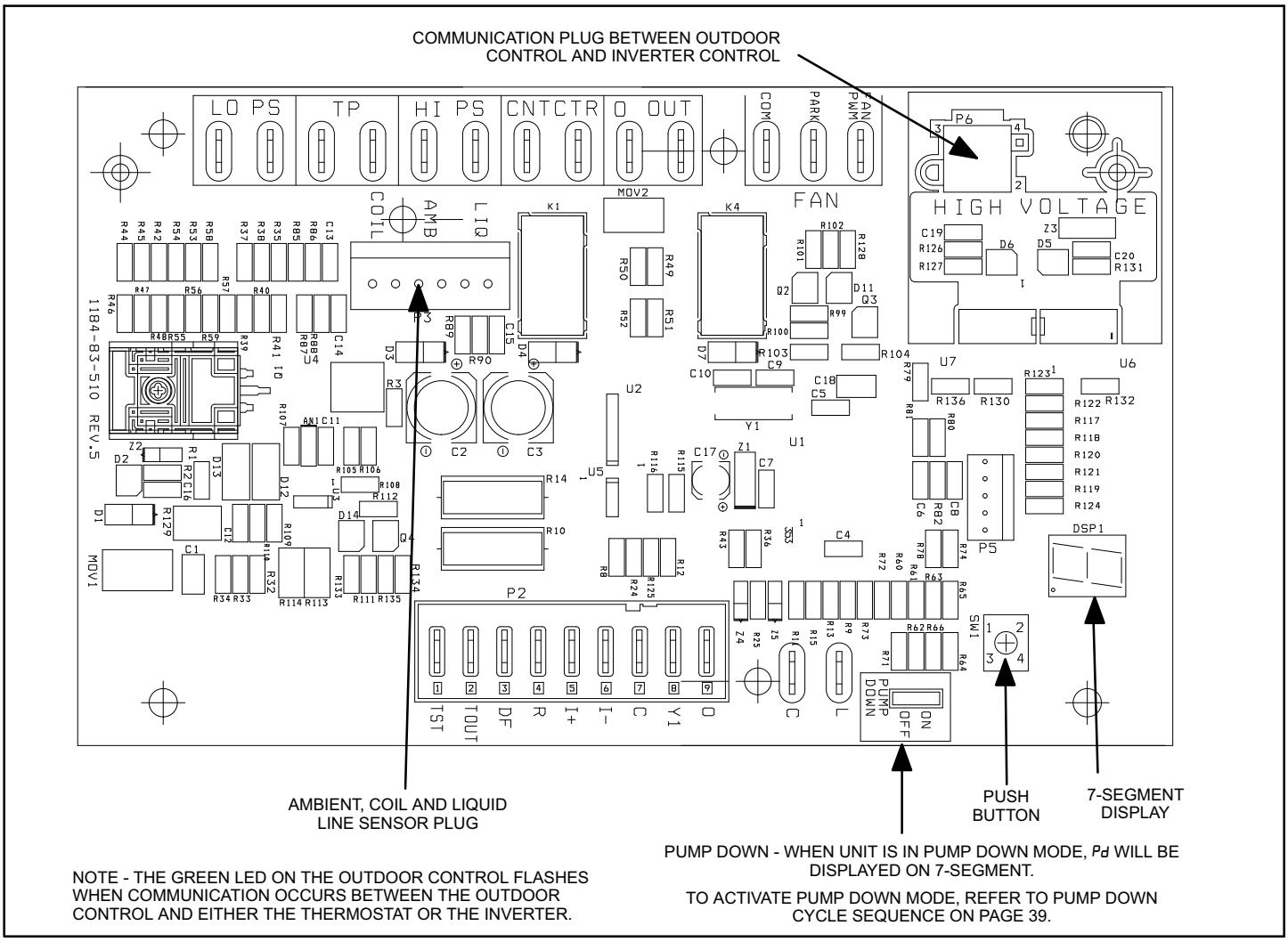


Figure 57. Outdoor Control Operation

STATUS CODES:

Table 16. 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 iComfort Wi-Fi® thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 600	Critical	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.
E 601	Critical	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.

ERROR CODES:

Table 17. 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 iComfort Wi-Fi® thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 105	Moderate	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 mis-wired 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	Moderate	There is a delay in the outdoor unit responding to the system.	Typically, this alarm/code does not cause any issues and will clear 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
E 124	Critical	The iComfort Wi-Fi® thermostat has lost communication with the outdoor unit for more than 3 minutes.	Equipment lost communication with the thermostat. Check the wiring connections, ohm wires and cycle power. The alarm stops all associated HVAC operations and waits for a heartbeat message from the unit that's not communicating. The alarm / fault clears after communication is re-established.
E 125	Critical	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	Critical	The outdoor unit control parameters are corrupted	Reconfigure the system. Replace the control if heating or cooling is not available
E 132	Critical	Internal software error.	Replace outdoor control.

Unit Sensor Operations, Checkout and Status / Error Codes

OPERATION

Coil Temperature Sensor (RT21)

Coil temperatures, as read by the sensor (shown in figure 59), which are below -35°F (-37°C) or above 120°F (48°C) trigger a fault condition. If the defrost coil sensor is open, shorted, or out of the temperature range, the outdoor control will not perform defrost operation (demand or time/temperature) and displays the appropriate fault code (see table 19 on page 79). Heating and cooling operation is allowed during this fault condition.

Ambient Temperature Sensor (RT13)

Ambient temperatures, as read by the ambient temperature sensor (shown in figure 59), 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 does not perform demand defrost operation. The control reverts to time/temperature defrost operation and displays the appropriate alert code (see table 19 on page 79). Heating and cooling operation is allowed in this fault condition.

Liquid Line Temperature Sensor (RT36)

Liquid line temperatures below -40°F (-40°C) or above 140°F (60°C) trigger a fault condition and result in the appropriate alarm code (see table 19 on page 79). The outdoor control uses the liquid line sensor to change the fan speed, allowing cooling operation at lowered ambient temperatures.

SENSOR	TEMP RANGE ºF (ºC)	RESISTANCE VALUES RANGE (OHMS)	PIN# / WIRE SLEEVE COLOR
COIL	-40 (-40) TO 140 (60)	336,000 to 2,487 (see table 18 on page 78 for exact temperature to ohm readings)	6 AND 5 (**BROWN**)
OUTDOOR AMBIENT			4 AND 3 (**BLACK**)
LIQUID LINE			2 AND 1 (**YELLOW**)

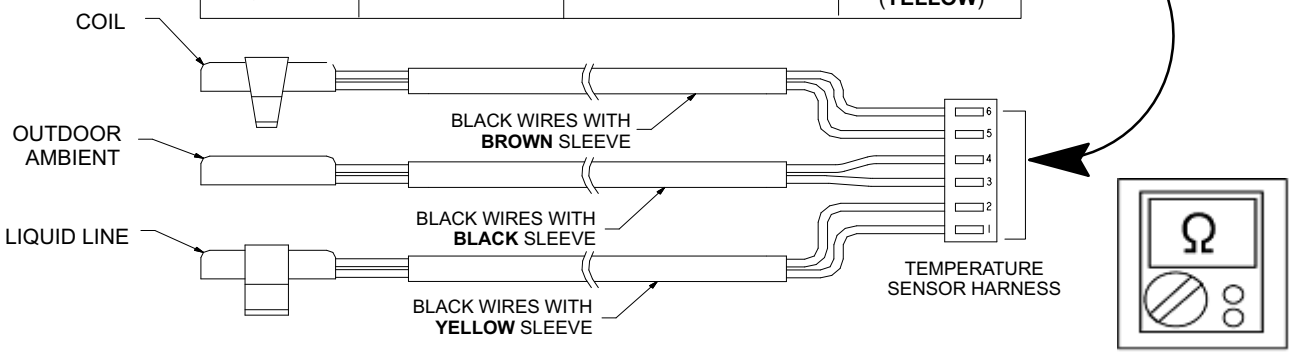


Figure 58. Temperature Sensor Specifications

CHECKOUT

Sensors connect to the outdoor control through a field-replaceable harness assembly that plugs into the 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. Table 18 on page 78 shows how the resistance varies as the temperature changes for both type of sensors. Check sensor operation by reading ohms across pins shown in figure 58.

NOTE - When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is <u>not</u> within the range shown in table 18 on page 78, 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.

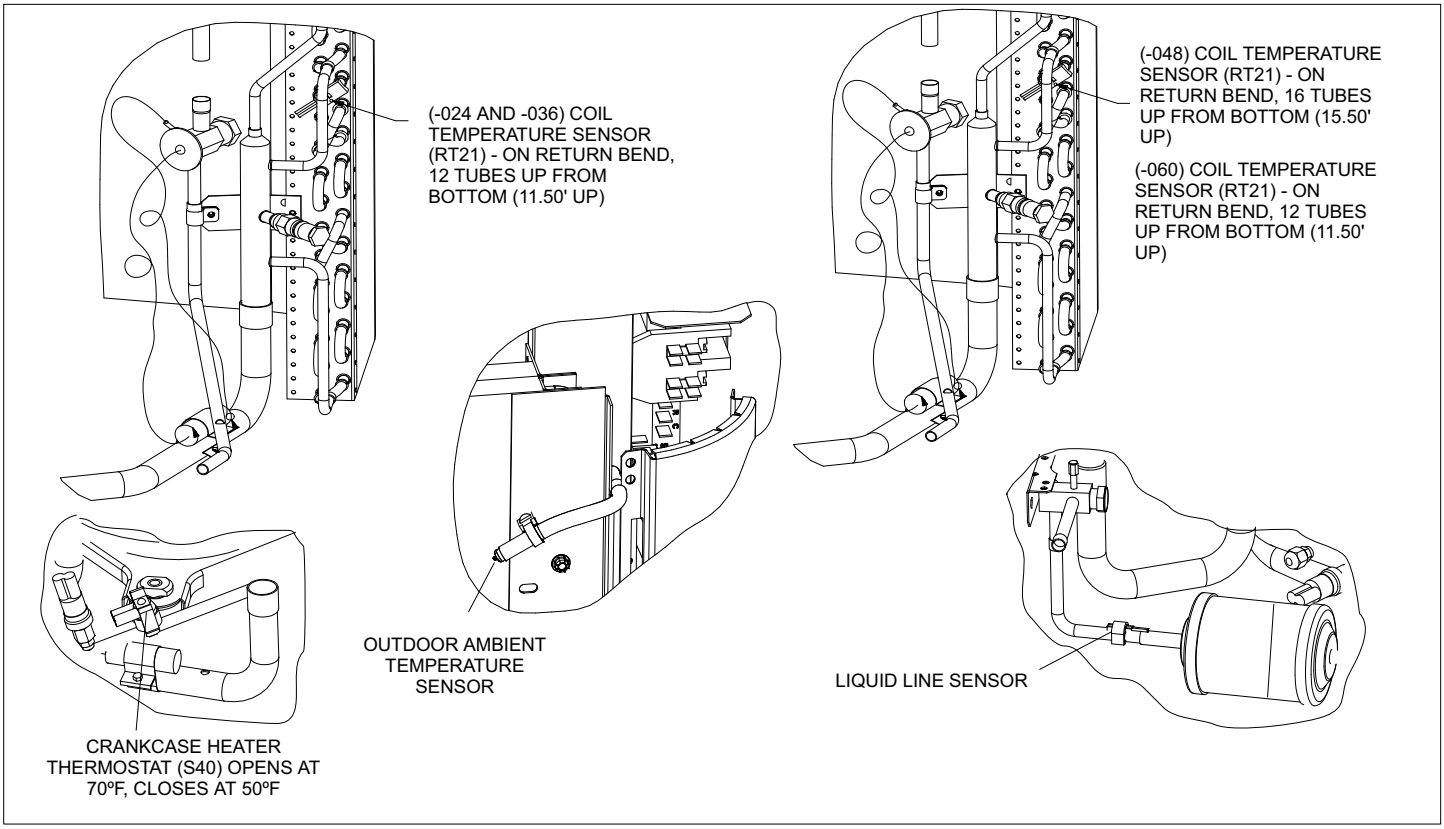


Figure 59. Temperature Sensor Locations

Table 18. Ambient, Coil 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 19. 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 iComfort Wi-Fi® thermostat.

Alert Codes	Priority	Alarm Description	Possible Causes and Clearing Alarm
E 180	Critical	The outdoor unit ambient temperature sensor has malfunctioned. As a result the outdoor unit control will not perform low ambient cooling.	In normal operation, after outdoor control recognizes sensors, the alarm is sent 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 detects the presence of the sensor(s). If detected (reading in range), appropriate feature is shown in the iComfort Wi-Fi® thermostat About screen. The alarm / fault clears upon configuration, or when normal values are sensed.
E 416	Moderate/ Critical	The outdoor coil sensor has malfunctioned. As a result the outdoor unit control will not perform defrost.	Coil sensor being detected open or shorted, or temperature is out of coil sensor range. Outdoor unit control will not perform demand or time/temperature defrost operation. System is still able heat and cool. Check the resistance of the coil sensor and compare to temperature resistance chart. Replace coil sensor if needed. The alarm clears when outdoor unit control detects proper coil sensor readings or after a power reset.
E 424	Moderate	The liquid line temperature sensor has malfunctioned.	In normal operation, after outdoor control recognizes sensors, the alarm is sent if valid temperature reading is lost. Compare liquid line 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 detects the presence of the sensor(s). If detected (reading in range), appropriate feature is shown in the iComfort Wi-Fi® thermostat About screen. The alarm / fault clears upon configuration, or when normal values are sensed.

Variable-capacity 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, and the avoidance of any interference effects.

NOTE - The 2- and 3-ton DC inverter control has the EMC built-in. The 4- and 5-ton units have an external EMC.

CONVERTER:

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

POWER FACTOR CORRECTION (PFC) CIRCUIT:

The PFC module is an integrated part of the outdoor DC inverter control 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 inverts DC voltage into AC voltage. 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 DC inverter control and the outdoor control.

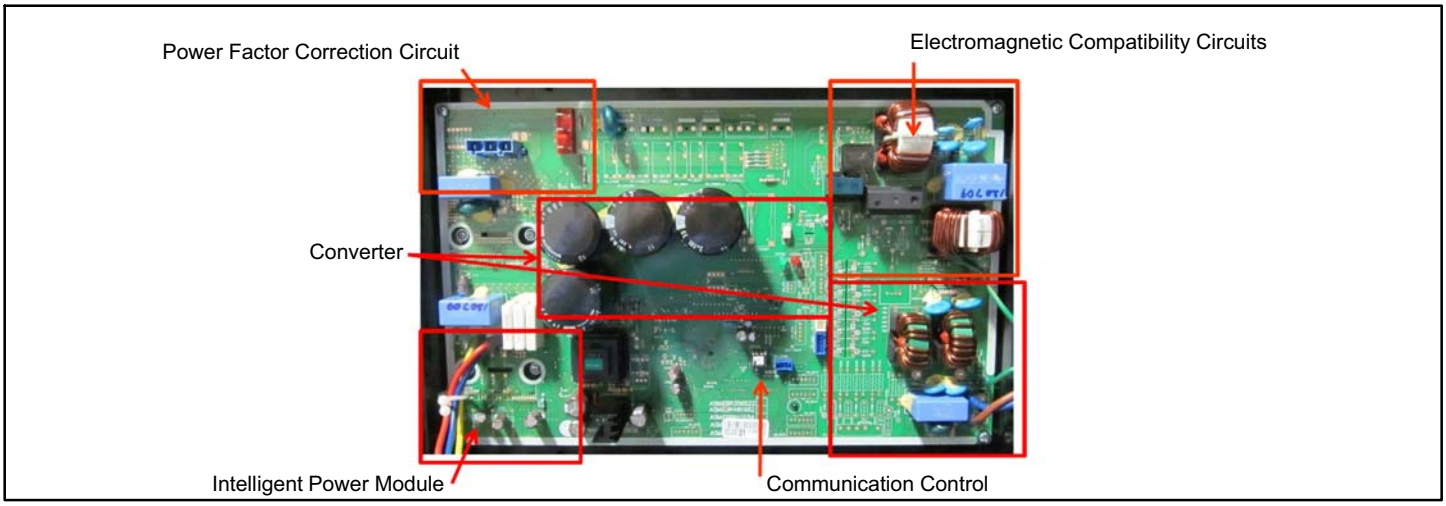


Figure 60. 2- and 3-Ton Unit Inverter

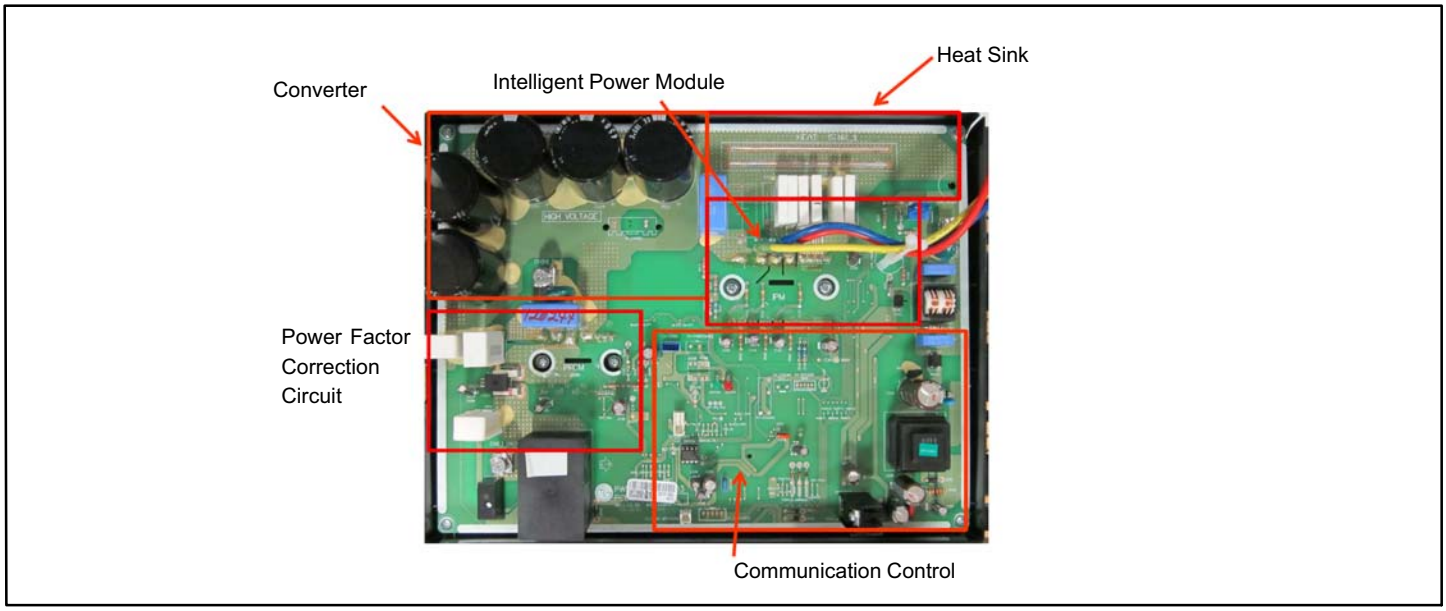


Figure 61. 4- and 5-Ton Unit Inverter

STATUS CODES:

Table 20. Outdoor Control 7-Segment Display Alert Codes, DC Inverter and Outdoor Control 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 iComfort Wi-Fi® thermostat.

Alert Codes	Code	Inverter LED Flash Code (number of flashes)		Priority	Possible Causes and Clearing Alarm
		Red LED	Green LED		
N/A	N/A	ON	OFF	N/A	XC/XP 25-024 and -036 only: Indicates inverter is operating normally.
N/A	N/A	ON	ON	N/A	XC/XP 25-048 and -060 only: Indicates inverter is operating normally.
N/A	N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.

ERROR CODES:

Table 21. 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 iComfort Wi-Fi® thermostat.

Alert Codes	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	Moderate / Critical	The inverter has detected a circuit problem.	Control locks out after 10 strikes within an hour. To clear, disconnect power to outdoor unit and restart.
E 426	N/A	N/A	N/A	Critical	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 error, disconnect power to outdoor unit and restart. Inverter alarms 12 to 14 and 53 do not count towards this lock out condition.
E 427	21	2 flashes	1 flash	Moderate / Critical	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 outdoor unit and restart.	

Table 21. 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 iComfort Wi-Fi® thermostat.

Alert Codes	Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 428	22	2 flashes	2 flashes	Moderate / Critical	The inverter has detected a high main input current condition.	If condition is detected, is detected, outdoor unit compressor and fan stop. Anti-short 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 outdoor unit and restart.
E 429	23	2 flashes	3 flashes	Moderate / Critical	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). Anti-short 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. (2) Outdoor control boards with part # 103686-03 have software update to delay the de-energizing of the reversing valve by four seconds when coming out of defrost.
E 431	27	2 flashes	7 flashes	Moderate / Critical	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) Outdoor control boards with part # 103686-03 have software update to delay the de-energizing of the reversing valve by four seconds when coming out of defrost.
E 432	28	2 flashes	8 flashes	Moderate / Critical	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 outdoor unit and restart.
E 433	29	2 flashes	9 flashes	Moderate / Critical	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 5 times within an hour, system is locked out. To clear disconnect power to outdoor unit and restart.

Table 21. 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 iComfort Wi-Fi® thermostat.

Alert Codes	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	Moderate / Critical	Outdoor control has lost communications with the inverter for greater than 3 minutes. Outdoor control will stop all compressor demands, recycle power to the inverter by de-energizing the contactor for 2 minutes. If this occurs 3 time in one thermostat call, the outdoor unit will locked out and display a critical code.	**Issues**: (1) Loose electrical connections. (2) Interruption of main power to inverter. **Corrective Actions**: (1) Check all electrical connections. (2) Check for proper main power to inverter.
E 435	60	6 flashes	OFF	Moderate / Critical	Inverter internal error.	When this error occurs, the outdoor control cycles 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	Moderate / Critical	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 outdoor unit and restart.	**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	Moderate / Critical	Heat sink temperature sensor fault has occurred (temperature less than 4 ºF or greater than 264ºF after 10 minutes of operation).	This occurs when the temperature sensor detects a temperature less than 0.4ºF or greater than 264ºF after 10 minutes of operation. If condition is detected, outdoor unit compressor and fan stop. Anti-short cycle is initiated. If condition occurs 5 times within an hour, system is locked out. To clear disconnect power to outdoor unit and restart. If problem persists, replace inverter.
E 438	73	7 flashes	3 flashes	Moderate / Critical	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.

Table 21. 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 iComfort Wi-Fi® thermostat.

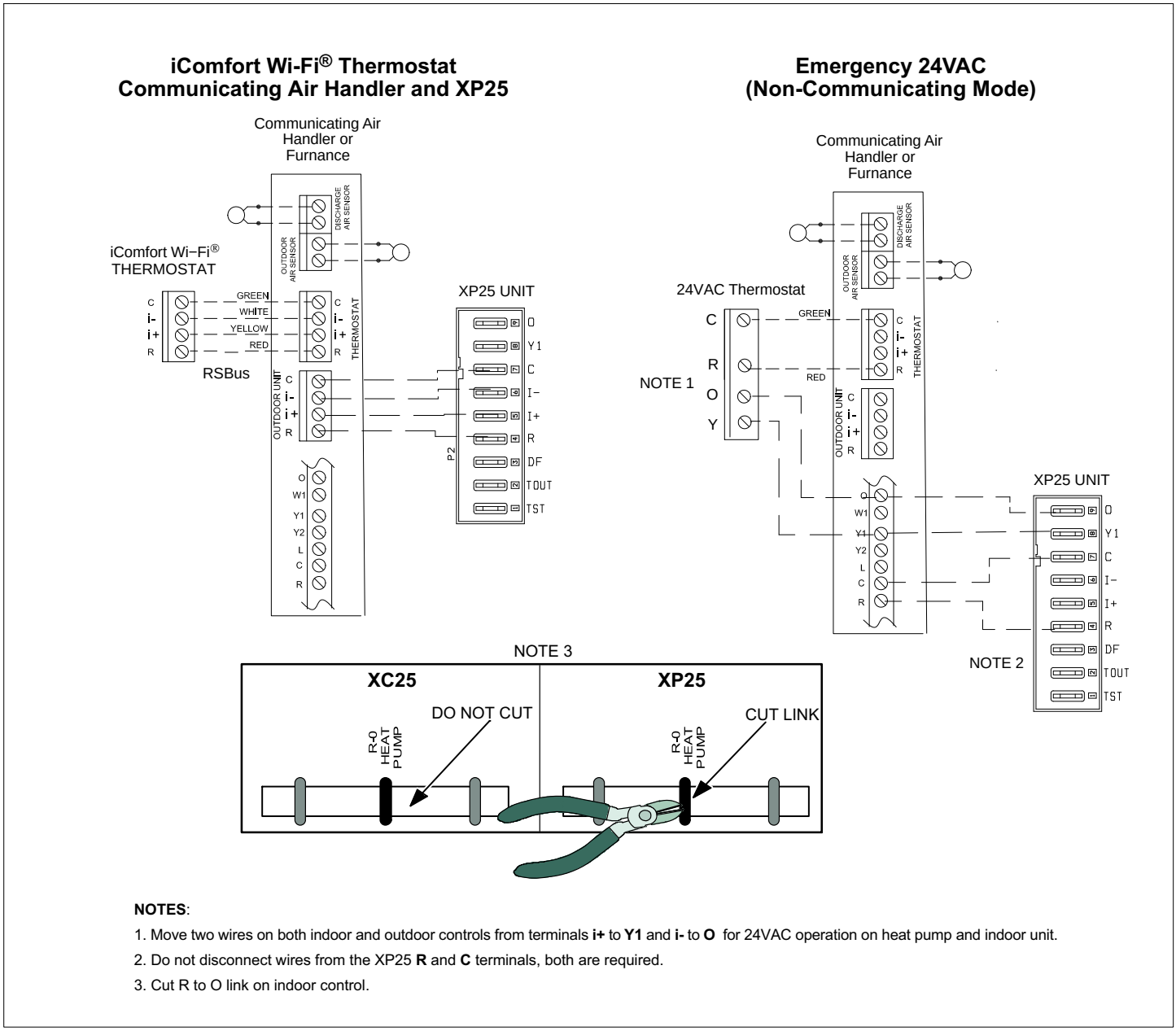
Alert Codes	Code	Inverter LED Flash Code (number of flashes)		Priority	Alarm Description	Possible Causes and Clearing Alarm
		Red LED	Green LED			
E 439	12	1 flash	2 flashes	Moderate	Compressor slowdown due to high input current.	Input current is approaching a high limit. Compressor speed will automatically slow down. The control continues sending the inverter speed demanded by the thermostat. The control will set indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. Alarm is automatically clear. See E428.
E 440	13	1 flash	3 flashes	Moderate	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.	**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 5 minutes to all capacitor to discharge before checking screws.
E 441	14	1 flash	4 flashes	Moderate	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..	**Issue**: Possible issue is system running at high pressures. Check for high pressure trips or other alert codes in room thermostat and outdoor control.

Emergency 24VAC System Operation

The **Y** and **O** terminals located on the outdoor control allow the outdoor unit to be cycled ON and OFF using 24VAC inputs. The outdoor unit will operate at 100% capacity in this configuration.

NOTE - Defrost operation will not have any indoor discharge air tempering due to the lack of a W1 out terminal.

The following wiring diagrams display the wiring changes needed to switch a full communicating system to a partial communicating system with the XP25 running in emergency mode (24VAC inputs to outdoor unit).



NOTES:

1. Move two wires on both indoor and outdoor controls from terminals **i+** to **Y1** and **i-** to **O** for 24VAC operation on heat pump and indoor unit.
2. Do not disconnect wires from the XP25 **R** and **C** terminals, both are required.
3. Cut R to O link on indoor control.

Figure 62. Thermostat Communication Mode

System Refrigerant

IMPORTANT !

The system must be operating at full capacity during charging. Increase (heat) or decrease (cooling) the thermostat setting by 5°F to create system demand. Confirm outdoor unit running capacity on the display on the outdoor control. Value should be 100%.

This section outlines procedures for:

1. Connecting gauge set for testing and charging as illustrated in figure 63.
2. Checking and adjusting indoor airflow as described in figure 64.
3. Adding or removing refrigerant using the weigh-in method shown in figure 65, and verifying charge using subcooling method described in figure 66.

IMPORTANT - Unit must be operating at 100% input to charge properly.

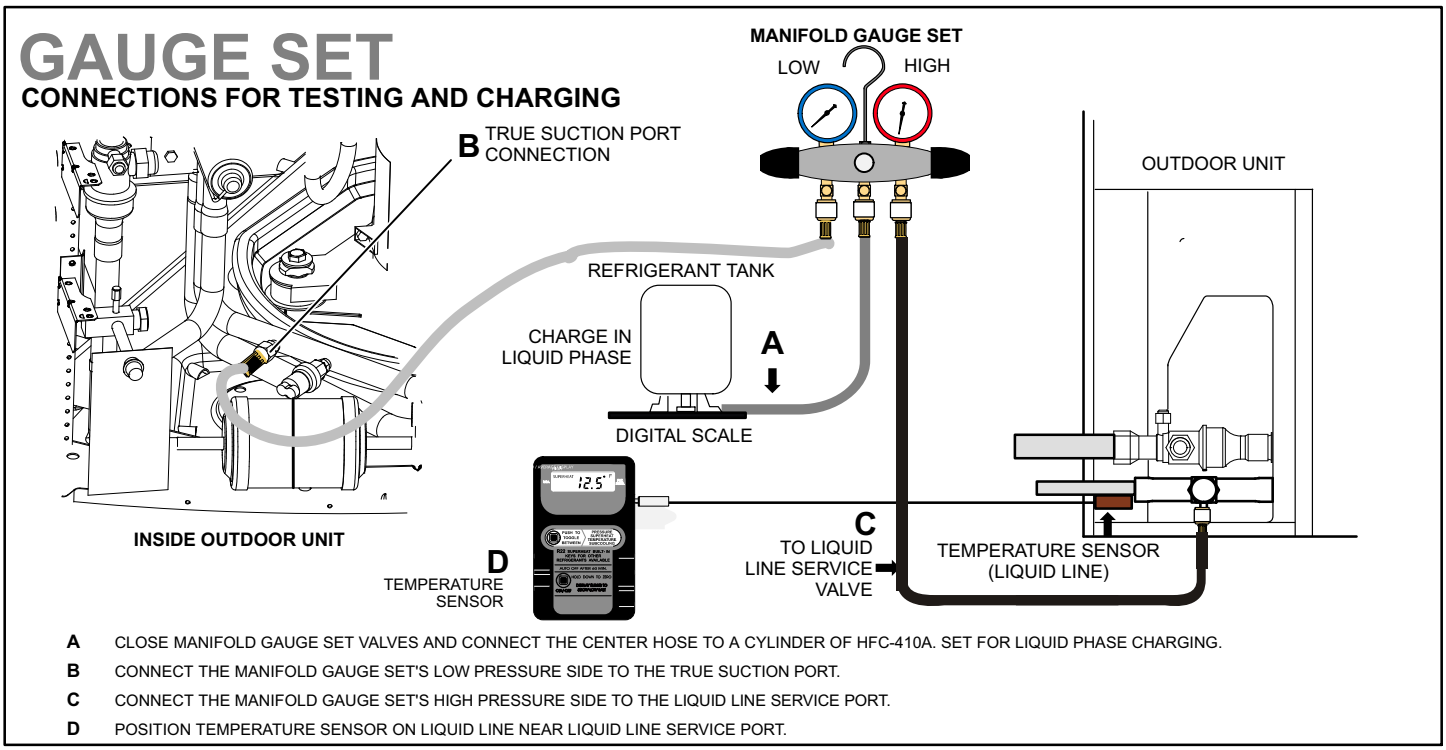
ADDING OR REMOVING REFRIGERANT

This system uses HFC-410A refrigerant which operates at much higher pressures than HCFC-22. The pre-installed liquid line filter drier is approved for use with HFC-410A only. Do not replace it with components designed for use with HCFC-22.

COOLING MODE INDOOR AIRFLOW CHECK

Check airflow using the Delta-T (DT) process using the illustration in figure 64.

The diagnostic screen on the thermostat or outdoor control 7-Segment display shows indoor and outdoor motor CFMs or RPMs.



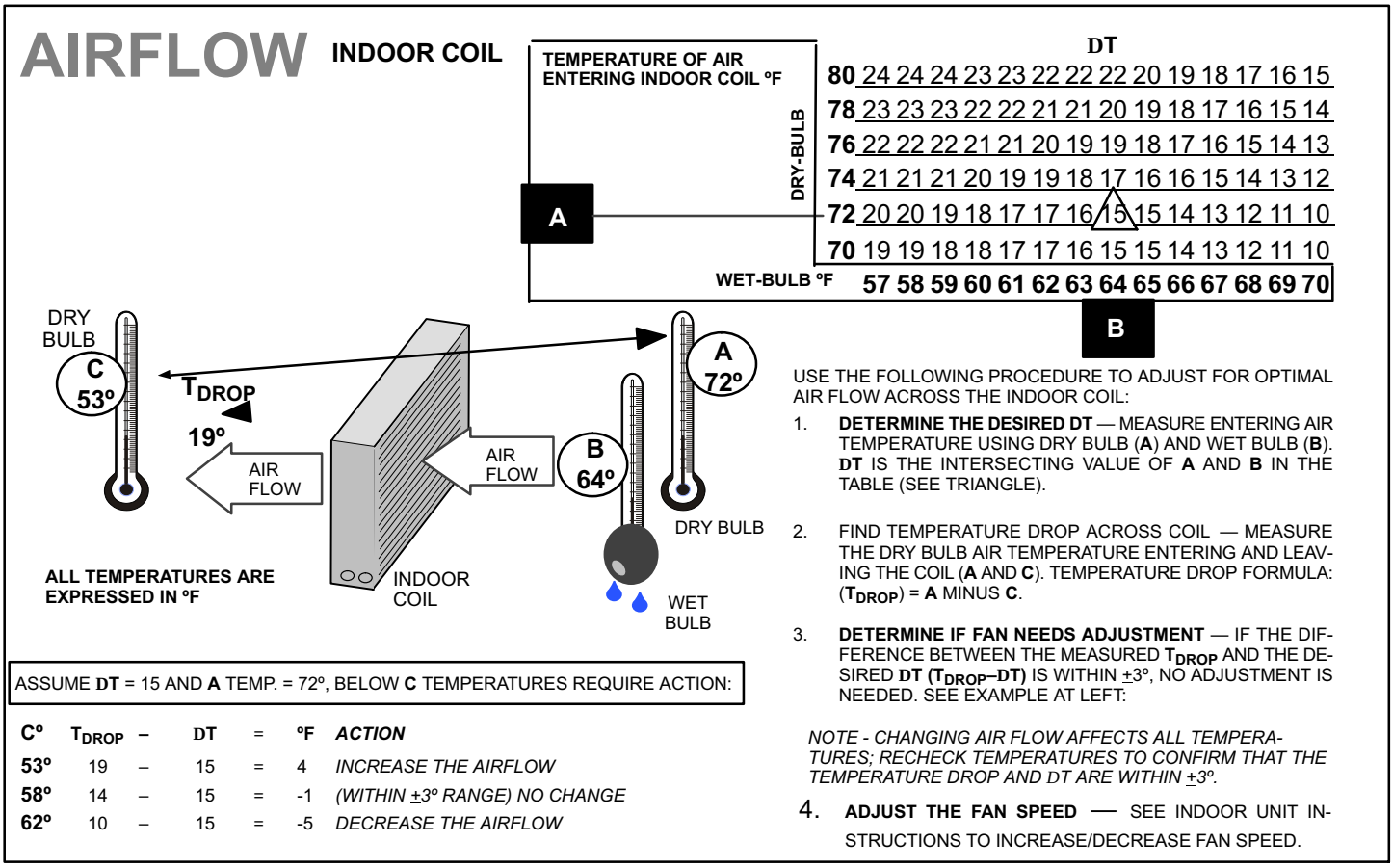
A CLOSE MANIFOLD GAUGE SET VALVES AND CONNECT THE CENTER HOSE TO A CYLINDER OF HFC-410A. SET FOR LIQUID PHASE CHARGING.

B CONNECT THE MANIFOLD GAUGE SET'S LOW PRESSURE SIDE TO THE TRUE SUCTION PORT.

C CONNECT THE MANIFOLD GAUGE SET'S HIGH PRESSURE SIDE TO THE LIQUID LINE SERVICE PORT.

D POSITION TEMPERATURE SENSOR ON LIQUID LINE NEAR LIQUID LINE SERVICE PORT.

Figure 63. Gauge Set Connections



USE THE FOLLOWING PROCEDURE TO ADJUST FOR OPTIMAL AIR FLOW ACROSS THE INDOOR COIL:

1. **DETERMINE THE DESIRED DT** — MEASURE ENTERING AIR TEMPERATURE USING DRY BULB (**A**) AND WET BULB (**B**). **DT** IS THE INTERSECTING VALUE OF **A** AND **B** IN THE TABLE (SEE TRIANGLE).

2. FIND TEMPERATURE DROP ACROSS COIL — MEASURE THE DRY BULB AIR TEMPERATURE ENTERING AND LEAVING THE COIL (**A** AND **C**). TEMPERATURE DROP FORMULA: (T_{DROP}) = **A** MINUS **C**.

3. **DETERMINE IF FAN NEEDS ADJUSTMENT** — IF THE DIFFERENCE BETWEEN THE MEASURED T_{DROP} AND THE DESIRED **DT** (T_{DROP}–**DT**) IS WITHIN ±3°, NO ADJUSTMENT IS NEEDED. SEE EXAMPLE AT LEFT:

NOTE - CHANGING AIR FLOW AFFECTS ALL TEMPERATURES; RECHECK TEMPERATURES TO CONFIRM THAT THE TEMPERATURE DROP AND DT ARE WITHIN ±3°.

4. **ADJUST THE FAN SPEED** — SEE INDOOR UNIT INSTRUCTIONS TO INCREASE/DECREASE FAN SPEED.

ASSUME **DT** = 15 AND **A** TEMP. = 72°, BELOW **C** TEMPERATURES REQUIRE ACTION:

C°	T_{DROP}	–	DT	=	°F	*ACTION*
53°	19	–	15	=	4	*INCREASE THE AIRFLOW*
58°	14	–	15	=	-1	*(WITHIN ±3° RANGE) NO CHANGE*
62°	10	–	15	=	-5	*DECREASE THE AIRFLOW*

Figure 64. Checking Indoor Airflow over Evaporator Coil Using Delta-T Chart

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

WEIGH-IN

CHARGING METHOD FOR LONG LINE SETS

64ºF (17.7ºC) and Below

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

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

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

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

Charging Formula for Liquid Line Charge Adjustments

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

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

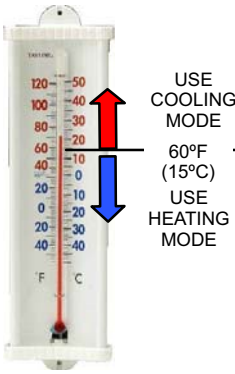
Figure 65. Using HFC-410A Weigh In Method

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; DETERMINE WHETHER TO USE **COOLING MODE** OR **HEATING MODE** TO CHECK CHARGE.
3. CONNECT GAUGE SET.
4. CHECK LIQUID AND VAPOR LINE PRESSURES. COMPARE PRESSURES WITH EITHER HEAT OR COOLING MODE NORMAL OPERATING PRESSURES IN THE APPLICABLE CHARGING STICKER, NORMAL OPERATING PRESSURES, HIGH STAGE.



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:

USING COOLING MODE — WHEN THE OUTDOOR AMBIENT TEMPERATURE IS 60°F (15°C) AND ABOVE. TARGET SUBCOOLING VALUES (SECOND STAGE - HIGH 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 THERMOSTAT TO COOLING MODE SETPOINT TO 68ºF (20ºC) WHICH SHOULD CALL FOR SECOND-STAGE (HIGH STAGE) COOLING. WHEN PRESSURES HAVE STABILIZED, CONTINUE WITH STEP 6.

USING HEATING MODE — WHEN THE OUTDOOR AMBIENT TEMPERATURE IS BELOW 60°F (15°C). TARGET SUBCOOLING VALUES (SECOND-STAGE - HIGH CAPACITY) IN APPLICABLE CHARGING STICKER ARE BASED ON 65-75°F (18-24°C) INDOOR RETURN AIR TEMPERATURE; IF NECESSARY, OPERATE COOLING TO REACH THAT TEMPERATURE RANGE; THEN SET THERMOSTAT TO HEATING MODE SETPOINT TO 77ºF (25ºC) WHICH SHOULD CALL FOR SECOND-STAGE (HIGH STAGE) HEATING. WHEN PRESSURES HAVE STABILIZED, CONTINUE WITH STEP 6.

SATº _____
LIQº – _____
SCº = _____

6. READ THE LIQUID LINE TEMPERATURE; RECORD IN THE LIQº 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 SATº SPACE.
8. SUBTRACT LIQº TEMPERATURE FROM SATº TEMPERATURE TO DETERMINE SUBCOOLING; RECORD IT IN SCº SPACE.
9. COMPARE SCº 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.

Figure 66. Using HFC-410A Subcooling Method — High Speed (High Capacity)

Table 22. 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		

XP25 HFC-410A CHARGING PROCEDURE

FOR COMPLETE CHARGING DETAILS, REFER TO THE INSTALLATION AND SERVICE PROCEDURE (CORP 1252-L11)

IMPORTANT: Room thermostat must be turned down at least 5°F from set point for cooling or turned up 5°F for heating so charging occurs with system operating at 100% capacity. Seven-segment display on outdoor control will show outdoor unit running capacity.

MAINTENANCE CHECKS USING THE NORMAL OPERATING PRESSURES TABLE

Table 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. The values in Table 2 are "most-popular-match-up" pressures; indoor match up, indoor air quantity, and indoor load will cause the pressures to vary. **Charge levels on the unit nameplate are based on installations with 15 feet line sets; be sure to consider any difference in line set length (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 2, adjust for the matchup difference.

NOTE: See installation instruction for adding charge for longer line sets.

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.

CHARGE USING THE SUBCOOLING METHOD

Cooling Mode—When the outdoor ambient temperature is 60°F and above, use the cooling mode to adjust the charge using the subcooling method. Target subcooling values in table 2 are based on 70 to 80°F indoor return air temperature.

Heating Mode—When the outdoor ambient temperature is below 60°F, use the heating mode to adjust the charge using the subcooling charge levels (table 2). Target subcooling values in table 2 are based on 65-75°F indoor return air temperature.

Normal Operating Pressures (Liquid ±10 and Suction ±5 psig)

Size	°F	Cooling				°F	Heating			
		Min Speed		Max Speed			Min Speed		Max Speed	
		Suc	Liq	Suc	Liq		Suc	Liq	Suc	Liq
-024	65	153	222	148	231	20	-	-	65	308
	75	155	260	150	273	30	-	-	79	337
	85	157	300	152	320	40	101	267	94	353
	95	158	346	154	356	50	119	281	111	384
	105	160	397	155	414	60	137	296	130	417
	115	160	452	156	468					
-036	65	153	210	134	222	20	-	-	62	308
	75	155	244	139	257	30	-	-	75	326
	85	158	285	142	304	40	101	291	89	350
	95	160	330	144	350	50	121	306	107	363
	105	162	381	147	402	60	143	321	125	375
	115	163	436	149	460					
-048	65	151	196	137	234	20	-	-	56	318
	75	152	247	138	271	30	-	-	72	354
	85	154	291	140	314	40	95	271	86	370
	95	156	333	142	361	50	112	282	104	394
	105	158	382	144	413	60	127	305	123	416
	115	159	437	147	472					
-060	65	147	218	129	232	20	-	-	60	333
	75	149	254	132	269	30	-	-	73	356
	85	151	293	135	316	40	96	269	82	360
	95	153	340	136	365	50	121	285	106	397
	105	155	392	139	416	60	135	300	122	420
	115	157	450	141	476					

XP25 Indoor Units Match-ups and Subcooling Charge Levels

OD Unit	ID Model	Lbs	Oz	Cooling SC	Heating SC	OD Unit	ID Model	Lbs	Oz	Cooling SC	Heating SC
-024	CBX32MV-036	2.0	8.0	9	22	-048	CBX40UHV-048	0.0	7.0	5	25
	CBX40UHV-024	2.0	8.0	9	22		CBX40UHV-060	2.0	0.0	7	19
	CBX40UHV-030	2.0	8.0	9	22		CX34-49	0.0	0.0	6	16
	CX34-31	1.0	4.0	5	18		CX34-62C	2.0	13.0	11	27
	CX34-38	2.0	3.0	8	17		CX34-62D	0.0	6.0	4	10
	CX34-44/48	1.0	14.0	5	20		CR33-50/60	0.0	8.0	6	27
	CR33-48	1.0	0.0	5	40		CR33-60D	0.0	8.0	6	27
	CH33-31B	0.0	0.0	5	17		CH33-49C	2.0	4.0	7	22
	CH33-42B	0.0	0.0	5	17		CH33-50/60C	2.0	4.0	7	22
-036	CBX32MV-036	0.0	4.0	7	18		CH33-62D	1.0	3.0	5	14
	CBX40UHV-036	0.0	4.0	7	18	-060	CBX32MV-060	1.0	4.0	7	16
	CX34-38	0.0	9.0	7	24		CBX40UHV-060	1.0	4.0	7	16
	CX34-43	1.0	0.0	8	23		CX34-49	0.0	0.0	7	12
	CX34-44/48	0.0	0.0	7	28		CX34-62C	1.0	5.0	10	14
	CX34-50/60C	1.0	0.0	7	28		CX34-62D	1.0	0.0	8	13
	CR33-50/60	2.0	8.0	3	11		CR33-50/60	0.0	7.0	8	20
	CH33-43C	0.0	12.0	8	24		CR33-60D	0.0	7.0	8	20
	CH33-44/48B	0.0	12.0	8	24		CH33-49C	0.0	6.0	3	21
-048	CBX32MV-048	0.0	7.0	5	25		CH33-50/60C	0.0	6.0	3	21
	CBX32MV-060	2.0	0.0	7	19		CH33-62D	2.0	1.0	12	25

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Figure 67. XP25 Charging Sticker