ALLIED™ Air Enterprises

SERVICE MANUAL

4SHP22LX

This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

Table of Contents

WARNING

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

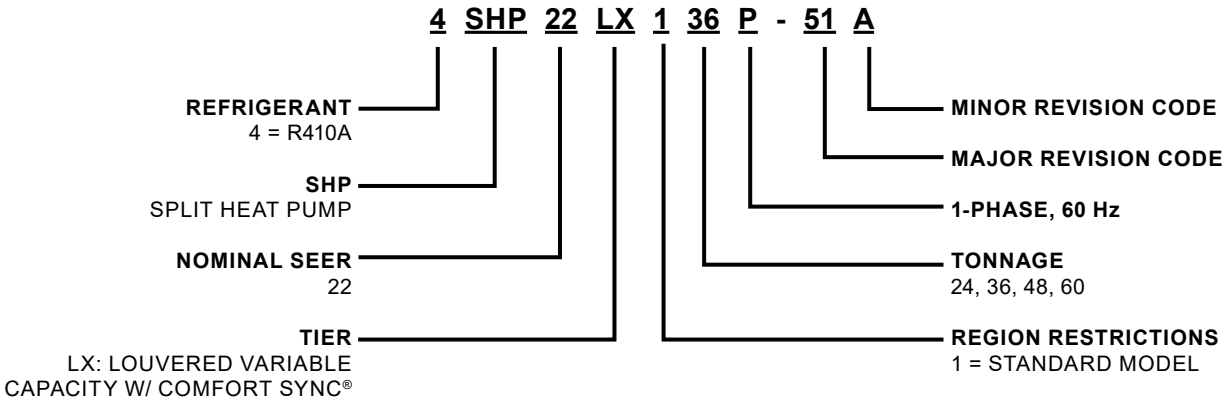
CAUTION

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.

(P) 508401-01

Technical Specifications

MODEL NUMBER GUIDE



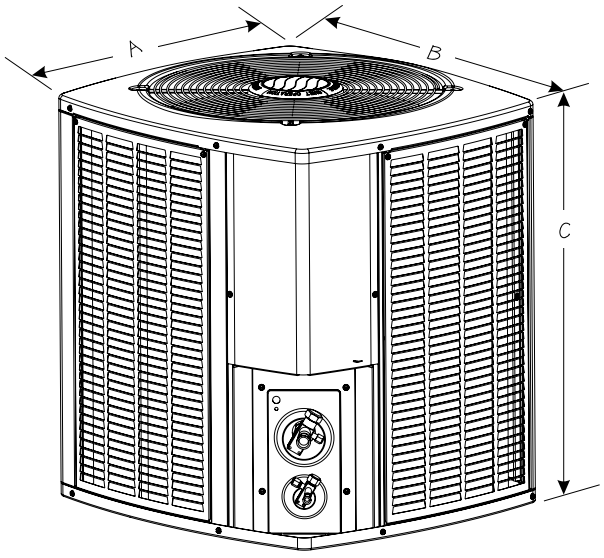
PHYSICAL AND ELECTRICAL DATA

Model	Voltage/Hz/Phase	Voltage Range	Min. Circuit Amp.	Max. Over Current Device (amps)	Compressor	Outdoor Fan Motor		
					Input (amps)	Full Load (amps)	Rated HP	Nom. RPM
4SHP22LX124P-51A	208-230/60/1	197-253	13.4	20	8.6	2.6	1/3	VAR. SPD
4SHP22LX136P-51A	208-230/60/1	197-253	19.9	30	13.9	2.6	1/3	VAR. SPD
4SHP22LX148P-51A	208-230/60/1	197-253	24.6	40	17.6	2.6	1/3	VAR. SPD
4SHP22LX160P-51A	208-230/60/1	197-253	33.5	50	24.7	2.6	1/3	VAR. SPD

UNIT DIMENSIONS (IN.)

Model	Dimensions (inch)			Shipping Weight (Lbs.)
	A - Width	B - Depth	C - Height	
4SHP22LX124P-51A	38.88	36.88	38.25	250
4SHP22LX136P-51A	38.88	36.88	38.25	255
4SHP22LX148P-51A	38.88	36.88	43.75	358
4SHP22LX160P-51A	38.88	36.88	43.75	361

NOTE: Dimensions listed are unit sizes w/o packaging
Weights listed are unit weights with packaging



SOUND RATINGS

Model	Sound Power[1] (Low)	Estimated Sound Pressure (dBA)[2]			Sound Power[1] (High)	Estimated Sound Pressure (dBA)[2]		
		Approximate Distance[3]				Approximate Distance[3]		
		One Meter (3.3 feet)	Two Meters (6.6 feet)	Three Meters (9.8 feet)		One Meter (3.3 feet)	Two Meters (6.6 feet)	Three Meters (9.8 feet)
4SHP22LX124P-51A	63	55	49	45	71	63	57	53
4SHP22LX136P-51A	61	53	47	43	74	66	60	56
4SHP22LX148P-51A	66	58	52	48	72	64	58	54
4SHP22LX160P-51A	64	56	50	46	77	69	63	59

1 Rated in accordance with AHRI standard 270 (2015)
2 Rated in accordance with AHRI standard 275 (2010)
3 Based only on distance factor; other factors may change this value such as:
Unit location (reflective surfaces adjacent to the unit)
Barrier shielding sources
Sound path/elevation
Outside noise sources

REFRIGERATION DATA

Model	Refrig. Charge (oz.) *	TXV	Refrigerant Line Size		Outdoor Unit Connection		Indoor Unit Connection	
			Suction	Liquid	Suction	Liquid	Suction	Liquid
4SHP22LX124P-51A	176	H4TXV01	3/4	3/8	3/4	3/8	3/4	3/8
4SHP22LX136P-51A	182	H4TXV02	7/8	3/8	7/8	3/8	7/8	3/8
4SHP22LX148P-51A	172	H4TXV03	7/8	3/8	7/8	3/8	7/8	3/8
4SHP22LX160P-51A	217	H4TXV03	1-1/8	3/8	1-1/8	3/8	7/8	3/8

** Factory charged for 15 feet of line set; adjust per installation instructions*
NOTE: Refrigerant charge also varies with indoor unit; refer to refrigerant charge label

COOLING PERFORMANCE WITH DTC[1]

Outdoor Model	Indoor Model	Cooling				Heating					High CFM	Med CFM	Low CFM
	Evap. Coil or Air Handler[3]	SEER2	EER2	AHRI Rated Capacity[2]	Sensible Capacity	HSPF2	47°		17°				
							Btuh	COP	Btuh	COP			
4SHP22LX124P-51A	BCE7S30M	21.0	13.5	24,000	19,000	9.0	22,400	3.90	14,300	2.80	800	500	350
4SHP22LX136P-51A	BCE7S36M	20.0	12.0	34,200	27,000	9.0	33,400	3.40	22,800	2.60	1170	750	415
4SHP22LX148P-51A	BCE7S60M	19.5	12.0	47,000	36,500	8.5	44,500	3.50	27,200	2.35	1600	1000	770
4SHP22LX160P-51A	BCE7S60M	19.0	12.0	55,000	41,500	8.7	55,500	3.30	37,000	2.40	1800	1100	920

Note:
1 DTC = Designated tested combination
2 Certified in accordance with Unitary Air Conditioner Certification Program, which is based on AHRI Standard 210/240
3 A blower time delay relay is standard on all Allied Air Enterprises furnace and air handler products

NOTE:
For the latest AHRI system matches, please visit
www.alliedratings.com or www.AHRIdirectory.org

ACCESSORIES

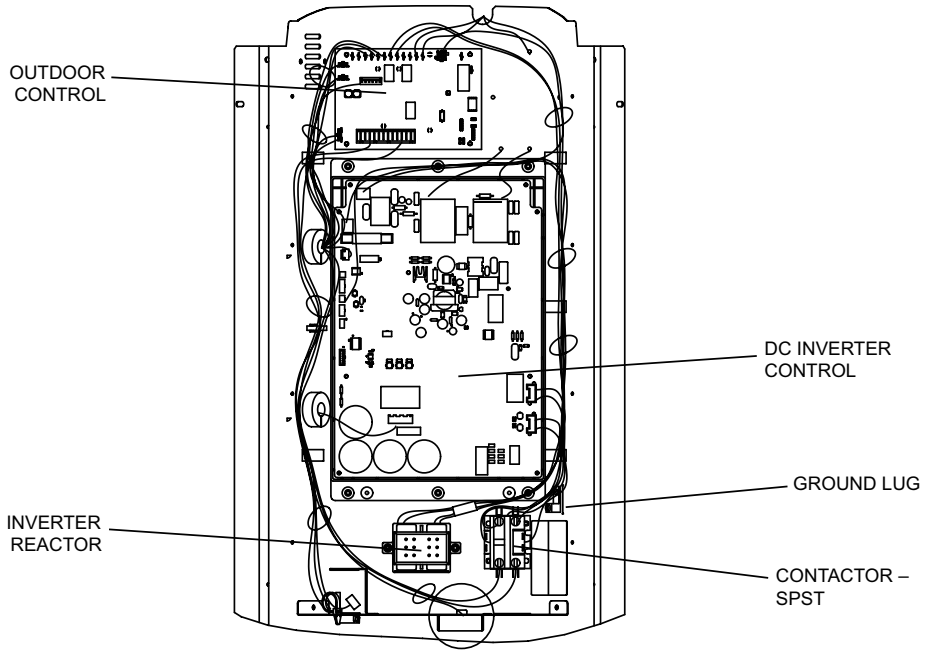
Description	Where Used	Kit Number
H4TXV01 (TXV Kit)	24	1.851363
H4TXV02 (TXV Kit)	36	1.851364
H4TXV03 (TXV Kit)	48, 60	1.851365
Freezestat	3/8 tubing	93G35
Crankcase Heater	All models	Factory Installed
Sound Cover	All models	Factory Installed
Loss of Charge Kit	All models	Factory Installed
Comfort Sync® Thermostat	All Models	1.841226
Comfort Sync® Zoning Controller	All models	1.851399
Comfort Sync® Zone Sensor	All Models	1.851422
Discharge Temperature Sensor	All models	88K38

FAN BLADE SPECS

4SHP22LX	Fan Blade			
	Dia.	#of Blades	Pitch	Part #
24	26"	3	28	100017-02
36, 48, 60	26"	3	20	100017-03

Parts Arrangement

CONTROL PANEL
-24, -36



CONTROL PANEL
-48, -60

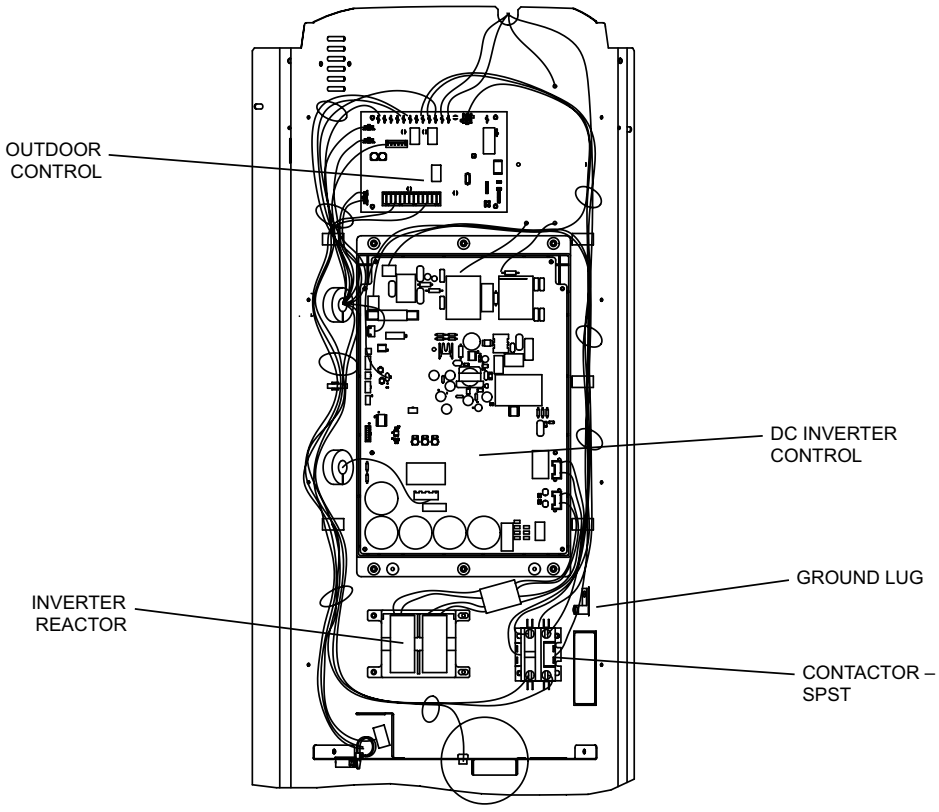


Figure 1. Parts Arrangement - Control Panel

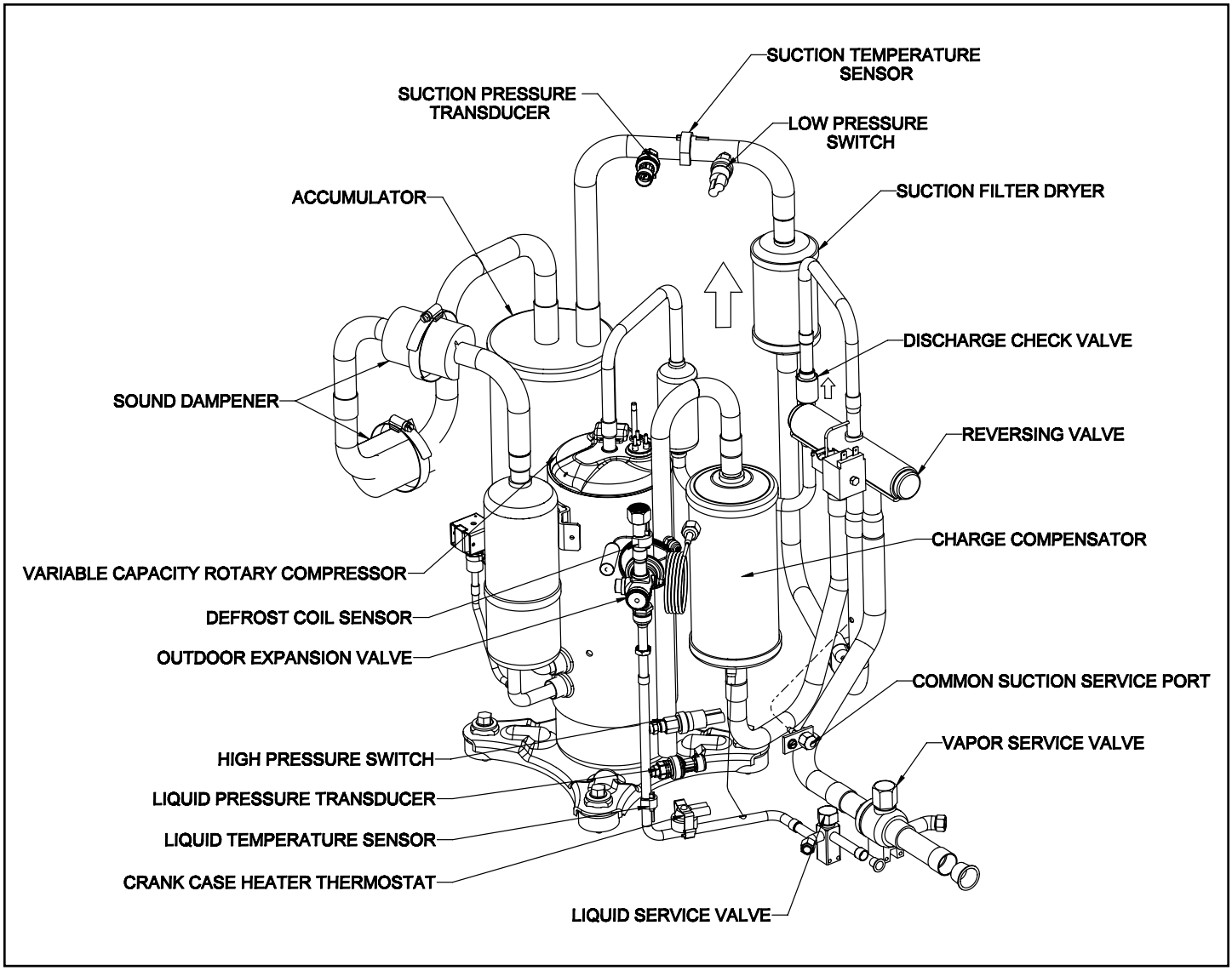


Figure 2. Component Locations – 4SHP22LX124 and -36

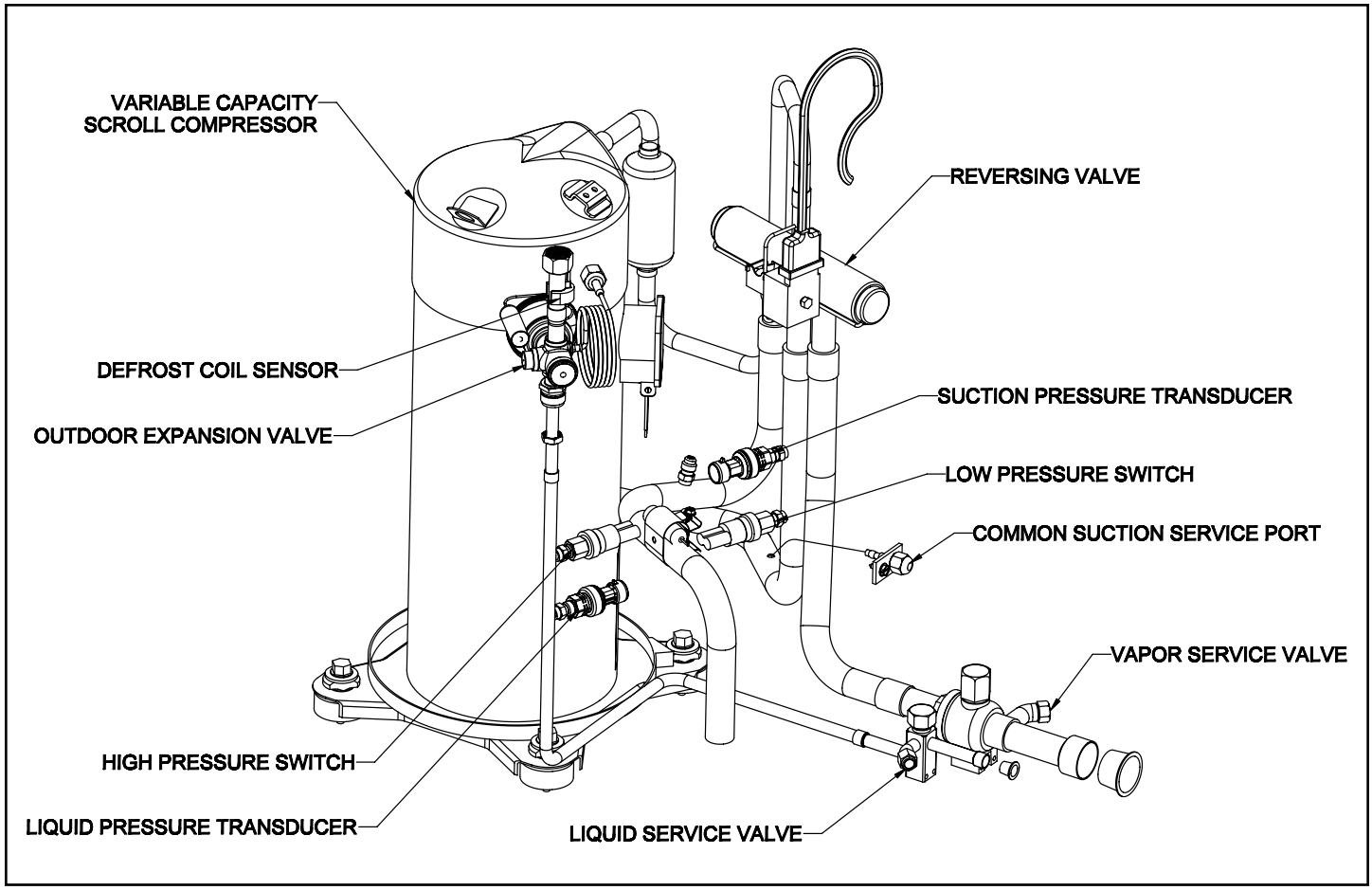


Figure 3. Component Locations 4SHP22LX148 and -60 (Scroll Compressor Models)

⚠ WARNING

Electric shock hazard.

Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

General

Read this entire instruction manual, as well as the instructions supplied in separate equipment, before starting the installation. Observe and follow all warnings, cautions, instructional labels, and tags. Failure to comply with these instructions could result in an unsafe condition and/or premature component failure.

These instructions are intended as a general guide only for use by qualified personnel and do not supersede any national or local codes in any way. The installation must comply with all provincial, state, and local codes as well as the National Electrical Code (U.S.) or Canadian Electrical Code (Canada). Compliance should be determined prior to installation.

This unit uses R-410A, which is an ozone-friendly HFC refrigerant. The unit must be installed with a matching indoor coil and line set. A filter drier approved for use with R-410A is installed in or provided along with the unit.

IMPORTANT: *This product has been designed and manufactured to meet ENERGY STAR criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and air flow instructions.* ***Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.***

Inspection of Shipment

Upon receipt of equipment, carefully inspect it for possible shipping damage. If damage is found, it should be noted on the carrier's freight bill. Take special care to examine the unit inside the carton if the carton is damaged. Any concealed damage discovered should be reported to the last carrier immediately, preferably in writing, and should include a request for inspection by the carrier's agent.

If any damages are discovered and reported to the carrier **DO NOT INSTALL THE UNIT**, as claim may be denied.

Check the unit rating plate to confirm specifications are as ordered.

Safety Precautions

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warning or cautions attached to the unit.

1. Always wear proper personal protection equipment.
2. Always disconnect electrical power before removing panel or servicing equipment.
3. Keep hands and clothing away from moving parts.
4. Handle refrigerant with caution; refer to proper MSDS from refrigerant supplier.
5. Use care when lifting, avoid contact with sharp edges.

Installation

NOTE: *In some cases, noise in the living area has been traced to gas pulsations from improper installation of equipment.*

- Locate unit away from windows, patios, decks, etc. where unit operation sounds may disturb customer.
- Leave some slack between structure and unit to absorb vibration.
- Place a sound-absorbing material, such as Isomode, under the unit if it will be installed in a location or position that will transmit sound or vibration to the living area or adjacent buildings.
- Install the unit high enough above the ground or roof to allow adequate drainage of defrost water and prevent ice buildup.
- In heavy snow areas, do not locate the unit where drifting snow will occur. The unit base should be elevated above the depth of average snows.

  NOTE: *Elevation of the unit may be accomplished by constructing a frame using suitable materials. If a support frame is constructed, it must not block drain holes in unit base.*
- When installed in areas where low ambient temperatures exist, locate unit so winter prevailing winds do not blow directly into outdoor coil.
- Locate unit away from overhanging roof lines which would allow water or ice to drop on, or in front of, coil or into unit.

When outdoor unit is connected to factory-approved indoor unit, outdoor unit contains system refrigerant charge for operation with matching indoor unit when connected by 15 ft. of field-supplied tubing. For proper unit operation, check refrigerant charge using charging information located on control box cover.

Outdoor Section

Zoning ordinances may govern the minimum distance the condensing unit can be installed from the property line.

Install on a Solid, Level Mounting Pad

The outdoor section is to be installed on a solid foundation. This foundation should extend a minimum of 2” (inches) beyond the sides of the outdoor section. To reduce the possibility of noise transmission, the foundation slab should NOT be in contact with or be an integral part of the building foundation. See Figure 4.

If conditions or local codes require the unit be attached to pad or mounting frame, tie down bolts should be used and secured to unit base pan.

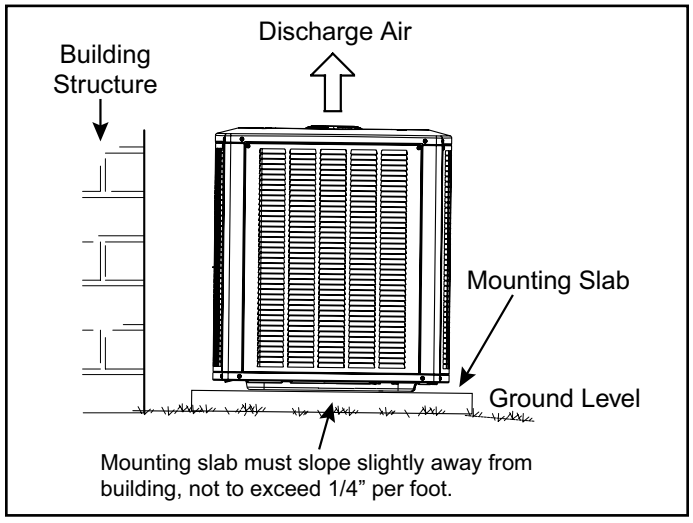


Figure 4. Slab Mounting

Elevate Unit

⚠ CAUTION

Accumulation of water and ice in base pan may cause equipment damage.

Elevate unit per local climate and code requirements to provide clearance above estimated snowfall level and ensure adequate drainage of unit. Use snow stand in areas where prolonged freezing temperatures are encountered.

If conditions or local codes require the unit be attached to pad or mounting frame, tie down bolts should be used and fastened through knockouts provided in unit base pan.

Clearance Requirements

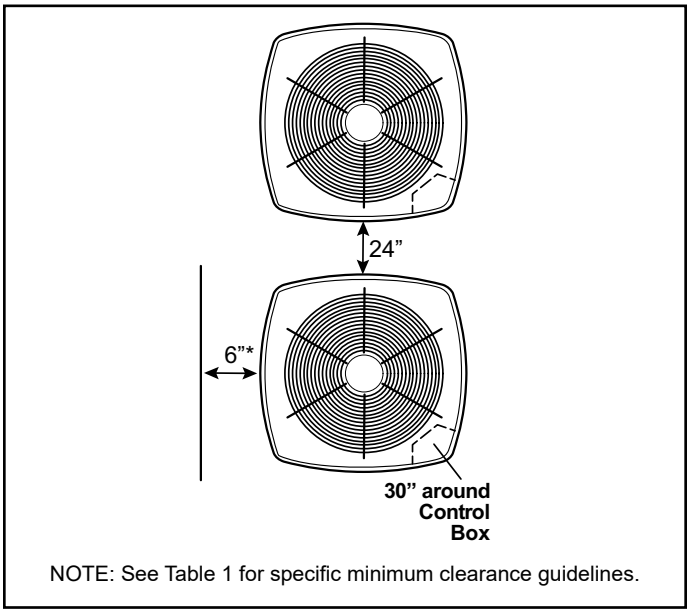
When installing, allow sufficient space for airflow clearance, wiring, refrigerant piping, and service. For proper airflow, quiet operation and maximum efficiency. Position so water, snow, or ice from roof or eaves cannot fall directly on unit. Refer to Table 1 for installation clearances.

Location	Minimum Clearance
Service box	30”
Top of unit*	48”
Between units	24”
Against wall	6”

* Maximum soffit overhang is 36”.

NOTE: At least one side should be unobstructed by a wall or other barrier.

Table 1. Clearances



NOTE: See Table 1 for specific minimum clearance guidelines.

Figure 5.

DO LOCATE THE UNIT:

- With proper clearances on sides and top of unit
- On a solid, level foundation or pad (unit must be level to within ± 1/4 in./ft. per compressor manufacturer specifications)
- To minimize refrigerant line lengths

DO NOT LOCATE THE UNIT:

- On brick, concrete blocks or unstable surfaces
- Near clothes dryer exhaust vents where debris accumulates
- Near sleeping area or near windows
- Under eaves where water, snow or ice can fall directly on the unit
- With clearance less than 2 ft. from a second unit
- With clearance less than 4 ft. on top of unit

Operating Ambient

The minimum outdoor operating ambient in cooling mode is 55°F, and the maximum outdoor operating ambient in cooling mode is 125°F. The maximum outdoor operating ambient in heating mode is 66°F.

Rooftop Installations

Install unit at a minimum of 6” above surface of the roof to avoid ice buildup around the unit. Locate the unit above a load bearing wall or area of the roof that can adequately support the unit. Consult local codes for rooftop applications.

If unit cannot be mounted away from prevailing winds, a wind barrier should be constructed. Due to variation in installation applications, size and locate barrier according to the best judgment of the installer.

⚠ IMPORTANT

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

⚠ CAUTION

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

⚠ 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.

⚠ 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.

The 4SHP22LX is a high efficiency residential split-system heat pump unit that is approved for use with HFC 410A refrigerant. The 4SHP22LX124 and -36 use a 380VAC three phase variable capacity rotary compressor specifically designed for unitary splits system. The 4SHP22LX148 and -60 units use a 380VAC three phase variable capacity scroll compressor. The series is designed for use with an expansion valve only (approved for use with HFC-410A) in the indoor unit.

Operating Gauge Set

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 2 shows torque values for fasteners.

Fastener	Torque
Valve Stems	4 in. lbs.
Stem Caps	8 ft. lbs.
Service Port Caps	8 ft. lbs.
Sheet Metal Screws	16 in. lbs.
#8 Machine Screws	16 in. lbs.
#10 Machine Screws	28 in. lbs.
Compressor Bolts	90 in. lbs.

Table 2. Torque Table

⚠ IMPORTANT

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

⚠ IMPORTANT

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

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

Using Manifold Gauge Set

When checking the system charge, only use a manifold gauge set that features low loss anti-blow back fittings. Manifold gauge set used with HFC-410A refrigerant systems must be capable of handling the higher system operating pressures.

The gauges should be rated for use with pressures of 0 - 800 psig on the high side and a low side of 30” vacuum to 250 psig with dampened speed to 500 psi. Gauge hoses

must be rated for use at up to 800 psig of pressure with a 4000 psig burst rating.

Operating Service Valves

The liquid and vapor line service valves are used for removing refrigerant, flushing, leak testing, evacuating, checking charge and charging. Each valve is equipped with a service port which has a factory-installed valve stem.

Liquid and Suction Line Service Valves

The liquid line and suction line service valves (see Figure 6) and service ports are used for leak testing, evacuation, charging, and checking charge.

Each valve is equipped with a service port which has a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary leak seal.

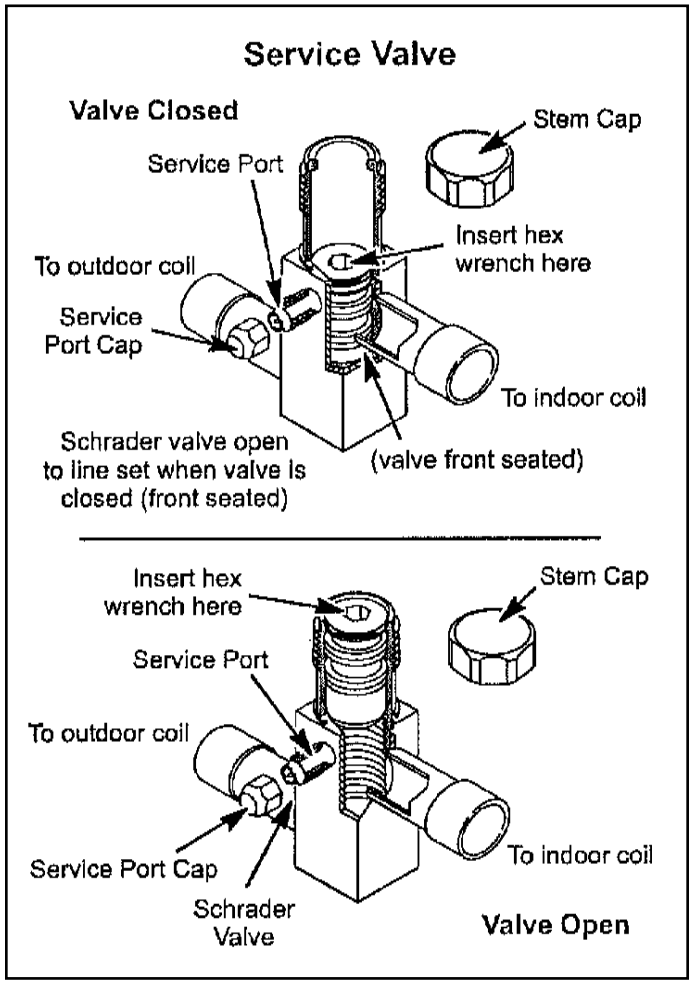


Figure 6.

To Access the Schrader Port:

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

To Open Liquid or Suction Line Service Valve:

1. Remove stem cap with an adjustable wrench.
2. Use service wrench with a hex-head extension to back the stem out counterclockwise as far as it will go. Use a 3/16” hex head extension for liquid line service valves and a 5/16” extension for suction line service valves.
3. Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

To Close Liquid or Suction Line Service Valve:

1. Remove the stem cap with an adjustable wrench.
2. Use a service wrench with a hex-head extension to turn the stem clockwise to seat the valve. Tighten firmly.
3. Replace the stem cap. Tighten finger tight, then tighten an additional 1/6 turn.

Suction Line (Ball Type) Service Valve

Suction line (ball type) service valves function the same way as the other valves; the difference is in the construction (see Figure 7).

The ball valve is equipped with a service port with a factory-installed Schrader valve. A service port cap protects the Schrader valve from contamination and serves as the primary seal.

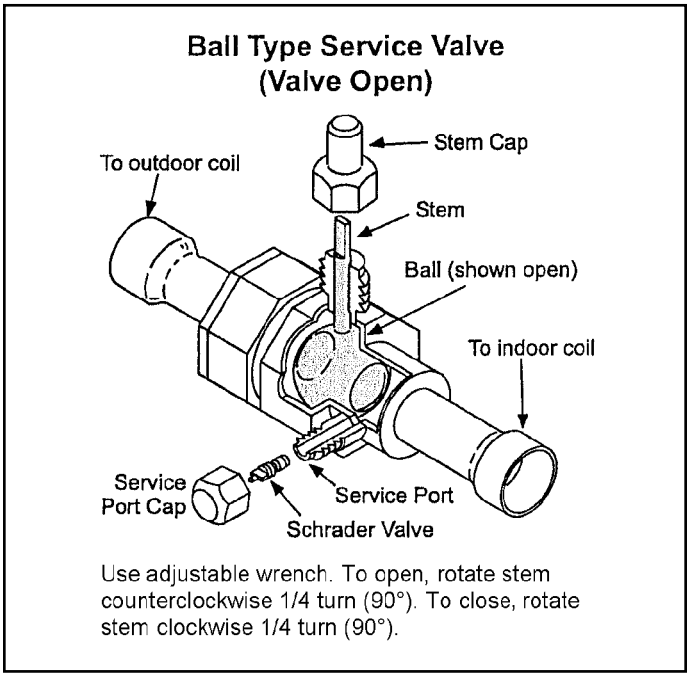


Figure 7.

New or Replacement Line Set

⚠ CAUTION

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

Flush the existing line set per the following instructions. For more information, refer to the Installation and Service Procedures manual.

⚠ CAUTION

DO NOT attempt to flush and re-use existing line sets or indoor coil when the system contains contaminants (i.e., compressor burn out).

For -024 and -036 units: Polyvinyl ether (PVE) oil is used in the variable capacity rotary compressors in -024 and -036 units. When installing these units with refrigerant lines or coils previously charged with R410A and POE oil, it is recommended to flush the existing lines and coil with R410A refrigerant to remove excess POE oil that may be in the system.

For -048 and -060 units: Polyol ester (POE) oils is used in the variable capacity scroll compressors in -048 and -060 units. When installing these units with refrigerant lines or coils previously charged with R410A and POE oil, the existing lines do **NOT** need to be flushed to remove the POE oil.

If a new line set is being installed, size the piping per Table 3.

Suction Traps

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

NOTE: *Special consideration must be taken for line sets over 50 feet. See Refrigerant Piping Guidelines.*

⚠ WARNING

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

⚠ WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.

Failure to follow this warning may result in personal injury or death.

⚠ WARNING

Fire, Explosion and Personal Safety hazard.

Failure to follow this warning could result in damage, personal injury or death.

Never use oxygen to pressurize or purge refrigeration lines. Oxygen, when exposed to a spark or open flame, can cause fire and/or an explosion, that could result in property damage, personal injury or death.

⚠ WARNING

Polyvinyl ether (PVE) oils used with HFC-410A refrigerant absorb moisture very quickly. It is very important that the refrigerant system be kept closed as much as possible.

DO NOT remove line set caps or service valve stub caps until you are ready to make connections.

Heat Pump System (HFC410A)

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

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

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

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

- Maximum length vapor riser = 60 feet.
- Up to 50 Linear Feet: Use rated line sizes listed in Table 3.
- Between 51 and 150 Linear Feet: Crankcase heater and nonbleed port TXV factory installed. No additional components required. Vertical vapor riser must be sized to the vapor riser listed in the Table 4 on systems with line sets longer than 51 feet. Use Table 4 and Table 5 to determine the correct liquid and vapor line sizes.
- Over 150 Linear Feet: not recommended.
- Additional oil is not required for systems with line lengths up to 150 feet.

Tonnage *	Valve Size Connections		Recommended Line Sets
	Liquid Line	Suction Line	Line Set Length
-24	3/8” (10mm)	3/4” (19mm)	30’ (9.1m)
-36		7/8” (22mm)	40’ (12.2m)
-48			50’ (15.2m)
-60		1-1/8” (29mm) **	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. Standard Refrigerant Line Set – Up to 50 Linear Feet in Length

Tonnage	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
-24	180	150	60	60	7/8”	5/8”
-36						3/4”
-48						7/8”
-60						

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

Tonnage	Line SIze	Total Linear Length (ft.)						
		25	50	75	100	125	150	
-24	3/8”	25	50	60	60	60	60	Max Elevation (ft)
-36	3/8”	25	50	60	56	51	45	
	1/2”	25	50	60	60	60	60	
-48	3/8”	25	50	50	41	31	22	
	1/2”	25	50	60	60	60	60	
-60	3/8”	25	50	36	22	8	NR	
	1/2”	25	50	60	60	60	59	

NOTE: Shaded rows indicate rated liquid line size.

A. Find your tonnage on the left side of the table.

B. Start with the rated liquid line size (shaded row) on the outdoor tonnage.

C. Select the actual Total Linear Length of your system shown at the top of the table.

D. The elevation listed in the table is the maximum allowed for the liquid line listed.

E. Select or consider the larger liquid line size shown in the table if the elevation does not meet your requirements.

Table 5. Liquid Line Diameter Selection

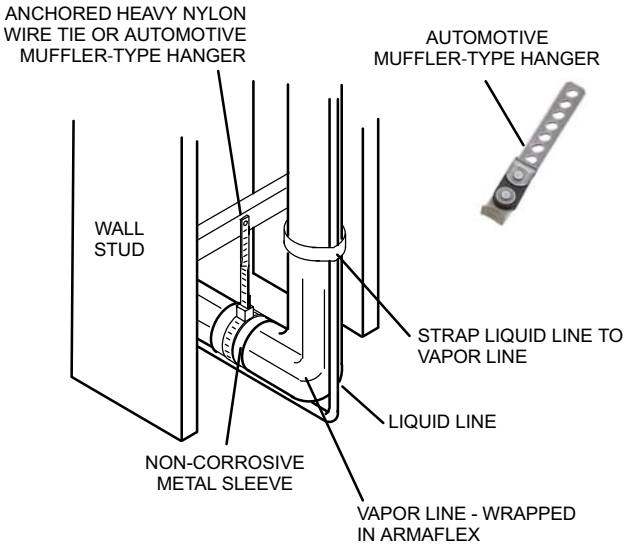
LINE SET

IMPORTANT — Refrigerant lines must not contact structure.

INSTALLATION

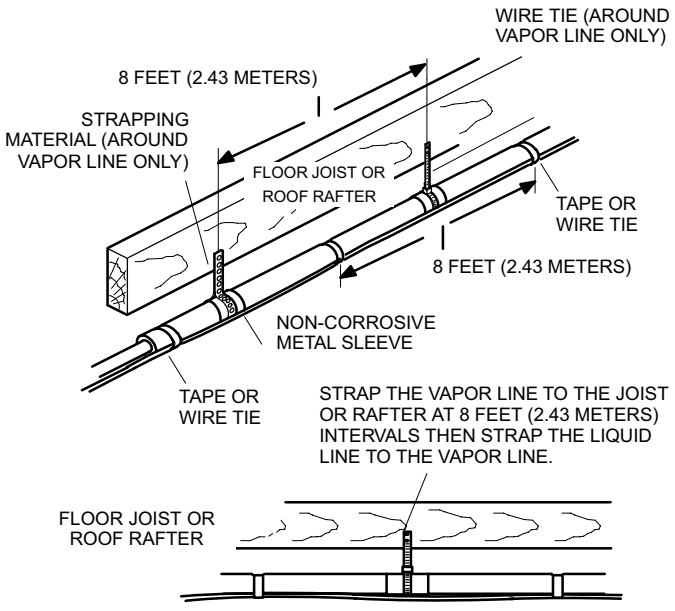
Line Set Isolation — The following illustrations are examples of proper refrigerant line set isolation:

REFRIGERANT LINE SET — TRANSITION FROM VERTICAL TO HORIZONTAL



REFRIGERANT LINE SET — INSTALLING HORIZONTAL RUNS

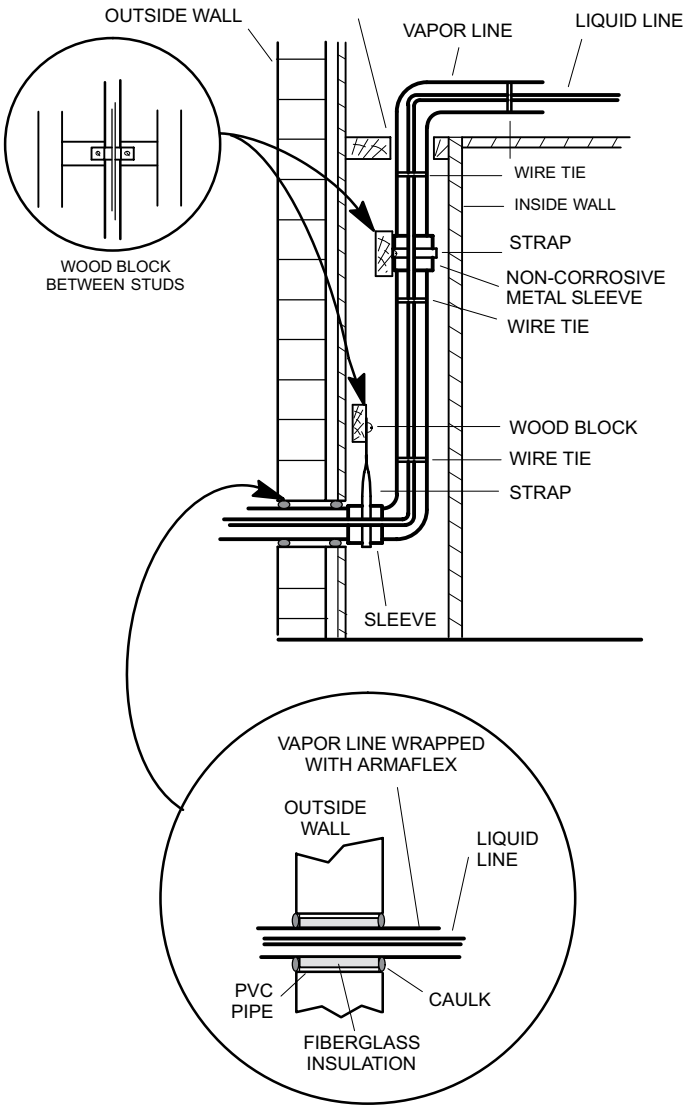
To hang line set from joist or rafter, use either metal strapping material or anchored heavy nylon wire ties.



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.

Typical Existing Fixed Orifice Removal Procedure

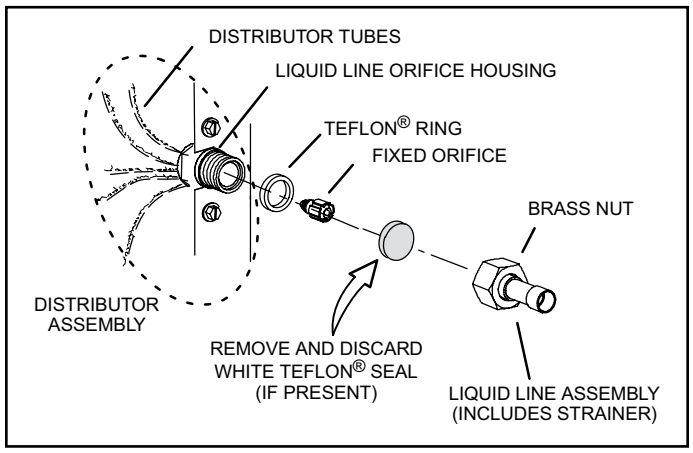


Figure 8. Remove Fixed Orifice (Uncased Coil Shown)

1. On fully cased coils, remove the coil access and plumbing panels.
2. Remove any shipping clamps from the liquid line and distributor assembly.
3. Using two wrenches (one to hold the orifice housing and one to remove the brass nut), disconnect liquid line from liquid line orifice housing. Take care not to twist or damage distributor tubes during this process.
4. Remove and discard fixed orifice, valve stem assembly (if present) and Teflon® washer, as shown in Figure 8.
5. Use a field-provided fitting to temporarily reconnect the liquid line to the indoor unit's liquid line orifice housing.

Typical Existing Expansion Valve Removal Procedure

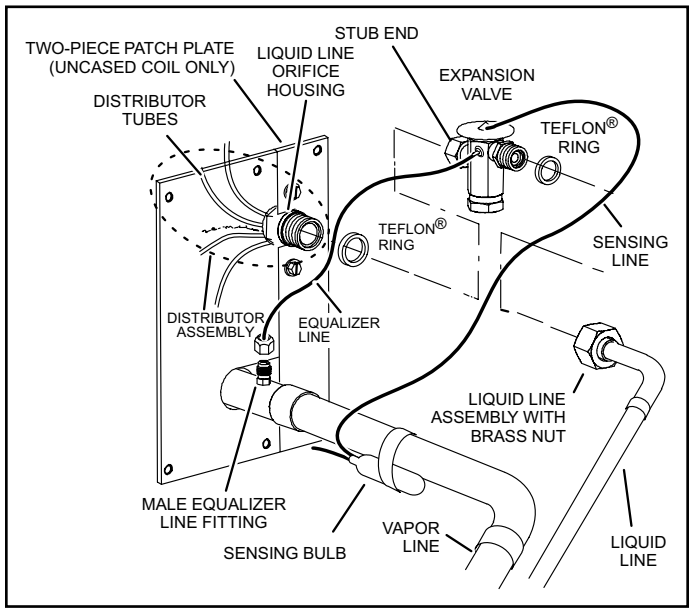


Figure 9. Remove Expansion Valve (Uncased Coil Shown)

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

Connect Gauges and Equipment for Flushing Procedure

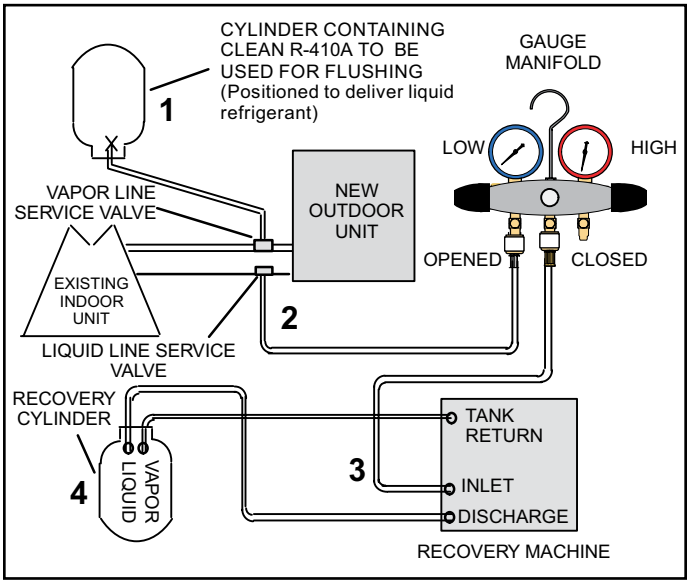


Figure 10. Connecting Gauges

1. Cylinder with clean R-410A (positioned to deliver liquid refrigerant) to the vapor service valve.
2. Refrigerant gauge set (low side) to the liquid line valve.
3. Refrigerant gauge set center port to inlet on the recovery machine with an empty recovery tank connected to the gauge set.
4. Connect recovery tank to recovery machine per machine instructions.

Flushing Line Sets

If the unit will be installed in an existing system that uses an indoor unit or line sets charged with R-22 refrigerant, installer must perform the following flushing procedure.

NOTE: *Existing system components (including line set and indoor coil) must be an AHRI match with the unit in order to fulfill unit warranty requirements.*

⚠ 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).

⚠ WARNING

Refrigerant must be reclaimed in accordance with national and local codes.

1. 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.
2. Position the cylinder of clean R-410A for delivery of liquid refrigerant and open its valve to allow liquid refrigerant to flow into the system through the vapor line valve. Allow the refrigerant to pass from the cylinder and through the line set and the indoor unit coil before it enters the recovery machine.
3. After all of the liquid refrigerant has been recovered, switch the recovery machine to vapor recovery so that all of the R-410A vapor is recovered. Allow the recovery machine to pull the system down to 0.
4. Close the valve on the inverted R-410A drum and the gauge set valves. Pump the remaining refrigerant out of the recovery machine and turn the machine off.

⚠ IMPORTANT

The Environmental Protection Agency (EPA) prohibits the intentional venting of HFC refrigerants during maintenance, service, repair and disposal of appliance.

Approved methods of recovery, recycling or reclaiming must be followed.

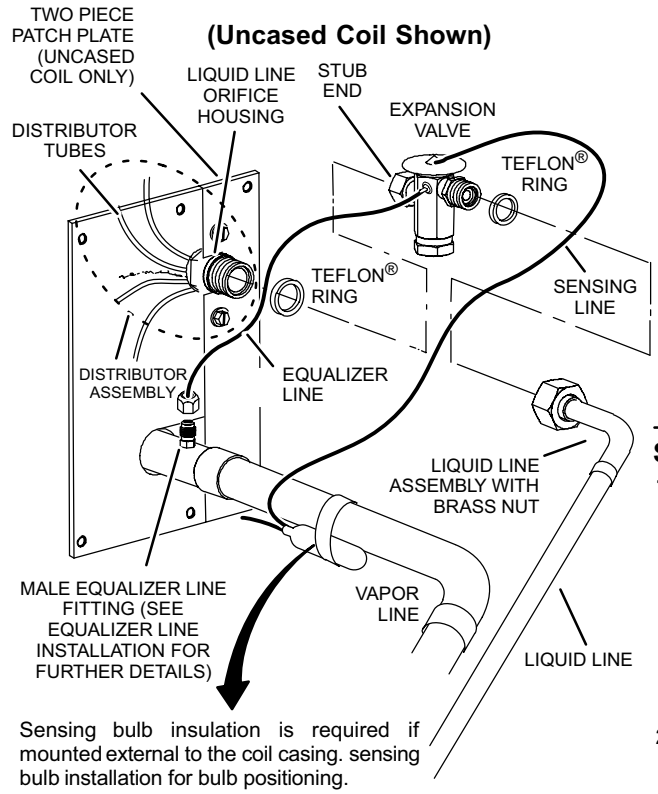
⚠ IMPORTANT

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

Refrigerant Piping - Install Indoor Expansion Valve

This outdoor unit is designed for use in systems that include a heat pump expansion valve metering device at the indoor coil. See the Product Specifications 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 expansion valve in a manner that will provide access for future field service of the expansion valve. Refer to below illustration for reference during installation of expansion valve unit.

INDOOR EXPANSION VALVE INSTALLATION

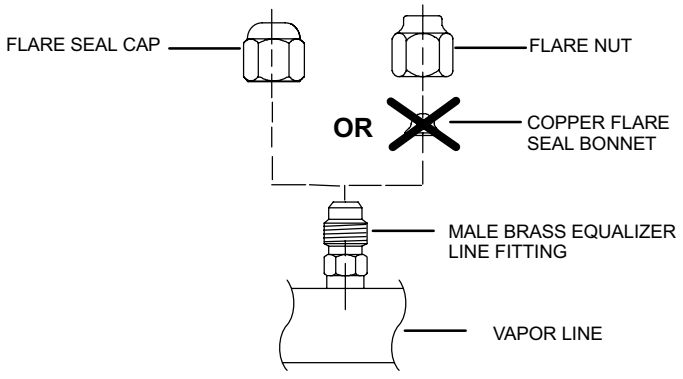


Sensing bulb insulation is required if mounted external to the coil casing. sensing bulb installation for bulb positioning.

EQUALIZER LINE INSTALLATION

1 - 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 below.

2 - Remove the field-provided fitting that temporarily reconnected the liquid line to the indoor unit's distributor assembly.

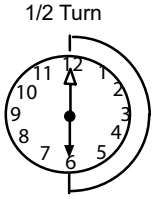


3 - Install one of the provided Teflon® rings around the stubbed end of the check expansion valve and lightly lubricate the connector threads and expose surface of the Teflon® ring with refrigerant oil.

4 - Attach the stubbed end of the check 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 tighten to 20 ft-lb.

5 - Place the remaining Teflon® washer around the other end of the check expansion valve. Lightly lubricate connector threads and expose surface of the Teflon® ring with refrigerant oil.

6 - Attach the liquid line assembly to the check 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 tighten to 20 ft-lb.

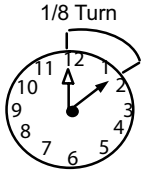


SENSING BULB INSTALLATION

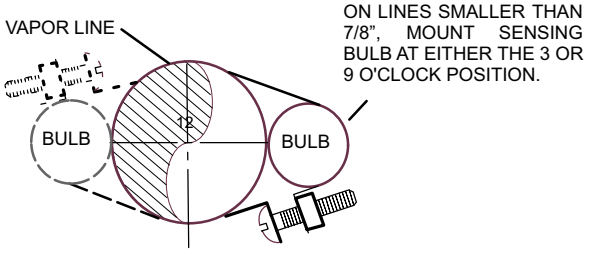
1 - Attach the vapor line sensing bulb in the proper orientation as illustrated to the right using the clamp and screws provided.

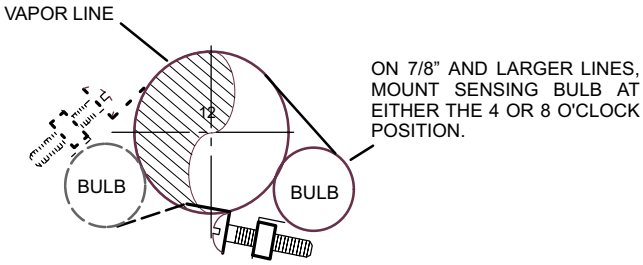
NOTE *- Though it is preferred to have the sensing bulb installed on a horizontal run of the vapor line, installation on a vertical run of piping is acceptable if necessary.*

NOTE *- Confirm proper thermal contact between vapor line and check/expansion bulb before insulating the sensing bulb once installed.*



2 - Connect the equalizer line from the check expansion valve to the equalizer vapor port on the vapor line. Finger tighten the flare nut plus 1/8 turn (7 ft-lbs) as illustrated below.

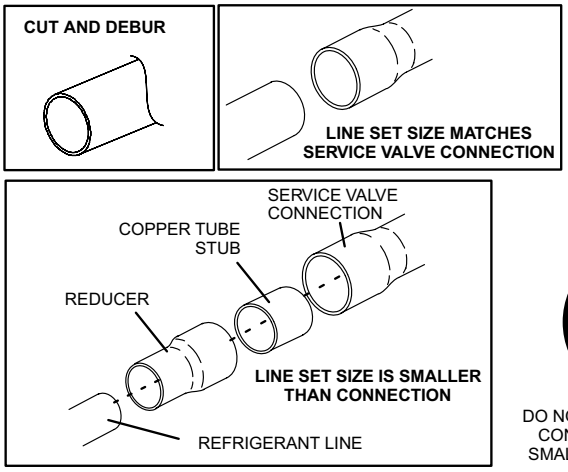




NOTE - *NEVER MOUNT THE SENSING BULB ON BOTTOM OF LINE.*

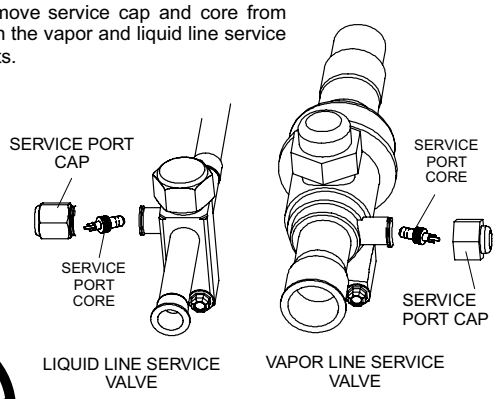
1 CUT AND DEBUR

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



2 CAP AND CORE REMOVAL

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

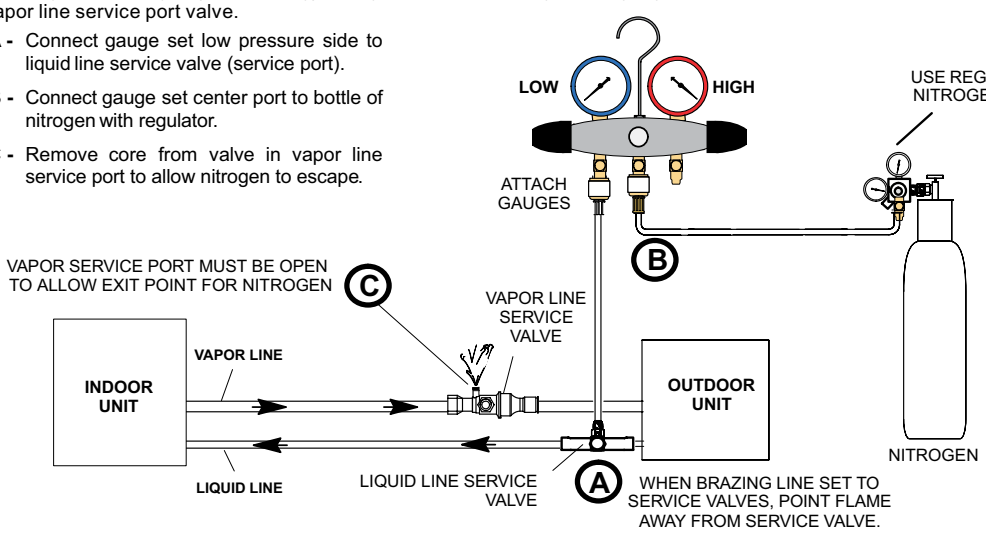


DO NOT CRIMP SERVICE VALVE CONNECTOR WHEN PIPE IS SMALLER THAN CONNECTION

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

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

- **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 core from valve in vapor line service port to allow nitrogen to escape.



NOTE

Use a manifold gauge set designed for use on R-410A refrigerant systems.

⚠ WARNING

Before brazing, ensure the system is fully recovered of all refrigerant. Application of a brazing torch to a pressurized system may result in ignition of the refrigerant and oil mixture. Check the high and low pressures before applying heat.

⚠ WARNING

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.

4 WRAP SERVICE VALVES

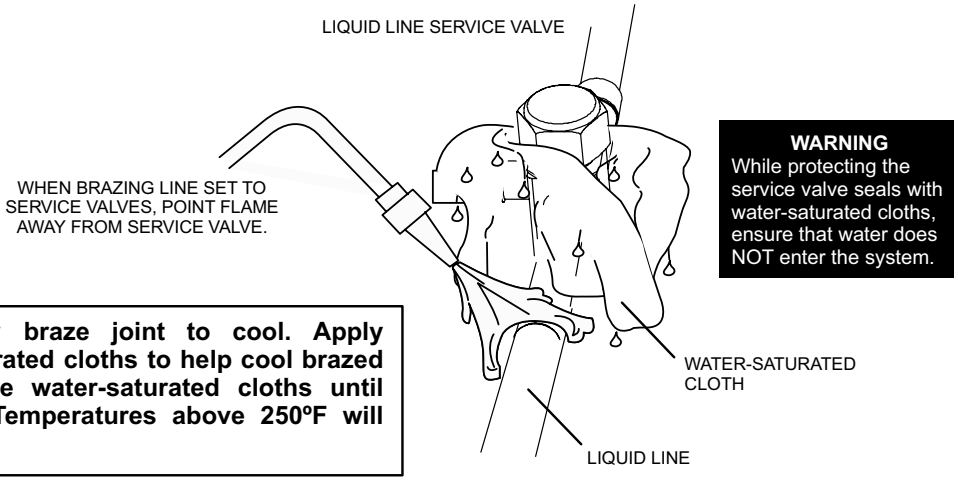
To help protect service valve seals during brazing, wrap water-saturated cloths around service valve bodies and copper tube stubs. Use additional water-saturated cloths underneath the valve body to protect the base paint.

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 vapor valve stem port. See steps **3A, 3B** and **3C** on manifold gauge set connections.

6 BRAZE LINE SET

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



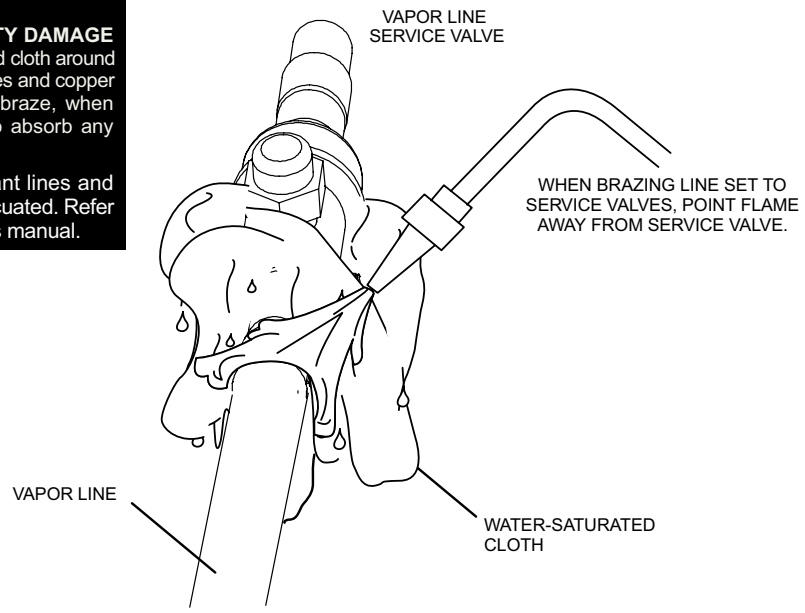
WARNING
While protecting the service valve seals with water-saturated cloths, ensure that water does NOT enter the system.

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

WARNING

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

Do not open service valves until refrigerant lines and indoor coil have been leak-tested and evacuated. Refer to Leak Test and Evacuation section of this manual.



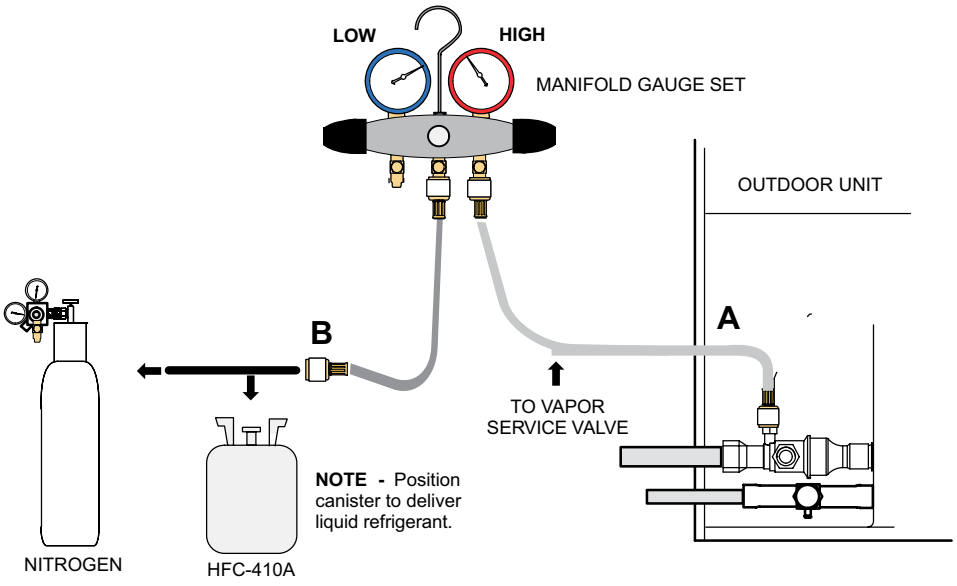
7 PREPARATION FOR NEXT STEP

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.

Leak Test and Evacuation

Evacuating the system of non-condensables is critical for proper operation of the unit. Non-condensables are defined as any gas that will not condense under temperatures and pressures present during operation of an air conditioning system. Non-condensables and water suction combine with refrigerant to produce substances that corrode copper piping and compressor parts.

LEAK TEST



1 CONNECT GAUGE SET

A - Connect the high pressure hose of an HFC-410A manifold gauge set to the vapor valve service port.
NOTE *- Normally, the high pressure hose is connected to the liquid line port. However, connecting it to the vapor port better protects the manifold gauge set from high pressure damage.*

B - With both manifold valves closed, connect the cylinder of HFC-410A refrigerant to the center port of the manifold gauge set.
NOTE *- Later in the procedure, the HFC-410A container will be replaced by the nitrogen container.*

2 TEST FOR LEAKS

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

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

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

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

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

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

F - After leak testing, disconnect gauges from service ports.
NOTE *- Service valve cores remain removed for the following evacuation procedure.*

3 CONNECT GAUGE SET

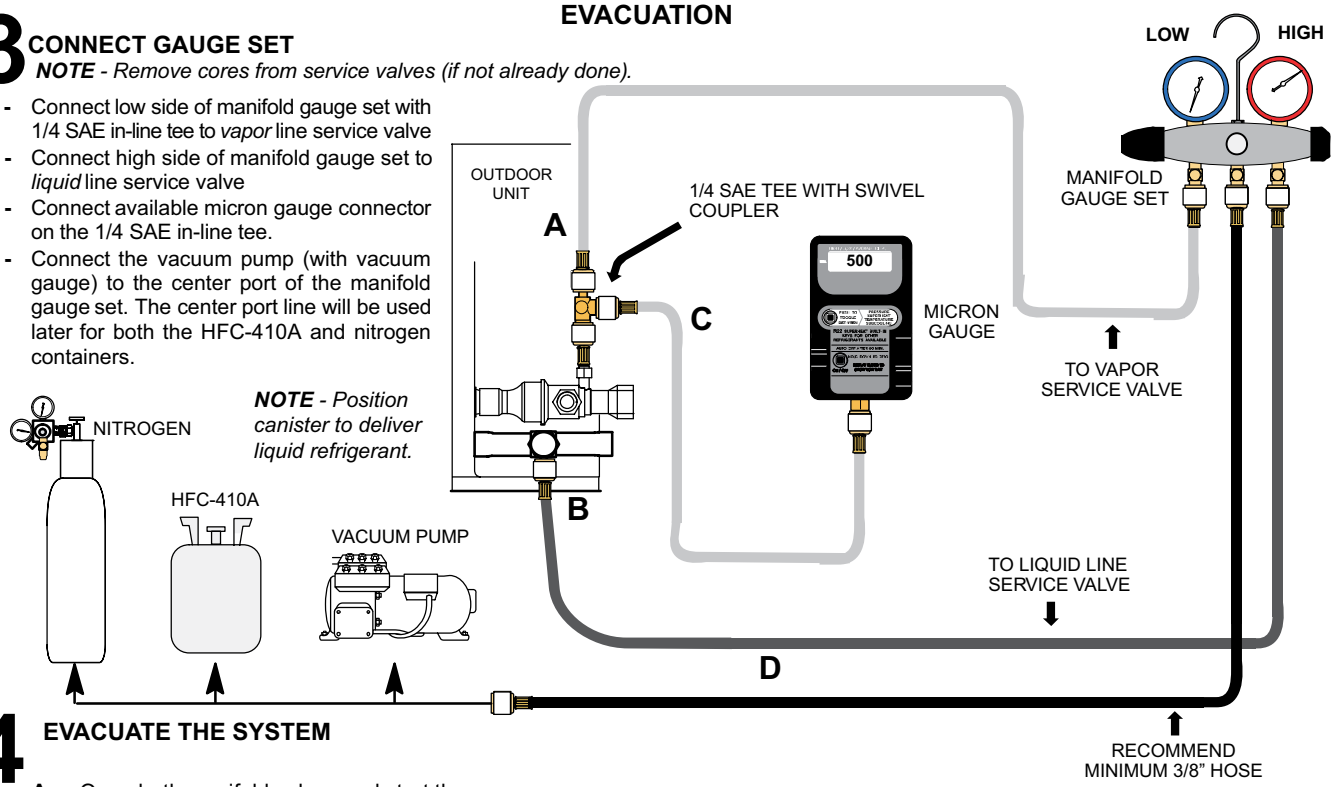
NOTE *- Remove cores from service valves (if not already done).*

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 available micron gauge connector on the 1/4 SAE in-line tee.

D - Connect the vacuum pump (with vacuum gauge) to the center port of the manifold gauge set. The center port line will be used later for both the HFC-410A and nitrogen containers.



NOTE *- Position canister to deliver liquid refrigerant.*

4 EVACUATE THE SYSTEM

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

B - Evacuate the line set and indoor unit until a slight vacuum is indicated on the micron gauge (approximately 23,000 microns or 29.01 inches of mercury).

NOTE *- During the early stages of evacuation, it is desirable to close the manifold gauge valve at least once. A rapid rise in pressure indicates a relatively large leak. If this occurs,* ***repeat the leak testing procedure****.*

NOTE *- The term* ***absolute pressure*** *means the total actual pressure above absolute zero within a given volume or system. Absolute pressure in a vacuum is equal to atmospheric pressure minus vacuum pressure.*

C - When the absolute pressure reaches 23,000 microns (29.01 inches of mercury), perform the following:

- Close manifold gauge valves.
- Close valve on vacuum pump.
- Turn off vacuum pump.
- Disconnect manifold gauge center port hose from vacuum pump.
- Attach manifold center port hose to a nitrogen cylinder with pressure regulator set to 150 psig (1034 kPa) and purge the hose.
- Open manifold gauge valves to break the vacuum in the line set and indoor unit.
- Close manifold gauge valves.

WARNING !

Possible equipment damage.

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

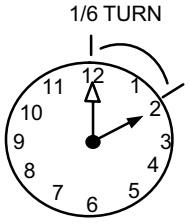
D - Shut off the nitrogen cylinder and remove the manifold gauge hose from the cylinder. Open the manifold gauge valves to release the nitrogen from the line set and indoor unit.

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 a cylinder of HFC-410A positioned to deliver liquid refrigerant. Open the manifold gauge valve 1 to 2 psig in order to release the vacuum in the line set and indoor unit.

G - Perform the following:

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



H - Open suction service valve first before liquid valve to release the unit charge into the system. Replace valve caps and tighten (8 ft. lb.). Caps are the primary seal.

Electrical - Circuit Sizing and Wire Routing

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

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

24VAC Transformer

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

Thermostat Control and Low Voltage Control Wiring

Thermostat Control Options

The 4SHP22LX variable capacity units provide two thermostat control options to provide application and installation flexibility.

Comfort Sync A3 Communicating Thermostat Control

The 4SHP22LX variable capacity unit may be installed as a fully communicating Comfort Sync system consisting of Comfort Sync A3 Communicating Thermostat, a Comfort Sync-enabled indoor unit and the 4SHP22LX variable capacity outdoor unit wired with (4) Comfort Sync communication wires (R, I+, I- and C) connected to the 4SHP22LX Outdoor Unitary Control.

The 4SHP22LX variable capacity unit when wired as a fully communicating Comfort Sync system will take full advantage of the advanced diagnostics and control, Wi-Fi accessibility and system operation parameters. Refer to the 4SHP22LX field wiring diagram for a Comfort Sync A3 communicating thermostat.

Conventional 24VAC Non-Communicating Thermostat Control

The 4SHP22LX variable capacity unit may be installed using a conventional 24VAC non-communicating two-stage heat pump or single-stage heat pump thermostat.

The 4SHP22LX unit will provide full variable capacity operation when installed with a conventional 24VAC non-communicating two stage heat pump or single-stage heat pump thermostat. The 4SHP22LX outdoor control has advanced control algorithms, which provide true variable speed capacity operation by modulating the compressor speed to achieve the target suction pressure set point in cooling mode, and liquid pressure set point in heating mode.

When utilizing a two-stage conventional 24VAC non-communicating heat pump thermostat, six wires are required to control the outdoor unit (R, C, W1, O, Y1 and Y2). Refer to the 4SHP22LX field wiring diagram for a conventional 24VAC non-communicating 2-stage thermostat.

When utilizing a single-stage conventional 24VAC non-communicating heat pump thermostat, five wires are required to control the outdoor unit (R, C, W1, O, and Y1) and Y1 is jumpered to Y2 in the outdoor unit. Note that the published performance data is based upon the use of a two-stage thermostat. Refer to the 4SHP22LX field wiring diagram for a conventional 24VAC non-communicating single-stage thermostat.

4SHP22LX Low Voltage Control Wiring Connections

The 4SHP22LX variable capacity units are provided with (2) RAST 6-Pin connections for connecting the field low voltage control wiring to the 4SHP22LX harnesses in the low voltage control make-up box. One RAST 6-pin connector is labeled with terminals TST, DF, R, I+, I- and C. The second RAST 6-pin connector is labeled with terminals DS, O, Y1, Y2, L and W.

⚠ WARNING

Electrical Shock Hazard!

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

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

⚠ WARNING

ELECTROSTATIC DISCHARGE (ESD)

Precautions and Procedures

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

⚠ WARNING

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

⚠ WARNING

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

Thermostat Type	Indoor Unit Type	Qty. of Wires to Unit	4SHP22LX Terminal Strip Connections	Unit Operation	Field Wiring Diagram
Comfort Sync A3 Communicating Thermostat	Comfort Sync Comunicating Gas Furnace or Air Handler	4	R, I+, I-, C	Fully Communicating Variable Capacity Operation Based Upon Thermostat Demand	Figure 14
Conventional 24VAC 2-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating)	6	R, C, W1, O, Y1, Y2	Full Variable Capacity Operation Controlled by 4SHP22LX Unitary Control Using Suction Pressure	Figure 16
Conventional 24VAC Single-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating)	5	R, C, W1, O, Y1 (Jumper Y1 to Y2)	Full Variable Capacity Operation Controlled by 4SHP22LX Unitary Control Using Suction Pressure	Figure 15

Table 6. 4SHP22LX Thermostat Control Options

Size Circuit and Install Service Disconnect Switch

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

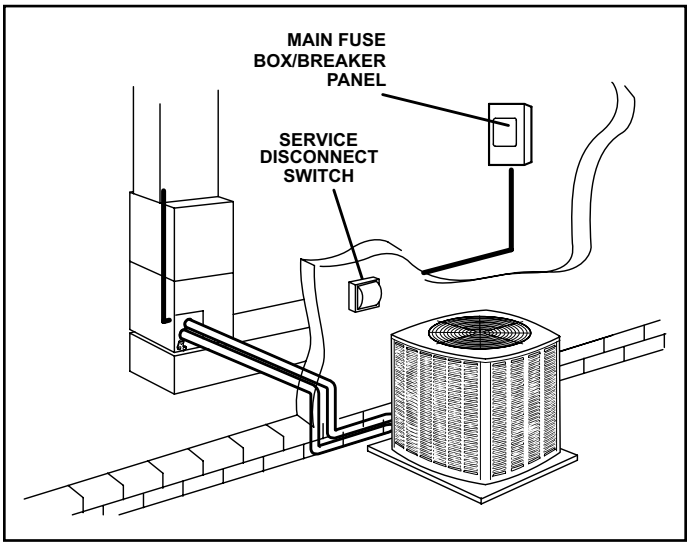


Figure 11.

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

Install Thermostat

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

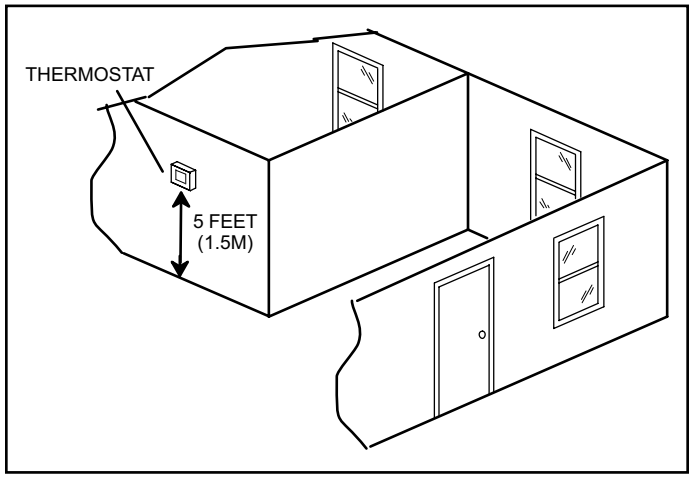


Figure 12.

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

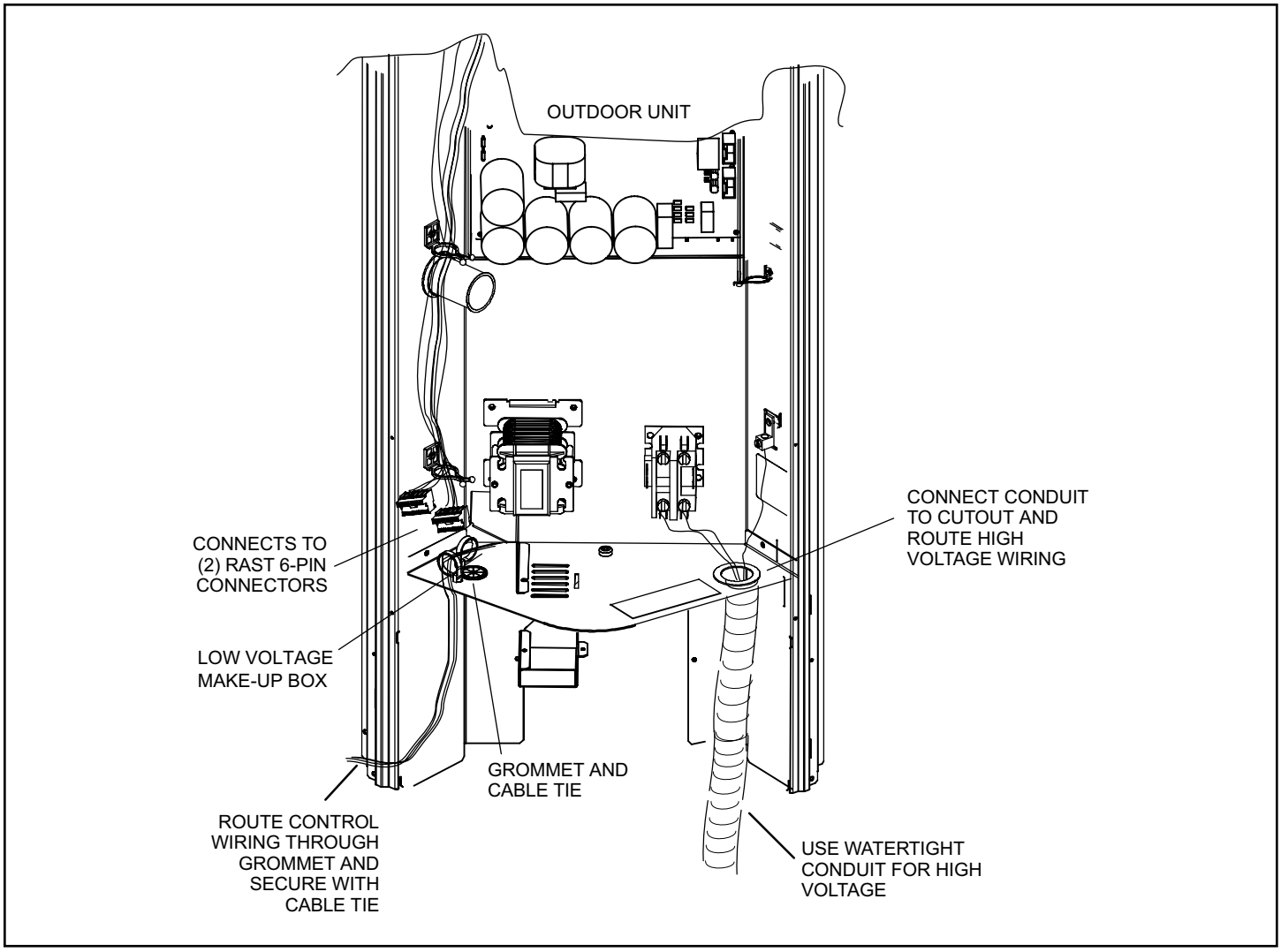


Figure 13.

Route Control Wires

Comfort Sync Communicating Thermostat Wiring

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

Conventional 24VAC Non-Communicating Thermostat Wiring

Wire Run Length	AWG#	Insulation Type
Less than 100’ (30m)	18	Temperature Rating 35°C Minimum
More than 100’ (30m)	16	

Table 7. Conventional 24VAC Non-Communicating Thermostat Wiring

Route High Voltage and Ground Wires

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

Connect the 208/230 high voltage power supply from the disconnect to the 4SHP22LX contactor as shown. Connect the ground wire from the power supply to the unit ground lug connection.

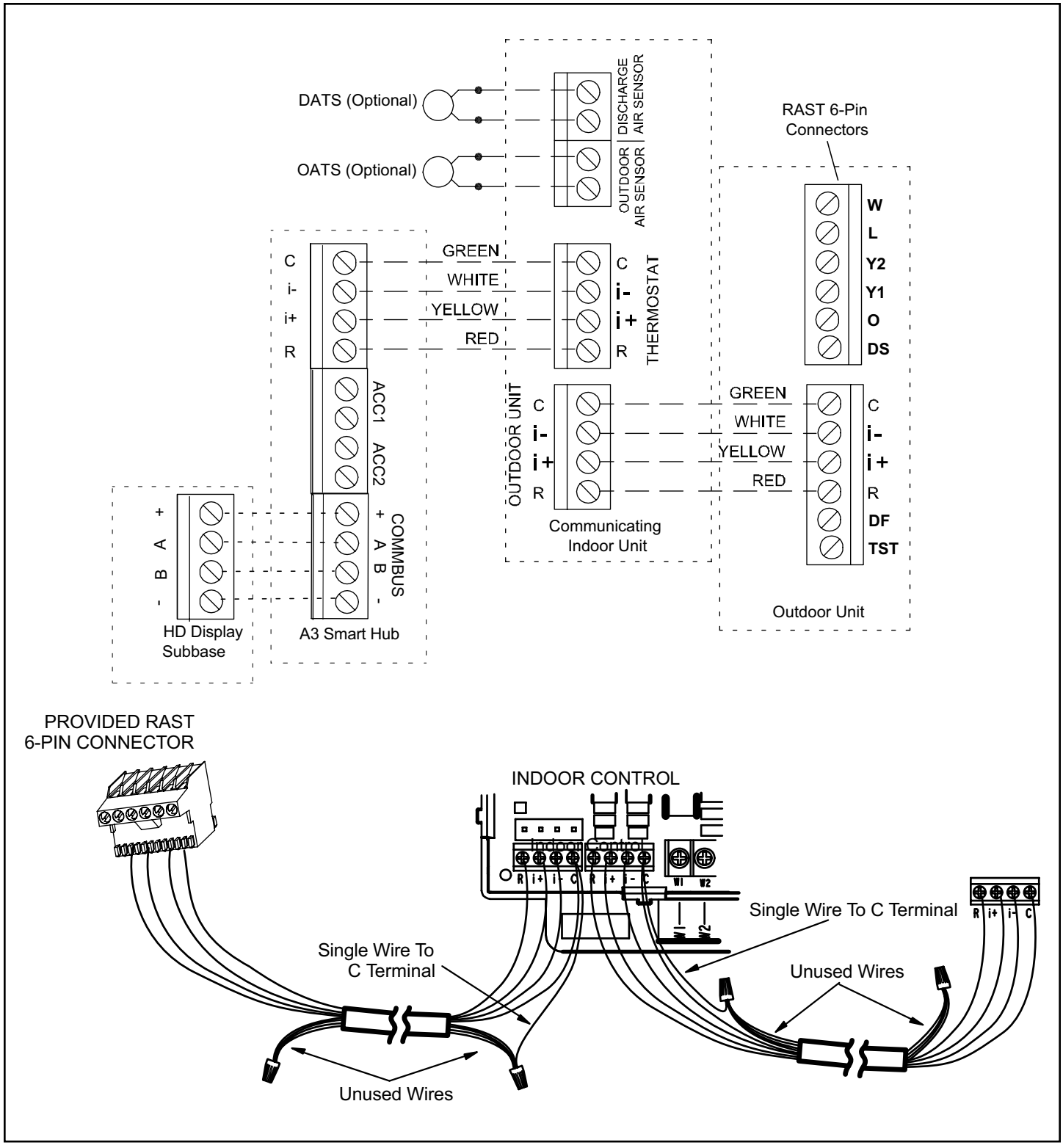


Figure 14. 4SHP22LX with Comfort Sync A3 Communicating Thermostat – Field Wiring

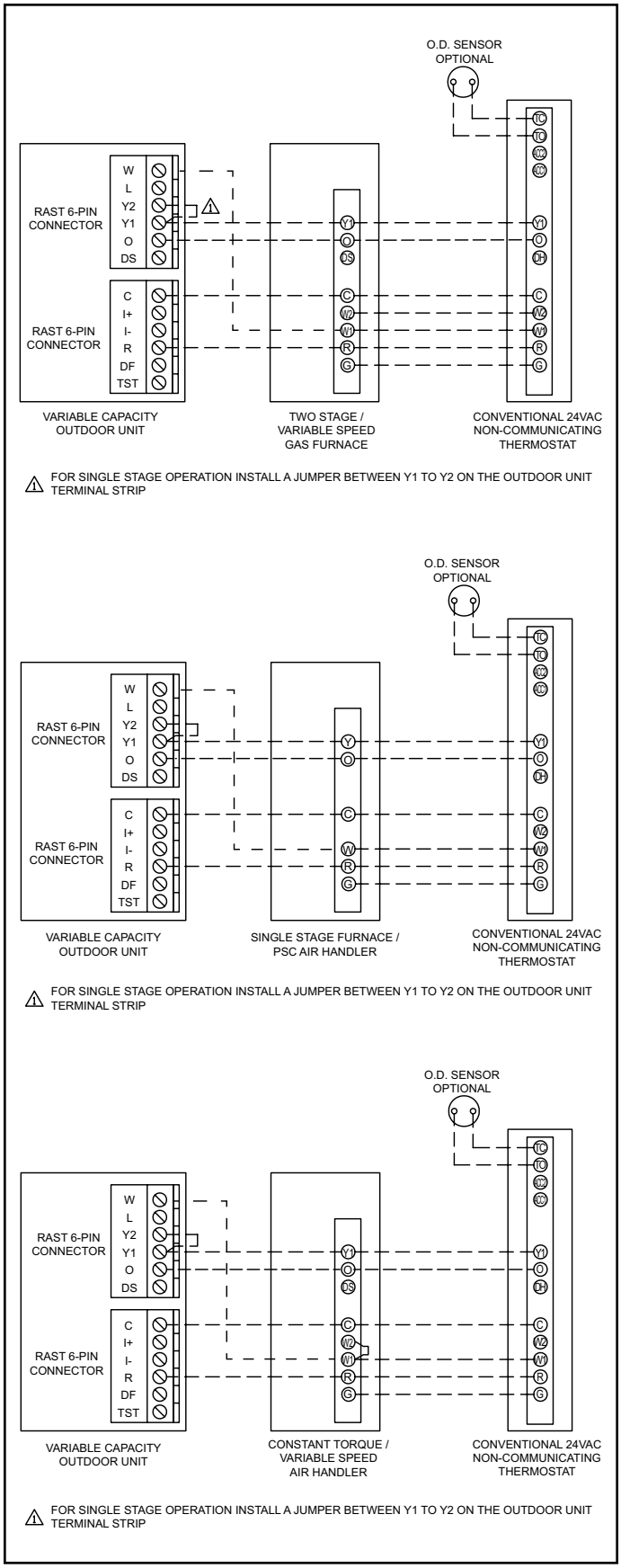


Figure 15. Conventional 24VAC Heat Pump Non-Communicating Thermostat Wiring - Single Stage

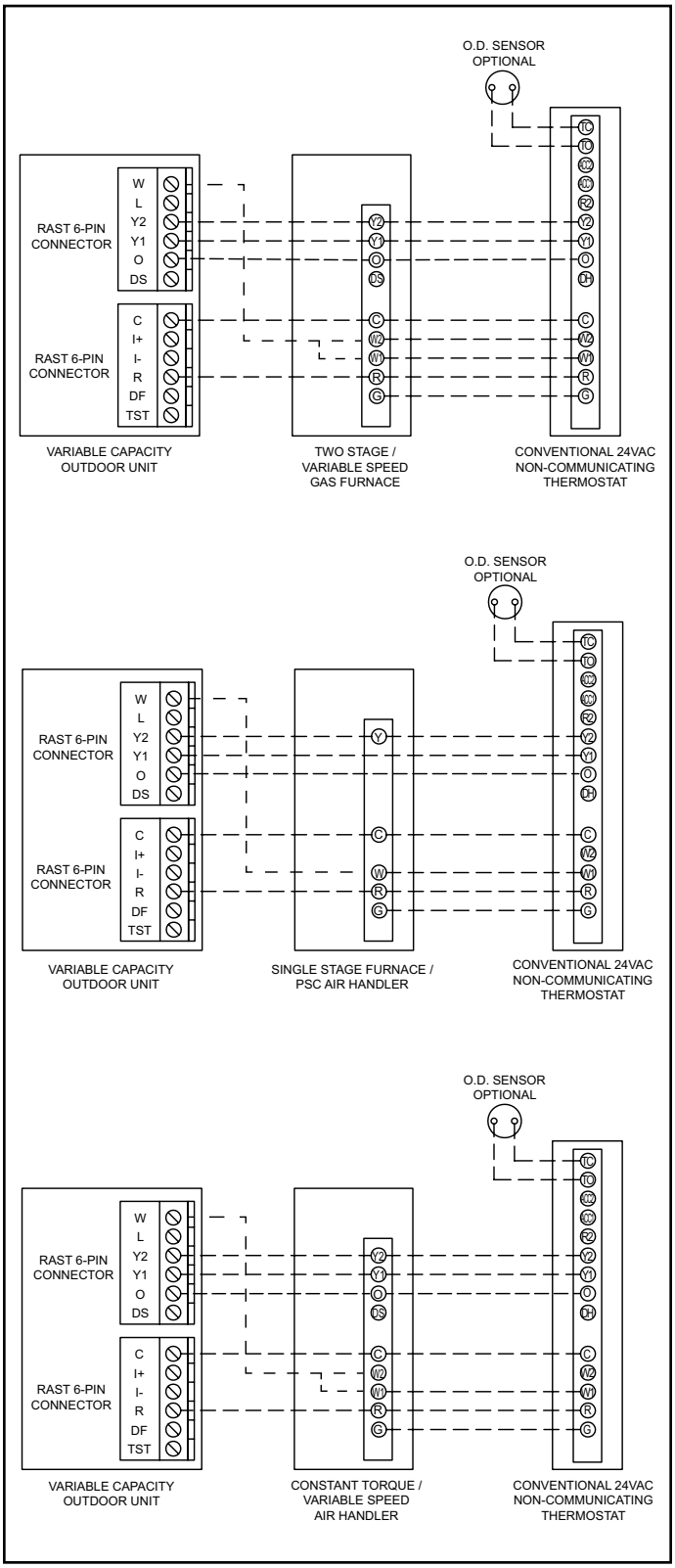


Figure 16. Conventional 24VAC Heat Pump Non-Communicating Thermostat Wiring - Two Stage

Jumpers and Terminals

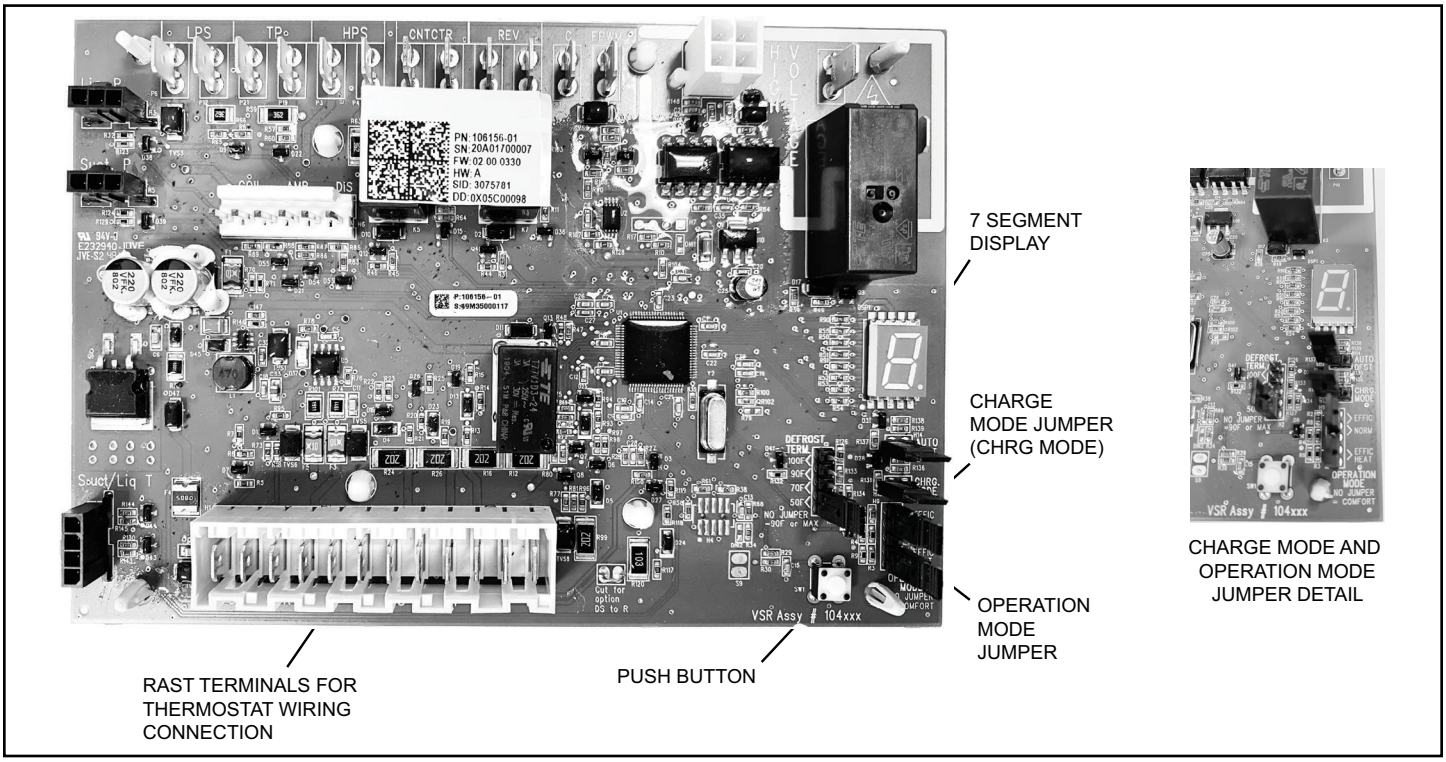


Figure 17.

7-Segment Display and Push Button

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

Alarms

Alarm information is provided on the unit control panel cover.

Charge Mode Jumper

To initiate the 4SHP22LX Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

4SHP22LX Charge Mode Operation with Comfort Sync Communicating Heat Pump Thermostat

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

4SHP22LX Charge Mode Operation with a Conventional 24VAC Non-Communicating Heat Pump Thermostat

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 compressor demand to the 4SHP22LX to initiate the Charge Mode. When using the Charge Mode in the cooling mode, the “O” must also be provided with a 24V signal to place the reversing valve in the cool position. In the heating mode only a Y1 compressor demand is required along with the blower demand for the full cooling air volume. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 Cooling demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

Charge Mode Display String

When unit is in the charge mode, Suction Pressure (SPxxx), Suction Temp (Stxx.x), Superheat (SHxx.x), Liquid Pressure (LPxxx), Liquid Temp (Ltxx.x) and Subcooling (SCxx.x) will be scrolled on the 7-segment display.

Example:

SP 135 pause St 62 pause SH 15 pause LP 345 pause Lt 96 pause SC 10 repeat

Charge Mode Jumper Operation in the Cooling Mode

On applications with a conventional 24VAC non-communicating heat pump thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a cooling compressor demand to the 4SHP22LX and an "O" cooling reversing valve demand to initiate the Charge Mode. A cooling blower demand must also be provided to initiate blower in high stage operation on the indoor unit.

The compressor and outdoor fan motor will begin to ramp up and reach 100% design capacity within 3 minutes. They will continue to operate at 100% design capacity for the duration of charge mode.

Charge Mode Jumper Operation in the Heat Pump Heating Mode

On applications with a conventional 24VAC non-communicating heat pump thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a heating compressor demand to the 4SHP22LX without an "O" reversing valve signal to initiate the Charge Mode. A heating blower demand must also be provided to initiate high speed blower operation on the indoor unit.

The compressor and outdoor fan motor will begin to ramp up and reach 100% design capacity within 3 minutes. They will continue to operate at 100% design capacity for the duration of charge mode.

Exiting Charge Mode

To exit the charging mode, remove the Charge Mode Jumper from the Charge Mode Pins. The system will be in Charge Mode for a maximum time of 60 minutes and will automatically exit the charge mode and resume normal operation after 60 minutes even if the charge mode jumper is left in place. To extend the charge mode beyond 60 minutes, ensure the cooling/heating demand, blower demand and appropriate reversing valve demand are available and reapply the charge mode jumper.

NOTE: *If compressor demand is lost during charge mode period, then the compressor and fan will cease to operate, and the unit will enter into a delay timer for 3 minutes. Repeat the charging mode procedure to get back into charge mode.*

Cooling Operation Mode Jumper

The Cooling Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump thermostat, the compressor capacity is controlled to maintain the target suction pressure setpoint. The Cooling Operation Mode Jumper has three selectable cooling modes. The three modes are Efficiency (Jumper installed on Pins 1 & 2), Normal Mode (Jumper installed on Pins 2 & 3) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode. The Efficiency mode has a variable suction pressure setpoint that will vary with the outdoor temperature; as the outdoor temperature increases the suction pressure setpoint will decrease. When the Cooling Operation Mode jumper is installed in the "Normal Mode" the suction pressure setpoint is 135 psig.

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

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

Table 8. Cooling Operation Mode Jumper (Conventional 24VAC Thermostats Only)

Heating Operation Mode Jumper

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

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

Table 9. Heating Operation Mode Jumper (Conventional 24VAC Thermostats Only)

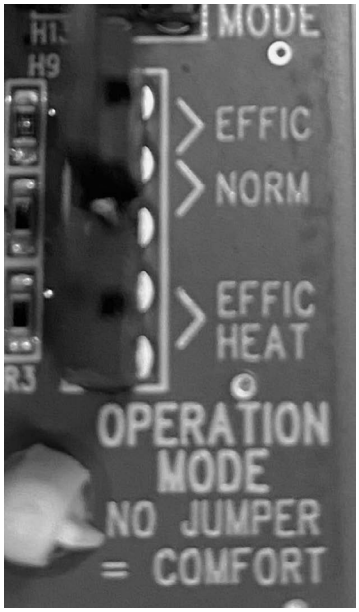


Figure 18. Operation Mode Jumper

Unit Operation

4SHP22LX Unit Operation with a Comfort Sync A3 Communicating Thermostat

When the 4SHP22LX unit is installed with a Comfort Sync A3 Communicating Thermostat and Comfort Sync-enabled indoor unit, the unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity based upon thermostat demand in both the cooling and heat pump heating mode. The indoor air volume will be controlled to match compressor capacity throughout the capacity range.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat – Cooling Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. The Y2 second stage cooling demand will initiate second stage blower operation. Increased air volume will increase the load on the indoor coil and increase the suction pressure. The 4SHP22LX compressor capacity will continue to be controlled based upon the suction pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat – Heating Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing hte unit in the heating mode. A Y1 first stage compressor demand will initiate compressor operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The Y2 second stage compressor demand will initiate second stage blower operation. Increased air volume will increase heat transfer on the indoor coil and degrease the liquid pressure. if the liquid pressure drops below the target setpoint, the compressor capacity will be increased. The 4SHP22LX compressor capacity will continue to be controlled based upon the liquid pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating Single-Stage Heat Pump Thermostat – Cooling Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating single-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and cooling indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the 4SHP22LX outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. If the cooling demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating Single-Stage Heat Pump Thermostat – Heating Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing the unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation.

In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the 4SHP22LX outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

Defrost Function

The outdoor unit control measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller self-calibrates (see Figure 29) when the defrost system starts and after each system defrost cycle. The outdoor unit control monitors ambient temperature, outdoor coil temperature, and total run-time to determine when a defrost cycle is required. The coil temperature sensor is designed with a spring clip to secure the sensor to the outdoor TXV distributor. The location of the coil sensor is important for proper defrost operation (see Figure 2 and Figure 3 for the proper location of the coil sensor).

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

Defrost Operating Modes

The outdoor control has three operational modes:

- Defrost calibration
- Operation
- Defrost test

Defrost Termination Temperatures

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

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

Defrost Test

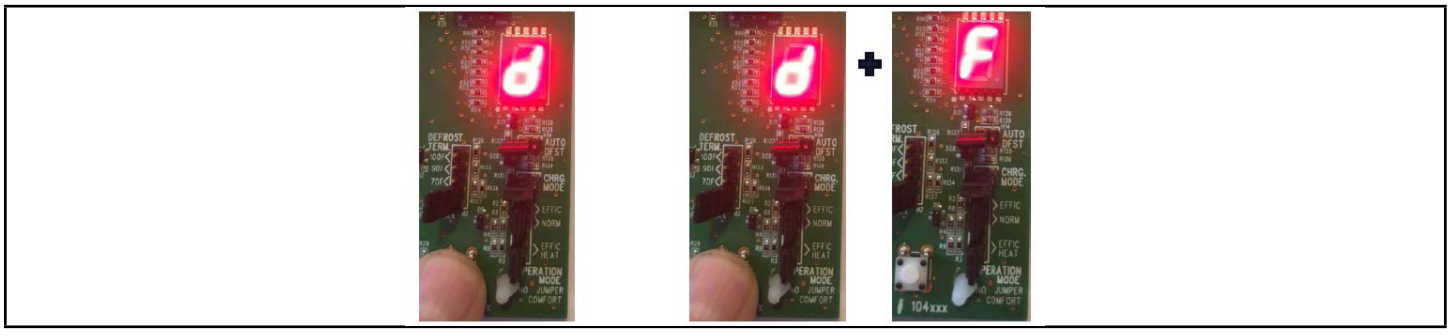
The 4SHP22LX defrost cycle can be tested for defrost diagnostic purposes or during service procedures to initiate a defrost cycle to clear the outdoor coil of frost or ice. The 4SHP22LX may be placed into a forced defrost mode by using the Outdoor Unitary Control push button.

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

1. While the 4SHP22LX is operating in the heating mode, press bush button until solid "-" is displayed to enter Field Test Mode and then release the button.
2. Press and hold the button until "d" is displayed for forced defrost cycle, then release the button. Press the button again while the display is flashing "d" to select the forced defrost mode.
3. The 4SHP22LX will enter a forced defrost cycle and "d" + "F" will be displayed on the 7-segment display.
4. The 30-second Shift Delay will be observed. The compressor and outdoor fan will cycle off. After a 4-second delay, the reversing valve will be energized and will shift to the "cool" position. After a 26-second delay, the compressor will restart and will run at the maximum cooling speed in the defrost cycle to defrost the coil.
5. Coil "c" and Ambient "A" temperature will be displayed on the 7-segment display.

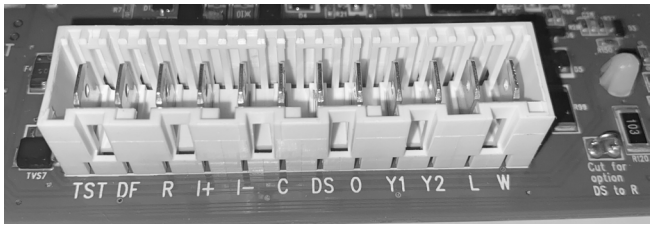
The Forced Defrost Cycle will end when any of the following conditions are met:

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



Designator	Description	Input	Output	Common
O	O Reversing Valve Input (24VAC conventional Heat Pump Thermostats only)	N/A	Switched 24VAC nominal	N/A
REV	Reversing valve output	N/A	Switched 24VAC nominal	24VAC common
LPS	Low pressure switch	N/A	24VAC nominal	N/A
LPS	Low pressure switch sensing connection	5ma @ 18VAC	N/A	N/A
HPS	High pressure switch	N/A	24VAC nominal	N/A
HPS	High pressure switch sensing connection	24VAC nominal	N/A	N/A
TP	Top cap thermostat switch (in series with the HPS)	N/A	24VAC nominal	N/A
TP	Top cap thermostat switch sensing connection	24VAC nominal	N/A	N/A
Cntctr	Control (inverter power) contactor switched output (in series with the HPS and TC)	N/A	Switched 24VAC nominal	N/A
Cntctr	Contactor common	N/A		24VAC common
FPWM	PWM fan output	N/A	10-97% duty cycle, 19-23 VDC peak	
C	PWM fan common connection	N/A	N/A	Fan PWM common
P10 (PSC Fan 1/4" QC)	1/4" QC terminals - Switched output for PSC outdoor fan control (not used on 4SHP22LX heat pumps)	N/A	Switched 230VAC Nominal	N/A
RAST Connector Terminal Designations				
W	24VAC Output for defrost auxiliary heat output	N/A	24VAC nominal	N/A
L	24VAC input to initiate load shed	24VAC nominal from load shed N.O. contacts (close to initiate load shed)	N/A	N/A
Y2	Y2 second stage cooling input when a conventional 24VAC non-communicating thermostat is used. Must be jumpered to Y1 if a single stage cooling thermostat is used	24VAC nominal from thermostat	N/A	N/A
Y1	Y1 first stage cooling input when a conventional 24VAC non-communicating thermostat is used	24VAC nominal from thermostat	N/A	N/A
O	O Reversing Valve Input (24VAC conventional Heat Pump Thermostats only)	24VAC nominal from thermostat	N/A	N/A
DS	Dehumidification input - not used	N/A	N/A	N/A
C	24VAC nominal power return	N/A	N/A	24VAC common
I-	Low data line	Data	Data	N/A
I+	High data line	Data	Data	N/A
R	24VAC nominal power input	24VAC nominal board main power input	N/A	N/A
DF	OEM test	N/A	N/A	N/A
TST	OEM test pin	24VAC nominal	N/A	N/A

Table 10. Outdoor Control Terminal Designations and Inputs / Outputs



WARNING - Electric Shock Hazard. Can cause injury or death. Unit must be grounded in accordance with national and local codes. The 4 pins in P6 have the potential of transferring up to 250 volts to the unit cabinet ground.

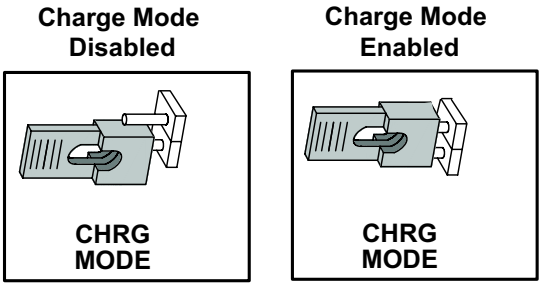
Designator		Description	Input	Output	Common
P6 - Pin 1	Tx	Transmit data to inverter, connects to Rx of inverter	Outdoor control communication transmit pin	– Pin 1 to pin 2 should read 4.5 to 5.55 VDC when not communicating – Pin 3 to pin 2 should read 4.5 to 5.55 VDC when not communicating – Pin 4 to pin 2 should read 4.5 to 5.5 VDC NOTE - Communication signals switch off and on rapidly. This may cause volt meter readings to fluctuate. This is normal. Communication signals will switch between this 5V and common (Pin 2).	
P6 - Pin2	Inverter Common	Inverter common NOTE – This is a signal reference point and not an earth ground.	Inverter common		
P6 - Pin 3	Rx	Receive data from the inverter Connects to Tx of inverter	Outdoor control communication receive pin		
P6 - Pin 4	Inv 5V	Inverter 5VDC volts	Inverter 5VDC volts		
DIS		Discharge Line temperature sensor - not used (10K ohm resistor installed)	N/A	N/A	N/A
DIS		Discharge Line temperature sensor - not used (10K ohm resistor installed)	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	N/A	N/A	N/A
COIL		Outdoor coil temperature sensor	N/A	N/A	N/A
CHRG MODE		Charge Mode function. Can be used when charging, checking charge, pump down or checking unit operation. Unit will run at 100% capacity. Conventional 24VAC heat pump thermostat - Cooling mode 1. Provide a Y1 compressor demand and a O Reversing Valve signal to the 4SHP22LX 2. Install the Charge Mode jumper (after the Y1 demand) 3. A blower demand must be provided to the indoor unit for 100% of the cooling air volume. 4. Remove the charge mode jumper to end the charge mode Conventional 24VAC Heat Pump Thermostat - Heating Mode 1. Provide a Y1 compressor heating demand (without an O demand) 2. Install the Charge Mode jumper (after the Y1 demand) 3. A blower demand must be provided to the indoor unit for 100% of the heating air volume. 4. Remove the charge mode jumper to end the charge mode. A3 Communicating Thermostat 1. Install the Charge Mode jumper 2. Unit will start and run at 100% capacity and communicate to the indoor unit to bring on the blower at 100% of the cooling air volume. 3. Remove the charge mode jumper to end the charge mode NOTE - If the charge mode jumper is in the ON position during power-up, it is ignored. NOTE - If the charge mode is left in place, it will be ignored after 60 minutes.			

Table 11. Outdoor Control Terminal Designations and Inputs / Outputs

WARNING - Electric Shock Hazard. Can cause injury or death. Unit must be grounded in accordance with national and local codes. The 4 pins in P6 have the potential of transferring up to 250 volts to the unit cabinet ground.				
Designator	**Description**	**Input**	**Output**	**Common**
Suction Pressure Out	Pressure transducer Supply Voltage Pin 1 of 3		5 VDC	
Suction Pressure In	Pressure transducer output voltage Pin 2 of 3	0.5-4.5 VDC		
Suction Pressure GND	Pressure transducer GND Pin 3 of 3			VDC Com
Liquid Pressure Out	Pressure transducer Supply Voltage Pin 1 of 3		5 VDC	
Liquid Pressure In	Pressure transducer Supply Voltage Pin 2 of 3	0.5-4.5 VDC		
Liquid Pressure GND	Pressure transducer GND Pin 3 of 3			VDC Com
SUCT1	Suction Line Temperature Sensor Supply - Pin 1 of 4	2.680k ohms to 327.3k ohms		
SUCT2	Suction Line Temperature Sensor Supply - Pin 2 of 4	2.680k ohms to 327.3k ohms		
LIQ1	Liquid Line Temperature Sensor Supply - Pin 3 of 4	2.680k ohms to 327.3k ohms		
LIQ2	Liquid Line Temperature Sensor Supply - Pin 4 of 4	2.680k ohms to 327.3k ohms		

Table 11. Outdoor Control Terminal Designations and Inputs / Outputs

Servicing Units Delivered Void of Charge

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

1. Leak test the system using the procedure outlined on Page 20.
2. Evacuate the system using procedure outlined on Page 20.
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 20.
5. Weigh in refrigerant using procedure outlined in Figure 54.
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**.

Start-Up

⚠ CAUTION

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 frozen bearings or binding.
2. Inspect all factory and field-installed wiring for loose connections.
3. After evacuation is complete, open liquid line and suction line service valves to release refrigerant charge (contained in outdoor unit) into system.
4. Replace the stem caps and secure finger tight, then tighten an additional 1/6 of a turn.
5. Check voltage supply at the disconnect switch. The voltage must be within the range listed on the unit nameplate. If not, do not start equipment until the power company has been consulted and the voltage condition corrected.
6. Set thermostat for cooling demand, turn on power to indoor blower, and close the outdoor unit disconnect switch to start the unit.
7. Recheck unit voltage with unit running. Power must be within range shown on unit nameplate.

7-Segment Alert and System Status Codes

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

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

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

Resetting Alert Codes

Alert codes can be reset manually or automatically:

Manual Reset

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

1. Disconnecting R wire from the outdoor control R terminal.
2. Turning the indoor unit off and back on again
3. After power up, all currently displayed codes are cleared.

Automatic Reset

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

NOTE: *Error codes can be recalled by following information shown in the following table.*

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
N/A	N/A	ON	OFF	N/A	4SHP22LX124, -36 only: Indicates inverter is operating normally.		
N/A	N/A	ON	ON	N/A	4SHP22LX148, -60 only: Indicates inverter is operating normally.		
N/A	N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.		

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
105		N/A	N/A	Service Urgent	Communication Problem	One of the system components has lost communication with the system. The system component (device) is unable to communicate. • A3 - Access dealer control center, select notifications icon, review alert code details to determine which device or unit has the communication problem. Review both active and cleared alerts. • Zoning - Remove wire from Smart Hub to Comfort Sync® control and just have wiring from furnace. **Troubleshooting:** • Check each control for additional codes • In most cases issues are related to electrical noise. Verify that high voltage power is separated from the low voltage communication wires. • Check for proper grounding on line voltage and low voltage wiring, transformer and equipment. • Check for incorrectly wired or loose or spliced connections between system components (devices or units). • Make sure all unused wires are tied together and taken back to the C terminal on the indoor control board as shown in the installation and setup guide. • Disconnect all wiring to other system components (except thermostat to indoor unit) and reconnect one device at a time and recommission system each time a device is reconnected until the issue is located. • Zoning: If zoning is installed and is wired directly from Smart Hub to Comfort Sync® control then disconnect that wiring. Run control wiring from the Comfort Sync® control directly to the indoor unit control. Wiring diagrams are provided in the Comfort Sync® Zoning Installation and Setup Guide. • Float Switch: When using a float switch, use isolation relay to break common wire to outdoor unit. For testing purposes, remove float switch from the circuit. • Firmware and Accessories: Make sure that Smart Hub has correct firmware version for added accessory. If software is not updated in system it will cause system operation issues. • Inductive voltage from surrounding sources. Check each wire in AC mode to C on circuit board. > Good voltage is .03-.3VAC inductive voltage is not an issue. > Acceptable can be up to .7VAC with moderate success. > Some units have worked with up to 1.2VAC with occasional success. > Voltage over 1.2VAC needs to be addressed.	Automatically clears when the system detects the issue no longer exists.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
120		N/A	N/A	Service Soon	Unresponsive Device	There is a delay in the system component responding to the system. Typically this alert code does not cause any operational issues and will clear on its own. • This alert code is usually caused by a delay in the outdoor unit responding to the thermostat. • Leaking voltage from strands within the bundle. > Land only the **R** wire on the **R** terminal to load the bundle with 24VAC. ► Typically only the **R** wire needs to be landed to identify if voltage is leaking. ► If voltage is present checking the other wires is informational only but not needed. ► If voltage is not present checking the other wires one at a time would be needed. > Check each loose wire in AC mode to **C** on circuit board. ► Good voltage is .03 -.3VAC leaking voltage is not the issue. ► Acceptable can be up to .7VAC with moderate success. ► Some units have worked with up to 1.2VAC with occasional success. ► Voltage over 1.2VAC needs to be addressed.	Automatically clears after an unresponsive system component (device) responds to any inquiry.
124		N/A	N/A	Service Urgent	Tstat Lost Communication To Smarthub	The thermostat has lost communication with a system component for more than three minutes. System component has lost communication with the thermostat. • Check the wiring connections between components. • Ohm wires. • Cycle power. • Any component that is miss-wired may cause a false component code to be shown on system component. • Disconnect all wiring to other system components and check communication one at a time. ***NOTE:*** *When using a float switch, use isolation relay to break common wire to outdoor unit. For testing purposes, remove float switch from the circuit* This alert code stops all associated system operations and waits for a heartbeat message from the system component that is not communicating.	Automatically clears after communication is re-established with applicable system component (device).
125				Service Urgent	Control Hardware Problem	There is a hardware problem on a system component control. There is a control hardware problem. Replace the control if the problem prevents operation and is persistent.	Automatically clears five minutes after the issue no longer exists.
131							
132				Service Urgent	Device Control Software Fault	System component control software is corrupted. • Recycle power. • If failure re-occurs, replace the system component control.	Manual system power reset is required to recover from this alert code.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
180				Service Soon	Outdoor Temperature Sensor Problem	The thermostat has found a problem with the outdoor sensor in the outdoor unit or the optional outdoor sensor connected to the indoor unit. In normal operation after system component control recognizes sensors, the alert code will be sent if valid temperature reading is lost. • Compare outdoor sensor resistance to temperature / resistance charts in unit installation instructions. Replace sensor pack or stand alone outdoor sensor. • At the beginning of (any) configuration, furnace, air-handler control or equipment interface module will detect the presence of the sensor(s). • If detected (reading in range), appropriate feature will be set as 'installed' and shown in the 'About' screen.	Automatically clears upon configuration, or sensing normal values.
181				Service Soon	OD Suction Pressure Transducer Fault	• Suction Pressure Transducer reading above 4.75V or below 0.25V for 24hrs +/- 3hrs. Run on staged operation.	Resets after 3 consecutive readings that are in range.
182				Service Soon	OD Suction Temperature Sensor Fault	• Reading below 0.25V or above 4.75V for 24hrs +/- 3hrs. System will continue to operate normally.	Resets after 3 consecutive readings that are in range.
183				Service Soon	OD Liquid Pressure Sensor Fault	• Under 0.25V and above 4.75V readings for 24 hours +/-3hrs or more on the sensor will cause this error. • Continue normal operation, see sections related to low pressure switch emulation for specific details related to low pressure switch faults.	Resets after 3 consecutive readings that are in range.
345				Service Urgent	Relay O Failure	The **O** relay on the system component has failed. Either the pilot relay contacts did not close or the relay coil did not energize. • Possible **O** relay / stage 1 failure. • Pilot relay contacts did not close or the relay coil did not energize. • Replace system component (device) control. If error is applicable to any Allied Air variable capacity outdoor unit, the outdoor control will need to be replaced.	Automatically clears after the fault recovered following reset.
409				Service Soon	OD Control Board Low 24VAC	The secondary voltage for the applicable system component has fallen below 18VAC. This may be due to: • Secondary voltage is below 18VAC. • If this continues for 10 minutes, the thermostat will turn off the applicable system component.	Automatically clears after voltage is detected as higher than 20VAC for two seconds or after power reset.
410				Information Only-Dealer	OD Open Low Pressure Switch	Unit low pressure is below the required limit. • Check operating pressures. • Low pressure switch opens at a specific pressure (system shuts down) and closes at a specific pressure (system restarts).	Automatically clears when the system detects that the issue no longer exists.
411				Service Urgent	OD Low Pressure Switch Strikes Lockout	The low pressure switch has opened five times during one cooling or heating demand. • Thermostat will shut down the outdoor unit. • Open low pressure switch error count reached five strikes. • Check system charge using both approach and sub-cooling methods. • Reset by putting outdoor unit control in test mode or resetting low voltage power.	Automatically clears when the system detects that the issue no longer exists.
412				Information Only-Dealer	OD Open High Pressure Switch	The unit high pressure is above the upper limit. • System will shut down. • Confirm that the system is properly charged with refrigerant. • Check condenser fan motor, expansion valve (if installed), indoor unit blower motor, stuck reversing valve or clogged refrigerant filter. • Confirm that the outdoor unit is clean.	Automatically clears after the high pressure switch closes or a power reset.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
413				Service Urgent	OD High Pressure Switch Strikes Lockout	The high pressure switch has opened five times during one cooling demand. • Thermostat will shut down the outdoor unit. • Open high pressure switch error count reached five strikes. • Check system charge using superheat and sub-cooling temperatures. • Check outdoor fan operation. • Check for dirt or debris blocking air flow to outdoor unit. • Reset by putting outdoor unit control in test mode or resetting low voltage power.	Automatically clears when the system detects that the issue no longer exists.
416				Service Soon	OD Coil Sensor Faulty	The outdoor coil sensor is either open, short-circuited or the temperature is out of sensor range. • Outdoor unit control will not perform demand or time / temperature defrost operation. (System will still heat or cool.) • This fault is detected by allowing the unit to run for 90 seconds before checking sensor resistance. If the sensor resistance is not within range after 90 seconds, the control will display a moderate code. • Advances from moderate to critical after ten (10) minutes. • Plug-in sensor harness correctly. • Check resistance of sensor to determine if it is open, shorted, out of temperature calibration or out of ambient temperature range. Replace if out-of-specifications.	Automatically clears when outdoor unit control detects proper sensor readings. If sensor is faulty and the system is reporting the condition as critical, replaced sensor. Reset power to clear alert code.
422				Service Soon	OD Compressor Top Cap Switch Open	Compressor top cap switch exceeding thermal limit. • Check condenser fan motor, TXV and indoor unit blower motor. • Check for stuck reversing valve or clogged refrigerant filter. • Check to ensure that one of the wires from the top cap switch has not been disconnected from one of the **TP** terminals on the outdoor control. Reconnect wire if disconnected. • Check superheat and sub-cooling.	Automatically clears when error is corrected.
423	40	4 flashes	OFF	Service Soon/ Service Urgent	OD Inverter CT Circuit Fault	The inverter has detected a circuit issue. • When this condition is detected the outdoor control will stop outdoor unit operations and start the anti-short cycle timer – moderate condition. • Outdoor control will lockout unit after 10 strikes within an hour – critical condition. • Inverter LEDs will flash code 40 • Refer to the unit service documentation for troubleshooting procedures. **Inverter flash code 40:** The sequence is: Red LED: Four Flashes Green LED: Off ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	A moderate alert code will clear automatically when the inverter detects the condition no longer exist and will send a clear alert code message. To clear critical alert code disconnect power to outdoor unit and restart.
424				Service Soon	OD Liquid Line Sensor Faulty	The liquid line temperature sensor has malfunctioned. • In normal operation after outdoor control recognizes sensors, the alert code will be sent if a 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 will detect the presence of the sensor(s). • If detected (reading in range), appropriate feature will be set as 'installed' and shown in the thermostat 'About' screen.	Automatically clears upon configuration, or sensing normal values.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
426				Service Urgent	OD Excessive Inverter Alarms	After 10 faults within 60 consecutive minutes, the control will lockout. Inverter will flash codes 12 to 14 and 53. ***NOTE:*** *These inverter codes do not count towards this lockout condition.*	To clear disconnect power to outdoor control and restart.
427	21	2 flashes	1 flash	Service Soon/ Service Urgent	OD Inverter DC Peak Fault	The inverter has detected a DC peak fault condition. • If condition (55A or higher) is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If peak current (55A or higher) occurs 10 times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 21. • If the unit is a variable capacity heat pump, this error may occur entering or exiting a defrost cycle as the compressor restarts after the 30 second compressor shift delay. If the unit was manufactured prior to serial number 5817F and has frequent alert code 427, then compare the inverter part number to the latest part number listed in the unit repair parts. Units produced after serial number 5817F which is listed on the unit name plate have an inverter with updated software that includes compressor current slope logic to reduce the potential of alert code 427 instances from occurring during defrost. Replace the inverter with the latest inverter if necessary. • Refer to the unit service documentation for detailed troubleshooting procedures. ***NOTE:*** *Serial number format on unit name plate is PPYYMNNNNN (PP = Manufacturing Plant, YY and M represents the year and month made.* **Inverter flash code 21.** The sequence is: • Red LED: Two Flashes • Green LED: One Flash ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect and reconnect power to outdoor control.
428	22	2 flashes	2 flashes	Service Soon/ Service Urgent	OD Inverter High Main Input Current	The inverter has detected a high main input current condition. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If condition occurs 10 times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 22. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 22.** The sequence is: • Red LED: Two Flashes • Green LED: Two Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect power to outdoor unit and restart.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
429	23	2 flashes	3 flashes	Service Soon/ Service Urgent	OD Inverter DC Link Low Voltage	The inverter has detected a DC link low voltage condition. • 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) – moderate condition. • An anti-short cycle timer is initiated. If condition occurs 10 times within a 60 consecutive minutes, system will lock out and display alert code 429 – critical condition. • The outdoor control anti-short cycle timer will time out and the unit will recycle the demand. • Inverter LEDs will flash code 23. • Refer to the unit service documentation for detailed troubleshooting procedures. Perform test function and verify inverter DC link and line input voltage and current. Also check input to filter board and reactor before replacing inverter board. **Inverter flash code 23.** The sequence is: • Red LED: Two Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* **Troubleshooting Suggestions:** • **Check wire connections (U, V and W) at inverter plug in harness and compressor.** • **Check the resistance of compressor windings. If not in range, replace compressor.** • Check compressor to ground. If ground issue, replace compressor. • Check input power (Single Phase - 208/230VAC ± 10%. If out of range, correct main power issue. • Check DC Link voltage and MICOM Sensing voltage. If out of range, replace inverter. if okay, possible mechanical issue with compressor. Go to outdoor unit service manual for detail troubleshooting procedures and require values for testing DC link voltages and various insulation resistance characteristics.	Automatically clears when the system detects that the issue no longer exists.
430	26	2 flashes	6 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Startup Fail	Compressor start-up failure. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 26. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 26.** The sequence is: • Red LED: Two Flashes • Green LED: Six Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* • Check refrigerant • Replace outdoor control board • Replace inverter.	To clear, disconnect power to outdoor unit and restart.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
431	27	2 flashes	7 flashes	Service Soon/ Service Urgent	OD Inverter PFC Fault	The inverter has detected a PFC circuit over-current condition. • Error occurs when PFC detects an over current condition of 100A peak. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle timer is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 27. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 27.** The sequence is: • Red LED: Two Flashes • Green LED: Seven Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect power to outdoor unit and restart.
432	28	2 flashes	8 flashes	Service Soon/ Service Urgent	OD Inverter DC Link High Voltage	The inverter has detected a DC link high voltage condition. • Error occurs when the DC link capacitor voltage is greater than 480 VDC. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle timer is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 28. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 28.,** The sequence is: • Red LED: Two Flashes • Green LED: Eight Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* **Troubleshooting Suggestions:** • Check wire connections (U, V and W) at inverter plug in harness and compressor. • Check the resistance of compressor windings. If not in range, replace compressor. • Check compressor to ground. If ground issue, replace compressor. • Check input power (Single Phase - 208/230VAC ± 10%. If out of range, correct main power issue. • Check DC Link voltage and MICOM Sensing voltage. If out of range, replace inverter. if okay, possible mechanical issue with compressor. Go to outdoor unit service manual for detail troubleshooting procedures and require values for testing DC link voltages and various insulation resistance characteristics.	To clear, disconnect power to outdoor unit and restart.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
433	29	2 flashes	9 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Over-current	Compressor phase current is too high. • During initial startup, a six minute time delay is implement to prevent the alarm from occurring. • Error occurs when compressor peak phase current is greater than 28 amps. • Inverter will issue inverter code 14 first and slow down to try to reduce the current. • If the current remains high, outdoor unit will stop (compressor and fan) – moderate condition. • Cycle timer is initiated. • If condition occurs five times within 60 consecutive minutes, the system will lockout – critical condition. • This alert code may be triggered by the inverter or the Allied Air variable capacity outdoor (inverter controlled) unit. • Allied Air outdoor control may trigger an this alert code if the inverter reduces the compressor speed which is identified as a alert code 441 and the compressor speed (in hz) is below the minimum speed. This will typically occur at start-up. The inverter automatically increases the compressor minimum speed below 45ºF in the heating mode and above 115ºF ensure the compressor capacity is sufficient for oil return. If alert code 433 occurs and inverter does not indicate an inverter code 29, the Allied Air communicating Allied Air outdoor control triggered the alert code 433. • Inverter LEDs will flash code 29. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 29.** The sequence is: • Red LED: Two Flashes • Green LED: Nine Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear alert code disconnect power to both the indoor and outdoor units and then reconnect power. Restart system.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
434	53	5 flashes	3 flashes	Service Soon/ Service Urgent	OD Inverter Comm Error to Main Control	• Outdoor control has lost communications with the inverter continuously during a single thermostat call and one hour period. • Outdoor control will stop all compressor demands – moderate condition. • Indoor blower will stop functioning. ***NOTE:*** *Indoor blower will not run in test mode either when alert code 434 is active. Only after system reset will it operate.* • This alert code will occur if the outdoor unit power is turned off and the indoor unit power (24VAC to Allied Air outdoor control) remains on, or if the indoor unit power is turned off (24VAC to Allied Air outdoor control) and the outdoor unit power is on. This could occur while performing service or maintenance procedures on the indoor or outdoor unit. • The Allied Air outdoor control will attempt to re-establish communication to the inverter when the alert code 434 occurs by cycling the outdoor unit contactor off for two minutes. Upon energizing the contactor the Allied Air outdoor control will attempt to communicate to the inverter for three minutes. This process will be repeated three times in attempt to establish communication before locking out. • If the unit is locked out with a critical alert code 434, reset the system by cycling the outdoor unit power off and back on. Then cycle the indoor power off (24VAC to the Allied Air outdoor control) and then back on. • If this condition continuously occurs during a one hour period and during a single thermostat call, the outdoor unit will lock out and display alert code 434 – critical condition. **Troubleshooting Options:** • Check for loose or disconnected electrical connections. • Interruption of main power to inverter. • Inverter LEDs will flash code 53. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 53.** The sequence is: • Red LED: Five Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF*	Automatically clears when the system detects that the issue no longer exists. If the unit is locked out with a critical alert code 434, reset the system by first cycling the outdoor unit power off and back. Then cycle the indoor power off (24VAC to the Allied Air outdoor control) and then back on.
435	60	6 flashes	OFF	Service Urgent	OD Inverter EEPROM Checksum fault	Inverter internal error. • When this error occurs, the outdoor control will cycle power to the inverter by opening the contactor for two minutes – moderate condition. • Outdoor control will cycle power to the inverter three times and then outdoor unit is locked out – critical condition. • Inverter LEDs will flash code 60. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 60.** The sequence is: • Red LED: Six Flashes • Green LED: Off ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear alert code disconnect power to outdoor unit and restart.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

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Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
436	62	6 flashes	2 flashes	Service Soon/ Service Urgent	OD Inverter High Heat-Sink Temperature	Inverter heat sink temperature exceeded limit. • This occurs when the heat sink temperature exceeds the inverter limit. Inverter will issue inverter alert code 13 first and slow down to try to cool the heat sink. • If temperature remains high, outdoor unit will stop both compressor and fan – moderate condition. • Anti-short cycle is initiated. • If condition occurs five times within an hour, system will lockout – critical condition. • The screws that hold the inverter to the inverter board were loose causing poor contact between these two components. • Tighten screws that hold the heat sink to the inverter control board. ***NOTE:*** *Wait five minutes for all capacitors to discharge before checking screws.* • Inverter LEDs will flash code 62. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 62.** The sequence is: • Red LED: Six Flashes • Green LED: Two Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate condition will automatically clear when the inverter sends an alert code clear message. Critical condition is cleared by disconnecting power to the outdoor unit and restart.
437	65	6 flashes	5 flashes	Service Soon/ Service Urgent	OD Inverter Heat-Sink temp Sensor Fault	Heat sink temperature sensor fault has occurred (temperature less than 4ºF or greater than 264ºF after 10 minutes of operation). • When the temperature sensor detects a temperature less than 4ºF or greater than 264ºF after 10 minutes of operation. • Outdoor unit will stop both compressor and fan – moderate condition. • Anti-short cycle is initiated. • If condition occurs five times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 65. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 65.** The sequence is: • Red LED: Six Flashes • Green LED: Five Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate priority condition will automatically clear when the inverter sends an alert code clear message. Critical priority condition can be cleared by disconnecting and reconnecting power to outdoor unit to restart.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
438	73	7 flashes	3 flashes	Service Urgent	OD Inverter PFC Input Over-current	The inverter has detected a power factor correction (PFC) circuit over-current condition. • The inverter has detected an PFC over current condition. This may be caused by a high load condition, high pressure, or outdoor fan failure. • Outdoor control will display the code when the inverter has detected the error – moderate condition. • After three minutes, the inverter will reset and the compressor will resume operation. • If the error condition occurs 10 times within a 60 minute rolling time period, the outdoor unit control will lock out operation of the outdoor unit – critical condition. • Possible issue is system running at high pressures. • Check for high pressure trips or other alert codes in thermostat and outdoor control. • Inverter LEDs will flash code 73. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 73.** The sequence is: • Red LED: Seven Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate priority condition is automatically cleared when the inverter sends a clear message. Critical priority condition will automatically clear when inverter is power cycled.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
440	13	1 flash	3 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Heat-Sink temperature	Compressor slowdown due to high heat sink temperature. • 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. • The screws that hold the inverter to the inverter board may be loose causing poor contact between these two components. • Tighten screws that hold the heat sink to the inverter control board. ***NOTE:*** *Wait five minutes for all capacitors to discharge before checking screws.* • This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110ºF) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. • The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occur frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. • The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 185ºF and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 176ºF. The heat sink temperature, compressor speed in Hertz & the Inverter Compressor Speed Reduction status (“On” or “Off ”) notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center. • Inverter LEDs will flash code 13. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 13.** The sequence is: • Red LED: One Flash • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.

Table 12. Alert Codes and Troubleshooting

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
441	14	1 flash	4 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Compressor Current	This alert code is for more information than an issue with the system. • When the inverter gets close to the current or heat sink temperature limit, it will limit the ramp rate. Instead of changing compressor speed at 1 hz/second, it changes to 5 hz/20 seconds. • Compressor slowdown due to high compressor current. • Compressor current is approaching limit. • The compressor speed automatically slows. • This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor current increases rapidly during startup. • The inverter will reduce the compressor speed by 4 Hz and slow the compressor ramp up speed to the requested compressor demand speed (capacity). This is normal and expected operation of the inverter to control the inverter within design parameters. In most cases the alert code 441 notification does not require any additional service or diagnostic procedures. • The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. • Possible issue is system running at high pressures. • Check for high pressure trips or other alert codes in thermostat and outdoor control. • Inverter LEDs will flash code 14. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 14.** The sequence is: • Red LED: One Flash • Green LED: Four Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.
442				Service Urgent	OD Compressor Top Cap Switch Strikes Lockout	The top cap switch has opened five times within one hour. As a result, the outdoor unit is locked out. • This condition occurs when compressor thermal protection sensor opens five times within one hour. • Outdoor unit will stop.	To clear, disconnect power to outdoor unit and restart.
443				Service Urgent	OD MUC Unit Code To Inverter Model Mismatch	The Allied Air variable capacity unitary control (outdoor control) has incorrect appliance unit size code selected. • Check for proper configuring under unit size code used for outdoor unit (see unit configuration guide or in installation instructions). • If replacing inverter, verify inverter model matches unit size. • Remove the thermostat from the system while applying power and reprogramming.	Automatically clears after the correct match is detected following a power reset.
600				Information Only-Dealer	Load Shed Event	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 24VAC power across the **L** and **C** terminals on the outdoor control	Automatically clears when L terminal is inactive.
601				Information Only-Dealer	OD Unit Low Ambient Operational Lockout	• Outdoor unit has been cycled off on low temperature protection. • Outdoor unit will not operate when the outdoor ambient is at or below 4°F (-15.6°C). • If the unit is satisfying a demand (running) and the outdoor ambient drops below 4°F (-15.6°C), the unit will continue to operate until the demand has been satisfied or the outdoor ambient drops to 15°F (-9.4°C) which will result in the unit being locked out (shut down).	Automatically clears when low temperature condition no longer exists.

Table 12. Alert Codes and Troubleshooting

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.

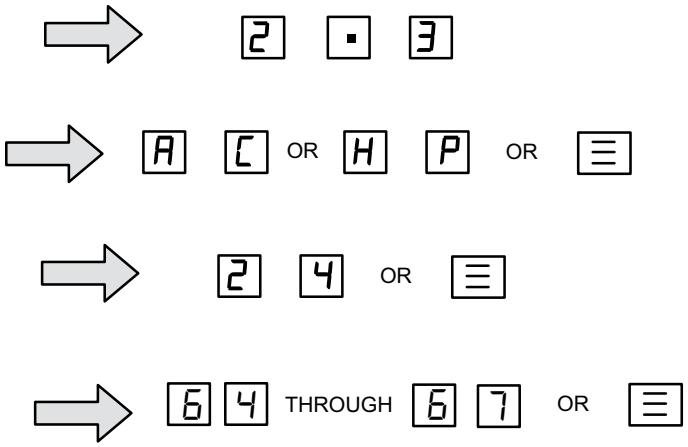
UNIT TYPE: The next item displayed is the self discovery unit type. AC = air conditioner and HP = heat pump. If the unit type cannot be determined, three bars appear.

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	
64	2-TON HEAT PUMP	4SHP22LX124
65	3-TON HEAT PUMP	4SHP22LX136
66	4-TON HEAT PUMP	4SHP22LX148
67	5-TON HEAT PUMP	4SHP22LX160

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

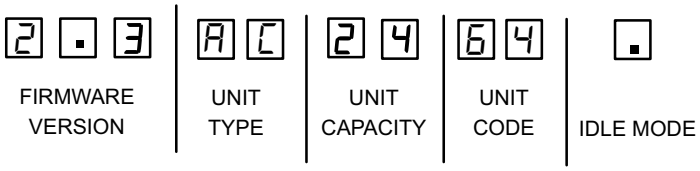


Figure 19. Outdoor Control 7-Segment Unit Status Displays

Description	Example of Display
Idle Mode: Decimal point flashes at 1 Hz.	**Idle Mode**: Decimal point flashes at 1 Hz (0.5 second on, 0.5 second off). Display OFF.
Soft Disable Mode: Top and bottom horizontal line and decimal point flash at 1 Hz. If indoor or outdoor control displays Soft Disable code: 1) Confirm proper wiring between all devices (thermostat, indoor and outdoor). 2) Cycle power to the control that is displaying the Soft Disable code. 3) Put the room thermostat through Setup. 4) Go to Setup/System Devices/Thermostat/Edit/push Reset. 5) Go to Setup/System Devices/Thermostat/Edit/push Reset All. If the room thermostat detects a new device or a device that is not communicating, it sends a Soft Disable. When this occurs, Alarm 10 is activated and the room thermostat sends a Soft Disable command to the offending device on the bus (outdoor control, IFC, AHC, EIM or Damper Control Module).	**Soft Disable Mode**: Top and bottom horizontal line and decimal point flash at 1 Hz (0.5 second on, 0.5 second off). The control in Soft Disable Mode is indicated by the following: • On AHC, IFC and outdoor controls, Soft Disable Mode is indicated by flashing double horizontal lines on the 7-segment display. • On the Damper Control Module and EIM, the green LED will blink 3 seconds on and 1 second off.
O.E.M. Test Mode	All segments flashing at 2 Hz (unless error is detected). NOTE - Control should be replaced.
Anti-Short-Cycle Delay	The middle line flashes at 1 Hz for 2 seconds, followed by a 2-second display of the number of minutes left on the timer (value is rounded up: 2 min. 1 sec. is displayed as 3). If activated, the anti-short cycle delay time remaining is displayed (default is 300 sec./5 min.).
Cooling Capacity: Shows cooling stage C1 or C2 operating if non-communicating. Shows cooling capacity percentage i.e. C70 operating if installed with a A3 communicating thermostat. Example to the right indicates a cooling demand of 50 percent.	Cooling compressor capacity (1second on, 0.5 second off) followed by ambient temperature. 24 VAC non-Communicating thermostat with second stage cooling active and ambient of 95F : C 2 pause A 9 5 repeat. A3 communicating thermostat with 70% demand and ambinet of 95F: C 7 0 pause A 9 5 Repeat C 5 0 pause A 7 6
Diagnostic recall: Shows the last 10 stored diagnostic error codes.	If first error is E 2 5 0, second E 2 3 1 pause E 2 5 0 pause E 2 3 1 Next codes (up to 10) are shown using same method.
Fault memory clears	If there are no error codes stored: E pause 0 0 0. After the fault memory is cleared, the following string flashes every 0.5 seconds: 0 0 0 0 pause
Active error in outdoor control Idle mode: Show all active error(s) codes.	Following display string is repeated if Error E 125 and E 201 are present: E 1 2 5 pause E 2 0 1
Active error in run mode: Show current status and all active error(s) codes.	Following display string is repeated if Error E 440 is present while cooling demand is 80 percent: C 8 0 pause E 4 4 0
Outdoor Ambient Temperature (OAT): Any time OAT is within operating range, value is displayed if unit is in diagnostic and non-diagnostic modes.	Following display string is repeated if cooling is active and OAT is 104°F: C 3 5 pause A 1 0 4 pause
Liquid Line Temperature (LIQ): Any time LIQ is sensed in operating range, value is displayed if unit is in diagnostic mode or manually enabled for non-diagnostic modes.	Following display string is repeated if cooling is active and LIQ is 105°F: C 3 1 pause L 1 0 5 pause

Table 13. Outdoor Control 7-Segment Unit Status Displays

Description	Example of Display
Charge Mode: When unit is in the charge mode, Suction pressure (SPxxx), Suction Temp (Stxx.x), Superheat (SHxx.x), Liquid pressure (LPxxx), Liquid Temp (Ltxx.x) and subcooling (SCxx.x) will be scrolled on the 7-segment display	The following string is repeated: S P 135 pause S t 62 pause S H 15 pause L P 345 pause L t 96 pause S C 10 Repeat

Table 13. Outdoor Control 7-Segment Unit Status Displays

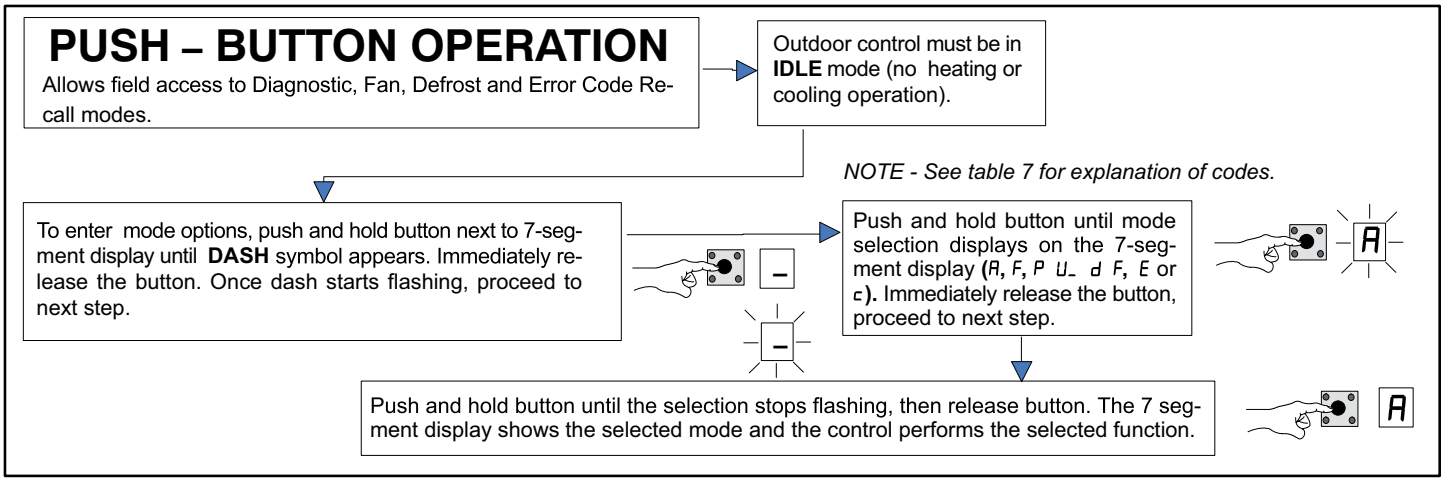


Figure 20. Push-Button Operation

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 23. When the desired unit selection code appears, press and hold the button until it stops flashing, then release.

Unit Code	Unit Type	Unit Model
64	2-ton heat pump	-24
65	3-ton heat pump	-36
66	4-ton heat pump	-48
67	5-ton heat pump	-60

Table 14.

Idle mode – System is energized with no demand – Decimal flashes at 1 Hertz > 0.5 second ON. 0.5 second OFF		
Display Symbol or Character	**Display**	**Fan Test and Display String Option**
Displayed during start-up or power recycling	Display string shows outdoor control firmware version I _ 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	Indicates cooling Capacity. C1 or C2 for conventional 24VAC thermostat or demand percentage if A3 communicating thermostat is used i.e. C 9 0	
F	Indicates you are in the outdoor fan test mode	**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 will initiate outdoor fan operation. Outdoor fan cycles ON for 10 minutes at the highest speed. To exit test – Push and hold button until three horizontal bars display. Release button, outdoor fan cycles **OFF**.
A	A in the display string represents the ambient temperature in °F at the sensor on the outdoor unit.	**Control can be in Idle or demand mode**: To enter display configuration option - 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) and 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.*

Table 15.

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 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 hold 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.

Table 16.

Field Test Mode Operation

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

Diagnostic Mode

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

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

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

Outdoor Fan Mode

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

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

Charge Mode Operation

To initiate the 4SHP22LX Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

4SHP22LX Charge Mode Operation with an A3 Communicating Thermostat

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

4SHP22LX Charge Mode Operation with a Conventional 24VAC Non-Communicating Thermostat

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 cooling demand to the 4SHP22LX to initiate the Charge Mode. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 Cooling demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

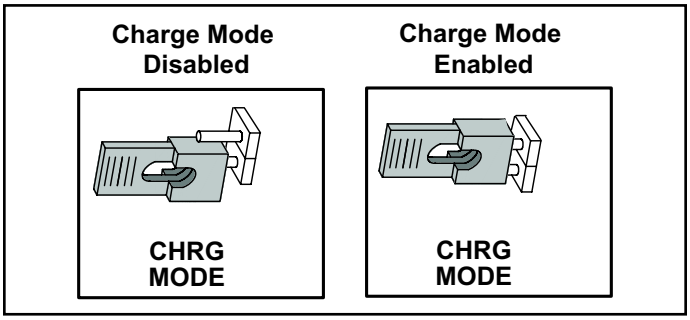


Figure 21.

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 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 F	Starts outdoor fan.
String P U	Enter unit code programming.
String d F	Enters Forced Defrost Mode (Provides Defrost Test: Initiates a Forced Defrost to Defrost the outdoor coil) See Defrost Test on Page 30.

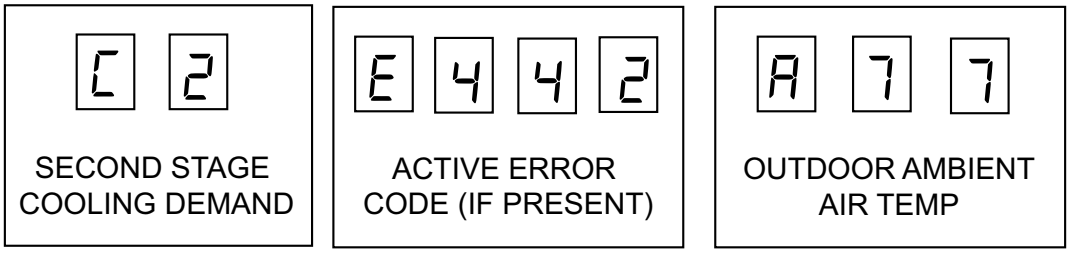
*No change indicates the display will continue to show whatever is currently being displayed for normal operations.
**Note once the error history is deleted it cannot be recovered. After the history is deleted, the unit will reset itself.

Table 17. Field Test, Diagnostic Recall and Program Menu Options

Display	Display and Action (normal operation)
.	Idle mode — decimal flashes at 1 Hertz > 0.5 second ON, 0.5 second OFF
C	Cooling operation. Shows cooling stage C1 or C2 operating if non-communicating. Shows cooling capacity percentage i.e. C 7 0 operating if installed with a A3 communicating thermostat. Example: C 2 0 pause A 7 5
E	E in the display string represents the active error code(s) in the outdoor unit. Example: C 5 0 pause E 4 4 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 A 7 5
Scrolling	When unit is in the charge mode, Suction pressure (SPxxx), Suction Temp (Stxx.x), Superheat (SHxx.x), Liquid pressure (LPxxx), Liquid Temp (Ltxx.x) and subcooling (SCxx.x) will be scrolled on the 7-segement display. Example: S P 1 3 5 pause S t 6 2 pause S H 1 5 pause L P 3 4 5 pause L t 9 6 pause S C 1 0 Repeat

Table 18.

TYPICAL 7-SEGMENT ACTIVE COOLING DEMAND DISPLAY STRING



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

Figure 22. Typical 7-Segment Demand Display String

Configuring Unit

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

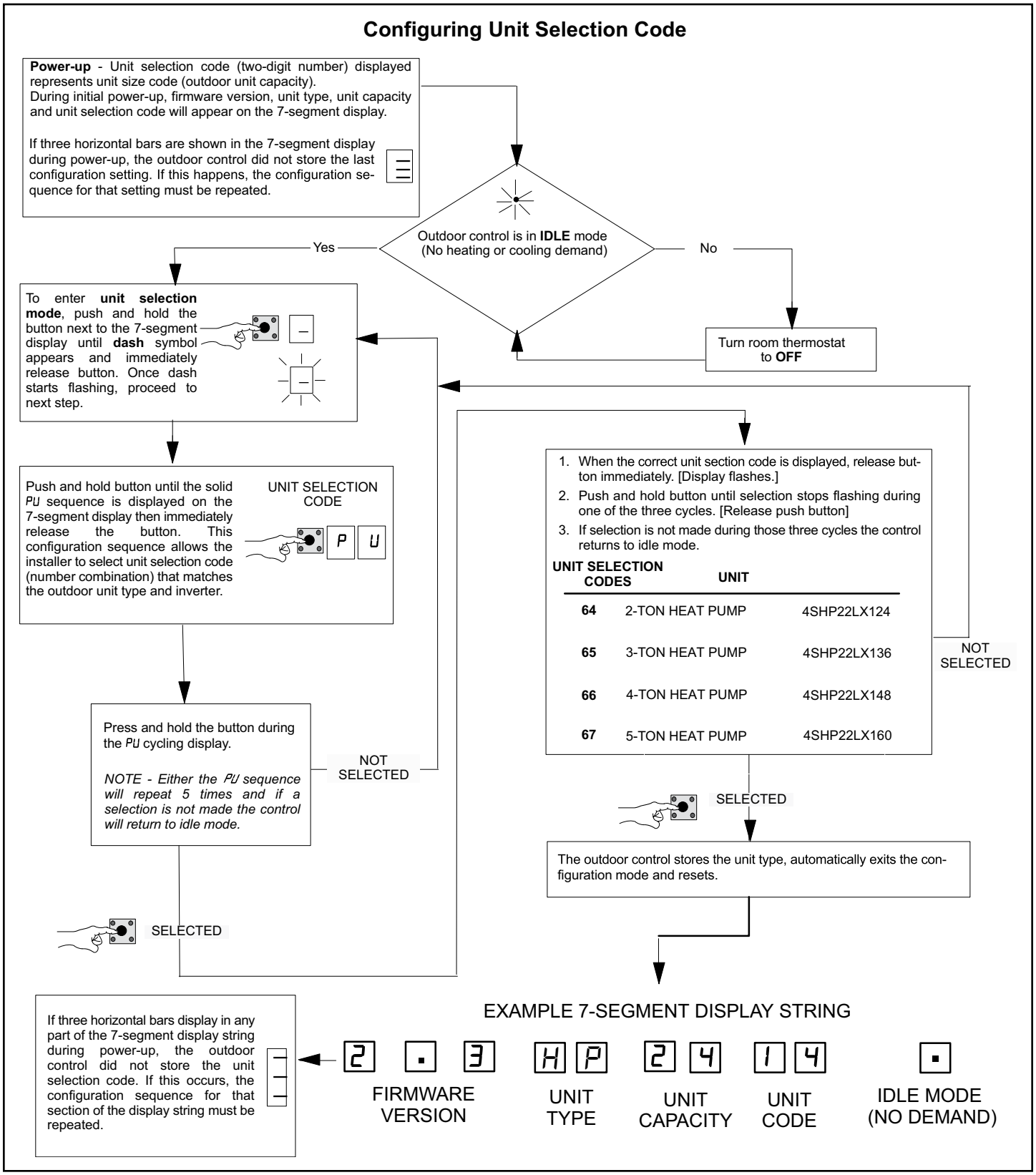


Figure 23. Configuring Unit Selection Code

Reconfiguring Outdoor Control using A3 Thermostat

Reconfiguring only applies to 4SHP22LX units installed as a fully communicating system with an A3 thermostat and communicating indoor unit.

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

System Overview

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

The outdoor control provides the following functions:

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

Compressor Protection – Five-Strike Lockout

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

Resetting Five-Strike Lockout

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

Diagnostic Information - Installations with A3 Thermostat

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

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

Installer Test - Installations with A3 Thermostat

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

Compressor Short Cycling Delay

The outdoor control protects the compressor from:

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

The delay is set by default for 300 seconds (five minutes) but can be changed through the thermostat interface (A3 thermostat installations only).

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

Crankcase Heater (HR1)

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

Crankcase Heater Thermostat (S40)

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

Defrost Function

The outdoor unit control uses a time dependent frost accumulation duration demand defrost control algorithm to provide a demand defrost when the system falls below optimum levels. The demand defrost control algorithm is reactive based upon the previous heat pump run time between defrost cycles (frost accumulation time) and the time spend in defrost (defrost time). The outdoor unit control monitors ambient temperature, outdoor coil temperature along with the compressor run time in heating mode and defrost cycle time. The outdoor unit control monitors compressor run time in the heating mode when the

outdoor coil temperature is below 35°F and accumulates the frost accumulation time. Once the frost accumulation time is met the unit control will initiate a defrost cycle. The unit will run in the defrost mode until the coil temperature reaches the defrost termination temperature setpoint. The maximum length of defrost cycle is 14 minutes and the defrost cycle will automatically be terminated if the defrost cycle exceeds 14 minutes.

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

Frost Accumulation Time

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

Defrost Cycle Time

The defrost cycle time is the amount of time the unit operates in the defrost mode from the point the defrost cycle was initiated until the coil temperature reaches 50°F regardless of defrost termination temperature setpoint. The demand defrost control target defrost cycle time is unique for each 4SHP22LX heat pump model. The target defrost cycle time of 4SHP22LX124 is 100s, 4SHP22LX136 is 133s, 4SHP22LX148 is 105s, 4SHP22LX160 is 102s.

Defrost Termination Temperature

The defrost termination temperature is adjustable on the unit control using the jumper pins. If an A3 thermostat is used, this parameter may be selected at the thermostat using the dealer control center under the heat pump. The defrost termination setting selections are 50, 70, 90 and 100°F. The factory default setting is 50°F (10°C). The defrost termination temperature is monitored by the coil sensor which is located at the outlet of the outdoor expansion valve. See coil sensor location in Figure 24 for details.

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

Additional Adjustable Defrost Parameters – S40 Thermostat Only

4SHP22LX systems installed with an S40 Smart Thermostat have additional adjustable defrost parameters that may be set by the technician.

- Defrost Time Adder – Range 5 – 60 minutes – default 30 minutes
- Defrost Time Reducer – Range 5 – 60 minutes – default 30 minutes
- Default Frost Accumulation Time – Range 30 – 360 minutes – default 90 minutes
- Defrost Time Increase Value – Range 0% to 100% – default 80%
- Defrost Time Decrease Value – Range 100% to 200% – default 120%
- Defrost Time Reset Limit – Range 150% to 400% – default 200%
- Nominal Defrost Time – Range 20 – 840 seconds – default 4SHP22LX124 – 100s, 36 – 133s, 48 – 105s, 60 – 102s

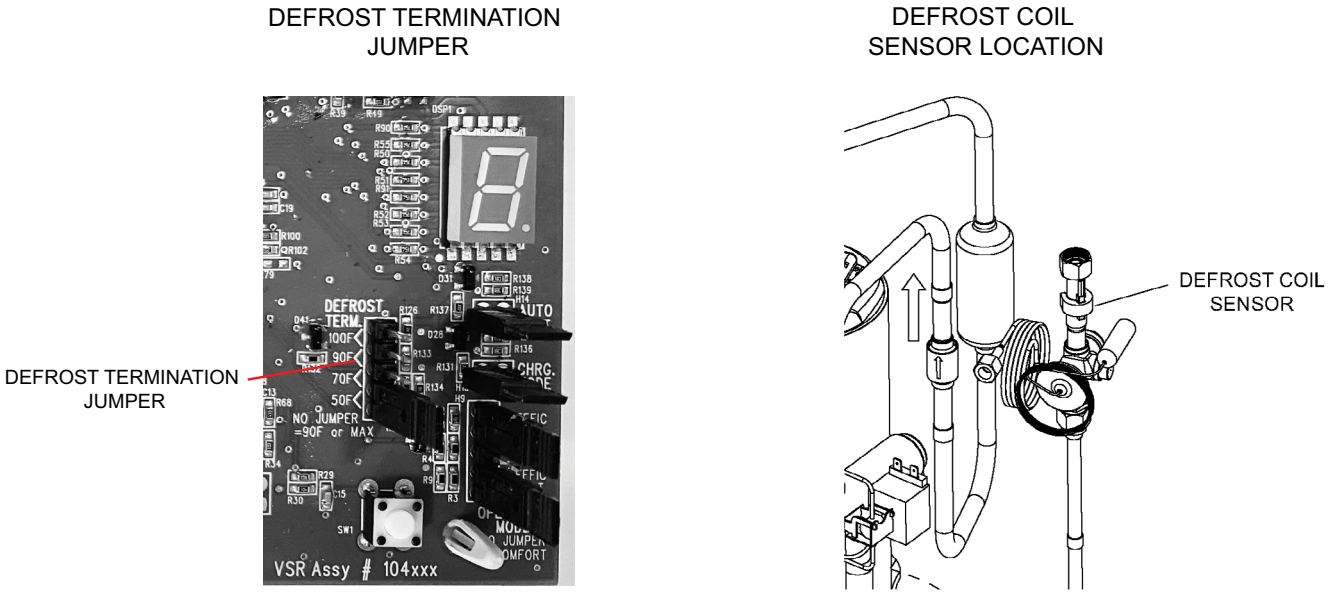


Figure 24. Defrost Components

Maintenance

Outdoor Unit

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

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

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

Outdoor Coil

It may be necessary to flush the outdoor coil more frequently if it is exposed to substances which are corrosive or which block airflow across the coil (e.g., pet urine, cottonwood seeds, fertilizers, fluids that may contain high levels of corrosive chemicals such as salts).

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

Indoor Unit

1. Clean or change filters.
2. Blower motors are factory-lubricated and permanently sealed. No more lubrication is needed.
3. Adjust blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
4. Check all wiring for loose connections.
5. Check for correct voltage at unit. (blower operating)
6. Check amp draw on blower motor.

Indoor Coil

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

Unit Wiring Diagram

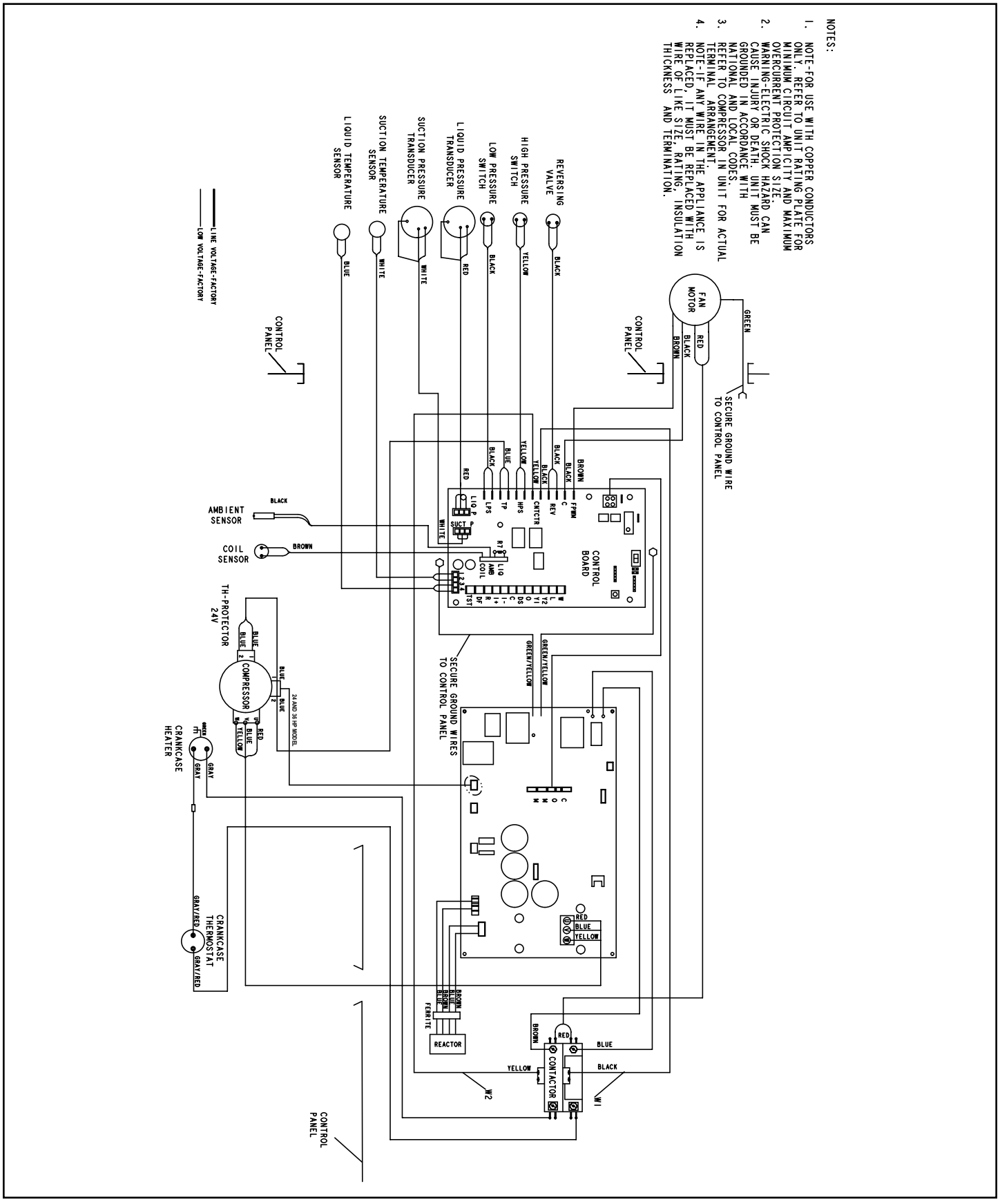


Figure 25. Wiring Diagram

Unit Sequence of Operation

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

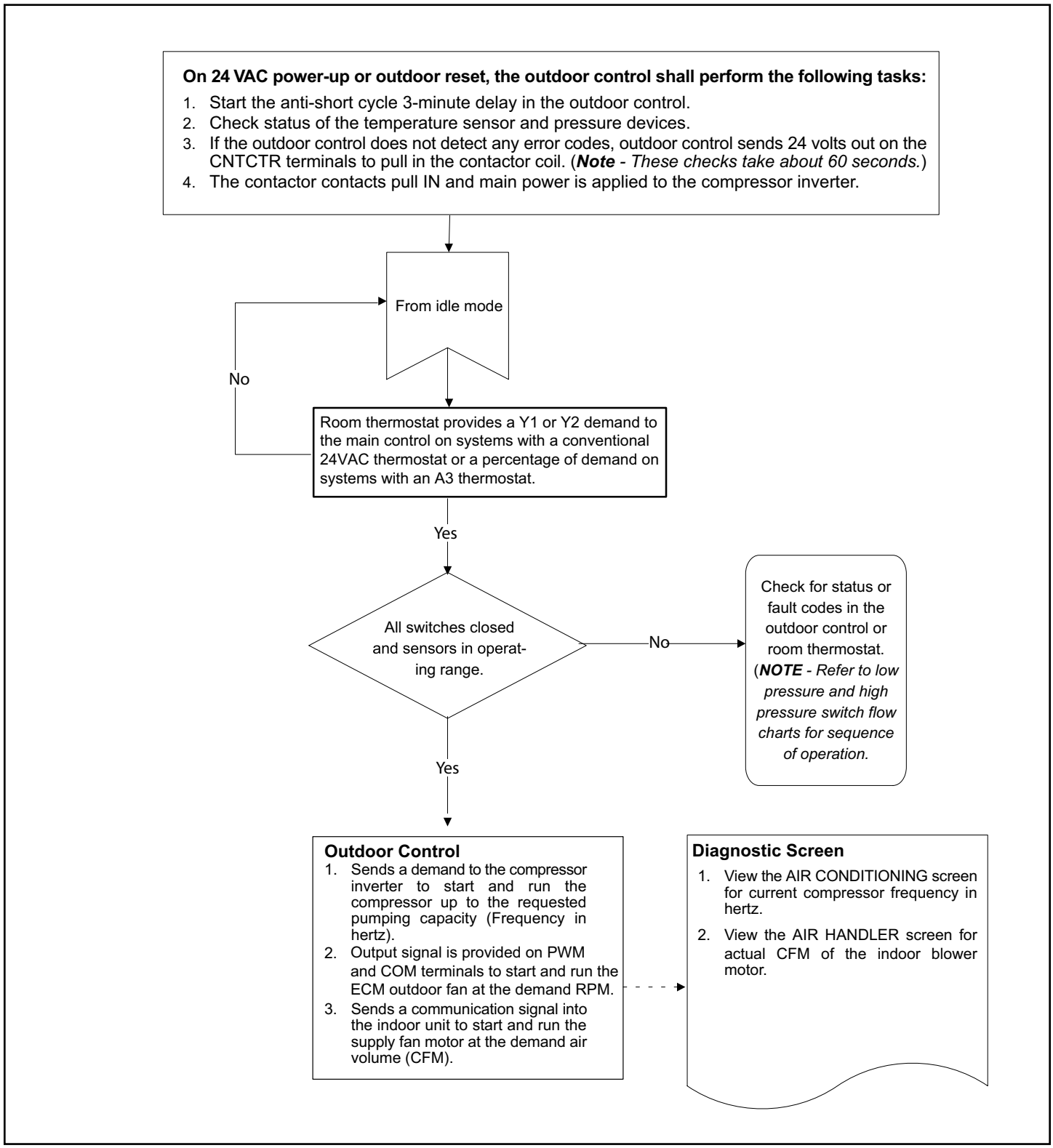


Figure 26. Volt Power-Up or Outdoor Reset

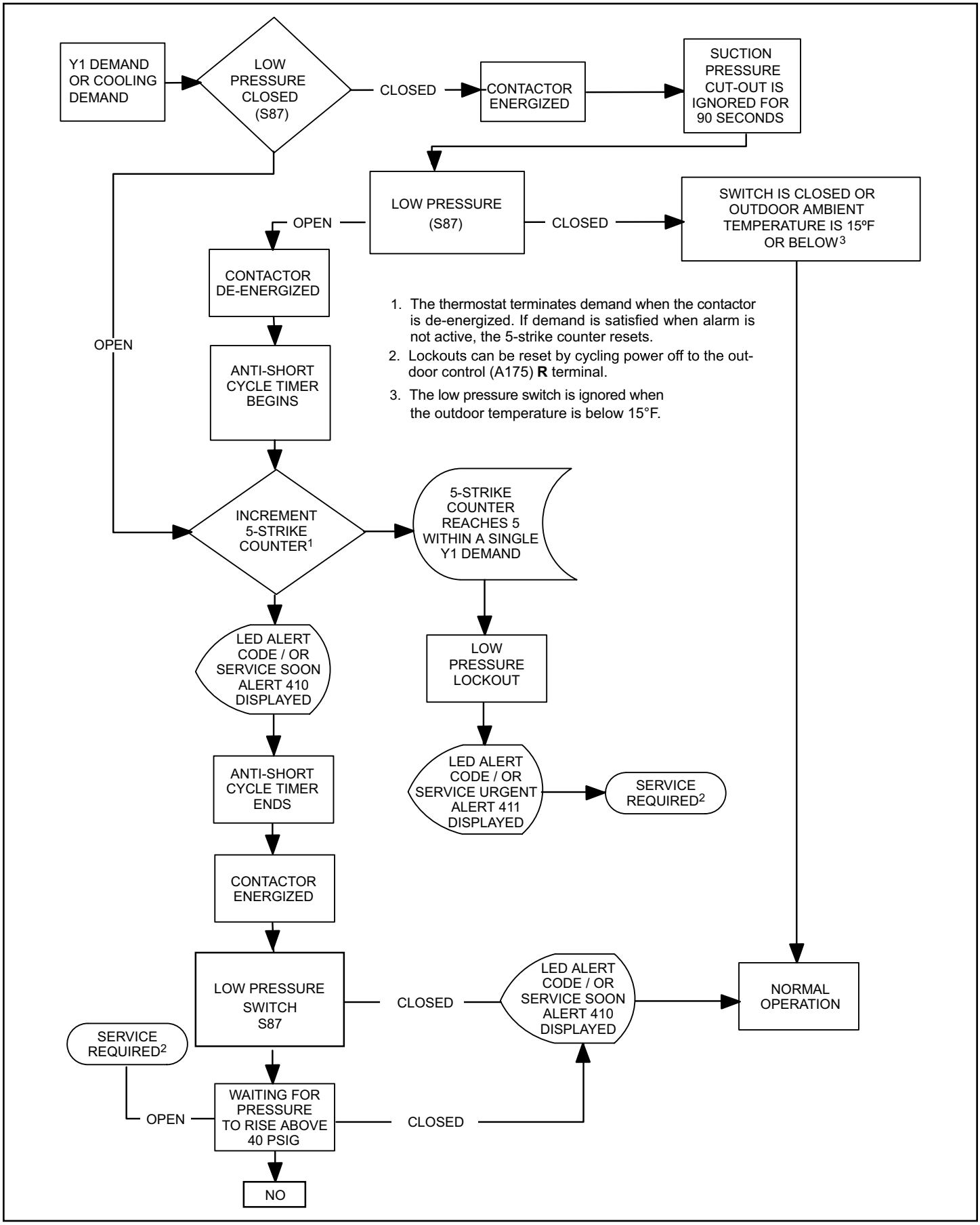


Figure 27. Low Pressure Switch (S87) Sequence of Operation (All Units)

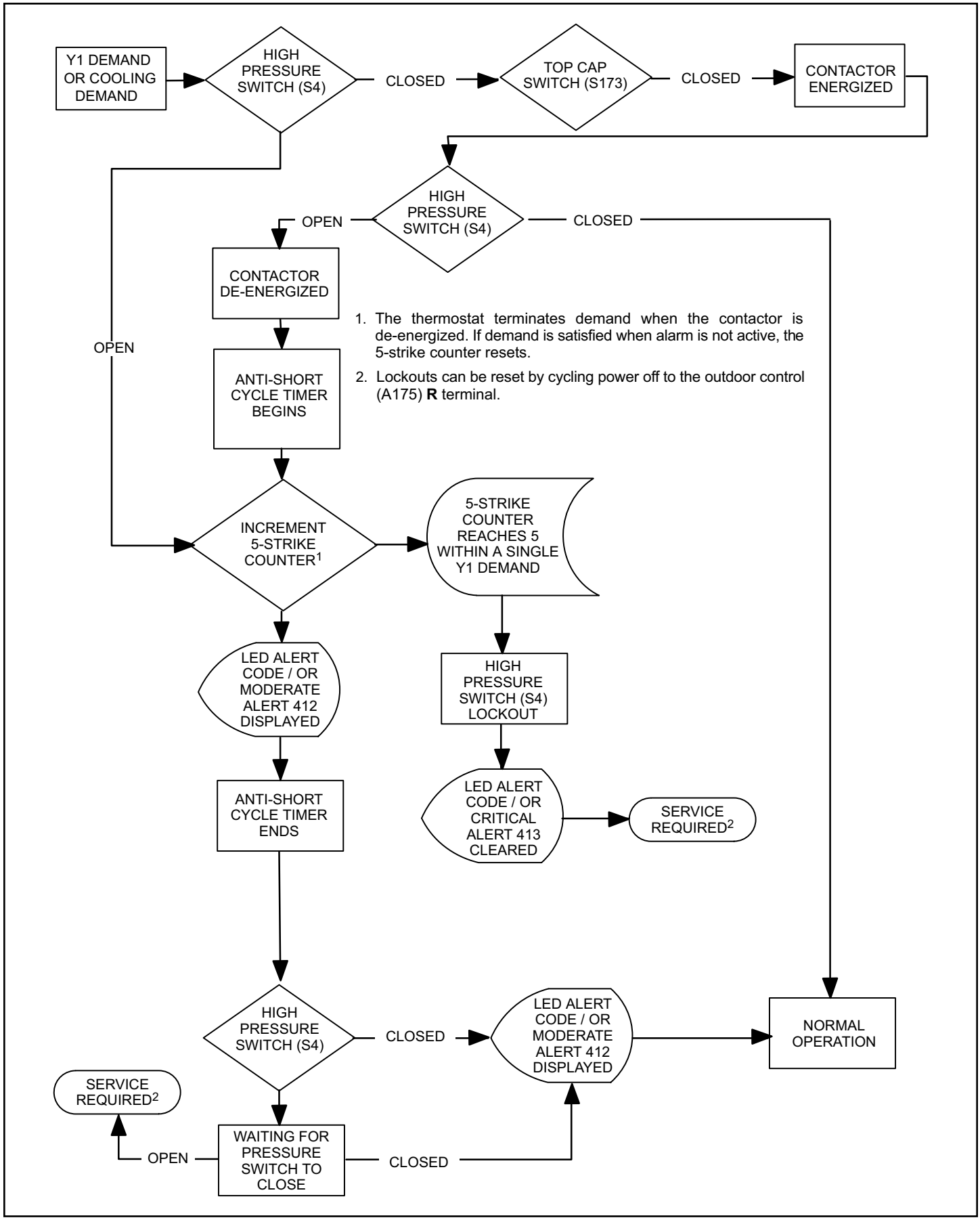


Figure 28. High Pressure Switch (S4) Sequence of Operation (All Versions)

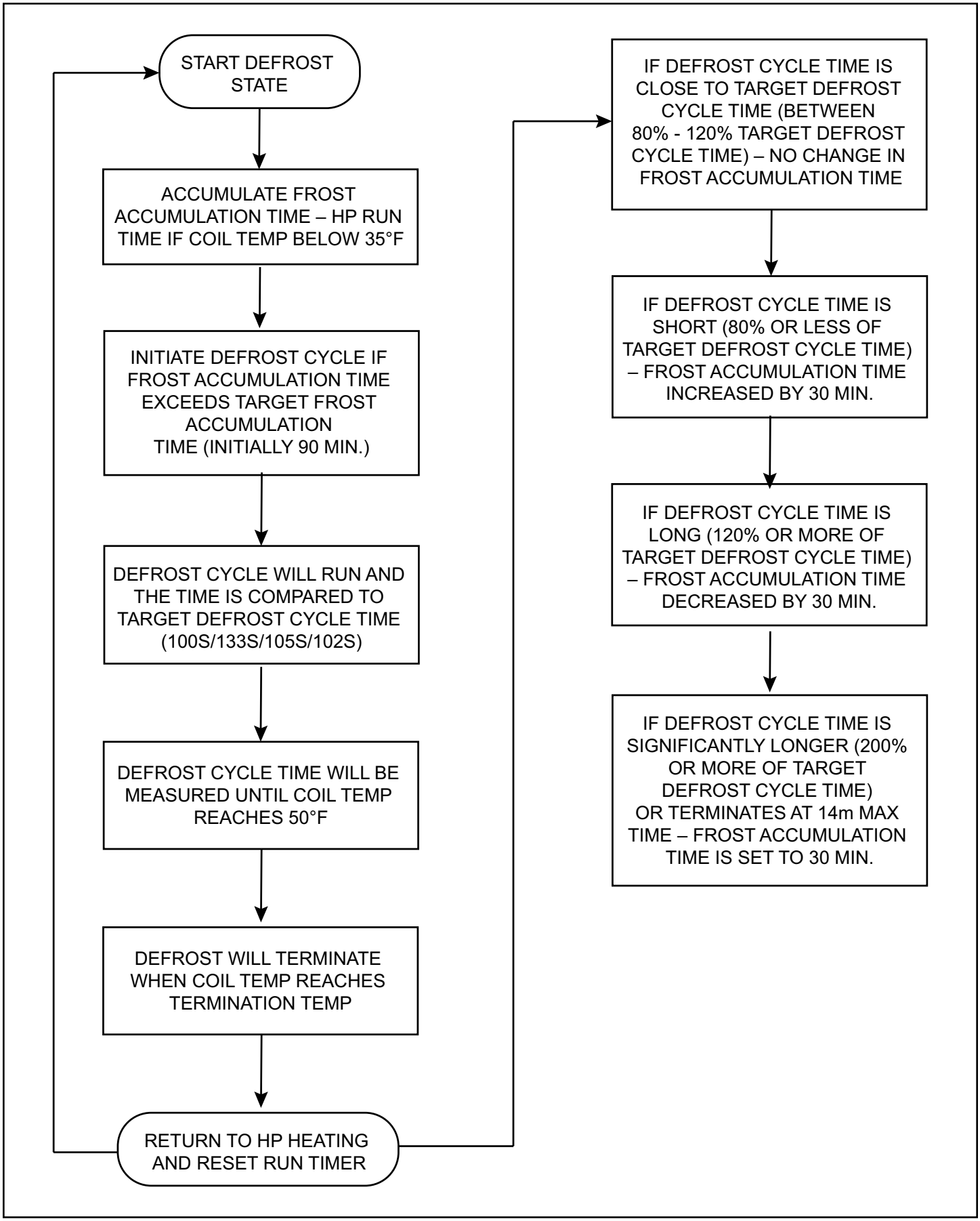


Figure 29. Demand Defrost Cycle – Sequence of Operation

Component Testing

Verifying High Pressure Switch and Low Pressure Protection Operation

Operation:

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

Low Suction Pressure Protection – See Figure 33 for low suction pressure protection sequence of operation.

High Pressure Switch (HI-PS) – See Figure 34 for high pressure switch sequence of operation.

Pressure Switch Event Settings

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

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

Checkout – S4 High Pressure Switch

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

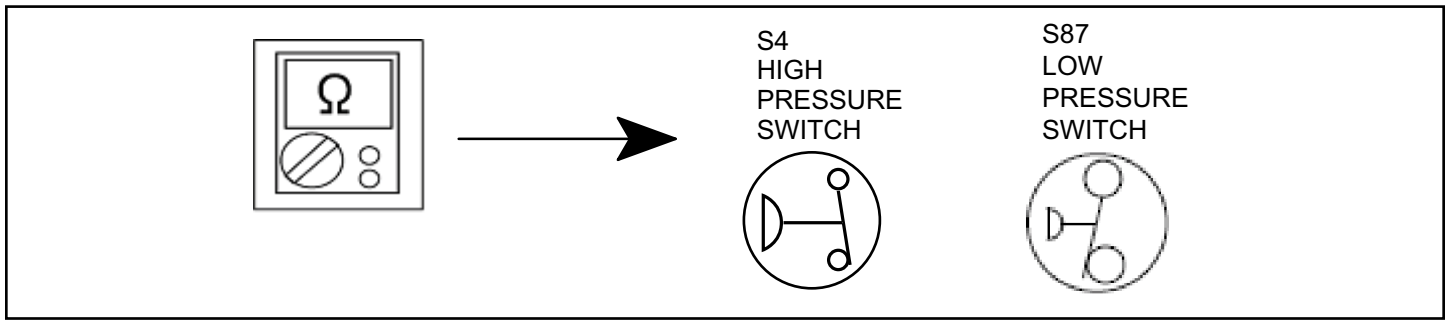


Figure 30. Verifying High and Low Pressure Switch Operation

Verifying Suction Pressure Transducer Operation

Using a multimeter set to VDC with the Suction Pressure Transducer connected to the "Suct P" 3-pin connector on the control board. Pin 1 (Red wire +5VDC) to Pin 3 (Black wire - GND) should read 5 VDC continuous. Pin 2 (Blue wire output from transducer) to Pin 3 (Black - GND) should read 0.5 to 4.5 VDC and will vary depending on suction pressure measured. See Table 19.

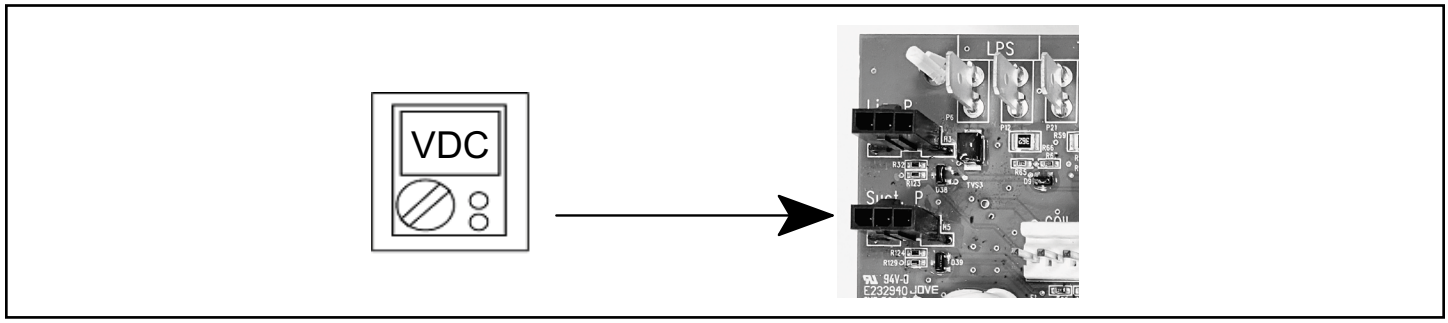


Figure 31. Suction Pressure Transducer Voltage

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

Table 19. Suction Pressure Transducer Output Voltage

Verifying Liquid Pressure Transducer Operation

Using a multimeter set to VDC with the Liquid Pressure Transducer connected to the "Liq P" 3-pin connector on the control board. Pin 1 (Red wire +5VDC) to Pin 3 (Black wire - GND) should read 5 VDC continuous. Pin 2 (Blue wire output from transducer) to Pin 3 (Black - GND) should read 0.5 to 4.5 VDC and will vary depending on liquid~ pressure measured. See Table 20.

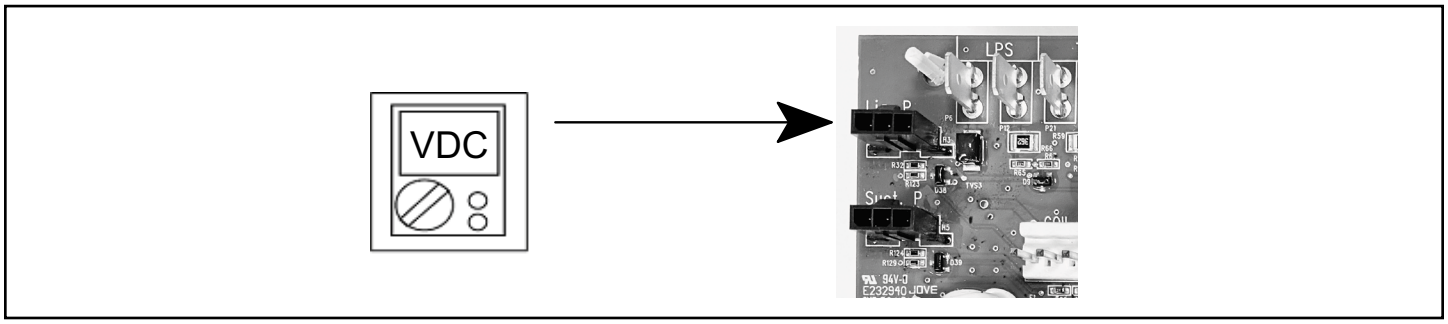


Figure 32. Liquid Pressure Transducer Voltage

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

Table 20. Liquid Pressure Transducer Output Voltage

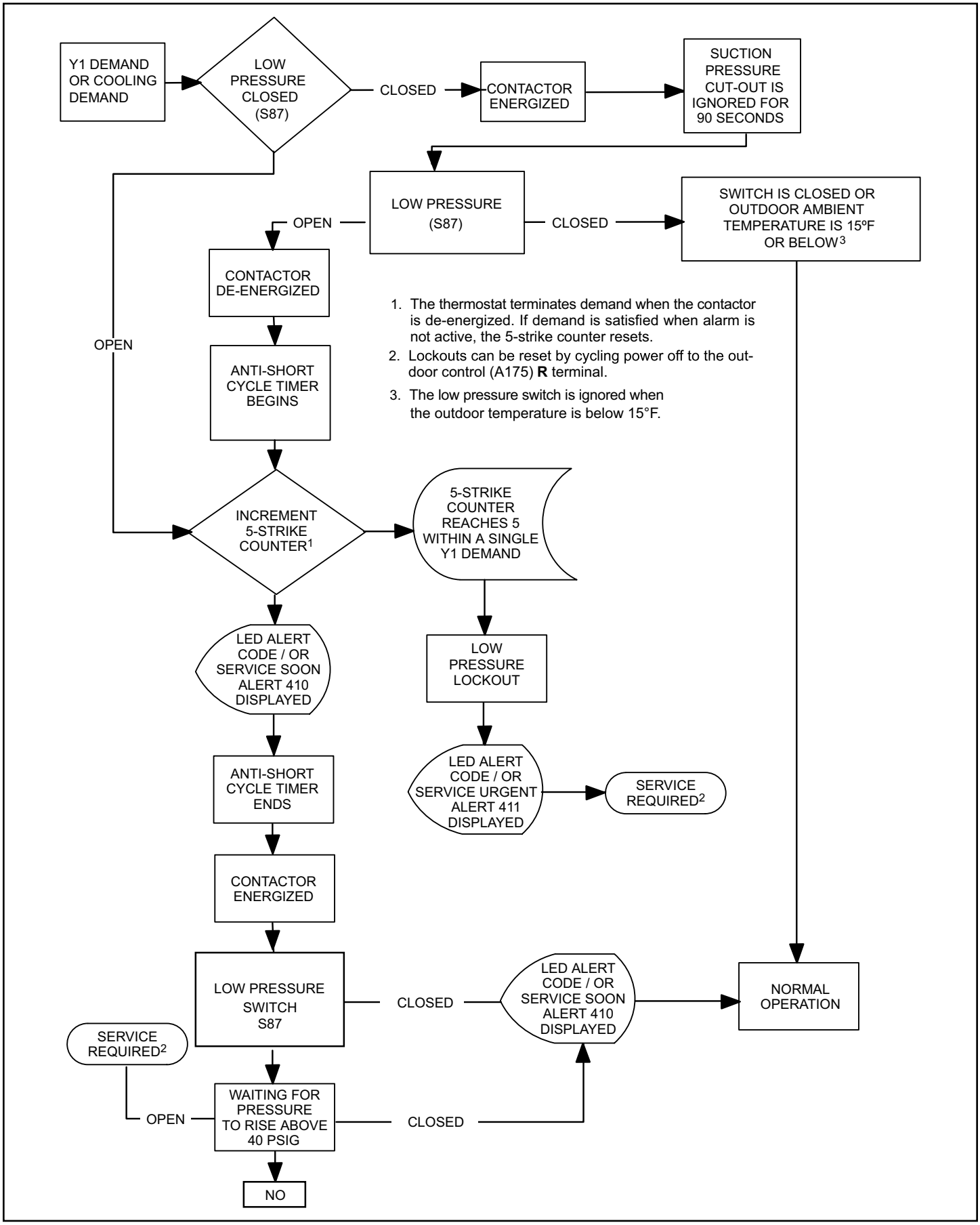


Figure 33. Low Pressure Switch (S87) Sequence of Operation (All Units)

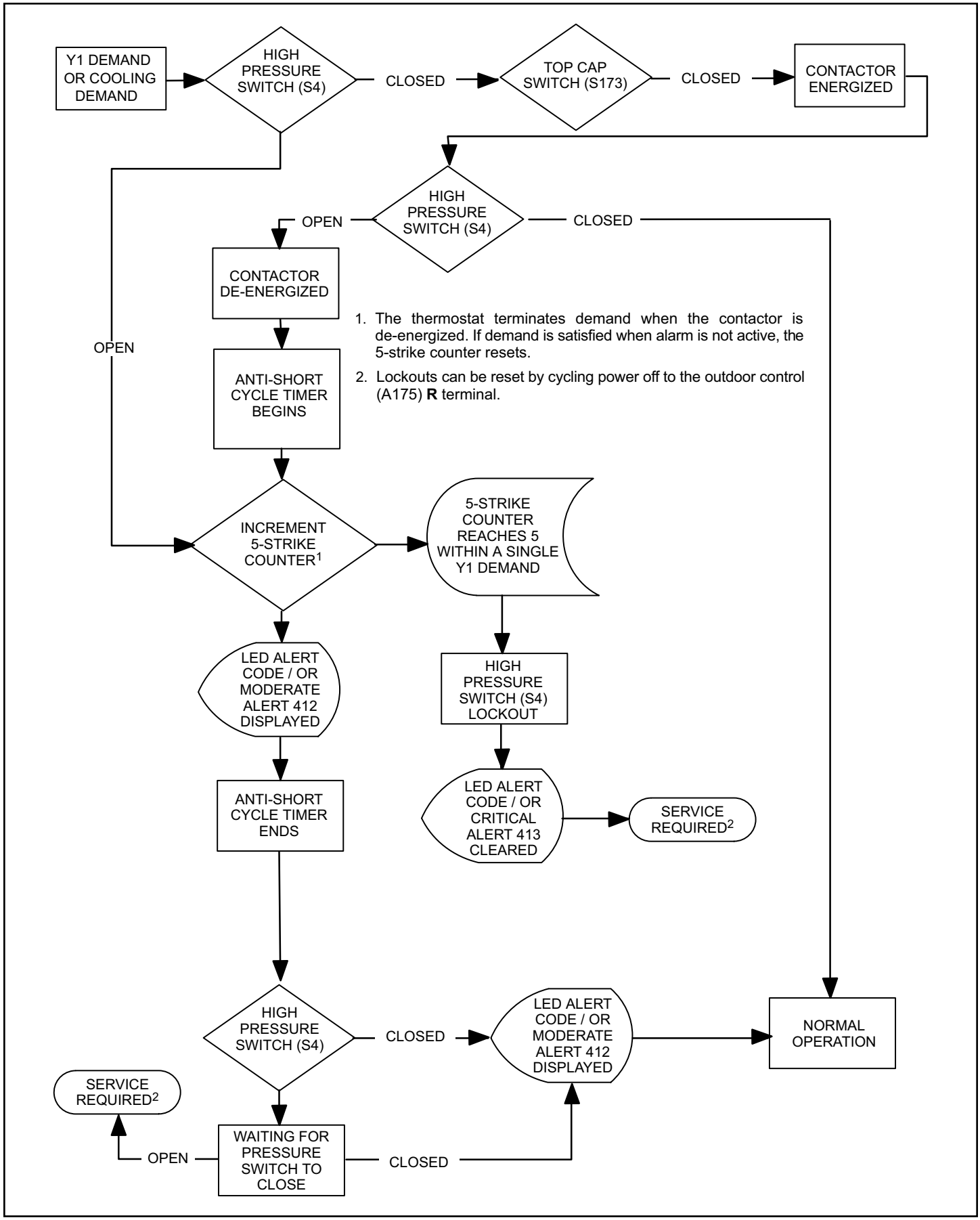


Figure 34. High Pressure Switch (S4) Sequence of Operation (All Versions)

High Pressure Switch Protection 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Flash Code	Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
410		Information Only-Dealer	OD Open Low Pressure Switch	Unit low pressure is below the required limit. • Check operating pressures. • Low pressure switch opens at a specific pressure (system shuts down) and closes at a specific pressure (system restarts).	Automatically clears when the system detects that the issue no longer exists.
411		Service Urgent	OD Low Pressure Switch Strikes Lockout	The low pressure switch has opened five times during one cooling or heating demand. • Thermostat will shut down the outdoor unit. • Open low pressure switch error count reached five strikes. • Check system charge using both approach and sub-cooling methods. • Reset by putting outdoor unit control in test mode or resetting low voltage power.	Automatically clears when the system detects that the issue no longer exists.
412		Information Only-Dealer	OD Open High Pressure Switch	The unit high pressure is above the upper limit. System will shut down. Confirm that the system is properly charged with refrigerant. Check condenser fan motor, expansion valve (if installed), indoor unit blower motor, stuck reversing valve or clogged refrigerant filter. Confirm that the outdoor unit is clean.	Automatically clears after the high pressure switch closes or a power reset.
413		Service Urgent	OD High Pressure Switch Strikes Lockout	The high pressure switch has opened five times during one cooling demand. Thermostat will shut down the outdoor unit. Open high pressure switch error count reached five strikes. Check system charge using superheat and sub-cooling temperatures. Check outdoor fan operation. Check for dirt or debris blocking air flow to outdoor unit. Reset by putting outdoor unit control in test mode or resetting low voltage power.	Automatically clears when the system detects that the issue no longer exists.

Table 21. Alert Codes and Troubleshooting

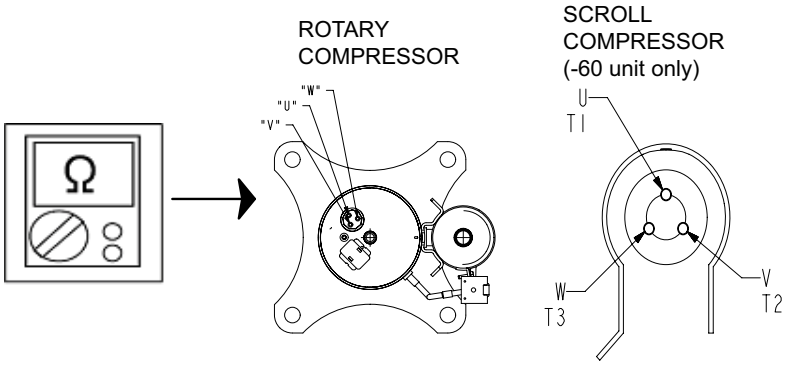
Compressor Operation, Checkout and Status / Error Codes

Operation:

The 4SHP22LX uses two different types of compressor, depending on the specific model. The 4SHP22LX124 and -36 use a 380VAC three phase variable capacity rotary compressor specifically designed for unitary splits system and is approved for use with HFC 410A refrigerant. The 4SHP22LX1-48 and -60 units use a 380VAC three phase variable capacity scroll compressor that is approved for use with HFC 410A refrigerant. The compressor, when connected to an inverter, is capable of operating in a running frequency range from 20 hertz up to a maximum of 70 hertz (maximum hertz is dependent on compressor size). The compressor speed is determined by thermostat demand and suction pressure when installed with a conventional 24VAC non-communicating thermostat and by thermostat demand when installed with an A3 thermostat.

Checkout:

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



MOTOR WINDING RESISTANCE AT 77° (±7%)

UNIT	U-V/T1-T2	V-W/T2-T3	W-U/T3-T1
-24	0.883Ω	0.883Ω	0.883 Ω
-36	0.883Ω	0.883Ω	0.883Ω
-48	0.705Ω	0.705Ω	0.705Ω
-60	0.587Ω	0.587Ω	0.587Ω

Figure 35. Compressor Operation, Checkout and Status/Error Codes

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

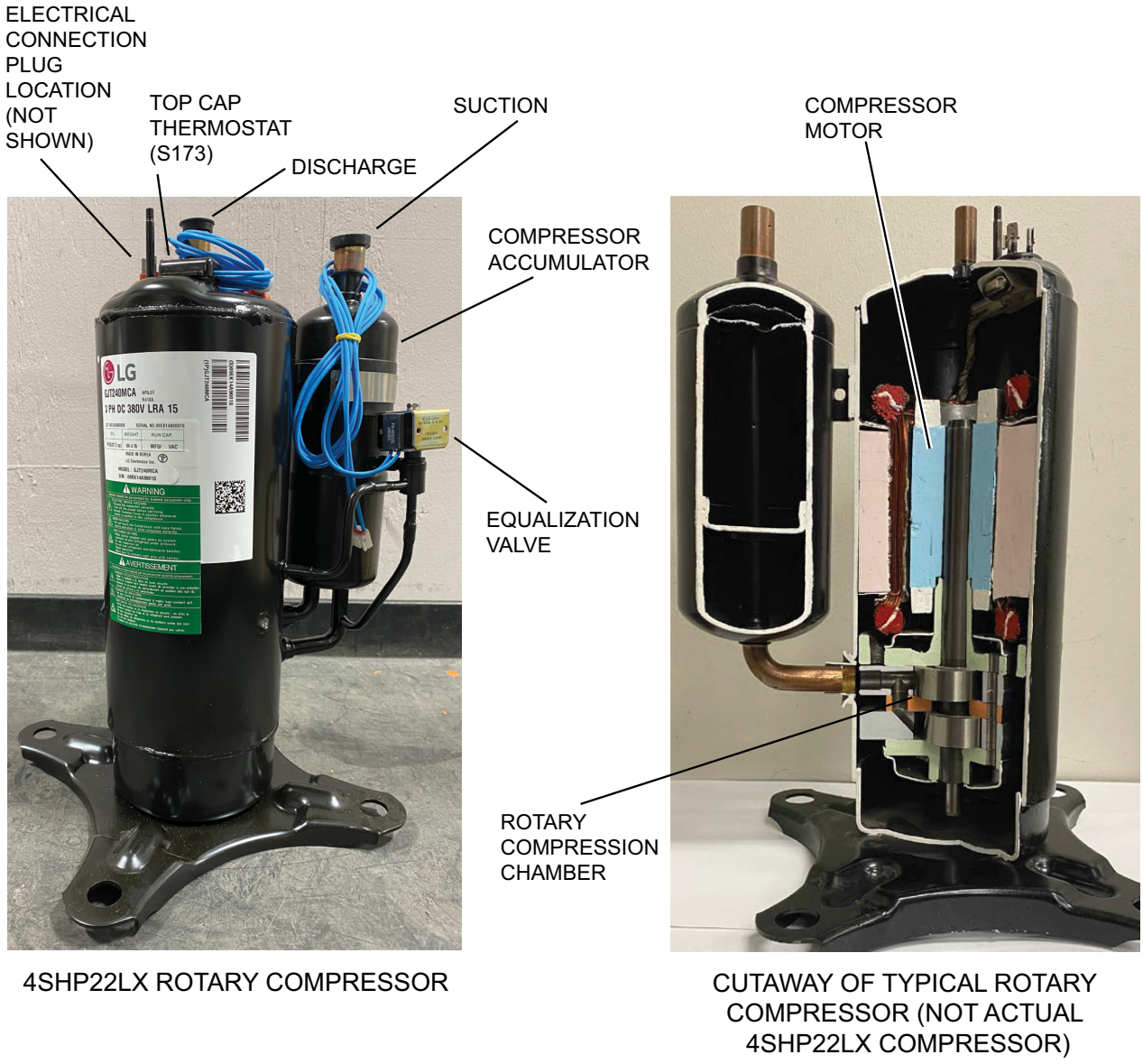


Figure 36. 4SHP22LX Rotary Compressor Detail (4SHP22LX124, -36 models)

Compressor Equalization Valve

The compressor equalization valve equalization solenoid equalizes the pressure across the rotary compression chamber allowing the compressor to start unloaded. The 240 VAC solenoid coil is controlled by the inverter. The solenoid coil is powered when the compressor is off to equalize the pressure and is de-energized when the compressor is operating.

Status Codes:

When the compressor is running, the 7-segment display will show the compressor capacity. When the unit is installed with a conventional 24VAC non-communicating thermostat the display will show C 1 or C 2. When the unit is installed with an A3 communicating thermostat the display will show the demand as a percentage. i.e. C 5 0.

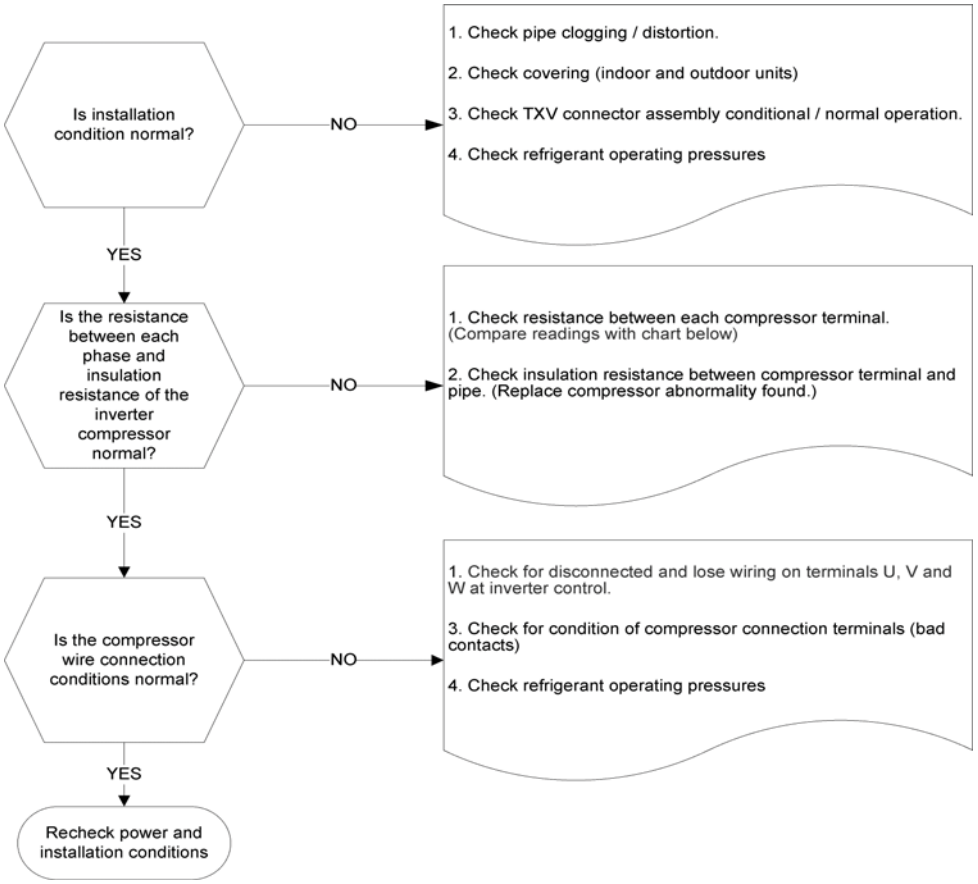


Figure 37. Compressor Operation, Checkout and Status/Error Codes

Error 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
430	26	2 flashes	6 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Startup Fail	Compressor start-up failure. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 26. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 26.** The sequence is: • Red LED: Two Flashes • Green LED: Six Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* • Check refrigerant • Replace outdoor control board • Replace inverter.	To clear, disconnect power to outdoor unit and restart.
433	29	2 flashes	9 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Over-current	Compressor phase current is too high. • During initial startup, a six minute time delay is implement to prevent the alarm from occurring. • Error occurs when compressor peak phase current is greater than 28 amps. • Inverter will issue inverter code 14 first and slow down to try to reduce the current. • If the current remains high, outdoor unit will stop (compressor and fan) – moderate condition. • Cycle timer is initiated. • If condition occurs five times within 60 consecutive minutes, the system will lockout – critical condition. • This alert code may be triggered by the inverter or the GEA variable capacity outdoor (inverter controlled) unit. • GEA outdoor control may trigger an this alert code if the inverter reduces the compressor speed which is identified as a alert code 441 and the compressor speed (in hz) is below the minimum speed. This will typically occur at start-up. The inverter automatically increases the compressor minimum speed below 45ºF in the heating mode and above 115ºF ensure the compressor capacity is sufficient for oil return. If alert code 433 occurs and inverter does not indicate an inverter code 29, the GEA outdoor control triggered the alert code 433. • Inverter LEDs will flash code 29. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 29.** The sequence is: • Red LED: Two Flashes • Green LED: Nine Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear alert code disconnect power to both the indoor and outdoor units and then reconnect power. Restart system.

Table 22. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
440	13	1 flash	3 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Heat-Sink temperature	Compressor slowdown due to high heat sink temperature. • 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. • The screws that hold the inverter to the inverter board may be loose causing poor contact between these two components. • Tighten screws that hold the heat sink to the inverter control board. ***NOTE:*** *Wait five minutes for all capacitors to discharge before checking screws.* • This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110ºF) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. • The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occur frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. • The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 185ºF and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 176ºF. The heat sink temperature, compressor speed in Hertz & the Inverter Compressor Speed Reduction status (“On” or “Off ”) notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center. • Inverter LEDs will flash code 13. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 13.** The sequence is: • Red LED: One Flash • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.

Table 22. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
441	14	1 flash	4 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Compressor Current	This alert code is for more information than an issue with the system. • When the inverter gets close to the current or heat sink temperature limit, it will limit the ramp rate. Instead of changing compressor speed at 1 hz/second, it changes to 5 hz/20 seconds. • Compressor slowdown due to high compressor current. • Compressor current is approaching limit. • The compressor speed automatically slows. • This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor current increases rapidly during startup. • The inverter will reduce the compressor speed by 4 Hz and slow the compressor ramp up speed to the requested compressor demand speed (capacity). This is normal and expected operation of the inverter to control the inverter within design parameters. In most cases the alert code 441 notification does not require any additional service or diagnostic procedures. • The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. • Possible issue is system running at high pressures. • Check for high pressure trips or other alert codes in thermostat and outdoor control. • Inverter LEDs will flash code 14. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 14.** The sequence is: • Red LED: One Flash • Green LED: Four Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.
600				Information Only-Dealer	Load Shed Event	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 24VAC power across the **L** and **C** terminals on the outdoor control	Automatically clears when L terminal is inactive.

Table 22. Outdoor Control 7-Segment Display Alert Codes - Compressor

Crankcase Heater, Checkout and Status / Error Codes

Operation:

Crankcase Heater (HR1)

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

Crankcase Heater Thermostat (S40)

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

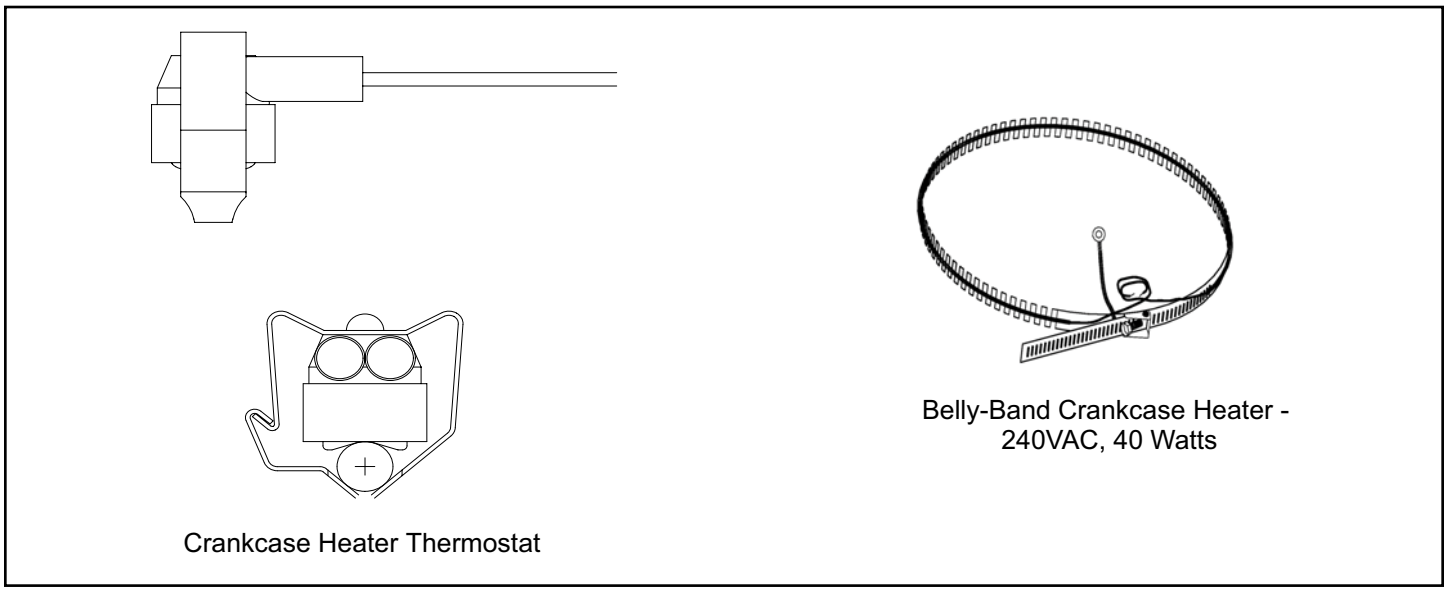


Figure 38. Belly-Band Crankcase Heater Thermostat

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.

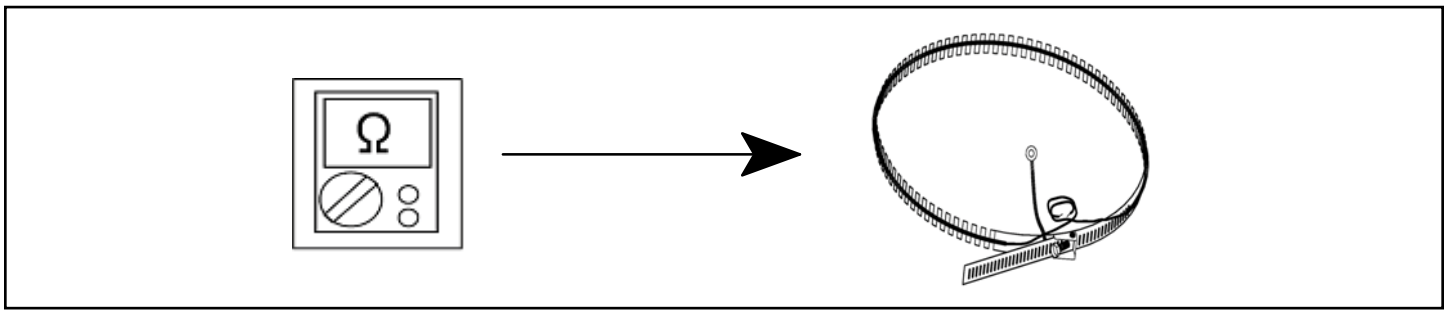


Figure 39. Checking Belly-Band Crankcase Heater

Crankcase Heater Thermostat: As the detected temperature changes, the resistance across the sensor changes. Table 29 on Page 89 shows how the resistance varies as the temperature changes for this sensor.

NOTE: *When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is not within the range shown in Figure 35, may be performing as designed. However, if a shorted or open circuit is detected, the sensor is faulty; the sensor needs to be replaced.*

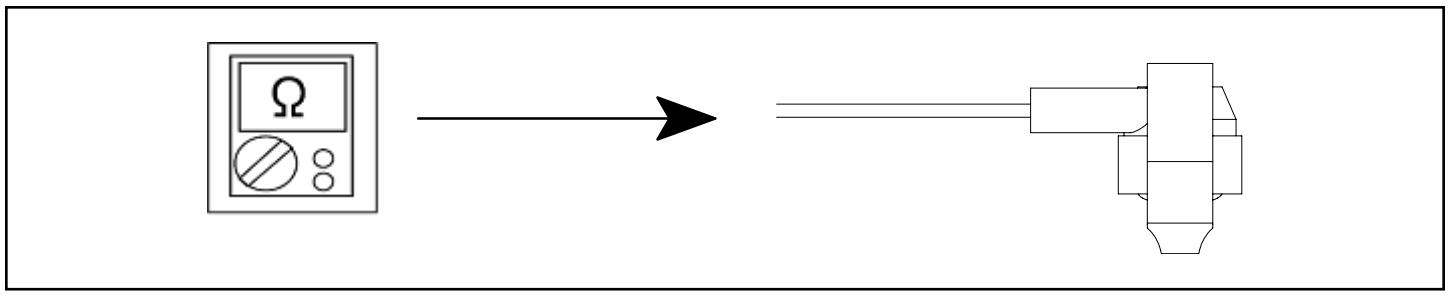


Figure 40. Checking Crankcase Heater Thermostat

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.

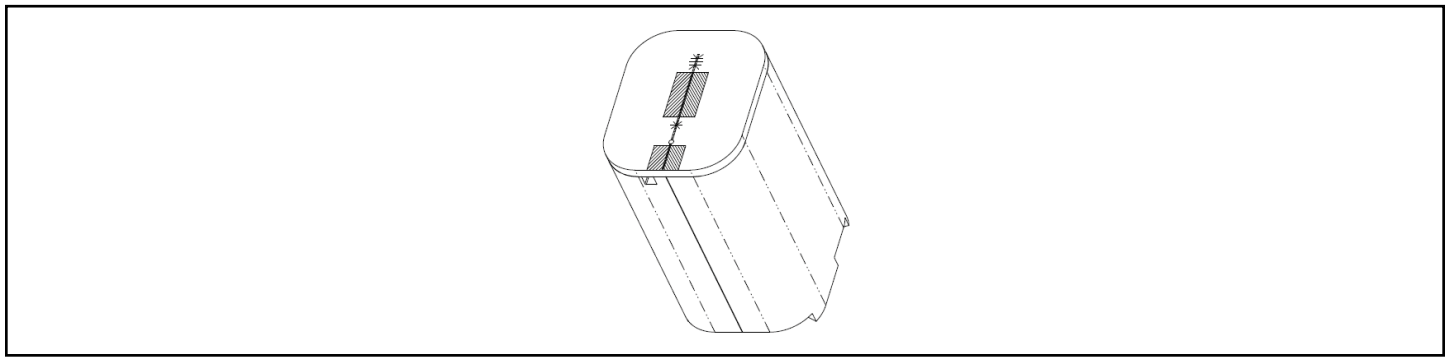


Figure 41. Compressor Sound Cover

Suction Line Filter Drier (Rotary Compressor Models Only)

The 4SHP22LX124 and -36 models have a rotary compressor and have a factory installed suction line filter drier installed in the suction line. Liquid drier is not required, but may be field installed. The filter drier is designed to remove moisture and foreign matter, which can lead to compressor failure.

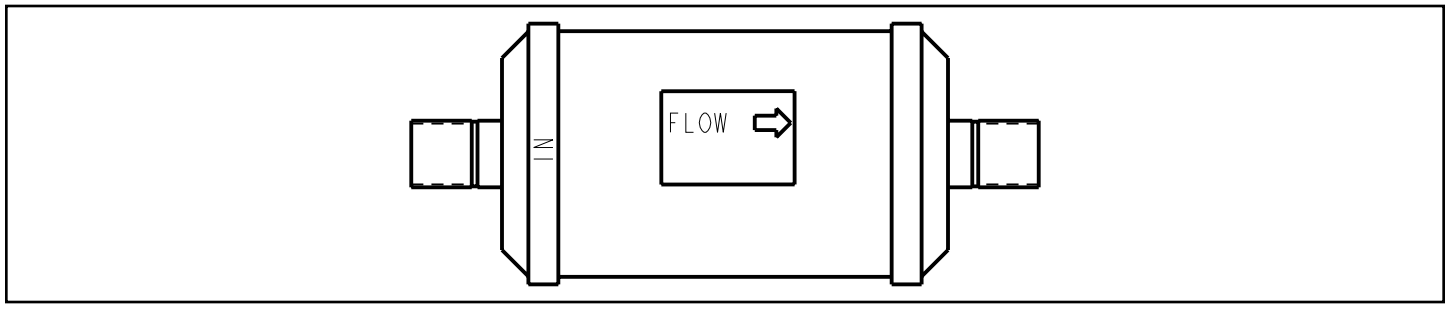


Figure 42. Suction Line Filter Drier

Liquid Line Filter Drier (4SHP22LX148 and -60 Scroll Compressor Models Only)

The 4SHP22LX148 and -60 have a scroll compressor and a liquid line filter drier that is factory-installed in the liquid line. The filter drier is designed to remove moisture and foreign matter, which can lead to compressor failure.

The 4SHP22LX models with a rotary compressor do not have a factory installed filter drier and it is not required on these models. A liquid line filter drier on the rotary compressor models may be field installed if desired.

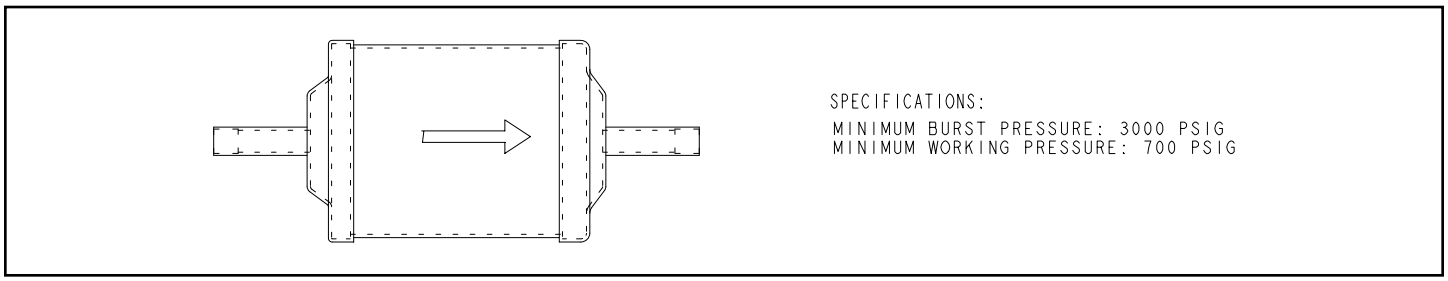


Figure 43. Liquid Line Filter Drier

Top Cap Switch Operation, Checkout and Status / Error Codes

Operation:

Top Cap Thermal Sensor Switch (S173)

Some units are equipped with a compressor-mounted normally closed temperature switch that prevents compressor damage due to overheating caused by internal friction. The switch is located on top of the compressor casing. This switch senses the compressor casing temperature and opens at 221 - 239°F on the 4SHP22LX124 and -36 and 239 - 257°F on the 4SHP22LX-48 and -60 to shut off compressor operation. The auto-reset switch closes when the compressor casing temperature falls to 140 - 176°F on the 4SHP22LX124 and -36 and 151 - 187°F on the 4SHP22LX148 and -60, and the compressor is re-energized. This is a single-pole, single-throw (SPST) bi-metallic switch.

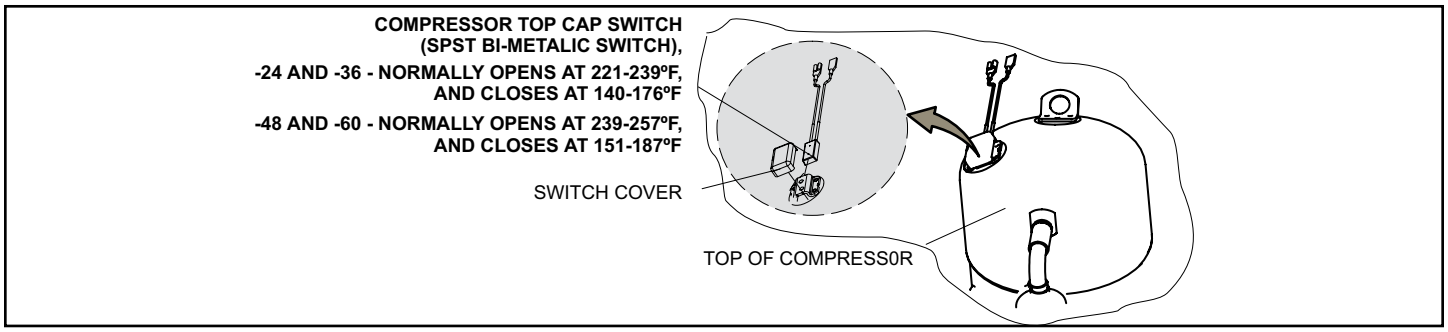


Figure 44. Top Cap Thermal Sensor Switch

Checkout:

Using a multimeter set to ohms, with the terminals disconnected from the system, check the resistance between the two terminals of the top cap switch. If the meter display does not change, the switch is closed. If the meter display goes to infinite, the switch is open.

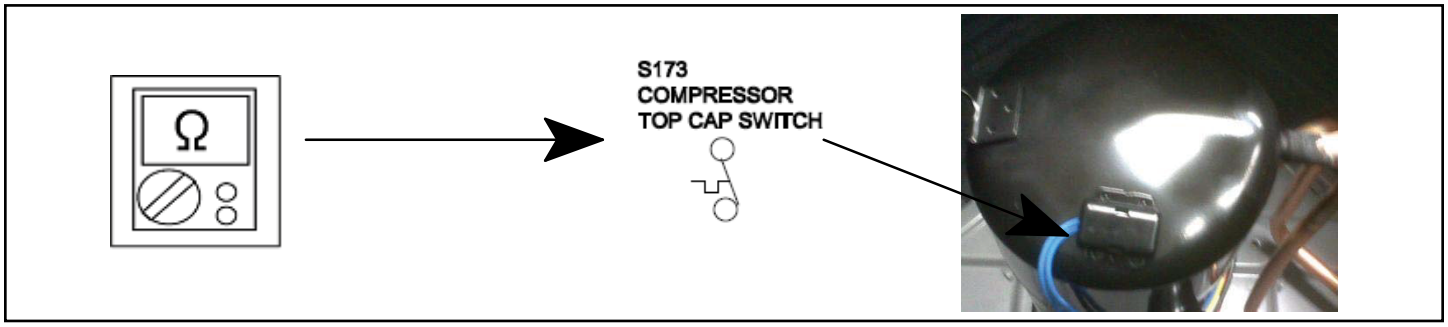


Figure 45. Verifying Top Cap Thermal Sensor Switch

Status:

None

Error:

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 communicating thermostat.					
GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat					
Alert Code	**Inverter Flash Code**	**Priority Condition**	**Actual Displayed Alert Text**	**Component or System Operational State and Troubleshooting Tip**	**How to Clear Alert Code**
422		Service Soon	OD Compressor Top Cap Switch Open	Compressor top cap switch exceeding thermal limit. • Check condenser fan motor, TXV and indoor unit blower motor. • Check for stuck reversing valve or clogged refrigerant filter. • Check to ensure that one of the wires from the top cap switch has not been disconnected from one of the **TP** terminals on the outdoor control. Reconnect wire if disconnected. • Check superheat and sub-cooling.	Automatically clears when error is corrected.
442		Service Urgent	OD Compressor Top Cap Switch Strikes Lockout	The top cap switch has opened five times within one hour. As a result, the outdoor unit is locked out. • This condition occurs when compressor thermal protection sensor opens five times within one hour. • Outdoor unit will stop.	To clear, disconnect power to outdoor unit and restart.

Table 23. Outdoor Control 7-Segment Display Alert Codes - Top Cap Switch

Reactor Operations, Checkout and Status / Error Codes

Operation:

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

Checkout:

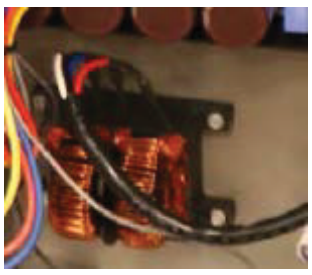
Main Power ON – Voltage IN reactor should be the same as the voltage OUT. With main power OFF and reactor disconnected from system; resistance between leads should be the same

Status Codes:

None

Error Codes:

None



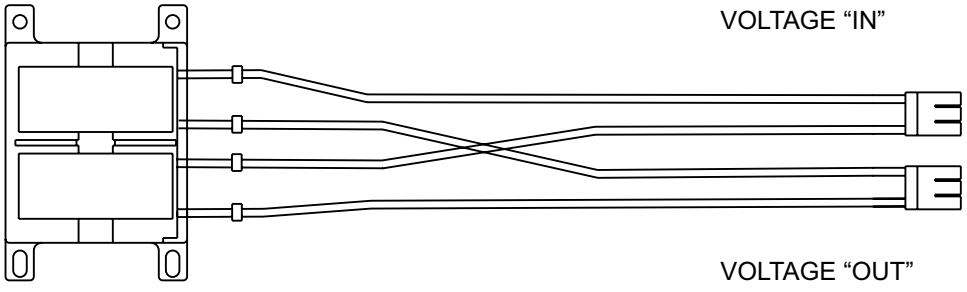


Figure 46. 4SHP22LX Reactor

Outdoor Fan Operation and Checkout

Operation:

4SHP22LX units have a variable speed ECM fan motor. The variable speed ECM fan motor is controlled by PWM fan output when the compressor is running and will vary the fan speed to match the compressor capacity.

Low Ambient Operation:

The 4SHP22LX units have factory installed low ambient operator that will control the condenser fan motor based upon liquid line temperature.

4SHP22LX units have a variable speed ECM fan motor. The outdoor control will begin to modulate the outdoor fan motor speed is below 65°F to maintain a liquid line sensor temperature between 58°F and 70°F. If the liquid line sensor drops below 55°F the control will cycle the fan off until liquid temperature rises above 58°F.

Checkout:

VAC Voltage Check

Check for 208/240 VAC power at inverter contactor (red wires) (see Figure 47).

All Units

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

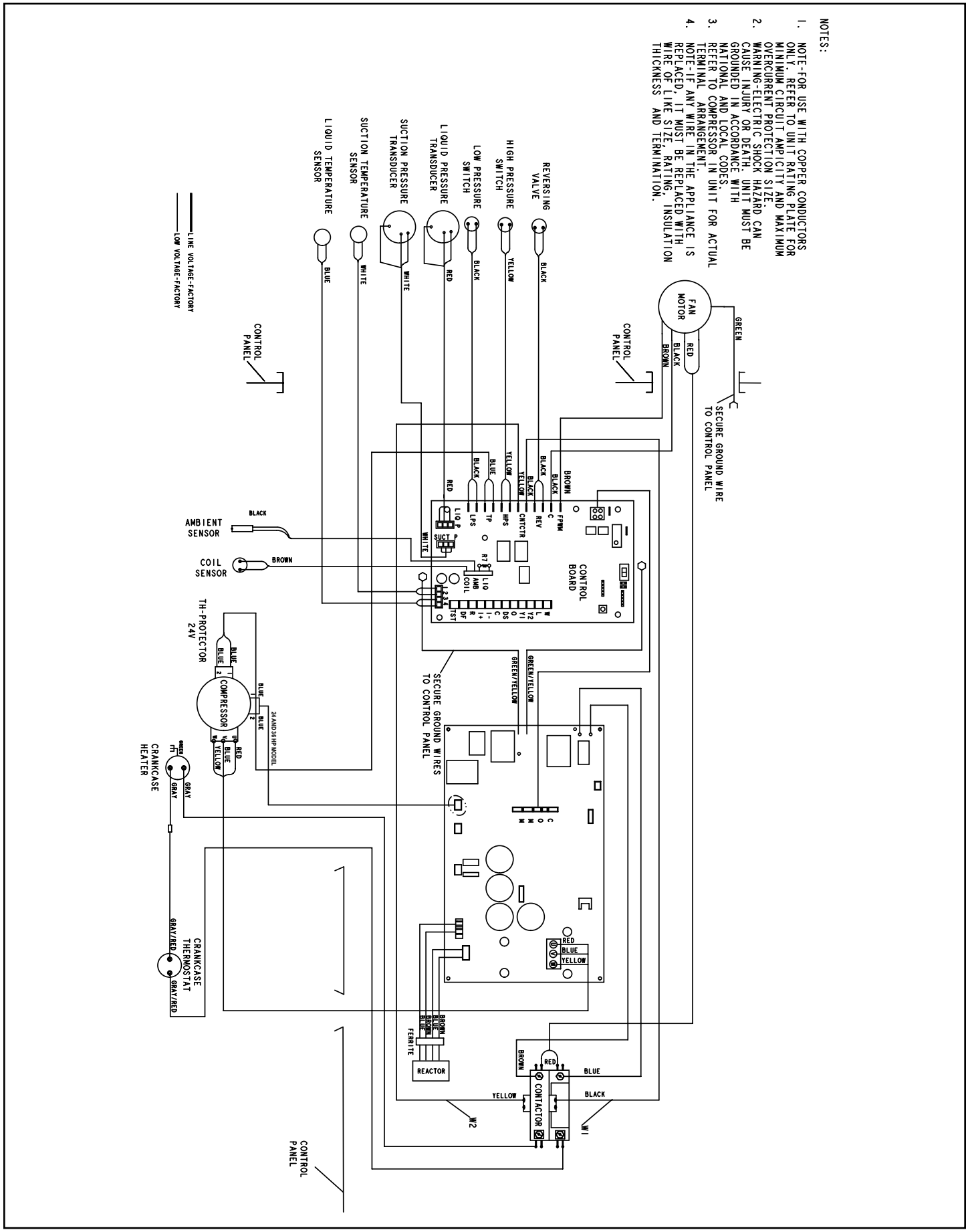


Figure 47. VAC Voltage Check

Outdoor Control Operation, Checkout and Status / Error Codes

Operation:

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

The 4SHP22LX outdoor control provides application flexibility. The 4SHP22LX may be installed with an A3 communicating thermostat in a fully communicating system or with a conventional 24VAC non-communicating single or two stage cooling thermostat.

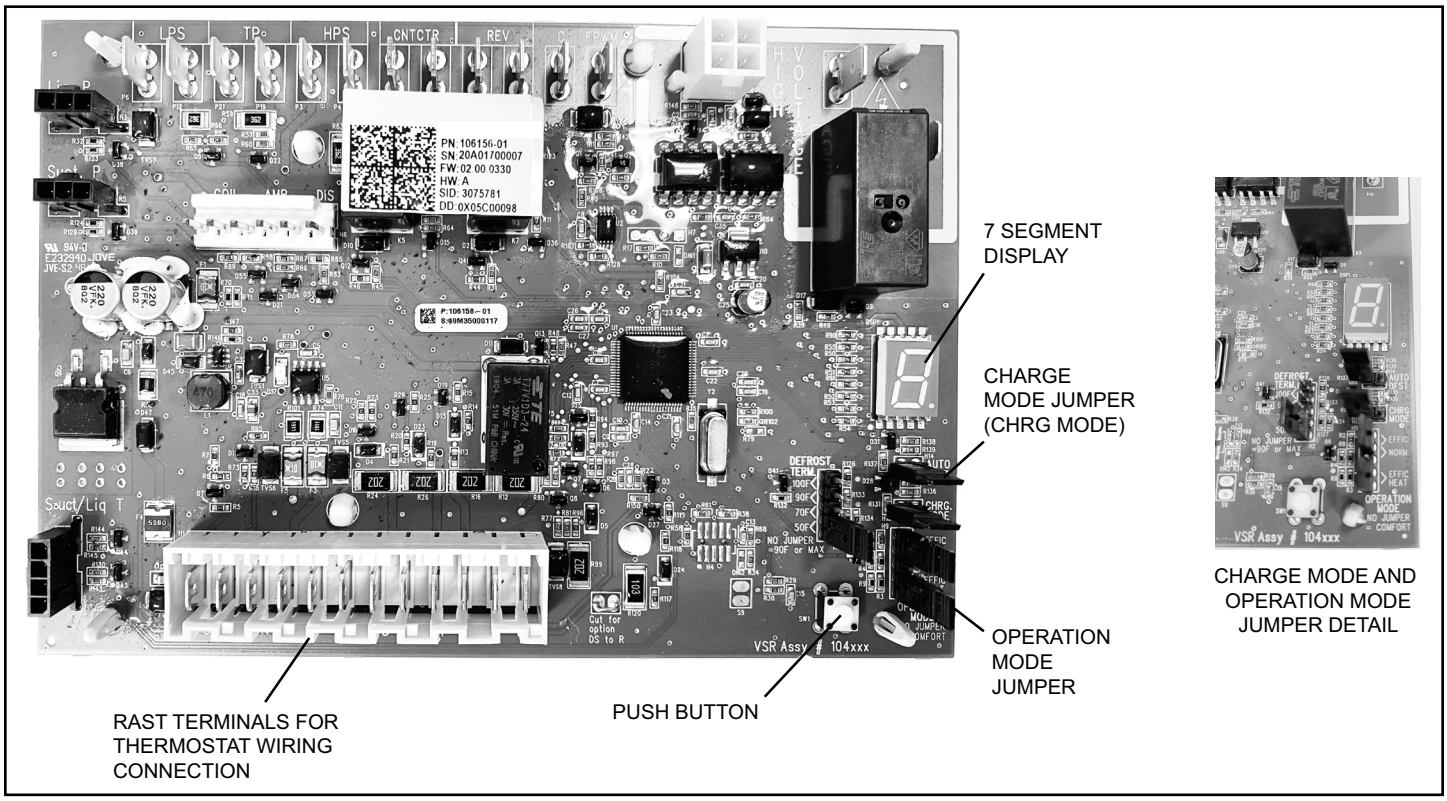


Figure 48. Outdoor Control Unit

Status 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Flash Code	Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
600		Information Only-Dealer	Load Shed Event	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 24VAC power across the **L** and **C** terminals on the outdoor control	Automatically clears when L terminal is inactive.
601		Information Only-Dealer	OD Unit Low Ambient Operational Lockout	• Outdoor unit has been cycled off on low temperature protection. • Outdoor unit will not operate when the outdoor ambient is at or below 4°F (-15.6°C). • If the unit is satisfying a demand (running) and the outdoor ambient drops below 4°F (-15.6°C), the unit will continue to operate until the demand has been satisfied or the outdoor ambient drops to 15°F (-9.4°C) which will result in the unit being locked out (shut down).	Automatically clears when low temperature condition no longer exists.

Table 24. Outdoor Control 7-Segment Display Alert Codes - Outdoor Control Status

4SHP22LX Thermostat Control Options

The 4SHP22LX variable capacity units provide two thermostat control options to provide application and installation flexibility.

A3 Communicating Thermostat Control

The 4SHP22LX variable capacity unit may be installed as a fully communicating system consisting of an A3 Communicating Thermostat, a communicating indoor unit and the 4SHP22LX variable capacity outdoor unit wired with (4) communication wires (R, I+, I- and C) connected to the 4SHP22LX Outdoor Unitary Control.

The 4SHP22LX variable capacity unit when wired as a fully communicating system will take full advantage of the advanced diagnostics and control, Wi-Fi accessibility and system operation parameters. Refer to the 4SHP22LX field wiring diagram for an S40 communicating thermostat.

Conventional 24VAC Non-Communicating Heat Pump Thermostat Control

The 4SHP22LX variable capacity unit may be installed using a conventional 24VAC non-communicating two-stage cooling or single-stage heat pump thermostat.

NOTE: *The conventional 24VAC non-communicating thermostat must have a compressor minimum on time of three minutes to prevent compressor short cycling.*

The 4SHP22LX unit will provide full variable capacity operation when installed with a conventional 24VAC non-communicating two stage or single-stage heat pump thermostat. The 4SHP22LX outdoor control has advanced control algorithms using the 4SHP22LX suction pressure sensor in the cooling mode and liquid pressure sensor in the heating mode to provide true variable capacity compressor operation.

When utilizing a two-stage conventional 24VAC non-communicating heat pump thermostat, six wires are required to control the outdoor unit (R, C, Y1, Y2, O and W). Refer to the 4SHP22LX field wiring diagram for a conventional 24VAC non-communicating 2-stage heat pump thermostat.

When utilizing a single-stage conventional 24VAC non-communicating heat pump thermostat, five wires are required to control the outdoor unit (R, C, Y1, O and W) and Y1 is jumpered to Y2 in the outdoor unit. Note that the published performance data is based upon the use of a two-stage thermostat. Refer to the 4SHP22LX field wiring diagram for a conventional 24VAC non-communicating single-stage heat pump thermostat.

Thermostat Type	Indoor Unit Type	Qty. of Wires to Unit	4SHP22LX Terminal Strip Connections	Unit Operation	Field Wiring Diagram
Comfort Sync A3 Communicating Thermostat	Comfort Sync Comunicating Gas Furnace or Air Handler	4	R, I+, I-, C	Fully Communicating Variable Capacity Operation Based Upon Thermostat Demand	Figure 14
Conventional 24VAC 2-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating)	6	R, C, W1, O, Y1, Y2	Full Variable Capacity Operation Controlled by 4SHP22LX Unitary Control Using Suction Pressure	Figure 17
Conventional 24VAC Single-Stage Heat Pump Thermostat (non-communicating)	Any Furnace or Air Handler (non-communicating)	5	R, C, W1, O, Y1 (Jumper Y1 to Y2)	Full Variable Capacity Operation Controlled by 4SHP22LX Unitary Control Using Suction Pressure	Figure 15

Table 25. 4SHP22LX Thermostat Control Options

Cooling Operation Mode Jumper

The Cooling Operation Mode Jumper is only used on applications installed with a conventional 24VAC non-communicating heat pump thermostat. In applications with a conventional 24VAC non-communicating heat pump 3thermostat, the compressor capacity is controlled to maintain the target suction pressure setpoint. The Cooling Operation Mode Jumper has three selectable cooling modes. The three modes are Efficiency (Jumper installed on Pins 1 & 2), Normal Mode (Jumper installed on Pins 2 & 3) and Comfort Mode (Jumper Removed). The factory default position is the Efficiency Mode. The Efficiency mode has a variable suction pressure setpoint that will vary with the outdoor temperature; as the outdoor temperature increases the suction pressure setpoint will decrease. When the Cooling Operation Mode jumper is installed in the “Normal Mode” the suction pressure setpoint is 135 psig.

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

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

Table 26. Cooling Operation Mode Jumper (Conventional 24VAC Thermostats Only)

Heating Operation Mode Jumper

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

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

Table 27. Heating Operation Mode Jumper (Conventional 24VAC Thermostats Only)

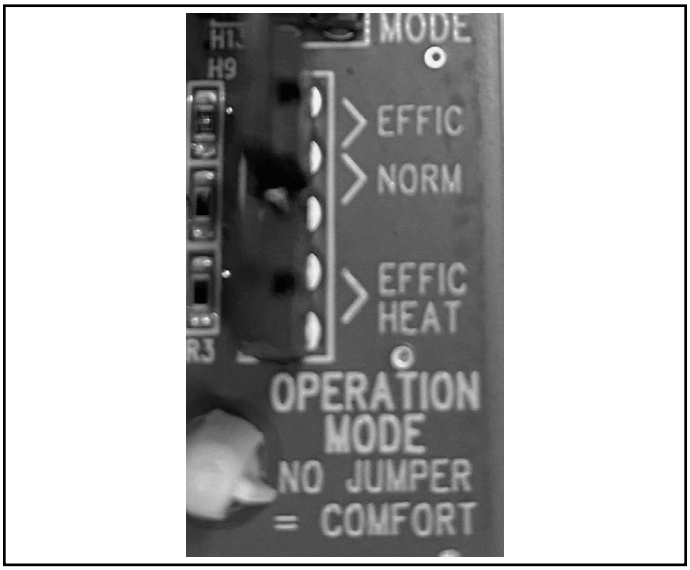


Figure 49. Belly-Band Crankcase Heater Thermostat

Unit Operation

4SHP22LX Unit Operation with an A3 Communicating Thermostat

When the 4SHP22LX unit is installed with an A3 Communicating Thermostat and a communicating indoor unit, the unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity based upon thermostat demand in both the cooling and heat pump heating mode. The indoor air volume will be controlled to match compressor capacity throughout the capacity range.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat – Cooling Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. The Y2 second stage cooling demand will initiate second stage blower operation. Increased air volume will increase the load on the indoor coil and increase the

suction pressure. The 4SHP22LX compressor capacity will continue to be controlled based upon the suction pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating 2-Stage Heat Pump Thermostat - Heating Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating 2-stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing hte unit in the heating mode. A Y1 first stage compressor demand will initiate compressor operation and first stage indoor blower operation. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The Y2 second stage compressor demand will initiate second stage blower operation. Increased air volume will increase heat transfer on the indoor coil and degrease the liquid pressure. if the liquid pressure drops below the target setpoint, the compressor capacity will be increased. The 4SHP22LX compressor capacity will continue to be controlled based upon the liquid pressure. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the Y2 demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating Single-Stage Heat PumpThermostat – Cooling Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating single-stage heat pump thermostat, the O terminal on the thermostat will energize the unit reversing valve to place the unit in the cooling mode. A Y1 first stage cooling demand will initiate cooling operation and cooling indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the 4SHP22LX outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target suction pressure set point. If the cooling demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing hte unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the 4SHP22LX outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

4SHP22LX Unit Operation with a Conventional 24VAC Non-Communicating - Single Stage Heat Pump Thermostat - Heat Pump Heating Mode

When the 4SHP22LX unit is installed with a conventional 24VAC non-communicating single stage heat pump thermostat, O terminal is not powered during the heating mode and the reversing valve is de-energized placing hte unit in the heating mode. A Y1 compressor demand will initiate compressor operation and indoor blower operation. In single stage thermostat applications, a jumper must be installed between Y1 and Y2 on the 4SHP22LX outdoor control. The compressor will be controlled in the variable capacity mode by varying the compressor capacity to obtain the target liquid pressure set point. The unit capacity will be controlled in the variable capacity mode throughout the range of capacity from minimum capacity to maximum capacity. If the compressor demand remains after 20 minutes, the 4SHP22LX control will begin to ramp up the compressor capacity until maximum capacity is achieved. The 4SHP22LX unit will cycle off once the thermostat demand is satisfied.

Defrost Function

The outdoor unit control measures differential temperatures to detect when the system is performing poorly because of ice build-up on the outdoor coil. The controller self-calibrates (see Figure 29) when the defrost system starts and after each system defrost cycle. The outdoor unit control monitors ambient temperature, outdoor coil temperature, and total run-time to determine when a defrost cycle is required. The coil temperature sensor is designed with a spring clip to secure the sensor to the outdoor TXV distributor. The location of the coil sensor is important for proper defrost operation (see Figure 2 and Figure 3 for location of the coil sensor).

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

Defrost Operating Modes

The outdoor control has three operational modes:

- Defrost calibration
- Operation
- Defrost test

Defrost Termination Temperatures

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

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

Error Codes:

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
105		N/A	N/A	Service Urgent	Communication Problem	One of the system components has lost communication with the system. The system component (device) is unable to communicate. • A3 - Access dealer control center, select notifications icon, review alert code details to determine which device or unit has the communication problem. Review both active and cleared alerts. • Zoning - Remove wire from Smart Hub to Comfort Sync® control and just have wiring from furnace. **Troubleshooting:** • Check each control for additional codes • In most cases issues are related to electrical noise. Verify that high voltage power is separated from the low voltage communication wires. • Check for proper grounding on line voltage and low voltage wiring, transformer and equipment. • Check for incorrectly wired or loose or spliced connections between system components (devices or units). • Make sure all unused wires are tied together and taken back to the C terminal on the indoor control board as shown in the installation and setup guide. • Disconnect all wiring to other system components (except thermostat to indoor unit) and reconnect one device at a time and recommission system each time a device is reconnected until the issue is located. • Zoning: If zoning is installed and is wired directly from Smart Hub to Comfort Sync® control then disconnect that wiring. Run control wiring from the Comfort Sync® control directly to the indoor unit control. Wiring diagrams are provided in the Comfort Sync® Zoning Installation and Setup Guide. • Float Switch: When using a float switch, use isolation relay to break common wire to outdoor unit. For testing purposes, remove float switch from the circuit. • Firmware and Accessories: Make sure that Smart Hub has correct firmware version for added accessory. If software is not updated in system it will cause system operation issues. • Inductive voltage from surrounding sources. Check each wire in AC mode to C on circuit board. > Good voltage is .03-.3VAC inductive voltage is not an issue. > Acceptable can be up to .7VAC with moderate success. > Some units have worked with up to 1.2VAC with occasional success. > Voltage over 1.2VAC needs to be addressed.	Automatically clears when the system detects the issue no longer exists.

Table 28. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
120		N/A	N/A	Service Soon	Unresponsive Device	There is a delay in the system component responding to the system. Typically this alert code does not cause any operational issues and will clear on its own. • This alert code is usually caused by a delay in the outdoor unit responding to the thermostat. • Leaking voltage from strands within the bundle. > Land only the **R** wire on the **R** terminal to load the bundle with 24VAC. ► Typically only the **R** wire needs to be landed to identify if voltage is leaking. ► If voltage is present checking the other wires is informational only but not needed. ► If voltage is not present checking the other wires one at a time would be needed. > Check each loose wire in AC mode to **C** on circuit board. ► Good voltage is .03 -.3VAC leaking voltage is not the issue. ► Acceptable can be up to .7VAC with moderate success. ► Some units have worked with up to 1.2VAC with occasional success. ► Voltage over 1.2VAC needs to be addressed.	Automatically clears after an unresponsive system component (device) responds to any inquiry.
124		N/A	N/A	Service Urgent	Tstat Lost Communication To Smarthub	The thermostat has lost communication with a system component for more than three minutes. System component has lost communication with the thermostat. • Check the wiring connections between components. • Ohm wires. • Cycle power. • Any component that is miss-wired may cause a false component code to be shown on system component. • Disconnect all wiring to other system components and check communication one at a time. ***NOTE:*** *When using a float switch, use isolation relay to break common wire to outdoor unit. For testing purposes, remove float switch from the circuit* This alert code stops all associated system operations and waits for a heartbeat message from the system component that is not communicating.	Automatically clears after communication is re-established with applicable system component (device).
125				Service Urgent	Control Hardware Problem	There is a hardware problem on a system component control. There is a control hardware problem. Replace the control if the problem prevents operation and is persistent.	Automatically clears five minutes after the issue no longer exists.
132				Service Urgent	Device Control Software Fault	System component control software is corrupted. • Recycle power. • If failure re-occurs, replace the system component control.	Manual system power reset is required to recover from this alert code.

Table 28. Outdoor Control 7-Segment Display Alert Codes - Outdoor Control Errors

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

Discharge Sensor (R7 - No Sensor)
There is no sensor located on positions 5 and 6 of the connector. A 10K Ohm resistor installed between pins 5 and 6 on the cable harness provides continuity for this circuit.

Ambient Temperature Sensor (RT13)
Ambient temperatures, as read by the ambient temperature sensor connected to pin 3 and pin 4, which are below -35°F (-37°C) or above 120°F (48°C) trigger a fault condition. If the ambient sensor is open, shorted, or out of the temperature range of the sensor, the control displays the appropriate alert code. Heating and cooling operation is allowed in this fault condition.

Coil Temperature Sensor (RT21)
The liquid temperature sensor located on the outlet of the outdoor TXV is connected to pins 5 and 6.

4-Pin Suction Temperature Sensor / Liquid Temperature Sensor Harness

Suction Line Sensor (RT41)
Suction line temperature is read by the suction line temperature sensor between Pins 1 and Pin 2 of the 4-pin sensor harness. Nominal Resistance of the sensor is 10K ohms at 77F. The control will display are E182 error code if the sensor reads open or shorted for 24 hours. Cooling operation is allowed with this fault.

Liquid Line Temperature Sensor (RT36)
Liquid line temperature is read by the liquid line temperature sensor between Pins 3 and Pin 4 of the 4-pin sensor harness. Nominal Resistance of the sensor is 10K ohms at 77F. The control will display are E184 error code if the sensor reads open or shorted for 24 hours. Cooling operation is allowed with this fault.

SENSOR	TEMP RANGE °F (°C)	RESISTANCE VALUES RANGE (OHMS)	PIN# / WIRE SLEEVE COLOR
COIL	-40 (-40) TO 140 (60)	336,000 to 2,487 (see table 17 on page 77 for exact temperature to ohm readings)	6 AND 5 (BROWN)
OUTDOOR AMBIENT	-40 (-40) TO 140 (60)	336,000 to 2,487 (see table 17 on page 77 for exact temperature to ohm readings)	4 AND 3 (BLACK)
NONE	N/A	N/A	2 AND 1

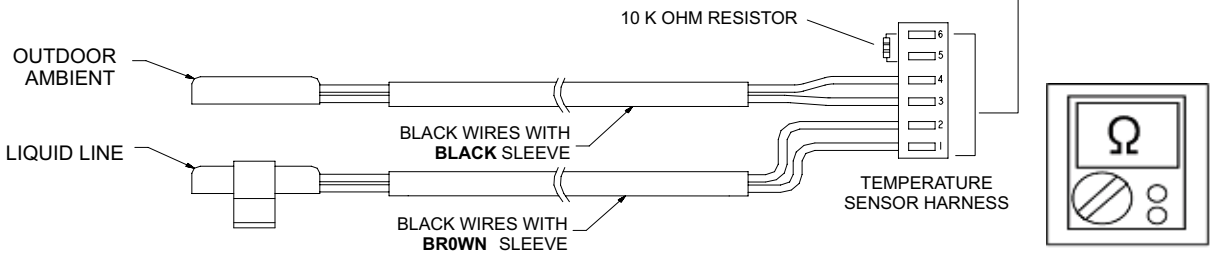


Figure 50. Temperature Sensor Specification

Checkout:

Sensors connect to the outdoor control through a field-replaceable harness assembly that plugs into the outdoor control. Through the sensors, the control detects outdoor ambient, coil and liquid temperature fault conditions. As the detected temperature changes, the resistance across the sensor changes. Check sensor operation by reading ohms across pins shown in Figure 50.

NOTE: *When checking the ohms across a sensor, be aware that a sensor showing a resistance value that is not within the range shown in Figure 50, 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.*

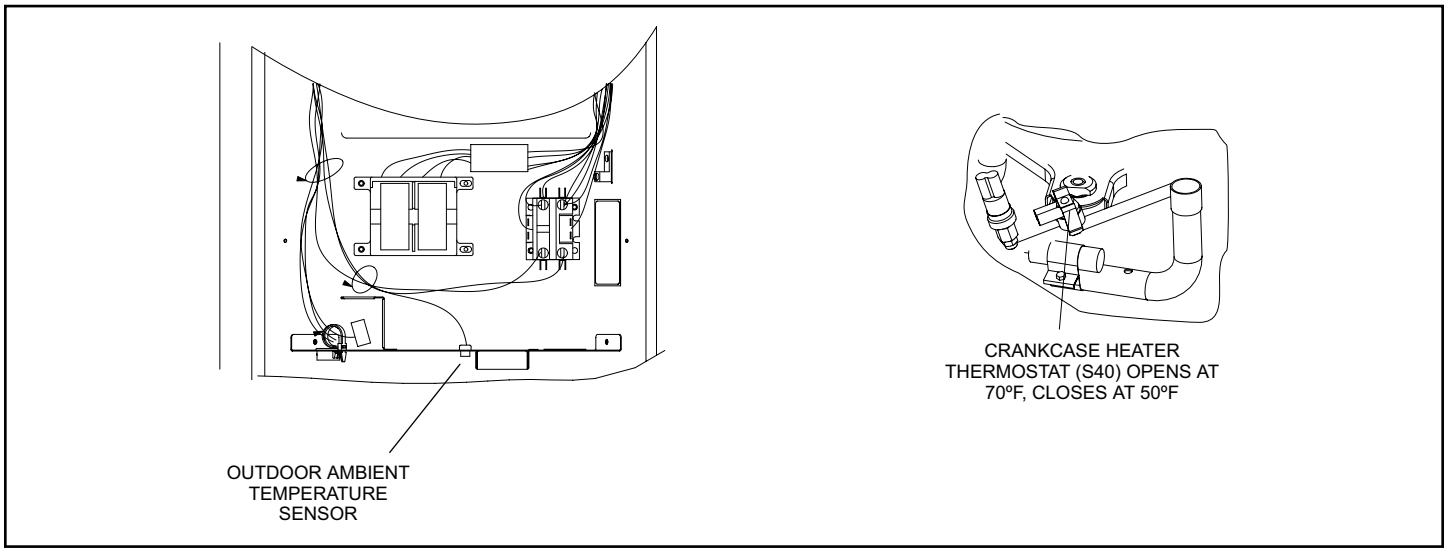


Figure 51. Temperature Sensor Locations

Degree Fahrenehit	Resistance	Degree Fahrenehit	Resistance	Degree Fahrenehit	Resistance	Degree Fahrenehit	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		

Table 29. Ambient and Liquid Line Sensors Temperature / Resistance Range

Error 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
180				Service Soon	Outdoor Temperature Sensor Problem	The thermostat has found a problem with the outdoor sensor in the outdoor unit or the optional outdoor sensor connected to the indoor unit. In normal operation after system component control recognizes sensors, the alert code will be sent if valid temperature reading is lost. • Compare outdoor sensor resistance to temperature / resistance charts in unit installation instructions. Replace sensor pack or stand alone outdoor sensor. • At the beginning of (any) configuration, furnace, air-handler control or equipment interface module will detect the presence of the sensor(s). • If detected (reading in range), appropriate feature will be set as 'installed' and shown in the 'About' screen.	Automatically clears upon configuration, or sensing normal values.
182				Service Soon	OD Suction Temperature Sensor Fault	• Reading below 0.25V or above 4.75V for 24hrs +/- 3hrs. System will continue to operate normally.	Resets after 3 consecutive readings that are in range.
183				Service Soon	OD Liquid Pressure Sensor Fault	• Under 0.25V and above 4.75V readings for 24 hours +/- 3hrs or more on the sensor will cause this error. • Continue normal operation, see sections related to low pressure switch emulation for specific details related to low pressure switch faults.	Resets after 3 consecutive readings that are in range.
424				Service Soon	OD Liquid Line Sensor Faulty	The liquid line temperature sensor has malfunctioned. • In normal operation after outdoor control recognizes sensors, the alert code will be sent if a 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 will detect the presence of the sensor(s). • If detected (reading in range), appropriate feature will be set as 'installed' and shown in the thermostat 'About' screen.	Automatically clears upon configuration, or sensing normal values.

Table 30. Outdoor Control 7-Segment Display Alert Codes – Outdoor Control Errors

DC Inverter Control Operation, Checkout, Status / Error Codes

Operation Of Components:

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

Converter:

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

Power Factor Correction (PFC) Circuit:

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

Intelligent (Inverter) Power Module (IPM):

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

Communication Control Circuit:

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

Status Codes:

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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
N/A	N/A	ON	OFF	N/A	4SHP22LX124 and -36 only: Indicates inverter is operating normally.		
N/A	N/A	ON	OFF	N/A	4SHP22LX148 and -60 only: Indicates inverter is operating normally.		
N/A	N/A	OFF	OFF	N/A	Indicates inverter is NOT energized.		

Table 31. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

Error 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
423	40	4 flashes	OFF	Service Soon/ Service Urgent	OD Inverter CT Circuit Fault	The inverter has detected a circuit issue. • When this condition is detected the outdoor control will stop outdoor unit operations and start the anti-short cycle timer – moderate condition. • Outdoor control will lockout unit after 10 strikes within an hour – critical condition. • Inverter LEDs will flash code 40 • Refer to the unit service documentation for troubleshooting procedures. **Inverter flash code 40:** The sequence is: Red LED: Four Flashes Green LED: Off ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	A moderate alert code will clear automatically when the inverter detects the condition no longer exist and will send a clear alert code message. To clear critical alert code disconnect power to outdoor unit and restart.
426				Service Urgent	OD Excessive Inverter Alarms	After 10 faults within 60 consecutive minutes, the control will lockout. Inverter will flash codes 12 to 14 and 53. ***NOTE:*** *These inverter codes do not count towards this lockout condition.*	To clear disconnect power to outdoor control and restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
427	21	2 flashes	1 flash	Service Soon/ Service Urgent	OD Inverter DC Peak Fault	The inverter has detected a DC peak fault condition. • If condition (55A or higher) is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If peak current (55A or higher) occurs 10 times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 21. • If the unit is a variable capacity heat pump, this error may occur entering or exiting a defrost cycle as the compressor restarts after the 30 second compressor shift delay. If the unit was manufactured prior to serial number 5817F and has frequent alert code 427, then compare the inverter part number to the latest part number listed in the unit repair parts. Units produced after serial number 5817F which is listed on the unit name plate have an inverter with updated software that includes compressor current slope logic to reduce the potential of alert code 427 instances from occurring during defrost. Replace the inverter with the latest inverter if necessary. • Refer to the unit service documentation for detailed troubleshooting procedures. ***NOTE:*** *Serial number format on unit name plate is PPYYMNNNNN (PP = Manufacturing Plant, YY and M represents the year and month made.* **Inverter flash code 21.** The sequence is: • Red LED: Two Flashes • Green LED: One Flash ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect and reconnect power to outdoor control.
428	22	2 flashes	2 flashes	Service Soon/ Service Urgent	OD Inverter High Main Input Current	The inverter has detected a high main input current condition. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If condition occurs 10 times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 22. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 22.** The sequence is: • Red LED: Two Flashes • Green LED: Two Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect power to outdoor unit and restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
429	23	2 flashes	3 flashes	Service Soon/ Service Urgent	OD Inverter DC Link Low Voltage	The inverter has detected a DC link low voltage condition. • 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) – moderate condition. • An anti-short cycle timer is initiated. If condition occurs 10 times within a 60 consecutive minutes, system will lock out and display alert code 429 – critical condition. • The outdoor control anti-short cycle timer will time out and the unit will recycle the demand. • Inverter LEDs will flash code 23. • Refer to the unit service documentation for detailed troubleshooting procedures. Perform test function and verify inverter DC link and line input voltage and current. Also check input to filter board and reactor before replacing inverter board. **Inverter flash code 23.** The sequence is: • Red LED: Two Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* **Troubleshooting Suggestions:** • **Check wire connections (U, V and W) at inverter plug in harness and compressor.** • **Check the resistance of compressor windings. If not in range, replace compressor.** • Check compressor to ground. If ground issue, replace compressor. • Check input power (Single Phase - 208/230VAC ± 10%. If out of range, correct main power issue. • Check DC Link voltage and MICOM Sensing voltage. If out of range, replace inverter. if okay, possible mechanical issue with compressor. Go to outdoor unit service manual for detail troubleshooting procedures and require values for testing DC link voltages and various insulation resistance characteristics.	Automatically clears when the system detects that the issue no longer exists.
430	26	2 flashes	6 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Startup Fail	Compressor start-up failure. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 26. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 26.** The sequence is: • Red LED: Two Flashes • Green LED: Six Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* • Check refrigerant • Replace outdoor control board • Replace inverter.	To clear, disconnect power to outdoor unit and restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
431	27	2 flashes	7 flashes	Service Soon/ Service Urgent	OD Inverter PFC Fault	The inverter has detected a PFC circuit over-current condition. • Error occurs when PFC detects an over current condition of 100A peak. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle timer is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 27. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 27.** The sequence is: • Red LED: Two Flashes • Green LED: Seven Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear, disconnect power to outdoor unit and restart.
432	28	2 flashes	8 flashes	Service Soon/ Service Urgent	OD Inverter DC Link High Voltage	The inverter has detected a DC link high voltage condition. • Error occurs when the DC link capacitor voltage is greater than 480 VDC. • If condition is detected, outdoor unit will stop (compressor and fan) – moderate condition. • Anti-short cycle timer is initiated. • If condition occurs 10 times within 60 consecutive minutes, the system will lockout – critical condition. • Inverter LEDs will flash code 28. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 28.,** The sequence is: • Red LED: Two Flashes • Green LED: Eight Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.* **Troubleshooting Suggestions:** • Check wire connections (U, V and W) at inverter plug in harness and compressor. • Check the resistance of compressor windings. If not in range, replace compressor. • Check compressor to ground. If ground issue, replace compressor. • Check input power (Single Phase - 208/230VAC ± 10%. If out of range, correct main power issue. • Check DC Link voltage and MICOM Sensing voltage. If out of range, replace inverter. if okay, possible mechanical issue with compressor. Go to outdoor unit service manual for detail troubleshooting procedures and require values for testing DC link voltages and various insulation resistance characteristics.	To clear, disconnect power to outdoor unit and restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
433	29	2 flashes	9 flashes	Service Soon/ Service Urgent	OD Inverter Compressor Over-current	Compressor phase current is too high. • During initial startup, a six minute time delay is implement to prevent the alarm from occurring. • Error occurs when compressor peak phase current is greater than 28 amps. • Inverter will issue inverter code 14 first and slow down to try to reduce the current. • If the current remains high, outdoor unit will stop (compressor and fan) – moderate condition. • Cycle timer is initiated. • If condition occurs five times within 60 consecutive minutes, the system will lockout – critical condition. • This alert code may be triggered by the inverter or the GEA variable capacity outdoor (inverter controlled) unit. • GEA outdoor control may trigger an this alert code if the inverter reduces the compressor speed which is identified as a alert code 441 and the compressor speed (in hz) is below the minimum speed. This will typically occur at start-up. The inverter automatically increases the compressor minimum speed below 45ºF in the heating mode and above 115ºF ensure the compressor capacity is sufficient for oil return. If alert code 433 occurs and inverter does not indicate an inverter code 29, the GEA outdoor control triggered the alert code 433. • Inverter LEDs will flash code 29. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 29.** The sequence is: • Red LED: Two Flashes • Green LED: Nine Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear alert code disconnect power to both the indoor and outdoor units and then reconnect power. Restart system.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
434	53	5 flashes	3 flashes	Service Soon/ Service Urgent	OD Inverter Comm Error to Main Control	• Outdoor control has lost communications with the inverter continuously during a single thermostat call and one hour period. • Outdoor control will stop all compressor demands – moderate condition. • Indoor blower will stop functioning. ***NOTE:*** *Indoor blower will not run in test mode either when alert code 434 is active. Only after system reset will it operate.* • This alert code will occur if the outdoor unit power is turned off and the indoor unit power (24VAC to outdoor control) remains on, or if the indoor unit power is turned off (24VAC to outdoor control) and the outdoor unit power is on. This could occur while performing service or maintenance procedures on the indoor or outdoor unit. • The GEA outdoor control will attempt to re-establish communication to the inverter when the alert code 434 occurs by cycling the outdoor unit contactor off for two minutes. Upon energizing the contactor the GEA outdoor control will attempt to communicate to the inverter for three minutes. This process will be repeated three times in attempt to establish communication before locking out. • If the unit is locked out with a critical alert code 434, reset the system by cycling the outdoor unit power off and back on. Then cycle the indoor power off (24VAC to the outdoor control) and then back on. • If this condition continuously occurs during a one hour period and during a single thermostat call, the outdoor unit will lock out and display alert code 434 – critical condition. **Troubleshooting Options:** • Check for loose or disconnected electrical connections. • Interruption of main power to inverter. • Inverter LEDs will flash code 53. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 53.** The sequence is: • Red LED: Five Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF*	Automatically clears when the system detects that the issue no longer exists. If the unit is locked out with a critical alert code 434, reset the system by first cycling the outdoor unit power off and back. Then cycle the indoor power off (24VAC to the outdoor control) and then back on.
435	60	6 flashes	OFF	Service Urgent	OD Inverter EEPROM Checksum fault	Inverter internal error. • When this error occurs, the outdoor control will cycle power to the inverter by opening the contactor for two minutes – moderate condition. • Outdoor control will cycle power to the inverter three times and then outdoor unit is locked out – critical condition. • Inverter LEDs will flash code 60. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 60.** The sequence is: • Red LED: Six Flashes • Green LED: Off ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	To clear alert code disconnect power to outdoor unit and restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
436	62	6 flashes	2 flashes	Service Soon/ Service Urgent	OD Inverter High Heat-Sink Temperature	Inverter heat sink temperature exceeded limit. • This occurs when the heat sink temperature exceeds the inverter limit. Inverter will issue inverter alert code 13 first and slow down to try to cool the heat sink. • If temperature remains high, outdoor unit will stop both compressor and fan – moderate condition. • Anti-short cycle is initiated. • If condition occurs five times within an hour, system will lockout – critical condition. • The screws that hold the inverter to the inverter board were loose causing poor contact between these two components. • Tighten screws that hold the heat sink to the inverter control board. ***NOTE:*** *Wait five minutes for all capacitors to discharge before checking screws.* • Inverter LEDs will flash code 62. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 62.** The sequence is: • Red LED: Six Flashes • Green LED: Two Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate condition will automatically clear when the inverter sends an alert code clear message. Critical condition is cleared by disconnecting power to the outdoor unit and restart.
437	65	6 flashes	5 flashes	Service Soon/ Service Urgent	OD Inverter Heat-Sink temp Sensor Fault	Heat sink temperature sensor fault has occurred (temperature less than 4ºF or greater than 264ºF after 10 minutes of operation). • When the temperature sensor detects a temperature less than 4ºF or greater than 264ºF after 10 minutes of operation. • Outdoor unit will stop both compressor and fan – moderate condition. • Anti-short cycle is initiated. • If condition occurs five times within an hour, system will lockout – critical condition. • Inverter LEDs will flash code 65. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 65.** The sequence is: • Red LED: Six Flashes • Green LED: Five Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate priority condition will automatically clear when the inverter sends an alert code clear message. Critical priority condition can be cleared by disconnecting and reconnecting power to outdoor unit to restart.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
438	73	7 flashes	3 flashes	Service Urgent	OD Inverter PFC Input Over-current	The inverter has detected a power factor correction (PFC) circuit over-current condition. • The inverter has detected an PFC over current condition. This may be caused by a high load condition, high pressure, or outdoor fan failure. • Outdoor control will display the code when the inverter has detected the error – moderate condition. • After three minutes, the inverter will reset and the compressor will resume operation. • If the error condition occurs 10 times within a 60 minute rolling time period, the outdoor unit control will lock out operation of the outdoor unit – critical condition. • Possible issue is system running at high pressures. • Check for high pressure trips or other alert codes in thermostat and outdoor control. • Inverter LEDs will flash code 73. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 73.** The sequence is: • Red LED: Seven Flashes • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and Green LED is OFF.*	Moderate priority condition is automatically cleared when the inverter sends a clear message. Critical priority condition will automatically clear when inverter is power cycled.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
440	13	1 flash	3 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Heat-Sink temperature	Compressor slowdown due to high heat sink temperature. • 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. • The screws that hold the inverter to the inverter board may be loose causing poor contact between these two components. • Tighten screws that hold the heat sink to the inverter control board. ***NOTE:*** *Wait five minutes for all capacitors to discharge before checking screws.* • This error code is primarily for informational purposes as the inverter controls the compressor speed to operate within design parameters. Typically the inverter will make a minor speed reduction of 4 Hz (approximately a 5-6% speed reduction) for a brief period of time and to reduce the heat sink temperature and will then resume normal operation. This may occur at high outdoor temperatures (above 110ºF) for brief periods of time (3 – 4 minutes) and is normal and expected operation of the inverter controlling the compressor safely within design parameters. • The inverter finned aluminum heat sink is located on the back side of the inverter in the condenser air stream. If the alert code 440 occur frequently, especially at lower outdoor temperatures, check the heat sink for debris that may reduce heat transfer or possible obstructions that may impact air flow across the heat sink. • The inverter will begin to briefly reduce the compressor speed when the heat sink temperature rises above 185ºF and will allow the inverter to resume the requested compressor demand speed once the inverter heat sink reaches 176ºF. The heat sink temperature, compressor speed in Hertz & the Inverter Compressor Speed Reduction status (“On” or “Off ”) notification can be viewed under the outdoor unit Diagnostics section of the thermostat dealer control center. • Inverter LEDs will flash code 13. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 13.** The sequence is: • Red LED: One Flash • Green LED: Three Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.

Table 32. 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 communicating thermostat.

GF= Gas Furnace, AH=Air Handler, ID=Indoor unit (GF or AH), HP=Heat Pump, AC=Air Conditioner, OD=Outdoor Unit (AC or HP), ZA=Zone system and TS=Thermostat

Alert Code	Inverter Code	Inverter Flash Code		Priority Condition	Actual Displayed Alert Text	Component or System Operational State and Troubleshooting Tip	How to Clear Alert Code
		Red LED	Green LED				
441	14	1 flash	4 flashes	Information Only-Dealer	OD Inverter Compressor Slowdown - High Compressor Current	This alert code is for more information than an issue with the system. • When the inverter gets close to the current or heat sink temperature limit, it will limit the ramp rate. Instead of changing compressor speed at 1 hz/second, it changes to 5 hz/20 seconds. • Compressor slowdown due to high compressor current. • Compressor current is approaching limit. • The compressor speed automatically slows. • This error code is primarily for informational purposes as the inverter controls the compressor to operate within design parameters. Alert code 441 typically occurs at startup as the compressor current increases rapidly during startup. • The inverter will reduce the compressor speed by 4 Hz and slow the compressor ramp up speed to the requested compressor demand speed (capacity). This is normal and expected operation of the inverter to control the inverter within design parameters. In most cases the alert code 441 notification does not require any additional service or diagnostic procedures. • The control sets indoor CFM and outdoor RPM to values according to demand percentage rather than the actual Hz. • Possible issue is system running at high pressures. • Check for high pressure trips or other alert codes in thermostat and outdoor control. • Inverter LEDs will flash code 14. • Refer to the unit service documentation for detailed troubleshooting procedures. **Inverter flash code 14.** The sequence is: • Red LED: One Flash • Green LED: Four Flashes ***NOTE:*** *Inverter normal operations with no error code present is as follows. Red LED is ON and green LED is OFF.*	Automatically clears when the condition no longer exists.

Table 32. Outdoor Control 7-Segment Display Alert Codes and Inverter LED Flash Codes

System Refrigerant

IMPORTANT

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

This section outlines the procedures to:

1. Connect a gauge set for testing and charging as illustrated in Figure 52.
2. Check and adjust indoor airflow as described in Figure 53.
3. Add or remove refrigerant using the weigh-in method shown in Figure 54.
4. Verify the charge using the subcooling method described in Figure 55.

IMPORTANT

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

Adding or Removing Refrigerant

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

Indoor Airflow Check

Check airflow using the Delta-T (DT) process using the illustration in Figure 53.

The diagnostic screen on the A3 thermostat displays the indoor CFMs on systems installed with the A3 communicating thermostat.

On systems installed with the A3 thermostat, the Cooling - Maximum Rate Test located in the Test section of the Dealer Control Center of the thermostat or the Dealer Setup App may be used to operate the unit at maximum capacity during charging.

Charge Mode Jumper

To initiate the 4SHP22LX Charge Mode function, install the jumper across the two Charge Mode Pins (CHRG MODE) on the outdoor control. The Charge Mode can be used when charging the system with refrigerant, checking the refrigerant charge, pumping down the system and performing other service procedures that requires outdoor unit operation at 100% capacity.

4SHP22LX Charge Mode Operation with an A3 Comfort Sync® Communicating Thermostat

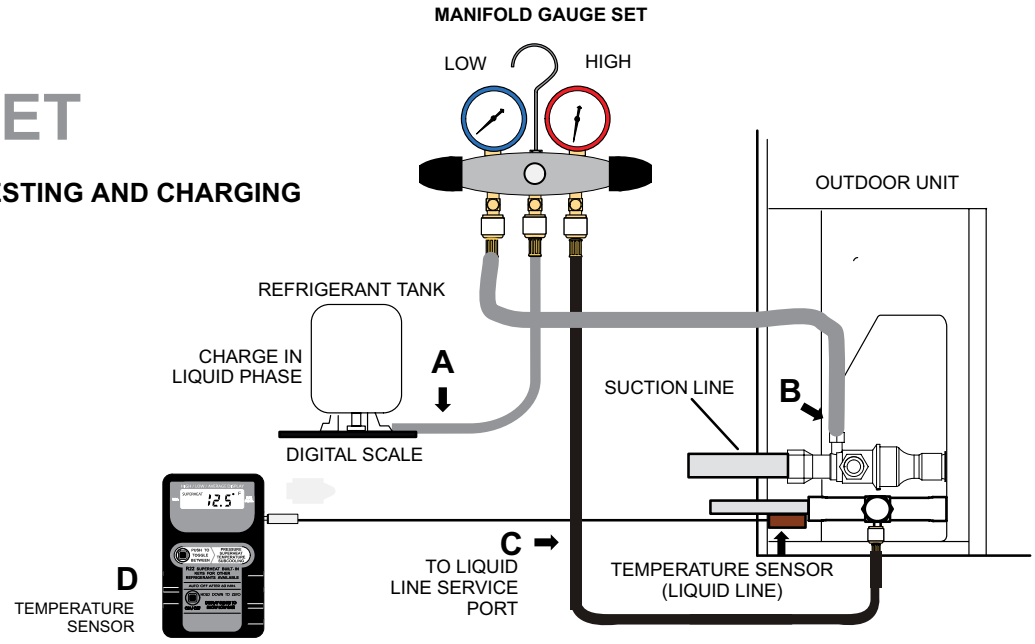
Installing a jumper on the Charge Mode Pins will initiate compressor operation and outdoor fan motor at 100% capacity and will provide a signal to the indoor unit to initiate indoor blower operation at the maximum cooling air volume. To exit the charge mode, remove the Charge Mode Jumper. The Charge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

4SHP22LX Charge Mode Operation with a Conventional 24VAC Non-Communicating Thermostat

On applications with a conventional 24VAC non-communicating thermostat, the charge mode jumper must be installed on the Charge Mode Pins after providing a Y1 cooling demand to the 4SHP22LX to initiate the Charge Mode. A cooling blower demand must also be provided to initiate blower operation on the cooling speed on the indoor unit. The compressor and outdoor fan motor will operate at 100% capacity. To exit the charging mode, remove the Charge Mode Jumper and remove the Y1 Cooling demand and indoor blower demand. The Charge Mode has a maximum time of 60 minutes and will automatically exit the charge mode after 60 minutes is the charge mode jumper is left in place.

GAUGE SET

CONNECTIONS FOR TESTING AND CHARGING



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 SUCTION LINE SERVICE 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 52. Gauge Set Connections

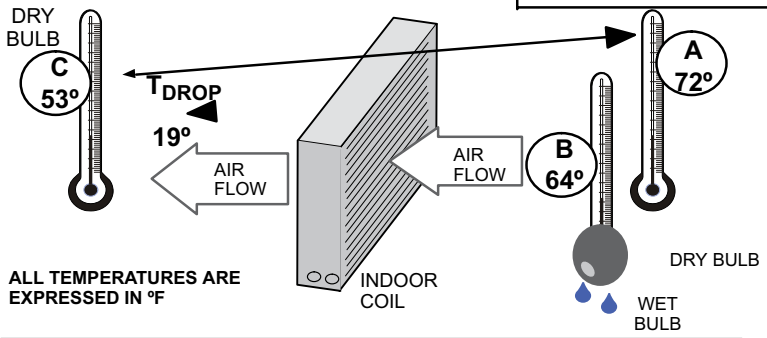
AIRFLOW

INDOOR COIL

TEMPERATURE OF AIR ENTERING INDOOR COIL °F

DRY-BULB	DT													
80	24	24	24	23	23	22	22	22	20	19	18	17	16	15
78	23	23	23	22	22	21	21	20	19	18	17	16	15	14
76	22	22	22	21	21	20	19	19	18	17	16	15	14	13
74	21	21	21	20	19	19	18	17	16	16	15	14	13	12
72	20	20	19	18	17	17	16	15	15	14	13	12	11	10
70	19	19	18	18	17	17	16	15	15	14	13	12	11	10
WET-BULB °F	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**

A **B**



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

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

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

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

WEIGH-IN CHARGING METHOD

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 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

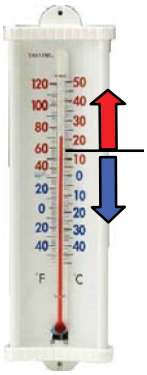
Example: Units are factory-charged for 15 feet (4.6 meters) of 3/8" line set. Factory charge for 3/8" is 0.60 oz/ft x 15 = 9.0 ounces.

Figure 54. Using HFC-410A Weigh-In Method

SUBCOOLING CHARGING METHOD

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

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



USE COOLING MODE

60ºF (15ºC)

USE HEATING MODE

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

6. READ THE LIQUID LINE TEMPERATURE; RECORD IN THE 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.

SATº _____

LIQº – _____

SCº = _____

Figure 55. Using HFC-410A Subcooling Method - High Speed (High Capacity)

°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		

Table 33. HFC-410A Temperature (°F) - Pressure (Psig)

4SHP22LX HFC-410A CHARGING INFORMATION - FOR COMPLETE CHARGING PROCEDURES, REFER TO THE APPLICABLE INSTALLATION AND SERVICE MANUAL

Maintenance checks using the Normal Operating Pressures table
Table 1 may be used to help perform maintenance checks. This table is not a procedure for charging the system. Minor variations in the pressures can 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.

Matched System Components/Charge Levels/Line Set Length/Liquid Line Sizing
Table 2 lists all the recommended indoor unit matches along with the charge levels for the various sizes of outdoor units. Charge levels on the unit nameplate are based on installations with 15' (4.6m) line sets; consider line set length and liquid line sizing differences when calculating charge adjustments. For each additional foot of 3/8" liquid line set, add 0.6 ounces or for 1/2" liquid lines, add 1.0 ounce of additional charge.

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.
1 - Recover the refrigerant from the unit.
2 - Conduct leak check; evacuate the system.
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 (15°C) 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 (21-27°C) indoor return air temperature.
Heating Mode-When the outdoor ambient temperature is below 60°F (15°C), use the heating mode to adjust the charge using the subcooling charge levels (table). Target subcooling values in table 2 are based on 65-75°F (18-24°C) indoor return air temperature.

TABLE-1 NORMAL OPERATING PRESSURES (LIQUID ±10 AND SUCTION ±5 psig)

4SHP22LX	24	36
°F	LIQUID LINE PRESSURE / VAPOR LINE PRESSURE	
HEATING OPERATION - MAX SPEED		
20	300/64	293/57
30	318/78	311/75
40	337/93	325/87
50	356/108	339/105
60	371/127	360/124
COOLING OPERATION - MAX SPEED		
65	237/142	228/132
70	256/143	262/133
75	276/145	283/134
80	297/146	304/135
85	322/145	327/136
90	345/147	351/137
95	370/148	378/138
100	397/148	403/139
105	425/150	432/141
110	453/151	461/142
115	487/151	493/144

TABLE -2 INDOOR UNIT MATCHUPS AND SUBCOOLING CHARGE LEVELS

INDOOR MATCHUP	SUBCOOL		ADDNL CHARGE ADD/REMOVE
	HEATING (±5°F)	COOLING (±1°F)	
4SHP22LX124			
BCE5*24M	20.5	10.5	10 Oz
BCE5*30M	18.5	11	11 Oz
BCE7*24M	23	12	2 Lbs 0 Oz
BCE7*30M	15	11	13 Oz
EA(C;U)IP24 / EAC4X24	33	10	0 Oz
EA(C;U)IP30 / EAC4X30	21	13	1 Lbs 7 Oz

INDOOR MATCHUP	SUBCOOL		ADDNL CHARGE ADD/REMOVE
	HEATING (±5°F)	COOLING (±1°F)	
4SHP22LX136			
BCE5*36M	11	14	1 Lbs 10 Oz
BCE5*42M	11	14	1 Lbs 10 Oz
BCE7*36M	13	13.5	1 Lbs 0 Oz
BCE7*42M	14	22	3 Lbs 5 Oz
EA(C;U)IP30 /EAC4X30	13	12	0 Oz
EA(C;U)IP36 /EAC4X36	19	17	2 Lbs 1 Oz
EA(C;U)IP48 /EAC4X48	11	14.5	1 Lbs 5 Oz
EAHIP30A	23	17	1 Lbs 10 Oz
EAHIP30B	18	16	1 Lbs 13 Oz
EAHIP36C	20	16	8 Oz
EAHIP42C	13	17	1 Lbs 15 Oz
EAHIP48B	13	16	1 Lbs 6 Oz
EDIP30/36	26	11.5	1 Oz
EDIP48	27	17	2 Lbs 2 Oz
E*IP36	32	15.5	12 Oz
E*IP43	9	18	3 Lbs 8 Oz

*Amount of charge required in addition to charge shown on unit nameplate. (Remember to consider line set length.)

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Figure 56. 4SHP22LX124, 36 Charging Label

4SHP22LX HFC-410A CHARGING INFORMATION - FOR COMPLETE CHARGING PROCEDURES, REFER TO THE APPLICABLE INSTALLATION AND SERVICE MANUAL

Maintenance checks using the Normal Operating Pressures table
Table 1 may be used to help perform maintenance checks. This table is not a procedure for charging the system. Minor variations in the pressures can 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.

Matched System Components/Charge Levels/Line Set Length/Liquid Line Sizing
Table 2 lists all the recommended indoor unit matches along with the charge levels for the various sizes of outdoor units. Charge levels on the unit nameplate are based on installations with 15' (4.6m) line sets; consider line set length and liquid line sizing differences when calculating charge adjustments. For each additional foot of 3/8" liquid line set, add 0.6 ounces or for 1/2" liquid lines, add 1.0 ounce of additional charge.

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.
1 - Recover the refrigerant from the unit.
2 - Conduct leak check; evacuate the system.
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 (15°C) 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 (21-27°C) indoor return air temperature.
Heating Mode-When the outdoor ambient temperature is below 60°F (15°C), use the heating mode to adjust the charge using the subcooling charge levels (table). Target subcooling values in table 2 are based on 65-75°F (18-24°C) indoor return air temperature.

TABLE-1 NORMAL OPERATING PRESSURES (LIQUID ±10 AND SUCTION ±5 psig)

4SHP22LX	48	60
°F	LIQUID LINE PRESSURE / VAPOR LINE PRESSURE	
HEATING OPERATION - MAX SPEED		
20	293/63	308/57
30	308/75	327/70
40	328/88	344/83
50	342/104	359/99
60	359/123	387/111
COOLING OPERATION - MAX SPEED		
65	241/137	235/130
70	260/137	255/132
75	281/137	275/132
80	303/138	297/133
85	326/139	318/136
90	351/140	342/134
95	374/140	368/135
100	403/1422	393/136
105	430/143	421/137
110	459/145	450/138
115	490/146	481/140

TABLE -2 INDOOR UNIT MATCHUPS AND SUBCOOLING CHARGE LEVELS

INDOOR MATCHUP	SUBCOOL		ADDNL CHARGE ADD/REMOVE
	HEATING (±5°F)	COOLING (±1°F)	
4SHP22LX148			
BCE5*48M	34	9	2 Lbs 11 Oz
BCE5*60M	28	10.5	3 Lbs 9 Oz
BCE7*48M	23	10	3 Lbs 4 Oz
BCE7*60M	20	12.5	4 Lbs 1 Oz
EA(C;U)1P60C / EAC4X60C	22.5	13	4 Lbs 0 Oz
EAHIP48B	33	8.5	0 Oz
EAHIP48C	33	8.5	1 Lbs 14 Oz
EAHIP51C	27	10.5	2 Lbs 13 Oz
EDIP50/60C	30	13	5 Lbs 0 Oz
E*IP49C	19	14	5 Lbs 4 Oz
E*IP62C	17.5	14.5	5 Lbs 7 Oz

INDOOR MATCHUP	SUBCOOL		ADDNL CHARGE ADD/REMOVE
	HEATING (±5°F)	COOLING (±1°F)	
4SHP22LX160			
BCE5*60M	16	10.5	2 Oz
BCE7*60M	13	10	3 Oz
EA(C;U)1P60C /EAC4X60C	17	10	11 Oz
EA(C;U)1P60D /EAC4X60D	18	10	7 Oz
EAHIP60D	16	9	9 Oz
EDIP50/60C	18	10	0 Oz
EDIP60D	18	10	0 Oz
EMIP62C	14	12	1 Lbs 12 Oz
EMIP62D	10	10	1 Lbs 9 Oz

*Amount of charge required in addition to charge shown on unit nameplate. (Remember to consider line set length.)

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Figure 57. 4SHP22LX148, 60 Charging Label