

INSTALLATION MANUAL

R-410A VARIABLE CAPACITY OUTDOOR SPLIT-SYSTEM AIR CONDITIONING

MODELS: 20 SEER
YXV, AC21, AL21 SERIES
2 – 5 TONS – 1 PHASE



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IMPORTANT

It is recommended before starting the system to connect the thermostat to Wi-Fi using a local network or portable hot-spot so the thermostat and system receive the latest software updates to optimize system performance.

CAUTION

The EEV is factory installed but shipped in the closed position. Prior to any brazing, power must be applied to the Indoor Unit. If installing a coil furnace match or multi-piece air handler system, the EEV harness must be plugged into the Comm port prior to applying power to the indoor unit. Allow 1 minute for the EEV to open to allow proper nitrogen flow through the coil and lineset.

SECTION I: GENERAL

The outdoor units are designed to be connected to a matching indoor coil with sweat connect lines. Sweat connect units are factory charged with refrigerant for a nominal sized matching indoor coil plus 15 feet of field-supplied lines.

SECTION II: SAFETY



This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention to the signal words **DANGER**, **WARNING**, or **CAUTION**.

DANGER indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury**.

WARNING indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury**.

CAUTION indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury**. It is also used to alert against unsafe practices and hazards involving only property damage.

WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer or service agency.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to building, electrical, and mechanical codes.

⚠ CAUTION

*R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment. Service equipment **Must Be Rated** for R-410A.*

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit including copper distributor lines that may have shifting during transit, and are touching either copper lines or the cabinet. If damage is evident, the extent of the damage should be noted on the carrier's delivery receipt. A separate request for inspection by the carrier's agent should be made in writing. See Local Distributor for more information.

Requirements For Installing/Service R-410A Equipment

- Gauge sets, hoses, refrigerant containers, and recovery system must be designed to handle the POE type oils, and the higher pressures of R-410A.
- Manifold sets should be high side and low side with low side retard.
- All hoses must have a 700 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- Recovery equipment (including refrigerant recovery containers) must be specifically designed to handle R-410A.

LIMITATIONS

The unit should be installed in accordance with all National, State and Local Safety Codes and the limitations listed below:

1. Limitations for the indoor unit, coil, and appropriate accessories must also be observed.
2. The outdoor unit must not be installed with any duct work in the air stream. The outdoor fan is the propeller type and is not designed to operate against any additional external static pressure.
3. The maximum and minimum conditions for operation must be observed to ensure a system will give maximum performance with minimal service.

TABLE 1: Minimum / Maximum Operating Limit Conditions

AIR TEMPERATURE AT OUTDOOR COIL, ° F (° C)		AIR TEMPERATURE AT INDOOR COIL, ° F (° C)	
Min.	Max.	Min.	Max.
DB Cool	DB Cool	WB Cool	WB Cool
35(2)*	125(52)*	57(14)	72(22)

*Reference the NOTICE under the "Unit Reduced Capacity Conditions" section.

4. The maximum allowable equivalent line length for this product is 80 feet.

Standard Lineset Applications

Maximum allowable lineset varies depending on the vertical separation between the evaporator and condenser. See Table 2 for allowable line set lengths and sizing.

TABLE 2: Allowable Vertical Linesets.

Model	Liquid Line	Suction Line	Max Line Length - Units on Equal Level	Max Suction Line Riser - If OD Unit is Above ID Unit	Max Liquid Line Riser - If OD Unit is Below ID Unit
24	3/8"	3/4"	80 feet	25 feet	25 feet
36					
48					
60					
		7/8"			

Unit Reduced Capacity Conditions**NOTICE****Inverter Temperature Protection:**

If excessive inverter temperatures are sensed, the compressor speed / capacity is reduced until an acceptable condition is reached.

When the inverter temperature returns to an acceptable level, the system returns to normal operation.

Over / Under Current Protection: *If a low or high Current Condition is sensed, the compressor speed / capacity is reduced until an acceptable current level is reached.*

When the system reaches an acceptable current level, the compressor and fan return to normal operating conditions.

Over / Under Voltage Protection: *If a low or high supply Voltage Condition is experienced (below 187 VAC or above 265 VAC), the compressor speed / capacity is automatically reduced until an acceptable voltage level is sensed.*

When an acceptable voltage level is sensed, the system automatically returns to a normal state of operation.

High Altitude Protection: *If the unit is installed in Altitudes of 6,500 ft / 2,000 m above sea level or higher, the compressor and outdoor fan reduce speeds to protect the system. It is not recommended these units be installed at altitudes greater than 6,500 ft / 2,000 m above sea level.*

Low Ambient Protection:

Cooling Mode: *The unit automatically adjusts to maintain cooling operation in outdoor ambient conditions down to 35° F (2° C). The unit reduces capacity and Low Ambient Protection (cooling mode) or cycles off if asked to provide cooling when the outdoor temperature is at or below these conditions.*

SECTION III: UNIT INSTALLATION**LOCATION**

Before starting the installation, select and check the suitability of the location for both the indoor and outdoor unit. Observe all limitations and clearance requirements.

The outdoor unit must have sufficient clearance for air entrance to the condenser coil, air discharge, and service access. See Figure 1.

NOTICE

For multiple unit installations, units must be spaced a minimum of 24" (61 cm) apart (coil face to coil face).

If the unit is to be installed on a hot sun exposed roof or a paved ground area that is seasonally hot, the unit should be raised sufficiently above the roof or ground to avoid taking the accumulated layer of hot air into the outdoor unit (which can cause the unit to derate prematurely).

If the system is being installed during seasonally cold weather of 55°F or below, the preferred method is to weigh in the charge. For charging or checking the system charge at 55°F or below, refer to the "Optional Cold Weather Charging" procedures near the end of SECTION VI: SYSTEM CHARGE. There is an "Optional Cold Weather Charging" accessory kit to prevent the outdoor unit from taking in cold air below 55°F. The kit part number can be found in the list of accessory kits on the UPGNET web site.

Provide adequate structural support for the unit.

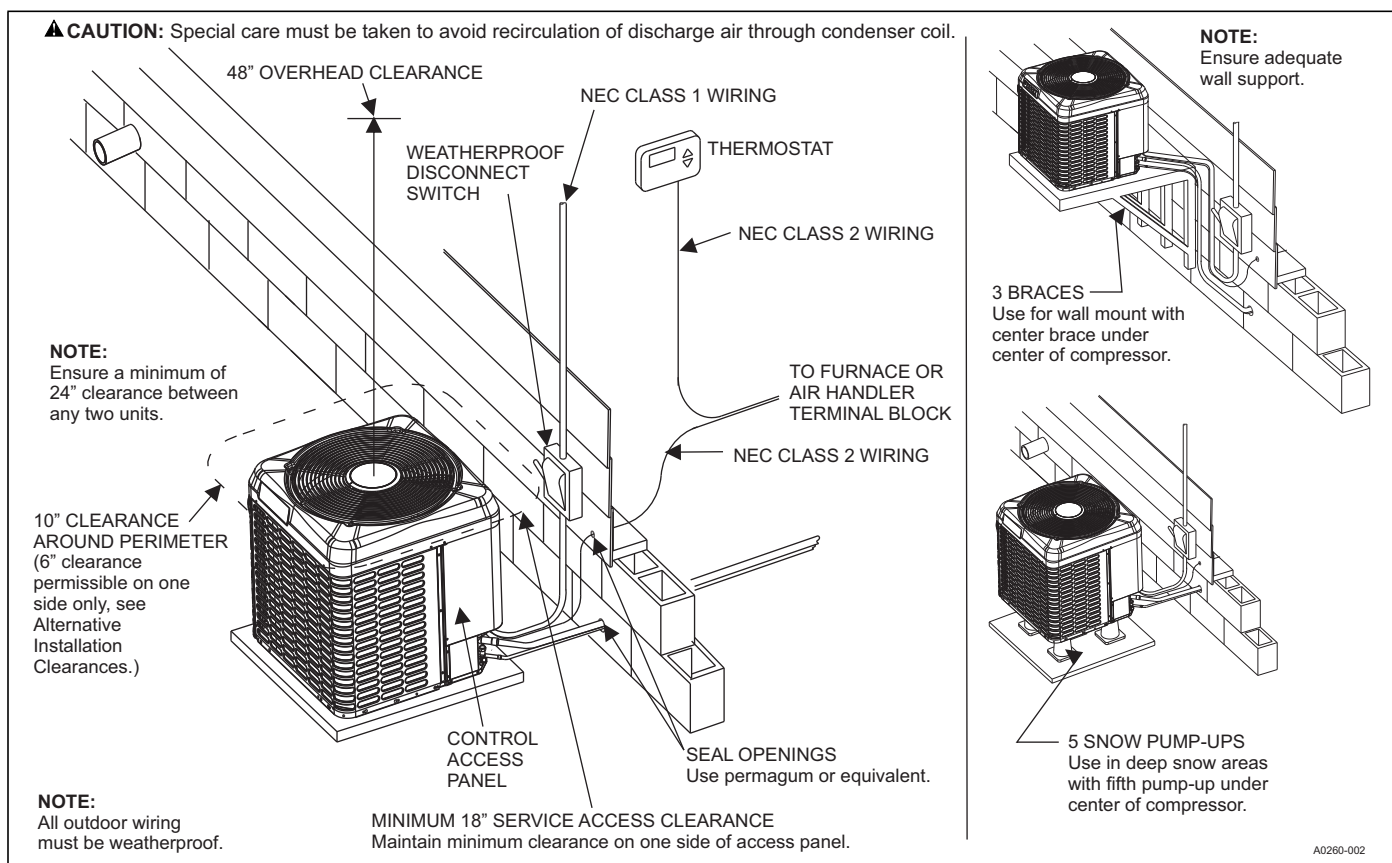


FIGURE 1: Typical Installation Clearances

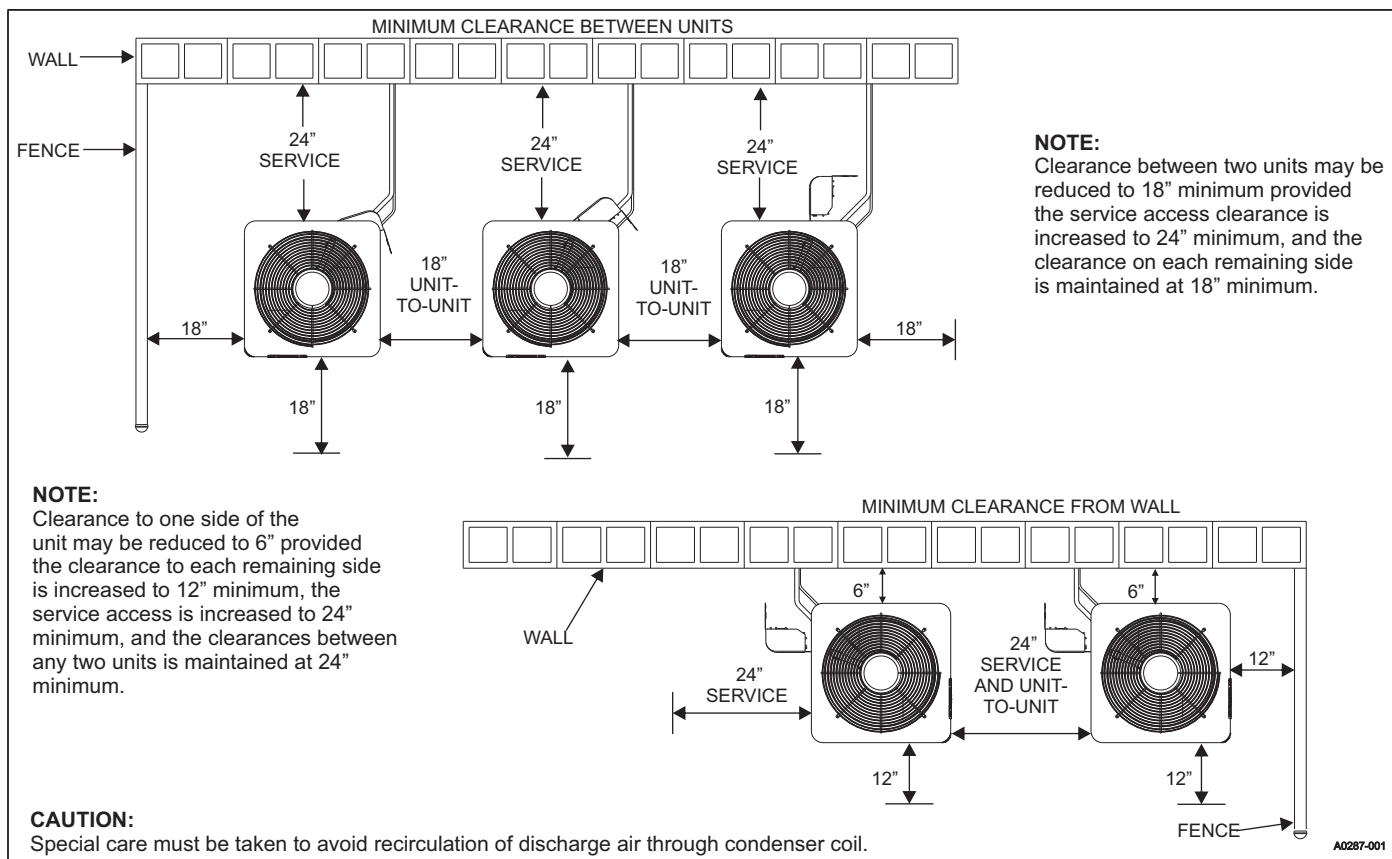


FIGURE 2: Alternative Installation Clearances

ADD-ON REPLACEMENT/RETROFIT

When this unit is being used as a replacement for an existing R-410A unit, these are matched systems and the indoor coil and outdoor unit must be replaced. The following steps should be performed in order to insure proper system operation and performance. Line-set change out is also recommended.

1. Change-out of the indoor coil to an approved R-410A coil / air handling unit combination with the appropriate metering device.
2. Change-out of the line-set when replacing an R-22 unit with an R410-A unit is highly recommended to reduce cross-contamination of oils and refrigerants.
3. If change-out of the line set is not practical, then the following precautions should be taken.
 - Inspect the line set for kinks, sharp bends, or other restrictions, and for corrosion.
 - Determine if there are any low spots which might be serving as oil traps.
 - Flush the line set with a commercially available flush kit to remove as much of the existing oil and contaminants as possible.
 - Install a suction line filter-drier to trap any remaining contaminants, and remove after 50 hours of operation.
4. If the outdoor unit is being replaced due to a compressor burnout, then installation of a 100% activated alumina suction-line filter drier in the suction-line is required, in addition to the factory installed bi-flow liquid-line drier. Operate the system for 10 hours. Monitor the suction drier pressure drop. If the pressure drop exceeds 3 psig, replace both the suction-line and liquid-line driers. After a total of 10 hours run time where the suction-line pressure drop has not exceeded 3 psig, replace the liquid line drier, and remove the suction-line drier. Never leave a suction-line drier in the system longer than 50 hours of run time.

GROUND INSTALLATION

The unit may be installed at ground level on a solid base that will not shift or settle, causing strain on the refrigerant lines and possible leaks. The unit must be installed in as level a position as possible while maintaining the clearances shown in Figure 2.

Normal operating sound levels may be objectionable if the unit is placed directly under windows of certain rooms (bedrooms, study, etc.).

⚠ WARNING

The outdoor unit should not be installed in an area where mud or ice could cause personal injury.

Elevate the unit sufficiently to prevent any blockage of the air entrances by snow in areas where there will be snow accumulation. Check the local weather bureau for the expected snow accumulation in your area. Isolate the unit from rain gutters to avoid any possible wash out of the foundation.

ROOF INSTALLATION

When installing units on a roof, the structure must be capable of supporting the total weight of the unit, including a pad, lintels, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

WALL MOUNT INSTALLATION

Care must be taken to mount the outdoor unit on a solid base that is sloped to shed water, secure from settlement, and is isolated from the structural foundation or walls to prevent sound and vibration transmission into the living space.

On occasion, site conditions may require direct wall mounted brackets to be used to locate and support the outdoor unit. In these applications, care must be taken to address unit base pan support, structural integrity, safe access and serviceability, as well as the possible sound and vibration transmission into the structure. Wall mounting requires 3 mounting brackets and best served by a properly engineered solution.

See price pages for specific part number for your application.

UNIT PLACEMENT

1. Provide a base in the pre-determined location.
2. Remove the shipping carton and inspect for possible damage.
3. Ensure that compressor tie-down bolts remain tightened.
4. Position the unit on the base provided.

LIQUID LINE FILTER-DRIER

The air conditioning unit's copper spun filter/dryer is located on the liquid line.

⚠ CAUTION

Failure to use the same as the original factory drier or using a substitute drier or a granular type may result in damage to the equipment.

NOTICE

Replacements for the liquid line drier must be exactly the same as marked on the original factory drier. See Source 1 for O.E.M. replacement driers.

R-410A Filter-Drier Source 1 Part No.	Apply with Models
S1-02922195000	All

PIPING CONNECTIONS

The outdoor condensing unit must be connected to the indoor evaporator coil using field supplied refrigerant grade (ACR) copper tubing that is internally clean and dry. Units should be installed only with the tubing sizes for approved system combinations as specified in tabular data sheet. The charge given is applicable for total tubing lengths up to 15 feet (4.6 m).

NOTICE

Using a larger than specified line size could result in oil return problems. Using too small a line will result in loss of capacity and other problems caused by insufficient refrigerant.

⚠ WARNING

Never install a suction-line filter drier in the liquid line of an R-410A system. Failure to follow this warning can cause a fire, injury or death.

⚠ CAUTION

This system uses R-410A refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gauge sets, hoses, refrigerant containers, and recovery system must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer.

PRECAUTIONS DURING LINE INSTALLATION

Install the refrigerant lines with as few bends as possible. Care must be taken not to damage the couplings or kink the tubing. Use clean hard drawn copper tubing where no appreciable amount of bending around obstruction is necessary. If soft copper must be used, care must be taken to avoid sharp bends which may cause a restriction.

5. The lines should be installed so that they will not obstruct service access to the coil, air handling system, or filter.
6. Care must also be taken to isolate the refrigerant lines to minimize noise transmission from the equipment to the structure.
7. The vapor line must be insulated with a minimum of 1/2" foam rubber insulation (Armaflex or equivalent). Liquid lines that will be exposed to direct sunlight, high temperatures, or excessive humidity must also be insulated.

8. Tape and suspend the refrigerant lines as shown. DO NOT allow tube metal-to-metal contact. See Figure 3.
9. Use PVC piping as a conduit for all underground installations as shown in Figure 4. Buried lines should be kept as short as possible to minimize the build up of liquid refrigerant in the vapor line during long periods of shutdown.

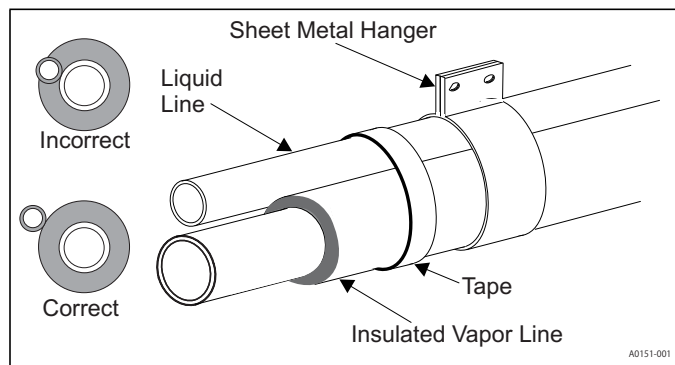


FIGURE 3: Installation of Vapor Line

10. Pack fiberglass insulation and a sealing material such as permagum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.

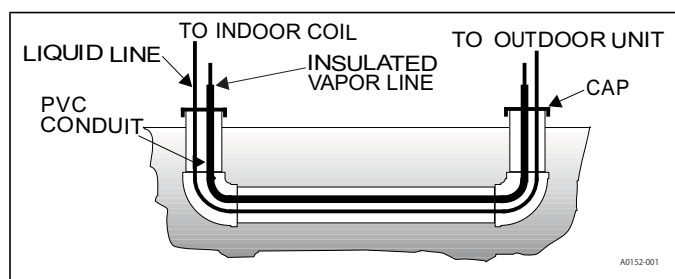


FIGURE 4: Underground Installation

PRECAUTIONS DURING BRAZING OF LINES

All outdoor unit and evaporator coil connections are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5, silver solder or equivalent. DO NOT use soft solder. The outdoor units have reusable service valves on both the liquid and vapor connections. The system refrigerant charge for 15 feet of lineset is retained within the outdoor unit during shipping and installation. The reusable service valves are provided to evacuate and charge per this instruction.

Serious service problems can be avoided by taking adequate precautions to assure an internally clean and dry system.

⚠ CAUTION

Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provided. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to insure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

⚠ CAUTION

The EEV is factory installed but shipped in the closed position. Prior to any brazing, power must be applied to the Indoor Unit. If installing a coil furnace match or multi-piece air handler system, the EEV harness must be plugged into the Comm port prior to applying power to the indoor unit. Allow 1 minute for the EEV to open to allow proper nitrogen flow through the coil and lineset.

PRECAUTIONS DURING BRAZING SERVICE VALVE

Precautions should be taken to prevent heat damage to service valve by wrapping a wet rag around it as shown in Figure 5. Also, protect all painted surfaces, insulation, and plastic base during brazing. After brazing, cool joint with wet rag.

⚠ WARNING

This is not a backseating valve. The service access port has a valve core. Opening or closing valve does not close service access port. If the valve stem is backed out past the chamfered retaining wall, the O-ring can be damaged causing leakage or system pressure could force the valve stem out of the valve body possibly causing personal injury.

Valve can be opened by removing the service valve cap and fully inserting a hex wrench into the stem and backing out counter-clockwise until valve stem just touches the chamfered retaining wall.

Connect the refrigerant lines using the following procedure:

1. Remove the cap and Schrader core from both the liquid and vapor service valve service ports at the outdoor unit. Connect low pressure nitrogen to the liquid line service port, allow nitrogen to flow.
2. Braze the liquid line to the liquid service valve at the outdoor unit. Be sure to wrap the valve body with a wet rag. Allow the nitrogen to continue flowing.
3. Carefully remove the plugs from the evaporator liquid and vapor connections at the indoor coil.

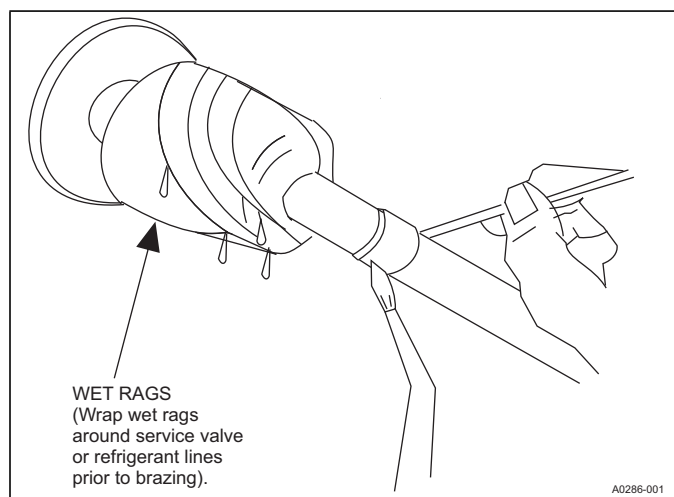


FIGURE 5: Heat Protection

⚠ CAUTION

Do not install any coil with a furnace which is to be operated during the heating season without attaching the refrigerant lines to the coil. The coil is under pressure which must be released to prevent excessive pressure build-up and possible coil damage.

4. Power must be applied to the indoor unit. If installing a coil/furnace match or multi piece air handler system, the EEV harness must be plugged into the communication port header on furnace or blower control board prior to apply power to the indoor unit. Allow 1 minute for the EEV to open to allow proper nitrogen flow through the coil and line-set.
5. Protect the vapor valve with a wet rag and braze the vapor line connection to the outdoor unit. The nitrogen flow should be exiting the system from the vapor service port connection. After this connection has cooled, remove the nitrogen source from the liquid fitting service port.
6. Braze the liquid line to the evaporator liquid connection. Nitrogen should be flowing through the evaporator coil.

7. Slide the grommet away from the vapor connection at the indoor coil and wrap with a wet rag as shown in Figure 5. Braze the vapor line to the evaporator vapor connection. After the connection has cooled, slide the grommet back into original position. After this connection has cooled, remove the nitrogen source from the liquid fitting service port.
8. Replace the Schrader core in the liquid and vapor valves.
9. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight. **DO NOT OVERTIGHTEN** (between 40 and 60 inch - lbs. maximum).

NOTICE

*Line set and indoor coil can be pressurized to 250 psig with dry nitrogen and leak tested with a bubble type leak detector. Then release the nitrogen charge.
Do not use the system refrigerant in the outdoor unit to purge or leak test.*

10. Evacuate the vapor line, evaporator, and liquid line to 500 microns or less.
11. Replace cap on service ports. Do not remove the flare caps from the service ports except when necessary for servicing the system.

CAUTION

Do not connect manifold gauges unless trouble is suspected. Approximately 3/4 ounce of refrigerant will be lost each time a standard manifold gauge is connected.

12. Release the refrigerant charge into the system. Open both the liquid and vapor valves by removing the service valve cap and with an Allen wrench back out counter-clockwise until valve stem just touches the chamfered retaining wall. If the service valve is a ball valve, use a Crescent wrench to turn valve stem one-quarter turn counterclockwise to open. Do not overturn or the valve stem may break or become damaged. See "PRECAUTIONS DURING BRAZING SERVICE VALVE".
13. Replace service valve cap finger tight, then tighten an additional 1/2 turn (1/2 hex flat). Cap must be replaced to prevent leaks.

WARNING

Never attempt to repair any brazed connections while the system is under pressure. Personal injury could result.

14. See Section VI "System Charge" section for checking and recording system charge.

SECTION IV: EVACUATION

Evacuate the system to 500 microns or less. If a leak is suspected, leak test with dry nitrogen to locate the leak. Repair the leak and test again.

To verify that the system has no leaks, simply close the valve to the vacuum pump suction to isolate the pump and hold the system under vacuum. Watch the micron gauge for a few minutes. If the micron gauge indicates a steady and continuous rise, it's an indication of a leak. If the gauge shows a rise, then levels off after a few minutes and remains fairly constant, it's an indication that the system is leak free but still contains moisture and may require further evacuation if the reading is above 500 microns.

SECTION V: ELECTRICAL CONNECTIONS

GENERAL INFORMATION & GROUNDING

The control box cover is held in place with 5 screws (one screw near each lower corner, one each at the midpoint of each side and one at top middle).

Check the electrical supply to be sure that it meets the values specified on the unit nameplate and wiring label.

Power wiring, control (low voltage) wiring, disconnect switches and over current protection must be supplied by the installer. Wire size should be sized per NEC requirements.

CAUTION

*All field wiring must **USE COPPER CONDUCTORS ONLY** and be in accordance with Local, National, Fire, Safety & Electrical Codes. This unit must be grounded with a separate ground wire in accordance with the above codes.*

The complete connection diagram and schematic wiring label is located on the inside surface of the unit service access panel. An example of typical field connections can be found in Figure 7.

FIELD CONNECTIONS POWER WIRING

1. Install the proper size weatherproof disconnect switch outdoors and within sight of the unit, per local code.
2. Remove the screws at the top and sides of the corner cover. Slide the control box cover down and remove from unit.
3. Run power wiring from the disconnect switch to the unit.
4. Route wires from disconnect through power wiring exit provided and into the unit control box as shown in Figure 1 and view the openings in Figure 6.
5. Make the power supply connections to the supplied terminal block.

WARNING

DO NOT connect the "R" terminal of unit control board.

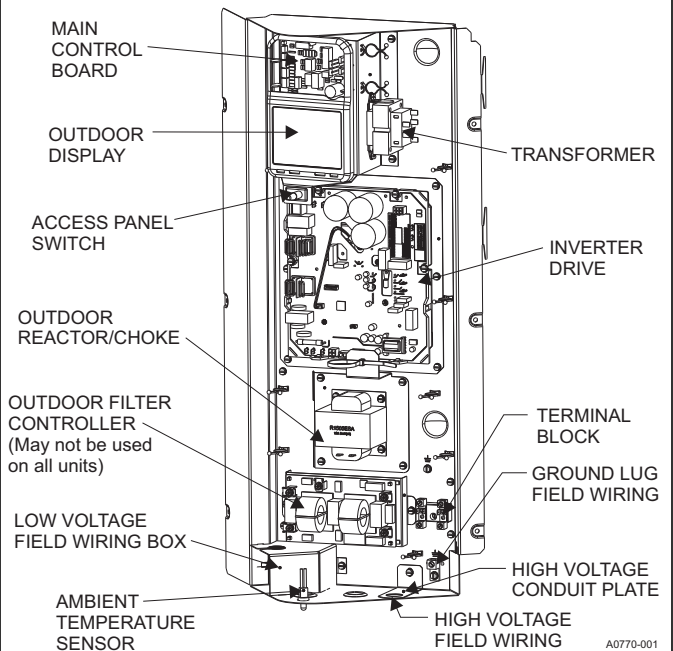


FIGURE 6: Outdoor Unit Control Box

FIELD CONNECTIONS CONTROL WIRING

1. Route low voltage wiring into bottom of control box. Connect low voltage wiring inside the low voltage box. See Figure 6.
2. The complete connection diagram and schematic wiring label is located on the inside surface of the unit service access panel.
3. Replace the control box cover removed in Step 2 of the FIELD CONNECTIONS POWER WIRING procedures.
4. All field wiring to be in accordance with national electrical codes (NEC) and/or local-city codes.
5. Mount the thermostat about 5 ft. above the floor, where it will be exposed to normal room air circulation. Do not place it on an outside wall or where it is exposed to the radiant effect from exposed glass or appliances, drafts from outside doors or supply air grilles.

6. Route the 24-volt control wiring (NEC Class 2) from the outdoor unit to the indoor unit and thermostat.

NOTICE

To eliminate erratic operation, seal the hole in the wall at the thermostat with permagum or equivalent to prevent air drafts affecting the operation of in the thermostat.

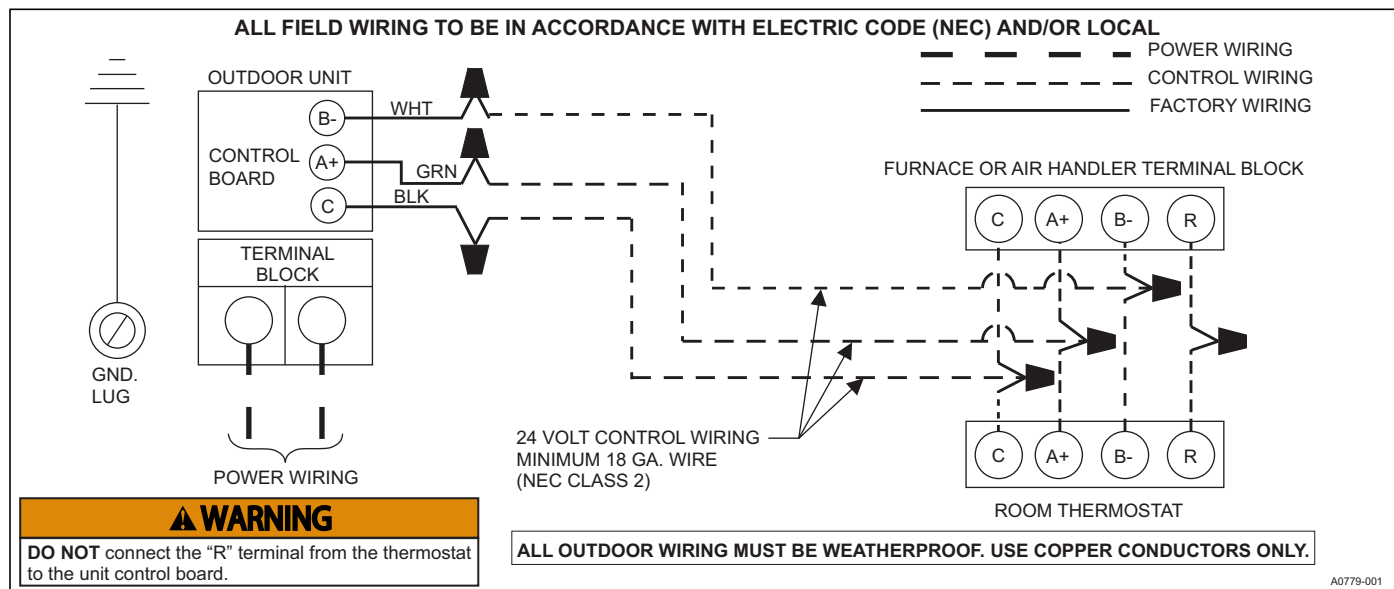


FIGURE 7: Typical Communicating Field Wiring (Air Handler / Furnace)

Demand Response (load shedding)

The main outdoor control has a conventional 24VAC input (DR) for utility demand response signals. When a 24VAC signal is present on the DR input the Hx™ thermostat will adjust the indoor temperature set-point by the user selected setting. For further details on available settings, please refer to the Hx™ thermostat installation and operation manual. The DR input terminal location can be found in Figure 10 and typical wiring is found in Figure 8.

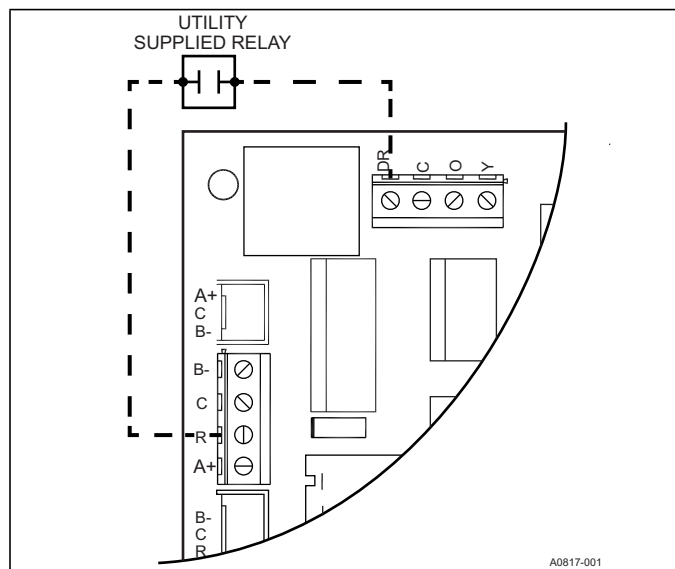


FIGURE 8: Demand Response Wiring

SECTION VI: SYSTEM CHARGE

After completion of system connections, apply power to the system, it is recommended before starting the system to connect the thermostat to Wi-Fi using a local network or portable hot-spot so the thermostat and system receive the latest software updates to optimize system performance. Utilize the Hx™ thermostat to "discover" the system components and identify the Indoor and Outdoor Communicating Equipment. AVV air handler or MVC modular blower with electric heat. Inputs to air handler control board come from the thermostat which are communicated from the main control of the outdoor unit. This maintains proper sensible/latent balance during cooling and proper discharge temperature during heating.

Proper indoor unit airflow is determined by the system and requires no initial set-up by the installing contractor unless using an AVV air handler or MVC modular blower with electric heat. If a unit is using electric heat, the unit must have the electric heat airflow set at the air handler control board. Refer to Table 14 when operating the air handler with the electric heat section.

After the system is started during the initial set-up process using the Hx™ thermostat, additional fine tuning of the airflow is accomplished by selecting on of the three operating profiles. The three operating profiles include: humid, dry or normal. Select the one that best reflects the outdoor environment where the conditioned space is located. This selection adjusts the how the indoor blower and the compressor work together to manage temperature and humidity. Additional fine tune adjustments are available using the Hx™ thermostat. Refer to the Hx™ thermostat manual for additional detail.

The proper airflow is determined by the main outdoor control in the outdoor unit.

CAUTION

If the outdoor temperature is below 55°F, an attempt to start the compressor without at least 2 hours of crankcase/stator heat can damage the compressor.

CAUTION

Refrigerant charging should only be carried out by a licensed qualified air conditioning contractor.

To ensure that your unit performs at the published levels, it is important that the indoor airflow is determined and refrigerant charge added accordingly.

CHARGING THE UNIT

The factory charge in the outdoor unit includes enough charge for the unit, 15 ft. (4.6 m) of refrigerant piping, and the smallest indoor coil/air handler match-up. Some indoor coil / air handler matches may require additional charge.

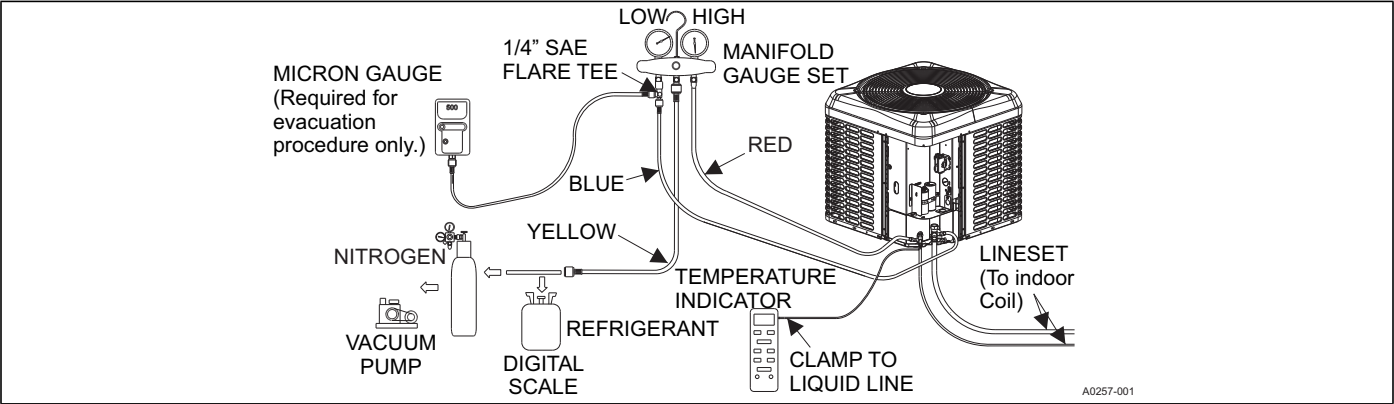


FIGURE 9: System Charging Connections

CAUTION

Compressor damage will occur if system is improperly charged. On new system installations, charge system per tabular data sheet for the matched coil and follow guidelines in this instruction.

See Tabular Data Sheet provided in unit Customer Booklet for initial weigh in charge requirements. The “TOTAL SYSTEM CHARGE” must be permanently marked on the unit data plate.

CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the POE oil in the system. This type of oil is highly susceptible to moisture absorption.

TOTAL SYSTEM CHARGE DETERMINED

1. Determine outdoor unit factory charge from Tabular Data Sheet.
2. Determine indoor coil adjustment (if any) from Tabular Data Sheet.
3. Calculate the additional charge for refrigerant piping using the Tabular Data Sheet if line length is greater than 15 feet (4.6 m).
4. Total system charge = item 1 + item 2 + item 3.
5. The manifold gauge set is already installed on the unit for evacuation and charging. Use these gauges to initially charge the system using system pressures and subcooling. You will find the charging information printed on the bottom of the unit data tag. More charging information is available in the “Service Data Application Guide”, available online. For subsequent annual maintenance visits the charge verification display can be used to quickly check overall system condition and the system charge without attaching a separate manifold gauge set or temperature sensors.
6. Permanently mark the unit data plate with the total amount of refrigerant in the system.

WARNING

DO NOT attempt to pump “Total System Charge” into outdoor unit for maintenance, service, etc. This may cause damage to the compressor and/or other components. Recover and weigh “System Charge” into an appropriate recovery cylinder for any instances requiring evacuation.

CAUTION

It is unlawful to knowingly vent, release or discharge refrigerant into the open air during repair, service, maintenance or the final disposal of this unit.

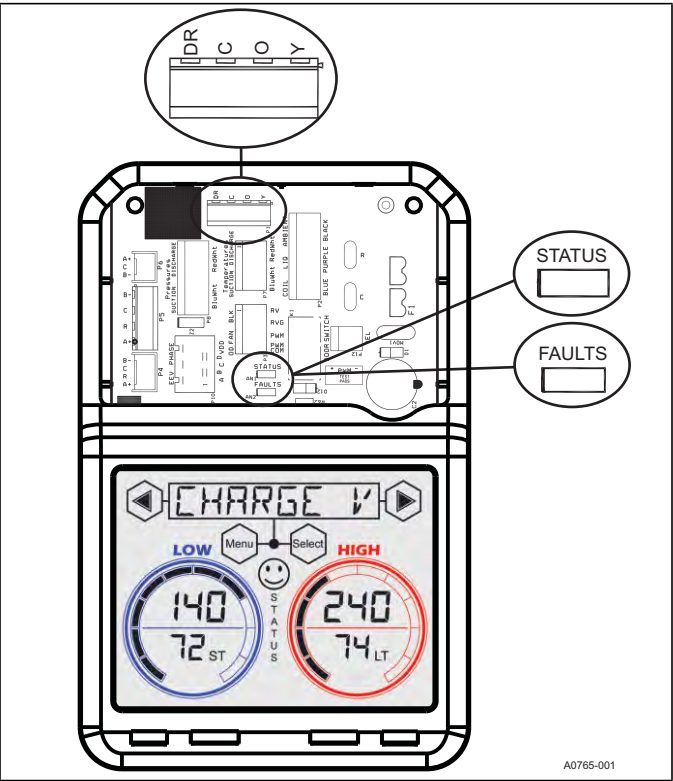


FIGURE 10: Main Outdoor Control and Display

CHARGE VERIFICATION MODE

The outdoor display will assist the installer with charging the system. Through interaction with the Outdoor Display the system will operate at predetermined nominal speed values. During this operation the system will monitor pressures and temperatures. When the subcooling is within the factory set values, the outdoor display will indicate SYSTEM CHARGE VALIDATED. This mode is only available when the ID temperature is within 73 to 83°F and humidity is less than 73% as measured by the Hx™ thermostat. Operation will continue but charge will not be verified.

If outside of these temperatures or humidity levels, unit will still ramp up in capacity to allow the installer to fine tune the system charge to the values listed in the condenser service data, or charging label attached to the unit.

User Interaction/Operation:

1. Press Menu, press Arrow until Modes is displayed, press Select. Press Arrow until Charge Verification is displayed, press Select.
2. Press Select while in Charge Verification Mode. The system will detect the Unit Type and Unit Tonnage. The outdoor display will update and scroll text, see the example below.
Example: 4-TON AC FOUND * VERIFY CHARGE? * 4-TON AC FOUND * VERIFY CHARGE?
3. Press Select to verify charge, the outdoor display will update and scroll text, see the example below.
Example: VERIFYING CHARGE * PLEASE WAIT * VERIFYING CHARGE * PLEASE WAIT
(5 minute wait time during initial charge calculation)
4. ADD CHARGE or REMOVE CHARGE will display on the banner with the appropriate response dependent upon the OEM's predetermined values, user may press Select when the banner displays ADD CHARGE or REMOVE CHARGE. The display will indicate ACCEPTED for 5 seconds and return to the example defined in Step 1. However, if the system does meet the charge requirements defined by the OEM, the outdoor display will indicate the below text example for 5 seconds and return to the text example in Step 2 until charge verification has fully completed.

Example: SYSTEM CHARGE VALIDATED

The system will repeat steps 1-3 until the subcooling has reached the predetermined values set by the OEM.

TABLE 3: TEST Mode Option

TEST MODE OPTION	
Menu Options	Operation
OPERATIONAL MODE (AC - HP)	Display current system configuration (AC or HP) and size stored in memory.
BYPASS ASCD TIMER	Bypass ASCD timer and initiate system operation if a call for space conditioning is present from the HX™ thermostat.

FAULT AND STATUS CODE BEHAVIOR

Fault Code Storage

The main control stores the ten most recent fault codes for review by the service technician. These codes are stored even when power is removed from the control and will remain in memory until the control is powered for 30 consecutive days or manually cleared from the control. All codes are stored in order of occurrence and time stamped.

The control stores only one identical fault code during the same series of events. For example, if two or more high pressure switch (HPS) faults occur sequentially without another fault occurring in between the HPS faults, the control only stores the HPS fault once.

In addition, the main unit control stores the following unit sensor values when a fault and/or event occurs.

1. Suction Superheat
2. Liquid Subcooling

5. Once charge verification is fully complete the outdoor display will return to the Second Menu Layer.

SECTION VII: SYSTEM OPERATION

ANTI SHORT-CYCLE DELAY

The control includes a five-minute anti short-cycle delay (ASCD) timer to prevent the compressor from short-cycling after a power or thermostat signal interruption. The ASCD timer is applied when the control is first powered and immediately following the completion of a compressor run cycle. The compressor and the outdoor fan will not operate during the five minutes that the timer is active.

LOW VOLTAGE DETECTION

The control monitors the outdoor transformer secondary (24 VAC) voltage and provides low voltage protection for the heat pump and its components. If the voltage drops below approximately 22 VAC, the control continues to energize any outputs that are already energized. If the voltage drops below approximately 19 VAC, the control immediately de-energizes the outputs and can no longer energize any outputs until the voltage level increases above 22VAC. The control stores and displays the appropriate fault codes when low voltage conditions occur.

TEST MODE OPERATION

Test mode operation provides the features found in Table 3 to assists in unit commissioning and troubleshooting. TEST MODE is accessed through the Outdoor Display. Please see Page 11 for detailed Outdoor Display operation.

3. Liquid Temperature
4. Discharge Pressure
5. Suction Temperature
6. Suction Pressure

When a fault and/or event is present, the system will indicate the corresponding fault and/or event text on the Outdoor Display status banner.

NOTICE

The display will continue to indicate the above fault (saved) value(s) on the Outdoor Display with the active Fault and/or Event text, while the fault and/or event is still present. When the fault and/or event has cleared, the system will return to the General Display Operation.

Fault Code Display

The system will provide fault and/or event text, using the Outdoor Display. Tables 7 & 8 describes the text behavior in further detail. The system will display the fault and/or event text on the Outdoor Display when CURRENT and/or STORED SYSTEM FAULT(s) are selected from the FAULT MODE category. If multiple faults and/or events are present at the same time, the Outdoor Display will show the most recent fault and/or event with the highest priority. In the event that multiple faults and/or events are populated at the same time, the Outdoor Display will indicate the most recent system fault and/or event that is stored in memory. The second system fault will not be displayed, but will be stored in memory. For example see Table 4.

TABLE 4: Same Priority Fault Storage

Control	Description	Time of Fault	Fault Priority
Inverter Control Fault	Microelectronic Fault	10:15:00	1
Outdoor Control Fault	Inverter Control Communications Fault	10:15:01	1

Status Code Display

The main control board contains 2 LED's for status and fault display as shown in Figure 10. The control will provide a status code indicating the state of the system using the Yellow LED as detailed in Table 5. The Red LED indicates a system fault is present. Further details of the fault can be found on the outdoor screen.

TABLE 5: Status Code Display

Description	Required Condition	LED	Color
No power to control	No power to control	OFF	OFF
Control Failure	Control failure occurs and can be detected.	ON	Yellow
System has 24 VAC present and the microprocessor is active.	No faults active	2s ON / 2s OFF ("Heartbeat")	Yellow
Control normal operation – in ASCD period	No faults/events active, compressor speed > 0, ASCD timer not expired	0.1 sec ON / 0.1 sec OFF	Yellow
System is active and presently communicating successfully.	No faults/events active, compressor speed > 0, ASCD timer not expired	0.5 sec ON / 0.5 sec OFF	Yellow

SECTION VIII: OUTDOOR SCREEN OPERATION

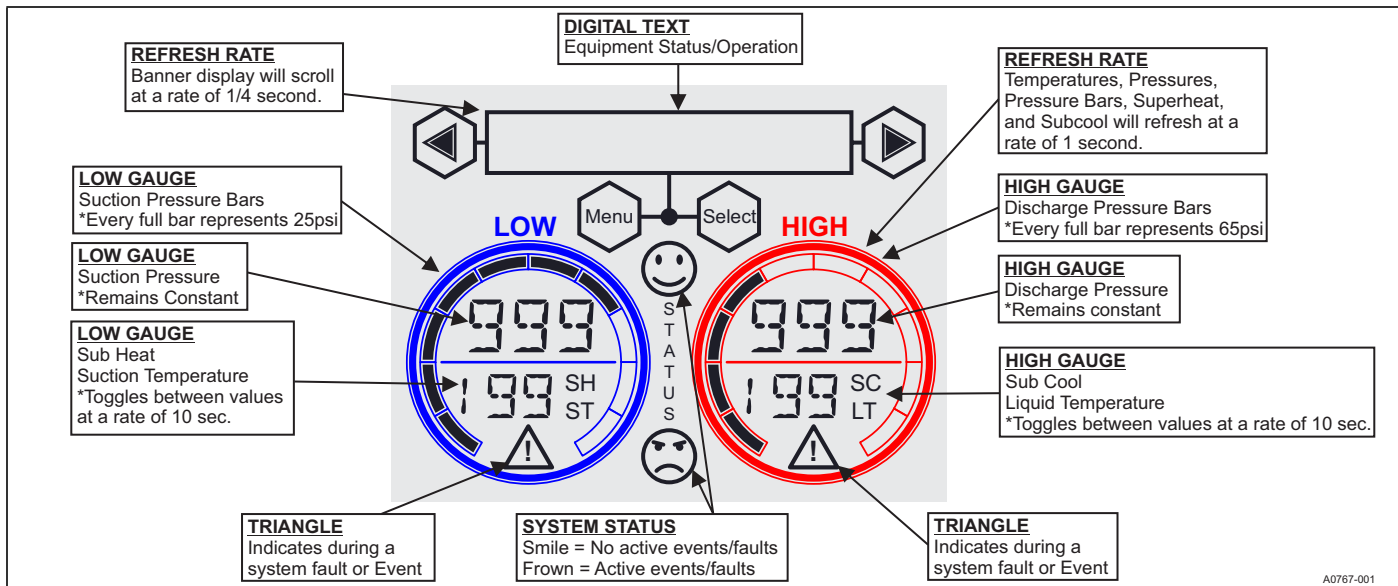


FIGURE 11: Outdoor Display

The system is provided with an advanced screen to assist in unit commissioning and troubleshooting. Operating pressures and temperatures from the system sensors are displayed in a format emulating a set of refrigerant gauges. Full description text is scrolled across a banner display to show current system operation and status. A menu structure for the outdoor display can be found in Table 6 and general operation is detailed in the following pages.

GENERAL DISPLAY OPERATION

1. During an Active Call

A. Display Current system values:

Value

- COMPRESSOR SPEED (RPM)
- OD FAN SPEED (RPM)
- EEV STEP (ID Status)

- EEV STEP (OD Status)
- ID FAN SPEED (CFM)
- INPUT CURRENT (AMPS) -From Inverter Input
- INPUT VOLTAGE (VOLTS) -From Inverter Input
- INPUT WATTS (WATTS) -From Inverter Input

Equipment Status information will scroll sequentially on a continuous loop, example below.

Continuous Loop Example:

COMPRESSOR (RPM) * OD FAN (RPM) * EEV STEP (ID EEV)
 * EEV STEP (OD EEV) * ID FAN (CFM) * INVERTER (APMS)
 * INVERTER (VOLTS) * INVERTER (WATTS)

2. No Active Call, High Voltage is applied

The control will scroll and display * STANDBY * when there are no active calls for compressor operation.

3. If any of the following conditions exists, do not display current values defined in 1-3 in the banner.

The control will indicate ASCD TIMER (ACTIVE) and display it as the highest priority over all of the below defined active modes, if the ASCD Timer is currently active.

A. Will ONLY Display the Active Condition

- ASCD TIMER (ACTIVE)
-Only present when the ASCD Timer is Active.
- DEMAND RESPONSE (ACTIVE)
- FACTORY RUN TEST (ACTIVE)
- REPAIR HEAT - HP (ACTIVE)
- REPAIR COOL - HP (ACTIVE)
- REPAIR COOL - AC (ACTIVE)

- EMERGENCY HEAT (ACTIVE)
- DEFROST CAL (ACTIVE)
- DEFROST DD (ACTIVE)
- DEFROST TT (ACTIVE)

4. No Active Call, No High Voltage

A. Display is OFF

MENU NAVIGATION

Time Duration Response

- | | | |
|---------------------------|---|--|
| a. Tap Menu | = | Back to the second layer string |
| b. Press Menu 2-5 seconds | = | Back to main layer string |
| c. Press Menu > 5 seconds | = | Exit menu layer string and Return to the General Display Operation |

TABLE 6: Outdoor Display Menu Structure

MAIN LAYER	SECOND LAYER	THIRD LAYER	BASE LAYER
EQUIPMENT STATUS	COMMANDED	COMPRESSOR (RPM)	
		OD FAN (RPM)	
		ID EEV (SP)	
		ID FAN (CFM)	
	CURRENT	COMPRESSOR (RPM)	
		OD FAN (RPM)	
		ID EEV (SP)	
		ID FAN (CFM)	
		INPUT CURRENT (AMPS)	
		INPUT VOLTAGE (VOLTS)	
		INPUT WATTS (WATTS)	
CONFIGURATIONS	DEMAND RESPONSE	OFF (Default)	
		NORMALY OPEN RELAY	
		NORMALY CLOSED RELAY	
	INVERTER REPAIR PART	System will first determine Unit Type (Reversing Valve Presence) and Unit Tonnage (Inverter Configuration) and will walk the user through the operation, per inverter part number.	
		2-TON	
		3-TON	
		4-TON	
		5-TON	
	SOFT JUMPERS	COMFORT - EFFICIENCY	EFFICIENCY (Default)
			COMFORT
MODES	FAULT MODE	CURRENT SYSTEM FAULTS	
		STORED SYSTEM FAULTS	
		CLEAR FAULT LOG	
	TEST MODE	BYPASS ASCD TIMER	
		OPERATIONAL MODE (AC)	
		System will display Unit Type (Reversing Valve Presence) and Unit Tonnage (Inverter Configuration)	
	CHARGE VERIFICATION	System determines Unit Tonnage (Inverter Configuration) and will walk the user through the operation.	

MENU NOTES:

Discharge Pressure, Liquid Temperature, Suction Pressure, Suction Temperature, Calculated Superheat, and Calculated Subcool. On the high gauge display, the control shall toggle at a rate of 10 seconds between the Liquid Temperature and the Subcool calculated value. On the low gauge display, the control shall toggle at a rate of 10 seconds between the Suction Temperature and the Superheat calculated value.

Time out period: While in the Menu Structure if the display does not sense a navigational response within 5 minutes, the outdoor display will return to General Display Operation.

Door Switch: If the outdoor display is in the Menu Structure and the door switch is de-activated, the system will de-energizing the outdoor screen. Upon re-energizing the outdoor screen, the display will return to the General Display Operation.

Saved Configuration/Selection: The system will save all individual configuration selections made on the Outdoor Display. Upon returning to a previously saved configuration the system shall display the previously saved configuration setting(s). Not the Default setting(s), unless the saved selection was in fact the default selection.

Operational Mode: The system will display (Inverter profile and reversing valve dependent) unit tonnage when the user selects Operational Mode (AC).

FAULT/STATUS CODE OUTDOOR SYSTEM TROUBLE SHOOTING**TABLE 7:** Outdoor Control Faults/Status Code Display

Outdoor Control Description	LED ¹	Outdoor Display Text	Left Triangle Indication (Outdoor Screen)	Right Triangle Indication (Outdoor Screen)
Control Fault				
Outdoor Control Failure	RED (solid)	CONTROL FAILURE	–	–
Operational Faults				
High-pressure switch fault (not in lockout yet)	RED (solid)	HPS - OPEN	–	X
System in high-pressure switch lockout (last mode of operation was normal compressor)	RED (solid)	HPS SOFT LOCKOUT - NORMAL	–	X
System in high-pressure switch lockout (last mode of operation was normal compressor)	RED (solid)	HPS HARD LOCKOUT - NORMAL	–	X
System in high-pressure switch lockout (last mode of operation was defrost)	RED (solid)	HPS SOFT LOCKOUT - DEFROST	–	X
System in high-pressure switch lockout (last mode of operation was defrost)	RED (solid)	HPS HARD LOCKOUT - DEFROST	–	X
Low Voltage (<19 VAC)	RED (solid)	LOW VOLTAGE – BELOW 19VAC	–	–
Inverter Control Communications Fault	RED (solid)	COMMUNICATIONS LOST - INVERTER DRIVE	–	–
JCI RS-485 Communications Lost	RED (solid)	COMMUNICATIONS LOST – SYSTEM MASTER	–	–
Repair part tonnage selection does not match the stored value programmed in the JCI factory	RED (solid)	INVERTER CONFIGURATION ERROR	–	–
Inverter Model Number installed does not match the stored tonnage in EEPROM	RED (solid)	INVERTER MODEL INSTALLATION ERROR – HARD LOCKOUT	–	–
Required Sensor or Switch Faults				
Outdoor ambient sensor failure (short)	RED (solid)	OUTDOOR AMBIENT SENSOR - SHORT – SOFT LOCKOUT	–	–
Outdoor ambient sensor failure (open)	RED (solid)	OUTDOOR AMBIENT SENSOR – OPEN – SOFT LOCKOUT	–	–
Coil sensor failure (short) not in lockout yet	RED (solid)	COIL TEMP SENSOR - SHORT	–	X
Coil sensor failure (short)	RED (solid)	COIL TEMP SENSOR - SHORT – SOFT LOCKOUT	–	X
Coil sensor failure (open) not in lockout yet	RED (solid)	COIL TEMP SENSOR - OPEN	–	X
Coil sensor failure (open)	RED (solid)	COIL TEMP SENSOR - OPEN – SOFT LOCKOUT	–	X
Liquid line temperature sensor failure (short) not in lockout yet	RED (solid)	LIQUID TEMP SENSOR - SHORT	–	X
Liquid line temperature sensor failure (short)	RED (solid)	LIQUID TEMP SENSOR - SHORT – SOFT LOCKOUT	–	X
Liquid line temperature sensor failure (open) not in lockout yet	RED (solid)	LIQUID TEMP SENSOR - OPEN	–	X
Liquid line temperature sensor failure (open)	RED (solid)	LIQUID TEMP SENSOR - OPEN – SOFT LOCKOUT	–	X
Discharge temperature sensor failure (short)	RED (solid)	DISCHARGE TEMP SENSOR - SHORT	–	X
Discharge temperature sensor failure (open) not in lockout yet	RED (solid)	DISCHARGE TEMP SENSOR - OPEN	–	X
Discharge temperature sensor failure (open)	RED (solid)	DISCHARGE TEMP SENSOR – OPEN – SOFT LOCKOUT	–	X
Suction temperature sensor failure (short) not in lockout yet	RED (solid)	SUCTION TEMP SENSOR - SHORT	X	–
Suction temperature sensor failure (short)	RED (solid)	SUCTION TEMP SENSOR – SHORT – SOFT LOCKOUT	X	–
Suction temperature sensor failure (open) not in lockout yet	RED (solid)	SUCTION TEMP SENSOR – OPEN	X	–

Continued on next page.

TABLE 7: Outdoor Control Faults/Status Code Display

Outdoor Control Description	LED ¹	Outdoor Display Text	Left Triangle Indication (Outdoor Screen)	Right Triangle Indication (Outdoor Screen)
Suction temperature sensor failure (open)	RED (solid)	SUCTION TEMP SENSOR – OPEN – SOFT LOCKOUT	X	–
Discharge pressure sensor failure (low voltage) not in lockout yet	RED (solid)	DISCHARGE PRESSURE SENSOR - LOW VOLTAGE	–	X
Discharge pressure sensor failure (low voltage)	RED (solid)	DISCHARGE PRESSURE SENSOR - LOW VOLTAGE – SOFT LOCKOUT	–	X
Discharge pressure sensor failure (high voltage) not in lockout yet	RED (solid)	DISCHARGE PRESSURE SENSOR - HIGH VOLTAGE	–	X
Discharge pressure sensor failure (high voltage)	RED (solid)	DISCHARGE PRESSURE SENSOR - HIGH VOLTAGE – SOFT LOCKOUT	–	X
Suction pressure sensor failure (low voltage)	RED (solid)	SUCTION PRESSURE SENSOR - LOW VOLTAGE – SOFT LOCKOUT	X	–
Suction pressure sensor failure (high voltage)	RED (solid)	SUCTION PRESSURE SENSOR - HIGH VOLTAGE – SOFT LOCKOUT	X	–
Discharge Temp Faults				
High discharge temperature (not in lockout yet)	RED (solid)	HIGH DISCHARGE TEMP	–	X
High discharge temperature	RED (solid)	HIGH DISCHARGE TEMP - SOFT LOCKOUT	–	X
High discharge temperature	RED (solid)	HIGH DISCHARGE TEMP - HARD LOCKOUT	–	X
Suction Pressure Faults				
Low suction pressure (not in lockout yet)	RED (solid)	LOW SUCTION PRESSURE	X	–
Low suction pressure	RED (solid)	LOW SUCTION PRESSURE - SOFT LOCKOUT	X	–
Low suction pressure	RED (solid)	LOW SUCTION PRESSURE - HARD LOCKOUT	X	–
Wiring Related Faults				
W and O signal received in HP mode	RED (solid)	W / O INPUTS - HP MODE – SOFT LOCKOUT	–	–
Inverter Drive Faults				
Multiple Inverter Faults	RED (solid)	MULTIPLE INVERTER FAULTS – SOFT LOCKOUT	–	–
Control Events				
O signal received in AC mode	Yellow (solid)	O INPUT - AC MODE	–	–
W and O signal received in AC mode	Yellow (solid)	W / O INPUTS - AC MODE	–	–
Demand Response	Yellow (per. section 15.2)	DEMAND RESPONSE (ACTIVE)	–	–
Factory Run Test	Yellow (solid)	FACTORY RUN TEST (ACTIVE)	–	–
Conventional Y1 signal receive in HP mode	Yellow (per. section 15.2)	REPAIR MODE HEAT – HP (ACTIVE)	–	–
Conventional Y1 and O signals receive in HP mode	Yellow (per. section 15.2)	REPAIR MODE COOL– HP (ACTIVE)	–	–
Conventional Y1 signal receive in AC mode	Yellow (per. section 15.2)	REPAIR MODE COOL – AC (ACTIVE)	–	–
Pipe Freeze Timer expiration	Yellow (solid)	PIPE FREEZE TIMER - ACTIVE	–	–
Low Suction Pressure	Yellow (solid)	LOW SUCTION PRESSURE	X	–
Low Voltage (<22.2VAC)	Yellow (solid)	LOW VOLTAGE – BELOW 22VAC	–	–
Superheat Events				
High Superheat	Yellow (solid)	HIGH SUPERHEAT	X	–
Low Superheat	Yellow (solid)	LOW SUPERHEAT	X	–

1. Refer to Figure 10 for Outdoor Control LED location.

TABLE 8: Inverter Drive Fault/Status Code Display

Inverter Drive Description	LED ¹	OD Display Text	Left Triangle Indication (Outdoor Screen)	Right Triangle Indication (Outdoor Screen)
Inverter - Faults				
Compressor Phase Over Current	RED (solid)	COMPRESSOR PHASE OVER CURRENT – INVERTER DRIVE	-	-
Compressor Phase Current Foldback Timeout	Yellow (solid)	COMPRESSOR PHASE CURRENT FOLDBACK – INVERTER DRIVE	-	-
AC Input Over Current	RED (solid)	AC INPUT OVER CURRENT – INVERTER DRIVE	-	-
DC Bus Over Voltage	RED (solid)	DC BUS OVER VOLTAGE – INVERTER DRIVE	-	-
DC Bus Under Voltage	RED (solid)	DC BUS UNDER VOLTAGE – INVERTER DRIVE	-	-
AC Input Over Voltage	Yellow (solid)	AC INPUT OVER VOLTAGE – INVERTER DRIVE	-	-
AC Input Under Voltage	Yellow (solid)	AC INPUT UNDER VOLTAGE – INVERTER DRIVE	-	-
Power Module Over Temp	RED (solid)	POWER MODULE OVER TEMP – INVERTER DRIVE	-	-
PFC-IGBT Over Temp	RED (solid)	PFC-IGBT OVER TEMP – INVERTER DRIVE	-	-
Lost Rotor Position	RED (solid)	LOST ROTOR POSITION – INVERTER DRIVE	-	-
Compressor Phase Current Imbalance	RED (solid)	COMPRESSOR PHASE CURRENT IMBALANCE – INVERTER DRIVE	-	-
Microelectronic Fault	RED (solid)	MICROELECTRONIC FAULT – INVERTER DRIVE	-	-
Power Module Temp Low or Sensor Open Fault	RED (solid)	POWER MODULE TEMP LOW / SENSOR OPEN – INVERTER DRIVE	-	-
AC Input Current Foldback Timeout	Yellow (solid)	AC INPUT CURRENT FOLDBACK – INVERTER DRIVE	-	-
Power Module Temp High	Yellow (solid)	POWER MODULE HIGH TEMP – INVERTER DRIVE	-	-
PFC-IGBT High Temp	Yellow (solid)	PFC-IGBT HIGH TEMP – INVERTER DRIVE	-	-
PFC MCU and DSP Communication Lost	Yellow (solid)	PFC MCU / DSP COMM ERROR – INVERTER DRIVE	-	-
COM MCU and DSP Communication Lost	Yellow (solid)	COM MCU / DSP COMM ERROR – INVERTER DRIVE	-	-
PFC-IGBT Temp Low or Sensor Open Fault	RED (solid)	PFC-IGBT LOW TEMP / SENSOR OPEN – INVERTER DRIVE	-	-
Power Module Temp. Foldback Timeout	Yellow (solid)	POWER MODULE TEMP FOLDBACK – INVERTER DRIVE	-	-
Compressor Model Configuration Error	RED (solid)	COMPRESSOR MODEL CONFIGURATION ERROR – INVERTER DRIVE	-	-
High Pressure Sensor Type Configuration Error	RED (solid)	HPS CONFIGURATION ERROR – INVERTER DRIVE	-	-
DLT Sensor Configuration Error	RED (solid)	DLT CONFIGURATION ERROR – INVERTER DRIVE	-	-
Fault Limit Lockout	RED (solid)	FAULT LIMIT LOCKOUT – INVERTER DRIVE	-	-

1. Refer to Figures 12-14 for LED inverter drive locations.

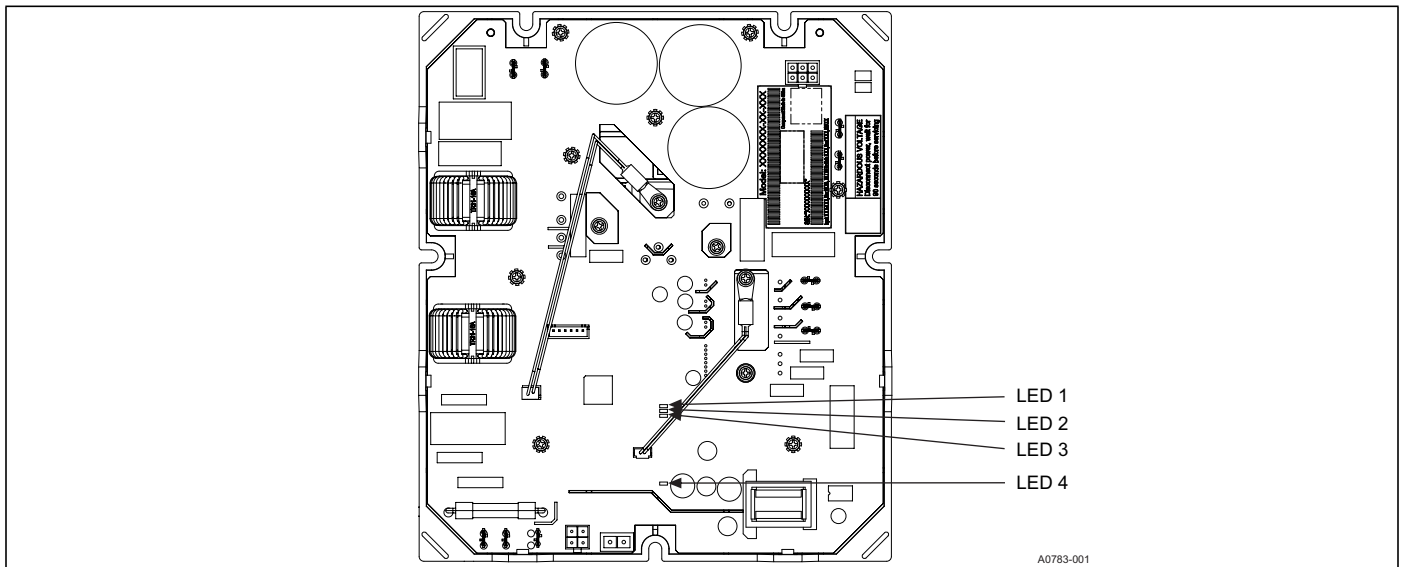


FIGURE 12: 2 Ton Inverter Drive LED Location

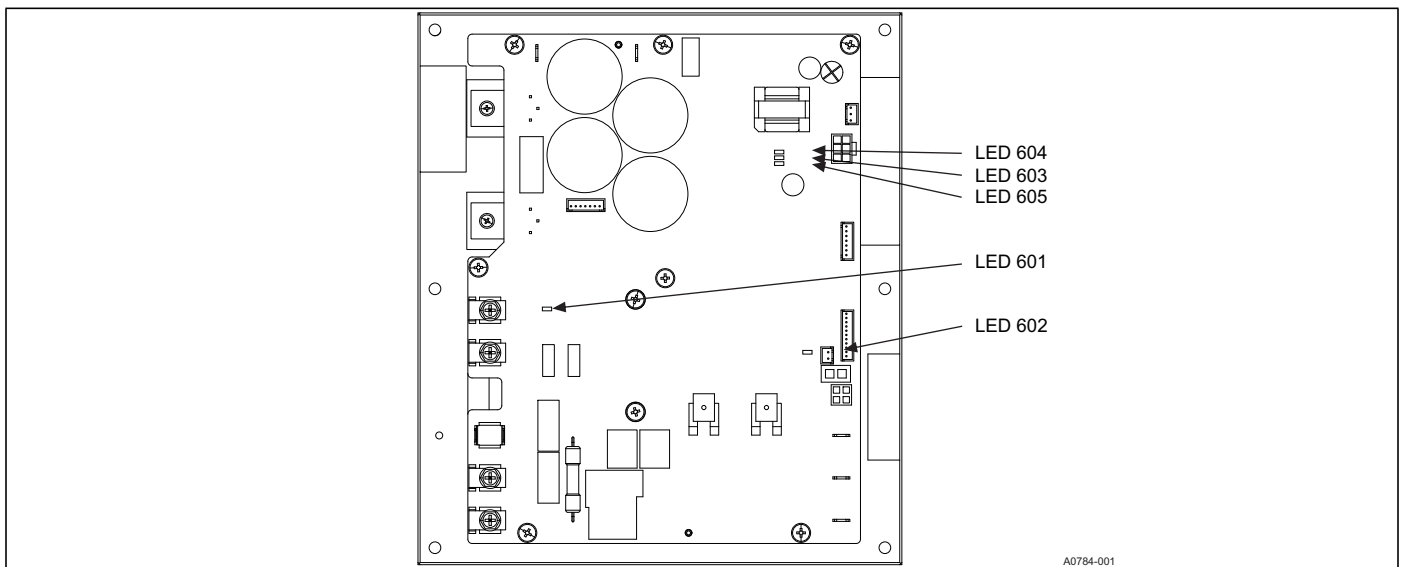


FIGURE 13: 3 & 4 Ton Inverter Drive LED Location

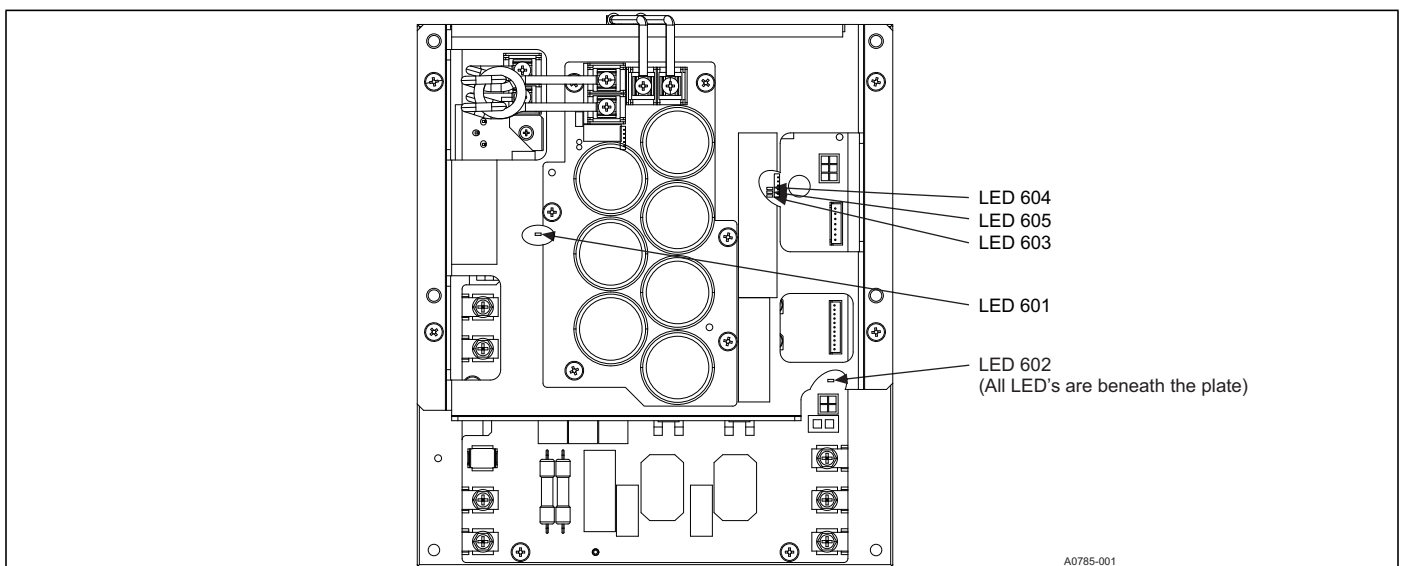


FIGURE 14: 5 Ton Inverter Drive LED Location

INVERTER DRIVE TROUBLE SHOOTING

⚠ WARNING	ELECTRICAL SHOCK HAZARD <ul style="list-style-type: none"> • Disconnect and lock out power before servicing. • Wait 2 minutes to ensure that drive capacitors are discharged before servicing. • Use compressor with grounded system only. • Molded electrical plug must be used for connection to compressor.
⚠ WARNING	BURN HAZARD <ul style="list-style-type: none"> • Failure to follow these warnings could result in serious personal injury or property damage. • Ensure that materials and wiring do not touch high temperature areas of the compressor. • Personal safety equipment must be used.
⚠ WARNING	RCD PROTECTION <ul style="list-style-type: none"> • Be sure to install a Residual Current protective Device (RCD) in accordance with the applicable legislation. Failure to do so may cause electric shock or fire. • Be sure to use a dedicated power circuit, never use a power supply shared by another appliance. • When installing the RCD be sure that it is compatible with the inverter (resistant to high frequency electric noise and to higher harmonics) to avoid unnecessary opening of the RCD. <p>The RCD must be a high speed type breaker of 30 mA (<0.1 seconds).</p>
⚠ CAUTION	DRIVE HANDLING <ul style="list-style-type: none"> • Caution must be used when lifting and installing the drive. Failure to use caution may result in bodily injury. • Personal safety equipment must be used. • Failure to follow these warnings could result in personal injury or property damage.
Safety Statements <ul style="list-style-type: none"> • Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission and maintain this equipment. • Electrical connections must be made by qualified electrical personnel. • All valid standards and codes for installing, servicing, and maintaining electrical and refrigeration equipment must be observed. 	

INVERTER DRIVE LED

There are three control chips on the drive board and all of them have their own LED status display as detailed below. The location of each LED can be found in Figures 11-13.

Operation Indicating LED (Green - 1 or 605) - When the drive is in normal or standby state with no protection or fault condition the LED will flash at 0.5 sec ON / 0.5 sec OFF. If the compressor is running the LED will be solid.

Protection Indicating LED (Yellow - 2 or 604) - When the drive is under protection, the yellow LED will flash. Refer to the fault status and troubleshooting section of this bulletin for more information.

Hardware Fault Indicating LED (Red - 3 or 603) - When the drive is under hardware fault, the red LED will flash. Refer to the fault status and troubleshooting section of this bulletin for more information.

LED for Drive Control (Green - 4 or 602) - When the drive is in normal state, whether the compressor is running or standby, the LED will flash at 1 sec ON / 1 sec OFF. When the drive is under protection or hardware fault, the LED will flash at 8 sec ON/ 8 sec OFF.

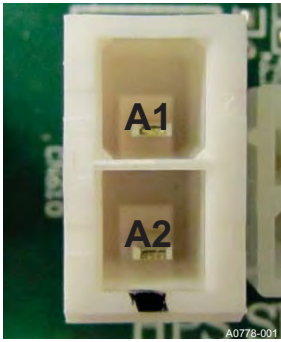
LED for Power Factor Correction (Green-601) - When the drive PFC is not in operation, the LED will blink at 1 sec ON / 1 sec OFF. When the PFC is in operation, the LED will be solid.

TABLE 9: Troubleshooting – Fault and Protection Table

Fault and Protection	Check and Handling
Compressor phase over current	<ol style="list-style-type: none"> 1. Check the U/V/W connections on drive side. 2. Check the compressor motor windings. 3. Check the compressor is operating within specified limits. 4. Sensor on drive not reading properly - Replace the drive.
Compressor phase current fold back timeout	Check if the compressor is operating outside the specified speed range.
AC input over current	<ol style="list-style-type: none"> 1. Check the line voltage if it is < 187VAC. 2. Check the line voltage for noise. 3. Check the compressor is operating with in specified limits. 4. If the problem still persist, then it's possibly a drive component issue. Replace the drive.
AC input current sampling fault	Sensor on drive not reading properly.
DC bus over voltage	<ol style="list-style-type: none"> 1. Check the line voltage if it is > 265VAC. 2. Check the DC bus voltage if it is > 385VDC. 3. Check the compressor is operating with in specified limits.
DC bus under voltage	<ol style="list-style-type: none"> 1. Check the line voltage if it is < 187VAC. 2. Check the DC bus voltage if it is < 385VDC. 3. Check the compressor is operating with in specified limits.
AC input over voltage	<ol style="list-style-type: none"> 1. Check the line voltage if it is > 265VAC. 2. Check the DC bus voltage if it is > 385VDC. 3. Check the compressor is operating with in specified limits.
AC input under voltage	<ol style="list-style-type: none"> 1. Check the line voltage if it is < 187VAC. 2. Check the DC bus voltage if it is < 385VDC. 3. Check the compressor is operating with in specified limits.
Power module over temp PFC-IGBT over temp	<ol style="list-style-type: none"> 1. Verify proper airflow over the heatsink of the drive. Remove any obstructions. 2. Check the compressor is operating with in specified limits. 3. If the problem still persists, replace the drive.
Lost rotor position Compressor phase current imbalance	<ol style="list-style-type: none"> 1. Check the U/V/W connections on drive side & compressor side. 2. Check the compressor motor windings.
Microelectronic fault EEPROM fault	<ol style="list-style-type: none"> 1. Check the DC bus voltage > 187VDC. 2. Power cycle the drive. 3. If problem persists, replace the drive.
Power module temp low or sensor open fault	Temperature sensing device on the drive are possibly defective. If problem persists, replace the drive.
DC Bus Voltage Low	<ol style="list-style-type: none"> 1. Check the line voltage if it is < 187VAC. 2. Check the DC bus voltage if it is < 385VDC. 3. Check the compressor is operating with in specified limits.
AC input current fold back timeout.	<ol style="list-style-type: none"> 1. Check the line voltage if it is < 187VAC. 2. Check the compressor is operating with in specified limits. 3. If problem persists, replace the drive.
Mod bus communication lost	<ol style="list-style-type: none"> 1. Check mod-bus communication cable connections. 2. Check the communication parameters are set right. 3. Power cycle the drive. 4. If problem persists, replace the drive.
Power module temp high PFC-IGBT high temp	<ol style="list-style-type: none"> 1. Verify proper airflow over the heatsink of the drive. Remove any obstructions. 2. Check the compressor is operating with in specified limits. 3. If the problem still persists, replace the drive.
PFC MCU and DSP communication lost COM MCU and DSP communication lost	<ol style="list-style-type: none"> 1. Check mod-bus communication cable connections. 2. Check the communication parameters are set right. 3. Power cycle the drive. 4. If problem persists, replace the drive.
PFC-IGBT temp low or sensor open fault Power module temp. fold back timeout	<ol style="list-style-type: none"> 1. Verify proper airflow over the heatsink of the drive. Remove any obstructions. 2. Check the compressor is operating with in specified limits. 3. If the problem still persists, replace the drive.
Compressor model configuration error	Compressor model and configuration code do not match.
High pressure sensor type configuration error	Pressure sensor and configuration code do not match.
AC input voltage sampling fault	Sensor on drive not reading properly.
DC bus voltage sampling fault	Sensor on drive not reading properly.
Fault limit lockout	Certain faults have a trip limit, see mod bus map for details

TABLE 10: Sensor Connector Pin Definition

A1	High Pressure Signal
A2	3.3VDC


PRESSURE SWITCH FAULT & LOCKOUT**HIGH PRESSURE SWITCH (HPS) FAULT**

If the compressor is operating and the high pressure switch is recognized as open, the control de-energizes the compressor output. The 5 minute ASCD timer starts when the compressor speed reaches 0. The compressor contactor remains off until the high pressure switch has re-closed and the 5 minute ASCD timer has been satisfied.

HIGH PRESSURE SWITCH LOCKOUT

If the system recognizes two HPS faults within six hours of accumulated compressor run-time, the system will enter the HPS lockout. During the lockout period, the defrost and compressor relays remain de-energized. While the system is locked out, the Outdoor Display will represent the appropriate fault message as described elsewhere in this document. The system will differentiate between PS faults that occur in heating or defrost modes. This is only for the system to decide which fault code to display. This may help the service person in troubleshooting issues with the unit when this lockout occurs. Otherwise it shouldn't differentiate between heating or defrost modes when counting PS faults.

The six hour timing starts after the ASCD has expired following the first PS fault. The timer only accumulates when the compressor is running. If the system recognizes a second opening of the PS before the six hour timer expires, the system will enter the PS soft lockout. If the system does not recognize a second opening of the PS before the six hour timer expires, the six hour timer is cleared and the PS fault counter is reset.

SUCTION PRESSURE SENSOR FAULT

The system will monitor the suction pressure during operation. If the suction pressure value falls below the trending limit point and is not increasing, the low suction pressure fault is recognized. The suction pressure must remain below the trending limit for 180 seconds in cool operation. The low suction pressure fault is bypassed for 120 seconds upon system startup. If the fault limit value is ever reached for > 5 seconds a low suction pressure fault is recognized regardless of a bypass time.

TABLE 11: Low Suction Pressure Limits

Mode of Operation	Trending Limit	Fault Limit
Cool	< 90psi	< 5psi

SECTION IX: INSTRUCTING THE OWNER

Assist the owner with registering the unit warranty using the warranty card included with the unit, or preferably online at www.upgproductregistration.com. It is strongly recommended to complete a startup sheet showing the critical readings of the unit at the time of commissioning, which can be uploaded as part of the online registration process.

When applicable, instruct the owner that the compressor is equipped with a crankcase heater to prevent the migration of refrigerant to the compressor during the OFF cycle. The heater is energized only when the unit is not running. If the main switch is disconnected for long periods of shut down, do not attempt to start the unit until 2 hours after the switch has been connected. This will allow sufficient time for all liquid refrigerant to be driven out of the compressor.

The installer should also instruct the owner on proper operation and maintenance of all other system components.

MAINTENANCE

1. Dirt should not be allowed to accumulate on the outdoor coils or other parts in the air circuit. Clean as often as necessary to keep the unit clean. Use a brush, vacuum cleaner attachment, or other suitable means.
2. The outdoor fan motor bearings are permanently lubricated and do not require periodic oiling.
3. If the coil needs to be cleaned, it should be washed with water or a PH neutral detergent. Allow solution to remain on coil for several minutes before rinsing with clean water. Solution should not be permitted to come in contact with painted surfaces.
4. Refer to the furnace or air handler instructions for filter and blower motor maintenance.
5. The indoor coil and drain pan should be inspected and cleaned regularly to prevent odors and assure proper drainage.

⚠ CAUTION

It is unlawful to knowingly vent, release or discharge refrigerant into the open air during repair, service, maintenance or the final disposal of this unit.

COOLING CHARGE TABLE IS ON THE INSIDE OF THE CONTROL BOX COVER.

SECTION X: WIRING DIAGRAM

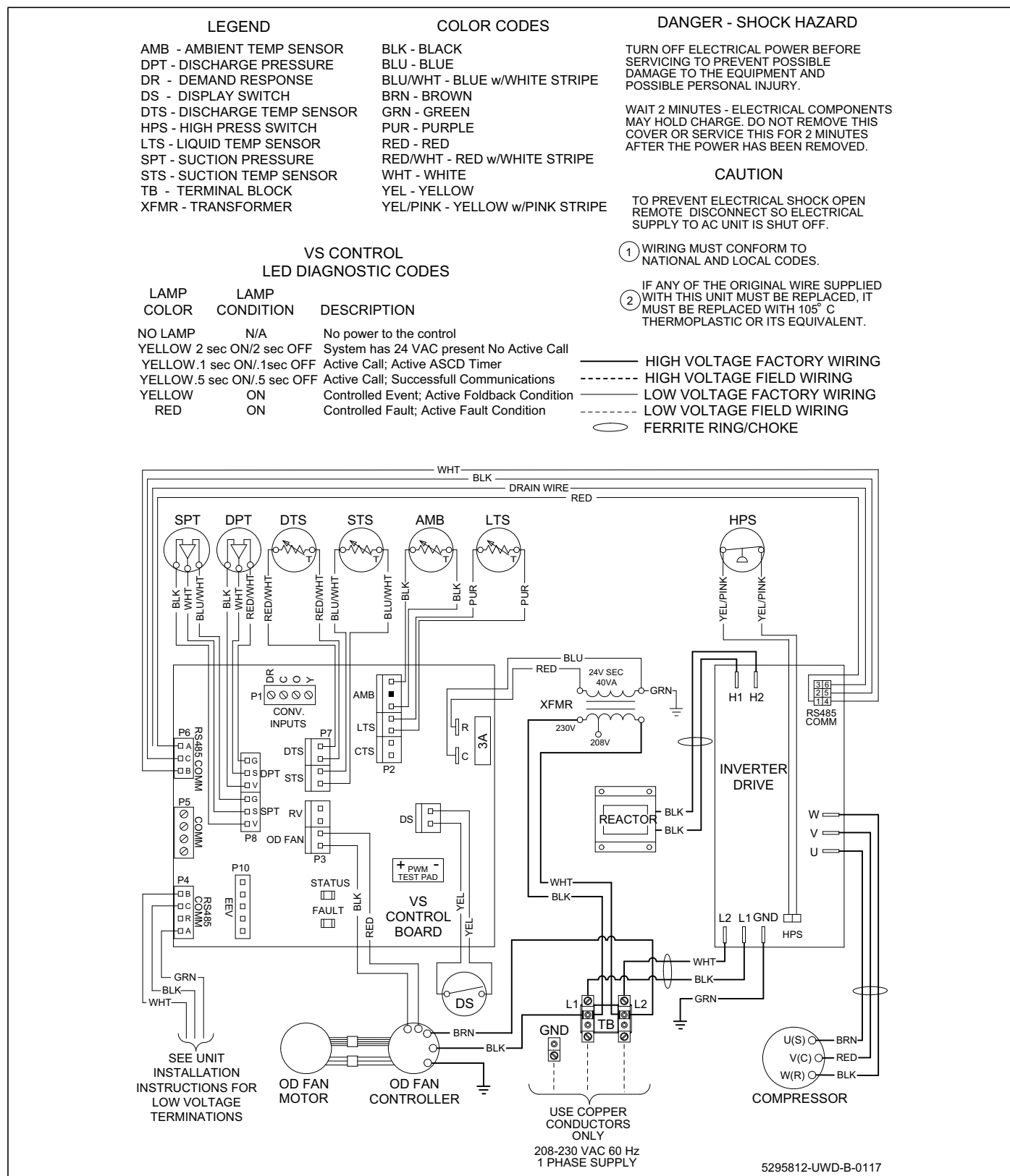


FIGURE 15: Wiring Diagram - 2 Ton

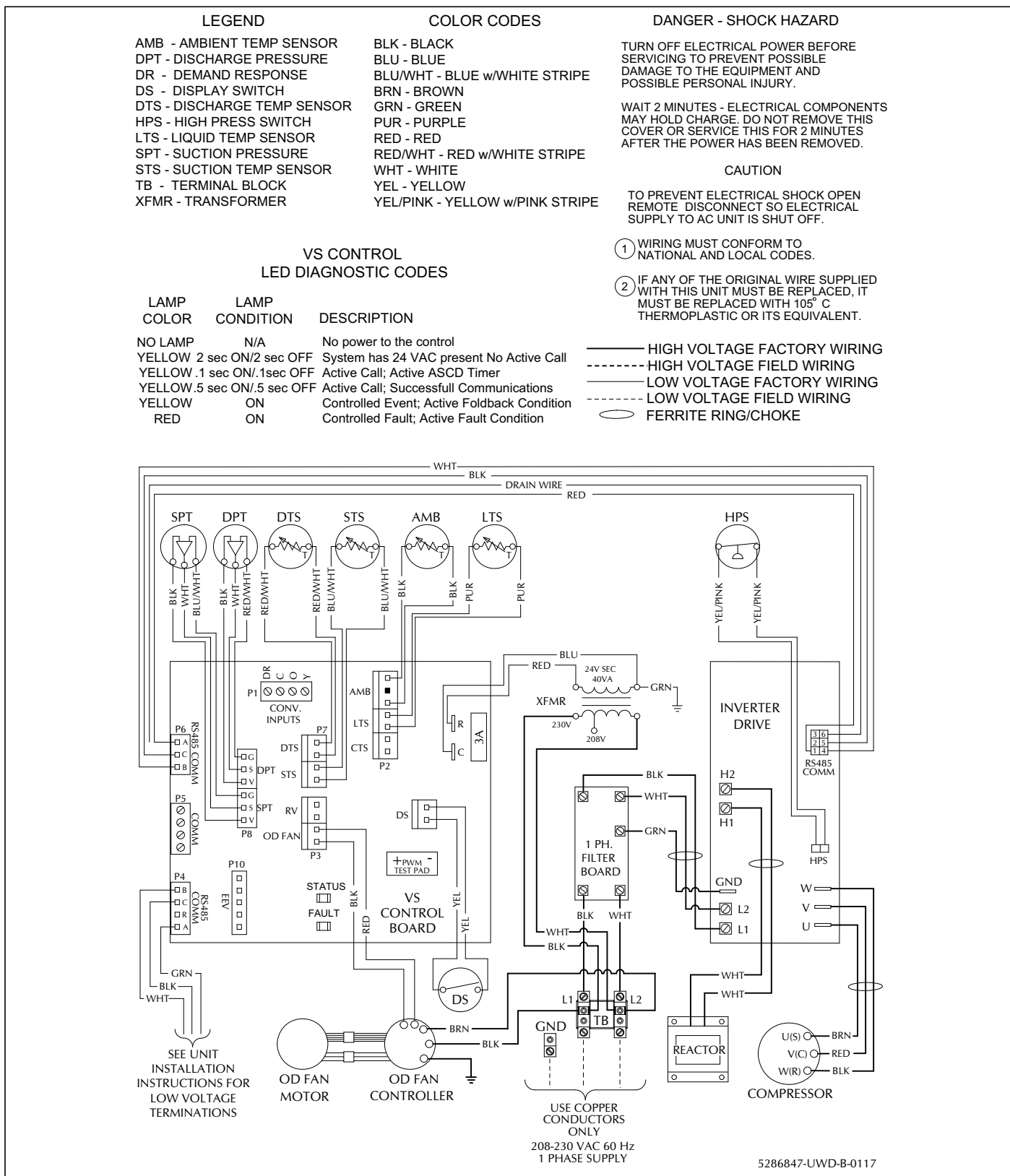


FIGURE 16: Wiring Diagram - 3-5 Ton

SECTION XI: START UP SHEET

Residential Split Variable Capacity System Unit Cooling With Electric Heat Start-Up Sheet
 Proper start-up is critical to customer comfort and equipment longevity

Start-Up Date	<input type="text"/>	Company Name	<input type="text"/>	Start-Up Technician	<input type="text"/>
Dealer Training Certification Number		<input type="text"/>			

Owner Information

Name	<input type="text"/>	Address	<input type="text"/>	Daytime Phone	<input type="text"/>
City	<input type="text"/>	State or Province	<input type="text"/>	Zip or Postal Code	<input type="text"/>

Equipment Data

Outdoor Model #	<input type="text"/>	Unit Serial #	<input type="text"/>
Indoor Data #	<input type="text"/>	Unit Serial #	<input type="text"/>

General Information (Check all that apply)

<input type="radio"/> New Construction	<input type="radio"/> Roof level	<input type="radio"/> Down flow	<input type="radio"/> Horizontal
<input type="radio"/> Retrofit	<input type="radio"/> Grade level	<input type="radio"/> Upflow	

Unit Location and Connections (Check all that apply)

<input type="checkbox"/> Unit is level and installed on:	<input type="checkbox"/> Slab	<input type="checkbox"/> Roof curb	<input type="checkbox"/> Duct connections are complete:	<input type="checkbox"/> Supply	<input type="checkbox"/> Return
<input type="checkbox"/> Condensate drain properly connected per the installation instructions		<input type="checkbox"/> Condensate trap has been primed with water			

Filters

<input type="checkbox"/> Filters installed	Number of filters	<input type="text"/>	Filter size	<input type="text"/>	<input type="radio"/> Filter located inside	<input type="radio"/> Filter located outside
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Electrical Connections & Inspection (Check all that apply)

<input type="radio"/> 208 volts AC	<input type="radio"/> 230 volt AC
<input type="checkbox"/> Inspect wires and electrical connections	<input type="checkbox"/> Transformer wired properly for primary supply voltage
<input type="checkbox"/> Ground connected	
<input type="checkbox"/> Low voltage present at control board "R & C"	Measured voltage "R" and "C" outdoor unit control board <input type="text"/>
<input type="checkbox"/> Line voltage present at disconnect	Measured voltage "L1 to L2" <input type="text"/>
Compressor amperes "L1" <input type="text"/>	"L2" <input type="text"/>
Total amperes "L1" <input type="text"/>	"L2" <input type="text"/>

Air Flow Setup / Cooling

Blower Type & Set-Up	<input type="radio"/> ECM	COOL			
		<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
		ADJUST			
		<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
		DELAY			
		<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D

Supply static (inches of water column)	<input type="text"/>	Supply air dry bulb temperature	<input type="text"/>	Supply air wet bulb temperature	<input type="text"/>
Return static (inches of water column)	<input type="text"/>	Return air dry bulb temperature	<input type="text"/>	Return air wet bulb temperature	<input type="text"/>
Total external static pressure	<input type="text"/>	Temperature drop	<input type="text"/>	Outside air dry bulb temperature	<input type="text"/>

Refrigerant Charge and Metering Device

<input type="radio"/> R-410A	Suction line temperature <input type="text"/>	Discharge pressure <input type="text"/>
Data plate - lbs / Oz <input type="text"/>	Suction pressure <input type="text"/>	Liquid line temperature <input type="text"/>
Discharge line temperature <input type="text"/>	Superheat <input type="text"/>	Subcooling <input type="text"/>

Electric Heat

Electric heat kit - Model number <input type="text"/>		Serial number <input type="text"/>		Rated KW <input type="text"/>	
<input type="radio"/> Single Phase	Measured Amperage	Heater 1 <input type="text"/>	Heater 2 <input type="text"/>	Heater 3 <input type="text"/>	
		Heater 4 <input type="text"/>	Heater 5 <input type="text"/>	Heater 6 <input type="text"/>	
Number of elements <input type="text"/>	Measured Voltage	Heater 1 <input type="text"/>	Heater 2 <input type="text"/>	Heater 3 <input type="text"/>	
		Heater 4 <input type="text"/>	Heater 5 <input type="text"/>	Heater 6 <input type="text"/>	
Heating return air dry bulb temperature <input type="text"/>		Heating supply air dry bulb temperature <input type="text"/>		Air temperature rise <input type="text"/>	

Clean Up Job Site

<input type="checkbox"/> Job site has been cleaned, indoor and outdoor debris removed from job site
<input type="checkbox"/> Tools have been removed from unit
<input type="checkbox"/> All panels have been installed

Unit Operation and Cycle Test

<input type="checkbox"/> Operate the unit through continuous fan cycles from the thermostat, noting and correcting any problems
<input type="checkbox"/> Operate the unit through cooling cycles from the thermostat, noting and correcting any problems

Owner Education

<input type="checkbox"/> Provide owner with the owner's manual
<input type="checkbox"/> Explain operation of system to equipment owner
<input type="checkbox"/> Explain thermostat use and programming (if applicable) to owner
<input type="checkbox"/> Explain the importance of regular filter replacement and equipment maintenance

Setup

WiFi enabled Yes <input type="checkbox"/> No <input type="checkbox"/>
Demand response enabled For profile Normal <input type="checkbox"/> Arid <input type="checkbox"/> Humid <input type="checkbox"/>
Fan Profile Normal <input type="checkbox"/> Arid <input type="checkbox"/> Humid <input type="checkbox"/>

Comments and Additional Job Details

<div></div>
