# INSTALLATION MANUAL

## R-410A OUTDOOR SPLIT-SYSTEM AIR CONDITIONING

### MODELS: 13, 14 & 17 SEER

### YCD, YCE, YCG, YCS, YFD, YFE, TC3, TC4, TC7, CC7, TW4, TF3, TF4, TCD, TCG, RAC13L, RAC14L, RAC17L, RAW14L, RAC13F, RAC14F SERIES

### 1.5 TO 5 TONS – 1 & 3 PHASE

AMERICAN QUALITY
DESIGNED, ENGINEERED & ASSEMBLED IN THE USA

C US

AHRI CERTIFIED
www.ahridirectory.org
Unitary Small AC
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

ISO 9000 REGISTRATION
ISO 9001
Certified Quality
Management System

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## SECTION I: GENERAL

These outdoor condensing units are designed to be connected to a matching UPG indoor coil. They are equipped with a filter-drier located in the liquid line.

Units with quick-connect coupling connections are factory charged with refrigerant to be matched with the appropriate pre-charged line set, and UPG indoor coil.

## 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. 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/Servicing 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.
- Do not use an R-22 TXV.

### 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 that will give maximum performance with minimum service.

**TABLE 1:** Application Limitations

| | Ambient Air Temperature on Outdoor Coil | | Air Temperature on Indoor Coil | |
|---|---|---|---|---|
| **MODEL** | **Min. DB** | **Max. DB** | **Min. WB** | **Max. WB** |
| YCD/TC3/RAC13L | 55°F | 115°F | 57°F | 72°F |
| YCS/YFE/YCE/TW4/TF4/TC4/ RAC14L/RAW14L/RAC14F/ YCG/TC7/CC7/RAC17L | 55°F | 125°F | 57°F | 72°F |

4. The unit should not be operated at outdoor temperatures below 55°F without an approved low ambient operation accessory kit installed.
5. The maximum allowable line length for this product is 80 feet. To install more than the maximum allowable line length, consult the Piping Application Guide (P/N 24077).

## 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.

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.

### ADD-ON REPLACEMENT/RETROFIT

When this unit is being used as a replacement for an R-410A unit, it is required that the outdoor unit, indoor coil, and metering device all 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/ condensing 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 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.

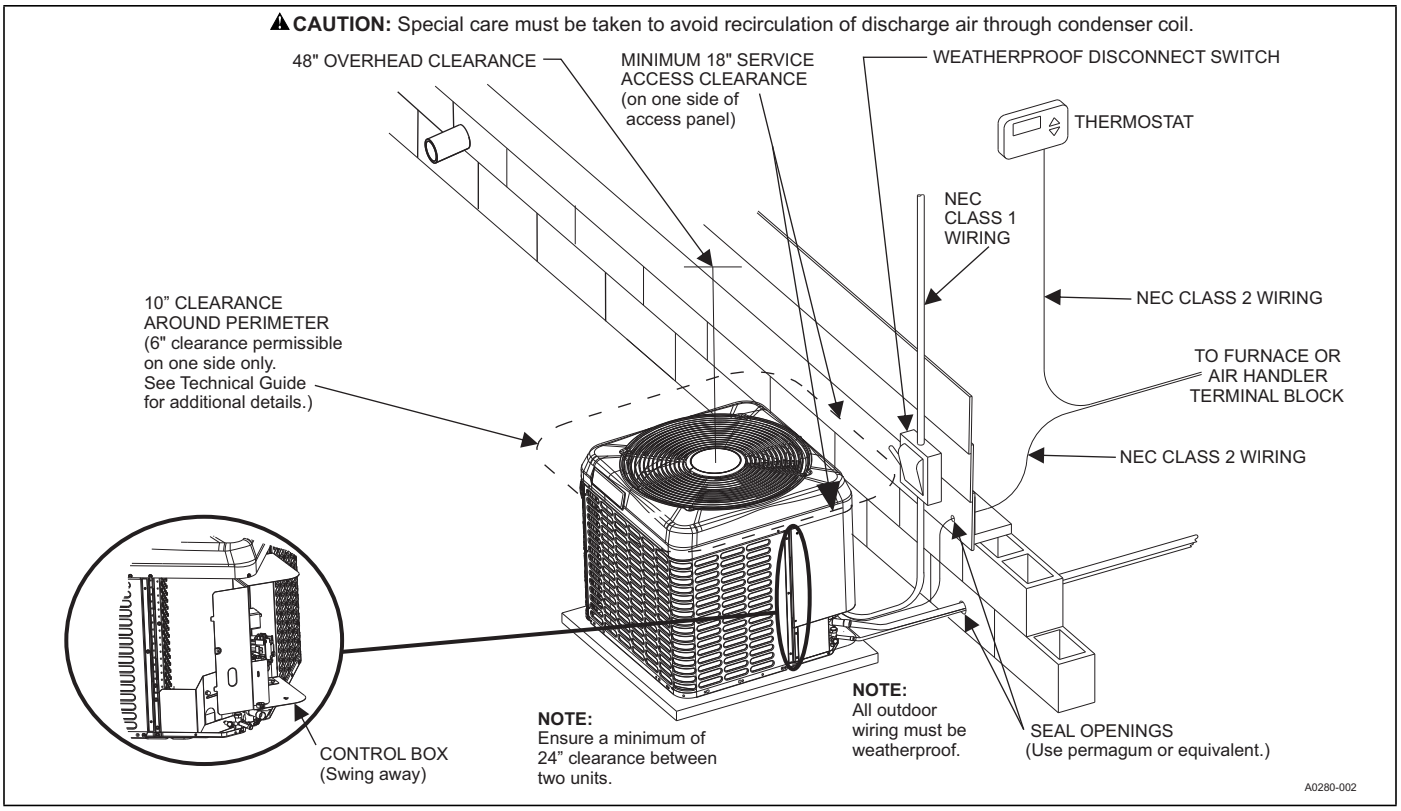



**FIGURE 1:** Typical Installation

## GROUND INSTALLATION

The unit should be installed on a solid base that is 2" (5.1 cm) above grade and will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances shown in Figure 1 and install the unit in a level position. The base pad should not come in contact with the foundation or side of the structure because sound may be transmitted to the residence.

The length of the refrigerant tubing between the outdoor unit and indoor coil should be as short as possible to avoid capacity and efficiency losses. Excessive spacing of the outdoor unit from the home can result in the refrigerant lines being restricted by trampling or being punctured by lawn mowers. Locate the outdoor unit away from bedroom windows or other rooms where sound might be objectionable.

Adverse effects of snow or sleet accumulating on the outdoor coil can be eliminated by placing the outdoor unit where the prevailing wind does not blow across the unit. Trees, shrubs, corners of buildings, and fences standing off from the coil can reduce capacity loss due to wind chill effect.

Provide ample clearance from shrubs to allow adequate air to pass across the outdoor coil without leaves or branches being pulled into the coil.

## 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 or any components 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. These applications are best served by a properly engineered solution.

## LIQUID LINE FILTER-DRIER

The air conditioning unit's filter/dryer is located inside the unit on the liquid line between the outdoor coil and the liquid valve inside the unit.

**⚠ CAUTION**

*Failure to do so or using a substitute drier or a granular type may result in damage to the equipment.*

| Filter-Drier Source 1 Part No. | Apply with Models |
|---|---|
| S1-401021 | 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). See Piping Application Guide (P/N 24077) for installing tubing of longer lengths and elevation differences.

**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 flow. Slope horizontal vapor lines at least 1" (2.5 cm) every 20 feet (6.1 m) toward the outdoor unit to facilitate proper oil return. If more than the 80 foot line length is necessary, facilitate proper refrigerant velocity with adjusted line diameter in accordance with the Piping Application Guide (P/N 24077).*

## ⚠ 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.*

## ⚠ 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.*

### PRECAUTIONS DURING LINE INSTALLATION

1. Install the 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.
2. The lines should be installed so that they will not obstruct service access to the coil, air handling system, or filter.
3. Care must also be taken to isolate the refrigerant lines to minimize noise transmission from the equipment to the structure.
4. 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.
5. Tape and suspend the refrigerant lines as shown. DO NOT allow tube metal-to-metal contact. See Figure 2.
6. Use PVC piping as a conduit for all underground installations as shown in Figure 3. 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.

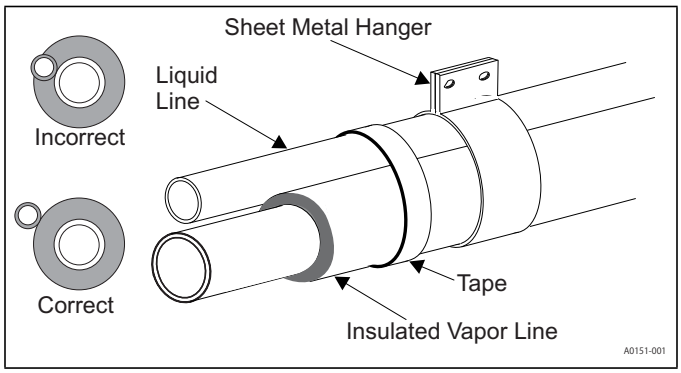



**FIGURE 2:** Installation of Vapor Line

7. 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.
8. For systems with total line length exceeding 75 feet (22.86 m), see Piping Application Guide (P/N 24077) for vapor and liquid line sizing, calibration of liquid line pressure loss or gain, determination of vapor line velocity, elevation limitations, TXV connections, system charging or traps.

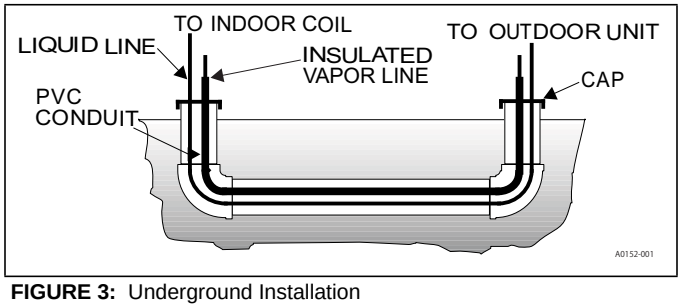



**FIGURE 3:** Underground Installation

### 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 or equivalent. DO NOT use soft solder. The outdoor units have reusable service valves on both the liquid and vapor connections. The total system refrigerant charge 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.*

### 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 4. 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.
2. Braze the liquid line to the liquid 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 indoor coil liquid and vapor connections at the indoor coil.

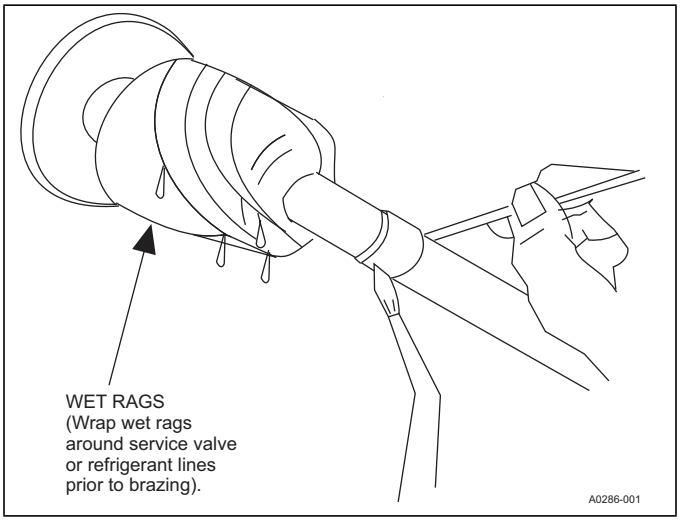



**FIGURE 4:** Heat Protection

**⚠ CAUTION**

*Do not install any coil in 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. Braze the liquid line to the indoor coil liquid connection. Nitrogen should be flowing through the indoor coil.
5. Slide the grommet away from the vapor connection at the indoor coil. Braze the vapor line to the evaporator vapor connection. After the connection has cooled, slide the grommet back into original position.
6. 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.
7. Replace the Schrader core in the liquid and vapor valves.
8. Go to SECTION IV for TXV installation.
9. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight. DO NOT OVER-TIGHTEN (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, indoor coil, 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 plunger 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 plunger cap finger tight, then tighten an additional 1/12 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.*

See “System Charge” section for checking and recording system charge.

## SECTION IV: COIL METERING DEVICES

A piston or a TXV is to be installed in the field. There is an installation manual that comes with the TXV kit. It is recommended to install the piston or TXV kit prior to installation of coil and brazing of line set. Until brazing is completed and cooled, the TXV sensing bulb must not be installed.

The outdoor technical guide for outdoor units should be consulted for required piston or TXV on the indoor coil. The piston and the Schrader core are supplied with the outdoor unit. When the piston is used instead of the TXV, the Schrader core is installed in the suction line equalizer connection port and is capped with the supplied plastic cap. The Schrader core must not be installed if the TXV is installed, because the TXV equalizer line attaches to the equalizer connection port.

**⚠ CAUTION**

***COIL UNDER PRESSURE**.*

*Verify that pressure has been released by depressing Schrader valve core.*

*The coil requires a metering device to be added.*

*See outdoor unit documentation for correct TXV or piston to be used.*

**NOTICE**

*To prevent moisture and contaminates from entering the system, the coil should not be open to atmosphere for extended periods of time. If the coil cannot be brazed into the refrigeration system during a routine installation period, the ends should be temporarily closed or plugged. For a short term delay, use masking tape over the ends of the copper tubing to close the tube from the air. For a longer term delay, use plugs or caps. There is no need to purge the coil if this procedure is followed.*

### PISTON INSTALLATION

**⚠ WARNING**

*Failure to install Schrader Valve Core in the vapor line* equalizer connection port *for piston applications could result in total refrigerant loss of the system!*

**Install Schrader Valve Core and Piston as follows:**

1. After holding charge is completely discharged, remove black plastic cap from equalizer connection port on the vertical part of the vapor line.
2. Distributor position must be adjusted to allow the preformed liquid line assembly to properly line up with the hole in the tubing access panel. Raise the distributor body approximately 2” toward the top of the coil or what would be the top of the coil if coil was in the upflow position. See Figure 5. Adjust as necessary.
3. Install Schrader valve core supplied with the outdoor unit into the equalizer fitting connection port using a valve core tool.
4. Loosen and remove the liquid line connection nut and the sealing disc from the distributor assembly. Note that the fitting has right hand threads.
5. Slide the nut over the liquid line to be installed, and discard the seal disc.
6. Install required size piston into the distributor. Refer to supplied Tabular Data Sheet for specific piston size and indoor coil match up.
7. Verify that the Teflon washer is still in place in the distributor opening. See Figure 6.

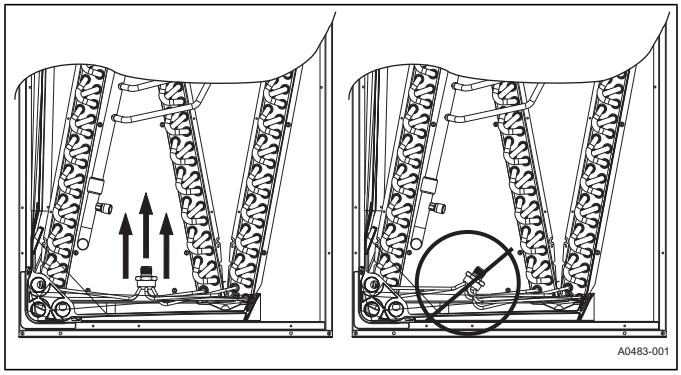



**FIGURE 5:** Recommended Distributor Adjustment

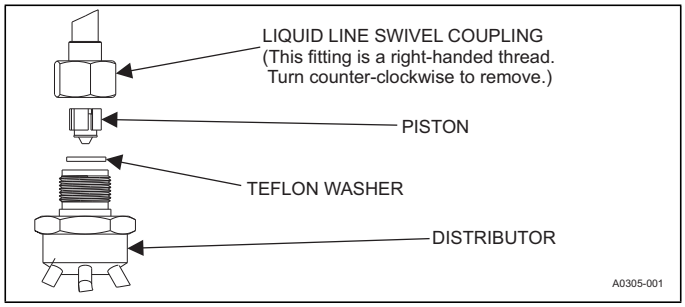



**FIGURE 6:** Piston Installation

**⚠ CAUTION**

*Do not overtorque. Do not use slip joint pliers. This will distort the aluminum distributor and the brass fitting (potentially causing leaks).*

8. After piston is installed, install the liquid line to the top of the piston/distributor assembly. Hand tighten, and turn an additional 1/4 turn to seal. Do not over tighten fittings.
9. Replace black plastic cap on unused equalizer fitting connection port.
10. After line set is installed, leak test the system.

## THERMOSTATIC EXPANSION VALVE (TXV) INSTALLATION

**⚠ CAUTION**

*Outdoor unit model numbers ending with an "H" have a factory installed hard start kit which is required when a TXV is installed. Outdoor unit model numbers with no "H" ending do not require a hard start kit unless local regulations dictate it.*

The following are basic steps for installation. For detailed instructions, refer to the Installation Instructions accompanying the TXV kit. Install TXV kit as follows:

**IMPORTANT**

*Refer to the Technical Guide for the unit to determine the proper TXV kit to be used on this product.*

1. Relieve the holding charge by depressing Schrader core on the suction manifold stub out.
2. After holding charge is completely discharged, loosen and remove the Schrader core.
3. Place a backup wrench on distributor, loosen and remove brass distributor nut. Retain brass nut for use on liquid line. Keep Teflon washer in place and discard clear disk.
4. Install the thermal expansion valve to the distributor assembly with supplied fittings. Ensure Teflon washer is seated in distributor. Hand tighten and turn an additional 1/4 turn to seal. Do not over-tighten fittings. See Figure 7.

**⚠ CAUTION**

*Do not over-torque. Do not use slip joint pliers. This will distort the aluminum distributor and the brass fitting (potentially causing leaks).*

5. Slide the nut removed in step 3 over the supplied liquid line. Place supplied Teflon washer from TXV kit in place on TXV, and install liquid line to the top of the thermal expansion valve. Adjust assembly so liquid line aligns with hole in access panel. See Figure 8. Hand tighten the liquid line, and apply an additional 1/4 turn to seal.

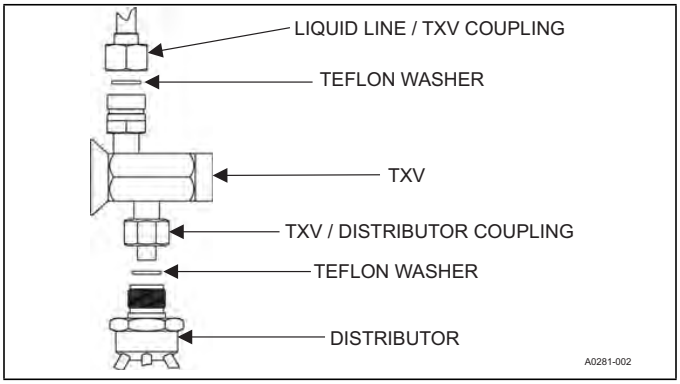



**FIGURE 7:** TXV Installation

**⚠ WARNING**

*Schrader valve core **MUST NOT** be installed with TXV installation. Poor system performance or system failure could result.*

6. Install the TXV equalizer line onto the vapor line by hand tightening the 1/4" SAE coupling nut to the equalizer fitting, and apply an additional 1/3 turn to seal. See Figures 8, 9 & 10.

**⚠ CAUTION**

*In all cases, mount the TXV temperature sensing bulb after vapor line is brazed and sufficiently cooled.*
*Failure to use suction line split grommet may result in TXV failure.*

7. Pass the temperature sensing bulb tube for the TXV through the tube opening in the split grommet of the access panel.
8. Install the TXV bulb to the vapor line near the cabinet, using the bulb clamp(s) furnished with the TXV assembly. Ensure the bulb is making maximum contact. See Figures 8, 9 & 10, and accomplish the following:
   a. If possible, install the temperature bulb on a horizontal run of the vapor line. Ensure that the bulb is installed at a 10 o'clock or 2 o'clock position. See Figure 9.
   b. If bulb installation is made on a vertical run, ensure that the bulb is a minimum of 8 inches (20.3 cm) away from elbow coming out of the coil. Position the bulb with the tail of the bulb at the top, so that the bulb acts as a reservoir. See Figure 10.
   c. Insulate the bulb using thermal insulation provided to protect it from the effect of the surrounding ambient temperature. Cover completely to insulate.

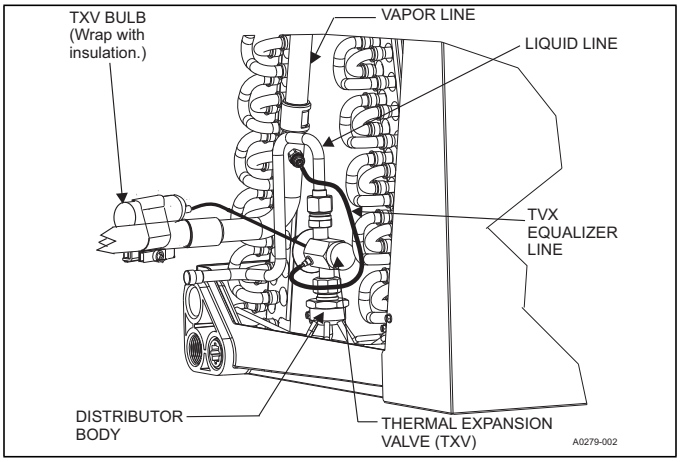



**FIGURE 8:** TXV Bulb and Equalizer line Installations

9. After line set is installed, leak test the system.

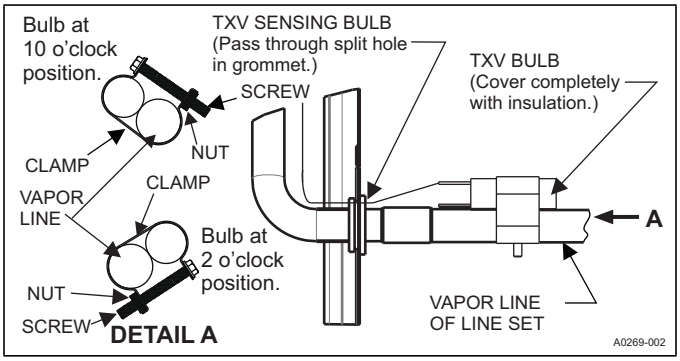



**FIGURE 9:** Proper Bulb Location

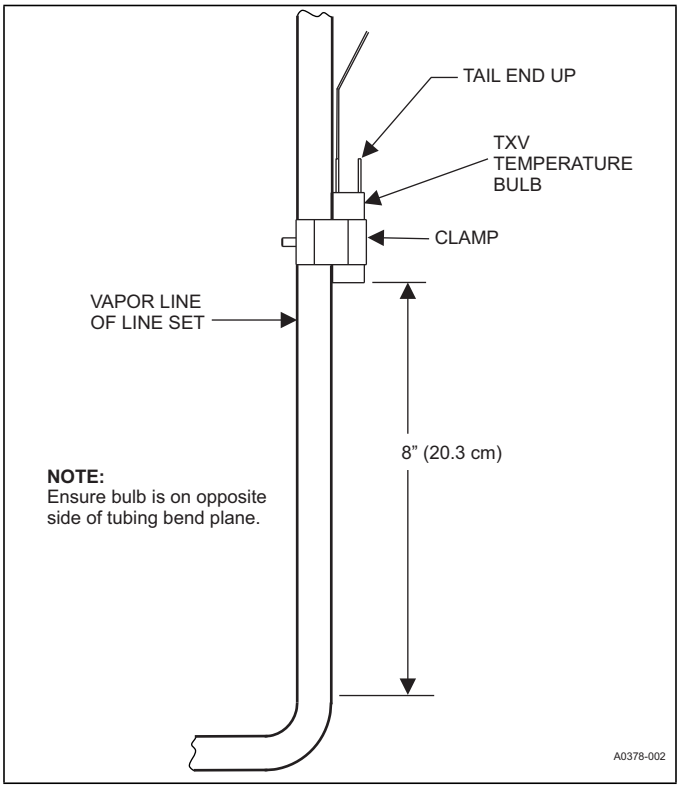



**FIGURE 10:** Vertical Temperature Bulb Orientation

## SECTION V: EVACUATION

It will be necessary to 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 VI: SYSTEM CHARGE

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

### MEASURE INDOOR AIR FLOW

To determine rated air flow for a specific match, consult the technical literature at www.upgnet.com. When attempting to match this air flow, select the lowest possible speed tap, measure the actual flow, and adjust as necessary.

**To measure actual air flow, it is not an acceptable method to just check the jumper pin setting tables and is to assume 0.5" water column total external static pressure.**

To determine indoor air flow, first measure the static pressure with a manometer between the filter and blower. On a single-piece air handler, take a second reading after the coil. On a furnace or modular air handler, take the second reading after the heat exchanger but before the indoor coil. Add the negative return static to the positive supply static to determine the system total static pressure. Treat the negative return static as a positive pressure (even though it is a negative reading). If there is static pressure on the blower (i.e. -.10) return, add it to a supply static (.40) which equals a (.50) total system static pressure. Compare this value to the table for the indoor unit's static pressure vs. CFM or to a curve chart.

### SYSTEM CHARGING

**NOTICE**

*For cold weather charging of the system at temperatures of 55°F or below, refer to the "Optional Cold Weather Charging" procedures near the end of SECTION VI: SYSTEM CHARGE.*

**⚠ CAUTION**

*R-410A refrigerant cylinders are rose colored. Always charge the system slowly with liquid R-410 refrigerant.*

The factory charge in the outdoor unit includes enough charge for the unit, a 15 ft. (4.6 m) line set, and the smallest indoor coil match-up. Some indoor coil matches may require additional charge. See tabular data sheet provided in unit literature packet for charge requirements.

**⚠ CAUTION**

*Do not leave the system open to the atmosphere.*

The "TOTAL SYSTEM CHARGE" must be permanently stamped on the unit data plate.

TOTAL SYSTEM CHARGE is determined as follows:

1. Determine the Base Charge shipped in the outdoor unit from the Tabular Data Sheet included with the outdoor unit.
2. Determine the charge adder for the matched indoor unit from the Tabular Data Sheet included with the outdoor unit.

3. If the lineset length is greater than 15 feet (4.6 m), calculate the charge adder for actual lineset length using the Tabular Data Sheet included with the outdoor unit.
4. Once the charge adders for matched indoor unit and for lineset have been weighed in, verify the system operation against the temperatures and pressures in the Charging Chart for the outdoor unit. Locate Charging Charts on the outdoor unit and also in the Service Application Data on www.upgnet.com. Follow the Subcool or the Superheat charging procedure in the section below according to the type of indoor metering device in the system, and allow ten minutes after each charge adjustment for the system operation to stabilize. Record the charge adjustment made to match the Charging Chart.
5. Verify that TOTAL SYSTEM CHARGE = Base Charge (as shipped) + charge adder for matched indoor unit + charge adder for actual lineset length + charge adjustments to match Charging Chart.
6. Permanently stamp the unit data plate with the TOTAL SYSTEM CHARGE as defined above.

This method is to be used whenever additional refrigerant is required for the system charge.

**⚠ WARNING**

*DO NOT attempt to pump "Total System Charge" into outdoor unit for maintenance or service. 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.*

**⚠ WARNING**

*It is recommended to not attempt to pump more than the "Factory Charge" and an additional 15 foot line charge into a tube and fin outdoor unit for maintenance or service. This can cause damage to the compressor and/or other components.*

**⚠ CAUTION**

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

**⚠ 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.*

If a calibrated charging cylinder or accurate weighing device is available, add refrigerant accordingly. Otherwise, model-specific charging charts are provided on the access panel of the unit.

## SUBCOOLING CHARGING METHOD - TXV INDOOR

The outdoor unit comes equipped with subcooling charts optimized for that particular unit. Please follow the instructions on the unit. If those instructions are not readily available, follow the instructions below.

1. Set the system running in cooling mode by setting the thermostat at least 6°F below the room temperature and operate system for at least 10 – 15 minutes.
2. Refer to the technical guide for the recommended indoor airflow and verify it is correct (it should be 350- 400 SCFM per ton).
3. Measure and record the indoor wet bulb (WB) and the outdoor ambient dry bulb (DB) temperature.
4. Using the charging chart located on the unit, find the intersection of the indoor wet bulb and the outdoor dry bulb. This is the recommended liquid pressure (and subcooling value).
5. Measure and record the pressure at the liquid valve pressure port and compare to the value obtained in step 4.
6. Add charge if the measured liquid pressure is lower than the recommended value. Remove / recover charge if the measured liquid pressure is above the recommended value.

Example: The liquid pressure listed at the intersection of the indoor WB and the outdoor DB 320 psig. Pressure at the liquid valve is 305 psig. It would be necessary to add refrigerant to increase the liquid pressure to 320 psig.

Condenser subcooling is obtained by calculating the difference of the saturated refrigerant temperature of the pressure measured at the liquid base valve and the liquid tube temperature as measured at the liquid base valve.

Subcooling Temp. (TC) = Saturated Temp. (TS) – Liquid Temp. (T).

**⚠ 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.*

## SUPERHEAT CHARGING METHOD - PISTON INDOOR

1. Set the system running in cooling mode by setting the thermostat at least 6°F below the room temperature and operate system for at least 10 – 15 minutes.
2. Refer to the technical guide for the recommended airflow and verify indoor airflow (it should be about 350-450 SCFM per ton).
3. Measure and record the outdoor ambient (DB) temperature and the suction pressure at the suction service valve.
4. Using the charging chart located on the unit, find the intersection of the outdoor ambient dry bulb and the suction pressure obtained in step 3. This is the recommended suction tube temperature at the service valve.
5. Measure and record the suction tube temperature at the service valve and compare to the recommended temperature obtained in step 4.
6. Add charge if the measured suction temperature in step 5 is above the recommended value. Remove / recover refrigerant if the measured suction temperature is below the recommended value.

Example: The suction tube temperature listed on the table at the intersection of the outdoor DB and the suction pressure is 63°F. Temperature of the suction tube at the service valve is 68°F. It would be necessary to add refrigerant to drop the suction tube temperature to 63°F.

**TABLE 2:** R-410A Saturation Properties

| TEMP. °F | PRESSURE PSIG | TEMP. °F | PRESSURE PSIG | TEMP. °F | PRESSURE PSIG | TEMP. °F | PRESSURE PSIG | TEMP. °F | PRESSURE PSIG |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 130 | 60 | 170 | 75 | 217 | 90 | 274 | 105 | 341 |
| 46 | 132 | 61 | 173 | 76 | 221 | 91 | 278 | 106 | 345 |
| 47 | 135 | 62 | 176 | 77 | 224 | 92 | 282 | 107 | 350 |
| 48 | 137 | 63 | 179 | 78 | 228 | 93 | 287 | 108 | 355 |
| 49 | 140 | 64 | 182 | 79 | 232 | 94 | 291 | 109 | 360 |
| 50 | 142 | 65 | 185 | 80 | 235 | 95 | 295 | 110 | 365 |
| 51 | 145 | 66 | 188 | 81 | 239 | 96 | 299 | 111 | 370 |
| 52 | 147 | 67 | 191 | 82 | 243 | 97 | 304 | 112 | 375 |
| 53 | 150 | 68 | 194 | 83 | 247 | 98 | 308 | 113 | 380 |
| 54 | 153 | 69 | 197 | 84 | 250 | 99 | 313 | 114 | 385 |
| 55 | 156 | 70 | 201 | 85 | 254 | 100 | 317 | 115 | 391 |
| 56 | 158 | 71 | 204 | 86 | 258 | 101 | 322 | 116 | 396 |
| 57 | 161 | 72 | 207 | 87 | 262 | 102 | 326. | 117 | 401 |
| 58 | 164 | 73 | 211 | 88 | 266 | 103 | 331 | 118 | 407 |
| 59 | 167 | 74 | 214 | 89 | 270 | 104 | 336 | 119 | 412 |

### OPTIONAL COLD WEATHER CHARGING

**NOTICE**

*For better airflow, the size of the charging tent must be at least 70"x70"x70" and must have some adjustable flaps or windows to control the temperature inside the charging tent. The charging tent must not have a floor or floor covering. Be sure to follow the "System Charge" procedures from Section VI of this Installation Manual.*

1. Assemble the charging tent.
2. Slide charging tent over top of condenser unit.
3. Position the door zipper over the lineset so charging tent sits evenly on ground.
4. Make sure distance around condenser inside of charging tent is even for airflow.
5. Stake down the edges of the charging tent cover to prevent the unit fan from blowing the charging tent away.
6. Start condenser.
7. For better temperature measurement inside the charging tent, use a thermocouple to monitor temperature readings. Locate the thermocouple monitor approximately 8-10 inches away from the coil guard and 2/3 the way above the bottom of the coil on the opposite side from the control box.
8. Based on outdoor ambient temperature, begin adjusting windows in order to achieve a stable temperature above 55°F inside tent. Note that the colder the outdoor ambient temperature is the fewer windows need removal.
9. Use condenser charging chart. Verify that the outdoor ambient temperature listed on the charging chart is the temperature inside the charging tent.
10. Carefully adjust the charging tent windows until reaching the desired temperature, and allow the unit to stabilize for a minimum of 15 minutes. Check the thermocouple to make sure the temperature is still maintained at desired temperature. If the temperature is out of range, adjust the windows by opening or closing them.
11. Once the condition inside the charging tent is STABILIZED, follow the "System Charge" procedure to adjust charge in the unit.
12. Add or remove charge, and adjust windows to maintain the desired temperature inside the tent.

## SECTION VII: ELECTRICAL CONNECTIONS

### GENERAL INFORMATION & GROUNDING

The control box cover is held in place with 3 screws (one screw in each lower corner and one screw at the top center post). The control box can swing open by removing the screw from the center of each side of the control box and allowing the control box to lower an inch or so into a pivotal position.

**NOTICE**

A flexible electrical whip must be installed in order to use the swing away function of the control box. Other type electrical whips require the wiring to be disconnected in order to swing the control box open.

The control box can then swing open from the left by rotating on the right side pivots for easy service of refrigeration components. If no wiring is in or routed through the control box, it can be removed from the unit by lifting slightly, tilting the top hinge out, and lifting the bottom hinge out. During the installation, it is recommended to route the low voltage wiring for the thermostat along the unit whip to help facilitate the swing away feature of the control box. Refer to Figure 11.

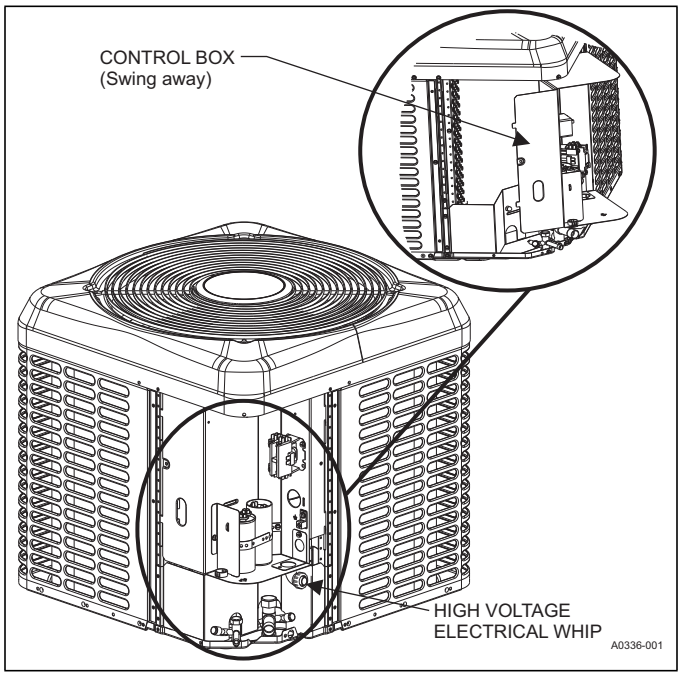



**FIGURE 11:** Outdoor Unit Swing Away Control Box

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.

## FIELD CONNECTIONS POWER WIRING

1. Install the proper size weatherproof disconnect switch outdoors and within sight of the unit.
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 Figures 11, 12, 13 & 14.
5. Install the proper size time-delay fuses or circuit breaker, and make the power supply connections.

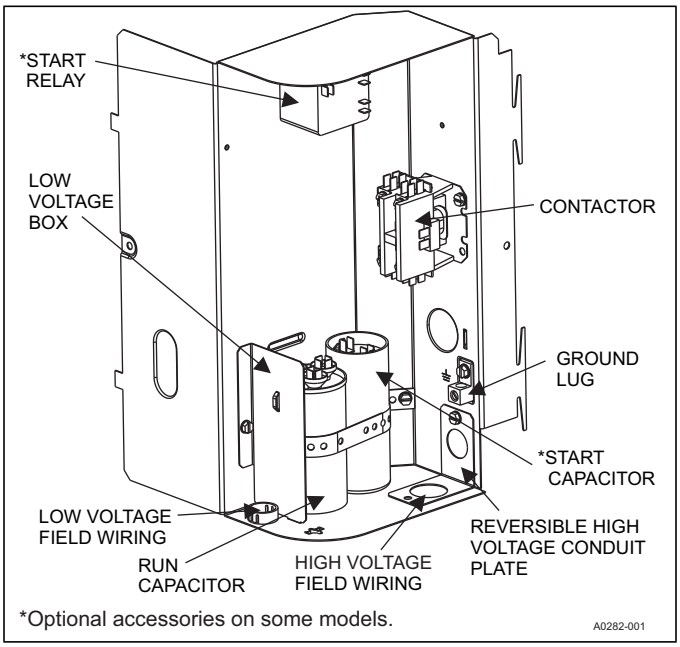



**FIGURE 12:** Outdoor Unit Control Box (Single Phase - Smaller Base)

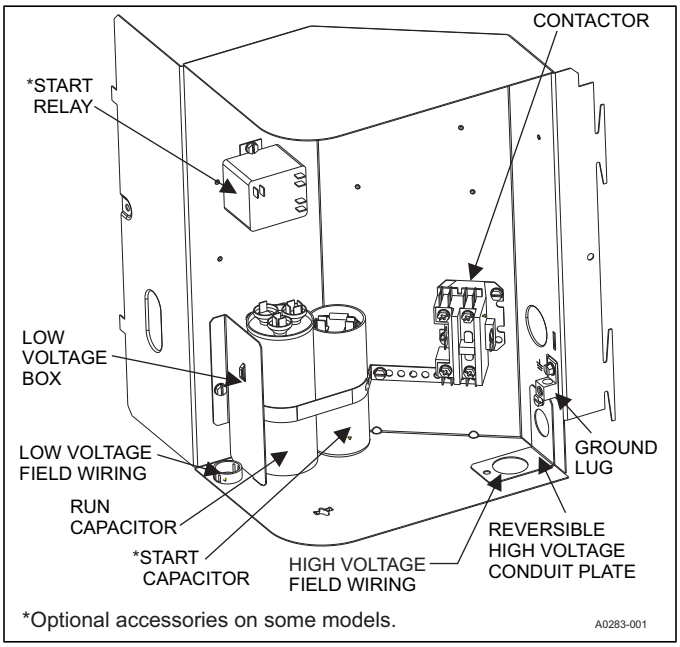



**FIGURE 13:** Outdoor Unit Control Box (Single Phase - Larger Base)

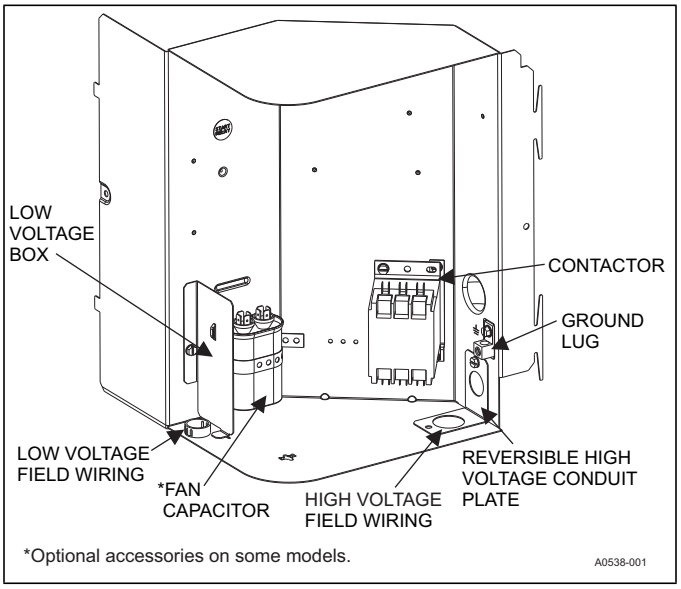



**FIGURE 14:** Outdoor Unit Control Box (Three Phase)

## FIELD CONNECTIONS CONTROL WIRING

1. Route low voltage wiring into bottom of control box as shown in Figure 12, 13 or 14. Make low voltage wiring connections inside the low voltage box per Figure 15.
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 CONNECTINS POWER WIRING procedures.
4. All field wiring to be in accordance with national electrical codes (NEC) and/or local-city codes.

**NOTICE**

A Start Assist Kit is available and recommended for long line set applications or in areas of known low voltage problems. The kit may be required when a TXV is used (reference the Tabular Data Sheet to determine if applicable).

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.*

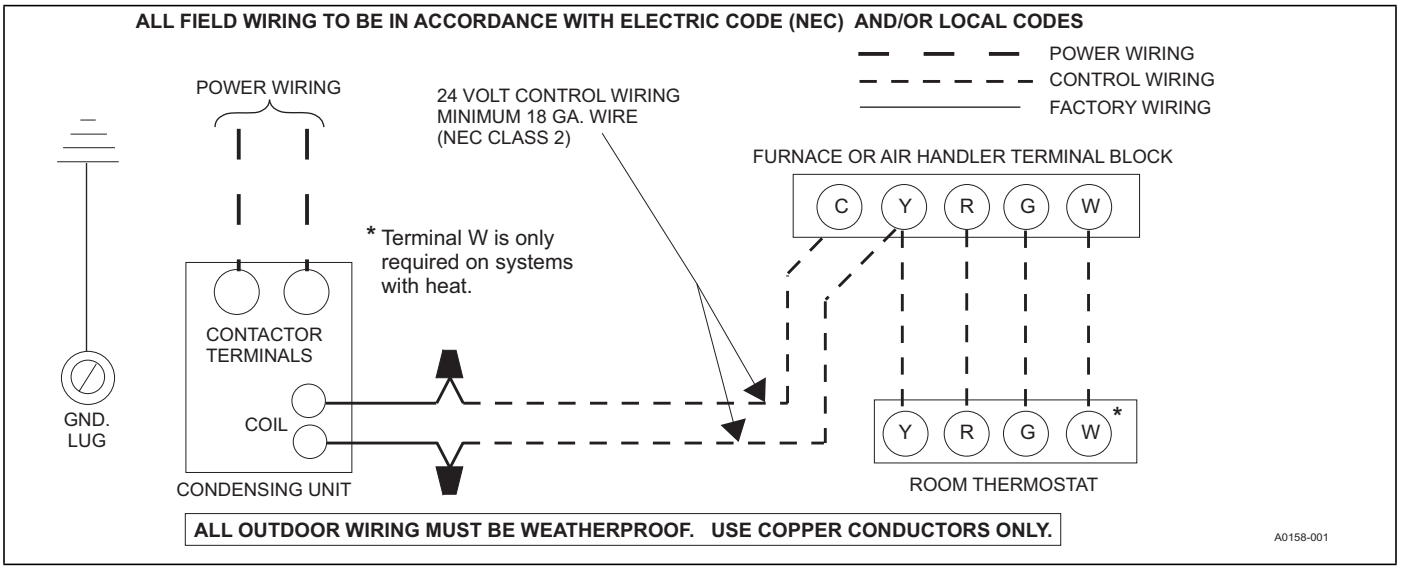



**FIGURE 15:** Typical Field Wiring (Air Handler / Electrical Heat) (Single-Phase)

For additional connection diagrams for all UPG equipment refer to “Low Voltage System Wiring” document available online at www.upgnet.com in the Product Catalog Section.

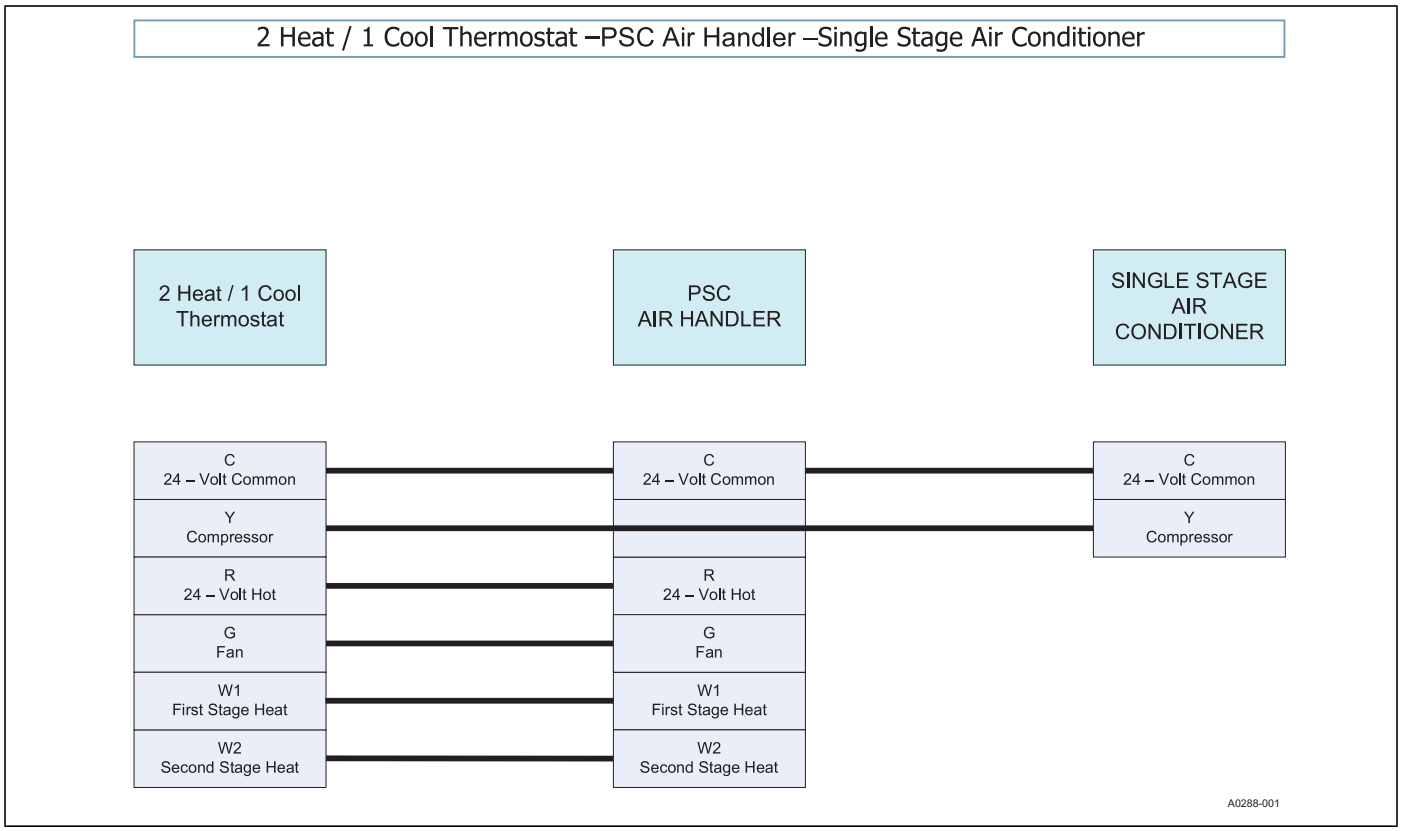



**FIGURE 16:** Thermostat Chart - PSC Air Handler with Single Stage Air Conditioner

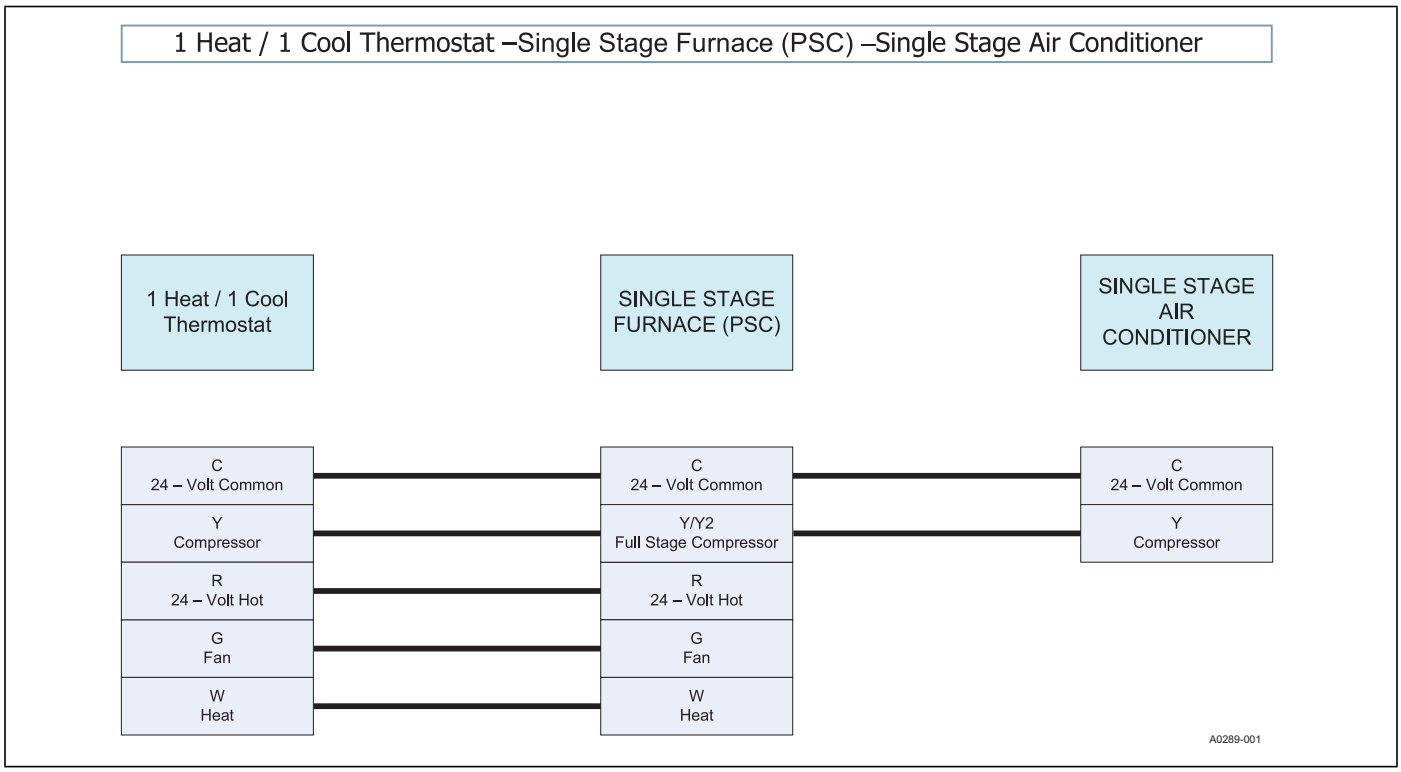



**FIGURE 17:** Thermostat Chart - Single Stage PSC Furnace with Single Stage Air Conditioner

## SECTION VIII: INSTRUCTING THE OWNER

Assist owner with processing warranty cards and/or online registration. Review Owners Guide and provide a copy to the owner and guidance on proper operation and maintenance. Instruct the owner or the operator how to start, stop and adjust temperature setting.

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 8 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 is permanently lubricated and does not require periodic oiling.
3. If the coil needs to be cleaned, use clean water to wash dust, dirt, and debris from outdoor condensing coil.

**NOTICE**

*DO NOT use coil cleaners to clean outdoor condensing coil. Cleaners containing HF –, hydroxides, chlorides, and sulfates can greatly reduce the lifetime of the micro channel coil.*

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.*

## SECTION IX: WIRING DIAGRAM

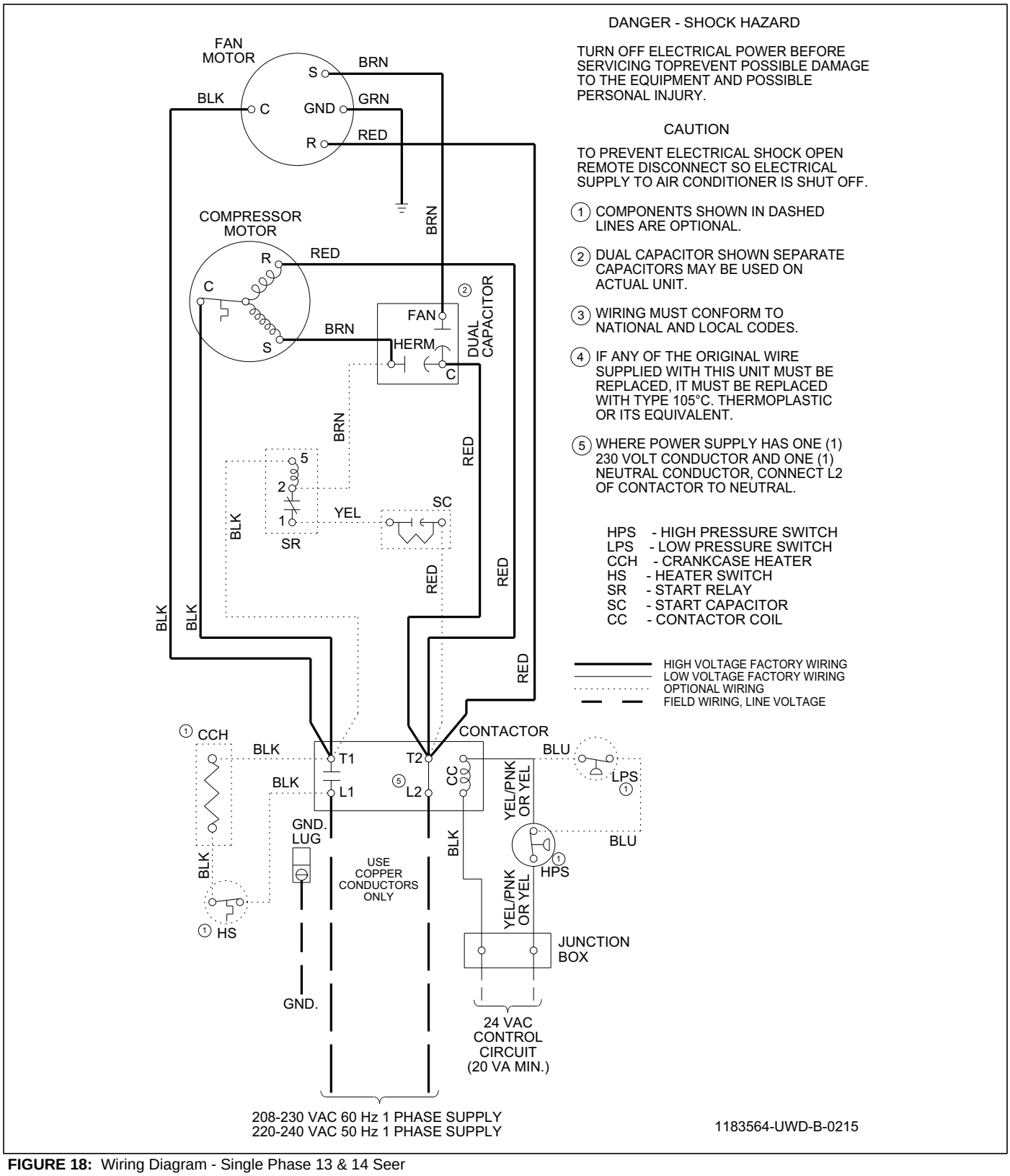



**FIGURE 18:** Wiring Diagram - Single Phase 13 & 14 Seer

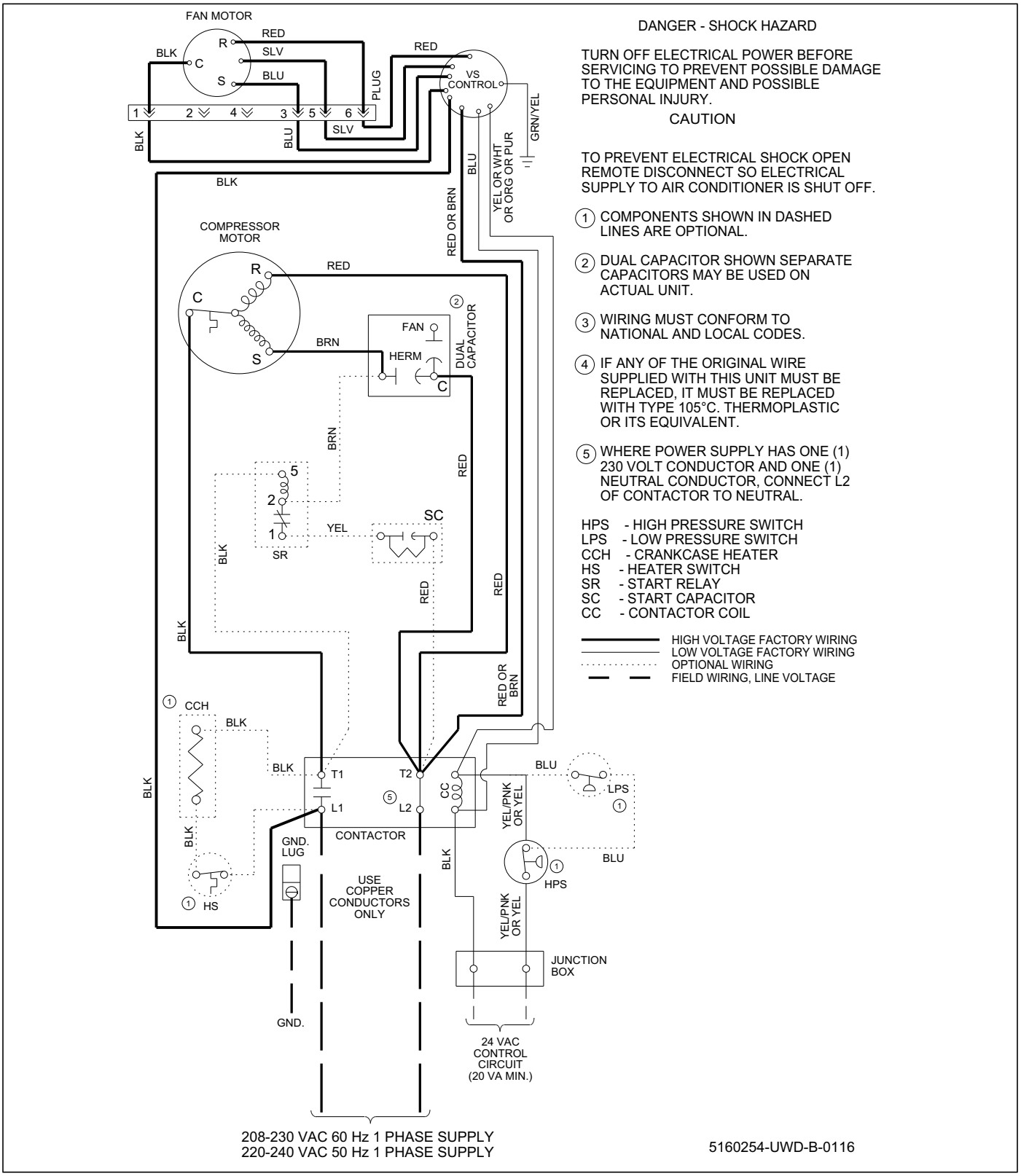



**FIGURE 19:** Wiring Diagram - Single Phase 17 Seer

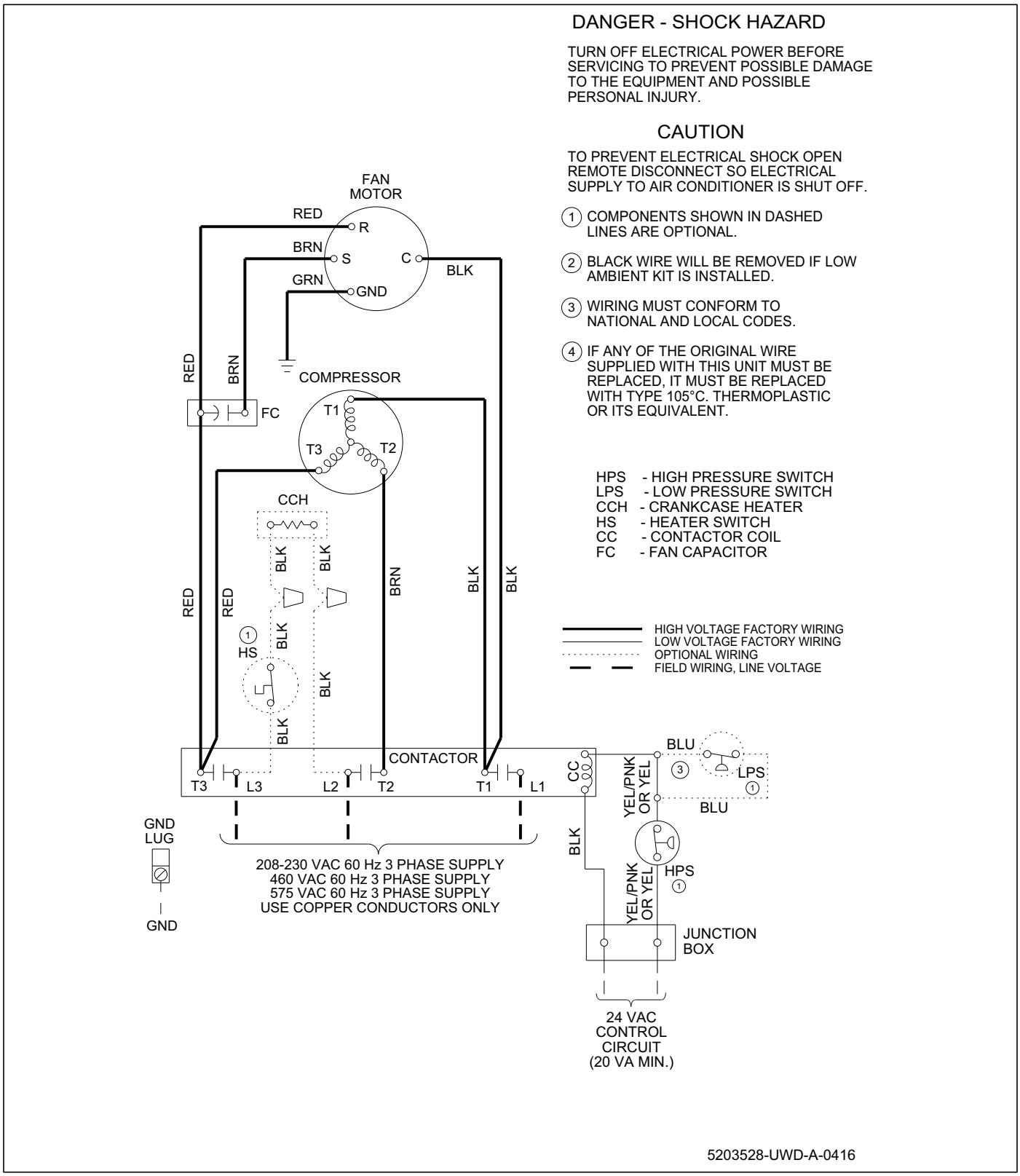



**FIGURE 20:** Wiring Diagram - Three Phase 13 Seer

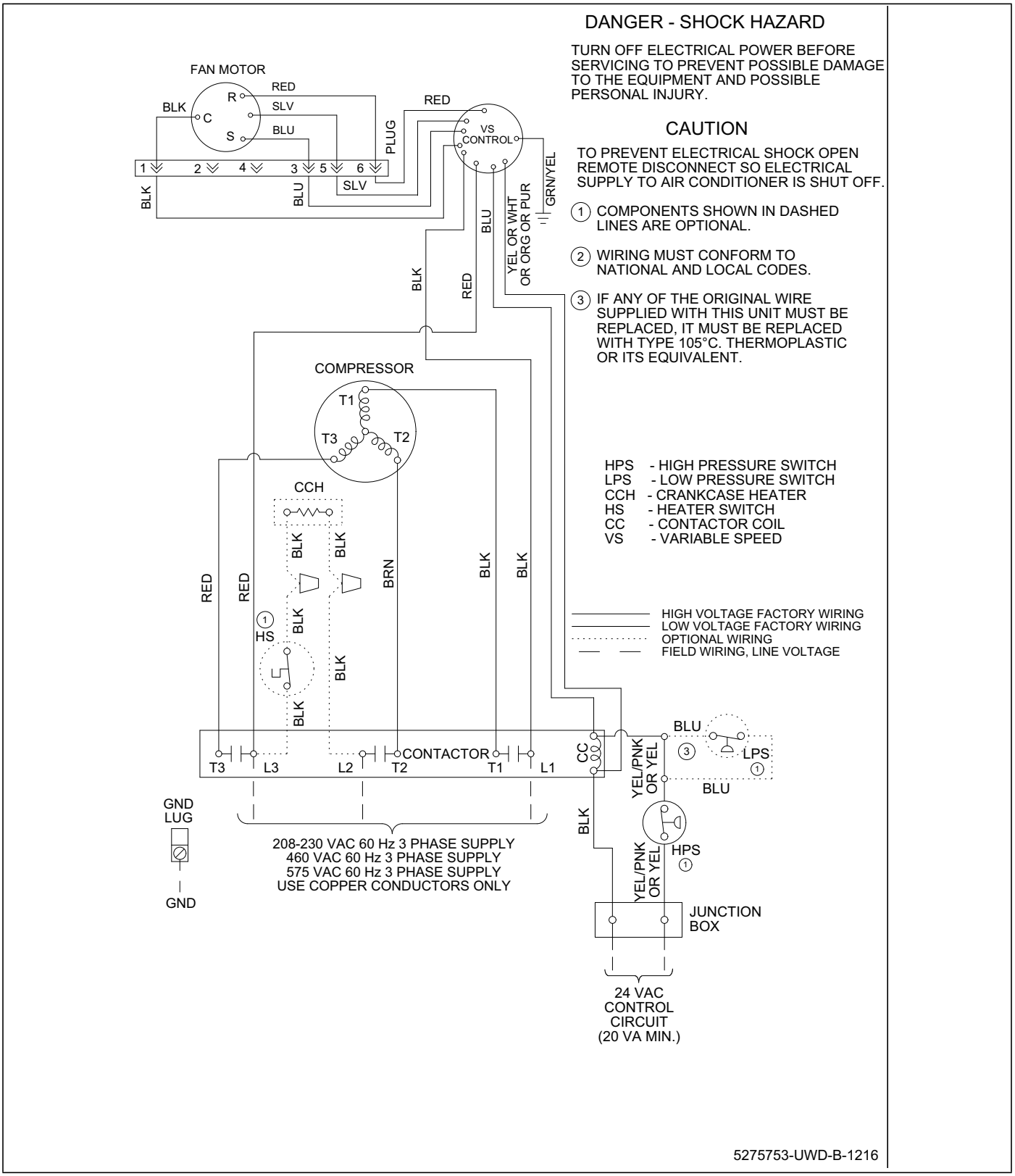



**FIGURE 21:** Wiring Diagram - Three Phase 17 Seer

# NOTES

## SECTION X: START UP SHEET

### Air Conditioning and Heating Start-Up Sheet

Proper start-up is critical to customer comfort and equipment longevity

Start-Up Date

Technician Performing Start-Up | Installing Contractor Name

**Owner Information**

Name | Address

City | State or Province | Zip or Postal Code

**Equipment Data** ○ Upflow ○ Downflow ○ Horizontal Left ○ Horizontal Right

Indoor Unit Model # | Indoor Unit Serial #

Indoor Coil Model # | Indoor Coil Serial #

Outdoor Unit Model # | Outdoor Unit Serial #

**Filter, Thermostat, Accessories**

Filter Type | Filter Size | Filter Location(s)

Thermostat Type | Other System Equipment and Accessories

**Connections -- Per Installation Instructions and Local Codes**

☐ Unit is level ☐ Supply plenum and return ducts are connected and sealed ☐ Refrigerant piping complete and leak tested

☐ Gas piping is connected (if applicable) ☐ Vent system is connected (if applicable)

☐ Condensate drain for indoor coil properly connected ☐ Condensate drain for furnace (if applicable)

**Electrical: Line Voltage**

Indoor unit (volts AC) | Outdoor unit (volts AC) | Overcurrent Protection Breaker / Fuses Amperes

☐ Ground wire is connected ☐ Polarity is correct (120vac indoor units) black is L1 (hot), white is N (neutral)

**Electrical: Low Voltage** ☐ Thermostat wiring complete

☐ Heat anticipator is set to the recommended value listed in the Installation Instructions | Heat anticipator recommended value

Low voltage values: "R" and "C" at Indoor unit control board (volts AC) | "R" and "C" Outdoor unit control board (volts AC)

**Heating Set-Up**

Heating Type ○ Electric Air Handler ○ Natural Gas ○ LP Gas (Requires LP Conversion Kit)

Inlet Gas Pressure (in. w.c.") | Manifold Gas Pressure (in. w.c.") | LP Gas Conversion Kit Part # Used

Calculated input in btuh - clock the gas meter (Nat Gas Only) | LP Kit Installed By

Electric Heat Kit Part # (if applicable) | KW installed | Rated BTU/H (furnaces)

**Venting (if applicable)** ☐ Venting system properly sized, within the limitations of the charts in the installation instructions.

Intake Size | # of 90 Degree Ells | # 0f 45 Degree Ells | Length

Exhaust Size | # of 90 Degree Ells | # 0f 45 Degree Ells | Length

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## Air Side: System Total External Static Pressure

| | | | |
|---|---|---|---|
| Supply static before indoor coil (in w.c.") | | Supply static after indoor coil (in w.c.") | |
| Return Static (in w.c.") before filter | | Return Static (in w.c.") after filter (furnace side) | |
| Total External Static Pressure | | Maximum Rated ESP (in w.c.") | |

### Cooling Indoor Blower Set-Up

| | | | | | | |
|---|---|---|---|---|---|---|
| | COOL | ○ A | ○ B | ○ C | ○ D | |
| ○ ECM | ADJUST | ○ A | ○ B | ○ C | ○ D | |
| | DELAY | ○ A | ○ B | ○ C | ○ D | |
| ○ X-13 | ○ 1 | ○ 2 | ○ 3 | ○ 4 | ○ 5 | |
| ○ PSC | ○ Low | ○ Medium Low | ○ Medium | ○ Medium High | ○ High | |

Return Air: Dry Bulb ____ Wet Bulb ____ Supply Air: Dry Bulb ____ Wet Bulb ____ Temperature Drop ____ Outside Air: Dry Bulb ____

### Heating Indoor Blower Set-Up

| | | | | | |
|---|---|---|---|---|---|
| ○ ECM | HEAT | ○ A | ○ B | ○ C | ○ D |
| ○ X-13 | ○ 1 | ○ 2 | ○ 3 | ○ 4 | ○ 5 |
| ○ PSC | ○ Low | ○ Medium Low | ○ Medium | ○ Medium High | ○ High |

Return Air: Dry Bulb ____ Wet Bulb ____ Supply Air: Dry Bulb ____ Wet Bulb ____ Temperature Rise ____

### Refrigerant Charge and Metering Device

○ R-407C ○ R-410A | ○ TXV ○ Fixed Orifice

Additional Lineset Length ____ Adder per foot - lbs. ____ Oz. ____

# Elbows ____ # 45s ____ Total Added - lbs. ____ Oz. ____

Orifice Size ____ Liquid Line Temp ____ High Side Pressure ____ Suction Line Temp ____ Low Side Pressure ____

TXV # ____ Subcooling ____ Superheat ____

### Cycle Test

- ☐ Operate the unit through continuous fan cycles from the thermostat, noting and correcting any problems
- ☐ Operate the unit through a cooling cycles, noting and correcting any problems
- ☐ Operate the unit through several heating cycles (if applicable) from the thermostat, noting and correcting any problems

### Clean Up

- ☐ Installation debris disposed of and indoor and outdoor areas cleaned up?

### Owner Education

- ☐ Provide owner with the owner's manual
- ☐ Explain operation of system to equipment owner
- ☐ Explain thermostat use and programming (if applicable) to owner
- ☐ Explain the importance of regular filter replacement and equipment maintenance

### Comments Section



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**York International Corp.**
**5005 York Drive**
**Norman, OK 73069**