

INSTALLATION MANUAL

R-407C OUTDOOR SPLIT-SYSTEM AIR CONDITIONING

MODELS: 14 SEER - GAW14L

1.5 TO 5 TONS



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SECTION I: GENERAL

NOTICE

The outdoor units are designed to be connected to a matching indoor coil with sweat connect lines.

The refrigerant charge may need to be changed for some indoor-outdoor unit combinations, elevation differences or total line lengths. Refer to Application Data covering "General Piping Recommendations and Refrigerant Line Length" (Part Number 247077). This unit has a compressor containing POE oil.

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.

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.

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	
Min. DB	Max. DB	Min. WB	Max. WB
55 °F	125 °F	57 °F	72 °F

- 4. The unit should not be operated at outdoor temperatures below 50° F without an approved low ambient operation accessory kit installed.
- 5. The maximum allowable line length for this product is 75 feet.

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 Figures 1 & 2.

NOTICE

For multiple unit installations, units must be spaced a minimum of 24 inches 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.

Provide adequate structural support.

ADD-ON REPLACEMENT/RETROFIT

The following steps should be performed in order to insure proper system operation and performance.

- 1. Change-out the indoor coil, if required, to an approved R-407C coil/ condensing unit combination with the appropriate metering device.
- 2. 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.

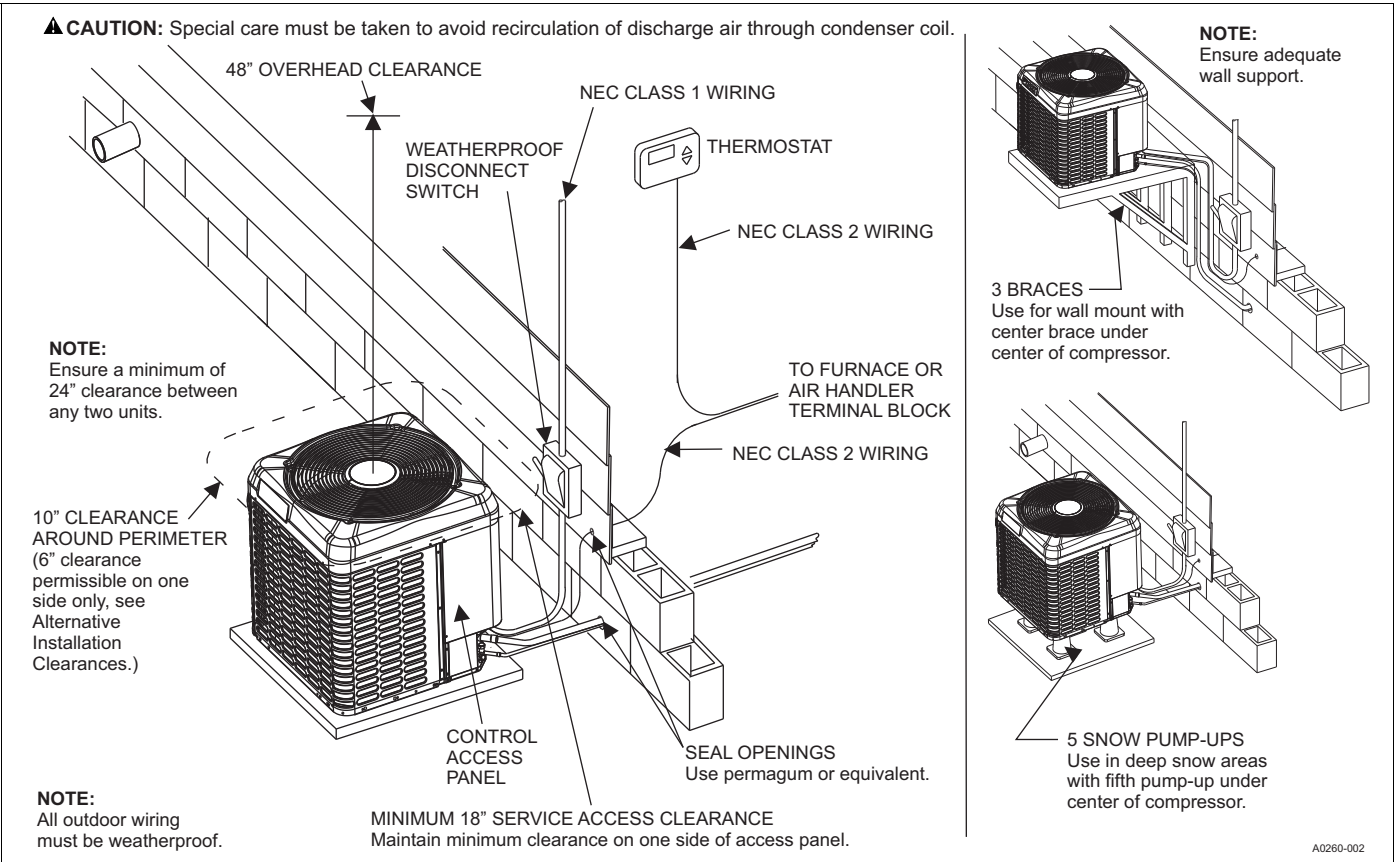


FIGURE 1: Typical Installation Clearances

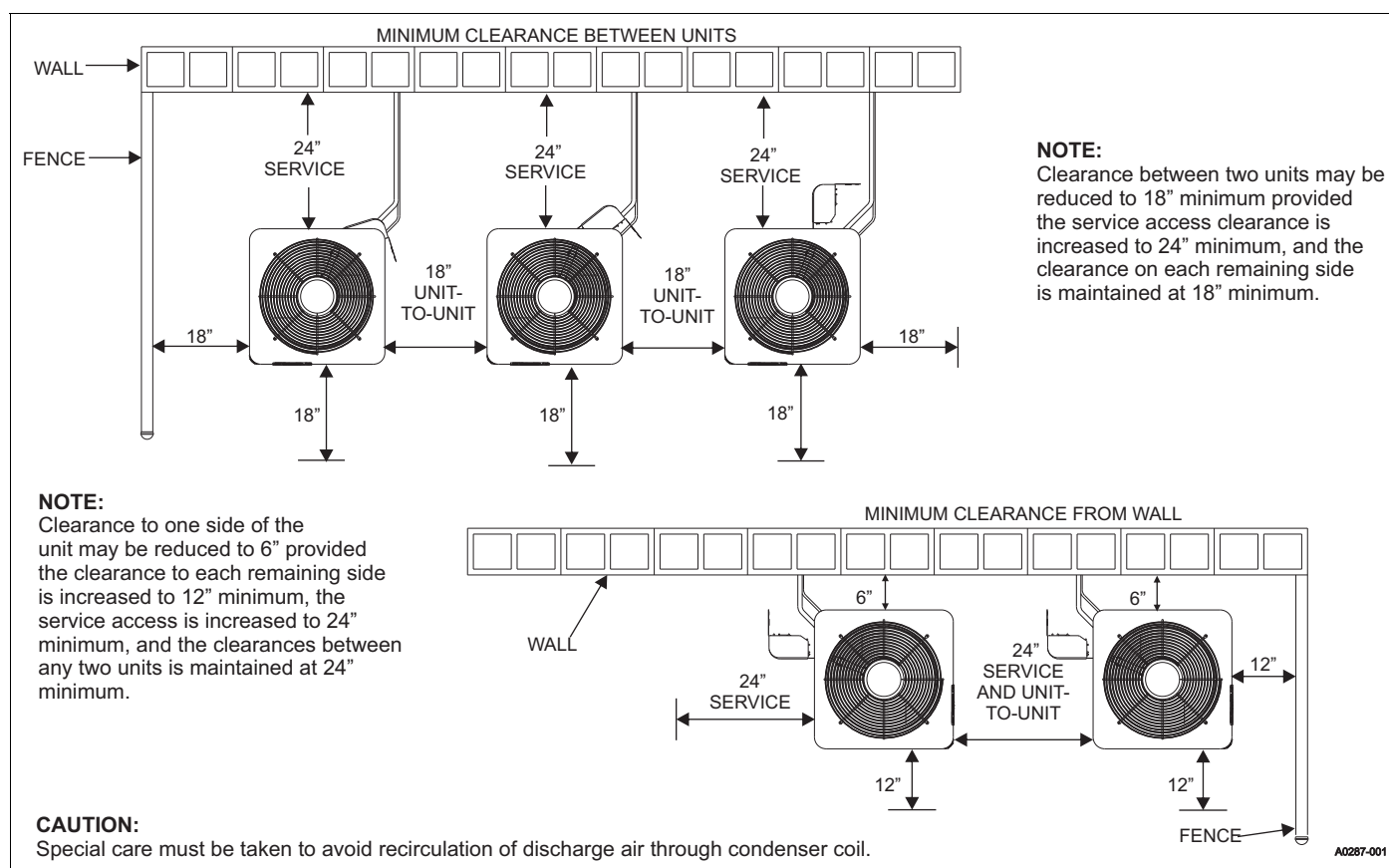


FIGURE 2: Alternative Installation Clearances

GROUND INSTALLATION

The unit should be installed on a solid base that is 2" above grade and will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances shown in Figures 1 & 2 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, 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. In addition heat pump units must be elevated above anticipated snow accumulation levels to allow for proper defrost drainage and airflow.

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 copper spun filter/dryer is located on the liquid line.

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.

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	14 SEER 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. See Application Data "General Piping Recommendations and Refrigerant Line Length" (Part Number 247077). This unit has a compressor containing POE oil.

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" every 20 feet toward the outdoor unit to facilitate proper oil return.

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 3.
6. 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.
7. Pack fiberglass insulation and a sealing material such as perma-gum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.
8. For systems with total line length exceeding 50 feet, see APPLICATION DATA and worksheet "General Piping Recommendations and Refrigerant Line Length" 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, traps, etc.

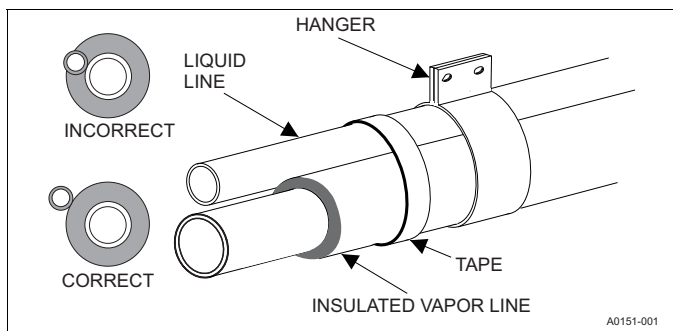


FIGURE 3: Installation of Vapor Line

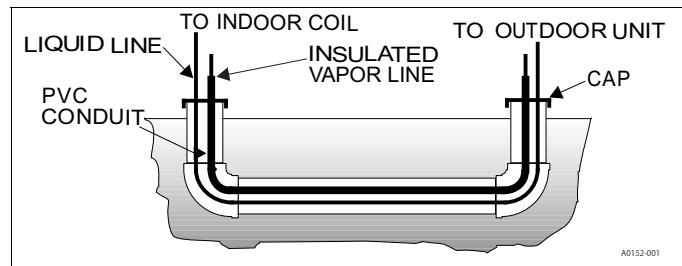


FIGURE 4: Underground Installation

PRECAUTIONS DURING BRAZING OF LINES

All outdoor unit and indoor 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. Units are shipped from factory with R-407C. Refer to Tabular Data Sheet for refrigerant charge quantities. 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

WARNING

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

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 base 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 unsolder or cut the original line set from the indoor liquid and vapor connections at the indoor coil.

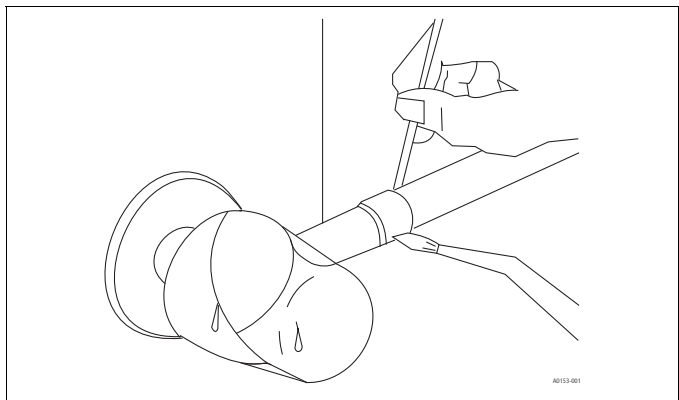


FIGURE 5: Heat Protection

4. Braze the new liquid line to the evaporator liquid connection. Nitrogen should be flowing through the indoor coil.
5. Remove the rubber ring from the vapor connection at the indoor coil. Braze the new vapor line to the indoor vapor connection. After the connection has cooled, place the rubber ring back into the mounting position. Refer to the Tabular Data Sheet for proper vapor line sizing.
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.

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.

7. Pressurize system and leak check. If no leaks are found, proceed to next step.
8. To vent the nitrogen used to leak check the lineset, open both service valves slowly on the outdoor unit by and wait for the pressure to dissipate. 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, and turn valve stem back 1/4 turn. If the service valve is a ball valve, use an adjustable end 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".
9. Replace the Schrader core in the liquid and vapor valves.
10. Replace plunger cap finger tight, then tighten an additional 1/12 turn (1/2 hex flat). Cap must be replaced to prevent leaks.
11. Go to "SECTION IV: INDOOR EXPANSION DEVICE" and accomplish the "THERMOSTATIC EXPANSION VALVE (TXV) INSTALLATION" procedures.
12. Evacuate the vapor line, the indoor coil, and liquid line to 500 microns or less.

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.

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

SECTION IV: INDOOR EXPANSION DEVICE THERMOSTATIC EXPANSION VALVE (TXV) INSTALLATIONS

Before accomplishing the following procedures, verify the proper TXV kit to be installed on the indoor coil distributor. Refer to supplied Tabular Data Sheet for proper indoor coil match up and specific TXV kit.

For installations requiring a TXV, the following are the basic steps for installation. For detailed instructions, refer to the Installation Instructions accompanying the TXV kit.

Install TXV kit as follows:

1. Relieve nitrogen holding charge from the indoor coil by depressing the Schrader valve stem located in the end of the suction line. After nitrogen holding charge is completely discharged, cut the spudown copper to allow installation of the suction line.

CAUTION

In all cases, mount the TXV bulb after vapor line is brazed and has had sufficient time to cool.

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.

2. Slide indoor coil out of cabinet far enough to gain access to equalizer fitting on the suction line.

NOTICE

All connections to be brazed are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5 or equivalent. Soft solder is NOT to be used.

3. Before the suction line from the outdoor unit is brazed to the indoor coil suction line, remove and discard black plastic cap from equalizer fitting on the indoor coil suction line.
4. Loosen and remove distributor cap seal.

NOTICE

Do not install TXV onto distributor assembly until field supplied liquid line is brazed onto the indoor coil liquid line and cooled.

5. Install the TXV to the distributor assembly by hand tightening, and then turn fitting an additional 1/4 turn to seal. **Do not over tighten fittings.** See Figure 6.

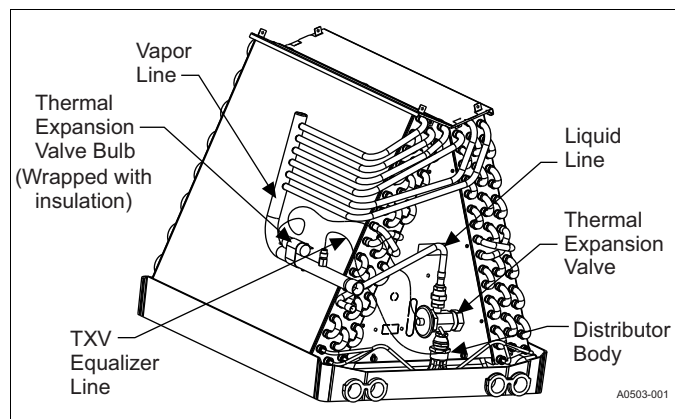


FIGURE 6: TXV Installation

⚠ CAUTION

Do not use slip joint pliers. Damage and distortion of distributor can prevent proper seal. Use appropriate sized adjustable end wrench.

6. Install the liquid line to the top of the TXV using the liquid line fitting which is supplied with the indoor coil. Hand modify the liquid line to align with casing opening. Hand tighten the liquid line on the TXV, and tighten an additional 1/4 turn to seal.

⚠ WARNING

The Schrader valve core from the TXV kit **MUST NOT** be installed in the equalizer fitting when the TXV kit is installed. Poor system performance or system failure could result.

NOTICE

Do not install TXV equalizer line onto equalizer fitting nor the TXV bulb onto the suction vapor line until field supplied suction line is brazed onto the indoor coil suction line and cooled.

7. Install the TXV liquid equalizer line onto the equalizer fitting of the suction line. Hand tighten the 1/4" SAE nut to the equalizer fitting, and tighten an additional 1/3 turn to seal.

NOTICE

The TXV bulb is to be installed on the suction line near the equalizer line, using the two bulb clamps furnished with the TXV assembly kit. The bulb is to make maximum contact. The TXV installation instructions provide an illustration of proper bulb location.

8. Install the TXV bulb to the suction line near the equalizer line, using the bulb clamp(s) furnished with the TXV assembly kit. Ensure the bulb is making maximum contact. Refer to TXV kit installation instructions for view of bulb location.
 - a. Install the bulb on the suction line near the equalizer line with the bulb horizontal to the suction line. On a suction line under 7/8" Outside Diameter (O.D.), install the bulb on top of the line. On a suction line 7/8" O.D. or larger, install the bulb at about the 2 or 10 o'clock position. See Figure 7.
 - b. If bulb must be installed vertically to the suction line, position the bulb at least 16 inches (40.6 cm) from any bend and on the opposite side of the bend plane. Positioned the bulb with the bulb tail at the top, so that the bulb acts as a reservoir. See Figure 8.
 - c. Use thermal insulation provided to protect the bulb from the effect of the surrounding ambient temperature. Cover the bulb completely to insulate from air-stream.
9. Leak test system after outdoor unit is connected.
10. Slide indoor coil back into cabinet.

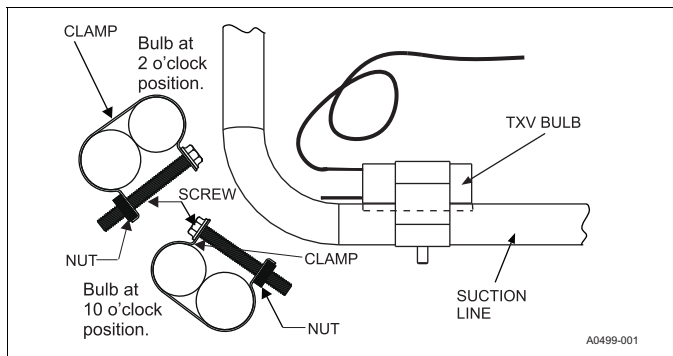


FIGURE 7: Proper Bulb Location

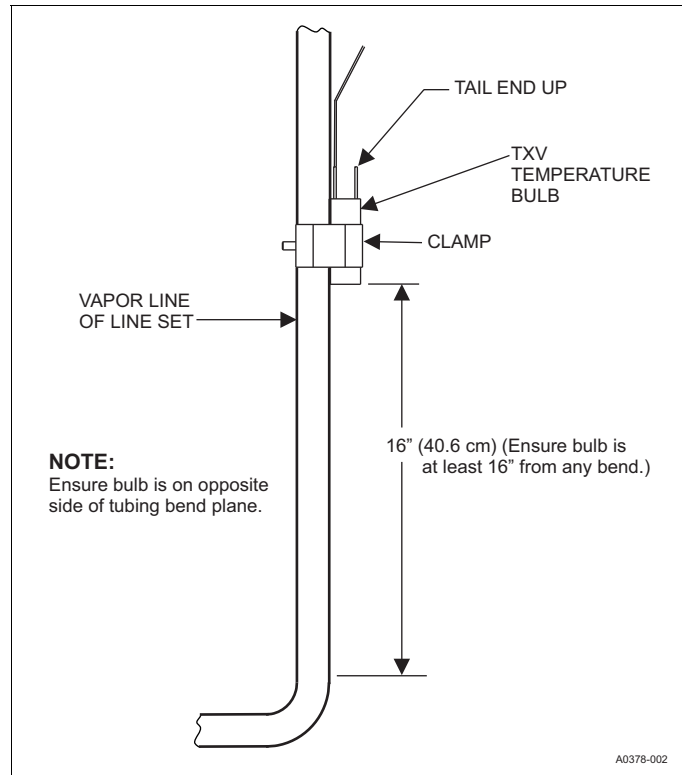


FIGURE 8: Vertical Temperature Bulb Orientation

SECTION V: EVACUATION

⚠ WARNING

DO NOT start unit while system is in a vacuum. Weigh in the base charge for the unit, and charge the unit before starting the system.

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.

After field connections are made to the outdoor and the indoor units, pressurize system with nitrogen and check for leaks. If no leaks are found, release the nitrogen charge from the complete system by opening the liquid line and suction line valves. Proceed with evacuation.

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

⚠ CAUTION

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

To determine that your unit performs at the published levels, it is important that the airflow is determined, the gauges checked, and the 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 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 (i.e. -.10) on the blower 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.

Flushing Existing Lineset Of Indoor Unit

If a GAW14L condensing unit is applied with an existing air handler or coil, the system must be evacuated and flushed to ensure that debris or mineral oil in the system does not damage the new system.

- Recover refrigerant according to Federal and local codes. All piping changes should be complete at this point.
- Perform an acid test on the oil. If oil is acidic, a suction line filter-drier is required.
- Remove old TXV(s) and solenoids from the existing air handler / coil.
- Remove old filter-driers.
- With valves, solenoids, and filter-driers removed, flush evaporator coil and lines with RX11 flush, followed by purging with dry nitrogen. Monitor the outflow to verify oil removal. If the indoor coil is oil logged, remove and flush the coil by itself or replace the coil.
- When the system is cleared of mineral oil, install a replacement TXV: S1-1TVM2A1 for GAW14L18-36 or S1-1TVM2C1 for GAW14L42-60. If the existing TXV is the same, a replacement is still needed to prevent oil contamination.

CAUTION

Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature 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.

- Set new condensing unit in place, and connect the refrigerant piping to the service valves.
- Install new oversized filter-drier(s) in the liquid line. Follow filter-drier manufacturer's recommendations for sizing. **If system contained acid, install a suction filter-drier at this time.**
- Leak test all joints, and repair as necessary.
- Evacuate lines and air handler to 300 microns or less. Turn valve off, and hold for 1 minute. If the vacuum level rises above 500 microns, leak test again, and repair as needed.
- Calculate the system refrigerant charge using data from the instructions below. Charge up to 80% of the system charge (use liquid refrigerant to add through the liquid line). **DO NOT CHARGE WITH VAPOR.**
- Open the service valves.
- Start the unit and run for 45 minutes. Add remaining charge into the suction line until the system is properly charged with the measured amount.

- Run system for 24–36 hours. Check pressure drop or temperature drop of the liquid line filter-drier. If suction filter-drier was installed, perform a pressure drop check. The maximum allowable pressure drop is 3 psig. Perform an acid test on the oil.
- If acid is still present or if pressure drop is excessive across the filter-drier, replace all filter-driers. Operate system(s) for another 24-36 hours, and retest for acidity and pressure drop. If necessary, repeat until a negative acid test and no pressure drop across the filter-drier(s) are detected. On the final test with no acid, remove suction line filter-drier from system.
- Perform a final check of the complete system operation and adjust as necessary.
- Complete a system start up sheet and retain for future reference.

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.

Checking The Gauges:

Because gauges are required for charging these units, it is important to confirm the accuracy of the gauges. This can be performed by placing a virgin refrigerant container in a conditioned space long enough to come to temperature equilibrium with the surroundings. Then measure the temperature of the air and the pressure of the refrigerant and compare it to a saturated properties table for that refrigerant. If using R-407C, use the following table:

TABLE 2: R-407C Saturation Properties

Temp (°F)	Pressure (PSIG)	Temp (°F)	Pressure (PSIG)	Temp (°F)	Pressure (PSIG)
40	80	75	153	110	260
45	89	80	166	115	278
50	98	85	179	120	298
55	108	90	194	125	318
60	118	95	209	130	340
65	129	100	225	-	-
70	140	105	242	-	-

Determining Total System Charge

The "TOTAL SYSTEM CHARGE" must be permanently stamped on the unit data plate. TOTAL SYSTEM CHARGE is determined as follows:

1. Determine the Starting Charge from the Tabular Data Sheet included with the outdoor unit.
2. 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.
3. Once the starting charge and charge adders 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 in the Service Application Data on www.upgnet.com. Follow the charging procedure in the section below according to the refrigerant type, and allow ten minutes after each charge adjustment for the system operation to stabilize. Record the charge adjustment made to match the Charging Chart.
4. Verify that TOTAL SYSTEM CHARGE = Starting Charge + charge adder for actual lineset length + charge adjustments to match Charging Chart.
5. 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.

System Charging Procedure With R-407C Refrigerant

The outdoor unit comes equipped with charging charts optimized for that particular unit.

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. Charge the unit to the starting charge value listed on the data sheet. 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. **Ignore the 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 value is lower than the recommended value. Remove / recover charge if the measured liquid pressure value is above the recommended value.

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 9.

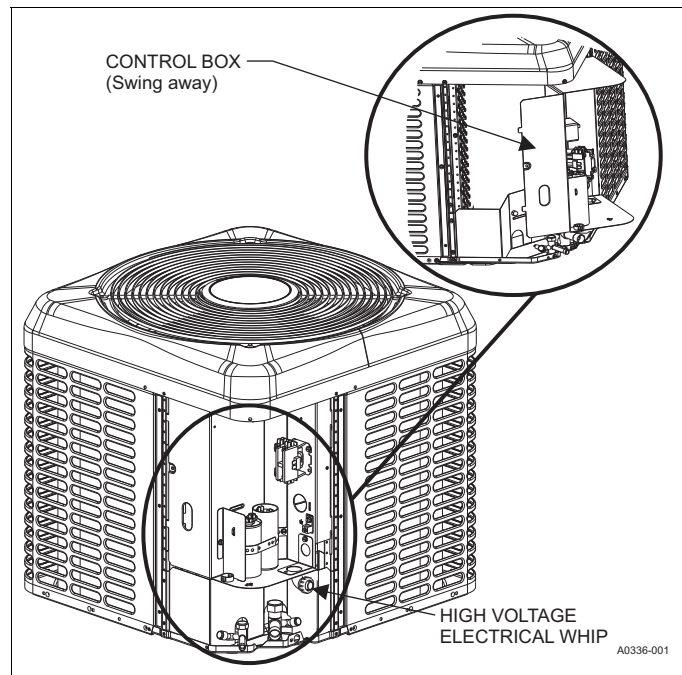


FIGURE 9: Outdoor Unit Swing Away Control Box

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 1 and 10.
5. Install the proper size time-delay fuses or circuit breaker, and make the power supply connections.

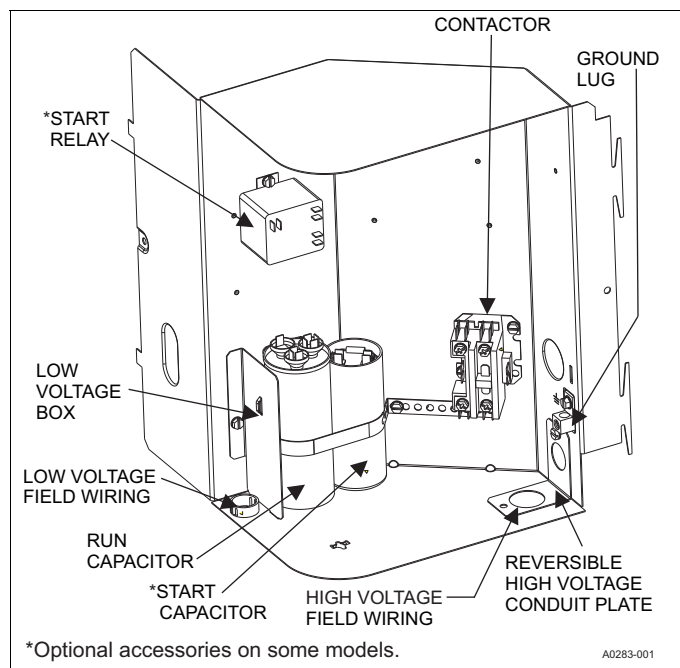


FIGURE 10: Outdoor Unit Control Box (Single Phase)

FIELD CONNECTIONS CONTROL WIRING

1. Route low voltage wiring into bottom of control box as shown in Figure 10. Make low voltage wiring connections inside the low voltage box per Figures 11 - 13.
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.

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.

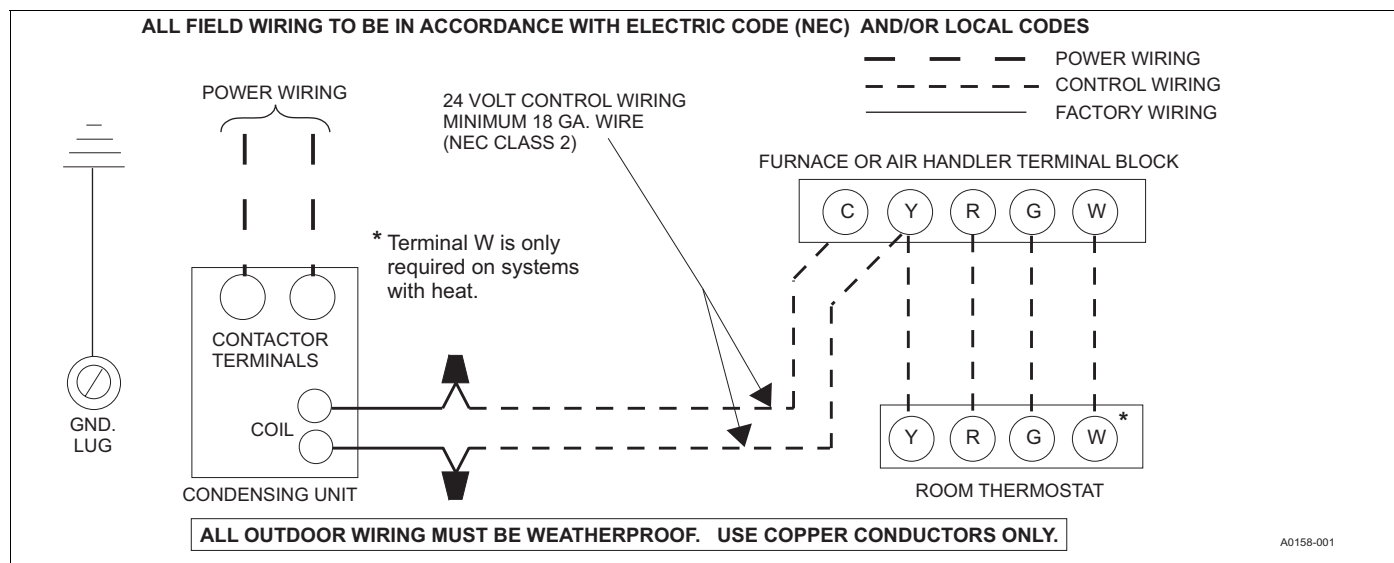


FIGURE 11: Typical Field Wiring (Air Handler / Electrical Heat) (Single-Phase)

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.

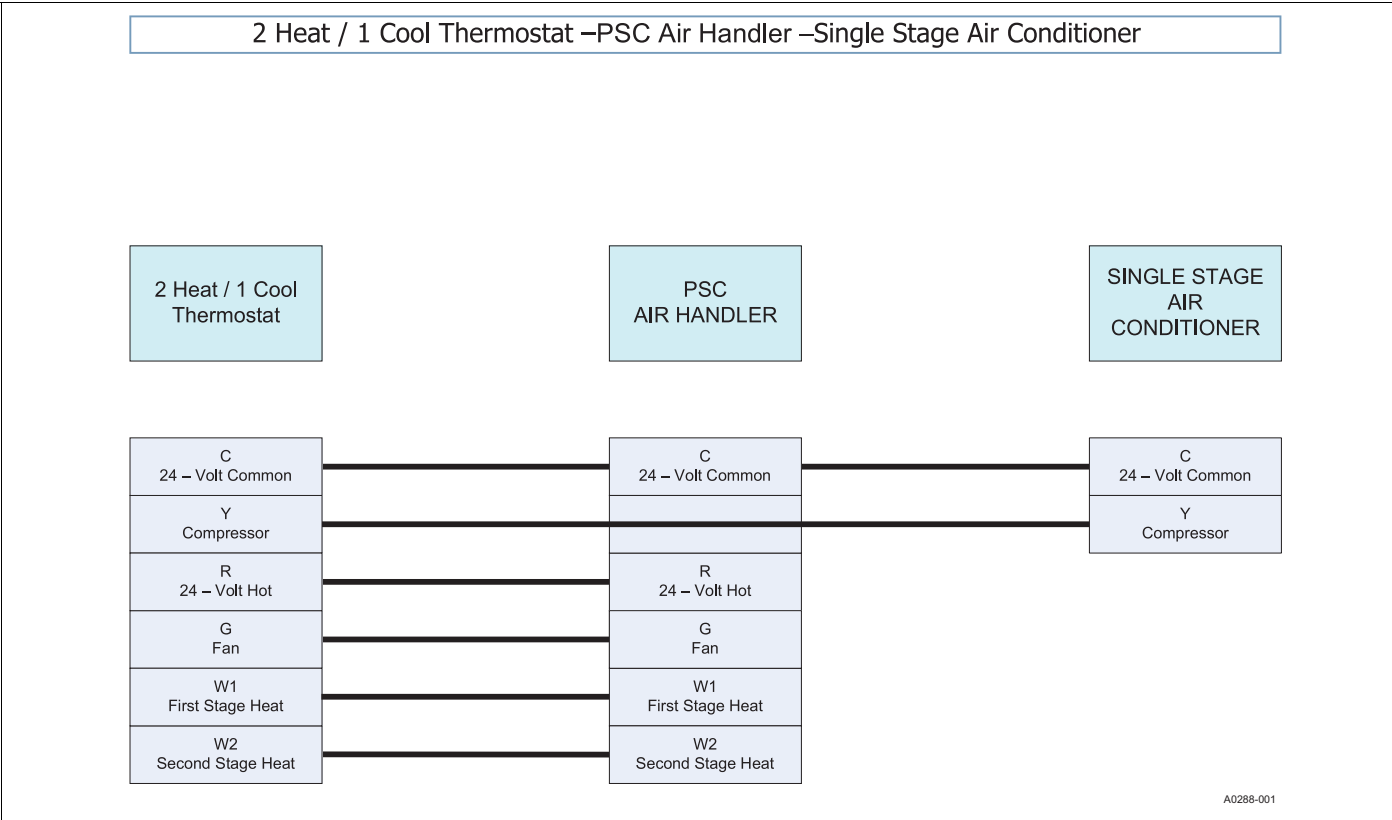


FIGURE 12: Thermostat Chart - PSC Air Handler with Single Stage Air Conditioner

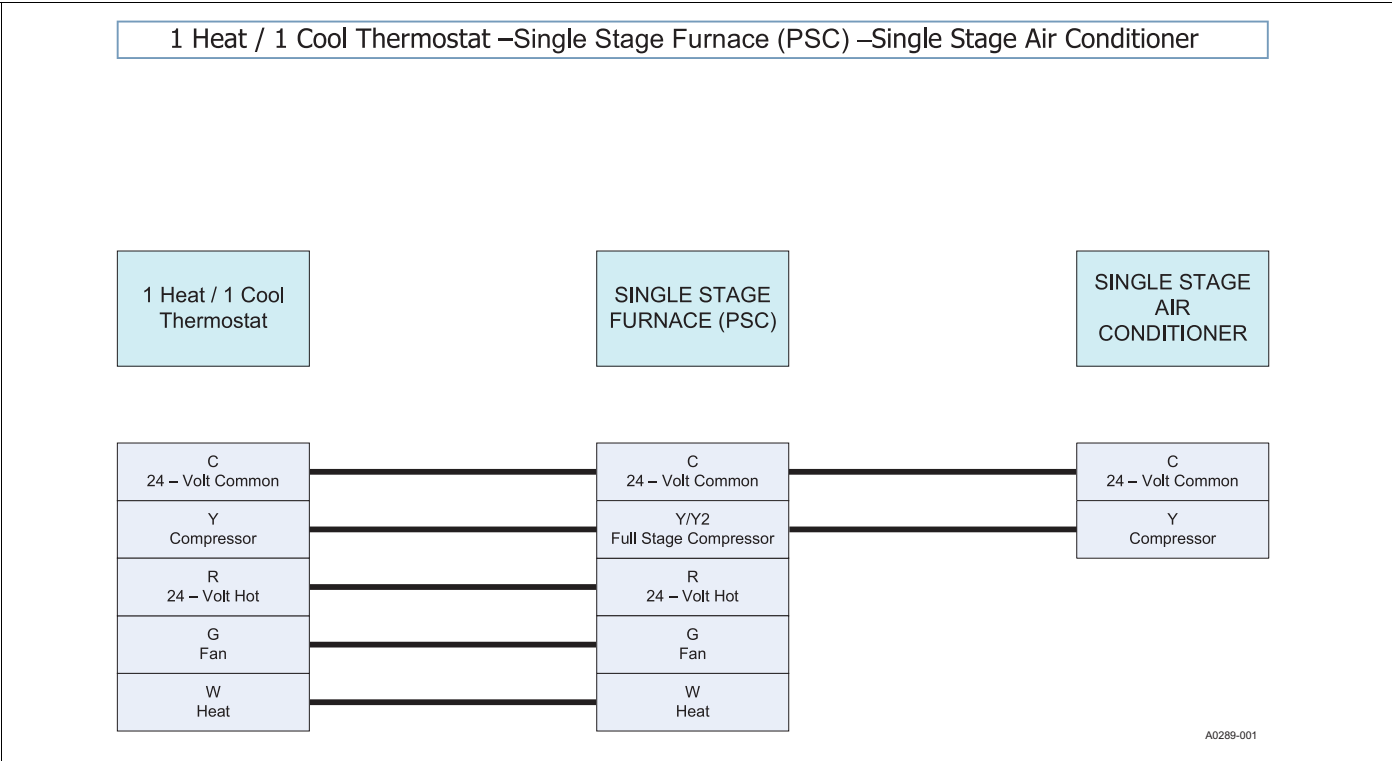


FIGURE 13: Thermostat Chart - Single Stage PSC Furnace with Single Stage Air Conditioner

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 aluminum condensing coil.

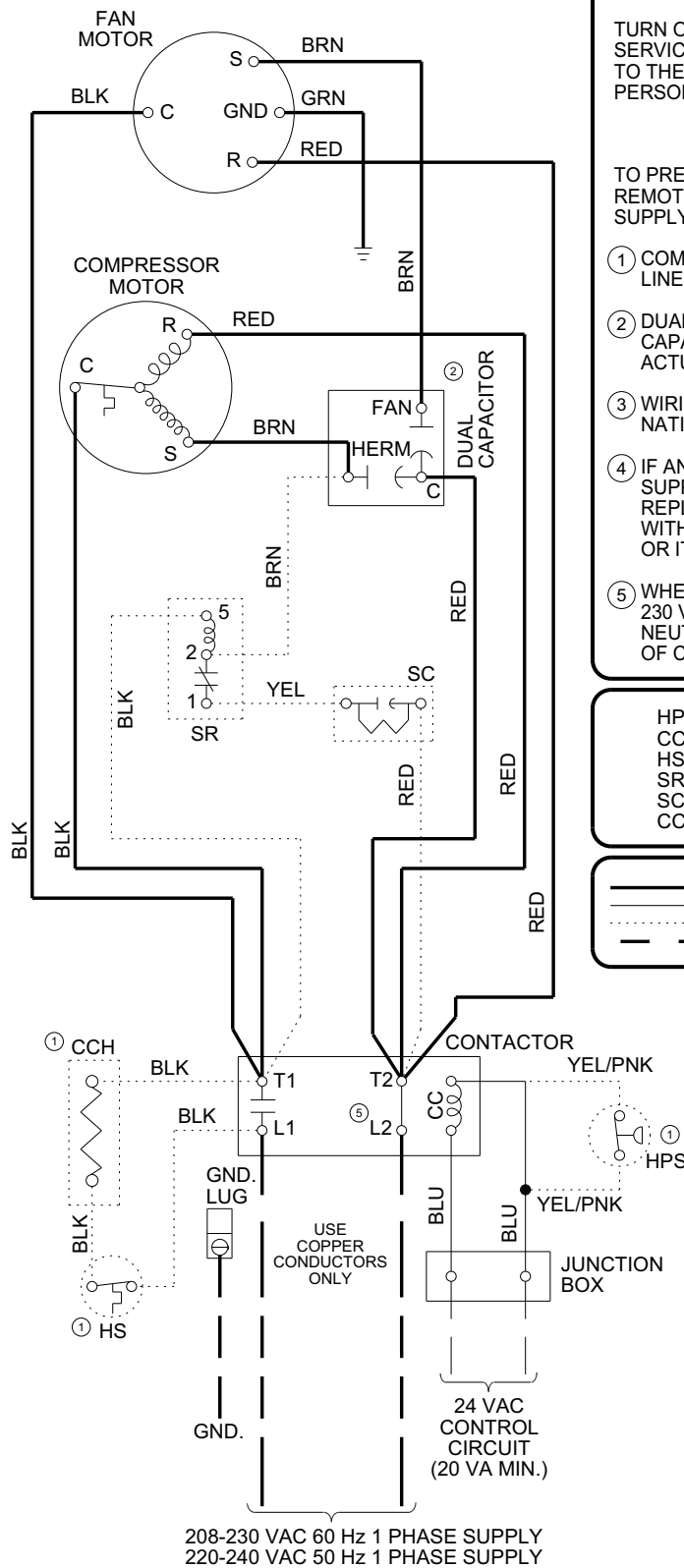
4. Refer to the furnace or air handler instructions for filter and blower motor maintenance.
5. The indoor coil and drain pan should be inspected and cleaned regularly to prevent odors and assure proper drainage.

⚠ 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.

WHEN THE SYSTEM IS FUNCTIONING PROPERLY AND THE OWNER HAS BEEN FULLY INSTRUCTED, SECURE THE OWNER'S APPROVAL.

SECTION IX: WIRING DIAGRAM

**DANGER - SHOCK HAZARD**

TURN OFF ELECTRICAL POWER BEFORE SERVICING TO PREVENT POSSIBLE DAMAGE TO THE EQUIPMENT AND POSSIBLE PERSONAL INJURY.

CAUTION

TO PREVENT ELECTRICAL SHOCK OPEN REMOTE DISCONNECT SO ELECTRICAL SUPPLY TO AIR CONDITIONER IS SHUT OFF.

- COMPONENTS SHOWN IN DASHED LINES ARE OPTIONAL.
- DUAL CAPACITOR SHOWN SEPARATE CAPACITORS MAY BE USED ON ACTUAL UNIT.
- WIRING MUST CONFORM TO NATIONAL AND LOCAL CODES.
- IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THIS UNIT MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE 105°C. THERMOPLASTIC OR ITS EQUIVALENT.
- WHERE POWER SUPPLY HAS ONE (1) 230 VOLT CONDUCTOR AND ONE (1) NEUTRAL CONDUCTOR, CONNECT L2 OF CONTACTOR TO NEUTRAL.

HPS - HIGH PRESSURE SWITCH
CCH - CRANKCASE HEATER
HS - HEATER SWITCH
SR - START RELAY
SC - START CAPACITOR
CC - CONTACTOR COIL

— HIGH VOLTAGE FACTORY WIRING
— LOW VOLTAGE FACTORY WIRING
- - - OPTIONAL WIRING
- - - FIELD WIRING, LINE VOLTAGE

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FIGURE 14: Wiring Diagram

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 RightIndoor 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 VoltageIndoor 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 InstructionsHeat 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 # Of 45 Degree Ells Length Exhaust Size # of 90 Degree Ells # Of 45 Degree Ells Length

Air Side: System Total External Static Pressure

Supply static before indoor coil (in w.c.)	<input type="text"/>	Supply static after indoor coil (in w.c.)	<input type="text"/>
Return Static (in w.c.) before filter	<input type="text"/>	Return Static (in w.c.) after filter (furnace side)	<input type="text"/>
Total External Static Pressure	<input type="text"/>	Maximum Rated ESP (in w.c.)	<input type="text"/>

**Cooling
Indoor
Blower 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
<input type="radio"/> X-13	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
<input type="radio"/> PSC	<input type="radio"/> Low	<input type="radio"/> Medium Low	<input type="radio"/> Medium	<input type="radio"/> Medium High	<input type="radio"/> High

Return Air: Dry Bulb	<input type="text"/>	Wet Bulb	<input type="text"/>	Supply Air: Dry Bulb	<input type="text"/>	Wet Bulb	<input type="text"/>	Temperature Drop	<input type="text"/>	Outside Air: Dry Bulb	<input type="text"/>
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**Heating
Indoor
Blower Set-Up**

<input type="radio"/> ECM	HEAT	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
<input type="radio"/> X-13	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
<input type="radio"/> PSC	<input type="radio"/> Low	<input type="radio"/> Medium Low	<input type="radio"/> Medium	<input type="radio"/> Medium High	<input type="radio"/> High

Return Air: Dry Bulb	<input type="text"/>	Wet Bulb	<input type="text"/>	Supply Air: Dry Bulb	<input type="text"/>	Wet Bulb	<input type="text"/>	Temperature Rise	<input type="text"/>
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Refrigerant Charge and Metering Device

<input type="radio"/> R-407C	<input type="radio"/> R-410A	<input type="radio"/> TXV	<input type="radio"/> Fixed Orifice	Additional Lineset Length	<input type="text"/>	Adder per foot - lbs.	<input type="text"/>	Oz.	<input type="text"/>		
				# Elbows	<input type="text"/>	# 45s	<input type="text"/>	Total Added - lbs.	<input type="text"/>	Oz.	<input type="text"/>
Orifice Size	<input type="text"/>	Liquid Line Temp	<input type="text"/>	High Side Pressure	<input type="text"/>	Suction Line Temp	<input type="text"/>	Low Side Pressure	<input type="text"/>		
TXV #	<input type="text"/>	Subcooling	<input type="text"/>	Superheat	<input type="text"/>						

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