


# Installation Instructions

## SAFETY CONSIDERATIONS

**NOTE:** Read the entire instruction manual before starting the installation.

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and current editions of the National Electrical Code (NEC) NFPA 70. In Canada, refer to current editions of the Canadian electrical code CSA 22.1.

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words; DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.



## WARNING

### ELECTRICAL SHOCK HAZARD

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

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.



## WARNING

### EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury, and/or property damage.

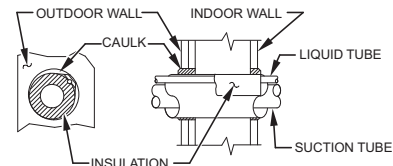
Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.



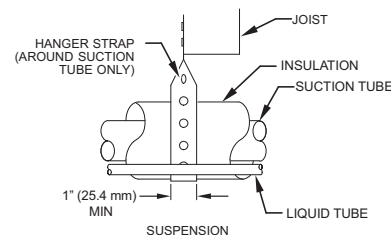
## INSTALLATION RECOMMENDATIONS

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

1. Locate unit away from windows, patios, decks, etc. where unit operation sound may disturb customer.
2. Ensure that vapor and liquid tube diameters are appropriate for unit capacity.
3. Run refrigerant tubes as directly as possible by avoiding unnecessary turns and bends.
4. Leave some slack between structure and unit to absorb vibration.
5. When passing refrigerant tubes through the wall, seal opening with RTV or other pliable silicon-based caulk. (See Fig. 1.)
6. Avoid direct tubing contact with water pipes, duct work, floor joists, wall studs, floors, and walls.
7. Do not suspend refrigerant tubing from joists and studs with a rigid wire or strap which comes in direct contact with tubing. (See Fig. 1.)
8. Ensure that tubing insulation is pliable and completely surrounds vapor tube.
9. When necessary, use hanger straps which are 1 in. (25.4 mm) wide and conform to shape of tubing insulation. (See Fig. 1.)
10. Isolate hanger straps from insulation by using metal sleeves bent to conform to shape of insulation.



THROUGH THE WALL



**Fig. 1 – Connecting Tubing Installation**

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The outdoor unit contains system refrigerant charge for operation with AHRI rated indoor unit when connected by 15 ft. (4.57 m) of field-supplied or factory accessory tubing. For proper unit operation, check refrigerant charge using charging information located on control box cover and/or in the Check Charge section of this instruction.

**IMPORTANT:** Maximum liquid-line size is 3/8-in. OD for all residential applications including long line.

**IMPORTANT:** Always install the factory-supplied liquid-line filter drier. If replacing the filter drier, refer to Product Data Digest for appropriate part number. Obtain replacement filter driers from your distributor or branch.

## INSTALLATION

### ⚠ CAUTION

#### CUT HAZARD

Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

**IMPORTANT:** Effective January 1, 2015, all split system and packaged air conditioners must be installed pursuant to applicable regional efficiency standards issued by the Department of Energy.

### Check Equipment and Job Site

#### UNPACK UNIT

Move to final location. Remove carton taking care not to damage unit.

#### Inspect Equipment

File claim with shipping company prior to installation if shipment is damaged or incomplete. Locate unit rating plate on unit corner panel. It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

### Install on a Solid, Level Mounting Pad

If conditions or local codes require the unit be attached to pad, tie down bolts should be used and fastened through knockouts provided in unit base pan. Refer to unit mounting pattern in Fig. 2 to determine base pan size and knockout hole location.

For hurricane tie downs, contact local distributor for details and PE (Professional Engineer) certification, if required by local authorities.

On rooftop applications, mount on level platform or frame. Place unit above a load-bearing wall and isolate unit and tubing set from structure. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Consult local codes governing rooftop applications.

Roof mounted units exposed to winds may require wind baffles. Consult the Application Guideline and Service Manual – Residential Split System Air Conditioners and Heat Pumps for wind baffle construction.

**NOTE:** Unit must be level to within  $\pm 2^\circ$  ( $\pm 3/8$  in./ft.,  $\pm 9.5$  mm/m.) per compressor manufacturer specifications.

### Clearance Requirements

When installing, allow sufficient space for airflow clearance, wiring, refrigerant piping, and service. Allow 24 in. (609.6 mm) clearance to service end of unit and 48 in. (1219.2 mm) (above unit. For proper airflow, a 6-in. (152.4 mm) clearance on 1 side of unit and 12-in. (304.8 mm) on all remaining sides must be maintained. Maintain a distance of 24 in. (609.6 mm) between units. Position so water, snow, or ice from roof or eaves cannot fall directly on unit.

On rooftop applications, locate unit at least 6 in. (152.4 mm) above roof surface.

### Operating Ambient

The minimum outdoor operating ambient in cooling mode is 55°F (12.78°C) without accessories and as low as 0°F (-17.78°C) with approved low-ambient accessory kits, and the maximum outdoor operating ambient in cooling mode is 125°F (51.67°C) when

operating voltage is 230v. For 208v applications, the maximum outdoor ambient is 120°F (48.9°C).

**NOTE:** Units operating at high stage operation, 208v (or below) line voltage and at an outdoor ambient 120°F (or greater), may experience compressor trip.

### Make Piping Connections

### ⚠ WARNING

#### PERSONAL INJURY AND ENVIRONMENTAL HAZARD

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

Relieve pressure and recover all refrigerant before system repair or final unit disposal. Use all service ports and open all flow-control devices, including solenoid valves.

Federal regulations require that you do not vent refrigerant to the atmosphere. Recover during system repair or final unit disposal.

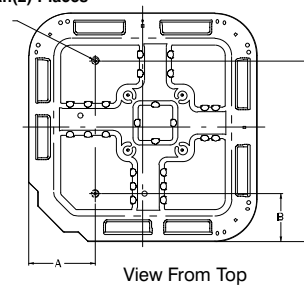
### ⚠ CAUTION

#### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

If ANY refrigerant tubing is buried, provide a 6-in (152.4 mm) vertical rise at service valve. Refrigerant tubing lengths up to 36-in (914.4 mm) may be buried without further special consideration. Do not bury lines more than 36-in. (914.4 mm).

3/8-in. (9.53 mm) Dia. Tiedown Knockouts in Basepan(2) Places



UNIT BASE PAN Dimension in. (mm)	TIEDOWN KNOCKOUT LOCATIONS in. (mm)		
	A	B	C
31-1/2 X 31-1/2 (800 X 800)	9-1/8 (231.8)	6-9/16 (166.7)	24-11/16 (627.1)
35 X 35 (889 X 889)	9-1/8 (231.8)	6-9/16 (166.7)	28-7/16 (722.3)

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**Fig. 2 – Tiedown Knockout Locations**

Outdoor units may be connected to indoor section using accessory tubing package or field-supplied refrigerant grade tubing of correct size and condition. Rated tubing diameters shown in Table 1 are recommended up to 80 ft. (24.38 m). See Product Data for acceptable alternate vapor diameters and associated capacity losses. For tubing requirements beyond 80 ft. (24.38 m), substantial capacity and performance losses can occur. Following the recommendations in the Longline Guideline will reduce these losses. Refer to Table 1 for field tubing diameters. Refer to Table 2 for accessory requirements.

There are no buried-line applications greater than 36-in. (914.4 mm) allowed.

If refrigerant tubes or indoor coil are exposed to atmosphere, they must be evacuated to 500 microns to eliminate contamination and moisture in the system.

## Outdoor Unit Connected to Factory Approved Indoor Unit

Outdoor unit contains correct system refrigerant charge for operation with factory approved AHRI rated indoor unit when connected by 15 ft. (4.57 m) of field-supplied or factory-accessory tubing, and factory supplied filter drier. Check refrigerant charge for maximum efficiency.

### Refrigerant Tubing Connection Outdoor

Connect vapor and liquid tubes to fittings on vapor and liquid service valves (see Table 1.) Use refrigerant grade tubing

### Sweat Connection



## CAUTION

### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Service valves must be wrapped in a heat-sinking material such as a wet cloth while brazing.

Use refrigeration grade tubing. Service valves are closed from factory and ready for brazing. After wrapping service valve with a wet cloth, braze sweat connections using industry accepted methods and materials. Consult local code requirements. Refrigerant tubing and indoor coil are now ready for leak testing. This check should include all field and factory joints.

**Table 1 – Refrigerant Connections and Recommended Liquid and Vapor Tube Diameters (In.)**

UNIT SIZE (SERIES)	LIQUID	RATED VAPOR*	
	Connection & Max. Tube Diameter	Connection Diameter	Tube Diameter
24	3/8	3/4	3/4
36	3/8	7/8	7/8
48	3/8	7/8	1-1/8
60	3/8	7/8	1-1/8

\* Units are rated with 25 ft. (7.6 m) of lineset. See Product Data sheet for performance data when using different size and length linesets.

#### Notes:

- Do not apply capillary tube or fixed orifice indoor coils to these units.
- For Tubing Set lengths between 80 and 200 ft. (24.38 and 60.96 m) horizontal or 35 ft. (10.7 m) vertical differential 250 ft. (76.2 m) Total Equivalent Length), refer to the Residential Piping and Longline Guide line— Air Conditioners and Heat Pumps using R-410A refrigerant.

### Install Liquid-Line Filter Drier Indoor



## CAUTION

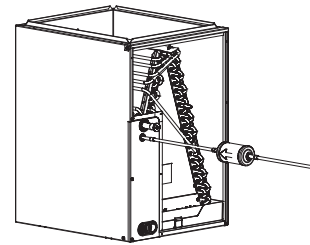
### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

- Installation of filter drier in liquid line is required.
- Filter drier must be wrapped in a heat-sinking material such as a wet cloth while brazing.

Refer to Fig. 3 and install filter drier as follows:

- Braze 5-in. liquid tube to the indoor coil.
- Wrap filter drier with damp cloth.
- Braze filter drier to above 5-in. (127 mm) liquid tube. Flow arrow must point towards indoor coil.
- Connect and braze liquid refrigerant tube to the filter drier.



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**Fig. 3 – Liquid Line Filter Drier**

### Evacuate Refrigerant Tubing and Indoor Coil



## CAUTION

### UNIT DAMAGE HAZARD

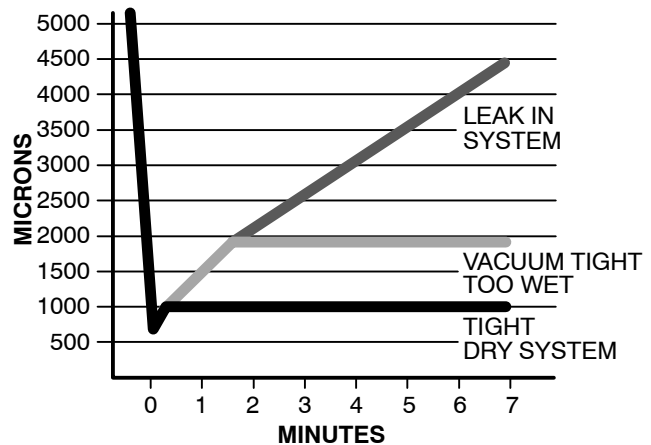
Failure to follow this caution may result in equipment damage or improper operation.

Never use the system compressor as a vacuum pump.

Refrigerant tubes and indoor coil should be evacuated using the recommended deep vacuum method of 500 microns. The alternate triple evacuation method may be used (see triple evacuation procedure in service manual). Always break a vacuum with dry nitrogen.

### Deep Vacuum Method

The deep vacuum method requires a vacuum pump capable of pulling a vacuum of 500 microns and a vacuum gage capable of accurately measuring this vacuum depth. The deep vacuum method is the most positive way of assuring a system is free of air and liquid water. A tight dry system will hold a vacuum of 1000 microns after approximately 7 minutes. See Fig. 4.



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**Fig. 4 – Deep Vacuum Graph**

### Final Tubing Check

**IMPORTANT:** Check to be certain factory tubing on both indoor and outdoor unit has not shifted during shipment. Ensure tubes are not rubbing against each other or any sheet metal or wires. Pay close attention to feeder tubes, making sure wire ties on feeder tubes are secure and tight.

**Table 2 – Accessory Usage**

Accessory	Required for Low Ambient Cooling Applications (Below 55°F / 12.8°C)	Required for Long Line Applications*	Required for Sea Coast Applications (within 2 miles/3.2 km)
Compressor Start Assist Capacitor and Relay	Yes	Yes	No
Crankcase Heater	Yes (standard on some units)	Yes (standard on some units)	No
Evaporator Freeze Thermostat	Yes	No	No
Hard Shutoff TXV	Yes (standard w/factory approved indoor unit)	Yes (standard w/factory approved indoor unit)	Yes (standard w/factory approved indoor unit)
Liquid Line Solenoid Valve	No	See Residential Piping and Long Line Guideline	No
Low–Ambient Pressure Switch	Yes	No	No
Support Feet	Recommended	No	Recommended
Winter Start Control	Yes	No	No

\* For tubing line sets between 80 and 200 ft. (24.38 and 60.96 m) and/or 35 ft. (10.7 m) vertical differential, refer to Residential Piping and Longline Guideline.

**Make Electrical Connections**

Be sure field wiring complies with local and national fire, safety, and electrical codes, and voltage to system is within limits shown on unit rating plate. Contact local power company for correction of improper voltage. See unit rating plate for recommended circuit protection device.

**NOTE:** Operation of unit on improper line voltage constitutes abuse and could affect unit reliability. See unit rating plate. Do not install unit in system where voltage may fluctuate above or below permissible limits.

**NOTE:** Use copper wire only between disconnect switch and unit.

**NOTE:** Install branch circuit disconnect of adequate size per NEC to handle unit starting current. Locate disconnect within sight from and readily accessible from unit, per Section 440–14 of NEC.

**Route Ground and Power Wires**

Remove access panel to gain access to unit wiring. Extend wires from disconnect through power wiring hole provided and into unit control box.

PA17NA

Use No. 18 AWG color-coded, insulated (35°C minimum) wire. If thermostat is located more than 100 ft. (30.48 m) from unit, as measured along the control voltage wires, use No. 16 AWG color-coded wire to avoid excessive voltage drop.

All wiring must be NEC Class 2 and must be separated from incoming power leads.

Use furnace transformer, fan coil transformer, or accessory transformer for control power, 24v/40va minimum.

**NOTE:** Use of available 24v accessories may exceed the minimum 40va power requirement. Determine total transformer loading and increase the transformer capacity or split the load with an accessory transformer as required.

**Final Wiring Check**

**IMPORTANT:** Check factory wiring and field wire connections to ensure terminations are secured properly. Check wire routing to ensure wires are not in contact with tubing, sheet metal, etc.

**Compressor Crankcase Heater**

When equipped with a crankcase heater, furnish power to heater a minimum of 24 hr before starting unit. To furnish power to heater only, set thermostat to OFF and close electrical disconnect to outdoor unit.

A crankcase heater is required if refrigerant tubing is longer than 80 ft. (24.38 m). Refer to the Application Guideline and Service Manual Longline Section–Residential Split–System Air Conditioners and Heat Pumps.

**Airflow Selections (ECM Furnaces)**

The ECM Furnaces provide blower operation to match the capacities of the compressor during high and low stage cooling operation. Tap selections on the furnace control board enable the installing technician to select the proper airflows for each stage of cooling. Below is a brief summary of the furnace airflow configurations

1. The Y2 call for high stage cooling energizes the “Cool” tap on the control board. The grey wire from cool tap is connected to tap 5 on the motor. Refer to the furnace Product Data to find the corresponding airflow. If the airflow setting for high cooling needs to be switched from tap 5 to a different tap, jumper a connection from the cool tap to the desired tap so that the Y2 signal is communicated via the cool tap to the desired speed tap.
2. The Y1 call for low stage cooling energizes the “Fan” tap on the control board. The red wire from the fan tap is connected to tap 1 on the motor. Refer to the furnace Product Data to find the corresponding airflow. If the airflow setting for low cooling needs to be switched from tap 1 to a different tap, jumper a connection from the Fan tap to the desired tap so that the Y1 signal is communicated via the Fan tap to the desired speed tap. The Y1 setting will also govern the continuous fan airflow for the furnace.

Refer to the literature for the furnace for further details.

**⚠ WARNING**

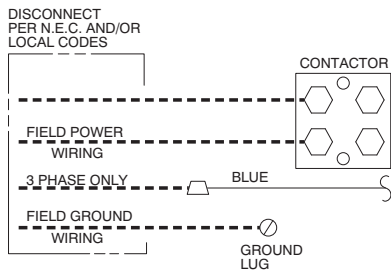
**ELECTRICAL SHOCK HAZARD**

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

The unit cabinet must have an uninterrupted or unbroken ground to minimize personal injury if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes.

**Connect Ground and Power Wires**

Connect ground wire to ground connection in control box for safety. Connect power wiring to contactor as shown in Fig. 5.



**Fig. 5 – Line Power Connections**

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**Connect Control Wiring**

Route 24–v control wires through control wiring grommet and connect leads to control wiring (See Fig. 7). Refer to Installation Instructions packaged with thermostat.

## Airflow Selection for Variable Speed Furnaces

The variable speed furnaces provide blower operation to match the capacities of the compressor during high and low stage cooling operation. The furnace control board allows the installing technician to select the proper airflows for each stage of cooling. Below is a summary of required adjustments. See furnace installation instructions for more details:

1. Turn SW1--5 ON for 400 CFM/ton airflow or OFF for 350 CFM/ton airflow. Factory default is OFF.
2. The A/C DIP switch setting determines airflow during high stage cooling operation. Select the A/C DIP switch setting corresponding to the available airflow shown in the furnace Installation Instructions that most closely matches the required airflow shown in the air conditioning Product Data for HIGH speed.
3. The CF DIP switch setting determines airflow during low stage cooling operation. Select the CF DIP switch setting corresponding to the available airflow shown in the furnace installation instructions that most closely matches the required airflow shown in the air conditioning Product Data for LOW speed. If a higher or lower continuous fan speed is desired, the continuous fan speed can be changed using the fan switch on the thermostat. Refer to the furnace Installation Instructions for details of how to use this feature.

## Airflow Selection for FV4C Fan Coils

The FV4 provides high- and low-stage blower operation to match the capacities of the compressor at high- and low-stage.

To select recommended airflow, refer to the FV4C Installation Instructions. The FV4C utilizes an Easy Select control board that allows the installing technician to select proper airflows. This fan coil has an adjustable blower-off delay factory set at 90 sec. for high- and low-stage blower operation.

## Install Electrical Accessories

Refer to the individual instructions packaged with kits or accessories when installing.

## Start-Up



### CAUTION

#### UNIT OPERATION AND SAFETY HAZARD

Failure to follow this caution may result in personal injury, equipment damage or improper operation.

- Do not overcharge system with refrigerant.
- Do not operate unit in a vacuum or at negative pressure.
- Compressor dome temperatures may be hot.



### CAUTION

#### PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

Wear safety glasses, protective clothing, and gloves when handling refrigerant and observe the following:

- Front seating service valves are equipped with Schrader valves.

## Follow these steps to properly start up the system:

1. After system is evacuated, fully back seat (open) liquid and vapor service valves.
2. Unit is shipped with valve stem(s) front seated (closed) and caps installed. Replace stem caps after system is opened to refrigerant flow (back seated). Replace caps finger-tight and tighten with wrench an additional 1/12 turn.
3. Close electrical disconnects to energize system.
4. Set room thermostat at desired temperature. Ensure that set point is below indoor ambient temperature and is set low enough to energize desired stage. In order to start the system in low stage, refer to the literature for the installed thermostat and adjust the set point so that the differential between the room temperature and the set temperature energizes Y1.
5. Set room thermostat to COOL and fan control to ON or AUTO mode, as desired.
6. Operate unit for 15 minutes. Verify system refrigerant charge by measuring the sub-cooling for low stage and comparing with the published sub-cool on the rating plate.
7. In order to switch the the system to high stage, refer to the literature for the installed thermostat and adjust the set point to a lower value so that the differential between the room temperature and the set temperature energizes Y2. Verify system refrigerant charge by measuring the sub-cooling for high stage and comparing with the published sub-cool on the rating plate.

## SYSTEM FUNCTIONS AND SEQUENCE OF OPERATION

The PA17NA models utilize a 2-stage cooling indoor thermostat. With a call for first stage cooling, the outdoor fan and low-stage compressor are energized. If low-stage cannot satisfy cooling demand, high-stage is energized by the second stage of indoor thermostat. After second stage is satisfied, the unit returns to low-stage operation until first stage is satisfied or until second stage is required again.

When both first stage and second stage cooling are satisfied, the compressor will shut off. Therefore, with first stage of cooling Y1 is powered on; and with second stage of cooling Y1 and Y2 are powered on. When a 2-stage unit is operating at low-stage, system vapor (suction) pressure will be higher than a standard single-stage system or high-stage operation.

## Compressor Operation

The basic scroll design has been modified with the addition of an internal unloading mechanism that opens a by-pass port in the first compression pocket, effectively reducing the displacement of the scroll.

The opening and closing of the by-pass port is controlled by an internal electrically operated solenoid. The modulated scroll uses a single step of unloading to go from full capacity to approximately 67% capacity. A single speed, high efficiency motor continues to run while the scroll modulates between the two capacity steps. Modulation is achieved by venting a portion of the gas in the first suction pocket back to the low side of the compressor, thereby reducing the effective displacement of the compressor. Full capacity is achieved by blocking these vents, thus increasing the displacement to 100%.

A DC solenoid in the compressor controlled by a rectified 24 volt AC signal in the external solenoid plug moves the slider ring that covers and uncovers these vents. The vent covers are arranged in such a manner that the compressor operates at approximately 67% capacity when the solenoid is not energized and 100% capacity when the solenoid is energized. The loading and unloading of the two step scroll is done "on the fly" without shutting off the motor between steps.

**NOTE:** 67% compressor capacity translates to approximately 75% cooling capacity at the indoor coil.

## Check Charge

### NOTE: CHARGE IN HIGH STAGE ONLY

Factory charge amount and desired subcooling are shown on unit rating plate. Charging method is shown on information plate inside unit. To properly check or adjust charge, conditions must be favorable for subcooling charging. Favorable conditions exist when the outdoor temperature is between 70°F and 100°F (21.11°C and 37.78°C), and the indoor temperature is between 70°F and 80°F (21.11°C and 26.67°C). Follow the procedure below:

Unit is factory charged for 15ft (4.57 m) of lineset. Adjust charge by adding or removing 0.6 oz/ft of 3/8 liquid line above or below 15ft (4.57 m) respectively.

For standard refrigerant line lengths (80 ft/24.38 m or less), allow system to operate in high-stage cooling mode at least 15 minutes. If conditions are favorable, check system charge by subcooling method. If any adjustment is necessary, adjust charge slowly and allow system to operate for 15 minutes to stabilize before declaring a properly charged system.

If the indoor temperature is above 80°F (26.67°C), and the outdoor temperature is in the favorable range, adjust system charge by weight based on line length and allow the indoor temperature to drop to 80°F (26.67°C) before attempting to check system charge by subcooling method as described above.

If the indoor temperature is below 70°F (21.11°C), or the outdoor temperature is not in the favorable range, adjust charge for line set length above or below 15ft (4.57 m) only. Charge level should then be appropriate for the system to achieve rated capacity. The charge level could then be checked at another time when the both indoor and outdoor temperatures are in a more favorable range.

**NOTE:** If line length is beyond 80 ft (24.38 m) or greater than 20 ft (6.10 m) vertical separation, See Long Line Guideline for special charging requirements.

## Final Checks

**IMPORTANT:** Before leaving job, be sure to do the following:

1. Ensure that all wiring is routed away from tubing and sheet metal edges to prevent rub-through or wire pinching.
2. Ensure that all wiring and tubing is secure in unit before adding panels and covers. Securely fasten all panels and covers.
3. Tighten service valve stem caps to 1/12-turn past finger tight.
4. Leave Owner's Manual with owner. Explain system operation and periodic maintenance requirements outlined in manual.
5. Fill out Dealer Installation Checklist and place in customer file.

## TROUBLESHOOTING

If the compressor fails to operate with a cooling call, the table below (Resistance table) can be used to verify if there is any damage to the compressor windings causing system malfunction.

**Table 3 – Winding Resistance**

Winding	Winding resistance at 70°F +/- 20°F (21.11°C +/- 11.11°C)			
	024	036	048	060
Start (S-C)	1.64	1.52	1.86	1.63
Run (R-C)	1.30	0.88	0.52	0.39

### Troubleshooting PA17NA units for proper switching between low- and high-stages

Check the suction pressures at the service valves. Suction pressure should be reduced by 3–10% when switching from low to high stage.

**NOTE:** The liquid pressures are very similar between low- and high- stage operation, so liquid pressure should not be used for troubleshooting.

Compressor current should increase 20 to 45% when switching from low to high stage. The compressor solenoid when energized in high stage, should measure 24vac at the leads inside control box.

When the compressor is operating in low stage, the 24v DC compressor solenoid coil is de-energized. When the compressor is operating in high stage, the 24v DC solenoid coil is energized.

The solenoid plug harness that is connected to the compressor has an internal rectifier that converts the 24v AC signal to 24v DC.

**DO NOT INSTALL A PLUG WITHOUT AN INTERNAL RECTIFIER.**

### Unloader Test Procedure:

The unloader is the compressor internal mechanism, controlled by the DC solenoid, that modulates between high- and low-stage. If it is suspected that the unloader is not working, the following methods may be used to verify operation:

1. Operate the system and measure compressor amperage. Cycle the unloader on and off at 30 second plus intervals at the thermostat (from low- to high-stage and back to low-stage). Wait 10 seconds after staging to high before taking a reading. The compressor amperage should go up or down at least 20 percent.
2. If step one does not give the expected results, remove the solenoid plug from the compressor and, with the unit running and the Thermostat calling for high-stage, test the voltage output at the plug with a DC voltmeter. The reading should be 24 volts DC.
3. If the correct DC voltage is at the control circuit molded plug, measure the compressor unloader coil resistance. The resistance should be approximately 330 or 1640 ohms depending on unloader coil supplier. If the coil resistance is infinite or is grounded, the compressor must be replaced.

## MAJOR COMPONENTS

### **2-Stage Compressor**

The 2-stage compressor contains motor windings that provide 2-pole (3500 RPM) operation.

### **Compressor Internal Relief**

The compressor is protected by an internal pressure relief (IPR) which relieves discharge gas into compressor shell when differential between suction and discharge pressures exceeds and 550 – 625 psi. The compressor is also protected by an internal overload attached to motor windings.

### **Compressor Control Contactor**

The contactor has a 24 volt coil and is controlled by Y1 input from the thermostat

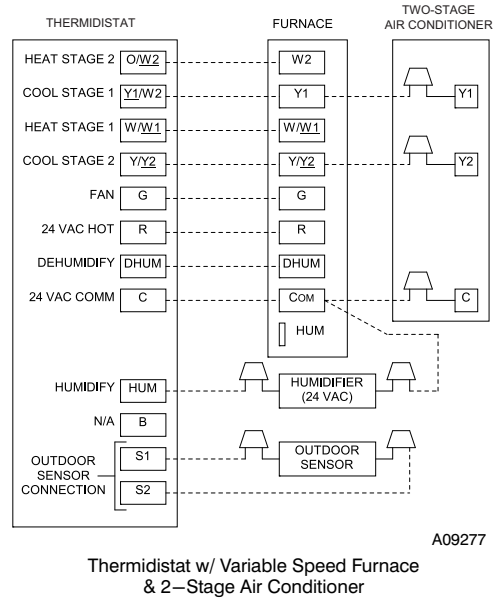
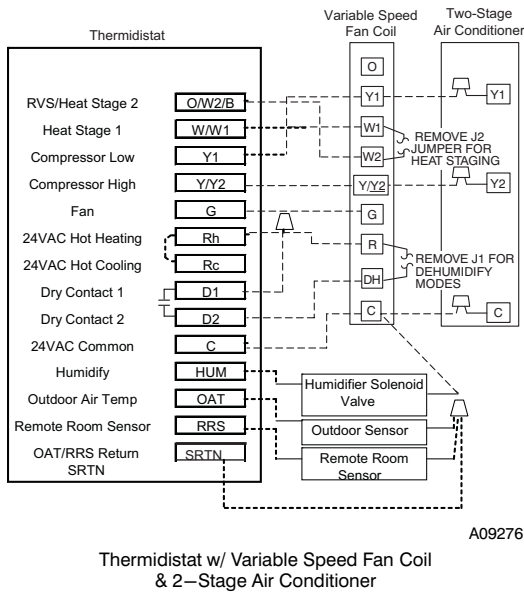
### **High and Low Pressure Switches**

High and low pressure switches are provided in line with the Y1 signal to the contactor for protection. The high pressure switch mounted on the liquid tube is set to open at 670 psi and higher, and the low pressure switch mounted on the suction tube opens at a pressure of 50 psi and lower.

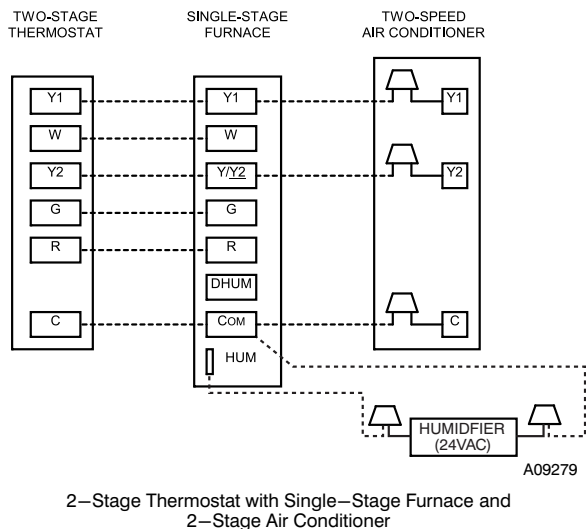
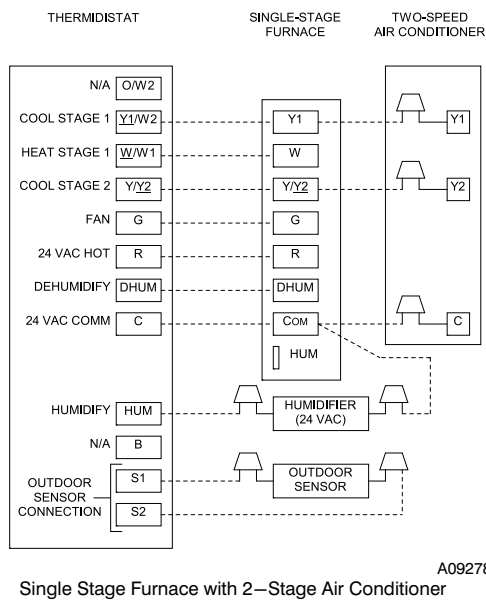
## CARE AND MAINTENANCE

For continuing high performance and to minimize possible equipment failure, periodic maintenance must be performed on this equipment.

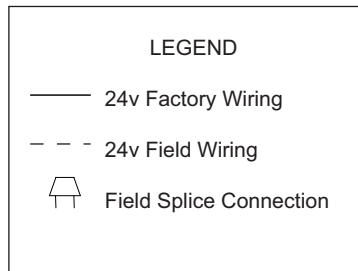
Frequency of maintenance may vary depending upon geographic areas, such as coastal applications. See Owner's Manual for information.



**Fig. 6 – Thermidstat Wiring with 2-Stage R-410A refrigerant Air Conditioner**



**Fig. 7 – Generic Wiring Diagrams**  
(See Thermostat Installation Instruction for specific unit combinations)





## R-410A REFRIGERANT QUICK REFERENCE GUIDE

- R-410A refrigerant operates at 50–70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A refrigerant
- R-410A refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- R-410A refrigerant systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose when charging into suction line with compressor operating
- Manifold sets should be 700 psig high side and 180 psig low side with 550 psig low-side retard.
- Use hoses with 700 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- R-410A refrigerant, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Do not use liquid–line filter driers with rated working pressures less than 600 psig.
- Do not leave R-410A suction line filter driers in line longer than 72 hours.
- Do not install a suction–line filter drier in liquid line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter driers and service valves with wet cloth when brazing.
- A factory approved liquid–line filter drier is required on every unit.
- Do NOT use an R-22 TXV.
- If indoor unit is equipped with an R-22 TXV or piston metering device, it must be changed to a hard shutoff R-410A TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, recover refrigerant, evacuate then break vacuum with dry nitrogen and replace filter driers. Evacuate to 500 microns prior to recharging.
- Do not vent R-410A refrigerant into the atmosphere.
- Do not use capillary tube coils.
- Observe all **warnings**, **cautions**, and **bold** text.
- All indoor coils must be installed with a hard shutoff R-410A TXV metering device.



