

**INSTALLATION INSTRUCTIONS****GROUND MOUNT - SINGLE PACKAGE GAS HEATING / ELECTRIC COOLING****⚠ WARNING / AVERTISSEMENT****FIRE OR EXPLOSION HAZARD**

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

**WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbors phone. Follow the gas suppliers instructions.
- If you cannot reach your gas supplier, call the fire department.

**RISQUE D'INCENDIE OU D'EXPLOSION**

- Le non-respect des avertissements de sécurité pourrait entraîner des blessures graves, la mort ou des dommages matériels.
- L'installation et l'entretien doivent être effectués par un installateur qualifié, un organisme de service ou le fournisseur de gazstaller, service agency or the gas supplier.
- Ne pas entreposer ni utiliser de l'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil, ni de tout autre appareil.

**QUE FAIRE S'IL Y A UNE ODEUR DE GAZ**

- Ne pas tenter d'allumer aucun appareil.
- Ne toucher à aucun interrupteur électrique; n'utiliser aucun téléphone dans le bâtiment.
- Évacuer l'immeuble immédiatement.
- Appeler immédiatement le fournisseur de gaz en employant le téléphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.
- Si personne ne répond, appeler le service des incendies.

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## IMPORTANT SAFETY INFORMATION

Please read all instructions before servicing this equipment. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

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### **WARNING:**

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#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

Failure to follow safety warnings exactly could result in serious injury or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- Before servicing, disconnect all electrical power to the unit.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing.

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### **WARNING:**

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These units are fully charged with R-410A refrigerant and ready for installation. When a system is installed according to these instructions, no refrigerant charging is required. If repairs make it necessary for evacuation and charging, it should only be attempted by qualified, trained personnel thoroughly familiar with this equipment. Some local codes require licensed installation service personnel to service this type of equipment. Under no circumstances should the homeowner attempt to install and/or service this equipment. Failure to comply with this warning could result in equipment damage, personal injury, or death.

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### **WARNING:**

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Do not place combustible material on or against the unit cabinet. Do not place combustible materials, including gasoline and any other flammable vapors and liquids, in the vicinity of the unit.

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### **WARNING:**

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**PROPOSITION 65 WARNING:** This product contains fiberglass insulation. Disturbing the insulation of this product during installation, maintenance, or repair may expose you to fiberglass insulation.

- Breathing this material may cause respiratory irritations.
- Fiberglass insulation may also cause eye irritation, skin sensitization, or other allergic responses in susceptible individuals.
- Always wear goggles, disposable gloves, long sleeved shirt, and appropriate breathing protection when working near this insulation. If contact with skin occurs, wash immediately with soap and water. In case of contact with eyes, flush immediately with water for at least 15 minutes. Contact a physician if needed.

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### **WARNING:**

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The information listed below and on the next page must be followed during the installation, service, and operation of this unit. Unqualified individuals should not attempt to interpret these instructions or install this equipment. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.

- Before beginning the installation, verify that the unit model is correct for the job. The unit model number is printed on the data label. Follow all precautions in the literature, on tags, and on labels provided with the equipment. Read and thoroughly understand the instructions provided with the equipment prior to performing the installation and operational checkout of the equipment.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections. See page 12.
- Installation of equipment may require brazing operations. Installer must comply with safety codes and wear appropriate safety equipment (safety glasses, work gloves, fire extinguisher, etc.) when performing brazing operations.
- This equipment is **NOT** to be used for temporary heating of buildings or structures under construction.
- Use caution when handling this appliance or removing components. Personal injury can occur from sharp metal edges present in all sheet metal constructed equipment.
- Follow all precautions in the literature, on tags, and on labels provided with the equipment. Read and thoroughly understand the instructions provided with the equipment prior to performing the installation and operational checkout of the equipment.

- The installer should become familiar with the units wiring diagram before making any electrical connections to the unit. See the unit wiring label or Figure 12 (page 32).

## REQUIREMENTS & CODES

- **This equipment must be installed in accordance with instructions outlined in this manual, all applicable local building codes, and the current revision of the National Fuel Gas Code (NFPA54/ANSI Z223.1) or the Natural Gas and Propane Installation Code, CAN/CGA B149.1.**
- All electrical wiring must be completed in accordance with local, state and national codes and regulations and with the National Electric Code (ANSI/NFPA 70) or in Canada the Canadian Electric Code Part 1 CSA C.22.1.
- The installer must comply with all local codes and regulations which govern the installation of this type of equipment. Local codes and regulations take precedence over any recommendations contained in these instructions. Consult local building codes and the National Electrical Code (ANSI C1) for special installation requirements.
- This equipment contains liquid and gaseous refrigerant under high pressure. Installation or servicing should only be performed by qualified trained personnel thoroughly familiar with this type equipment.
- Install this unit only in a location and position as specified on page 5. This unit is designed only for outdoor installations and should be located with consideration of minimizing the length of the supply and return ducts. Consideration should also be given to the accessibility of fuel, electric power, service access, noise, shade, and drainage for the units heat exchanger condensate drainage pit.
- Air Ducts must be installed in accordance with the standards of the National Fire Protection Association "Standards for Installation of Air Conditioning and Ventilation Systems" (NFPA 90A), "Standard for Installation of Residence Type Warm Air Heating and Air Conditioning Systems" (NFPA 90B), these instructions, and all applicable local codes. See page 7 for additional information.
- Consult Tables 8-13 (pages 24-28), and the rating plate for the proper circulating air flow and temperature rise. It is important that the duct system be designed to provide the correct flow rates and external pressure rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.

- Use only with the type of gas approved for this unit. Refer to the unit rating plate.
- Provide adequate combustion and ventilation air to the unit. See page 6.
- Provide adequate clearances around the combustion air intake louvers. See Figure 1 (page 5).
- Combustion products must be discharged outdoors. Connect this unit to an approved vent system only, as specified on page 6 and in the Appendix (pages 36-38).
- The information listed below is for reference purposes only and does not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

### Combustion & Ventilation Air

- US: National Fuel Gas Code (NFGC), Air for Combustion and Ventilation
- CANADA: Natural Gas and Propane Installation Codes (NSCNGPIC), Venting Systems and Air Supply for Appliances

### Duct Systems

- US and CANADA: Air Conditioning Contractors Association (ACCA) Manual D, Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Fundamentals Handbook

### Electrical Connections

- US: National Electrical Code (NEC) ANSI/NFPA 70
- CANADA: Canadian Electrical Code CSA C22.1

### Gas Piping & Gas Pipe Pressure Testing

- US: NFGC and National Plumbing Codes
- CANADA: NSCNGPIC

### General Installation

- US: Current edition of the NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or American Gas Association, 400 N. Capitol, N.W., Washington DC 20001 or [www.NFPA.org](http://www.NFPA.org)
- CANADA: NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3 Canada

### Safety

- US: (NFGC) NFPA 54–1999/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.
- CANADA: CAN/CGA-B149.1 and .2–M00 National Standard of Canada. (NSCNGPIC)

## GENERAL INFORMATION

This Single Package Gas Heating / Electric Cooling Unit is designed only for **ground level** slab installations and can be readily connected to the duct system of a home. This unit has been tested for capacity and efficiency in accordance with AHRI standards and will provide many years of safe and dependable comfort, providing it is properly installed and maintained. With regular maintenance, this unit will operate satisfactorily year after year. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards.

To achieve optimum performance and minimize equipment failure, it is recommended that periodic maintenance be performed on this unit. The ability to properly perform maintenance on this equipment requires certain tools and mechanical skills.

### Before you install this unit

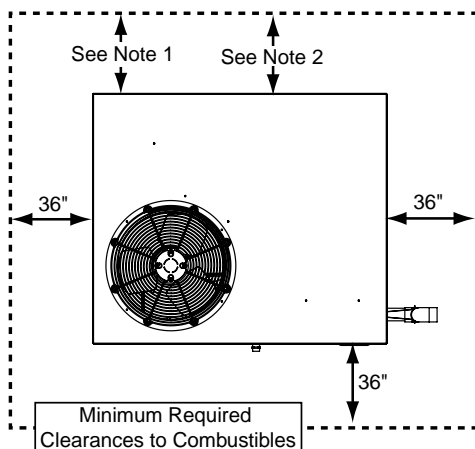
- ✓ The cooling load of the area to be conditioned must be calculated and a system of the proper capacity selected. It is recommended that the area to be conditioned be completely insulated and vapor sealed.
- ✓ Check the electrical supply and verify the power supply is adequate for unit operation. Consideration should be given to availability of electric power, service access, noise, and shade. If there is any question concerning the power supply, contact the local power company.
- ✓ All units are securely packed at the time of shipment and upon arrival should be carefully inspected for damage prior to installing the equipment at the job site. Verify coil fins are straight. If necessary, comb fins to remove flattened or bent fins. Claims for damage (apparent or concealed) should be filed immediately with the carrier.
- ✓ Survey the job site to determine the best location for setting the unit. Choose an appropriate location that minimizes the length of the supply and return air ducts.
- ✓ Please consult your dealer for maintenance information and availability of maintenance contracts. Please read all instructions before installing the unit.

## Locating the Equipment

- Select a solid, level position, preferably on a concrete slab, slightly above the grade level, and parallel to the home. **DO NOT PLACE UNIT UNDER THE HOME.**
- Overhead obstructions, poorly ventilated areas, and areas subject to accumulation of debris should be avoided. Do not place the unit in a confined space or recessed area where discharge air from the unit to re-circulate into the condenser air inlet, through the coil.
- Sufficient clearance for unobstructed airflow through the louvered control access panel and outdoor coil must be maintained in order to achieve rated performance. See Figure 1 for minimum clearances to obstructions.
- A clearance of at least 36 inches from the blower access panel and from the louvered control access panel is recommended for servicing and maintenance. **Where accessibility clearances are greater than minimum clearances to combustibles, accessibility clearances must take preference.**
- The hot condenser air must be discharged up and away from the home, and if possible, in a direction with the prevailing wind.
- If practical, place the air conditioner and its ducts in an area where they will be shaded from the afternoon sun, when the heat load is greatest.

## Heating Load

This unit should be sized to provide the design heating load requirement. Heating load estimates can be made using approved methods available from Air Conditioning Contractors of America (Manual J); American Society of Heating, Refrigerating, and Air Conditioning Engineers; or other approved engineering methods. For installations above 2,000 ft., the unit should have a sea level input rating large enough that it will meet the heating load after deration for altitude.



**NOTE 1:** 6" When coil is present on duct side.

**NOTE 2:** 1" When no coil is present on duct side.

**Figure 1. Clearance Requirements**

## COMBUSTION AIR & VENTING REQUIREMENTS

### **WARNING:**

Installation methods other than those described in the following sections must comply with the National Fuel Gas Code and all applicable local codes for providing sufficient combustion air to the unit.

- Provisions must be made during the installation of this unit that provide an adequate supply of air for combustion.
- Instructions for determining the adequacy of an installation can be found in the current revision of the NFGC (ANSI Z223.1 / NFPA54). **Consult local codes for special requirements.** These requirements are for US installations as found in the NFGC.
- The requirements in Canada (B149.1) are structured differently. Consult with B149.1 and local code officials for Canadian installations.

### **WARNING:**

**Combustible air must not be drawn from a contaminated atmosphere. Excessive exposure to contaminated combustion air will result in safety and performance related problems.**

To maximize heat exchanger life, the combustion air must be free of chemicals which form corrosive acidic compounds in the combustion gases.

#### IMPORTANT NOTE:

**Do not store any chemicals with flammable or caustic vapors near the vent termination. Some examples of these chemicals are:**

- |   |                                  |
|---|----------------------------------|
| • CARBON TETRACHLORIDE                            | • GASOLINE/KEROSENE              |
| • CEMENTS, GLUES, PAINT REMOVERS, VARNISHES, ETC. | • HALOGEN TYPE REFRIGERANTS      |
| • CLEANING SOLVENTS                               | • HYDROCHLORIC ACID              |
| • CHLORINE BASED SWIMMING POOL CHEMICALS          | • MASONRY ACID WASHING MATERIALS |
| • CHLORINATED WAXES & CLEANERS                    | • PERMANENT WAVE SOLUTIONS       |
| • DE-ICING SALTS OR CHEMICALS                     | • WATER SOFTENING CHEMICALS      |

### Vent Termination

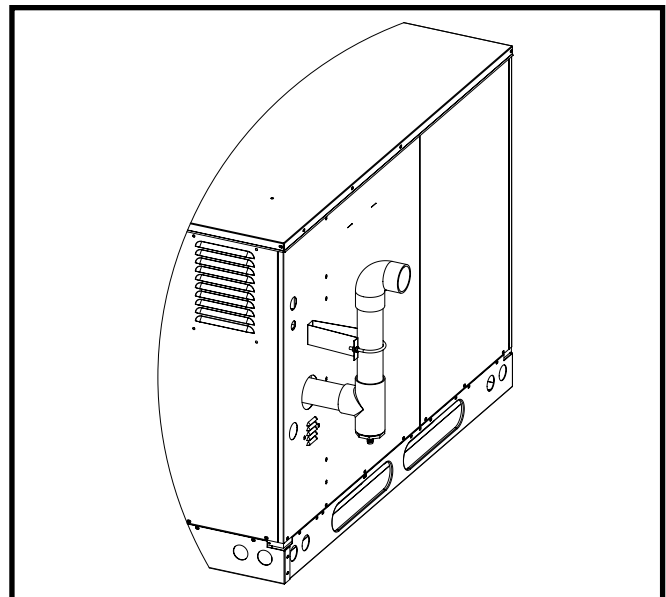
This unit has been developed for use with a combination heat exchanger condensate drain and venting system designed to operate only with this type of system. A Condensate Drain and Vent Kit (P/N 922323) is available for purchase as an accessory item to attach to the 13.25" x 2" PVC pipe within the control area of this unit. If the kit is not being used, see Appendix (pages 36-39).

### **WARNING:**

**This unit is intended for outdoor installation only. This unit must be vented to the outdoors. No additional venting shall be used. Do not vent the unit through a conventional venting system.**

The vent and drain assembly must be installed to assure proper operation of the unit. Figure 2 shows the proper installation of the vent and drain assembly over the vent outlet on the exterior of the corner panel. The fasteners used to secure the vent and drain assembly have been included in the kit. The following list summarizes the requirements for the location of the vent system termination:

- The location of the vent termination must be consistent with the National Fuel Gas Code (ANSI Z223.1) or CAN/CGA-B149 Installation Codes.
- The vent termination must be located at least 4 feet horizontally from any electric meters, gas meters, regulators, and relief equipment.
- The vent termination must be located at least 3 feet above any forced air inlet located within 10 feet.
- The vent termination must be located at least 4 feet below, 4 feet horizontally from, or 1 foot above any door, window, or gravity air inlet into any building.
- The unit should be installed in a way that prevents any obstruction of the vent termination during accumulating snow.
- Verify exhaust gases will not impinge on windows or building surfaces, which may be compromised or damaged by condensation.
- Do not install the unit such that exhaust from the vent termination is directed into window wells, stairwells, under decks, or in alcoves or similarly recessed areas.



**Figure 2. Heat Exchanger Condensate Drain  
& Vent Assembly**

## CIRCULATING AIR SUPPLY

### **WARNING:**

Products of combustion must not be allowed to enter the return air ductwork or the circulating air supply. Failure to prevent products of combustion from being circulated into the living space can create potentially hazardous conditions including carbon monoxide poisoning that could result in personal injury or death.

All return ductwork must be adequately sealed, all joints must be taped, and the ductwork must be secured to the unit with sheet metal screws. When return air is provided through the bottom of the unit, the joint between the unit and the return air plenum must be air tight.

The cement pad that the unit is mounted must provide sound physical support of the unit with no gaps, cracks, or sagging between the unit and pad.

Return air and circulating air ductwork must not be connected to any other heat producing device such as a fireplace insert, stove, etc. Doing so may result in fire, explosion, carbon monoxide poisoning, personal injury, or property damage.

### **Air Ducts**

This unit is designed only for use with a supply and return duct. Air ducts should be installed in accordance with the standards of the National Fire Protection Association "Standard for Installation of Air Conditioning Systems" (NFPA 90A), "Standard for Installation of Residence Type Warm Air Heating and Air Conditioning Systems" (NFPA 90B), and all applicable local codes. NFPA publications are available by writing to: National Fire Protection Association, Batterymarch Park, Quincy, ME 02269 or visit [www.NFPA.org](http://www.NFPA.org) on the web.

- Design the duct work according to Manual D by the Air Conditioning Contractors of America (ACCA).
- The ducts must be properly sized not to exceed the units maximum ESP rating at 400 SCFM per nominal ton of cooling capacity.
- Duct work should be attached directly to the unit flanges for horizontal applications.
- It is recommended that the outlet duct be provided with a removable access panel. The opening should be accessible when the unit is installed in service and shall be sized so that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover for the opening shall be attached in a way that will prevent leaks.

## Air Filter Requirements

### **WARNING:**

Never operate the unit without a filter in place. Dust and lint could accumulate on internal parts, resulting in loss of efficiency, equipment damage and possible fire.

**NOTE TO INSTALLER:** After installing or replacing the filtration system for this unit, add the following statement on or adjacent to the filter service panel: **"Replace filter(s) installed in your system only with the same dimensional size filters that are being replaced."**

- A suitable air filter must be installed upstream of the evaporator coil of the return air system. For recommended external filter sizes, refer to Table 1.
- All return air must pass through the filters before entering the evaporator coil. It is important that all filters be kept clean and replaced frequently to ensure proper operation of unit. Dirty or clogged filters will reduce the efficiency of the unit and result in unit shutdowns.
- Air filter pressure drop is recommended not to exceed 0.08 inches WC.

| NOMINAL COOLING (TONNAGE) | APPROXIMATE AIR FLOW RANGE (CFM) | APPROXIMATE FILTER AREA (SQ. IN.)* | RECOMMENDED FILTER SIZE (IN. X IN.) |
|---------------------------|----------------------------------|------------------------------------|-------------------------------------|
| 2.0                       | 600-900                          | 450                                | 20 x 25                             |
| 2.5                       | 750-1200                         | 550                                | 20 x 30                             |
| 3.0                       | 1100-1300                        | 625                                | 25 x 25                             |
| 3.5                       | 1200-1600                        | 750                                | 24 x 30                             |
| 4.0                       | 1400-1800                        | 850                                | 18 x 24 (2 required)                |
| 5.0                       | 1700-2200                        | 1000                               | 20 x 25 (2 required)                |

\* Based on velocity of 300 ft/min for disposable filters.

**Table 1. Recommended External Air Filter Sizes**

### **Unconditioned Spaces**

All duct work passing through unconditioned space must be properly insulated to minimize duct losses and prevent condensation. Use insulation with an outer vapor barrier. Refer to local codes for insulation material requirements.

### **Acoustical Duct Work**

Certain installations may require the use of acoustical lining inside the supply duct work.

- Acoustical insulation must be in accordance with the current revision of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) application standard for duct liners.
- Duct lining must be UL classified batts or blankets with a fire hazard classification of FHC-25/50 or less.
- Fiber duct work may be used in place of internal duct liners if the fiber duct work is in accordance with the current revision of the SMACNA construction standard on fibrous glass ducts. Fibrous duct work and internal acoustical lining must be NFPA Class 1 air ducts when tested per UL Standard 181 for Class 1 ducts.



## UNIT INSTALLATION

### Packaging Removal

Remove the shipping carton and User's Manual from the equipment. Set aside the 13" x 2" PVC pipe for later use when installing the heat exchanger condensate drain and vent kit.

### Rigging & Hoisting

#### **WARNING:**

To avoid the risk of property damage, personal injury, or death, it is the rigger's responsibility to ensure that whatever means are used to hoist the unit are safe and adequate:

- The lifting equipment must be adequate for the load. Refer to Table 7 (page 23) for unit weights.
- The unit must be lifted from the holes in the base rails using cables or chains.
- Spreader bars are required to protect the unit and ensure even loading.
- Keep the unit in an upright position at all times. The rigging must be located outside the unit's center of gravity. Refer to Figure 7 (page 23) for locating the center of gravity.
- All panels must be securely in place during rigging and hoisting.

### Clearances to Combustible Materials

These units are certified as combination heating and cooling equipment for outdoor ground level installations.

- Sufficient clearance for unobstructed airflow through the outdoor coil must also be maintained in order to achieve rated performance. See page 5 for information about locating the equipment.

### Ground Level

Ground level installations must be located according to local building codes or ordinances and these requirements:

- Clearances must be in accordance with those shown in Figure 1 (page 5).
- A suitable mounting pad must be provided and be separate from the building foundation. The pad must be level to ensure proper condensate disposal and strong enough to support the unit's weight. The slab height must be a minimum of 2" (5cm) above grade and with adequate drainage. See Figure 3.
- Remove and discard the horizontal Supply and Return duct covers located on the rear of the unit. Form duct attachment flanges by bending the sheet metal outward 90 degrees along the perforated lines.
- Firmly attach ductwork directly to these flanges with screws or other approved mechanical connections and not to the Supply/Return air panels to avoid damage to internal components of the equipment. Use approved duct sealing methods to ensure an air and watertight seal is achieved.

### Condensate Drain (Air Conditioning)

Air conditioning condensate is removed from the unit through the 3/4" female pipe fitting located on the front side of the unit. See Figure 4.

Install a 2 inch condensate trap in the drain line of the same size and prime with water. When connecting rigid drain line, hold the female fitting with a wrench to prevent twisting. **Do not over tighten!** Refer to local codes and restrictions for proper condensate disposal requirements.

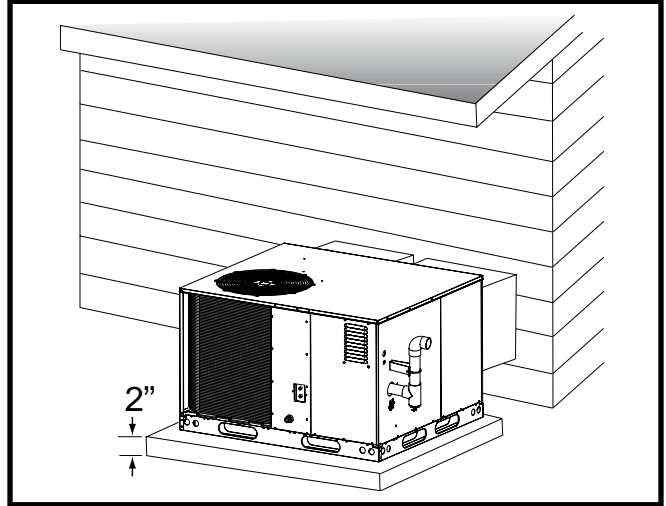


Figure 3. Ground Level Installation

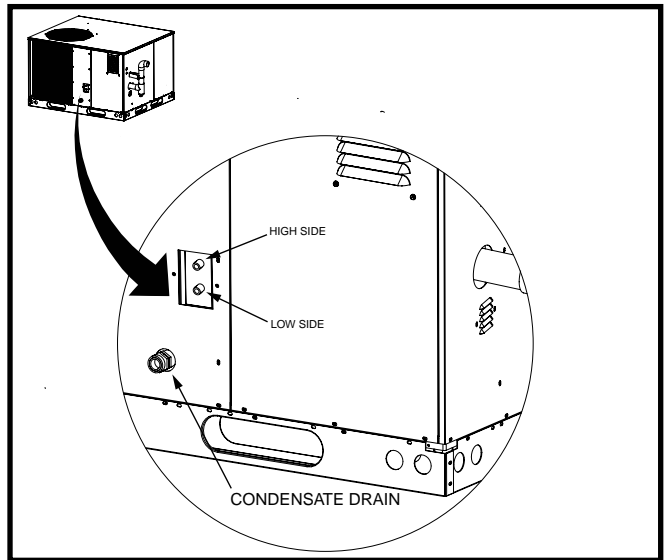


Figure 4. Refrigerant Service Ports & Air Conditioning Condensate Drain Locations



## ELECTRICAL WIRING

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury or property damage.**

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- Before servicing, disconnect all electrical power to furnace.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing.”

### **AVERTISSEMENT:**

#### **RISQUE DE CHOC ÉLECTRIQUE, D'INCENDIE OU D'EXPLOSION**

**Le non-respect des avertissements de sécurité pourrait entraîner un fonctionnement dangereux de l'appareil, des blessures graves, la mort ou des dommages matériels.**

**Un entretein incorrect pourrait entraîner un fonctionnement dangereux de l'appareil, des blessures graves, la mort ou des dommages matériels**

- Couper toute alimentation électrique au générateur d'air chaud avant de prodéder aux travaux d'entretien.
- Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. S'assurer de les raccorder correctement.
- S'assurer que l'appareil fonctionne adéquatement après l'entretien.

- Electrical connections must be in compliance with all applicable local codes with the current revision of the National Electric Code (ANSI/NFPA 70).
- For Canadian installations the electrical connections and grounding shall comply with the current Canadian Electrical Code (CSA C22.1 and/or local codes).

**IMPORTANT NOTE: If replacing any of the original wires supplied with the furnace, the replacement wire must be copper wiring having the same guage, voltage, and temperature rating.**

## Pre-Electrical Checklist

- ✓ Verify the voltage, frequency, and phase of the supply source match the specifications on the unit rating plate.
- ✓ Verify that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. See Table 16 (page 31) (or the unit rating label) for proper high voltage wiring requirements.
- ✓ Verify factory wiring is in accordance with the unit wiring diagram (Figure 12, page 32). Make sure the connections didn't loosen during shipping or installation.

## Grounding

### **WARNING:**

**The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. Do not use gas piping as an electrical ground!**

This unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code (ANSI/NFPA 70) or the CSA C22.1 Electrical Code. Grounding of the unit is accomplished by using the grounding lug provided in the control box.

## Line Voltage

- The line voltage to the unit should be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the unit.
- **An electrical disconnect must be located within sight of and readily accessible to the unit.** This switch shall be capable of electrically de-energizing the outdoor unit. See unit data label for proper incoming field wiring. Any other wiring methods must be acceptable to authority having jurisdiction.
- Use only copper wire for the line voltage power supply to this unit (Table 17, page 31). Use proper code agency listed conduit and a conduit connector for connecting the supply wires to the unit. Use of rain tight conduit is recommended.
- Provide power supply for the unit in accordance with the unit wiring diagram and the unit rating plate.
- Overcurrent protection must be provided at the branch circuit distribution panel and sized as shown on the unit rating label and according to applicable local codes. See Table 16 (page 31) or the unit rating plate for minimum circuit ampacity and maximum overcurrent protection limits.
- A wiring diagram is located on the inside cover of the control access panel of the outdoor unit. The installer should become familiar with the wiring diagram before making any electrical connections to the outdoor unit. See Figure 12 (page 32).
- Units are shipped from the factory wired for 240 volt transformer operation. For 208V operation, remove the lead from the transformer terminal marked 240V and connect it to the terminal marked 208V.
- Connect the line-voltage leads to the terminals on the contactor inside the control compartment.

## Thermostat / Low Voltage Connections

- This unit is designed to operate from a 24 VAC Class II control circuit. A single stage cooling / two stage heating thermostat should be used with this unit. See Figure 9 (page 31) for typical thermostat connection.
- The control circuit wiring must comply with the current provisions of the NEC (ANSI/NFPA 70) and with applicable local codes having jurisdiction. Thermostat connections should be made in accordance with the instructions supplied with the thermostat and the indoor equipment.
- The low voltage wires must be properly connected. Route 24V control wires through the sealing grommet near the power entrance. Recommended wire gauge and wire lengths for typical thermostat connections are listed in Table 18 (page 31).
- Several thermostat options are available depending on the accessories installed with the unit. Select a thermostat that operates in conjunction with the installed accessories.
- The thermostat should be mounted about 5 feet above the floor on an inside wall. DO NOT install the thermostat on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances. Refer to the thermostat manufacturer's instruction sheet for detailed mounting information.

## 2-Stage Heat / 1-Stage Cool Thermostat

(Recommended): For highest efficiency a 2 Stage Heating/Single Cooling thermostat is recommended for this unit. A Single Stage Cool thermostat is only required for cooling operation control of this unit. A 2 Stage Heat thermostat will allow the gas heat to operate at a more efficient low heat condition until there is a demand for higher heat output to the conditioned space.

## Single Stage Heat / Single Stage Cool Thermostat

(Optional): A Single Stage Cool thermostat is only required for cooling operation of this unit. A Single Stage Heat thermostat can be used in conjunction with the automatic heat staging jumper on the ignition control board. The heat staging function will automatically move the unit into high heat operation after 10 minutes when the jumper is moved from OFF to the ON position. See Figure 11 (page 31).

Connect the Red, Yellow, Green, White, and Brown low voltage thermostat wires to terminals **R**, **Y1** (1st Stage Cool), **G**, **W1** (1st Stage Heat), & **W2** 2nd Stage Heat (optional) on both the thermostat sub-base and unit low voltage terminal board. The **C** terminal (Black wire), is the **24V** common wire required on some thermostat models. See Figure 9 (page 31).

## Checking Heat Anticipator Settings

- Add the current draw of the system heating components.  
OR
- Measure the current flow on the thermostat **R-W** circuit after the circulating blower motor has started. Set the heat anticipator according to the thermostat manufacturer's instructions for heat anticipator settings.

## Cooling Configurations

This unit is designed to connect with any single stage thermostat. The connection between **Y1** on the thermostat and **Y1** on the unit terminal strip energizes cooling operation. See Figure 9 (page 31).

## Heating Configurations

This gas pack is factory configured for two stage gas heating operation with a two stage heating thermostat. Connect the low voltage thermostat White & Brown wires to **W1** & **W2**, between the unit low voltage terminal board and thermostat sub-base. See Figure 9.

To operate with a single stage heat thermostat, only connect the low voltage thermostat White wire between **W1** on the unit low voltage terminal board and thermostat sub-base. Reposition the automatic heat staging jumper located on the ignition control module from OFF to ON to set a 10 minute time delay before the gas furnace will automatically move to high heat operation. **NOTE:** When low fire on the gas valve is energized, the furnace operates in low fire mode at a lower blower speed and the timer begins its delay function. If the room thermostat is not satisfied before the timer activates, the furnace will stage to high fire. The inducer motor and blower will ramp to a higher speed until the thermostat is satisfied.

## Blower Speed

The blower speed is preset at the factory for proper fan only, heating, and cooling operation. These factory settings are listed in Tables 8-13 (pages 24-28). For optimum system performance and comfort, it may be necessary to change the factory set speed. **To avoid personal injury or property damage, make sure the motor leads do not come into contact with any un-insulated metal components of the unit.**

### NOTES:

- The CFM values listed in Tables 9-13 are DEPENDANT on duct static pressure for individual switch settings.
- If coil icing occurs, the basic cooling airflow selected may be too low. Verify the selected setting is within the range shown in Table 8 and the system is properly charged. If icing continues, raise the selected airflow to the next higher tap.
- For maximum dehumidification and energy efficiency, select an airflow near the middle or bottom of the CFM range for that nominal capacity.
- The 2-stage heating feature of the unit requires modulating the airflow. The unit will automatically adjust the airflow to the appropriate rate when the unit heating capacity changes.

## Configuring the Fixed Speed Blower

The fixed speed blower assembly has been designed to give the installer maximum flexibility for optimizing system performance, efficiency, and comfort. It is equipped with a microprocessor-controlled motor when coupled with a fixed speed motor control board delivers constant torque to optimize airflow in a variety of conditions and system configurations. Because the blower can be configured in many ways, it is important to read and follow all instructions carefully.

Upon initial start up, the fixed speed blower must be checked so that the factory settings match the unit with the system, climatic conditions, and other system options. With the blower installed and configured properly, the furnace will change speed in response to changes in system variables such as Heat/Cool setting, Fan Auto/On, or 2 Stage furnace High/Low Heat. The fixed speed blower is configured by setting the 8 switches for heating and cooling operation located on the blower control board. Use pins 1 to 4 to set the blower speed for heating and pins 5 to 8 to set the speed for cooling. To determine the appropriate switch settings for your installation, see Tables 9-13 (pages 24-28) for heating or Table 8 (page 24) for cooling. See Figure 10 (page 31) for switch locations. **NOTE:** For change in blower speed selection to take effect, system power must be cycled off then restored after 10 seconds.

## Selecting Cooling Airflow

(Switches # 5, 6, 7, & 8)

The COOLING airflow is selected by setting switches # 5, 6, 7, & 8 on the motor control board (Figure 10, Page 31). Table 8 (page 24) lists the recommended airflow values (CFM) and switch settings for each nominal cooling system capacity. All airflows for other modes of operation are determined by these basic settings. For maximum capacity, generally, a selection near the middle or top of the CFM range for that nominal capacity is used. Factory settings are displayed in **BOLD ITALICS**

## Selecting Heating Airflow

(Switches # 1, 2, 3, & 4)

The HEATING airflow is selected by setting switches # 1, 2, 3, & 4 on the motor control board (Figure 10, Page 31). Tables 9-13, (pages 24-28) lists the recommended airflow values (CFM) and switch settings for each heat exchanger capacity. All airflows are determined by these basic settings. For most applications the factory heat setting will operate at a nominal rise based on the furnace's nominal efficiency and firing input. Follow across the table row to find the switch setting and nominal air-flow. Verify the selected rise is within the specification shown on the furnace rating label or Tables 9-13.

## **Dehumidification Options**

The fixed speed motor control board has a **DEHUM** connection that allows the system to increase the amount of humidity that is removed from the circulating air. This is accomplished by reducing the CFM and allowing the

cooling coil to become colder. This function is only available when there is a call for cooling. There are many ways this function can be electrically wired.

When 24VAC is present at the **DEHUM** terminal of the blower control board the airflow requirements will be reduced to approximately 75% of the nominal airflow requirements. If the humidity level of the conditioned space decreases during the cycle and the humidistat opens, the airflow will be restored to 100% of the selected value.

- If the room thermostat incorporates a humidity sensor and **DEHUM** output, connect the **DEHUM** on the thermostat to the **DEHUM** terminal on the motor control board. See Figure 10 (page 31).
- If using a separate humidistat, connect the **DEHUM & R** terminals on the humidistat to the **DEHUM & R** terminals on the motor control board. In this option, the **DEHUM** output of the humidistat must be set to be normally open and closed when there is a call for humidification.

If a humidistat is not available, it is an acceptable option to directly jumper the **R & DEHUM** on the blower control board. **NOTE:** This option will always operate the blower at 75% the rated airflow for the first 10 minutes of every cooling cycle no matter what the humidity level of the home is. See Figure 10.

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## **CAUTION:**

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**To avoid personal injury or property damage, make sure the motor leads do not come into contact with any uninsulated metal components of the unit.**

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## **Optional Furnace Control Board Connections**

### Electronic Air Cleaner

The furnace control board provides output terminals for an optional electronic air cleaner (EAC) that can be installed in the return air duct of your system. The **EAC** output is energized any time the HEAT or COOL blower speed is energized. Control ratings are 1.0 Amp. @ 240 VAC. Output connections are made via board terminals labeled **EAC** and **NEUTRAL**.

### Humidifier

The furnace control board provides output terminals for an optional humidifier (**HUM**) that can be installed on your system. The **HUM** output is energized any time the furnace inducer motor is energized. Control ratings are 1.0 Amp. @ 240 VAC. Output connections are made via board terminals labeled **HUM** and **NEUTRAL**.

Check all factory wiring to the units wiring diagram (Figure 12, page 32). Inspect the factory wiring connections to be sure none loosened during shipping or installation.

## GAS SUPPLY & PIPING

### **WARNING:**

#### **FIRE OR EXPLOSION HAZARD**

- Failure to follow safety warnings exactly could result in serious injury or property damage.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

#### **WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

### **AVERTISSEMENT:**

#### **RISQUE D'INCENDIE OU D'EXPLOSION**

- Le non-respect des avertissements de sécurité pourrait entraîner des blessures graves, la mort ou des dommages matériels.
- L'installation et l'entretien doivent être effectués par un installateur qualifié, un organisme de service ou le fournisseur de gaz.
- Ne pas entreposer ni utiliser de l'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil, ni de tout autre appareil.

#### **QUE FAIRE S'IL Y A UNE ODEUR DE GAZ**

- Ne pas tenter d'allumer aucun appareil.
- Ne toucher à aucun interrupteur électrique; n'utiliser aucun téléphone dans le bâtiment.
- Évacuer l'immeuble immédiatement.
- Appeler immédiatement le fournisseur de gaz en employant le téléphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.
- Si personne ne répond, appeler le service des incendies.

- All gas piping must be installed in compliance with local codes and utility regulations. In the absence of local codes the gas line installation must comply with the latest edition of the National Fuel Gas Code ANSI Z223.1 or CAN/CGA B149 Installation Codes.
- Some local codes require the installation of a manual main shut-off valve and ground joint union external to the unit. The shut-off valve should be readily accessible for service and/or emergency use. Consult the local utility or gas supplier for additional requirements regarding placement of the manual main gas shut-off. See Figure 5 (page 13).
- The manifold pressure must be set to the appropriate value for your installation. To measure and adjust the manifold pressure see page 17.
- Gas piping must never run in or through air ducts, chimneys, gas vents, or elevator shafts.
- Compounds used to seal joints on gas piping must be resistant to the actions of LP propane gas.
- The main gas shutoff valve and main power disconnect to the unit must be properly labeled by the installer in case emergency shutdown is required.
- An 1/8 inch NPT plugged tap can be installed in the gas line immediately upstream of the gas supply connection to the unit for use when measuring the gas supply pressure when not using the inlet pressure tap supplied on the factory installed gas valve. The plug should be readily accessible for service use.
- A drip leg should be installed in the vertical pipe run to the unit. See Figure 5.

This unit only has right side gas entry. When connecting the gas, provide clearance between the gas supply line and the entry hole in the unit's casing to avoid unwanted noise and/or damage to the unit. A typical gas service hookup is shown in Figure 5.

Table 14 (page 29) lists gas pipe capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

### **Leak Check**

### **WARNING:**

#### **FIRE OR EXPLOSION HAZARD**

Never test for gas leaks with an open flame. Check all connections using a commercially available soap solution. A fire or explosion may result causing property damage, personal injury or loss of life. Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

After the gas piping to the unit is complete, all connections must be tested for gas leaks. This includes pipe connections at the main gas valve, emergency shutoff valve and other gas connectors. A soap and water solution can be applied on each joint or union using a small paintbrush.

If any bubbling is observed, the connection is not sealed adequately and must be retightened. Repeat the tightening and soap check process until bubbling ceases.

- If pressure testing the gas supply lines at pressures greater than 1/2 psig (14 inches WC), the unit must be disconnected from the gas supply piping system to prevent damage to the gas valve.
- If the test pressure is less than or equal to 1/2 psig (14 inches WC), the unit must be isolated from the gas supply line by closing the manual shut-off valve.

### High Altitude Conversion - Natural Gas

Conversion of this unit must be performed by qualified service personnel, using only approved parts. All installations must be made in accordance with the National Fuel Gas Code and/or local jurisdiction codes.

## ⚠ WARNING:

**The reduction of input rating necessary for high altitude installation may only be accomplished with factory supplied orifices. Do not attempt to drill out orifices in the field. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.**

High altitude conversion can be field performed by a simple adjustment of manifold pressure or a change of the orifices (if necessary) as described in the Measuring & Adjusting the Manifold section (page 17). The changes required depend on the installation altitude and the heating value of the gas (based on sea level) which can be obtained from your local gas utility. The heating value of gas at high altitude is always lower than the sea level heating value. Natural Gas heating values listed in Table 3 (page 14) are based on sea level values.

All factory shipped furnaces are ready to operate using Natural Gas between zero and 2,000 ft. above sea level. For altitudes between 2,000 and 10,000 feet above sea level, the unit can be converted by adjusting the unit's manifold pressure and/or changing the orifices. See Table 3 for the correct manifold pressure settings.

**NOTE:** If installing this unit above 2,000 feet, the input rate must be reduced 4% per 1,000 feet of altitude (Example: 12% at 3,000 feet, 16% at 4,000 feet, etc). Deration is necessary to compensate for low atmospheric pressure at high altitudes.

## LP / Propane Gas Conversion

## ⚠ WARNING:

**This unit was equipped at the factory for use with natural gas only. A special kit, supplied by the manufacturer, is required to convert the unit to operate on LP/propane gas. Failure to use the proper conversion kit can cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.**

Conversion of this equipment to LP/Propane gas must be made by qualified service personnel, using approved factory parts. Conversion to LP can be accomplished by replacing the natural gas orifices with the appropriate LP/Propane orifices and then adjusting the manifold pressure (page 17). Conversion to LP/Propane (sea level and high altitude) is detailed in the installation instructions provided with the conversion kit. **Please follow the instructions provided in each kit.** Approved conversion kits are listed below:

- The United States LP/Propane Gas Sea Level and High Altitude Conversion Kit (P/N 922311) is for LP/propane conversion in the United States at altitudes between zero and 10,000 ft. above sea level.
- The Canadian LP/Propane Gas Sea Level and High Altitude Conversion Kit (P/N 922312) is for LP/propane conversions in Canada at altitudes between zero and 4,500 ft. above sea level.

For installations between zero and 4,999 ft. above sea level, a #55 drill size orifice should be used. Installations 5,000 ft. above sea level require a # 56 drill size orifice. Table 4 (page 14) lists the correct orifice sizes and manifold pressures for operation at different altitudes.

After changing the orifices, it is required that you measure the gas input rate by clocking the gas meter and using the local gas heating value. See Verifying the Firing Rate of the Appliance section on page 16.

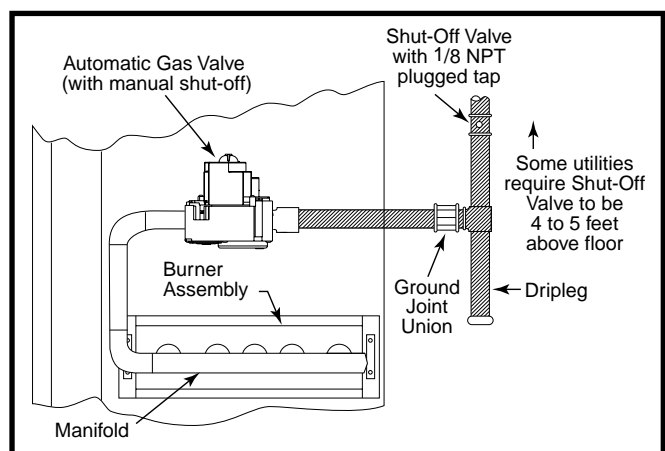


Figure 5. Typical Gas Hookup - Right Side Entry

| MODEL NUMBER | MAXIMUM GAS SUPPLY PRESSURE (IN. WC) | MINIMUM GAS SUPPLY PRESSURE (IN. WC) | MANIFOLD PRESSURE (IN. WC) | HIGH INPUT (BTU/HR) | HIGH OUTPUT (BTU/HR) | LOW INPUT (BTU/HR) | LOW OUTPUT (BTU/HR) | GAS ORIFICE SIZE | RISE RANGE (OF) | MAX. OUTLET AIR TEMP. | MAXIMUM EXTERNAL STATIC PRESSURE E.S.P. (IN WC) | NET COOLING CAPACITY (BTUH) | BLOWER SIZE | MOTOR (HP) |
|--------------|--------------------------------------|--------------------------------------|----------------------------|---------------------|----------------------|--------------------|---------------------|------------------|-----------------|-----------------------|---|-----------------------------|-------------|------------|
| -X24K060X    | 10.0                                 | 4.5                                  | 3.5                        | 60,000              | 57,000               | 39,000             | 37,050              | 45               | 30-60           | 160                   | 0.80  | 24,000                      | 11" x 8"    | 3/4        |
| -X30K060X    | 10.0                                 | 4.5                                  | 3.5                        | 60,000              | 57,000               | 39,000             | 37,050              | 45               | 30-60           | 160                   | 0.80  | 29,000                      | 11" x 8"    | 3/4        |
| -X36K080X    | 10.0                                 | 4.5                                  | 3.5                        | 80,000              | 76,000               | 52,000             | 49,400              | 45               | 35-65           | 165                   | 0.80  | 36,000                      | 11" x 8"    | 3/4        |
| -X42K080X    | 10.0                                 | 4.5                                  | 3.5                        | 80,000              | 76,000               | 52,000             | 49,400              | 45               | 35-65           | 165                   | 0.80  | 42,000                      | 11" x 10"   | 3/4        |
| -X48K100X    | 10.0                                 | 4.5                                  | 3.5                        | 100,000             | 95,000               | 65,000             | 61,750              | 45               | 35-65           | 165                   | 0.80  | 47,000                      | 11" x 10"   | 1          |
| -X60K100X    | 10.0                                 | 4.5                                  | 3.5                        | 100,000             | 95,000               | 65,000             | 61,750              | 45               | 35-65           | 165                   | 0.80  | 56,000                      | 11" x 10"   | 1          |

**Table 2. R8HE Nominal Rates and Temperature Rises**

|  | INPUT<br>(BTUH)             | GAS<br>VALVE<br>SETTING | ALTITUDE ABOVE SEA LEVEL |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |
|--|-----------------------------|-------------------------|--------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|  |                             |                         | ZERO TO<br>1,999         |                      | 2,000 TO<br>2,999 FT |                      | 3,000 TO<br>3,999 FT |                      | 4,000 TO<br>4,999 FT |                      | 5,000 TO<br>5,999 FT |                      | 6,000 TO<br>6,999 FT |                      | 7,000 TO<br>7,999 FT |                      | 8,000 TO<br>8,999 FT |                      | 9,000 TO<br>9,999 FT |                      |
|  |                             |                         | ORIFICE<br>SIZE          | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE |
| NATURAL GAS<br>HEATING VALUE<br>OF 800 TO 899<br>BTU / Cu. Ft        | 60,000<br>80,000<br>100,000 | High                    | 45                       | 3.5                  | 45                   | 3.5                  | 45                   | 3.4                  | 45                   | 3.2                  | 45                   | 3.1                  | 45                   | 2.9                  | 48                   | 3.5                  | 48                   | 3.3                  | 48                   | 3.1                  |
|  |                             | Low                     |                          | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |
| NATURAL GAS<br>HEATING VALUE<br>OF 900 TO 999<br>BTU / Cu. Ft        | 60,000<br>80,000<br>100,000 | High                    | 45                       | 3.5                  | 45                   | 3.4                  | 45                   | 3.2                  | 45                   | 3.0                  | 45                   | 2.9                  | 48                   | 3.7                  | 48                   | 3.4                  | 48                   | 3.1                  | 48                   | 2.9                  |
|  |                             | Low                     |                          | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |
| NATURAL GAS<br>HEATING VALUE<br>OF 1,000 TO<br>1,100 BTU /<br>Cu. Ft | 60,000<br>80,000<br>100,000 | High                    | 45                       | 3.5                  | 45                   | 3.3                  | 45                   | 3.1                  | 45                   | 2.9                  | 45                   | 2.8                  | 48                   | 3.5                  | 48                   | 3.3                  | 48                   | 3.0                  | 48                   | 2.8                  |
|  |                             | Low                     |                          | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |                      | 1.7                  |

**Table 3. Manifold Pressure Setting (in WC) for Natural Gas**

| MODEL<br>NUMBER<br>R8HE/ PPG3HE | INPUT<br>(BTUH) | GAS<br>VALVE<br>SETTING | ALTITUDE ABOVE SEA LEVEL |                      |                      |                      |                      |                      |                      |                      |                      |                      |                       |                      |
|---------------------------------|-----------------|-------------------------|--------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|----------------------|
|                                 |                 |                         | ZERO TO<br>1,999 FT      |                      | 2,000 TO<br>2,999 FT |                      | 3,000 TO<br>4,999 FT |                      | 5,000 TO<br>5,999 FT |                      | 6,000 TO<br>7,999 FT |                      | 8,000 TO<br>10,000 FT |                      |
|                                 |                 |                         | ORIFICE<br>SIZE          | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE      | MANIFOLD<br>PRESSURE | ORIFICE<br>SIZE       | MANIFOLD<br>PRESSURE |
| -X24K060X<br>-X30K060X          | 60,000          | High                    | 55                       | 10.0                 | 55                   | 9.0                  | 55                   | 8.0                  | 56                   | 10.0                 | 56                   | 9.0                  | 56                    | 8.0                  |
|                                 | 39,000          | Low                     |                          | 4.2                  |                      | 3.8                  |                      | 3.6                  |                      | 4.2                  |                      | 3.8                  |                       | 3.6                  |
| -X36K080X<br>-X42K080X          | 80,000          | High                    | 55                       | 10.0                 | 55                   | 9.0                  | 55                   | 8.0                  | 56                   | 10.0                 | 56                   | 9.0                  | 56                    | 8.0                  |
|                                 | 52,000          | Low                     |                          | 4.2                  |                      | 3.8                  |                      | 3.6                  |                      | 4.2                  |                      | 3.8                  |                       | 3.6                  |
| -X48K100X<br>-X60K100X          | 100,000         | High                    | 55                       | 10.0                 | 55                   | 9.0                  | 55                   | 8.0                  | 56                   | 10.0                 | 56                   | 9.0                  | 56                    | 8.0                  |
|                                 | 65,000          | Low                     |                          | 4.2                  |                      | 3.8                  |                      | 3.6                  |                      | 4.2                  |                      | 3.8                  |                       | 3.6                  |

**Table 4. Manifold Pressure Setting (in WC) & Orifice Size for LP Gas**

## START UP & ADJUSTMENTS

### Pre-Start Check List

- ✓ Verify the unit is level and allows evaporator condensate to drain.
- ✓ Verify heat exchanger condensate drain and vent kit have been installed according to the instructions included with kit 922323 or as described in the Appendix section (pages 36-39).
- ✓ Verify all clearance requirements are met and there is free airflow to and from the outdoor coil.
- ✓ Verify that the duct work is sealed to prevent air leakage and air filter is installed.
- ✓ Verify that the line voltage power leads are securely connected and the unit is properly grounded.
- ✓ Verify that the low voltage wires are securely connected to the correct terminals in the low voltage area of the control box.
- ✓ Verify that the gas line service pressure does not exceed 10.0 inches WC (0.36 psig), and is not less than 4.5 inches WC (0.16 psig) for natural gas. For LP gas the line service pressure must not exceed 14 inches WC (0.51 psig) and must not be less than 11.0 inches WC (0.40 psig).
- ✓ Verify that the flame roll-out control is closed. If necessary, press the red button to reset the control. **DO NOT** install a jumper wire across the control to defeat its function. If the control reopens upon start-up, **DO NOT** reset the control without identifying and correcting the fault condition which caused the control to trip.
- ✓ Verify that the gas line has been purged and all connections are leak tight.
- ✓ Verify that all exterior panels are replaced and securely fastened.
- ✓ Verify that the outdoor fan turns freely.
- ✓ Verify that the power supply branch circuit overcurrent protection is sized properly.
- ✓ Verify that the thermostat is wired correctly. The thermostat function switch should be set to OFF and the thermostat fan switch should be set to AUTO.

### Start-Up Procedure

#### **WARNING:**

**If this unit is equipped with crankcase heaters, allow 24 hrs for heating of the refrigerant compressor crankcase prior to start up or anytime the power has been removed for more than 12 hrs. Failure to comply may result in damage or cause premature failure of the system.**

#### Air Circulation

Leave the thermostat system mode on OFF, and set the fan mode to ON. Blower should run continuously. Check the air delivery at the supply registers and adjust register openings for balanced air distribution. Examine ductwork for leaks or obstruction if insufficient air is detected. Set the thermostat fan mode to AUTO. The blower should stop running.

**NOTE:** When FAN ON is selected, the blower will operate at 50% of selected airflow when no call for heating or cooling is present.

#### Lighting the Appliance

#### **WARNING:**

##### **FIRE OR EXPLOSION HAZARD**

- **Failure to follow safety warnings exactly could result in serious injury or property damage.**
- **Installation and service must be performed by a qualified installer, service agency or the gas supplier.**
- **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**

##### **WHAT TO DO IF YOU SMELL GAS**

- **Do not try to light any appliance.**
- **Do not touch any electrical switch; do not use any phone in your building.**
- **Leave the building immediately.**
- **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

#### **AVERTISSEMENT:**

##### **RISQUE D'INCENDIE OU D'EXPLOSION**

- **Le non-respect des avertissements de sécurité pourrait entraîner des blessures graves, la mort ou des dommages matériels.**
- **L'installation et l'entretien doivent être effectués par un installateur qualifié, un organisme de service ou le fournisseur de gazstaller, service agency or the gas supplier.**
- **Ne pas entreposer ni utiliser de l'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil, ni de tout autre appareil.**

##### **QUE FAIRE S'IL Y A UNE ODEUR DE GAZ**

- **Ne pas tenter d'allumer aucun appareil.**
- **Ne toucher à aucun interrupteur électrique; n'utiliser aucun téléphone dans le bâtiment.**
- **Évacuer l'immeuble immédiatement.**
- **Appeler immédiatement le fournisseur de gaz en employant le téléphone d'un voisin. Respecter à la lettre les instructions du fournisseur de gaz.**
- **Si personne ne répond, appeler le service des incendies.**



1. Turn ON the manual gas valve, located on the outside of the unit to the ON position.
2. Check all gas connections for leaks with a soap and water solution. If the solution bubbles there is a gas leak which must be corrected.
3. Turn on the electrical power to the appliance.
4. Place the gas valve ON/OFF switch to the ON position. See Figure 6 (page 17).
5. Set the thermostat above room temperature to begin the heating cycle of the furnace.
6. Check that the furnace ignites and operates properly.
7. After ignition, visually inspect the burner assembly to ensure that the flame is drawn directly into the center of the heat exchanger tube. In a properly adjusted burner assembly, the flame color should be blue with some light yellow streaks near the outer portions of the flame.

**NOTE:** The ignitor may not ignite the gas until all air is bled from the gas line. If the ignition control locks out, turn the thermostat to its lowest setting and wait one minute then turn the thermostat above room temperature and the ignitor will try again to ignite the main burners. This process may have to be repeated several times before the burners will ignite. After the burners are lit, check all gas connections for leaks again with the soap and water solution.

### Verifying System Heating (2-Stage Heating)

1. Set the thermostat to the lowest setting.
2. Follow the procedures given on the operating instruction label, in this manual or attached inside the louvered control access panel.
3. Set the thermostat one degree above room temperature and verify the Operating Sequence (page 19).
4. Verify that the compressor and outdoor fan motor are not energized.
5. After determining the system is running (1-2 minutes), raise the thermostat's setpoint an additional 3-4 degrees until the heating system moves into 2nd stage or high heat operating mode. The gas valve will energize to high heat mode while the induced draft motor and indoor blower motor both increase in speed.
6. After the unit has run for approximately five minutes, set the thermostat below room temperature and verify the shutdown sequence; steps 10 -12 in the Operating Sequence section (page 19).

### Verifying & Adjusting Temperature Rise

Verify the temperature rise through the unit is within the range specified on the unit data label. Temperature rises outside the specified range could result in premature heat exchanger failure.

1. Place thermometers in the return and supply air stream as close to the unit as possible. The thermometer on the supply air side must be shielded against direct radiation from the heat exchanger to avoid false readings.
2. Adjust all registers and duct dampers to the desired position. Run the unit for 10 to 15 minutes before taking any temperature readings. The temperature

rise is the difference between the supply and return air temperatures.

**NOTE:** For typical duct systems, the temperature rise will fall within the range specified on the data label (with the blower speed at the factory recommended setting) shown in Tables 9-13 (pages 24-28). If the measured temperature rise falls outside the specified range, it may be necessary to change the blower speed. Lowering the blower speed increases the temperature rise and a higher speed decreases the temperature rise.

The unit is equipped with an ECM type motors. Speed selection is made by setting the switches on the motor control board (Figure 10, page 31). **NOTE:** For change in blower speed selection to take effect, system power must be cycled off then restored after 10 seconds. Refer to the Blower Speed section (page 10) for additional information.

The integrated control starts the circulating air blower 22 seconds after the gas valve is opened. The control board is factory set to turn the blower motor off 120 seconds after the gas valve is closed.

### Gas Supply Pressure Verification & Adjustment

1. Turn OFF the gas supply at the manual valve located on the outside of the unit.
2. Using a 3/16" Allen wrench, remove the plug from the inlet pressure tap (INLET side of gas valve). See Figure 6 (page 17).
3. Install an 1/8" NPT pipe thread fitting, that is compatible with a Manometer or similar pressure gauge.
4. Connect the Manometer or pressure gauge to the Inlet Pressure Tap.
5. Turn ON the main gas supply at the manual valve.
6. Check and adjust the incoming gas line pressure to 4.5-10.0 inches Water Column for Natural gas or 11.0-14.0 inches Water Column if converting unit to LP/Propane gas.
7. Turn OFF the gas supply at the manual valve.
8. Disconnect the Manometer or pressure gauge.
9. Remove the NPT fitting and reinstall the INLET pressure tap plug. Hand tighten the plug first to prevent cross threading. Tighten with 3/16 Allen wrench.

### Verifying the Firing Rate of the Appliance

## **WARNING:**

**Do not attempt to drill the gas orifices. If the orifice size must be changed, use only factory supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.**

The firing rate must be verified for both LOW and HIGH fire for each installation to prevent over-firing of the unit. The firing rate must not exceed the rate shown on the unit data label. To determine the firing rate, follow the steps below:

1. Obtain the gas heating value (HHV) from the gas supplier.
2. Shut off all other gas fired appliances.
3. Start the unit in LOW heating mode and allow it to run for at least 3 minutes.
4. Measure the time (in seconds) required for the gas meter to complete one revolution.
5. Convert the time per revolution to cubic feet of gas per hour using Table 15 (page 29).
6. Multiply the gas flow rate in cubic feet per hour by the heating value of the gas in Btu per cubic foot to obtain the firing rate in Btu per hour. See Example.

| <b>EXAMPLE:</b><br><b>(INPUT --&gt; HIGH = 100,000 / LOW = 65,000)</b>                    |  |
|---|--|
| • Time for 1 revolution of a gas meter with a 1 cubic foot dial = 58 seconds.             |  |
| • From Table 15, read 62 cubic feet gas per hour.   |  |
| • Local heating value of the gas (obtained from gas supplier) = 1,040 Btu per cubic foot. |  |
| • Low Input rate = 1,040 x 62 = 64,480 Btuh = PASS  |  |

7. Record your findings and move unit operation to HIGH heating mode and Repeat Steps 3-6.
8. Adjust the manifold pressure if necessary by following the steps in the Measuring & Adjusting the Manifold sections (page 17). For additional information about elevations above 2,000 feet, see High Altitude Conversion section (page 13).

### Measuring the Manifold Pressure

The manifold pressure must be measured for both LOW and HIGH fire by installing a pressure gauge (Manometer, Magnehelic Meter, etc.) to the outlet end of the gas valve as follows:

1. Turn off all electrical power to the appliance.
2. Shut OFF the gas supply at the manual shutoff valve located outside of the appliance.
3. Using a 3/16" Allen wrench, remove the manifold pressure tap plug located on the outlet side of the gas valve (Figure 6).
4. Install an 1/8" NPT pipe thread fitting, that is compatible with a Manometer or similar pressure gauge.
5. Connect the Manometer or pressure gauge to the manifold pressure tap.
6. Set the room thermostat 1 degree above room temperature To start the furnace on LOW fire.
7. Allow the furnace to operate for 3 minutes and then check the manifold pressure. Compare the measured value with the value shown in Table 3 (page 14) for Natural Gas and Table 4 (page 14) for LP/Propane gas. If the manifold pressure is not set to the appropriate pressure, then it must be adjusted.
8. Record your findings and move unit operation to HIGH heating mode and Repeat Steps 3-6.

### Adjusting the Manifold Pressure

**NOTE:** If adjustment must be made to either LOW or HIGH fire settings perform the following steps:

1. Remove the cap screw from the top of the gas valve regulator (Figure 6).

2. Using a screwdriver or Allen wrench (where appropriate), slowly turn the adjustment screw till the appropriate manifold pressure listed in Table 3 or Table 4, or the LOW and/or HIGH firing rate for your specific gas HHV is achieved.

**NOTE:** Turning the screw clockwise increases the pressure, turning the screw counter-clockwise decreases the pressure. To prevent the screw from backing all the way out from the valve, turn the screw slowly.

3. Replace and tighten the cap screw or the plastic cap over the adjustment screw.

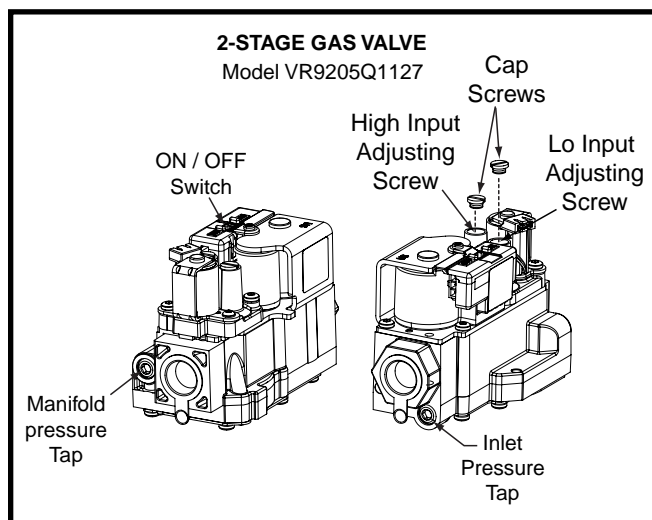
### Removing the Manometer/Pressure Gauge

After the LOW and HIGH manifold pressures are properly adjusted, the Manometer or pressure gauge must be removed from the gas valve.

1. Turn the thermostat to its lowest setting.
2. Turn OFF the main gas supply to the unit at the manual shut-off valve, which is located outside of the unit.
3. Turn OFF all of the electrical power supplies to the unit.
4. Remove the pressure gauge adapter from the gas valve and replace it with the 1/8" NPT manifold pressure plug that had been removed earlier. **NOTE:** Make sure the plug is tight and not cross-threaded.
5. Turn ON the electrical power to the unit.
6. Turn ON the main gas supply to the unit at the manual shut-off valve.

### Verifying Over-Temperature Limit Control Operation

1. Verify the louvered control access panel is in place and that there is power to the unit.
2. Block the return airflow to the unit by installing a close-off plate in place of or upstream of the filter.
3. Set the thermostat above room temperature and verify the units operating sequence (page 19).



**Figure 6. Regulator Capscrew & Tap Locations**

**NOTE:** The over-temperature limit control should turn off the gas valve within approximately four minutes (exact time depends on the efficiency of the close-off when blocking the return air). The circulating air and combustion blowers should continue to run when the over-temperature limit control switch opens.

4. Remove the close-off plate immediately after the over-temperature limit control opens. If the unit operates for more than four minutes with no return air, set the thermostat below room temperature, shut off power to the unit, and replace the over-temperature limit control.

#### Verifying Burner Operation

### **WARNING:**

**Uninsulated live components are exposed when louvered control access panel is removed.**

1. Remove the louvered control access panel and verify there is power to the unit.
2. Set thermostat above room temperature and observe the ignition sequence.

**NOTE:** The burner flame should carry over immediately between all burners without lifting off, curling, or floating. The flames should be blue, without yellow tips. Make sure the flame is drawn into the center of the heat exchanger tube. In a properly adjusted burner assembly, the flame bends down and to the right at the end of the heat exchanger tube. The end of the flame will be out of sight around the bend.

3. After validating flame characteristics, set the thermostat below room temperature and verify the burner flame extinguishes completely.

#### Verifying System Cooling (Single Stage Operation)

### **WARNING:**

**These units are shipped fully charged with R-410A refrigerant and ready for installation. When a system is installed according to these instructions, no refrigerant charging is required. If repairs make it necessary for evacuation and charging, it should only be done by qualified, trained personnel thoroughly familiar with this equipment. Some local codes require licensed installation/service personnel to service this type of equipment. Under no circumstances should the owner attempt to install and/or service this equipment. Failure to comply with this warning could result in property damage, personal injury, or death.**

### **CAUTION:**

**This unit uses R-410A refrigerant. DO NOT use any other refrigerant in this unit. Use of another refrigerant will damage the unit.**

1. Set the thermostat's system mode to COOL and the fan mode to AUTO. Gradually lower the thermostat temperature setpoint below room temperature and verify the compressor, fan and indoor blower energize.
2. Feel the air being circulated by the indoor blower and verify that it is cooler than ambient temperature. Listen for any unusual noises. If unusual sounds occur, determine the source of the noise and correct as necessary.
3. Allow the cooling system to operate for several minutes and then set the temperature selector above room temperature. Verify the fan and compressor cycle off with the thermostat. **NOTE:** The blower will also stop after a 60 second delay.

The system refrigerant charge can be checked and adjusted through the service ports provided at the front panel. Use only gauge lines which have a "Schrader" depression device present to actuate the valve. Draw a vacuum on gauge lines to remove air before attaching them to the service ports on the unit. Refrigerant charging must be done by qualified personnel familiar with safe and environmentally responsible refrigerant handling procedures.

## OPERATING SEQUENCE

The operating sequences for the heating, cooling, and fan modes are described below. Refer to the field and unit wiring diagram (Figure 12, page 32).

### Heating Mode

1. On a call for 1st stage heat, the thermostat closes and applies 24 VAC to terminal **W1** on the control board.
2. Safety Circuit Proving - The control board verifies continuity through the 24VAC limit control circuit. If the high temperature limit switch, inducer limit, and flame roll-out switch are closed and both the inducer hall effect sensor and vent pressure switches are open, the control board will then begin pressure switch proving. If an open limit is detected, the control board will energize the indoor blower motor and operate it continuously while the limit switch circuit is open. All other system functions will be inoperable until the limit circuit closes. While the limit circuit is open, the control will display Open Limit Switch Fault. See Table 5, (page 22).
3. The furnace control checks for continuity (24VAC) across the hall effect sensor and pressure switch. If either the hall effect sensor or vent pressure switch is closed, the heat mode sequence will not continue. If either remains closed, the control will display a Pressure Switch Closed with Inducer Off Fault until the fault condition clears.
4. Hall Effect Sensor and Pressure Switch Proving - The control energizes the induced draft motor on High speed and waits for the hall effect sensor and vent pressure switch to close. If the hall effect sensor switch does not close within 12 seconds, the control will display a Pressure Switch Open with Inducer On Fault. If the hall effect sensor switch does not close before 60 seconds expires, the control will de-energize the inducer for 5 minutes and continue to display a Pressure Switch Open with Inducer On Fault during the 5 minute inducer off period. After the inducer has been off for 5 minutes, the control energizes the inducer motor and restarts the 60 second pressure switch proving period.
5. Pre-Purge - If the hall effect sensor switch closes the control runs the inducer on high speed for a 30 second pre-purge time while monitoring the thermostat call for heat, limit switch circuit, vent pressure switch, and flame sense.
6. Igniter Warm Up - When the 30 second pre-purge time has elapsed, the control begins the Hot Surface Ignition (HSI) warm-up as follows:

*Initial Power up:* After 30 seconds of igniter warm-up, the gas valve will open. The igniter circuit will stay energized for 3 seconds after the gas valve opens.

*After Initial Power up:* The control has a programmed adaptive ignition feature which varies the warm-up period as follows: If ignition is successful the warm-up is reduced by 3 seconds on each subsequent call for heat until ignition failure occurs. Upon ignition failure, the warm-up is increased by 3 seconds on the next try. If successful, the timing remains fixed at this level. In general, whenever ignition failure occurs the warm-up interval is increased by 3 seconds on the next try.

If successful, it remains there. Minimum and maximum warm-up time limits are set at 9 and 54 seconds.

7. Flame Proving / Ignition / Low Heat Operation - The furnace control must prove flame via the flame sensor 5 seconds after the high main gas valve is energized.
  - If flame is sensed, burners are on and the igniter cools off. The Yellow LED will be lit.
  - If no flame is sensed, the gas valve closes immediately and the inducer continues to run on high. A second trial for ignition (step 6) begins. If no flame is sensed on the fifth try for ignition, the furnace control is locked and the control will display 1 Hour Lockout Fault. The thermostat must be opened for at least 10 seconds to reset the furnace control after a lock out. Otherwise, the furnace will attempt another ignition sequence in 1 hour.

*Low Fire Heat (Stage 1):* If flame is present at the end of the trial for ignition time, the control leaves High main gas valve energized and inducer motor on High speed for the first 15 seconds, and begins the heat blower 22 second on delay. Control inputs are continuously monitored while the call for heat remains. The control will always energize the gas valve on High fire with the inducer on High speed for the first 15 seconds of any heating cycle. After this 15 second period, the control switches the gas valve to Low fire and inducer to Low speed if no second stage (**W2**) demand is present.

8. Blower Start-Up - After flame is proven, the furnace control energizes the circulating air blower after 22 seconds. The blower will then ramp up to the airflow selected for heating.
9. High Heat Staging (with 2 Stage Heat Thermostat) - Unit will always start in High heat operation. See step 7 for start up sequence. After the initial 15 second start up sequence is satisfied, the control will move to Low heat and wait for a **W2** call from a 2-stage thermostat. After a second stage heat demand is present (**W2** energized), the gas valve will open to High heat mode increasing the flow of gas to the burners while the inducer and blower motor ramp to high speed.

Single Stage Heat Thermostat with Automatic Heat Staging - Automatic heat staging allows the unit to operate as a two stage gas furnace with the use of a single stage heating thermostat. With the ignition control AUTO HEAT STAGE jumper repositioned from the OFF position to the ON position, see Figure 11 (page 31), the gas furnace will automatically switch to High heat mode of operation after a 10 minute delay. The induced draft motor and blower motor will both ramp to high speed.

10. When the thermostat has been satisfied, gas valve is de-energized.
11. The inducer motor is de-energized after a 30 second post purge.
12. The circulating air blower will remain energized for approximately 120 seconds (factory setting) after the demand for heat is no longer present.
13. Abnormal Conditions - If a limit switch opens during heating operation the gas valve is de-energized

immediately. The control de-energizes the induced draft motor and runs the indoor blower motor continuously while the limit switch is open.

**NOTE: This unit has two special features programmed into the furnace control board for safety and proper unit operation.**

### Thaw Cycle Start Up / Shutdown

The vent pressure switch is constantly monitored throughout the ignition cycle. If after 1 minute of burner ignition the vent pressure switch remains open, the control will de-energize the gas valve, energize the main blower, and begin another ignition sequence after a 30 second inter-purge. If after 5 cycles the pressure switch fails to close the unit will lockout for a period of one hour. The blower stays energized for the selected blower off delay period. This feature only activates if the unit is off for extended periods of time between heating cycles in extremely cold weather which could lead to ice formation over the vent pressure tap or the switch itself is faulty. Any ice formation will clear after one or two trials. One hour lockout period can be terminated by shutting off the thermostat for 5-10 seconds or main power to unit for 1-2 seconds.

### Blocked Vent / Condensate Disposal Shutdown

The pressure switch is constantly monitored throughout the ignition cycle. After normal operation is established, if the pressure switch opens for more than 2-3 seconds, the unit will shutdown and go into a 1 hour lockout. The control will de-energize the gas valve and inducer motor after normal post purge timing, energize the main blower, and store the fault in non-volatile memory. The blower stays energized for the selected blower off delay period. The ignition control will display a flash code of Green-OFF / Red-Flash to indicate system fault for "Pressure Switch Loss Due To Blocked Vent / Condensate Disposal". One hour lockout period can be terminated by shutting off the thermostat for 5-10 seconds or main power to unit for 1-2 seconds.

After expiration of the 1 hour lockout period or manual reset, the control will attempt a new ignition cycle. If the pressure switch fails to close on first ignition attempt of one minute burn time and a non-volatile condensate/vent fault is set, control will go back to lockout and display the condensate/vent fault flash code. Fault remains stored in non-volatile memory even with cycling of thermostat or main power. **NOTE: Nonvolatile blocked condensate/vent fault will be cleared when a complete thermostat heat demand is satisfied in steady state heat mode.**

### Cooling Mode - Single Stage Operation

1. On a call for cooling, the thermostat closes applying 24 VAC to the **G** & **Y** terminals on the low voltage terminal strip.
2. The **G** terminal applies 24VAC to the **G** terminal of the integrated control, energizing the main circulating blower circuit at the selected cooling speed.

3. The **Y** terminal applies 24VAC to the contactor energizing the outdoor compressor and fan.
4. When the thermostat is satisfied, the contactor and integrated control de-energize. Compressor and outdoor fan will stop running.
5. The circulating blower motor de-energizes after a 60 second delay.

### De-Humidification Control

If installing a humidistat, install it in the return air duct as directed in the installation instructions included in the accessory kit. Run the humidistat wiring through the low voltage wire entrance of the packaged unit. Connect one side of the humidistat to the **R** terminal of the low voltage field connection board and connect the other side to the **DEHUM** terminal on the blower control board. Wire the humidistat to close on rise in humidity.

For dehumidification, the **DEHUM** input on the FSHE board (Figure 10, page 31) can be used to control this function. If the **DEHUM** input is active and the unit is operating, the blower CFM is 75% of cooling for the operating speed.

### Fan Mode

1. On a call for fan only operation, the thermostat applies 24 VAC to the **G** terminal connected to the **G** terminal of the integrated control.
2. The circulating blower is energized immediately and will operate approximately 50% of the selected airflow when no call for heating or cooling is present.

**NOTE:** If a call for heat occurs, the circulating blower de-energizes prior to normal heating cycle.

## COMPONENT FUNCTIONS

**Flame Roll-Out Control** - The flame roll-out control acts to verify that the burner flame is being drawn into the heat exchanger tubes. If the burner flame is not being drawn into the heat exchanger tubes, the roll-out control will open within several seconds and the integrated control diagnostic light will flash one time. The circulating air blower and combustion blower will continue to operate if the flame roll-out control opens.

**Flame Sensor** - The flame sensor acts to prove that flame has carried over from the ignitor to the right-most burner. If no flame is sensed, the unit will be shut down automatically.

**Gas Valve** - The gas valve controls the flow of gas to the burners. When the gas valve is energized it automatically opens and regulates the gas pressure in the manifold.

**Inducer Hall Effect Sensor Switch** - This sensor verifies the inducer motor is running in the event of power outages or during long intervals of unit off time where pressure switch reading could be lost due to ice formation over the pressure switch port. This will clear within the first or second thaw cycle routine.

**Pressure Switch** - The pressure switch verifies that the inducer motor is drawing the combustion gases through the heat exchanger tubes and venting the gases through the vent system.

**Over-Temperature Limit Control** - The over-temperature limit control prevents the air temperature leaving the unit from exceeding the maximum outlet air temperature. If the limit opens, the integrated control diagnostic will flash one time. The circulating air blower and combustion blower will continue to operate if the over-temperature limit control opens.

## EQUIPMENT MAINTENANCE

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury or property damage.**

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- Before servicing, disconnect all electrical power to furnace.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing.”

### **AVERTISSEMENT:**

#### **RISQUE DE CHOC ÉLECTRIQUE, D'INCENDIE OU D'EXPLOSION**

**Le non-respect des avertissements de sécurité pourrait entraîner un fonctionnement dangereux de l'appareil, des blessures graves, la mort ou des dommages matériels.**

**Un entretein incorrect pourrait entraîner un fonctionnement dangereux de l'appareil, des blessures graves, la mort ou des dommages matériels**

- Couper toute alimentation électrique au générateur d'air chaud avant de prodéder aux travaux d'entretein.
- Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. S'assurer de les raccorder correctement.
- S'assurer que l'appareil fonctionne adéquatement après l'entretien.

### **CAUTION:**

**Use care when removing parts from this unit. Personal injury can result from sharp metal edges present in all equipment of sheet metal construction.**

Proper maintenance is important to achieve optimum performance from the system. The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these skills, contact your dealer for maintenance. Consult your local dealer about the availability of maintenance contracts. Routine maintenance should include the following:

### **CAUTION:**

**The unit should never be operated without a filter in the return air system. Replace disposable filters with the same type and size.**

- Inspect, clean or replace air filters at the beginning of each heating and cooling season, or more frequently if required.
- Inspect the evaporator condensate drain and outdoor coil at the beginning of each cooling season. Remove any debris. Clean the outdoor coil and louvers as necessary using a mild detergent and water. Rinse thoroughly with water.
- Inspect the electrical connections for tightness at the beginning of each heating and cooling season.
- The blower compartment should be cleaned monthly during the heating and cooling seasons to remove any dirt and lint that may have accumulated in the compartment or on the blower and motor. Buildup of dirt and lint on the blower and motor can create excessive loads on the motor resulting in higher than normal operating temperatures and possible shortened service life.
- The motors for the circulating air blower, outdoor fan, and combustion blower are pre-lubricated at the factory. No further oiling is required for the life of this product.
- Inspect and clean the screen of the vent cover assembly at the beginning of each heating and cooling season.
- Inspect the heat exchanger condensate drain at the beginning of each heating season.
- Inspect condensate disposal pit or trench to ensure ground is still higher than surrounding area to shed rain and melting snow away from pit or trench.

## Heat Exchanger & Burner Maintenance

### **WARNING:**

**Holes in the heat exchanger can cause products of combustion to enter the home. Replace the heat exchanger if leaks are found. Failure to prevent products of combustion from being circulated into the living space can create potentially hazardous conditions including carbon monoxide poisoning that could result in personal injury or death.**

- Maintain heat exchanger and burners. The furnace should operate for many years without excessive scale buildup in the heat exchanger, however, the heat exchanger, the vent system, and the burners should be inspected and cleaned (if required) by a qualified serviceman annually to ensure continued safe operation.

Particular attention must be given to identify deterioration from corrosion or other sources.

## Cleaning of Burners

If the burners must be cleaned, follow the steps below.

1. Shut off the gas supply to the unit either at the meter or at a manual valve in the supply piping.
2. Turn off all power to the unit and set the thermostat to the lowest temperature setting.
3. Remove the louvered control access panel from the unit.
4. Turn the gas control switch to the OFF position. See Figure 8 (page 30) for gas valve shut off instructions.
5. Disconnect the wires from the gas valve, ignitor, and flame sensor. **NOTE:** Mark wires to prevent miswiring of unit when reassembling.

## CAUTION:

**To prevent damage to the unit or internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not over tighten!**

6. Using two wrenches, separate the ground-joint union in the gas supply piping at the unit.
7. Remove the piping between the gas valve and the ground-joint union (if applicable).
8. Remove all screws securing the burner assembly to the unit.
9. Carefully remove the burner assembly from the unit. **DO NOT DAMAGE THE IGNITER WHILE REMOVING THE BURNER ASSEMBLY.**
10. Inspect the burners for accumulated dust or debris. If necessary carefully clean them with a soft wire brush and a vacuum cleaner. **DO NOT DAMAGE THE IGNITER WHILE CLEANING THE BURNER.**
11. Replace all the parts in reverse order from which they were removed.
12. Follow the lighting instructions found on the lower unit door to return the unit to operation.
13. Verify proper operation after servicing.

## TROUBLESHOOTING

### Cooling Mode

If the unit does not operate in the cooling mode, check the following:

- Verify the thermostat is operating properly
- Verify electrical power to the unit is turned on
- Verify the filters are not dirty
- Verify the service doors are in place
- Verify the 3 amp fuse is operational
- Verify the anti-short cycle timer's 5 minute cycle has finished.
- Verify the LED flash code (on the blower control board) against the diagnostic codes listed in Table 5 or on the wiring diagram (Figure 12, page 32).

### Heating Mode

If the unit does not operate in the heating mode, check the following:

- Verify the thermostat is operating properly
- Verify electrical power to the unit is turned on
- Verify the filters are not dirty
- Verify the gas is turned on and the manual shut-off valve is open and the gas valve switch is in the ON position
- Verify the service doors are in place
- Verify the flame roll-out switch is closed
- Verify the 3 amp fuse is operational
- Verify the LED flash codes on the furnace ignition control board against the diagnostic codes listed in Table 5 or on the wiring diagram (Figure 12 page 32).
- Verify the LED flash codes on the motor control board against the diagnostic codes listed in Table 6 or on the wiring diagram (Figure 12).

| DIAGNOSTIC DESCRIPTION           | GREEN LED         | RED LED |
|----------------------------------|-------------------|---------|
| Control Fault (No Power)         | Off               | Off     |
| L1/Neutral Polarity Fault        | Flash             | Flash   |
| 1 Hour Lockout                   | Alternating Flash |         |
| Normal Operation                 | On                | On      |
| Pressure Switch Closed Fault     | On                | Flash   |
| Pressure Switch Open Fault       | Flash             | On      |
| Open Limit Switch Fault          | Flash             | Off     |
| Motor Fault                      | On                | Off     |
| Blocked Condensate Drain or Vent | OFF               | Flash   |
| DIAGNOSTIC DESCRIPTION           | YELLOW LED        |         |
| Low Flame Sensor Signal          | Continuous Flash  |         |
| Flame Present                    | On                |         |

**Table 5. Furnace Control Board Fault Conditions**

|                         | DIAGNOSTIC DESCRIPTION   | GREEN LED | RED LED |
|-------------------------|--------------------------|-----------|---------|
| VARIABLE SPEED FURNACES | Control Fault (No Power) | Off       | Off     |
|                         | Normal Operation         | On        | On      |
|                         | Motor Fault              | On        | Flash   |
|                         | Communications Fault     | Flash     | Flash   |

**Table 6. Motor Control Board Fault Conditions**



## FIGURES & TABLES

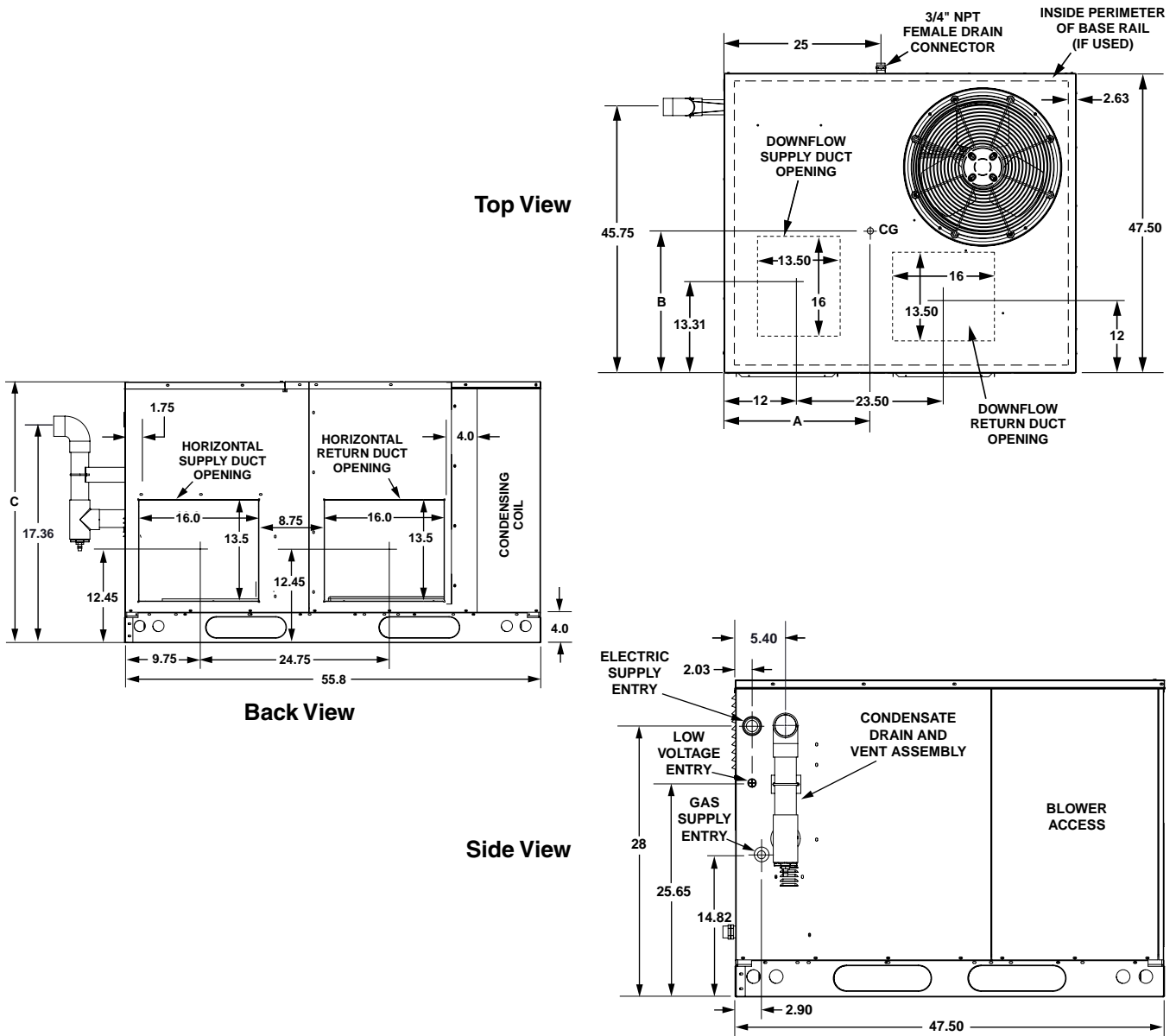


Figure 7. Unit Dimensions

| MODEL NUMBER<br>R8HE / PPG3HE | UNIT WEIGHT | SHIPPING WEIGHT | CENTER OF GRAVITY |      | UNIT DIMENSIONS (INCHES) |                           |        |       |
|-------------------------------|-------------|-----------------|-------------------|------|--------------------------|---------------------------|--------|-------|
|                               |             |                 | A                 | B    | HEIGHT WITH BASE RAILS   | HEIGHT WITHOUT BASE RAILS | LENGTH | WIDTH |
| X24K060X                      | 380         | 410             | 26.5              | 26.5 | 35                       | 31.3                      | 55.8   | 47.5  |
| X30K060X                      | 384         | 414             | 26.5              | 26.5 | 35                       | 31.3                      | 55.8   | 47.5  |
| X36K080X                      | 391         | 417             | 26.5              | 26.5 | 35                       | 31.3                      | 55.8   | 47.5  |
| X42K080X                      | 407         | 436             | 27.0              | 26.5 | 39                       | 35.3                      | 55.8   | 47.5  |
| X48K100X                      | 455         | 482             | 27.5              | 26.5 | 43                       | 39.3                      | 55.8   | 47.5  |
| X60K100X                      | 485         | 510             | 28.0              | 26.5 | 47                       | 43.3                      | 55.8   | 47.5  |

Table 7. Center of Gravity & Shipping Weights

## Airflow Information

| SWITCH SETTING |   |   |   | RECOMMENDED AIRFLOW (CFM) |             | SWITCH SETTING |   |   |   | RECOMMENDED AIRFLOW (CFM) |             |
|----------------|---|---|---|---------------------------|-------------|----------------|---|---|---|---------------------------|-------------|
| 5              | 6 | 7 | 8 |                           |             | 5              | 6 | 7 | 8 |                           |             |
| 0              | 0 | 0 | 0 | <b>2 TON</b>              | 800         | 0              | 0 | 0 | 0 | <b>2.5 TON</b>            | 800         |
| 1              | 0 | 0 | 0 |                           | <b>875</b>  | 1              | 0 | 0 | 0 |                           | 875         |
| 0              | 1 | 0 | 0 |                           | 925         | 0              | 1 | 0 | 0 |                           | 925         |
| 1              | 1 | 0 | 0 |                           | 1000        | 1              | 1 | 0 | 0 |                           | 1000        |
| 0              | 0 | 1 | 0 |                           | 1075        | 0              | 0 | 1 | 0 |                           | 1075        |
| 1              | 0 | 1 | 0 |                           | 1125        | 1              | 0 | 1 | 0 |                           | <b>1125</b> |
| 0              | 1 | 1 | 0 |                           | 1175        | 0              | 1 | 1 | 0 |                           | 1175        |
| 1              | 1 | 1 | 0 |                           | 1225        | 1              | 1 | 1 | 0 |                           | 1225        |
| 0              | 0 | 0 | 1 |                           | 1300        | 0              | 0 | 0 | 1 |                           | 1300        |
| 1              | 0 | 0 | 1 |                           | 1350        | 1              | 0 | 0 | 1 |                           | 1350        |
| 0              | 1 | 0 | 1 | <b>3 TON</b>              | 1400        | 0              | 1 | 0 | 1 | <b>3.5 TON</b>            | 1400        |
| 1              | 1 | 0 | 1 |                           | 1450        | 1              | 1 | 0 | 1 |                           | 1450        |
| 0              | 0 | 1 | 1 |                           | 1500        | 0              | 0 | 1 | 1 |                           | 1500        |
| 1              | 0 | 1 | 1 |                           | 1525        | 1              | 0 | 1 | 1 |                           | 1525        |
| 0              | 1 | 1 | 1 |                           | 1560        | 0              | 1 | 1 | 1 |                           | 1560        |
| 1              | 1 | 1 | 1 |                           | 1600        | 1              | 1 | 1 | 1 |                           | 1600        |
| 0              | 0 | 0 | 0 |                           | 800         | 0              | 0 | 0 | 0 |                           | 820         |
| 1              | 0 | 0 | 0 |                           | 875         | 1              | 0 | 0 | 0 |                           | 900         |
| 0              | 1 | 0 | 0 |                           | 925         | 0              | 1 | 0 | 0 |                           | 990         |
| 1              | 1 | 0 | 0 |                           | 1000        | 1              | 1 | 0 | 0 |                           | 1075        |
| 0              | 0 | 1 | 0 |                           | 1085        | 0              | 0 | 1 | 0 |                           | 1160        |
| 1              | 0 | 1 | 0 |                           | 1140        | 1              | 0 | 1 | 0 |                           | 1210        |
| 0              | 1 | 1 | 0 |                           | <b>1200</b> | 0              | 1 | 1 | 0 |                           | 1260        |
| 1              | 1 | 1 | 0 |                           | 1260        | 1              | 1 | 1 | 0 |                           | 1340        |
| 0              | 0 | 0 | 1 |                           | 1320        | 0              | 0 | 0 | 1 |                           | 1420        |
| 1              | 0 | 0 | 1 |                           | 1375        | 1              | 0 | 0 | 1 |                           | <b>1475</b> |
| 0              | 1 | 0 | 1 |                           | 1425        | 0              | 1 | 0 | 1 |                           | 1525        |
| 1              | 1 | 0 | 1 |                           | 1460        | 1              | 1 | 0 | 1 |                           | 1570        |
| 0              | 0 | 1 | 1 |                           | 1500        | 0              | 0 | 1 | 1 |                           | 1605        |
| 1              | 0 | 1 | 1 |                           | 1530        | 1              | 0 | 1 | 1 |                           | 1650        |
| 0              | 1 | 1 | 1 |                           | 1560        | 0              | 1 | 1 | 1 |                           | 1700        |
| 1              | 1 | 1 | 1 |                           | 1600        | 1              | 1 | 1 | 1 |                           | 1725        |
| 0              | 0 | 0 | 0 | <b>4 TON</b>              | 1240        | 0              | 0 | 0 | 0 | <b>5 TON</b>              | 1240        |
| 1              | 0 | 0 | 0 |                           | 1300        | 1              | 0 | 0 | 0 |                           | 1300        |
| 0              | 1 | 0 | 0 |                           | 1370        | 0              | 1 | 0 | 0 |                           | 1370        |
| 1              | 1 | 0 | 0 |                           | 1420        | 1              | 1 | 0 | 0 |                           | 1420        |
| 0              | 0 | 1 | 0 |                           | 1470        | 0              | 0 | 1 | 0 |                           | 1470        |
| 1              | 0 | 1 | 0 |                           | 1530        | 1              | 0 | 1 | 0 |                           | 1530        |
| 0              | 1 | 1 | 0 |                           | 1590        | 0              | 1 | 1 | 0 |                           | 1590        |
| 1              | 1 | 1 | 0 |                           | <b>1640</b> | 1              | 1 | 1 | 0 |                           | 1640        |
| 0              | 0 | 0 | 1 |                           | 1690        | 0              | 0 | 0 | 1 |                           | 1690        |
| 1              | 0 | 0 | 1 |                           | 1750        | 1              | 0 | 0 | 1 |                           | <b>1750</b> |
| 0              | 1 | 0 | 1 |                           | 1780        | 0              | 1 | 0 | 1 |                           | 1780        |
| 1              | 1 | 0 | 1 |                           | 1810        | 1              | 1 | 0 | 1 |                           | 1810        |
| 0              | 0 | 1 | 1 |                           | 1840        | 0              | 0 | 1 | 1 |                           | 1840        |
| 1              | 0 | 1 | 1 |                           | 1870        | 1              | 0 | 1 | 1 |                           | 1870        |
| 0              | 1 | 1 | 1 |                           | 1900        | 0              | 1 | 1 | 1 |                           | 1900        |
| 1              | 1 | 1 | 1 |                           | 1930        | 1              | 1 | 1 | 1 |                           | 1930        |

**NOTE:** Factory settings & recommended operating range are highlighted in bold / italics.

**Table 8. Cooling Airflow Settings**

| SWITCH SETTING |   |   |   | 2 & 2.5 TON CFM |           |             |           | SWITCH SETTING |   |   |   | 3.5 TON CFM   |           |             |           |
|----------------|---|---|---|-----------------|-----------|-------------|-----------|----------------|---|---|---|---------------|-----------|-------------|-----------|
|                |   |   |   | LOW HEAT        |           | HIGH HEAT   |           |                |   |   |   | LOW HEAT      |           | HIGH HEAT   |           |
|                |   |   |   | 39,000          |           | 60,000      |           |                |   |   |   | 52,000        |           | 80,000      |           |
| 1              | 2 | 3 | 4 | CFM             | RISE      | CFM         | RISE      | 1              | 2 | 3 | 4 | CFM           | RISE      | CFM         | RISE      |
| 0              | 0 | 0 | 0 | 600             | 57        | 800         | 66        | 0              | 0 | 0 | 0 | 612           | 75        | 817         | 86        |
| 1              | 0 | 0 | 0 | 656             | 52        | 875         | 60        | 1              | 0 | 0 | 0 | 675           | 68        | 900         | 78        |
| 0              | 1 | 0 | 0 | 694             | 49        | 925         | 57        | 0              | 1 | 0 | 0 | 750           | 61        | 1000        | 70        |
| 1              | 1 | 0 | 0 | 750             | 46        | 1000        | 53        | 1              | 1 | 0 | 0 | 806           | 57        | 1075        | 65        |
| 0              | 0 | 1 | 0 | 806             | 43        | 1075        | 49        | 0              | 0 | 1 | 0 | 863           | 53        | 1150        | 61        |
| 1              | 0 | 1 | 0 | 844             | 41        | 1125        | 47        | 1              | 0 | 1 | 0 | 900           | 51        | 1200        | 59        |
| 0              | 1 | 1 | 0 | 881             | 39        | 1175        | 45        | 0              | 1 | 1 | 0 | 938           | 49        | 1250        | 56        |
| 1              | 1 | 1 | 0 | <b>919</b>      | <b>37</b> | <b>1225</b> | <b>43</b> | 1              | 1 | 1 | 0 | 994           | 46        | 1325        | 53        |
| 0              | 0 | 0 | 1 | 975             | 35        | 1300        | 40        | 0              | 0 | 0 | 1 | 1050          | 44        | 1400        | 49        |
| 1              | 0 | 0 | 1 | 1013            | 34        | 1350        | 39        | 1              | 0 | 0 | 1 | 1106          | 41        | 1475        | 48        |
| 0              | 1 | 0 | 1 | 1050            | 33        | 1400        | 38        | 0              | 1 | 0 | 1 | <b>1144</b>   | <b>40</b> | <b>1525</b> | <b>46</b> |
| 1              | 1 | 0 | 1 | 1088            | 32        | 1450        | 36        | 1              | 1 | 0 | 1 | 1181          | 39        | 1575        | 45        |
| 0              | 0 | 1 | 1 | 1125            | 30        | 1500        | 35        | 0              | 0 | 1 | 1 | 1208          | 38        | 1610        | 44        |
| 1              | 0 | 1 | 1 | 1144            | 30        | 1525        | 35        | 1              | 0 | 1 | 1 | 1238          | 37        | 1650        | 43        |
| 0              | 1 | 1 | 1 | 1170            | 29        | 1560        | 34        | 0              | 1 | 1 | 1 | 1275          | 36        | 1700        | 41        |
| 1              | 1 | 1 | 1 | 1200            | 29        | 1600        | 33        | 1              | 1 | 1 | 1 | 1294          | 35        | 1725        | 41        |
| SWITCH SETTING |   |   |   | 3 TON CFM       |           |             |           | SWITCH SETTING |   |   |   | 4 & 5 TON CFM |           |             |           |
|                |   |   |   | LOW HEAT        |           | HIGH HEAT   |           |                |   |   |   | LOW HEAT      |           | HIGH HEAT   |           |
|                |   |   |   | 52,000          |           | 80,000      |           |                |   |   |   | 65,000        |           | 100,000     |           |
| 1              | 2 | 3 | 4 | CFM             | RISE      | CFM         | RISE      | 1              | 2 | 3 | 4 | CFM           | RISE      | CFM         | RISE      |
| 0              | 0 | 0 | 0 | 600             | 76        | 800         | 88        | 0              | 0 | 0 | 0 | 930           | 61        | 1240        | 71        |
| 1              | 0 | 0 | 0 | 656             | 70        | 875         | 80        | 1              | 0 | 0 | 0 | 975           | 59        | 1300        | 68        |
| 0              | 1 | 0 | 0 | 694             | 66        | 925         | 76        | 0              | 1 | 0 | 0 | 1028          | 56        | 1370        | 64        |
| 1              | 1 | 0 | 0 | 750             | 61        | 1000        | 70        | 1              | 1 | 0 | 0 | 1065          | 54        | 1420        | 62        |
| 0              | 0 | 1 | 0 | 814             | 56        | 1085        | 65        | 0              | 0 | 1 | 0 | 1103          | 52        | 1470        | 60        |
| 1              | 0 | 1 | 0 | 855             | 53        | 1140        | 62        | 1              | 0 | 1 | 0 | 1148          | 50        | 1530        | 57        |
| 0              | 1 | 1 | 0 | 900             | 51        | 1200        | 59        | 0              | 1 | 1 | 0 | 1193          | 48        | 1590        | 55        |
| 1              | 1 | 1 | 0 | 945             | 48        | 1260        | 56        | 1              | 1 | 1 | 0 | 1230          | 46        | 1640        | 54        |
| 0              | 0 | 0 | 1 | 990             | 46        | 1320        | 52        | 0              | 0 | 0 | 1 | 1268          | 45        | 1690        | 51        |
| 1              | 0 | 0 | 1 | 1031            | 44        | 1375        | 51        | 1              | 0 | 0 | 1 | 1313          | 44        | 1750        | 50        |
| 0              | 1 | 0 | 1 | 1069            | 43        | 1425        | 49        | 0              | 1 | 0 | 1 | 1335          | 43        | 1780        | 49        |
| 1              | 1 | 0 | 1 | 1095            | 42        | 1460        | 48        | 1              | 1 | 0 | 1 | 1358          | 42        | 1810        | 49        |
| 0              | 0 | 1 | 1 | 1125            | 41        | 1500        | 47        | 0              | 0 | 1 | 1 | 1380          | 41        | 1840        | 48        |
| 1              | 0 | 1 | 1 | <b>1148</b>     | <b>40</b> | <b>1530</b> | <b>46</b> | 1              | 0 | 1 | 1 | 1403          | 41        | 1870        | 47        |
| 0              | 1 | 1 | 1 | 1170            | 39        | 1560        | 45        | 0              | 1 | 1 | 1 | 1425          | 40        | 1900        | 46        |
| 1              | 1 | 1 | 1 | 1200            | 38        | 1600        | 44        | 1              | 1 | 1 | 1 | <b>1448</b>   | <b>39</b> | <b>1930</b> | <b>46</b> |

**NOTES:**

1. Factory settings are bold / italicized. Use of any other switch setting may result in nuisance trips and should be verified for the application.
2. Temperature rises in tables are approximate. Actual temperature rises may vary.
3. Shaded areas are not approved for proper operation of equipment.

**Table 9. Heating Airflow Settings**

**R8HE / PPG3HE -X24K060X / -X30K060X**  
**60,000 BTUH, 30" CABINET, 11"X8" BLOWER W- 3/4 HP ECM MOTOR**

| 230 VOLT OPERATION |          |          |          |             |           |             |           |             |           |             |           |             |           |             |           |             |           |      |      |      |      |
|--------------------|----------|----------|----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|------|------|------|------|
| SWITCH SETTINGS    |          |          |          | 0.20        |           | 0.30        |           | 0.40        |           | 0.50        |           | 0.60        |           | 0.70        |           | 0.80        |           | 0.90 |      | 1.00 |      |
| 1                  | 2        | 3        | 4        | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM  | RISE | CFM  | RISE |
| 0                  | 0        | 0        | 0        | 824         | 64        | 782         | 67        | 740         | 71        | 697         | 76        | 653         | 81        | 611         | 86        | 568         | 93        | 529  | 100  | 489  | 108  |
| 1                  | 0        | 0        | 0        | 894         | 59        | 852         | 62        | 810         | 65        | 766         | 69        | 722         | 73        | 681         | 78        | 640         | 82        | 601  | 88   | 562  | 94   |
| 0                  | 1        | 0        | 0        | 964         | 55        | 922         | 57        | 880         | 60        | 836         | 63        | 791         | 67        | 752         | 70        | 712         | 74        | 674  | 78   | 635  | 83   |
| 1                  | 1        | 0        | 0        | 1039        | 51        | 997         | 53        | 956         | 55        | 915         | 58        | 874         | 60        | 833         | 63        | 793         | 67        | 754  | 70   | 716  | 74   |
| 0                  | 0        | 1        | 0        | 1113        | 47        | 1073        | 49        | 1032        | 51        | 995         | 53        | 957         | 55        | 915         | 58        | 873         | 60        | 835  | 63   | 797  | 66   |
| 1                  | 0        | 1        | 0        | 1168        | 45        | 1128        | 47        | 1088        | 49        | 1051        | 50        | 1014        | 52        | 973         | 54        | 932         | 57        | 894  | 59   | 857  | 62   |
| 0                  | 1        | 1        | 0        | 1222        | 43        | 1183        | 45        | 1144        | 46        | 1107        | 48        | 1070        | 49        | 1031        | 51        | 991         | 53        | 954  | 55   | 916  | 58   |
| <b>1</b>           | <b>1</b> | <b>1</b> | <b>0</b> | <b>1283</b> | <b>41</b> | <b>1246</b> | <b>42</b> | <b>1209</b> | <b>44</b> | <b>1158</b> | <b>46</b> | <b>1107</b> | <b>48</b> | <b>1081</b> | <b>49</b> | <b>1054</b> | <b>50</b> | 1015 | 52   | 975  | 54   |
| 0                  | 0        | 0        | 1        | 1343        | 39        | 1308        | 40        | 1273        | 41        | 1209        | 44        | 1144        | 46        | 1131        | 47        | 1117        | 47        | 1076 | 49   | 1034 | 51   |
| 1                  | 0        | 0        | 1        | 1393        | 38        | 1358        | 39        | 1324        | 40        | 1273        | 41        | 1223        | 43        | 1196        | 44        | 1169        | 45        | 1128 | 47   | 1088 | 49   |
| 0                  | 1        | 0        | 1        | 1443        | 37        | 1409        | 37        | 1374        | 38        | 1338        | 39        | 1301        | 41        | 1261        | 42        | 1220        | 43        | 1181 | 45   | 1142 | 46   |
| 1                  | 1        | 0        | 1        | 1482        | 36        | 1446        | 37        | 1410        | 37        | 1374        | 38        | 1339        | 39        | 1300        | 41        | 1261        | 42        | 1223 | 43   | 1185 | 45   |
| 0                  | 0        | 1        | 1        | 1521        | 35        | 1483        | 36        | 1445        | 37        | 1411        | 37        | 1376        | 38        | 1339        | 39        | 1301        | 41        | 1264 | 42   | 1227 | 43   |
| 1                  | 0        | 1        | 1        | 1560        | 34        | 1522        | 35        | 1485        | 36        | 1450        | 36        | 1416        | 37        | 1378        | 38        | 1340        | 39        | 1303 | 40   | 1267 | 42   |
| 0                  | 1        | 1        | 1        | 1598        | 33        | 1562        | 34        | 1525        | 35        | 1490        | 35        | 1455        | 36        | 1417        | 37        | 1379        | 38        | 1343 | 39   | 1306 | 40   |
| 1                  | 1        | 1        | 1        | 1633        | 32        | 1595        | 33        | 1557        | 34        | 1524        | 35        | 1490        | 35        | 1458        | 36        | 1426        | 37        | 1390 | 38   | 1353 | 39   |

| 208 VOLT OPERATION |          |          |          |             |           |             |           |             |           |             |           |             |           |             |           |            |           |      |      |      |      |
|--------------------|----------|----------|----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|------------|-----------|------|------|------|------|
| SWITCH SETTINGS    |          |          |          | 0.20        |           | 0.30        |           | 0.40        |           | 0.50        |           | 0.60        |           | 0.70        |           | 0.80       |           | 0.90 |      | 1.00 |      |
| 1                  | 2        | 3        | 4        | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM        | RISE      | CFM  | RISE | CFM  | RISE |
| 0                  | 0        | 0        | 0        | 783         | 67        | 740         | 71        | 696         | 76        | 645         | 82        | 594         | 89        | 554         | 95        | 514        | 103       | 472  | 112  | 429  | 123  |
| 1                  | 0        | 0        | 0        | 851         | 62        | 808         | 65        | 765         | 69        | 719         | 73        | 672         | 79        | 631         | 84        | 590        | 90        | 549  | 96   | 509  | 104  |
| 0                  | 1        | 0        | 0        | 919         | 57        | 877         | 60        | 834         | 63        | 792         | 67        | 750         | 70        | 708         | 75        | 665        | 79        | 627  | 84   | 588  | 90   |
| 1                  | 1        | 0        | 0        | 994         | 53        | 953         | 55        | 913         | 58        | 871         | 61        | 830         | 64        | 785         | 67        | 741        | 71        | 702  | 75   | 664  | 79   |
| 0                  | 0        | 1        | 0        | 1068        | 49        | 1030        | 51        | 991         | 53        | 950         | 56        | 909         | 58        | 863         | 61        | 816        | 65        | 778  | 68   | 740  | 71   |
| 1                  | 0        | 1        | 0        | 1122        | 47        | 1084        | 49        | 1046        | 50        | 1005        | 53        | 964         | 55        | 920         | 57        | 876        | 60        | 837  | 63   | 797  | 66   |
| 0                  | 1        | 1        | 0        | 1175        | 45        | 1138        | 46        | 1101        | 48        | 1060        | 50        | 1018        | 52        | 977         | 54        | 936        | 56        | 895  | 59   | 854  | 62   |
| <b>1</b>           | <b>1</b> | <b>1</b> | <b>0</b> | <b>1237</b> | <b>43</b> | <b>1198</b> | <b>44</b> | <b>1159</b> | <b>46</b> | <b>1120</b> | <b>47</b> | <b>1082</b> | <b>49</b> | <b>1040</b> | <b>51</b> | <b>999</b> | <b>53</b> | 957  | 55   | 916  | 58   |
| 0                  | 0        | 0        | 1        | 1299        | 41        | 1258        | 42        | 1216        | 43        | 1181        | 45        | 1146        | 46        | 1104        | 48        | 1061       | 50        | 1020 | 52   | 978  | 54   |
| 1                  | 0        | 0        | 1        | 1349        | 39        | 1308        | 40        | 1267        | 42        | 1232        | 43        | 1197        | 44        | 1156        | 46        | 1115       | 47        | 1072 | 49   | 1030 | 51   |
| 0                  | 1        | 0        | 1        | 1398        | 38        | 1358        | 39        | 1318        | 40        | 1283        | 41        | 1248        | 42        | 1208        | 44        | 1168       | 45        | 1125 | 47   | 1082 | 49   |
| 1                  | 1        | 0        | 1        | 1440        | 37        | 1398        | 38        | 1357        | 39        | 1322        | 40        | 1288        | 41        | 1247        | 42        | 1206       | 44        | 1163 | 45   | 1121 | 47   |
| 0                  | 0        | 1        | 1        | 1481        | 36        | 1439        | 37        | 1396        | 38        | 1362        | 39        | 1327        | 40        | 1285        | 41        | 1243       | 42        | 1202 | 44   | 1160 | 45   |
| 1                  | 0        | 1        | 1        | 1516        | 35        | 1476        | 36        | 1436        | 37        | 1400        | 38        | 1365        | 39        | 1325        | 40        | 1285       | 41        | 1247 | 42   | 1209 | 44   |
| 0                  | 1        | 1        | 1        | 1550        | 34        | 1513        | 35        | 1475        | 36        | 1439        | 37        | 1402        | 38        | 1365        | 39        | 1327       | 40        | 1292 | 41   | 1257 | 42   |
| 1                  | 1        | 1        | 1        | 1581        | 33        | 1544        | 34        | 1507        | 35        | 1476        | 36        | 1444        | 37        | 1410        | 37        | 1375       | 38        | 1332 | 40   | 1289 | 41   |

**NOTES:**

1. Factory settings are in bold. Use of any other switch setting may result in nuisance trips and should be verified for the application.
2. Temperature rises in tables are approximate. Actual temperature rises may vary.
3. Shaded areas are not recommended or approved for proper heating operation of equipment.

Heat rise: Btu/h (Input) = CFM \* ΔT \* 1.08

ΔT = (Btu/h \* 0.95) / (CFM \* 1.08)

**Table 10. Blower Performance - 2 & 2.5 Ton**

**R8HE / PPG3HE -X36K080X**  
**80,000 BTUH, 30" CABINET, 11"X8" BLOWER W- 3/4 HP ECM MOTOR**

| 230 VOLT OPERATION |   |   |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|---|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20 |      | 0.30 |      | 0.40 |      | 0.50 |      | 0.60 |      | 0.70 |      | 0.80 |      | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 843  | 83   | 801  | 88   | 758  | 93   | 712  | 99   | 665  | 106  | 630  | 112  | 595  | 118  | 551  | 128  | 507  | 139  |
| 1                  | 0 | 0 | 0 | 910  | 77   | 867  | 81   | 824  | 85   | 783  | 90   | 742  | 95   | 704  | 100  | 666  | 106  | 625  | 113  | 584  | 121  |
| 0                  | 1 | 0 | 0 | 977  | 72   | 933  | 75   | 889  | 79   | 854  | 82   | 818  | 86   | 777  | 91   | 736  | 96   | 698  | 101  | 660  | 107  |
| 1                  | 1 | 0 | 0 | 1053 | 67   | 1009 | 70   | 965  | 73   | 929  | 76   | 894  | 79   | 853  | 83   | 812  | 87   | 775  | 91   | 738  | 95   |
| 0                  | 0 | 1 | 0 | 1129 | 62   | 1085 | 65   | 1041 | 68   | 1005 | 70   | 969  | 73   | 929  | 76   | 888  | 79   | 852  | 83   | 815  | 86   |
| 1                  | 0 | 1 | 0 | 1183 | 59   | 1141 | 62   | 1098 | 64   | 1061 | 66   | 1024 | 69   | 985  | 71   | 947  | 74   | 908  | 77   | 870  | 81   |
| 0                  | 1 | 1 | 0 | 1237 | 57   | 1196 | 59   | 1155 | 61   | 1117 | 63   | 1078 | 65   | 1042 | 68   | 1006 | 70   | 965  | 73   | 924  | 76   |
| 1                  | 1 | 1 | 0 | 1298 | 54   | 1258 | 56   | 1218 | 58   | 1179 | 60   | 1140 | 62   | 1103 | 64   | 1067 | 66   | 1027 | 69   | 987  | 71   |
| 0                  | 0 | 0 | 1 | 1359 | 52   | 1320 | 53   | 1281 | 55   | 1241 | 57   | 1201 | 59   | 1165 | 60   | 1128 | 62   | 1089 | 65   | 1049 | 67   |
| 1                  | 0 | 0 | 1 | 1414 | 50   | 1375 | 51   | 1336 | 53   | 1296 | 54   | 1256 | 56   | 1218 | 58   | 1181 | 60   | 1142 | 62   | 1103 | 64   |
| 0                  | 1 | 0 | 1 | 1468 | 48   | 1429 | 49   | 1390 | 51   | 1350 | 52   | 1310 | 54   | 1272 | 55   | 1233 | 57   | 1195 | 59   | 1157 | 61   |
| 1                  | 1 | 0 | 1 | 1505 | 47   | 1466 | 48   | 1427 | 49   | 1387 | 51   | 1347 | 52   | 1310 | 54   | 1272 | 55   | 1233 | 57   | 1195 | 59   |
| 0                  | 0 | 1 | 1 | 1541 | 46   | 1502 | 47   | 1463 | 48   | 1424 | 49   | 1384 | 51   | 1348 | 52   | 1311 | 54   | 1272 | 55   | 1232 | 57   |
| 1                  | 0 | 1 | 1 | 1579 | 45   | 1532 | 46   | 1501 | 47   | 1457 | 48   | 1425 | 49   | 1382 | 51   | 1355 | 52   | 1307 | 54   | 1278 | 55   |
| 0                  | 1 | 1 | 1 | 1617 | 44   | 1562 | 45   | 1539 | 46   | 1490 | 47   | 1466 | 48   | 1417 | 50   | 1398 | 50   | 1343 | 52   | 1323 | 53   |
| 1                  | 1 | 1 | 1 | 1658 | 42   | 1595 | 44   | 1579 | 45   | 1524 | 46   | 1504 | 47   | 1458 | 48   | 1431 | 49   | 1390 | 51   | 1359 | 52   |

| 208 VOLT OPERATION |   |   |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|---|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20 |      | 0.30 |      | 0.40 |      | 0.50 |      | 0.60 |      | 0.70 |      | 0.80 |      | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 803  | 88   | 759  | 93   | 714  | 99   | 670  | 105  | 626  | 112  | 585  | 120  | 544  | 129  | 493  | 143  | 441  | 160  |
| 1                  | 0 | 0 | 0 | 873  | 81   | 828  | 85   | 782  | 90   | 740  | 95   | 698  | 101  | 656  | 107  | 615  | 115  | 570  | 124  | 525  | 134  |
| 0                  | 1 | 0 | 0 | 943  | 75   | 897  | 78   | 850  | 83   | 810  | 87   | 770  | 91   | 728  | 97   | 685  | 103  | 647  | 109  | 608  | 116  |
| 1                  | 1 | 0 | 0 | 1013 | 69   | 968  | 73   | 922  | 76   | 881  | 80   | 841  | 84   | 800  | 88   | 759  | 93   | 719  | 98   | 679  | 104  |
| 0                  | 0 | 1 | 0 | 1083 | 65   | 1039 | 68   | 994  | 71   | 953  | 74   | 911  | 77   | 872  | 81   | 832  | 85   | 791  | 89   | 750  | 94   |
| 1                  | 0 | 1 | 0 | 1137 | 62   | 1094 | 64   | 1051 | 67   | 1010 | 70   | 969  | 73   | 930  | 76   | 892  | 79   | 850  | 83   | 809  | 87   |
| 0                  | 1 | 1 | 0 | 1190 | 59   | 1149 | 61   | 1107 | 64   | 1067 | 66   | 1026 | 69   | 989  | 71   | 952  | 74   | 910  | 77   | 867  | 81   |
| 1                  | 1 | 1 | 0 | 1251 | 56   | 1209 | 58   | 1168 | 60   | 1128 | 62   | 1088 | 65   | 1051 | 67   | 1014 | 69   | 971  | 72   | 928  | 76   |
| 0                  | 0 | 0 | 1 | 1311 | 54   | 1270 | 55   | 1229 | 57   | 1189 | 59   | 1149 | 61   | 1112 | 63   | 1075 | 65   | 1032 | 68   | 989  | 71   |
| 1                  | 0 | 0 | 1 | 1365 | 52   | 1322 | 53   | 1279 | 55   | 1241 | 57   | 1202 | 59   | 1163 | 60   | 1125 | 63   | 1083 | 65   | 1042 | 68   |
| 0                  | 1 | 0 | 1 | 1418 | 50   | 1374 | 51   | 1329 | 53   | 1292 | 54   | 1255 | 56   | 1215 | 58   | 1174 | 60   | 1134 | 62   | 1094 | 64   |
| 1                  | 1 | 0 | 1 | 1450 | 49   | 1409 | 50   | 1368 | 51   | 1328 | 53   | 1289 | 55   | 1248 | 56   | 1208 | 58   | 1170 | 60   | 1132 | 62   |
| 0                  | 0 | 1 | 1 | 1482 | 47   | 1445 | 49   | 1407 | 50   | 1365 | 52   | 1322 | 53   | 1282 | 55   | 1242 | 57   | 1206 | 58   | 1170 | 60   |
| 1                  | 0 | 1 | 1 | 1526 | 46   | 1486 | 47   | 1446 | 49   | 1406 | 50   | 1366 | 52   | 1327 | 53   | 1289 | 55   | 1252 | 56   | 1216 | 58   |
| 0                  | 1 | 1 | 1 | 1569 | 45   | 1527 | 46   | 1485 | 47   | 1447 | 49   | 1409 | 50   | 1372 | 51   | 1335 | 53   | 1299 | 54   | 1262 | 56   |
| 1                  | 1 | 1 | 1 | 1617 | 44   | 1573 | 45   | 1529 | 46   | 1490 | 47   | 1450 | 49   | 1416 | 50   | 1381 | 51   | 1343 | 52   | 1305 | 54   |

**NOTES:**

1. Factory settings are in bold. Use of any other switch setting may result in nuisance trips and should be verified for the application.
2. Temperature rises in tables are approximate. Actual temperature rises may vary.
3. Shaded areas are not recommended or approved for proper heating operation of equipment.

Heat rise: Btu/h (Input) = CFM \* ΔT \* 1.08

ΔT = (Btu/h \* 0.95) / (CFM \* 1.08)

**Table 11. Blower Performance - 3 Ton**

**R8HE / PPG3HE -X42K080X**  
**80,000 BTUH, 34" CABINET, 11"X10" BLOWER W- 3/4 HP ECM MOTOR**

| 230 VOLT OPERATION |   |   |   |             |           |             |           |             |           |             |           |             |           |             |           |             |           |      |      |      |      |
|--------------------|---|---|---|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20        |           | 0.30        |           | 0.40        |           | 0.50        |           | 0.60        |           | 0.70        |           | 0.80        |           | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 843         | 83        | 801         | 88        | 758         | 93        | 712         | 99        | 665         | 106       | 630         | 112       | 595         | 118       | 551  | 128  | 507  | 139  |
| 1                  | 0 | 0 | 0 | 910         | 77        | 867         | 81        | 824         | 85        | 783         | 90        | 742         | 95        | 704         | 100       | 666         | 106       | 625  | 113  | 584  | 121  |
| 0                  | 1 | 0 | 0 | 977         | 72        | 933         | 75        | 889         | 79        | 854         | 82        | 818         | 86        | 777         | 91        | 736         | 96        | 698  | 101  | 660  | 107  |
| 1                  | 1 | 0 | 0 | 1053        | 67        | 1009        | 70        | 965         | 73        | 929         | 76        | 894         | 79        | 853         | 83        | 812         | 87        | 775  | 91   | 738  | 95   |
| 0                  | 0 | 1 | 0 | 1129        | 62        | 1085        | 65        | 1041        | 68        | 1005        | 70        | 969         | 73        | 929         | 76        | 888         | 79        | 852  | 83   | 815  | 86   |
| 1                  | 0 | 1 | 0 | 1183        | 59        | 1141        | 62        | 1098        | 64        | 1061        | 66        | 1024        | 69        | 985         | 71        | 947         | 74        | 908  | 77   | 870  | 81   |
| 0                  | 1 | 1 | 0 | 1237        | 57        | 1196        | 59        | 1155        | 61        | 1117        | 63        | 1078        | 65        | 1042        | 68        | 1006        | 70        | 965  | 73   | 924  | 76   |
| 1                  | 1 | 1 | 0 | 1298        | 54        | 1258        | 56        | 1218        | 58        | 1179        | 60        | 1140        | 62        | 1103        | 64        | 1067        | 66        | 1027 | 69   | 987  | 71   |
| 0                  | 0 | 0 | 1 | 1359        | 52        | 1320        | 53        | 1281        | 55        | 1241        | 57        | 1201        | 59        | 1165        | 60        | 1128        | 62        | 1089 | 65   | 1049 | 67   |
| 1                  | 0 | 0 | 1 | 1414        | 50        | 1375        | 51        | 1336        | 53        | 1296        | 54        | 1256        | 56        | 1218        | 58        | 1181        | 60        | 1142 | 62   | 1103 | 64   |
| 0                  | 1 | 0 | 1 | <b>1468</b> | <b>48</b> | <b>1429</b> | <b>49</b> | <b>1390</b> | <b>51</b> | <b>1350</b> | <b>52</b> | <b>1310</b> | <b>54</b> | <b>1272</b> | <b>55</b> | <b>1233</b> | <b>57</b> | 1195 | 59   | 1157 | 61   |
| 1                  | 1 | 0 | 1 | 1505        | 47        | 1466        | 48        | 1427        | 49        | 1387        | 51        | 1347        | 52        | 1310        | 54        | 1272        | 55        | 1233 | 57   | 1195 | 59   |
| 0                  | 0 | 1 | 1 | 1541        | 46        | 1502        | 47        | 1463        | 48        | 1424        | 49        | 1384        | 51        | 1348        | 52        | 1311        | 54        | 1272 | 55   | 1232 | 57   |
| 1                  | 0 | 1 | 1 | 1579        | 45        | 1532        | 46        | 1501        | 47        | 1457        | 48        | 1425        | 49        | 1382        | 51        | 1355        | 52        | 1307 | 54   | 1278 | 55   |
| 0                  | 1 | 1 | 1 | 1617        | 44        | 1562        | 45        | 1539        | 46        | 1490        | 47        | 1466        | 48        | 1417        | 50        | 1398        | 50        | 1343 | 52   | 1323 | 53   |
| 1                  | 1 | 1 | 1 | 1658        | 42        | 1595        | 44        | 1579        | 45        | 1524        | 46        | 1504        | 47        | 1458        | 48        | 1431        | 49        | 1390 | 51   | 1359 | 52   |

| 208 VOLT OPERATION |   |   |   |             |           |             |           |             |           |             |           |             |           |             |           |             |           |      |      |      |      |
|--------------------|---|---|---|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20        |           | 0.30        |           | 0.40        |           | 0.50        |           | 0.60        |           | 0.70        |           | 0.80        |           | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM         | RISE      | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 803         | 88        | 759         | 93        | 714         | 99        | 670         | 105       | 626         | 112       | 585         | 120       | 544         | 129       | 493  | 143  | 441  | 160  |
| 1                  | 0 | 0 | 0 | 873         | 81        | 828         | 85        | 782         | 90        | 740         | 95        | 698         | 101       | 656         | 107       | 615         | 115       | 570  | 124  | 525  | 134  |
| 0                  | 1 | 0 | 0 | 943         | 75        | 897         | 78        | 850         | 83        | 810         | 87        | 770         | 91        | 728         | 97        | 685         | 103       | 647  | 109  | 608  | 116  |
| 1                  | 1 | 0 | 0 | 1013        | 69        | 968         | 73        | 922         | 76        | 881         | 80        | 841         | 84        | 800         | 88        | 759         | 93        | 719  | 98   | 679  | 104  |
| 0                  | 0 | 1 | 0 | 1083        | 65        | 1039        | 68        | 994         | 71        | 953         | 74        | 911         | 77        | 872         | 81        | 832         | 85        | 791  | 89   | 750  | 94   |
| 1                  | 0 | 1 | 0 | 1137        | 62        | 1094        | 64        | 1051        | 67        | 1010        | 70        | 969         | 73        | 930         | 76        | 892         | 79        | 850  | 83   | 809  | 87   |
| 0                  | 1 | 1 | 0 | 1190        | 59        | 1149        | 61        | 1107        | 64        | 1067        | 66        | 1026        | 69        | 989         | 71        | 952         | 74        | 910  | 77   | 867  | 81   |
| 1                  | 1 | 1 | 0 | 1251        | 56        | 1209        | 58        | 1168        | 60        | 1128        | 62        | 1088        | 65        | 1051        | 67        | 1014        | 69        | 971  | 72   | 928  | 76   |
| 0                  | 0 | 0 | 1 | 1311        | 54        | 1270        | 55        | 1229        | 57        | 1189        | 59        | 1149        | 61        | 1112        | 63        | 1075        | 65        | 1032 | 68   | 989  | 71   |
| 1                  | 0 | 0 | 1 | 1365        | 52        | 1322        | 53        | 1279        | 55        | 1241        | 57        | 1202        | 59        | 1163        | 60        | 1125        | 63        | 1083 | 65   | 1042 | 68   |
| 0                  | 1 | 0 | 1 | <b>1418</b> | <b>50</b> | <b>1374</b> | <b>51</b> | <b>1329</b> | <b>53</b> | <b>1292</b> | <b>54</b> | <b>1255</b> | <b>56</b> | <b>1215</b> | <b>58</b> | <b>1174</b> | <b>60</b> | 1134 | 62   | 1094 | 64   |
| 1                  | 1 | 0 | 1 | 1450        | 49        | 1409        | 50        | 1368        | 51        | 1328        | 53        | 1289        | 55        | 1248        | 56        | 1208        | 58        | 1170 | 60   | 1132 | 62   |
| 0                  | 0 | 1 | 1 | 1482        | 47        | 1445        | 49        | 1407        | 50        | 1365        | 52        | 1322        | 53        | 1282        | 55        | 1242        | 57        | 1206 | 58   | 1170 | 60   |
| 1                  | 0 | 1 | 1 | 1526        | 46        | 1486        | 47        | 1446        | 49        | 1406        | 50        | 1366        | 52        | 1327        | 53        | 1289        | 55        | 1252 | 56   | 1216 | 58   |
| 0                  | 1 | 1 | 1 | 1569        | 45        | 1527        | 46        | 1485        | 47        | 1447        | 49        | 1409        | 50        | 1372        | 51        | 1335        | 53        | 1299 | 54   | 1262 | 56   |
| 1                  | 1 | 1 | 1 | 1617        | 44        | 1573        | 45        | 1529        | 46        | 1490        | 47        | 1450        | 49        | 1416        | 50        | 1381        | 51        | 1343 | 52   | 1305 | 54   |

**NOTES:**

1. Factory settings are in bold. Use of any other switch setting may result in nuisance trips and should be verified for the application.
2. Temperature rises in tables are approximate. Actual temperature rises may vary.
3. Shaded areas are not recommended or approved for proper heating operation of equipment.

Heat rise: Btu/h (Input) = CFM \* ΔT \* 1.08

ΔT = (Btu/h \* 0.95) / (CFM \* 1.08)

**Table 12. Blower Performance - 3.5 Ton**

**R8HE -X48K100X / -X60K100X**  
**100,000 BTUH, 38"-42" CABINET, 11"X10" BLOWER W- 1 HP ECM MOTOR**

| 230 VOLT OPERATION |   |   |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|---|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20 |      | 0.30 |      | 0.40 |      | 0.50 |      | 0.60 |      | 0.70 |      | 0.80 |      | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 1347 | 65   | 1295 | 68   | 1242 | 71   | 1187 | 74   | 1131 | 78   | 1077 | 82   | 1023 | 86   | 970  | 91   | 916  | 96   |
| 1                  | 0 | 0 | 0 | 1402 | 63   | 1353 | 65   | 1305 | 67   | 1252 | 70   | 1199 | 73   | 1147 | 77   | 1094 | 80   | 1039 | 85   | 984  | 89   |
| 0                  | 1 | 0 | 0 | 1457 | 60   | 1412 | 62   | 1367 | 64   | 1317 | 67   | 1267 | 69   | 1216 | 72   | 1165 | 76   | 1109 | 79   | 1052 | 84   |
| 1                  | 1 | 0 | 0 | 1517 | 58   | 1468 | 60   | 1420 | 62   | 1374 | 64   | 1328 | 66   | 1279 | 69   | 1229 | 72   | 1172 | 75   | 1115 | 79   |
| 0                  | 0 | 1 | 0 | 1576 | 56   | 1524 | 58   | 1472 | 60   | 1431 | 61   | 1389 | 63   | 1341 | 66   | 1293 | 68   | 1236 | 71   | 1178 | 75   |
| 1                  | 0 | 1 | 0 | 1625 | 54   | 1576 | 56   | 1528 | 58   | 1485 | 59   | 1442 | 61   | 1394 | 63   | 1346 | 65   | 1289 | 68   | 1233 | 71   |
| 0                  | 1 | 1 | 0 | 1674 | 53   | 1629 | 54   | 1583 | 56   | 1539 | 57   | 1494 | 59   | 1446 | 61   | 1398 | 63   | 1343 | 66   | 1287 | 68   |
| 1                  | 1 | 1 | 0 | 1721 | 51   | 1675 | 53   | 1629 | 54   | 1583 | 56   | 1538 | 57   | 1491 | 59   | 1445 | 61   | 1390 | 63   | 1336 | 66   |
| 0                  | 0 | 0 | 1 | 1768 | 50   | 1721 | 51   | 1674 | 53   | 1628 | 54   | 1582 | 56   | 1537 | 57   | 1491 | 59   | 1438 | 61   | 1384 | 64   |
| 1                  | 0 | 0 | 1 | 1807 | 49   | 1762 | 50   | 1717 | 51   | 1671 | 53   | 1626 | 54   | 1580 | 56   | 1534 | 57   | 1483 | 59   | 1433 | 61   |
| 0                  | 1 | 0 | 1 | 1846 | 48   | 1803 | 49   | 1759 | 50   | 1715 | 51   | 1670 | 53   | 1623 | 54   | 1576 | 56   | 1529 | 58   | 1482 | 59   |
| 1                  | 1 | 0 | 1 | 1889 | 47   | 1843 | 48   | 1798 | 49   | 1754 | 50   | 1710 | 51   | 1663 | 53   | 1617 | 54   | 1571 | 56   | 1526 | 58   |
| 0                  | 0 | 1 | 1 | 1931 | 46   | 1884 | 47   | 1837 | 48   | 1793 | 49   | 1749 | 50   | 1703 | 52   | 1657 | 53   | 1613 | 55   | 1569 | 56   |
| 1                  | 0 | 1 | 1 | 1970 | 45   | 1925 | 46   | 1881 | 47   | 1836 | 48   | 1792 | 49   | 1747 | 50   | 1703 | 52   | 1658 | 53   | 1614 | 54   |
| 0                  | 1 | 1 | 1 | 2008 | 44   | 1967 | 45   | 1910 | 46   | 1880 | 47   | 1834 | 48   | 1791 | 49   | 1748 | 50   | 1704 | 52   | 1659 | 53   |
| 1                  | 1 | 1 | 1 | 2038 | 43   | 1980 | 44   | 1939 | 46   | 1910 | 46   | 1891 | 47   | 1874 | 47   | 1857 | 47   | 1809 | 49   | 1760 | 50   |

| 208 VOLT OPERATION |   |   |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|---|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| SWITCH SETTINGS    |   |   |   | 0.20 |      | 0.30 |      | 0.40 |      | 0.50 |      | 0.60 |      | 0.70 |      | 0.80 |      | 0.90 |      | 1.00 |      |
| 1                  | 2 | 3 | 4 | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE | CFM  | RISE |
| 0                  | 0 | 0 | 0 | 1308 | 67   | 1252 | 70   | 1196 | 74   | 1139 | 77   | 1082 | 81   | 1025 | 86   | 967  | 91   | 915  | 96   | 863  | 102  |
| 1                  | 0 | 0 | 0 | 1363 | 65   | 1309 | 67   | 1255 | 70   | 1199 | 73   | 1143 | 77   | 1088 | 81   | 1033 | 85   | 979  | 90   | 926  | 95   |
| 0                  | 1 | 0 | 0 | 1417 | 62   | 1366 | 64   | 1314 | 67   | 1259 | 70   | 1203 | 73   | 1151 | 76   | 1098 | 80   | 1043 | 84   | 988  | 89   |
| 1                  | 1 | 0 | 0 | 1470 | 60   | 1418 | 62   | 1366 | 64   | 1315 | 67   | 1265 | 70   | 1212 | 73   | 1159 | 76   | 1102 | 80   | 1045 | 84   |
| 0                  | 0 | 1 | 0 | 1523 | 58   | 1471 | 60   | 1418 | 62   | 1372 | 64   | 1326 | 66   | 1273 | 69   | 1220 | 72   | 1161 | 76   | 1102 | 80   |
| 1                  | 0 | 1 | 0 | 1566 | 56   | 1515 | 58   | 1464 | 60   | 1417 | 62   | 1371 | 64   | 1321 | 67   | 1271 | 69   | 1211 | 73   | 1151 | 76   |
| 0                  | 1 | 1 | 0 | 1608 | 55   | 1559 | 56   | 1509 | 58   | 1462 | 60   | 1415 | 62   | 1369 | 64   | 1322 | 67   | 1261 | 70   | 1200 | 73   |
| 1                  | 1 | 1 | 0 | 1650 | 53   | 1602 | 55   | 1554 | 57   | 1508 | 58   | 1461 | 60   | 1411 | 62   | 1362 | 65   | 1303 | 68   | 1245 | 71   |
| 0                  | 0 | 0 | 1 | 1691 | 52   | 1645 | 53   | 1599 | 55   | 1553 | 57   | 1507 | 58   | 1454 | 60   | 1401 | 63   | 1345 | 65   | 1289 | 68   |
| 1                  | 0 | 0 | 1 | 1737 | 51   | 1691 | 52   | 1644 | 54   | 1599 | 55   | 1554 | 57   | 1503 | 59   | 1451 | 61   | 1396 | 63   | 1342 | 66   |
| 0                  | 1 | 0 | 1 | 1783 | 49   | 1736 | 51   | 1689 | 52   | 1645 | 53   | 1601 | 55   | 1551 | 57   | 1501 | 59   | 1448 | 61   | 1394 | 63   |
| 1                  | 1 | 0 | 1 | 1823 | 48   | 1776 | 50   | 1730 | 51   | 1684 | 52   | 1638 | 54   | 1589 | 55   | 1539 | 57   | 1488 | 59   | 1437 | 61   |
| 0                  | 0 | 1 | 1 | 1862 | 47   | 1817 | 48   | 1771 | 50   | 1723 | 51   | 1675 | 53   | 1626 | 54   | 1577 | 56   | 1529 | 58   | 1480 | 59   |
| 1                  | 0 | 1 | 1 | 1904 | 46   | 1857 | 47   | 1810 | 49   | 1763 | 50   | 1717 | 51   | 1672 | 53   | 1627 | 54   | 1599 | 55   | 1572 | 56   |
| 0                  | 1 | 1 | 1 | 1946 | 45   | 1898 | 46   | 1849 | 48   | 1804 | 49   | 1758 | 50   | 1717 | 51   | 1676 | 52   | 1670 | 53   | 1664 | 53   |
| 1                  | 1 | 1 | 1 | 1977 | 44   | 1936 | 45   | 1895 | 46   | 1878 | 47   | 1860 | 47   | 1809 | 49   | 1757 | 50   | 1709 | 51   | 1660 | 53   |

**NOTES:**

1. Factory settings are in bold. Use of any other switch setting may result in nuisance trips and should be verified for the application.
2. Temperature rises in tables are approximate. Actual temperature rises may vary.
3. Shaded areas are not recommended or approved for proper heating operation of equipment.

Heat rise: Btu/h (Input) = CFM \* ΔT \* 1.08

ΔT = (Btu/h \* 0.95) / (CFM \* 1.08)

**Table 13. Blower Performance - 4 & 5 Ton**

## Gas Information

| CAPACITY OF BLACK IRON GAS PIPE (CU. FT. PER HOUR)<br>FOR NATURAL GAS (SPECIFIC GRAVITY - 0.60)                     |                           |       |     |     |     |     |     |     |
|---|---------------------------|-------|-----|-----|-----|-----|-----|-----|
| NOMINAL PIPE<br>DIAMETER (IN.)  | LENGTH OF PIPE RUN (FEET) |       |     |     |     |     |     |     |
|   | 10                        | 20    | 30  | 40  | 50  | 60  | 70  | 80  |
| 1/2   | 130                       | 90    | 75  | 65  | 55  | 50  | 45  | 40  |
| 3/4   | 280                       | 190   | 150 | 130 | 115 | 105 | 95  | 90  |
| 1   | 520                       | 350   | 285 | 245 | 215 | 195 | 180 | 170 |
| 1 1/4   | 1,050                     | 730   | 590 | 500 | 440 | 400 | 370 | 350 |
| 1 1/2   | 1,600                     | 1,100 | 890 | 760 | 670 | 610 |     |     |
| Cubic Feet Per Hour Required = $\frac{\text{Input To Furnace (Btu/hr)}}{\text{Heating Value of Gas (Btu/Cu. Ft.)}}$ |                           |       |     |     |     |     |     |     |

**NOTE:** The cubic feet per hour listed in the table above must be greater than the cubic feet per hour of gas flow required by the furnace. To determine the cubic feet per hour of gas flow required by the furnace, divide the input rate of the furnace by the heating value (from gas supplier) of the gas.

**Table 14. Gas Pipe Capacities**

| GAS FLOW RATES<br>(CUBIC FEET PER HOUR) |   |       |       | GAS FLOW RATES<br>(CUBIC FEET PER HOUR) |   |     |     |
|---|---|-------|-------|---|---|-----|-----|
| TIME FOR<br>ONE REVOLUTION<br>(SECONDS) | CUBIC FEET PER<br>REVOLUTION OF GAS METER |       |       | TIME FOR<br>ONE REVOLUTION<br>(SECONDS) | CUBIC FEET PER<br>REVOLUTION OF GAS METER |     |     |
|   | 1   | 5     | 10    |   | 1   | 5   | 10  |
| 10                                      | 360                                       | 1,800 | 3,600 | 66                                      | 55  | 273 | 545 |
| 12                                      | 300                                       | 1,500 | 3,000 | 68                                      | 53  | 265 | 529 |
| 14                                      | 257                                       | 1,286 | 2,571 | 70                                      | 51  | 257 | 514 |
| 16                                      | 225                                       | 1,125 | 2,250 | 72                                      | 50  | 250 | 500 |
| 18                                      | 200                                       | 1,000 | 2,000 | 74                                      | 49  | 243 | 486 |
| 20                                      | 180                                       | 900   | 1,800 | 76                                      | 47  | 237 | 474 |
| 22                                      | 164                                       | 818   | 1,636 | 78                                      | 46  | 231 | 462 |
| 24                                      | 150                                       | 750   | 1,500 | 80                                      | 45  | 225 | 450 |
| 26                                      | 138                                       | 692   | 1,385 | 82                                      | 44  | 220 | 439 |
| 28                                      | 129                                       | 643   | 1,286 | 84                                      | 43  | 214 | 429 |
| 30                                      | 120                                       | 600   | 1,200 | 86                                      | 42  | 209 | 419 |
| 32                                      | 113                                       | 563   | 1,125 | 88                                      | 41  | 205 | 409 |
| 34                                      | 106                                       | 529   | 1,059 | 90                                      | 40  | 200 | 400 |
| 36                                      | 100                                       | 500   | 1,000 | 92                                      | 39  | 196 | 391 |
| 38                                      | 95  | 474   | 947   | 94                                      | 38  | 191 | 383 |
| 40                                      | 90  | 450   | 900   | 96                                      | 38  | 188 | 375 |
| 42                                      | 86  | 429   | 857   | 98                                      | 37  | 184 | 367 |
| 44                                      | 82  | 409   | 818   | 100                                     | 36  | 180 | 360 |
| 46                                      | 78  | 391   | 783   | 102                                     | 35  | 176 | 353 |
| 48                                      | 75  | 375   | 750   | 104                                     | 35  | 173 | 346 |
| 50                                      | 72  | 360   | 720   | 106                                     | 34  | 170 | 340 |
| 52                                      | 69  | 346   | 692   | 108                                     | 33  | 167 | 333 |
| 54                                      | 67  | 333   | 667   | 110                                     | 33  | 164 | 327 |
| 56                                      | 64  | 321   | 643   | 112                                     | 32  | 161 | 321 |
| 58                                      | 62  | 310   | 621   | 114                                     | 32  | 158 | 316 |
| 60                                      | 60  | 300   | 600   | 116                                     | 31  | 155 | 310 |
| 62                                      | 58  | 290   | 581   | 118                                     | 31  | 153 | 305 |
| 64                                      | 56  | 281   | 563   | 120                                     | 30  | 150 | 300 |

**Table 15. Gas Flow Rates**



## FOR YOUR SAFETY READ BEFORE OPERATING

**WARNING:** If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
  - B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or move by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

## POUR VOTRE SÉCURITÉ. À LIRE AVANT L'EMPLOI

**ATTENTION!** L'inobservation de ces instructions peut entraîner un incendie ou une explosion pouvant causer des dommages à votre propriété à votre personne, ou la mort.

- A. Cet appareil ménager n'a pas de veilleuse. Il est doté d'un système d'allumage automatique. Ne pas essayer d'allumer le brûleur manuellement.
  - B. AVANT L'USAGE. Attention à une possible odeur de gaz surtout au niveau du plancher où les gaz les plus lourds ont la tendance de se concentrer.
- EN CAS D'ODEUR DE GAZ.**
- Ne mettre en marche aucun appareil électrique.
  - Ne toucher à aucun commutateur électrique, ne pas employer le téléphone.
  - Quitter le bâtiment immédiatement et avvertir la compagnie du gaz en utilisant le téléphone d'un voisin.
  - A défaut de la compagnie du gaz, avvertir le service des pompiers.
- C. Enfoncer ou faire tourner le robinet à gaz à la main seulement. Ne jamais utiliser d'outils. S'il n'est pas possible de faire tourner ou d'enfoncer le robinet à la main, ne pas essayer de le réparer. Faire appel à un spécialiste. Forcer ou tenter de réparer le robinet pourrait être à l'origine d'une explosion ou d'un incendie.
- D. Il est déconseillé d'utiliser cet appareil en contact prolongé avec l'eau. Faire inspecter ou remplacer toute commande par un technicien qualifié si un des systèmes de contrôle du gaz s'est trouvé sous l'eau.

## OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the appliance.
4. The appliance's ignition device automatically lights the burner. Do not try to light burner by hand.
5. Remove the control access door/panel (upper door if two-door model).
6. Move the gas control switch to the "OFF" position. (See Figure 1)
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in above information. If you don't smell gas, go to the next step.
8. Move the gas control switch to the "ON" position. (See Figure 1)
9. Replace the control access door/panel (upper door if two-door model).
10. Turn on all electrical power to the appliance.
11. Turn the thermostat to a desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

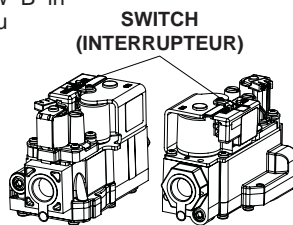


Figure 1

## MODE D'EMPLOI

1. **ATTENTION!** Lire d'abord la liste des mesures de sécurité ci-dessus.
2. Mettre le thermostat à la position minimale.
3. Couper le courant électrique qui mène à l'appareil.
4. Cet appareil ménager étant doté d'un système d'allumage automatique, ne pas essayer d'allumer le brûleur manuellement.
5. Retirer le panneau/volet d'accès de commande (panneau supérieur s'il s'agit d'un modèle à deux panneaux).
6. Réglez l'interrupteur de commande du gaz à la position "OFF". (voir Figure 1).
7. Attendre cinq (5) minutes pour s'assurer de la dissipation du gaz.  
En cas d'odeur, ARRÊTER LE PROCÉDÉ. Suivre les instructions ci-dessus (Section B). En l'absence de toute odeur de gaz, avancer à l'étape suivante.
8. Réglez l'interrupteur de commande du gaz à la position "ON". (voir Figure 1).
9. Remettre le panneau/volet d'accès de commande en place (panneau supérieur s'il s'agit d'un modèle à deux panneaux).
10. Rebrancher l'appareil sur le réseau électrique.
11. Ajuster le thermostat à la position désirée.
12. Si l'appareil ne fonctionne pas, suivre les "Directives d'arrêt" ci-dessous et appeler le technicien de service.

## TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the appliance if service is to be performed.
3. Remove the control access door/panel (upper door if two-door model).
4. Move the gas control switch to the "OFF" position. Do not use force. (See Figure 1)

## DIRECTIVES D'ARRÊT

1. Mettre le thermostat à la position minimale.
2. Débrancher l'appareil en prévision de la réparation.
3. Retirer le panneau/volet d'accès de commande (panneau supérieur s'il s'agit d'un modèle à deux panneaux).
4. Réglez l'interrupteur de commande du gaz à la position "OFF". Ne forcez pas. (voir Figure 1).

Figure 8. Gas Valve Label

## Electrical Data & Diagrams

| MODEL NUMBER<br>R8HE / PPG3HE | HEATING INPUT<br>(BTUH) | INDUCER MOTOR | NOMINAL ELECTRICAL SUPPLY | VOLTAGE RANGE |      | COMPRESSOR |     | FAN AMPS | BLOWER MOTOR AMPS | MINIMUM CIRCUIT AMPACITY | MAXIMUM OVER-CURRENT PROTECTION |
|-------------------------------|-------------------------|---------------|---------------------------|---------------|------|------------|-----|----------|-------------------|--------------------------|---------------------------------|
|                               |                         | RLA           |                           | MIN.          | MAX. | RLA        | LRA |          |                   |                          |                                 |
| X24K060X                      | 60,000                  | 0.30          | 208/230-60-1              | 187           | 253  | 12.8       | 58  | 1.0      | 5.4               | 22.4                     | 35                              |
| X30K060X                      | 60,000                  | 0.30          | 208/230-60-1              | 187           | 253  | 15.7       | 73  | 1.5      | 5.4               | 26.5                     | 40                              |
| X36K080X                      | 80,000                  | 0.30          | 208/230-60-1              | 187           | 253  | 18.6       | 79  | 1.5      | 5.4               | 30.1                     | 45                              |
| X42K080X                      | 80,000                  | 0.30          | 208/230-60-1              | 187           | 253  | 22.1       | 109 | 1.5      | 5.4               | 34.5                     | 55                              |
| X48K100X                      | 100,000                 | 0.30          | 208/230-60-1              | 187           | 253  | 24.3       | 117 | 1.5      | 7.0               | 38.8                     | 60                              |
| X60K100X                      | 100,000                 | 0.30          | 208/230-60-1              | 187           | 253  | 29.4       | 134 | 1.5      | 7.0               | 45.2                     | 70                              |

**NOTE:** FLA = Full Load Amps; LRA = Lock Rotor amps; RLA = Rated Load Amps.

**Table 16. Electrical Data.**

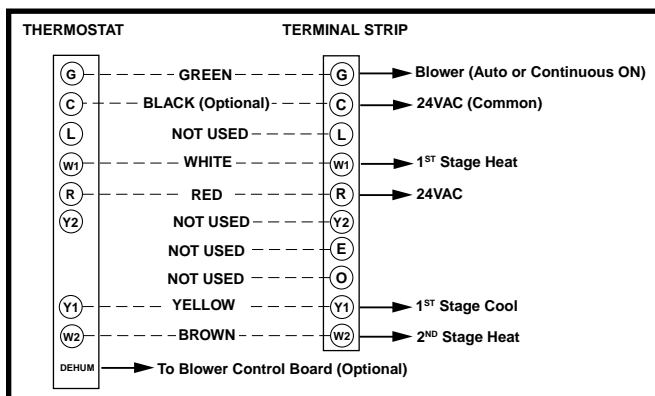
| COPPER WIRE SIZE — AWG<br>(1% VOLTAGE DROP) |     |     |    |                         |
|---|-----|-----|----|-------------------------|
| SUPPLY WIRE LENGTH-FEET                     |     |     |    | SUPPLY CIRCUIT AMPACITY |
| 200   | 150 | 100 | 50 |                         |
| 6   | 8   | 10  | 14 | 15                      |
| 4   | 6   | 8   | 12 | 20                      |
| 4   | 6   | 8   | 10 | 25                      |
| 4   | 4   | 6   | 10 | 30                      |
| 3   | 4   | 6   | 8  | 35                      |
| 3   | 4   | 6   | 8  | 40                      |
| 2   | 3   | 4   | 6  | 45                      |
| 2   | 3   | 4   | 6  | 50                      |
| 2   | 3   | 4   | 6  | 55                      |
| 1   | 2   | 3   | 4  | 60                      |

**NOTE:** Wire Size based on N.E.C. for 60° type copper conductors.

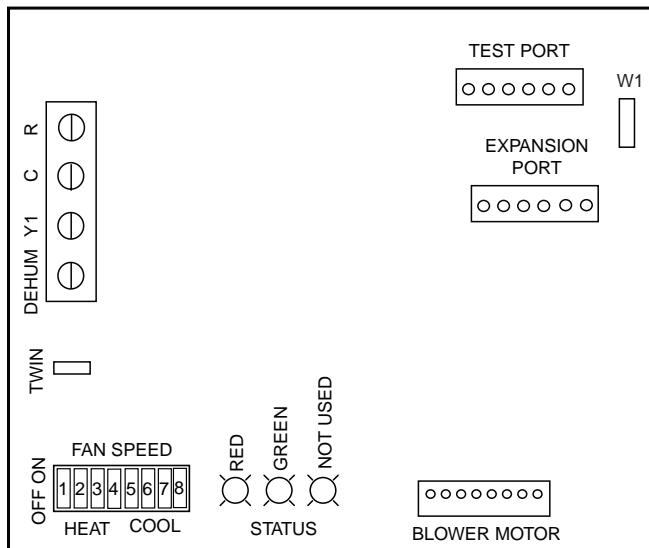
**Table 17. Copper Wire Size**

| THERMOSTAT WIRE GAUGE | RECOMMENDED T-STAT WIRE LENGTH (UNIT TO T-STAT) |                            |
|-----------------------|---|----------------------------|
|                       | 2-WIRE (HEATING)                                | 5-WIRE (HEATING / COOLING) |
| 24                    | 55  | 25                         |
| 22                    | 90  | 45                         |
| 20                    | 140   | 70                         |
| 18                    | 225   | 110                        |

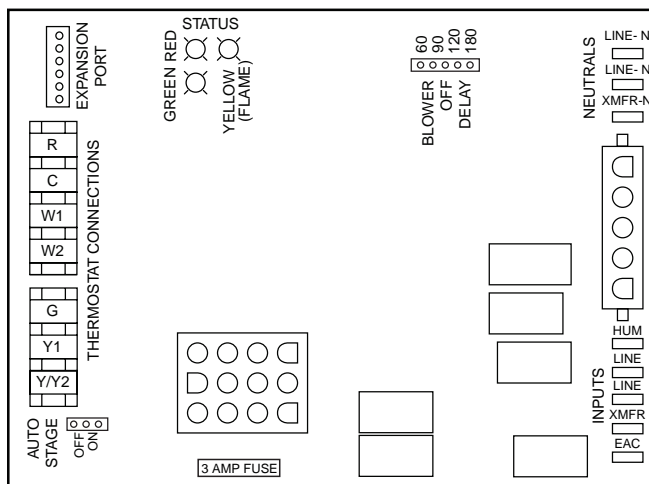
**Table 18. Thermostat Wire Gauge**



**Figure 9. Two Stage Heating / Single Stage Cooling Configuration**



**Figure 10. Fixed Speed Motor Control Board**



**Figure 11. Ignition Control Board - 624809**

# WIRING DIAGRAM

## 2-5 Ton Package 2 Stage Gas/Single Stage Air Conditioner

208/230 Volt / 1 Phase / 60 Hz

### NOTES:

1. Disconnect all power before servicing.
2. For supply connections use copper conductors only.
3. Not suitable on systems that exceed 150 volts to ground.

4. For replacement wires use conductors suitable for 105 deg.C.
5. For ampacities and overcurrent protection, see unit rating plate.
6. For 208-230V Models only. For 208V operation remove wire from 230V tap and place on 208V tap.

1. Couper le courant avant de faire l'entretien.
2. Employez uniquement des conducteurs en cuivre.
3. Ne convient pas aux installations de plus de 150 volt a la terre.

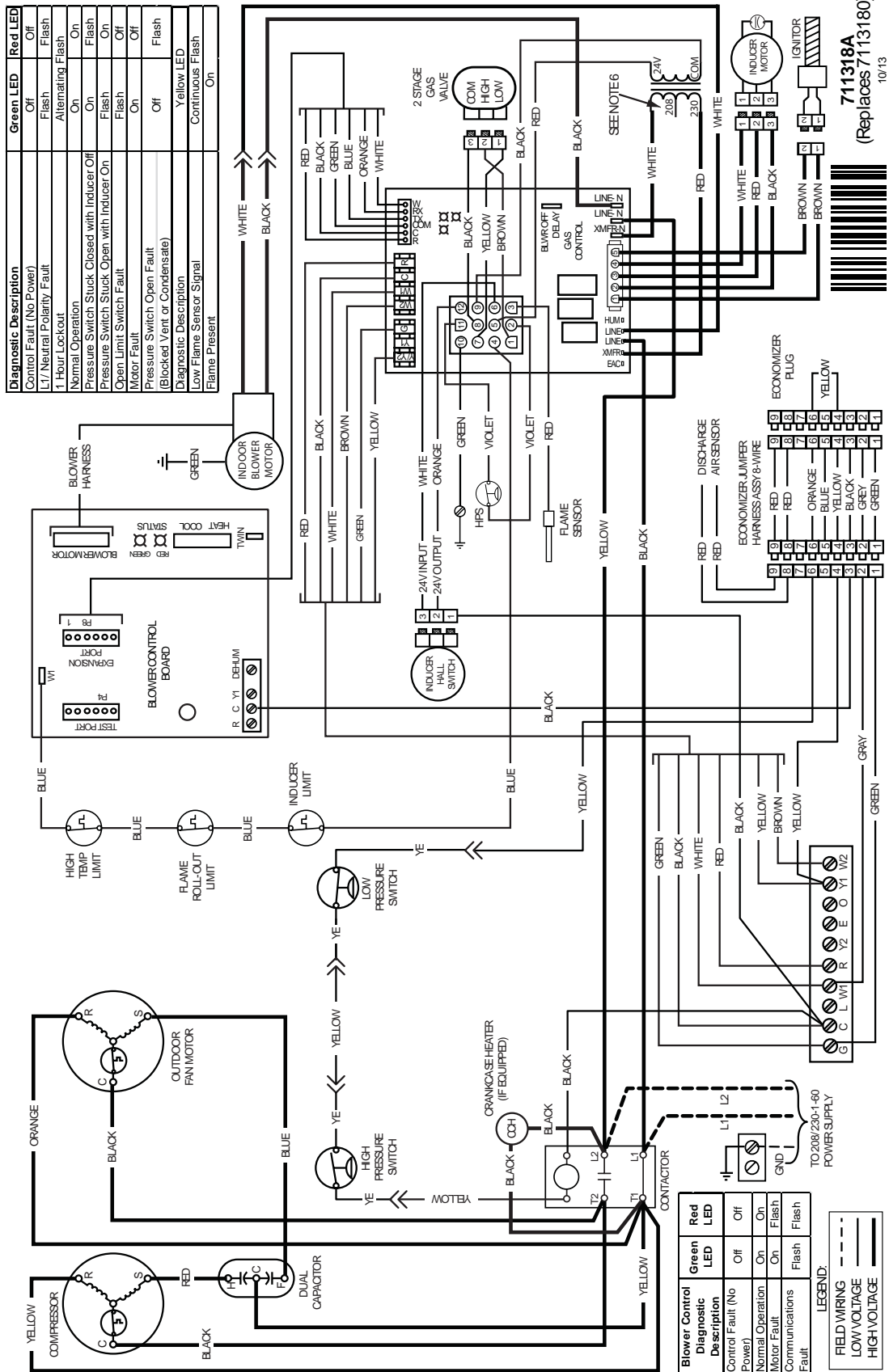


Figure 12. Wiring Diagram

## Charging Charts

### 2 TON CHARGING CHART

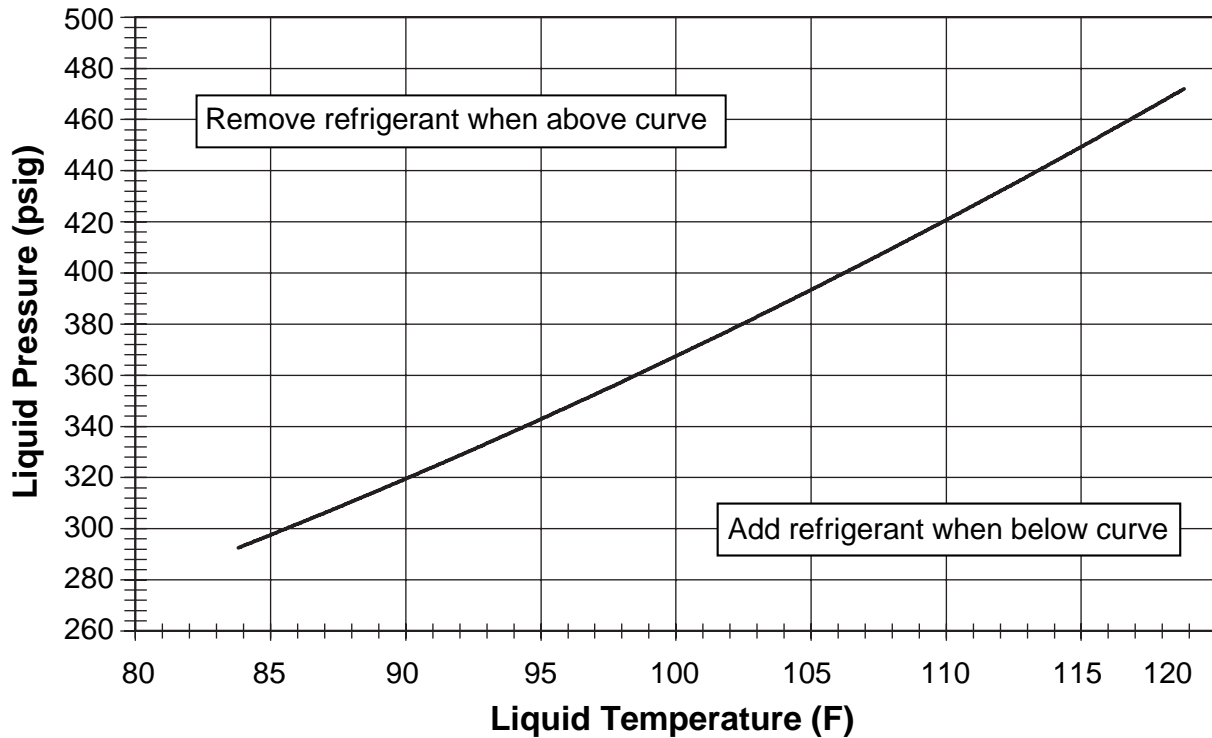


Figure 13. Charging Chart for 2 Ton Units

### 2.5 TON CHARGING CHART

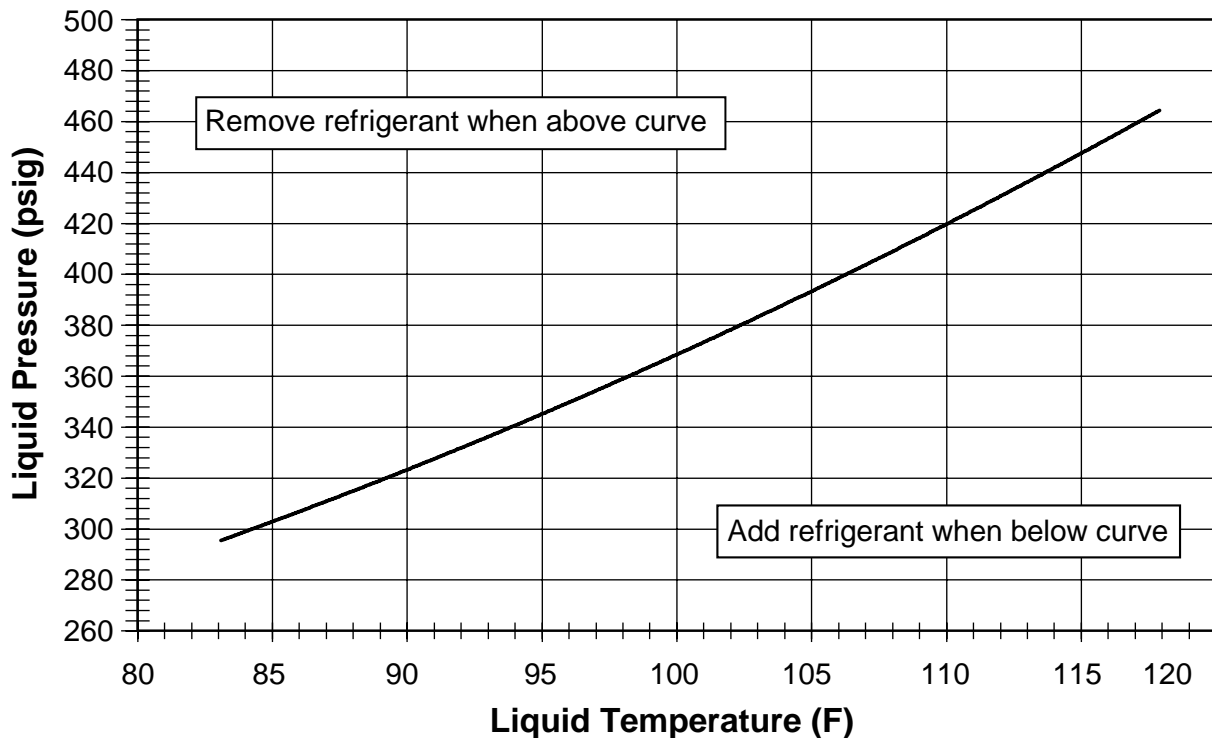


Figure 14. Charging Chart for 2.5 Ton Units

### 3 TON CHARGING CHART

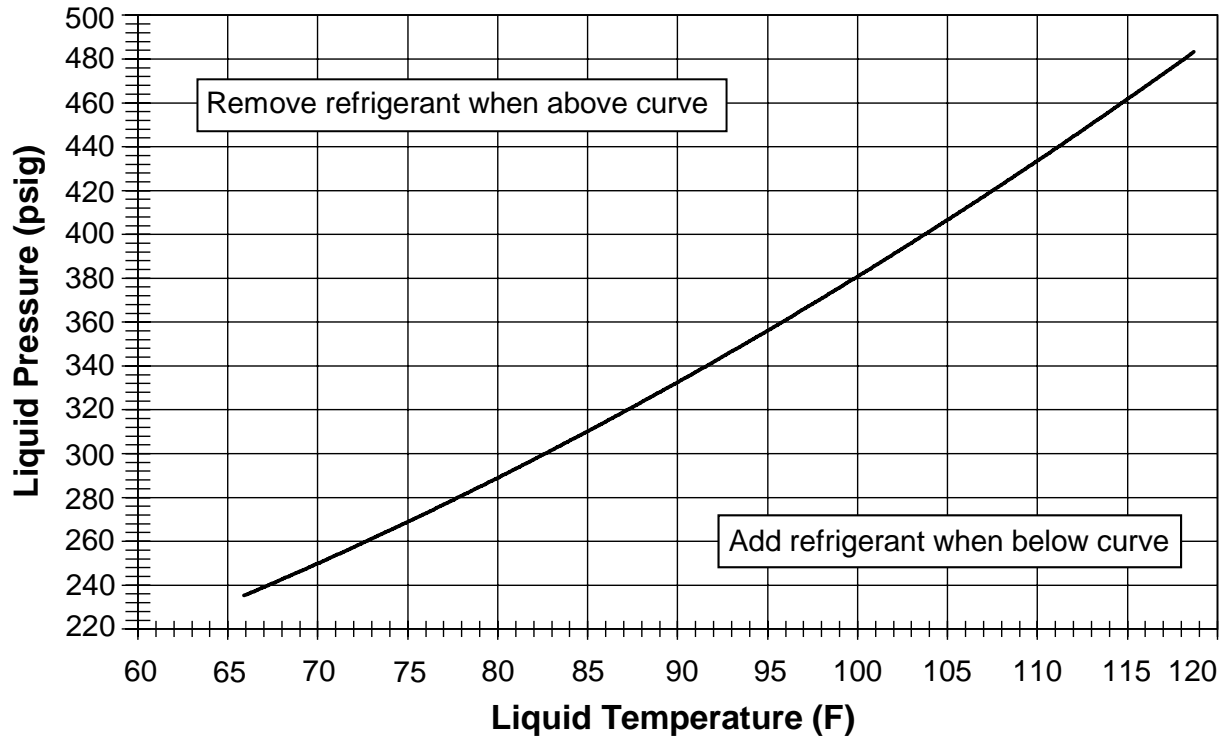


Figure 15. Charging Chart for 3 Ton Units

### 3.5 TON CHARGING CHART

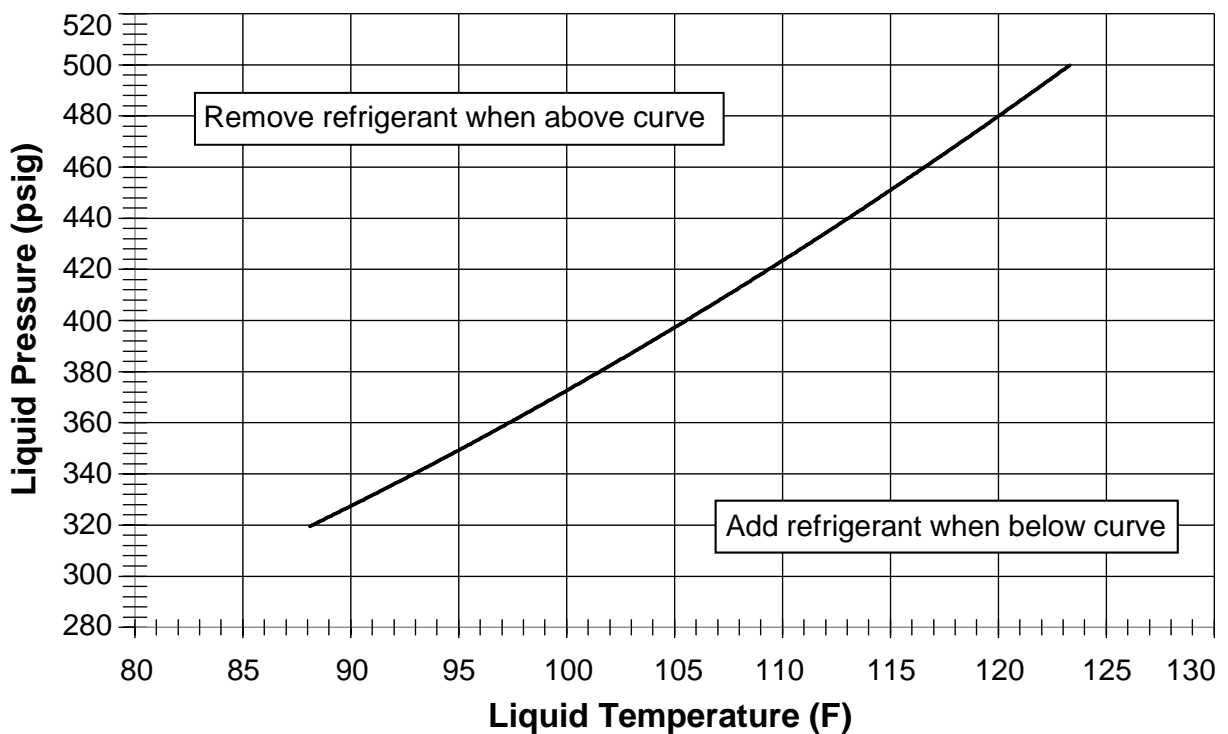


Figure 16. Charging Chart for 3.5 Ton Units

### 4 TON CHARGING CHART

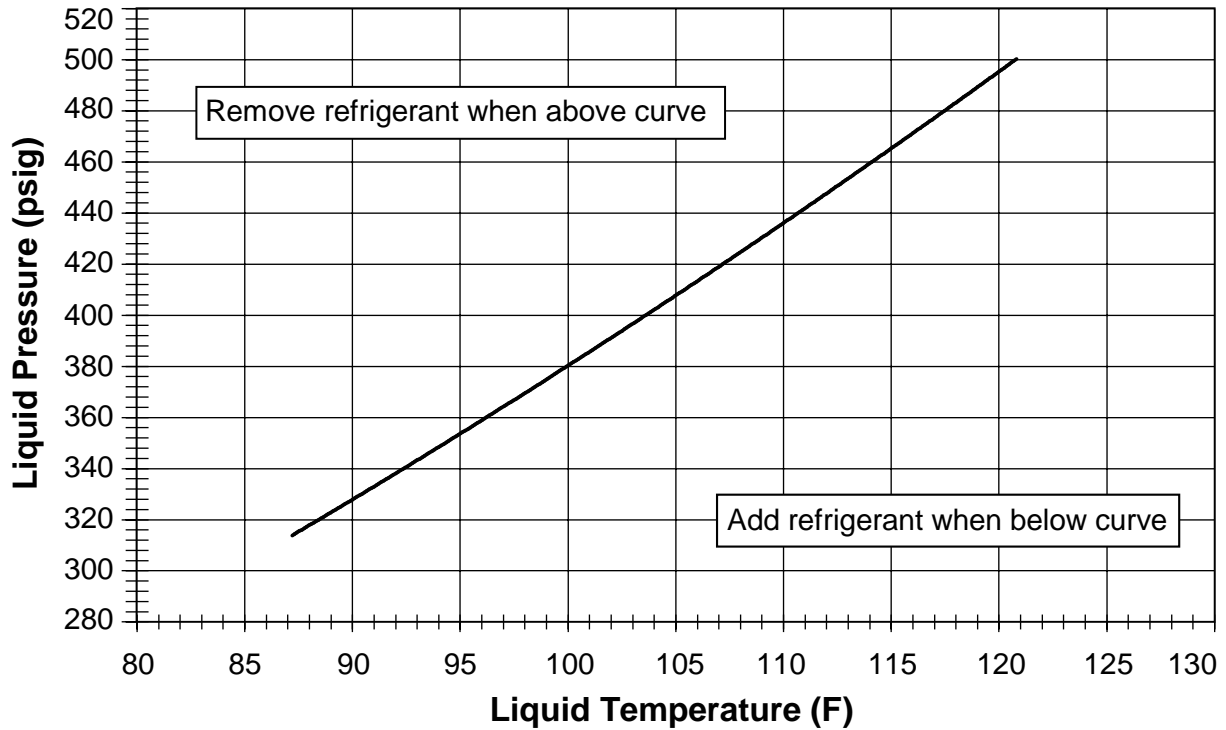


Figure 17. Charging Chart for 4 Ton Units

### 5 TON CHARGING CHART

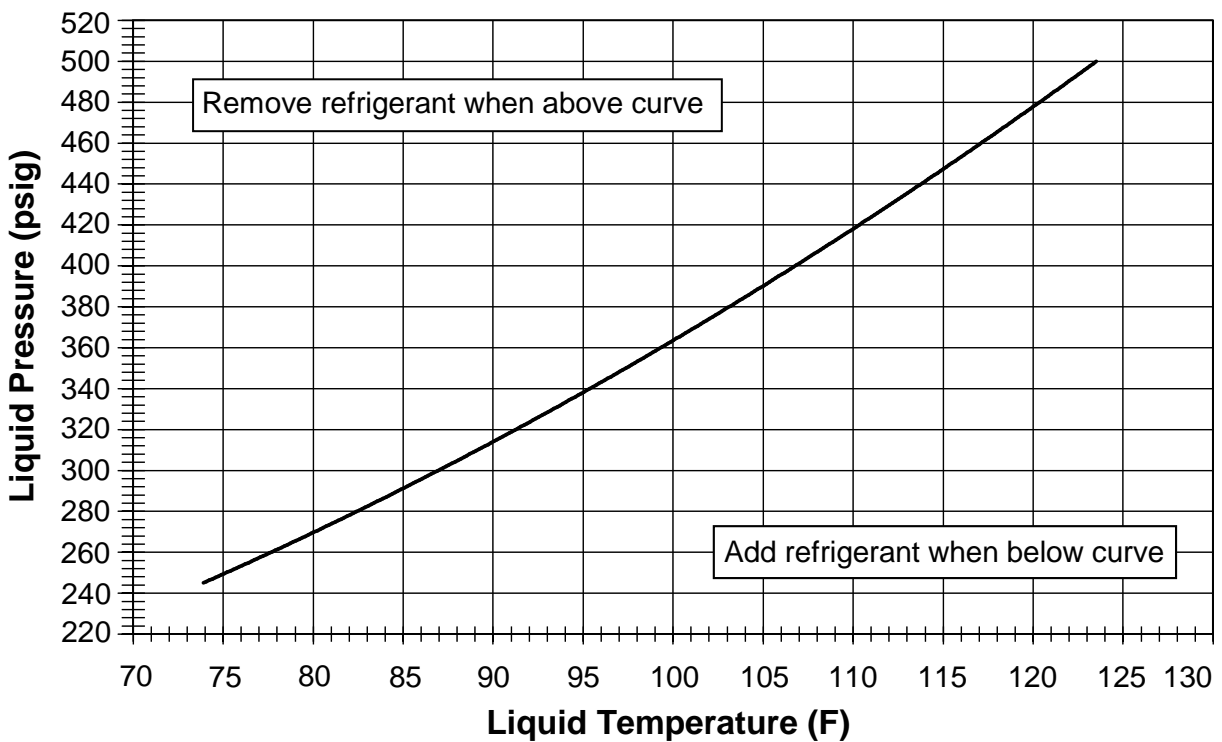


Figure 18. Charging Chart for 5 Ton Units

## APPENDIX - HEAT EXCHANGER CONDENSATE DRAIN & VENT SYSTEM

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury or property damage.**

**Improper servicing could result in dangerous operation, serious injury, death or property damage.**

- **Before servicing, disconnect all electrical power to the equipment.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

This appendix section is a supplement for the Condensate Drain and Vent Kit (P/N 922323) that is available for purchase as an accessory item for R8HE series condensing style package gas/electric units. These instructions may be used to properly field install a heat exchanger condensate disposal and venting system. Table 19 is a detailed listing of the components that will be needed to properly connect the heat exchanger condensate drain and vent system if the kit is not being used.

### **Vent Pipe & Drain Hose Assembly**

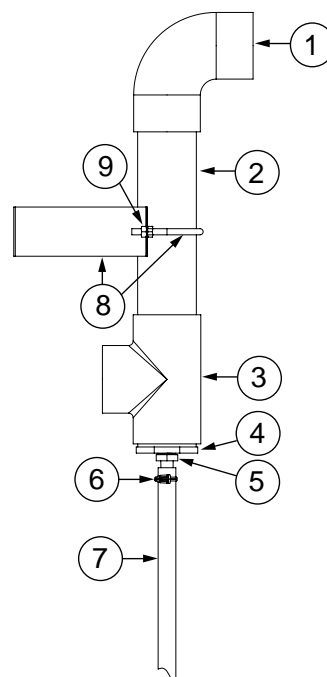
1. Connect the horizontal 13.25" x 2" PVC pipe (supplied with the unit) to the inducer motor rubber coupler and secure using 3" hose clamp provided. **NOTE:** A horizontal pipe length up to 18" is approved if pit location circumstances require it to be further from the unit and pad. A new support bracket or adaptor piece will have to be field created to ensure the vent assembly does not rotate.
2. Clean & glue the 2" x 1/2" reducer bushing into the Tee.
3. Install the 1/2" hose connector to the reducer bushing.
4. Place the 2" PVC Tee onto the end of the horizontal pipe. **DO NOT CEMENT THE TEE ON AT THIS TIME.** Drop a plumb line from the bottom of the 1/2" drain fitting to the ground to locate the starting point of the pit or trench.

### **Vertical Drain Pit Method**

**IMPORTANT NOTE:** The flue condensate of this unit is slightly acidic and some local codes may require a neutralizing treatment when disposing directly into the ground. Check state or local code requirements for application of this equipment and if necessary substitute limestone rock, chat, or lime pellets to the pit to neutralize the condensate instead of using basic rock or chat.

### FIELD SUPPLIED PARTS

| ITEM #  | DESCRIPTION                                 | QTY |
|---|---|-----|
| 1   | 2" PVC x 90 Degree Elbow & 1/4" Mesh Screen | 1   |
| 2   | 2" PVC x 10" Pipe                           | 1   |
| 3   | 2" PVC Tee                                  | 1   |
| 4   | 2" x 1/2" PVC Reducer Bushing               | 1   |
| 5   | 1/2" Barb x 1/2" NPTF                       | 1   |
| 6   | Spring Hose Clamp                           | 1   |
| 7   | 1/2" ID x 36" Drain Hose                    | 1   |
| 8   | Horizontal Vent Support Bracket & U-Bolt    | 1   |
| 9   | 1/4-20 Nuts                                 | 4   |
|   | Self Drilling Screws (Not shown)            | 2   |
|   | Wire Tie (Not shown)                        | 1   |
|   | 3 Ft. Flexible Insulation (Not Shown)       | 1   |
| 2" PVC pipe x Length. (Length is approximately 16" + Regional Frost Line Depth for unit on standard 2' concrete pad). <b>NOTE:</b> For a trench style drain installation (page 3) you will also need 4"x36" (min.) corrugated flexible pipe w/ drain holes, a 2"x4" PVC reducer, 4" corrugated piping connection, 2"x90 degree PVC elbow, and 4" filtration sleeve or permeable barrier material. (Not Shown) |   |     |
| 40-80 Lb. Rock or chat, (Limestone rock or lime pellets if required by local code for neutralizing the condensate when disposing into the ground). (Not Shown)  |   |     |
| PVC Solvent Cleaner and Pipe Cement. (Not Shown)  |   |     |



**Table 19. Parts List**



## NOTE TO INSTALLER READ THIS BEFORE YOU DIG!

**Before you begin digging the pit for the condensate drain line assembly, you may need to call to find out where underground electric, gas, or other utilities are located. Some state laws require that a locate request be placed at least three (3) working days prior to any digging projects. The utilities should respond to your request by marking the approximate location of their utilities or notifying you that they have no utilities in your dig site area. After confirming utility response, you can then proceed with your excavation avoiding damages.**

### Preparing the pit

After pit location has been determined, the condensate drain pit must be prepared for installation of the vertical 2" PVC vent pipe and insulated drain hose assembly. If desired, remove any sod and top soil prior to digging for later use at end of installation.

Vertical pit should be approximately 12"-14" in diameter (or larger) for installation of the rock base and vertical piping system to allow for proper drainage with a depth of 4"-6" below the regional frost line if possible. See Figure 19.

### Percolation Test (Optional)

A simple percolation test (not required) can be performed to aide in determining if the diameter and depth for the pit is suitable. It will allow you to simply observe how quickly a known volume of water dissipates into the subsoil of a drilled hole of known surface area. In general, sandy soil will absorb more water than soil with a high concentration of clay or where the water table is close to the surface.

1. Using Table 20, identify the approximate volume of water being produced for the equipment being installed.
2. Pour a volume (V) of water large enough into the hole capable of measuring the height.

$$(V) = (X) \times \text{Steady state Disposal Rate.}$$

**Example:** For 5-Tube (100,000 BTU), if X=4 then water volume (V) = 4 x 0.55 GPH = 2.20 Gallons.

3. Immediately measure the water level depth at the start of the test (Y1Start) and then again after one hour (Y2Final).

**NOTE:** The pit water level height change should be greater than or equal to the disposal rate height change or you may want to widen or deepen the hole if possible. Pit Water Level Height Change = (Y1Start)-(Y2Final) should be greater than or equal to Disposal Rate Height Change= (Y1Start)/(X).

| FURNACE HX SIZE   | UNIT CONDENSATE DISPOSAL RATE |
|-------------------|-------------------------------|
|                   | STEADY STATE                  |
| 3 Tube – 60 KBTU  | 0.35 GPH                      |
| 4 Tube – 80 KBTU  | 0.45 GPH                      |
| 5 Tube – 100 KBTU | 0.55 GPH                      |

**Table 20. Condensate Disposal Rate**

### Vertical Drain Pipe Installation

1. After the pit has been dug out, pour the rock or chat base to a level **approximately 2" below the frost line**. Mix in 50% of the limestone rock, chat, or lime pellets (if required by code) with the initial rock base.
2. Measure the distance between the top of the rock base and bottom of ½" drain fitting.
3. Cut the field supplied 2" PVC pipe to the measured length.
4. Cut the drain hose and insulation to the measured length **less 3"** so the drain cannot become blocked.
5. Connect vinyl drain tube to the ½" barbed drain connection at bottom of 2" PVC Tee and secure with spring hose clamp.
6. Install flexible insulation over the entire length of drain tube and cut away any excess, then secure at the top with wire tie provided.
7. Place the 2" PVC pipe into the pit and work the drain hose assembly into the pipe until the entire length is inside and the PVC pipe is vertical.
8. Glue or use two 1/2" long screws (field supplied) to secure the 2" PVC Tee to the unit horizontal vent pipe. See Joint A in Figure 19. **NOTE:** Fastening the Tee to the horizontal vent pipe with 1/2" screws will make disassembly easier for future cleaning or inspection of the drain / vent system.
9. While holding the 2" pipe completely vertical and centered to the drain Tee, slowly backfill the pit around the outside of the pipe. **NOTE:** Use the remaining rock or chat until above the frost line then use remaining backfill materials from the excavation area.
10. Continue to backfill the hole until 1"-2" above grade level, then grade away to keep rain water from collecting in the pit area as the ground settles over time. Add any remaining top soil and sod back to pit location if desired.
11. Proceed to Completing the Vent section (page 38).

## NOTE TO INSTALLER READ THIS BEFORE YOU DIG!

**Before you begin digging the trench for the condensate drain line assembly, you may need to call to find out where underground electric, gas, or other utilities are located. Some state laws require that a locate request be placed at least three (3) working days prior to any digging projects. The utilities should respond to your request by marking the approximate location of their utilities or notifying you that they have no utilities in your dig site area. After confirming utility response, you can then proceed with your excavation avoiding damages.**

### Horizontal Drain Trench Method (Alternate Drain Construction)

If the surrounding area does not allow the digging of a pit due to rock, dense clay soil, etc., the drain may be applied in a shallower horizontal trench as long as regional conditions allow. This type of application is not

recommended for areas where temperatures are below 20° F for extended periods of time but is also dependent on the final depth of the trench if the frost line cannot be reached. The unit will operate longer and more frequently during colder weather to help keep the trench from freezing.

**IMPORTANT NOTE: The flue condensate of this unit is slightly acidic and some local codes may require a neutralizing treatment when disposing directly into the ground. Check state or local code requirements for application of this equipment and if necessary substitute limestone rock, chat, or lime pellets to the pit to neutralize the condensate instead of using basic rock or chat.**

### Preparing the Trench

Start the trench where the 2" vertical pipe can be installed vertically into the trench and centered under the vent tee. The horizontal trench should be approximately 8"-10" wide x 30"-36" long with a minimum depth of 12"-14" (or deeper) when possible to allow for proper drainage and minimize chance of freeze up. The trench should be directed away from the unit and home with an approximate 1" / 12" slope. To determine if the length and width for the trench is suitable, refer to the optional percolation test section on page 37.

### Horizontal Drain Pipe Installation

1. After the trench has been dug out, lay in a 3"-4" rock or chat base the full length of the trench with a slight slope of 1/4"-1/2" / per foot. Mix in 50% of the limestone rock, chat, or lime pellets (if required by code) with the initial rock base.
2. Clean and cement the field supplied 2" x 90 degree elbow and 2" x 4" reducer assembly together.
3. Measure and cut a length of 2" PVC that extends vertically from the bottom of the 3/4" drain fitting at the bottom of the tee to the 2" elbow/reducer assembly resting on the rock base as shown in Figure 20.
4. Cut the 3/4" vinyl drain hose and flexible insulation to the same length as the 2" vertical PVC pipe.
5. Secure the elbow/reducer assembly to one end of the 4" drain pipe.
6. Cut the 4" corrugated flexible drain pipe with drain holes to a length extending to the end of the trench.
7. Connect vinyl drain tube to the 1/2" barbed drain connection at bottom of 2" PVC Tee and secure with spring hose clamp.
8. Install flexible insulation over the entire length of drain tube and cut away any excess, then secure at the top with wire tie provided.
9. Cement the 2" PVC pipe into the elbow/reducer assembly.
10. Work the drain hose assembly into the pipe until the entire length is inside and the PVC pipe is vertical.
11. Glue or use two 1/2" long screws (field supplied) to secure the 2" PVC Tee to the unit horizontal vent pipe. See Joint A in Figure 20. **NOTE:** Fastening the Tee to the horizontal vent pipe with 1/2" screws will make disassembly easier for future cleaning or inspection of the drain / vent system.

12. Prior to backfilling install the 4" flexible pipe filtration sleeve over the drain pipe or lay the permeable barrier material down over the length of pipe in the trench.
13. While holding the 2" pipe completely vertical and centered to the drain tee, slowly backfill the trench over the full length of the pipe. Use any remaining rock or chat until the entire length of 4" drain pipe is covered then use remaining backfill materials from the excavation area.
14. Continue to backfill the hole until 1"-2" above grade level and then grade away to keep rain water from collecting in the trench area as the ground settles over time. Add any remaining top soil and sod back to pit location if needed.

### Completing the Vent Installation

1. Mark a pencil line up from the centerline of the unit vent exit hole for aligning and attaching the vent support bracket.
2. Holding bracket on pencil line at desired height (for securing to the 10" vent pipe), secure the support bracket to the unit with two self drilling screws provided in kit.
3. Carefully insert the 1/4" mesh screen into the elbow and make sure it is firmly in place.
4. Cement the 2" x 90 Degree PVC Elbow (opposite end with 1/4" mesh screen) and 10" pipe together.
5. Cement or mechanically fasten the assembly (with 1/2" long screws) into the top of the tee. Verify the outlet is perpendicular to the unit. See Joint B in Figure 19 and Figure 20.

**NOTE:** Fastening the 10" pipe to the Tee with 1/2" screws will make disassembly easier for future cleaning or inspection of the drain / vent system.

6. Install the 2-1/2" U-Bolt to support bracket using nuts (provided in kit) to secure the vent assembly to the unit.

## REPLACEMENT PARTS

Replacement parts are available through all Nordyne distributors. Please have the complete model and serial number of the unit when ordering replacement parts.

#### ELECTRICAL:

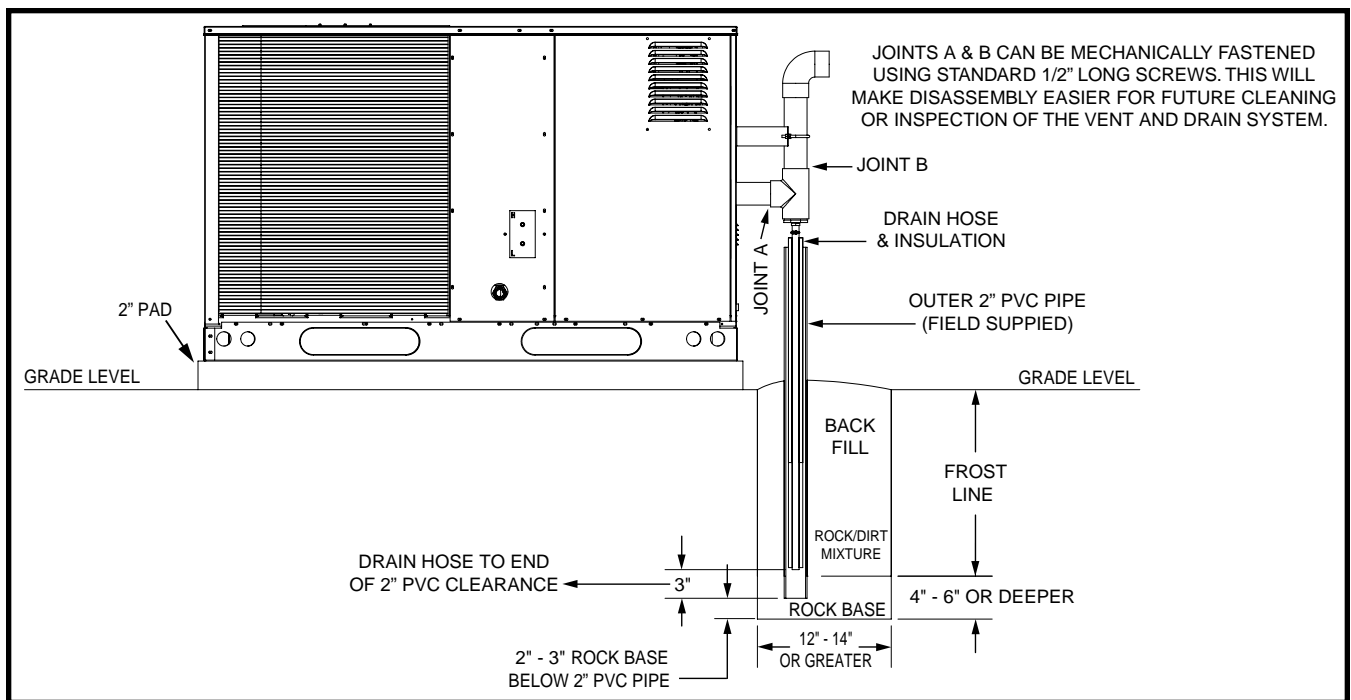
- |                        |                              |
|------------------------|------------------------------|
| • Blower Control Board | • Ignitors/Flame Sensors     |
| • Capacitors           | • Pressure Switches          |
| • Compressors          | • Relays                     |
| • Contactors           | • Temperature Limit Switches |
| • Gas Valves           | • Thermostats                |
| • Hall Effect Sensor   | • Time Delay Relays          |
| • Ignition Controls    | • Transformers               |

#### MOTORS:

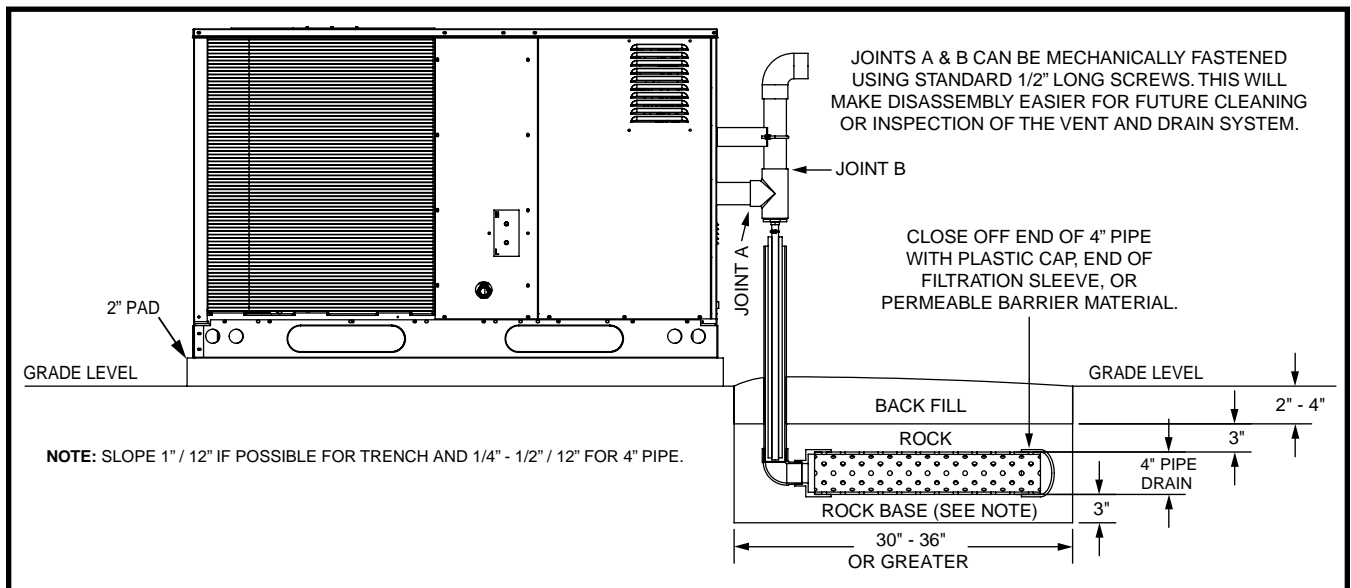
- Blower Motor
- Fan Motor
- Inducer Blower Motor

#### COMPONENTS:

- |                    |                  |
|--------------------|------------------|
| • Blower Assembly  | • Fan Grille     |
| • Burner Manifold  | • Filter/Driers  |
| • Burners/Orifices | • Gaskets        |
| • Cabinet Panels   | • Heat Exchanger |
| • Expansion Valves |                  |



**Figure 19. Condensate Disposal Using A Vertical Drainage Pit**



**Figure 20. Condensate Disposal Using A Horizontal Drainage Trench**

## INSTALLATION / PERFORMANCE CHECK LIST

|  |             |    |
|--|-------------|----|
| <b>INSTALLATION ADDRESS:</b>                                 |             |    |
| CITY _____   | STATE _____ |    |
| UNIT MODEL # _____   |             |    |
| UNIT SERIAL # _____  |             |    |
| Unit Installed Minimum clearances per Figure 1 (page 5)?     | YES         | NO |
| <b>INSTALLER NAME:</b>                                       |             |    |
| CITY _____   | STATE _____ |    |
| Has the owner's information been reviewed with the customer? | YES         | NO |
| Has the Literature Package been left with the unit?          | YES         | NO |

| ELECTRICAL SYSTEM                        |     |    |
|--|-----|----|
| Electrical connections tight?            | YES | NO |
| Line voltage polarity correct?           | YES | NO |
| Rated Voltage: _____ VOLTS               |     |    |
| L1-L2 Volts: _____ VOLTS                 |     |    |
| Has the thermostat been calibrated?      | YES | NO |
| Is the thermostat level?                 | YES | NO |
| Is the heat anticipator setting correct? | YES | NO |

| VENTING SYSTEM  |     |    |
|---|-----|----|
| Is the heat exchanger condensate drain and vent pipe installed? | YES | NO |
| Is pipe free of restrictions?                                   | YES | NO |
| Filter(s) secured in place?                                     | YES | NO |
| Filter(s) clean?  | YES | NO |

| GAS SYSTEM   |             |         |
|--|-------------|---------|
| Gas Type: (circle one)   | Natural Gas | Propane |
| Gas pipe connections leak-tested?                                  | YES         | NO      |
| Gas Line Pressure: _____ (in - W.C.)                               |             |         |
| Is there adequate fresh air supply for combustion and ventilation? | YES         | NO      |
| Installation Altitude: _____ (FT.)                                 |             |         |
| Deration Percentage: _____ (%)                                     |             |         |
| Unit Input: _____ (Btuh)   |             |         |
| Supply Air Temperature: _____ (° F)                                |             |         |
| Return Air Temperature: _____ (° F)                                |             |         |
| Temperature Rise: _____ (° F)                                      |             |         |
| During Unit Operation:   |             |         |
| Manifold pressure: _____ (in - W.C.)                               |             |         |

| REFRIGERATION SYSTEM   |     |    |
|--|-----|----|
| Was unit given 24 hr warm up period for crankcase heaters (if equipped)? | YES | NO |
| Stage-1 Liquid Pressure (high side) _____                                |     |    |
| Stage-1 Suction Pressure (low side) _____                                |     |    |

### ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the unit or failure to follow safety warnings could result in serious injury, death, or property damage. These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment.



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Specifications & illustrations subject to change without notice or incurring obligations (11/13).



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