

## INSTALLATION INSTRUCTIONS

### SINGLE PACKAGE GAS HEATING / ELECTRIC COOLING SINGLE PHASE



HORIZONTAL MOUNT SHOWN

#### ⚠ WARNING

##### FIRE OR EXPLOSION HAZARD

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

- 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.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

#### ⚠ AVERTISSEMENT

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

Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels.

- 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 SI UNE ODEUR DE GAZ EST DÉTECTÉE

- Ne mettre en marche aucun appareil.
- Ne toucher aucun interrupteur électrique; ne pas utiliser de téléphone dans le bâtiment.
- Quitter le bâtiment immédiatement.
- Appeler immédiatement le fournisseur de gaz en utilisant le téléphone d'un voisin. Suivre les instructions du fournisseur de gaz.
- Si le fournisseur de gaz n'est pas accessible, appeler le service d'incendie.
- L'installation et l'entretien doivent être effectués par un installateur ou une entreprise d'entretien qualifié, ou le fournisseur de gaz.

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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 15](#).
- 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 13 \(page 37\)](#).

## 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 8](#) for additional information.
- Consult [Table 8 \(page 28\)](#), [Table 9 \(page 28\)](#), [Table 10 \(page 29\)](#), [Table 11 \(page 30\)](#), [Table 12 \(page 31\)](#) & [Table 13 \(page 32\)](#), 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](#), [page 7](#), & [page 8](#).
- 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 for outdoor rooftop or ground level slab installations and can be readily connected to the duct system of a home or building. 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

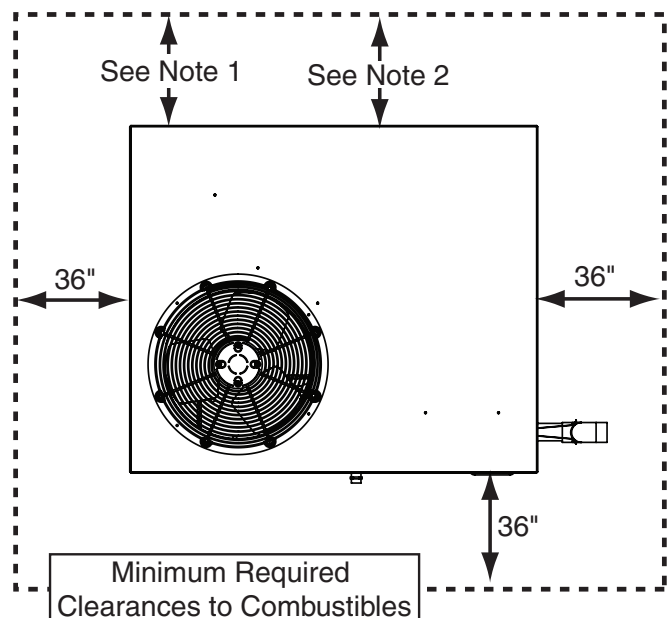
- ✓ The cooling load of the area to be conditioned must be calculated and a system of the proper capacity selected. It is recommended that the area to be conditioned be completely insulated and vapor sealed.
- ✓ Check the electrical supply and verify the power supply is adequate for unit operation. Consideration 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:**

#### **CARBON MONOXIDE POISONING HAZARD**

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed with each individual appliance connected to the venting system being placed in operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CSA B149.1, Natural Gas and Propane Installation Codes and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Codes.
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

### **AVERTISSEMENT:**

#### **RISQUE D'INTOXICATION AU MONOXYDE DE CARBONE**

Si les étapes décrites ci-dessous ne sont pas suivies pour chacun des appareils raccordés au système de ventilation au moment de sa mise en marche, cela peut entraîner une intoxication au monoxyde de carbone ou la mort. Les étapes suivantes doivent être suivies pour chacun des appareils raccordés au système de ventilation au moment de sa mise en marche, alors que tous les autres appareils raccordés au système de ventilation ne sont pas en marche :

1. Sceller toutes les ouvertures inutilisées du système de ventilation.
2. Inspecter le système de ventilation afin de vérifier si la taille et l'inclinaison par rapport à l'horizontale sont conformes aux exigences du National Fuel Gas Code, ANSI Z223.1/NFPA 54 ou du Code d'installation du gaz naturel et du propane, CSA B149.1 et à ces instructions. Vérifier qu'il n'y a pas d'obstruction ou de restriction, de fuite, de corrosion et d'autres problèmes qui pourraient entraîner une situation dangereuse.
3. Si possible, fermer toutes les portes et fenêtres du bâtiment ainsi que toutes les portes séparant l'endroit où se trouvent les appareils raccordés au système de ventilation et les autres zones du bâtiment.
4. Fermer le registre des foyers.
5. Mettre les sècheuses en marche ainsi que tous les autres appareils qui ne sont pas raccordés au système de ventilation. Mettre en marche tous les ventilateurs de tirage, comme celui des hottes de cuisine et des salles de bains, et les régler à la puissance maximale. Ne pas mettre en marche les ventilateurs d'été.
6. Suivre les instructions d'allumage. Mettre en marche l'appareil soumis à l'inspection. Régler le thermostat de manière à ce que l'appareil fonctionne en continu.
7. Vérifier la présence de fuite au niveau de l'ouverture du coupe-tirage des appareils qui en sont dotés après 5 minutes de fonctionnement du brûleur principal. Utiliser la flamme d'une allumette ou d'une bougie.
8. Si un problème de ventilation est observé pendant l'un des essais décrits ci-dessus, des correctifs doivent être apportés au système de ventilation conformément au National Fuel Gas Code, ANSI Z223.1/NFPA 54 et (ou) au Code d'installation du gaz naturel et du propane, CSA B149.1.
9. Une fois qu'il a été déterminé que chaque appareil raccordé au système de ventilation fonctionne correctement au moyen des essais décrits ci-dessus, les portes, les fenêtres, les ventilateurs, les registres de foyer et tous les autres appareils de combustion alimentés au gaz doivent être remis dans leur état initial.

## **⚠ 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. Condensate Drain and Vent Kits are available for purchase as accessory items.

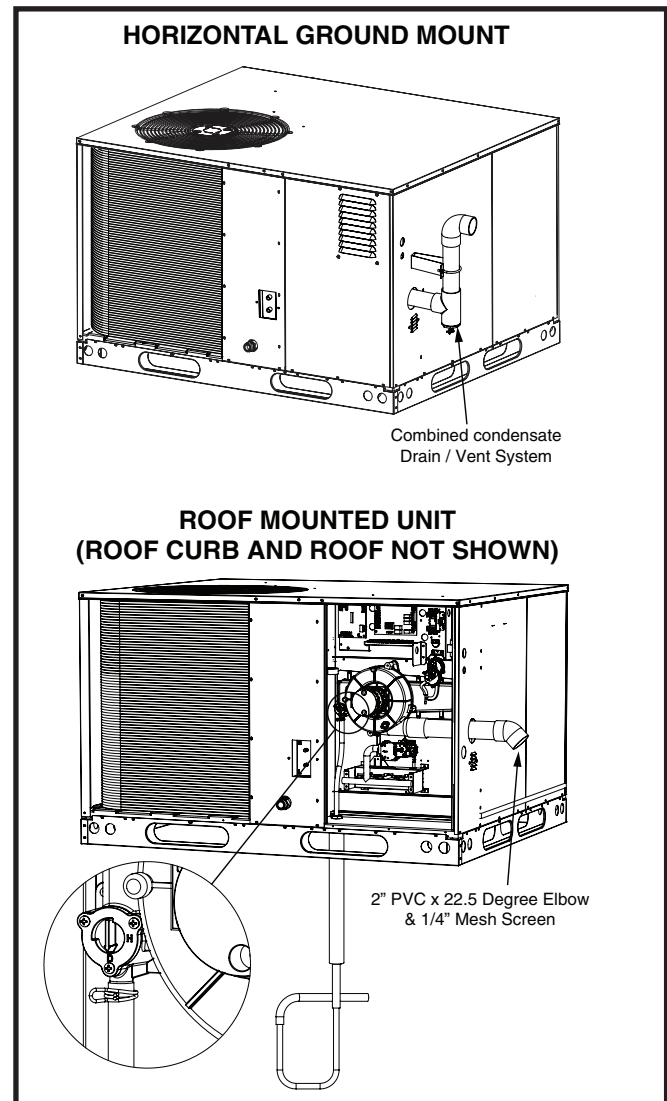
Horizontal ground mount applications can use P/N-922323 to attach the 13.25" x 2" PVC pipe within the control area of this unit. Rooftop mount applications can use the downflow condensate drain / vent kit (P/N-922485). If any of these kits are not being used, see Appendix on [page 42](#) or [page 44](#) for your specific application.

## **⚠ 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 for both horizontal and downflow applications. 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.



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

- 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.

## 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 roof curb or 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.
- If a roof curb is installed, the ducts must be attached to the curb hangers, not the unit.
- 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.
- If outside air is utilized as return air to the unit for ventilation or to improve indoor air quality, the system must be designed so that the return air to the unit is not less than 50° F (10° C) during heating operation.
- If a combination of indoor and outdoor air is used, the ducts and damper system must be designed so that the return air supply to the furnace is equal to the return air supply under normal, indoor return air applications.

### **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. Take care not to damage the coil or cabinet when removing the carton. For rooftop installations, remove and discard the two supports attached beneath the unit

### 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 \(page 27\)](#) 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 \(page 19\)](#) for locating the center of gravity.
- All panels must be securely in place during rigging and hoisting, except control access panel. See [page 47](#) for additional lifting and setting of unit requirements.

### Clearances to Combustible Materials

These units are certified as combination heating and cooling equipment for outdoor rooftop or ground level installations. Units may be installed on combustible flooring or class A, B, or C roofing material when used with bottom supply and return air ducts as long as the following requirements are met:

- If using bottom discharge with return air ducts a roof curb must be installed prior to unit installation. See Rigging and Hoisting section for setting of the unit.
- Sufficient clearance for unobstructed airflow through the outdoor coil must also be maintained in order to achieve rated performance. For information about locating the equipment, see [page 5](#).

### 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.

### Rooftop

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

- The roof must be capable of handling the weight of the unit. Reinforce the roof if necessary. For unit weights, see [Table 7 \(page 27\)](#).
- The appropriate accessory roof curb must be installed prior to unit installation. The roof curb must be square and level to ensure proper condensate drainage. See [Figure 2 \(page 7\)](#). Please follow all instructions provided with the kit.
- Secure roof curb or frame to roof using acceptable mechanical methods per local codes. **NOTE:** Make sure the two supports beneath the unit have been removed.

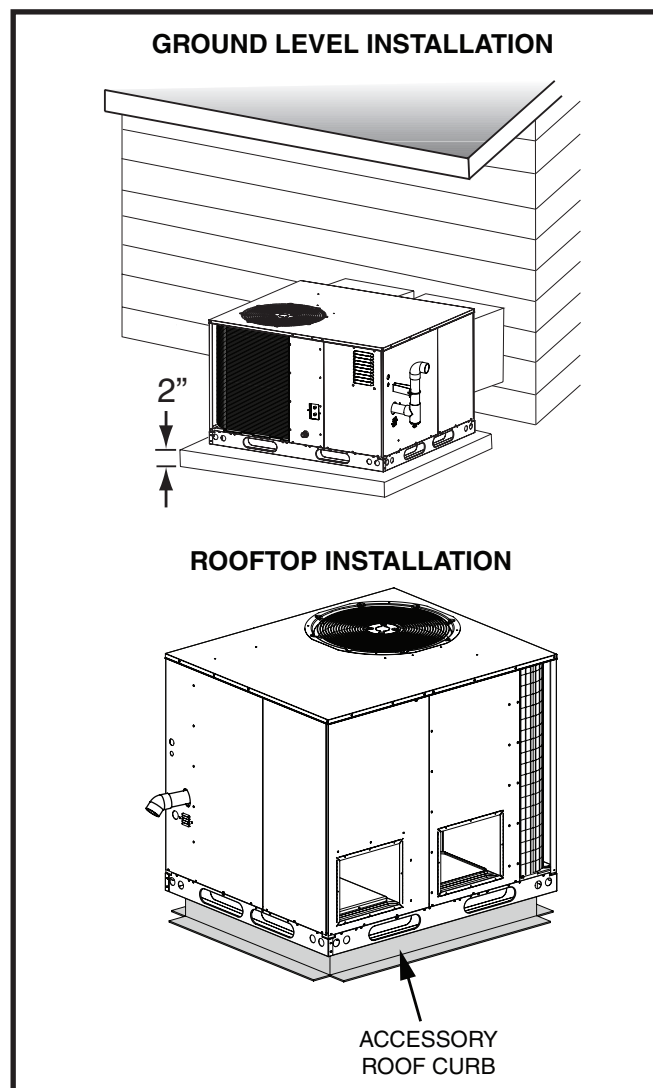


Figure 3. Ground & Rooftop Installation

### IMPORTANT NOTES TO INSTALLER

- When setting the roof curb for installation, routing and securement of the gas heat exchanger condensate drain line must be determined and installed prior to setting the unit on the curb. It is recommended to drill a 1.00"-1.25" diameter hole through the roof below the rectangular opening located in outer close off curb panel (G), approximately 15" in from the short side of curb and 1"-2" in from the long side of curb. If drilling a hole is not an option, routing the condensate drain hose over to the duct passage opening with enough slope is acceptable as long as drain line is secured to curb and duct, ensuring no kinks or traps can form between the collector box drain or interior of the building. Leave a minimum of 24" drain line extending out the top of roof curb front close off panel (G) for passage through unit bottom and connection to unit drain when unit is being set. See unit or condensate/vent drain kit (P/N-922485) instructions for completion of the drain connection.
- It is recommended no non-serviceable connections are introduced in the drain line between unit drain connection and an accessible area within the building interior.
- Securement of the drain line to the inside surface of the roof curb is acceptable and should be made in the wood nailer area (top 3.5") to avoid possible leaks or penetrations to roofing materials.
- Cut and remove the insulation covering the 2" x 3" condensate drain passage in outer panel (G) only. Before installing inner panel (G) ensure there is enough slope and there are no kinks or high spots that could trap water in the line prior to entering the warmer interior of the building where a drain trap is acceptable.

- All panels must be securely in place during rigging and hoisting, except control access panel. See [page 47](#) for additional lifting and setting of unit requirements.

### Horizontal to Downflow Conversion

The unit is shipped ready for horizontal duct connections. If down flow ducts are required, the unit must be converted following the steps below for both the supply and return ducts.

- Remove both horizontal duct caps.
- Locate the duct cap inside the duct openings and remove the screw holding it in place.
- Lift the cap out of the unit. (Hint: The cap can be pushed up from the bottom by reaching through the fork slot).
- Cover the horizontal duct openings with the horizontal duct caps removed earlier in step 1. The insulation will be on the indoor side.
- Fasten the cover with screws to seal.
- Remove and discard the two wood supports beneath the unit.

### Condensate Drain (Air Conditioning)

Air conditioning condensate is removed from the unit through the 3/4" female pipe and supplied fitting located on the front side of the unit. [Figure 4 \(page 11\)](#).

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.

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

INTERNAL FILTER SIZES				
CABINET HEIGHT	OUTDOOR FAN DIAMETER	FILTER SIZE (IN. X IN.)	APPROXIMATE AIR FLOW RANGE (CFM)	APPROXIMATE FILTER AREA (SQ. IN.)*
30"	20	(2) 14"x25"	700 - 1300	700
	24"	(1) 12"x20" and (1) 16"x25"		640
34"	20	(2) 16"x25"	900 - 1400	800
	24"	(1) 12"x20" and (2) 10"x25"		740
38"	20"	(2) 18"x25"	1100 - 1600	900
	24"	(1) 12"x20" and (2) 12"x25"		840
42"	20"	(2) 20"x25"	1300 - 1800	1000
	24"	(1) 12"x20" and (2) 14"x25"		940

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

**Table 1. External & Internal Filter Sizes**

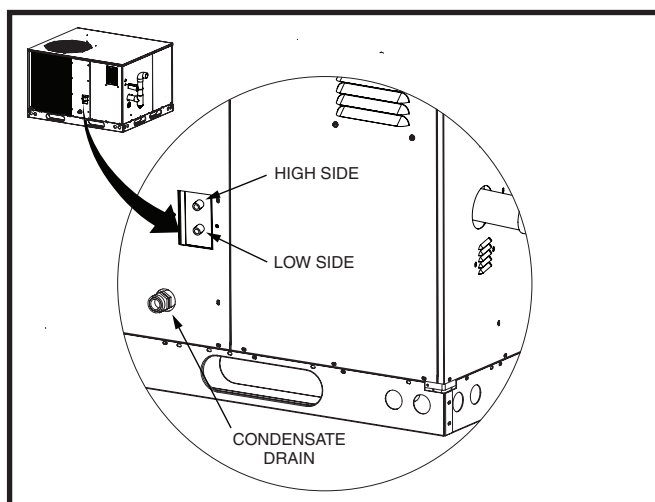
## Air Filter Requirements

### **WARNING:**

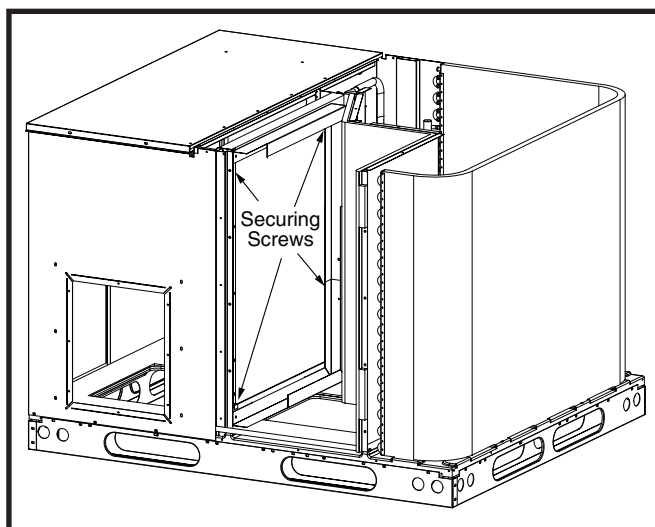
**Never operate the unit without a filter in place. Dust and lint could accumulate on internal parts, resulting in loss of efficiency, equipment damage and possible fire.**

**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.”**

- An air filter is not supplied with this package unit as shipped from the factory. The installer must provide a high velocity filter that is appropriately sized to the return air duct opening or internal filter rack. The filters must comply with ANSI/UL 900 or CAN/ULC-S111.



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



**Figure 5. Internal Filter Rack Location**

- For recommended external filter sizes, refer to [Table 1 \(page 10\)](#).
- 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.
- Single phase downflow applications require either a Nortek internal filter kit be used or an air filter system be installed in the return air ductwork. See [Table 1](#) for specific unit model and filter sizes. Nortek internal filter rack adjusts for 1" or 2" filters. To convert the unit from 1 inch to 2 inch filters, see 1" to 2" Filter Conversion section below.
- Horizontal installations require the air filter system be installed in the return air ductwork.

### **Installing Filters in the Internal Filter Rack** (If Equipped)

1. Remove access panel screws from return air panel. (**Hint:** Loosen the unit's top panel screws near the top edge of the access panel. The access panel was designed to be captured underneath the top panel.)
2. Slide the first filter between both guide channels of filter rack and allow the filter to drop easily into place.
3. Verify the bottom of the filter is within the channels of the rack.
4. Slide the 2nd filter (and 3rd filter on taller models) between both guide channels of filter rack.
5. Verify the top of the filter is within the channels of the rack.
6. Replace access cover by sliding the top edge of panel under the lip of the unit's top panel. Secure access panel by replacing the screws.

### **1" to 2" Filter Conversion**

Factory installed internal filter rack (3 phase models only) is set up to accept 1" filters. If conversion to 2" filters is desired, remove the two (or three) 1" filter adaptors secured in the assembly with clips by pulling straight off the frame. The filter bracket must be reoriented to accept 2" filters by removing two screws securing it to the hinge and rotating 180 degrees. See [Figure 22 \(page 45\)](#).

### **Removing Filters from Internal Filter Rack** (If Equipped)

1. Remove access panel screws from return air panel. (**Hint:** Loosen the unit's top panel screws near the top edge of the access panel. The access panel was designed to be captured underneath the top panel.)
2. Remove upper filter by gently pulling filter through the access panel opening.
3. Remove lower filter by lifting media to top of filter rack. Remove in the same manner as described in step 2.
4. Install new filter in the filter rack as described in the previous section.

## 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 entreteïn 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'entreteïn.
- 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

(Single Phase Models)

- ✓ 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 \(page 35\)](#) (or the unit rating label) for proper high voltage wiring requirements.
- ✓ Verify factory wiring is in accordance with the unit wiring diagram. [Figure 13 \(page 37\)](#). 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. See [Table 17 \(page 35\)](#). 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 \(page 35\)](#) 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 13 \(page 37\)](#).
- All 208-240 volt 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 10 \(page 36\)](#) 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 \(page 35\)](#).
- 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 12 \(page 36\)](#).

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 10 \(page 36\)](#).

### Heat Anticipator

Verify if the thermostat being used for the installation has a heat anticipator setting. This function allows the thermostat to anticipate the space heating rate and time the burner to shutoff accordingly. Always refer to the thermostat manufacturer's instructions for correct 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 cooling thermostat. The connection between **Y1** on the thermostat and **Y1** on the unit terminal strip energizes cooling operation. See [Figure 10 \(page 36\)](#).

### 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 10](#).

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 [Table 8 \(page 28\)](#), [Table 9 \(page 28\)](#), [Table 10 \(page 29\)](#), [Table 11 \(page 30\)](#), [Table 12 \(page 31\)](#) & [Table 13 \(page 32\)](#). 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 [Table 8](#), [Table 9](#), [Table 10](#), [Table 11](#), [Table 12](#) & [Table 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 [Table 9](#), [Table 10](#), [Table 11](#), [Table 12](#) & [Table 13](#) for heating or [Table 8](#) for cooling. See [Figure 10 \(page 36\)](#) 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](#)). [Table 8 \(page 28\)](#) 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](#)). [Table 9](#), [Table 10](#), [Table 11](#), [Table 12](#) & [Table 13](#) list 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 in the tables.

### **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 \(page 36\)](#).
- 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 dehumidification.

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 proper unit wiring diagram: [Figure 13 \(page 37\)](#). Inspect the factory wiring connections and make sure they didn't loosen 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 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.

- 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 6 \(page 16\)](#).

- The manifold pressure must be set to the appropriate value for your installation. To measure and adjust the manifold pressure see [page 19](#).
- 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 6](#).

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 6](#).

[Table 14 \(page 33\)](#) 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**

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

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

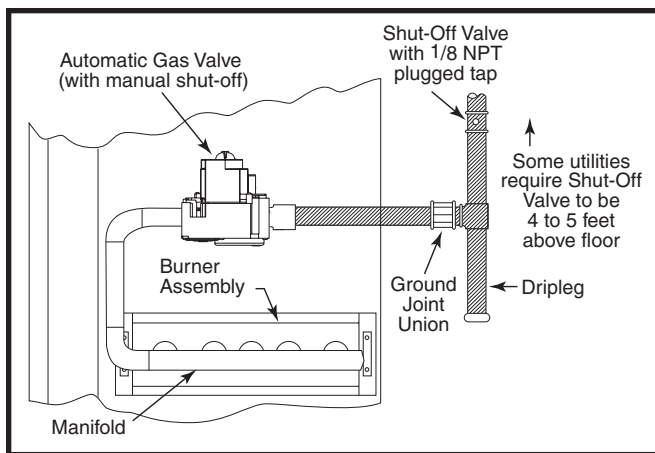
### **AVERTISSEMENT:**

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

Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels.

Ne jamais vérifier la présence de fuites de gaz au moyen d'une flamme nue. Vérifier tous les raccords en utilisant une solution savonneuse commerciale conçue spécialement pour la détection de fuites. Un incendie ou une explosion risque de se produire, ce qui peut entraîner la mort, des blessures ou des dommages matériels.





**Figure 6. Typical Gas Hookup - Right Side Entry**

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 19). 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 20) 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 19). 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 20) 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 18.



## 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 horizontal kit 922323 or downflow kit 922485 or as described in the Appendix section (page 42).
- ✓ 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 7 \(page 19\)](#).

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 22).
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 22).

#### Verifying & Adjusting Temperature Rise

Verify the temperature rise through the unit is within the range specified on the unit data label and in Table 2 (page 20). 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) see in Table 8 (page 28), Table 9 (page 28), Table 10 (page 29), Table 11 (page 30), Table 12 (page 31) & Table 13 (page 32). 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. See Figure 11 (page 36). **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 13) 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 7 (page 19).
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 33).
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.

**EXAMPLE**  
(INPUT --> HIGH = 100,000 / LOW = 65,000)

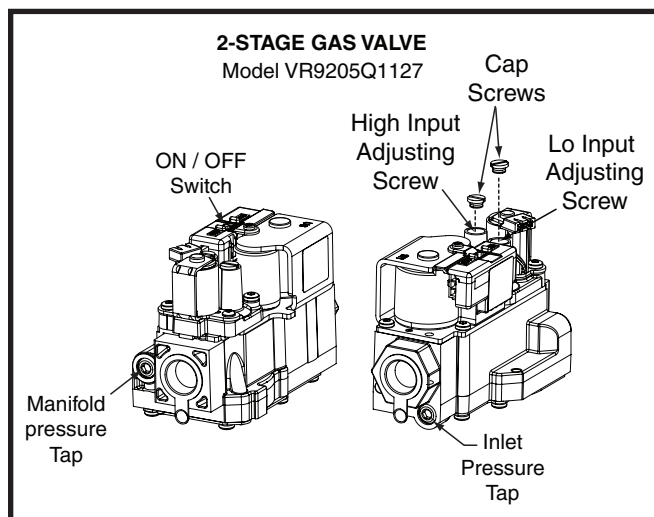
- Time for 1 revolution of a gas meter with a 1 cubic foot dial = 58 seconds.
- From [Table 15](#), read 62 cubic feet gas per hour.
- Local heating value of the gas (obtained from gas supplier) = 1,040 Btu per cubic foot.
- Low Input rate = 1,040 x 62 = 64,480 Btuh = PASS

- Record your findings and move unit operation to HIGH heating mode and Repeat Steps 3-6.
- Adjust the manifold pressure if necessary by following the steps in the Measuring & Adjusting the Manifold sections. For additional information about elevations above 2,000 feet, see High Altitude Conversion section ([page 16](#)).

#### 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:

- Turn off all electrical power to the appliance.
- Shut OFF the gas supply at the manual shutoff valve located outside of the appliance.
- Using a 3/16" Allen wrench, remove the manifold pressure tap plug located on the outlet side of the gas valve ([Figure 7](#)).
- Install an 1/8" NPT pipe thread fitting, that is compatible with a Manometer or similar pressure gauge.
- Connect the Manometer or pressure gauge to the manifold pressure tap.
- Set the room thermostat 1 degree above room temperature To start the furnace on LOW fire.
- 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 \(page 20\)](#) for Natural Gas and [Table 4 \(page 20\)](#) for LP/Propane gas. If the manifold pressure is not set to the appropriate pressure, then it must be adjusted.
- Record your findings and move unit operation to HIGH heating mode and Repeat Steps 3-6.



**Figure 7. Regulator Capscrew & Tap Locations**

#### Adjusting the Manifold Pressure

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

- Remove the cap screw from the top of the gas valve regulator ([Figure 7](#)).
- 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.

- 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.

- Turn the thermostat to its lowest setting.
- Turn OFF the main gas supply to the unit at the manual shut-off valve, which is located outside of the unit.
- Turn OFF all of the electrical power supplies to the unit.
- 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.
- Turn ON the electrical power to the unit.
- Turn ON the main gas supply to the unit at the manual shut-off valve.

#### Verifying Over-Temperature Limit Control Operation

- Verify the louvered control access panel is in place and that there is power to the unit.
- Block the return airflow to the unit by installing a close-off plate in place of or upstream of the filter.
- Set the thermostat above room temperature and verify the units operating sequence ([page 22](#)).

**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.

- 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.**

- Remove the louvered control access panel and verify there is power to the unit.

MODEL NUMBER R104HD	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)
-X24K060C	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
-X30K060C	10.0	4.5	3.5	60,000	57,000	39,000	37,050	45	30-60	160	0.80	28,600	11" x 8"	3/4
-X36K080C	10.0	4.5	3.5	80,000	76,000	52,000	49,400	45	35-65	165	0.80	34,600	11" x 8"	1
-X42K080C	10.0	4.5	3.5	80,000	76,000	52,000	49,400	45	35-65	165	0.80	41,000	11" x 10"	1
-X48K096C	10.0	4.5	3.5	96,000	91,200	62,400	59,300	45	40-70	170	0.80	47,000	11" x 10"	1
-X60K096C	10.0	4.5	3.5	96,000	91,200	62,400	59,300	45	40-70	170	0.80	57,000	11" x 10"	1

**Table 2. R104HD Nominal Rates and Temperature Rises**

MANIFOLD PRESSURE (IN W.C.) FOR NATURAL GAS INSTALLATIONS				
ALTITUDE ABOVE SEA LEVEL	HEATING VALUE BTU/CU. FT			ORIFICE SIZE
	800 TO 899 FT	900 TO 999 FT	1,000 TO 1,100 FT	
Zero to 1,999 Ft.	3.5	3.5	3.5	45
2,000 to 2,999 Ft.	3.2	3.2	3.2	45
3,000 to 3,999 Ft.	2.9	2.9	2.9	45
4,000 to 4,999 Ft.	2.7	2.7	2.7	45
5,000 to 5,999 Ft.	3.4	3.4	3.4	48
6,000 to 6,999 Ft.	3.1	3.1	3.1	48
7,000 to 7,999 Ft.	2.9	2.9	2.9	48
8,000 to 8,999 Ft.	2.7	2.7	2.7	48
9,000 to 10,000 Ft.	2.6	2.6	2.6	48

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

MANIFOLD PRESSURE (IN W.C.) AND ORIFICES FOR LP/PROPANE GAS INSTALLATIONS		
ALTITUDE ABOVE SEA LEVEL	MANIFOLD PRESSURE	ORIFICE SIZE
Zero to 1,999 Ft.	10	54
2,000 to 2,999 Ft.	9.2	54
3,000 to 3,999 Ft.	8.5	54
4,000 to 4,999 Ft.	8	54
5,000 to 5,999 Ft.	9.2	55
6,000 to 6,999 Ft.	8.4	55
7,000 to 7,999 Ft.	8	55
8,000 to 8,999 Ft.	10	56
9,000 to 10,000 Ft.	9	56

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



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)

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## **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.**

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## **CAUTION:**

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

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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 diagrams: [Figure 13 \(page 37\)](#).

### 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 \(page 25\)](#).
3. The furnace control checks for continuity (24 VAC) 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 12 \(page 36\)](#), 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 Shut Down**

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 11 (page 36)) 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 D'ÉLECTROCUTION, D'INCENDIE OU D'EXPLOSION

**Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures, un fonctionnement dangereux ou des dommages matériels.**

**Un entretien inadéquat peut entraîner la mort, de graves blessures, un fonctionnement dangereux ou des dommages matériels.**

- Avant de faire l'entretien de l'appareil de chauffage, le débrancher de l'alimentation électrique.
- Avant l'entretien des commandes, étiqueter tous les fils avant de les déconnecter. Rebrancher correctement les fils.
- Vérifier que l'appareil fonctionne correctement 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.
- Horizontal Mounted Units Only - 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 9 \(page 34\)](#) 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.

## REPLACEMENT PARTS

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

### ELECTRICAL:

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

### MOTORS:

- Blower Motor
- Fan Motor
- Inducer Blower Motor

### COMPONENTS:

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

## 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 diagrams: [Figure 13 \(page 37\)](#).

### 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 diagrams: [Figure 13 \(page 37\)](#).
- Verify the LED flash codes on the motor control board against the diagnostic codes listed in [Table 6](#) or on the wiring diagrams: [Figure 13](#).

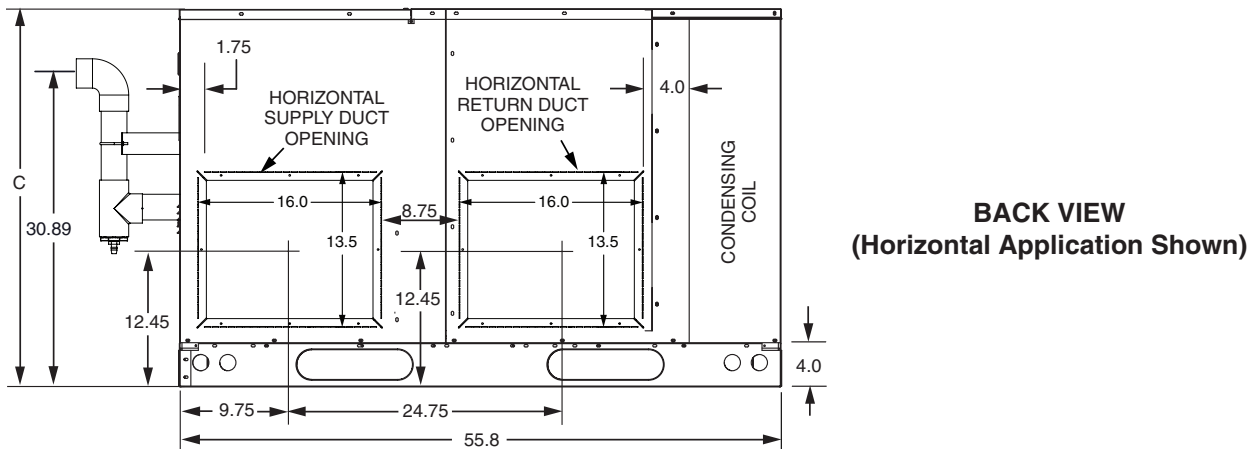
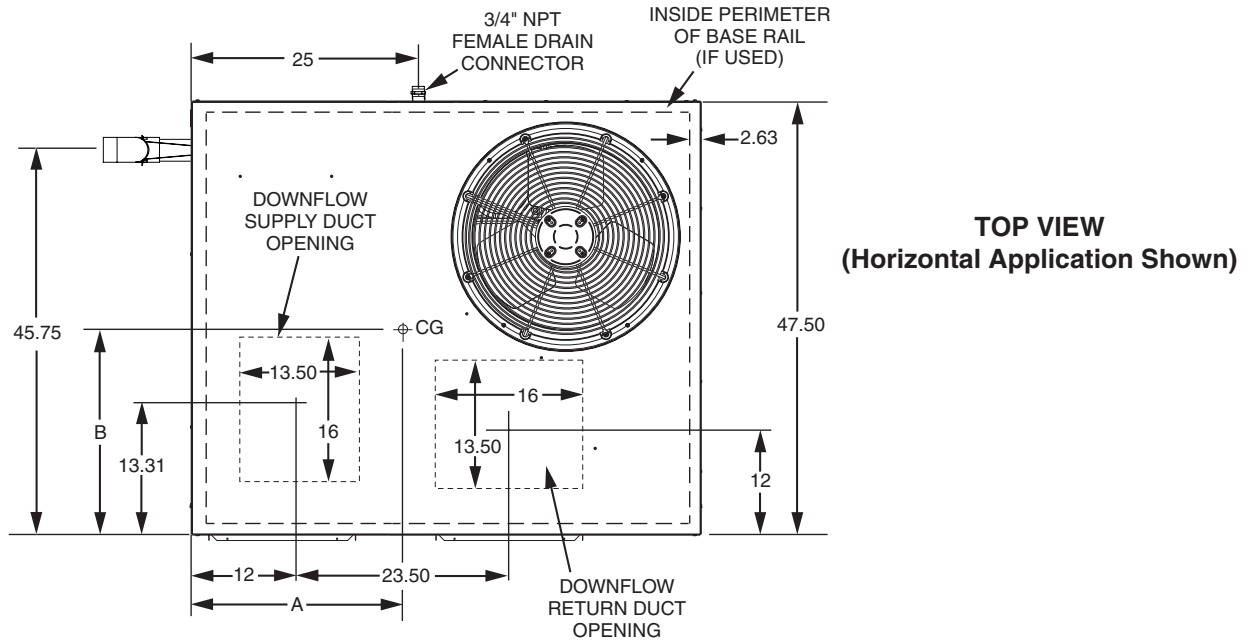
DIAGNOSTIC DESCRIPTION	GREEN LED	RED LED
Control Fault (No Power)	Off	Off
L1/Neutral Polarity Fault	Flash	Flash
1 Hour Lockout	Alternating Flash	
Normal Operation	On	On
Pressure Switch Closed Fault	On	Flash
Pressure Switch Open Fault	Flash	On
Open Limit Switch Fault	Flash	Off
Motor Fault	On	Off
Blocked 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**

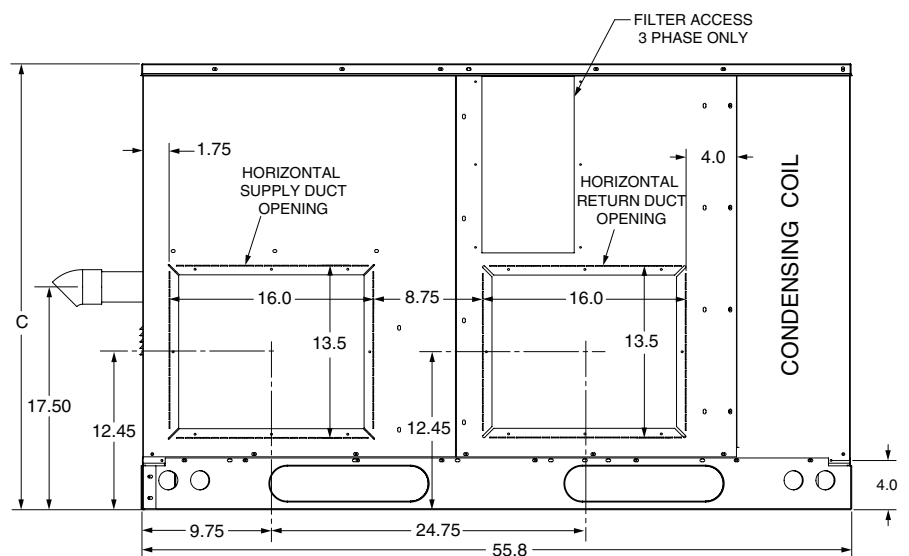
VARIABLE SPEED FURNACES	DIAGNOSTIC DESCRIPTION	GREEN LED	RED LED
	Control Fault (No Power)	Off	Off
	Normal Operation	On	On
	Motor Fault	On	Flash
	Communications Fault	Flash	Flash

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

## FIGURES & TABLES



**BACK VIEW  
(Downflow Application Shown)**



**Figure 8. Unit Dimensions**

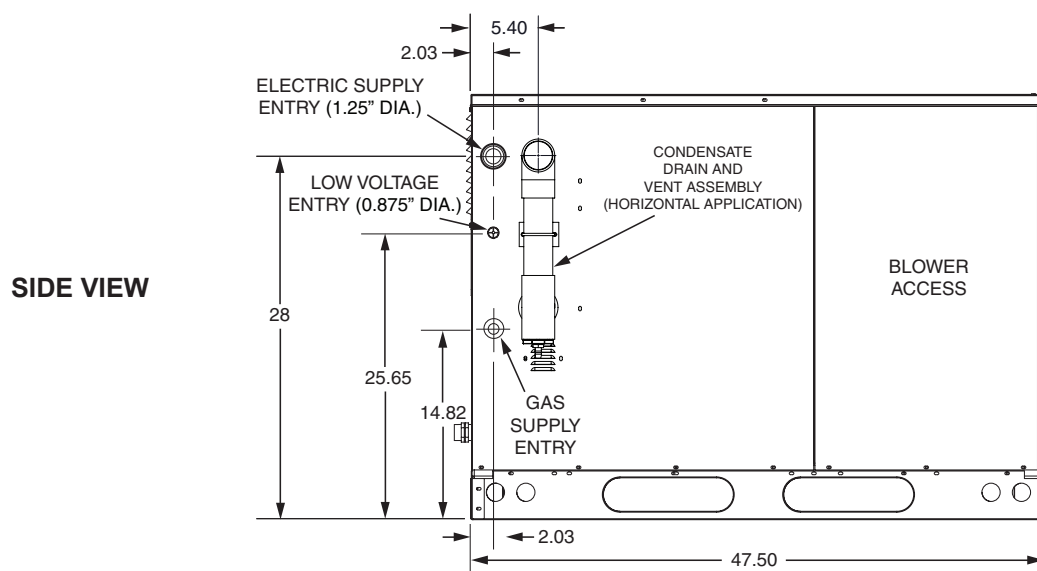
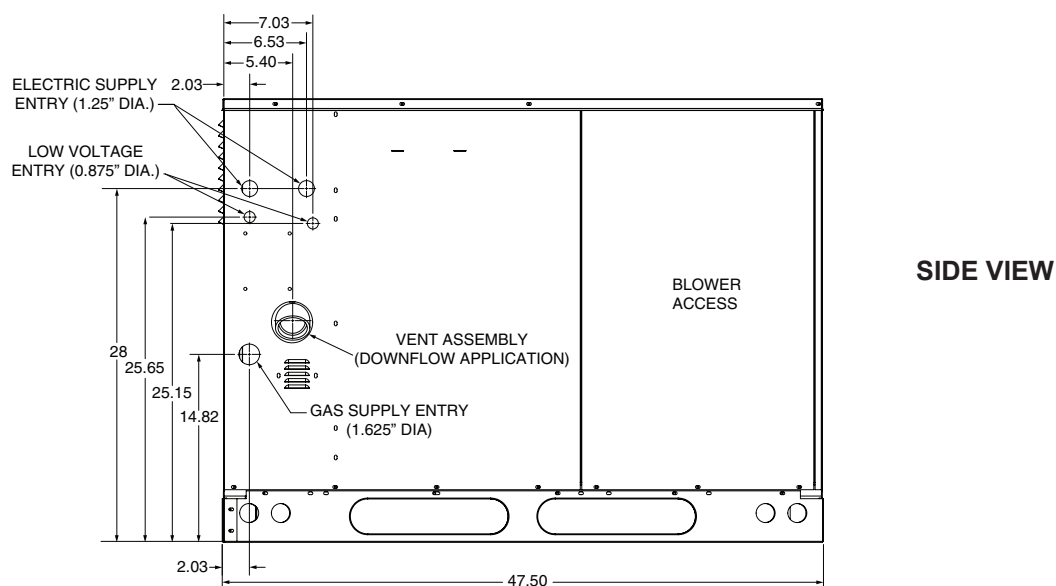


Figure 8. Continued

	MODEL NUMBER R104HD	UNIT WEIGHT	SHIPPING WEIGHT	CENTER OF GRAVITY		UNIT DIMENSIONS (INCHES)			
				A	B	HEIGHT WITH BASE RAILS	HEIGHT WITHOUT BASE RAILS	LENGTH	WIDTH
<b>SINGLE PHASE MODELS</b>	X24K060C	395	411	26.5	26.5	35	31.3	55.8	47.5
	X30K060C	401	417	26.5	26.5	35	31.3	55.8	47.5
	X36K080C	404	420	26.5	26.5	35	31.3	55.8	47.5
	X42K080C	446	463	27.0	26.5	39	35.3	55.8	47.5
	X48K096C	470	488	27.5	26.5	43	39.3	55.8	47.5
	X60K096C	506	525	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		875	1	0	0	0		875
0	1	0	0		<b>925</b>	0	1	0	0		925
1	1	0	0		1000	1	1	0	0		1000
0	0	1	0	<b>3 TON</b>	1075	0	0	1	0	<b>3.5 TON</b>	1075
1	0	1	0		1125	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>		<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		1400	0	1	0	1		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

SWITCH SETTING				RECOMMENDED AIRFLOW (CFM)		SWITCH SETTING				RECOMMENDED AIRFLOW (CFM)	
5	6	7	8			5	6	7	8		
0	0	0	0	<b>3 TON</b>	1110	0	0	0	0	<b>3.5 TON</b>	1180
<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>		1145	1	0	0	0		1250
0	1	0	0		1180	0	1	0	0		1320
1	1	0	0		<b>1215</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>		1380
0	0	1	0		1250	0	0	1	0		1440
1	0	1	0		1285	1	0	1	0		<b>1500</b>
0	1	1	0		1320	0	1	1	0		1560
1	1	1	0		1355	1	1	1	0		1610
0	0	0	1		1390	0	0	0	1		1660
1	0	0	1		1430	1	0	0	1		1710
0	1	0	1		1480	0	1	0	1		1740
1	1	0	1		1525	1	1	0	1		1770
0	0	1	1	<b>4 TON</b>	1575	0	0	1	1	<b>5 TON</b>	1800
1	0	1	1		1625	1	0	1	1		1830
0	1	1	1		1675	0	1	1	1		1860
1	1	1	1		1725	1	1	1	1		1895
0	0	0	0		1180	0	0	0	0		1180
1	0	0	0	<b>4 TON</b>	1250	1	0	0	0		1250
0	1	0	0		1320	0	1	0	0		1320
1	1	0	0		1380	1	1	0	0		1380
0	0	1	0		1440	0	0	1	0		1440
1	0	1	0		1500	1	0	1	0		1500
0	1	1	0		1560	0	1	1	0		1560
1	1	1	0		<b>1610</b>	1	1	1	0		1610
<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>		1660	0	0	0	1		1660
1	0	0	1		1710	1	0	0	1		<b>1710</b>
0	1	0	1		1740	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>		1740
1	1	0	1		1770	1	1	0	1		1770
0	0	1	1		1800	0	0	1	1		1800
1	0	1	1		1830	1	0	1	1		1830
0	1	1	1		1860	0	1	1	1		1860
1	1	1	1		1895	1	1	1	1		1895

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

**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	885	55	1180	64
1	0	0	0	656	52	875	60	1	0	0	0	938	52	1250	61
0	1	0	0	694	49	925	57	0	1	0	0	990	49	1320	58
1	1	0	0	750	46	1000	53	1	1	0	0	1035	47	1380	55
0	0	1	0	806	43	1075	49	0	0	1	0	1080	45	1440	53
1	0	1	0	844	41	1125	47	1	0	1	0	1125	43	1500	51
0	1	1	0	881	39	1175	45	0	1	1	0	1170	42	1560	49
1	1	1	0	919	37	1225	43	1	1	1	0	1208	41	1610	47
<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	975	35	1300	40	0	0	0	1	1245	40	1660	45
1	0	0	1	1013	34	1350	39	1	0	0	1	1283	39	1710	44
0	1	0	1	1050	33	1400	38	0	1	0	1	1305	38	1740	43
1	1	0	1	1088	32	1450	36	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	1328	37	1770	42
0	0	1	1	1125	30	1500	35	0	0	1	1	1350	36	1800	41
1	0	1	1	1144	30	1525	35	1	0	1	1	1373	35	1830	40
0	1	1	1	1170	29	1560	34	0	1	1	1	1395	34	1860	39
1	1	1	1	1200	29	1600	33	1	1	1	1	1421	34	1895	39

SWITCH SETTING				3 TON CFM				SWITCH SETTING				4 & 5 TON CFM			
				LOW HEAT		HIGH HEAT						LOW HEAT		HIGH HEAT	
				52,000		80,000						62,400		96,000	
1	2	3	4	CFM	RISE	CFM	RISE	1	2	3	4	CFM	RISE	CFM	RISE
0	0	0	0	833	55	1110	63	0	0	0	0	885	62	1180	73
1	0	0	0	859	53	1145	61	1	0	0	0	938	59	1250	70
0	1	0	0	885	52	1180	60	0	1	0	0	990	55	1320	67
1	1	0	0	911	50	1215	58	1	1	0	0	1035	53	1380	65
0	0	1	0	938	49	1250	56	0	0	1	0	1080	51	1440	63
1	0	1	0	964	47	1285	55	1	0	1	0	1125	49	1500	61
0	1	1	0	990	46	1320	53	0	1	1	0	1170	47	1560	59
1	1	1	0	1016	45	1355	52	1	1	1	0	1208	46	1610	57
0	0	0	1	1043	44	1390	50	0	0	0	1	1245	45	1660	55
1	0	0	1	1073	43	1430	49	1	0	0	1	1283	44	1710	54
0	1	0	1	1110	41	1480	48	0	1	0	1	1305	43	1740	53
<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	1144	40	1525	46	1	1	0	1	1328	42	1770	52
0	0	1	1	1181	39	1575	45	0	0	1	1	1350	41	1800	51
1	0	1	1	1219	38	1625	43	1	0	1	1	1373	40	1830	50
0	1	1	1	1256	36	1675	42	0	1	1	1	1395	39	1860	49
1	1	1	1	1294	35	1725	41	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	1421	39	1895	48

### NOTES:

1. Factory settings are 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 approved for proper operation of equipment.

**Table 9. Heating Airflow Settings**



**R104HD -X24K060C / -X30K060C**  
**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
1	1	1	0	1283	41	1246	42	1209	44	1158	46	1107	48	1081	49	1054	50	1015	52	975	54
<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1343</b>	<b>39</b>	<b>1308</b>	<b>40</b>	<b>1273</b>	<b>41</b>	<b>1209</b>	<b>44</b>	<b>1144</b>	<b>46</b>	<b>1131</b>	<b>47</b>	<b>1117</b>	<b>47</b>	<b>1076</b>	<b>49</b>	<b>1034</b>	<b>51</b>
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
1	1	1	0	1237	43	1198	44	1159	46	1120	47	1082	49	1040	51	999	53	957	55	916	58
<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1299</b>	<b>41</b>	<b>1258</b>	<b>42</b>	<b>1216</b>	<b>43</b>	<b>1181</b>	<b>45</b>	<b>1146</b>	<b>46</b>	<b>1104</b>	<b>48</b>	<b>1061</b>	<b>50</b>	<b>1020</b>	<b>52</b>	<b>978</b>	<b>54</b>
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 \* Δ T \* 1.08

Δ T = (Btu/h \* 0.95) / (CFM \* 1.08)

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

**R104HD -X36K080C**  
**80,000 BTUH, 30" CABINET, 11"X8" 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	1272	55	1227	57	1181	60	1145	61	1108	64	1076	65	1043	67	1005	70	967	73
1	0	0	0	1323	53	1282	55	1241	57	1205	58	1170	60	1135	62	1101	64	1062	66	1024	69
0	1	0	0	1374	51	1338	53	1301	54	1266	56	1231	57	1195	59	1158	61	1119	63	1080	65
1	1	0	0	1424	49	1387	51	1350	52	1314	54	1279	55	1242	57	1205	58	1167	60	1130	62
0	0	1	0	1474	48	1437	49	1399	50	1363	52	1326	53	1289	55	1251	56	1215	58	1179	60
1	0	1	0	1516	46	1478	48	1441	49	1404	50	1366	52	1329	53	1292	54	1257	56	1222	58
0	1	1	0	1557	45	1520	46	1483	47	1445	49	1406	50	1370	51	1333	53	1299	54	1265	56
1	1	1	0	1598	44	1559	45	1521	46	1482	47	1444	49	1409	50	1374	51	1339	53	1304	54
0	0	0	1	1638	43	1598	44	1558	45	1520	46	1481	48	1448	49	1415	50	1379	51	1343	52
1	0	0	1	1674	42	1634	43	1595	44	1557	45	1520	46	1484	47	1448	49	1413	50	1379	51
0	1	0	1	1709	41	1671	42	1632	43	1595	44	1558	45	1519	46	1480	48	1448	49	1415	50
1	1	0	1	1741	40	1702	41	1664	42	1628	43	1593	44	1555	45	1517	46	1484	47	1452	48
0	0	1	1	1772	40	1734	41	1695	42	1662	42	1628	43	1591	44	1554	45	1521	46	1488	47
1	0	1	1	1809	39	1772	40	1735	41	1718	41	1701	41	1662	42	1623	43	1589	44	1555	45
0	1	1	1	1846	38	1811	39	1775	40	1774	40	1773	40	1732	41	1691	42	1657	42	1622	43
1	1	1	1	1928	36	1890	37	1852	38	1810	39	1767	40	1732	41	1697	41	1658	42	1618	43

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	1218	58	1175	60	1132	62	1097	64	1062	66	1024	69	986	71	950	74	914	77
1	0	0	0	1270	55	1230	57	1191	59	1153	61	1116	63	1079	65	1043	67	1005	70	966	73
0	1	0	0	1321	53	1285	55	1249	56	1209	58	1169	60	1135	62	1100	64	1059	66	1018	69
1	1	0	0	1373	51	1335	53	1298	54	1260	56	1222	58	1185	59	1147	61	1107	64	1066	66
0	0	1	0	1425	49	1386	51	1346	52	1311	54	1275	55	1235	57	1194	59	1154	61	1114	63
1	0	1	0	1466	48	1426	49	1387	51	1350	52	1314	54	1274	55	1234	57	1195	59	1156	61
0	1	1	0	1507	47	1467	48	1427	49	1390	51	1352	52	1313	54	1273	55	1236	57	1198	59
1	1	1	0	1543	46	1504	47	1466	48	1425	49	1383	51	1347	52	1312	54	1274	55	1237	57
0	0	0	1	1578	45	1542	46	1505	47	1460	48	1414	50	1382	51	1350	52	1313	54	1276	55
1	0	0	1	1615	44	1575	45	1536	46	1494	47	1452	48	1417	50	1381	51	1346	52	1312	54
0	1	0	1	1651	43	1609	44	1567	45	1529	46	1490	47	1451	48	1412	50	1380	51	1347	52
1	1	0	1	1683	42	1642	43	1601	44	1564	45	1528	46	1490	47	1452	48	1416	50	1381	51
0	0	1	1	1715	41	1675	42	1634	43	1600	44	1565	45	1528	46	1491	47	1453	48	1414	50
1	0	1	1	1754	40	1731	41	1708	41	1670	42	1632	43	1593	44	1554	45	1515	46	1477	48
0	1	1	1	1792	39	1787	39	1782	39	1741	40	1699	41	1658	42	1617	44	1578	45	1539	46
1	1	1	1	1865	38	1824	39	1783	39	1741	40	1698	41	1658	42	1617	44	1579	45	1540	46

**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 \* Δ T \* 1.08

Δ T = (Btu/h \* 0.95) / (CFM \* 1.08)

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

**R104HD -X42K080C**  
**80,000 BTUH, 34" 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	53	1295	55	1242	57	1187	60	1131	63	1077	66	1023	70	970	74	916	78
1	0	0	0	1402	51	1353	53	1305	55	1252	57	1199	59	1147	62	1094	65	1039	69	984	72
0	1	0	0	1457	49	1412	50	1367	52	1317	54	1267	56	1216	59	1165	61	1109	64	1052	68
1	1	0	0	1517	47	1468	49	1420	50	1374	52	1328	54	1279	56	1229	58	1172	61	1115	64
0	0	1	0	1576	45	1524	47	1472	48	1431	50	1389	51	1341	53	1293	55	1236	58	1178	61
1	0	1	0	1625	44	1576	45	1528	47	1485	48	1442	49	1394	51	1346	53	1289	55	1233	58
0	1	1	0	1674	43	1629	44	1583	45	1539	46	1494	48	1446	49	1398	51	1343	53	1287	55
1	1	1	0	1721	41	1675	43	1629	44	1583	45	1538	46	1491	48	1445	49	1390	51	1336	53
0	0	0	1	1768	40	1721	41	1674	43	1628	44	1582	45	1537	46	1491	48	1438	50	1384	52
1	0	0	1	1807	39	1762	40	1717	42	1671	43	1626	44	1580	45	1534	46	1483	48	1433	50
0	1	0	1	1846	39	1803	40	1759	41	1715	42	1670	43	1623	44	1576	45	1529	47	1482	48
1	1	0	1	<b>1889</b>	<b>38</b>	<b>1843</b>	<b>39</b>	<b>1798</b>	<b>40</b>	<b>1754</b>	<b>41</b>	<b>1710</b>	<b>42</b>	<b>1663</b>	<b>43</b>	<b>1617</b>	<b>44</b>	<b>1571</b>	<b>45</b>	<b>1526</b>	<b>47</b>
0	0	1	1	1931	37	1884	38	1837	39	1793	40	1749	41	1703	42	1657	43	1613	44	1569	45
1	0	1	1	1970	36	1925	37	1881	38	1836	39	1792	40	1747	41	1703	42	1658	43	1614	44
0	1	1	1	2008	36	1967	36	1925	37	1880	38	1834	39	1791	40	1748	41	1704	42	1659	43
1	1	1	1	2038	35	1998	36	1957	36	1924	37	1891	38	1874	38	1857	38	1809	39	1760	41

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	55	1252	57	1196	60	1139	63	1082	66	1025	70	967	74	915	78	863	83
1	0	0	0	1363	52	1309	54	1255	57	1199	59	1143	62	1088	66	1033	69	979	73	926	77
0	1	0	0	1417	50	1366	52	1314	54	1259	57	1203	59	1151	62	1098	65	1043	68	988	72
1	1	0	0	1470	49	1418	50	1366	52	1315	54	1265	56	1212	59	1159	62	1102	65	1045	68
0	0	1	0	1523	47	1471	48	1418	50	1372	52	1326	54	1273	56	1220	58	1161	61	1102	65
1	0	1	0	1566	46	1515	47	1464	49	1417	50	1371	52	1321	54	1271	56	1211	59	1151	62
0	1	1	0	1608	44	1559	46	1509	48	1462	49	1415	50	1369	52	1322	54	1261	57	1200	59
1	1	1	0	1650	43	1602	45	1554	46	1508	47	1461	49	1411	51	1362	52	1303	55	1245	57
0	0	0	1	1691	42	1645	43	1599	45	1553	46	1507	47	1454	49	1401	51	1345	53	1289	55
1	0	0	1	1737	41	1691	42	1644	43	1599	45	1554	46	1503	47	1451	49	1396	51	1342	53
0	1	0	1	1783	40	1736	41	1689	42	1645	43	1601	45	1551	46	1501	47	1448	49	1394	51
1	1	0	1	<b>1823</b>	<b>39</b>	<b>1776</b>	<b>40</b>	<b>1730</b>	<b>41</b>	<b>1684</b>	<b>42</b>	<b>1638</b>	<b>44</b>	<b>1589</b>	<b>45</b>	<b>1539</b>	<b>46</b>	<b>1488</b>	<b>48</b>	<b>1437</b>	<b>50</b>
0	0	1	1	1862	38	1817	39	1771	40	1723	41	1675	43	1626	44	1577	45	1529	47	1480	48
1	0	1	1	1904	37	1857	38	1810	39	1763	40	1717	42	1672	43	1627	44	1599	45	1572	45
0	1	1	1	1946	37	1898	38	1849	39	1804	40	1758	41	1717	42	1676	43	1670	43	1664	43
1	1	1	1	1977	36	1936	37	1895	38	1878	38	1860	38	1809	39	1757	41	1709	42	1660	43

**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 \* Δ T \* 1.08

Δ T = (Btu/h \* 0.95) / (CFM \* 1.08)

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

**R104HD -X48K096C & R104HD -X60K096C**  
**96,000 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 \* Δ T \* 1.08

Δ T = (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) FOR NATURAL GAS (SPECIFIC GRAVITY - 0.60)								
NOMINAL PIPE 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 (CUBIC FEET PER HOUR)			
TIME FOR ONE REVOLUTION (SECONDS)	CUBIC FEET PER REVOLUTION OF GAS METER		
	1	5	10
10	360	1,800	3,600
12	300	1,500	3,000
14	257	1,286	2,571
16	225	1,125	2,250
18	200	1,000	2,000
20	180	900	1,800
22	164	818	1,636
24	150	750	1,500
26	138	692	1,385
28	129	643	1,286
30	120	600	1,200
32	113	563	1,125
34	106	529	1,059
36	100	500	1,000
38	95	474	947
40	90	450	900
42	86	429	857
44	82	409	818
46	78	391	783
48	75	375	750
50	72	360	720
52	69	346	692
54	67	333	667
56	64	321	643
58	62	310	621
60	60	300	600
62	58	290	581
64	56	281	563

GAS FLOW RATES (CUBIC FEET PER HOUR)			
TIME FOR ONE REVOLUTION (SECONDS)	CUBIC FEET PER REVOLUTION OF GAS METER		
	1	5	10
66	55	273	545
68	53	265	529
70	51	257	514
72	50	250	500
74	49	243	486
76	47	237	474
78	46	231	462
80	45	225	450
82	44	220	439
84	43	214	429
86	42	209	419
88	41	205	409
90	40	200	400
92	39	196	391
94	38	191	383
96	38	188	375
98	37	184	367
100	36	180	360
102	35	176	353
104	35	173	346
106	34	170	340
108	33	167	333
110	33	164	327
112	32	161	321
114	32	158	316
116	31	155	310
118	31	153	305
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.

- 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.
- 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.
- 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.
- 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.

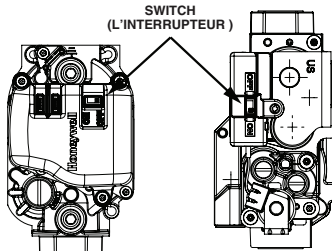
## POUR VOTRE SÉCURITÉ. À LIRE AVANT L'EMPLOI

**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.

- 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.
- 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.
- 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.
- 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

- STOP!** Read the safety information above on this label.
- Set the thermostat to the lowest setting.
- Turn off all electrical power to the appliance.
- The appliance's ignition device automatically lights the burner. Do not try to light burner by hand.
- Remove the control access door/panel (upper door if two-door model).
- Move the gas control switch to the "OFF" position. (See Figure 1)
- 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.
- Move the gas control switch to the "ON" position. (See Figure 1)
- Replace the control access door/panel (upper door if two-door model).
- Turn on all electrical power to the appliance.
- Turn the thermostat to a desired setting.
- If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



## MODE D'EMPLOI

- ATTENTION!** Lire d'abord la liste des mesures de sécurité ci-dessus.
- Mettre le thermostat à la position minimale.
- Couper le courant électrique qui mène à l'appareil.
- Cet appareil ménager étant doté d'un système d'allumage automatique, ne pas essayer d'allumer le brûleur manuellement.
- Retirer le panneau/volet d'accès de commande (panneau supérieur s'il s'agit d'un modèle à deux panneaux).
- Régler l'interrupteur de commande du gaz à la position "OFF". (voir Figure 1).
- 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.
- Régler l'interrupteur de commande du gaz à la position "ON". (voir Figure 1).
- Remettre le panneau/volet d'accès de commande en place (panneau supérieur s'il s'agit d'un modèle à deux panneaux).
- Rebrancher l'appareil sur le réseau électrique.
- Ajuster le thermostat à la position désirée.
- 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

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

## DIRECTIVES D'ARRÊT

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

10186330 (Replaces 7106740)  
(10/17)

Figure 9. Gas Valve Label

## Electrical Data

SINGLE PHASE MODELS											
MODEL NUMBER R104HD	HEATING INPUT (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				
X24K060C	High - 60,000	0.30	208/230-1-60	187	253	12.8	58	1.0	5.4	22.4	35
	Low - 39,000										
X30K060C	High - 60,000	0.30	208/230-1-60	187	253	14.1	73	1.5	5.4	24.5	35
	Low - 39,000										
X36K080C	High - 80,000	0.30	208/230-1-60	187	253	15.4	84	1.5	7.0	27.7	40
	Low - 52,000										
X42K080C	High - 80,000	0.30	208/230-1-60	187	253	19.9	110	1.5	7.0	33.3	50
	Low - 52,000										
X48K096C	High - 96,000	0.30	208/230-1-60	187	253	21.8	117	1.5	7.0	35.7	50
	Low - 62,400										
X60K096C	High - 96,000	0.30	208/230-1-60	187	253	26.9	171	1.5	7.0	42.1	60
	Low - 62,400										

**NOTES:** LRA = Locked Rotor Amps; RLA = Rated Load Amps

**Table 16. Electrical Data.**

COPPER WIRE SIZE — AWG (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**

## Electrical Diagrams

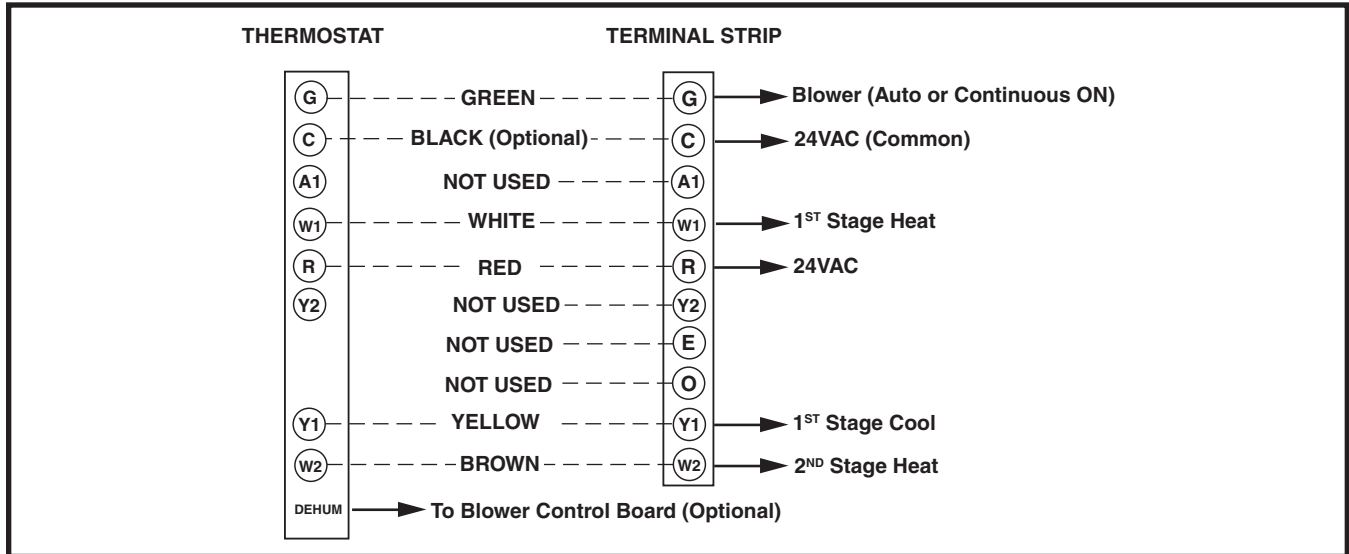


Figure 10. Two Stage Heating / Single Stage Cooling Configuration

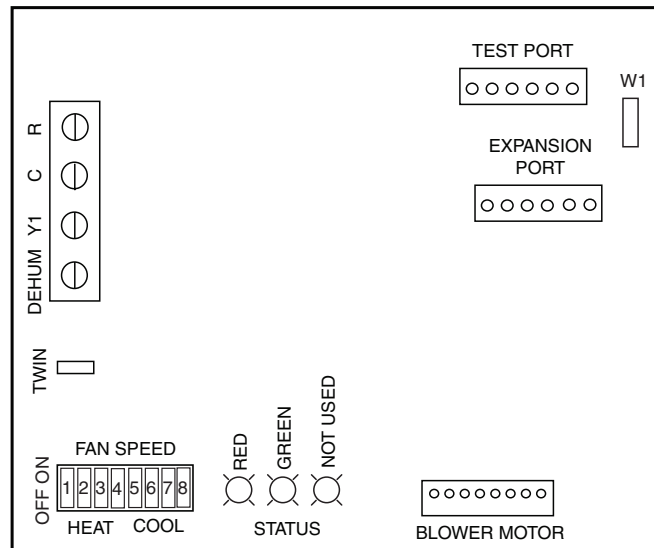


Figure 11. Fixed Speed Motor Control Board

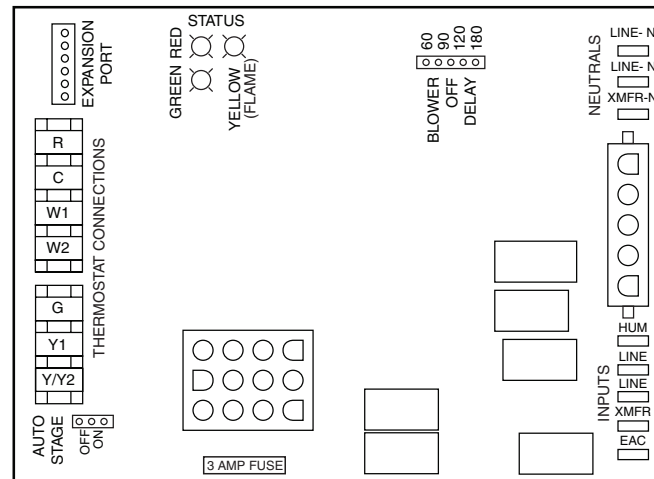


Figure 12. Ignition Control Board - 624817



## Wiring Diagrams

### WIRING DIAGRAM

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

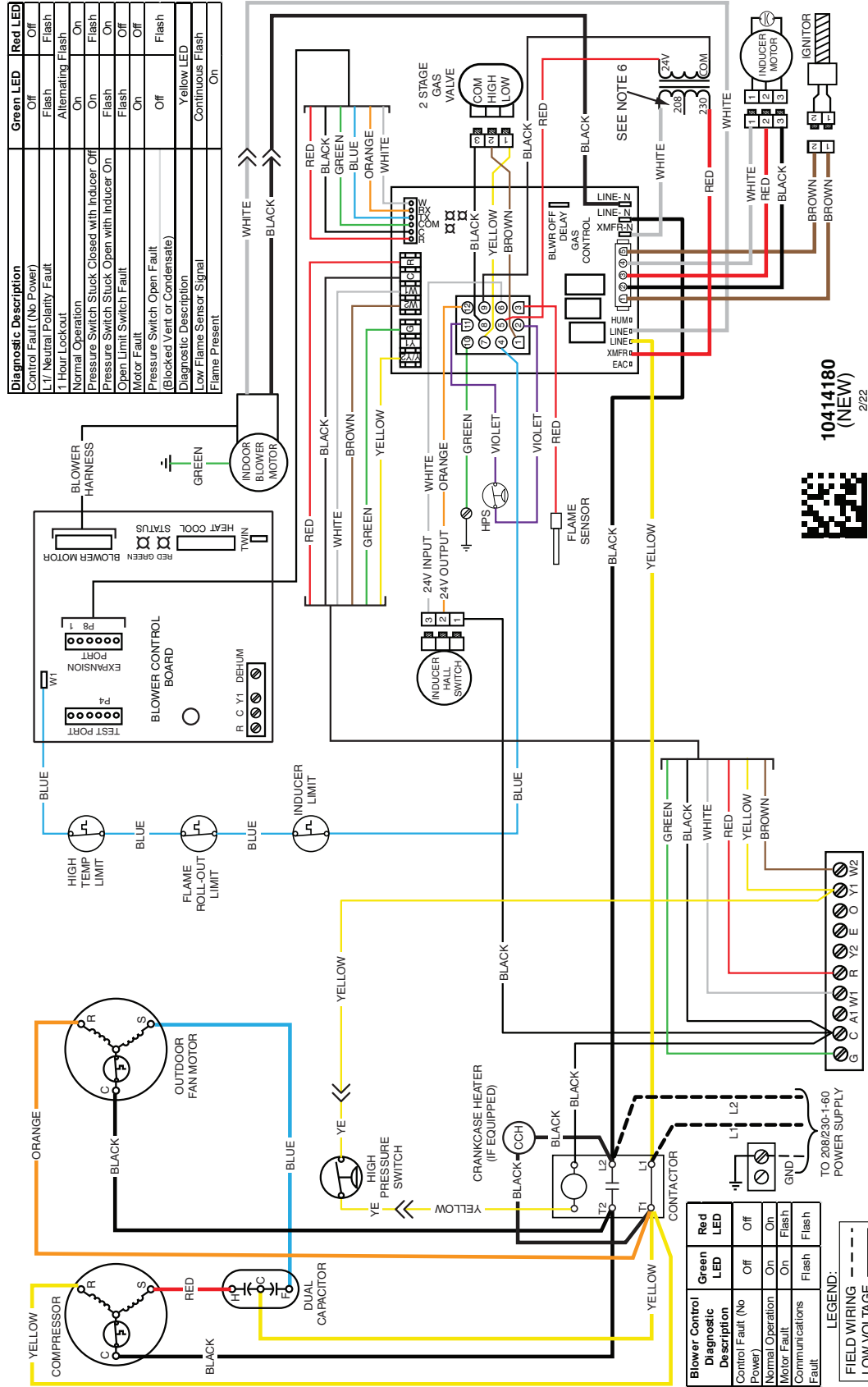
NOTES:

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.

#### 208/230 Volt / 1 Phase / 60 Hz

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



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Figure 13. Single Phase, 2-5 Ton, 208/230V

## Charging Charts

### 2 TON CHARGING CHART

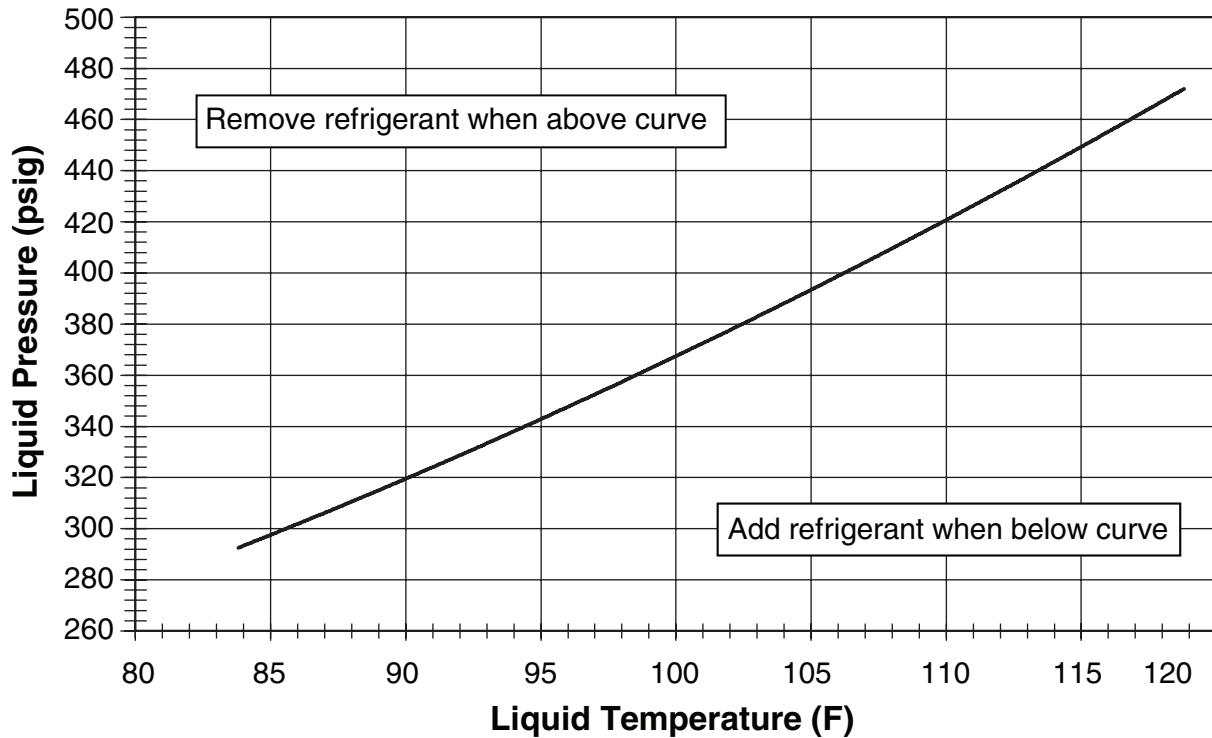


Figure 14. Charging Chart for 2 Ton Units

### 2.5 TON CHARGING CHART

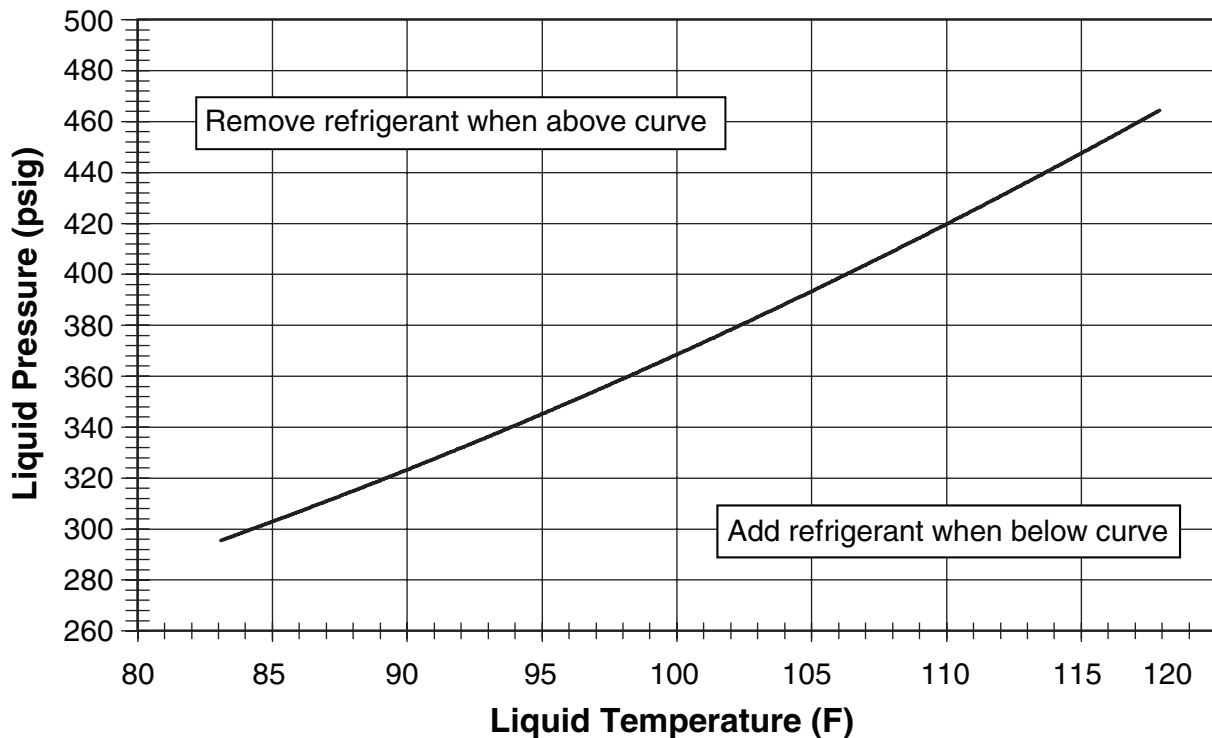


Figure 15. Charging Chart for 2.5 Ton Units

### 3 TON CHARGING CHART

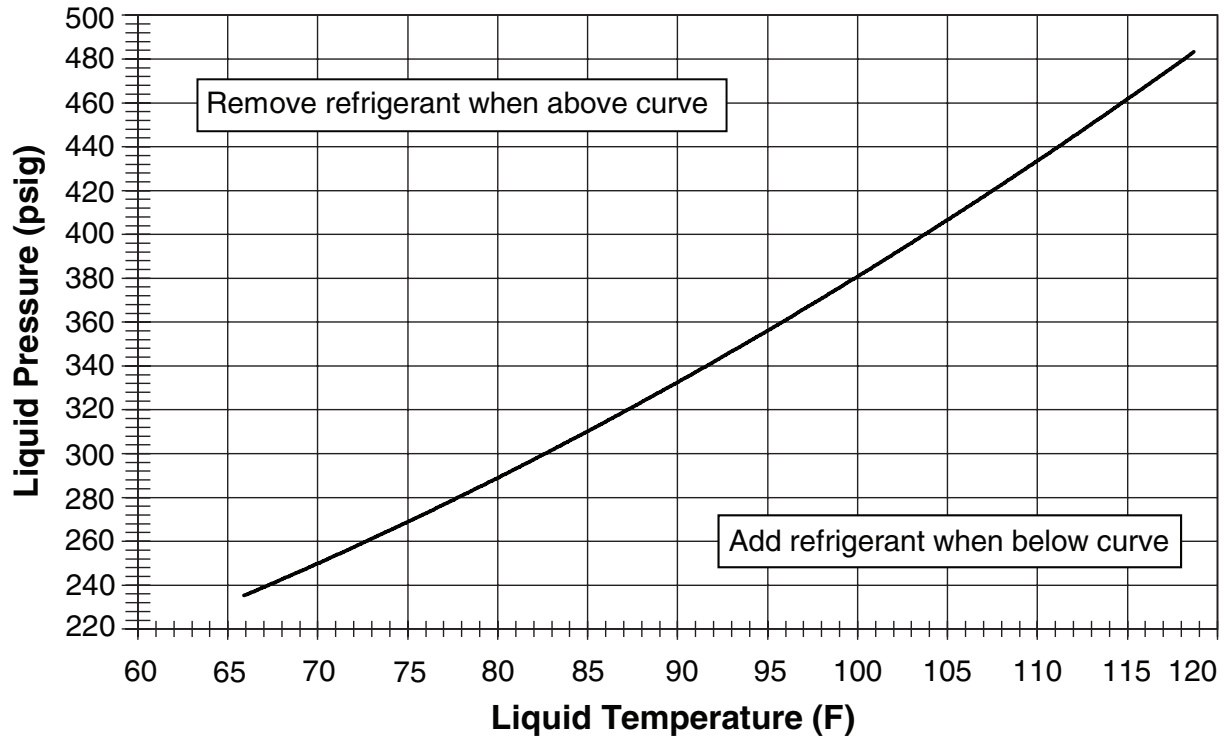


Figure 16. Charging Chart for 3 Ton Units

### 3.5 TON CHARGING CHART

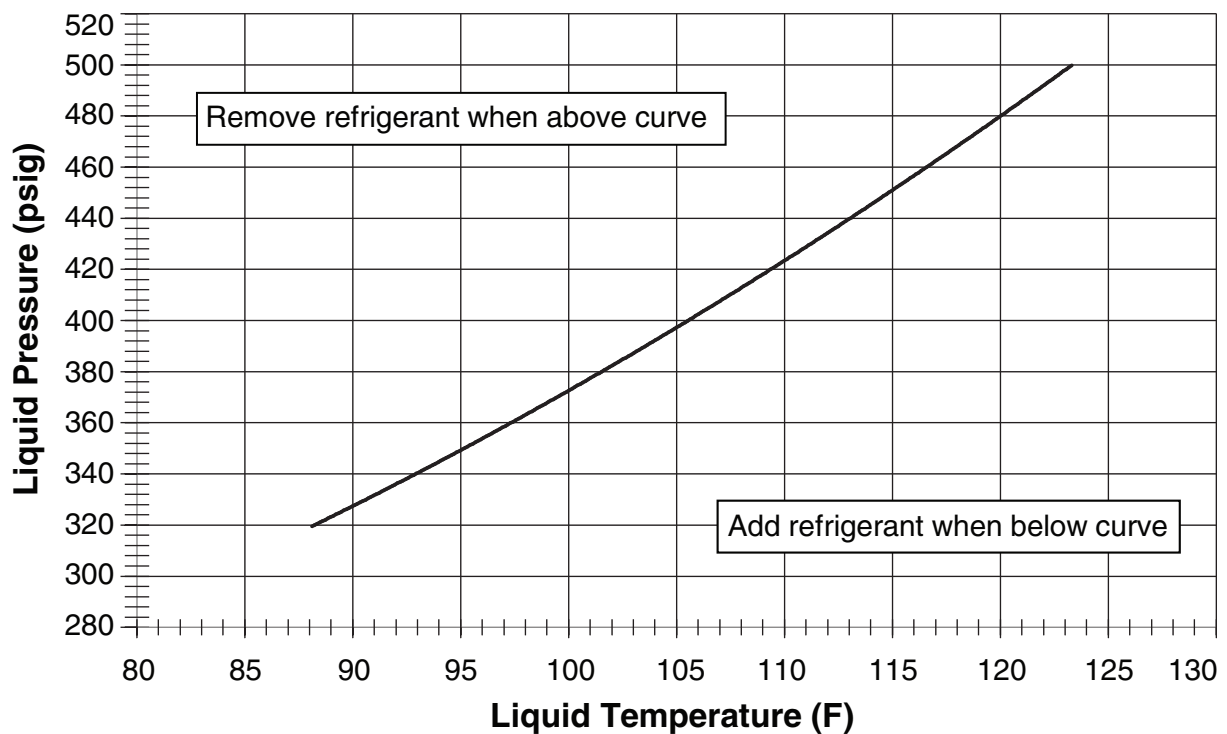


Figure 17. Charging Chart for 3.5 Ton Units

### 4 TON CHARGING CHART

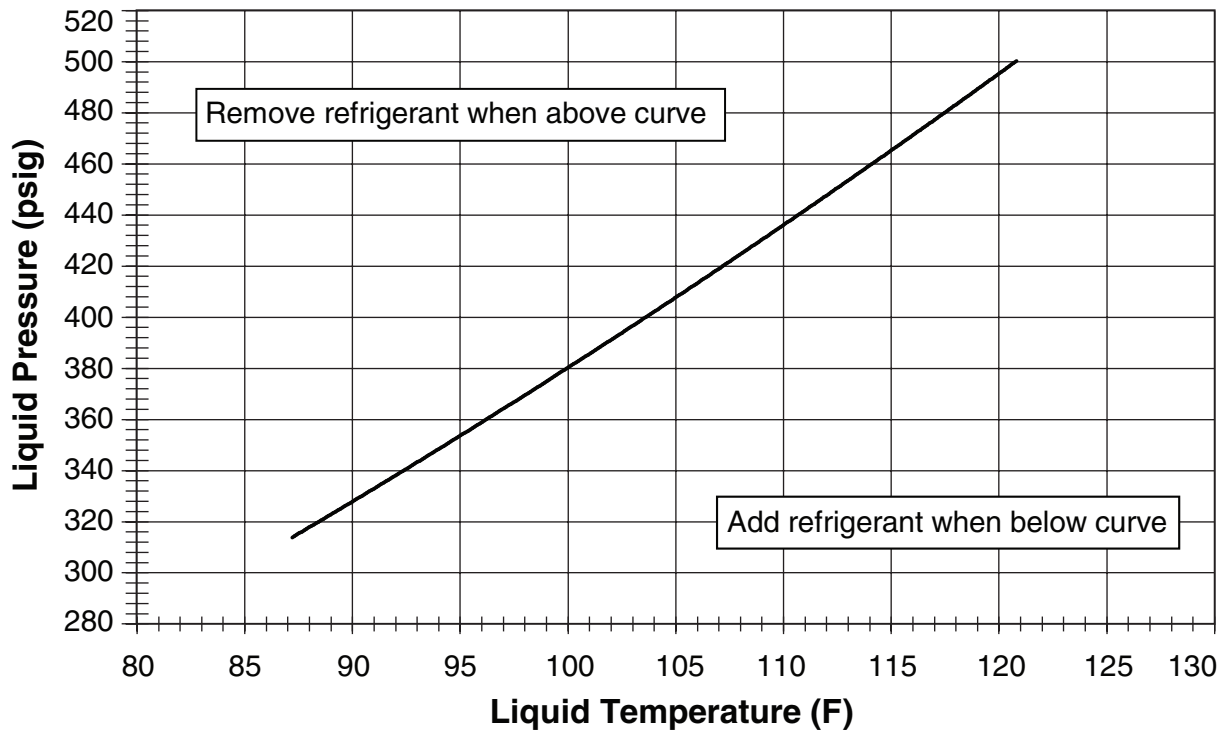


Figure 18. Charging Chart for 4 Ton Units

### 5 TON CHARGING CHART

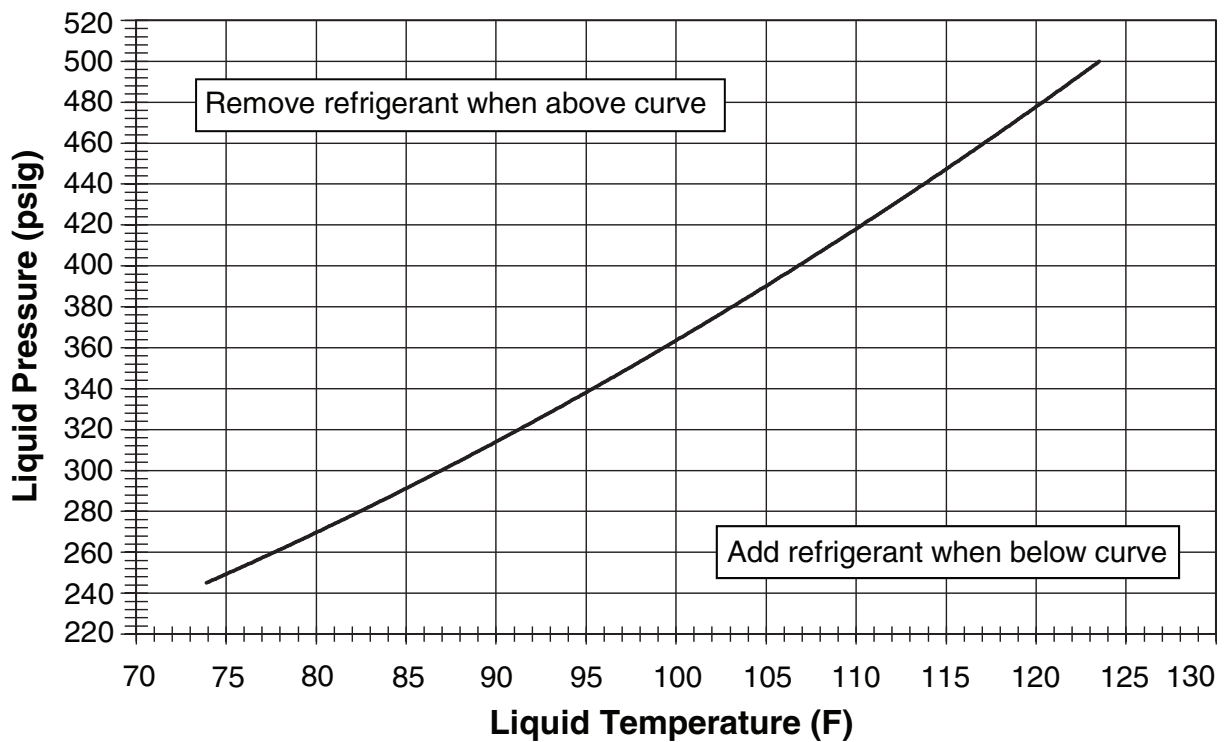


Figure 19. Charging Chart for 5 Ton Units



## Internal Filter Conversion

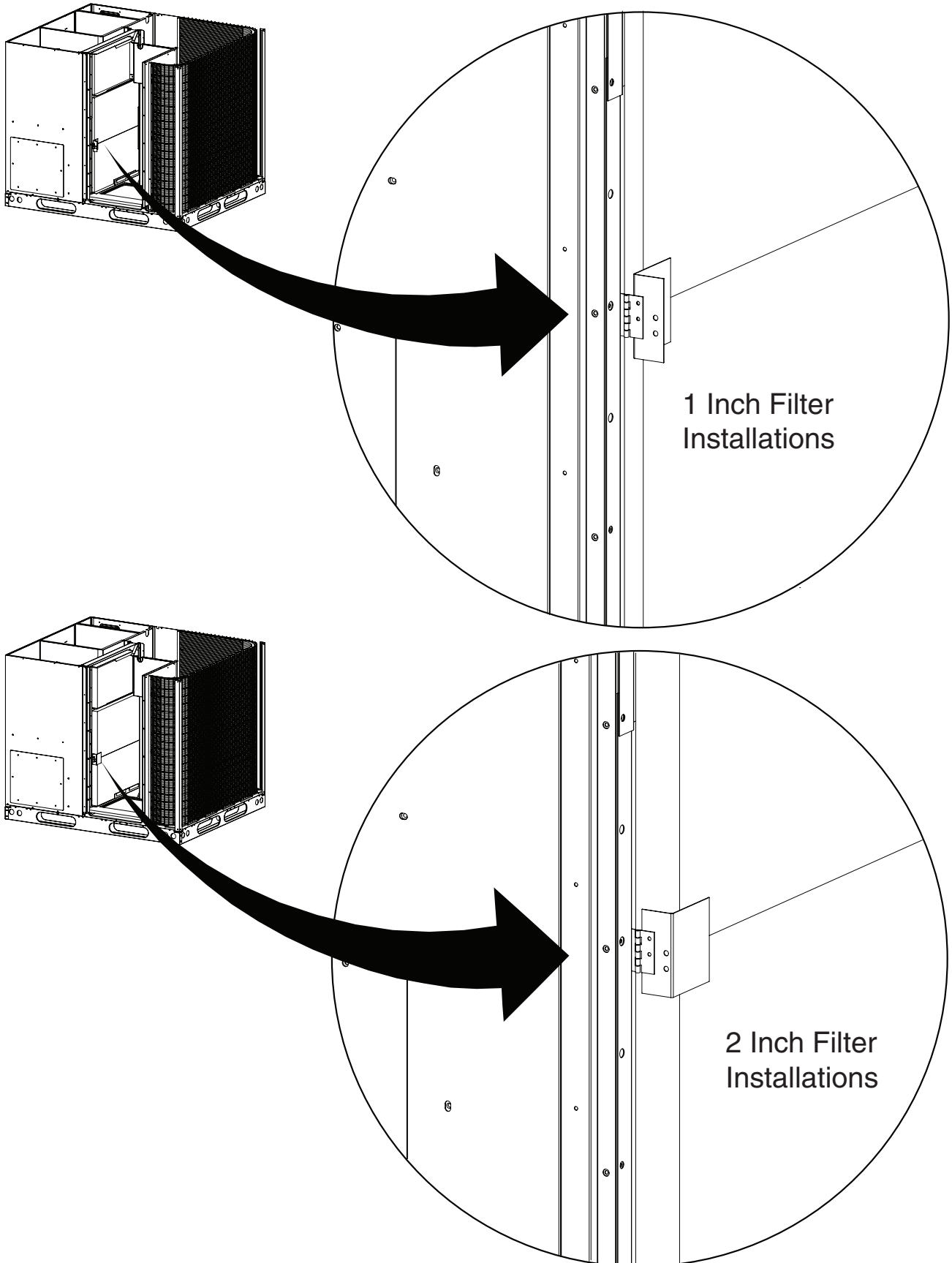


Figure 20. Filter Conversion

## APPENDIX A - HEAT EXCHANGER CONDENSATE DRAIN & VENT KIT (HORIZONTAL MOUNT APPLICATIONS)

**⚠ 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.

## About the Kit

This Condensate Drain and Vent Kit (P/N 922323) is available for purchase as an accessory item for R8HE/R104HD 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 23 \(page 46\)](#).

### 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 – 60,000 KBTU	0.35 GPH
4 Tube – 80,000 KBTU	0.45 GPH
5 Tube – 96,000 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 23](#). **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 44](#)).

## 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 43](#).

Horizontal Drain Pipe Installation

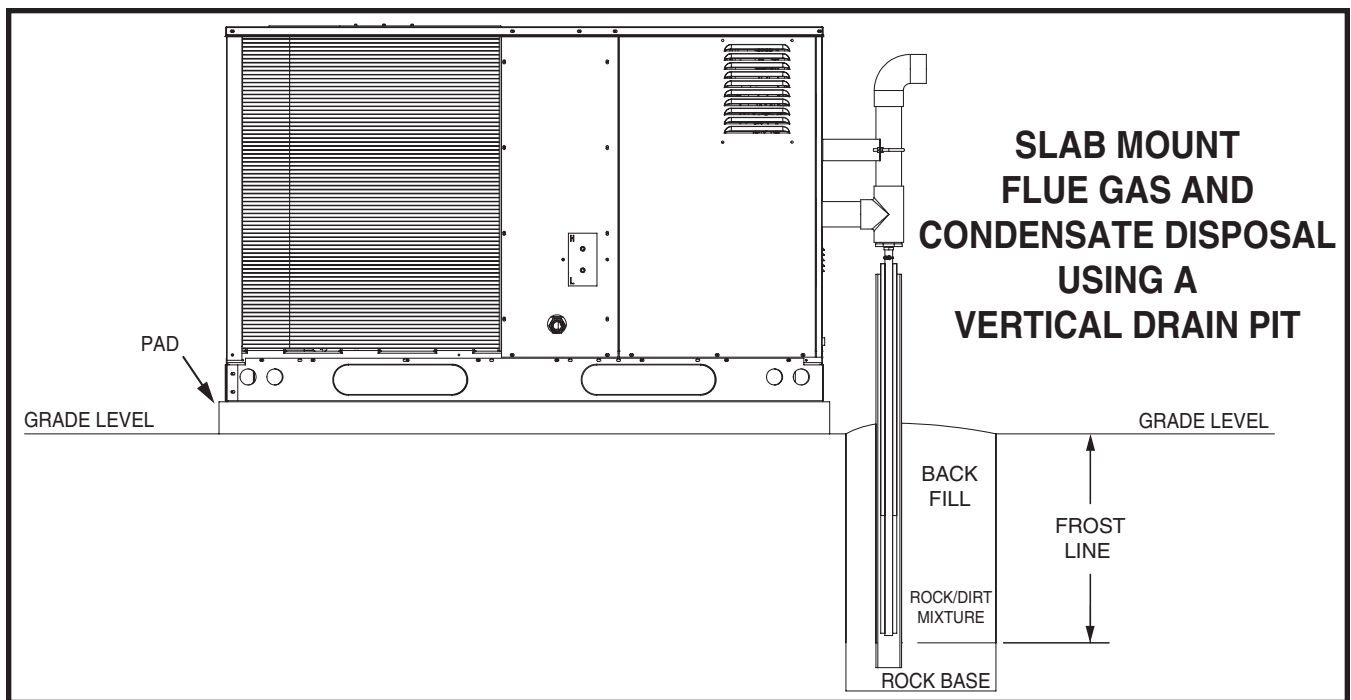
1. After the trench has been dug out, lay in a 3"-4" rock or chat base the full length of the trench with a slight slope of 1/4"-1/2" / per foot. Mix in 50% of the limestone rock, chat, or lime pellets (if required by code) with the initial rock base.
2. Clean and cement the field supplied 2" x 90 degree 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 24 \(page 48\)](#).
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 24](#). **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.

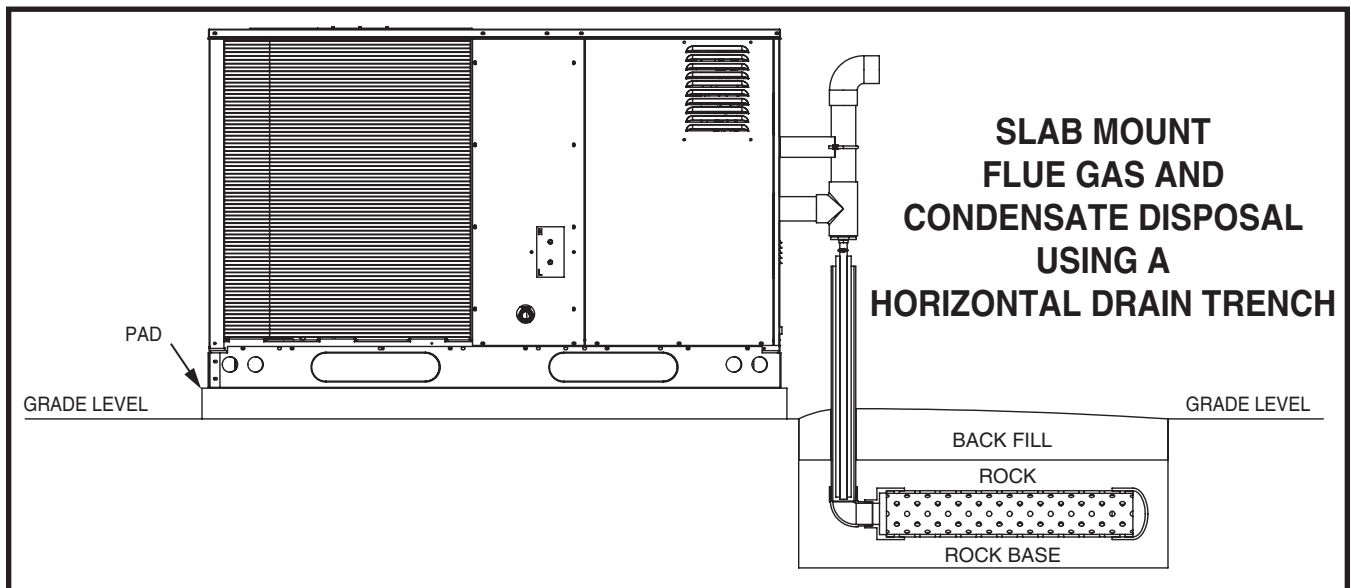
**Completing the Vent Installation**

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 23](#) and [Figure 24](#).
- 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.





**Figure 21. Condensate Disposal Using A Vertical Drainage Pit**



**Figure 22. Condensate Disposal Using A Horizontal Drainage Trench**

## APPENDIX B - HEAT EXCHANGER CONDENSATE DRAIN & VENT KIT (ROOF CURB MOUNT APPLICATIONS)

### **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.

#### **About the Kit**

This accessory kit is for use with 2-5 Ton 95% condensing style package gas/electric unit roof curb mount installations for proper heat exchanger condensate disposal and venting. Table 21 is a detailed listing of the components in the drain and vent kit to allow the heat exchanger condensate line to pass through the roof. Please check the contents of the kit with that of the parts listing, and familiarize yourself with each component.

#### **Before Setting unit on the Curb**

### **IMPORTANT NOTE TO INSTALLER**

**When setting the roof curb for installation, routing and securement of the gas heat exchanger condensate drain line must be determined and installed prior to setting the unit on the curb.**

- Nortek Condensate Drain & Vent Kit # 922485 is set up for installing the HX condensate drain line straight down through the roof. It is recommended to drill a 1.00"-1.25" diameter hole through the roof below the rectangular opening located in outer close off curb panel (G), approximately 15" in from the short side of curb and 1"-2" in from the long side of curb. See Figure 23.
- If drilling a hole is not an option, routing the condensate drain hose over to the duct passage opening with enough slope is acceptable as long as drain line is secured to curb and duct, ensuring no kinks or traps can form between the collector box drain or interior of the building. Leave a minimum of 24" drain line extending out the top of roof curb front close off panel (G) for passage through unit bottom and connection to unit drain when unit is being set. See Figure 23. Seal roof penetration as required.

KIT SUPPLIED PARTS	
DESCRIPTION	QTY
2" PVC x 22.5 Degree Elbow & 1/4" Mesh Screen	1
Spring Hose Clamp	1
1/2" ID x 84" Drain Hose	1
Hose Clamp 3/4" Diameter	1
Self Tapping Screws	1
FIELD SUPPLIED PARTS	
<ul style="list-style-type: none"> <li>• PVC Solvent Cleaner and Pipe Cement.</li> <li>• Additional condensate drain components to complete the installation: PVC Pipe, Hose Clamps, Hangers.</li> </ul>	

Table 21. Kit and Field Supplied Parts

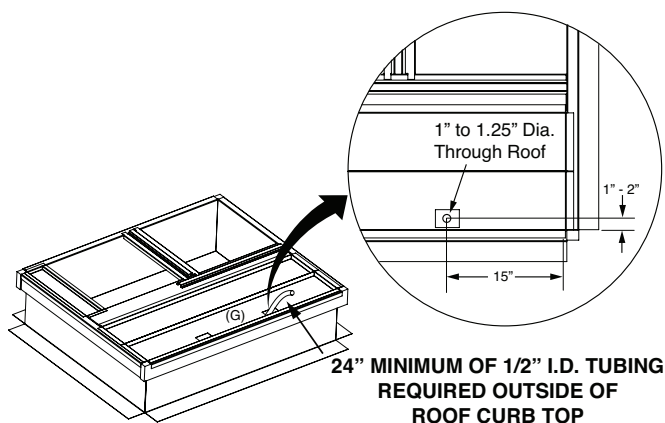


Figure 23. Roof Curb for 2 - 5 Ton Units

- It is recommended no non-serviceable connections are introduced in the drain line between unit drain connection and an accessible area within the building interior. Securement of the drain line to the inside surface of the roof curb is acceptable and should be made in the wood nailer area (top 3.5") to avoid possible leaks or penetrations to roofing materials.
- Cut and remove the insulation covering the 2" x 3" condensate drain passage in outer panel (G) only. **Before installing inner panel (G) make sure there is enough slope and there are no kinks or high spots that could trap water in the line prior to entering the warmer interior of the building where a drain trap is REQUIRED.**

## Setting the Unit

### IMPORTANT NOTE:

Before hoisting and setting the unit in place, the short piece of factory installed drain line located next to the unit burner section must be removed from the HX collector box drain valve to allow for passage of the condensate drain line installed with the roof curb. The condensate drain valve is located in the bottom left corner of the heat exchanger collector box. See [Figure 24 \(page 48\)](#). Remove the drain line and rubber grommet located in the unit bottom pan, setting the rubber grommet aside for later use.

- Set unit in place on curb as instructed in the Rigging and Hoisting section of unit installation instructions.

### IMPORTANT NOTE:

**R104HD models may be lifted without the control access panel in place to accommodate the passage and installation of the condensate drain line.**

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## WARNING:

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**To avoid accidental injury 6"x6" boards should be placed across corners of the roof curb while routing the condensate drain line up through the bottom of the unit. After enough drain line is passed through the bottom pan opening to guide from inside the control / burner area the boards may be removed for lowering the unit the remainder of the way onto the curb.**

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- While lowering unit onto the curb, carefully pass the first few inches of the 24 inch condensate drain line left outside the top of the curb up through the hole in the bottom pan below the collector box drain fitting.
- While holding the end of the drain line continue lowering the unit until fully seated on curb ensuring the drain line feeds up through the hole and does not become trapped or kinked under the unit.

## Completing the Heat Exchanger Condensate Drain Installation

### IMPORTANT NOTE

Downflow applications require the factory set position of the condensate drain valve be changed from the horizontal (H) to downflow (D) position. The condensate drain valve is located in the bottom left corner of the heat exchanger collector box to the left of the inducer motor. See [Figure 24](#). Carefully rotate the valve 90 degrees in a clockwise direction until the arrow is pointing vertically downward.

1. Slide the rubber grommet (large diameter first) down the 24" of tubing and reinstall back into the unit bottom pan ensuring a water tight seal. Additional sealing is permissible.
2. Route the drain line up and onto to the condensate drain valve barbed fitting. Cut hose to length required to keep line from bending and secure to barbed fitting using the spring hose lamp provided in the kit.

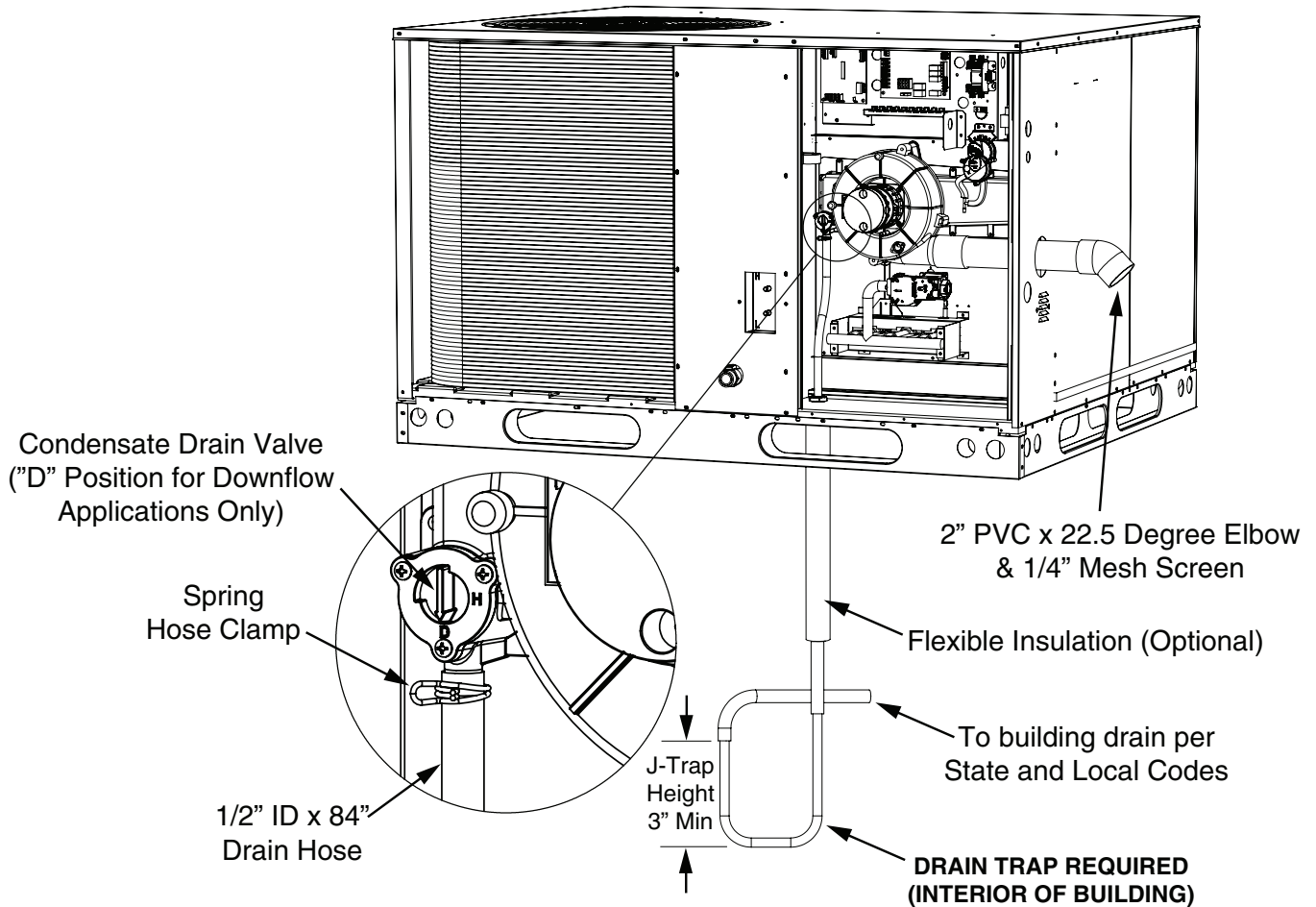
### Condensate Disposal

- The method for disposing of condensate varies according to local codes. Consult your local code or authority having jurisdiction.
- The condensate drain line must be trapped using a kit (Nortek P/N- 922485) or field supplied parts. After the drain trap, condensate can continue to the drain by connecting to a recommended 3/4" ID minimum drain line, but no smaller than the original tubing ID supplied by the manufacturer. The drain line should slope downward away from the furnace to ensure proper drainage.
- Neutralizer kit P/N 902377 is available for use with this furnace. Please follow the instructions provided with the kit.
- For Installations where there is limited clearance for the J-Trap (such as an attic where it may be installed between ceiling joists), either side of the J-Trap can be shortened to a minimum of 3 Inches. See [Figure 24 \(page 48\)](#).

### Completing the Vent Pipe Installation and Assembly

1. Connect the horizontal 13.25" x 2" PVC pipe that came supplied with the unit to the inducer motor rubber coupler and secure using the 3" hose clamp provided.
2. Clean the opposite end of vent pipe and cement the 2" x 22.5 degree elbow onto the 2" pipe at this time. Orient elbow in a downward position.

**ROOF MOUNTED UNIT  
(ROOF CURB AND ROOF NOT SHOWN)**



**Figure 24. Condensate Disposal**









## INSTALLATION CHECKLIST

<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
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	YES	NO

SINGLE PHASE UNITS
Rated Voltage: ..... VOLTS
L1-L2 Volts: ..... VOLTS

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: ..... (%)		
Heating Input: ..... (Btuh)		
Supply Air Temperature: ..... (° F)		
Return Air Temperature: ..... (° F)		
Temperature Rise: ..... (° F)		
During Unit Operation:		
High Fire Manifold pressure: ..... (in - W.C.)		
Low Fire 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.



Single Phase Models Only



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