GAS FURNACES **92.1% AFUE**

Installation Instructions

G7XC Series - Single Stage Condensing Furnace



Upflow/Horizontal Model

⚠ WARNING:

- **PROPOSITION 65 WARNING: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.**
- **This furnace is not approved for installation in mobile homes. Installing this furnace in a mobile home could cause fire, property damage, and/or personal injury.**

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 furnace 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. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

⚠ 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 neighbors phone. Follow the gas suppliers instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

DO NOT DESTROY.
KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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SAFETY INFORMATION

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.

⚠ WARNING:

The safety information listed below must be followed during the installation, service, and operation of this furnace. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.

- Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
- Install this furnace only in a location and position as specified in Table 1 (page 5).
- Provide adequate combustion and ventilation air to the furnace space as specified on pages 4 - 8.
- Provide adequate clearances around the vent air intake terminal as shown in Figures 6 - 9 (pages 9 - 10).
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified on pages 8 - 10.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections (page 16).
- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column. Consult Table 8 (pages 26 - 27), and the rating plate for the proper circulating air flow and temperature rise. **NOTE:** It is important that the duct system be designed to handle the desired flow rate and temperature rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.
- When supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. See page 11.
- A gas-fired furnace for installation in a residential garage must be installed as specified on page 4.

REQUIREMENTS AND CODES

This furnace must be installed in accordance with these instructions, all applicable local building codes or current revision of the International Fuel Gas Code.

Any additional codes shown are for reference purposes only and do not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

GENERAL INSTRUCTIONS

Combustion Air Quality

⚠ CAUTION:

Combustion air must not be drawn from a corrosive atmosphere.

To maximize heat exchanger life, the combustion air must be free of chemicals that can form corrosive acidic compounds in the combustion gases. The recommended source of combustion air is to use the outdoor air supply. However, the use of indoor air in most applications is acceptable except as listed:

- If the furnace is installed in a confined space it is required that the necessary combustion air come from the outdoors by way of attic, crawl space, air duct, or direct opening. For installations in confined spaces, see pages 4 - 8 for combustion air requirements.
- Installation in these locations may require outdoor air for combustion, due to chemical exposures:
  - Commercial buildings
  - Buildings with indoor pools
  - Furnaces installed in laundry rooms
  - Furnaces installed in hobby or craft rooms
  - Furnaces installed near chemical storage areas
- Exposure to the following substances in the combustion air supply may require outdoor air for combustion:
  - Permanent wave solutions
  - Chlorinated waxes and cleaners
  - Chlorine based swimming pool chemicals
  - Water softening chemicals
  - De-icing salts or chemicals
  - Carbon Tetrachloride
  - Halogen type refrigerants
  - Cleaning solvents (Perchloroethylene)
  - Printing inks, paint removers, varnishes, etc.
  - Hydrochloric Acid
  - Cements and glues
  - Antistatic fabric softeners
  - Masonry acid washing materials

Clearances to Combustible Materials

Access for positioning and servicing the unit must be considered when locating unit. The need to provide clearance for access to panels or doors may require clearance distances over and above the requirements. **Allow 24 inches minimum clearance from the front of the unit. However, 36 inches is strongly recommended.** Specific clearance information can be found on the furnace rating plate.

Installation in a Garage

⚠ WARNING:

Do not place combustible material on or against the furnace cabinet or within 6 inches of the vent pipe. Do not place combustible materials, including gasoline and any other flammable vapors and liquids, in the vicinity of the furnace.

This Gas-fired furnace may be installed in a residential garage with the provision that the burners and igniter are located no less than 18 inches (457mm) above the floor. The furnace must be located or protected to prevent physical damage by vehicles.

Heating Load

The ductwork should be appropriately sized to the capacity of the furnace to ensure its proper airflow rating. For installations above 2,000 ft., the furnace should have a sea level input rating large enough that it will meet the heating load after deration for altitude. **Excessive oversizing of the furnace could cause the furnace and/or vent to fail prematurely.**

COMBUSTION AIR REQUIREMENTS

Provisions must be made during the installation of this furnace that provide an adequate supply of air for combustion.

General Information

- Instructions for determining the adequacy of an installation can be found in the current revision of the IFGC. **Consult local codes for special requirements**.

⚠ WARNING:

Furnace installation using methods other than those described in the following sections must comply with the International Fuel Gas Code (IFGC) and all applicable local codes.

- This condensing furnace is certified for installation either as a Direct Vent (2-pipe) or Conventional (1-pipe) appliance. Direct Vent appliances draw combustion air from the outdoors and vent combustion products back outside. Installation with air taken from around the furnace is often referred to as conventional (1- pipe) installation - i.e. only the vent (exhaust) pipe is provided.
- The combustion air coming from the outside needs to be clear of chemicals that can cause corrosion, so the inlet pipe should not be placed near corrosive chemicals. A 2-pipe installation has the additional advantage that it isolates the system from the effects of negative pressure in the house.

UPFLOW/HORIZONTAL INSTALLATION CLEARANCES*	
Left Side.....0 Inches	Back.....0 Inches
Right Side ..... 0 Inches	Top ..... 1 Inch
Vent.....1 Inch	Front.....4 Inches

* Allow 24 in. minimum clearance for servicing.
Recommended clearance is 36 in.

NOTE: This furnace is listed for installation on combustible or non-combustible flooring. However, wood is the only combustible flooring allowed for installation.

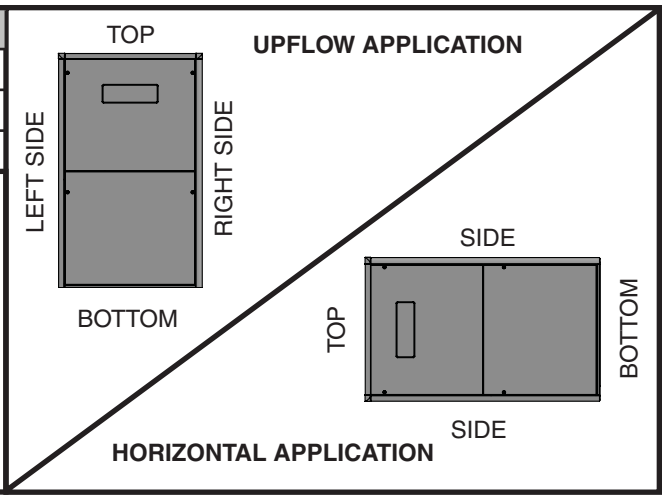


Table 1. Minimum Clearances to Combustible Materials

⚠ 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.**

- Air openings on top of the furnace and in closet doors or walls must never be restricted. If the furnace is operated without adequate air for combustion, the flame roll-out switch will open, turning off the gas supply to the burners. **This safety device is a manually reset switch. DO NOT install jumper wires across these switches to defeat their function or reset a switch without identifying and correcting the fault condition.** If the switch must be replaced, use only the correct sized part specified in the Replacement Parts List provided online.

⚠ CAUTION:

Exhaust fans, clothes dryers, fireplaces and other appliances that force air from the house to the outdoors can create a negative pressure inside the house, resulting in improper furnace operation or unsafe conditions such as flame roll out. It is imperative that sufficient air exchange with the outdoors is provided to prevent depressurization. Additional information about how to test for negative pressure problems can be found in the IFGC.

Conventional Furnaces - Confined Spaces

A confined space is an area with volume less than 50 cubic feet per 1,000 Btuh of the combined input rates of all appliances drawing combustion air from that space. Furnace closets, small equipment rooms and garages are confined spaces. Furnaces installed in a confined space which supply heated air to areas outside the space must draw return air from outside the space and must have the return air ducts tightly sealed to the furnace. Ducts must have cross - sectional area at least as large as the free area of their respective openings to the furnace space.

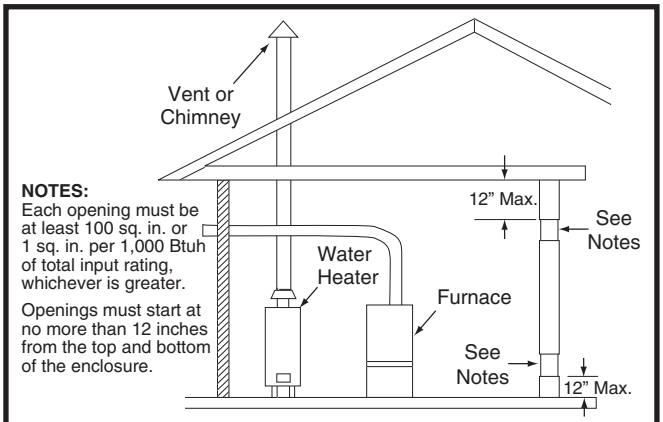
The required sizing of these openings is determined by whether inside or outside air is used to support combustion, the method by which the air is brought to the space, and by the total input rate of all appliances in the space. In all cases, the minimum dimension of any combustion air opening is 3 inches.

Air From Inside

If combustion air is taken from the heated space, the two openings must each have a free area of at least one square inch per 1,000 Btuh of total input of all appliances in the confined space, but **not less than 100 square inches of free area** (Figure 1)**.**

Example:

If the combined input rate of all appliances is less than or equal to 100,000 Btuh, each opening must have a free area of at least 100 square inches. If the combined input rate of all appliances is 120,000 Btuh, each opening must have a free area of at least 120 square inches.



Total Input Rating (Btuh)	Minimum Free Area (Each Opening)	Round Duct Diameter
40,000	100 sq. In	12 inches
60,000	100 sq. In	12 inches
80,000	100 sq. In	12 inches
100,000	100 sq. In	12 inches
120,000	120 sq. In	13 inches
140,000	140 sq. In	14 inches
160,000	160 sq. In	15 inches

Figure 1. Combustion Air Drawn from Inside

Outdoor Air from a Crawl Space or Vented Attic

When the openings can freely exchange air with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 Btuh of total appliance input. The openings shall exchange directly, or by ducts, with the outdoor spaces (crawl or attic) that freely exchange with the outdoors (Figure 2).

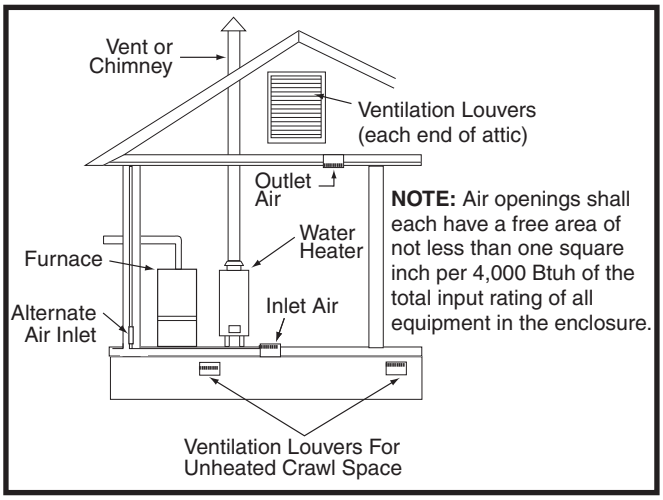
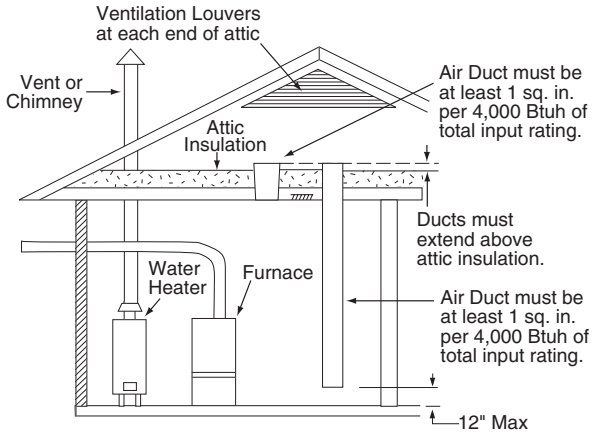


Figure 2. Combustion Air Drawn from a Crawl Space or Vented Attic

Outdoor Air Using Vertical Ducts

If combustion air is taken from outdoors through vertical ducts, the openings and ducts must have a minimum free area of one square inch per 4,000 Btuh of total appliance input (Figure 3, page 7). Attics or crawl spaces must connect freely with the outdoors if they are the source of air for combustion and ventilation.

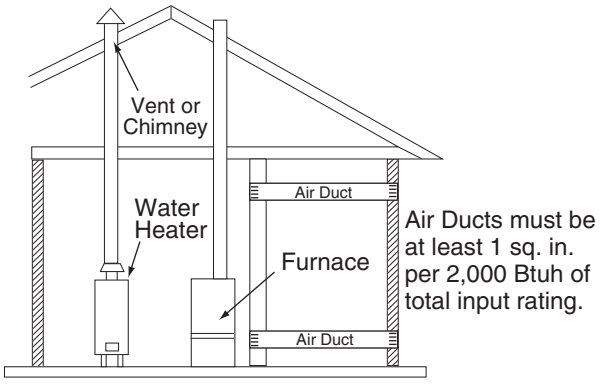


Total Input Rating (Btuh)	Minimum Free Area (Each Opening)	Round Duct Diameter
40,000	10 sq. In	4 inches
60,000	15 sq. In	5 inches
80,000	20 sq. In	5 inches
100,000	25 sq. In	6 inches
120,000	30 sq. In	6 inches
140,000	35 sq. In	7 inches
160,000	40 sq. In	8 inches

Figure 3. Combustion Air Drawn from Outside Through Vertical Ducts

Outdoor Air Using Horizontal Ducts

If combustion air is taken from outdoors through horizontal ducts, the openings and ducts must have a minimum free area of one square inch per 2,000 Btuh of total appliance input (Figure 4).

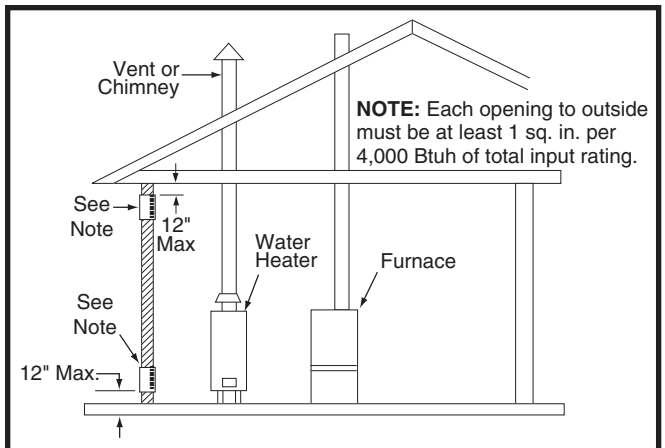


Total Input Rating (Btuh)	Minimum Free Area (Each Opening)	Round Duct Diameter
40,000	20 sq. In	5 inches
60,000	30 sq. In	6 inches
80,000	40 sq. In	7 inches
100,000	50 sq. In	8 inches
120,000	60 sq. In	9 inches
140,000	70 sq. In	10 inches
160,000	80 sq. In	10 inches

Figure 4. Combustion Air Drawn from Outside Through Horizontal Ducts

Air Directly Through An Exterior Wall

If combustion air is provided directly through an exterior wall, the two openings must each have free area of at least one square inch per 4,000 Btuh of total appliance input (Figure 5).



Total Input Rating (Btuh)	Minimum Free Area (Each Opening)	Round Duct Diameter
40,000	10 sq. In	4 inches
60,000	15 sq. In	5 inches
80,000	20 sq. In	5 inches
100,000	25 sq. In	6 inches
120,000	30 sq. In	6 inches
140,000	35 sq. In	7 inches
160,000	40 sq. In	8 inches

Figure 5. Combustion Air Drawn from Outside Through an Exterior Wall

Conventional Furnaces - Unconfined Spaces

An unconfined space is an area including all rooms not separated by doors with a volume greater than 50 cubic feet per 1,000 Btuh of the combined input rates of all appliances which draw combustion air from that space.

In general, a furnace installed in an unconfined space will not require outside air for combustion. However, in homes built for energy efficiency (low air change rates), it may be necessary to provide outside air to ensure adequate combustion and venting, even though the furnace is located in an unconfined space. See example.

Example:

A space with a water heater rated at 45,000 Btuh input and a furnace rated at 75,000 Btuh requires a volume of 6,000 cubic feet [50 x (45 + 75) = 6,000] to be considered unconfined. If the space has an 8 foot ceiling, the floor area of the space must be 750 square feet (6,000 / 8 = 750).

Direct Vent Furnaces
Direct Vent (2-pipe) furnaces pull combustion air directly from the outdoors and then vent the combustion products back outside, isolating the entire system from the indoor space. It is important to make sure that the whole system is sealed and clearances to combustibles are maintained regardless of the installation being in a confined or unconfined space.

VENTING REQUIREMENTS

This furnace is classified as a "Category IV" appliance, which requires special venting materials and installation procedures. It must be vented in compliance with the current revision of the International Fuel Gas Code and the instructions below. **Consult local codes for special requirements.**

Category IV appliances operate with positive vent pressure and therefore require vent systems which are thoroughly sealed. They also produce liquid condensate, which is slightly acidic and can cause severe corrosion of ordinary venting materials.

⚠ WARNING:

This furnace must not be vented with other appliances, even if that appliance is of the condensing type. Common venting can result in severe corrosion of other appliances or their venting and can allow combustion gases to escape through such appliances or vents. Do not vent the furnace to a fireplace chimney or building chase.

⚠ WARNING:

Upon completion of the furnace installation, carefully inspect the entire flue system both inside and outside the furnace to assure it is properly sealed. Leaks in the flue system can result in serious personal injury or death due to exposure of flue products, including carbon monoxide.

IMPORTANT NOTES:

- **The venting system should be designed to have the minimum number of elbows or turns.**
- **All horizontal runs must slope upwards from the furnace at 1/4 inch minimum per running foot of vent.**
- **Transition to the final vent diameter should be done as close to the furnace outlet as practical.**
- **Always use the same size or a larger pipe for combustion air that is used for the exhaust vent.**
- **To ensure the furnace operates properly, the combustion air and vent piping must not be excessively restrictive.**

This section specifies installation requirements for Conventional (1-pipe) and Direct Vent (2-pipe) piping. For 1- pipe installations, install vent piping per this section and provide air for combustion and ventilation per the previous section.

The inducer assembly on this furnace can be rotated to vent the flue products out of the top, left or right side. This increases the flexibility of which direction the vent pipe can exit the furnace.

Vent Pipe Material
Vent and combustion air pipe and fittings must be one of the following materials in the list and must conform to the indicated ANSI/ASTM standards. Cement must conform to ASTM Standard D2564 for PVC and Standard D2235 for ABS. PVC primer must meet standard ASTM F656. When joining PVC piping to ABS, use PVC solvent cement. (See procedure specified in ASTM Standard D3138.)

Material	**Standard**
Schedule 40PVC	D1785
PVC-DWV	D2665
SDR-21 & SDR-26	D2241
ABS-DWV	D2661
Schedule 40 ABS	F628
Foam/Cellular Core PVC	F891

Vent Pipe Length and Diameter
When estimating the length of vent runs, consideration must be made to the effect of elbows and other fittings. This is conveniently handled using the idea of "equivalent length". This means the fittings are assigned a linear length that accounts for the pressure drop they will cause. For example: a 2" diameter, long radius elbow is worth the equivalent of 2.5 feet of linear run. A 90° tee is worth 7 ft.

Table 2 (page 9) indicates the maximum allowable pipe length for a furnace of known input rate, when installed with piping of selected diameter and number of elbows. Measure the linear length of your vent run and then add in the equivalent length of each fitting from Table 2. The total length, including the equivalent fitting lengths, must be less than the maximum length specified.

Vent Pipe Installation

⚠ CAUTION:

Combustion air must not be drawn from a corrosive atmosphere.

This furnace has been certified for installation with zero clearance between vent piping and combustible surfaces. However, it is good practice to allow space for convenience in installation and service.

FURNACE MODELS	SINGLE VENT PIPE with 1 long radius elbow*	DUAL VENT PIPE with 1 long radius elbow on each pipe*
	OUTLET 3" Diameter	INLET/OUTLET 3" Diameter
XC046	80	80
XC061	80	80
XC076	80	80
XC102	80	80

***NOTES:**

1. These lengths apply for elevations from sea level to 2,000 ft. For higher elevations decrease vent pipe lengths by 8% per 1,000 ft. of altitude.
2. When calculating vent lengths, subtract 2.5 ft. for each additional 2" elbow and 3.5 ft. for each additional 3" elbow. Two 45° elbows are equivalent to one 90° elbow. One short radius elbow is equivalent to two long radius elbows. Do not include termination elbows in calculation of vent length.
3. The length of pipe needed between the inducer and the finish flange is 7 3/4".

Table 2. Vent Pipe Lengths (FT.)

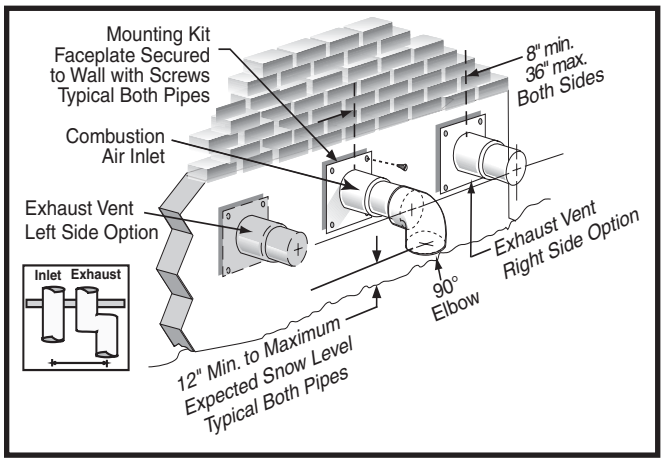


Figure 6. Exhaust and Combustion Air Pipe Clearances

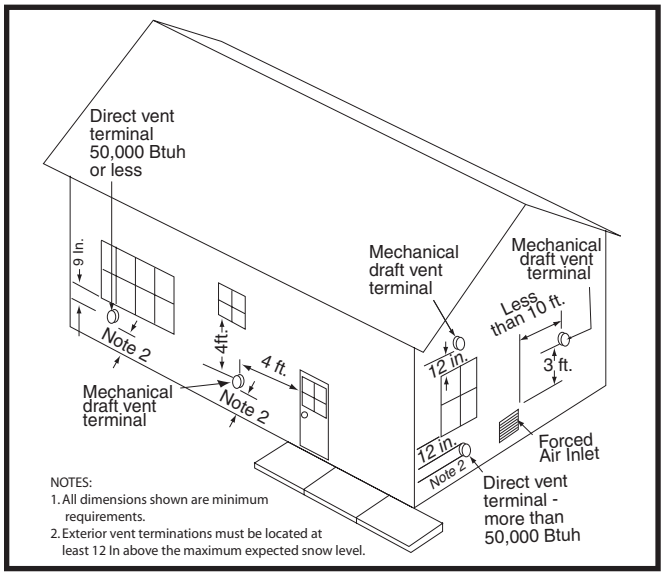


Figure 7 Vent Locations

- The quality of outdoor air must also be considered. Be sure that the combustion air intake is not located near a source of solvent fumes or other chemicals which can cause corrosion of the furnace combustion system.
- Route piping as direct as possible between the furnace and the outdoors.
- If a Direct Vent (2-pipe) system is used, the combustion air intake and the vent exhaust must be located in the same atmospheric pressure zone. This means both pipes must exit the building through the same portion of exterior wall or roof as shown in Figure 30 (page 34). Vent piping must be sloped upwards 1/4" per foot in the direction from the furnace to the terminal. This is to ensure that any condensate flows back to the condensate disposal system.
- Piping must be mechanically supported so that its weight does not bear on the furnace. Pipe supports must be installed a minimum of every 5 feet along the vent run to ensure no displacement after installation. Supports may be at shorter intervals if necessary to ensure that there are no sagging sections that can trap condensate. It is recommended to install couplings along the vent pipe, on either side of the exterior wall (Figure 30). These couplings may be required by local code.

Outdoor Terminations - Horizontal Venting

Vent termination clearances must be consistent with the IFGC and in accordance with these instructions.

- Vent and combustion air intake terminations shall be installed as shown in Figures 6 & 7.
- All minimum clearances (Figure 7) must be maintained to protect building materials from degradation by flue gases.
- Vent and combustion air intake terminations must be located to ensure proper furnace operation and conformance to applicable codes. Figure 7 lists the distances from the vent termination to windows and building air intakes.
- For optimal performance, vent the furnace through a wall that experiences the least exposure to winds**.**
- Do not install the vent terminal such that exhaust is directed into window wells, stairwells, under decks or into alcoves or similar recessed areas, and do not terminate above any public walkways.
- If venting horizontally, a side wall vent kit is available according to the pipe diameter size of the installation (kit # 904349). **Please follow the instructions provided with the kit.**
- Concentric vent termination kits are available for use with these furnaces (kit # 904176). **Please follow the instructions provided with the kit.**
- When the vent pipe must exit an exterior wall close to the grade or expected snow level where it is not possible to obtain clearances shown in Figure 6, a riser may be provided as shown in Figure 8 (page 10). Insulation is required to prevent freezing of this section of pipe. See vent freezing protection information below.

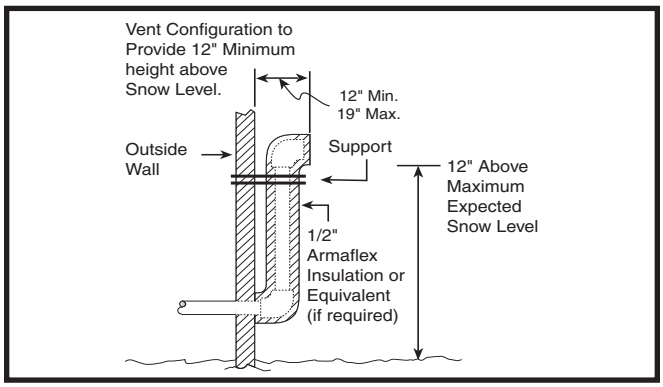


Figure 8. Alternate Horizontal Vent Installation

Outdoor Terminations - Vertical Venting

Termination spacing requirements from the roof and from each other are shown in Figure 9. The roof penetration must be properly flashed and waterproofed with a plumbing roof boot or equivalent flashing. Vent and combustion air piping may be installed in an existing chimney which is not in use provided that:

- Both the exhaust vent and air intake run the length of the chimney.
- The top of the chimney is sealed and weatherproofed.
- The termination clearances shown in Figure 9 are maintained.
- No other gas fired or fuel-burning equipment is vented through the chimney.

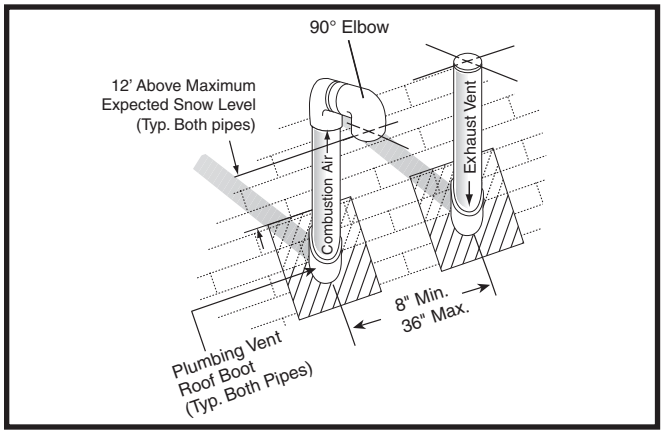


Figure 9. Vertical Vent Termination

Winter Design Temperature	Maximum Flue Pipe Length in Unconditioned and Exterior Spaces	
	Without Insulation (feet)	With Insulation (feet)*
20	45	70
0	20	70
-20	10	60
* = Insulation thickness greater than 3/8 inch, based on an R value of 3.5 (ft x F x hr) / (BTU x in.)		

Table 3. Vent Protection

Vent Freezing Protection

- When the vent pipe is exposed to temperatures below freezing (i.e., when it passes through unheated spaces, chimneys, etc.) the pipe must be insulated with 1/2 inch thick sponge rubber insulation, Armaflex-type insulation or equivalent. Insulating pipe is important to avoid condensate icing.
- Table 3 lists the maximum length of flue pipe that can travel through an unconditioned space or an exterior space. The total vent length must not exceed the lengths noted in the Table.
- For extremely cold climates or for conditions of short furnace cycles (i.e. set back thermostat conditions) the last 18 inches of vent pipe can be reduced. It is acceptable to reduce from 3" to 2-1/2", 3" to 2", or 2" to 1-1/2" if the total vent length is at least 15 feet in length, and the vent length is within the parameters specified in Table 2 (page 9). The restriction should be counted as 3 equivalent feet. Smaller vent pipes are less susceptible to freezing, but must not be excessively restrictive. The length of the 2 inch pipe must not be longer than 18 inches.
- If furnace is installed horiziontally, make sure the drainage port on the in-line drain assembly is pointed downward to ensure proper drainage of condensate. See pages 32 & 33.
- To prevent debris or creatures from entering the combustion system, a protective screen may be installed over the combustion air intake opening. The screens hole size must be large enough to prevent air restriction.

Condensate Disposal

The method for disposing of condensate varies according to local codes. Consult your local code or authority having jurisdiction. Neutralizer kit P/N 902377 is available for use with this furnace. **Please follow the instructions provided with the kit.**

This furnace has multiple options for positioning the vent pipe as described in the section, Vent and Inducer Assembly Options. Each of the condensate drain lines must be J-trapped using field supplied parts. After the condensate lines are J-trapped, they may be combined to run to the drain.

Existing Installations

When an existing furnace is removed from a vent system serving other appliances, the existing vent system may not be sized properly to vent the remaining appliances (for example a water heater). An improperly sized venting system can result in the formation of condensate, leakage, or spillage. The existing vent system should be checked to make sure it is in compliance with IFGC and must be brought into compliance before installing the furnace.

CIRCULATING AIR REQUIREMENTS

⚠ WARNING:

- **Do not allow combustion products to enter the circulating air supply. Failure to prevent the circulation of combustion products 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 secured to the furnace with sheet metal screws. For installations in confined spaces, all return ductwork must be adequately sealed. When return air is provided through the bottom of the furnace, the joint between the furnace and the return air plenum must be air tight.**
- **The surface that the furnace is mounted on must provide sound physical support of the furnace with no gaps, cracks or sagging between the furnace and the floor or platform.**
- **Return air and circulating air ductwork must not be connected to any other heat producing device such as a fireplace insert, stove, etc. This may result in fire, explosion, carbon monoxide poisoning, personal injury, or property damage.**

Plenums and Air Ducts

- Supply and return air must be delivered to the furnace by duct(s) secured to the furnace casing, running full size and without interruption.
- Table 8 (pages 26 & 27) contains the maximum airflow and temperature rise data for each furnace input rate. **NOTE:** If the maximum airflow is 1,600 CFM or more, it is recommended that two openings be used for return air on upflow furnaces.
- It is recommended that the outlet duct contain a removable access panel that is accessible when the furnace is installed in service. The opening shall be of a size 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 such a manner as to prevent leaks.
- If outside air is used as return air to the furnace for ventilation or to improve indoor air quality, the system must be designed so that the return air is not less than 60° F (15° C) during 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.
- If a cooling system is installed which uses the furnace blower to provide airflow over the indoor coil, the coil must be installed downstream (on the outlet side) of the furnace or in parallel with the furnace.
- If a cooling system is installed in parallel with the furnace, a damper must be installed to prevent chilled air from entering the furnace and condensing on the heat exchanger. If a manually operated damper is installed, it must be designed so that the furnace will not operate when the damper is in the cooling position or when in heating position, the cooling system is inoperable.
- It is good practice to seal all connections and joints with industrial grade sealing tape or liquid sealant. Requirements for sealing ductwork vary from region to region. Consult with local codes for specific requirements.

Supply Air Connections

To attach the supply air duct to the furnace, bend the furnace flanges (Figure 25, page 25) upward 90° with wide duct pliers. Position the duct on top of the furnace and secure together with sheet metal screws. The screws must penetrate the sheet metal casing and furnace flange.

Return Air Connections

For upflow installations, the return air ductwork may be connected to the left side, right side, or bottom. The bottom panel (Figure 25) must be installed for left or right return air. **Do not use the back of the furnace for return air.**

Side Return Installations

⚠ WARNING:

The solid base of the furnace must be in position when the furnace is installed with side return air ducts. Removal of all or part of the base could cause circulation of combustible products into the living space and create potentially hazardous conditions, including carbon monoxide poisoning that could result in personal injury or death.

To attach the return air duct to the left or right side of the furnace, punch out the four knockouts (Figure 25) from the preferred side of the furnace. Using sharp metal cutters, cut an opening between all four knockouts to expose the blower assembly. Position the return air duct over the opening in the side and secure together with sheet metal screws. The screws must penetrate the duct and furnace cabinet.

Bottom Return Installations

The bottom panel (Figure 25) must be removed from the bottom of the furnace for bottom return air. Refer to page 13 for removal instructions. Position the furnace over the return air duct and secure together with sheet metal screws. The screws must penetrate the duct and furnace cabinet.

FURNACE INSTALLATION

G7XC series gas furnaces are shipped ready for installation in the upflow or horizontal right or left positions. Access for positioning and servicing must be considered when locating the unit. See Table 1 (page 5) for the required clearances needed to move the furnace to its installation point (hallways, doorways, etc).

General Requirements

- The furnace must be leveled at installation and attached to a properly installed duct system. Refer to page 11 for circulating air requirements.
- The furnace requires special venting materials and installation procedures. See pages 8 -10 for venting guidelines and specifications.
- The furnace must be installed so that all electrical components are protected from water.
- The furnace must be installed upstream from a refrigeration system.
- The cabinet plug must always be used to close the hole in the side of the furnace when rotating the inducer.

⚠ WARNING:

The furnace must not be installed directly on carpeting, tile, or any combustible material other than wood flooring.

Direct vent (two pipe) applications

It is important that Direct Vent (2 pipe) systems maintain an airtight flow path from the air inlet to the flue gas outlet. The furnace ships from the factory with two holes (See Figure 25, page 25) in the cabinet for the air inlet and flue gas outlet. In certain configurations, it is necessary to remove and relocate a plastic cap in the furnace cabinet. If changing the position of the air inlet and flue gas outlet, it is required that the previous hole be closed off with the plastic cap to maintain air tightness in the furnace.

Upflow Installation

⚠ WARNING:

The furnace must not be installed directly on carpeting, tile, or any combustible material other than wood flooring.

The G7XC gas furnace may be installed directly on combustible wood flooring or supports. For venting guidelines and specifications, see Venting Requirements section.

Side Return Air Inlet

This gas furnace is shipped with the bottom panel installed (Figure 25). If the furnace is installed using both side return air inlets, the bottom panel must not be removed.

Bottom Return Air Inlet

If the bottom of the furnace is being used as a return air inlet, the bottom panel must be removed prior to installation. See Bottom Panel Removal (page 13).

Horizontal Installation

The G7XC furnace can be installed horizontally in an attic, basement, crawl space or alcove (Figure 10). It can also be suspended from a ceiling in a basement or utility room in either a right to left airflow or left to right airflow as shown in Figure 11.

If the furnace is to be suspended from the ceiling, it will be necessary to use steel straps around each end of the furnace. The straps should be attached to the furnace with sheet metal screws and to the rafters with bolts. The furnace could also be suspended by an angle iron frame bolted to the rafters (Figure 11.) Access for positioning and servicing must be considered when locating the unit. See Table 1 (page 5) for clearance specifications.

If the furnace is to be installed in an attic, it is required that a drip pan be placed under the furnace. If the installation is on a combustible platform, it is recommended that the drip pan extend at least 12 inches past the top and front of the furnace. Always refer to local codes.

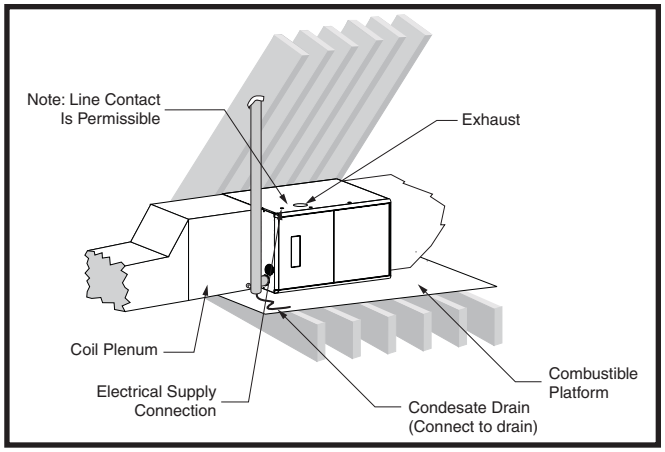


Figure 10. Horizontal installation on a Platform

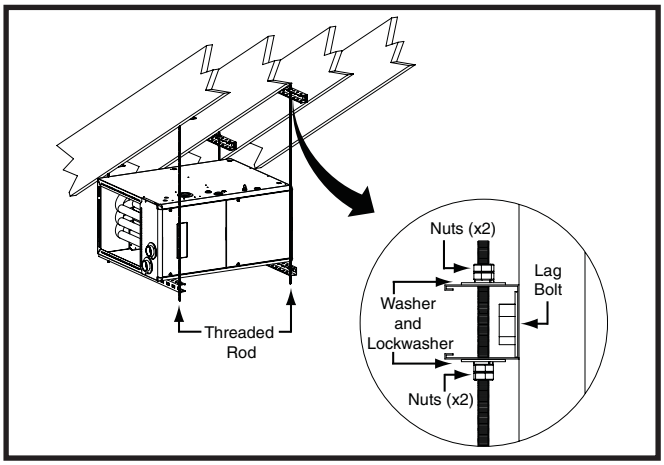


Figure 11. Horizontally Suspended in Attic or Crawl Space

Bottom Panel Removal

The steps listed below describe how to remove the bottom panel from the furnace. See Figure 12.

1. Remove the door (1) from the blower compartment.
2. Disconnect the blower motor wiring harness (2) from the control board.
3. Remove two screws (3) securing the blower assembly (4) to the furnace.
4. Carefully pull the blower assembly (4) out thru the front of the furnace.
5. Remove all screws (5) securing bottom panel (6) to bottom of furnace and front brace (7).
6. Lift up and slide bottom panel (6) out through front of furnace.
7. Reinstall the blower assembly (4) in reverse order.

Alternate Bottom Panel Removal

If the bottom panel cannot be removed using the previous instructions, the steps below are an alternate method for removing the bottom panel. (See Figure 13).

1. Remove the door (1) from the blower compartment
2. Remove all screws securing the bottom panel (2) to the front brace (3).
3. Remove two screws (4) securing the furnace cabinet to the blower deck (5).
4. Remove all screws (6) securing the furnace cabinet to the bottom panel (2).
5. Remove the screw (7) securing the bottom corner of the furnace cabinet to the front brace (3).
6. Carefully spread the bottom corner of the furnace cabinet outwards while sliding the bottom panel (2) out through the front of the furnace.
7. Reassemble the furnace in reverse order.

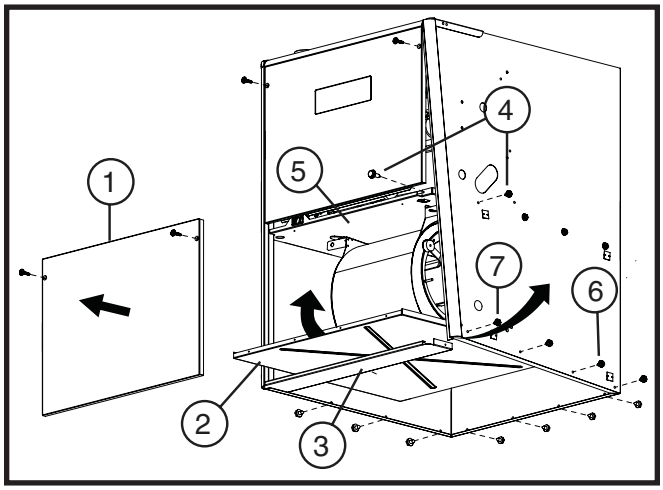


Figure 13. Alternate Removal Method

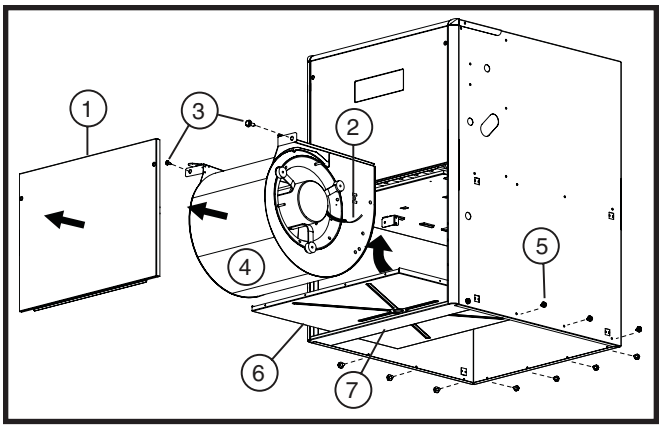


Figure 12. Bottom Panel Removal

Inducer Assembly Rotation

⚠ WARNING:

Inducer rotation must be completed before the furnace is connected to gas and electric. If both utilities have been connected, follow the shutdown procedures printed on the furnace label and disconnect the electrical supply.

⚠ CAUTION:

It is good practice to label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation.

1. Disconnect the electrical harness (1) from the inducer assembly (2). See Figure 14, page 14.
2. Remove the inducer assembly ground wire (3) from the blower deck (4) or door.
3. Remove three screws (5) securing the inducer assembly (2) to the header box (6).
4. Rotate the inducer assembly (2) to its new position.
5. Secure the inducer assembly (2) to the header box (6) by reinstalling the three screws (5). If the inducer assembly is rotated to the left or right side of the furnace, use the extra screw provided in the parts package.
6. Remove the cabinet plug (7) from side of furnace and reinstall in hole on opposite side of cabinet.
7. Install in-line drain assembly and tubing.
8. If applicable, install the condensate drain as shown in Figures 27 - 29 (pages 31 - 33).
9. Reconnect the electrical harness (1) to the inducer assembly (2).
10. Reconnect the inducer assembly ground wire (3) to the blower deck (4) or door.
11. Verify operation as detailed on the furnace label.

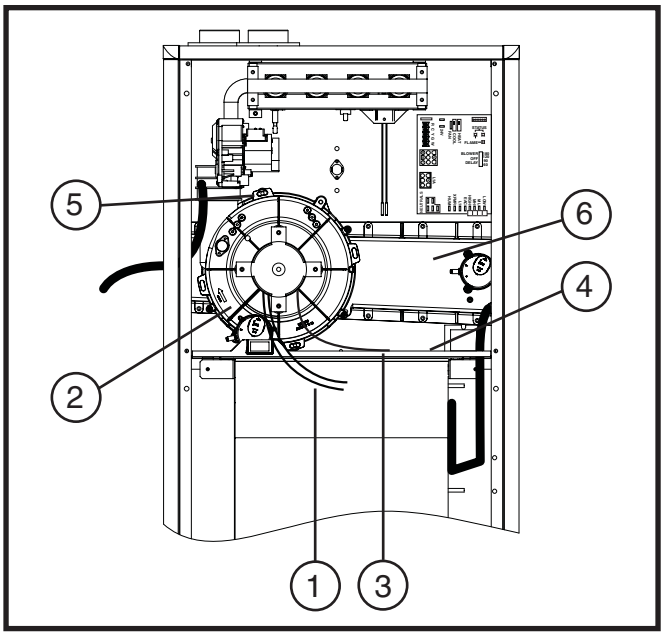


Figure 14. Inducer Assembly Rotation

Vent and Inducer Assembly Options

The G7XC gas furnace offers a wide range of installation options, including installation in the upflow or horizontal positions with either right, left, or upflow return air. To increase installation flexibility, the inducer assembly can be rotated up to 3 different positions. Each variation has slightly different requirements with regard to condensate disposal and, in some cases, the need to seal the furnace cabinet. **The inducer assembly must never be positioned to vent downwards on horizontal installs**.

Before using Table 4, the number of pipes (1-pipe or 2-pipe) connected to the furnace must be known. Find your furnace style (upflow or horizontal) and the side that the pipes will exit from the furnace. Finally select the option that properly matches your installation in Figures 27 - 29 (pages 31 - 33).

Conventional (1 Pipe)			
Vent	**Upflow**	**Horizontal Right**	**Horizontal Left**
Up	Option 1	Option 7*	Option 10*
Right	Option 2*	Option 8	N/A
Left	Option 3*	N/A	Option 9
Direct Vent (2 Pipe)			
Vent	**Upflow**	**Horizontal Right**	**Horizontal Left**
Up	Option 4	Option 11*	Option 14*
Right	Option 5*	Option 12	N/A
Left	Option 6*	N/A	Option 13
* Requires a 2 inch PVC endcap.			

Table 4. Vent and Inducer Blower Options

Accessories

The components below are included in the extra parts bag that is supplied with the purchase of your furnace. Depending on your particular installation, some of these components are optional and may not be used. Please refer to the descriptions and accompanying figures when installing these items.

Finish Flanges (Fig. 15)

The finish flanges must be installed to vent the combustion air pipe through the top of the furnace. **NOTE:** For proper installation it is important that the pipe and screw holes in the finish flanges, gasket, and cabinet are aligned.

1. Position flange gasket over hole in the furnace cabinet.
2. Position finish flange on top of the flange gasket.
3. Secure flange and gasket to cabinet with three field supplied sheet metal screws.
4. Repeat steps 1 - 3 for other vent hole.

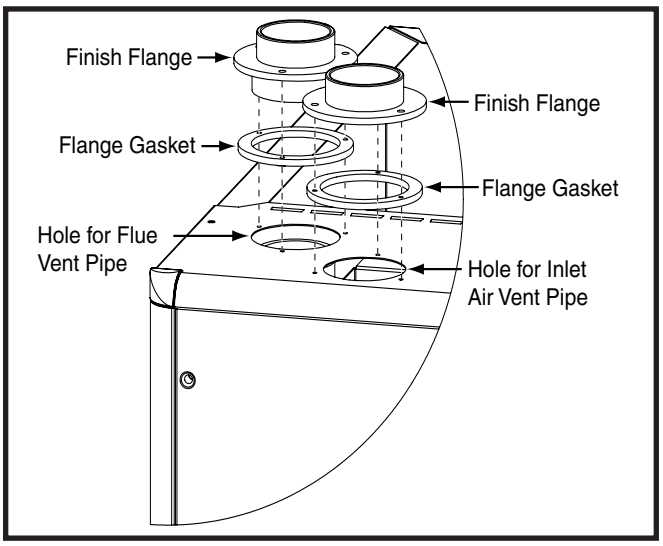


Figure 15. Finish Flanges

Rubber Grommets (Fig. 16, page 15)

The 2 1/4” rubber grommet is used to seal the opening between the furnace cabinet and the 2” PVC vent pipe. The rubber grommet should be installed in the 3” hole prior to running the vent pipe out of cabinet. No sealants are required.

The 7/8” rubber grommet is used to seal the opening between the furnace cabinet and the gas pipe. The rubber grommet should be installed in the 1 5/8” hole prior to running the gas pipe into the cabinet. No sealants are required.

The 3/4” rubber grommet is used if venting out the left side of the cabinet and the drain tube is routed through the blower deck. Remove the plastic plug from the hole and install the grommet before routing the drain tube.

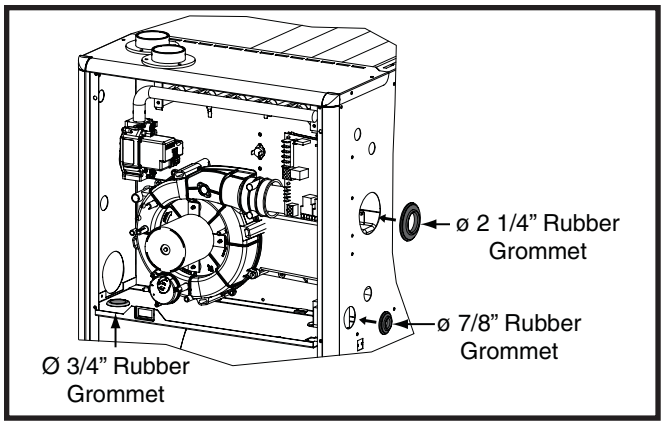


Figure 16. Rubber Grommets

PVC TEE, Reducer, and Hose Barbs (Fig. 17)

IMPORTANT NOTES:

Before permanently installing these components, it is recommended you dry-fit them first to ensure proper fit and alignment with other vent pipes.

The PVC items shown in Figure 17 are not provided in the extra parts bag.

The 2" PVC tee, reducer, and hose barb are used when the inducer is rotated to vent out thru the left or right side of the furnace cabinet.

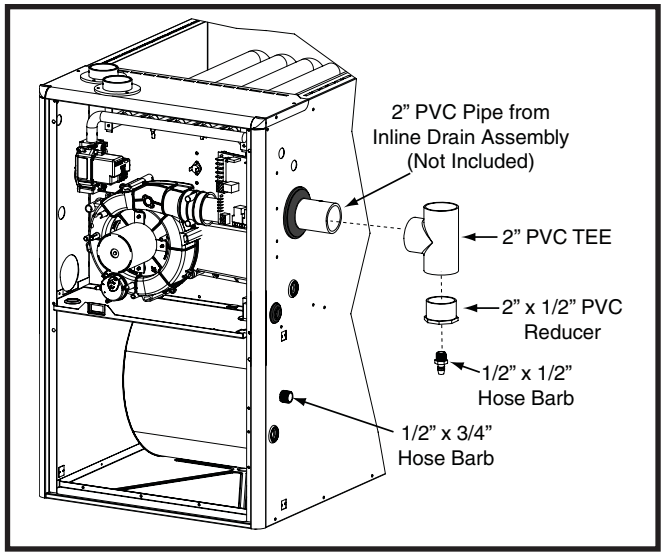


Figure 17. 2" PVC Tee, Reducer and Hose Barb

The 1/2" x 3/4" hose barb can be used to route the condensate drain to the outside of the cabinet. It must be installed from inside the cabinet with the threaded end inserted thru the 1 1/16" hole. See Figure 25 (page 25) for hole location. The Condensate drain should be connected to the barbed end. Attach 1" PVC drain line to the threaded end.

1. Install the 1/2" x 1/2" hose barb on the 2" PVC reducer. Do not over tighten! NOTE: Use an adequate amount of Teflon tape on the threads. Do not use liquid sealants.
2. Install the reducer on one end of the PVC tee. Use appropriate primer and cement to permanently bond the reducer and tee together.
3. Install the tee on the 2" vent pipe that is extending out the side of the cabinet. Use appropriate primer and cement to permanently bond them together.
4. Verify all connections and joints for tight fit and proper alignment with other vent pipes.

Condensate Drain Lines

The placement of the condensate drain lines will depend on the configuration selected in Table 4 (page 14). The drain lines can be routed out the left or right side of the furnace, but must maintain a downward slope to ensure proper condensate drainage. The J-trap may need to be rotated to the side that matches your setup in Figures 27 - 29 (pages 31 - 33). To rotate the J-trap, loosen the clamp on the drain tube, rotate the J-trap to either side, and retighten the clamp

Four general principles apply:

- Each condensate drain must be trapped separately using a J-Trap or field supplied loop.
- There must always be a drain attached to the collector at the outlet of the secondary heat exchanger.
- There must always be a drain at the outlet of the inducer assembly.
- There must always be a drain at the lowest point of the venting system.

Exceptions and clarifications to the general rules:

- In some cases, the lowest point in the vent system is where it connects to the inducer. Options 3, 13, & 14. In this case one drain at this location is sufficient.
- If the vent exits the furnace horizontally, the vent may be turned vertically with a tee. **The drip leg formed by the tee must include a drain.** Options 2,3,5,6,8,9,12, 13,16,17,19, & 20.
- In certain cases, it is permitted to drain the inducer back into the top drain of the collector. **This drain must not sag in the middle.** Options 1, 2, 4, 5, 7, & 11.

IMPORTANT NOTE: If the furnace is installed in an area where temperatures fall below freezing, special precautions must be made for insulating condensate drain lines that drain to the outdoors. If condensate freezes in the lines, this will cause improper operation or damage to the furnace. It is recommended that all drain lines on the outside of the residence be wrapped with an industry approved insulation or material allowed by local code.

Optional PVC Pipe Installation (Figure 18)

When running the 2” PVC pipe out through the top of the *SC upflow furnace, there may be possible clearance issues when transitioning the PVC pipe from 2” to 3”:

- If you have to increase the size of the PVC flue from 2” to 3”, you may use two, 2” x 45° PVC elbows to achieve the clearances needed between the coil box and the 2 x 3 coupling.
- Install the 2 x 3 coupling in the vertical run only. If the coupling is installed horizontally, it will allow water to build up inside the furnace and cause a lock out condition.
- To avoid the clearance issue, it is recommended that the furnace be vented through the left side or the right side of the cabinet as shown in Figures 25-28 (pages 38-41).

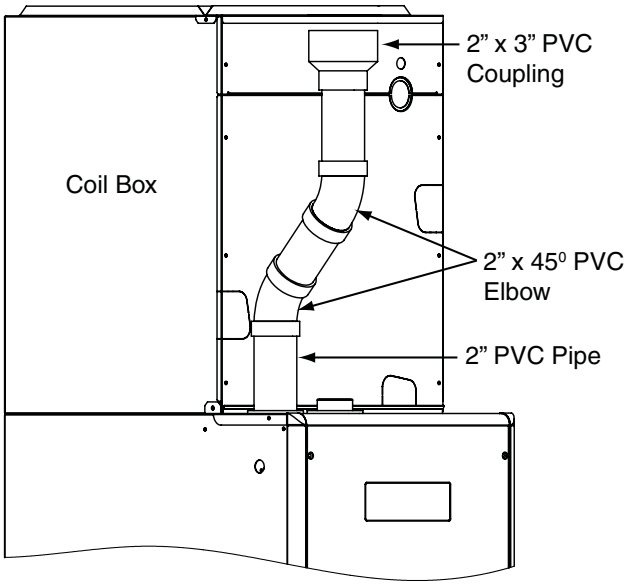


Figure 18. Optional PVC Pipe Installation

GAS SUPPLY AND PIPING

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 International Fuel Gas Code.

IMPORTANT NOTES:

- **Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace. See Figure 19 (page 17). 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.**
- **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 gases.**
- **The main gas valve and main power disconnect to the furnace must be properly labeled by the installer in case emergency shutdown is required.**
- **A drip leg should be installed in the vertical pipe run to the unit (Figure 14).**

Table 10 (page 28) lists gas pipe capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

The furnace may be installed for either left or right side gas entry. A typical gas service hookup is shown in Figure 19. **NOTE:** When connecting the gas supply, provide clearance between the gas supply line and the entry hole in the furnace casing to avoid unwanted noise and/or damage to the furnace.

Leak Check

⚠ WARNING:

FIRE OR EXPLOSION HAZARD

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

After the gas piping to the furnace is complete, all connections must be tested for gas leaks. This includes pipe connections at the main gas valve, emergency shutoff valve and flexible gas connectors (if applicable). The 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.

IMPORTANT NOTE: When pressure testing gas supply lines at pressures greater than 1/2 psig (14 inch W.C.), the gas supply piping system must be disconnected from the furnace to prevent damage to the gas control valve. If the test pressure is less than or equal to 1/2 psig (14 inch W.C.), close the manual shut-off valve.

High Altitude Application

The installation of this furnace at altitudes above 2,000 feet must meet the requirements of the International Fuel Gas Code or local codes. High altitude conversion of this furnace depends on the installation altitude and heating value of the gas (at sea level) from your local gas utility. **NOTE:** At high altitudes, the heating value is always lower than heating value at sea level.

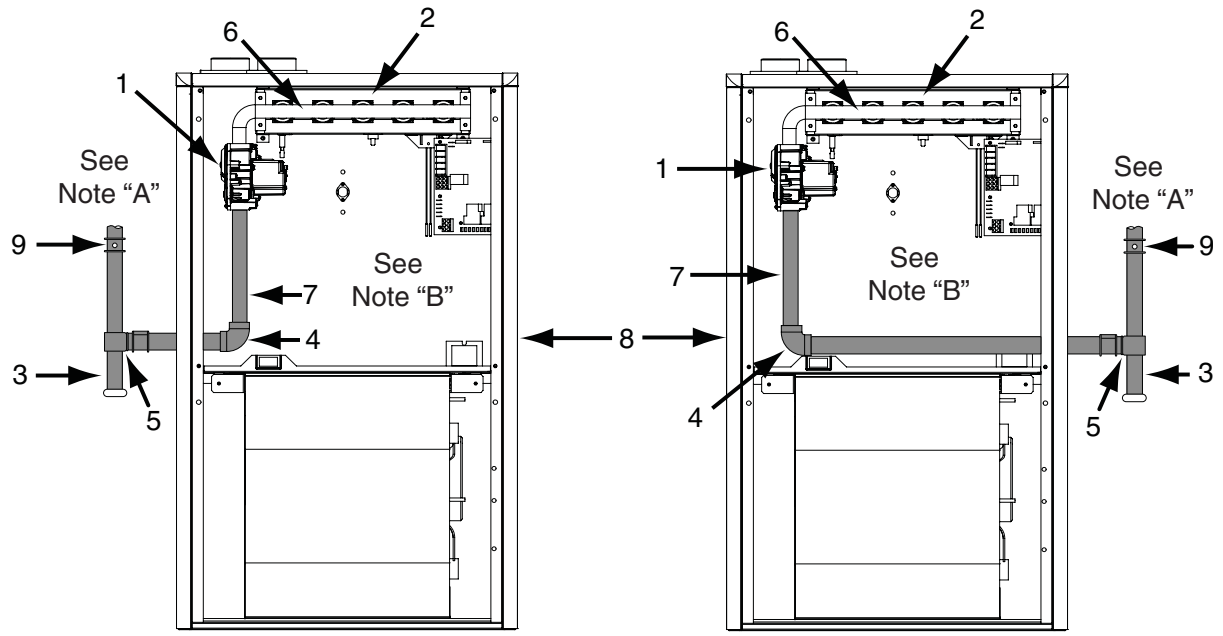
The *XC furnace is shipped from the factory with orifices and gas regulator settings for natural gas operation at sea level. At 2,000 feet, this appliance needs to be derated 4% per 1,000 feet of altitude. For example, the input needs to be reduced 8% at 2,000 feet, 12% at 3,000 feet, etc. This deration is in reference to the input rate and gas heating value at sea level.

⚠ 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.

From 2,000 to 5,000 feet, deration may be performed by adjusting the manifold pressure on the gas valve as shown on page 20. Above 5,000 feet, it is necessary to change both the orifice and manifold pressure. Table 11 (page 29) contains the manifold pressure and orifice sizes to use at various altitudes for natural gas installations.

UPFLOW FURNACE



Left Side Entry **Right Side Entry**

ITEM # and COMPONENT		
(1) Automatic Gas Valve (w/ manual shut-off)	(2) Burner Assembly	(3) Dripleg
(4) Elbow	(5) Ground Joint Union	(6) Manifold
(7) Pipe Nipple (8 inch)	(8) Plug	(9) Shut - Off Valve

NOTE A: Some utilities require Shut- Off Valve to be 4 to 5 feet above floor.
NOTE B: Inducer assembly omitted for clarity of pipe installation.

Figure 19. Typical Gas Connection

When deration is completed, it is required that you measure the gas input rate. This may be accomplished in the usual way, by clocking the gas meter and using the local gas heating value. **NOTE:** It will be necessary to check the input rate using the actual heating value, (which will be less) because the atmospheric pressure is also lower than sea level. See Verifying and Adjusting the Input Rate (page 20).

Conversion to LP/Propane

⚠ WARNING:

The furnace was shipped from the factory equipped to operate on natural gas. Conversion to LP/propane gas must be performed by qualified service personnel using a factory supplied conversion kit. Failure to use the proper conversion kit can cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.

Conversion to LP/propane is detailed in the installation instructions provided with the conversion kit. Generally, this will require the replacement of the burner orifices and the spring found under the cap screw on the pressure regulator.

The LP/Propane Gas Sea Level and High Altitude Conversion Kit (P/N 904923) is an approved conversion kit for LP/propane conversion at altitudes between zero and 10,000 ft. above sea level. If installation is above 2,000 ft., refer to Table 12 (page 29) to determine the correct orifice size and manifold pressure. When conversion is complete, verify the manifold pressure and input rate are correct as listed in table 12. **Please follow the instructions provided with the kit**.

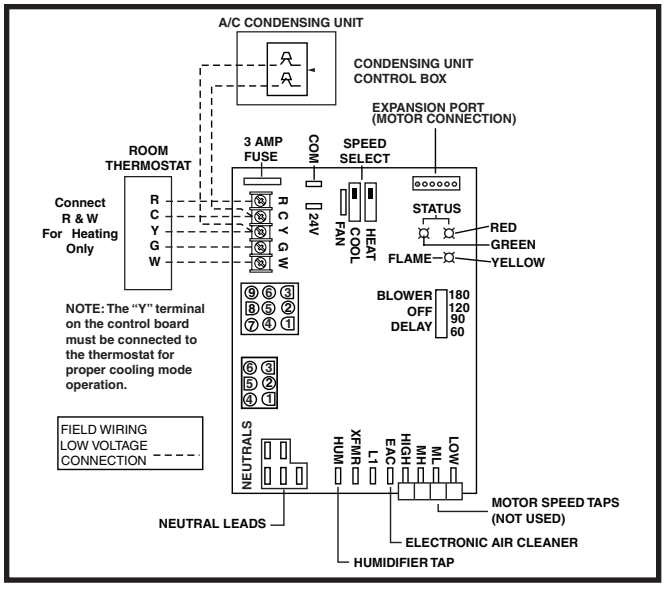


Figure 20. Low Voltage Field, Four-wire Heating/Cooling Applications

ELECTRICAL WIRING

Electrical connections must be in compliance with all applicable local codes. For electrical requirements, refer to Table 5 (page 19) or the furnace nameplate.

⚠ WARNING:

To avoid electric shock, personal injury, or death, turn off the electric power at the disconnect or the main service panel before making any electrical connections.

⚠ CAUTION:

Label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

NOTE: If replacing any of the original wires supplied with the furnace, the replacement wire must be copper wiring and have a temperature rating of at least 105°F (40°C).

Low Voltage Wiring

The thermostat must be installed according to the instructions supplied by the thermostat manufacturer. The thermostat must not be installed 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.

Low voltage connections (24 VAC) from the thermostat are wired to the terminal strip on the integrated control in the furnace. See Figure 20 for proper connections for heating only (two-wire) and heating/cooling (four-wire) applications. Recommended minimum wire gauge for thermostat wiring is shown in Table 5.

NOTE: Set the heat anticipator according to the instructions supplied by the thermostat manufacturer. To determine the heat anticipator setting, perform the following steps:

1. Add the current draw of the system components; or
2. Measure the current flow on the thermostat **R-W** circuit after the circulating blower motor has started.

Line Voltage Wiring

It is recommended that the line voltage (230 VAC) to the furnace be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the furnace (Table 5).

IMPORTANT NOTES:

An electrical disconnect must be installed readily accessible from and located within sight of the furnace. Any other wiring methods must be acceptable to authority having jurisdiction.

Furnace Model Number G7XC	Furnace Input (Btu/hr)	Cabinet Width (in.)	Nominal Electrical Supply	Maximum Operating Voltage	Minimum Operating Voltage	Maximum Furnace Amperes	Minimum Wire Gauge	Maximum Fuse or Circuit Breaker Amps**
046E-24B	46,000	17 ½	230-50-1	230	208	6.3	14	15
061E-24B	61,000	17 ½	230-50-1	230	208	9.7	14	20
076E-35C	76,000	21	230-50-1	230	208	9.7	14	20
102E-45D	102,000	24 ½	230-50-1	230	208	15.2	12	30
** Time-delay fuses or HACR-type circuit breakers are required.								

Thermostat Wire Gauge	Recommended Thermostat Wire Length	
	2 - wire (Heating only)	4 or 5 wire (Heating/Cooling)
24	55 ft.	25 ft.
22	90 ft.	45 ft.
20	140 ft.	70 ft.
18	225 ft.	110 ft.

Table 5. Wire Length and Voltage Specifications

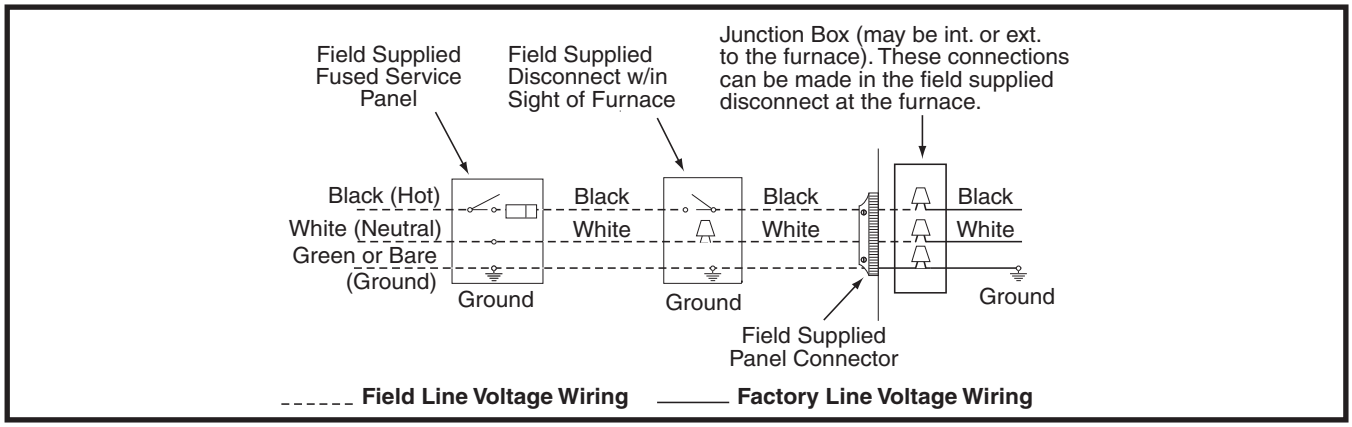


Figure 21. Line Voltage Field Wiring

Proper line voltage polarity must be maintained in order for the control system to operate correctly. Verify the incoming neutral line is connected to the white wire and the incoming "hot" line is connected to the black wire. The furnace will not operate unless the polarity and ground are properly connected as shown in Figure 21 or the wiring diagram label inside of the control door.

Twinning

The control boards on fixed speed furnaces are capable of being twinned to other furnaces of the same series, only if the following criteria are met:

- The circuit boards are the same.
- The thermostat wires and the 1/4 inch thick quick-connect terminals marked **"TWIN"** (Figure 22) on the furnace controls must be connected together.
- The fuses must remain installed on each board.
- Twinned furnaces must be properly grounded according to local codes.

IMPORTANT NOTE: G7 furnaces equipped with <u>variable</u> speed iSEER™ motors may not be twinned under any circumstances

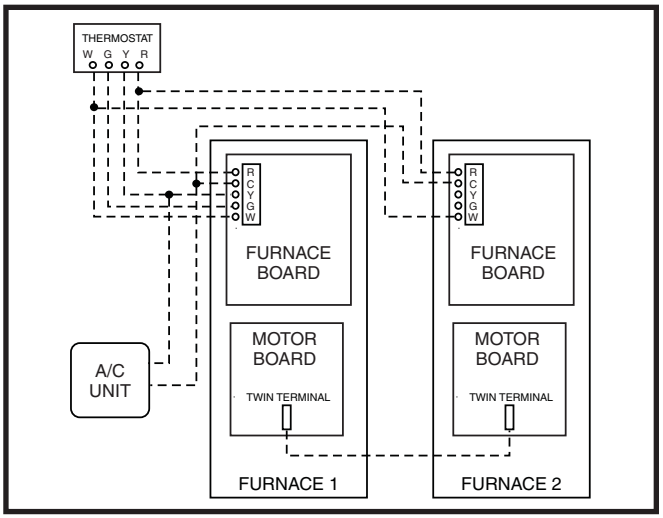


Figure 22. Twinning

Grounding

⚠ WARNING:

To minimize personal injury, the furnace cabinet must have an uninterrupted or unbroken electrical ground. The controls used in this furnace require an earth ground to operate properly. Acceptable methods include electrical wire or conduit approved for ground service. Do not use gas piping as an electrical ground

START-UP AND ADJUSTMENTS

Pre-Start Check List

√ verify the polarity of the connections are correct, the line voltage power leads are securely connected and the furnace is properly grounded.

√ verify the thermostat wires (**R**, **W**, **Y**, and **G**) are securely connected to the correct leads on the terminal strip of the circuit board.

√ verify the gas line service pressure does not exceed 10.0 inches of W.C., and is not less than 4.5 inches W.C. for natural gas. For LP gas the line service pressure must not exceed 14 in. W.C., and must not be less than 11.0 in. W.C.

√ verify the roll-out and manual reset switch is closed. If necessary, press the red button to reset a switch. If a switch reopens on startup, DO NOT reset the switch without identifying and correcting the fault condition. **DO NOT install a jumper wire across a switch to defeat its function.**

√ verify the blower door is in place, closing the door switch in the line voltage circuit.

√ verify the gas line has been purged and all connections are leak free.

Start-up Procedures

Do not perform these steps until all of the checks in the previous steps have been completed:

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the furnace.
3. Follow the operating instructions on the label attached to the furnace.
4. Set the thermostat above room temperature and verify the Operating Sequence (page 22).
5. After 5 minutes of operation, set the thermostat below room temperature and verify steps 9-11 of the Operating Sequence.

Verifying and Adjusting Input Rate

The input rate must be verified at installation to prevent over-firing of the furnace. **The input rate must not exceed the specification listed on the furnace rating plate. At altitudes above 2,000 feet, it must not exceed that on the rating plate less 4% for each 1,000 feet.** To determine the exact input rate, perform these steps:

1. Shut off all other gas fired appliances.
2. Start the furnace and run it for at least 3 minutes.
3. Measure the time (in seconds) required for the gas meter to complete one revolution.
4. Convert the time per revolution to cubic feet of gas per hour using Table 9 (page 28).
5. Multiply the gas flow rate in cubic ft per hr by the heating value of the gas in Btu per cubic ft to obtain the input rate in Btuh. See the example.

Example:

- Time for 1 revolution of a gas meter with a 1 cubic ft dial = 40 seconds.
- From Table 9 read 90 cubic ft gas per hr.
- Local heating value of the gas (obtained from gas supplier) = 1,040 Btu per cubic ft.
- Input rate = 1,040 x 90 = 93,600 Btuh.

6. The manifold pressure must be set to the appropriate value for each installation by a qualified installer, service agency or the gas supplier.

⚠ WARNING:

Do not attempt to drill the gas orifices. Use only factory supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury or death.

a.) Obtain the manifold pressure setting required for this installation by referring to Table 11 (page 29) for natural gas or Table 12 for propane gas.

b.) Remove the regulator capscrew (Figure 23) from the INLET side of the regulator.

c.) Slowly turn the adjustment screw inside the regulator to obtain the appropriate manifold pressure. **NOTE:** Turning the screw clockwise increases the pressure and turning the screw counter-clockwise decreases the pressure. To prevent backing the screw all the way out from the valve, turn the screw slowly.

d.) Replace and tighten the regulator capscrew over the adjustment screw.

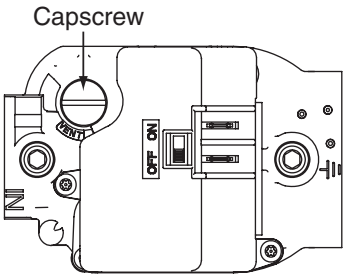


Figure 23. Regulator Capscrew

Verifying and Adjusting Temperature Rise

Confirm the temperature rise through the furnace is within the limits specified on the furnace rating plate. Any temperature rise outside the specified limits could result in premature failure of the heat exchanger.

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

For typical duct systems, the temperature rise will fall within the limits specified on the rating plate with the blower speed at the factory recommended setting. If the measured temperature rise is outside the specified limits, it may be necessary to change the speed of the blower.

The *XC furnace is equipped with a multi-speed motor. Heating, cooling, and fan speed selection is made by moving the switch located on the motor control board (Figure 24). **NOTE:** Lowering the blower speed will increase the temperature rise and a higher blower speed will decrease the temperature rise.

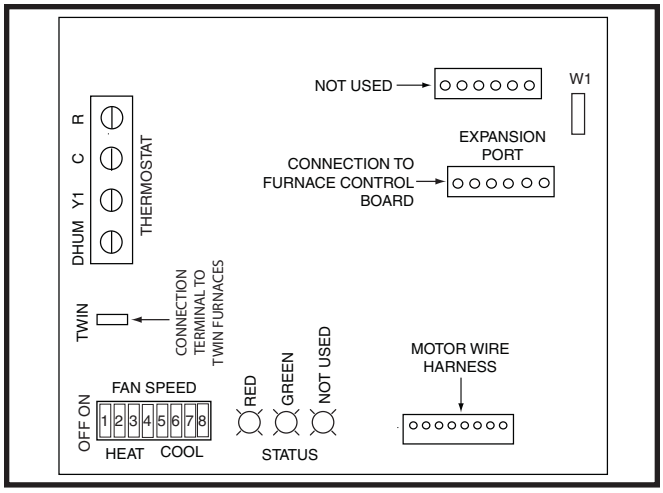


Figure 24. Motor Control Board

Verifying Burner Operation

⚠ CAUTION:

The door over the burners may only be open for inspection purposes only. The door must be installed during unattended operation.

1. Remove the burner compartment door.
2. Set the thermostat above room temperature and observe the ignition sequence. **The burner flame should carry over immediately between all burners without lifting off, curling, or floating. The flames should be blue, without yellow tips.**
3. After validating the flame, change thermostat setting to below room temperature.
4. Verify the burner flame is completely extinguished.
5. Replace the burner compartment door.

Verifying Operation of the Supply Air Limit Switch

A properly functioning limit switch should turn off the gas valve when the return is blocked (time depends on how well the return air is blocked). The circulating air and combustion blowers should continue to run when the limit switch opens.

1. Check the blower door and verify that it is securely mounted in place and that there is power to the furnace.
2. Block the return airflow to the furnace by installing a close-off plate in place of or upstream of the filter(s).
3. Set the thermostat above room temperature and observe the Operating Sequence (page22).
4. Remove the close-off immediately after the limit switch opens. If the furnace continues to operate with no return air, set the thermostat below room temperature, shut off the power to the furnace, and replace the limit switch.

OPERATING SEQUENCE

The operating sequences for the heating, cooling, and fan modes are described below. Refer to the field and furnace wiring diagrams (Figure 15, page 16), (Figure 16, page 17) and (Figure 23, page 29).

Heating Cycle

1. The thermostat calls for heat by energizing the **W** terminal with 24VAC.
2. The control verifies the pressure switch is open.
3. If the pressure switch is open, the control energizes the inducer and waits for the pressure switch to close. The pressure switch must close within 10 seconds.
4. The control runs the inducer for a 30 second pre-purge.
5. The control energizes the Hot Surface Igniter (HSI) output for the appropriate warm-up time limit.
6. The control energizes the gas valve for 3 seconds.
7. If the flame proved and ignites the gas, the control de-energizes the HSI. The gas valve and inducer remains energized. The control goes to blower on delay.
8. If flame is present, the control energizes the blower on the selected HEAT speed 30 seconds after the gas valve opened. The gas valve and inducer remain energized.
9. When the thermostat demand for heat is satisfied, the control de-energizes the gas valve. The Inducer output remains on for a 30 second post-purge period.
10. Blower off timing begins when the thermostat is satisfied. The control will operate at the selected HEAT speed of 60, 90, 120, or 180 seconds. If the blower off delay jumper is not present, the fan should still operate for 120 seconds at the selected HEAT speed. The Indoor blower motor is de-energized after a blower off delay as selected by the movable jumper.

Cooling Cycle

1. The thermostat calls for cooling by energizing the **Y** terminal with 24VAC.
2. The control energizes the blower in cooling speed and sends 24VAC to the contactor in the condensing unit
3. When the thermostat removes the call for cooling, the contactor in the outdoor condensing unit is de-energized and the control continues to run the fan for a period of 60 seconds.

Fan Mode

- When the thermostat energizes the **G** terminal for continuous fan (without calling for heat or cooling), the indoor fan is energized on the selected FAN speed.
- If a call for cooling occurs during continuous fan, the blower will switch over to the selected COOL speed.
- If the **W** terminal receives a call for heat during continuous fan, the blower will de-energize.
- A call for fan is ignored while in lockout

MAINTENANCE

⚠ WARNING:

These maintenance instructions are primarily intended to assist qualified technicians experienced in the proper maintenance and operation of this appliance.

To prevent electric shock, personal injury, or death, disconnect the electric power before performing any maintenance.

Proper maintenance is most important to achieve the best performance from a furnace. Follow these instructions for years of safe, trouble free operation.

- Always replace the doors on the furnace after servicing or cleaning/changing the filters. **Do not operate the furnace without all doors and covers in place**.
- Verify the thermostat is properly installed and is not being affected by drafts or heat from lamps or other appliances.
- To achieve the best performance and minimize equipment failure it is recommended that a yearly maintenance checkup be performed. At a minimum, this check should include the following items:

Air Filter(s)

⚠ WARNING:

Never operate the furnace without a filter in place. Dust and lint can build up on internal components, resulting in loss of efficiency, equipment damage, and possible fire.

Air filter(s) are <u>not supplied</u> with the furnace as shipped from the factory. The installer must provide a high velocity filter and rack for a filter in the return air duct adjacent to the furnace, or in a return air grill to the furnace. **NOTE:** It is recommended that filters be cleaned or replaced monthly. New or newly renovated homes may require more frequent changing until the construction dust has minimized. Filters designed to remove smaller particles such as pollen, may require additional maintenance. Filters for side return and bottom return applications are available from most local distributors.

Cleaning of Burners

If the burners must be cleaned, follow the steps below and see Figure 31 (page 35) for component location and identification.

1. Shut off gas supply to the furnace either at the meter or at a manual valve in the supply piping.
2. Turn off all power to the furnace and set the thermostat to it's lowest setting.

3. Remove the burner door from the furnace.
4. Turn the gas control switch to the OFF position.

⚠ CAUTION:

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

5. Disconnect the wires from the gas valve, igniter, flame sensor, and flame rollout switch.
6. Using two wrenches, separate the ground-joint union in the gas supply piping at the furnace.
8. Remove all screws securing the Manifold Assembly to the Burner Box.
9. Carefully remove the Burner Assembly from the furnace. **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 that they were removed.
12. Follow the lighting instructions found on the furnace door to return the furnace to operation. Verify proper operation after servicing.

Blower Compartment
Dirt and lint can create excessive loads on the motor resulting in higher than normal operating temperatures and shortened service life. It is recommended that the blower compartment be cleaned of dirt or lint that may have accumulated in the compartment or on the blower and motor as part of the annual inspection.

Heat Exchanger and Burner Maintenance
The furnace should operate for many years without soot buildup in the flue passageways, however, the flue passageways, the vent system, and the burners should be inspected and cleaned (if required) by a qualified service technician annually to ensure continued safe operation. Particular attention must be given to identify deterioration from corrosion or other sources.

⚠ WARNING:

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

Lubrication
The bearings in the blower motor and inducer blower used in these furnaces are pre-lubricated and sealed by the manufacturer. No further oiling of the bearings is required for the life of the motor.

Vent System
Check the inlet pipe (if applicable) and outlet pipe to ensure they are not blocked by debris. Any damaged section of vent pipe must be replaced, and any obstruction or blockage must be removed prior to operating the furnace.

DESCRIPTION OF COMPONENTS

The descriptions below are various functional components that affect the operation and shutting down of the furnace. Some of these components and their locations are shown in Figure 31. If any component of the furnace must be replaced, use only factory authorized replacement parts specified in the Replacement Parts List provided online.

Blower Limit Switch
The Blower switch prevents furnace operation when blower is not operational.

Condensate Drain Switch
The Condensate Drain Switch will shut down the furnace if the condensate drain from the collector pan becomes blocked.

Flame Roll-Out Switch
The flame roll-out switch verifies that the burner flames are drawn into the heat exchanger tubes. If the burner flames are not properly drawn into the heat exchanger, the flame roll-out switch will close the gas valve and initiate the shutdown cycle.

Flame Sensor
The flame sensor verifies when a flame has carried over from the igniter to the opposite end burner. If no flame is detected, the furnace will shut down within 4 seconds.

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 Assembly
The inducer assembly vents products of combustion to the outside.

Pressure Switch
The pressure switch verifies that the inducer is drawing the combustion gases through the heat exchanger. If the flame is not properly drawn into the heat exchanger tube, the rollout switch or the flame sensor will shut the furnace down.

Supply Air Limit Switch
The supply air limit switch prevents the air temperature leaving the furnace from exceeding the maximum allowable outlet air temperature

TROUBLESHOOTING

If the furnace fails to operate check the following:

- Is the thermostat operating properly?
- Are the blower compartment door(s) in place?
- Is the furnace disconnect closed?
- Has the circuit breaker tripped or the control board fuse burned open?
- Is the gas turned on?
- Are any manual reset switches open?
- Is the filter dirty or plugged?
- Is the flame sensor coated? (Remove and clean with steel wool).
- Are all the LED's on the furnace control board constantly ON? If not, refer to Tables 6 - 7 or the wiring diagram (Figure 26, page 30) to determine fault condition

IMPORTANT NOTE: The furnace will lock out after 5 failed attempts for ignition and will try again every hour if the call for heat remains.

- If the Inducer Blower is operating, and items above have been verified, check the Blower Limit Switch (Figure 31, page 35) and reset if necessary.
- If the furnace operates when the Blower Limit Switch is reset, contact a qualified service technician to identify and repair the problem.
- If the furnace still doesn't operate, check the Flame Roll-out Switches (Figure 31) and reset if necessary.
- If the furnace operates when the Flame Rollout Switch is reset, contact a qualified service technician to identify and repair the problem.

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
Diagnostic Description	**Yellow LED**	
Low Flame Sensor Signal	Continuous Flash	
Flame Present	On	

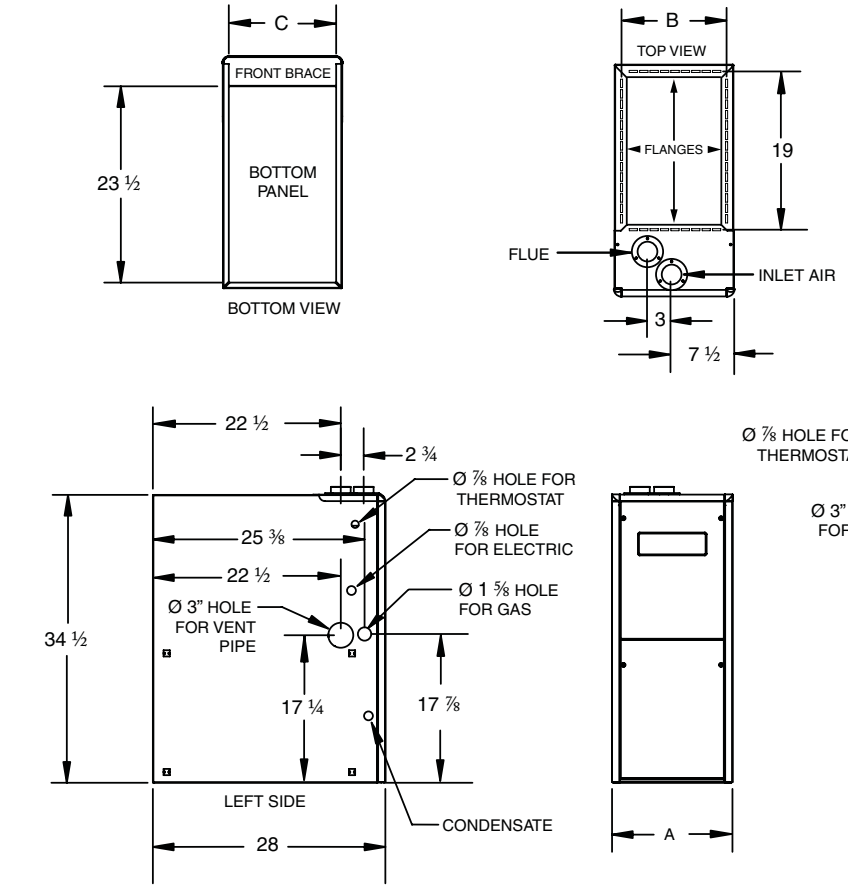
Table 6. Furnace Control Board Fault Conditions

Diagnostic Description	Red LED	Green LED
Control Fault (No Power)	Off	Off
Normal Operation	On	On
Motor Fault	On	Flash
Twin Fault (no motor fault)	Flash	On
Communications Fault	Flash	Flash

Table 7. Motor Control Board Fault Conditions

FIGURES AND TABLES

*XC 92.1% Upflow/Horizontal Furnace



*XC Model #'s	Dim. "A"	Dim. "B"	Dim. "C"
046E-24B	17 ½	15 ⅞	16 ⅛
061E-24B			
076E-35C	21	19 ⅜	19 ⅝
102E-45D	24 ½	22 ⅞	23 ⅛
NOTE: Dimensions shown in inches.			

Figure 25. Furnace Dimensions

AIRFLOW DATA

G7XC UPFLOW / HORIZONTAL GAS FURNACES - 92.1% AFUE																					
Model Number	Heating Input (Btuh)	Motor Switch Setting				External Static Pressure (in.w.c.)															
						0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		1/5	2/6	3/7	4/8	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise
XC046-B	46,000	0	0	0	0																
		1	0	0	0																
		0	1	0	0																
		1	1	0	0	725	56														
		0	0	1	0	810	50														
		1	0	1	0	940	43	890	44	845	46	795	49	750	52	700	56				
		0	1	1	0	990	41	945	42	905	43	860	46	820	48	775	51	735	53	690	57
		1	1	1	0	1,055	39	1,015	39	970	40	930	42	890	44	845	46	805	49	760	52
		0	0	0	1	1,135	36	1,095	36	1,055	37	1,010	39	960	41	930	42	890	44	850	46
		1	0	0	1	1,185	35	1,145	34	1,105	35	1,065	37	1,030	38	990	40	950	41	910	43
		0	1	0	1	1,250	33	1,210	33	1,170	33	1,135	35	1,095	36	1,055	37	1,020	38	980	40
		1	1	0	1	1,290	32	1,255	31	1,220	32	1,180	33	1,145	34	1,110	35	1,075	36	1,040	38
		0	0	1	1	1,315	31	1,275	31	1,240	32	1,200	33	1,160	34	1,120	35	1,085	36	1,045	37
		1	0	1	1	1,350	30	1,315	30	1,280	31	1,245	31	1,205	33	1,170	33	1,135	35	1,100	36
		0	1	1	1	1,390	29	1,350	29	1,315	30	1,275	31	1,240	2	1,200	33	1,160	34	1,125	35
		1	1	1	1	1,420	29	1,380	29	1,345	29	1,310	30	1,270	31	1,235	32	1,200	33	1,160	34
XC061-B	61,000	0	0	0	0																
		1	0	0	0																
		0	1	0	0																
		1	1	0	0	725	72														
		0	0	1	0	810	64														
		1	0	1	0	940	55	890	59	845	61	795	65	750	69	700	74				
		0	1	1	0	990	52	945	55	905	57	860	60	820	63	775	67	735	71	690	75
		1	1	1	0	1,055	49	1,015	51	970	54	930	56	890	58	845	61	805	65	760	68
		0	0	0	1	1,135	46	1,095	48	1,055	49	1,010	51	960	54	930	56	890	58	850	61
		1	0	0	1	1,185	44	1,145	46	1,105	47	1,065	49	1,030	50	990	52	950	55	910	57
		0	1	0	1	1,250	42	1,210	43	1,170	44	1,135	46	1,095	47	1,055	49	1,020	51	980	53
		1	1	0	1	1,290	40	1,255	42	1,220	43	1,180	44	1,145	45	1,110	47	1,075	48	1,040	50
		0	0	1	1	1,315	40	1,275	41	1,240	42	1,200	43	1,160	45	1,120	46	1,085	48	1,045	50
		1	0	1	1	1,350	38	1,315	40	1,280	41	1,245	42	1,205	43	1,170	44	1,135	46	1,100	47
		0	1	1	1	1,390	37	1,350	39	1,315	40	1,275	41	1,240	42	1,200	43	1,160	45	1,125	46
		1	1	1	1	1,420	37	1,380	38	1,345	39	1,310	40	1,270	41	1,235	42	1,200	43	1,160	45

Table 8. Maximum Airflow and Temperature Rises (° F)

G7XC UPFLOW / HORIZONTAL GAS FURNACES - 92.1% AFUE																							
Model Number	Heating Input (Btuh)	Motor Switch Setting				External Static Pressure (in.w.c.)																	
						0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8			
		1/5	2/6	3/7	4/8	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise		
XC076-C	76,000	0	0	0	0	1,125	58	1,040	63														
		1	0	0	0	1,205	54	1,120	58	1,040	62												
		0	1	0	0	1,305	50	1,225	53	1,150	56	1,070	61	995	65								
		1	1	0	0	1,430	45	1,350	48	1,270	51	1,190	54	1,110	58	1,030	63						
		0	0	1	0	1,525	42	1,450	45	1,375	47	1,300	50	1,225	53	1,150	56	1,075	60	1,000	65		
		1	0	1	0	1,620	40	1,540	42	1,465	44	1,390	47	1,315	49	1,240	52	1,165	56	1,090	59		
		0	1	1	0	1,695	38	1,620	40	1,545	42	1,465	44	1,390	47	1,315	49	1,235	52	1,160	56		
		1	1	1	0	1,770	37	1,700	38	1,630	40	1,555	42	1,485	44	1,410	46	1,340	48	1,265	51		
		0	0	0	1	1,875	35	1,805	36	1,730	37	1,655	39	1,580	41	1,510	43	1,435	45	1,340	48		
		1	0	0	1	1,905	34	1,840	35	1,775	36	1,710	38	1,640	39	1,575	41	1,510	43	1,445	45		
		0	1	0	1	1,980	33	1,910	34	1,845	35	1,780	36	1,715	38	1,650	39	1,580	41	1,515	43		
		1	1	0	1	2,025	32	1,960	33	1,895	34	1,830	35	1,765	37	1,700	38	1,635	40	1,570	41		
		0	0	1	1	2,085	31	2,025	32	1,960	33	1,900	34	1,840	35	1,775	36	1,715	38	1,655	39		
		1	0	1	1	2,135	30	2,070	31	2,010	32	1,945	33	1,880	34	1,815	36	1,750	37	1,685	38		
		0	1	1	1	2,200	29	2,145	30	2,090	31	2,035	32	1,980	33	1,925	34	1,870	35	1,820	36		
		1	1	1	1	2,280	28	2,225	29	2,170	30	2,115	31	2,065	31	2,010	32	1,955	33	1,900	34		
XC102-D	102,000	0	0	0	0	1,395	62	1,350	65	1,305	67	1,260	69	1,210	72	1,165	75	1,120	78				
		1	0	0	0	1,465	59	1,420	62	1,375	63	1,330	65	1,290	67	1,245	70	1,200	72	1,155	75		
		0	1	0	0	1,555	56	1,510	58	1,470	59	1,425	61	1,380	63	1,340	65	1,295	67	1,250	70		
		1	1	0	0	1,625	53	1,585	55	1,540	56	1,500	58	1,460	60	1,415	61	1,375	63	1,335	65		
		0	0	1	0	1,690	51	1,650	53	1,610	54	1,570	55	1,530	57	1,485	59	1,445	60	1,405	62		
		1	0	1	0	1,760	49	1,715	51	1,670	52	1,625	53	1,575	55	1,530	57	1,485	59	1,440	60		
		0	1	1	0	1,835	47	1,790	49	1,745	50	1,695	51	1,650	53	1,605	54	1,555	56	1,510	58		
		1	1	1	0	1,885	46	1,840	47	1,790	49	1,745	50	1,700	51	1,655	53	1,610	54	1,565	56		
		0	0	0	1	1,945	45	1,900	46	1,850	47	1,805	48	1,760	49	1,710	51	1,665	52	1,620	54		
		1	0	0	1	1,950	45	1,905	46	1,860	47	1,820	48	1,775	49	1,735	50	1,690	51	1,650	53		
		0	1	0	1	2,075	42	2,030	43	1,990	44	1,945	45	1,900	46	1,855	47	1,810	48	1,770	49		
		1	1	0	1	2,125	41	2,085	42	2,040	43	2,000	43	1,955	44	1,910	45	1,870	46	1,825	48		
		0	0	1	1	2,170	40	2,130	41	2,090	42	2,045	42	2,005	43	1,965	44	1,925	45	1,880	46		
		1	0	1	1	2,215	39	2,180	40	2,140	41	2,105	41	2,070	42	2,035	43	2,000	43	1,965	44		
		0	1	1	1									2,225	39	2,165	40	2,100	41	2,040	43		
		1	1	1	1											2,170	40	2,120	41	2,065	42		

NOTES:

1. Motor Switch Settings are for heating speeds using HEAT switches 1, 2, 3, & 4 and cooling speeds using COOL switches 5, 6, 7, & 8.
2. Two openings are recommended for airflows above 1,600 CFM if the filter(s) is (are) adjacent to the furnace.
3. Data is shown without filter
4. Temperature rises in the table are approximate. Actual temperature rises may vary.
5. Temperature rises that are shaded in grey are for reference only. These conditions are not recommended

Table 8. Continued

GAS INFORMATION

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

Table 9. Gas Flow Rates

CAPACITY OF BLACK IRON GAS PIPE (CU. FT. PER HOUR) FOR NATURAL GAS (SPECIFIC GRAVITY - 0.60)								
NOMINAL BLACK IRON PIPE DIAMETER (IN.)	LENGTH OF PIPE RUN (FT)							
	10	20	30	40	50	60	70	80
½	130	90	75	65	55	50	45	40
¾	280	190	150	130	115	105	95	90
1	520	350	285	245	215	195	180	170
1 ¼	1,050	730	590	500	440	400	370	350
1 ½	1,600	1,100	890	760	670	610		

NOTES

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.

$$\text{Cubic Feet Per Hour Required} = \frac{\text{Input To Furnace (Btu/hr)}}{\text{Heating Value of Gas (Btu/Cu. Ft.)}}$$

Table 10. Black Iron Gas Pipe Capacities

NATURAL GAS					
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)				
	46,000	61,000	76,000	102,000	
0 to 1,999 FT	49	49	49	49	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
2,000 to 2,999 FT	49	49	49	49	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
3,000 to 4,999 FT	49	49	49	49	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE
5,000 to 5,999 FT	51	51	51	51	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
6,000 to 7,999 FT	51	51	51	51	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
8,000 to 10,000 FT	51	51	51	51	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE

Table 11. High Altitude Deration - Natural Gas

PROPANE					
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)				
	46,000	61,000	76,000	102,000	
0 to 1,999 FT	57	57	57	57	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
2,000 to 2,999 FT	57	57	57	57	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
3,000 to 4,999 FT	57	57	57	57	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE
5,000 to 5,999 FT	59	59	59	59	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
6,000 to 7,999 FT	59	59	59	59	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
8,000 to 10,000 FT	59	59	59	59	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE

Table 12. High Altitude Deration - Propane Gas

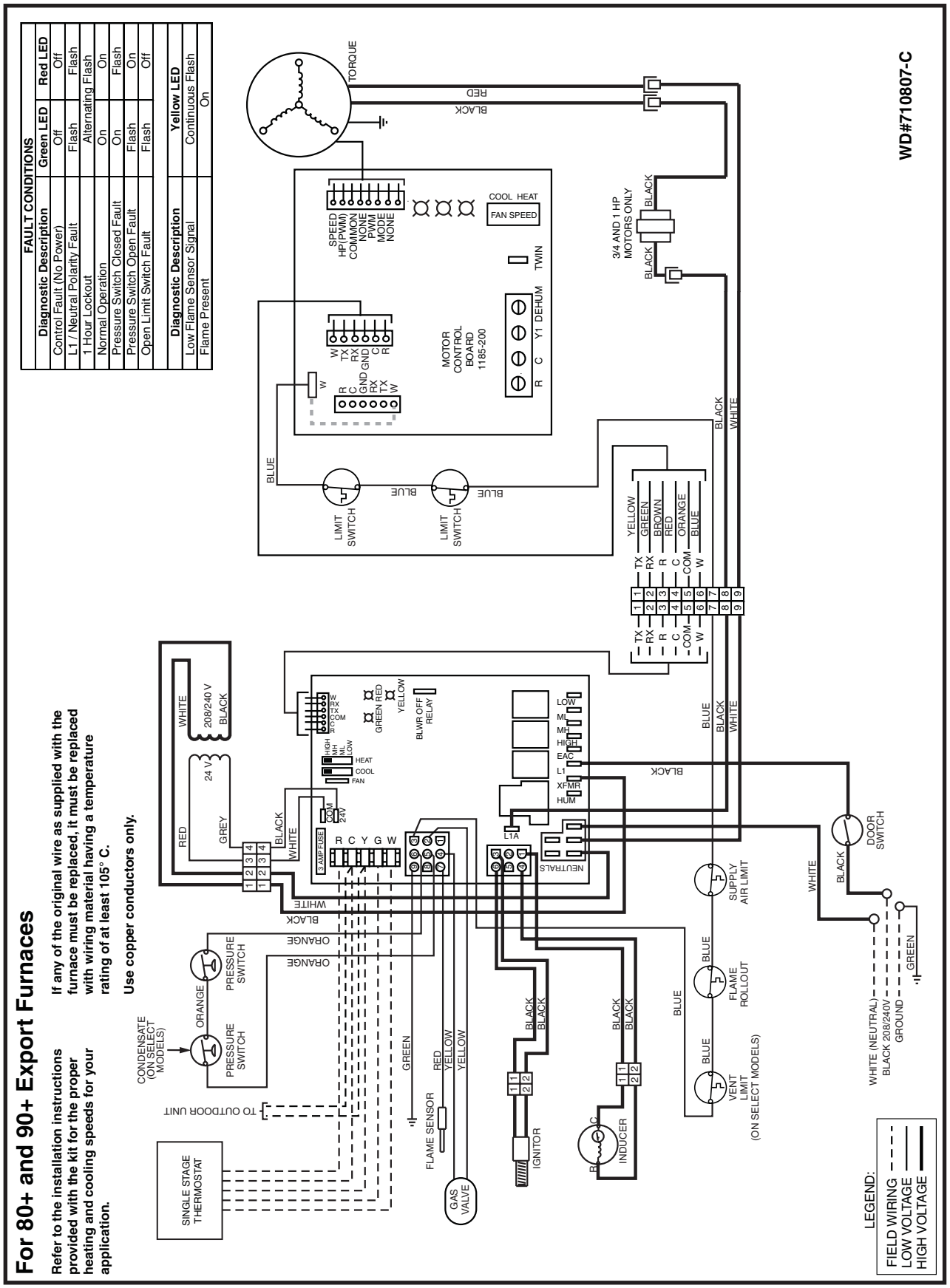


Figure 26. Wiring Diagram for Upflow/Horizontal Furnaces

VENTING INFORMATION

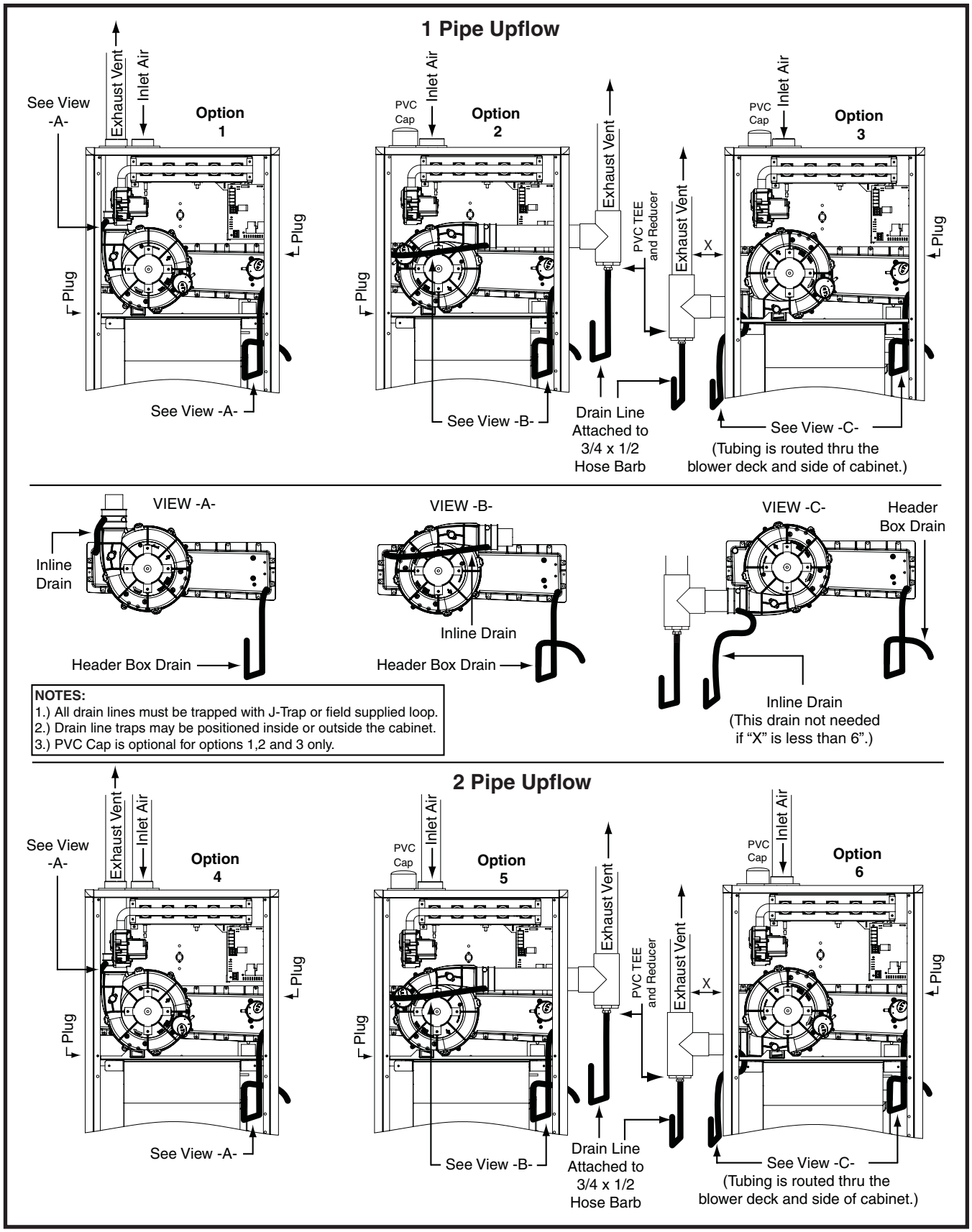


Figure 27. Upflow Options

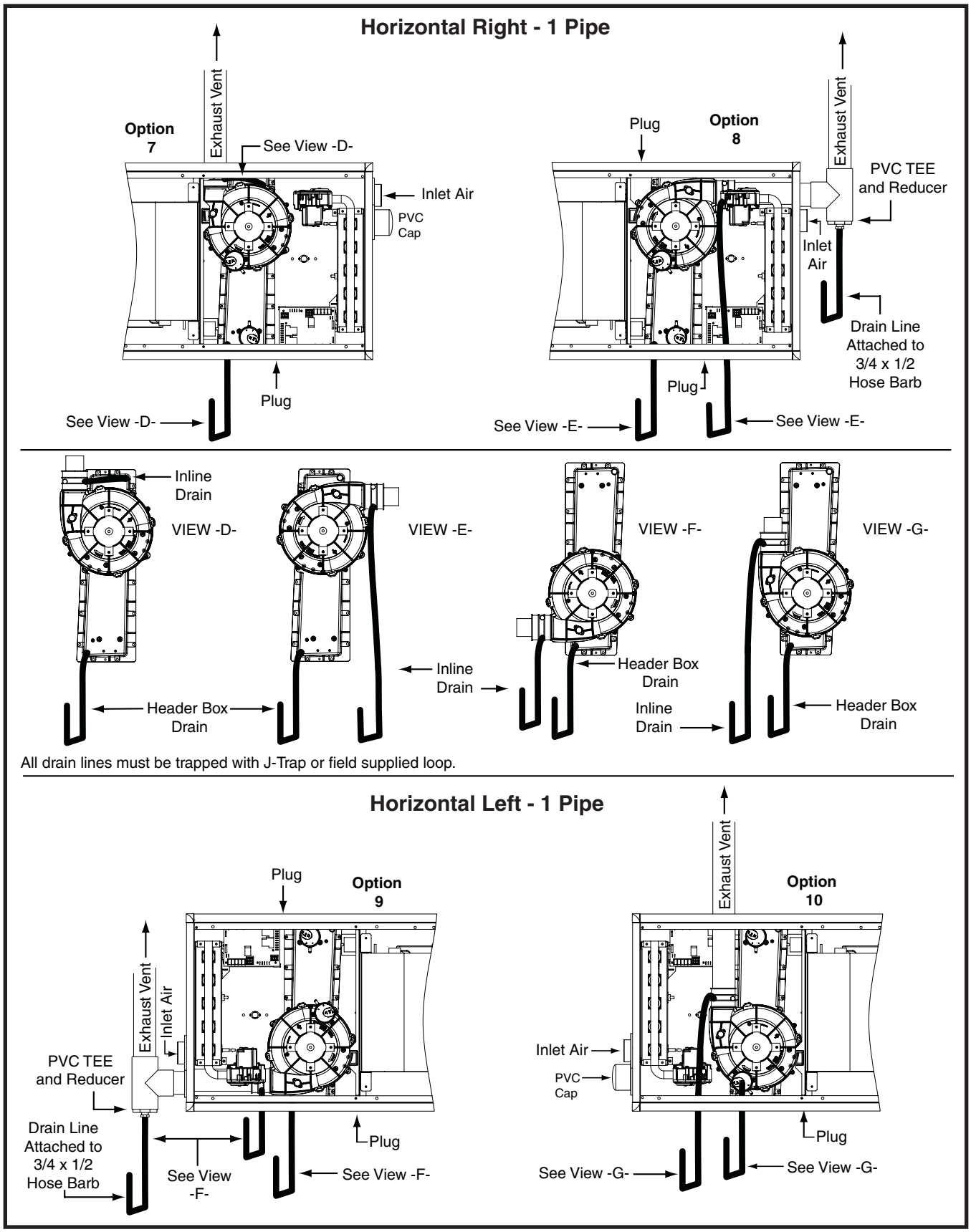


Figure 28. Horizontal Options - 1 Pipe Furnaces

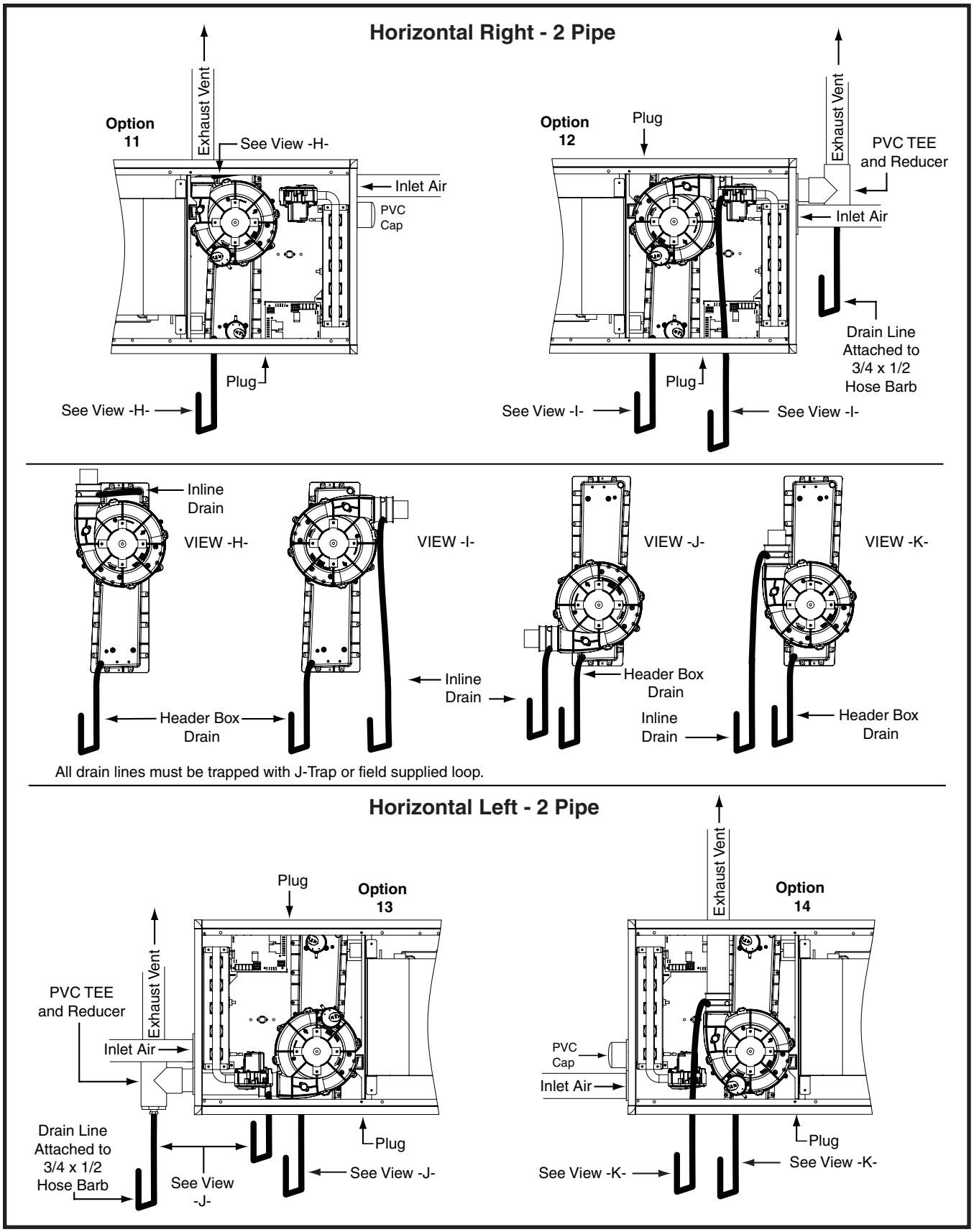
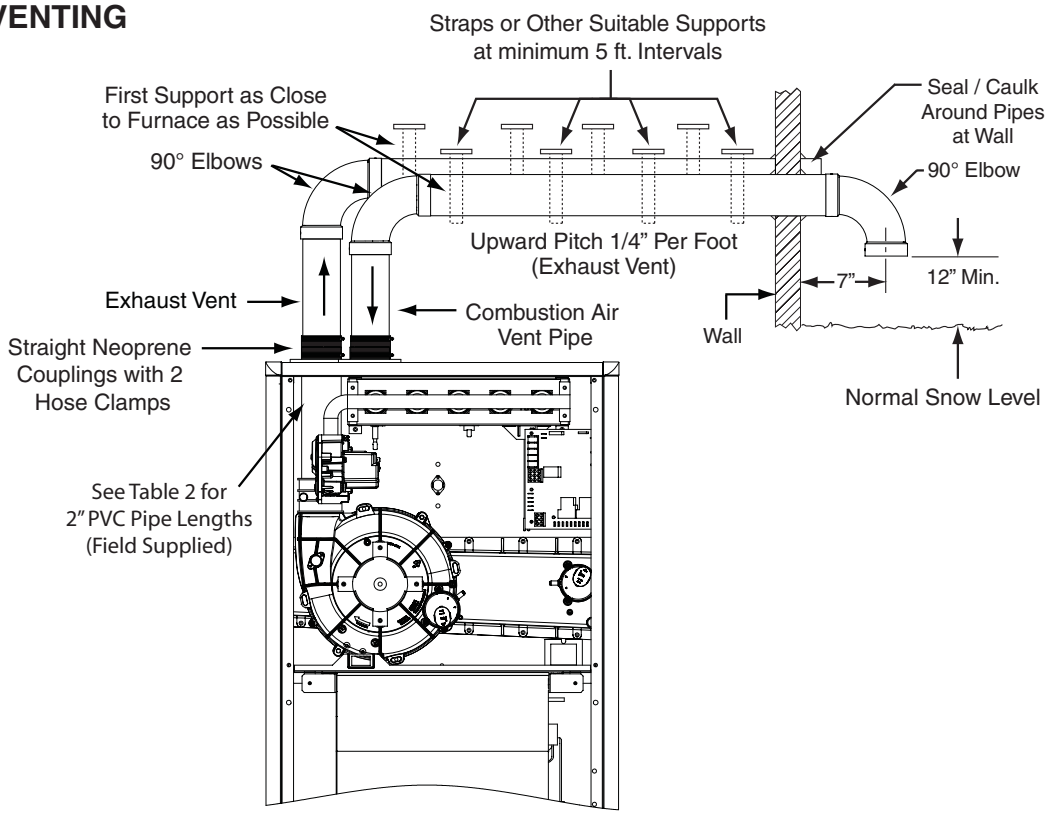


Figure 29. Horizontal Options - 2 Pipe Furnaces

HORIZONTAL VENTING
(2-Pipe Shown)



VERTICAL VENTING
(2-Pipe Shown)

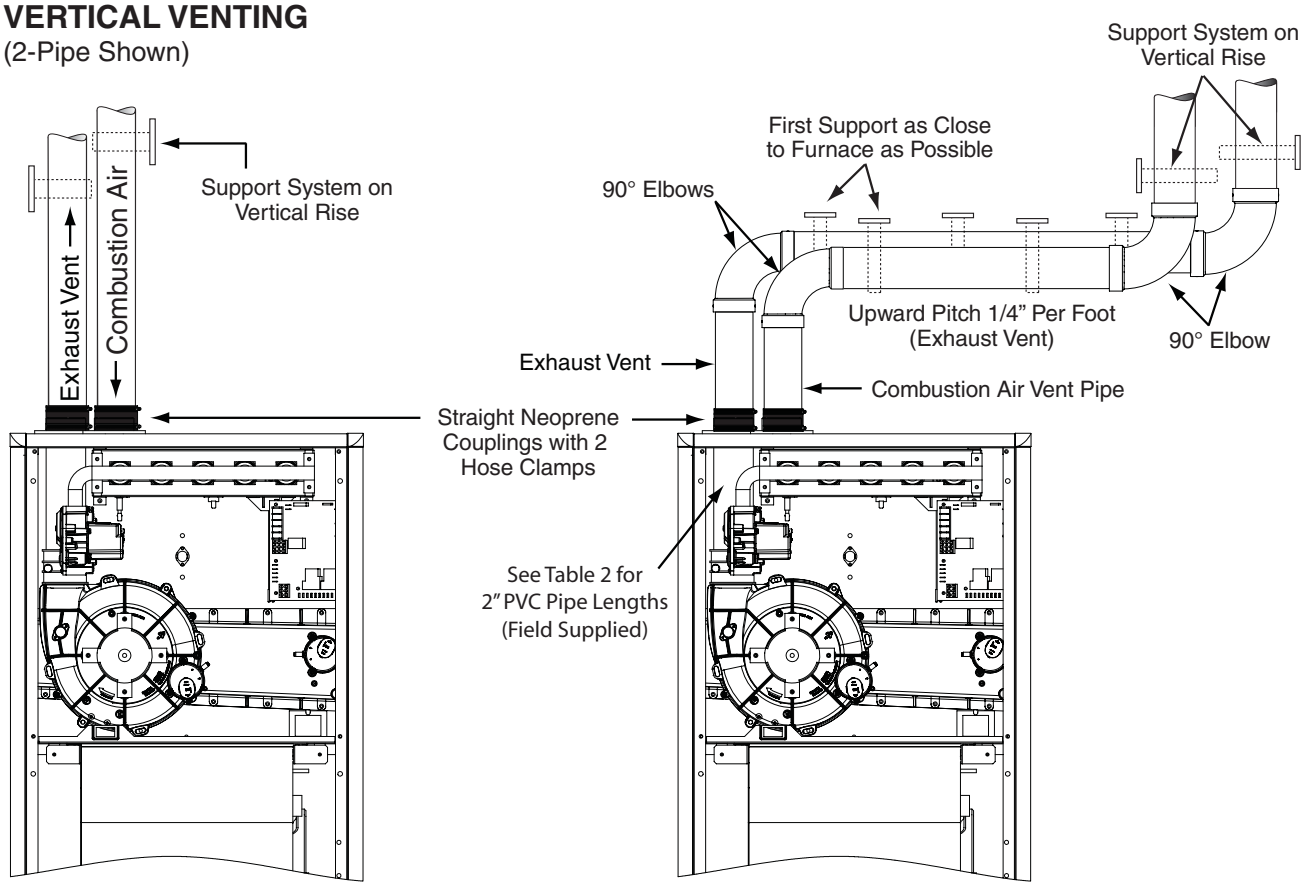


Figure 30. Horizontal and Vertical Venting

LOCATION OF FURNACE COMPONENTS

ITEM	COMPONENT NAME
1.	Blower Assembly
2.	Blower Door Switch
3.	Burner Assembly
4.	Control Board
5.	Finish Flanges
6.	Flame Sensor
7.	Gas Manifold
8.	Gas Valve
9.	Igniter
10.	Inducer Assembly
11.	Limit Switch
12.	Main Air Limit Switch
13.	Motor Control Board
14.	Pressure Switch(s) ('B', 'C', & 'D' cabinets only)
15.	Roll-Out Switch(s)
16.	Transformer

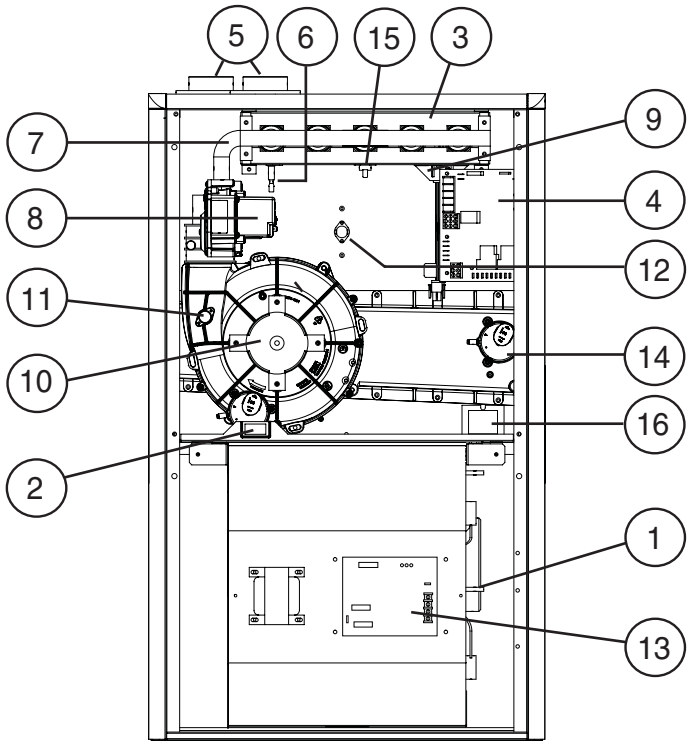


Figure 31. Upflow/Horizontal Gas Furnace Components

INSTALLATION/PERFORMANCE CHECK LIST

INSTALLER NAME:	
CITY _____	STATE _____

INSTALLATION ADDRESS:	
CITY _____	STATE _____

UNIT MODEL #_____
UNIT SERIAL # _____

Minimum clearances per Table 1 (page 5)?	YES	NO

Has the owner's information been reviewed with the home-owner?	YES	NO

Has the literature package been left near the furnace?	YES	NO

ELECTRICAL SYSTEM:		
Electrical connections tight?	YES	NO
Line voltage polarity correct?	YES	NO
Supply Voltage: _____ VOLTS		
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	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: _____ (%)		
Furnace Input: _____ (Btuh)		
Supply Air Temperature: _____ (° F)		
Return Air Temperature: _____ (° F)		
Temperature Rise: _____ (° F)		

VENTING SYSTEM:		
Vent free from restrictions?	YES	NO
Filter(s) secured in place?	YES	NO
Filter(s) clean?	YES	NO
Flue connections tight?	YES	NO

CE 1450

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