



INSTALLATION INSTRUCTIONS

GUH80X

Warm Air Gas Furnace
Upflow/Horizontal
Left/Right Air Discharge

This manual must be left with the homeowner for future reference.



This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional installer (or equivalent), service agency or the gas supplier.

CAUTION

As with any mechanical equipment, personal injury can result from contact with sharp sheet metal edges. Be careful when you handle this equipment.

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Comfort-Aire / Century
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Jackson, MI 49203



(P) 507651-04M

Unit Dimensions

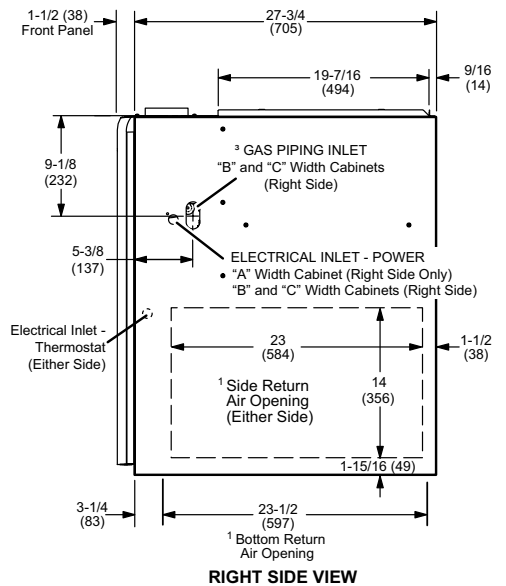
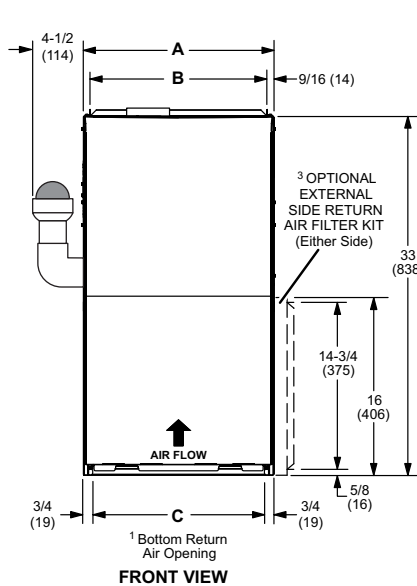
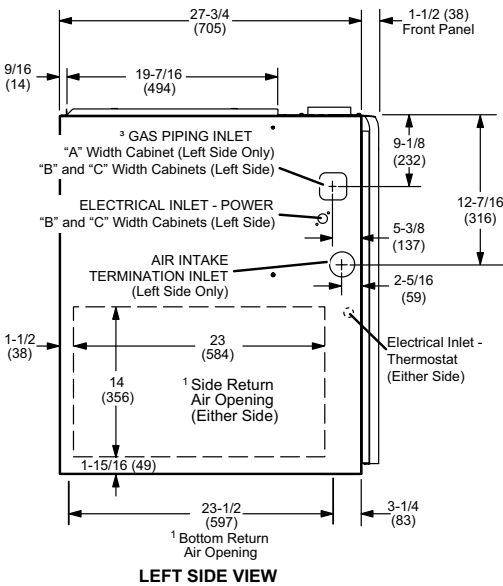
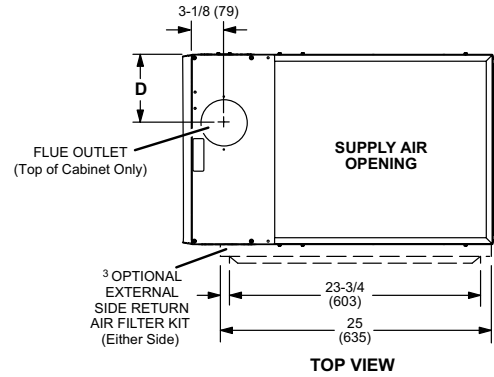
1. NOTE - C5 size units that require air volumes over 1800 cfm must have one of the following:
 - a. Single side return air and Optional Return Air Base with transition that must accommodate required 20 x 25 x 1 inch (508 x 635 x 25 mm) air filter to maintain proper velocity.
 - b. Bottom return air.
 - c. Return air from both sides.
 - d. Bottom and one side return air.

See Blower Performance Tables for additional information.

2. Flue outlet may be horizontal but furnace must be vented vertically
3. Optional External Side Return Air Filter Kit is not for use with the optional Return Air Base.

NOTE - Gas entry is only available on the left side of the cabinet for "A" width cabinet models.

NOTE - Electrical entry for power is only available on the right side of the cabinet for "A" width cabinet models.



Model	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
040-A3	14-1/2	368	13-3/8	340	13	330	4-3/4	121
060-A3								
080-B4	17-1/2	446	16-3/8	416	16	406	6-1/4	159
100-C5	21	533	19-7/8	504	19-1/2	495	8	203

GUH80X Gas Furnace

The GUH80X unit is shipped ready for installation in the upflow or horizontal position fueled by natural gas. The furnace is shipped with the bottom panel in place. The bottom panel must be removed if the unit is to be installed in a horizontal application. The panel may also be removed in upflow applications. **This furnace is approved for installations from 0 - 7500 ft.**

Shipping & Packing List

- 1 - Assembled Gas Furnace
- 1 - Bag assembly containing the following:
 - 2 - Screws
 - 1 - Snap bushing
 - 1 - Snap plug
 - 1 - Wire tie
 - 1 - PVC 2" elbow
 - 1 - PVC 3" to 2" reducer
 - 1 - PVC 2" pipe (2-1/2" long)
 - 1 - Inlet screen
 - 1 -Vent warning label
 - 1 - Owner's manual and warranty card

Check equipment for shipping damage. If you find any damage, immediately contact the last carrier.

Please refer to specification sheets for available accessories.

Safety Information

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional installer (or equivalent), service agency or the gas supplier.

CAUTION

As with any mechanical equipment, personal injury can result from contact with sharp sheet metal edges. Be careful when you handle this equipment.

Certifications

These units are CSA International certified to ANSI Z21.47.

In the USA, installation of gas furnaces must conform with local building codes. In the absence of local codes, units must be installed according to the current National Fuel Gas Code (ANSI-Z223.1). The National Fuel Gas Code is available from the following address:

American National Standards Institute, Inc.
11 West 42nd Street
New York, NY 10036

Clearances

Adequate clearance must be made around the air openings into the vestibule area. In order to ensure proper unit operation, combustion and ventilation air supply must be provided according to the current National Fuel Gas Code. Vent installations must be consistent with the venting tables (in this instruction) and applicable provisions of local building codes.

This furnace is CSA International certified for installation clearances to combustible material as listed on the unit nameplate and in the tables in Figure 7 and Figure 12. Installers should also consider the greater of either accessibility/service clearances or fire protection clearances.

NOTE: *For installation on combustible floors, the furnace shall not be installed directly on carpeting, tile, or other combustible material other than wood flooring.*

Installed Locations

For installation in a residential garage, the furnace must be installed so that the burner(s) and the ignition source are located no less than 18 inches (457 mm) above the floor. The furnace must be located or protected to avoid physical damage by vehicles. When a furnace is installed in a public garage, hangar, or other building that has a hazardous atmosphere, the furnace must be installed according to recommended good practice requirements and current National Fuel Gas Code.

Temperature Rise

NOTE: *Furnace must be adjusted to obtain a temperature rise within the range specified on the unit nameplate. Failure to do so may cause erratic limit operation and may result in premature heat exchanger failure.*

This furnace must be installed so that its electrical components are protected from water.

IMPORTANT

The GUH80X is approved for natural gas only. Do not attempt to convert and or install in LP propane applications.

Installed in Combination with a Cooling Coil

When this furnace is used with cooling units, it shall be installed in parallel with, or on the upstream side of, cooling units to avoid condensation in the heating compartment. See Figure 1. With a parallel flow arrangement, a damper (or other means to control the flow of air) must adequately prevent chilled air from entering the furnace. If the damper is manually operated, it must be equipped to prevent operation of either the heating or the cooling unit, unless it is in the full HEAT or COOL setting. See Figure 1.

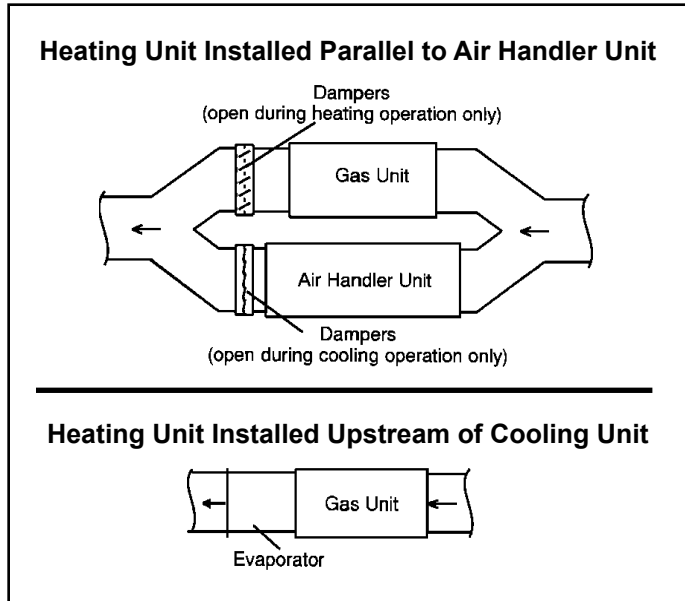


Figure 1.

When installed, this furnace must be electrically grounded according to local codes. In addition, in the United States, installation must conform with the current National Electric Code, ANSI/NFPA No. 70. The National Electric Code (ANSI/NFPA No. 70) is available from the following address:

National Fire Protection Association
1 Battery March Park
Quincy, MA 02269

NOTE: This furnace is designed for a minimum continuous return air temperature of 60° F (16°C) or an intermittent operation down to 55° F (13°C) dry bulb for cases where a night setback thermostat is used. Return air temperature must not exceed 85° F (29°C) dry bulb.

This furnace may be installed in alcoves, closets, attics, basements, garages, crawl spaces and utility rooms in the upflow or horizontal position.

This furnace design has not been CSA International certified for installation in mobile homes, recreational vehicles, or outdoors.

Use of Furnace as a Construction Heater

Units may be used for heating of buildings or structures under construction, if the following conditions are met to ensure proper operation.

DO NOT USE THE UNIT FOR CONSTRUCTION HEAT UNLESS ALL OF THE FOLLOWING CRITERIA ARE MET:

- Furnace must be in its final location. The vent system must be permanently installed per these installation instructions.
- Furnace must be installed as a two pipe system and one hundred percent (100%) outdoor air must be provided for combustion air requirements during construction.
- A room thermostat must control the furnace. The use of fixed jumpers that will provide continuous heating is prohibited.
- The input rate and temperature rise must be set per the furnace rating plate.
- Supply and Return air ducts must be provided and sealed to the furnace. Return air must be terminated outside of the space where furnace is installed.
- Return air temperature range between 60°F (16°C) and 80°F (27°C) must be maintained.
- MERV 11 or greater air filters must be installed in the system and must be regularly inspected and maintained (e.g., regular static checks and replaced at end of life) during construction.
- Blower and vestibule access panels must be in place on the furnace at all times.
- The furnace heat exchanger, components, duct system, and evaporator coils must be thoroughly cleaned following final construction clean-up.
- Air filters must be replaced upon construction completion.
- All furnace operating conditions (including ignition, input rate, temperature rise and venting) must be verified in accordance with these installation instructions.

EQUIPMENT MAY EXPERIENCE PREMATURE COMPONENT FAILURE AS A RESULT OF FAILURE TO FOLLOW THE ABOVE INSTALLATION INSTRUCTIONS. FAILURE TO FOLLOW THE ABOVE INSTALLATION INSTRUCTIONS VOIDS THE MANUFACTURER'S EQUIPMENT LIMITED WARRANTY. COMFORT-AIRE / CENTURY DISCLAIMS ALL LIABILITY IN CONNECTION WITH INSTALLER'S FAILURE TO FOLLOW THE ABOVE INSTALLATION INSTRUCTIONS.

NOTWITHSTANDING THE FOREGOING, INSTALLER IS RESPONSIBLE FOR CONFIRMING THAT THE USE OF CONSTRUCTION HEAT IS CONSISTENT WITH THE POLICIES AND CODES OF ALL REGULATING ENTITIES. ALL SUCH POLICIES AND CODES MUST BE ADHERED TO.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities having jurisdiction before installation.

In addition to the requirements outlined previously, the following general recommendations must be considered when installing one of these furnaces:

- Place the furnace as close to the center of the air distribution system as possible. The furnace should also be located close to the chimney or vent termination point.
- Do not install the furnace where drafts might blow directly into it. This could cause improper combustion and unsafe operation.
- Do not block the furnace combustion air openings with clothing, boxes, doors, etc. Air is needed for proper combustion and safe unit operation.
- When the furnace is installed in an attic or other insulated space, keep insulation away from the furnace.
- Please consult the manufacturer of your evaporator coil for their recommendations on distance required between the heat exchanger and their drain pan. Adequate space must be provided between the drain pan and the furnace heat exchanger.

Combustion, Dilution & Ventilation Air

In the past, there was no problem in bringing in sufficient outdoor air for combustion. Infiltration provided all the air that was needed. In today's homes, tight construction practices make it necessary to bring in air from outside for combustion. Take into account that exhaust fans, appliance vents, chimneys, and fireplaces force additional air that could be used for combustion out of the house. If sufficient combustion air is not available, the furnace or other appliance will operate inefficiently and unsafely.

Unless outside air is brought into the house for combustion, negative pressure (outside pressure is greater than inside pressure) will build to the point that a down draft can occur in the furnace vent pipe or chimney. As a result, combustion gases enter the living space creating a potentially dangerous situation.

In addition to providing combustion air, fresh outdoor air dilutes contaminants in the indoor air. These contaminants may include bleaches, adhesives, detergents, solvents and other contaminants which can corrode furnace components.

CAUTION

Do not install the furnace in a corrosive or contaminated atmosphere. Meet all combustion and ventilation air requirements, as well as all local codes.

In the absence of local codes concerning air for combustion and ventilation, use the guidelines and procedures in this section to install these furnaces to ensure efficient and safe operation. You must consider combustion air needs and requirements for exhaust vents and gas piping. A portion of this information has been reprinted with permission from the National Fuel Gas Code (ANSI-Z223.1/NFPA 54). This reprinted material is not the complete and official position of ANSI on the referenced subject, which is represented only by the standard in its entirety.

WARNING

Insufficient combustion air can cause headaches, nausea, dizziness or asphyxiation. It will also cause excess water in the heat exchanger resulting in rusting and premature heat exchanger failure. Excessive exposure to contaminated combustion air will result in safety and performance related problems. Avoid exposure to the following substances in the combustion air supply:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine base swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Anti-static fabric softeners for clothes dryers
- Masonry acid washing materials

The requirements for providing air for combustion and ventilation depend largely on whether the furnace is installed in an unconfined or a confined space.

Unconfined Space

An unconfined space is an area such as a basement or large equipment room with a volume greater than 50 cubic feet (1.42 m³) per 1,000 Btu (.29 kW) per hour of the combined input rating of all appliances installed in that space. This space also includes adjacent rooms which are not separated by a door. Though an area may appear to be unconfined, it might be necessary to bring in outdoor air for combustion if the structure does not provide enough air by infiltration. If the furnace is located in a building of tight construction with weather stripping and caulking around the windows and doors, follow the procedures in the air from outside section.

Confined Space

A confined space is an area with a volume less than 50 cubic feet (1.42 m³) per 1,000 Btu (.29 kW) per hour of the combined input rating of all appliances installed in that space. This definition includes furnace closets or small equipment rooms.

When the furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air must be handled by ducts which are sealed to the furnace casing and which terminate outside the space containing the furnace. This is especially important when the furnace is mounted on a platform in a confined space such as a closet or small equipment room. Even a small leak around the base of the unit at the platform or at the return air duct connection can cause a potentially dangerous negative pressure condition. Air for combustion and ventilation can be brought into the confined space either from inside the building or from outside.

Air from Inside

If the confined space that houses the furnace adjoins a space categorized as unconfined, air can be brought in by providing two permanent openings between the two spaces. Each opening must have a minimum free area of 1 square inch (645 mm²) per 1,000 Btu (.29 kW) per hour of total input rating of all gas fired equipment in the confined space. Each opening must be at least 100 square inches (64516 mm²). One opening shall be within 12 inches (305 mm) of the top of the enclosure and one opening within 12 inches (305 mm) of the bottom. See Figure 2.

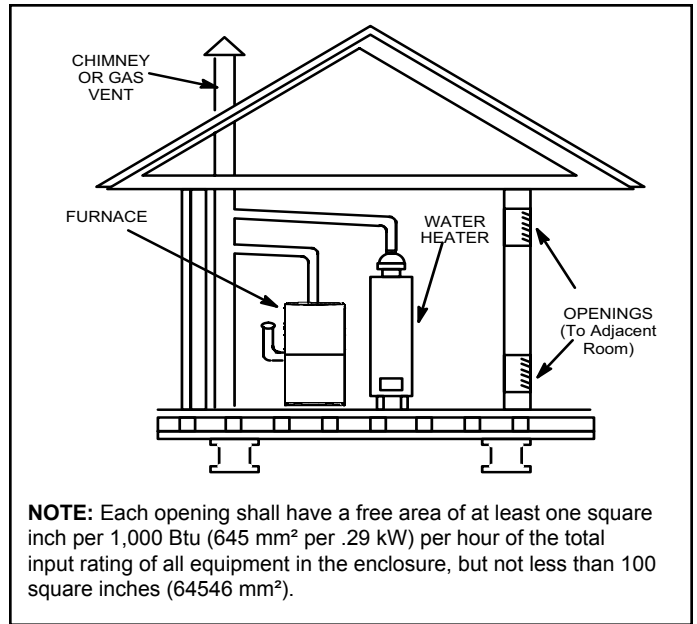


Figure 2. Equipment in Confined Space - All Air from Inside

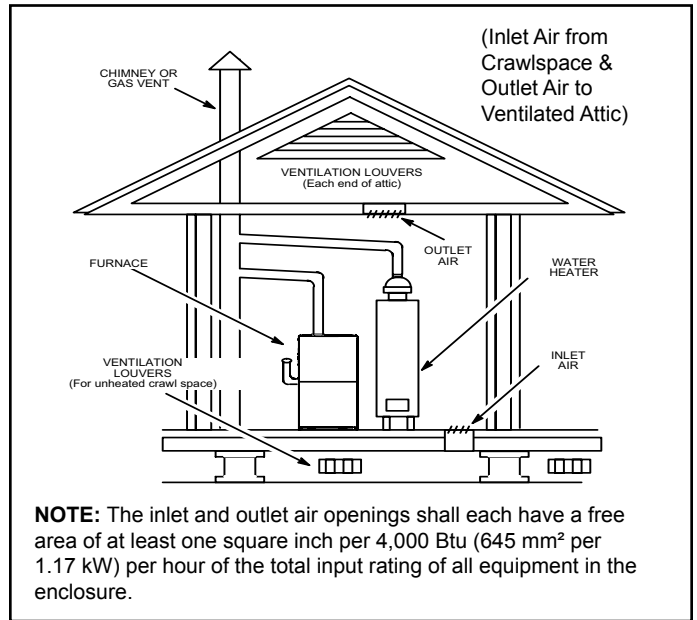


Figure 3. Equipment in Confined Space - All Air from Outside

When ducts are used, they shall be of the same cross sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be no less than 3 inches (75 mm). In calculating free area, the blocking effect of louvers, grilles, or screens must be considered. If the design and free area of protective covering is not known for calculating the size opening required, it may be assumed that wood louvers will have 20 to 25 percent free area and metal louvers and grilles will have 60 to 75 percent free area. Louvers and grilles must be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

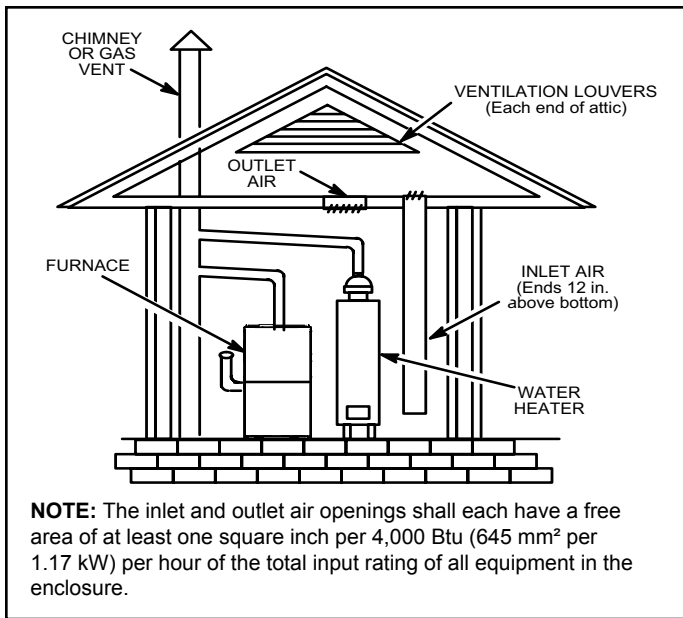


Figure 4. Equipment in Confined Space - All Air from Outside (Ventilated Attic)

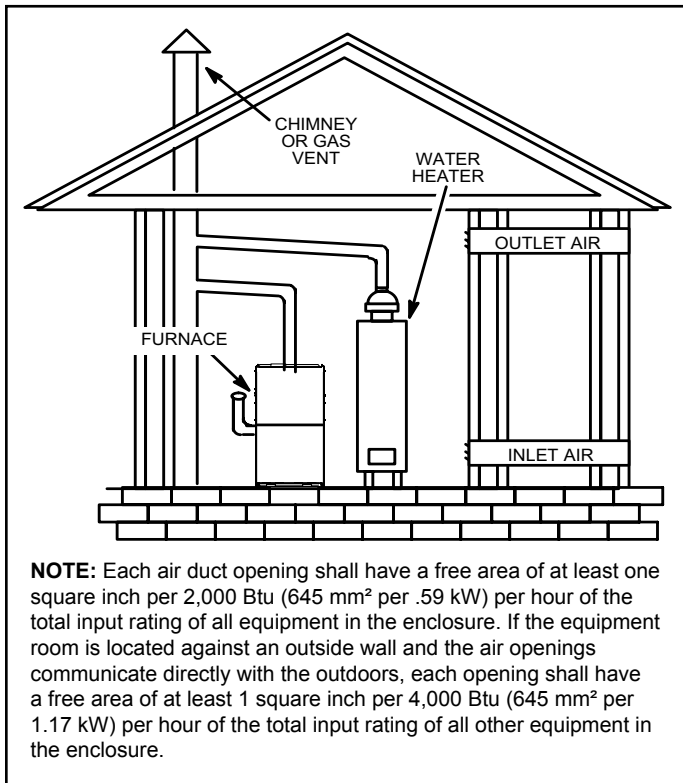


Figure 5. Equipment in Confined Space - All Air from Outside

Shipping Bolt Removal

Units with 1/2 hp and 3/4 hp blower motors are equipped with three flexible legs and one rigid leg. See Figure 6. The rigid leg is equipped with a shipping bolt and a flat white plastic washer (rather than the rubber mounting grommet used with a flexible mounting leg). **The bolt and washer must be removed before the furnace is placed into operation.** After the bolt and washer have been removed, the rigid leg will not touch the blower housing.

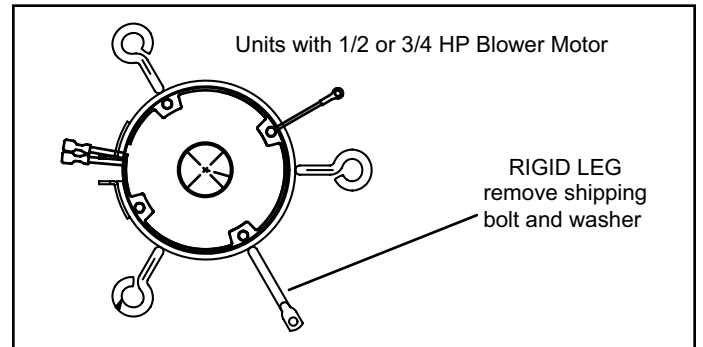


Figure 6.

Setting Equipment

⚠ WARNING

Do not install the furnace on its front or its back. Do not connect the return air ducts to the back of the furnace. Doing so will adversely affect the operation of the safety control devices, which could result in personal injury or death.

The gas furnace can be installed as shipped in either the upflow position or the horizontal position.

Select a location that allows for the required clearances that are listed on the unit nameplate. Also consider gas supply connections, electrical supply, vent connection, and installation and service clearances [24 inches (610 mm) at unit front]. The unit must be level.

Upflow Applications

Allow for clearances to combustible materials as indicated on the unit nameplate. Minimum clearances for closet or alcove installations are shown in Figure 7.

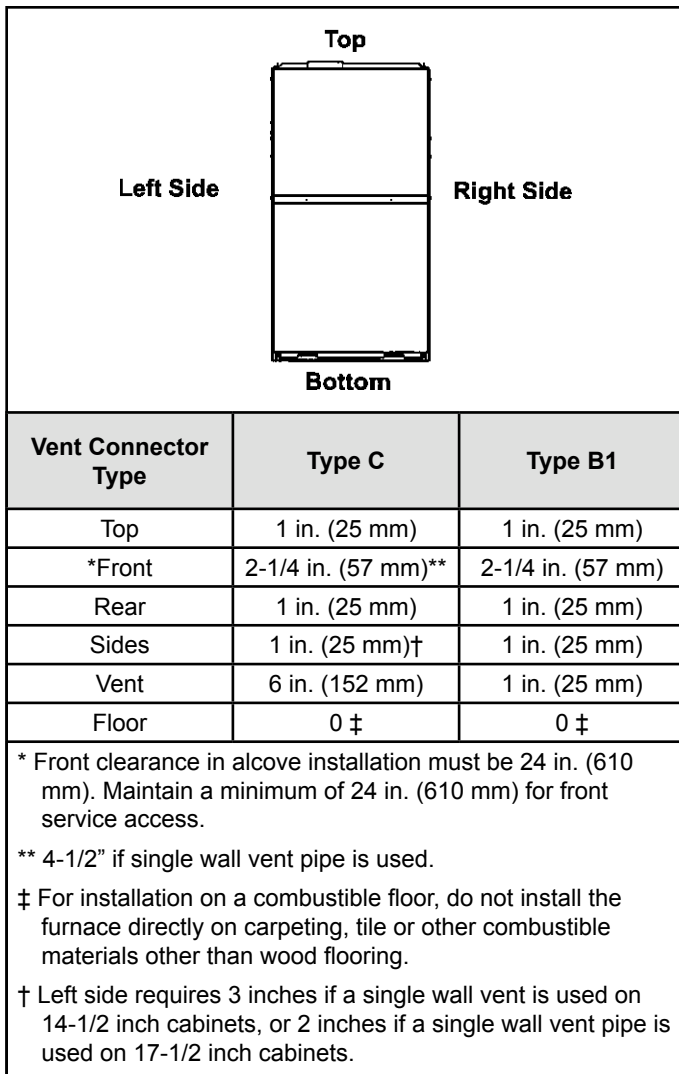


Figure 7. Upflow Application Installation Clearances

Return Air - Upflow Applications

Return air can be brought in through the bottom or either side of the furnace installed in an upflow application. If the furnace is installed on a platform with bottom return, make an airtight seal between the bottom of the furnace and the platform to ensure that the furnace operates properly and safely. The furnace is equipped with a removable bottom panel to facilitate installation.

Markings are provided on both sides of the furnace cabinet for installations that require side return air. Cut the furnace cabinet at the maximum dimensions shown on Page 2.

NOTE: C*20C units that require air volumes over 1800 cfm (850 L/s) must have one of the following:

1. Single side return air with transition to accommodate 20 x 25 x 1 in. (508 x 635 x 25 mm) cleanable air filter. (Required to maintain proper air velocity.) See Figure 9.
2. Single side return air with optional return airbase. See Figure 9.
3. Bottom return air.
4. Return air from both sides.
5. Bottom and one side return air.

See blower performance tables for additional information.

Optional external side return air filter kit cannot be used with the optional RAB Return Air Base.

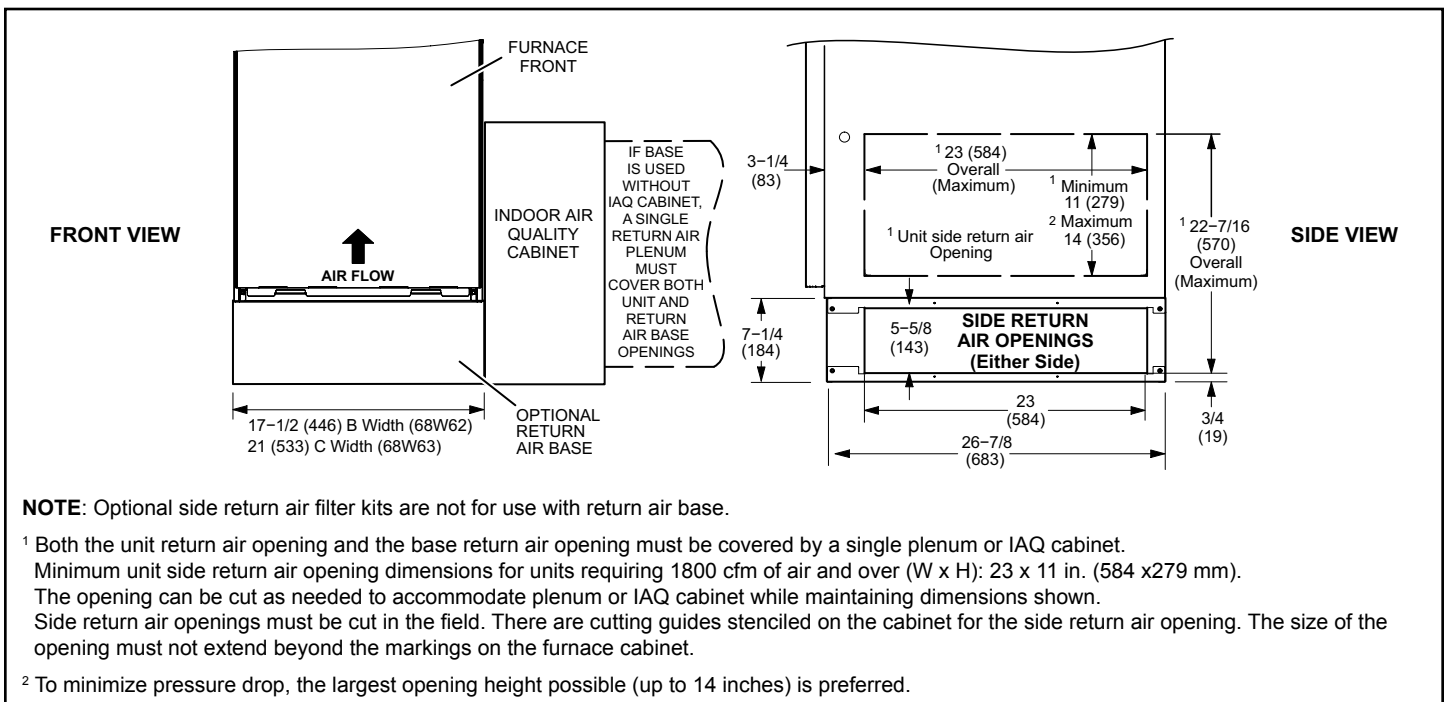


Figure 8. Optional Return Air Base (Upflow Applications Only)

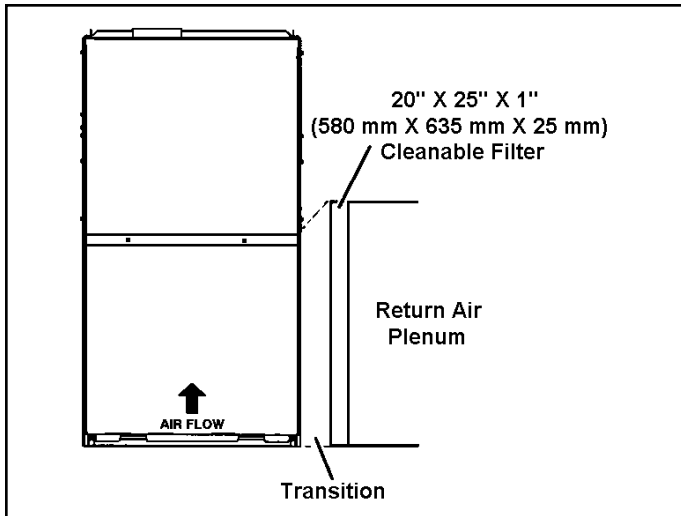


Figure 9. Single Side Return Air (with transition and filter)

Removing the Bottom Panel

Remove the two screws that secure the bottom cap to the furnace. Pivot the bottom cap down to release the bottom panel. Once the bottom panel has been removed, reinstall the bottom cap. See Figure 10.

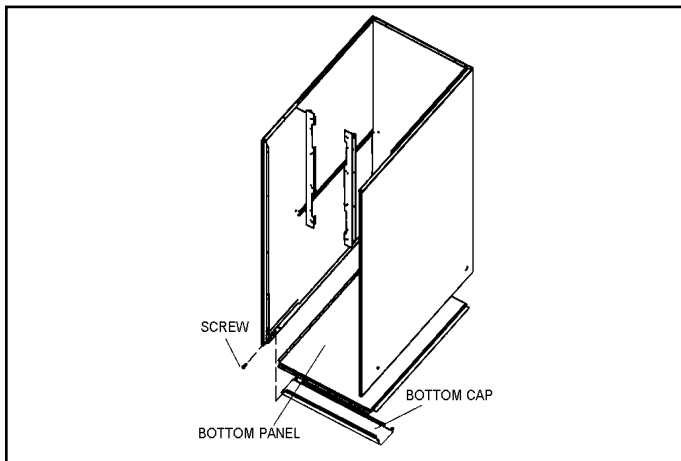


Figure 10. Removing the Bottom Panel

Horizontal Applications

The furnace can be installed in horizontal applications.

Allow for clearances to combustible materials as indicated on the unit nameplate. Minimum clearances for closet or alcove installations are shown in Figure 12.

This furnace may be installed in either an attic or a crawl space. Either suspend the furnace from roof rafters or floor joists, as shown in Figure 11, or install the furnace on a platform, as shown in Figure 13.

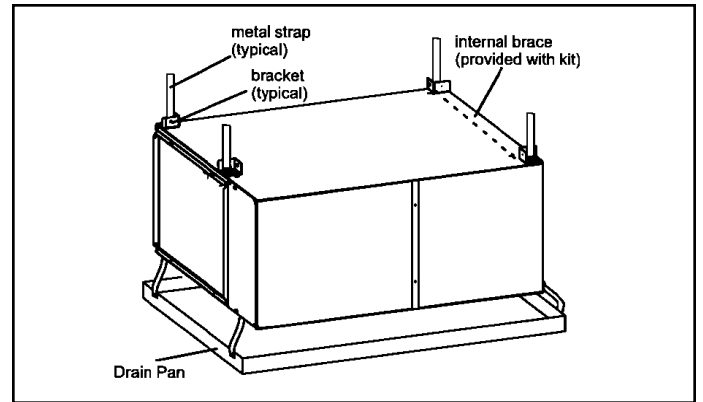
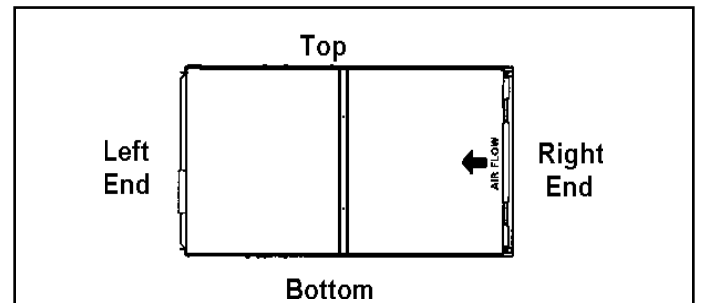


Figure 11. Typical Horizontal Application - Unit Suspended in Attic or Crawspace

NOTE: Heavy gauge perforated sheet metal straps may be used to suspend the unit from roof rafters or ceiling joists. When straps are used to suspend the unit in this way, support must be provided for both the ends. The straps must not interfere with the plenum or exhaust piping installation. Cooling coils and supply and return air plenums must be supported separately.

NOTE: When the furnace is installed on a platform in a crawspace, it must be elevated enough to avoid water damage and to allow the evaporator coil to drain.



Vent Connector Type	Type C	Type B1
Top	1 in. (25 mm)	1 in. (25 mm)
*Front	2-1/4 in. (57 mm)**	2-1/4 in. (57 mm)
Rear	1 in. (25 mm)	1 in. (25 mm)
Ends	2 in. (51 mm)	2 in. (51 mm)
Vent	6 in. (152 mm)	1 in. (25 mm)
Floor	1 in. (25 mm)‡	1 in. (25 mm)‡

* Front clearance in alcove installation must be 24 in. (610 mm). Maintain a minimum of 24 in. (610 mm) for front service access.

** 4-1/2 in. if single wall vent pipe is used.

‡ For installations on a combustible floor, do not install the furnace directly on carpeting, tile or other combustible materials other than wood flooring.

Figure 12. Horizontal Application Installation Clearances

Return Air - Horizontal Applications

Return air must be brought in through the end of a furnace installed in a horizontal application. The furnace is equipped with a removable bottom panel to facilitate installation. See Figure 10.

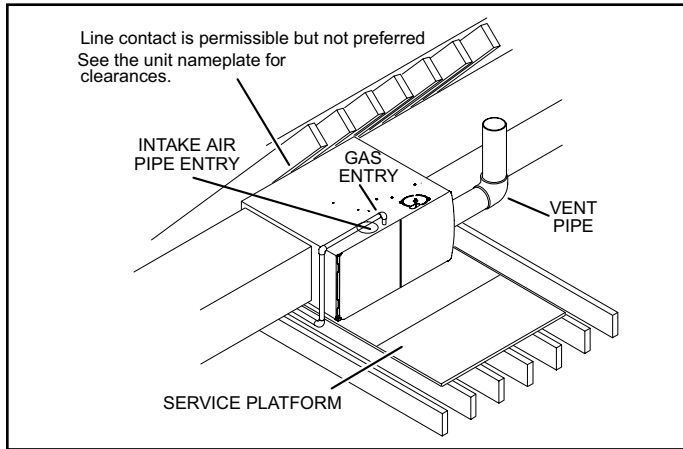


Figure 13. Horizontal Application - Unit Installed on Platform

⚠ CAUTION

If this unit is being installed in a space serviced by an exhaust fan, power exhaust fan, or other device which may create a negative pressure in the space, take care when sizing the inlet air opening. The inlet air opening must be sized to accommodate the maximum volume of exhausted air as well as the maximum volume of combustion air required for all gas appliances serviced by this space.

⚠ WARNING

Improper installation of the furnace can result in personal injury or death. Combustion and flue products must never be allowed to enter the return air system or the living space. Use screws and joint tape to seal the return air system to the furnace.

In platform installations with bottom return air, the furnace should be sealed airtight to the return air plenum. A door must never be used as a portion of the return air duct system. The base must provide a stable support and an airtight seal to the furnace. Allow absolutely no sagging, cracks, gaps, etc..

The return and supply air duct systems must never be connected to or from other heating devices such as a fireplace or stove, etc. Fire, explosion, carbon monoxide poisoning, personal injury and/or property damage could result.

⚠ WARNING

The inner blower panel must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

Filters

This unit is not equipped with a filter or rack. A field provided high velocity filter is required for the unit to operate properly. Table 1 lists recommended filter sizes.

⚠ IMPORTANT

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer against the data given in the appropriate Product Specifications. Additional information is provided in Service and Application Note ACC002 (August 2000).

A filter must be in place any time the unit is operating.

Furnace Cabinet Width	Filter Size	
	Side Return	Bottom Return
14-1/2"	16 x 25 x 1 (1)	14 x 25 x 1 (1)
17-1/2"		16 x 25 x 1 (1)
21"		20 x 25 x 1 (1)

Table 1.

Duct System

Use industry approved standards (such as those published by Air Conditioning Contractors of America or American Society of Heating, Refrigerating and Air Conditioning Engineers) to size and install the supply and return air duct system. This will result in a quiet and low static system that has uniform air distribution.

NOTE: Do not operate the furnace in the heating mode with an external static pressure that exceeds 0.8 inches w.c. Higher external static pressures may cause erratic limit operation.

Supply Air Plenum

If the furnace is installed without a cooling coil, a removable access panel must be installed in the supply air duct. The access panel should be large enough to permit inspection (either by smoke or reflected light) of the heat exchanger for leaks after the furnace is installed. The furnace access panel must always be in place when the furnace is operating and it must not allow leaks into the supply air duct system.

Return Air Plenum

NOTE: Return air must not be drawn from a room where this furnace, or any other gas fueled appliance (i.e., water heater), or carbon monoxide producing device (i.e., wood fireplace) is installed.

When return air is drawn from a room, a negative pressure is created in the room. If a gas appliance is operating in a room with negative pressure, the flue products can be pulled back down the vent pipe and into the room. This reverse flow of the flue gas may result in incomplete combustion and the formation of carbon monoxide gas. This toxic gas might then be distributed throughout the house by the furnace duct system.

In upflow applications, the return air can be brought in through the bottom or either side of the furnace. If a furnace with bottom return air is installed on a platform, make an airtight seal between the bottom of the furnace and the platform to ensure that the unit operates properly and safely. Use fiberglass sealing strips, caulking, or equivalent sealing method between the plenum and the furnace cabinet to ensure a tight seal. If a filter is installed, size the return air duct to fit the filter frame.

Intake Piping

See Figure 15 and Figure 16

The furnace must have the provided air intake screen assembly installed. The assembly may be rotated if necessary to accommodate furnace installation.

Follow the next three steps when installing the air intake pipe with screen.

1. Using a rubber mallet tap the provided elbow into the intake pipe inside the cabinet.

NOTE: Air intake termination is available on the bottom of the cabinet with left-hand air discharge. The provided elbow must be firmly secured into the intake pipe inside the cabinet.

2. Tap a 2-1/2" long 2" PVC pipe to the elbow.

3. Tap the 3" to 2" reducer with screen onto the 2" PVC pipe. See Figure 14 and Figure 15.

NOTE: Ensure that there is 4-1/2" of space between the air intake assembly and furnace cabinet side.

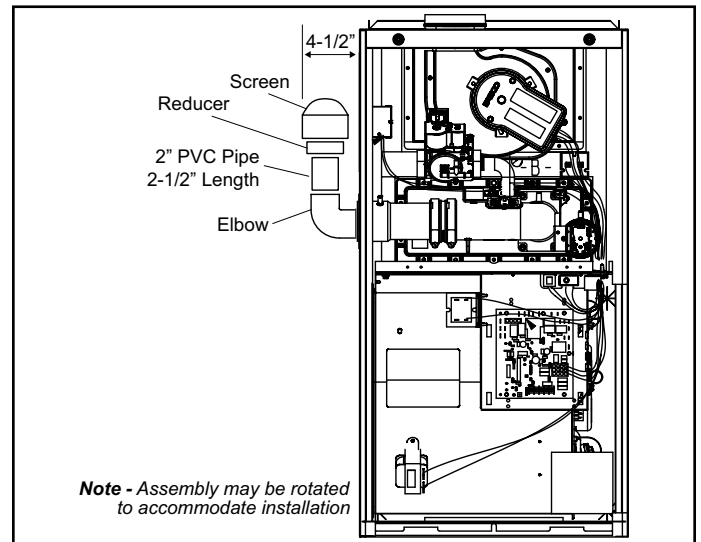


Figure 14. Air Intake Pipe Connections - Upflow

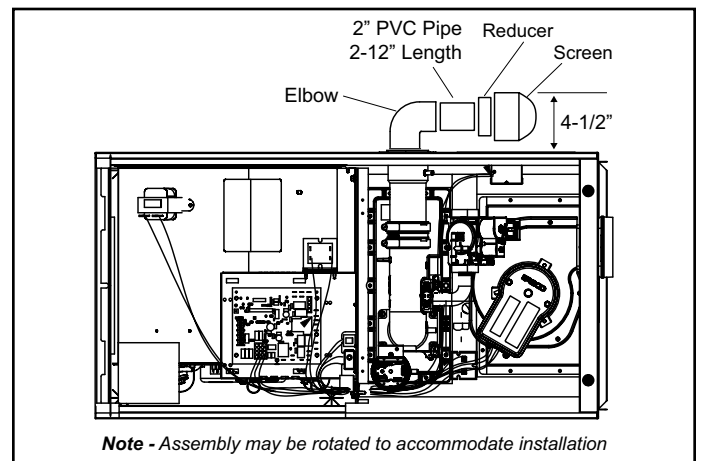


Figure 15. Air Intake Pipe Connections - Horizontal (Right-Hand Air Discharge Shown)

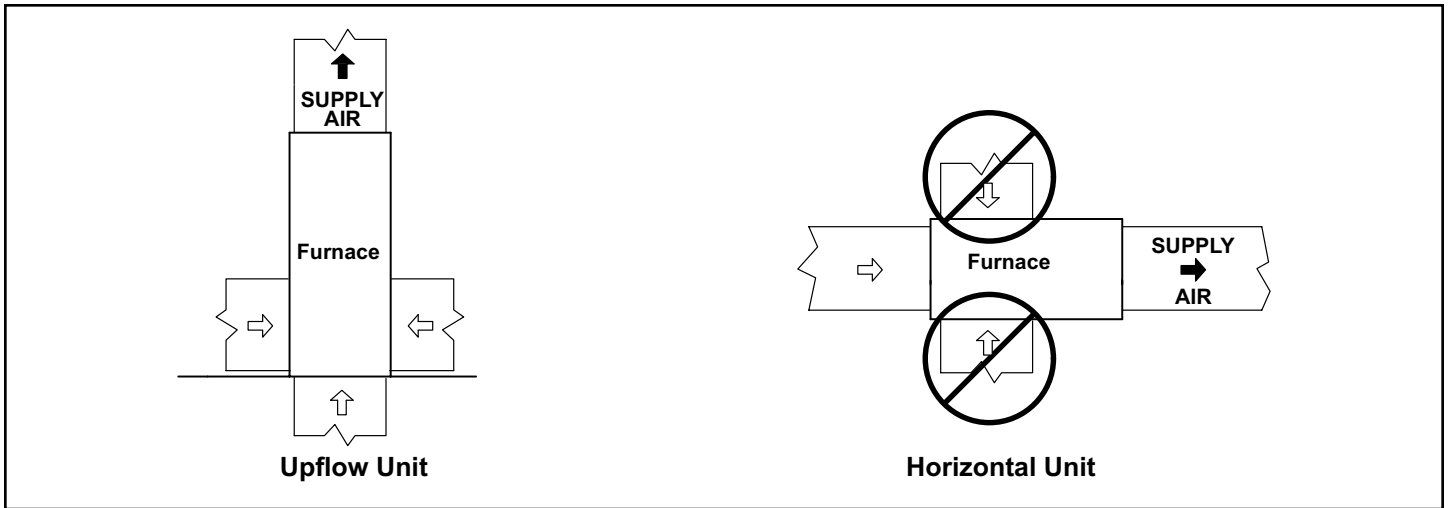


Figure 16. Duct System and Proper Installation

Venting

A 4 inch diameter flue transition is factory installed on the combustion air inducer outlet of all models.

These series units are classified as fan assisted Category I furnaces when vertically vented according to the latest edition of National Fuel Gas Code (NFPA 54 / ANSI Z223.1) in the USA. A fan assisted Category I furnace is an appliance equipped with an integral mechanical means to either draw or force combustion products through the combustion chamber and/or heat exchanger. This unit is not approved for use with horizontal venting.

NOTE: Use these instructions as a guide. They do not supersede local codes. This furnace must be vented according to all local codes these installation instructions, and the provided venting tables in these instructions.

The venting tables in this manual were extracted from the National Fuel Gas Code (NFPA 54 / ANSI Z223.1) and are provided as a guide for proper vent installation. Proper application, termination, construction and location of vents must conform to local codes having jurisdiction. In the absence of local codes, the NFGC serves as the defining document.

Use self drilling sheet metal screws or a mechanical fastener to firmly secure the vent pipe to the round collar of the flue transition. If self drilling screws are used to attach the vent pipe, it is recommended that three be used. Drive one self drilling screw through the front and one through each side of the vent pipe and collar. See Figure 18.

Install the first vent connector elbow at a minimum of six inches (152 mm) from the furnace vent outlet. See Figure 18.

Venting Using a Masonry Chimney

The following additional requirements apply when a lined masonry chimney is used to vent this furnace.

- Masonry chimneys used to vent Category I central furnaces must be either tile lined or lined with a listed metal lining system or dedicated gas vent. Unlined masonry chimneys are prohibited. See Figure 17 and Figure 19 for common venting.
- A chimney with one or more sides exposed to the outside of the structure is considered to be an exterior chimney.
- An exterior masonry chimney that is not tile lined must be lined with B1 vent or a listed insulated flexible metal vent. An exterior tile lined chimney that is sealed and capped may be lined with a listed uninsulated flexible metal vent.
- If the existing chimney will not accommodate a listed metal liner, either the chimney must be rebuilt to accommodate one of these liners or an alternate approved venting method must be found.
- Insulation for the flexible vent pipe must be an encapsulated fiberglass sleeve recommended by the flexible vent pipe manufacturer.

Refer to the tables and the venting information contained in these instructions to properly size and install the venting system.

! IMPORTANT

Once the venting system is installed, attach the "Disconnected Vent" warning sticker to a visible area of the plenum near the vent pipe. See Figure 18. The warning sticker is provided in the bag assembly. Order kit 66W04 for additional stickers.

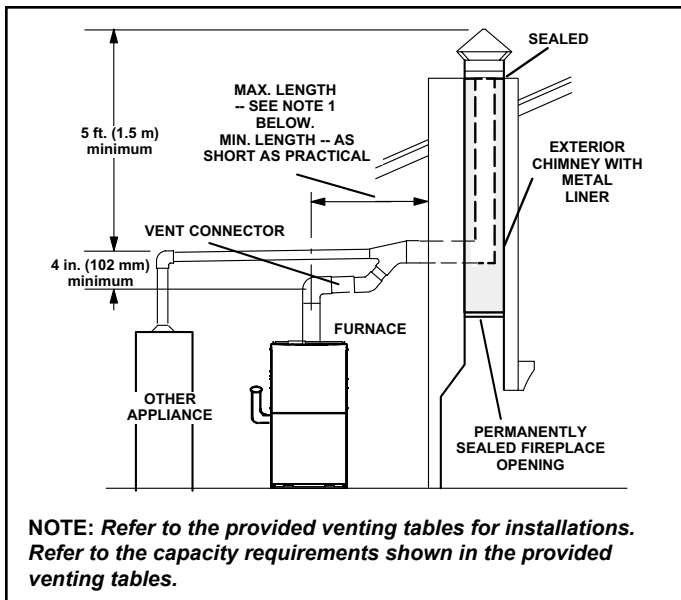


Figure 17. Common Venting Using Metal-Lined Masonry Chimney

⚠ WARNING

Asphyxiation hazard. The exhaust vent for this furnace must be securely connected to the furnace flue transition at all times.

⚠ IMPORTANT

SINGLE appliance venting of a fan assisted furnace into a tile lined masonry chimney (interior or outside wall) is prohibited. The chimney must first be lined with either type B1 vent or an insulated single wall flexible vent lining system which has been sized according to the provided venting tables and the vent pipe manufacturer's instructions.

DO NOT insulate the space between the liner and the chimney wall with puffed mica or any other loose granular insulating material.

A fan assisted furnace may be commonly vented into an existing lined masonry chimney if the following conditions are met:

- The chimney is currently serving at least one drafthood equipped appliance.
- The vent connectors and chimney are sized according to the provided venting tables.

If type B1 double wall vent is used inside a chimney, no other appliance can be vented into the chimney. The outer wall of type B1 vent pipe must not be exposed to flue products. A type B1 vent or masonry chimney liner shall terminate above the roof surface with a listed cap or a listed roof assembly according to the terms of their respective listings and the vent manufacturer's instructions.

When inspection reveals that an existing chimney is not safe for the intended purpose, it shall be rebuilt to conform to nationally recognized standards, lined or relined with suitable materials, or replaced with a gas vent or chimney suitable for venting. The chimney passageway must be checked periodically to ensure that it is clear and free of obstructions.

Do not install a manual damper, barometric draft regulator, or flue restrictor between the furnace and the chimney.

Never connect a Category I appliance to a chimney that is servicing a solid fuel appliance. If a fireplace chimney flue is used to vent this appliance, the fireplace opening must be permanently sealed.

A type B1 or listed chimney lining system that passes through an unused masonry chimney flue is not considered to be exposed to the outdoors.

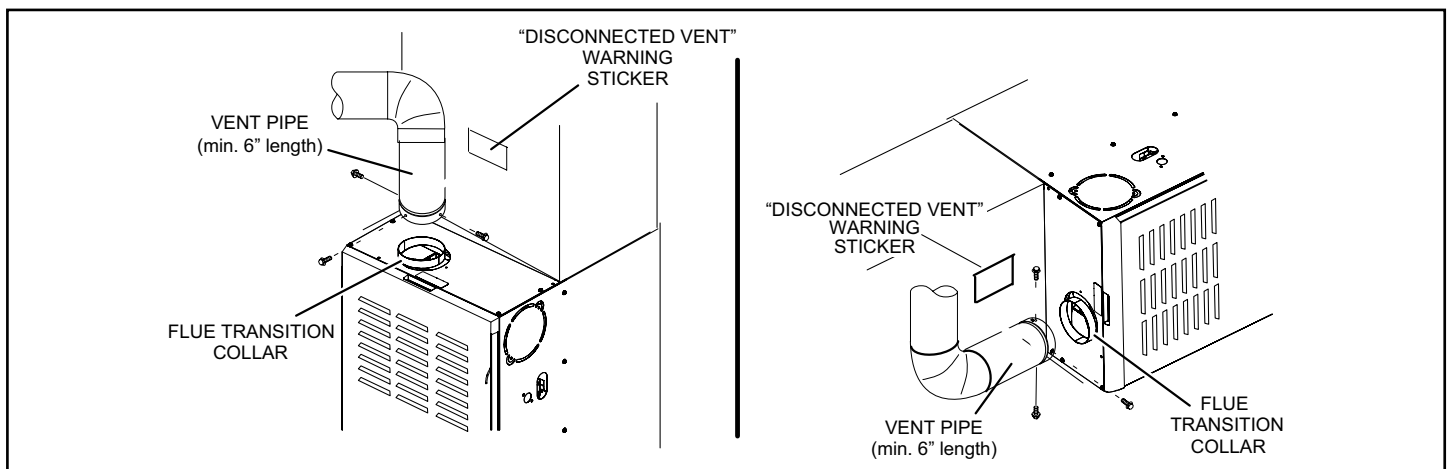


Figure 18. Vent Connection Upflow and Horizontal Position

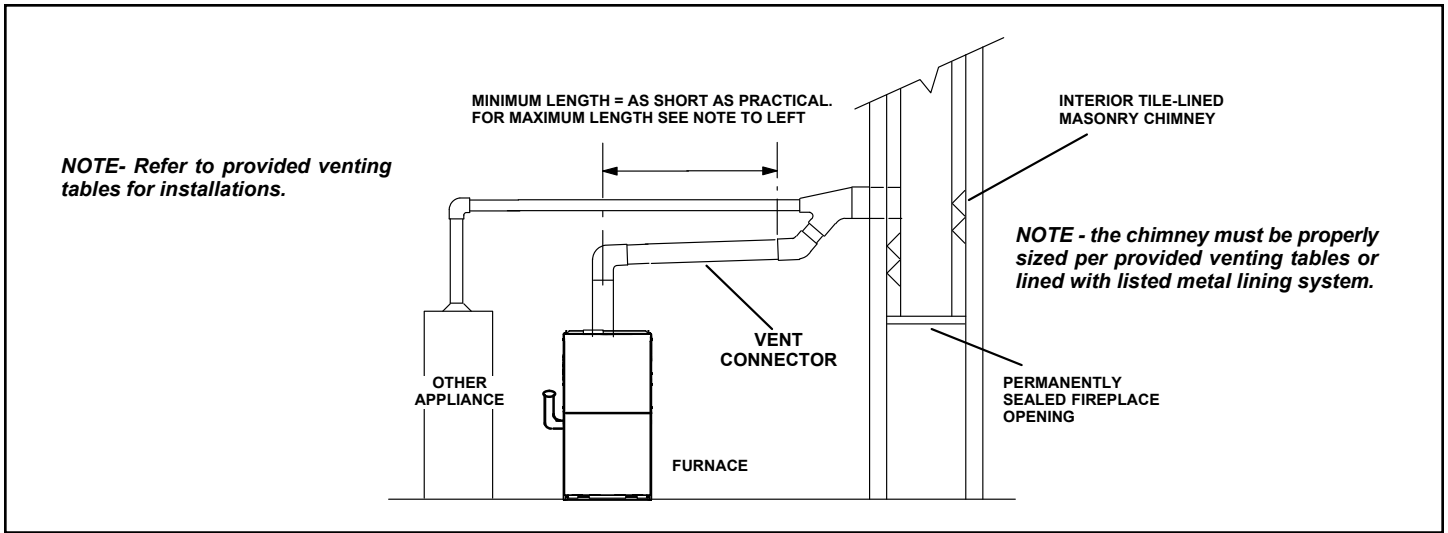


Figure 19. Common Venting Using Tile-Lined Interior Masonry Chimney and Combined Vent Connector

General Venting Requirements

Vent all furnaces according to these instructions:

1. Vent diameter recommendations and maximum allowable piping runs are found in the provided venting tables.
2. In no case should the vent or vent connector diameter be less than the diameter specified in the provided venting tables.
3. The minimum vent capacity determined by the sizing tables must be less than the low fire input rating and the maximum vent capacity must be greater than the high fire input rating.
4. *Single appliance vents* - If the vertical vent or tile lined chimney has a larger diameter or flow area than the vent connector, use the vertical vent diameter to determine the **minimum vent capacity and the vent connector diameter to determine the maximum vent capacity**. The flow area of the vertical vent, however, shall not exceed 7 times the flow area of the listed appliance categorized vent area, draft hood outlet area or flue collar area unless designed according to approved engineering methods.
5. *Multiple appliance vents* - The flow area of the largest section of vertical vent or chimney shall not exceed 7 times the smallest listed appliance categorized vent area, draft hood outlet area or flue collar area unless designed according to approved engineering methods.
6. The entire length of single wall metal vent connector shall be readily accessible for inspection, cleaning, and replacement.
7. Single appliance venting configurations with zero lateral lengths (Table 3) are assumed to have no elbows in the vent system. For all other vent configurations, the vent system is assumed to have two 90° elbows. For each additional 90° elbow or equivalent (for example two 45° elbows equal one 90° elbow) beyond two, the

maximum capacity listed in the venting table should be reduced by 10% (0.90 x maximum listed capacity).

8. Common venting Table 4 and Table 5 were generated using a maximum horizontal vent connector length of 1-1/2 feet (.46 m) for each inch (25 mm) of connector diameter as follows:

Connector Diameter inches (mm)	Maximum Horizontal Connector Length feet (m)
3 (76)	4-1/2 (1.37)
4 (102)	6 (1.83)
5 (127)	7-1/2 (2.29)
6 (152)	9 (2.74)
7 (178)	10-1/2 (3.20)

Table 2.

9. If the common vertical vent is offset, the maximum common vent capacity listed in the common venting tables should be reduced by 20%, the equivalent of two 90° elbows (0.80 x maximum common vent capacity). The horizontal length of the offset shall not exceed 1-1/2 feet (.46 m) for each inch (25 mm) of common vent diameter.
10. The vent pipe should be as short as possible with the least number of elbows and angles required to complete the job. Route the vent connector to the vent using the shortest possible route.
11. A vent connector shall be supported without any dips or sags and shall slope a minimum of 1/4 inch (6.4 mm) per linear foot (305 mm) of connector, back toward the appliance.
12. Vent connectors shall be firmly attached to the furnace flue collar by self drilling screws or other approved means, except vent connectors of listed type B vent material which shall be assembled according to the manufacturer's instructions. Joints between sections

of single wall connector piping shall be fastened by screws or other approved means.

13. When the vent connector used for Category I appliances must be located in or pass through a crawl space, attic or other areas which may be cold, that portion of the vent connector shall be constructed of listed doublewall type B vent material or material having equivalent insulation qualities.
14. All venting pipe passing through floors, walls, and ceilings must be installed with the listed clearance to combustible materials and be fire stopped according to local codes. In absence of local codes, refer to NFGC (2223.1).
15. No portion of the venting system can extend into, or pass through any circulation air duct or plenum.
16. Vent connectors serving Category I appliances shall not be connected to any portion of mechanical draft systems operating under positive pressure such as Category III or IV venting systems.
17. If vent connectors are combined prior to entering the common vent, the maximum common vent capacity listed in the common venting tables must be reduced by 10%, the equivalent of one 90° elbow (0.90 x maximum common vent capacity).
18. The common vent diameter must always be at least as large as the largest vent connector diameter.
19. In no case, shall the vent connector be sized more than two consecutive table size diameters over the size of the draft hood outlet or flue collar outlet.
20. Do not install a manual damper, barometric draft regulator or flue restrictor between the furnace and the chimney.
21. When connecting this appliance to an existing dedicated or common venting system, you must inspect the venting system's general condition and look for signs of corrosion. The existing vent pipe size must conform to these instructions and the provided venting tables. If the existing venting system does not meet these requirements, it must be resized.

Capacity of Type B Double Wall Vents with Type B Double Wall Connectors Serving a Single Category I Appliance

Height H (feet)	Lateral L (feet)	Vent and Connector Diameter - D (inches)							
		3 inch		4 inch		5 inch		6 inch	
		Appliance Input Rating in Thousands of Btu per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	0	0	78	0	152	0	251	0	375
	2	13	51	18	97	27	157	32	232
	4	21	49	30	94	39	153	50	227
	6	25	46	36	91	47	149	59	223
8	0	0	84	0	165	0	276	0	415
	2	12	57	16	109	25	178	28	263
	5	23	53	32	103	42	171	53	255
	8	28	49	39	98	51	164	64	247
10	0	0	88	0	175	0	295	0	447
	2	12	61	17	118	23	194	26	289
	5	23	57	32	113	41	187	52	280
	10	30	51	41	104	54	176	67	267
15	0	0	94	0	191	0	327	0	502
	2	11	69	15	136	20	226	22	339
	5	22	65	30	130	39	219	49	330
	10	29	59	40	121	51	206	64	315
	15	35	53	48	112	61	195	75	301
20	0	0	97	0	202	0	349	0	540
	2	10	75	14	149	18	250	20	377
	5	21	71	29	143	38	242	47	367
	10	28	64	38	133	50	229	62	351
	15	34	58	46	124	59	217	73	337
	20	48	52	55	116	69	206	84	322
30	0	0	100	0	213	0	374	0	587
	2	9	81	13	166	14	283	18	432
	5	21	77	28	160	36	275	45	421
	10	27	70	37	150	48	262	59	405
	15	33	64	44	141	57	249	70	389
	20	56	58	53	132	66	237	80	374
	30	NR	NR	73	113	88	214	104	346

NOTE: Single appliance venting configurations with zero lateral lengths are assumed to have no elbows in the vent system. For all other vent configurations, the vent system is assumed to have two 90° elbows. For each additional 90° elbow or equivalent (for example two 45° elbows equal one 90° elbow) beyond two, the maximum capacity listed in the venting table should be reduced by 10 percent (0.90 x maximum listed capacity).

Table 3.

Vent Connector Capacity

Type B Double Wall Vents with Type B Double Wall Connectors Serving Two or More Category I Appliances

Vent Height H (feet)	Connector Rise R (feet)	Vent and Connector Diameter - D (inches)							
		3 inch		4 inch		5 inch		6 inch	
		Appliance Input Rating in Thousands of Btu per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	1	22	37	35	66	46	106	58	164
	2	23	41	37	75	48	121	60	183
	3	24	44	38	81	49	132	62	199
8	1	22	40	35	72	49	114	64	176
	2	23	44	36	80	51	128	66	195
	3	24	47	37	87	53	139	67	210
10	1	22	43	34	78	49	123	65	189
	2	23	47	36	86	51	136	67	206
	3	24	50	37	92	52	146	69	220
15	1	21	50	33	89	47	142	64	220
	2	22	53	35	96	49	153	66	235
	3	24	55	36	102	51	163	68	248
20	1	21	54	33	99	46	157	62	246
	2	22	57	34	105	48	167	64	259
	3	23	60	35	110	50	176	66	271
30	1	20	62	31	113	45	181	60	288
	2	21	64	33	118	47	190	62	299
	3	22	66	34	123	48	198	64	309

Table 4.

Common Vent Capacity

Type B Double Wall Vents with Type B Double Wall Connectors Serving Two or More Category I Appliances

Vent Height H (feet)	Common Vent Diameter							
	4 inch		5 inch		6 inch		7 inch	
	Appliance Input Rating in Thousands of Btu per Hour							
	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT
6	92	81	140	116	204	161	309	248
8	101	90	155	129	224	178	339	275
10	110	97	169	141	243	194	367	299
15	125	112	195	164	283	228	427	352
20	136	123	215	183	314	255	475	394
30	152	138	244	210	361	297	547	459

Table 5.

Removal of the Furnace from Common Vent

In the event that an existing furnace is removed from a venting system commonly run with separate gas appliances, the venting system is likely to be too large to properly vent the remaining attached appliances.

Conduct the following test while each appliance is operating and the other appliances (which are not operating) remain connected to the common venting system. If the venting system has been installed improperly, you must correct the system as indicated in the general venting requirements section.

CAUTION

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 for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the common venting system.
2. Inspect the venting system for proper size and horizontal pitch. Determine that there is no blockage, restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.
3. Close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Follow the lighting instructions. Turn on the appliance that is being inspected. Adjust the thermostat so that the appliance operates continuously.
5. After the burners have operated for 5 minutes, test for leaks of flue gases at the draft hood relief opening. Use the flame of a match or candle.
6. After determining that each appliance connected to the common venting system is venting properly, (step 3) return all doors, windows, exhaust fans, fireplace dampers, and any other gas burning appliances to their previous mode of operation.
7. If a venting problem is found during any of the preceding tests, the common venting system must be modified to correct the problem.

Resize the common venting system to the minimum vent pipe size determined by using the appropriate tables in Appendix G. These are in the current standards of the National Fuel Gas Code ANSI Z223.1.

Gas Piping

Gas supply piping should not allow more than 0.5"W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

CAUTION

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet. The flexible connector can then be added between the black iron pipe and the gas supply line.

Gas Supply

WARNING

Do not over torque (800 in-lbs) or under torque (350 in-lbs) when attaching the gas piping to the gas valve.

1. This unit is shipped standard for left or right side installation of gas piping (or top entry in horizontal applications). Connect the gas supply to the piping assembly.
2. When connecting the gas supply piping, consider factors such as length of run, number of fittings, and furnace rating to avoid excessive pressure drop. Table 6 lists recommended pipe sizes for typical applications.
3. The gas piping must not run in or through air ducts, clothes chutes, gas vents or chimneys, dumb waiters, or elevator shafts.
4. The piping should be sloped 1/4 inch (6.4 mm) per 15 feet (4.57 m) upward toward the meter from the furnace. The piping must be supported at proper intervals [every 8 to 10 feet (2.44 to 3.01 m)] with suitable hangers or straps. Install a drip leg in vertical pipe runs to the unit.
5. A 1/8" N.P.T. plugged tap or pressure post is located on the gas valve to facilitate test gauge connection. See Figure 20.
6. In some localities, codes may require the installation of a manual main shut off valve and union (furnished by the installer) external to the unit. The union must be of the ground joint type.

⚠ IMPORTANT

Compounds used on threaded joints of gas piping must be resistant to the actions of liquified petroleum gases.

Leak Check

After gas piping is completed, carefully check all field-installed piping connections for gas leaks. Use a commercially available leak detecting solution specifically manufactured for leak detection. Never use an open flame to test for gas leaks.

The furnace must be isolated from the gas supply system by closing the individual manual shut-off valve during any gas supply system at pressures greater than or equal to 1/2 psig (3.48 kPa, 14 inches w.c.). This furnace and its components are designed, manufactured and independently certified to comply with all applicable ANSI/CSA standards. A leak check of the furnace and its components is not required.

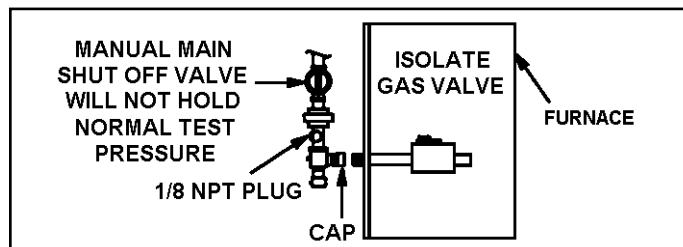


Figure 20.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death, or property damage. Never use an open flame to test for gas leaks. Check all connections using a commercially available soap solution made specifically for leak detection. Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed.

⚠ IMPORTANT

When testing pressure of gas lines, gas valve must be disconnected and isolated. See Figure 20. Gas valves can be damaged if subjected to pressures greater than 1/2 psig (3.48 kPa, 14 inches w.c.).

Gas Pipe Capacity - ft³/hr (m³/hr)

Nominal Iron Pipe Size inches (mm)	Internal Diameter inches (mm)	Length of Pipe - feet (m)									
		10 (3.048)	20 (6.096)	30 (9.144)	40 (12.192)	50 (15.240)	60 (18.288)	70 (21.336)	80 (24.384)	90 (27.432)	100 (30.480)
1/2 (12.7)	.622 (17.799)	172 (4.87)	118 (3.34)	95 (2.69)	81 (2.29)	72 (2.03)	65 (1.84)	60 (1.69)	56 (1.58)	52 (1.47)	50 (1.42)
3/4 (19.05)	.824 (20.930)	360 (10.19)	247 (7.00)	199 (5.63)	170 (4.81)	151 (4.28)	137 (3.87)	126 (3.56)	117 (3.31)	110 (3.11)	104 (2.94)
1 (25.4)	1.049 (26.645)	678 (19.19)	466 (13.19)	374 (10.59)	320 (9.06)	284 (8.04)	257 (7.27)	237 (6.71)	220 (6.23)	207 (5.86)	195 (5.52)
1-1/4 (31.75)	1.380 (35.052)	1350 (38.22)	957 (27.09)	768 (22.25)	657 (18.60)	583 (16.50)	528 (14.95)	486 (13.76)	452 (12.79)	424 (12.00)	400 (11.33)
1-1/2 (38.1)	1.610 (40.894)	2090 (59.18)	1430 (40.49)	1150 (32.56)	985 (27.89)	873 (24.72)	791 (22.39)	728 (20.61)	677 (19.17)	635 (17.98)	600 (17.00)
2 (50.8)	2.067 (52.502)	4020 (113.83)	2760 (78.15)	2220 (62.86)	1900 (53.80)	1680 (47.57)	1520 (43.04)	1400 (39.64)	1300 (36.81)	1220 (34.55)	1160 (32.844)
2-1/2 (63.5)	2.469 (67.713)	6400 (181.22)	4400 (124.59)	3530 (99.95)	3020 (85.51)	2680 (75.88)	2480 (70.22)	2230 (63.14)	2080 (58.89)	1950 (55.22)	1840 (52.10)
3 (76.2)	3.068 (77.927)	11300 (319.98)	7780 (220.30)	6250 (176.98)	5350 (151.49)	4740 (134.22)	4290 (121.47)	3950 (111.85)	3670 (103.92)	3450 (97.69)	3260 (92.31)

NOTE: Capacity given in cubic feet (m³) of gas per hour and based on 0.60 specific gravity gas.

Table 6.

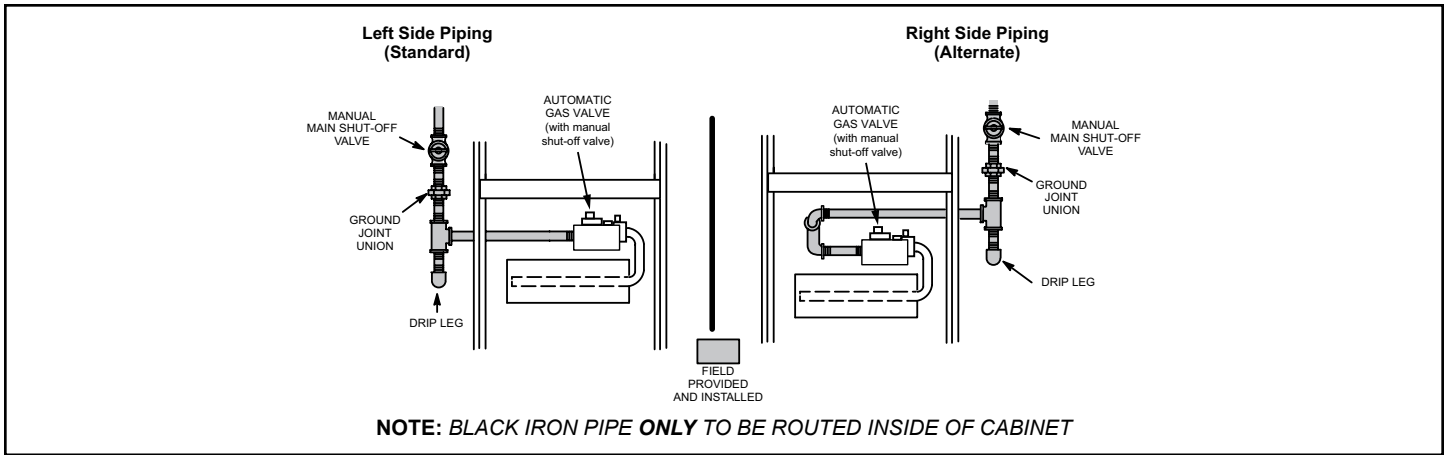


Figure 21.

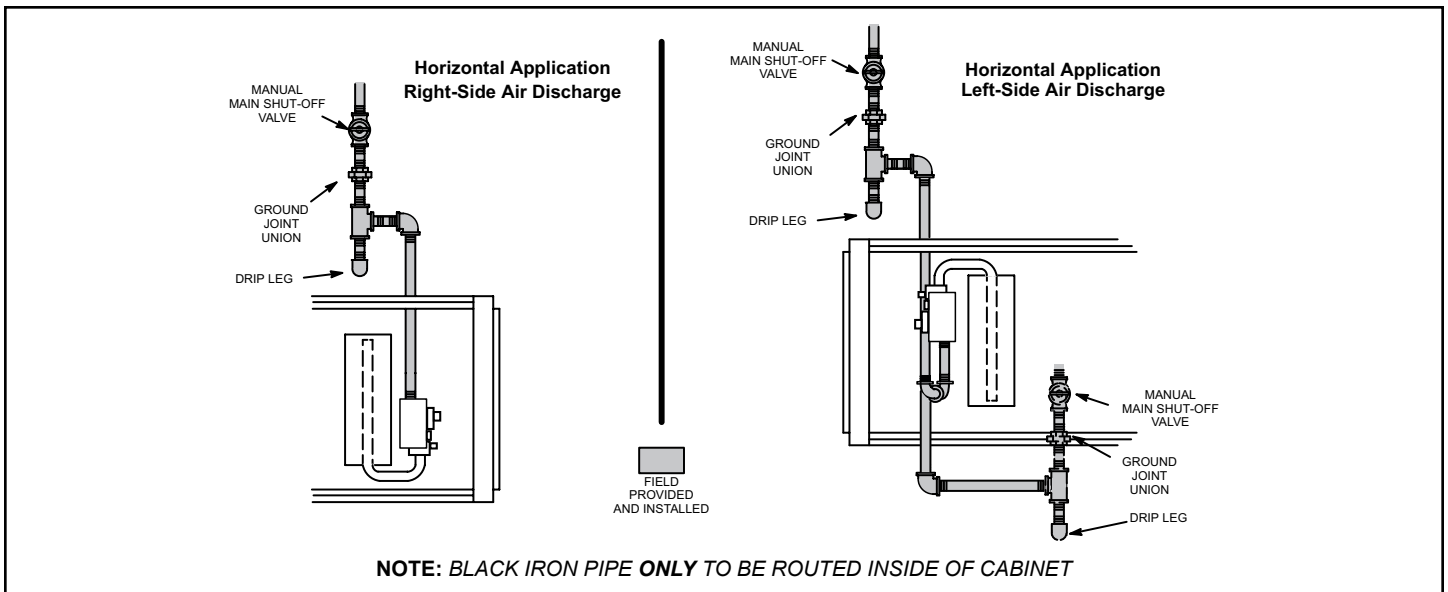



Figure 23. Horizontal Applications Possible Gas Piping Configurations

Electrical

ELECTROSTATIC DISCHARGE (ESD)

Precautions and Procedures

CAUTION



Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

The unit is equipped with a field make-up box on the right hand side of the cabinet. The make-up box may be moved to the left side of the furnace to facilitate installation. If the make-up box is moved to the left side, clip the wire ties that bundle the wires together. Route the wires to keep them off of hot surfaces.

WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

Refer to Figure 24 or Figure 25 for wiring diagram and troubleshooting.

The power supply wiring must meet Class I restrictions. Protected by either a fuse or circuit breaker, select circuit protection and wire size according to unit nameplate.

CAUTION

Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per unit rating plate.

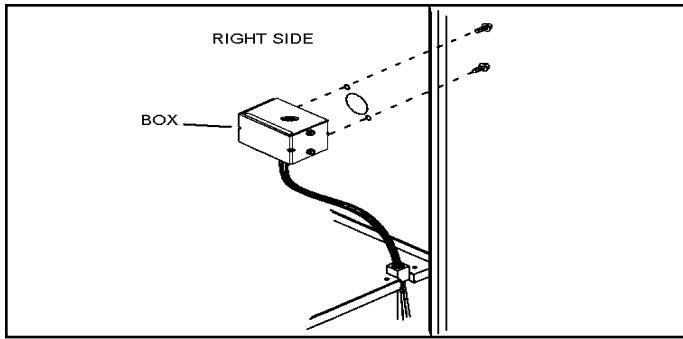


Figure 22. Interior Make-Up Box Installation

NOTE: Unit nameplate states maximum current draw. Maximum over current protection allowed is 15 AMP.

Holes are on both sides of the furnace cabinet to facilitate wiring for cabinet "B" and "C" units. For cabinet "A" model units, the electrical entry for power is only available on the right side of the cabinet.

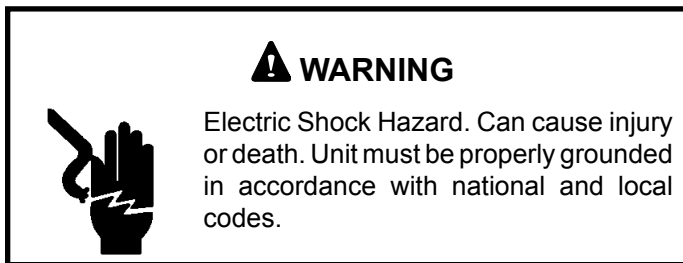
Install a separate (properly sized) disconnect switch near the furnace so that power can be turned off for servicing.

Before connecting the thermostat, check to make sure the wires will be long enough for servicing at a later date. Make sure that thermostat wire is long enough to facilitate future removal of blower for service.

Complete the wiring connections to the equipment. Use the provided unit wiring diagram and the wiring diagram shown in Figure 24 or Figure 25. Use 18 gauge wire or larger that is suitable for Class II rating for thermostat connections.

Electrically ground the unit according to local codes or, in the absence of local codes, according to the current National Electric Code (ANSI/NFPA No. 70). A green ground wire is provided in the field make-up box.

NOTE: This furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.



Accessory Terminals

One line voltage "EAC" 1/4" spade terminal is provided on the furnace integrated control. See Figure 26 or Figure 27 for integrated control configuration. This terminal is energized when the indoor blower is operating. Any accessory rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected

to one of the provided neutral terminals. If an accessory rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

One line voltage "HUM" 1/4" spade terminal is provided on the furnace integrated control. See Figure 26 or Figure 27 for integrated control configuration. This terminal is energized in the heating mode when the combustion air inducer is operating. Any humidifier rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If a humidifier rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

One 24V "H" 1/4" spade terminal is provided on the furnace integrated control. See Figure 26 or Figure 27 for integrated control configuration. The terminal is energized in the heating mode when the combustion air inducer is operating and the pressure switch is closed. Any humidifier rated up to 0.5 amp can be connected to this terminal with the ground leg of the circuit connected to ground or the "C" terminal.

Generator Use - Voltage Requirements

The following requirements must be kept in mind when specifying a generator for use with this equipment:

- The furnace requires 120 volts \pm 10% (Range: 108 volts to 132 volts).
- The furnace operates at 60 Hz \pm 5% (Range: 57 Hz to 63 Hz).
- The furnace integrated control requires both polarity and proper ground. Both polarity and proper grounding should be checked before attempting to operate the furnace on either permanent or temporary power.
- Generator should have a wave form distortion of less than 5% RHO.

Thermostat

Install the room thermostat according to the instructions provided with the thermostat. See Figure 24 or Figure 25 for thermostat designations. If the furnace is being matched with a heat pump, refer to the appropriate dual fuel thermostat instruction.

Indoor Blower Speeds

1. When the thermostat is set to "FAN ON," the indoor blower will run continuously on the fan speed when there is no cooling or heating demand. See Table 15 for allowable continuous circulation speeds.
2. When the unit is running in the heating mode, the indoor blower will run on the heating speed.
3. When there is a cooling demand, the indoor blower will run on the cooling speed.

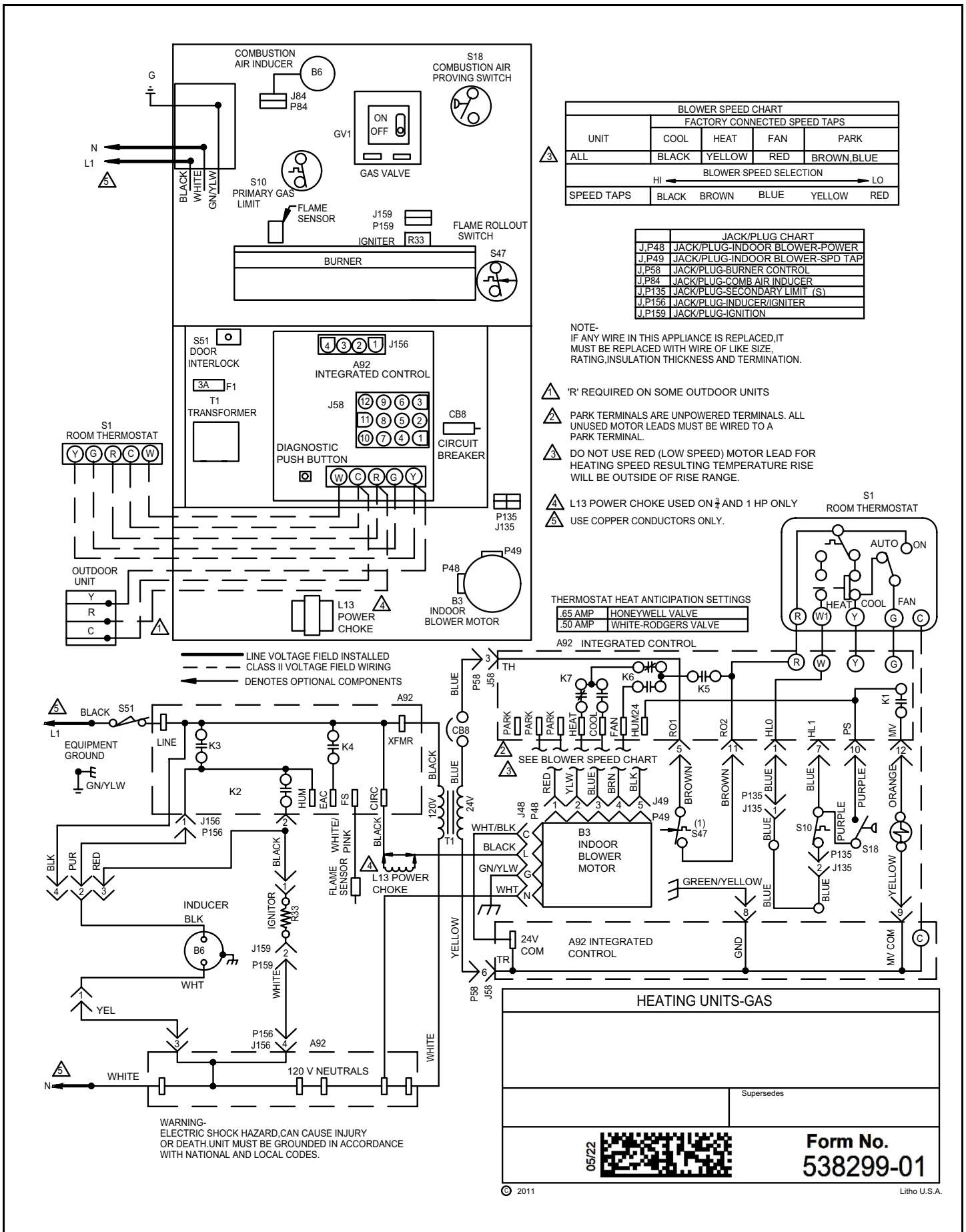


Figure 24. Wiring Diagram - 040, 060, 080 Models

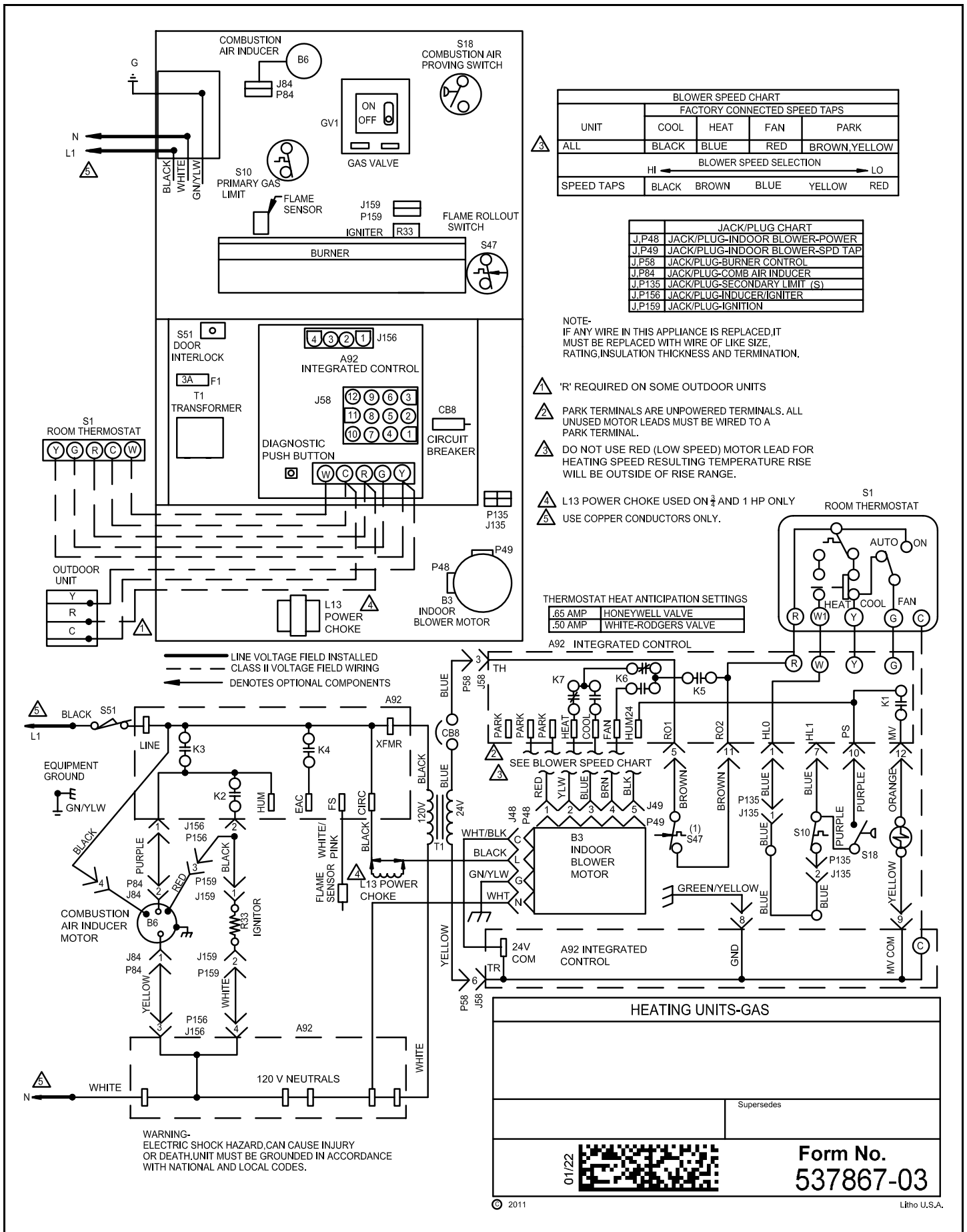


Figure 25. Wiring Diagram - 100 Models

Red LED Flash Code ²	Diagnostic Codes / Status of Furnace
Off	No power to control or control hardware fault detected
Heartbeat ¹	Normal operation - idle, continuous fan, cool
Continuous Rapid Flash	Call for heat / burner operation
1 Flash	Reverse line voltage polarity
2 Flashes	Improper earth ground
3 Flashes	Burner failed to light, or lost flame during heat demand
4 Flashes	Low flame signal - check flame sensor
5 Flashes	Soft lockout - burner failed to light, exceeded maximum number of retries or recycles
6 Flashes	Not used
7 Flashes	Primary or Secondary limit open or soft lockout mode - limit switch open longer than 3 minutes
8 Flashes	Rollout switch open
9 Flashes	Pressure switch failed to close or opened during heat demand
10 Flashes	Soft lockout - Pressure switch opened 5 times during one heat demand
11 Flashes	Pressure switch stuck closed prior to activation of combustion air inducer
12 Flashes	Flame sensed without gas valve energized
13 Flashes	Low line voltage

¹ A "heartbeat" is indicated by a "slow flash" - 1 sec on 1 sec off, repeating

² Error codes are indicated by a "rapid flash" - the LED flashes X times at 1/2 sec on, 1/2 sec off, remains off for 3 sec, then repeats

NOTE: Last 10 error codes are stored in memory, including when power is shut off to the unit. To recall, press and release button. Most recent will be displayed first, LED off for 3 sec, then next error code is displayed, etc. To clear error codes, depress and hold button longer than 5 sec.

Table 7. Diagnostic Codes for 103217-03 Control

Red LED Flash Code ²	Diagnostic Codes / Status of Furnace
Off	No power to control or control hardware fault detected
On	Board Fault Detected
Fast Heartbeat ³	Call for Heat / Burner Operation
Slow Heartbeat ¹	Normal Operation – Idle, Continuous Fan, or Cool
1 Flash ²	Reverse Line Voltage Polarity or Phasing of 120V power
2 Flashes ²	Improper earth ground
3 Flashes ²	Burner failed to light, or lost flame during heat demand
4 Flashes ²	Low flame signal - check flame sensor
5 Flashes ²	Soft lockout – burner failed to light, exceeded maximum number of retries/recycles, 1 hour lockout
6 Flashes ²	Not used
7 Flashes ²	Primary or Secondary limit switch open or soft lockout mode – Limit Switch open longer than 3 minutes
8 Flashes ²	Rollout switch open
9 Flashes ²	Pressure switch failed to close or opened during heat demand
10 Flashes ²	Soft lockout - Pressure switch opened 5 times during one heat demand
11 Flashes ²	Pressure switch stuck closed prior to activation of combustion air inducer
12 Flashes ²	Flame sensed without gas valve energized
13 Flashes ²	Low line voltage

¹ A slow heartbeat is indicated by 1 sec on / 1 sec off. It is used for idle, continuous fan and cool modes.

² Error codes are indicated by a "rapid flash" - the LED flashes X times at 1/2 sec on / 1/2 sec off, remains off for 2 sec, then repeats.

³ A fast heartbeat is indicated by 1/2 sec on / 1/2 sec off. It is only used during a heat call.

NOTE: Last 10 error codes are stored in memory, including when power is shut off to the unit. To recall, press and release button. Most recent will be displayed first, LED off for 3 sec, then next error code is displayed, etc. To clear error codes, depress and hold button longer than 5 sec.

Table 8. Diagnostic Codes for 107163-01 Control

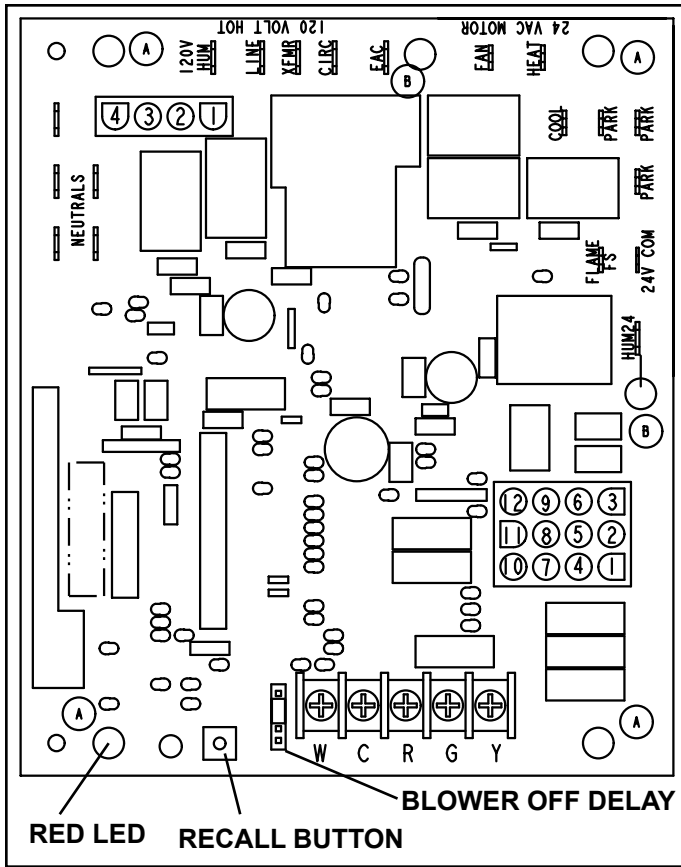


Figure 26. 103217-03 Integrated Control (Automatic Hot Surface Ignition System)

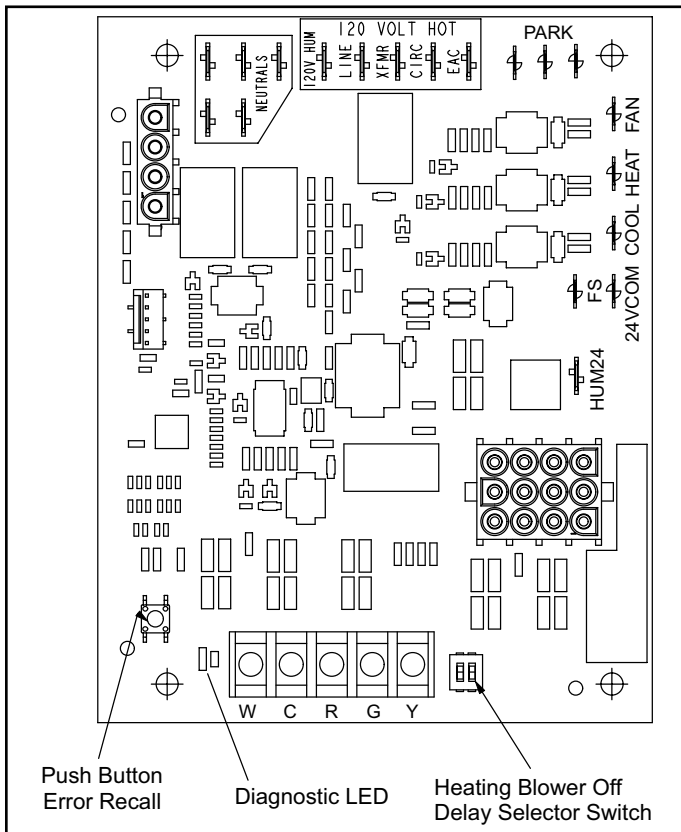


Figure 27. 107163-01 Integrated Control

1/4" Quick Connect Terminal Designations	
120V HUM	Power for Humidifier (120VAC)
LINE	Incoming Power Line (120VAC)
XFMR	Transformer Primary (120VAC)
CIRC	Indoor Blower Motor (120VAC)
EAC	Electronic Air Cleaner (120VAC)
HUM24	Power For Humidifier (24VAC)
NEUTRALS (5)	Neutral
3/16" Quick Connect Terminal Designations	
COOL	Cool Speed From Indoor Blower Motor (24VAC)
HEAT	Heat Speed From Indoor Blower Motor (24VAC)
FAN	Continuous Fan Speed From Indoor Blower Motor (24VAC)
PARK (3)	Terminals For Unused Motor Speed Taps
FS	Flame Sensor Electrode (120VAC)
24V COM	Common (24VAC)

Table 9. Terminal Designations (Applicable to 103217-03 and 107163-01 Controls)

Unit Start-Up

FOR YOUR SAFETY, READ BEFORE LIGHTING UNIT.

⚠ WARNING

Do not use this furnace if any part has been underwater. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. Immediately call a qualified service technician to inspect the furnace and to replace all gas controls, control system parts, and electrical parts that have been wet or to replace the furnace, if deemed necessary.

⚠ WARNING

If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠ CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

The gas valve on this unit will be equipped with a gas control switch. Use only your hand to move the switch. Never use tools. If the switch will not turn or if the control switch will not move by hand, do not try to repair it.

Placing the Furnace into Operation

These units are equipped with an automatic ignition system. Do not attempt to manually light burners on these furnaces. Each time the thermostat calls for heat, the burners will automatically light. The ignitor does not get hot when there is no call for heat on units with an automatic ignition system.

WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or death.

Gas Valve Operation

See Figure 28

1. **STOP!** Read the safety information at the beginning of this section.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the unit.
4. This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Remove the upper access panel.
6. Move switch on gas valve to **OFF**. Do not force. See Figure 28.
7. Wait five minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.

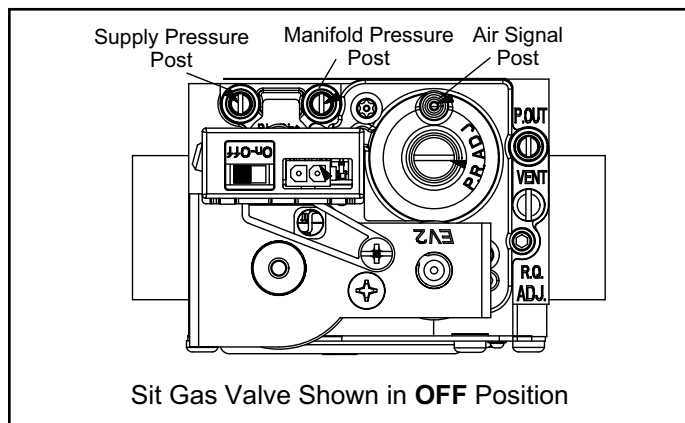


Figure 28. Sit Valve

8. Move switch on gas valve to ON. Do not force. See Figure 28.
9. Replace the upper access panel.
10. Turn on all electrical power to the unit.
11. Set the thermostat to desired setting.

NOTE: When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.

12. If the appliance will not operate, follow the instructions "Turning Off Gas to Unit" and call your service technician or gas supplier.

Turning Off Gas to Unit

1. Set the thermostat to the lowest setting.
2. Turn OFF all electrical power to the unit if service is to be performed.
3. Remove the upper access panel.
4. Move switch on gas valve to OFF. Do not force.
5. Replace the upper access panel.

Failure to Operate

If the unit fails to operate, check the following:

1. Is the thermostat calling for heat?
2. Are access panels securely in place?
3. Is the main disconnect switch closed?
4. Is there a blown fuse or tripped circuit breaker?
5. Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.
6. Is gas turned on at the meter?
7. Is the manual main shut-off valve open?
8. Is the internal manual shut-off valve open?
9. Is the unit ignition system in lock out? If the unit locks out again, call the service technician to inspect the unit for blockages.
10. Is pressure switch closed? Obstructed flue will cause unit to shut off at pressure switch. Check flue and outlet for blockages.
11. Are flame rollout switches tripped? If flame rollout switches are tripped, call the service technician for inspection.

Heating Sequence of Operation

1. When thermostat calls for heat, combustion air blower starts.
2. Combustion air pressure switch proves blower operation. Switch is factory-set and requires no adjustment.
3. After a 15-second prepurge, the hot surface ignitor energizes.
4. After a 20-second ignitor warm-up period, the gas valve solenoid opens. A 4-second trial for ignition period begins.
5. Gas is ignited, flame sensor proves the flame, and the combustion process continues.
6. If flame is not detected after first ignition trial, the ignition control will repeat steps 3 and 4 four more times before locking out the gas valve ("soft lockout" flame failure mode). The ignition control will then automatically repeat steps 1 through 6 after 60 minutes.
7. To interrupt the 60-minute "soft lockout" period, move thermostat from "Heat" to "OFF" then back to "Heat." Heating sequence then restarts at step 1.

Gas Pressure Adjustment

Gas Flow (Approximate)

Gas Meter Clocking Chart				
Model	Seconds for One Revolution			
	Natural Gas		LP / Propane	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
040	90	180	n/a	n/a
060	60	120	150	300
080	45	90	112	224
100	36	72	n/a	n/a

NOTE: Natural - 1000 btu/cu ft; LP / Propane - 2500 btu/cu ft

Table 10.

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. Two revolutions assures a more accurate time. Divide by two and compare to time in Table 10.

NOTE: To obtain accurate reading, shut off all other gas appliances connected to meter.

Supply Pressure Measurement

On multiple unit installations, each unit should be checked separately, with and without units operating. Supply pressure must fall within range listed in Table 11.

IMPORTANT

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

Altitude	Unit	Supply
0 - 7,500 ft.	All	4.5 - 10.5

Table 11. Supply Line Pressure (inches w.c.)

Manifold Pressure

A manifold port is located on the gas valve. Loosen the screws and connect a manometer to measure manifold pressure. The manifold pressure should read 0.00" - 0.10" w.c. Tighten after measurements have been taken.

IMPORTANT

DO NOT ADJUST GAS VALVE

See unit service manual for troubleshooting if manifold pressure and combustion sample do not meet specification.

Proper Combustion

Furnace should operate a minimum 15 minutes with correct gas flow rate before checking combustion. Take combustion sample beyond the flue out let and compare to Table 12. **The maximum carbon monoxide reading should not exceed 100 ppm.**

Unit	CO ₂ % for Nat
040	6.3 - 7.3
060	7.0 - 8.0
080	
100	

Table 12.

High Altitude

Units may be installed at altitudes up to 7,500 ft. above sea level with no changes to the unit.

Other Unit Adjustments

Primary Limit

The primary limit is located on the heating compartment vestibule panel. The secondary limits (if equipped) are located in the blower compartment, attached to the back side of the blower. These auto reset limits are factory-set and require no adjustment.

Thermal Switch

This manually-reset switch is located on the air gas mixing elbow.

Pressure Switch

The pressure switch is located in the heating compartment adjacent to the combustion air inducer. The switch checks for proper combustion air inducer operation before allowing ignition trial. The switch is factory-set and requires no adjustment.

Temperature Rise

After the furnace has been started, and supply and return air temperatures have been allowed to stabilize, check the temperature rise. If necessary, adjust the blower speed to maintain the temperature rise within the range shown on the unit nameplate. See Table 14 for allowable heating speeds. Increase the blower speed to decrease the temperature. Decrease the blower speed to increase the temperature rise. Failure to adjust the temperature rise may cause erratic limit operation.

Fan Control

Ignition Control 103217-03

The fan on time of 45 seconds is not adjustable. The heat fan off delay (amount of time that the blower operates after the heat demand has been satisfied) may be adjusted by changing the jumper position across the five pins on the integrated control. The unit is shipped with a factory fan off delay setting of 90 seconds. The fan off delay affects comfort and is adjustable to satisfy individual applications. Adjust the fan off delay to achieve a supply air temperature between 90° and 110° F at the moment that the blower is de-energized. Longer off delay settings provide lower return air temperatures; shorter settings provide higher return air temperatures. See Figure 29.

Ignition Control 107163-01

The heat fan-on time of 30 seconds is not adjustable. The heat fan-off delay (amount of time that the blower operates after the heat demand has been satisfied) may be adjusted by changing the two position dip switch on the integrated control, to one of four selections. Blower off delay is factory set at 90 seconds. For other blower off delay settings, please refer to Table 13.

	SW2-1	SW2-2
60	OFF	ON
90*	OFF	OFF
120	ON	OFF
180	ON	ON

* Factory setting

Table 13. Blower Delay Select

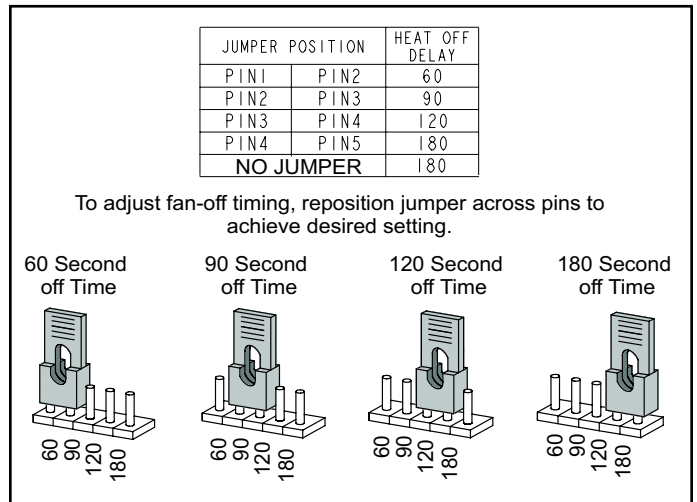


Figure 29. Heat Fan Off Time in Seconds

Constant Torque Motor

These units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speeds. The motor has five speed taps. Each tap requires 24 volts to energize.

Input Voltage Requirements

The circuit is designed to be operated with AC voltage. A voltage of 12 to 33VAC is required to energize the motor. Expected current draw will be less than 20mA.

Blower Speeds

Follow the steps below to change the blower speeds.

1. Turn off electrical power to furnace.
2. Remove blower access panel.
3. Disconnect existing speed tap at integrated control speed terminal.

NOTE: Termination of any unused motor leads must be insulated.
4. Place unused blower speed tap on integrated control "PARK" terminal or insulate.
5. Refer to blower speed selection chart on unit wiring diagram for desired heating or cooling speed. See Product Specifications for blower performance data. See Table 14 for allowable heating speeds.

6. Connect selected speed tap at integrated control speed terminal.
7. Resecure blower access panel.
8. Turn on electrical power to furnace.
9. Recheck temperature rise.

Electronic Ignition

The integrated control has an added feature of an internal soft lockout control. The feature serves as an automatic reset device for integrated control lockout caused by ignition failure. This type of lockout is usually due to low gas line pressure. After one hour of continuous thermostat demand for heat, the soft lockout will reset and remake thermostat demand to the furnace and automatically reset the integrated control to begin the ignition sequence.

Blower Performance

GUH80X040A3M Performance (less filter)

External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds									
	High		Medium-High		Medium		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1389	251	1146	156	1007	111	963	98	945	94
0.20	1355	267	1098	171	935	115	826	89	789	79
0.30	1315	280	1068	184	881	126	768	97	646	75
0.40	1278	287	1022	194	837	133	709	108	593	84
0.50	1247	303	978	203	782	144	646	116	529	92
0.60	1199	317	948	216	719	151	602	126	471	102
0.70	1176	328	899	228	679	163	537	131	422	106
0.80	1128	344	860	235	627	172	500	141	382	115
0.90	1075	347	821	246	577	179	454	146	320	118
1.00	966	322	771	256	546	188	416	154	292	121

GUH80X060A3M Performance (less filter)

External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds									
	High		Medium-High		Medium		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1389	251	1146	156	1007	111	963	98	945	94
0.20	1355	267	1098	171	935	115	826	89	789	79
0.30	1315	280	1068	184	881	126	768	97	646	75
0.40	1278	287	1022	194	837	133	709	108	593	84
0.50	1247	303	978	203	782	144	646	116	529	92
0.60	1199	317	948	216	719	151	602	126	471	102
0.70	1176	328	899	228	679	163	537	131	422	106
0.80	1128	344	860	235	627	172	500	141	382	115
0.90	1075	347	821	246	577	179	454	146	320	118
1.00	966	322	771	256	546	188	416	154	292	121

GUH80X080B4M Performance (less filter)

External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds											
	High		Medium-High		Medium		Medium-Low		Low			
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts		
0.10	1828	419	1640	297	1503	238	1440	209	1240	147		
0.20	1775	438	1571	318	1446	255	1385	229	1187	159		
0.30	1727	457	1515	335	1393	275	1323	244	1110	173		
0.40	1676	473	1477	349	1340	292	1263	259	1058	190		
0.50	1632	490	1422	376	1290	309	1200	276	991	201		
0.60	1575	509	1370	391	1227	326	1154	290	922	218		
0.70	1502	507	1309	407	1171	343	1092	305	869	232		
0.80	1335	460	1267	422	1114	357	1043	320	804	243		
0.90	1115	395	1091	381	1047	367	984	334	735	255		
1.00	829	310	845	322	846	318	858	321	669	266		

GUH80X100C5M Performance (less filter)

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air with Optional Return Air Base, Return Air from Both Sides or Return Air from Bottom and One Side.						Single Side Return Air – Air volumes in bold require field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.													
	High		Med-High		Medium		Med-Low		Low		High		Med-High		Medium		Med-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	2216	637	1961	438	1707	305	1576	245	1457	193	2245	633	1980	427	1763	299	1592	240	1486	194
0.20	2165	663	1921	460	1667	324	1515	255	1323	190	2200	652	1931	454	1685	323	1533	253	1343	189
0.30	2129	684	1853	486	1624	344	1460	275	1262	208	2147	678	1876	474	1640	343	1470	273	1276	205
0.40	2060	710	1818	508	1559	365	1401	294	1193	222	2110	702	1815	491	1574	358	1424	292	1198	219
0.50	2030	726	1775	526	1515	380	1346	317	1134	238	2064	725	1777	516	1525	375	1360	312	1134	236
0.60	1985	749	1707	547	1453	401	1312	332	1080	252	2025	744	1726	533	1476	398	1311	330	1083	253
0.70	1931	769	1662	567	1405	419	1238	346	1012	269	1973	765	1673	558	1417	420	1243	344	1025	268
0.80	1882	789	1617	586	1364	438	1190	364	946	278	1925	788	1636	577	1372	436	1193	361	955	277
0.90	1832	807	1565	606	1317	457	1135	381	893	294	1883	806	1575	597	1312	457	1148	378	908	293
1.00	1727	772	1533	623	1244	468	1059	397	823	304	1785	789	1531	616	1263	469	1089	390	838	301

Allowable Heating Speeds					
Models	Red	Yellow	Blue	Brown	Black
040	Not Allowed	Factory Setting	Allowed	Allowed	Not Allowed
060	Not Allowed	Allowed	Factory Setting	Allowed	Not Allowed
080	Not Allowed	Factory Setting	Allowed	Allowed	Not Allowed
100	Not Allowed	Factory Setting	Allowed	Not Allowed	Not Allowed

Table 14.

Allowable Circulation Speeds					
Models	Red	Yellow	Blue	Brown	Black
All Models	Factory Setting	Not Allowed	Not Allowed	Not Allowed	Not Allowed

Table 15.

Service

WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD.

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death, or property damage. Before servicing, disconnect all electrical power to furnace.

When servicing controls, label all wires prior to disconnecting. Take care to reconnect wires correctly. Verify proper operation after servicing.

WARNING

Blower access panel must be securely in place when blower and burners are operating. If panels are left off, gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

Annual Furnace Maintenance

At the beginning of each heating season, and to comply with the Comfort-Aire / Century Limited Warranty, your system should be checked by a licensed professional technician (or equivalent) as follows:

NOTE: *Burner inspection and service is not recommended for annual furnace maintenance.*

1. Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
2. Inspect all gas pipe and connections for leaks.

3. Check the cleanliness of filters and change if necessary (monthly).
4. Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary.
5. Inspect the combustion air inducer and clean if necessary.
6. Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at www.ahrinet.org. See "Induced-draft Furnace Heat Exchanger Inspection Procedure".
7. Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
8. Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code.
9. Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
10. Check the condition of the furnace cabinet insulation and repair if necessary.
11. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
12. Verify operation of smoke detectors and CO detectors and replace batteries as required.

Perform a general system test. Turn on the furnace to check operating functions such as the start-up and shut-off operation.

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.

2. Verify that system total static pressure and airflow settings are within specific operating parameters.
3. Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure. **Do not check manifold pressure. Manifold pressure is NOT adjustable.**

Repair Parts List

The following repair parts are available through independent Comfort-Aire / Century dealers. When ordering parts, include the complete furnace model number listed on the CSA International nameplate. **All service must be performed by a licensed professional installer (or equivalent), service agency, or gas supplier.**

Cabinet Parts

- Upper access panel
- Blower panel
- Top cap

Control Panel

- Parts Transformer
- Integrated control
- Door interlock switch
- Circuit breaker

Blower Parts

- Blower wheel
- Blower housing
- Motor
- Motor mounting frame
- Motor power choke
- Blower housing cutoff plate

Heating Parts

- Flame sensor
- Heat exchanger assembly
- Gas manifold
- Combustion air inducer
- Gas valve
- Main burner
- Main burner orifice
- Pressure switch
- Ignitor
- Primary limit control
- Rollout switch