



93% CONVERTIBLE MULTISPEED GAS FURNACE INSTALLATION INSTRUCTIONS

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ATTENTION INSTALLATION PERSONNEL

As a professional installer, you have an obligation to know the product better than the customer. This includes all safety precautions and related items. Prior to actual installation, thoroughly familiarize yourself with this instruction manual. Pay special attention to all safety warnings. Often during installation or repair, it is possible to place yourself in a position which is more hazardous than when the unit is in operations.

Remember, it is your responsibility to install the product safely and to know it well enough to be able to instruct a customer in its safe use. Safety is a matter of common sense...a matter of thinking before acting. Most dealers have a list of specific good safety practices...follow them.

The precautions listed in this installation manual are intended as supplemental to existing practices. However, if there is a direct conflict between existing practices and the content of this manual, the precautions listed here take precedence.



Whirlpool Gold® Model
WFD193
WPIO-299F

Whirlpool® Home Cooling and Heating
14610 Breakers Drive
Jacksonville, Florida 32258



GAS FURNACE SAFETY



Recognize this symbol as a safety precaution.



WARNING

Hazards or unsafe practices could result in property damage, product damage, severe personal injury or death.



CAUTION

Hazards or unsafe practices may result in property damage, product damage, personal injury or death.

CAUTION

Hazards or unsafe practices may result in property or product damage.

IMPORTANT SAFETY INSTRUCTIONS

- 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 the "Location Requirements" section of these instructions.
- Provide adequate combustion and ventilation air to the furnace space as specified in the "Venting Requirements" section of these instructions.
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in the "Venting Requirements" section of these instructions.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in the "Make Gas Connections" section of these instructions.
- Adequate clearance must be provided around the vent-air intake terminals.
- Always install furnace to operate within the furnace's intended temperature-rise range with a duct system which has an external static pressure within the allowable range, as specified in the "Complete Installation" section of these instructions. See furnace rating plate.
- When a furnace is installed so that 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.
- A gas-fired furnace for installation in a residential garage must be installed as specified in the "Location Requirements" section of these instructions.
- The furnace shall be installed so the electrical components are protected from water.
- Furnaces for indoor installation on combustible flooring shall not be installed directly on carpeting, tile or other combustible material other than wood flooring.

SAVE THESE INSTRUCTIONS

WARNING

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

— 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.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

Please adhere to the following warnings and cautions when installing, adjusting, altering, servicing or operating the furnace.

DANGER



CARBON MONOXIDE POISONING HAZARD

Special Warning for Installation of Furnace or Air Handling Units in Enclosed Areas such as Garages, Utility Rooms or Parking Areas.

Carbon monoxide producing devices (such as an automobile, space heater, gas water heater, etc.) should not be operated in enclosed areas such as unventilated garages, utility rooms or parking areas because of the danger of carbon monoxide (CO) poisoning resulting from the exhaust emissions. If a furnace or air handler is installed in an enclosed area such as a garage, utility room or parking area and a carbon monoxide producing device is operated therein, there must be adequate, direct outside ventilation.

This ventilation is necessary to avoid the danger of CO poisoning which can occur if a carbon monoxide producing device continues to operate in the enclosed area. Carbon monoxide emissions can be (re)circulated throughout the structure if the furnace or air handler is operating in any mode.

CO can cause serious illness including permanent brain damage or death.

WARNING

Should overheating occur or the gas supply fail to shut off, turn off the manual gas shutoff valve external to the furnace before turning off the electrical supply.

WARNING

To prevent personal injury or death due to improper installation, adjustment, alteration, service or maintenance, refer to this manual. For additional assistance or information, consult a qualified installer, service agency or the gas supplier.

WARNING

This product contains or produces a chemical or chemicals which may cause serious illness or death and which are known to the State of California to cause cancer, birth defects or other reproductive harm.

WARNING

To prevent possible property damage, personal injury or death due to electrical shock, the furnace must be located to protect the electrical components from water.

WARNING

Heating unit should not be utilized without reasonable, routine inspection, maintenance and supervision. If the building in which any such device is located will be vacant, care should be taken that such device is routinely inspected, maintained and monitored. In the event that the building may be exposed to freezing temperatures and will be vacant, all water-bearing pipes should be drained, the building should be properly winterized and the water source closed. In the event that the building may be exposed to freezing temperatures and will be vacant, any hydronic coil units should be drained as well, and, in such case, alternative heat sources should be utilized.

INSTALLATION REQUIREMENTS

These instructions are intended as a general guide only for use by qualified persons and do not supersede any national or local codes in any way. Compliance with all local, state, or national codes pertaining to this type of equipment should be determined prior to installation.

Read this entire instruction manual, as well as the instructions supplied in separate equipment, before starting the installation.

The installation of the furnace, wiring, warm air ducts, venting, etc., must conform to the requirements of the National Fire Protection Association; the National Fuel Gas Code, ANSI Z223.1/NFPA No. 54 (latest edition) and the National Electrical Code, ANSI/NFPA No. 70 (latest edition) in the United States, and any state laws, local ordinances (including plumbing or wastewater codes), or local gas utility requirements.

Local authorities having jurisdiction should be consulted before installation is made. Such applicable regulations or requirements take precedence over the general instructions in this manual.

This furnace design is certified by CSA International as a Category IV furnace in compliance with the latest edition of American National Standard Z21.47/CSA Standard 2.3 for Gas-Fired Central Furnaces, for operation with Natural gas or propane. Consult the rating plate on the furnace for gas type before installing.

Tools and Parts

Gather the required tools and parts before starting installation. Read and follow the instructions provided with any tools listed here.

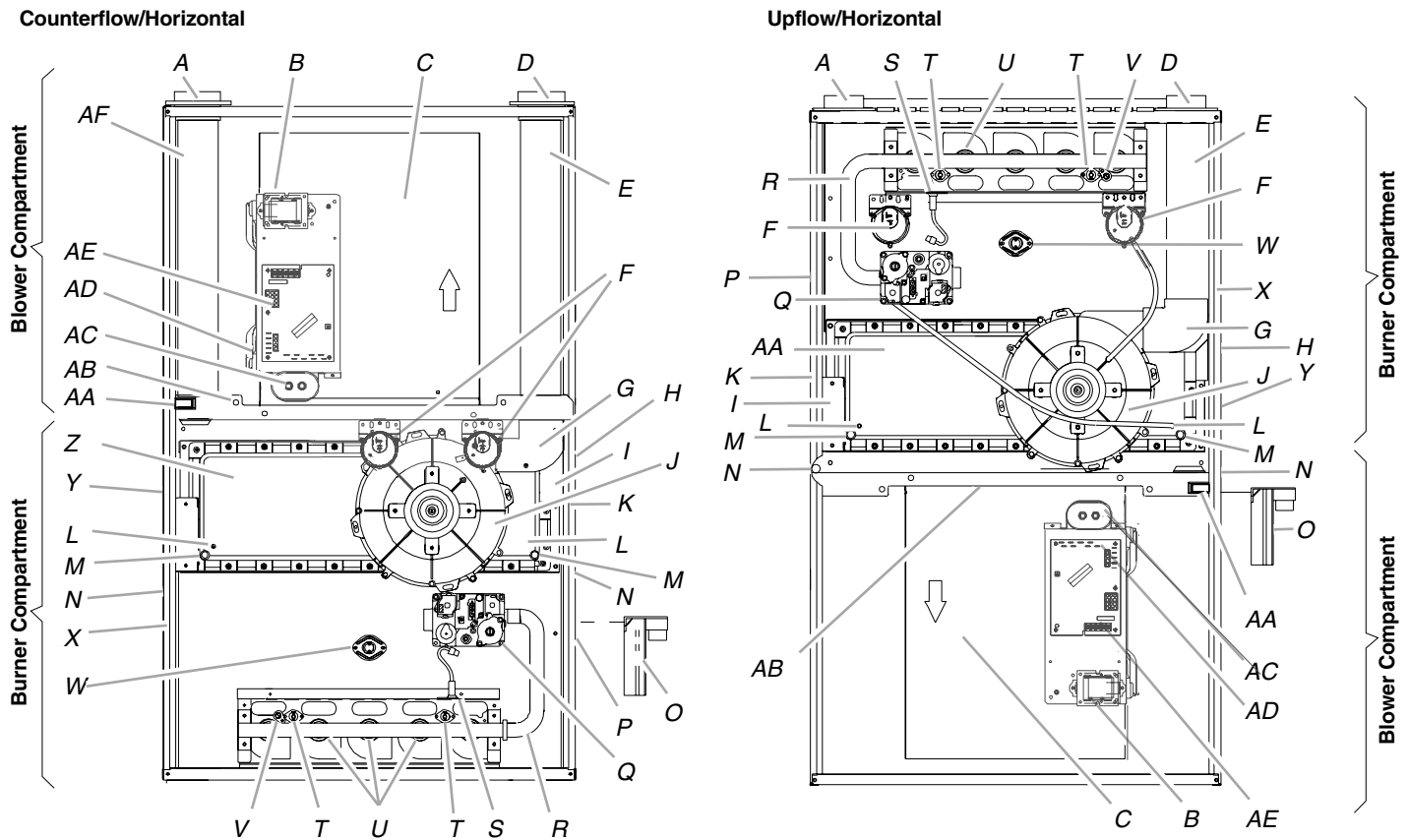
Tools needed

- Pipe wrench
- Noncorrosive leak check solution
- Screwdriver
- Test gauge with 1/8" NPT connection (for measuring gas supply pressure)
- Tape measure
- Thread sealant
- Allen wrench
- Level

Parts needed

Check local codes and with gas supplier. Check existing gas supply, electrical supply, and venting, and read "Ductwork Requirements," "Electrical Requirements," "Gas Supply Requirements" and "Venting Requirements" before purchasing parts.

Component Identification



- | | | | |
|---|----------------------------------|---|--|
| A. Combustion air intake connection | I. Junction box | R. Gas manifold | AA. Blower door interlock switch |
| B. Transformer (40VA) | J. 2-speed induced draft blower | S. Hot surface igniter | AB. Auxiliary limit switch |
| C. ECM variable speed circulator blower | K. Electrical connection inlets | T. Rollout limit switch | AC. Inductor (on some models) |
| D. Flue pipe connection | L. Coil front cover pressure tap | U. Burners | AD. 24-volt thermostat connections |
| E. Flue pipe | M. Coil front cover drain port | V. Flame sensor | AE. 2-stage integrated control module (with fuse and diagnostic LED) |
| F. Pressure switches | N. Drain line penetrations | W. Primary limit switch | AF. Combustion air inlet pipe |
| G. Rubber elbow | O. Drain trap | X. Gas line entrance | |
| H. Flue pipe connection (alternate) | P. Gas line entrance (alternate) | Y. Electrical connection inlets (alternate) | |
| | Q. 2-stage gas control valve | Z. Coil front cover | |

Electrostatic Discharge (ESD)

NOTE: Discharge static electricity accumulated in the body before touching the unit. An electrostatic discharge can adversely affect electrical components.

Use the following steps during furnace installations and servicing to avoid damage to the integrated control module. By putting the furnace, the control and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and non installed (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.

2. Firmly touch a clean, unpainted, metal surface of the furnace near the control. Any tools held in a person's hand during grounding will be discharged also.
3. Service the integrated control module or connect wiring after following the discharge process in Step 2.

NOTE: Do not recharge your body with static electricity by moving or shuffling your feet or touching ungrounded objects. Repeat Step 2 if you touch an ungrounded object.

4. Follow steps 1 through 3 before removing a new control from its container or installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

Location Requirements

WARNING

Possible property damage, personal injury or death due to fire, explosion, smoke, soot, condensation, electrical shock or carbon monoxide may result from improper installation, repair, operation or maintenance of this product.

WARNING

To prevent property damage, personal injury or death due to fire, do not install the furnace in a mobile home, trailer or recreational vehicle.

WARNING

To prevent possible equipment damage, property damage, personal injury or death, the following bullet points must be observed when installing the unit.

Follow the instructions listed below when selecting a furnace location. Refer also to the guidelines provided in "Combustion and Ventilation Air Requirements."

- Centrally locate the furnace with respect to the proposed or existing air distribution system.
- Check that the temperature of the return air entering the furnace is between 55°F and 100°F (12.8°C and 37.8°C) when the furnace is heating.
- Provide provisions for venting combustion products outdoors through a proper venting system. Special consideration should be given to the vent/flue pipe routing and the combustion air intake pipe when applicable. Refer to "Vent/Flue Pipe and Combustion Air Pipe—Termination Locations" for appropriate termination locations and to determine if the piping system from the furnace to the termination can be accomplished within the guidelines given.

NOTE: The length of flue and/or combustion air piping can be a limiting factor in the location of the furnace.

- Locate the furnace so that the condensate flows downward to the drain.

NOTE: Do not locate the furnace or its condensate drainage system in any area subject to below freezing temperatures without the proper freeze protection. Refer to "Condensate Drain Lines and Trap."

- Check that adequate combustion air is available for the furnace. Improper or insufficient combustion air can expose building occupants to gas combustion products that could include carbon monoxide. Refer to "Combustion and Ventilation Air Requirements."
- Set the furnace on a level floor to enable proper condensate drainage. If the floor becomes wet or damp at times, place the furnace above the floor on a concrete base sized approximately 1½" (3.8 cm) larger than the base of the furnace. Refer to "Horizontal Applications and Considerations" for leveling of horizontal furnaces.
- Check that the upflow or horizontal furnaces are not installed directly on carpeting, or any other combustible material.
NOTE: The only combustible material allowed is wood.
- A special accessory subbase must be used for the upright counterflow unit installations over any combustible material (including wood). Refer to subbase instructions for installation details.

NOTE: A subbase will not be required if an air conditioning coil is located beneath the furnace between the supply air opening and the combustible floor.

- Exposure to contaminated combustion air will result in safety and performance-related problems.

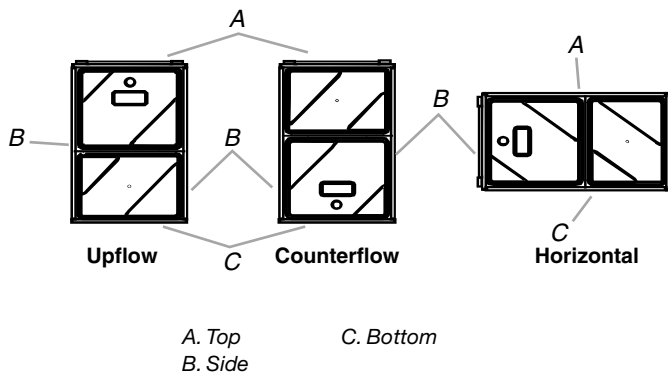
NOTE: Do not install the furnace where the combustion air is exposed to the following substances:

- Chlorinated waxes or cleaners
- Chlorine-based swimming pool chemicals
- Water softening chemicals
- Deicing salts or chemicals
- Carbon tetrachloride
- Halogen-type refrigerants
- Cleaning solutions (such as perchloroethylene)
- Printing inks
- Paint removers
- Varnishes
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials

- Seal off a nondirect vent furnace if it is installed near an area frequently contaminated by any of the above substances. This protects the nondirect vent furnace from airborne contaminants. To ensure that the enclosed nondirect vent furnace has an adequate supply of combustion air, vent from a nearby uncontaminated room or from outdoors. Refer to "Combustion and Ventilation Air Requirements."
- If the furnace is used in connection with a cooling unit, install the furnace upstream or in parallel with the cooling unit. Premature heat exchanger failure will result if the cooling unit is placed ahead of the furnace.
- If the furnace is installed in a residential garage, position the furnace so that the burners and ignition source are located not less than 18" (45.7 cm) above the floor. Protect the furnace from physical damage by vehicles.
- If the furnace is installed horizontally, the furnace access doors must be vertical so that the burners fire horizontally into the heat exchanger.
- **NOTE:** Do not install the unit with the access doors on the "up/top" or "down/bottom" side of the furnace.

Installation Clearances and Accessibility

- The minimum clearance information for this furnace is provided on the furnace's clearance label. These clearances must be permanently maintained.
- Clearances must accommodate an installation's gas, electrical, drain trap and drain line connections.
- If the alternate combustion air intake or vent/flue connections are used, additional clearance must be provided to accommodate these connections. See "Plan Vent System."
- A furnace installed in a confined space (for example, a closet or utility room) must have 2 ventilation openings with a total minimum free area of 0.25 sq. in. (1.6 cm²) per 1,000 Btu/h of furnace input rating. Refer to Specification Sheet applicable to your model for minimum clearances to combustible surfaces. One of the ventilation openings must be within 12" (30.5 cm) of the top; the other opening must be within 12" (30.5 cm) of the bottom of the confined space. In a typical construction, the clearance between the door and door frame is usually adequate to satisfy this ventilation requirement.
- All servicing and cleaning of the furnace can be performed from the front. If installed in a closet or utility room, provide 24" (61 cm) clearance in front for service if the door to the room is not in line with the front of the furnace. Where servicing clearances are greater than clearances to combustibles, servicing clearances take precedence.



High Altitude Installations

High Altitude Derate

When this furnace is installed at high altitudes, the appropriate high altitude orifice kit must be used. This is required due to the natural reduction in the density of both the gas fuel and combustion air as altitude increases. The kit will provide the proper design-certified input rate within the specified altitude range.

High altitude kits are purchased according to the installation altitude and usage of either Natural or propane gas. Contact your local distributor for a tabular listing of appropriate altitude ranges and corresponding manufacturer's high altitude (Natural, propane gas and/or pressure switch) kits.

NOTE: Do not derate the furnace by adjusting the manifold pressure to a lower pressure than specified on the furnace rating plate. The combination of the lower air density and a lower manifold pressure will keep the burner orifice from drawing the proper amount of air into the burner. This may cause incomplete combustion, flashback and possible yellow tipping.

In some areas, the gas supplier may artificially derate the gas in an effort to compensate for the effects of altitude. If the gas is artificially derated, the appropriate orifice size must be determined based upon the Btu/ft³ content of the derated gas and the altitude. Refer to the National Fuel Gas Code, NFPA54/ANSI Z223.1 and information provided by the gas supplier to determine the proper orifice size.

A different pressure switch may be required at high altitudes regardless of the Btu/ft³ content of the fuel used. Contact your local distributor for a tabular listing of appropriate altitude ranges and corresponding manufacturer's pressure switch kits.

Propane Gas/High Altitude Installations

WARNING

Possible property damage, personal injury or death may occur if the correct conversion kits are not installed. The appropriate kits must be applied to insure safe and proper furnace operation. All conversions must be performed by a qualified installer or service agency.

This furnace is shipped from the factory configured for Natural gas at standard altitude. Propane gas installations require an orifice change to compensate for the energy content difference between Natural and propane gas.

High altitude installations may require both a pressure switch and an orifice change. These changes are necessary to compensate for the natural reduction in the density of both the gas fuel and the combustion air at higher altitude.

For installations above 7,000 ft (2,133.6 m), refer to your local distributor for required kit(s).

Gas	Altitude	Kit	Orifice	Manifold Pressure		Pressure Switch Change
				High Stage	Low Stage	
Natural	0 to 7,000 ft	None	#43	3.5" W.C.	1.9" W.C.	None
Propane	(2,133.6 m)	LPM-05	#55	10.0" W.C.	6.0" W.C.	None

NOTE: In Canada, gas furnaces are only certified to 4,500 ft (1,371.6 m).

Contact your local distributor for a tabular listing of appropriate manufacturer's kits for propane gas and/or high altitude installations. The indicated kits must be used to insure proper furnace operation. All conversions must be performed by a qualified installer or service agency.

Installation Configurations

This furnace may be installed in an upright position or horizontal on either the left or right side panel.

NOTE: Do not install this furnace on its back.

For upright upflow furnaces, the return air ductwork may be attached to the side panel(s) and/or base pan.

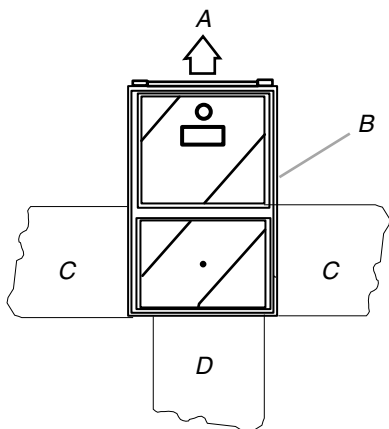
For horizontal upflow furnaces, the return air ductwork must be attached to the base pan.

For both the upright or horizontal counterflow furnaces, the return air ductwork must be attached to the base pan (top end of the blower compartment).

NOTE: Do not attach the ductwork to the back of the furnace.

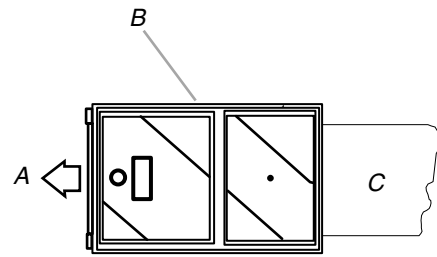
Contact your local distributor for the proper airflow requirements and the number of required ductwork connections. See the "Recommended Installation Positions" illustrations for the appropriate installation positions, ductwork connections and the resulting airflow arrangements.

Recommended Installation Positions—Upright Upflow



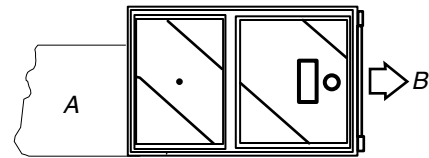
- A. Air discharge
- B. Alternate flue pipe location
- C. Side return duct connections
- D. Bottom return duct connection

Recommended Installation Positions—Horizontal Upflow—Left Side Panel Discharge



- A. Air discharge
- B. Alternate flue pipe location
- C. Bottom return duct connection

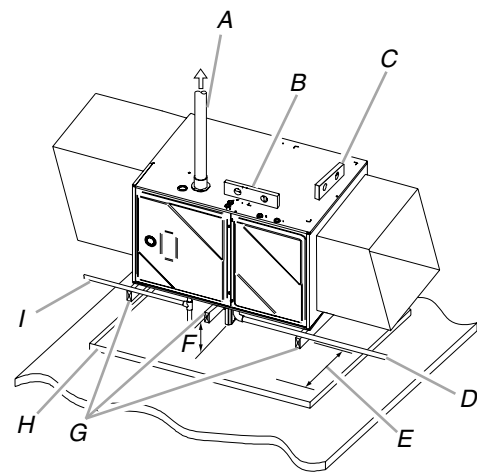
Recommended Installation Positions—Horizontal Upflow—Right Side Panel Discharge



- A. Bottom return duct connection
- B. Air discharge

Installation for Horizontal Applications

Horizontal applications dictate airflow direction, ductwork connections and flue and combustion air pipe connections. The basic application of this furnace as a horizontal furnace differs only slightly from an upright installation. When installing a furnace horizontally, additional consideration must be given to the drain trap and lines, leveling the furnace, alternate vent/flue and combustion air connections, alternate electrical and gas line connections, the drain pan, freeze avoidance and furnace suspension.



- A. Alternate vent/flue location
- B. Level end-to-end
- C. Level side-to-side or slightly tilted—doors 0" to 3/4" (1.9 cm) below back panel
- D. Drain line—1/4" (6.4 mm) per foot downward slope
- E. 24" (61 cm) minimum service clearance
- F. 4 3/4" (12.1 cm) minimum drain trap clearance
- G. Supports at both ends and middle
- H. Drain pan
- I. Gas line with 3" (7.6 cm) minimum drip leg

Drain Trap and Lines

In horizontal applications, the condensate drain trap is secured to the furnace side panel, suspending it below the furnace. A minimum clearance of 4¾" (12.1 cm) below the furnace must be provided for the drain trap. Additionally, the appropriate downward piping slope must be maintained from the drain trap to the drain location. See "Condensate Drain Trap and Lines." If the drain trap and drain line will be exposed to temperatures near or below freezing, adequate measures must be taken to avoid condensate from freezing.

Leveling

Leveling ensures proper condensate drainage from the heat exchanger and induced draft blower. For proper flue pipe drainage, the furnace must be level lengthwise from end to end. The furnace should also be level from back to front, or have a slight tilt with the access doors sloping downward ¾" (1.9 cm) lower than the back panel. The slight tilt allows the heat exchanger condensate, generated in the recuperator coil, to flow forward to the recuperator coil front cover.

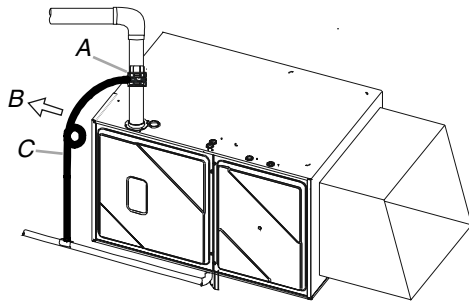
Alternate Vent/Flue Connections

In horizontal installations, provisions for alternate flue piping are available for counterflow furnaces with right air discharge. This configuration allows the flue piping to be run vertically through the furnace. See "Recommended Installation Positions" illustrations for further details. The standard piping connections may also be used in these positions. See "Vent/Flue Pipe and Combustion Air Pipe" for details concerning the conversion to the alternate vent/flue connections.

When using the horizontal alternate vent configuration, you must use the RF000142 vent drain kit. See "Alternate Flue/Vent Location" illustration.

NOTE: Alternate vertical piping connections cannot be used when an upflow furnace is installed with the supply air discharging to the right, or when a counterflow furnace is installed with the supply air discharging to the left. In either case, use the standard flue and combustion air piping connections.

Alternate Flue/Vent Location



A. Vent/Drain
B. Airflow
C. Field supplied drain hose

NOTES:

- The field supplied drain hose is connected from the vent/drain connection to the condensate drain line with a field supplied connector.
- Make a small loop in the drain hose to serve as a P-trap.

Alternate Electrical and Gas Line Connections

This furnace has provisions allowing for electrical and gas line connections through either side panel. In horizontal applications, the connections can be made either through the top or bottom of the furnace.

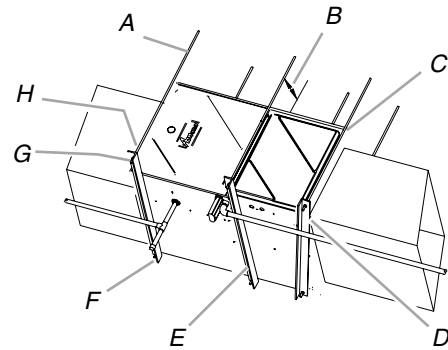
Freeze Avoidance

See "Horizontal Applications and Conditions—Drain Trap and Lines."

Furnace Suspension

If suspending the furnace from rafters or joists, use ¾" (1 cm) threaded rod and 2" x 2" x ⅛" (5.1 cm x 5.1 cm x 3.2 mm) angle iron as shown in the "Suspended Furnace" illustration. The length of the rod will depend on the application and the clearances necessary.

Suspended Furnace



- A. ¾" (1 cm) diameter threaded rod (6)
- B. 8" (20.3 cm) minimum clearance between center rod and furnace cabinet to allow for circulator blower removal.
- C. Level furnace end to end, slight forward tilt with front 0" to ¾" (1.9 cm) below back.
- D. Tilt outward to allow for door and circulator blower removal.
- E. Position as close as possible to blower deck to allow for circulator blower removal.
- F. 2" x 2" x ⅛" (5.1 cm x 5.1 cm x 3.2 mm) angle iron (3)
- G. Support nuts
- H. Hold down nuts

Ductwork Requirements

- Install all conditioned air plenums, ducts and air filters (if not provided on the furnace) in accordance with NFPA 90B Standard for the Installation of Warm Air Heating and Air-Conditioning Systems (latest edition).
- The furnace is provided with flanges for the connection of the plenum and ducts.
- All air filters must be listed as Class 2 furnace air filters.
- All ductwork must be made of materials and insulated to meet local, state and national codes. Ductwork installed outdoors must be sealed, weatherproof and kept from physical damage. Caulking, flashing or other means of adequately providing a permanent weather seal should be used where duct penetrates a building or structure opening.
- A closed return duct system must be used with the return duct connected to the furnace.

- Do not attach ductwork to the back of the furnace.
- Flexible joints may be used for supply and return connections to reduce noise transmission.
- A connecting duct must be installed between the furnace and the utility room wall to keep the blower from interfering with combustion air or draft when a central return is used.
- Do not use a room, closet or alcove as a return air chamber.
- For models with airflow over 1,800 CFM, install a bottom return, 2 side returns or 1 side and 1 bottom return.

Electrical Requirements

WARNING



Electrical Shock Hazard

Electrically ground furnace.

Connect ground wire to green ground screw.

Failure to do so can result in death or electrical shock.

- The furnace must be grounded and wired in accordance with local codes or, in the absence of local codes, with the National Electrical Code ANSI/NFPA No. 70 (latest edition).
- In all instances, other than wiring for the thermostat, the wiring to be done and any replacement of wire shall conform with the temperature limitation for Type T wire (63°F [17°C] rise).
- The line voltage supply should be routed through a readily accessible disconnect located within sight of the furnace. A junction box on the furnace side panel is provided for line voltage connections. See the Wiring Connection Diagram in the “Troubleshooting” section for specific connection information.

- Proper polarity of the supply connections (“HOT” and “NEUTRAL”) must be observed to be sure that the control system provides the damage avoidance intended.

Gas Supply Requirements

This unit is equipped for use with Natural gas. A conversion kit is required for use with propane. To order the correct conversion kit, see your local distributor.

- Gas supply piping should be installed in accordance with local, state and national codes and the regulations of the utility. Piping must be of adequate size to prevent undue pressure drop. Consult the local utility or gas supplier for complete details on special requirements for sizing gas piping.
- If local codes allow the use of a flexible gas appliance connector, use a CSA design-certified outdoor flexible stainless steel appliance connector or rigid gas supply line as needed.

Venting Requirements

Adequate provisions for combustion air and ventilation of furnace must be made. Refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 (latest edition), or applicable provisions of the local building codes.

WARNING

Failure to follow these instructions can result in bodily injury or death. Carefully read and follow all instructions given in this section.

WARNING

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

Existing Venting Systems

When an existing furnace is removed or replaced, the original venting system may no longer be sized to properly vent the attached appliances. An improperly sized venting system can result in the spilling of flue products into the living space, the formation of condensate, leakage, etc. See the “Carbon Monoxide Poisoning Hazard” for proper test procedure.



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 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 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 appliances to their previous conditions of use.

Combustion and Ventilation Air Requirements



WARNING

To avoid property damage, personal injury or death, sufficient fresh air for proper combustion and ventilation of flue gases must be supplied. Most homes require outside air be supplied into the furnace area.

Improved construction and additional insulation in buildings have reduced heat loss by reducing air infiltration and escape around doors and windows. These changes have helped in reducing heating/cooling costs, but have created a problem supplying combustion and ventilation air for gas-fired and other fuel burning appliances. Appliances that pull air out of the house (clothes dryers, exhaust fans, fireplaces, etc.) increase the problem by starving appliances for air.

House depressurization can cause back drafting or improper combustion of gas-fired appliances, thereby exposing building occupants to gas combustion products that could include carbon monoxide.

If this furnace is to be installed in the same space with other gas appliances, such as a water heater, be sure that there is an adequate supply of combustion and ventilation air for the other appliances. Refer to the latest edition of the National Fuel Gas Code NFPA 54/ANSI Z223.1 (Section 5.3), or CSA B149.1-05 Installation Codes (Sections 7.2, 7.3 or 7.4), or applicable provisions of the local building codes for determining the combustion air requirements for the appliances.

Most homes will require outside air to be supplied to the furnace area by means of ventilation grilles or ducts connecting directly to the outdoors or spaces open to the outdoors such as attics or crawl spaces.

Venting Options

The furnace can be installed as either direct vent or nondirect vent furnace.

For either type of installation, special venting considerations must be followed. See “Determine Vent Pipe Direction” for the type of furnace and venting being installed.

Vent/Flue Pipe and Combustion Air Pipe

A condensing gas furnace achieves its high level of efficiency by extracting almost all of the heat from the products of combustion and cooling them to the point where condensation takes place. Because of the relatively low flue gas temperature and water condensation requirements, PVC pipe is used as venting material.

NOTES:

- This furnace must not be connected to Type B, BW, or L vent or vent connector, and must not be vented into any portion of a factory-built or masonry chimney except when used as a pathway for PVC.
- Do not common vent this appliance with another appliance or use a vent which is used by a solid fuel appliance.
- Do not use commercially available “no hub connectors” other than those shipped with this product.

It is the responsibility of the installer to follow the manufacturers' recommendations and to verify that all vent/flue piping and connectors are compatible with furnace flue products.

Additionally, it is the responsibility of the installer to ensure that all piping and connections possess adequate structural integrity and support to avoid flue pipe separation, shifting or sagging during furnace operation.

Dual Certification: Nondirect/Direct Vent

This furnace is dual certified and may be installed as a nondirect vent (single pipe) or direct vent (dual pipe) appliance. A nondirect vent installation requires only a vent/flue pipe, while a direct vent installation requires both a vent/flue pipe and a combustion air intake pipe.

Unconfined Space

An unconfined space is defined as "a space whose volume is more than 50 cu. ft (1.4 m³) per 1,000 Btu/h of the combined input rating of all appliances installed in that space."

When a furnace is installed in an unconfined space in a building, it can be assumed that the infiltration will be sufficient to supply the required air.

If the furnace is installed in a ventilated attic or crawl space, it is assumed that the air infiltration is sufficient to supply the required combustion air. However, in a building of unusually tight construction, additional outdoor air should be provided.

Confined Space

A confined space is defined as "a space whose volume is less than 50 cu. ft (1.4 m³) per 1,000 Btu/h of the combined input rating of all appliances installed in that space." Use direct vent method. See "Plan Vent System."

Contaminated Combustion Air

Excessive exposure to contaminated combustion air will result in performance related problems. The recommended source of combustion air is outdoor air.

Outdoor Air as the Source of Combustion Air

If the furnace is installed in a confined space, it is recommended that the necessary combustion air come from the outdoors by way of an attic, crawl space, air duct, or direct opening.

Outdoor air is required as the source of combustion air when the indoor air is contaminated with chemical substances and in the following types of installations:

- Furnaces installed in commercial buildings
- Furnaces installed in buildings with indoor pools
- Furnaces installed in hobby or craft rooms
- Furnaces installed near chemical storage areas
- Furnaces installed in laundry rooms
- Furnaces installed in hair salons

Indoor Air as the Source of Combustion Air

Indoor air as the source of combustion air is acceptable in most applications if the following guidelines are met:

- All provisions for indoor combustion air must meet the requirements for combustion air indicated in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 (latest edition), and/or any applicable local codes.
- If indoor combustion air is used, the air supply to the furnace should not be exposed to the following substances:
 - Permanent wave solutions
 - Chlorinated waxes and cleaners
 - Chlorine-based swimming pool chemicals
 - Water softening chemicals
 - Deicing salts or chemicals
 - Carbon tetrachloride
 - Halogen-type refrigerants
 - Cleaning solvents (such as perchloroethylene)
 - Printing inks, paint removers, varnishes, etc.
 - Cements and glues
 - Antistatic fabric softeners for clothes dryers
 - Masonry acid washing materials
 - Chlorinated laundry products
 - Hydrochloric acid

INSTALLATION INSTRUCTIONS

Inspect Shipment

This furnace is shipped in one package, completely assembled and wired. The indoor thermostat and accessories are shipped in a separate carton when ordered.

- Check the furnace rating plate to confirm specifications are as ordered.
- Upon receipt of the furnace, inspect it for possible shipping damage. Examine the furnace inside the carton if the carton is damaged.

- If damage is found, it should be noted on the carrier's freight bill. Damage claims should be filed with the carrier immediately. Claims of shortages should be filed with the seller within 5 days.

NOTE: If any damages are discovered and reported to the carrier, do not install the furnace, because your claim may be denied.

Plan Vent System

WARNING

Failure to follow these instructions can result in bodily injury or death. Carefully read and follow all instructions given in this section.

WARNING

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

IMPORTANT: The venting system must be supported with mounting straps to keep any weight load from being applied to the vent blower. Horizontal vent pipe must be supported every 5 ft (1.5 m) and vertical pipe should be supported every 10 ft (3 m) to avoid sagging and provide rigid support.

Materials

- All pipe, fittings, primer, and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM) standards. The solvent shall be free flowing and contain no lumps, undissolved particles, or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall show no gelatinization, stratification, or separation that cannot be removed by stirring. See Piping and Fitting Specifications chart for approved piping and fitting materials.

WARNING

To avoid bodily injury, fire or explosion, solvent cements must be kept away from all ignition sources (for example, sparks, open flames and excessive heat) as they are combustible liquids. Avoid breathing cement vapors or contact with skin and/or eyes.

Piping and Fitting Specifications

Piping and Fitting Material	ASTM Specification
Schedule 40 PVC (Pipe)	D1785
Schedule 40 PVC (Cellular Core Pipe)	F891
Schedule 40 PVC (Fittings)	D2466
SDR-26 (Pipe)	D2241
Schedule 40 ABS (Pipe)	D1527
Schedule 40 ABS (Fittings)	D2468
Schedule 40 & 80 CPVC (Pipe)	F441
ABS-DWV Drain Waste and Vent (Pipe and Fittings)	D2661, D3311
PVC-DWV Drain Waste and Vent (Pipe and Fittings)	D2665, D3311

2" or 3" (5.1 cm or 7.6 cm) nominal diameter PVC Schedule 40 pipe meeting ASTM D1785, PVC primer meeting ASTM F656 and PVC solvent cement meeting ASTM D2564 specifications must be used. Fittings must be DWV type fittings meeting ASTM D2665 and ASTM D3311. Carefully follow the manufacturer's instructions for cutting, cleaning and solvent cementing of PVC.

Schedule 40 PVC Cellular Core (Foam Core) Plastic Pipe is a coextruded poly (vinyl chloride) (PVC) plastic pipe with a cellular core (contains numerous cells intentionally introduced, interconnecting or not, distributed throughout the pipe) and concentric inner and outer solid layers. PVC primer meeting ASTM F656 and PVC solvent cement meeting ASTM D2564 specifications must be used. Fittings must be DWV type fittings meeting ASTM D2665 and ASTM D3311. Carefully follow the manufacturer's instructions for cutting, cleaning and solvent cementing of PVC.

To ensure proper furnace operation, this Schedule 40 PVC Cellular Core (Foam Core) Plastic Pipe must be installed in accordance with the installation instructions, all local building codes and ordinances. In their absence, follow the latest edition of the National Fuel Gas Code (NFPA 54/ANSI Z223.1), and or CAN/CGA B149 Installation Codes, local plumbing or wastewater codes, and other appliance codes.

Canadian Venting Requirements

In Canada, venting must conform to the requirements of the current CAN/CSA-B149.1-05 Installation Code. Use only CSA-listed, ULC-S636 compliant 2" or 3" diameter PVC, PVC ceill core or ABS pipe, solvent cement and fittings throughout. The certified piping should be clearly marked with the ULC Std "S636" on the pipe and fittings. Follow the manufacturer's instructions for cutting, cleaning and solvent cementing PVC and/or ABS.

The vent can be run through an existing unused chimney provided the space between the vent pipe and the chimney is insulated and closed with a weather-tight, corrosion-resistant flashing.

Schedule 40 PVC Cellular Core (Foam Core) Plastic Pipe is not approved for use in Canada. CSA does not have a Reference Standard for Cellular Core PVC Plastic Pipe.

Direct Vent Applications

Refer to the following tables for applicable length, elbows and pipe diameter for construction of the vent/flue and combustion air intake pipe systems of a direct vent (dual pipe) installation. The number of elbows tabulated represents the number of elbows and/or tees in each vent/flue and combustion air intake pipe. Elbows and/or tees used in the terminations must be included when determining the number of elbows in the piping systems.

If the combustion air intake pipe is to be installed above a finished ceiling or other area where dripping of condensate will be objectionable, insulation of the combustion air pipe may be required. Use ½" (1.3 cm) thick closed cell foam insulation where required.

Direct Vent (Dual Pipe) Maximum Allowable Length of Vent/Flue and Combustion Air Intake Pipe—ft (m)

Unit Input (Btu)	Vent/Flue Air		Number of Elbows						
	Intake Termination	Pipe Size—in. (cm)	2	3	4	5	6	7	8
045_3	Standard	2 or 2½ (5.12 or 6.4)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	2 or 2½ (5.12 or 6.4)	55 (16.8)	52 (15.9)	49 (14.9)	46 (14)	43 (13.1)	40 (12.2)	37 (11.3)
070_3	Standard	2 or 2½ (5.12 or 6.4)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	2 or 2½ (5.12 or 6.4)	55 (16.8)	52 (15.9)	49 (14.9)	46 (14)	43 (13.1)	40 (12.2)	37 (11.3)
070_4	Standard	2 or 2½ (5.12 or 6.4)	46 (14)	43 (13.1)	40 (12.2)	Not Recommended			
	Alternate	2 or 2½ (5.12 or 6.4)	33 (10.1)	30 (9.1)	27 (8.2)				
070_4	Standard	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	3 (7.6)	54 (16.5)	51 (15.5)	48 (14.6)	45 (13.7)	42 (12.8)	39 (11.9)	36 (11)
090_4	Standard	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	3 (7.6)	55 (16.8)	52 (15.9)	49 (14.9)	46 (14)	43 (13.1)	40 (12.2)	37 (11.3)
090_5	Standard	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	3 (7.6)	55 (16.8)	52 (15.9)	49 (14.9)	46 (14)	43 (13.1)	40 (12.2)	37 (11.3)
115_5	Standard	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
	Alternate	3 (7.6)	55 (16.8)	52 (15.9)	49 (14.9)	46 (14)	43 (13.1)	40 (12.2)	37 (11.3)

NOTES:

- Elbows and/or tees used in the terminations must be included when determining the number of elbows in the piping system.
- Number of elbows tabulated are for each vent/flue and combustion air intake pipe.
- Minimum length of each vent/flue and combustion air intake pipe is 5 ft (1.5 m) and one elbow/tee.
- 2½" (6.4 cm) or 3" (7.6 cm) diameter pipe can be used in place of 2" (5.1 cm) diameter pipe.

Nondirect Vent Applications

Refer to the following tables for applicable length, elbows and pipe diameter for construction of the vent/flue pipe systems of a nondirect vent (single pipe) installation. In addition to the vent/flue pipe, a single 90° elbow should be secured to the combustion air intake to avoid inadvertent blockage. The tee used in the vent/flue termination must be included when determining the number of elbows in the piping system.

Nondirect Vent (Single Pipe) Maximum Allowable Length of Vent/Flue Pipe—ft (m)

Models (kBtu_Tons)	Pipe Size—in. (cm)	Number of Elbows						
		2	3	4	5	6	7	8
045_3	2 or 2½ (5.12 or 6.4)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
070_3	2 or 2½ (5.12 or 6.4)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
070_4	2 or 2½ (5.12 or 6.4)	46 (14)	43 (13.1)	40 (12.2)	Not Recommended			
070_4	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
090\$	2 or 2½ (5.12 or 6.4)	16 (4.9)	13 (4)	10 (3)	Not Recommended			
	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
090_5	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)
115_5	3 (7.6)	68 (20.7)	65 (19.8)	62 (18.9)	59 (18)	56 (17.1)	53 (16.2)	50 (15.2)

NOTES:

- One 90° elbow should be secured to the combustion air intake connection.
- Tee used in the vent/flue termination must be included when determining the number of elbows in the piping system.
- Minimum length of each vent/flue pipe is 5 ft (1.5 m) and one elbow/tee.
- 2½" (6.4 cm) or 3" (7.6 cm) diameter pipe can be used in place of 2" (5.1 cm) diameter pipe.

Determine Vent Pipe Direction

The vent system of the furnace must be self-supporting and must not apply any weight load to the combustion blower.

Combustion Air Sources

There are 2 sources for combustion air:

1. From outside the building (Direct Vent)
2. From inside the building (Nondirect Vent)

Please read the information provided here about vertical and horizontal venting, then find and follow the instructions for your venting configuration.

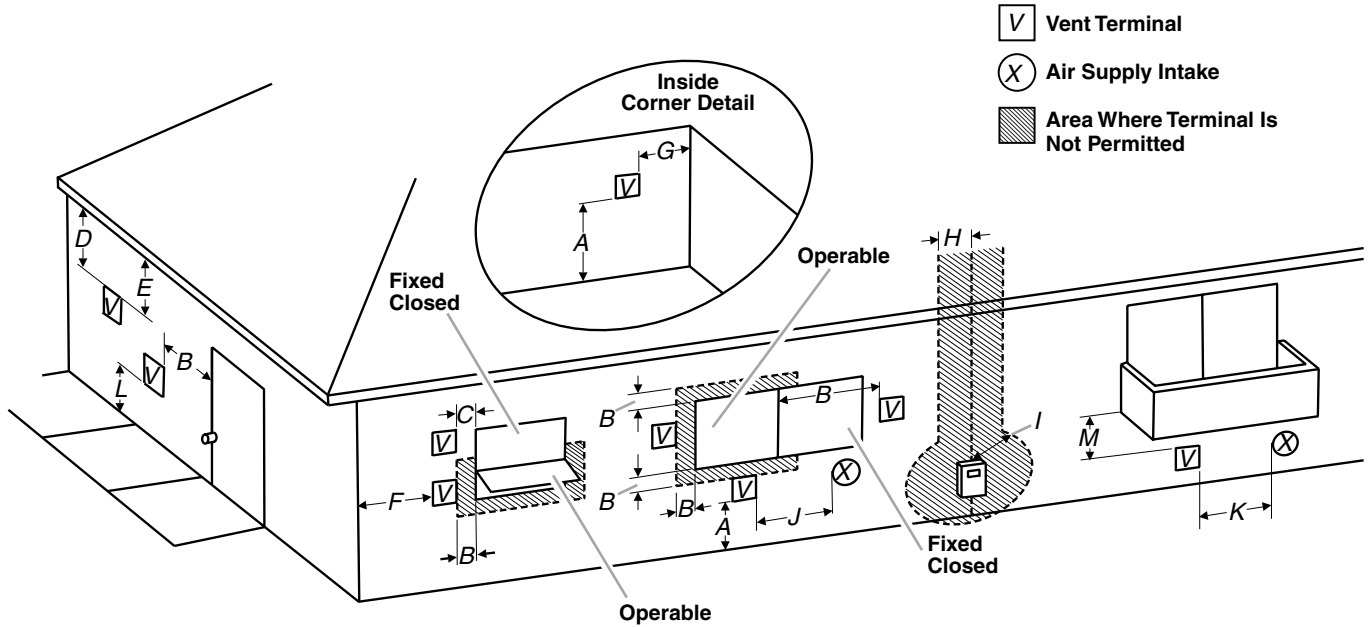
Vertical Venting

A vertical vent should extend through the roof a minimum of 24" (5.1 cm) and not be obstructed a minimum of 10 ft (3 m) in any direction.

Horizontal Venting

The vent terminal location shall comply with the National Fuel Gas Code (ANSI Z223.1) or local requirements. For informational purposes, the side wall terminal vent clearances are shown in the Sidewall Vent Terminal Clearances tables.

Sidewall Vent Terminal Clearances—Direct Vented Furnaces (Horizontal Venting)



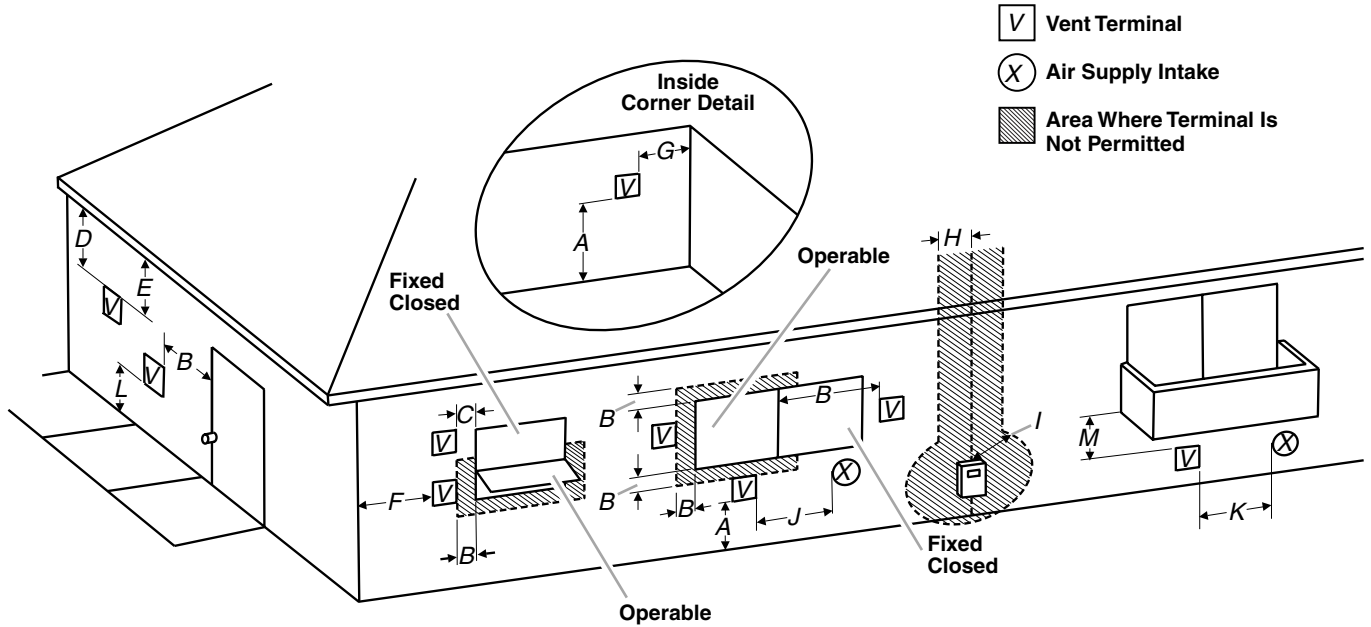
U.S. Installations¹

A	Clearance above grade, veranda, porch, deck, or balcony	12" (30.5 cm)
B	Clearance to window or door that may be opened	6" (15.2 cm) for appliances less than 10,000 Btu/h, 9" (22.9 cm) for appliances greater than 10,000 Btu/h, and less than or equal to 50,000 Btu/h, 12" (30.5 cm) for appliances greater than 50,000 Btu/h
C	Clearance to permanently closed window	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 24" (61 cm) from the center line of the terminal	*
E	Clearance to unventilated soffit	*
F	Clearance to outside corner	*
G	Clearance to inside corner	*
H	Clearance to each side of center line extended above meter/regulator assembly	*
I	Clearance to service regulator vent outlet	*
J	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	6" (15.2 cm) for appliances less than or equal to 10,000 Btu/h, 9" (22.9 cm) for appliances greater than 10,000 Btu/h, and less than or equal to 50,000 Btu/h, 12" (30.5 cm) for appliances greater than 50,000 Btu/h
K	Clearance to a mechanical air supply inlet	36" (91.4 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	*
M	Clearance under veranda, porch, deck, or balcony	*

¹In accordance with the current ANSI Z2223.1/NFPA 54, National Fuel Gas Code.

*Clearance in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.

Sidewall Vent Terminal Clearances—Nondirect Vented Furnaces (Horizontal Venting)



U.S. Installations¹

A	Clearance above grade, veranda, porch, deck, or balcony	12" (30.5 cm)
B	Clearance to window or door that may be opened	48" (121.9 cm) below or to side of opening; 12" (30.5 cm) above opening
C	Clearance to permanently closed window	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 24" (61 cm) from the center line of the terminal	*
E	Clearance to unventilated soffit	*
F	Clearance to outside corner	*
G	Clearance to inside corner	*
H	Clearance to each side of center line extended above meter/regulator assembly	*
I	Clearance to service regulator vent outlet	*
J	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	48" (121.9 cm) below or to side of opening; 12" (30.5 cm) above opening
K	Clearance to a mechanical air supply inlet	36" (91.4 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.1 m)
M	Clearance under veranda, porch, deck, or balcony	*

¹In accordance with the current ANSI Z2223.1/NFPA 54, National Fuel Gas Code.

*Clearance in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.

Vent Pipe Installation—Standard Furnace Connections

It is the responsibility of the installer to ensure that the piping connections to the furnace are secure, airtight, and adequately supported.

Attachment “couplings” for vent/flue and combustion air intake pipe connections are provided on the furnace’s top cover (upflow) or base pan (counterflow). To use the standard connections, field supplied vent/flue pipe and combustion air intake pipe (when applicable) should be secured directly to the furnace at these locations.

Vent/Flue Pipe

Vent/flue pipe can be secured to the vent/flue coupling using the rubber coupling and worm gear hose clamps provided with this furnace. See “Standard Connections” illustration. The rubber coupling allows separation of the vent/flue pipe from the furnace during servicing.

NOTE: Do not use other commercially available “no hub connectors” due to possible material conflicts.

The vent/flue pipe can also be secured using a PVC or ABS elbow or coupling using the appropriate glue.

NOTE: For nondirect vent installations, a minimum of one 90° elbow should be installed on the combustion air intake coupling to guard against inadvertent blockage.

Combustion Air Pipe—Direct Vent Installations

On upflow furnaces, secure the combustion air intake pipe directly to the air intake coupling. On counterflow furnaces, secure the combustion air intake pipe to the air intake coupling using the rubber coupling and worm gear hose clamps provided with this furnace. The counterflow rubber coupling allows service removal of air intake piping inside the furnace blower compartment.

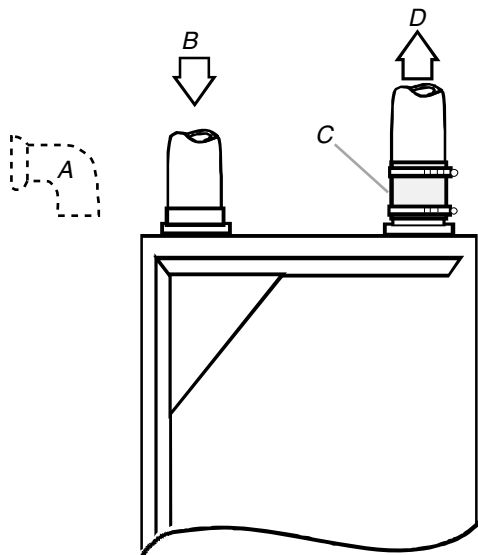
NOTE: Do not use other commercially available “no hub connectors” due to possible material conflicts.

The combustion air intake pipe can also be secured directly to the counterflow unit air intake pipe coupling.

Combustion Air Pipe—Nondirect Vent Installations

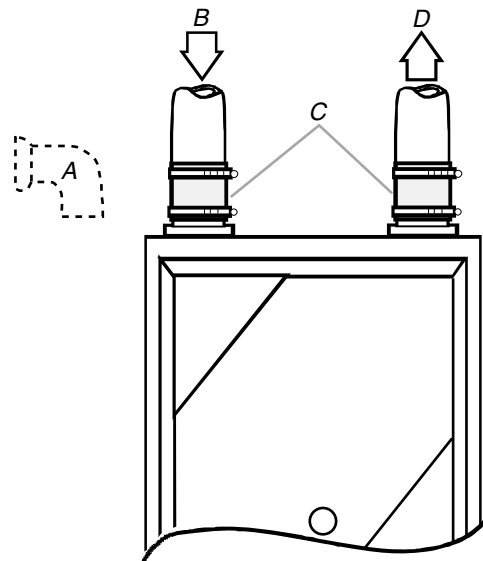
A minimum of one 90° elbow should be installed on the combustion air intake coupling to avoid inadvertent blockage.

Standard Connection—Upflow



A. 90° PVC elbow (nondirect vent only) C. Rubber coupling with worm gear hose clamps
B. Combustion air pipe (direct vent only) D. Vent/flue pipe

Standard Connection—Counterflow



A. 90° PVC elbow (nondirect vent only) C. Rubber couplings with worm gear hose clamps
B. Combustion air pipe (direct vent only) D. Vent/flue pipe



WARNING

Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

Vent Pipe Installation—Alternate Furnace Connections

Alternate side panel locations are available for both combustion air inlet and vent/flue pipe connections. These connections may be used for any of the following situations:

- Upright counterflow installations requiring additional access to a filter or electronic air cleaner.
- Horizontal installations of the downflow/horizontal model desiring vent/flue (and combustion air intake) piping run vertically from the side of the cabinet.

NOTE: Standard and alternate locations can be combined (for example, an installation may use the standard combustion air intake location, but use the alternate vent/flue location or vice versa), if needed.

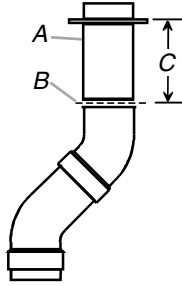
Alternate Vent/Flue Location—Upflow

The alternate vent/flue location is the large hole directly in line with the induced draft blower outlet.

1. Remove and save the 4 screws securing the vent/flue coupling to the furnace top panel.
2. Loosen the worm gear hose clamps on the rubber elbow and detach the rubber elbow from both the induced draft blower and the vent/flue pipe.

- Remove the vent/flue pipe from the furnace.
- Cut the vent/flue pipe 3¾" (9.5 cm) from the flanged end of the pipe. See "Vent/Flue Pipe Cuts" illustration.
NOTE: The section of pipe attached to the coupling will reach through the side panel to the induced draft blower.
- Discard remaining pipe and elbows.

Vent/Flue Pipe Cuts



A. Flange
B. Cut location
C. 3¾" (9.5 cm)

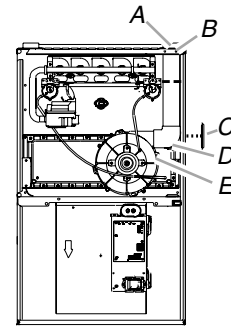
- Remove the plastic plug from the alternate vent/flue location.
- Relocate and install the plastic plug in the standard vent/flue location (top cover).
- Insert the cut section of the vent/flue pipe and coupling into the alternate vent/flue location.
- Attach the vent/flue pipe and coupling to the induced draft blower using a rubber coupling and worm gear hose clamps provided in the drain kit bag.
- Secure the coupling to the cabinet using the screws removed in Step 1 or with field-supplied ¾" #8 self-drilling screws.

⚠ WARNING

The rubber elbow is not designed to support a load. When the rubber elbow is mounted externally to the furnace cabinet, extreme care must be taken to adequately support field-supplied vent/flue piping, as damage can result in leaks causing bodily injury or death due to exposure to flue gases, including carbon monoxide.

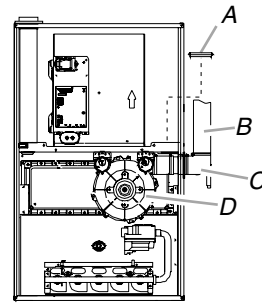
- For upright installations, externally mount the rubber elbow to the vent/flue coupling using a worm gear hose clamp.
- Secure the field supplied vent/flue piping to the rubber elbow using a worm gear hose clamp.
NOTE: Use of the alternate vent/flue location for upright installations, requires the drain trap to be installed on the same side of the furnace as the flue pipe.
- For horizontal installations, externally secure the field supplied vent/flue pipe directly to the vent/flue coupling using a PVC or ABS coupling or elbow.

Alternate Vent/Flue Location—Upflow



A. Vent/flue pipe
B. Screw locations (4)
C. Plastic plug—alternate vent/flue location
D. Rubber elbow
E. Induced draft blower

Alternate Vent/Flue Location—Counterflow/Upright (Upflow Similar)

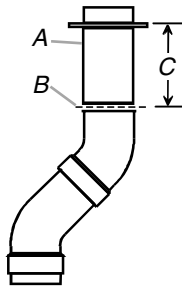


A. Plastic plug from drain kit bag
B. Vent/flue pipe
C. Rubber elbow
D. Induced draft blower

Alternate Vent/Flue Location—Counterflow

- Remove and save the 4 screws securing the vent/flue coupling to the furnace base pan.
- Remove the 3 screws securing the furnace's internal vent/flue piping to the induced draft blower deck.
- Loosen the worm gear hose clamps on the rubber elbow and detach the rubber elbow from both the induced draft blower and the vent/flue pipe.
- Remove the vent/flue pipe from the furnace.
- Cut the vent/flue pipe 3¾" (9.5 cm) from the induced draft blower deck coupling. See "Vent/Flue Pipe Cuts" illustration.
- Save the vent/flue pipe attached to the induced draft blower deck coupling for use in the alternate location.
- Discard remaining pipe and elbows.

Vent/Flue Pipe Cuts



A. Flange
B. Cut location
C. 3 3/4" (9.5 cm)

8. Remove the plastic plug from the alternate vent/flue location.
9. Relocate and install the plastic plug in the standard vent/flue location (base pan).
10. Insert the plastic plug (included in the drain kit bag) into the remaining hole in induced draft blower deck.
11. Insert the cut section of the vent/flue pipe and rubber coupling into the alternate vent/flue location.
12. Attach the vent/flue pipe and coupling to the induced draft blower using a rubber coupling and worm gear hose clamps provided in the drain kit bag.
13. Secure the rubber coupling to the cabinet using the screws removed in Step 1 or with field-supplied 3/8" #8 self-drilling screws.

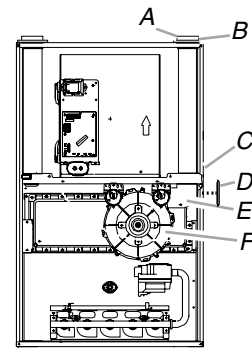


WARNING

The rubber elbow is not designed to support a load. When the rubber elbow is mounted externally to the furnace cabinet, extreme care must be taken to adequately support field-supplied vent/flue piping, as damage can result in leaks causing bodily injury or death due to exposure to flue gases, including carbon monoxide.

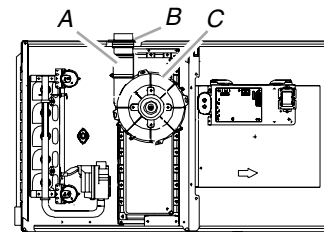
14. For upright installations, externally mount the rubber elbow to the vent/flue coupling using a worm gear hose clamp.
15. Secure the field supplied vent/flue piping to the rubber elbow using a worm gear hose clamp.
NOTE: Use of the alternate vent/flue location for upright installations, requires the drain trap to be installed on the same side of the furnace as the flue pipe.
16. For horizontal installations, externally secure the field supplied vent/flue pipe directly to the vent/flue coupling using a PVC or ABS coupling or elbow.

Alternate Vent/Flue Location—Counterflow



A. Vent/flue pipe
B. Screw locations (4)
C. Screw locations (3)
D. Plastic plug—alternate vent/flue location
E. Rubber elbow
F. Induced draft blower

Alternate Vent/Flue Location—Upflow /Horizontal (Counterflow Similar)

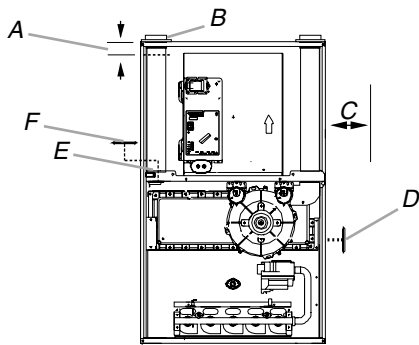


A. Rubber coupling
B. Vent/flue pipe
C. Induced draft blower

Alternate Combustion Air Intake Location—Counterflow

1. Remove and save the 4 screws securing the combustion air intake coupling to the base pan.
2. Remove the 3 screws securing the furnace's internal combustion air intake pipe to the induced draft blower deck.
3. Remove the combustion air intake pipe from the furnace and cut the pipe at the base pan coupling.
4. Save the base pan coupling and gasket from the induced draft blower deck coupling for use in the alternate location. Discard the remaining pipe.
5. Remove the plastic plug from the alternate combustion air intake location.
6. Relocate and install the plastic plug in the standard air intake location (base pan).
7. Insert the plastic plug (included in the drain kit bag) into the remaining hole in the induced draft blower deck.

Alternate Combustion Air Intake Location—Counterflow



- A. Section of pipe to be cut
 B. Screw locations (4)
 C. 2" (5.1 cm) minimum
 D. Plastic plug—alternate combustion air intake location
 E. Screw locations (3)
 F. Plastic plug from drain kit bag

8. With the gasket facing the cabinet side panel, and the flange's flat spot facing forward, secure the combustion air intake coupling to the cabinet using the screws removed in Step 1 or with field-supplied $\frac{3}{8}$ " #8 self-drilling screws.

WARNING

The rubber elbow is not designed to support a load. When the rubber elbow is mounted externally to the furnace cabinet, extreme care must be taken to adequately support field-supplied vent/flue piping, as damage can result in leaks causing bodily injury or death due to exposure to flue gases, including carbon monoxide.

9. For nondirect vent installations installed horizontally, a minimum of one 90° elbow should be installed on the combustion air intake coupling to guard against inadvertent blockage.
NOTE: No elbow is required on the alternate combustion air intake of upright installations, however, a minimum clearance of 2" (5.1 cm) is required to assure proper air supply.
10. For direct vent installations, secure field-supplied combustion air intake pipe directly to the air intake coupling.
NOTE: A PVC coupling or elbow is required on counterflow furnaces.

Nondirect Vent (Single Pipe) Piping

Nondirect vent installations require only a vent/flue pipe. The vent pipe can be run horizontally with an exit through the side of the building or run vertically with an exit through the roof of the building. The vent can also be run through an existing unused chimney; however, it must extend a minimum of 12" (30.5 cm) above the top of the chimney. The space between the vent pipe and the chimney must be closed with a weather-tight, corrosion-resistant flashing. See "Vent Pipe Installation—Standard Furnace Connections" or "Vent Pipe Installation—Alternate Furnace Connections."

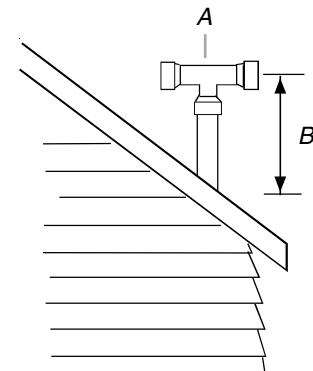
Although nondirect vent installations do not require a combustion air intake pipe, a minimum of one 90° elbow should be attached to the furnace's combustion air intake if an upright installation uses the standard intake location, or a horizontal installation uses the alternate air intake location. This elbow will guard against inadvertent blockage of the air intake.

Vent/Flue Pipe Terminations

- The vent/flue pipe may terminate vertically, as through a roof, or horizontally, as through an outside wall.
- The penetration of the vent through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.
- A 2 $\frac{3}{8}$ " (6.1 cm) diameter wall penetration is required for 2" (5.1 cm) diameter pipe.
- A 3" (7.6 cm) diameter hole is required for a 2 $\frac{1}{2}$ " (6.4 cm) pipe.
- A 3 $\frac{1}{2}$ " (8.9 cm) diameter hole is required for 3" (7.6 cm) diameter pipe.
- To secure the pipe passing through the wall and avoid damage to the piping connections, a coupling should be installed on either side of the wall and solvent cemented to a length of pipe connecting the 2 couplings.
- The length of pipe should be the wall thickness plus the depth of the socket fittings to be installed on the inside and outside of the wall.
- The wall penetration should be sealed with silicone caulking material.
- In a basement installation, the vent/flue pipe can be run between joist spaces.

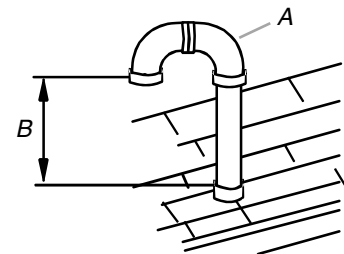
NOTE: If the vent pipe must go below a joist and then up into the last joist space to penetrate the header, two 45° elbows should be used to reach the header rather than two 90° elbows.

Vertical Vent Termination (Single Pipe)



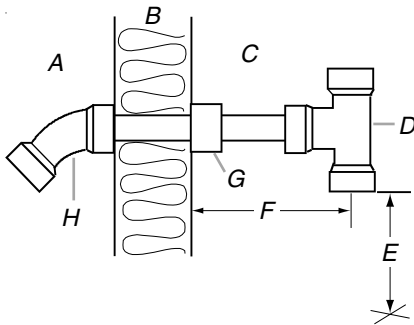
- A. Tee
 B. 12" (30.5 cm) minimum to roof or highest anticipated snow level

Alternate Vertical Vent Termination (Single Pipe)



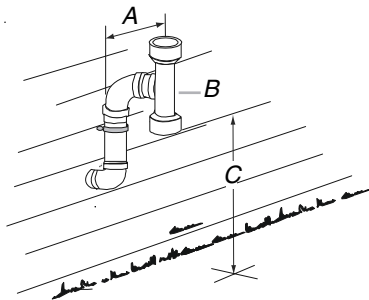
- A. 90° medium radius elbows
 B. 12" (30.5 cm) minimum to roof or highest anticipated snow level

Standard Horizontal Vent Termination (Single Pipe)



- A. Inside building
- B. Wall
- C. Outside building
- D. Tee or 90° elbow turned down
- E. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- F. 12" (30.5 cm) minimum from wall
- G. Coupling
- H. Elbow or coupling

Standard Horizontal Vent Termination (Single Pipe)—Above Highest Anticipated Snow Level



- A. 12" (30.5 cm) minimum from wall
- B. Tee or 90° elbow turned down
- C. 12" (30.5 cm) minimum to roof or highest anticipated snow level

Direct Vent (Dual Pipe) Piping

The inlet air screens provided in the installation instruction packet are available for the installer to use in the inlet of the combustion air pipe to keep animals from building nests in the combustion air pipe. Installation of screens, while strongly recommended, is not required and will not affect performance of the furnace.

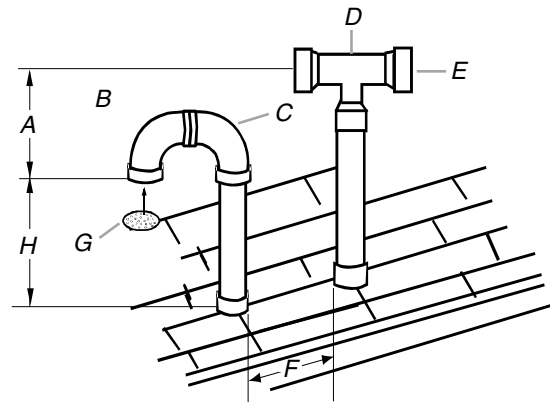
Direct vent installations require both a combustion air intake and a vent/flue pipe. The pipes may be run horizontally and exit through the side of the building or run vertically and exit through the roof of the building. The pipes may be run through an existing unused chimney; however, they must extend a minimum of 12" (30.5 cm) above the top of the chimney. The space between the pipes and the chimney must be closed with a weather tight, corrosion resistant flashing. Both the combustion air intake and a vent/flue pipe terminations must be in the same atmospheric pressure zone. See "Vent/Flue and Combustion Air Pipe Terminations," "Concentric Vent Termination," "Vent Pipe Installation—Standard Furnace Connections" or "Vent Pipe Installation—Alternate Furnace Connections."

Vent/Flue and Combustion Air Pipe Terminations

- The vent/flue and combustion air pipes may terminate vertically, as through a roof, or horizontally, as through an outside wall.
- The penetrations through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.
- A 2 $\frac{3}{8}$ " (6.1 cm) diameter wall penetration is required for 2" (5.1 cm) diameter pipe.

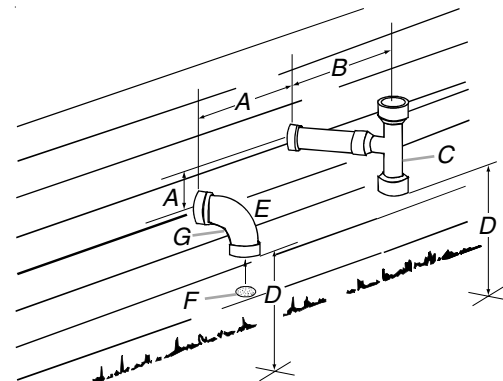
- A 3" (7.6 cm) diameter hole is required for a 2 $\frac{1}{2}$ " (6.4 cm) pipe.
 - A 3 $\frac{1}{2}$ " (8.9 cm) diameter hole is required for 3" (7.6 cm) diameter pipe.
 - To secure the pipe passing through the wall and avoid damage to piping connections, a coupling should be installed on either side of the wall and solvent cemented to a pipe connecting the 2 couplings.
 - The pipe length should be the wall thickness plus the depth of the socket fittings to be installed on the inside and outside of the wall.
 - The wall penetration should be sealed with silicone caulking material.
 - In a basement installation, the pipes may be run between the floor joist spaces.
- NOTE:** If the pipes must go below the floor joist and then up into the last floor joist space to penetrate the header, two 45° elbows should be used to reach the header rather than two 90° elbows.

Vertical Vent Terminations (Dual Pipe)



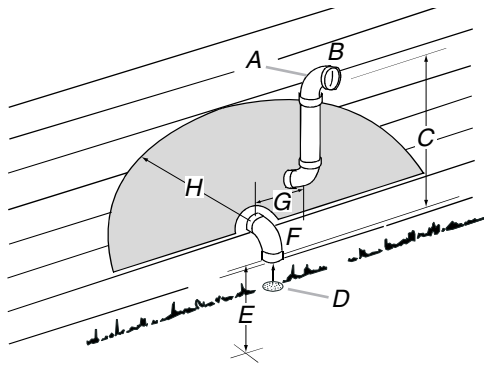
- A. 12" (30.5 cm) minimum
- B. Combustion air intake
- C. 90° medium radius elbows
- D. Tee
- E. Vent/flue pipe
- F. 24" (61 cm) maximum, 3" (7.6 cm) minimum
- G. Screen
- H. 12" (30.5 cm) minimum to roof or highest anticipated snow level

Standard Horizontal Vent Terminations (Dual Pipe)



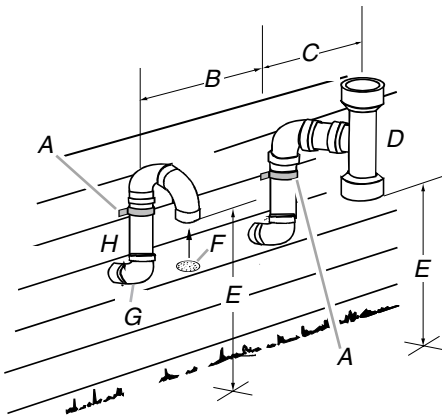
- A. 24" (61 cm) maximum, 3" (7.6 cm) minimum
- B. 12" (30.5 cm) minimum from wall
- C. Tee or 90° elbow turned down
- D. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- E. Combustion air intake
- F. Screen
- G. 90° medium radius elbow

Alternate Horizontal Vent Terminations (Dual Pipe)



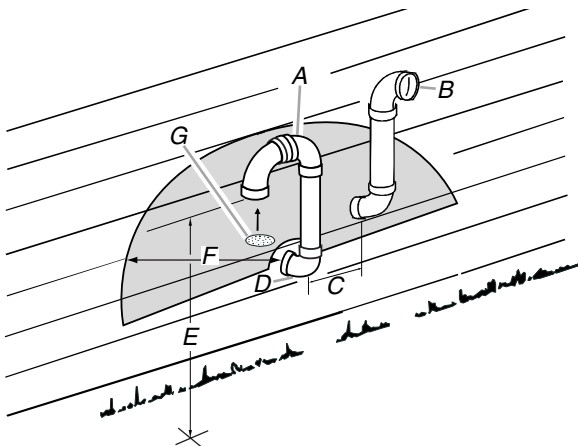
- A. 90° medium radius elbow
- B. Flue/vent pipe
- C. 12" (30.5 cm) minimum from wall
- D. Screen
- E. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- F. Combustion air intake
- G. 24" (61 cm) maximum, 3" (7.6 cm) minimum
- H. 24" (61 cm) maximum radius

Standard Horizontal Terminations (Dual Pipe)—Above Highest Anticipated Snow Level



- A. Support straps
- B. 24" (61 cm) maximum, 3" (7.6 cm) minimum
- C. 12" (30.5 cm) minimum from wall
- D. Tee or 90° elbow turned down
- E. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- F. Screen
- G. 90° medium radius elbow
- H. Combustion air intake

Alternate Horizontal Terminations (Dual Pipe)—Above Highest Anticipated Snow Level



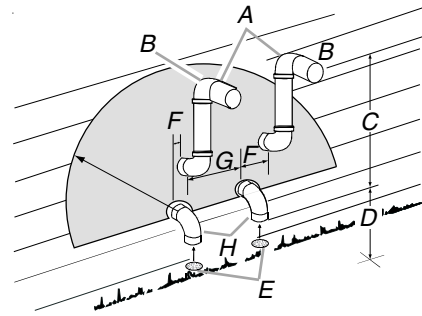
- A. 90° medium radius elbow
- B. Flue/vent pipe
- C. 24" (61 cm) maximum, 3" (7.6 cm)
- D. Combustion air intake
- E. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- F. 24" (61 cm) maximum radius
- G. Screen

Vent/Intake Terminations for Installation of Multiple Direct Vent Furnaces

If more than one direct vent furnace is to be installed vertically through a common roof top, maintain the same minimum clearances between the exhaust vent and air intake terminations of adjacent furnaces as with the exhaust vent and air intake terminations of a single furnace.

If more than one direct vent furnace is to be installed horizontally through a common side wall, maintain the clearances as shown in "Horizontal Venting of Multiple Furnaces" illustration. Always terminate all exhaust vent outlets at the same elevation and always terminate all air intakes at the same elevation.

Horizontal Venting of Multiple Furnaces



- A. 90° medium radius elbows
- B. Flue/vent pipes
- C. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- D. 12" (30.5 cm) minimum to roof or highest anticipated snow level
- E. Screens
- F. 24" (61 cm) maximum, 3" (7.6 cm) minimum
- G. 3" (7.6 cm) minimum
- H. Combustion air intakes

Concentric Vent Termination

Refer to the directions provided with the Concentric Vent Kit (DCVK) for installation specifications.

Side Wall Vent Kit

This kit is to be used with 2" (5.1 cm) or 3" (7.6 cm) direct vent systems. The vent kit must terminate outside the structure and may be installed with the intake and exhaust pipes located side-by-side or with one pipe above the other.

NOTE: Do not use the Side Wall Vent Kit for single pipe (nondirect vent) installations.

Refer to the directions furnished with the Side Wall Vent Kit (Part Number 0170K0000S) for installation specifications

Connect Venting

1. Run venting to the furnace, see "Plan Vent System."
2. Attach the air intake pipe to the furnace connector.
3. For nondirect vent installations only, install the inlet air restrictor plate in the air inlet pipe. See Nondirect vents in "Venting Requirements" for details.
4. Install the condensate drain assembly as shown.
5. Attach the flue pipe connector to the furnace.
6. Make sure all vent connections do not leak.
7. Check that the exhaust vent pipe terminates outside the building.
8. After the condensate disposal system has been installed, prime the trap system by slowly pouring 8 oz (250 mL) of water into the drain trap.

Install Condensate Drain Lines and Drain Trap—Standard Vent/Flue Drain Hose Connections

A condensing gas furnace achieves its high level of efficiency by extracting almost all of the heat from the products of combustion and cooling them to the point where condensation takes place. The condensate which is generated must be piped to an appropriate drain location.

In upright installations, the furnace's drain hoses may exit either the right or left side of the furnace.

NOTE: If the alternate vent/flue outlet is utilized in an upright installation, the drain trap and drain connections must be located on the right.

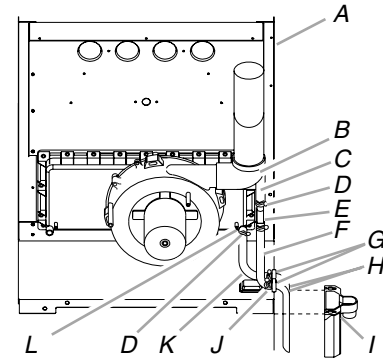
In horizontal installations, the drain hoses will exit through the bottom (down side) of the furnace with the drain trap suspended beneath the furnace. The field-supplied drain system must be in accordance with all local codes and the instructions in the following sections.

NOTES:

- The drain trap supplied with the furnace must be used.
- The drain line between the furnace and drain location must be constructed of ¾" (1.9 cm) PVC or CPVC.
- The drain line between the furnace and drain location must maintain a ¼" (6.4 mm) per foot downward slope toward the drain.
- Do not trap the drain line in any other location than at the drain trap supplied with the furnace.
- Do not route the drain line outside where it may freeze.
- If the drain line is routed through an area which may see temperatures near or below freezing, use measures that will keep the condensate from freezing within the drain line.
- If an air conditioning coil is installed with the furnace, a common drain may be used. An open tee must be installed in the drain line near the cooling coil to relieve positive air pressure from the coil's plenum. This is necessary to avoid any interference with the function of the furnace's drain trap.

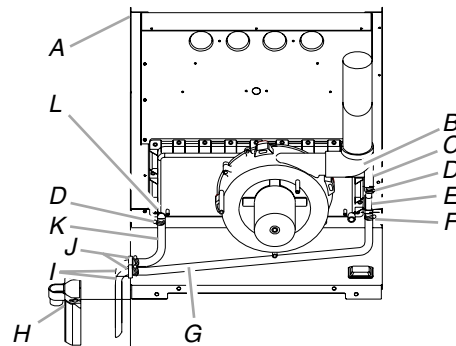
1. Remove the rubber plug from the front cover drain port (right or left side, depending on the intended drain trap mounting).
 2. Secure Hose A to the front cover drain port with a red hose clamp.
 3. Route Hose A to the rear side panel grommet hole.
- NOTE:** For left side drainage, the grommets will have to be relocated to left side panel.

Upright Standard Connections—Right Side Upflow (Counterflow Similar)



- | | |
|----------------------------|-----------------------------|
| A. Right side panel | G. Side panel grommet holes |
| B. Rubber elbow | H. Tubes 2 |
| C. Rubber elbow drain port | I. Drain trap |
| D. Red hose clamps | J. Green hose clamps (3) |
| E. Tube 1 | K. Hose A |
| F. Hose B | L. Front cover drain port |

Upright Standard Connections—Left Side Upflow (Counterflow Similar)



- | | |
|----------------------------|---------------------------|
| A. Left side panel | G. Hose B |
| B. Rubber elbow | H. Drain trap |
| C. Rubber elbow drain port | I. Tubes 2 |
| D. Red hose clamps | J. Side panel drain holes |
| E. Tube 1 | K. Hose A |
| F. Green hose clamps (3) | L. Front cover drain port |

4. Cut and remove ¼" (6.4 cm) from the end of the drain port on the rubber elbow.
5. Insert Tube 1 into the rubber elbow drain port and secure with the red hose clamp. Angle Tube 1 outward toward the front of the furnace.
6. For right side drains, cut 17¾" (45.1 cm) from the long end of Hose B and discard.
7. Secure the remaining Hose B to Tube 1 with a green hose clamp.
8. Route the other end of Hose B to the front right side panel grommet hole.

Upright Installations

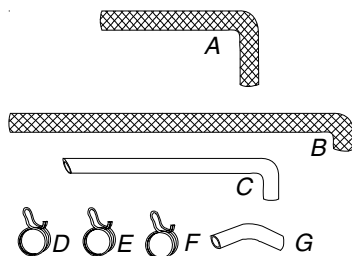
In an upright installation, drain hoses are connected to drain ports on the rubber elbow and the recuperator coil front cover. The drain lines are then routed through the right or left side panel and into the drain trap secured to the outside of the cabinet.

NOTE: For upright installations using an alternate vent/flue outlet, see "Condensate Drain Lines and Drain Trap—Alternate Vent/Flue Hose Connections."

Standard Right or Left Side Drain Hose Connections

Upright installations using the standard vent/flue outlet require the drain hoses to be connected as follows. The following quantity of hoses, tubes, and hose clamps are provided with the furnace.

Hose and Tube Identification



- | | |
|--------------------------|--------------------------|
| A. Hose A | E. Red hose clamp (1) |
| B. Hose B | F. Silver hose clamp (1) |
| C. Tube 2 | G. Tube 1 |
| D. Green hose clamps (3) | |

- For left side drains, cut 0" to 7" (17.8 cm) from the long end of Hose B and discard. See the following chart.
- Secure the remaining Hose B to Tube 1 with a green hose clamp.
- Route other end of Hose B to the front left side panel grommet hole.

Cabinet Width	Models (kBtu/Tons)	Length to Cut from Long End of Hose B
17½" (44.5 cm)	45	7" (17.8 cm)
21" (53.4 cm)	70	3½" (8.89 cm)
24½" (62.3 cm)	90	0"
	115	0"

- Insert the short end of each Tube 2 through the side panel grommet holes.
- Secure the tubes to Hose A and Hose B with the green hose clamps.

NOTE: Ensure hoses and tubes maintain a downward slope for proper drainage and that they are not kinked or binding.
- For instructions to mount the drain trap, see "Condensate Drain Lines and Drain Trap—Upright Drain Trap Mounting."

Install Condensate Condensate Drain Lines and Drain Trap—Alternate Vent/Flue Drain Hose Connections

Upright Installation —Right Side Only Drain Hoses

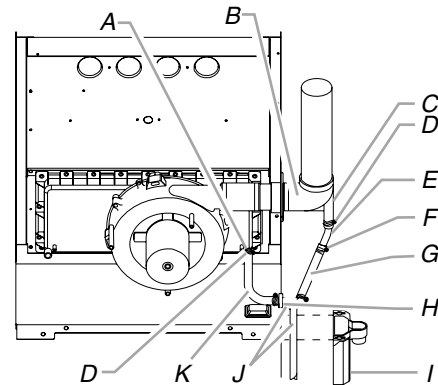
Upright installations using the alternate vent/flue outlet will require right-side only drain hoses to be connected as follows. See "Determine Vent Pipe Direction" for details on alternate vent/flue pipe connection.

- Remove the rubber plug from the right-side drain port on the front cover. Save the rubber plug for later use.
- Secure Hose A to the drain port on the front cover with a red hose clamp.
- Route Hose A to the right side panel grommet hole on the rear panel.
- Remove the grommet from the right-side panel drain hole on the front panel.
- Seal the hole in the grommet with the large end of the rubber plug removed in Step 1.
- Reinstall the grommet and rubber plug into the side panel drain hole.
- Cut ¼" (6.4 cm) from the end of the drain port on the externally mounted rubber elbow. Discard cut portion.
- Insert Tube 1 into the rubber elbow drain port and secure with a red hose clamp.

NOTE: Angle tube outward toward front of furnace.
- Cut 17⅞" (45.4 cm) from the long end of Hose B. Discard cut portion.
- Secure the remaining end of Hose B to the exposed end of Tube 1 with a green hose clamp.
- Route Hose B toward the right side panel grommet holes.
- Insert the short end of one Tube 2 through the rear right side panel grommet drain hole.
- Secure Tube 1 to Hose A with a green hose clamp.
- Insert the short end of the remaining Tube 2 into Hose B from the rubber elbow and secure with green hose clamp.

- Ensure that the hoses and tubes maintain a downward slope for proper drainage and are not kinked or binding.

Alternate Upright Upflow Connections—Right Side Only (Counterflow Similar)



- | | |
|--------------------------------------|-----------------------------|
| A. Front cover drain port | G. Hose B |
| B. Rubber elbow (externally mounted) | H. Side panel grommet holes |
| C. Rubber elbow drain port | I. Drain trap |
| D. Red hose clamps | J. Tubes 2 |
| E. Tube 1 | K. Hose A |
| F. Green hose clamps (3) | |

Upright Drain Trap Mounting—Left or Right Side Panel

- Insert the drain tubes into the drain trap and position the drain trap against the side panel.

NOTE: Drain tubes must reach the bottom of the drain trap.
- Secure the drain trap to the side panel at the mounting holes (dimples or crosshairs on counterflow models) located below the grommet drain holes.
- Attach the PVC drain line to the drain trap outlet with either a 90° elbow or coupling.

Horizontal Installations—Right Side Down

Horizontal installations with the right side down require that the drain hoses be connected to the right side front cover drain port and the rubber elbow drain port.

NOTE: On counterflow models, relocation of the front cover pressure switch hose is required.

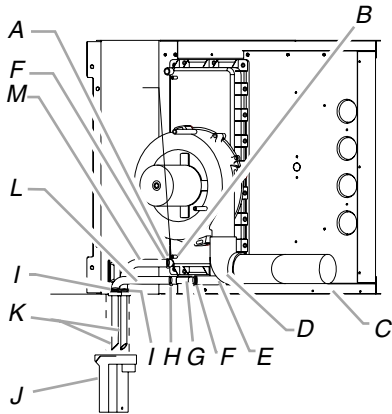
- Remove the rubber plug from the coil front cover drain port.

NOTE: On counterflow furnaces, relocate the front cover pressure switch hose connection from the left side pressure tap to the right (down) side tap to guard against blocked drain conditions. Cut the hose to appropriate length to minimize sagging. Plug the left (unused) pressure tap with the plug removed from right side.
- Secure Hose A to the front cover drain tap with a red hose clamp.
- Route Hose A to the rear right (down) side panel grommet holes.
- Cut ¼" (6.4 cm) from the end of the drain port on the externally mounted rubber elbow. Discard cut portion.
- Insert Tube 1 into the rubber elbow drain port and secure with a red hose clamp.

NOTE: Angle tube outward toward front of furnace.
- Cut 17¾" (45.1 cm) from the long end of Hose B. Discard cut portion.
- Secure the remaining end of Hose B to exposed end of Tube 1 with a green hose clamp.

8. Route Hose B to the front right (down) side panel grommet holes.
9. Cut 5½" (14 cm) straight length from the long end of each Tube 2.

Alternate Horizontal Upflow Connections—Right Side Down (Counterflow Similar)



- | | |
|-----------------------------|-----------------------------|
| A. Front cover drain port | H. Green hose clamps (3) |
| B. Front cover pressure tap | I. Side panel grommet holes |
| C. Right side panel | J. Drain trap |
| D. Rubber elbow | K. Tubes 2 |
| E. Rubber elbow drain port | L. Hose B |
| F. Red hose clamps | M. Hose A |
| G. Tube 1 | |

10. Insert approximately 1" (2.5 cm) of each Tube 2 through the right (down) side panel grommet holes.
11. Secure the tubes to Hose A and Hose B using the green hose clamps.
12. Ensure that the hoses and tubes maintain a downward slope for proper drainage and are not kinked or bound.
13. See "Upright Drain Trap Mounting—Left or Right Side Panel" for mounting of the drain trap.

Horizontal Installations—Left Side Down

Horizontal installations with the left side panel down will require the drain hoses to be connected to the left side front cover drain port and the side drain port on the rubber elbow.

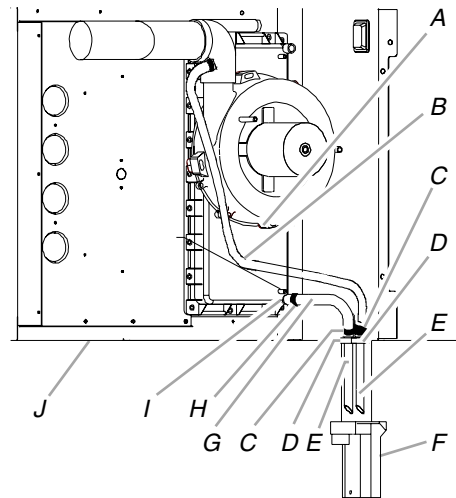
1. Remove the rubber plug from the coil front cover left (down) side drain port.
2. Relocate the front cover pressure switch hose connection from the right side (as shipped) pressure tap to the left (down) side tap.

NOTE: The pressure switch hose must be connected to the down side to guard against blocked drain conditions. Cut the hose to the appropriate length to minimize sagging. Plug the right (unused) pressure tap with the rubber plug removed from left side.

3. Secure Hose A to the front cover drain port with a red hose clamp.
4. Route Hose A to the rear left (down) side panel grommet holes.

NOTE: For left side drainage, grommets must be relocated to the left side panel.

Alternate Horizontal Upflow Connections—Left Side Down (Counterflow Similar)



- | | |
|------------------------------------|---------------------------|
| A. Induced draft blower drain port | F. Drain trap |
| B. Hose B | G. Hose A |
| C. Green hose clamps (3) | H. Red hose clamps |
| D. Side panel grommet holes | I. Front cover drain port |
| E. Tubes 2 | J. Left side panel |

5. Remove the rubber cap from the side drain port on the rubber elbow.
6. Secure the short end of Hose B to the rubber elbow side drain port using a green hose clamp.

NOTES:

- For left side drainage, route Hose B to the far left (down) side panel grommet holes.
- Horizontal left side connections (when using a new side port drain elbow) does not require connecting a hose to the induced draft blower housing.

7. Cut 5½" (14 cm) straight length from the long end of each Tube 2.
 8. Insert approximately 1" (2.5 cm) of each Tube 2 through the left side panel grommet hole.
 9. Secure the tubes to Hose A and Hose B with the green hose clamps.
- NOTE:** Tube must reach bottom of trap.
10. Ensure that the hoses and tubes maintain a downward slope for proper drainage and are not kinked or bound.
 11. See "Upright Drain Trap Mounting—Left or Right Side Panel" for mounting of the drain trap.

Horizontal Drain Trap Mounting—Left or Right Side Panel

1. Position the drain trap against the side panel with the drain tubes inserted into the trap.
- NOTE:** The trap may be orientated with the outlet facing either the furnace's top cover or base pan.
2. Secure the drain trap to the side panel at the dimples or crosshairs located on either side of the grommet drain holes.
 3. Confirm that the tubes reach the bottom of the drain trap and that all of the hoses maintain a downward slope and are not kinked or binding.
 4. Attach the PVC drain line to the drain trap outlet with either a 90° elbow or coupling.

Install Ductwork

IMPORTANT:

- Install ductwork in accordance with NFPA 90B and any local codes.
- When the furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall be handled by a duct or ducts sealed to the furnace casing and terminated outside the space containing the furnace.
- If there is no complete return air duct system, the return air connection must be sealed to the furnace casing and run full size to a location outside the utility room or space housing the furnace to avoid a negative pressure on the venting system.

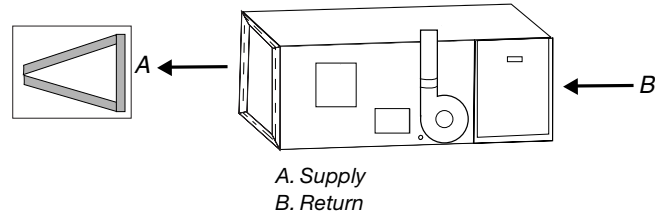
Installation with Return Ducts

A return air duct system is recommended. If the furnace is installed in a confined space or closet, a return connection must be run, full size, to a location outside the closet. The air duct in the closet must be tight to avoid any entrance of air from the closet into the circulating air.

Installation with an Evaporator Coil

IMPORTANT: When an air conditioning unit is used in conjunction with the furnace, the evaporator coil must be installed in the discharge (supply) air. Do not install an evaporator coil in the return air; excessive condensation will occur within the furnace.

When installing a WEC coil in a horizontal position with a horizontal gas furnace, the open end of the A-coil must face the supply air outlet of the furnace (blow into the open end of the A-coil). The A-coil should point away from the supply air outlet of the furnace as shown.



Installation without an Evaporator Coil

If a cooling coil is not installed with the furnace, then a removable access panel should be provided in the supply plenum for purposes of inspecting the heat exchanger. This opening must be accessible when the furnace is installed. It must be large enough that the heat exchanger can be viewed for possible openings using light assistance or so that a probe can be inserted for sampling the airstream. The cover for the opening must be leak tight.

Filter Specifications

Filters are not supplied with these furnaces. It is the furnace installer's responsibility to install properly sized filters in accordance with the Minimum Filter Requirements Chart.

- Filters must comply with UL900 or CAN/ULCS111 Standards.
- If the furnace is installed without filters, the warranty will be voided.
- Areas and dimensions shown for cleanable filters are based on filters rated at 300 ft (91.4 m) per minute face velocity.
- On upflow models, guide dimples show the location of the side return cutout. Use a straight edge to scribe lines connecting the guide dimples. Cut out the opening along these lines
- An undersized opening will cause reduced airflow.

Minimum Filter Requirements Chart

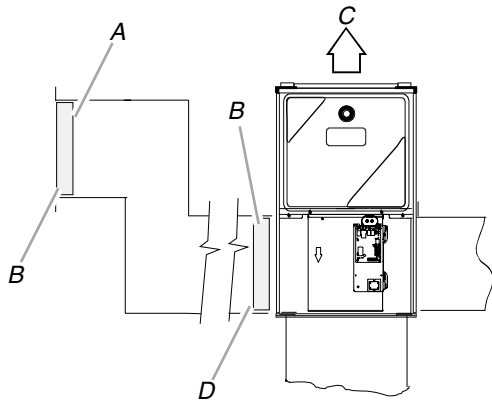
Input Airflow	Cooling Airflow Requirement (CFM)—Permanent Minimum Filter Area (sq. in.) Based On 600 ft (182.9 m) Per Minute Filter Face Velocity						
	600	800	1,000	1,200	1,400	1,600	2,000
0453BXA	194*	194*	240	288	-	-	-
0703BXA	-	324*	324*	324*	336	-	-
0704CXA	-	-	291*	291*	336	384	-
0904CXA	-	-	432*	432*	432*	432*	-
0905DXA	-	-	-	388*	388*	388*	480
1155DXA	-	-	-	486*	486*	486*	486*
Input Airflow	Cooling Airflow Requirement (CFM)—Disposable Minimum Filter Area (sq. in.) Based On 300 ft (91.4 m) Per Minute Filter Face Velocity						
	600	800	1,000	1,200	1,400	1,600	2,000
0453BXA	388*	388*	480	576	-	-	-
0703BXA	-	647*	647*	647*	672	-	-
0704CXA	-	-	583*	583*	672	768	-
0904CXA	-	-	863*	863*	863*	863*	-
0905DXA	-	-	-	777*	777*	777*	960
1155DXA	-	-	-	971*	971*	971*	971*

*Minimum filter area dictated by heating airflow requirement.

Upright Installations

Depending on the installation and/or customer preference, filters can be installed in the central return register or a side panel external filter rack kit (upflows). As an alternative a media air filter or electronic air cleaner can be used as the requested filter.

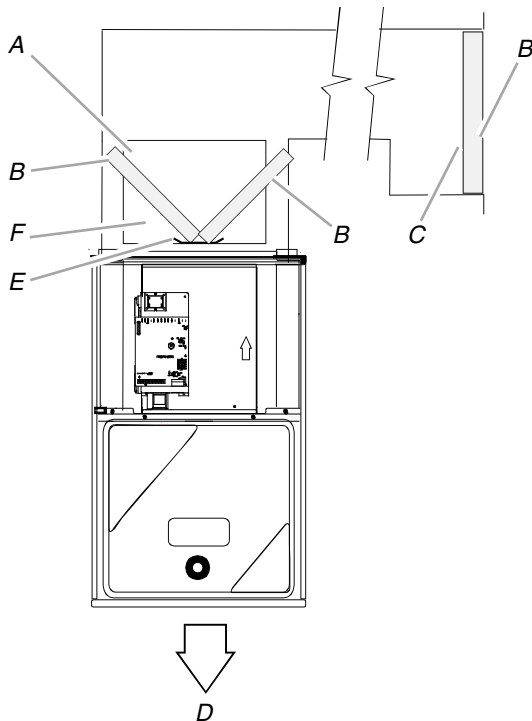
Filter Locations—Possible Upright Upflow



A. Central return grille
B. Filter

C. Airflow
D. Side return external filter rack kit (either side)

Filter Locations—Possible Upright Counterflow



A. Filter access door
B. Filter
C. Central return grille

D. Airflow
E. Filter support bracket (provided)
F. Return duct

Horizontal Installations

Filters must be installed in either the central return register or in the return air ductwork.

Make Electrical Connections

WARNING

To avoid the risk of electrical shock, wiring to the unit must be polarized and grounded.

WARNING

HIGH VOLTAGE!

Disconnect **ALL** power before servicing.

Multiple power sources may be present.

Failure to do so may cause property damage, personal injury or death.



WARNING

Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

CAUTION

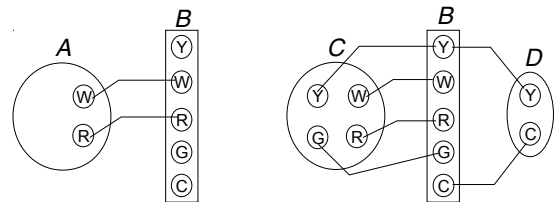
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

Thermostat

NOTE: Wire routing must not interfere with circulator blower operation, filter removal, or routine maintenance.

Low voltage connections can be made through either the right-hand or left-hand side panel. Thermostat wiring entrance holes are located in the lower compartment. Refer to "Thermostat Diagram" for thermostat connections to the integrated control module terminal strip.

Thermostat Diagram



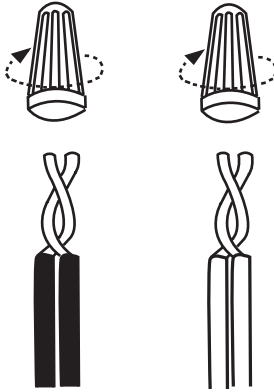
A. Heating room thermostat
B. Furnace

C. Heating and cooling room thermostat
D. Remote condensing unit

This furnace is equipped with a 40 VA transformer to facilitate use with most cooling equipment. Consult the wiring diagram located on the blower compartment door for further details of 115-volt and 24-volt wiring.

1. Disconnect power.
2. Remove the screw from the furnace electrical connection box.

3. Remove the cover from the furnace electrical connection box.
4. Route the field supply wires to the furnace electrical connection box.
5. Using UL listed wire connectors, connect the field supply wires to the furnace (black to black and white to white).

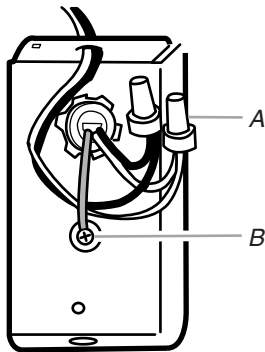


⚠ WARNING

HIGH VOLTAGE!

To avoid the risk of injury, electrical shock or death, the furnace must be electrically grounded in accordance with local codes or in their absence, with the latest edition of the National Electric Code (NEC).

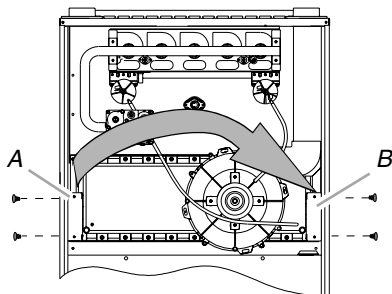
6. Connect ground wire to green ground screw.



A. Connect white to white and black to black
 B. Green ground screw

7. Replace the furnace electrical connection box cover and screw.

Junction Box Relocation



A. Standard junction box location
 B. Alternate junction box location

Make Gas Connections

The furnace rating plate includes the approved furnace gas input rating and gas types. The furnace must be equipped to operate on the type of gas applied. This includes any conversion kits required for alternate fuels and/or high altitude.

⚠ CAUTION

To prevent unreliable operation or equipment damage, the inlet gas supply pressure must be as specified on the unit rating plate with all other household gas-fired appliances operating.

⚠ WARNING

To avoid the possibility of explosion or fire, never use a match or open flame to test for leaks.

Inlet gas supply pressures must be maintained within the ranges specified in the Inlet Gas Supply Pressure chart. The supply pressure must be constant and available with all other household gas-fired appliances operating. The minimum gas supply pressure must be maintained to avoid unreliable ignition. The maximum must not be exceeded to keep the furnace from overfiring.

Inlet Gas Supply Pressure

Natural gas	5.0" W.C. minimum; 10.0" W.C. maximum
Propane gas	11.0" W.C. minimum; 13.0" W.C. maximum

Propane Gas Conversion

⚠ WARNING

Possible property damage, personal injury or death may occur if the correct conversion kits are not installed. The appropriate kits must be applied to insure safe and proper furnace operation. All conversions must be performed by a qualified installer or service agency.

This furnace is configured for Natural gas. The appropriate manufacturer's propane gas conversion kit, must be applied for propane gas installations. See "Propane Gas/High Altitude Installations" in "Location Requirements."

Gas Control Valve

This furnace is equipped with a 24-volt gas control valve controlled during the furnace operation by the integrated control module. As shipped, the gas control valve is configured for Natural gas. The gas control valve is field convertible for use with propane gas by replacing the regulator spring with a propane gas spring from an appropriate manufacturer's propane gas conversion kit. Taps for measuring the gas supply pressure and manifold pressure are provided on the valve.

The gas control valve has a manual ON/OFF control located on the gas control valve itself. This control may be set only to the "ON" or "OFF" position.

Refer to the lighting instructions label or see "Complete Installation" for use of this control during start-up and shut down periods.

Gas Piping Connections

WARNING

Possible property damage, personal injury or death may occur if the correct conversion kits are not installed. The appropriate kits must be applied to insure safe and proper furnace operation. All conversions must be performed by a qualified installer or service agency.

When sizing a trunk line, be sure to include all appliances which will operate simultaneously when sizing a trunk line. The gas piping supplying the furnace must be properly sized based on the gas flow required, specific gravity of the gas, and length of the run. The gas line installation must comply with local codes, or in their absence, with the latest edition of the National Fuel Gas Code, NFPA 54/ANSI Z223.1.

Natural Gas Capacity of Pipe—In cu ft (m³) of Gas Per Hour (CFH)

Length of Pipe—ft (m)	Nominal Black Pipe Size— inches				
	½	¾	1	1¼	1½
10 (3)	132 (3.7)	278 (7.9)	520 (14.7)	1,050 (29.7)	1,600 (45.3)
20 (6.1)	92 (2.6)	190 (5.4)	350 (9.9)	730 (20.7)	1,100 (31.1)
30 (9.2)	73 (2.1)	152 (4.3)	285 (8.1)	590 (16.7)	980 (27.8)
40 (12.2)	63 (1.8)	130 (3.7)	245 (6.9)	500 (14.2)	760 (21.5)
50 (15.2)	56 (1.6)	115 (3.3)	215 (6.1)	440 (12.5)	670 (19)
60 (18.3)	50 (1.52)	105 (3)	195 (5.5)	400 (11.3)	610 (17.3)
70 (21.3)	46 (1.3)	96 (2.7)	180 (5.1)	370 (10.5)	560 (15.9)
80 (24.4)	43 (1.2)	90 (2.5)	170 (4.8)	350 (9.9)	530 (15)
90 (27.4)	40 (1.1)	84 (2.4)	160 (4.5)	320 (9.1)	490 (13.9)
100 (30.5)	38 (1.1)	79 (2.2)	150 (4.2)	305 (8.6)	460 (13)

Pressure 0.5 psig or less and pressure drop of 0.3" W.C.; Based on 0.60 Specific Gravity Gas

$$CFH = \frac{\text{Btu/h Furnace Input}}{\text{Heating Value of Gas (Btu/cu. ft)}}$$

To connect the furnace to the building's gas piping, the installer must supply a ground joint union, drip leg, manual shutoff valve and line and fittings to connect to the gas control valve. In some cases, the installer may also need to supply a transition piece from ½" (1.3 cm) pipe to a larger pipe size.

See "Gas Piping Connections" illustrations for typical gas line connections to the furnace.

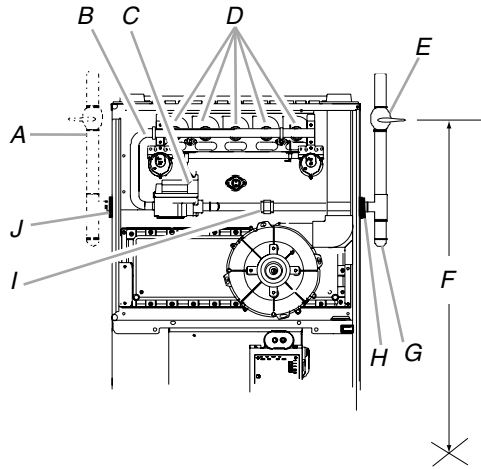
When connecting gas piping:

WARNING

Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

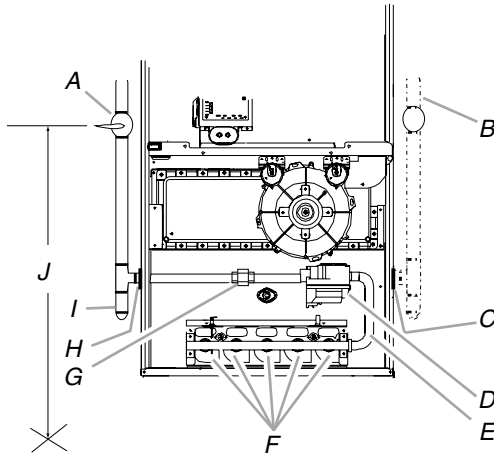
- Use black iron or steel pipe and fittings for building piping.
- Where possible, use new pipe that is properly chamfered, reamed and free of burrs and chips.
 - NOTE:** If old pipe is used, be sure it is clean and free of rust, scale, burrs, chips and old pipe joint compound.
- Use pipe joint compound (pipe dope) on male threads only.
- Always use pipe joint compound (pipe dope) that is approved for all gases.
- Do not apply compound to the first 2 threads.
- Use ground joint unions.
- Install a drip leg to trap dirt and moisture before it can enter the gas control valve. The drip leg must be a minimum of 3" (7.6 cm) long.
- Install a ⅛" NPT pipe plug fitting, accessible for test gage connection, immediately upstream of the gas supply connection to the furnace.
- Always use a backup wrench when making the connection to the gas control valve to keep it from turning.
 - NOTE:** The orientation of the gas control valve on the manifold must be maintained as shipped from the factory.
- Maximum torque for the gas control valve connection is 375 in/lbs.
 - NOTE:** Do not overtighten the gas control valve.
- Install a manual shutoff valve between the gas meter and the furnace within 6 ft (1.8 m) of the furnace.
- If a union is installed, the union must be downstream of the manual shutoff valve, between the shutoff valve and the furnace.
- Tighten all joints securely.
- Connect the furnace to the building piping by one of the following methods:
 1. Rigid metallic pipe and fittings.
 2. Semirigid metallic tubing and metallic fittings.
 - NOTE:** Aluminum alloy tubing must not be used in exterior locations. In order to seal the grommet cabinet penetration, rigid pipe must be used to reach the outside of the cabinet. A semirigid connector to the gas piping may be used from there.
- Use listed gas appliance connectors in accordance with their instructions.
- Gas connectors must be fully in the same room as the furnace.
- Keep gas connectors and semirigid tubing away from physical and thermal damage when installed.
- Ensure aluminum alloy tubing and connectors are coated to avoid external corrosion when in contact with masonry, plaster or insulation, or subjected to repeated wetting by liquids such as water (except rainwater), detergents, or sewage.

Gas Piping Connections—Upflow



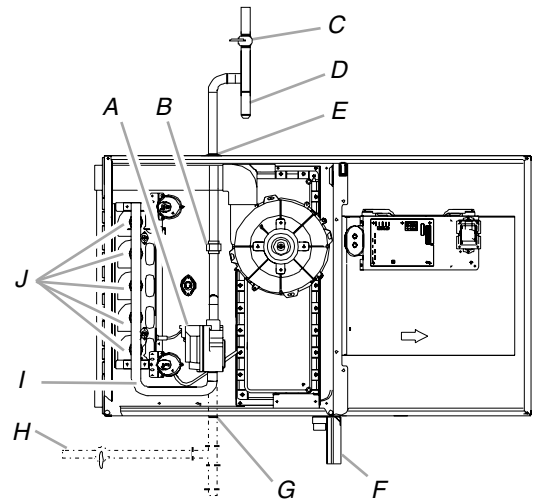
- A. Alternate gas line location
- B. Manifold
- C. Gas control valve
- D. Burners
- E. Manual shutoff valve (upstream from ground joint pipe union)
- F. Height required by local codes
- G. Drip leg
- H. Grommet in standard gas line hole
- I. Ground joint pipe union
- J. Plug in alternate gas line hole

Gas Piping Connections—Counterflow



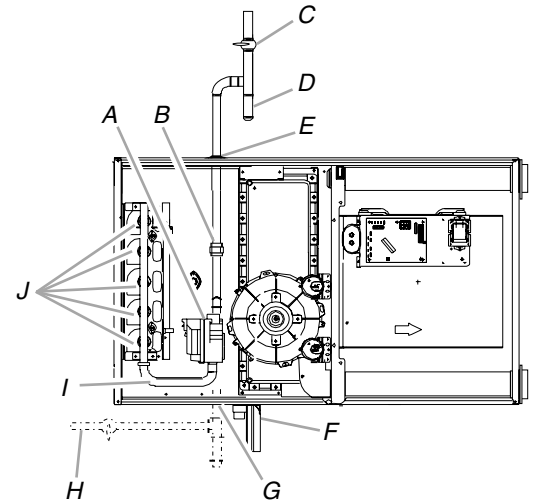
- A. Manual shutoff valve (upstream from ground joint pipe union)
- B. Alternate gas line location
- C. Plug in alternate gas line hole
- D. Gas control valve
- E. Manifold
- F. Burners
- G. Ground joint pipe union
- H. Grommet in standard gas line hole
- I. Drip leg
- J. Height required by local codes

Gas Piping Connections—Horizontal Upflow



- A. Gas control valve
- B. Ground joint pipe union
- C. Manual shutoff valve (upstream from ground joint pipe union)
- D. Drip leg
- E. Grommet in standard gas line hole
- F. Drain trap
- G. Plug in alternate gas line hole
- H. Alternate gas line location
- I. Manifold
- J. Burners

Gas Piping Connections—Horizontal Counterflow



- A. Gas control valve
- B. Ground joint pipe union
- C. Manual shutoff valve (upstream from ground joint pipe union)
- D. Drip leg
- E. Grommet in standard gas line hole
- F. Drain trap
- G. Plug in alternate gas line hole
- H. Alternate gas line location
- I. Manifold
- J. Burners

Direct/Standard Inlet Piping

When gas piping enters directly to the gas control valve through the standard inlet hole, the installer must supply straight pipe with a ground joint union to reach the exterior of the furnace. The rigid pipe must be long enough to reach the outside of the cabinet to seal the grommet cabinet penetration. A semirigid connector to the gas piping can be used outside the cabinet per local codes.

Indirect/Alternate Inlet Piping

When gas piping enters indirectly to the gas control valve through the alternate gas inlet hole, the following fittings (starting from the gas control valve) must be supplied to reach the outside of the cabinet:

- Coupling
- 90° elbow
- 2" close nipple
- 90° elbow
- Straight pipe with a ground joint union to reach the exterior of the furnace.

NOTE: The rigid pipe must be long enough to reach the outside of the cabinet so as to seal the grommet cabinet penetration. A semirigid connector to the gas piping can be used outside the cabinet per local codes.

Gas Piping Checks

Before placing the furnace in operation, leak test the furnace and gas connections.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved testing methods.

NOTE: Do not exceed specified pressures for testing. Higher pressure may damage the gas control valve and cause subsequent overfiring, resulting in heat exchanger failure. Isolate this furnace from the gas supply piping system by closing the external manual gas shutoff valve before pressure testing supply piping system with test pressures equal to or less than ½ psig (3.48 kPa).

Propane Gas Tanks and Piping

WARNING

If the gas furnace is installed in a basement, and excavated area or a confined space, it is strongly recommended to contact a propane supplier to install a gas detecting warning device in case of a gas leak.

- Since propane gas is heavier than air, any leaking can settle in low areas or confined spaces.
- Propane gas odorant may fade, making the gas undetectable except with a warning device.

A gas detecting warning system is the only reliable way to detect a propane gas leak. Rust can reduce the level of odorant in propane gas. Do not rely on your sense of smell. Contact a local propane gas supplier about installing a gas detecting warning system.

All propane gas equipment must conform to the safety standards of the National Board of Fire Underwriters, NBFU Manual 58. For satisfactory operation, propane gas pressure must be 11" W.C. at the furnace manifold with all gas appliances in operation.

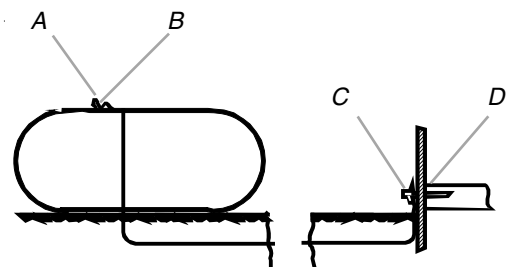
Maintaining proper gas pressure depends on three main factors:

- Vaporization rate, depending on temperature of the liquid and "wetted surface" area of the container or containers.
- Proper pressure regulation. Two-stage regulation is recommended for both cost and efficiency.
- Pressure drop in the lines between the regulators, and between 2nd stage regulator and the appliance. Pipe size will depend on the length of the pipe run and the total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and propane gas suppliers.

Since propane gas will quickly dissolve white lead and most standard commercial compounds, special pipe dope must be used. Shellac-based compounds resistant to the actions of liquefied petroleum gases are satisfactory.

Propane Gas Installation—Typical



A. 1st stage regulator
B. 5 to 15 psig (20 psig maximum)

C. 2nd stage regulator
D. Continuous 11" W.C.

Sizing Between 1st and 2nd Stage Regulator*

Maximum propane capacities listed are based on 2 psig pressure drop at 10 psig setting. Capacities in 1,000 Btu/h.

Propane Gas Piping Chart I

Pipe or Tubing Length—ft (m)	Tubing Size, O.D. Type L					Nominal Pipe Size Schedule 40	
	3/8	1/2	5/8	3/4	7/8	1/2	3/4
10 (3)	730	1,700	3,200	5,300	8,300	3,200	7,500
20 (6.1)	500	1,100	2,200	3,700	5,800	2,200	4,200
30 (9.2)	400	920	2,000	2,900	4,700	1,800	4,000
40 (12.2)	370	850	1,700	2,700	4,100	1,600	3,700
50 (15.2)	330	770	1,500	2,400	3,700	1,500	3,400
60 (18.3)	300	700	1,300	2,200	3,300	1,300	3,100
80 (24.4)	260	610	1,200	1,900	2,900	1,200	2,600
100 (30.5)	220	540	1,000	1,700	2,600	1,000	2,300
125 (38.1)	200	490	900	1,400	2,300	900	2,100
150 (45.7)	190	430	830	1,300	2,100	830	1,900
175 (53.3)	170	400	780	1,200	1,900	770	1,700
200 (61)	160	380	730	1,100	1,800	720	1,500

To convert to capacities at 15 psig settings—multiply by 1.13. To convert to capacities at 5 psig settings—multiply by 0.879.

Sizing Between Single or 2nd Stage Regulator and Appliance*

Maximum Propane Capacities Listed are Based on 1/2" W.C. pressure drop at 11" W.C. setting. Capacities in 1,000 Btu/h.

Propane Gas Piping Chart II

Pipe or Tubing Length—ft (m)	Tubing Size, O.D. Type L					Nominal Pipe Size Schedule 40					
	3/8	1/2	5/8	3/4	7/8	1 1/8	1/2	3/4	1	1 1/4	1 1/2
10 (3)	39	92	199	329	501	935	275	567	1,071	2,205	3,307
20 (6.1)	26	62	131	216	346	630	189	393	732	1,496	2,299
30 (9.2)	21	50	107	181	277	500	152	315	590	1,212	1,858
40 (12.2)	19	41	90	145	233	427	129	267	504	1,039	1,559
50 (15.2)	18	37	79	131	198	376	114	237	448	913	1,417
60 (18.3)	16	35	72	121	187	340	103	217	409	834	1,275
80 (24.4)	13	29	62	104	155	289	89	185	346	724	1,066
100 (30.5)	11	26	55	90	138	255	78	162	307	630	976
125 (38.1)	10	24	48	81	122	224	69	146	275	567	866
150 (45.7)	9	21	43	72	109	202	63	132	252	511	787
200 (61)	8	19	39	66	100	187	54	112	209	439	665
250 (76.2)	8	17	36	60	93	172	48	100	185	390	590

Data in accordance with NFPA pamphlet Number 54.

Check the Furnace Input Rate (if required)

CAUTION

To prevent unreliable operation or equipment damage, the inlet gas supply pressure must be as specified on the unit rating plate with all other household gas-fired appliances operating.

IMPORTANT:

- The furnace input rate must not exceed the input rating on the furnace rating plate.
- This furnace is equipped for rated input at manifold pressures of 1.7" (4.32 cm) W.C. (1st stage) and 3.5" (8.89 cm) W.C. (2nd stage) for Natural gas. When an LP conversion kit is used, it is equipped for rated input at manifold pressures of 4.9"

(12.45 cm) W.C. (1st stage) and 10.0" (25.4 cm) W.C. (2nd stage) for propane gas.

- For Natural gas, check the furnace rate by observing the gas meter, making sure all other gas appliances are turned off. The test hand on the meter should be timed for at least one revolution.

$$\text{Btu/h Input} = \frac{\text{Cu. ft per Revolution}}{\# \text{ Seconds per Revolution}} \times 3600 \times \text{Heating Value}$$

- At altitudes from 2,000 to 7,500 ft (609.6 m to 2,286 m) the furnace input rate must not exceed that on the rating plate.

NOTE: The actual heating value of your gas can be obtained from your local utility company. Typical values are shown in the Manifold Pressure vs. Altitude Chart in "Adjust the Furnace Input Rate."

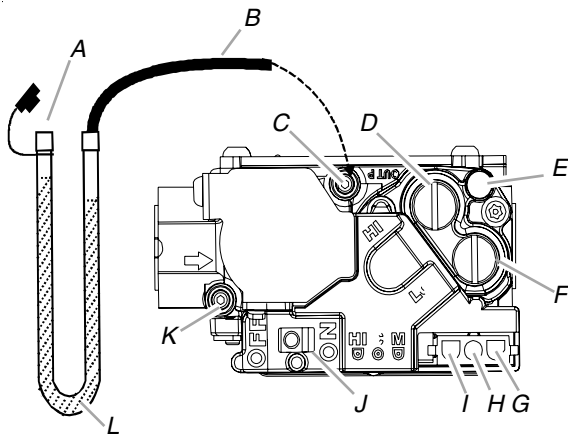
Adjust the Furnace Input Rate (if required)

CAUTION

To prevent unreliable operation or equipment damage, the gas manifold pressure must be as specified on the unit rating plate. Only minor adjustments should be made by adjusting the gas control valve pressure regulator.

For Altitudes 4,500 to 7,500 ft (1,371.6 m to 2,286 m) Above Sea Level

Gas Control Valve



- | | | |
|-------------------------------|------------------------------|---------------------------------|
| A. Open to atmosphere | E. Regulator vent | I. High-fire coil terminal (HI) |
| B. Manometer hose | F. Low-fire regulator adjust | J. ON/OFF switch |
| C. Outlet pressure boss | G. Coaxial coil terminal (M) | K. Inlet pressure boss |
| D. High-fire regulator adjust | H. Common terminal (C) | L. Manometer |

Only small variations in gas pressure should be made by adjusting the gas control valve pressure regulator. The manifold pressure must be measured with the burners operating. To measure and adjust the manifold pressure, use the following procedure.

1. Turn off the gas to the furnace at the manual gas shutoff valve external to the furnace.
2. Turn off all electrical power to the system.

3. Loosen the outlet pressure test screw (inlet/outlet pressure boss) one turn (counterclockwise, not more than one turn).
4. Attach a hose and manometer to the outlet pressure boss of the valve.
5. Turn on the gas supply.
6. Turn on the power and energize the main (M) solenoid.

NOTE: Do not energize the (HI) solenoid.

7. Measure the gas manifold pressure with the burners firing.
8. Adjust the manifold pressure using the following Manifold Gas Pressure table.
9. Remove the regulator cover screw from the low (LO) outlet pressure regulator adjust tower and turn the screw clockwise to increase pressure, or counterclockwise to decrease pressure.
10. Energize the main (M) solenoid as well as the (HI) terminal.
11. Remove the regulator cover screw from the (HI) outlet pressure regulator adjust tower and turn the screw clockwise to increase pressure, or counterclockwise to decrease pressure.
12. Turn off all electrical power and gas supply to the system.
13. Remove the manometer hose from the outlet pressure boss.
14. Tighten the outlet pressure test screw to seal pressure port (clockwise, 7 in-lb minimum).
15. Turn on the electrical power and gas supply to the system.
16. Turn on the system power and energize the gas control valve.
17. Using a leak detection solution or soap suds, check for leaks at the pressure boss screw. Bubbles forming indicate a leak.

IMPORTANT: If a leak is found, turn off gas and fix all leaks immediately.

NOTE: For gas-to-gas conversion, consult your dealer for the appropriate conversion.

Manifold Gas Pressure

Gas	Rate	Range	Nominal
Natural	Low Stage	1.7" to 2.3" W.C.	2.0" W.C.
	High Stage	3.2" to 3.8" W.C.	3.5" W.C.
Propane	Low Stage	5.7" to 6.3" W.C.	6.0" W.C.
	High Stage	9.7" to 10.3" W.C.	10.0" W.C.

Complete Installation

IMPORTANT: Do not use this furnace if any part has been under water. Immediately call a qualified person to inspect the furnace and to replace any part of the control system and gas control which has been under water.

1. Check that you have all of your tools.
2. Dispose of/recycle all packaging materials.
3. Check the furnace in its final location. Be sure the vent is not blocked.

Start-up Procedure and Adjustment

This furnace must have a 115 VAC power supply properly connected and grounded. Proper polarity must be maintained for correct operation. See "Operational Checks."

Heat Anticipator Setting

The heat anticipator in the room thermostat must be correctly adjusted to obtain the proper number of cycles per hour and to avoid "overshooting" of the setting. Set the heat anticipator setting to 0.7 amps. Follow the thermostat manufacturer's instructions on how to adjust the heat anticipator setting.

Drain Trap Priming

The drain trap must be primed prior to the furnace start-up. To prime, fill the drain trap with water. This ensures proper furnace drainage upon start-up and avoids the possibility of flue gases escaping through the drain system.

Furnace Operation

1. Purge the gas lines of air prior to start-up.
NOTE: Be sure not purge lines into an enclosed burner compartment.
2. Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector or other approved method.
3. Verify that all required kits (propane gas, high altitude, etc.) have been appropriately installed.

Furnace Start-up

1. Close the manual gas shutoff valve external to the furnace.
2. Turn off the electrical power to the furnace.
3. Set the room thermostat to the lowest possible setting.
4. Remove the burner compartment door.

NOTE: This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

5. Move the furnace gas control valve manual control to the OFF position.
6. Wait 5 minutes, and then check for a gas odor.

NOTE: Check near the floor as some types of gas are heavier than air.

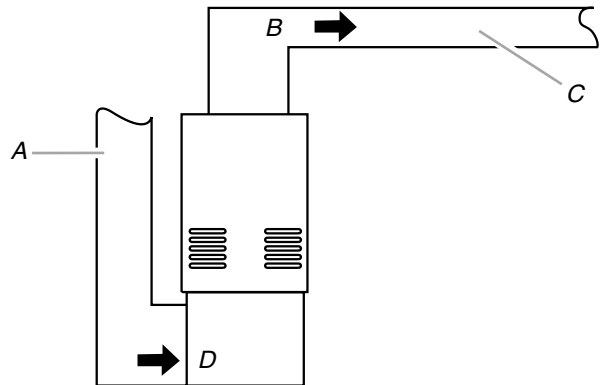
7. After 5 minutes, move the furnace gas control valve manual control to the ON position.
8. Replace the burner compartment door.
9. Open the manual gas shutoff valve external to the furnace.

10. Turn on the electrical power to the furnace.
11. Adjust the thermostat to a setting above room temperature.
12. After the burners are lit, set the thermostat to the desired temperature.

Measure Temperature Rise

1. Adjust room thermostat to the highest temperature setting possible.
2. After 20 minutes of heating operation, measure the furnace temperature rise. Take air temperature readings in both the return air ducts and the heated air ducts (about 72" [1.8 m] from the furnace where they will not be affected by radiant heat) as shown.

NOTE: If more than one run of return or heated air ducts are used, air temperature measurements should be taken in each duct. These measurements can be converted to an average to obtain the temperature rise of the whole system.



A. Measure return air here. C. Measure supply temperature here.
B. Warm air D. Return air

3. If furnace doesn't maintain temperature rise within the range shown on the furnace rating plate, adjust the blower speed.

Final Checklist

- Cycle the furnace with the thermostat at least 3 times. Verify cooling and fan only operation.
- Review the owner's manual with the homeowner and discuss proper furnace operation and maintenance.
- Leave literature packet near furnace.

Furnace Shut Down

1. Set the thermostat to the lowest setting.
The integrated control will close the gas control valve and extinguish the flame. Following a 15-second delay, the induced draft blower will be de-energized. After a 120-, 150-, 180- or 210-second delay period (field-selectable delay OFF [90, 120, 150, 180] plus a 30-second ramp down), the circulator blower deenergizes.
2. Remove the burner compartment door and move the furnace gas control valve manual control to the OFF position.
3. Close the manual gas shutoff valve external to the furnace.
4. Replace the burner compartment door.

SEQUENCE OF OPERATION

Power Up

The normal power up sequence is as follows:

- 115 VAC power applied to furnace.
- Integrated control module performs internal checks.
- Integrated control module LED will light.
- Integrated control module monitors safety circuits continuously.
- Furnace awaits call from thermostat.

Heating Mode—Mode DIP Switch Set to 1 STG Position

The normal operational sequence in heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized for a 15-second prepurge period causing the pressure switch contacts to close.
- Igniter warm up begins after 15-second prepurge expires.
- Low-stage and high-stage gas control valves open at the end of the igniter warm up period, delivering gas to the burners and establishing flame.
- Integrated control module monitors flame presence. Gas control valve will remain open only if flame is detected.
- Circulator blower is energized on high heat speed following a fixed 30-second blower on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace operates; integrated control module monitors safety circuits continuously.
- R and W thermostat contacts open, completing the call for heat.
- Gas control valve closes, extinguishing flame.
- Induced draft blower is de-energized following a 15-second post purge.
- The circulator blower remains at high heat speed for 30 seconds. The circulator blower then switches to low heat speed for the remainder of the selected heat off delay period. For example, the selected heat off delay period is 150 seconds. The circulator blower operates at high heat for 30 seconds and at low speed for $150 - 30 = 120$ seconds.
- Circulator blower and electronic air cleaner terminals are de-energized.
- Circulator blower ramps down to OFF during the 30 seconds following the heat off delay period.
- Furnace awaits next call from thermostat.

Heating Mode—Mode DIP Switch Set to 2 STG Position

The normal operational sequence in heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized for a 15-second prepurge period causing the pressure switch contacts to close.
- Igniter warm up begins after 15-second prepurge expires.

- Low-stage and high-stage gas control valves open at the end of the igniter warm up period, delivering gas to the burners and establishing flame.
 - High-stage gas control valve closes after 5 seconds; low-stage gas control valve remains open.
 - Integrated control module monitors flame presence. Gas control valve will remain open only if flame is detected.
 - Circulator blower is energized on low-heat speed following a fixed 30-second blower on delay. Electronic air cleaner terminals are energized with circulator blower.
 - Furnace is now operating in low-stage heating mode.
 - Furnace operates; integrated control module monitors safety circuits continuously.
 - If low-stage delay period expires, control will shift operation from low-stage heating mode operation to high-stage heating mode operation. Control will energize circulator blower high-heat speed and high-stage gas control valve.
 - Furnace is now operating in high-stage heating mode.
 - R and W thermostat contacts open, completing the call for heat.
 - Induced draft blower is de-energized following a 15-second post purge.
 - Circulator blower is de-energized following a heat off delay period (selectable 100 to 150 seconds; factory-set at 150 seconds).
- If the furnace is operating in the low-stage heating mode when thermostat contacts open, circulator remains at low-heat speed for the selected delay off period. If the furnace is operating in high-stage heating mode when the thermostat contacts open, the circulator blower remains at high-heat speed for 30 seconds. The circulator blower then switches to low-heat speed for the remainder of the selected heat off delay period. For example, the selected heat off delay period is 150 seconds. The circulator blower operates at high heat for 30 seconds and at low speed for $150 - 30 = 120$ seconds.
- Furnace awaits the next call from thermostat.

Cooling Mode

The normal operational sequence in cooling mode is as follows:

- R and Y thermostat contacts close, initiating a call for cool.
- Integrated control module performs safety circuit checks.
- Outdoor fan and compressor are energized.
- Circulator blower is energized on cool speed following a fixed 5-second on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace circulator blower and outdoor cooling unit run; integrated control module monitors safety circuits continuously.
- R and Y thermostat contacts open, completing the call for cool.
- Outdoor fan and compressor are de-energized.
- Circulator blower is de-energized following a fixed 45-second cool off delay period. Electronic air cleaner terminals are de-energized.
- Furnace awaits the next call from thermostat.

Fan Only Mode

The normal operational sequence in fan only mode is as follows:

- R and G thermostat contacts close, initiating a call for fan.
- Integrated control module performs safety circuit checks.
- Circulator blower is energized on low-heat speed. Electronic air cleaner terminals are energized.

- Circulator blower runs; integrated control module monitors safety circuits continuously.
- R and G thermostat contacts open, completing the call for fan.
- Circulator blower is de-energized. Electronic air cleaner terminals are de-energized.
- Furnace awaits the next call from thermostat.

CIRCUIT/SWITCH DESCRIPTIONS

A number of circuits are employed to ensure proper furnace operation. These circuits serve to control any potential hazards and serve as inputs in the monitoring and diagnosis of abnormal function. These circuits are continuously monitored during furnace operation by the integrated control module.

Integrated Control Module

The integrated control module is an electronic device which, if a potential concern is detected, will take the necessary precautions and provide diagnostic information through an LED.

Primary Limit Switch

The primary limit switch is located on the partition panel and monitors heat exchanger compartment temperatures. It is a normally closed (electrically), automatic reset, temperature-activated sensor. The limit switch guards against overheating as a result of insufficient conditioned air passing over the heat exchanger.

Auxiliary Limit Switches

The auxiliary limit switches are located on or near the circulator blower and monitors blower compartment temperatures. They are normally-closed (electrically), manual-reset sensors. These limit switches guard against overheating as a result of insufficient conditioned air passing over the heat exchanger.

Rollout Limit Switches

The rollout limit switches are mounted on the burner/manifold assembly and monitor the burner flame. They are normally-closed (electrically), manual-reset sensors. These limit switches guard against burner flames not being properly drawn into the heat exchanger.

Pressure Switches

The pressure switches are normally-open (closed during operation), negative air pressure-activated switches. They monitor the airflow (combustion air and flue products) through the heat exchanger via pressure taps located on the induced draft blower and the coil front cover. These switches guard against insufficient airflow (combustion air and flue products) through the heat exchanger and/or blocked condensate drain conditions.

Flame Sensor

The flame sensor is a probe mounted to the burner/manifold assembly which uses the principle of flame rectification to determine the presence or absence of flame.

Circulator Blower Speeds

This furnace is equipped with a multispeed circulator blower. This blower provides ease in adjusting blower speeds. The Specification Sheet applicable to your model provides an airflow table, showing the relationship between airflow (CFM) and external static pressure (E.S.P.), for the proper selection of heating and cooling speeds.

The cooling blower speed is shipped set on HIGH, and the heating blower speed is set as indicated in the Specification Sheet applicable to your model. These blower speeds should be adjusted by the installer to match the installation requirements so as to provide the correct heating temperature rise and correct cooling CFM.


To adjust the circulator blower speed, proceed as follows:

1. Turn off power to the furnace.
2. Select the heating and cooling blower speeds that match the installation requirements from the airflow table in the Specification Sheet.
3. Relocate the desired motor leads to the circulator blower heat and cool speed terminals on the integrated control module. (Terminals are identified as LO HEAT-H, HI HEAT-H and COOL-H [hot]). If a heating speed and the cooling blower speed are the same, a jumper wire must be used between the heat and cool terminals.
4. Connect all unused blower motor leads to the "PARK" terminals on the integrated control module. Any leads not connected to the "PARK" terminals must be taped.
5. Turn on power to furnace.
6. Verify the proper temperature rise as outlined in "Measure Temperature Rise" in "Complete Installation."

Circulator Blower Speeds

Low	Red
Medium Low	Orange
Medium	Blue
High	Black
Common/Neutral	White

115-Volt Line Connection of Accessories—Electronic Air Cleaner


**WARNING**

HIGH VOLTAGE!

Disconnect ALL power before servicing.

Multiple power sources may be present.

Failure to do so may cause property damage, personal injury or death.



The furnace's integrated control module is equipped with line-voltage accessory terminals for controlling power to an optional field-supplied electronic air cleaner.

The accessory load specifications are as follows:

Electronic Air Cleaner—1.0 Amp maximum at 120 VAC

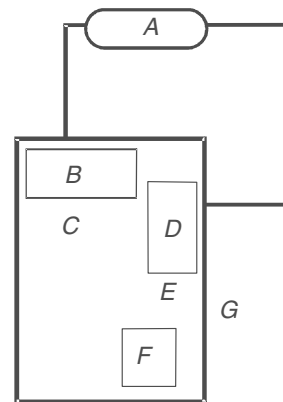
NOTES:

- Turn off power to the furnace before installing any accessories.
- Follow the air cleaner manufacturers' instructions for locating, mounting, grounding and controlling these accessories.
- Accessory wiring connections are to be made through the ¼" quick connect terminals provided on the furnace integrated control module.
- The electronic air cleaner hot terminal is identified as EAC-H.
- The electronic air cleaner neutral terminal is identified as LINE NEUTRAL.

- All field wiring must conform to applicable codes.

Optional Accessories Wiring

Connections should be made as shown below.



- A. Electronic air cleaner (optional) D. Line neutral
B. EAC-H E. 120 VAC neutral terminals
C. 120 VAC hot and park terminals F. 12-pin connector
G. Integrated control module

- If it is necessary for the installer to supply additional line voltage wiring to the inside of the furnace, the wiring must conform to all local codes, and have a minimum temperature rating of 105°C.
- All line voltage wire splices must be made inside the furnace junction box.
- The integrated control module electronic air cleaner terminals (EAC) are energized with 115 volts whenever the circulator blower is energized.

MAINTENANCE

Resetting from Lockout

Furnace lockout results when a furnace is unable to achieve ignition after 3 attempts. It is characterized by a non-functioning furnace and a one 1-flash diagnostic LED code. If the furnace is in "lockout," it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a 1 hour lockout period.
2. Manual power interruption. Interrupt 115-volt power to the furnace for 1 to 20 seconds.
3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat then reset to previous setting. Interrupt thermostat signal to the furnace for 1 to 20 seconds.

NOTE: If the condition which originally caused the lockout still exists, the control will return to lockout. See "Troubleshooting."

Annual Inspection

The furnace should be inspected by a qualified installer, or service agency at least once per year. This check should be performed at the beginning of the heating season. This will ensure that all furnace components are in proper working order and that the heating system functions appropriately. Pay particular attention to the following items. Repair or service as necessary.

- Flue pipe system. Check for blockage and/or leakage. Check the outside termination and the connections at and internal to the furnace.

- Heat exchanger. Check for corrosion and/or buildup within the heat exchanger passageways.
- Burners. Check for proper ignition, burner flame, and flame sense.
- Drainage system. Check for blockage and/or leakage. Check hose connections at and internal to furnace.
- Wiring. Check electrical connections for tightness and/or corrosion. Check wires for damage.
- Filters

Filters

Maintenance

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every 2 months or as required. When replacing a filter, it must be replaced with a filter of the same type and size.

Filter Removal

Depending on the installation, differing filter arrangements can be applied. Filters can be installed in either the central return register or a side panel external filter rack (upflow only). A media air filter or electronic air cleaner can be used as an alternate filter. Follow the filter sizes given in the Recommended Minimum Filter size table to ensure proper unit performance.

To remove filters from an external filter rack in an upright upflow installation, follow the directions provided with external filter rack kit.

Horizontal Furnace Filter Removal

Filters in horizontal installations are located in the central return register or the ductwork near the furnace.

To remove:

1. Disconnect power to the furnace.
2. Remove the filter(s) from the central return register or ductwork.
3. Replace the filter(s) by reversing the procedure for removal.
4. Reconnect power to the furnace.

Media Air Filter or Electronic Air Cleaner Removal

Follow the manufacturer's directions for service.

Burners

Visually inspect the burner flames periodically during the heating season. Turn on the furnace at the thermostat and allow several minutes for flames to stabilize, since any dislodged dust will alter the flames normal appearance. Flames should be stable, quiet, soft, and blue (dust may cause orange tips but they must not be yellow). They should extend directly outward from the burners without curling, floating, or lifting off. Flames must not impinge on the sides of the heat exchanger firing tubes.

Induced Draft and Circulator Blowers

The bearings in the induced draft blower and circulator blower motors are permanently lubricated by the manufacturer. No further lubrication is required. Check motor windings for accumulation of dust which may cause overheating. Clean as necessary.

Condensate Trap and Drain System (Qualified Servicer Only)

Annually inspect the drain tubes, drain trap, and field-supplied drain line for proper condensate drainage. Check drain system for hose connection tightness, blockage, and leaks. Clean or repair as necessary.

Flame Sensor (Qualified Servicer Only)

Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator causing a drop in the flame sense signal. If the flame sense signal drops too low the furnace will not sense flame and will lock out. The flame sensor should be cleaned by a qualified servicer using emery cloth or steel wool. Following cleaning, the flame sense signal should be as indicated in the Specifications Sheet.

Flue Passages (Qualified Servicer Only)

The heat exchanger flue passageways should be inspected at the beginning of each heating season. If necessary, clean the passageways as outlined below.

1. Disconnect power and turn off the gas supply to the furnace.
2. Disconnect the gas line and remove the burner/manifold assembly by removing the screws securing the assembly to the partition panel.
3. Disconnect the flue pipe system from the induced draft blower.
4. Remove the induced draft blower and, drain and pressure tap hoses from the recuperator coil front cover.

5. Remove the recuperator coil front cover to expose the coil tubes and turbulators.
6. Remove the recuperator coil turbulators individually by slowly pulling each turbulator forward firmly.
7. Clean the recuperator coil tubes using a long handle wire brush, such as a gun cleaning brush.
8. Clean the primary heat exchanger tubes using a wire brush attached to a length of high grade stainless steel cable, such as drain cleanout cable. Attach a variable speed reversible drill to the other end of the cable. Slowly rotate the cable with the drill and insert it into one of the heat exchanger tubes. While reversing the drill, work the cable in and out several times to obtain sufficient cleaning. Repeat for each tube.
9. Clean the residue from the furnace by using a vacuum cleaner.
10. Replace the parts removed in the previous steps in reverse order.
11. Turn on electrical power and gas to furnace. Check for leaks and proper furnace operation.
12. Severe heat exchanger fouling is an indication of an operational problem. Perform the checks listed in "Start-up Procedure and Adjustments" to reduce the chances of repeated fouling.

Bottom Return Removal

1. Disconnect power to the furnace.
2. Remove blower compartment door.
3. Push back and up on the wire filter retainer to release it from under the front lip of the furnace base pan.
4. Slide the filter forward and out.
5. Replace the filter by reversing the procedure.

Repair and Replacement Parts

When ordering any of the listed functional parts, be sure to provide the furnace model, manufacturing, and serial numbers with the order.

Although only functional parts are shown in the parts list, all sheet metal parts, doors, etc., may be ordered by description.

Parts are available from your distributor.

Functional Parts List


■ Gas Control Valve	■ Blower Motor
■ Gas Manifold	■ Blower Wheel
■ Natural Gas Orifice	■ Blower Mounting Bracket
■ Propane Gas Orifice	■ Blower Cutoff
■ Igniter	■ Blower Housing
■ Rollout Limit Switch	■ Heat Exchanger
■ Primary Limit Switch	■ Recuperator Coil
■ Auxiliary Limit Switch	■ Coil Front Cover
■ Pressure Switch	■ Integrated Control Module
■ Induced Draft Blower	■ Transformer
■ Capacitor	■ Door Switch
■ Flame Sensor	

TROUBLESHOOTING

See “Electrostatic Discharge (ESD)” before touching any electronic part on this furnace.

Furnace Fails to Operate Properly

Review “Sequence of Operation” and visually inspect the following before troubleshooting:




WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing.

Multiple power sources may be present.

Failure to do so may cause property damage, personal injury or death.



- Is the blower compartment door securely closed?
- Are the manual shutoff valves in the gas line to the furnace open?
- Are all wiring connections secure?

Start the system by setting thermostat above room temperature. Observe system response. Then use the information provided in this section to check the system operation.

Fault Recall

The ignition control is equipped with a momentary push button switch that can be used to display on the diagnostic LED the last 5 faults detected by the control. The control must be in Standby Mode (no thermostat inputs) to use the feature. Depress the push button switch for approximately 2 seconds. Release the switch when the LED is turned off. The diagnostic LED will then display the flash codes associated with the last 5 detected faults. The order of display is the most recent fault to the least recent fault.

- Is the integrated ignition/blower control board and power to the furnace on?

Problem	LED Code	Fault/Cause	Solution
<ul style="list-style-type: none"> ■ Furnace fails to operate ■ Integrated control module diagnostic LED provides no signal 	None	<ul style="list-style-type: none"> ■ No 115-volt power to furnace, or no 24-volt power to integrated control module. ■ Blown fuse or circuit breaker. ■ Internal fault in integrated control module. 	<ul style="list-style-type: none"> ■ Check that there is 115-volt power to the furnace, or 24-volt power to integrated control module. ■ Check integrated control module fuse (3A). Replace if necessary. ■ Check for possible shorts in 115-volt and 24-volt circuits. Repair as necessary. ■ Replace bad integrated control module.
<ul style="list-style-type: none"> ■ LED is steady On. 	Continuous On—not flashing	<ul style="list-style-type: none"> ■ Normal operation 	<ul style="list-style-type: none"> ■ None
<ul style="list-style-type: none"> ■ Furnace fails to operate. ■ Integrated control module diagnostic LED is flashing 1 flash. 	1 flash	<ul style="list-style-type: none"> ■ Furnace lockout due to an excessive number of ignition “retries” (3 total). ■ Failure to establish flame. Cause may be no gas to burners, front cover pressure switch stuck open, bad igniter or igniter alignment, improper orifices or coated/oxidized or improperly connected flame sensor. ■ Loss of flame after establishment. Cause may be interrupted gas supply, lazy burner flames (improper gas pressure or restriction in flue and/or combustion air piping), front cover pressure switch opening or improper induced draft blower performance. 	<ul style="list-style-type: none"> ■ Locate and correct gas interruption. ■ Check front cover pressure switch operation (hose, wiring, contact operation). Correct if necessary. ■ Replace or realign igniter. Igniter is fragile, handle gently. ■ Check flame sensor signal. Sand sensor with emery cloth if coated and/or oxidized. ■ Check flue piping for blockage, proper length, elbows and termination. See “Vent/Flue Pipe.” ■ Verify proper induced draft blower performance.
<ul style="list-style-type: none"> ■ Furnace fails to operate. ■ Integrated control module diagnostic LED is flashing 2 flashes. 	2 flashes	<ul style="list-style-type: none"> ■ Pressure switch circuit is closed. ■ Induced draft blower is not operating. ■ Induced draft blower pressure switch contacts sticking. ■ Shorts in pressure switch circuit. 	<ul style="list-style-type: none"> ■ Replace induced draft blower pressure switch. ■ Repair short.

Problem	LED Code	Fault/Cause	Solution
<ul style="list-style-type: none"> ■ Induced draft blower runs continuously with no further furnace operation. ■ Integrated control module diagnostic LED is flashing 3 flashes. 	3 flashes	<ul style="list-style-type: none"> ■ Pressure switch circuit not closed. ■ Induced draft blower is operating. ■ Pressure switch hose blocked, pinched or connected improperly. ■ Blocked flue and/or inlet air pipe, blocked drain system or weak induced draft blower. ■ Incorrect pressure switch setpoint or malfunctioning switch contacts. ■ Loose or improperly connected wiring. 	<ul style="list-style-type: none"> ■ Inspect pressure switch hose. Repair, if necessary, ■ Inspect flue and/or inlet air piping for blockage, proper length, elbows, and termination. Check drain system. Correct as necessary. ■ Correct pressure switch setpoint or contact motion. ■ Tighten or correct wiring connection.
<ul style="list-style-type: none"> ■ Circulator blower runs continuously. No furnace operation. ■ Integrated control module diagnostic LED is flashing 4 flashes. 	4 flashes	<ul style="list-style-type: none"> ■ Primary or auxiliary limit circuit is open or faulty. ■ Insufficient conditioned air over the heat exchanger. Blocked filters, restrictive ductwork, improper circulator blower speed or failed circulator blower. ■ Loose or improperly connected wiring. 	<ul style="list-style-type: none"> ■ Check primary limit switch. Replace, if necessary. ■ Check filters and ductwork for blockage. Clean filters or remove obstruction. ■ Check circulator blower speed and performance. Correct speed or replace blower if necessary. ■ Tighten or correct wiring connection.
<ul style="list-style-type: none"> ■ Induced draft blower and circulator blower runs continuously. No furnace operation. ■ Integrated control module diagnostic LED is flashing 5 flashes. 	5 flashes	<ul style="list-style-type: none"> ■ Flame sensed with no call for heat. ■ Short to ground in flame sensor circuit. 	<ul style="list-style-type: none"> ■ Correct short at flame sensor or in flame sensor wiring.
<ul style="list-style-type: none"> ■ Furnace fails to operate. ■ Integrated control module diagnostic LED is flashing 6 flashes. 	6 flashes	<ul style="list-style-type: none"> ■ Rollout limit switch open. ■ Integrated control module fuse is blown. ■ Flame rollout. ■ Misaligned burners, blocked flue and/or air inlet pipe or failed induced draft blower. ■ Loose or improperly connected wiring. ■ Short in 24-volt AC control circuits or safety circuits. ■ Faulty rollout limit switch. 	<ul style="list-style-type: none"> ■ Check burners for proper alignment. ■ Check flue and air inlet piping for blockage, proper length, elbows and termination. Correct as necessary. See "Vent/Flue Pipe." ■ Check rollout limit switch. Replace, if necessary. ■ Check induced draft blower for proper performance. Replace, if necessary. ■ Tighten or correct wiring connection. ■ Repair short in 24-volt AC control/safety circuit(s). ■ Replace integrated control module fuse (3A).
<ul style="list-style-type: none"> ■ Normal furnace operation. ■ Integrated control module diagnostic LED is flashing 7 flashes. 	7 flashes	<ul style="list-style-type: none"> ■ Flame sensor microamp signal is low. ■ Flame sensor is coated/oxidized. ■ Flame sensor incorrectly positioned in burner flame. ■ Lazy burner flame due to improper gas pressure or combustion air. 	<ul style="list-style-type: none"> ■ Sand flame sensor with emery cloth. ■ Inspect for proper sensor alignment. ■ Compare current gas pressure to rating plate info. Adjust as needed.
<ul style="list-style-type: none"> ■ Furnace not operating. ■ Integrated control module diagnostic LED is flashing 8 flashes. 	8 flashes	<ul style="list-style-type: none"> ■ Problem with igniter circuit. Improperly connected igniter. Bad igniter. ■ Poor unit ground. ■ Poor burner ground. ■ Faulty integrated control module. 	<ul style="list-style-type: none"> ■ Check and correct wiring from integrated control module to igniter ■ Replace bad igniter. ■ Check and correct unit ground wiring. ■ Replace bad integrated control module.
<ul style="list-style-type: none"> ■ Induced draft blower runs continuously. Furnace fails to operate. ■ Integrated control module diagnostic LED is flashing continuously. 	Continuous flashes	<ul style="list-style-type: none"> ■ Polarity of 115-volt or 24-volt power is reversed. ■ Polarity of 115-volt AC power to furnace or integrated control module is reversed. ■ Red and blue wires to transformer are reversed. ■ Poor unit ground. 	<ul style="list-style-type: none"> ■ Review wiring diagram to correct polarity. ■ Verify proper ground. Correct if necessary. ■ Reverse red and blue wires connected to transformer.

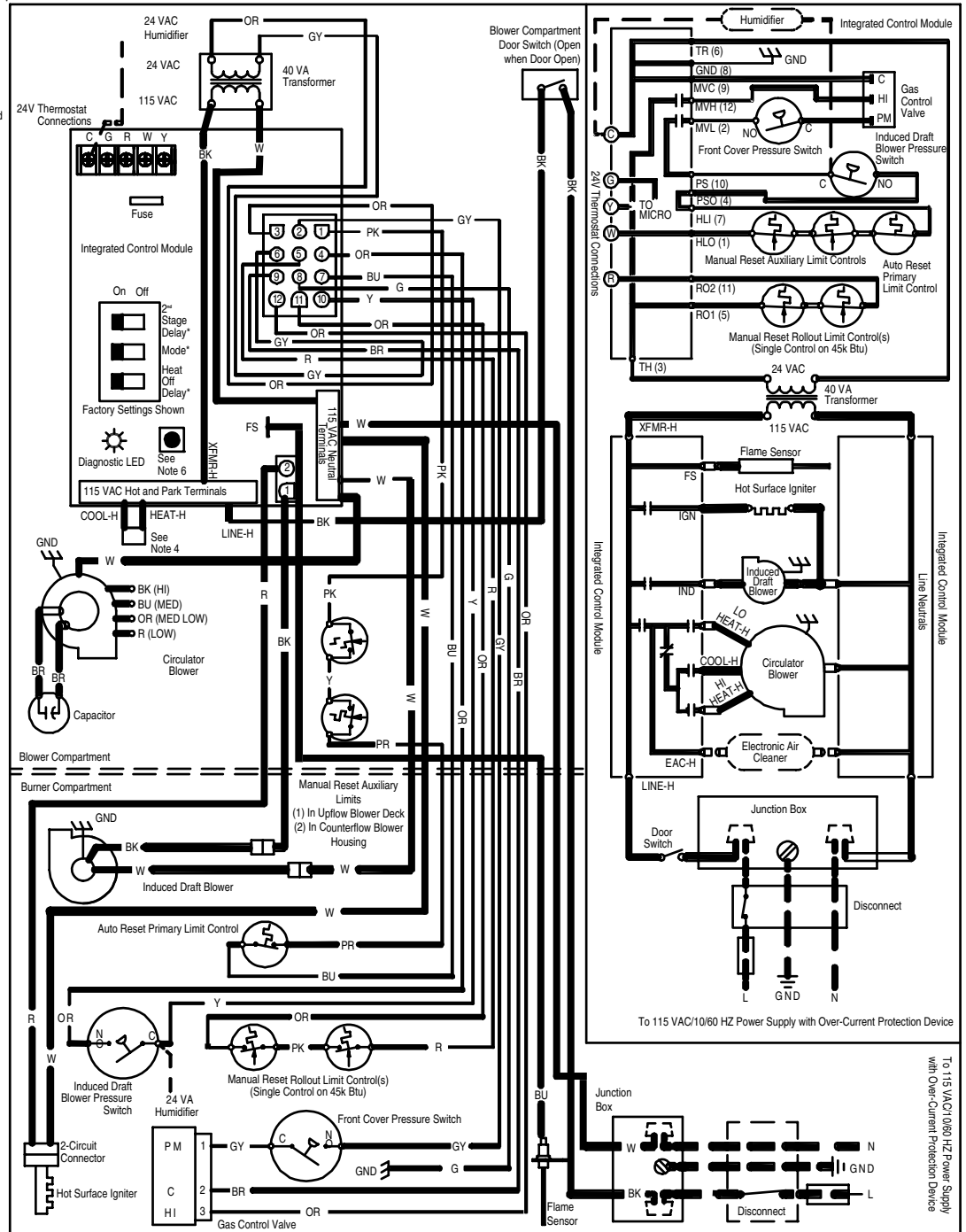
Wiring Diagram

- Steady On = Normal Operation
- 1 Flash = System Lockout (Retries/Recycles Exceeded)
- 2 Flashes = Low Fire Pressure Switch Stuck Closed
- 3 Flashes = Low Fire Pressure Switch Stuck Open
- 4 Flashes = Thermal Protective Device Open
- 5 Flashes = Flame Sensed With Gas Control Valve De-energized
- 7 Flashes = Low Flame Sense Signal
- 8 Flashes = Check Igniter Or Improper Grounding
- 9 Flashes = High Fire Pressure Switch Stuck Open
- Continuous Flashes = 115-Volt AC Power Reversed

- Equipment GND
- Field GND
- Field Splice
- Switch (Temp.)
- Igniter
- Pressure Switch
- Over-Current Protection Device

- Low Voltage (24V)
- Low Voltage Field
- High Voltage (115V)
- High Voltage Field
- Junction
- Terminal
- Internal To Integrated Control
- Plug Connection

Color	Symbol
Gray	GY
White	W
Black	BK
Red	R
Blue	BU
Orange	OR
Yellow	Y
Green	G
Pink	PK
Azure	A
Violet	V
Brown	BR



Check codes for proper wiring and circuit protection before installation.

NOTES:

1. Set heat anticipator on room thermostat at 0.7 amps.
2. Manufacturer's specified replacement parts must be used when servicing.
3. If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C. Use copper conductors only.

4. If heating and cooling blower speeds are not the same, discard jumper before connecting blower leads. Unused blower leads must be placed on "PARK" terminals of integrated control or taped.
5. Unit must be permanently grounded and conform to NEC and local codes.
6. To recall the last 5 faults, most recent to least recent, depress switch for more than 2 seconds while in standby (no thermostat inputs).

ASSISTANCE OR SERVICE

If you need further assistance, you can write to the below address with any questions or concerns:

Whirlpool® Home Cooling and Heating
14610 Breakers Drive
Jacksonville, FL 32258

Please include a daytime phone number in your correspondence.

Accessories

to order accessories, contact your Whirlpool® Home Cooling and Heating dealer.

Notes

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