

Installation Instructions

Single Stage Condensing Gas Furnaces



M4RC Upflow Furnace



M4RL Downflow Furnace

⚠ WARNING:

PROPOSITION 65 WARNING: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

ATTENTION INSTALLERS:

It is your responsibility to know this product better than your customer. This includes being able to install the product according to strict safety guidelines and instructing the customer on how to operate and maintain the equipment for the life of the product. Safety should always be the deciding factor when installing this product and using common sense plays an important role as well. Pay attention to all safety warnings and any other special notes highlighted in the manual. Improper installation of the furnace or failure to follow safety warnings could result in serious injury, death, or property damage.

These instructions are primarily intended to assist qualified individuals experienced in the proper installation of this appliance. Some local codes require licensed installation/service personnel for this type of equipment. Please read all instructions carefully before starting the installation. Return these instructions to the customer's package for future reference.

⚠ WARNING:

FIRE OR EXPLOSION HAZARD

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

WHAT TO DO IF YOU SMELL GAS

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

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

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SAFETY INFORMATION

Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.



WARNING:

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

- Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
- Install this furnace in accordance to the minimum clearances to combustible materials listed in Table 1 (page 9).
- Provide adequate combustion and ventilation air to the furnace space as specified on pages 6 - 9.
- Provide adequate clearances around the vent air intake terminal as specified in Figures 6 - 9 (pages 12 - 13).
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified on Pages 10 - 13.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections (page 24).
- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column. Consult Table 8 (page 38), and the rating plate for the proper circulating air flow and temperature rise.
NOTE: It is important that the duct system be designed to handle the desired flow rate and external pressure rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.
- When supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. See page 14.
- This furnace may not be used for temporary heating of buildings or structures under construction.

REQUIREMENTS and CODES

This furnace must be installed in accordance with these instructions, all applicable local building codes and the current revision of the National Fuel Gas Code (NFPA54/ANSI Z223.1) or the Natural Gas and Propane Installation Code, CAN/CGA B149.1.

CE générateur d'air chaud doit être installé conformément aux instructions du fabricant et aux codes locaux. En l'absence de code local, respecter la norme ANSI Z223., 1, intitulé National Fuel Gas Code ou les codes d'installation CAN/GCA-B149.

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through – the – wall vented gas appliances as follows:

1. For direct-vent appliances, mechanical-vent heating appliances or domestic hot water equipment, where the bottom of the vent terminal and the air intake is installed below four feet above grade the following requirements must be satisfied:
 - a.) A carbon monoxide (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
 - b.) A (CO) detector shall be located in the room that houses the appliance or equipment and shall:
 - Be powered by the same electrical circuit as the appliance or equipment. Only one service switch shall power the appliance and the (CO) detector;
 - Have battery back-up power;
 - Meet ANSI/UL 2034 Standards and comply with NFPA 720 (2005 Edition); and Approved and listed by a Nationally Recognized Testing Laboratory as recognized under 527 CMR.
 - c.) A Product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.
 - d.) A metal or plastic identification plate shall be mounted at the exterior of the building, four feet directly above the location of vent terminal. The plate shall be of sufficient size, easily read from a distance of eight feet away, and read "Gas Vent Directly Below".
2. For direct-vent appliances, mechanical-vent heating appliances or domestic hot water equipment where the bottom of the vent terminal and the air intake is installed above four feet above grade the following requirements must be satisfied:

- a.) A (CO) detector and alarm shall be placed on each floor level where there are bedrooms. The detector shall comply with NFPA 720 (2005 Edition) and be mounted in the living area outside the bedroom(s).
- b.) The (CO) detector shall:
 - Be located in the room that houses the appliance or equipment;
 - Be hard-wired or battery powered or both.
 - Shall comply with NFPA 720 (2005 Edition).
- c.) A product-approved vent terminal must be used, and if applicable, a product-approved air intake must be used. Installation shall be in strict compliance with the manufacturer's instructions. A copy of the installation instructions shall remain with the appliance or equipment at the completion of the installation.

Additional information listed below is for reference purposes only and does not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

Combustion and Ventilation Air

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

Duct Systems

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

Electrical Connections

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

Gas Piping and Gas Pipe Pressure Testing

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

General Installation

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

Safety

- US: (NFGC) NFPA 54–1999/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.
- Federal Manufactured Home Constructions & Safety Standard (H.U.D. Title 24, Part 3280.707[a][2])
- The Standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Set-Ups) ANSI A225.1 and/or CAN/CSA-2240 MH Series).
- American National Standard (ANSI-119.2/NFPA-501C) for all recreational vehicle installations.
- CANADA: CAN/CGA-B149.1 and .2–M00 National Standard of Canada. (NSCNGPIC)

GENERAL INSTRUCTIONS

Manufacturer Warranty, Owner's Responsibilities

It is the sole responsibility of the homeowner to make certain the gas furnace has been correctly installed in the home, converted to the proper fuel (LP gas or Natural gas), and adjusted for proper operation.

A warranty certificate with full details is included with this furnace. However, NORDYNE will not be responsible for any costs found necessary to correct problems due to improper setup, improper installation, furnace adjustments, improper operating procedure on the part of the user, etc.

Some specific examples of service calls which cannot be included in warranty payments are:

- Converting the furnace to use another type of gas.
- Repairing duct work in the home found to be faulty.
- Correcting wiring problems in the electrical circuit supplying the furnace.
- Resetting circuit breakers, blown fuses or other switches.
- Correcting problems due to improper gas supply pressure to the furnace.
- Providing instructional training on how to light and operate the furnace.
- Correcting any problems caused by installation of an air conditioner, heat pump or other air comfort devices.
- Revising installation of the furnace flue assembly.
- Adjusting or calibrating of thermostat.
- Removing any construction debris which has fallen into flue system.

Carefully review these responsibilities with your manufactured housing dealer, service company, or gas supplier, so that there will be no misunderstanding at a later time.

Combustion Air Quality



CAUTION:

Combustion air must not be drawn from a corrosive atmosphere.

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

- If the furnace is a single pipe installation and installed in a confined space, it is required that the necessary combustion air come from the outdoors by way of attic, crawl space, air duct, or direct opening. See pages 6 - 9 for combustion air requirements.
- Installations in these locations may require outdoor air for combustion, due to chemical exposures:
 - Commercial buildings
 - Buildings with indoor pools
 - Furnaces installed in laundry rooms
 - Furnaces installed in hobby or craft rooms
 - Furnaces installed near chemical storage areas
- Exposure to the following substances in the combustion air supply may require outdoor air for combustion:
 - Permanent wave solutions
 - Chlorinated waxes and cleaners
 - Chlorine based swimming pool chemicals
 - Water softening chemicals
 - De-icing salts or chemicals
 - Carbon Tetrachloride
 - Halogen type refrigerants
 - Cleaning solvents (perchloroethylene)
 - Printing inks, paint removers, varnishes, etc.
 - Hydrochloric Acid
 - Cements and glues
 - Antistatic fabric softeners
 - Masonry acid washing materials

Installation in a Garage



WARNING:

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

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

Heating Load

This furnace should be sized to provide the design heating load requirement. Heating load estimates can be made using approved methods available from Air Conditioning Contractors of America (Manual J); American Society of Heating, Refrigerating, and Air Conditioning Engineers; or other approved engineering methods. **Excessive oversizing of the furnace could cause the furnace and/or vent to fail prematurely.** In addition, the ductwork should be appropriately sized to the capacity of the furnace to ensure its proper airflow rating. For installations above 2,000 ft., the furnace should have a sea level input rating large enough that it will meet the heating load after deration for altitude.

Clearances to Combustible Materials

This furnace is Design Certified in the U.S. and Canada by CSA International for the minimum clearances to combustible material listed in Table 1 (page 9). To obtain model number and specific clearance information, refer to the furnace rating plate, located inside of the furnace cabinet.

Access for positioning and servicing the unit must be considered when locating unit. The need to provide clearance for access to panels or doors may require clearance distances over and above the requirements. **Allow 30 inches minimum clearance from the front of the unit for servicing and positioning. However, 36 inches is strongly recommended.**

COMBUSTION AIR REQUIREMENTS

General Information

Provisions must be made during the installation of this furnace that provide an adequate supply of air for combustion. NORDYNE condensing furnaces must be installed with outdoor combustion air piped directly to the furnace.

WARNING:

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

- Instructions for determining the adequacy of an installation can be found in the current revision of the NFGC (ANSI Z223.1 / NFPA54). **Consult local codes for special requirements.** These requirements are for US installations as found in the NFGC.

- Requirements in Canada (B149.1) are structured differently. Consult with B149.1 and local code officials for Canadian installations.
- The M4 series gas furnace has been certified for use in manufactured homes in the United States to the UL 307B standard and to ANSI Z21.47 CAN/CGA-2.3 in Canada and the United States. These furnaces may be installed in:

Manufactured Homes
Recreational Vehicles, Park Models
Manufactured Buildings
Modular Homes / Buildings

- The M4 furnace is listed as a Direct Vent (2-pipe) forced air furnace (type FSP) for use with both natural and propane (LP) gases. **NOTE:** Direct vent appliances draw combustion air from the outdoors and vent combustion products back outside, isolating the entire system from the indoor space. It is important to make sure that the whole system is sealed and clearances to combustibles are maintained regardless of the installation being in a confined or unconfined space.
- The combustion air from the outside needs to be clear of chemicals that can cause corrosion. The inlet pipe should not be placed near corrosive chemicals such as those listed on page 5. These chemicals can cause severe corrosion in the furnace combustion system.
- Air openings on top of the furnace and in closet doors or walls must never be restricted. If the furnace is operated without adequate combustion air, the flame roll-out switch will open and turn off the gas supply to the burners. **This safety device is a manually reset switch. DO NOT install jumper wires across these switches to defeat their function or reset a switch without identifying and correcting the fault condition.** If a switch must be replaced, use only the correct sized part specified in the Replacement Parts List provided online.

CAUTION:

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

Installation in Confined Spaces

A confined space is an area with volume less than 50 cubic feet per 1,000 Btuh of the combined input rates of all appliances drawing combustion air from that space.

Furnace closets, small equipment rooms and garages are confined spaces. Furnaces installed in a confined space which supply heated air to areas outside the space must draw return air from outside the space and must have the return air ducts tightly sealed to the furnace.

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

Air From Inside

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

Example:

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

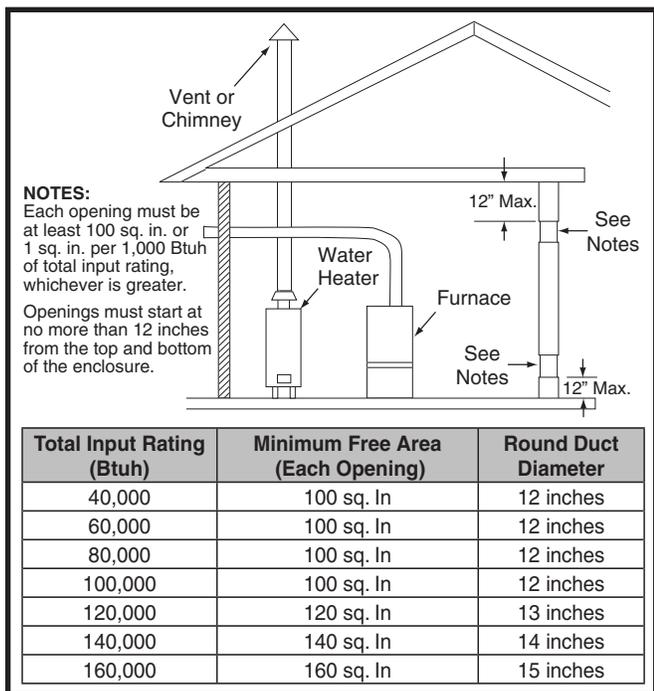


Figure 1. Combustion Air Drawn from Inside

Outdoor Air from a Crawl Space or Vented Attic

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

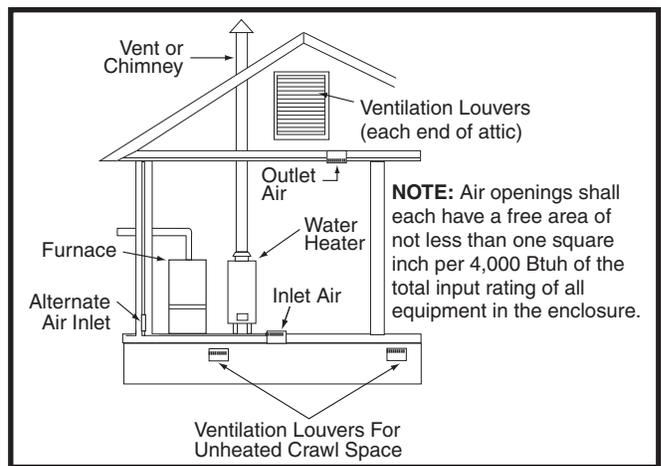


Figure 2. Combustion Air Drawn from a Crawl Space or Vented Attic

Outdoor Air Using Vertical Ducts

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

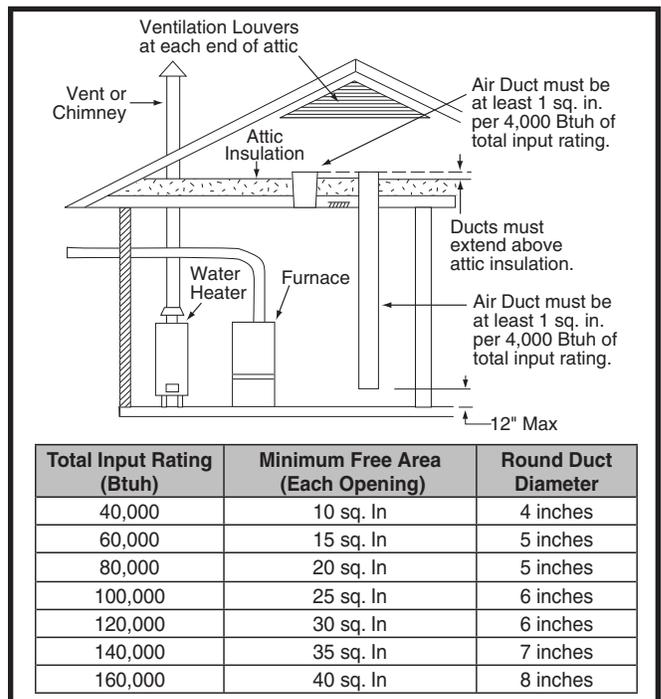


Figure 3. Combustion Air Drawn from Outside Through Vertical Ducts

Outdoor Air Using Horizontal Ducts

If combustion air is taken from outdoors through horizontal ducts, the openings and ducts must have a minimum free area of one square inch per 2,000 Btuh of total appliance input. Ducts must have cross-sectional area at least as large as the free area of their respective openings to the furnace space. See Figure 4 (page 8).

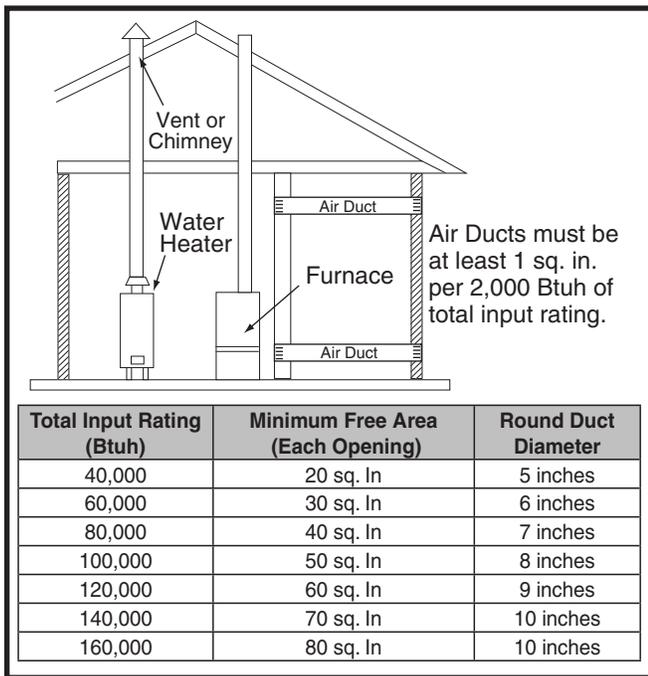


Figure 4. Combustion Air Drawn from Outside Through Horizontal Ducts

Air Directly Through An Exterior Wall

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

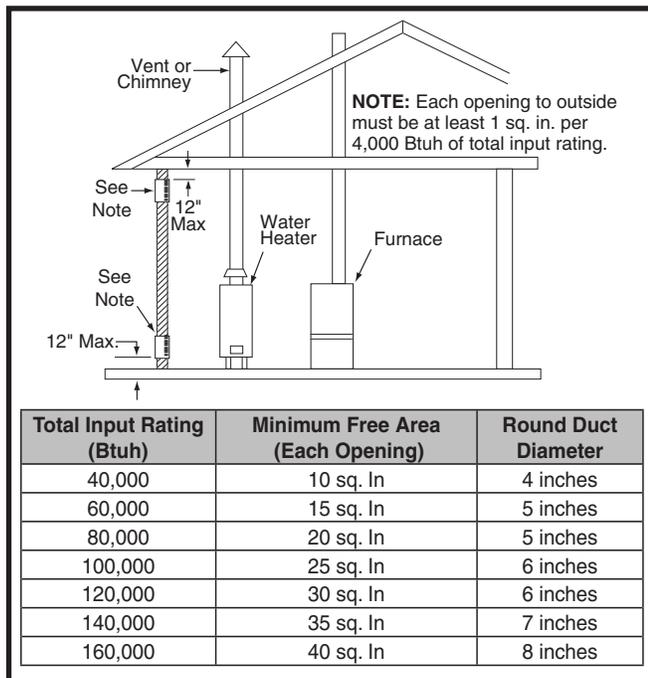


Figure 5. Combustion Air Drawn from Outside Through an Exterior Wall

Alternate Method of Providing Air from Outside:

If acceptable under local Codes, it is permitted to provide outside air using one opening (See NFGC).

Generally, confined spaces must have two openings in the space for combustion air. One opening must be within 12 inches of the ceiling, and the other must be within 12 inches of the floor. However, an alternative method recently adopted by the NFGC uses one opening within 12 inches of the top of the space. This method may be used if it is acceptable to the local codes.

The following conditions must be met:

1. The opening must start within 12" of the top of the structure and connect with the out of doors through vertical or horizontal ducts or be ducted to a crawl or attic space that connects with the out of doors.
2. The opening must have a minimum free area of 1 sq. in. per 3,000 Btu per hour of the total input rating of all equipment located in the enclosure.
3. The free area must not be less than the sum of all the areas of the vent connectors in the enclosure.

Installation in Unconfined Spaces

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

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

Example:

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

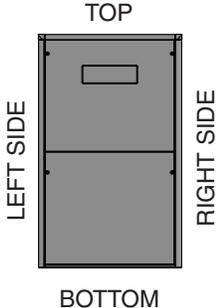
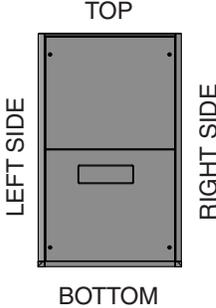
INSTALLATION CLEARANCES to COMBUSTIBLE MATERIALS For UPFLOW, HORIZONTAL & DOWNFLOW FURNACES		
Left Side.....0 Inches	Vent..... 1 Inch	Top.....1 Inches
Right Side0 Inches	Back.....0 Inches	Front..... 4 Inches [†]
<p style="text-align: center;">UPFLOW APPLICATION</p> 		<p style="text-align: center;">DOWNFLOW APPLICATION</p> 
[†] Allow 30 in. minimum clearance for servicing. Recommended clearance is 36 in.		
NOTE: The furnace is listed for installation on combustible or non-combustible flooring. However, wood is the only combustible flooring allowed for installation.		

Table 1. Minimum Clearances to Combustible Materials



WARNING:

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death. The following steps shall be followed with each individual appliance connected to the venting system being placed in operation, while all other appliances connected to the venting system are not in operation:

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

VENTING REQUIREMENTS

WARNING:

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

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

- This furnace must be vented in compliance with the current revision of the National Fuel Gas Code (ANSI-Z223.1/NFPA54) and the instructions provided below. **Consult local codes for special requirements.**
- In Canada, venting shall conform to the requirements of the current (CAN/CGA B149.1 or .2) installation codes. **Consult local codes for special requirements.**

This furnace is classified as a “Category IV” appliance, which requires special venting materials and installation procedures. This type of appliance operates with positive vent pressure and therefore requires the furnace to be vented to the outdoors and thoroughly sealed. They also produce liquid condensate, which is slightly acidic and

can cause severe corrosion of ordinary venting materials. Furnace operation can be adversely affected by restrictive vent and combustion air piping.

Vent Pipe Length and Diameter

In order for the furnace to operate properly, the combustion air and vent piping must not be excessively restrictive.

- The venting system should be designed to have the minimum number of elbows or turns.
- All horizontal runs must slope upwards from the furnace at 1/4 inch minimum per running foot of vent.
- Transition to the final vent diameter should be done as close to the furnace outlet as practical.
- Always use the same size or a larger pipe for combustion air that is used for the exhaust vent.

Table 2 specifies the maximum allowable pipe length for vent and combustion air for a furnace of known input rate, when installed with piping of selected diameter and number of elbows. To use the table, the furnace input rate, the centerline length and the number of elbows on each pipe must be known.

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

The equivalent lengths of tees and various elbows are listed in Table 2. Measure the linear length of your vent run and then add in the equivalent length of each fitting. The total length, including the equivalent fitting lengths, must be less than the maximum length in the table.

Furnace (BTU)	FURNACE INSTALLATION	SINGLE PIPE LENGTH (FT.) with 1 long radius elbow (See Notes)	DUAL VENT PIPE LENGTH (FT.) with 1 long radius elbow on each pipe (See Notes)
		OUTLET 3” Diameter	INLET/OUTLET 3” Diameter
54,000	Upflow	90	90
72,000	Upflow	90	90
90,000	Upflow	90	90
	Downflow	90	90
108,000	Upflow	90	90
NOTES:			
1. The length of 2” pipe needed between the inducer and the exit hole (top of cabinet) is 8 3/4” for upflow models and 16” for downflow models.			
2. Subtract 2.5 ft. for each additional 2 inch long radius elbow, 5 ft. for each additional 2 inch short radius elbow, 3.5 ft. for each additional 3 inch long radius elbow, and 7 ft. for each additional 3 inch short radius elbow. Subtract 8ft for each 3” tee.			
3. Two 45 degree elbows are equivalent to one 90 degree elbow.			
4. This table applies for elevations from sea level to 2,000 ft. For higher elevations, decrease pipe lengths by 8% per 1,000 ft of altitude.			

Table 2. Vent Pipe Lengths

Condensing furnace combustion products have very little buoyancy, so Table 2 is to be used without consideration of any vertical rise in the piping.

Vent Pipe Material

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

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

In Canada, all plastic vent pipes and fittings including any cement, cleaners, or primers must be certified as a system to ULC S636. However, this requirement does not apply to the finish flanges or piping internal to the furnace.

Vent Pipe Installation



CAUTION:

Combustion air must not be drawn from a corrosive atmosphere.

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

- The quality of outdoor air must also be considered. Be sure that the combustion air intake is not located near a source of solvent fumes or other chemicals which can cause corrosion of the furnace combustion system. See list of substances on page 5.
- Route piping as direct as possible between the furnace and the outdoors. Longer vent runs require larger diameters. Vent piping must be sloped upwards 1/4" per foot in the direction from the furnace to the terminal. This is to ensure that any condensate flows back to the condensate disposal system.
- The combustion air intake and the vent exhaust must be located in the same atmospheric pressure zone. This means both pipes must exit the building through the same portion of exterior wall or roof as shown in Figures 6 - 9 (page 12 - 13) and Figure 41 (page 44).
- Piping must be mechanically supported so that its weight does not bear on the furnace. Supports must be at intervals no greater than 5 ft. Supports may be at shorter intervals if necessary to ensure that there are no sagging sections that can trap condensate.

Outdoor Terminations - Horizontal Venting

Vent and combustion air intake terminations shall be installed as depicted in Figures 6 - 7 (page 12) and in accordance with these instructions:

- Vent termination clearances must be consistent with the NFGC, ANSI 2223.1/NFPA 54 and/or the CSA B149.1, Natural Gas and Propane Installation Code.
- All minimum clearances must be maintained to protect building materials from degradation by flue gases as shown in Figure 7.
- Vent and combustion air intake terminations must be located to ensure proper furnace operation and conformance to applicable codes. The minimum distance from any door, open window, or air gravity inlet is 1ft. below, 1ft. horizontally, or 1ft. above. In Canada, CSA B149.1 takes precedence over these instructions. Table 15 (page 43) lists the necessary distances from the vent termination to windows and building air intakes.
- The vent termination shall be located at least 4 ft. horizontally from any electric meter, gas meter, regulator and any relief equipment. These distances apply ONLY to U.S. installations. In Canada, the Canadian Fuel Gas Code takes precedence over these instructions.
- Do not install the vent terminal such that exhaust is directed into window wells, stairwells, under decks or into alcoves or similar recessed areas, and do not terminate above any public walkways.
- If venting horizontally, a side wall vent kit is available according to the pipe diameter size of the installation. For 2 inch pipe use side wall vent kit #904617, and for 3 inch pipe use kit #904349. **Please follow the instructions provided with the kit.**
- When the vent pipe must exit an exterior wall close to the grade or expected snow level where it is not possible to obtain clearances shown in Figure 6, a riser may be provided as shown in Figure 8 (page 12). Insulation is required to prevent freezing of this section of pipe. For vent freezing protection, see page 13.



WARNING:

The combustion air vent and exhaust vent must be configured as shown in Figure 9. Improper vent terminations can cause the recirculation of flue gases which may result in furnace vibration. In severe cases, the furnace will cycle, due to the intermittent contact between the flame and the flame sensor. If you notice these oscillations occurring, check the vent configuration to make sure the exhaust vent does not have a 90 degree termination.

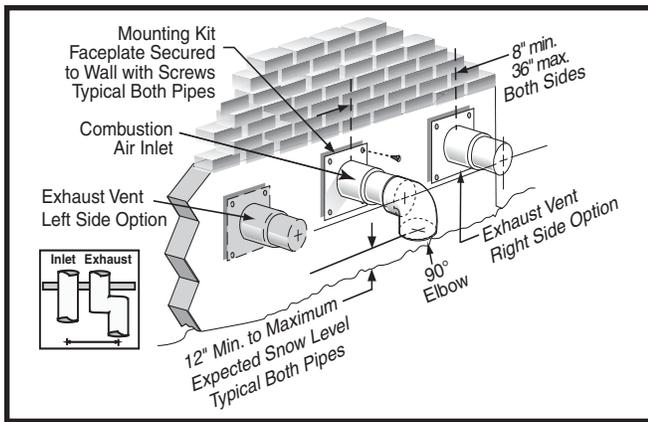


Figure 6. Exhaust and Combustion Air Pipe Clearances

- For optimal performance, vent the furnace through a wall that experiences the least exposure to winter winds.
- Termination kits consist of two face plates and an insulating gasket to seal the exterior surface.
- The hole in the wall must be sized closely to the diameter of the pipe.
- The pipe that penetrates the wall should be long enough that it can be held in place by standard close fitting couplings.
- Face plates are secured to both sides of the wall by the couplings, and the gasket is retained against the wall by the exterior face plate.
- Face plates must be fastened to the wall. Exterior face plates must be flashed to prevent water infiltration.

If termination kits are not used, these requirements must be followed:

- The hole size cut through the exterior wall is smaller than the outside diameter of the couplings.
- The vent pipe extends through the wall approximately 1" and the gap between the wall and pipe is sealed.
- Couplings are applied to the vent pipe on the interior and exterior sides of the wall. **NOTE:** This insures the pipe can not be pushed or pulled through the wall.
- The combustion air inlet pipe must have a 90 degree termination elbow, and pointed downwards as shown in Figure 6 & Figure 9 (page 13).

Outdoor Terminations - Vertical Venting

Termination spacing requirements from the roof and from each other are shown in Figure 9.

- The roof penetration must be properly flashed and waterproofed with a plumbing roof boot or equivalent flashing.
- The combustion air intake must be provided with an elbow opening downward.

Vent and combustion air piping may be installed in an existing chimney which is not in use provided that:

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

Vent Freezing Protection

- When the vent pipe is exposed to temperatures below freezing (i.e., when it passes through unheated spaces, chimneys, etc.) the pipe must be insulated with 1/2 inch thick sponge rubber insulation, Armaflex-type insulation or equivalent. Insulating pipe is important to avoid condensate icing.
- Table 3 (page 13) lists the maximum length of flue pipe that can travel through an unconditioned space or an exterior space. The total vent length must not exceed

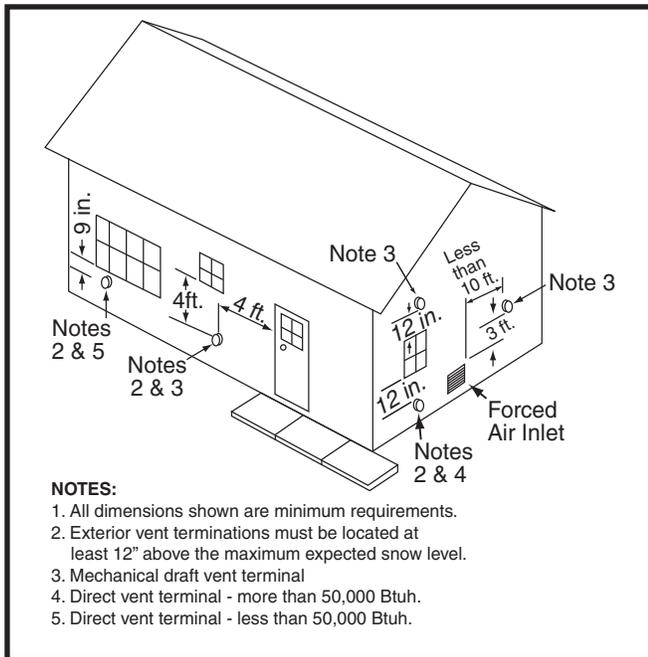


Figure 7. Vent Locations

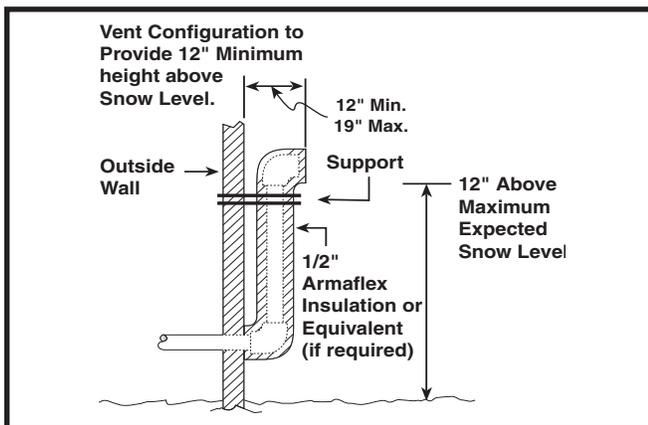


Figure 8. Alternate Horizontal Vent Installation

the lengths noted in Table 2 (page 10). For Canadian installations please refer to the Canadian Installation Code (CAN/CGA-B149.1 or 2) and/or local codes.

- For extremely cold climates or conditions of short furnace cycles (i.e. set back thermostat conditions), the last 18 inches of vent pipe can be reduced from 3" to 2-1/2", 3" to 2" or 2" to 1-1/1" if the total vent length is at least 15 feet in length and the vent is sized in accordance with Table 2. The length of the 2 inch pipe must not be longer than 18 inches. Smaller vent pipes are less susceptible to freezing, but must not be excessively restrictive.
- To prevent debris or creatures from entering the combustion system, a protective screen may be installed over the combustion air intake opening. The screens hole size must be large enough to prevent air restriction

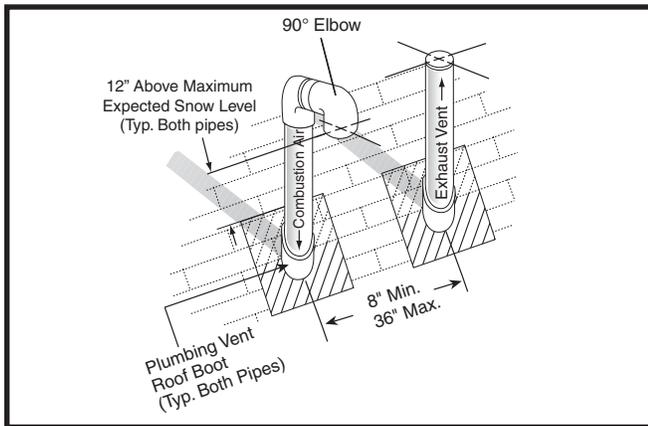


Figure 9. Vertical Vent Termination

Winter Design Temperature	Maximum Flue Pipe Length in Unconditioned and Exterior Spaces	
	Without Insulation (feet)	With Insulation (feet)*
20	45	70
0	20	70
-20	10	60

* = Insulation thickness greater than 3/8 inch, based on an R value of 3.5 (ft x F x hr) / (BTU x in.)

Table 3. Vent Protection

Condensate Disposal

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

This furnace has multiple options for positioning the vent pipe as described in the Vent and Inducer Assembly Options section (page 20). Each of the condensate drain lines must be J-trapped using field supplied parts.

After the condensate lines are J-trapped, they may be combined together when routed to the drain. Avoid areas where condensate drainage may cause problems by dropping onto planters, patios, etc.

NOTE: Industry research studies indicate that when condensate is routed to an active drain, household detergents, etc., buffer its acidity. If the drain is not actively used or if codes require, obtain a neutralizer kit (usually contains limestone). Proper drains and connections to the condensate tubing are required as NORDYNE cannot be held responsible for water leakage which occurs due to loose hose connections or improperly sealed drain line pipes.

Concentric Vent Termination

A concentric vent termination is approved for use with these furnaces. Please follow the installation instructions provided with the kit for proper installation.

Existing Installations

When an existing furnace is removed from a vent system serving other appliances, the existing vent system may not be sized properly to vent the remaining appliances (Example: water heater). An improperly sized venting system can result in the formation of condensate, leakage, or spillage. The existing vent system should be checked to make sure it is in compliance with NFGC, ANSI Z223.1, or CAN/CGA B149 and must be brought into compliance before installing the furnace.

NOTE: If replacing an existing furnace, it is possible you will encounter an existing plastic venting system that is subject to a Consumer Product Safety Commission recall. The pipes involved in the recall are High Temperature Plastic Vent (HTPV). **If your venting system contains these pipes DO NOT reuse this venting system!** This recall does not apply to other plastic vent pipes, such as white PVC or CPVC. Check for details on the CPSC website or call their toll-free number (800) 758-3688.

CIRCULATING AIR REQUIREMENTS

WARNING:

Do not allow combustion products to enter the circulating air supply. Failure to prevent the circulation of combustion products into the living space can create potentially hazardous conditions including carbon monoxide poisoning that could result in personal injury or death.

All return ductwork must be secured to the furnace with sheet metal screws. For installations in confined spaces, all return ductwork must be adequately sealed. When return air is provided through the bottom of the furnace, the joint between the furnace and the return air plenum must be air tight.

The surface that the furnace is mounted on must provide sound physical support of the furnace with no gaps, cracks or sagging between the furnace and the floor or platform.

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

Plenums and Air Ducts

- Plenums and air ducts must be installed in accordance with the Standard for the Installation of Air Conditioning and Ventilating Systems (NFPA No. 90A) or the Standard for the Installation of Warm Air Heating and Air Conditioning Systems (NFPA No. 90B).
- Table 8 (page 38) contains the maximum airflow and temperature rise data for each furnace input rate. **NOTE:** If the maximum airflow is 1,600 CFM or more, it is recommended that two openings be used for return air on upflow furnaces. Downflow furnaces can only use one return opening.
- It is recommended that the outlet duct contain a removable access panel. The opening should be accessible when the furnace is installed in service and shall be of a size that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover for the opening shall be attached in such a manner as to prevent leaks.
- If outside air is used as return air to the furnace for ventilation or to improve indoor air quality, the system must be designed so that the return air is not less than 60° F (15° C) during operation. If a combination of indoor and outdoor air is used, the ducts and damper system must be designed so that the return air supply

to the furnace is equal to the return air supply under normal, indoor return air applications.

- When a cooling system is installed which uses the furnace blower to provide airflow over the indoor coil, the coil must be installed downstream (on the outlet side) of the furnace or in parallel with the furnace.
- If a cooling system is installed in parallel with the furnace, a damper must be installed to prevent chilled air from entering the furnace and condensing on the heat exchanger. If a manually operated damper is installed, it must be designed so that the furnace will not operate when the damper is in the cooling position or when in heating position, the cooling system is inoperable.
- It is good practice to seal all connections and joints with industrial grade sealing tape or liquid sealant. Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

Return Air Connections

In applications where the supply ducts carry heated air to areas outside the space where the furnace is installed, the return air must be delivered to the furnace by duct(s) secured to the furnace casing, running full size and without interruption.

- Upflow furnaces draw the return air from the base of the furnace. A stand or return air duct must be supplied to the furnace to provide the required return air.
- Downflow models draw the return air from the top of the furnace. The minimum required clearance to the top of the furnace is detailed on the furnace rating plate. Additional clearance may be required depending upon filter accessibility.

For each U.S.A. application, the home manufacturer shall comply with all of the following conditions to have acceptable return air systems for closet installed forced air heating appliances:

- Regardless of the location, the return air opening into the closet shall not be less than specified in the appliance's listing.
- Means shall be provided to prevent inadvertent closure by a flat object placed over the return air opening when it is located in the floor of the closet (versus the vertical front or side wall).
- The cross-sectional area of the return duct system leading into the closet shall not be less than 390 square inches.
- The total free area of openings in the floor or ceiling registers serving the return air duct system must be at least 352 sq. in. At least one register should be located where it is not likely to be covered by carpeting, boxes and other objects.
- Materials located in the return duct system must have a flame spread classification of 200 or less. This includes a closet door if the furnace is in a closet.

- Noncombustible pans having 1" upturned flanges are located beneath openings in a floor duct system.
- Wiring materials located in the return duct system shall conform to Articles 300-22 of the National Electrical Code (ANSI C1/NFPA-70).
- Gas piping is not run in or through the return duct system.
- Test the negative pressure in the closet with the air-circulating fan operating at high speed and the closet closed. The negative pressure is to be no more negative than minus 0.05 inch water column.
- Air conditioning systems may require more duct, register and open louver area to obtain necessary airflow. Use NORDYNE's certiduct program to determine proper duct size for A/C.
- For floor return systems, the manufactured home manufacturer shall affix a prominent marking on or near the appliance where it can be easily read when the closet door is open. The marking shall read:

! CAUTION:

HAZARD OF ASPHYXIATION: Do not cover or restrict return air opening.

Supply Air Connections

For proper air distribution, the supply duct system must be designed so that the static pressure measured external to the furnace does not exceed the listed static pressure rating shown on the furnace rating plate. **The supply air must be delivered to the heated space by duct(s) secured to the furnace casing, running full size and without interruption.**

Three typical distribution systems are shown in Figure 10. The location, size, and number of registers should be selected on the basis of best air distribution and floor plan of the home.

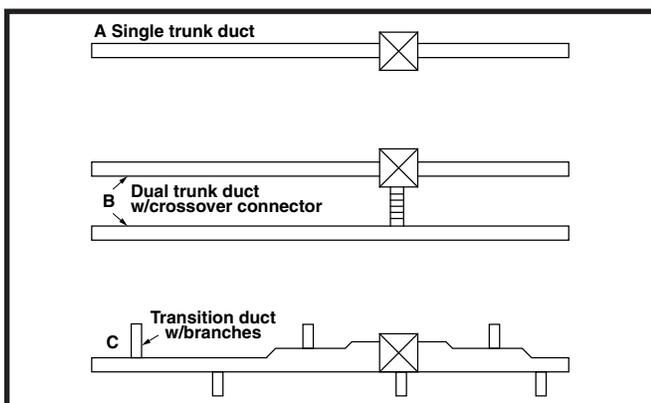


Figure 10. Typical Supply Duct System

Acoustical Treatments

Damping ducts, flexible vibration isolators, or pleated media-style filters on the return air inlet of the furnace may be used to reduce the transmission of equipment

noise emanating from the furnace. These treatments can produce a quieter installation, particularly in the heated space. However, they can increase the pressure drop in the duct system. Care must be taken to maintain the proper maximum pressure rise across the furnace, temperature rise and flow rate. This may mean increasing the duct size and/or reducing the blower speed. These treatments must be constructed and installed in accordance with NFPA and SMACNA construction standards. Consult with local codes for special requirements. For best sound performance, install all the needed gaskets and grommets around penetrations into the furnace, such as for electrical wiring.

FURNACE INSTALLATION

*RC series gas furnaces are shipped ready for installation in the upflow position with upflow return air. *RL series gas furnaces may only be used for downflow operation. See Table 1 (page 9) for the required clearances needed to move the furnace to its installation point (hallways, doorways, stairs, etc).

General Requirements

- The furnace must be leveled at installation and attached to a properly installed duct system. **Do not use the back of the furnace for return air.** See page 14 for circulating requirements.
- The furnace must be installed so that all electrical components are protected from water.
- The dimensions of the room or alcove must be able to accommodate the overall size of the furnace and the installation clearances listed in Table 1.
- The furnace must be installed upstream from a refrigeration system.
- The plenum attached to the A/C coil box and ductwork within 3 ft. of the furnace must be installed so that surfaces are at least 1/4" from combustible construction.
- The cabinet plug must always be used to close the hole in the side of the furnace when rotating the inducer.
- Upflow and downflow models must be installed with the Nordyne A/C coil box which are listed according to the cabinet size of the furnace: "B" cabinet - 920169, "C" cabinet - 920171, and "D" cabinet - 920172.

Requirements and Codes

The installer must be familiar with and comply with all local codes and regulations applicable to the installation of heating appliances and related equipment. In the absence of local codes, the installation must conform with these instructions and the current provisions of one or more of the following standards:

- Federal Manufactured Home Construction & Safety Standard (H.U.D. Title 24, Part 3280.707[a][2])
- The Standard for Manufactured Home Installations (Manufactured Home Sites, Communities, and Set-Ups) ANSI A225.1 and/or CAN/CSA-2240 MH Series).
- American National Standard (ANSI-119.2/NFPA-501C) for all recreational vehicle installations.

- American National Standard (ANSI-Z223.1/NFPA-54) and/or CAN/CGA B149 for all gas-fired furnace models.
- American National Standard (ANSI-C1/NFPA-70) and/or CSA 22.1 Canadian Electric Code Part 1 for all electrical field wiring.

Upflow Furnace Installation

WARNING:

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

The *RC series gas furnace is certified for use on wood flooring or supports. The upflow furnace is shipped with the bottom panel (Figure 39, page 37) installed and must be removed from the bottom of the cabinet before positioning and installing the furnace. See page 19 for removal instructions. For venting Requirements, see page 10.

NOTE: These Installation procedures are suggested for typical furnace installations. Since all installations are different from each other, the sequence of these steps may differ from the actual installation. **Only qualified HVAC technicians should install this furnace.**

1. Position the furnace on top of the return air ductwork or return air stand ensuring even alignment of furnace air opening and return air duct. **NOTE:** The ductwork or stand must have an opening equal to that of the return air opening of the furnace. See the furnace dimensions in Figure 39 for the proper return air opening size.
2. Secure the furnace to the floor or base. Check for level from front to back and side to side. **NOTE:** Additional fasteners may be used at rear, sides or through door frame, as desired, to secure furnace to closet or alcove framing.
3. Secure the return air ductwork to the bottom of the furnace with self drilling screws.
4. Position the A/C coil box on the top of the furnace and secure in place using the provided attachment brackets. To install the brackets: position one bracket on side of furnace and using the provided self-drilling screws, secure the bracket to the A/C coil box and the furnace. Repeat for other side of furnace.
5. Position the plenum on top of the coil box and secure together with sheet metal screws. The screws must penetrate the sheet metal casing and coil box flange.
6. Secure the supply air ductwork to the plenum. Tape or seal all seams if required by local code.

Downflow Furnace Installation

NOTE: These Installation procedures are suggested for typical furnace installations. Since all installations are different from each other, the sequence of instructions may differ from the actual installation. Only qualified HVAC technicians should install this furnace.

WARNING:

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

The *RL series gas furnace is certified for use on wood flooring or supports, but must be installed on a special duct connector (Figure 11). This factory supplied accessory must be installed in the floor cavity and attached to the supply air duct before the downflow furnace is installed.

The depth of the floor cavity (shown as "X" in Figure 12) will determine the duct connector size to use. Several connector sizes are listed in Table 4.

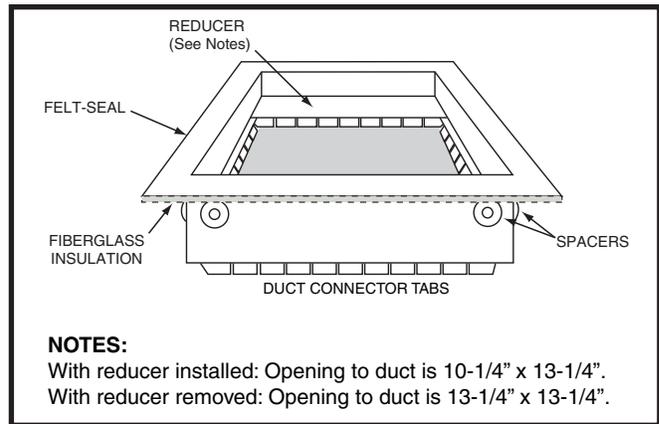


Figure 11. Duct Connector

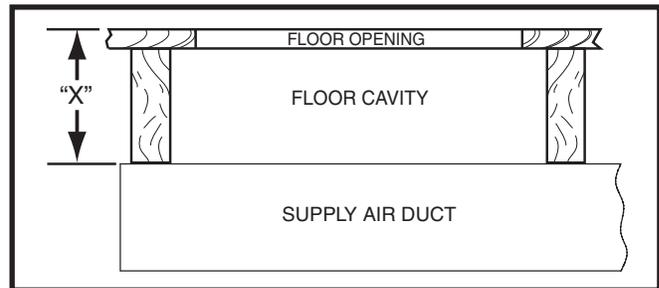


Figure 12. Floor Cavity

If Floor cavity ("X") is:	Duct Connector Model
7/8" (22mm)	901987A
2" (51mm)	901988A
4 1/4" (108mm)	901989A
6 1/4" (159mm)	901990A
8 1/4" (210mm)	901991A
10 1/4" (260mm)	901992A
12 1/4" (311mm)	901993A

Table 4. Duct Connector Sizes

IMPORTANT NOTE: Cut-outs in the floor, ceiling, roof, walls and/or ductwork must be carefully located to avoid misalignment of the furnace, combustion air piping, and vent piping.

1. Determine the depth of the floor cavity:
 - a. Measure 10" from the rear wall or alcove and mark the centerline of the cut-out on the floor. Using the centerline as a starting point, draw the rest of the cut-out to the dimensions shown in Figure 13.
 - b. Cut out the floor opening 1/16" larger than the actual cutout drawn. This will allow some clearance when installing the duct connector.
 - c. Measure from the top of the floor down to the top of the supply air duct to obtain the depth ("X") of the floor cavity.
 - d. See Table 4 to determine which duct connector to use.

2. Install the duct connector:

NOTE: The duct connector is designed for use on ducts 12" in width. However ducts narrower than 12" may not allow sufficient clearances for this type of installation. For an alternate installation method, see page 18.

- a. Center the duct connector in the floor opening with bottom tabs resting on top of the supply air duct.
- b. Mark the cut-out area on the supply air duct by tracing around the connector tabs (Figure 11, page 16) of the duct connector.
- c. Remove the duct connector and cut out the marked area of the supply air duct 1/4" larger the actual cutout drawn.
- d. Install the duct connector back in the floor opening with the bottom tabs extending into the supply air duct.
- e. Install the mounting plate (Figure 14) under the back side of the duct connector. Align the screw holes in both components.
- f. Secure the duct connector and the mounting plate to the wood floor with appropriate size screws.
- g. Install 2 plates (Figure 15) on top of the duct connector, one on each side (left and right) of the opening. Align the screw holes in both components.
- h. Secure both plates and duct connector to the wood floor with appropriate size screws.
- i. Bend the connector tabs on the bottom of the duct connector upwards and as tight as possible against the supply air duct.
- j. Bend both tabs on the mounting plate (Figure 16) up 90°.
- k. Seal all connections with industrial grade sealing tape or liquid sealant. **NOTE:** Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

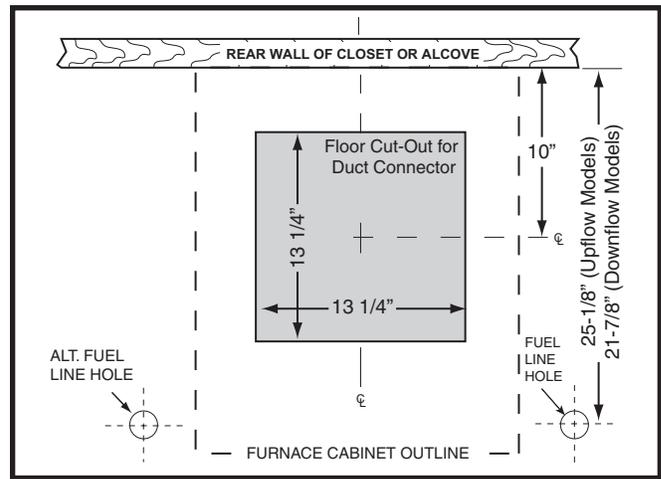


Figure 13. Floor Cutout Dimensions

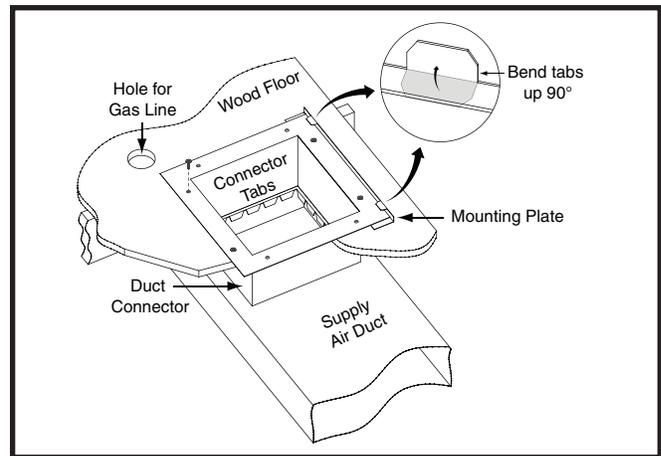


Figure 14. Duct Connector Installed

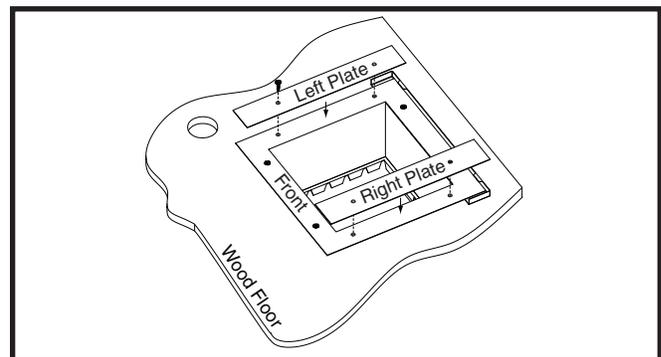


Figure 15. Duct Connector Side Plates

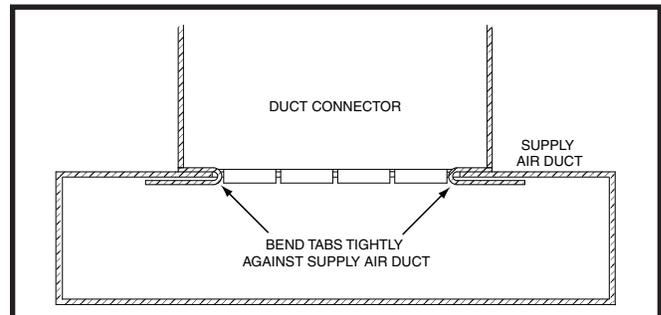


Figure 16. Duct Connector Tabs

3. Prepare the A/C coil box for installation:
 - a. Remove two screws (Figure 17) from the sides of the A/C coil box.
 - b. Install the close-off plate on the bottom of the of the coil box.
 - c. Align the screw holes in the close off plate and the coil box. Secure both components with the screws removed in step 3-a.
4. Install the furnace:
 - a. Place the A/C coil box on the duct connector until it is firmly against the mounting plate tabs. Mounting plate tabs must be bent upwards to prevent interference with furnace. See step 2-j.
 - b. Secure the A/C coil box to the connector assembly and wood floor with appropriate size screws at all four corners. **NOTE:** To minimize damage to coil box, see Figure 18 for appropriate screw locations.
 - c. Install the furnace on top of the A/C coil box. Align the furnace evenly on the coil box from front to back and side to side (Figure 19).
 - d. Secure the furnace to the A/C coil box with an attachment bracket (Figure 19) on both sides of the furnace. **NOTE:** The attachment brackets must be evenly positioned over the seam between the A/C coil box and the furnace. Install four self drilling screws in each bracket.

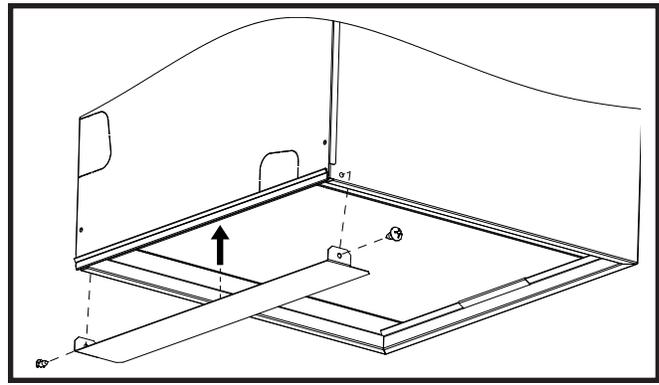


Figure 17. Close-Off Plate

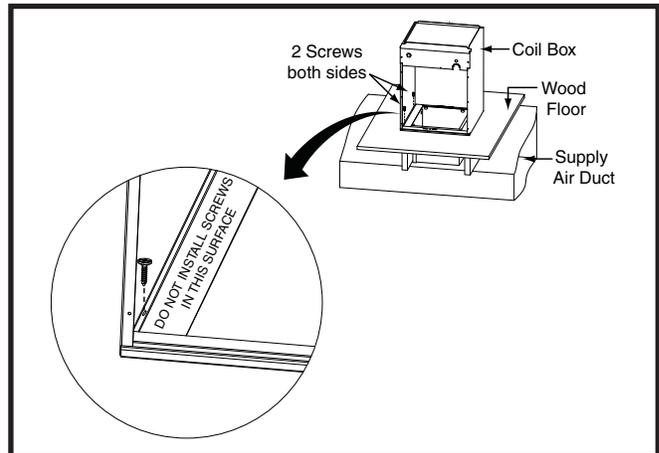


Figure 18. A/C Coil Box Installation

Alternate Attachment Method

The duct connector is designed for use on ducts 12" in width. However if there is insufficient clearance to bend the duct connector tabs, this alternate attachment method may be used.

1. Score and cut the top of the supply air duct as indicated in Option 1 or Option 2 (Figure 20). With Option 1 choice, cut out the metal from the shaded area.
2. Fold the two flaps (Options 1 or 2) up to form the opening for the duct connector.
3. Install the duct connector with the bottom tabs extending into the supply air duct.
4. Bend the tabs on the bottom of the duct connector upwards and as tight as possible against the supply air duct (Figure 21, page 19).
5. Form the flaps (Options 1 or 2) up against the duct connector as tight as possible.
6. Secure the duct connector flaps to the supply air duct with staples (3 minimum) or if a 2x block/joist is not provided, use sheet metal screws (2 minimum). **NOTE:** The duct connector tabs may be attached to the air duct with sheet metal screws or other suitable fasteners as long as the duct connector and the air duct are securely attached (See Figure 21).
7. Seal all connections with industrial grade sealing tape or liquid sealant. **NOTE:** Requirements for sealing ductwork vary from region to region. Consult with local codes for requirements specific to your area.

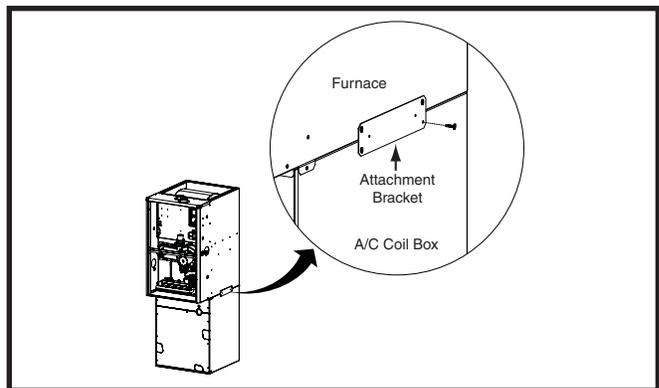


Figure 19. Attachment Bracket

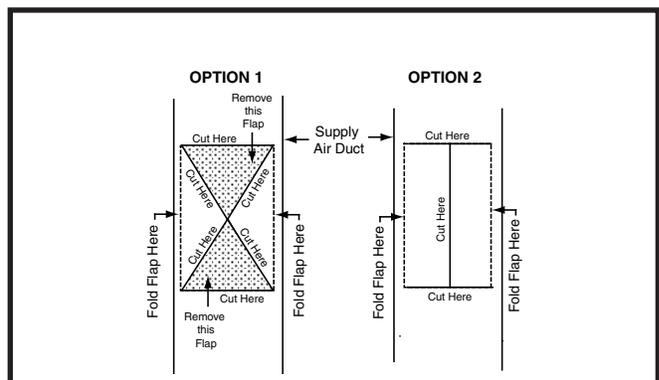


Figure 20. Narrow Air Duct Openings

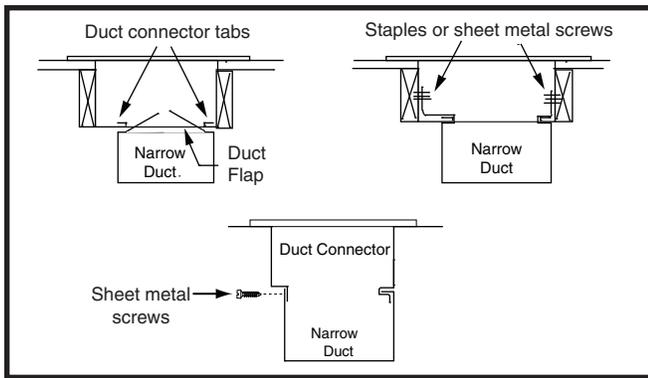


Figure 21. Narrow Ducts

Bottom Panel Removal

The steps listed below describe how to remove the bottom panel from the furnace. See Figure 22.

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

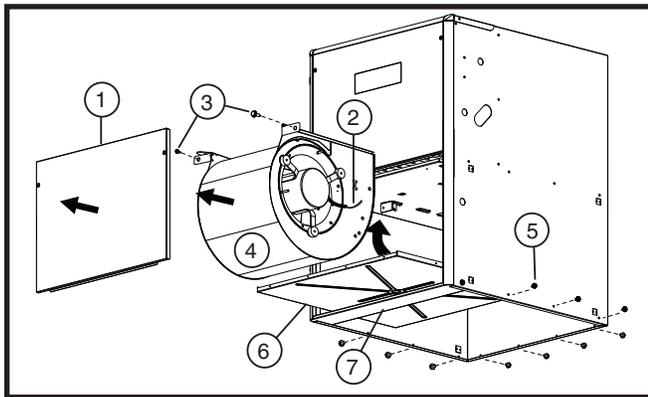


Figure 22. Bottom Panel Removal

Alternate Bottom Panel Removal

If the bottom panel cannot be removed using the previous instructions, the steps below are an alternate method for removing the bottom panel. See Figure 23.

1. Remove the door (1) from the blower compartment .
2. Remove all screws securing the bottom panel (2) to the front brace (3).
3. Remove two screws (4) securing the furnace cabinet to the blower deck (5).
4. Remove all screws (6) securing the furnace cabinet to the bottom panel (2).

5. Remove the screw (7) securing the bottom corner of the furnace cabinet to the front brace (3).
6. Carefully spread the bottom corner of the furnace cabinet outwards while sliding the bottom panel (2) out through the front of the furnace.
7. Reassemble the furnace in reverse order.

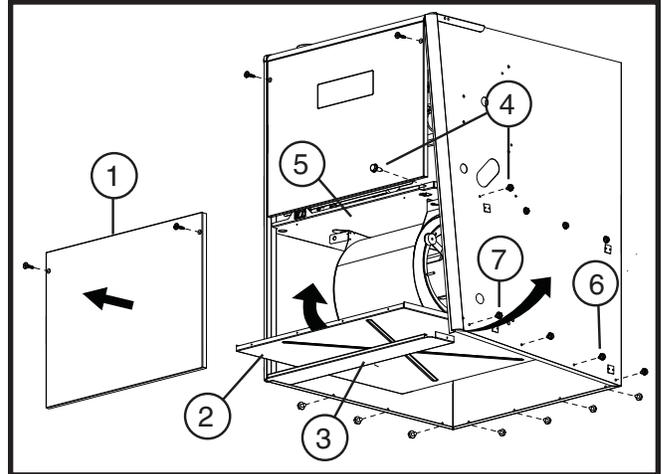


Figure 23. Alternate Removal Method

Pressure Switch Relocation

In some inducer orientations, the inducer pressure switch may interfere with gas pipe installation. Check the side of the cabinet the gas pipe will enter and determine if the inducer pressure switch needs to be moved. If the switch interferes with gas pipe installation, please follow these instructions for relocating it to the alternate location:

1. Shut off any electrical power to the furnace.
2. Label and disconnect the tubing and wires from the pressure switch.
3. Remove two screws securing the pressure switch to the inducer housing.
4. Remove the pressure switch from the mounts on the inducer housing and relocate it to the other set of mounts 90° from previous location. See Figure 24.
5. Secure the pressure switch with two screws.
6. Reconnect the tubes and wires to the pressure switch.

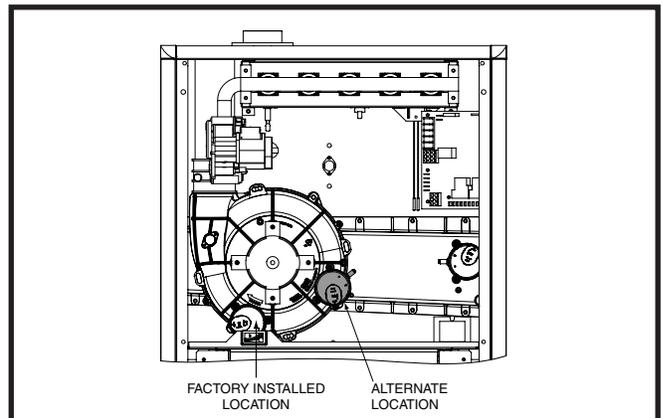


Figure 24. Alternate Pressure Switch Location

Inducer Assembly Rotation

WARNING:

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

CAUTION:

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

1. Disconnect the electrical harness (1) from the inducer assembly (2). See Figure 25.
2. Remove the inducer assembly ground wire (3) from the blower deck (4).
3. Remove three screws (5) securing the inducer assembly (2) to the header box (6).
4. Rotate the inducer assembly (2) to its new position.
5. Reinstall the three screws (5) removed in step 3. If the inducer assembly is rotated to the left or right side of the furnace, use the extra 4th screw provided in the parts package.
6. Remove the cabinet plug from side of furnace and reinstall in hole on opposite side of cabinet.
7. Reconnect the electrical harness (1) to the inducer assembly (2).
8. Reconnect the inducer assembly ground wire (3) to the blower deck (4) or door.

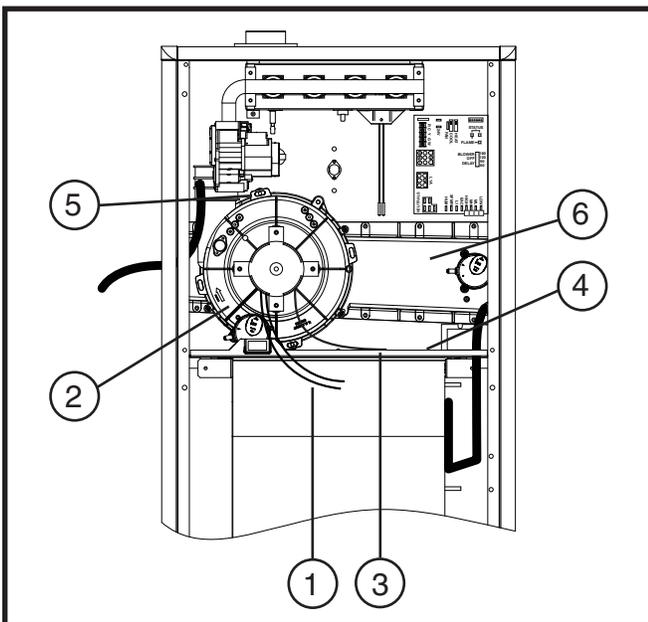


Figure 25. Inducer Assembly Rotation

Direct Vent (2-Pipe) Applications

It is important that Direct Vent (2-pipe) systems maintain an airtight flow path from the air inlet to the flue gas outlet. The furnace ships from the factory with two holes in the cabinet for the air inlet and flue gas outlet. In certain configurations, it is necessary to remove and relocate a plastic cap in the furnace cabinet. If changing the position of the air inlet and flue gas outlet, it is required that the previous hole be closed off with the plastic cap to maintain air tightness in the furnace. Measurements for hole locations on *RC and *RL series furnaces are shown in Figure 39 (page 37).

Vent and Inducer Assembly Options

To increase installation flexibility, the inducer assembly can be rotated up to 3 different positions. Each variation has slightly different requirements with regard to condensate disposal and, in some cases, the need to seal the furnace cabinet.

1. Prior to vent installation, determine the number of pipes to be connected to the furnace (1-pipe or 2-pipe), the airflow of the furnace (upflow or downflow), and then the side that the pipes will exit from the furnace.
2. Select the option from Table 5 that properly matches your installation type and then find your setup (by Option number) in Figures 42 - 43 (pages 45 - 46).

1 Pipe Installations		
Vent	Upflow	Downflow
Up	Option 1	Option 7
Right	Option 2*	Option 8*
Left	Option 3*	Option 9*
2-Pipe Installations		
Vent	Upflow	Downflow
Up	Option 4	Option 10
Right	Option 5*	Option 11*
Left	Option 6*	Option 12*

Table 5. Vent and Inducer Blower Options

Accessories

The components in Figures 26 - 29 (pages 21 - 22) are included in the extra parts bag that is supplied with the purchase of M4RC/M4RL furnaces. Depending on your particular installation, some of these components are optional and may not be used. Please refer to the descriptions and accompanying figures when installing these items.

Finish Flange (Figure 26)

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

1. Position flange gasket and finish flange on top of the furnace cabinet. Evenly align vent hole and screw holes in gasket, flange, and cabinet.
2. Secure flange and gasket to cabinet with three field supplied sheet metal screws.

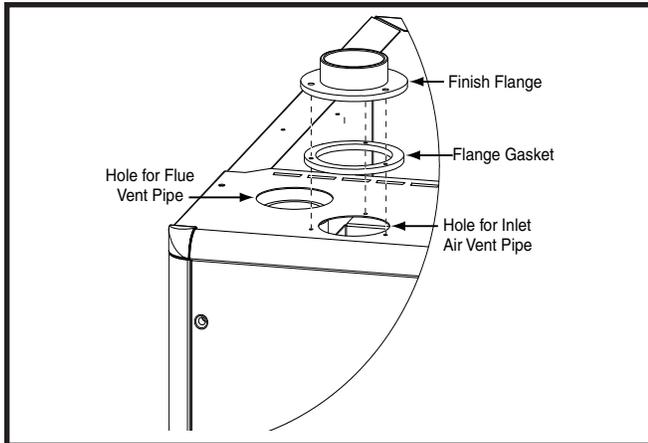


Figure 26. Finish Flanges

Rubber Grommets (Figure 27)

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

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

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

Inline Drain Assembly (Figure 28)

1. Install the inline drain assembly on the inducer assembly.
2. Insert the vent pipe through the hole in the cabinet and into the inline drain assembly.
3. Verify the vent pipe, inline drain assembly, and inducer are aligned properly for drainage of condensate.
4. Tighten both clamps to secure the inline drain assembly.
5. Insert smaller end of the 3/8" x 1/2" hose barb into the lowest port of the inline drain assembly. Connect the condensate drain tube to the hose barb and cap off the other port.

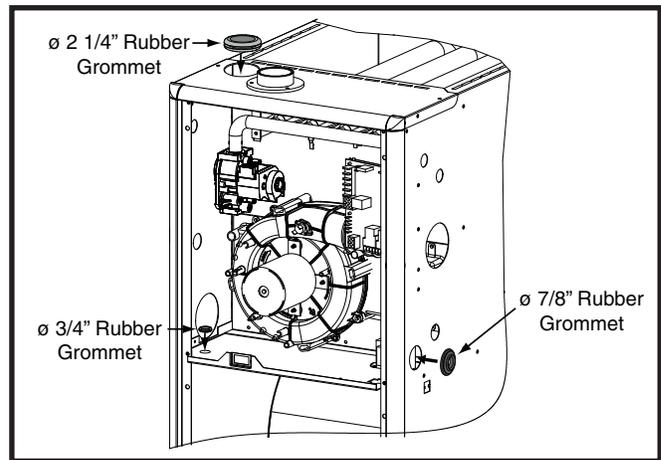


Figure 27. Rubber Grommets

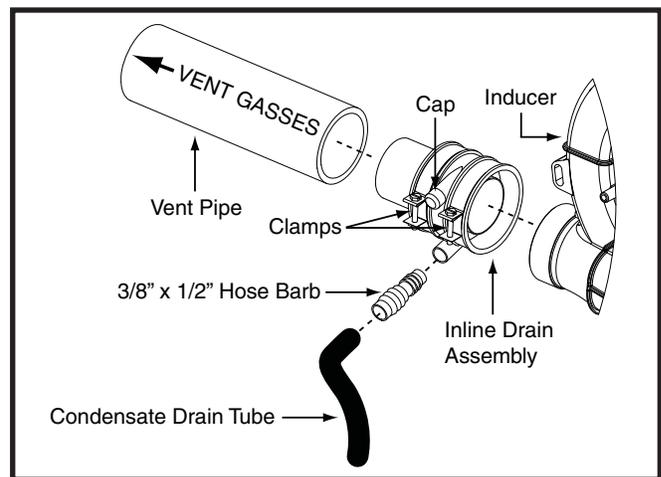


Figure 28. Inline Drain Assembly

PVC TEE, Reducer & Hose Barbs (Figure 29, page 22)

The 2" PVC tee, reducer, and hose barb are used when the inducer is rotated to vent out thru the left or right side of the furnace cabinet. **The PVC TEE and reducer are not provided in the extra parts bag.**

The 1/2" x 3/4" hose barb can be used to route the condensate drain to the outside of the cabinet. It must be installed from inside the cabinet with the threaded end inserted thru the 1 1/16" hole. The Condensate drain should be connected to the barbed end. Attach 1" PVC drain line to the threaded end. **IMPORTANT NOTE: Before permanently installing these components, it is recommended you dry-fit them first to ensure proper fit and alignment with other vent pipes.**

1. Install the 1/2" x 1/2" hose barb on the 2" PVC reducer with an adequate amount of approved sealant on the threads. **Do not over tighten the hose barb!**
2. Install the tee on the 2" vent pipe that is extending out the side of the cabinet. Use appropriate primer and cement to permanently bond the tee to the 2" PVC pipe.

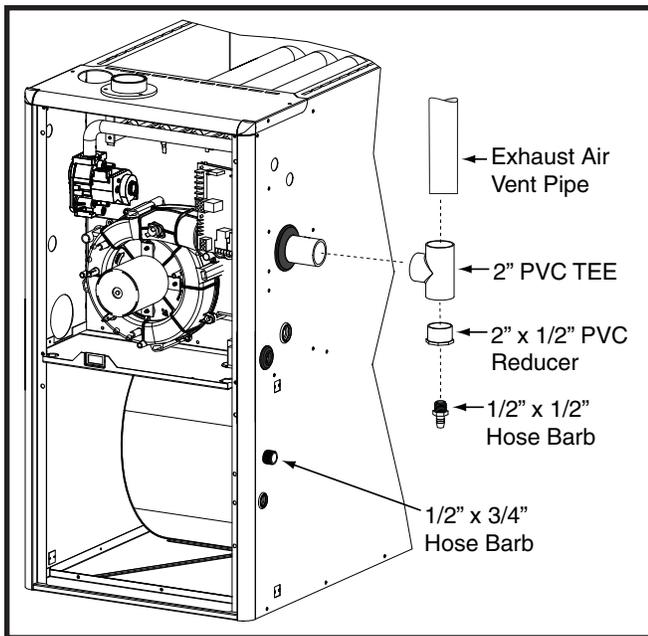


Figure 29. TEE, Reducer, and Hose Barbs

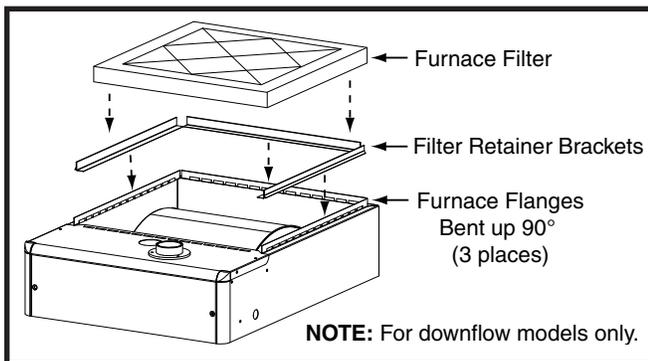


Figure 30. Filter Retainer Brackets

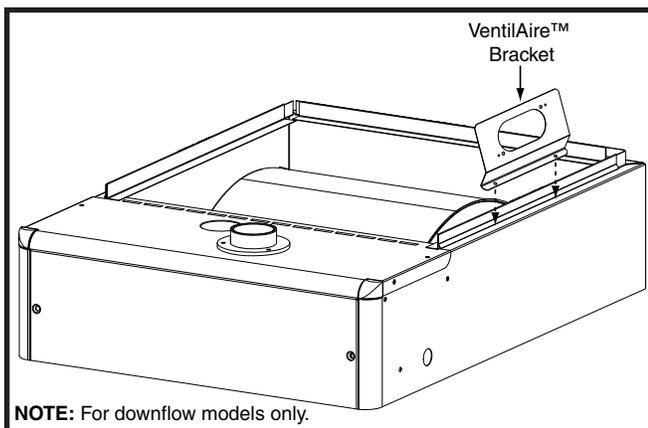


Figure 31. VentilAire™ Bracket

Condensate Drain Lines (Figs. 42 - 43, pages 45 - 46)

The placement of the condensate drain lines will depend on the configuration selected in Table 5 (page 20). The drain lines can be routed out the left or right side of the furnace, but must maintain a downward slope to ensure proper condensate drainage. The J-trap may need to be rotated to the side that matches your setup in Figures 43 - 44 (pages 45 - 46). To rotate the J-trap, loosen the clamp on the drain tube, rotate the J-trap to either side, and retighten the clamp

Four general rules apply:

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

Exceptions and clarifications to the general rules:

- If venting out the left or right side of the cabinet, the vent must be turned vertically with a tee. The drip leg formed by the tee, reducer, and hose barb must be drained as shown in Options 2, 3, 5, 6, 8, 9, 11, & 12.
- In certain cases, the inducer may be drained back into the collector pan (Options 1, 2, 4, 5, 7, 8, 10, & 11). Take care that this drain tube does not sag in the middle.
- Sometimes the lowest point in the vent system is where it connects to the inducer (Options 3, 6, 9, & 12). If the distance between the exhaust pipe and the cabinet is 6 inches or less, one drain at this location is sufficient. If the distance is more than 6 inches, then another drain will need to be added to the bottom of the tee.

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

Filter Retainer Brackets (Figure 30)

1. Bend the rear, right and left side furnace flanges upward 90° with a pair of wide duct pliers.
2. Install three filter retainer brackets on the furnace flanges. **NOTE:** Press down firmly to ensure brackets are tightly installed on the furnace flanges.
3. Position a furnace filter on top of the filter brackets.

VentilAire™ Bracket (Figure 31)

Ventilation must be provided for homes built to HUD Manufactured Homes Safety and Construction Standards. This ventilation can be supplied by a VentilAire™ III

(914098) or VentilAire™ IV (914229) fresh air supply system. Alternate means for providing ventilation air must meet the requirements of all applicable local and federal codes.

For downflow models, a special mounting bracket is supplied with the furnace for installation of the VentilAire™ supply air system. The bracket is installed on the right hand side at the top of the cabinet, as shown in Figure 31. The bracket can be secured to the unit using the self-drilling screws supplied with the kit. **Please follow the instructions provided with the kit.**

For upflow models, the means for providing the required ventilation must be incorporated into the upflow furnace base or the return air ductwork to the furnace.

Vent Couplings (Figure 32)

M4 series furnaces require couplings to be installed over the combustion air finish flange and where the vent pipe exits the furnace cabinet. **NOTE:** These couplings are not supplied in the *RL extra parts bag

- Each coupling must be secured to the finish flange or vent pipe with a hose clamp (if using neoprene couplings).
- Upflow furnaces require the 3" neoprene coupling clamps to be installed above the coil box.

Upflow Furnaces:

Combustion air and exhaust vent piping must have removable connections between the furnace flanges and vent pipes when installed vertically in front of the coil box. **NOTE:** Both vent pipes must be long enough to clear the height of the coil box when installed. This allows for future servicing or maintenance of the coil.

Position the 2" x 3" neoprene coupling between the top of the 2" vent pipe and the 3" vent pipe. Secure both ends of the couplings with hose clamps, ensuring that the connection is tight and leak free.

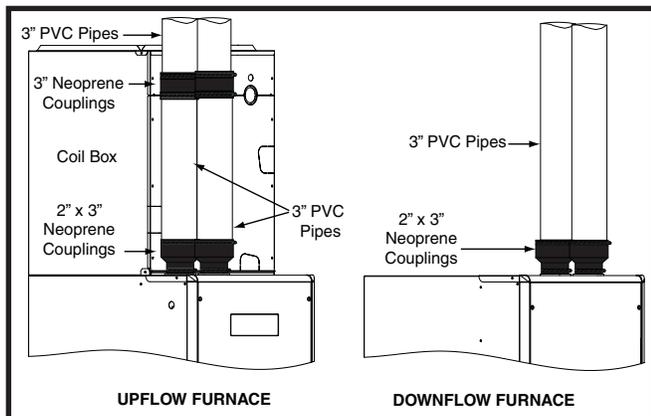


Figure 32. Vent Couplings

Downflow Furnaces

Since there is no coil box above the furnace, both 3" vent pipes can be run vertically for the entire length of the pipes from the 2" x 3" coupling to the outdoors. Secure both ends of the couplings, ensuring that the connection is tight and leak free.

Alternate Vent Pipe Installation

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

- To increase the size of the PVC flue from 2" to 3", you may use two, 2" x 45° PVC elbows to achieve the clearances needed between the coil box and the 2" x 3" neoprene coupling. See Figure 33.
- Install the 2" x 3" neoprene coupling in the vertical run only. If the coupling is installed horizontally, it will allow water to build up inside the furnace and cause a lock out condition.

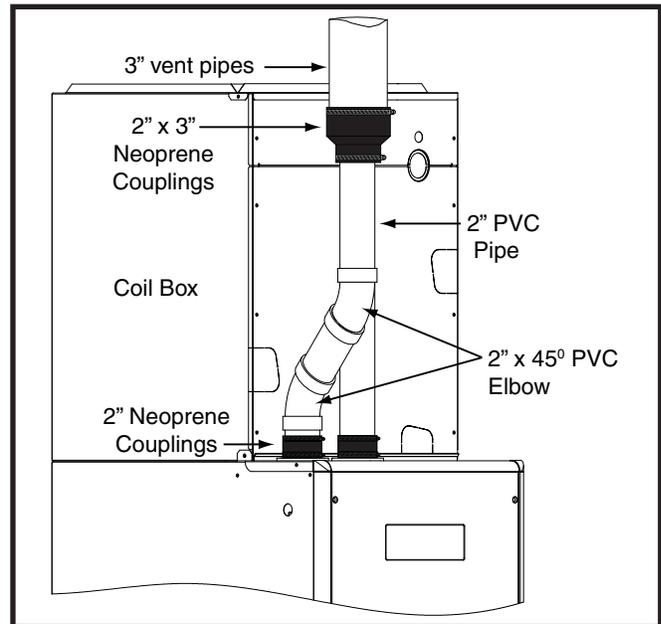


Figure 33. Alternate vent Pipe Installation

GAS SUPPLY AND PIPING

WARNING:

All gas piping must conform with local building codes, or in the absence of local codes, with the most recent edition of the National Fuel Gas Code ANSI Z223.1 or (CAN/CGA B149.1 or .2). Failure to follow all safety warnings could result in serious injury, death or property damage.

This furnace may be installed for either left or right side gas entry. When connecting the gas supply, provide clearance between the gas supply line and the entry hole in the furnace casing to avoid unwanted noise and/or damage to the furnace. Typical gas service hookup for upflow and downflow furnaces is shown in Figure 36 (page 28). Table 10 (page 40) lists gas flow capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

IMPORTANT NOTES:

- **Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace (Figure 36). The shut-off valve should be readily accessible for service and/or emergency use. Consult the local utility or gas supplier for additional requirements regarding placement of the manual main gas shut-off.**
- **Gas piping must never run in or through air ducts, chimneys, gas vents, or elevator shafts.**
- **Compounds used on threaded joints of gas piping must be resistant to the actions of liquefied petroleum gases.**
- **The main gas valve and main power disconnect to the furnace must be properly labeled by the installer in case emergency shutdown is required.**
- **Flexible gas connectors are not recommended for this furnace but may be used if allowed by local jurisdiction. Only new flexible connectors may be used. DO NOT reuse old flexible gas connectors.**
- **A drip leg should be installed in the vertical pipe run to the unit (Figure 36).**

Leak Check

WARNING:

FIRE OR EXPLOSION HAZARD

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

All gas pipe connections must be tested for gas leaks after they've been connected to the furnace. This includes connections at the main gas valve, emergency shutoff valve and flexible gas connectors (if applicable). The soap and water solution can be applied on each joint or union using a small paintbrush. If any bubbling is observed, the connection is not sealed adequately and must be retightened. Repeat the tightening and soap check process until bubbling ceases.

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

High Altitude Application

High altitude conversion with this furnace depends on the installation altitude and the heating value of the gas. The installation of this furnace at altitudes above 2,000 feet must meet the requirements of the National Fuel Gas Code or local jurisdiction. In Canada, the requirements for high altitude are different and governed by CGA B149.1. Please consult your local code authority.

WARNING:

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

This furnace is shipped from the factory with orifices and gas regulator settings for natural gas operation at sea level altitudes. At 2000 feet, the NFGC requires that this appliance be derated 4% for each 1000 feet of altitude. For example, the input needs to be reduced 8% at 2,000 feet, 12% at 3,000 feet and etc. This deration is in reference to the input rate and gas heating value at sea level.

To derate the furnace requires knowing the heating value of the gas at the installation site. Heating values at particular job sites vary for two reasons:

1. The chemical mixture of the gas varies from region to region and is expressed as the "sea level heating value".
2. The heating value varies by altitude. For this reason, especially in high altitude areas, the local gas utility specifies the heating value at the residence's gas meter as the "local value".

For added flexibility, two tables have been provided for natural gas installations with high or low heating values at sea level. Tables 13 and 14 (page 42) contain the manifold

pressure and orifice sizes to use at various altitudes. Table 13 (HIGH) is for natural gas installations with a heating value of more than 1,000 Btu per cubic foot and Table 14 (LOW) is for less than 1,000 Btu per cubic foot. To determine which table to use:

1. Consult the local utility for the local heating value at your installation site.
2. From Table 12 (page 41), find your local heating value as supplied by the utility company. Follow down the column and stop at your altitude level.
3. If your sea level heating value is HIGH, use Table 13 or if it's LOW, use Table 14. See example.

After changing the regulator pressure or the orifices, it is required that you measure the gas input rate. This may be accomplished in the usual way, by clocking the gas meter and using the local gas heating value. See Verifying and Adjusting the Input Rate (page 31).

IMPORTANT NOTE: Observe the action of the burners to make sure there is no yellowing, lifting or flashback of the flame.

INSTALLATION EXAMPLE

Elevation: 5,000 feet
Type of Gas: Natural Gas
Local Heating Value of Gas: 750

Determine which natural gas table to use. From Table 11, find 750 and follow down the column, stop at the 5,000 feet row. The heating value listed is LOW. Table 13 will be used to determine orifice size and manifold pressure.

Conversion to LP/Propane

! WARNING:

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

This furnace can be converted from factory-equipped natural gas to Liquid Propane gas. Conversion of this valve requires replacement of the burner orifices on the manifold assembly. The orifices required for conversion are supplied with the furnace.

For altitudes between 0 and 1,999 feet, only the orifice is changed. Altitudes between 2,000 and 10,000 feet require both the orifice and regulator pressure to be changed.

See Table 11 (page 41) to determine the correct orifice size and manifold pressure to use at different altitudes.

! WARNING:

Shut off the gas supply at the manual gas shutoff valve, before disconnecting the electrical power. A fire or explosion may result causing property damage, personal injury or loss of life. Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

! WARNING:

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

1. Remove the burner orifices (Figure 34):
 - a. Adjust the thermostat to the "OFF" position, or its lowest temperature setting.
 - b. Turn the main gas supply valve (on the outside of the unit) to the OFF position.
 - c. Turn off all electrical power to the furnace.
 - d. Remove the door from the burner compartment.
 - e. Turn the gas valve ON/OFF knob (1) to the OFF position.

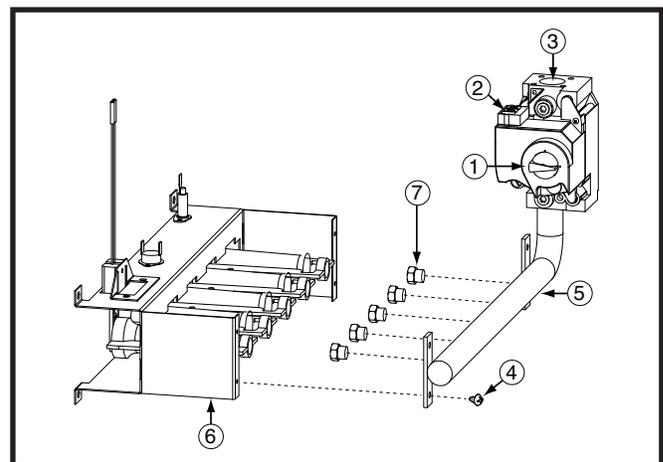


Figure 34. Burner and Manifold Assembly

! CAUTION:

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

- f. Disconnect the wires from the terminals (2).
- g. Remove the supply gas piping from the gas valve inlet (3).

- h. Remove four screws (4) securing the gas manifold assembly (5) to the burner assembly (6).
- i. Set aside the screws (4) and remove the gas manifold assembly (5) from the burner assembly.
- j. Carefully remove the burner orifices (7) from the gas manifold assembly (5).

! WARNING:

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

- k. Read the rating plate affixed to the appliance to determine its rated input (Btu/hr) and the size of the factory installed orifices. **NOTE:** Natural Gas furnaces may be equipped with one of three orifices.

! WARNING:

Do not use Teflon tape or pipe joint compound on the orifice threads. The hole in the orifice may become blocked and cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.

IMPORTANT NOTES:

Before installing an orifice, check the face or side of the orifice for the drill number to ensure that it is the appropriate size.

To prevent cross threading, screw the orifices (7) into the gas manifold assembly (5) by hand until snug, then tighten with a wrench.

- l. Install the appropriate LP/Propane orifices (7) into the gas manifold assembly (5).
- m. Remove the pressure regulator cap (Figure 35) from the gas valve.
- n. Invert the cap so that the letters facing up represent the type of gas being used for the furnace.

NOTE: The cap is marked NAT on one end for natural gas and LP on the other end for propane. If converting to LP propane, make sure the LP end is facing up when installed.
- o. Replace the cap and tighten firmly.
- p. Install the gas manifold assembly (5) back into the burner assembly (6). Make sure the center of the orifices are aligned with center of the burners.
- q. Secure the manifold assembly (5) to the burner assembly (6) with the four screws (4), removed in step 1-h.
- r. Reconnect the gas piping to the gas valve inlet (3).

- s. Reconnect the wires to the gas valve terminals (2).

2. Measure the Supply Gas Pressure:

IMPORTANT NOTE: To obtain an accurate pressure reading, turn off all gas appliances (i.e. Dryers, water heaters, stoves, etc.) at their ON/OFF control or individual gas valves.

- a. Remove the inlet pressure plug (Figure 35) from the INLET side of the gas valve with a 3/16 Allen wrench.
- b. Install a 1/8 NPT fitting, which is compatible with a manometer or similar pressure gauge.
- c. Connect the manometer or pressure gauge to the inlet pressure tap.
- d. Turn on all electrical power to the furnace.
- e. Turn the main gas supply valve (on the outside of the unit) to the ON position.
- f. Start the furnace by adjusting the thermostat to it's highest setting. Allow the furnace to run for 10 minutes.
- g. Check the incoming gas line pressure. Propane gas furnaces must be between 11.0"-14.0" W.C. Natural gas installations must be between 4.5"-10.0" W.C. If the pressure is not between these specified ranges, contact your local gas supplier for adjustment.
- h. Adjust the thermostat to it's lowest setting and allow the unit to cycle off.
- i. Turn the main gas supply valve (on the outside of the unit) to the OFF position.
- j. Turn off all electrical power to the furnace.
- k. Disconnect the manometer or pressure gauge.
- l. Remove the NPT fitting and reinstall the inlet pressure plug. **NOTE:** To prevent cross threading, hand tighten the plug first, then tighten with 3/16 Allen wrench.

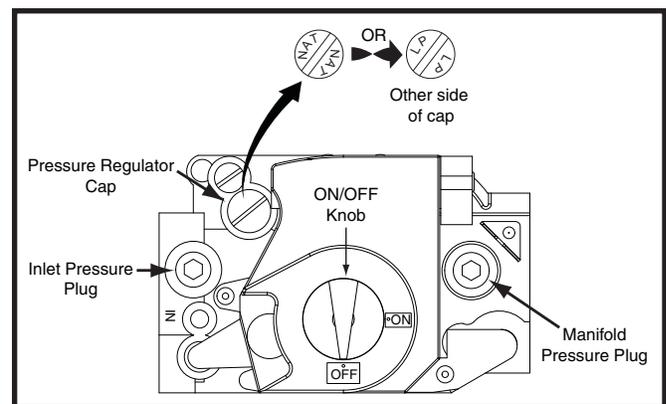


Figure 35. Gas Valve - Top View

3. Measure / Adjust the Manifold Pressure:

The manifold pressure must be measured by installing a pressure gauge (Manometer, Magnehelic Meter, etc.) to the outlet end of the gas valve.

- a. Remove the manifold pressure plug (Figure 35) from the outlet side of the gas valve with a 3/16 Allen wrench.
- b. Install a 1/8 NPT fitting, which is compatible with a Manometer or similar pressure gauge.
- c. Connect the manometer or pressure gauge to the pipe thread fitting.
- d. Start the furnace by adjusting the thermostat 5 degrees above room temperature. Allow the furnace to operate for 3 minutes.
- e. Measure the manifold pressure on the manometer or pressure gauge. Compare the measured value to the value in Table 11 (page 41).
- f. If the manifold pressure is not set to the pressure specified in Table 11, remove the pressure regulator cap (Figure 35) from the gas valve. Slowly turn the adjusting screw underneath the cap with a small screwdriver until the appropriate manifold pressure is obtained. **NOTE:** Turning the screw clockwise increases the pressure, turning the screw counter-clockwise decreases the pressure.
- g. After the manifold pressure is properly set, replace the cap so that the letters facing up represent the type of gas being used for the furnace.
- h. Adjust the thermostat to its lowest setting.
- i. Turn off the main gas supply to the unit at the manual shut-off valve, which is located outside of the unit.
- j. Turn off all of the electrical power to the furnace.
- k. Disconnect the manometer or pressure gauge.
- l. Remove the 1/8 NPT fitting and reinstall the manifold pressure plug. **NOTE:** To prevent cross threading, hand tighten the plug first then tighten with 3/16 Allen wrench.

4. Complete the Conversion:

 **WARNING:**

FIRE OR EXPLOSION HAZARD

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

- a. Turn the main gas supply valve (on the outside of the furnace) to the ON position.

- b. Check all gas connections for leaks with a soap and water solution. If the solution bubbles there is a gas leak which must be corrected.
- c. Turn on all electrical power to the furnace.
- d. Turn the gas valve ON/OFF knob (Figure 35) to the ON position.
- e. Start the furnace by adjusting the thermostat 5 degrees above room temperature.
- f. Check the furnace for proper ignition and operating sequence (See page 32).
- g. After ignition, visually inspect the burner assembly to verify that the flame is drawn directly into the center of the heat exchanger tube.

NOTES:

In a properly adjusted burner assembly, the flame color should be blue with some light yellow streaks near the outer portions of the flame.

The ignitor may not ignite the gas until all of the air is bled from the gas line. If the ignition control locks out, adjust the thermostat to its lowest setting and wait one minute. Adjust the thermostat 5 degrees above room temperature and the ignitor will try again to ignite the main burners. This process may have to be repeated several times before the burners will ignite. Once the burners are lit, check all gas connections for leaks again with the soap and water solution.



WARNING:

Do not alter or remove the original rating plate from the furnace.

- h. Affix the conversion warning label (P/N 703935) to the outside of the unit door and the conversion information label (P/N 703942) near the rating plate inside the control area.
- i. Affix the gas conversion label from the conversion kit on the gas valve. Each label should be prominent and visible after installation.
- j. Reinstall the appliance door.
- k. Run the appliance through three complete cycles to assure proper operation.

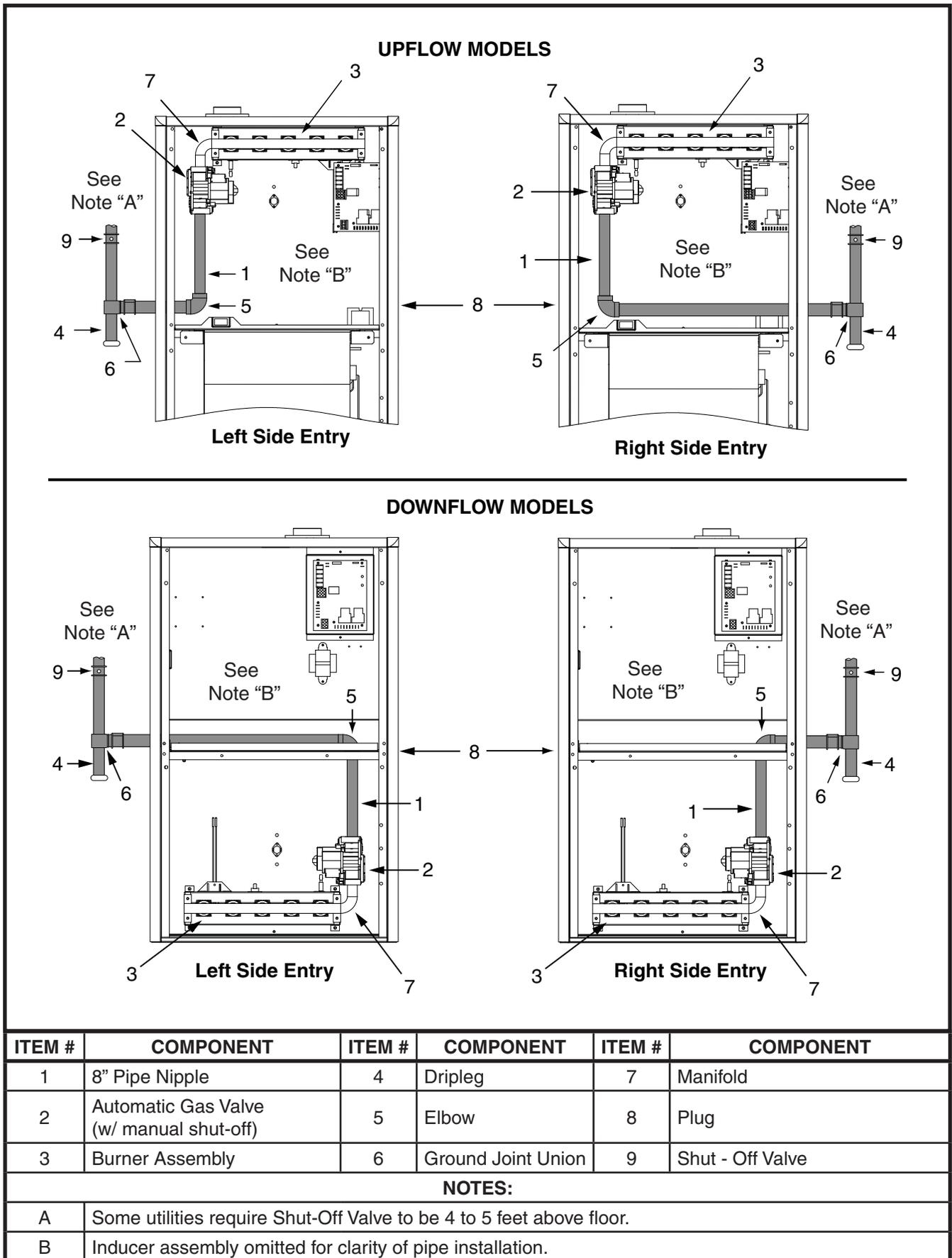


Figure 36. Typical Gas Connections

ELECTRICAL WIRING

WARNING:

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

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

IMPORTANT NOTE: If replacing any of the original wires supplied with the furnace, the replacement wire must be copper wiring and have a temperature rating of at least 105°F (40°C). For electrical specifications, refer to the furnace nameplate or Table 6 (page 30).

Low Voltage Wiring

The thermostat must be installed according to the instructions supplied by the thermostat manufacturer. Low voltage connections (24 VAC) from the thermostat are wired to the terminal strip on the integrated control in the furnace. Figure 37 contains the proper connections for heating only (two-wire) and heating/cooling (four-wire) applications. Recommended minimum wire gauge for thermostat wiring is shown in Table 6.

The thermostat must not be installed on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances.

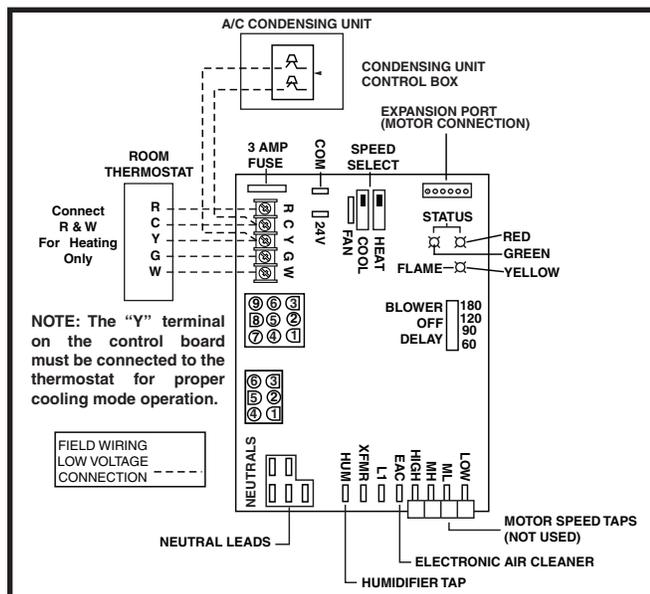


Figure 37. Low Voltage Field, Four-wire Heating / Cooling Applications

IMPORTANT NOTE: Set the heat anticipator according to the instructions supplied by the thermostat manufacturer.

To determine the heat anticipator setting:

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

The six pin terminal marked “Expansion Port” is not used in the single stage furnace as shipped from the factory. It is used for the furnace control board to communicate to a fixed speed or variable speed high efficiency motor that may be optionally installed. Please contact your distributor for the proper upgrade motor kit.

Line Voltage Wiring

It is recommended that the line voltage (115 VAC) to the furnace be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the furnace as listed in Table 6.

IMPORTANT NOTE: An electrical disconnect must be installed readily accessible from and located within sight of the furnace. See Figure 38 (page 30) or the wiring diagram label inside of the control door. Any other wiring methods must be acceptable to authority having jurisdiction.

CAUTION:

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

IMPORTANT NOTE: Proper line voltage polarity must be maintained in order for the control system to operate correctly. Verify the incoming neutral line is connected to the white wire and the incoming “hot” line is connected to the black wire. The furnace will not operate unless the polarity and ground are properly connected as shown in Figure 38.

Grounding

WARNING:

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

Furnace Model Number *RC/*RL	Furnace Input (Btuh)	Cabinet Width (in.)	Nominal Electrical Supply	Maximum Operating Voltage	Minimum Operating Voltage	Maximum Furnace Amperes	Minimum Wire Gauge	Maximum Fuse or Circuit Breaker Amps**
054D-24B	54,000	17 ½	115-60-1	127	103	10.0	14	20
072D-35C	72,000	21	115-60-1	127	103	9.3	14	15
090D-35C	90,000	21	115-60-1	127	103	15.6	14	30
108D-45D	108,000	24 ½	115-60-1	127	103	15.6	14	30

** Time-delay fuses or HACR-type circuit breakers are required.

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

Table 6. Wire Length and Voltage Specifications

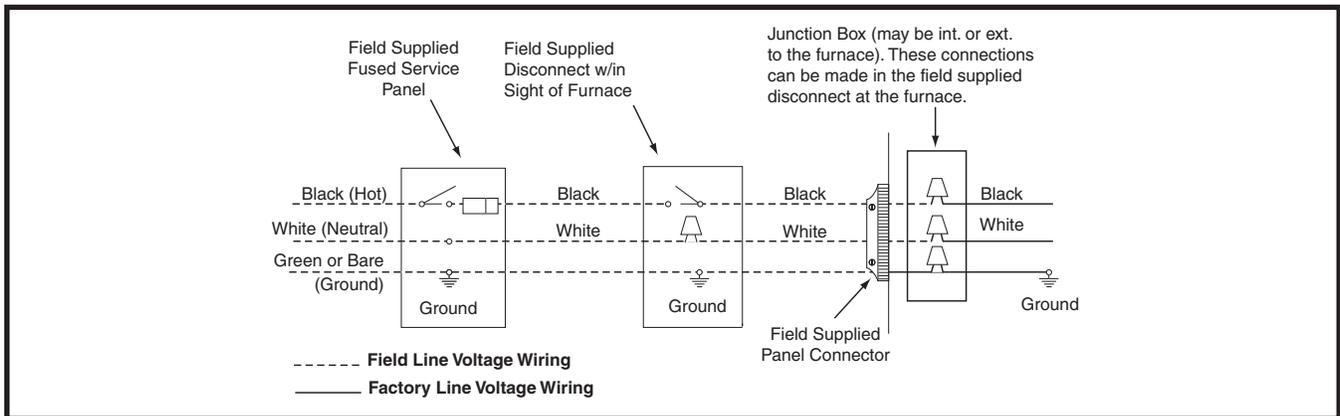


Figure 38. Line Voltage Field Wiring

Twinning

Single stage M4 furnaces are not supplied with a built-in twinning capability. Other valuable features and enhancements were made to the new control that made it necessary to remove the twinning capability. All standard two-stage furnaces equipped with the fixed speed iSEER™ motor include a twinning terminal on the blower control board.

However, if both single stage furnaces are upgraded to the fixed speed iSEER™ blower, the twin terminal on the blower control boards (Figure 39) may be used to twin the single stage furnaces only if the following criteria are met:

- Both furnaces and motors must be the same size.
- Both motors must be on the same speed for cooling and heating.
- Both furnaces must have a common return duct and common supply plenum.
- Both furnaces must be on the same leg of power.

IMPORTANT NOTE: M4 furnaces equipped with variable speed iSEER™ motors may not be twinned under any circumstances. Please contact your furnace distributor for technical details.

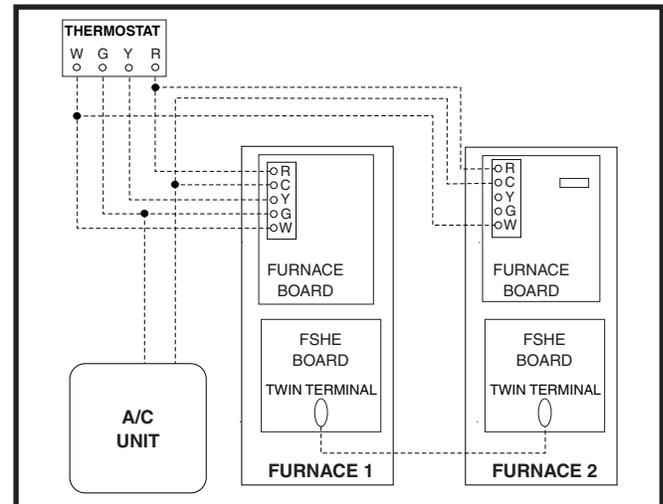


Figure 39. Single Stage Twinning

START-UP AND ADJUSTMENTS

Pre-Start Check List

- √ Verify the polarity of the connections are correct, the line voltage power leads are securely connected and the furnace is properly grounded.
- √ Verify the thermostat wires (**R**, **W**, **Y**, and **G**) are securely connected to the correct leads on the terminal strip of the circuit board.
- √ Verify the gas line service pressure does not exceed 10.0 inches of W.C., and is not less than 4.5 inches W.C. for natural gas. For LP gas the line service pressure must not exceed 14 in. W.C., and must not be less than 11.0 in. W.C.
- √ Verify the roll-out and manual reset switch is closed. If necessary, press the red button to reset a switch. **DO NOT install a jumper wire across a switch to defeat its function.** If a switch reopens on startup, **DO NOT** reset the switch without identifying and correcting the fault condition.
- √ Verify the blower door is in place, closing the door switch in the line voltage circuit.
- √ Verify the gas line has been purged and all connections are leak free.

Start-up Procedures

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

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the furnace.
3. Follow the Operating Instructions on the label attached to the furnace.
4. Set the thermostat above room temperature and verify the Operating Sequence (page 32).
5. After 5 minutes of operation, set the thermostat below room temperature and verify steps 9 & 10 of the Operating Sequence.

Verifying and Adjusting Input Rate

IMPORTANT NOTE: The input rate must not exceed the rate shown on the furnace rating plate. At altitudes above 2,000 feet, it must not exceed that on the rating plate less 4% for each 1,000 feet.

The input rate must be verified for each installation to prevent over-firing of the furnace. To determine the exact input rate, perform the following procedures:

1. Shut off all other gas fired appliances.
2. Start the furnace and run it for at least 3 minutes.
3. Measure the time (in seconds) required for the gas meter to complete one revolution.
4. Convert the time per revolution to cubic feet of gas per hour using Table 9 (page 40).

5. Multiply the gas flow rate in cubic ft per hr by the heating value of the gas in Btu per cubic ft to obtain the input rate in Btuh. See example.
6. The manifold pressure must be set to the appropriate value for each installation by a qualified installer, service agency or the gas supplier. See step 3 on page 27.

Example:

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

Verifying and Adjusting Temperature Rise

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

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

For typical duct systems, the temperature rise will fall within the limits specified on the rating plate with the blower speed at the factory recommended setting. If the measured temperature rise is outside the specified limits, it may be necessary to change the speed of the blower. **NOTE:** Lowering the blower speed will increase the temperature rise and a higher blower speed will decrease the temperature rise.

The furnace is equipped with a multi-speed motor. Heating and cooling speed selection is made by moving the switch on the integrated control inside of the furnace.

Verifying Burner Operation

CAUTION:

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

1. Remove the burner compartment door.
2. Set the thermostat 5 degrees above room temperature and observe the ignition sequence.

NOTE: The flame should carry over immediately between all burners without lifting off, curling, or floating. The flames should be blue, without yellow tips.

3. After validating the flame, change thermostat setting to below room temperature.
4. Verify the burner flame is completely extinguished.
5. Replace the burner compartment door.

Verifying Operation of the Supply Air Limit Switch

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

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

OPERATING SEQUENCE

The operating sequences for the heating, cooling, and fan modes are described below. Refer to the field and furnace wiring diagrams: (Figures 37, page 29), (Figure & 38, page 30) and (Figure 40, page 39).

Heating Cycle

1. The thermostat calls for heat by energizing the **W** terminal with 24VAC.
2. The control verifies the pressure switch is open.
3. If the pressure switch is open, the control energizes the inducer and waits for the pressure switch to close. The pressure switch must close within 10 seconds.
4. The inducer runs for a 30 second pre-purge.
5. The control energizes the Hot Surface Igniter (HSI) output for the appropriate warm-up time limit.
6. The main gas valve energizes for 3 seconds.
7. If the flame proved and ignites the gas, the control de-energizes the HSI. The gas valve and inducer remains energized. The control goes to blower on delay.
8. If flame is present, the control energizes the blower on the selected HEAT speed 30 seconds after the gas valve opened. The gas valve and inducer remain energized.
9. When the thermostat demand for heat is satisfied, the control de-energizes the gas valve. The Inducer output remains on for a 30 second post-purge period.

10. Blower off timing begins when the thermostat is satisfied. The control will operate at the selected HEAT speed of 60, 90, 120, or 180 seconds. If the blower off delay jumper is not present, the fan should still operate for 120 seconds at the selected HEAT speed. The Indoor blower motor is de-energized after a blower off delay as selected by the movable jumper.

Cooling Cycle

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

Fan Mode

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

MAINTENANCE



WARNING:

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

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

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

Air Filter(s)



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

NOTE: An air filter is supplied with the furnace as shipped from the factory. It is recommended that filters be cleaned or replaced monthly during the heating season. New or newly renovated homes may require more frequent changing until the construction dust has minimized. Filters designed to remove smaller particles such as pollen, may require additional maintenance. Filters for side return and bottom return applications are available from most local distributors.

For upflow models, the filter is located inside the blower compartment underneath the blower. To replace the filter:

1. Remove the lower compartment door.
2. Slide the filter backwards until the edge of the filter clears the front flange of the furnace.
3. Lift the filter up over the flange and out through the front of the furnace.
4. Install new filter in reverse order of the removal instructions. **NOTE:** Center the filter over the return opening and secure it to the fastener at the rear of the furnace compartment.

For downflow models, the filter sits on three filter brackets located on top of the furnace. The filter can be easily removed and replaced. Do not remove the filter brackets. When installing the new filter, make sure it is centered over the return air opening.

Blower Compartment

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

Cleaning of Burners

If the burners must be cleaned, follow steps 1 - 12. See Figure 45 or 46 (page 47) for component location and identification.

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

3. Remove the burner door from the furnace.
4. Turn the gas control switch to the OFF position.
5. Disconnect the wires from the gas valve, igniter, flame sensor, and flame rollout switch.
6. Using two wrenches, separate the ground-joint union in the gas supply piping at the furnace.
7. Remove the piping between the Gas Valve and the ground-joint union. (If applicable).
8. Remove all screws securing the Manifold Assembly to the Burner Box.
9. Carefully remove the burner assembly from the furnace. **DO NOT DAMAGE THE IGNITER WHILE REMOVING THE BURNER ASSEMBLY.**
10. Inspect the burners for accumulated dust or debris. If necessary carefully clean them with a soft wire brush and a vacuum cleaner. **DO NOT DAMAGE THE IGNITER WHILE CLEANING THE BURNER.**
11. Replace all the parts in reverse order from which they were removed.
12. Follow the lighting instructions found on the furnace door to return the furnace to operation. Verify proper operation after servicing.

Heat Exchanger and Burner Maintenance

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

Lubrication

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

Vent System

Check the inlet pipe (if applicable) and outlet pipe to ensure they are not blocked by any debris. Damaged vent pipe sections must be replaced and any obstructions or blockages must be removed before operating the furnace.



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

DESCRIPTION OF COMPONENTS

The descriptions below are various functional components that affect the operation and shutting down of this furnace. Some of these components and their locations are shown in Figures 45 and 46 (page 47). If any component of the furnace must be replaced, use only factory authorized replacement parts specified in the Replacement Parts List provided online.

Blower Limit Switch

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

Condensate Drain Switch

The Condensate Drain Switch will shut down the furnace if the condensate drain from the Collector Pan becomes clogged.

Flame Sensor

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

Flame Roll-Out Switch

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

Gas Valve

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

Inducer Assembly

The inducer assembly vents products of combustion to the outside.

Pressure Switch

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

Supply Air Limit Switch

The supply air limit switch prevents the air temperature leaving the furnace from exceeding the maximum allowable outlet air temperature.

TROUBLESHOOTING

If the furnace fails to operate check the following:

- Is the thermostat operating properly?
- Are the blower compartment door(s) in place?
- Is the furnace disconnect closed?
- Has the circuit breaker tripped or the control board fuse burned open?
- Is the gas turned on?
- Are any manual reset switches open?
- Is the filter dirty or plugged?
- Is the flame sensor coated? Remove and clean with steel wool. **(Do not use emery cloth or sandpaper!)**
- Is there blockage in the condensate drain switch? Also verify that there is no double trapping of condensate.
- Is the secondary heat exchanger free of debris and clogs?
- Is evaporator coil clean and free of debris (If applicable).
- Are all the LED's on the furnace control board constantly ON? If not, refer to Table 7 or the wiring diagram (Figure 40, page 39) to determine fault condition.

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

- If the Inducer Blower is operating, and items above have been verified, check the blower limit switch and reset if necessary. See Figure 45 or 46 (page 47) for component location.
- If the furnace operates when the blower limit switch is reset, contact a qualified service technician to identify and repair the problem.
- If the furnace still doesn't operate, check the flame roll-out switches (Figure 45 or 46) and reset if necessary.
- If the furnace operates when the flame rollout switch is reset, contact a qualified service technician to identify and repair the problem.

Diagnostic Description	Green LED	Red LED
Control Fault (No Power)	Off	Off
L1/Neutral Polarity Fault	Flash	Flash
1 Hour Lockout	Alternating Flash	
Normal Operation	On	On
Pressure Switch Closed Fault	On	Flash
Pressure Switch Open Fault	Flash	On
Open Limit Switch Fault	Flash	Off
Motor Fault	On	Off
Diagnostic Description	Yellow LED	
Low Flame Sensor Signal	Continuous Flash	
Flame Present	On	

Table 7. Control Board Fault Codes

FRENCH TRANSLATIONS

The following are French translations of important warning statements found within this manual.

AVERTISSEMENT:

RISQUE D'EMPOISONNEMENT AU MONOXYDE DE CARBONÉ

Le non-respect des consignes suivantes portant sur chacun des appareils raccordés au système d'évacuation mis en service pourrait entraîner l'empoisonnement au monoxyde de carbone ou la mort. Les consignes suivantes doivent être observées pour chaque appareil raccordé au système d'évacuation mis en service si les autres appareils raccordés au système ne sont pas en service:

1. **Sceller toute ouverture non utilisée de la système d'évacuation;**
2. **S'assurer que la système d'évacuation présente des dimensions et une pente horizontale conformes à la norme ANSI Z223.1/NFPA 54, intitulée National Fuel Gas Code ou aux codes d'installation CSA-B149.1, ainsi qu'aux présentes instructions. S'assurer que la système d'évacuation n'est pas bloquée, restreinte, corrodée, qu'elle ne fuit pas et qu'elle ne présente aucun autre défaut potentiellement dangereux;**
3. **Dans la mesure du possible, fermer toutes les portes et fenêtres du bâtiment, et toutes les portes entre la pièce où se trouve l'appareil raccordé à la système d'évacuation et les autres pièces du bâtiment.**
4. **Fermer les registres des foyers;**
5. **Mettre en service les sècheuses et tout autre appareil qui n'est pas raccordé à la système d'évacuation. Faire fonctionner à régime maximal tout ventilateur d'évacuation, tel que les hottes de cuisinière et les ventilateurs de salles de bains. Ne pas mettre en service les ventilateurs d'été.**
6. **Respecter les instructions d'allumage. Mettre en service l'appareil à l'essai. Régler le thermostat de manière à ce que l'appareil fonctionne sans interruption;**
7. **Vérifier s'il y a débordement à l'orifice d'évacuation du coupe tirage des appareils dotés d'un coupe tirage 5 minutes après l'allumage du brûleur principal. Utiliser la flamme d'une allumette ou d'une chandelle.**
8. **Si l'on constate, au cours de l'un des essais qui précèdent, que l'évacuation est déficiente, corriger le système d'évacuation conformément à la norm ANSI Z223.1/NFPA 54, National Fuel Gas Code, et (ou) aux codes d'installation CSA B149.1.**
9. **Après avoir déterminé que tous les appareils raccordés à la système d'évacuation évacuent correctement tel que prescrit ci-dessus, rouvrir les portes et les fenêtres et remettre les ventilateurs d'évacuation, les registres de foyers et tout autre appareil fonctionnant au gaz à leur état de fonctionnement initial.**

 **AVERTISSEMENT:**

RISQUE D'INCENDIE OU D'EXPLOSION

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

QUE FAIRE S'IL Y A UNE ODEUR DE GAZ

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

 **AVERTISSEMENT:**

RISQUE D'INCENDIE ET D'EXPLOSION

Risque de blessures graves ou de mort.

Ne pas entreposer ni utiliser de l'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil, ni de tout autre appareil. Le fait d'entreposer ou d'utiliser de l'essence ou d'autres liquides ou vapeurs inflammables à proximité de cet appareil ou de tout autre appareil peut causer des blessures graves ou la mort.

 **AVERTISSEMENT:**

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

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

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

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

 **AVERTISSEMENT:**

Ne jamais utiliser une flamme nue por vérifier la présence des fuites de gaz. Pour la vérification de tous les joints, utiliser plutôt une solution savonneuse commerciale fabriquée spécifiquement pur la détection des fuites de gaz. Un incendie ou une explosion peut entraîner des dommages matériels, des blessures ou la mort.

Le non-respect des avertissements de sécurité pourrait d'entraîner des blessures graves, la mort ou des dommages matériels.

FIGURES AND TABLES

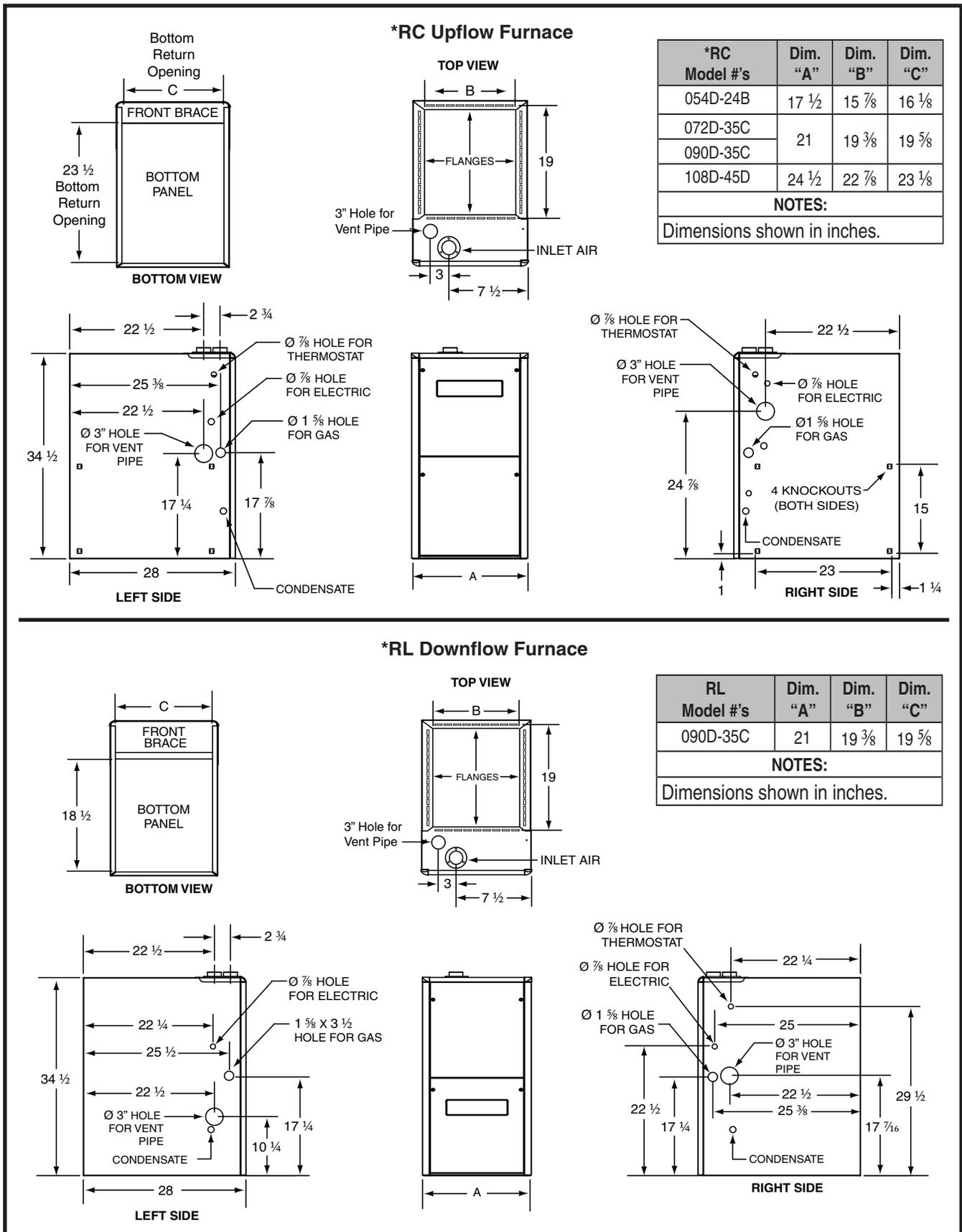


Figure 40. Furnace Dimensions

AIRFLOW DATA

	Model Number	Heating Input (Btuh)	Motor Speed	External Static Pressure (Inches Water Column)															
				0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
				CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise
UPFLOW FURNACES	RC054-24B Bottom Return	54,000	High*	1550	30	1520	30	1485	31	1450	32	1410	33	1360	34	1300	35	1255	37
			Med-High	1250	37	1220	38	1200	38	1170	39	1140	40	1105	42	1065	43	1010	46
			Med-Low**	935	49	910	51	880	52	850	54	815	56	785	59	735	63	680	68
			Low	720	64	690	67	655	70	620	74	585	79	550	84	520	88	485	95
	RC054D-24B Side Return	54,000	High*	1630	28	1595	29	1560	29	1525	30	1480	31	1430	32	1365	34	1320	35
			Med-High	1315	35	1280	36	1260	37	1230	37	1200	38	1160	40	1120	41	1060	43
			Med-Low**	980	47	955	48	925	50	890	52	855	54	825	56	775	59	715	64
			Low	755	61	725	63	690	67	650	71	615	75	580	79	545	84	510	90
	RC072D-35C Bottom Return	72,000	High*	1895	32	1790	34	1720	36	1630	38	1550	40	1445	42	1330	46	1225	50
			Med-High**	1775	35	1710	36	1650	37	1550	40	1470	42	1385	44	1290	48	1180	52
			Med-Low	1255	49	1200	51	1155	53	1105	56	1050	58	1000	61	925	66	830	74
			Low	1140	54	1100	56	1065	58	1025	60	980	63	930	66	870	70	805	76
	RC072D-35C Side Return	72,000	High*	1970	31	1865	33	1780	34	1695	36	1615	38	1505	41	1385	44	1275	48
			Med-High**	1845	33	1780	34	1715	36	1615	38	1530	40	1440	43	1340	46	1230	50
			Med-Low	1305	47	1250	49	1200	51	1150	53	1090	56	1040	59	965	64	865	71
			Low	1185	52	1145	54	1110	55	1065	58	1020	60	965	64	905	68	840	73
	RC072D-35C Side + Bottom or 2 Sides	72,000	High*	1990	31	1880	33	1805	34	1710	36	1630	38	1510	41	1400	44	1285	48
			Med-High**	1865	33	1795	34	1735	35	1630	38	1545	40	1455	42	1355	45	1240	49
Med-Low			1320	46	1260	49	1215	50	1160	53	1105	56	1050	58	970	63	875	70	
Low			1200	51	1155	53	1120	55	1075	57	1030	60	975	63	915	67	845	73	
RC090D-35C Bottom Return	90,000	High*	2155	36	2090	37	2015	38	1960	39	1910	40	1835	42	1755	44	1660	46	
		Med-High**	2015	38	1960	39	1920	40	1860	41	1805	42	1755	44	1695	45	1615	47	
		Med-Low	1705	45	1675	46	1640	47	1590	48	1555	49	1495	51	1435	53	1340	57	
		Low	1410	54	1390	55	1365	56	1330	58	1310	59	1275	60	1235	62	1210	63	
RC090D-35C Side Return	90,000	High*	2240	34	2175	35	2100	37	2040	38	1985	39	1910	40	1825	42	1725	44	
		Med-High**	2095	37	2040	38	2000	38	1935	40	1875	41	1825	42	1765	43	1680	46	
		Med-Low	1775	43	1740	44	1705	45	1655	46	1615	47	1555	49	1490	51	1335	57	
		Low	1465	52	1445	53	1420	54	1385	55	1360	56	1325	58	1285	60	1260	61	
RC090D-35C Side + Bottom or 2 Sides	90,000	High*	2265	34	2195	35	2115	36	2060	37	2005	38	1930	40	1845	42	1745	44	
		Med-High**	2115	36	2060	37	2015	38	1955	39	1895	40	1845	42	1780	43	1695	45	
		Med-Low	1790	43	1760	44	1725	44	1670	46	1635	47	1570	49	1510	51	1410	54	
		Low	1480	52	1460	53	1435	53	1400	55	1375	56	1340	57	1300	59	1270	60	
RC108D-45D Bottom only or 2 openings	108,000	High*	2135	43	2095	44	2040	45	1975	47	1910	48	1840	50	1735	53	1675	55	
		Med-High**	2000	46	1955	47	1900	48	1845	50	1800	51	1735	53	1665	55	1570	59	
		Med-Low	1665	55	1660	55	1625	57	1590	58	1530	60	1500	61	1415	65	1340	69	
		Low	1385	66	1360	68	1310	70	1300	71	1275	72	1250	74	1200	77	1150	80	
RC108D-45D Side Return	108,000	High*	2115	43	2075	44	2020	46	1955	47	1890	49	1822	50	1720	53	1660	55	
		Med-High**	1980	46	1935	48	1880	49	1830	50	1780	52	1720	53	1650	56	1555	59	
		Med-Low	1650	56	1645	56	1610	57	1575	58	1515	61	1485	62	1400	66	1330	69	
		Low	1370	67	1345	68	1300	71	1290	71	1260	73	1240	74	1190	77	1140	81	
DOWNFLOW FURNACES	RL090-35C	90,000	High*	1,955	39	1,905	40	1,835	42	1,795	43	1,730	44	1,620	47	1,545	50	1,450	53
			Med-High**	1,845	42	1,790	43	1,750	44	1,680	46	1,515	51	1,540	50	1,475	52	1,410	54
			Med-Low	1,320	58	1,290	59	1,250	61	1,215	63	1,180	65	1,120	68	1,050	73	970	79
			Low	1,190	64	1,165	66	1,125	68	1,080	71	1,055	73	1,000	77	945	81	875	88

NOTES:

* Factory Set Cooling Speed

** Factory Set Heating Speed

1. Two openings are recommended for airflows above 1,600 CFM if filter(s) is(are) adjacent to furnace.

2. Temperature rises in the table are approximate. Actual temperature rises may vary.

3. Temperature rises shaded in gray are for reference only. These conditions are not recommended.

Table 8. Blower Performance

ELECTRICAL INFORMATION

WIRING DIAGRAM

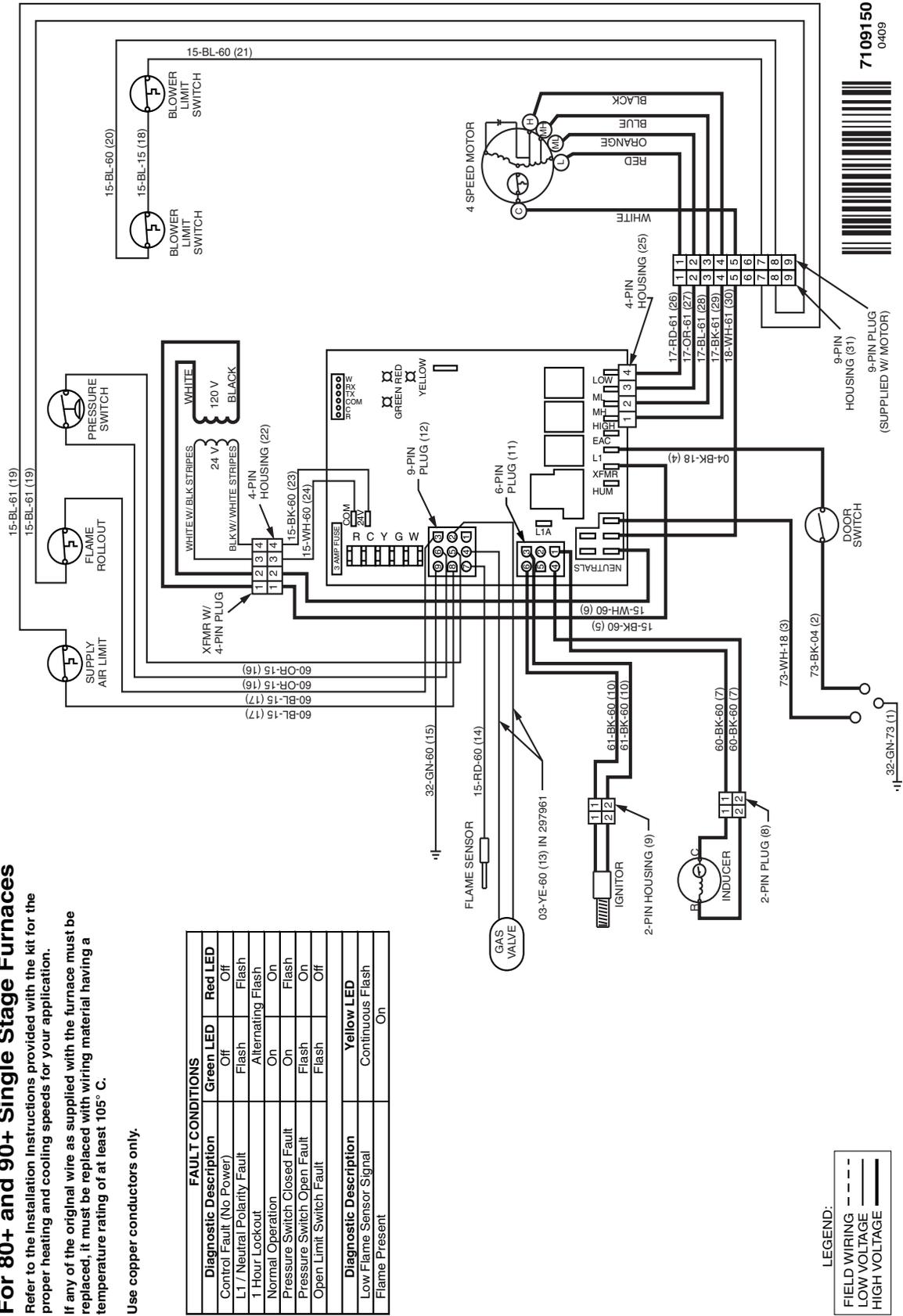
For 80+ and 90+ Single Stage Furnaces

Refer to the Installation Instructions provided with the kit for the proper heating and cooling speeds for your application.

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.

FAULT CONDITIONS			
Diagnostic Description	Green LED	Red LED	Red LED
Control Fault (No Power)	Off	Off	Off
L1 / Neutral Polarity Fault	Flash	Flash	Flash
1 Hour Lockout	On	Alternating Flash	On
Normal Operation	On	On	On
Pressure Switch Closed Fault	Flash	Flash	Flash
Pressure Switch Open Fault	Flash	Flash	On
Open Limit Switch Fault	Flash	Flash	Off
Diagnostic Description			
Low Flame Sensor Signal		Continuous Flash	
Flame Present		On	



LEGEND:
 FIELD WIRING
 LOW VOLTAGE
 HIGH VOLTAGE



Figure 41. Wiring Diagram for Upflow and Downflow Models

GAS INFORMATION

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

Table 9. Gas Flow Rates

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

NOTES:

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

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

Table 10. Black Iron Gas Pipe Capacities

PROPANE GAS					
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)				
	54,000	72,000	90,000	108,000	
0 to 1,999 FT	56	56	56	56	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
2,000 to 2,999 FT	56	56	56	56	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
3,000 to 4,999 FT	56	56	56	56	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE
5,000 to 5,999 FT	57	57	57	57	ORIFICE SIZE
	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
6,000 to 7,999 FT	57	57	57	57	ORIFICE SIZE
	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
8,000 to 10,000 FT	57	57	57	57	ORIFICE SIZE
	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE

Table 11. High Altitude Deration Chart for Propane Gas

ALTITUDE ABOVE SEA LEVEL	LOCAL HEATING VALUE, BTU PER CUBIC FOOT								
	650	700	750	800	850	900	950	1,000	1,050
2,000 FT	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH
3,000 FT	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH
4,000 FT	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH
5,000 FT	LOW	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH
6,000 FT	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH
7,000 FT	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH
8,000 FT	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
9,000 FT	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
10,000 FT	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH

Table 12. Natural Gas Heating Values

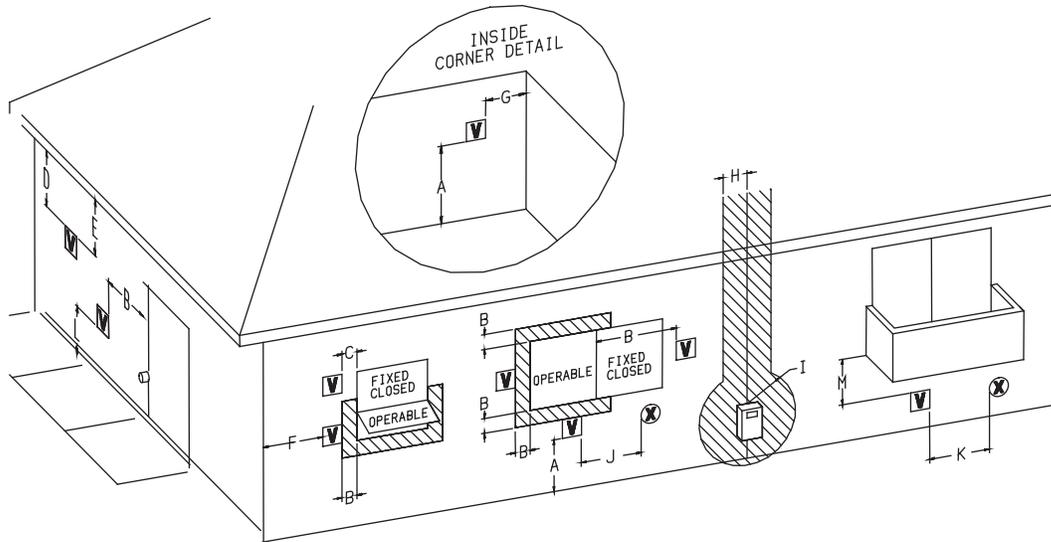
NATURAL GAS - HIGH HEATING VALUE					
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)				
	54,000	72,000	90,000	108,000	
0 to 1,999 FT	47	47	47	47	ORIFICE SIZE
	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	47	47	47	47	ORIFICE SIZE
	3.2	3.2	3.2	3.2	MANIFOLD PRESSURE
3,000 to 3,999 FT	47	47	47	47	ORIFICE SIZE
	3.0	3.0	3.0	3.0	MANIFOLD PRESSURE
4,000 to 4,999 FT	47	47	47	47	ORIFICE SIZE
	2.8	2.8	2.8	2.8	MANIFOLD PRESSURE
5,000 to 5,999 FT	47	47	47	47	ORIFICE SIZE
	2.7	2.7	2.7	2.7	MANIFOLD PRESSURE
6,000 to 6,999 FT	49	49	49	49	ORIFICE SIZE
	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
7,000 to 7,999 FT	49	49	49	49	ORIFICE SIZE
	3.3	3.3	3.3	3.3	MANIFOLD PRESSURE
8,000 to 8,999 FT	49	49	49	49	ORIFICE SIZE
	3.0	3.0	3.0	3.0	MANIFOLD PRESSURE
9,000 to 9,999 FT	49	49	49	49	ORIFICE SIZE
	2.8	2.8	2.8	2.8	MANIFOLD PRESSURE

Table 13. High Altitude Deration Chart for Natural Gas - High Heating Value

NATURAL GAS - LOW HEATING VALUE					
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)				
	54,000	72,000	90,000	108,000	
0 to 1,999 FT	47	47	47	47	ORIFICE SIZE
	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	47	47	47	47	ORIFICE SIZE
	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
3,000 to 3,999 FT	47	47	47	47	ORIFICE SIZE
	3.3	3.3	3.3	3.3	MANIFOLD PRESSURE
4,000 to 4,999 FT	47	47	47	47	ORIFICE SIZE
	3.1	3.1	3.1	3.1	MANIFOLD PRESSURE
5,000 to 5,999 FT	47	47	47	47	ORIFICE SIZE
	2.9	2.9	2.9	2.9	MANIFOLD PRESSURE
6,000 to 6,999 FT	47	47	47	47	ORIFICE SIZE
	2.8	2.8	2.8	2.8	MANIFOLD PRESSURE
7,000 to 7,999 FT	49	49	49	49	ORIFICE SIZE
	3.4	3.4	3.4	3.4	MANIFOLD PRESSURE
8,000 to 8,999 FT	49	49	49	49	ORIFICE SIZE
	3.2	3.2	3.2	3.2	MANIFOLD PRESSURE
9,000 to 9,999 FT	49	49	49	49	ORIFICE SIZE
	2.9	2.9	2.9	2.9	MANIFOLD PRESSURE

Table 14. High Altitude Deration Chart for Natural Gas - Low Heating Value

VENTING INFORMATION



V VENT TERMINAL

X AIR SUPPLY INLET

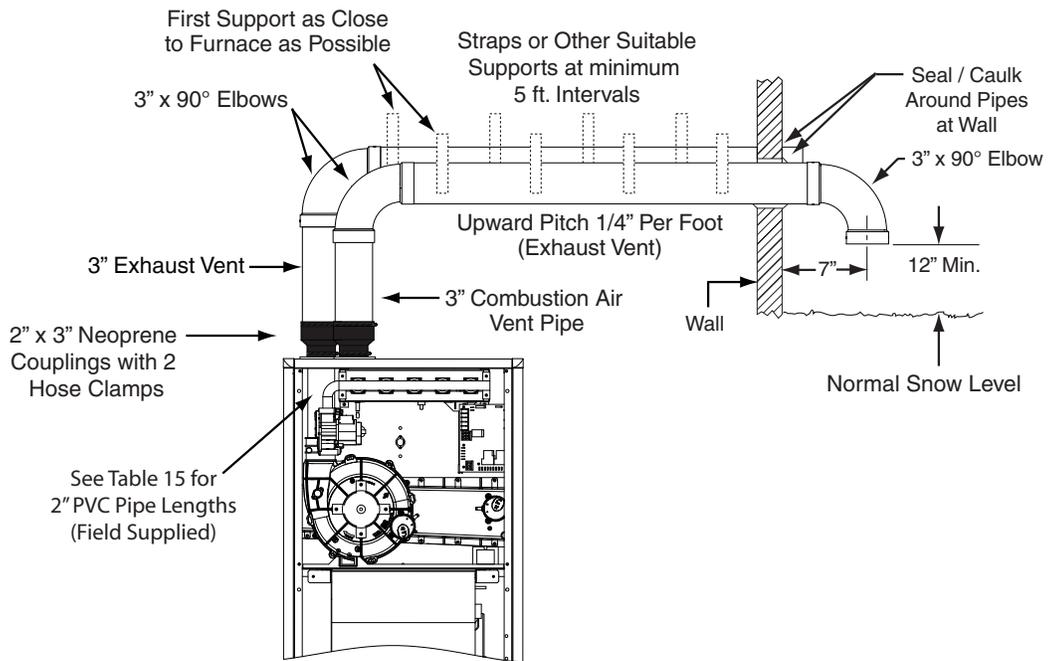
AREA WHERE TERMINAL IS NOT PERMITTED

Clearance Location	CANADIAN INSTALLATIONS ^a	US INSTALLATIONS ^b	
	Direct Vent (2-pipe) & Conventional Vent (1-pipe) Furnaces	Direct Vent (2-pipe) Furnaces	Conventional Vent (1-pipe) Furnaces
A = Clearance above grade, veranda, porch, deck, balcony, or maximum expected snow level.	12 inches (30cm)	12 inches (30cm)	12 inches (30cm)
B = Clearance to window or door that may be opened.	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW) 36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW) 12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
C = Clearance to permanently closed window	*	*	*
D = Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61cm) 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.	3 feet (91cm) within a height 15 feet above the meter/regulator assembly	*	*
I = Clearance to service regulator vent outlet.	3 feet (1.83m)	*	*
J = Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance.	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW) 36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW) 12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
K = Clearance to mechanical air supply inlet.	6 feet (1.83m)	3 feet (91cm) above if within 10 feet (3m) horizontally	3 ft. (91cm) above if within 10 feet (3m) horizontally
L = Clearance above paved sidewalk or driveway located on public property.	7 feet (2.13m) ^c	*	7 ft. (2.13m)
M = Clearance under veranda, porch, deck, or balcony.	12 inches (30cm) ^d	*	*
NOTES:			
a	In accordance with the current CSA B149.1 Natural Gas and Propane Installation Guide Code		
b	In accordance with the current ANSI Z223.1 / NFPA 54 Natural Fuel Gas Code		
c	A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.		
d	Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.		
*	For clearances not specified in ANSI Z223.1 / NFPA 54 or CSA B149.1, the following statement shall be included: "Clearance in accordance with local installation codes, and the requirements of the gas supplier and the manufacturers installation instructions"		

Table 15. Vent Termination Clearances

HORIZONTAL VENTING

(2-Pipe Shown)



VERTICAL VENTING

(2-Pipe Shown)

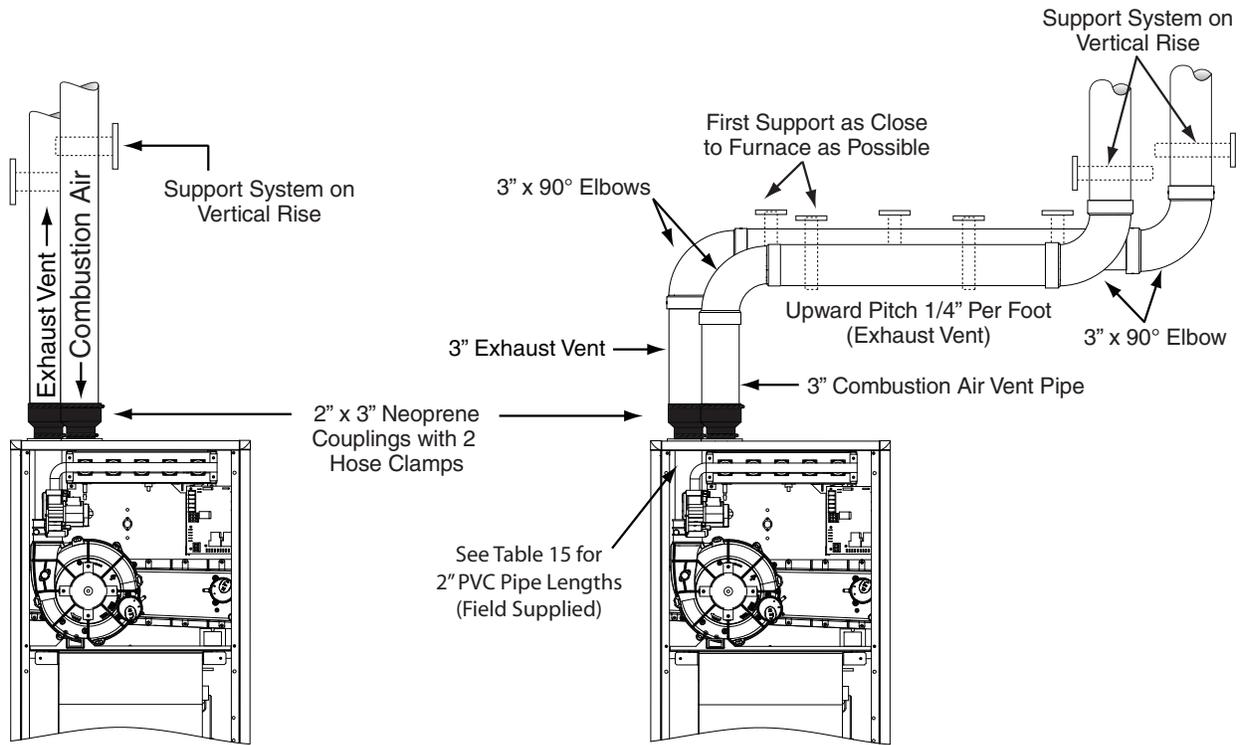
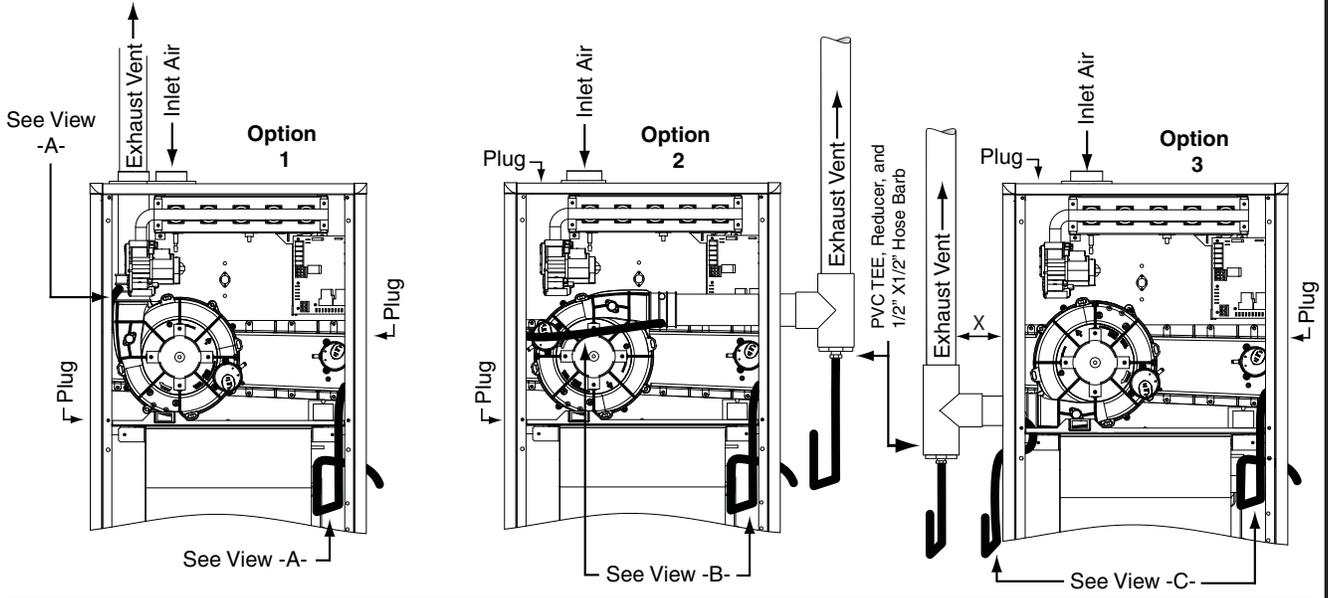
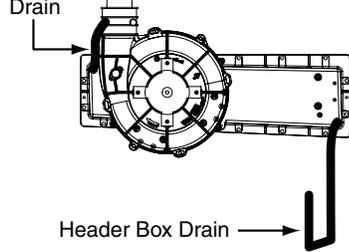


Figure 42. Horizontal and Vertical Venting

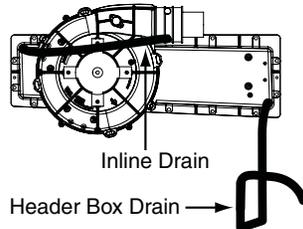
1 Pipe Upflow



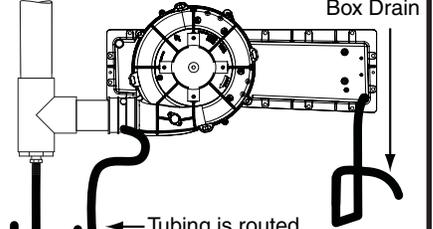
VIEW -A-



VIEW -B-



VIEW -C-



NOTES:

- 1.) All drain lines must be trapped with J-Trap or field supplied loop.
- 2.) Drain line traps may be positioned inside or outside the cabinet.
- 3.) PVC Cap is required for options 5 and 6.

Inline Drain
(This drain not needed if "X" is less than 6")

← Tubing is routed thru the blower deck and side of cabinet.

2 Pipe Upflow

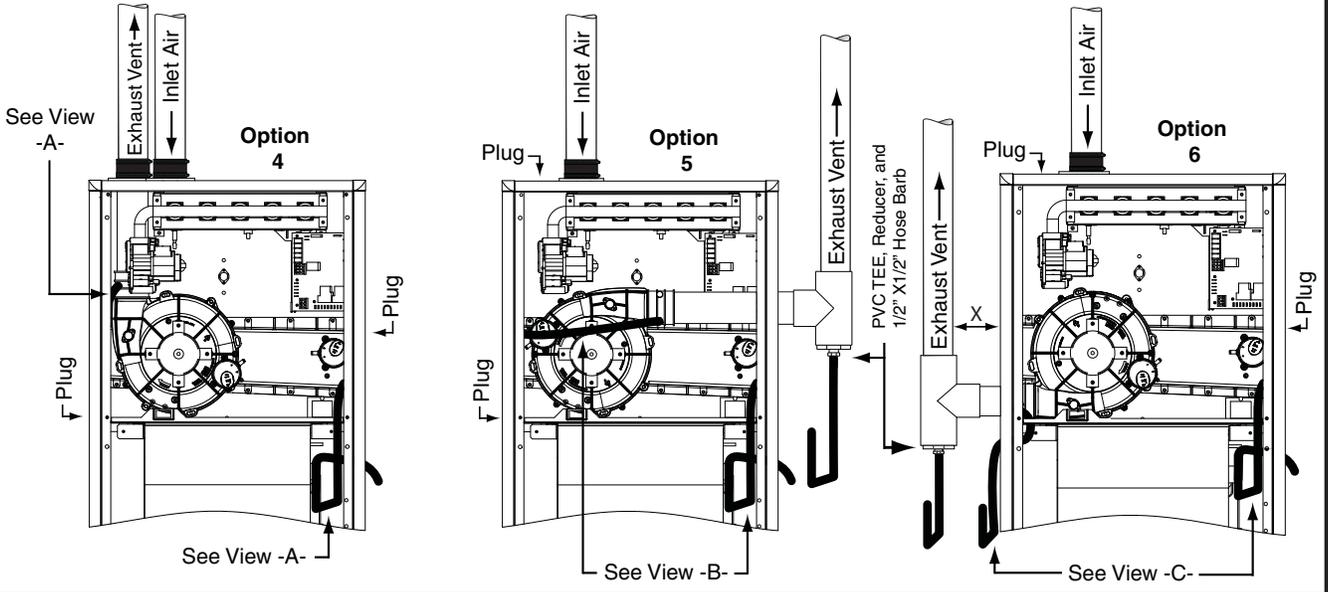


Figure 43. Upflow Options

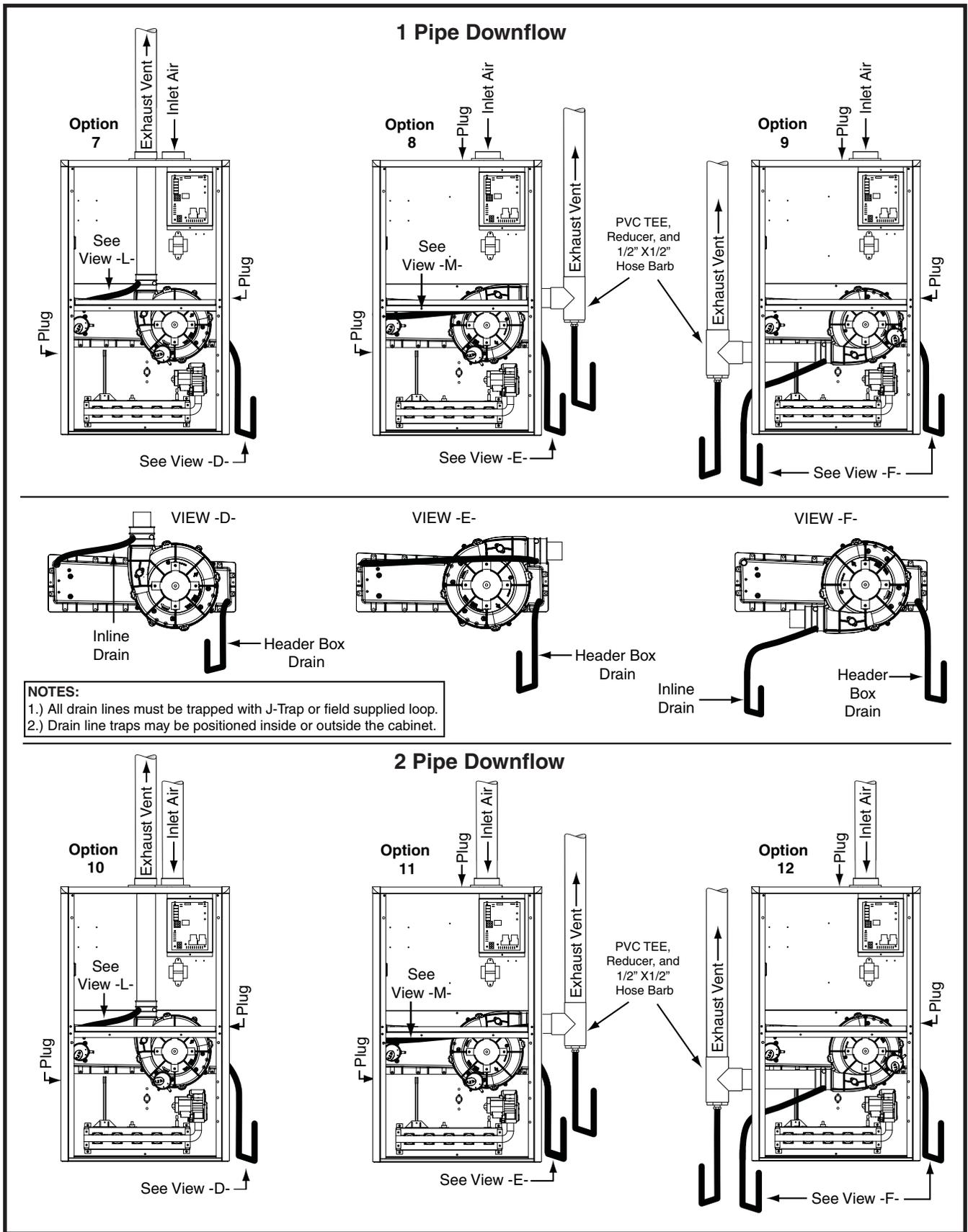


Figure 44. Downflow Options

LOCATION OF FURNACE COMPONENTS

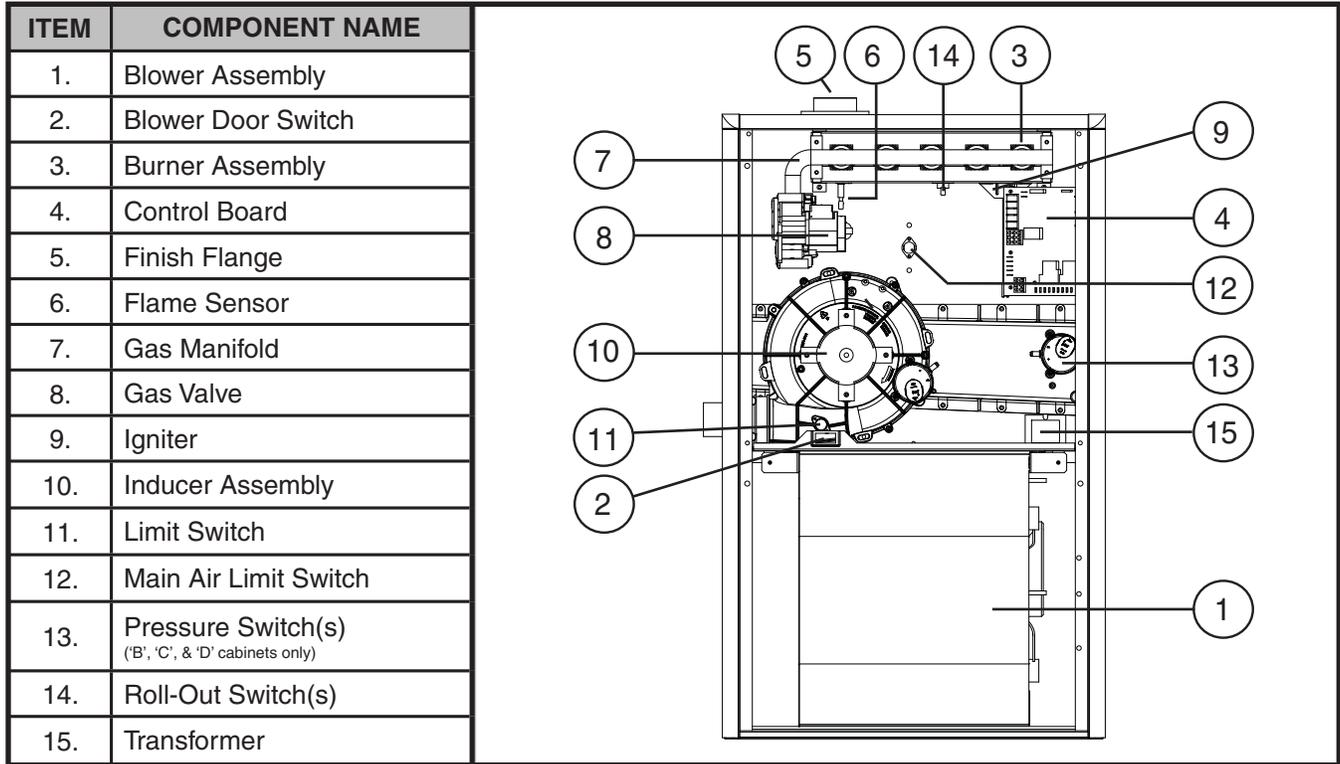


Figure 45. Upflow Gas Furnace Components

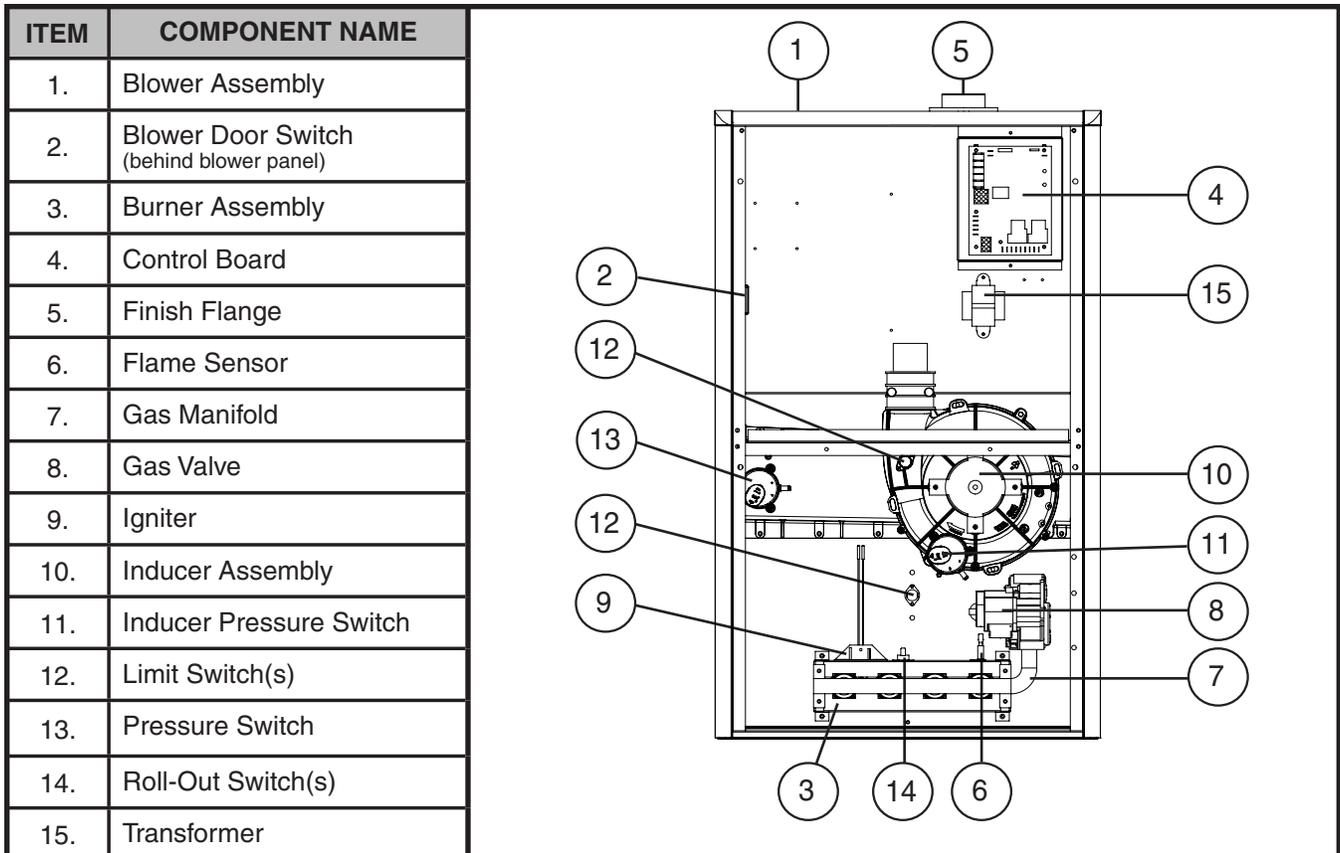


Figure 46. Downflow Gas Furnace Components

INSTALLATION/PERFORMANCE CHECK LIST

INSTALLER NAME:	
CITY _____	STATE _____

INSTALLATION ADDRESS:	
CITY _____	STATE _____

UNIT MODEL # _____
UNIT SERIAL # _____

Minimum clearances per Table 1 (page 9)?	YES	NO
--	-----	----

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

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

ELECTRICAL SYSTEM:		
Electrical connections tight?	YES	NO
Line voltage polarity correct?	YES	NO
Supply Voltage: _____ VOLTS		
Has the thermostat been calibrated?	YES	NO
Is the thermostat level?	YES	NO
Is the heat anticipator setting correct?	YES	NO

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



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

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