Single Stage Condensing Gas Furnaces

INSTALLATION INSTRUCTIONS



*SC Upflow / Horizontal Furnace



*SD Dedicated Upflow Furnace

⚠ WARNING

FIRE OR EXPLOSION HAZARD

- **Failure to follow safety warnings exactly could result in serious injury, death 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. PLEASE READ CAREFULLY & KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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IMPORTANT SAFETY INFORMATION

INSTALLER: Please read all instructions before servicing this equipment. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored. **WARNING** - Indicates a potentially hazardous situation that if not avoided, could result in personal injury or death. **CAUTION** - Indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

⚠ WARNING:

The safety information listed in this manual must be followed during the installation, service, and operation of this unit. Unqualified individuals should not attempt to interpret these instructions or install this equipment. Failure to follow safety recommendations could result in possible damage to the equipment, serious personal injury or death.

⚠ WARNING:

Improper installation, service, adjustment, or maintenance may cause explosion, fire, electrical shock or other hazardous conditions which may result in personal injury or property damage. Unless otherwise noted in these instructions, only factory authorized kits or accessories may be used with this product.

⚠ WARNING:

Do not install this furnace if any part has been submerged under water. A flood damaged furnace is extremely dangerous. Attempts to use the furnace may result in fire or explosion. A qualified service agency should be contacted to inspect the furnace and to replace any electrical or control system parts that have been wet or under water.

- To minimize equipment failure or personal injury, it is essential that only qualified individuals install, service, or maintain this equipment. If you do not posses mechanical skills or tools, call your local dealer for assistance.
- Follow all precautions in the literature, on tags, and on labels provided with the equipment. Read and thoroughly understand the instructions provided with the equipment prior to performing the installation and operational checkout of the equipment.
- Use caution when handling this appliance or removing components. Personal injury can occur from sharp metal edges present in all sheet metal constructed equipment.
- Do not store any of the following on, or in contact with, the unit: Rags, brooms, vacuum cleaners, or other cleaning tools, spray or aerosol cans, soap powders, bleaches, waxes, cleaning compounds, plastics or plastic containers, paper bags or other paper products, gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids, paint thinners, or other volatile fluids.
- The installer should become familiar with the units wiring diagram before making any electrical connections to the unit. See Figure 28 (page 29), Figure 29 (page 30) or the unit wiring label.
- **Always reinstall the doors on the furnace after servicing. Do not operate the furnace without all doors and covers in place.**

REQUIREMENTS & CODES

⚠ WARNING:

The 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.

- 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/CSA B149.1.
- Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
- Install this furnace only in a location and position as specified on page 5.
- Provide adequate combustion and ventilation air to the furnace space as specified on page 6, page 7, page 8 & page 9.
- Provide adequate clearances around the vent air intake terminal as shown in Figure 7 (page 11), Figure 8 (page 11), Figure 9 (page 12), & Figure 10 (page 12).
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified on page 9, page 10, page 11, & page 12.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections. See page 20.
- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column. Consult the rating plate for the proper circulating air flow and temperature rise. It is important that the duct system be designed to provide the correct flow rates and external pressure rise. An improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.
- 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 in the conditioned space. See page 13.
- A gas-fired furnace for installation in a residential garage must be installed as specified on page 5.
- This furnace is not approved for installation in mobile homes. Installing this furnace in a mobile home could cause fire, property damage, and/or personal injury.
- 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.

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

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

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

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

Gas Piping & Gas Pipe Pressure Testing
- US: NFGC and National Plumbing Codes
- CANADA: NSCNGPIC

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

Safety
- US: (NFGC) NFPA 54–1999/ANSI Z223.1 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.
- CANADA: CAN/CSA-B149.1 and .2–M00 National Standard of Canada. (NSCNGPIC)

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 installed as a single pipe installation in a confined space, it is required that the necessary combustion air come from the outdoors by way of attic, crawl space, air duct, or direct opening. For Installations in confined spaces, see page 7 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

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.**

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.

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.

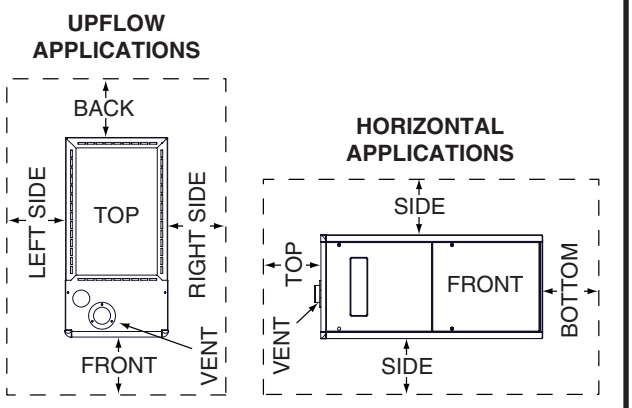
This gas-fired furnace may be installed in a residential garage with the provision that the burners and igniter are located no less than 18 inches (457mm) above the floor. The furnace must be located or protected to prevent physical damage by vehicles.

Clearances to Combustible Materials

This furnace is Design Certified in the U.S. and Canada by CSA International or Underwriter's Laboratories for the minimum clearances to combustible materials. **NOTE:** The furnace is listed for installation on combustible or non-combustible flooring. However, wood is the only combustible flooring allowed for installation. 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 24 inches minimum clearance from the front of the unit. However 36 inches is strongly recommended.** See Figure 1 for minimum clearance requirements.

CLEARANCES TO COMBUSTIBLE MATERIALS



Left Side	0 Inches	Top	1 Inches
Right Side	0 Inches	Front	†1 Inches
Vent	0 Inches	Back	0 Inches

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

Figure 1. Minimum Clearances to Combustible Materials

Operation of Furnace During Construction

⚠ CAUTION:

Failure to follow these instructions will void the factory warranty and may significantly reduce the life or the performance of the furnace, and/or result in other unsafe conditions. It is the responsibility of the installing contractor to insure these provisions are met.

Operating gas furnaces in construction environments can cause a variety of problems with the furnace. Proper use of commercial portable space heating equipment during construction is recommended. This gas furnace may be used during construction if it is not in violation of any applicable codes and the following criteria are met:

- The installation must meet all applicable codes. The furnace must be permanently installed according to the instructions supplied with the furnace. This includes the electrical supply, gas piping, duct work, and venting. The furnace must be controlled by a room thermostat properly installed according to the instructions supplied with the furnace and thermostat. The installation must include a properly installed air filter in the return air duct, sealed to the furnace with no by-pass air. The filter must be inspected frequently and replaced when necessary.
- The furnace input rate and air temperature rise must be checked and verified to be within the acceptable ranges as marked on the furnace nameplate.
- Before occupying the structure: The air filter must be replaced or cleaned, the duct work must be inspected and cleaned of any construction debris, and the furnace must be cleaned and/or repaired if found to be dirty, damaged, or malfunctioning in any way by a qualified HVAC technician. The furnace shall be inspected and approved by applicable local authority even if this requires redundant inspections.

- Serial numbers for furnaces used during construction must be submitted in writing (fax and email also acceptable). This information will be used to track the long-term affects of the use during construction on furnaces. Proof of this submittal shall be available for the final inspection of the furnace prior to occupancy.
- This furnace is designed to operate with return air temperatures in ranges normally found in occupied residences, including setbacks. Minimum continuous return temperature must not be below 60° F (15° C). Occasionally a temporary return temperature of 55° F (12° C) is acceptable. However, operation with a return temperature below 55° F (12° C) is not allowed.
- The installing contractor and / or builder must:
  - — Comply with the requirements of this section.
  - — Complete the attached Use of Furnace During Construction checklist.
  - — Email copy of completed Use of Furnace During Construction checklist to warranty@nortek.com
  - — Leave original completed Use of Furnace During Construction checklist with furnace.
  - — Disclose use of the furnace during construction to the homeowner in advance of the sale.

COMBUSTION AIR & VENTING REQUIREMENTS

⚠ WARNING:

CARBON MONOXIDE POISONING HAZARD

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

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

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

IMPORTANT INFORMATION:

- **This furnace must be vented in compliance with the current revision of the National Fuel Gas Code (ANSI-Z223.1/NFPA54). Instructions for determining the adequacy of an installation can be found in the current revision of the NFGC (ANSI Z223.1 / NFPA54). Refer to the NFGC for approved vent tables. Consult local codes for special requirements. These requirements are for US installations as found in the NFGC.**
- **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.**
- **Requirements in Canada (B149.1) are structured differently. In Canada, venting shall conform to the requirements of the current (CAN/CSA B149.1) installation codes. Consult local codes for special requirements.**
- **Provisions must be made during the installation of this furnace that provide an adequate supply of air for combustion. 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.**

⚠ WARNING:

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

⚠ 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.

This condensing furnace is certified for installation either as a Direct Vent (2-pipe) or Conventional (1-pipe) appliance. Direct Vent appliances draw combustion air from the outdoors and vent combustion products back outside. Installation with air taken from around the furnace is often referred to as Conventional installation - i.e. only the vent (exhaust) pipe is provided.

Another important consideration when selecting one or two pipe installation is the quality of the Indoor air which can sometimes be contaminated with various household chemicals . These chemicals can cause severe corrosion in the furnace combustion system. A 2-pipe installation has the additional advantage that it isolates the system from the effects of negative pressure in the house.

⚠ 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.

Air openings on top of the furnace and openings in closet doors or walls must never be restricted. If the furnace is operated without adequate air for combustion, the flame roll-out switch will open, turning off the gas supply to the burners.

IMPORTANT NOTE

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.

Direct Vent Furnaces

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

Conventional Vent Systems - Confined Spaces

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

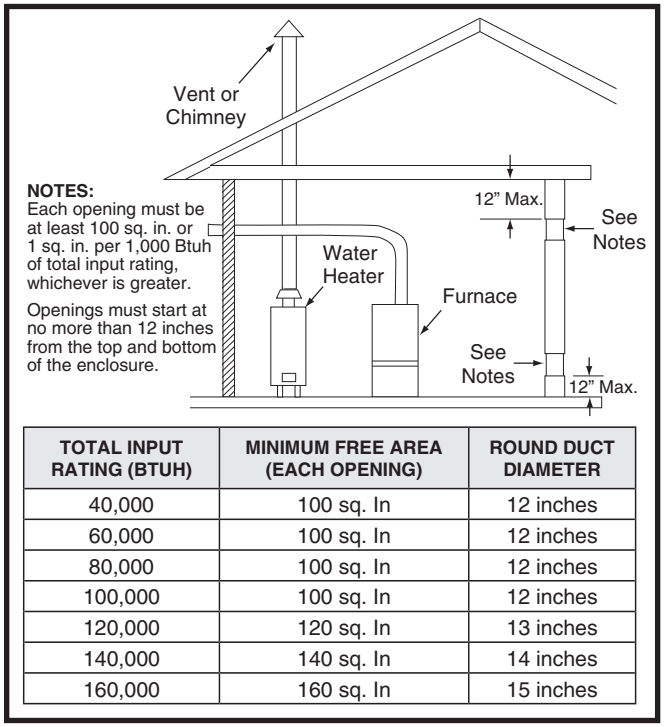
The required sizing of these openings is determined by whether inside or outside air is used to support combustion, the method by which the air is brought to the space, and by the total input rate of all appliances in the space. In all cases, the minimum dimension of any combustion air opening is 3 inches.

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 2.

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 in^2. If the combined input rate of all appliances is 120,000 Btuh, each opening must have a free area of at least 120 in^2.



TOTAL INPUT RATING (BTUH)	MINIMUM FREE AREA (EACH OPENING)	ROUND DUCT DIAMETER
40,000	100 sq. In	12 inches
60,000	100 sq. In	12 inches
80,000	100 sq. In	12 inches
100,000	100 sq. In	12 inches
120,000	120 sq. In	13 inches
140,000	140 sq. In	14 inches
160,000	160 sq. In	15 inches

Figure 2. 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 3 (page 8).

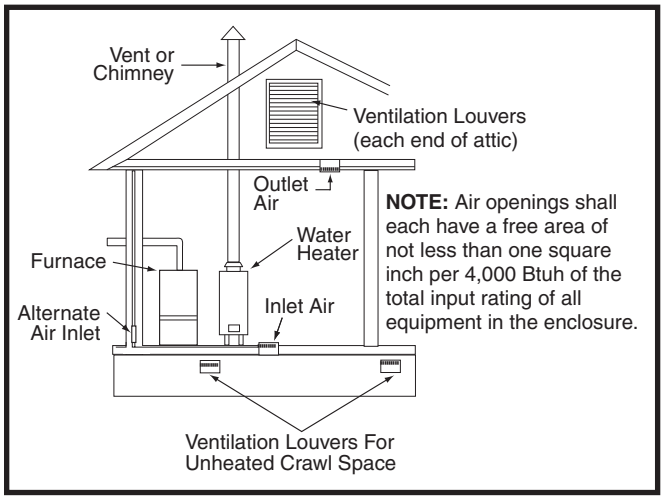


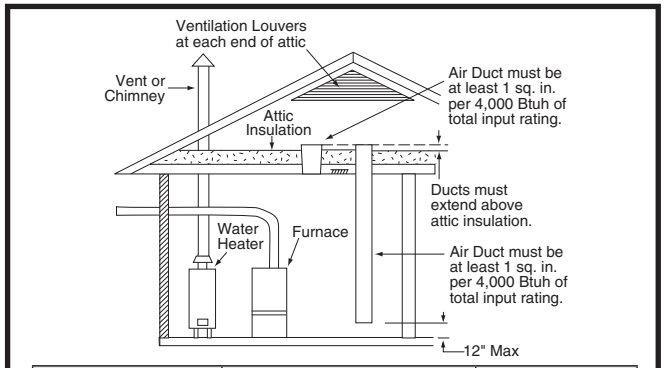
Figure 4. Combustion Air Drawn from a Crawl Space or Vented Attic

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. See Figure 4 (page 8).

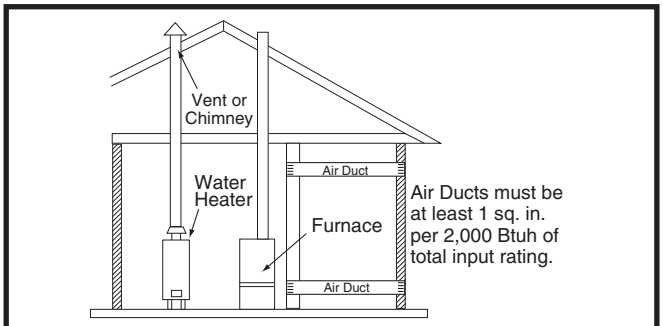
Outdoor Air Using Horizontal Ducts

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 5.



TOTAL INPUT RATING (BTUH)	MINIMUM FREE AREA (EACH OPENING)	ROUND DUCT DIAMETER
40,000	10 sq. In	4 inches
60,000	15 sq. In	5 inches
80,000	20 sq. In	5 inches
100,000	25 sq. In	6 inches
120,000	30 sq. In	6 inches
140,000	35 sq. In	7 inches
160,000	40 sq. In	8 inches

Figure 3. Combustion Air Drawn from Outside Through Vertical Ducts

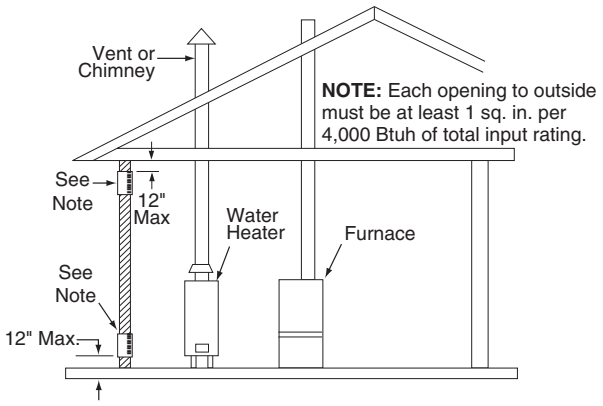


TOTAL INPUT RATING (BTUH)	MINIMUM FREE AREA (EACH OPENING)	ROUND DUCT DIAMETER
40,000	20 sq. In	5 inches
60,000	30 sq. In	6 inches
80,000	40 sq. In	7 inches
100,000	50 sq. In	8 inches
120,000	60 sq. In	9 inches
140,000	70 sq. In	10 inches
160,000	80 sq. In	10 inches

Figure 5. 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 6.



TOTAL INPUT RATING (BTUH)	MINIMUM FREE AREA (EACH OPENING)	ROUND DUCT DIAMETER
40,000	10 sq. In	4 inches
60,000	15 sq. In	5 inches
80,000	20 sq. In	5 inches
100,000	25 sq. In	6 inches
120,000	30 sq. In	6 inches
140,000	35 sq. In	7 inches
160,000	40 sq. In	8 inches

Figure 6. 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.

Conventional Vent Systems - 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 below.

EXAMPLE

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

Category IV Venting

⚠ WARNING:

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

This furnace is classified as a "Category IV" appliance, which requires special venting materials and installation procedures. This section specifies installation requirements for Conventional (1-pipe) and Direct Vent (2-pipe) piping.

For 1- pipe installations, install vent piping as described in this section and provide air for combustion and ventilation according to page 6, page 7, page 8 & page 9. The length of vent and combustion air piping for either type of installation are llisted in Table 2.

Category IV appliances operate with positive vent pressure and therefore require vent systems which are thoroughly sealed. They also produce liquid condensate, which is slightly acidic and can cause severe corrosion of ordinary venting materials. Furnace operation can be adversely affected by restrictive vent and combustion air piping.

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

Vent Pipe Material

Vent and combustion air pipe and fittings must be one of the following materials in the list and must conform to the indicated ANSI/ASTM standards.

APPROVED VENT PIPE MATERIALS			
	HEAT DEFLECTION TEMPERATURE		
Materials	°F	°C	Product Description/Standard
PVC	158°	70°	DWV per ASTM D2665 or CSA B181.2. Schedule 40, 80, or 120 per ASTM D1785 or CSA B137.3, or SDR Series per ASTM D2241 or CSA D137.3
CPVC	212°	100°	CPVC 41 per ASTM D2846/ D2846M or CSA B137.6. Schedule 40 or 80 per ASTM F441/F441M or CSA B137.6 SDR Series per ASTM F442/ F442M
ABS	180°	82°	Schedule 40 or DWV per ASTM D2661 or CSA B181.1

Table 1. Approved Vent Pipe Materials

NOTES:

° Based on HDT in accordance with ASTM D648 (HDT at 264 psi (1.82 Mpa)).

Cellular Core PVC (ASTM F891), cellular core ABS, Radel® (polyphenysulfone) and Utem, shall not be used in non-metallic venting systems.

In Canada, all plastic vent pipes and fittings including cement, cleaners, or primers must be certified as a system to ULCS636. However this requirement does not apply to the finish flanges or piping internal to the furnace.

When joining PVC to PVC, use cement that conforms to ASTM standard D2564. PVC primer must meet standard ASTM F656. When joining ABS to ABS, use cement that conforms to ASTM standard D2235. When joining PVC to ABS, use cement as specified in procedure from ASTM standard D3138

When using PolyPro® or Innoflue®, all venting and fittings must be from the same manufacturer with no interchanging of other materials. Refer to specific instructions supplied with the PolyPro or Innoflue vent kits.

Materials not identified in Table 1. Approved Vent Pipe Materials are tested to ASTM D648.

Vent Pipe Length & 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.
- 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 (page 10) indicates the maximum allowable pipe length 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 specified in the table.

FURNACE MODELS (BTU)	FURNACE INSTALLATION	SINGLE VENT PIPE LENGTH (FT.) WITH 1 LONG RADIUS ELBOW†		DUAL VENT PIPE LENGTH (FT.) WITH 1 LONG RADIUS ELBOW ON EACH PIPE†	
		OUTLET 2” DIAMETER	OUTLET 3” DIAMETER	INLET / OUTLET 2” DIAMETER	INLET / OUTLET 3” DIAMETER
38,000	Upflow	50	70	50	70
54,000		70	90	70	90
72,000		50	90	50	90
85,000		60	90	60	90
90,000		60	90	60	90
108,000		N/A	90	N/A	90
115,000		N/A	90	N/A	90
120,000		N/A	90	N/A	90

†NOTES:

1. 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 5 ft for each 2” tee and 8 ft for each 3” tee.
2. Two 45 degree elbows are equivalent to one 90 degree elbow.
3. 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.
4. A long radius elbow’s centerline radius is equal to or greater than 1.5 times the vent diameter.

Table 2. Vent Pipe Lengths

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.

- In the absence of local codes, the location of any combustion air inlet relative to any vent terminal must be at least 8 inches. This includes installations involving more than one furnace.
- 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 page 5 for a sample list of substances).
- Route piping as direct as possible between the furnace and the outdoors. Horizontal piping from inducer to the flue pipe must be sloped 1/4" per foot to ensure condensate flows towards the drain tee or PVC trap. Longer vent runs require larger pipe diameters. Refer to the Inducer & Venting Options section on page 15 for additional information.
- If a Direct Vent (2-pipe) system is used, the combustion air intake and the vent exhaust must be located in the same atmospheric pressure zone. This means both pipes must exit the building through the same portion of exterior wall or roof as shown in Figure 31 (page 36) or Figure 35 (page 40).
- Piping must be mechanically supported so that its weight does not bear on the furnace. Pipe supports must be installed a minimum of every five feet along the vent run to ensure no displacement after installation. Supports may be at shorter intervals if necessary to ensure that there are no sagging sections that can trap condensate. It is recommended to install couplings along the vent pipe, on either side of the exterior wall (Figure 31 or Figure 35). These couplings may be required by local code.
- If breakable connections are required in the combustion air inlet pipe (if present) and exhaust vent piping, then straight neoprene couplings for 2" or 3" piping with hose clamps can be used. These couplings can be ordered through your local furnace distributor. To install a coupling:

1. Slide the rubber coupling over the end of the pipe that is attached to the furnace and secure it with one of the hose clamps.
2. Slide the other end of the rubber coupling onto the other pipe from the vent.
3. Secure the coupling with the second hose clamp, ensuring that the connection is tight and leak free.

Outdoor Terminations - Horizontal Venting

- Vent and combustion air intake terminations shall be installed as shown in Figure 7 & Figure 8 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. Table 13 (page 35) lists the necessary distances from the vent termination to windows and building air intakes.

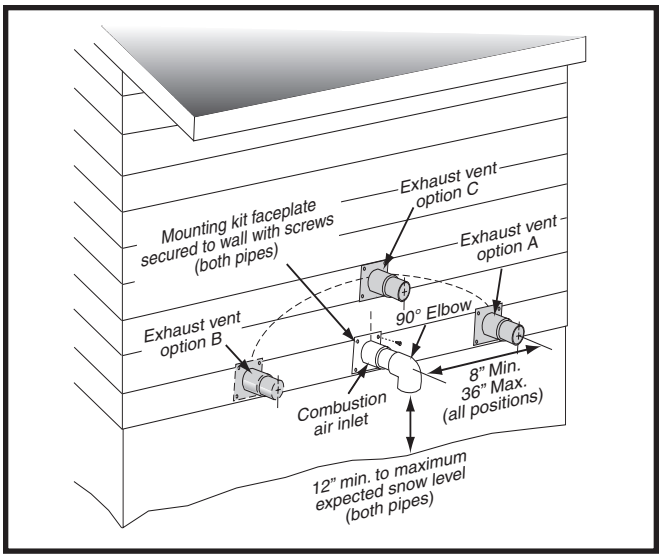


Figure 7. Inlet & Exhaust Pipe Clearances

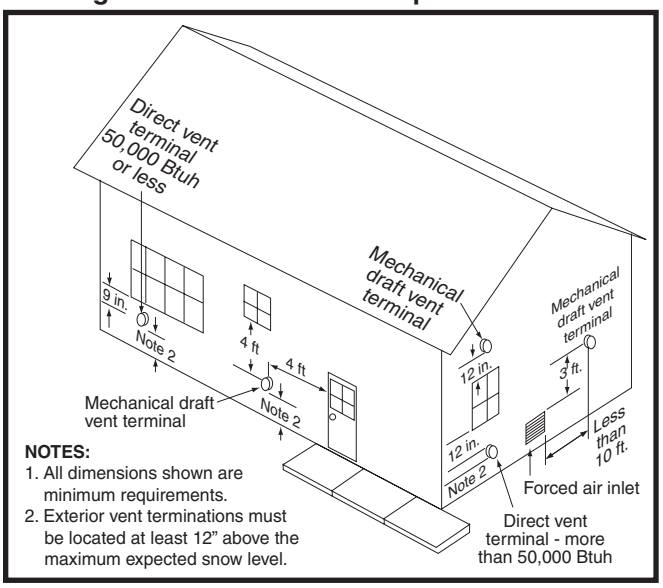


Figure 8. Vent Locations

- Vent and combustion air intake terminations must be located to ensure proper furnace operation and conformance to applicable codes. A vent terminal must be located at least 3 feet above any forced air inlet located within 10 feet. This does not apply to the combustion air inlet of a direct vent (two pipe) appliance. In Canada, CSA B149.1 takes precedence over these instructions. See Table 13.
- All minimum clearances must be maintained to protect building materials from degradation by moisture content in flue gases. When wall venting on surfaces that could be affected by this moisture, it is recommended that a corrosion resistant shield be used behind the vent terminal. Adequately seal or caulk all joints, cracks, and seams around the vent terminal. See (Figure 7).
- For optimal performance, vent the furnace through a wall that experiences the least exposure to winter winds.
- The vent termination shall be located at least 3 ft. horizontally from any electric meter, gas meter, regulator and any relief equipment. These distances apply ONLY to U.S. installations. In Canada, CSA B149.1 takes precedence over these instructions.

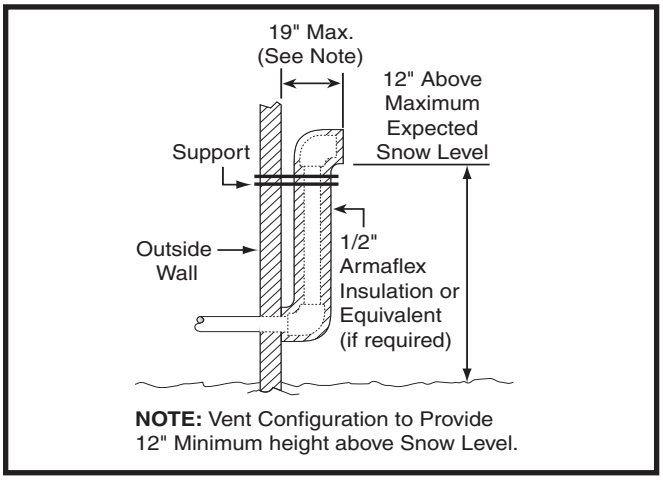


Figure 9. Alternate Horizontal Vent Installation

- 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. 2 inch and 3 inch kits are available. Refer to the technical sales literature for part numbers. **Please follow the instructions provided with the kit.**
- Concentric vent termination kits are available for use with these furnaces. Refer to the technical sales literature for kit numbers.
- 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 7, a riser may be provided as shown in Figure 9 (page 12). Insulation is required to prevent freezing of this section of pipe. See Table 4 (page 15) for vent freezing protection.

Outdoor Terminations - Vertical Venting

Termination spacing requirements from the roof and from each other are shown in Figure 10. The roof penetration must be properly flashed and waterproofed with a plumbing roof boot or equivalent flashing. Vent and combustion air piping may be installed in an existing chimney which is not in use provided that:

- Both the exhaust vent and air intake run the length of the chimney.
- The top of the chimney is sealed and weatherproofed.
- The termination clearances shown in Figure 10 are maintained.
- No other gas fired or fuel-burning equipment is vented through the chimney.

Vent Freezing Protection

⚠ CAUTION:

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.

WINTER DESIGN TEMPERATURE	MAXIMUM FLUE PIPE LENGTH (FEET) IN UNCONDITIONED & EXTERIOR SPACES	
	WITHOUT INSULATION	WITH INSULATION*
20	45	70
0	20	70
-20	10	60

***NOTE:** 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

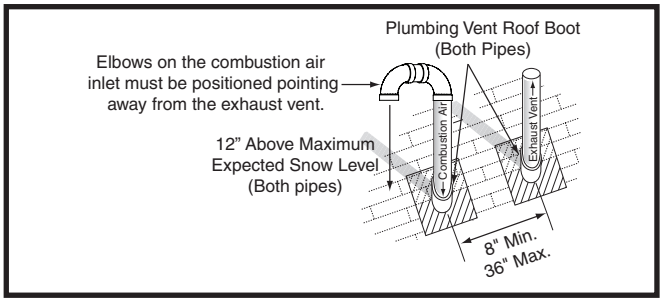


Figure 10. Vertical Vent Termination

- Table 3 lists the maximum length of flue pipe that can travel through an unconditioned space or an exterior space. The total vent length must not exceed the lengths noted in Table 2 (page 10). For Canadian installations, please refer to the Canadian Installation Code (CAN/CSA-B149.1 or 2) and/or local codes.
- For extremely cold climates or for conditions of short furnace cycles (i.e. set back thermostat conditions) the last 18 inches of vent pipe can be reduced. It is acceptable to reduce from 3" to 2-1/2", 3" to 2", or 2" to 1-1/2" if the total vent length is at least 15 feet in length, and the vent length is within the parameters specified in Table 2. The restriction should be counted as 3 equivalent feet. Smaller vent pipes are less susceptible to freezing, but must not be excessively restrictive. The length of the 2 inch pipe must not be longer than 18 inches.
- If furnace is installed horizontally, make sure the drainage port on the in-line drain assembly is pointed downward to ensure proper drainage of condensate. For *SC series, see Figure 33 (page 38) & Figure 34 (page 39). For *SD series, see Figure 37 (page 42).
- 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.

Existing Installations

When an existing furnace is removed from a vent system serving other appliances, the existing vent system may not be sized properly to vent the remaining appliances (For example: 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 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.

Condensate Disposal

The method for disposing of condensate varies according to local codes. Consult your local code or authority having jurisdiction. Neutralizer kit is available for use with this furnace. Refer to the technical sales literature for part numbers. **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 15). 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.

For Installations where there is limited clearance for the J-Trap (such as an attic where it may be installed between ceiling joists), either side of the J-Trap can be shortened to a minimum of 3 Inches. See Figure 11 (page 14).

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 & 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).
- On upflow furnaces, if the maximum airflow is 1,600 CFM or more, two openings shall be used for return air to comply with government mandated efficiency standards.
- 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 a way that 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 operation of the furnace is prevented when the damper is in the cooling position and operation of the cooling system is prevented when the damper is in the heating position.
- 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. **Do not use the back of the furnace for return air.**
- Position the furnace with the return air ductwork ensuring even alignment of furnace (or coil casing) air opening and return air duct. **NOTE**: The ductwork must have an opening equal to that of the return air opening of the furnace (or coil casing). See Figure 28 (page 29) for return air opening size.

Upflow & Horizontal Furnaces

- The return air ductwork may be connected to the left side, right side, or bottom of the furnace. **NOTE**: If using the left or right side of the furnace for return air, the bottom panel (Figure 21) must not be removed from the bottom of the furnace.

⚠ WARNING:

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

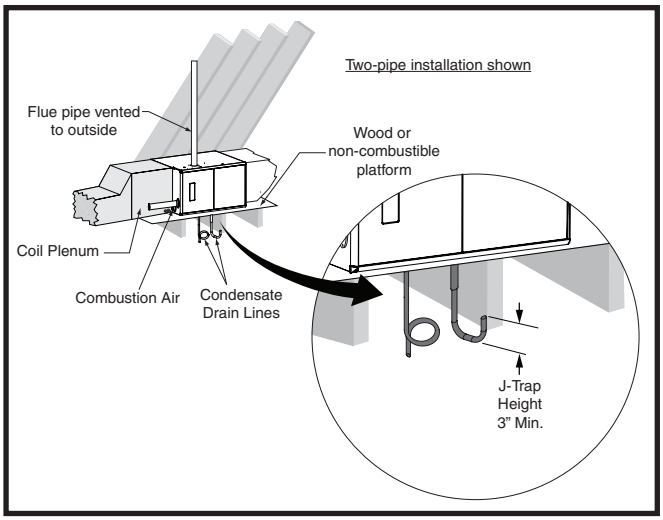


Figure 11. *SC & *SD Horizontal installation on a Platform

- **Side Return Installations**: To attach the return air duct to the left or right side of the furnace, punch out the 4 knockouts from the side of the furnace (Figure 28). Using sharp metal cutters, cut an opening between all 4 knockouts to expose the blower assembly. Position the return air duct over the opening and secure to the side with sheet metal screws.
- **Bottom Return Installations**: If using the bottom of the furnace for return air, the bottom panel (Figure 28) must be removed from the bottom of the furnace. See page 19 for removal instructions. Position the furnace over the return air duct and secure together with sheet metal screws. Make sure the screws penetrate the duct and furnace casing.

Supply Air Connections

- The supply air must be delivered to the heated space by duct(s) secured to the furnace or coil box casing, running full size and without interruption.
- To attach the supply air duct to upflow & horizontal furnaces, bend the flanges on the furnace upward 90° with wide duct pliers. See Figure 28 for furnace flange locations. **NOTE**: If system installation includes AC coil casing, bend the flanges on the coil casing upward 90° before attaching the supply air duct.
- Position the supply air ductwork onto the furnace ensuring even alignment of furnace air opening and supply air duct. **NOTE**: The ductwork must have an opening equal to that of the supply air opening of the furnace. See Figure 28 (page 29) for supply air opening size.

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

*SC & *SD series gas furnaces offer a wide range of installation options, including installation in the upflow or horizontal positions with either right, left, or upflow return air.

General Requirements

- The furnace must be leveled at installation and attached to a properly installed duct system. See Figure 1 (page 5) for the required clearances needed to move the furnace to its installation point (hallways, doorways, stairs, etc).
- The furnace must be installed so that all electrical components are protected from water.
- The furnace must be installed upstream from a refrigeration system. (If applicable)
- The cabinet plug must always be used to close the hole in the side of the furnace when rotating the inducer.
- The furnace requires special venting materials and installation procedures. See page 6, page 7, page 8, page 9, page 11, page 11, & page 12 for venting guidelines and specifications.

Upflow Furnaces

⚠ WARNING:

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

*SC & *SD series gas furnaces are shipped with the bottom panel installed as shown in Figure 28 (page 29). If the furnace is installed with only side return air, the bottom panel must not be removed. If the furnace is installed with bottom return air, the bottom panel must be removed. See Bottom Panel Removal on page 19.

Horizontal Furnaces

⚠ WARNING:

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

*SC & *SD series gas furnaces can be installed horizontally (Figure 11) in an attic, basement, crawl space or alcove. It can also be suspended from a ceiling in a basement or utility room in either a right to left airflow or left to right airflow as shown in Figure 12 (page 15).

These furnaces are shipped with the bottom panel installed. If the furnace is installed horizontally, remove the bottom panel from the furnace before attaching the duct system. See Bottom Panel Removal on page 19.

If installing the furnace with an evaporator coil (in an attic), it is required that a drip pan be placed under the furnace. If the installation is on a combustible platform as shown in Figure 11, it is recommended that the drip pan extend at least 12 inches past the top and front of the furnace.

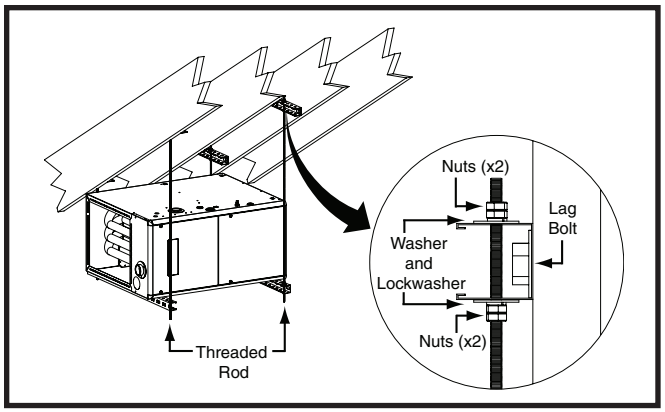


Figure 12. *SC & *SD Horizontally Suspended in an Attic

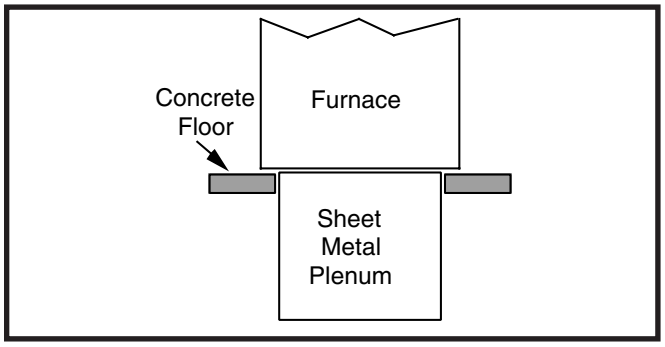


Figure 13. Furnace on a Concrete Slab

NOTE: Although it is not required to use a drip pan for heat only applications, state and local codes may require it.

If suspending the furnace from the ceiling, assemble a support frame (Figure 12) using slotted iron channel and full threaded rod. Fasten the frame together with nuts, washers, and lockwashers. Secure the support frame to the rafters with lag bolts. The furnace can also be suspended using steel straps around each end of the furnace. The straps should be attached to the furnace with sheet metal screws and to the rafters with bolts.

It is recommended for further reduction of fire hazard that cement board or sheet metal be placed between the furnace and the combustible floor and extend 12 inches beyond the front of the door and top of the furnace.

Installation on a Concrete Slab

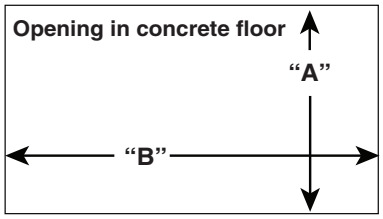
1. Create an opening in the floor according to the dimensions in Table 4.
2. Position the plenum and the furnace as shown in Figure 13.

Inducer & Venting 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.

IMPORTANT NOTE:

The Inducer Assembly must never be positioned to vent downwards on horizontal installs.



MODEL #	DIM. "A"	DIM. "B"
054D-24B2	16 5/8	19 1/4
072D-24B2	16 5/8	19 1/4
072D-35C2	20 1/8	19 1/4
090D-35C2	20 1/8	19 1/4

NOTE: Dimensions shown in Inches.

Table 4. Cutout Dimensions

Before using Table 5, the number of pipes (1-pipe or 2-pipe) connected to the furnace must be known. Find the proper furnace style (upflow or horizontal) and then the side that the pipes will exit from the furnace. Finally select the option that properly matches your installation type. For *SC series, Figure 31, Figure 332, Figure 33 or Figure 34. For *SD series, see Figure 35, Figure 36 or Figure 37.

NOTE: 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 plug 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 plug to maintain air tightness in the furnace. The hole locations for all furnace series are shown in Figure 30.

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.

*SC SERIES - CONVENTIONAL (1 PIPE)			
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT
Up	Option 1	Option 7	Option 10
Right	Option 2	Option 8	N/A
Left	Option 3	N/A	Option 9

*SC SERIES - DIRECT VENT (2-PIPE)			
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT
Up	Option 4	Option 12	Option 14
Right	Option 5	Option 11	N/A
Left	Option 6	N/A	Option 13

*SD SERIES - CONVENTIONAL (1 PIPE)			
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT
Right	Option 21	N/A	N/A
Up	N/A	Option 25	Option 26
Left	Option 22	N/A	N/A

*SD SERIES - DIRECT VENT (2-PIPE)			
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT
Right	Option 23	N/A	N/A
Up	N/A	Option 27	Option 28
Left	Option 24	N/A	N/A

Table 5. Vent & Inducer Blower Options

⚠ 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 from the inducer assembly.
2. Remove the inducer assembly ground wire from the blower deck.
3. Remove 3 screws securing the inducer assembly to the header box.
4. Rotate the inducer assembly to its new position.
5. Secure the inducer assembly to the header box by reinstalling the three screws. If the inducer assembly is rotated to the left or right side of the furnace, use the extra screw provided in the parts package.
6. Remove the cabinet plug from side of furnace and reinstall in hole on opposite side of cabinet.
7. Install in-line drain assembly and tubing.
8. Install all condensate drain lines. For *SC series, refer to Figure 31, Figure 32, Figure 33 or Figure 34. For *SD series, refer to Figure 35, Figure 36 or Figure 37.
9. Reconnect the electrical harness to the inducer assembly.
10. Reconnect the inducer assembly ground wire to the blower deck or door.
11. Verify operation as detailed on the furnace label.

Pressure Switch Tubing

All upflow / horizontal furnaces have two switches, one connected to the static tap on the inducer assembly and the other to the collector box. Figure 14 & Figure 15 display the proper routing of pressure switch tubing for *SC & *SD furnaces.

Alternate Pressure Switch Location

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

1. Shut off any electrical power to the furnace.
2. Label and disconnect the tubing and wires from the pressure switch (Figure 16 (page 17)).
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.
5. Secure the pressure switch with two screws.
6. Reconnect the tubes and wires to the pressure switch.

Accessories

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

Finish Flange

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 flanges, gasket, and cabinet are aligned. See Figure 17.

1. Position flange gasket over hole in the furnace cabinet.
2. Position finish flange on top of the flange gasket. **NOTE**: Make sure the flange is properly oriented so that the FRONT lettering is located near the front of the furnace as shown in Figure 17.
3. Secure flange and gasket to cabinet with three field supplied sheet metal screws.

Rubber Grommets

The 2 1/4" rubber grommet is used to seal the opening between the furnace cabinet and the 2" PVC vent pipe. The rubber grommet should be installed in the 3" hole prior to running the vent pipe out of cabinet. No sealants are required. See Figure 18 (page 17).

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

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

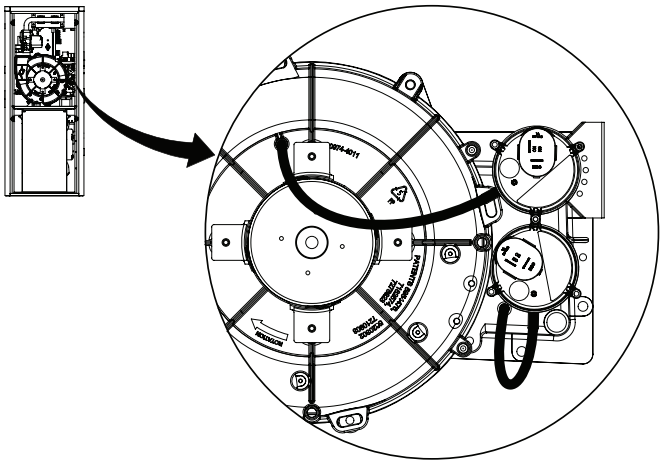


Figure 14. Pressure Switch Tubing for *SC038 Furnaces Only

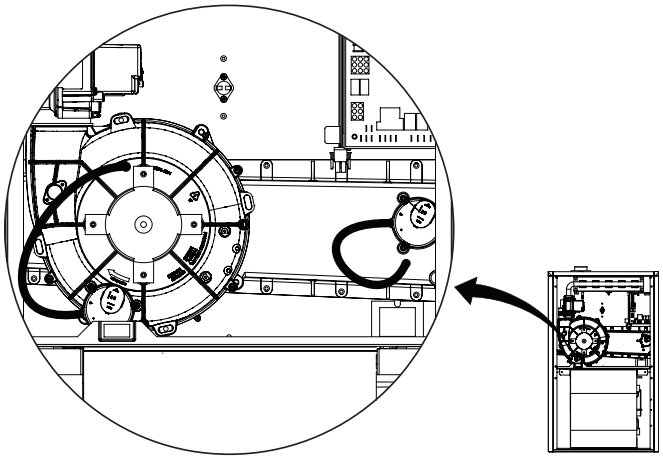


Figure 15. Pressure Switch Tubing for Upflow Furnaces
Models *SC054, *SC072, *SC090, *SC108, & *SC120
Models *SD038, *SD054, *SD072, *SD090, *SD108, & *SD120

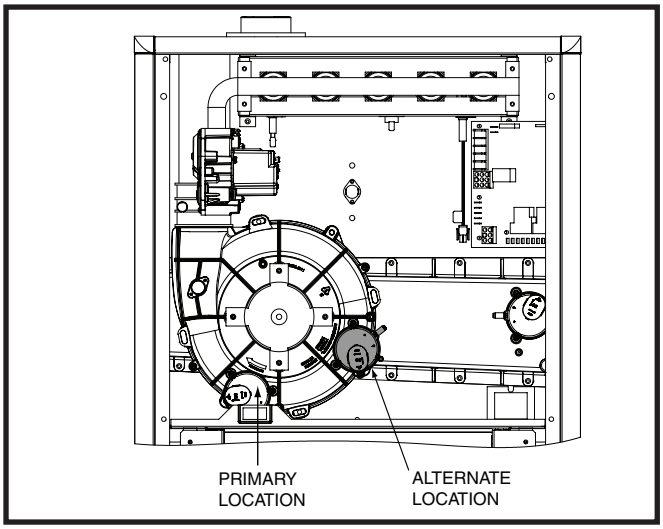


Figure 16. Alternate Pressure Switch Location

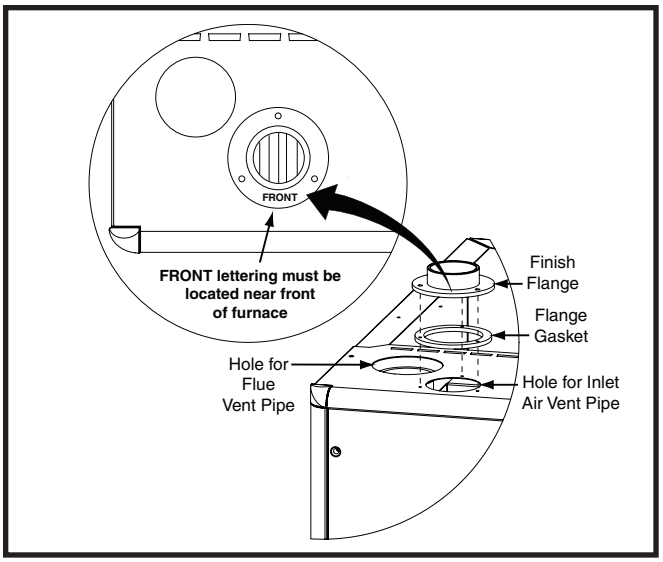


Figure 17. Finish Flange

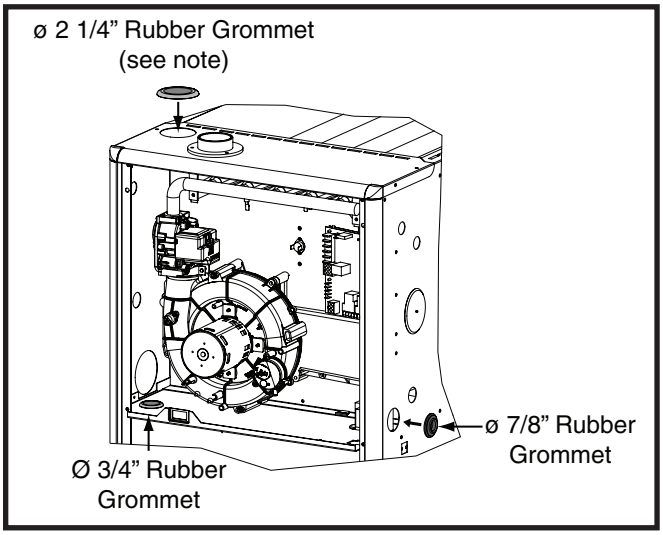


Figure 18. Rubber Grommets

PVC Components

IMPORTANT NOTES:

- **Before permanently installing these components, it is recommended you dry-fit them first to ensure proper fit and alignment with other vent pipes.**
- **The 2" PVC components shown in Figure 19 are not provided in the extra parts bag for *SC & *SL models. However the PVC Trap (P/N 664659) can be purchased thru your local distributor.**

The 2" PVC tee, reducer, PVC Trap and 1/2" X 1/2" hose barb are used when the inducer is rotated to vent out thru the left or right side of the furnace cabinet. See Figure 19.

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. See Figure 28 (page 17) for hole location.

Typical Orientation

1. Install the PVC Tee vertically on the 2” vent pipe that is extending out the side of the cabinet. Permanently bond them together using appropriate primer and cement. Refer to the typical orientation shown in Figure 19.
2. Install the reducer or PVC trap (if supplied) on the bottom end of the PVC Tee. Permanently bond them together using appropriate primer and cement.
3. Install the 1/2” x 1/2” hose barb on the 2” PVC reducer. **NOTE**: Do not over tighten! Use an adequate amount of Teflon tape on the threads. Do not use liquid sealants.
4. Verify all connections and joints for tight fit and proper alignment with other vent pipes.

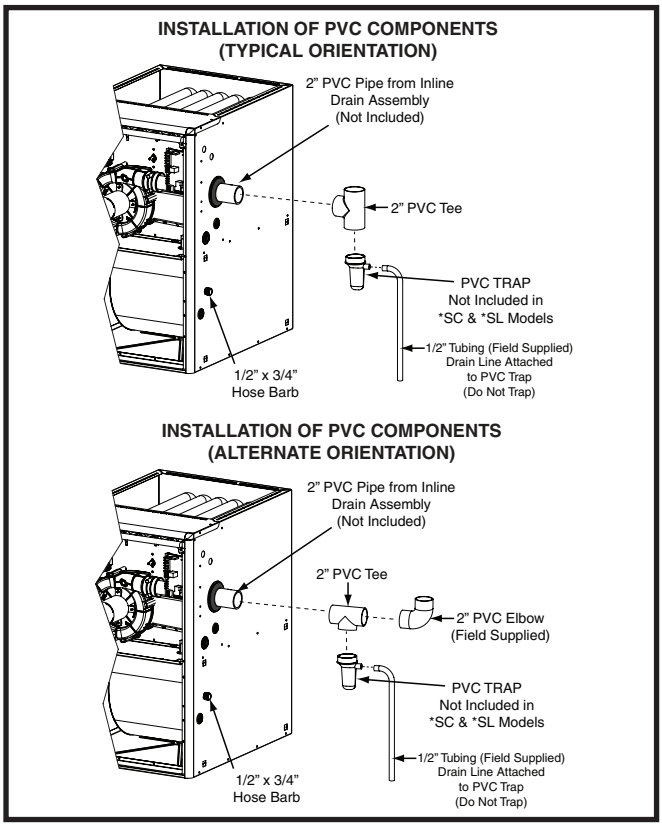


Figure 19. PVC Components

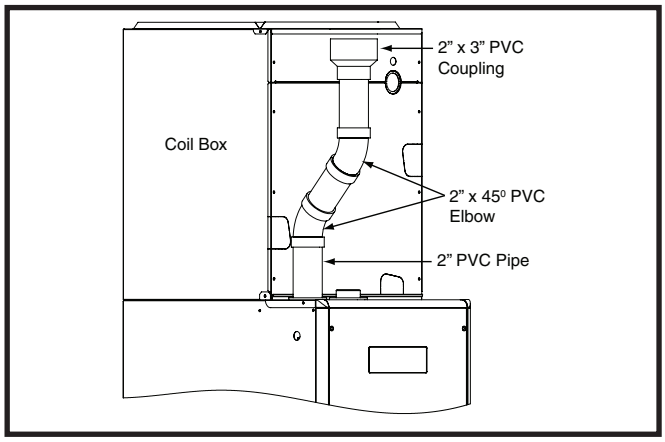


Figure 20. Optional PVC Pipe Installation

Alternate Orientation

1. Install the 2” PVC Tee horizontally on the 2” vent pipe that is extending out the side of the cabinet. Permanently bond them together using appropriate primer and cement. Refer to the alternate orientation shown in Figure 19.
2. Install the 2” PVC Elbow on the end of the 2” PVC Tee. Permanently bond them together using appropriate primer and cement.
3. Install the reducer or PVC trap (if supplied) on the bottom end of the PVC Tee. Permanently bond them together using appropriate primer and cement.
4. Install the 1/2” x 1/2” hose barb on the 2” PVC reducer. **NOTE**: Do not over tighten! Use an adequate amount of Teflon tape on the threads. Do not use liquid sealants.
5. Verify all connections and joints for tight fit and proper alignment with other vent pipes.

Optional PVC Pipe Installation

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

- If the size of the PVC flue needs to be increased from 2” to 3”, two, 2” x 45° PVC elbows may be used to achieve the clearances needed between the coil box and the 2” x 3” coupling. See Figure 20 (page 18).
- Install the 2” x 3” coupling in the vertical run only. If the coupling is installed horizontally, it will allow water to build up inside the furnace and cause a lock out condition.
- To avoid the clearance issue, it is recommended that the furnace be vented through the left side or the right side of the cabinet.

Condensate Drain Lines

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.

- The method for disposing condensate varies according to local codes. Consult your local code or authority having jurisdiction.
- The condensate drain line must be trapped using a kit (P/N- 922485) or field supplied parts. After the drain trap, condensate can continue to the drain by connecting to a recommended 3/4” ID minimum drain line, but no smaller than the original tubing ID supplied by the manufacturer. The drain line should slope downward away from the furnace to ensure proper drainage.
- The placement of the condensate drain lines will depend on the configuration selected in Table 5 (page 16). 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.

  For *SC series, see Figure 32 (page 37), Figure 32 (page 38) & Figure 34 (page 39). For *SD series, see Figure 36 (page 41) & Figure 37 (page 42). To rotate the J-trap, loosen the clamp on the drain tube, rotate the J-trap to either side, and re-tighten the clamp.

- It is permissible to locate the trap away from the furnace. The condensate drain system (J-trap and drain tube) should be no more than 30 equivalent feet while maintaining 1/4" per foot slope, and insulated if located in an unconditioned space.

THREE GENERAL PRINCIPLES APPLY:

- Each condensate drain must be trapped separately using a J-Trap or field supplied loop. After individually trapping the condensate lines, it is acceptable to combine the drains.
- There must always be a drain attached to the collector at the outlet of the secondary heat exchanger.
- There must always be a drain at the lowest point of the venting system. **NOTE:** If using a condensate pump, the furnace drain line must be installed above the pumps water line.

EXCEPTIONS & CLARIFICATIONS TO THE GENERAL RULES:

- If the vent exits the furnace horizontally, the vent may be turned vertically with a tee. **The drip leg formed by the tee must include a drain.** (Option 2, Option 3, Option 5, Option 6, Option 8, Option 9, Option 12, Option 13, Option 16, Option 17, Option 19, Option 20, Option 21, Option 23, Option 24, Option 31, Option 32, & Option 34)
- In certain cases, it is permitted to drain the inducer back into the top drain of the collector. **This drain must not sag in the middle.** (Option 2, Option 5, Option 7, Option 11, Option 15, Option 16, Option 18, Option 19, Option 21, Option 23, Option 25, Option 27, Option 29, Option 30, Option 32, & Option 33)

Bottom Panel Removal

The steps listed below describe how to remove the bottom panel from the furnace. See Figure 21.

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

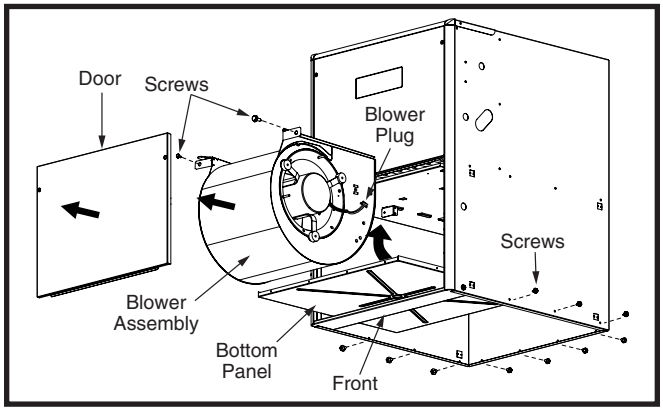


Figure 21. Bottom Panel Removal

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 22.

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

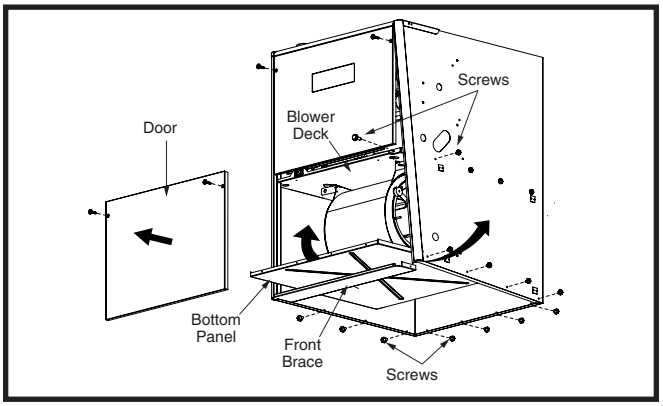


Figure 22. Alternate Removal Method

GAS SUPPLY & PIPING

⚠ WARNING:

FIRE OR EXPLOSION HAZARD

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

WHAT TO DO IF YOU SMELL GAS

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

- **All gas piping must be installed in compliance with local codes and utility regulations. In the absence of local codes the gas line installation must comply with the latest edition of the National Fuel Gas Code (ANSI Z223.1) or (CAN/CSA B149.1) Installation Codes.**
- **Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace as shown in Figure 23 (page 20). 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.**
- **Per ANSI 21.47, A 1/8-inch NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the furnace external to the cabinet. If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector that has previously serviced another gas appliance.**
- **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 LP propane gas.**
- **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 type of furnace but may be used if allowed by local jurisdiction. Only new flexible connectors may be used. Do not use a connector which has previously serviced another gas appliance.**
- **A drip leg should be installed in the vertical pipe run to the unit. See Figure 23.**

Table 7 (page 32) lists gas flow capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

The furnace may be installed with 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 hookups are shown in Figure 23.

Leak Check

⚠ WARNING:

FIRE OR EXPLOSION HAZARD

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

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

After the gas piping to the furnace is complete, all connections must be tested for gas leaks. This includes pipe connections at the main gas valve, emergency shutoff valve and flexible gas connectors (if applicable). The soap and water solution can be applied on each joint or union using a small paintbrush. If any bubbling is observed, the connection is not sealed adequately and must be re-tightened. 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 (Natural Gas Only)

High altitude conversion with this furnace depends on the installation altitude and the heating value of the gas. Installation of this furnace at altitudes above 2,000 feet shall be in accordance with local codes, or in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 or National Standard of Canada, Natural Gas & Propane Installation Code CSA 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.

The furnaces are shipped from the factory with orifices and gas regulator settings for natural gas operation at sea level altitudes. At 2,000 feet, the NFGC requires that this appliance be derated 4% for each 1,000 feet of altitude.

For example, the input needs to be reduced 8% at 2,000 feet, 12% at 3,000 feet, etc. This deration is in reference to the input rate and gas heating value at sea level.

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 across regions 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. Table 11 & Table 12 (page 34) contain the manifold pressure and orifice sizes to use at various altitudes. Table 11 (HIGH) is for natural gas installations with a heating value of more than 1,000 Btu per cubic foot and Table 12 (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 10 (page 33), 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 11 or if it’s LOW, use Table 12. See Example below.

EXAMPLE

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

From Table 10, find 750 and follow down the column, stop at the 5,000 feet row. The heating value listed is LOW. Table 12 will be used to determine orifice size and manifold pressure.

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 section on page 26.

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

For US installations only: To avoid nuisance tripping at altitudes from 7500 to 10,000 feet, a pressure switch conversion may be required. Consult the tables in the LP and High altitude and LP gas conversion kit for installations in the US.

Converting from Natural Gas to LP / Propane

⚠ WARNING:

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

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

- Installations in the United States: For Propane (LP) conversion or for LP gas installations in altitudes between 2,000 ft. and 10,000 ft. above sea level, use the LP & High Altitude LP Gas Conversion Kit (P/N 905028) for Installations in the United States. **Please follow the instructions provided with the kit**.
- Installations in Canada: For Propane (LP) conversion or for LP Gas installations in altitudes between zero and 4,500 ft. above sea level, use the LP & High Altitude LP Gas Conversion Kit (P/N 905029) for Installations in Canada. **Please follow the instructions provided with the kit.**

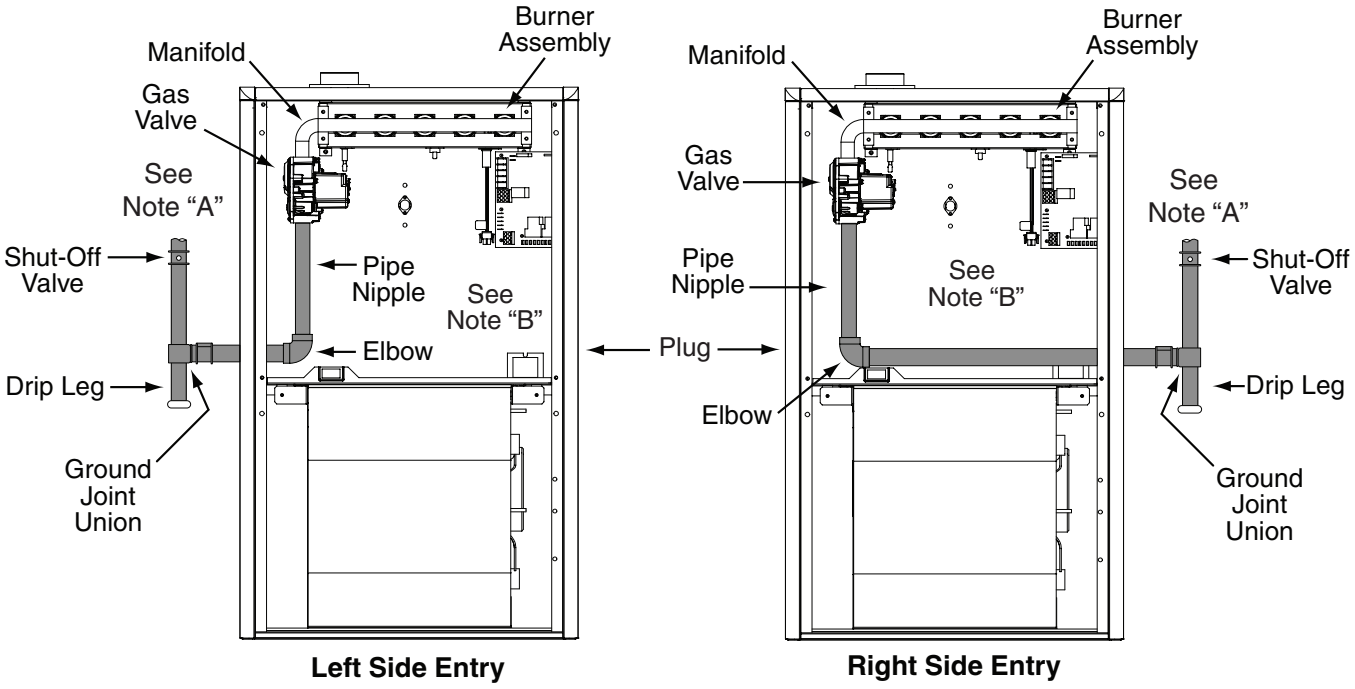
If the installation is in the U.S. and above 2,000 ft., refer to Table 9 (page 33) to determine the correct orifice size and regulator pressure. See Example below.

EXAMPLE
Elevation: .....5,000 feet
Type of Gas:..... Propane Gas
Input BTUH of Furnace: 72,000

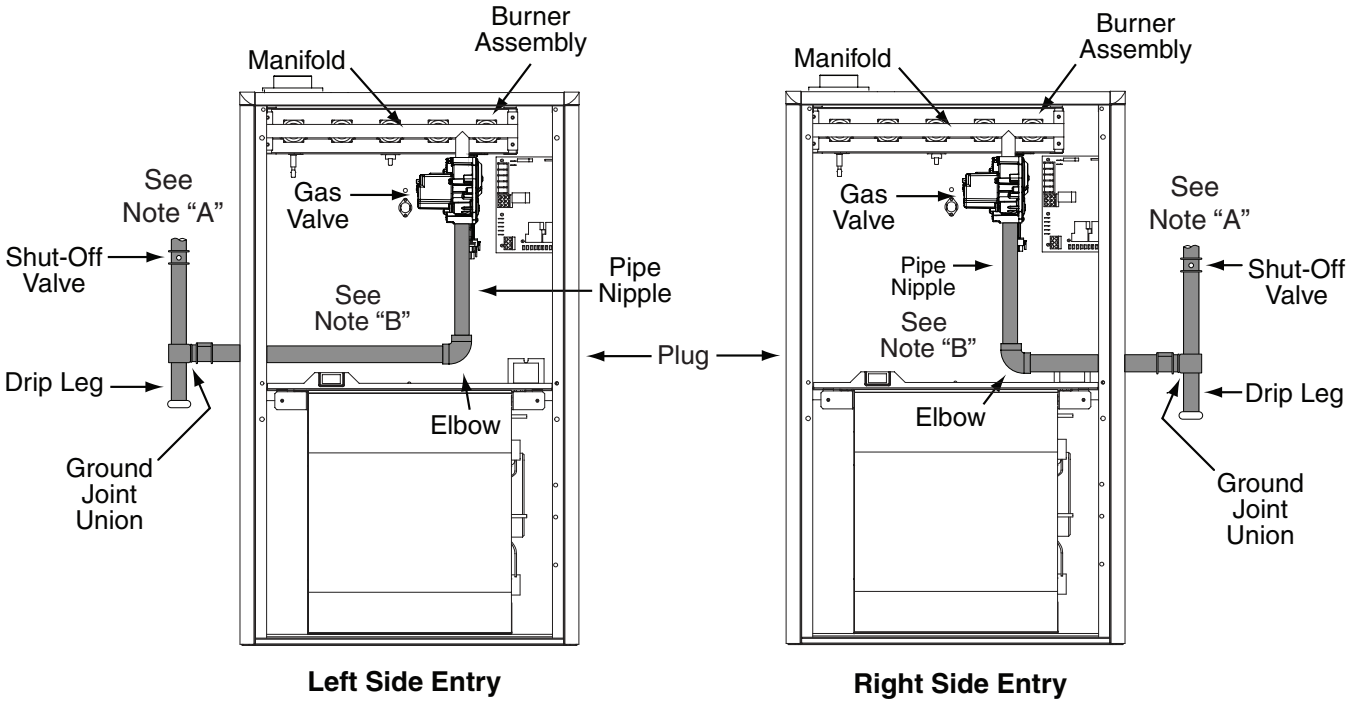
From Table 9, find 5,000 and follow across the row, stop at the 72,000 btu column. The manifold pressure listed is 10.0 and the orifice size is 57.

When conversion is complete, verify the manifold pressure and input rate are correct as listed in the table.

*SC SERIES



*SD SERIES



NOTE A: Consult local codes for Shut-Off Valve location requirements
NOTE B: Inducer assembly omitted for clarity of pipe installatio

Figure 23. Typical Gas Connections - Upflow Models

ELECTRICAL WIRING

⚠ WARNING:

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD

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

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

- 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 23).

Line Voltage Wiring

It is recommended that the line voltage (120 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 (page 23).

The installer should become familiar with the units wiring diagram before making any electrical connections to the unit. See Figure 29 (page 30), Figure 30 (page 31), or the unit wiring label.

IMPORTANT NOTES:

An electrical disconnect must be installed readily accessible from and located within sight of the furnace. See Figure 24 (page 24) or the wiring diagram label inside of the control door. Any other wiring methods must be acceptable to authority having jurisdiction.

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 24.

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	FURNACE INPUT (BTUH)	CABINET WIDTH (IN.)	NOMINAL ELECTRICAL SUPPLY	MAXIMUM OPERATING VOLTAGE	MINIMUM OPERATING VOLTAGE	MAXIMUM FURNACE AMPERES	MAXIMUM FUSE OR CIRCUIT BREAKER AMPS*
SC-038D-T23A2	38,000	14 1/4	120-60-1	132	102	6.9	15
SD-038D-T24B2	38,000	17 1/2	120-60-1	132	102	9.3	15
SC/SD-054D-T24B2	54,000	17 1/2	120-60-1	132	102	9.3	15
SC-072D-T24B2	72,000	17 1/2	120-60-1	132	102	9.3	15
SC/SD-072-T35C2	72,000	21	120-60-1	132	102	9.3	15
SD-090D-T35C2	85,000	21	120-60-1	132	102	12.0	20
SC-090D-T35C2	90,000	21	120-60-1	132	102	12.0	20
SC/SD-108D-T45D2	108,000	24 1/2	120-60-1	132	102	12.0	20
SD-120D-T45C2	115,000	24 1/2	120-60-1	132	102	12.0	20
SC-120D-T45D2	120,000	24 1/2	120-60-1	132	102	12.0	20

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 & Voltage Specifications

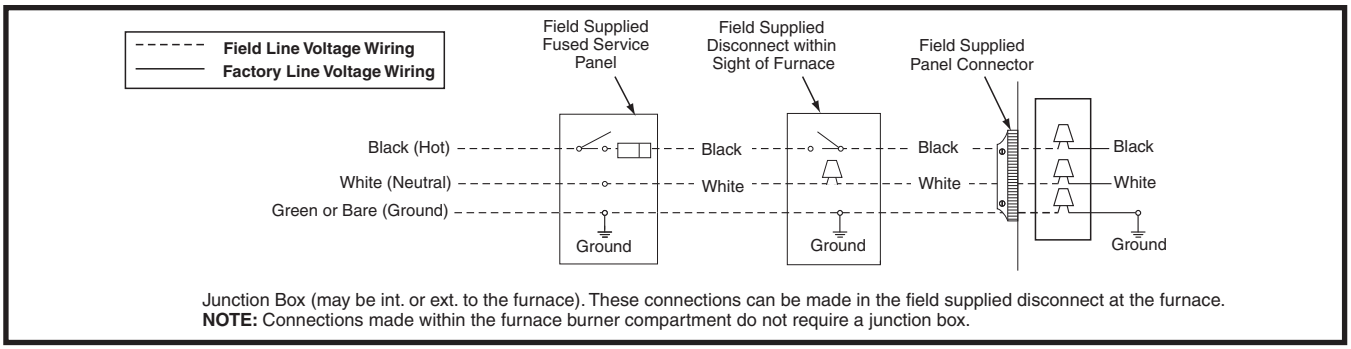


Figure 24. Line Voltage Field Wiring

Thermostat / Low Voltage Connections

- The furnace is designed to be controlled by a 24 VAC thermostat. The thermostat's wiring must comply with the current provisions of the NEC (ANSI/NFPA 70) and with applicable local codes having jurisdiction.
- 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 25 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 (page 23).
- The thermostat should be mounted about 5 feet above the floor on an inside wall. DO NOT install the thermostat on an outside wall or any other location where its operation may be adversely affected by radiant heat from fireplaces, sunlight, or lighting fixtures, and convective heat from warm air registers or electrical appliances. Refer to the thermostat manufacturer's instruction sheet for detailed mounting information.

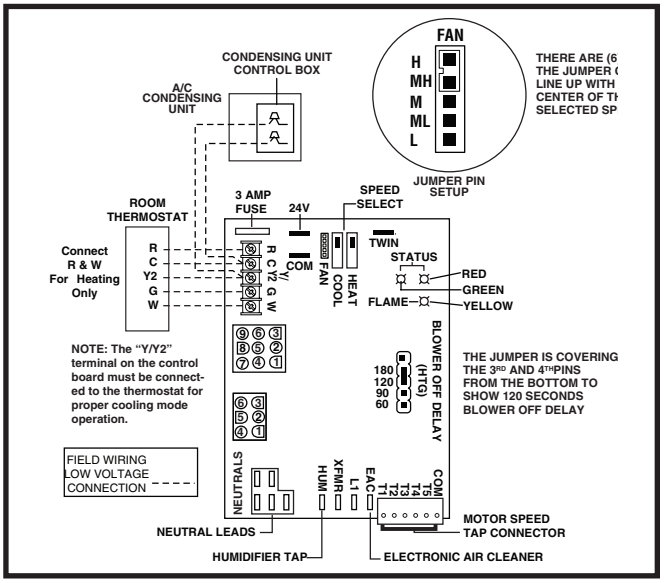


Figure 25. Nordyne/Channel Low Voltage Field, Four-wire Heating/Cooling Applications

Twinning

⚠ WARNING:

When servicing either twinned furnace, power must be turned off on both furnaces. Failure to comply may result in improper operation leading to damage to the furnaces or personal injury!

This function is available using 1046397 Integrated Control Board and 624843 relay. Both furnaces must have the same control 1046397 for twinning.

If units are wired as depicted in Twinning Electrical Wiring Diagrams, the primary unit with main thermostat connections determines the blower speed for both units based on its blower speed selector switch setting for COOL, CONTINUOUS FAN, and HEAT and overrides the secondary furnace switch settings.

With both boards having "W" terminal energized during a call for HEAT, the HEAT speed will follow the higher of the two boards blower settings (if selector switch settings differ from each other) but revert to their individual CONTINUOUS FAN selector switch settings for any duration of time remaining between the initial 60 second blower off delay and Blower Heat Off Time Delay (J3) jumper setting.
If additional wires are run between the two units for "Y" and "G", then the unit with the higher blower setting will dictate where both units operate if the selector speed settings differ from each other.

A twinning fault will occur when the signal is either all low or cannot synchronize to the other furnace. The furnace functions as an individual furnace while there is a Twinning fault. The board flash twinning error while in stand-by but otherwise will function as a single furnace. The twinning fault is displayed by green LED off and red LED flashing.

For proper twinning of fixed speed furnaces the following criteria must be met:

- Both furnaces and motors must be the same model.
- Both furnaces must be on the same motor speed for cooling, heating and continuous fan.
- Both furnaces must have a common return duct and common supply plenum.
- Both furnaces must be connected to the same phase leg of the branch circuit.
- **Furnaces equipped with variable speed motors may not be twinned under any circumstances.**

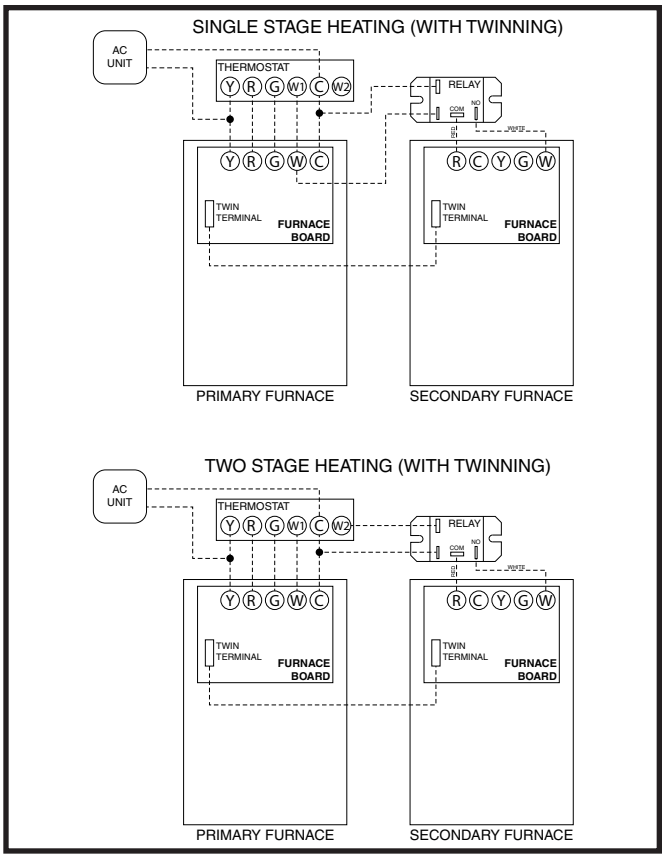


Figure 26. Nordyne/Channel Single & Two Stage Twinning

For twinning of single stage furnaces equipped with fixed speed blowers, refer to Figure 27 and the following instructions:

1. Turn off all power to both furnaces.
2. Attach a wire between the two twin terminals on the blower control boards. Use field supplied wire and 3/16" wire terminals.

NOTE: One furnace can be used for one stage of heating and the other furnace can be used for the second stage of heating. The installer also has the choice of running one furnace only or both furnaces. In both cases the blowers will run at the same time and at the same speeds:

One stage heating

- Connect the thermostat wires to the primary furnace control board. Mount the relay on the bracket on the secondary furnace.
- Connect **W** from the primary furnace to the coil side of the relay (using field supplied wire and 3/16" terminals).
- Connect **C** from the primary furnace to the coil side of the relay (using field supplied wire and 3/16" terminals). **NOTE:** Make sure connections are made on opposite sides of the coil.
- Connect **R** from the secondary furnace control board to the COM side of the relay (use included **red** wire).
- Connect **W** from the secondary furnace control board to **NO** side of the relay (use included white wire).

Two stage heating

- Connect the thermostat wires to the furnace control board (except W2). Mount the relay on the bracket on the secondary furnace.
- Connect **W1** from the thermostat control to **W** of the primary furnace.
- Connect **W2** from the thermostat to the coil side of the relay (using field supplied wire and 3/16" terminals)
- Connect **C** from the primary furnace to the coil side of the relay (using field supplied wire and 3/16" terminals).

  NOTE: Make sure connections are made on opposite sides of the coil

- Connect **R** from the secondary furnace control board to the COM side of the relay (use included **red** wire).
- Connect **W** from the secondary furnace control board to **NO** side of the relay (use included white wire).

Heat Anticipator

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.

START-UP & 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**, & **G**) are securely connected to the correct leads on the terminal strip of the circuit board.
√ Verify the jumper on the control board. See Figure 25 (page 24).
√ 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 27).
5. After 5 minutes of operation, set the thermostat below room temperature and verify steps 9 - 10 of the Operating Sequence.

Verifying & Adjusting Input Rate

The input rate must be verified for each installation to prevent over-firing of the furnace. **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. 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 7 (page 32).
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.

EXAMPLE:

- Time for 1 revolution of a gas meter with a 1 cubic ft dial = 40 seconds.
- From Table 7 read 90 cubic ft gas per hr.
- Local heating value of the gas (obtained from gas supplier) = 1,040 Btu per cubic ft.
- Input rate = 1,040 x 90 = 93,600 Btuh.

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

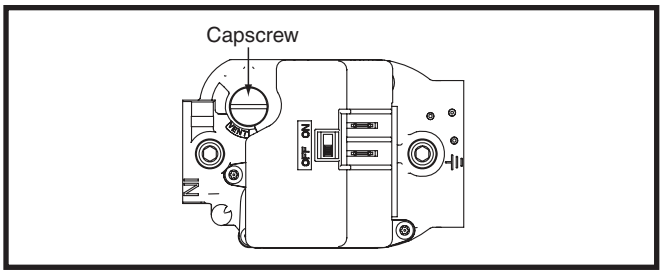


Figure 27. Regulator Capscrew

⚠ WARNING:

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

a.) Obtain the manifold pressure setting required for this installation by referring to Table 9 (page 33) for Propane or Table 11 (page 34) or Table 12 (page 34) for Natural Gas.
b.) Remove the regulator capscrew (Figure 27) from the INLET side of the regulator.
c.) Slowly turn the adjustment screw inside the regulator to obtain the appropriate manifold pressure.

NOTE: Turning the screw clockwise increases the pressure and turning the screw counter-clockwise decreases the pressure. To prevent backing the screw all the way out from the valve, turn the screw slowly.

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

Verifying & Adjusting Temperature Rise

After installation of the furnace, confirm the temperature rise of the furnace is within the limits specified on the 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 5-speed ECM motor. Heating and cooling speed selection is made by moving the switch on the integrated control inside of the furnace. The heating and cooling speed can be changed by selecting L, ML, M, MH and H.

Verifying Burner Operation

⚠ CAUTION:

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

1. Remove the burner compartment door.
2. Set the thermostat above room temperature and observe the ignition sequence. **NOTE**: The burner flame should carry over immediately between all burners without lifting off, curling, or floating. The flames should be blue, without yellow tips.
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

NOTE: 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 power to the furnace, and replace the limit switch.

System Operation

(Gas) Heating Mode

When the thermostat calls for heating, the circuit between **R** and **W** is completed. The furnace control board initiates the ignition sequence. Approximately 30 seconds after the gas flame has proven, the blower motor will start. The blower will continue to operate after the call for heat has been removed for a selectable (switch on furnace control board) number of seconds. **NOTE:** All on- and off-delays for heating continue to be controlled by the furnace control board.

Cooling Mode

When the thermostat calls for cooling or heat pump heating, the circuit between **R**, **G**, and **Y** (**O** is ignored by the blower) is completed. The blower runs at the selected cooling motor torque.

Blower Configuration

There are 5 blower configurations for the fan, heating and cool speeds. The settings are L(LOW), ML(MEDIUM LOW), M(MEDIUM), MH(MEDIUM HIGH), and H(HIGH). Refer to the blower document provided with this unit for the correct settings. To change the HEAT and COOL setting, locate the speed selects on the control board. For HEAT and COOL, move the selector switch up or down to the desired setting. For the FAN speed, there is jumper that will need to be moved. For instance, covering the last 2 pins(H and MH) will give a H(HIGH) fan setting. See Figure 15 for more detail.

Heating Blower Off Delay

There are 4 heating blower off delay settings, 60, 90, 120, and 180 seconds. The factory setting is 120 seconds. These can be changed by moving a jumper on the control board. For instance, moving the jumper to the first 2 pins will give a 60 second heating blower off delay.

Fault Conditions

There is a green and a red LED (labeled “Status”) on the motor control board to provide system faults as described below. Refer to Table 16 (page 45) for Nordyne/Channel boards or Table 15 (page 45) for Emerson boards to determine motor control board fault conditions.

OPERATING SEQUENCE

The operating sequences for the heating, cooling, and fan modes are described below. Refer to the field and furnace wiring diagrams: Figure 24 (page 24), Figure 25 (page 24), Figure 29 (page 30) and Figure 30 (page 31).

Heating Cycle

1. The thermostat calls for heat by energizing the **W** terminal with 24VAC.
2. The control verifies the pressure switch is open.
3. If the pressure switch is open, the control energizes the inducer and waits for the pressure switch to close. The pressure switch must close within 10 seconds.
4. The control runs the inducer for a 45 second pre-purge.
5. The control energizes the Hot Surface Igniter (HSI) output for the appropriate warm-up time limit.
6. The control energizes the main gas valve for 3 seconds.
7. If the flame proved and ignites the gas, the control de-energizes the HSI. The gas valve and inducer remains energized. The control goes to blower on delay.
8. If flame is present, the control energizes the blower on the selected HEAT speed 30 seconds after the gas valve opened. The gas valve and inducer remain energized.
9. When the thermostat demand for heat is satisfied, the control de-energizes the gas valve. The Inducer output remains on for a 30 second post-purge period.
10. Blower off timing begins when the thermostat is satisfied. For Nordyne/Channel boards, 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.

Cooling Cycle

1. The thermostat calls for cooling by energizing the Y terminal with 24VAC.
2. The control energizes the blower in cooling speed and sends 24VAC to the contactor in the condensing unit
3. When the thermostat removes the call for cooling, the contactor in the outdoor condensing unit is de-energized and the control continues to run the fan for a period of 40 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. See Figure 25 (page 24) for fan speed settings.
- 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:

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD

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

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

- Proper maintenance is most important to achieve the best performance from a furnace. Follow these instructions for years of safe, trouble free operation.
- These maintenance instructions are primarily intended to assist qualified technicians experienced in the proper maintenance and operation of this appliance.
- Always reinstall the doors on the furnace after servicing. **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) - Air filter(s) are not supplied with the furnace as shipped from the factory. The installer must provide a high velocity filter that is appropriately sized to the return air duct opening or external filter rack.

⚠ WARNING:

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

It is recommended that filter(s) be 1" or 2" thick and be cleaned or replaced monthly.

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.

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 38 (page 44) for component location.

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.

⚠ CAUTION:

To prevent damage to the unit or internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not over tighten!

6. Using two wrenches, separate the ground-joint union in the gas supply piping at the 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.

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

Heat Exchanger & 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.

⚠ WARNING:

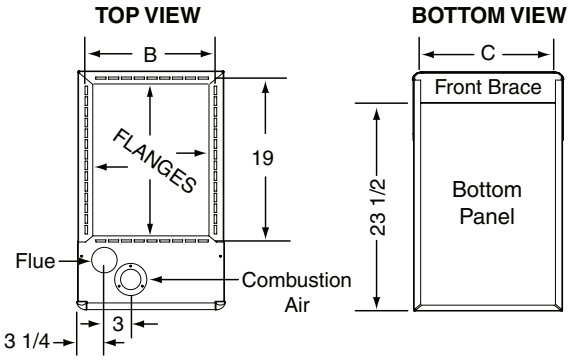
Holes in the vent pipe or heat exchanger can cause combustion products to enter the home. Replace the vent pipe or heat exchanger if leaks are found. Failure to prevent the circulation of combustion products into the living space can create potentially hazardous conditions including carbon monoxide poisoning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

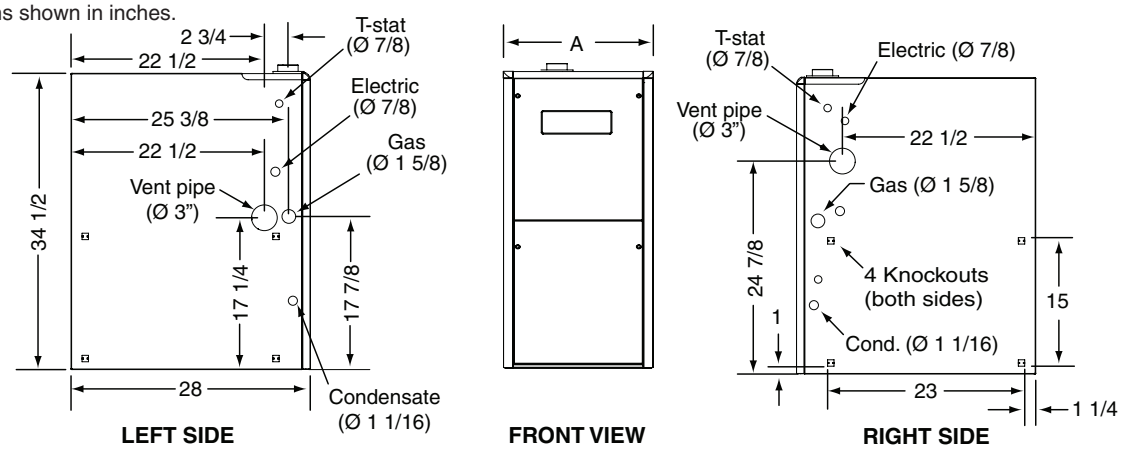
Lubrication - The bearings in the blower motor and inducer blower used in these furnaces are pre-lubricated and sealed by the manufacturer. No further oiling of the bearings is required for the life of the motor.

FIGURES & TABLES

*SC UPFLOW / HORIZONTAL FURNACES			
MODEL #'S	DIM. -A-	DIM. -B-	DIM. -C-
038D-T23A2	14 1/4	12 5/8	12 7/8
054D-T24B2	17 1/2	15 7/8	16 1/8
072D-T24B2			
072D-T35C2	21	19 3/8	19 5/8
090D-T35C2			
108D-T45D2	24 1/2	22 7/8	23 1/8
120D-T45D2			

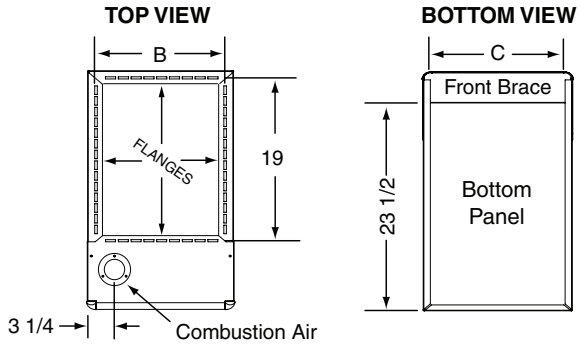
NOTE: Dimensions shown in inches.





*SD UPFLOW / HORIZONTAL FURNACES			
MODEL #'S	DIM. -A-	DIM -B-	DIM -C-
038D-T24B2	17 1/2	15 7/8	16 1/8
054D-T24B2			
072D-T35C2	21	19 3/8	19 5/8
090D-T35C2			
108D-T45D2	24 1/2	22 7/8	23 1/8
120D-T45D2			

NOTE: Dimensions shown in inches.



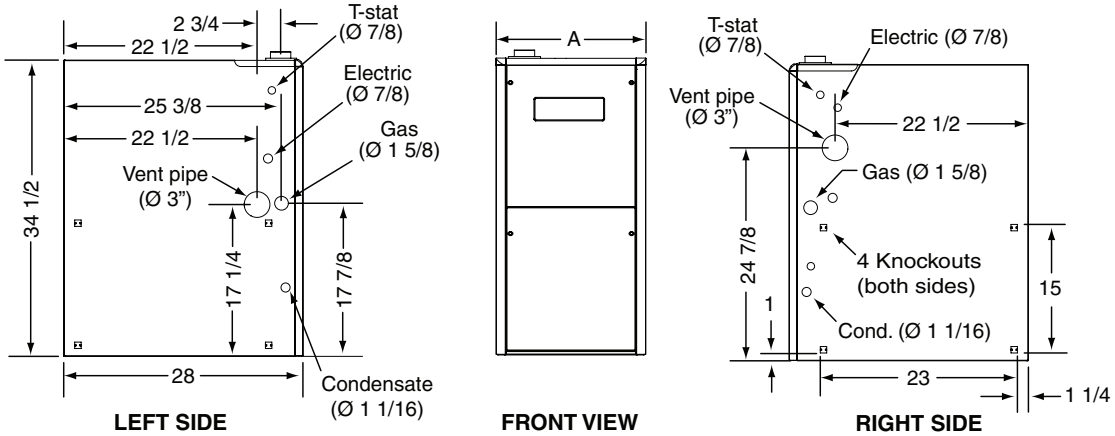
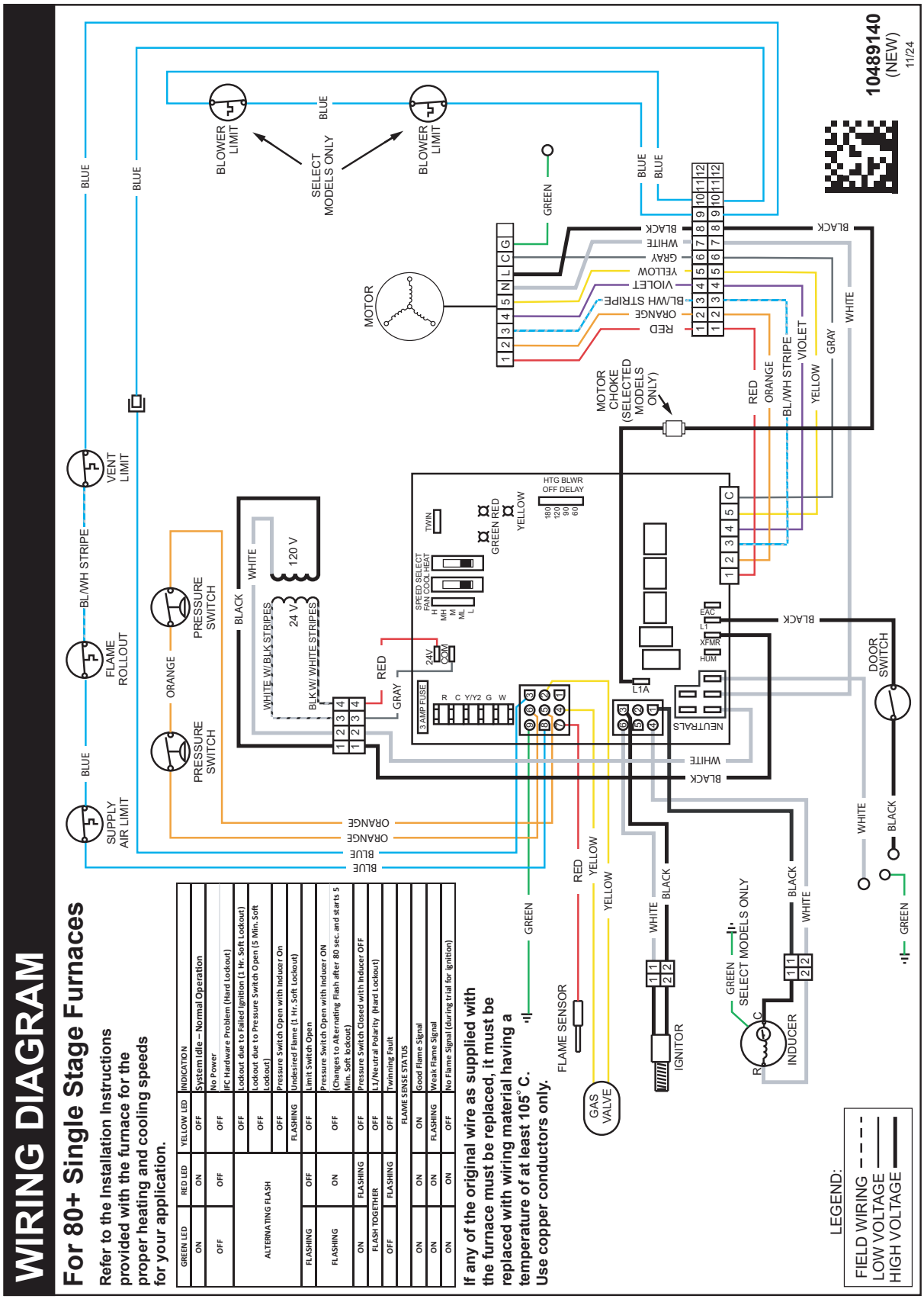


Figure 28. *SC & *SD Cabinet Dimensions



GREEN LED	RED LED	YELLOW LED	INDICATION
ON	ON	OFF	System Idle – Normal Operation
OFF	OFF	OFF	No Power
			IFC Hardware Problem (Hard Lockout)
ALTERNATING FLASH		OFF	Lockout due to Failed Ignition (1 Hr. Soft Lockout)
		OFF	Lockout due to Pressure Switch Open (5 Min. Soft Lockout)
		OFF	Pressure Switch Open with Inducer On
		FLASHING	Undesired Flame (1 Hr. Soft Lockout)
FLASHING	OFF	OFF	Limit Switch Open
FLASHING	ON	OFF	Pressure Switch Open with Inducer ON (Changes to Alternating Flash after 80 sec. and starts 5 Min. Soft lockout)
ON	FLASHING	OFF	Pressure Switch Closed with Inducer OFF
FLASH TOGETHER		OFF	L1/Neutral Polarity (Hard Lockout)
OFF	FLASHING	OFF	Twinning Fault
			FLAME SENSE STATUS
ON	ON	ON	Good Flame Signal
ON	ON	FLASHING	Weak Flame Signal
ON	ON	OFF	No Flame Signal (during trial for ignition)

Figure 29. Nordyne/Channel Wiring Diagram

LADDER DIAGRAM

Single Stage Furnaces

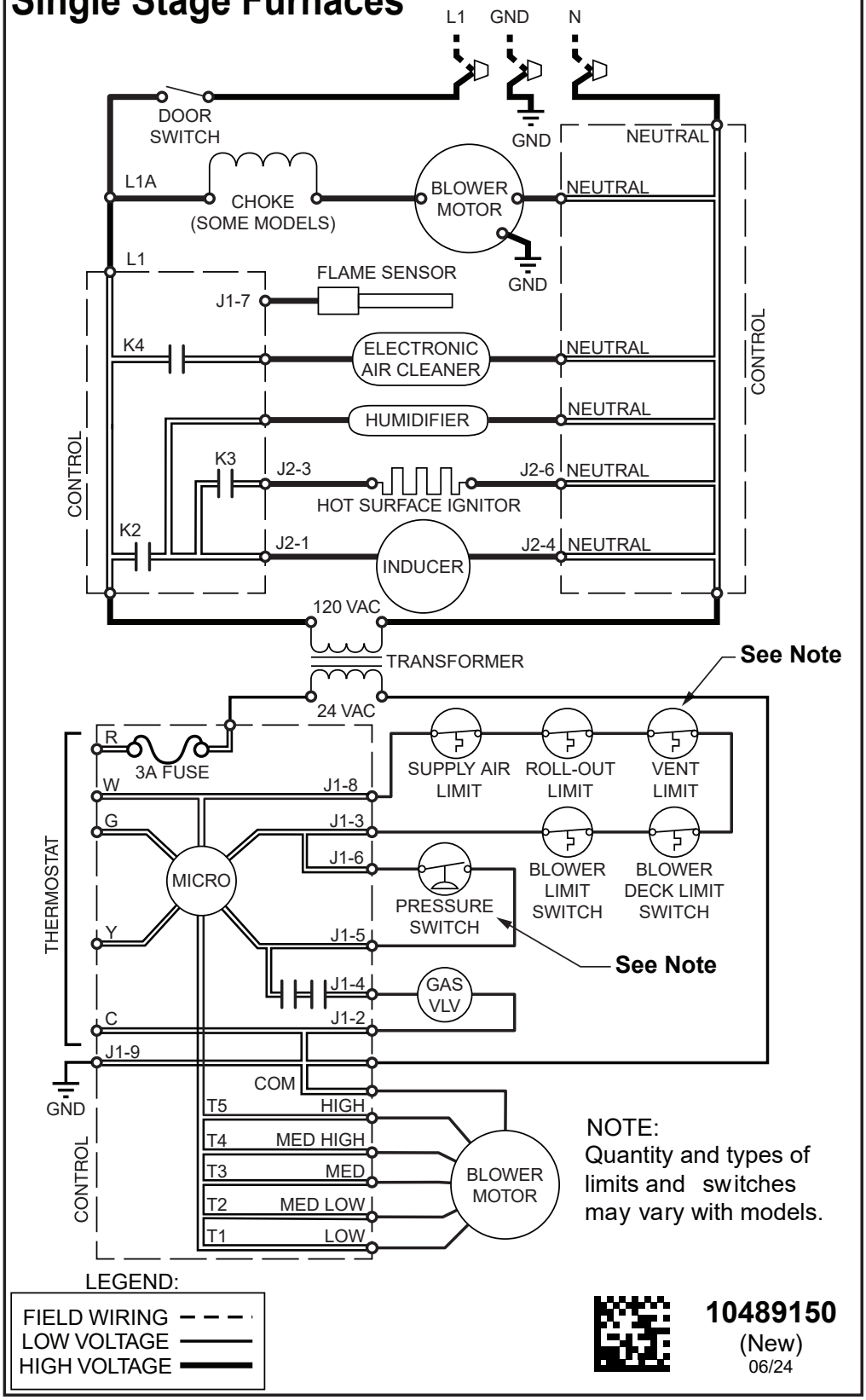


Figure 30. Nordyne/Channel Ladder Diagram

Gas Information

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

GAS FLOW RATES (CUBIC FEET PER HOUR)			
TIME FOR ONE REVOLUTION (SECONDS)	CUBIC FEET PER REVOLUTION OF GAS METER		
	1	5	10
66	55	273	545
68	53	265	529
70	51	257	514
72	50	250	500
74	49	243	486
76	47	237	474
78	46	231	462
80	45	225	450
82	44	220	439
84	43	214	429
86	42	209	419
88	41	205	409
90	40	200	400
92	39	196	391
94	38	191	383
96	38	188	375
98	37	184	367
100	36	180	360
102	35	176	353
104	35	173	346
106	34	170	340
108	33	167	333
110	33	164	327
112	32	161	321
114	32	158	316
116	31	155	310
118	31	153	305
120	30	150	300

Table 7. Gas Flow Rates

CAPACITY OF BLACK IRON GAS PIPE (CU. FT. PER HOUR) FOR NATURAL GAS W/ SPECIFIC GRAVITY = 0.60								
NOMINAL PIPE DIAMETER (IN.)	LENGTH OF PIPE RUN (FEET)							
	10	20	30	40	50	60	70	80
1/2	130	90	75	65	55	50	45	40
3/4	280	190	150	130	115	105	95	90
1	520	350	285	245	215	195	180	170
1 1/4	1,050	730	590	500	440	400	370	350
1 1/2	1,600	1,100	890	760	670	610		

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

NOTE:

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

Table 8. Gas Pipe Capacities

HIGH ALTITUDE DERATION – PROPANE GAS									
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)								
	38,000 (SC MODELS)	38,000 (SD MODELS)	54,000	72,000	90,000	108,000	118,000	120,000	
0 to 1,999 FT	56	60	56	56	56	56	55	55	ORIFICE SIZE
	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
2,000 to 2,999 FT	56	60	56	56	56	56	55	55	ORIFICE SIZE
	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
3,000 to 4,999 FT	56	60	56	56	56	56	55	55	ORIFICE SIZE
	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE
5,000 to 5,999 FT	57	61	57	57	57	57	56	56	ORIFICE SIZE
	10.0	8.5	10.0	10.0	10.0	10.0	10.0	10.0	MANIFOLD PRESSURE
6,000 to 7,999 FT	57	61	57	57	57	57	56	56	ORIFICE SIZE
	9.0	8.0	9.0	9.0	9.0	9.0	9.0	9.0	MANIFOLD PRESSURE
8,000 to 10,000 FT	57	61	57	57	57	57	56	56	ORIFICE SIZE
	8.5	7.5	8.5	8.5	8.5	8.5	8.5	8.5	MANIFOLD PRESSURE

Table 9. High Altitude Deration – Propane Gas

LOCAL HEATING VALUES FOR NATURAL GAS									
ALTITUDE ABOVE SEA LEVEL	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 10. Natural Gas Heating Values

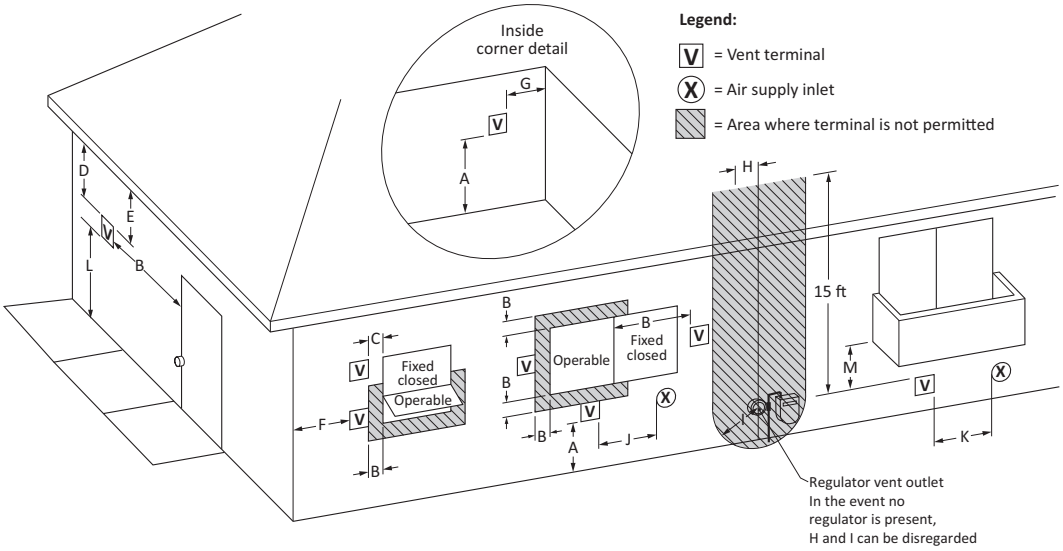
HIGH ALTITUDE DERATION – NATURAL GAS WITH HIGH HEATING VALUE									
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)								
	38,000 (SC MODELS)	38,000 (SD MODELS)	54,000	72,000	90,000	108,000	118,000	120,000	
0 to 1,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.0	3.2	3.2	3.2	3.2	3.2	3.2	3.3	MANIFOLD PRESSURE
3,000 to 3,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.8	3.0	3.0	3.0	3.0	3.0	3.2	3.1	MANIFOLD PRESSURE
4,000 to 4,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.9	MANIFOLD PRESSURE
5,000 to 5,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.5	2.5	2.7	2.7	2.7	2.7	2.7	2.8	MANIFOLD PRESSURE
6,000 to 6,999 FT	49	53	49	49	49	49	48	48	ORIFICE SIZE
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
7,000 to 7,999 FT	49	53	49	49	49	49	48	48	ORIFICE SIZE
	3.4	3.2	3.3	3.3	3.3	3.3	3.3	3.3	MANIFOLD PRESSURE
8,000 to 8,999 FT	49	53	49	49	49	49	48	48	ORIFICE SIZE
	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	MANIFOLD PRESSURE
9,000 to 9,999 FT	49	53	49	49	49	49	48	48	ORIFICE SIZE
	3.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	MANIFOLD PRESSURE

Table 11. High Altitude Deration – Natural Gas with HIGH Heating Value

HIGH ALTITUDE DERATION – NATURAL GAS WITH LOW HEATING VALUE)									
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)								
	38,000 (SC MODELS)	38,000 (SD MODELS)	54,000	72,000	90,000	108,000	118,000	120,000	
0 to 1,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
3,000 to 3,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.1	3.4	3.3	3.3	3.3	3.3	3.3	3.4	MANIFOLD PRESSURE
4,000 to 4,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.9	3.2	3.1	3.1	3.1	3.1	3.1	3.2	MANIFOLD PRESSURE
5,000 to 5,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.8	3.1	2.9	2.9	2.9	2.9	2.9	3.1	MANIFOLD PRESSURE
6,000 to 6,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	2.6	2.9	2.8	2.8	2.8	2.8	2.8	2.9	MANIFOLD PRESSURE
7,000 to 7,999 FT	48	53	49	49	49	49	48	48	ORIFICE SIZE
	3.3	3.5	3.4	3.4	3.4	3.4	3.4	3.5	MANIFOLD PRESSURE
8,000 to 8,999 FT	48	53	49	49	49	49	48	48	ORIFICE SIZE
	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.3	MANIFOLD PRESSURE
9,000 to 9,999 FT	48	53	49	49	49	49	48	48	ORIFICE SIZE
	2.8	3.1	2.9	2.9	2.9	2.9	2.9	3.1	MANIFOLD PRESSURE

Table 12. High Altitude Deration – Natural Gas with LOW Heating Value

Venting Information



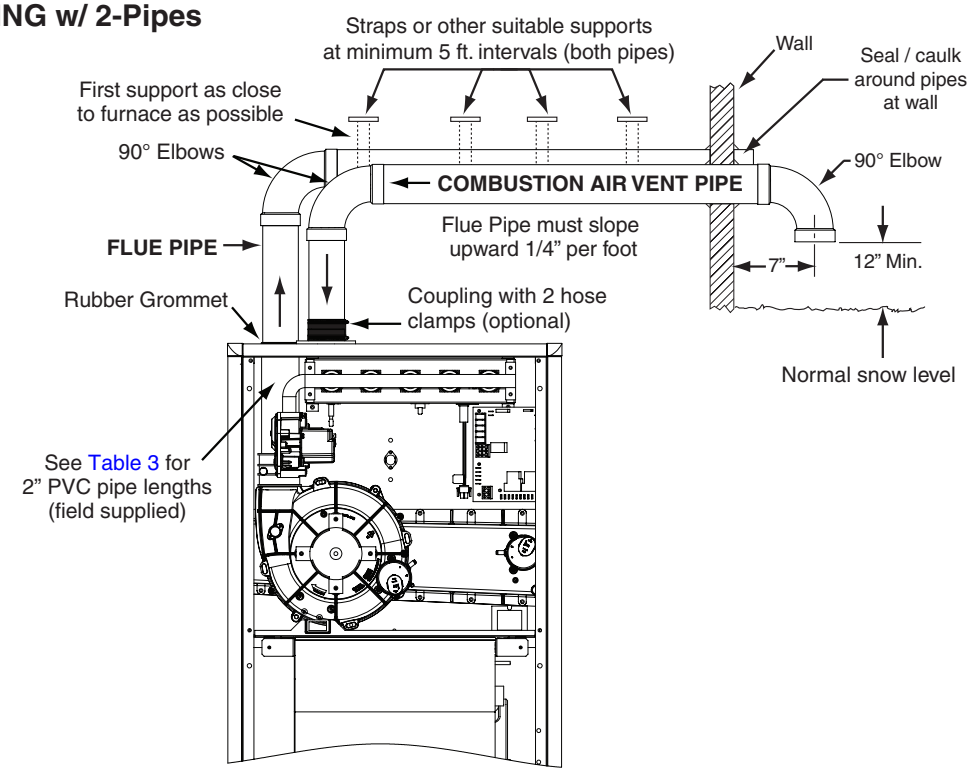
CLEARANCE LOCATION		CANADIAN INSTALLATIONS [A]	US INSTALLATIONS [B]	
		DIRECT VENT (2-PIPE) & CONVENTIONAL VENT (1-PIPE) FURNACES	DIRECT VENT (2-PIPE) FURNACES	CONVENTIONAL VENT (1-PIPE) FURNACES
A =	Clearance above grade, veranda, porch, deck, balcony, or maximum expected snow level.	12 inches (30cm)	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)	6 inches (15cm) for appliances < 10,000 Btuh (3kW)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
		12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW)	9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW)	
		36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	
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)	6 inches (15cm) for appliances < 10,000 Btuh (3kW)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
		12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW)	9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW)	
		36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	
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 (2.13 m) for mechanical draft systems (Category I appliances); vents for category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard	7 ft (2.13 m) for mechanical draft systems (Category I appliances); vents for category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard
M =	Clearance under veranda, porch, deck, or balcony.	12 inches (30cm) [d]	*	*

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 13. Vent Termination Clearances

HORIZONTAL VENTING w/ 2-Pipes

(Upflow Furnace Shown)



VERTICAL VENTING w/ 2-Pipes

(Upflow Furnace Shown)

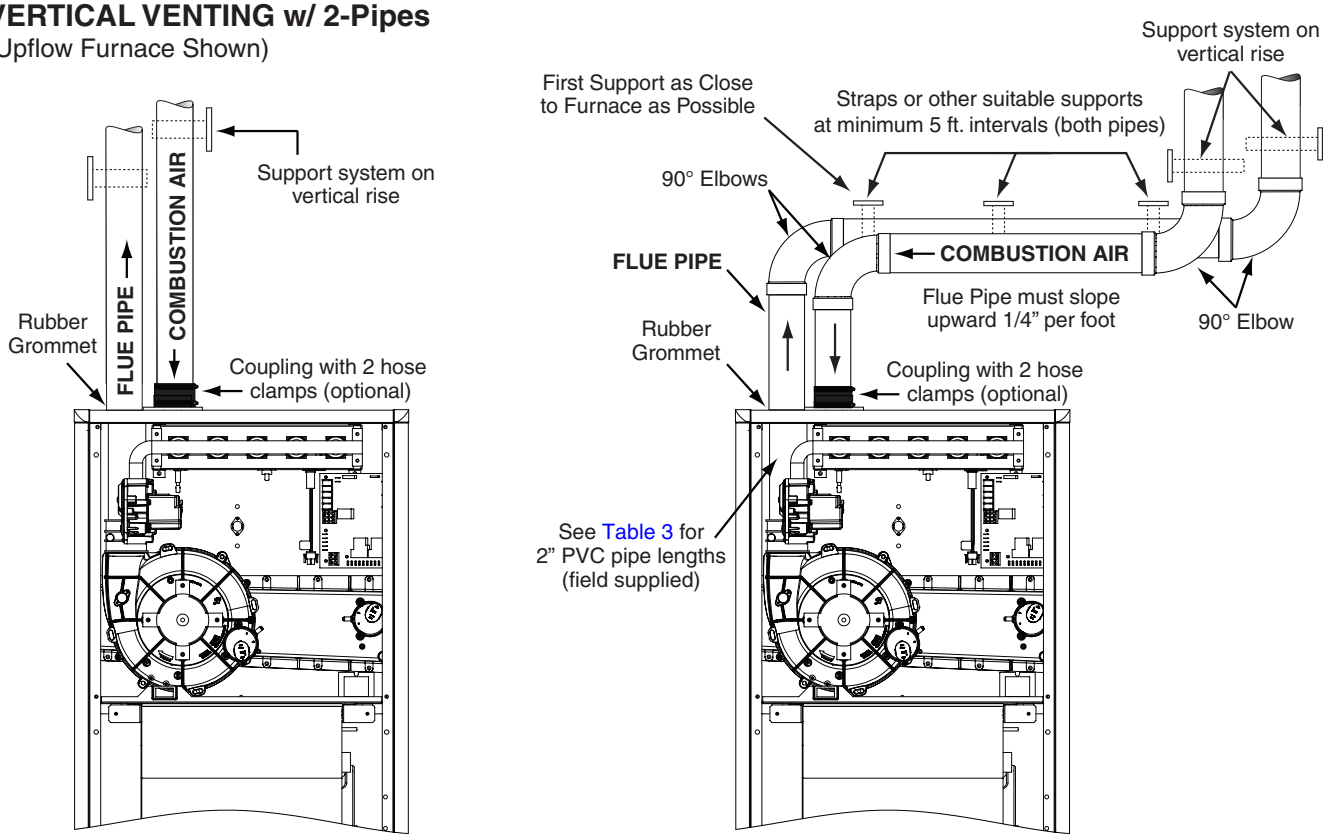
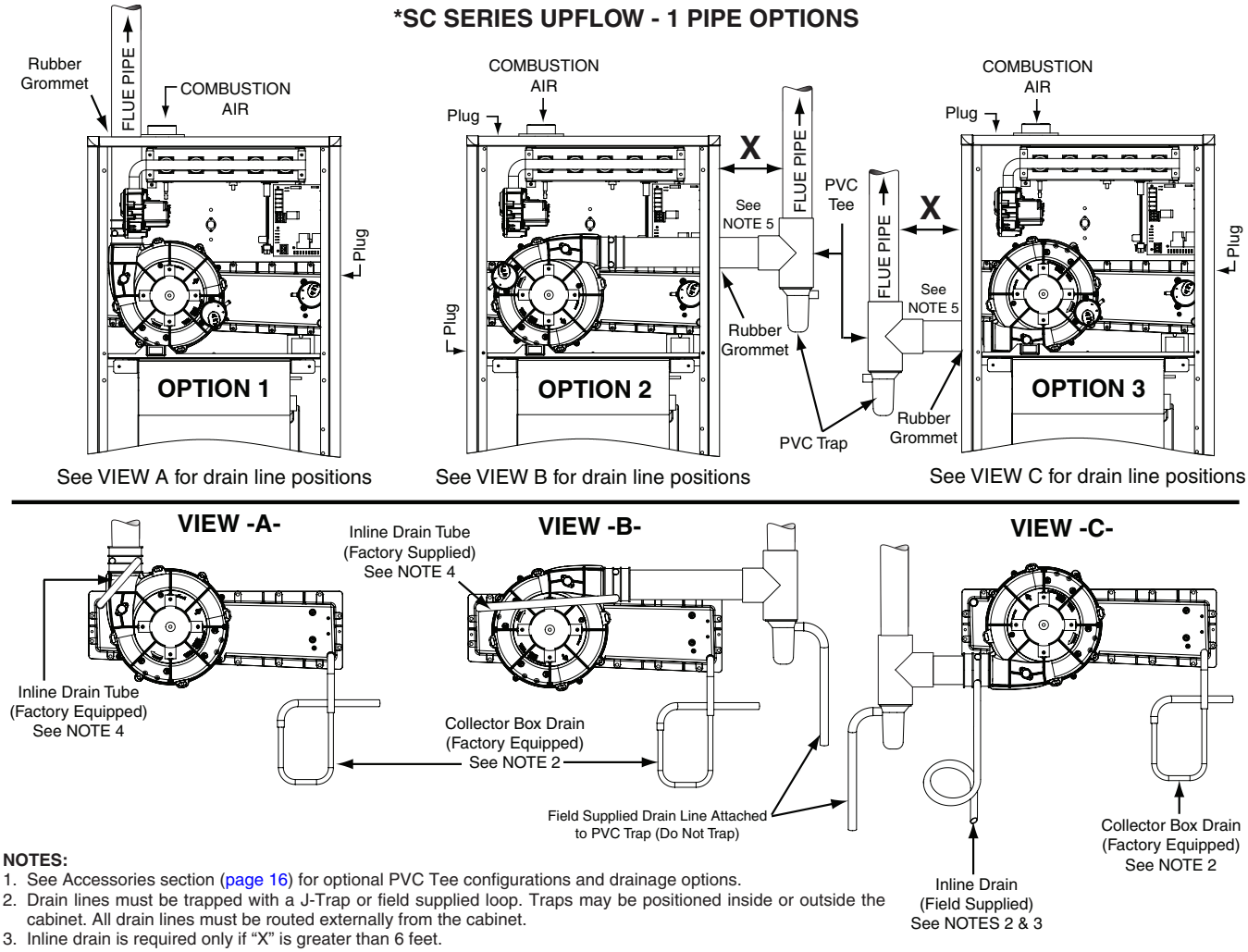


Figure 31. Horizontal & Vertical Venting



NOTES:

1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required only if "X" is greater than 6 feet.
4. Tubing needs to be cut to length and attached during unit installation.
5. Horizontal piping from inducer to flue pipe must be sloped 1/4" per foot to ensure drainage to PVC trap.

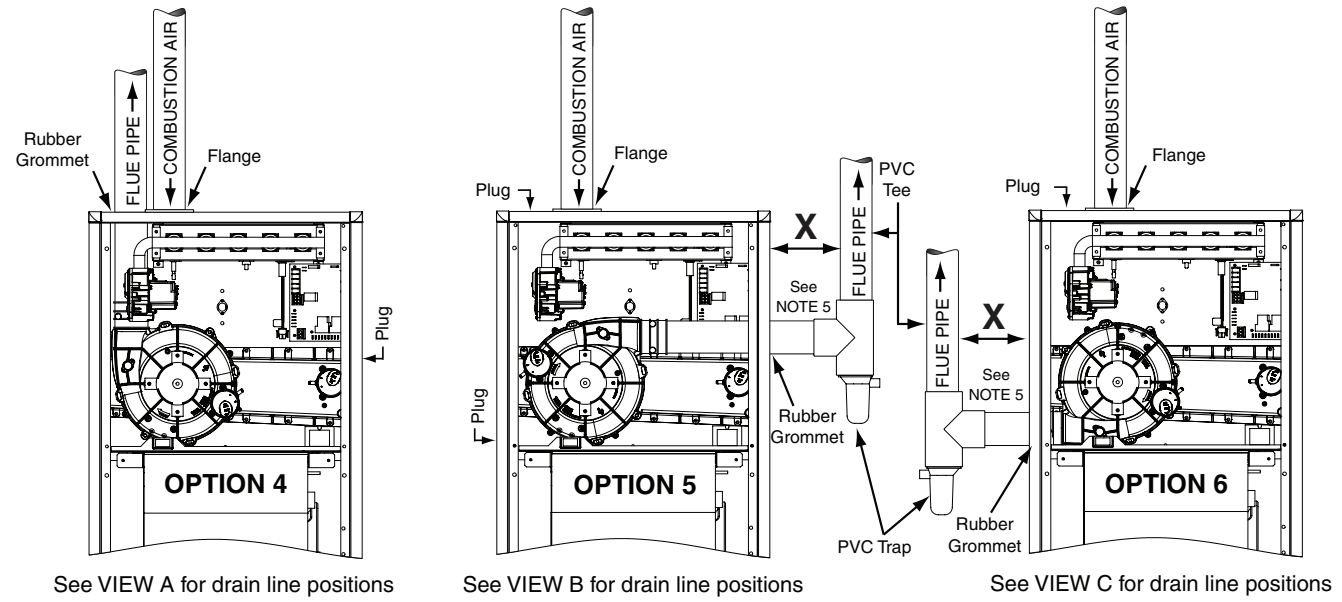
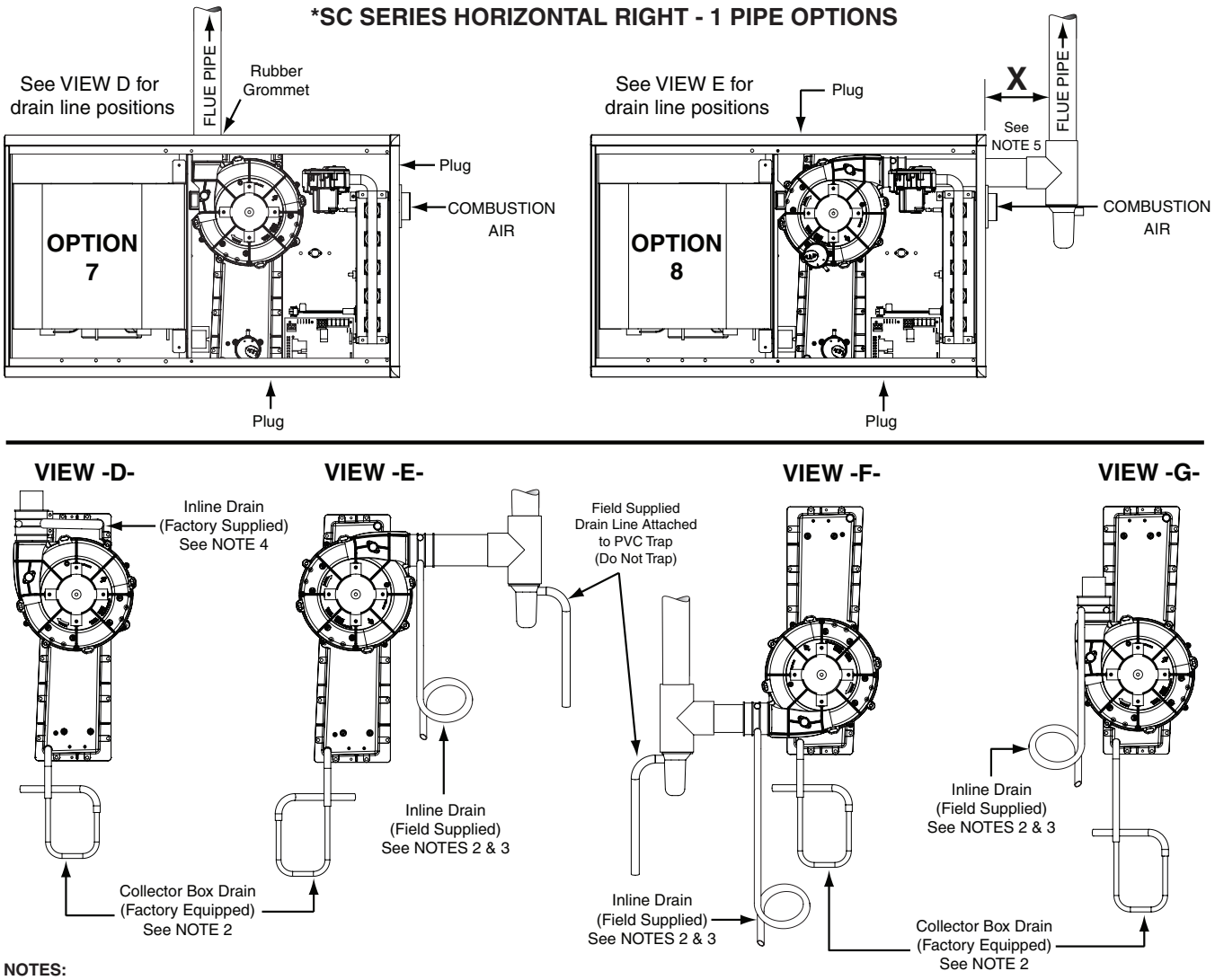


Figure 32. Venting Options for Upflow Installations (*SC Series)



NOTES:

1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required only if "X" is greater than 6 feet.
4. Tubing needs to be cut to length and attached during unit installation.
5. Horizontal piping from inducer to flue pipe must be sloped 1/4" per foot to ensure drainage to PVC trap.

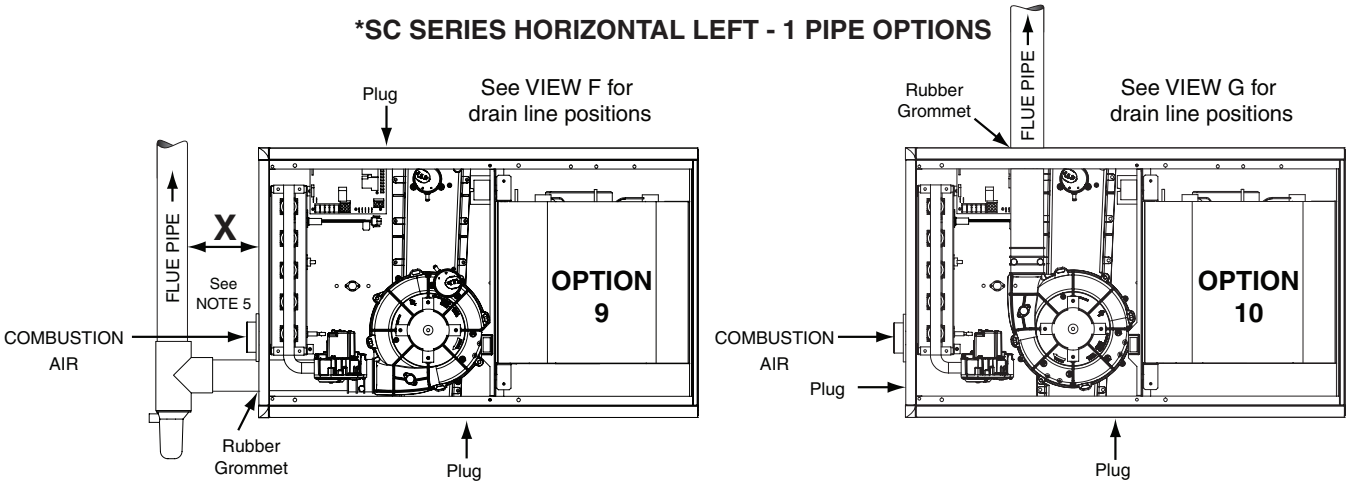
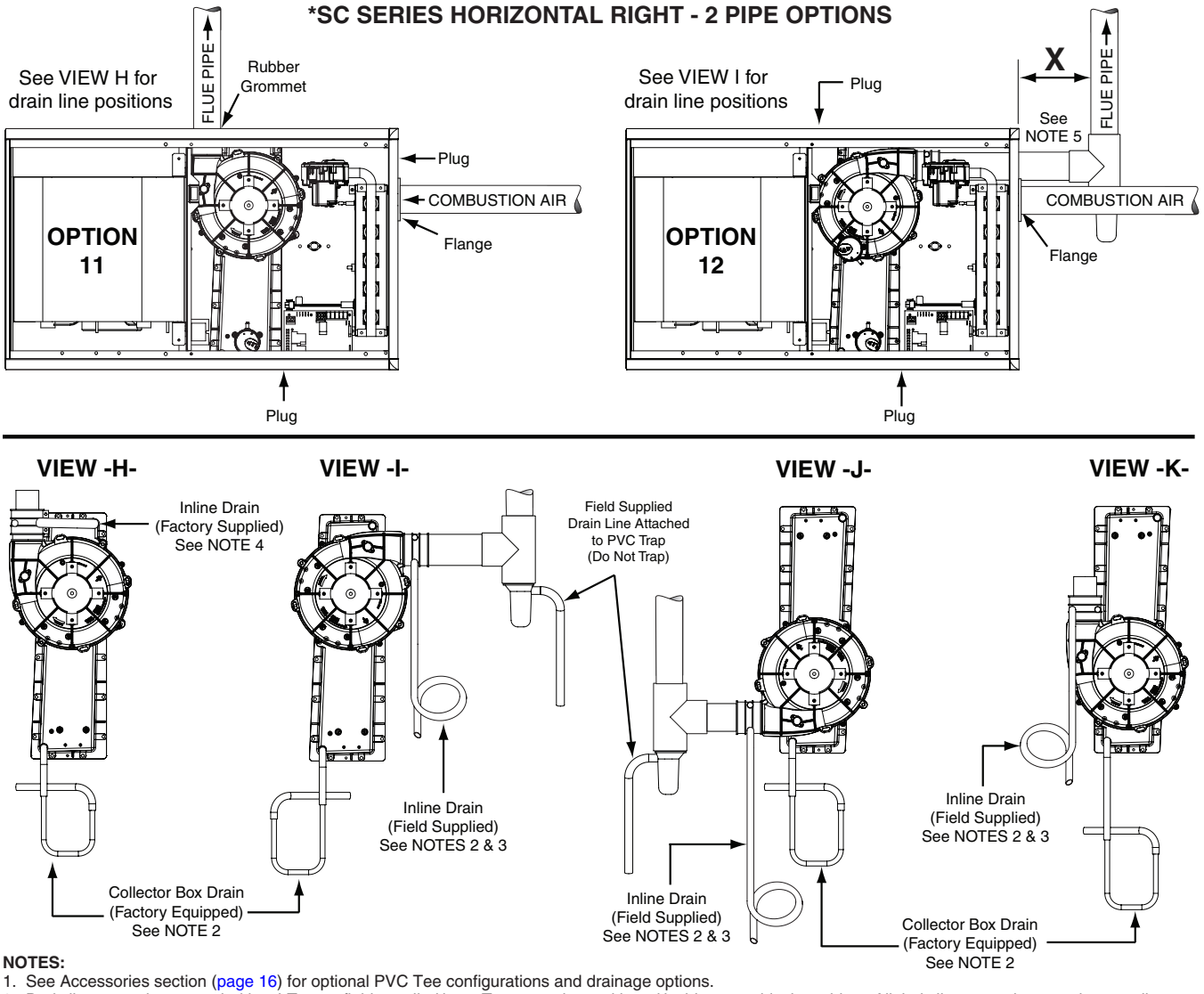


Figure 33. Venting Options for 1 Pipe Horizontal Installations (*SC Series)



NOTES:

1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required only if "X" is greater than 6 feet.
4. Tubing needs to be cut to length and attached during unit installation.
5. Horizontal piping from inducer to flue pipe must be sloped 1/4" per foot to ensure drainage to PVC trap.

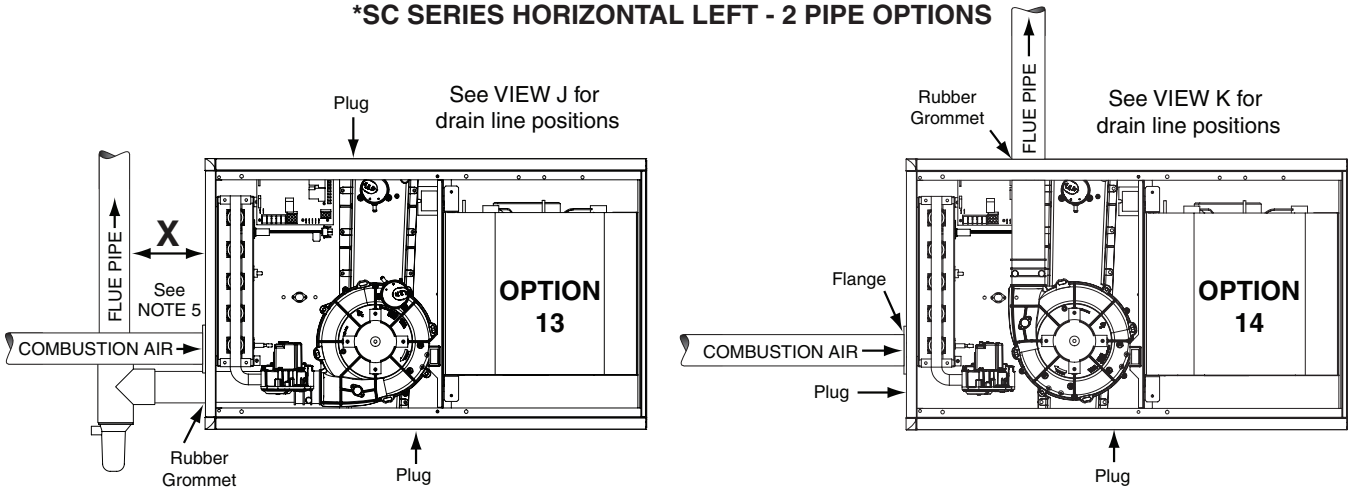
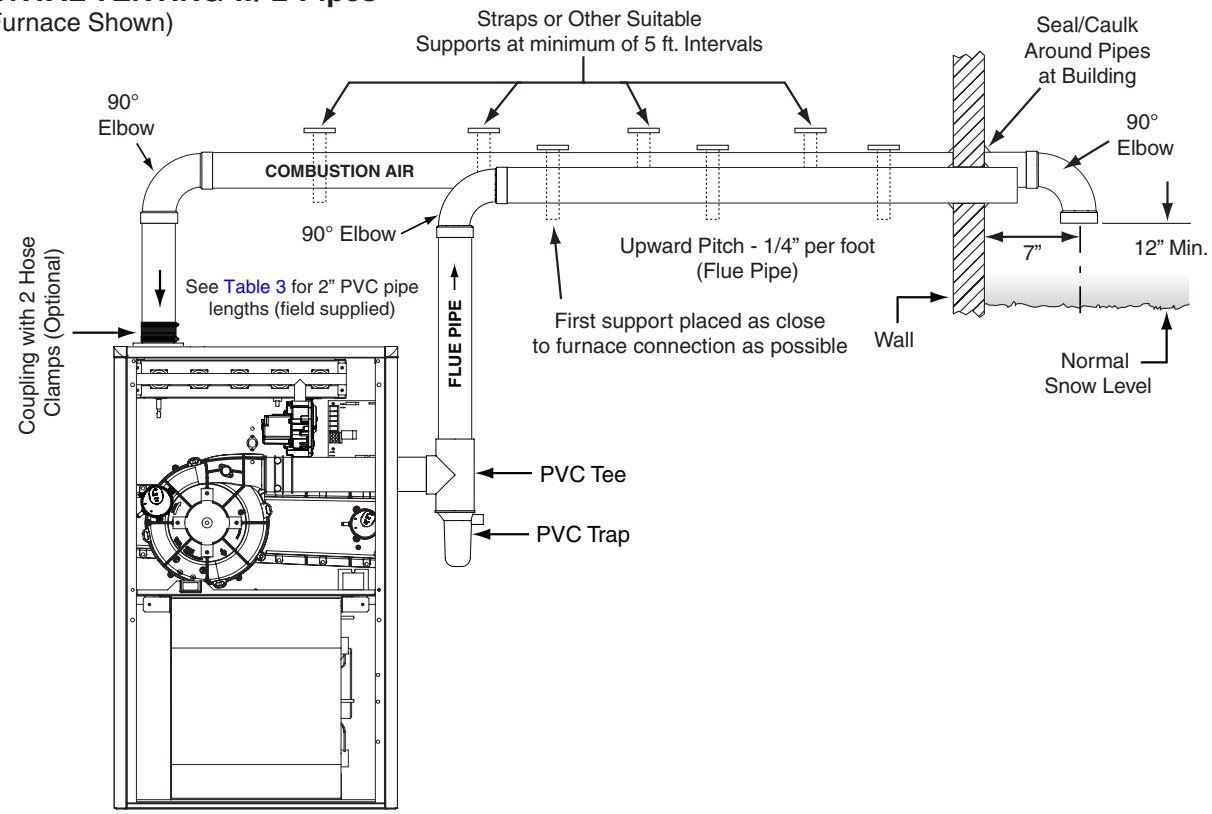


Figure 34. Venting Options for 2-Pipe Horizontal Installations (*SC Series)

HORIZONTAL VENTING w/ 2-Pipes

(Upflow Furnace Shown)



VERTICAL VENTING w/ 2-Pipes

(Upflow Furnace Shown)

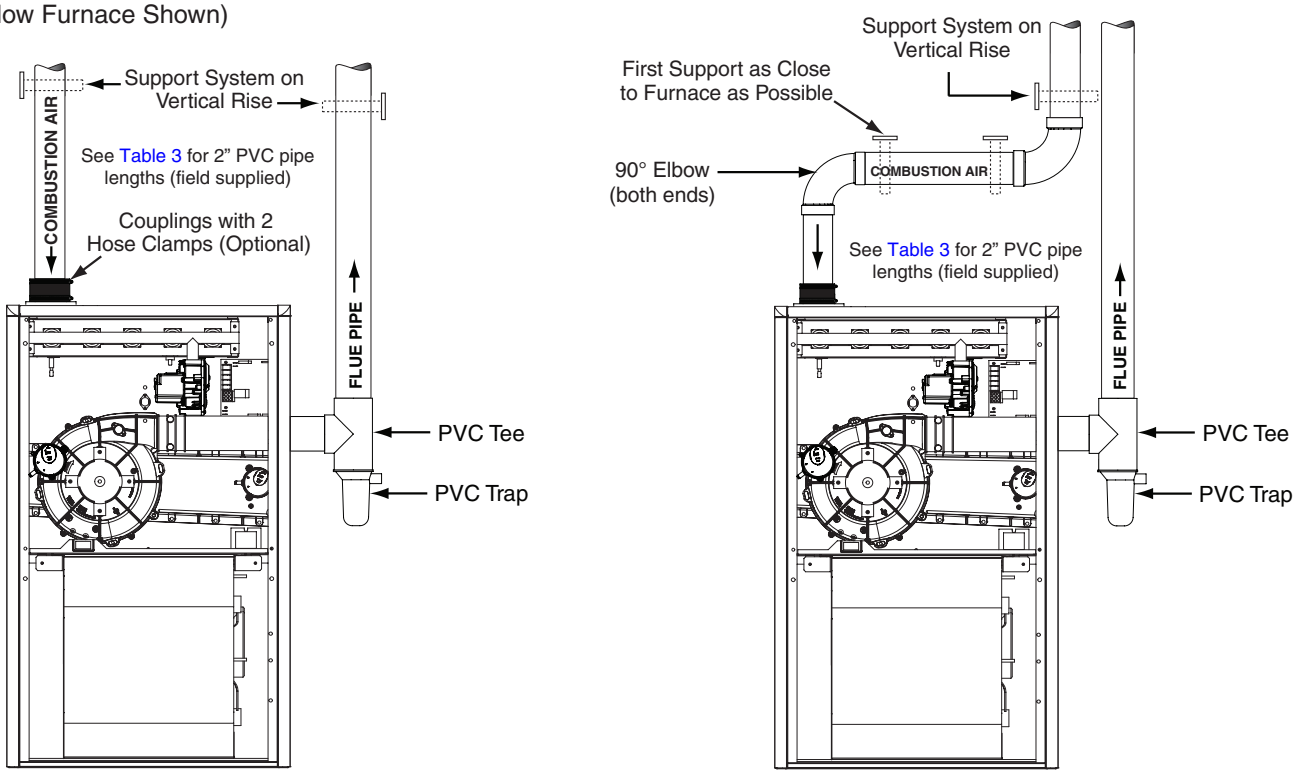
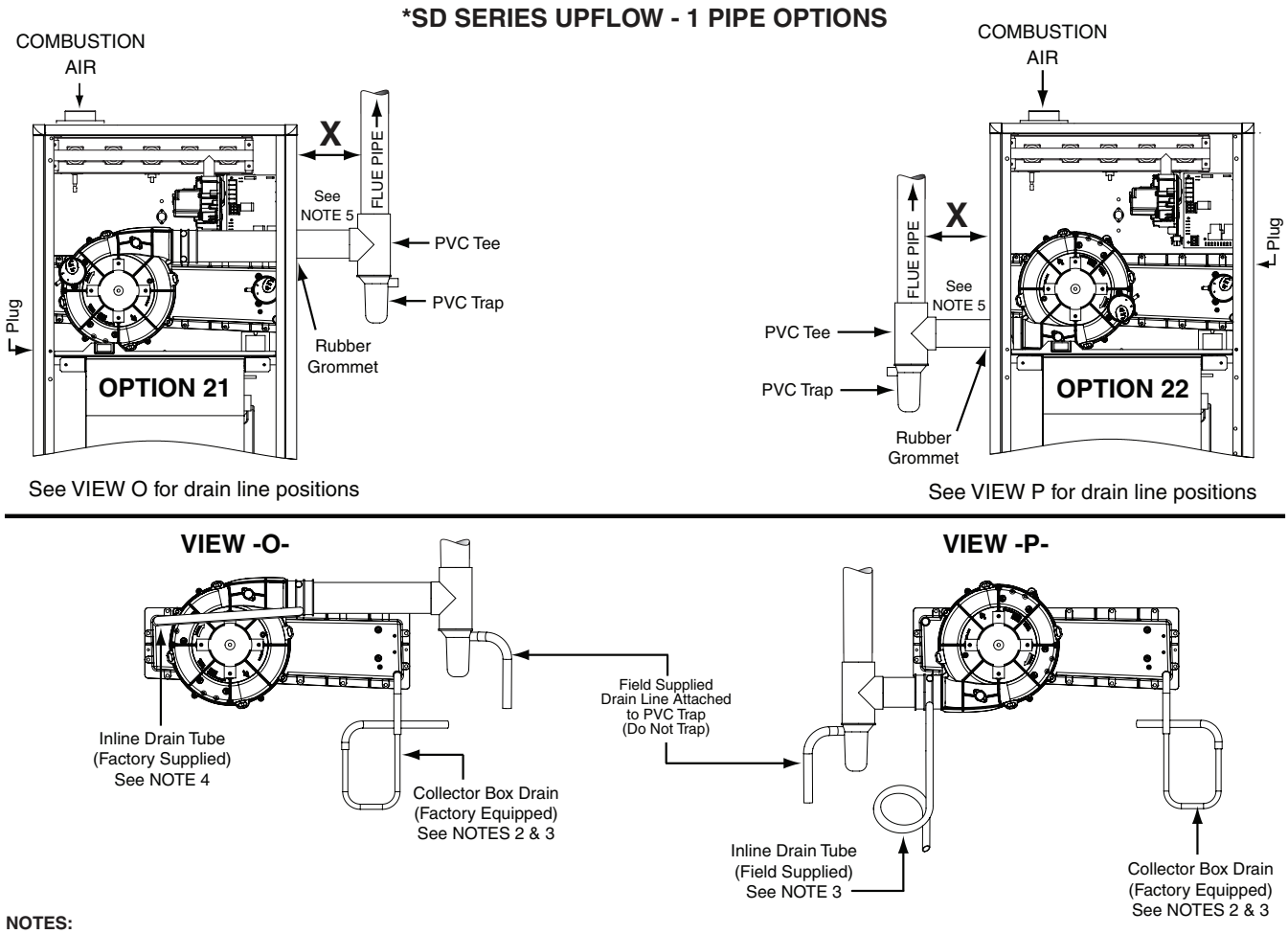


Figure 35. Horizontal & Vertical Venting



NOTES:

1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required only if "X" is greater than 6 feet.
4. Tubing needs to be cut to length and attached during unit installation.
5. Horizontal piping from inducer to flue pipe must be sloped 1/4" per foot to ensure drainage to PVC trapt.

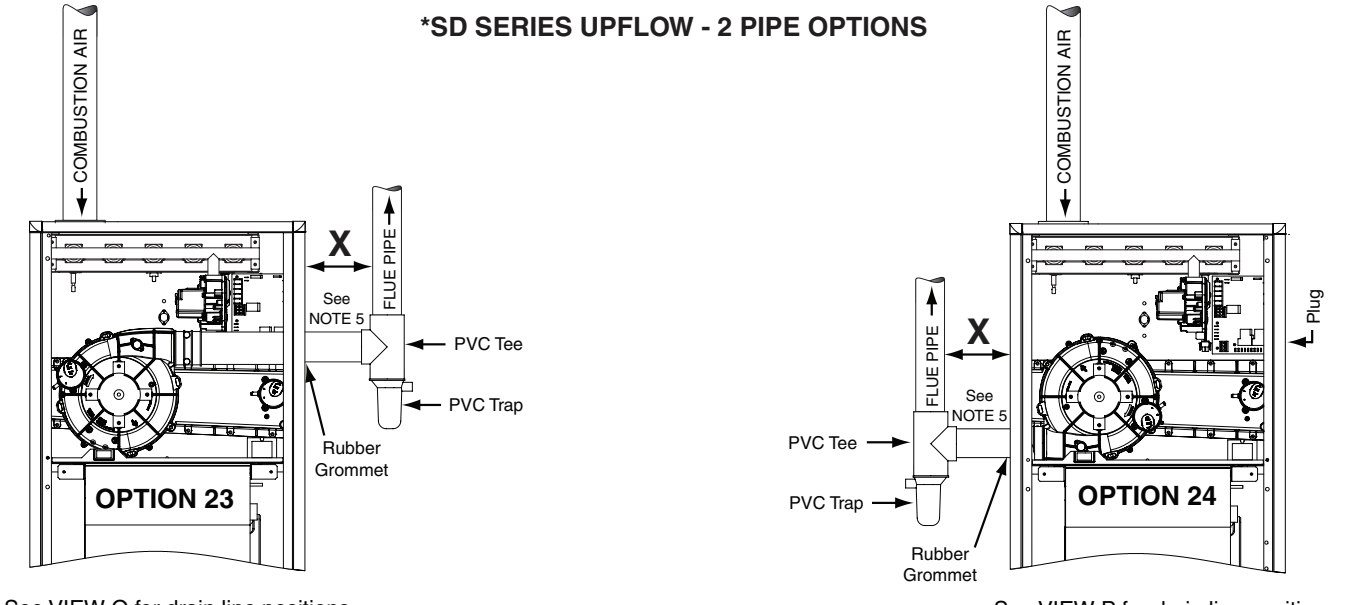
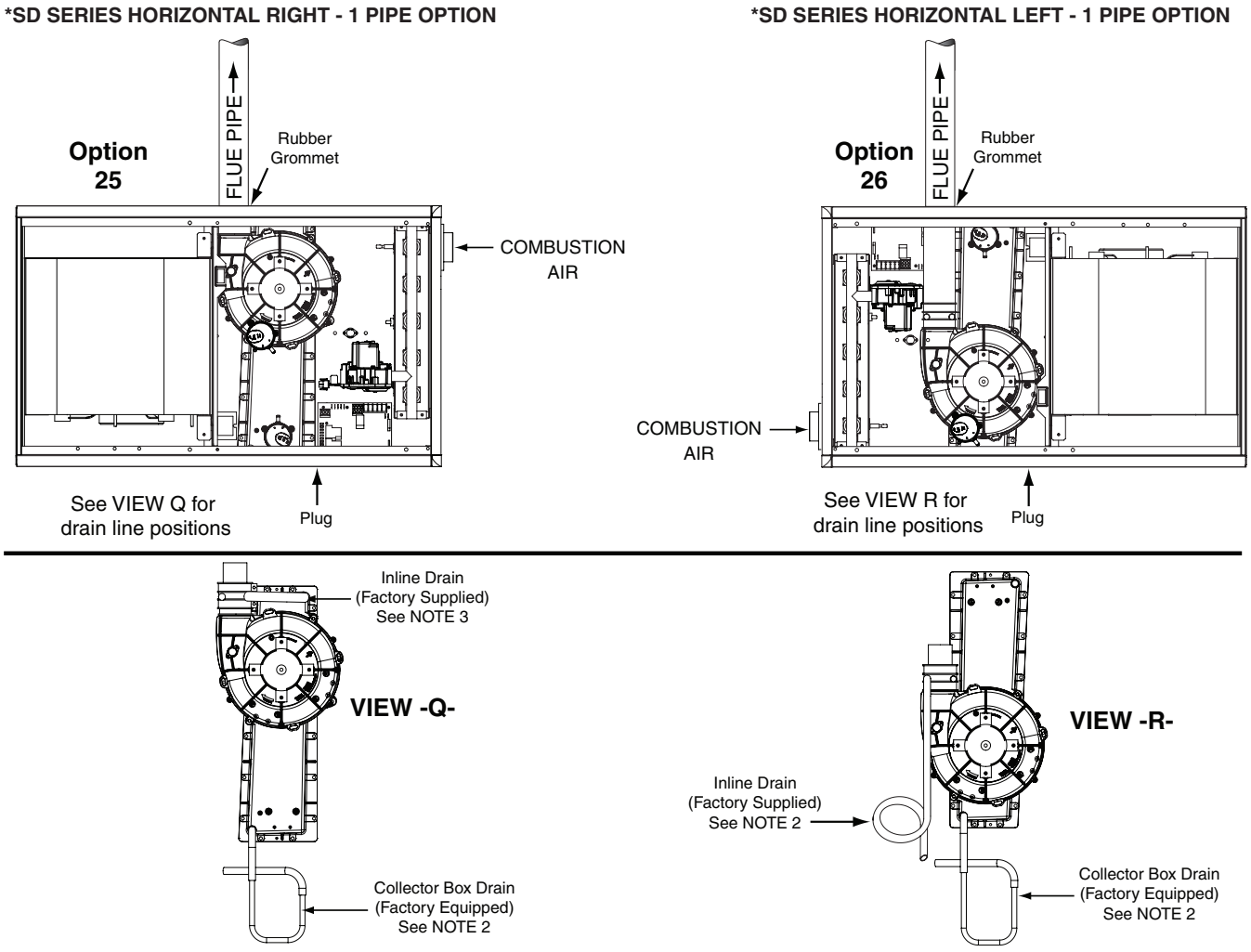


Figure 36. Venting Options for Upflow Installations (*SD Series)



NOTES:
1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Tubing needs to be cut to length and attached during unit installation.

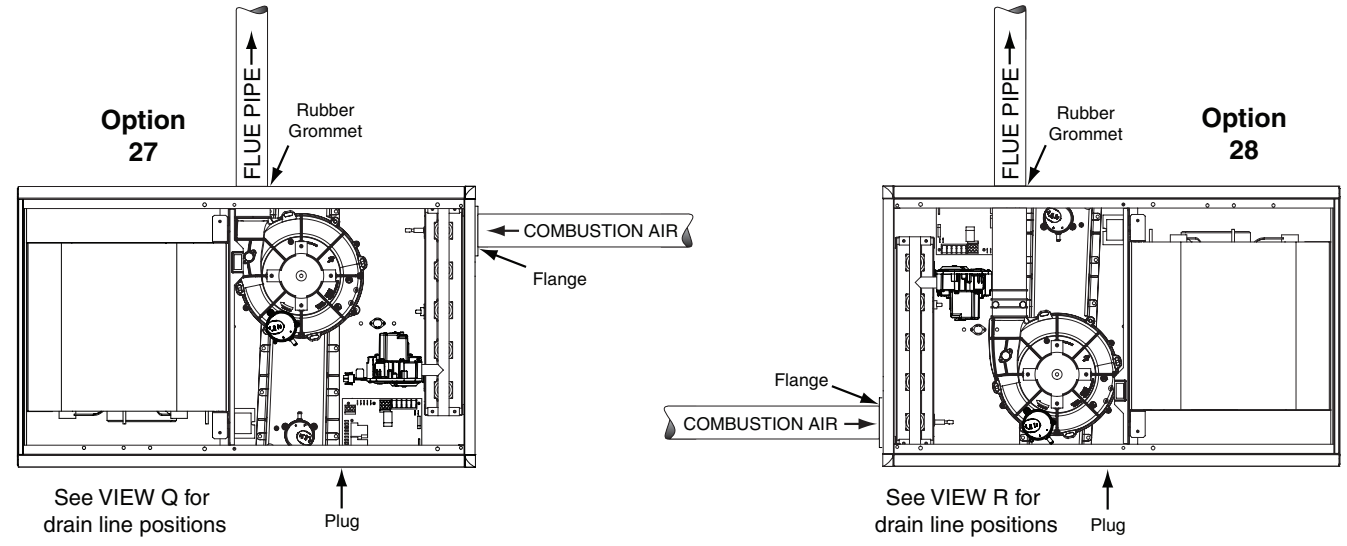


Figure 37. Venting Options for Horizontal Installations (*SD Series)

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 14 or the wiring diagram, Figure 29 (page 30) or Figure 30 (page 31) to determine fault condition.
- Are all the LED's on the motor control board constantly ON? If not, refer to Table 16 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 38 (page 44) 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 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.

GREEN LED	RED LED	YELLOW LED	INDICATION
ON	ON	OFF	System Idle - Normal Operation
OFF	OFF	OFF	No Power IFC Hardware Problems (Hard Lockout)
ALTERNATIVE FLASHING		OFF	Lockout due to Failed Ignition (1 Hr. Soft Lockout)
		OFF	Lockout due to Pressure Switch Open (5 Min. Soft Lockout)
		OFF	Pressure Switch Open with Inducer On (After initial 80 seconds of trial when changing to 5 Min. soft lockout mode)
		FLASHING	Undisered Flame (1 Hr. Soft Lockout)
FLASHING	OFF	OFF	Limit Switch Open
FLASHING	ON	OFF	Pressure Switch Open with inducer ON (Initial 80 seconds to trail) changing to Alternative Flash after 80 Sec. and starts 5 Min. soft lockout)
ON	FLASHING	OFF	Pressure Switch Closed with Inducer OFF
FLASH TOGETHER		OFF	115/120 VAC & Neutral reversed or No Ground (Hard Lockout)
OFF	FLASHING	OFF	Twinning Fault
FLAME SENSE STATUS			
ON	ON	ON	Good Flame Signal
ON	ON	FLASHING	Weak Flame Signal
ON	ON	OFF	No Flame Signal (during trial for ignition)

Table 14. Nordyne/Channel Board Fault Condtions.

FURNACE COMPONENTS

The descriptions on this page are various functional components that affect the operation and shutting down of this furnace. Some of these components and their locations are shown in Figure 38 (page 44). If any component of the furnace must be replaced, use only factory authorized replacement parts specified in the Replacement Parts List provided online.

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

Blower Limit Switch: Prevents operation when blower is not operational.

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: 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: 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: Vents products of combustion to the outside.

Pressure Switches: Verifies that the inducer is drawing the combustion gases through the heat exchanger. The pressure switch prevents furnace operation with excessive flue/condensate blockage or improper inducer operation.

Supply Air Limit Switch: Prevents the air temperature leaving the furnace from exceeding the maximum allowable outlet air temperature.

UPFLOW / HORIZONTAL FURNACE (*SC SERIES A CABINET)

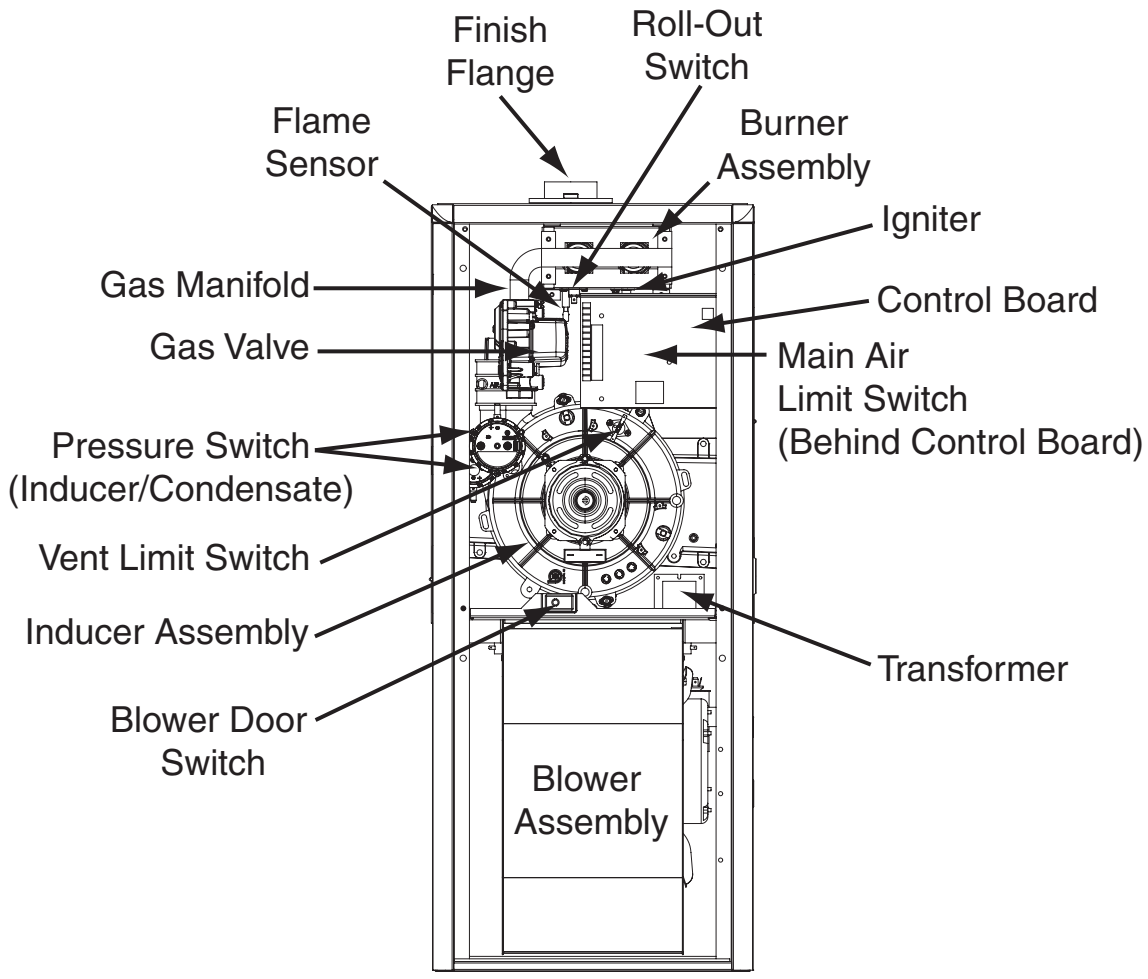
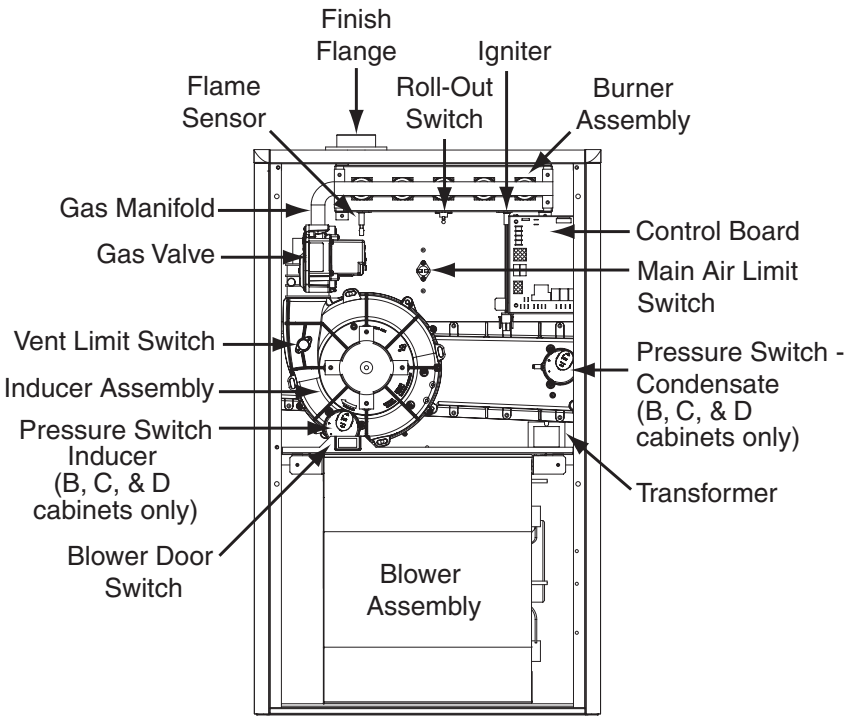


Figure 38. *SC & *SD Component Locations

UPFLOW / HORIZONTAL FURNACE (*SC SERIES B, C & D CABINETS)



UPFLOW / HORIZONTAL FURNACE

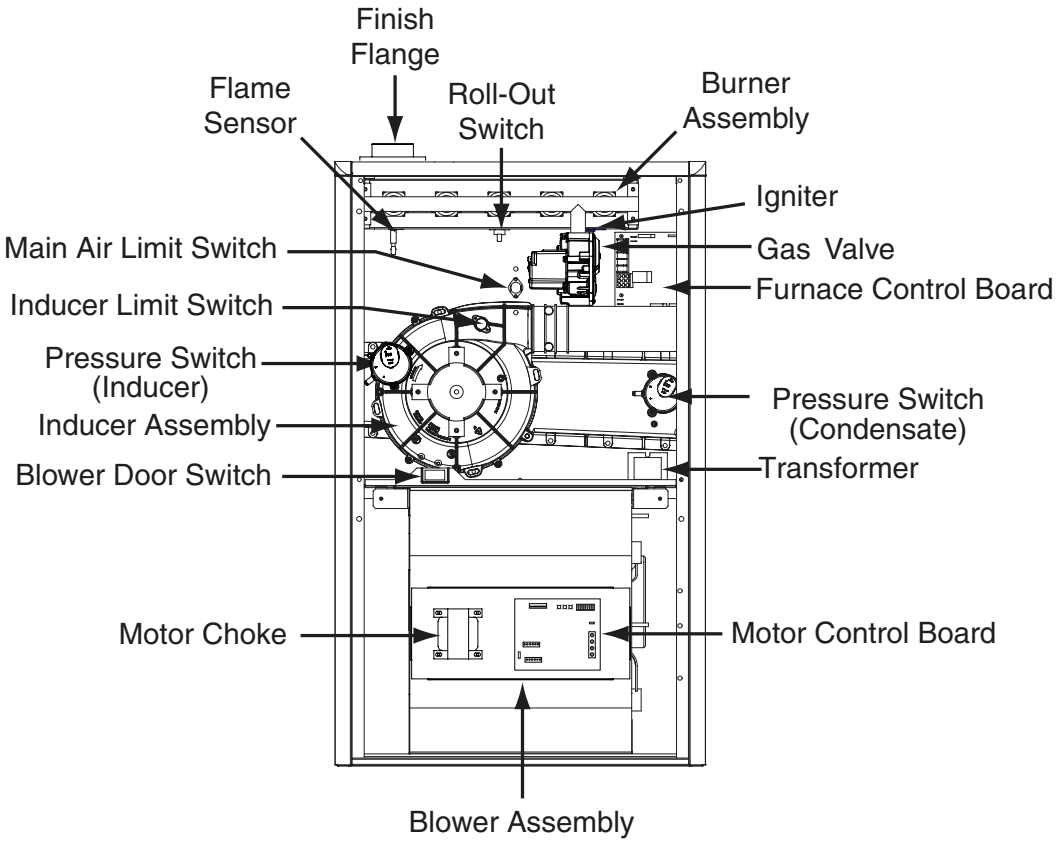


Figure 39. *SC & *SD Component Locations

INSTALLATION CHECKLIST

INSTALLER NAME:		
CITY:	STATE:	
INSTALLATION ADDRESS:		
CITY:	STATE:	
UNIT MODEL #		
UNIT SERIAL #		
Minimum clearances per Figure 1 (page 5)?	YES	NO
Has the owner's information been reviewed with the home-owner?	YES	NO
Has the literature package been left near the furnace?	YES	NO

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.

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.)		
Installation Altitude:.....(FT.)		
Deration Percentage:.....(%)		
Furnace Input:.....(Btuh)		
Supply Air Temperature: .....(° F)		
Return Air Temperature: .....(° F)		
Temperature Rise: .....(° F)		

COMBUSTION AIR & VENTING SYSTEM		
Is there adequate fresh air supply for combustion and ventilation?	YES	NO
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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HRAI MEMBER COMPANY

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DOE 10 CFR Part 430

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