

## INSTALLATION INSTRUCTIONS



**\*SC (92.1%AFUE)**  
Upflow / Horizontal Furnace



**\*SD & \*SD-E (95.0% AFUE)**  
Upflow / Horizontal Furnace



**\*SL (92.1% AFUE) &  
\*SM (95.0% AFUE)**  
Downflow Furnace

### **⚠ WARNING**

#### **FIRE OR EXPLOSION HAZARD**

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

#### **WHAT TO DO IF YOU SMELL GAS**

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

**DO NOT DESTROY. PLEASE READ CAREFULLY & KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.**

## TABLE OF CONTENTS

<b>IMPORTANT SAFETY INFORMATION.....</b>	<b>3</b>	Accessories.....	16
<b>REQUIREMENTS &amp; CODES .....</b>	<b>4</b>	Finish Flange .....	17
Combustion Air Quality.....	5	Rubber Grommets .....	17
Heating Load .....	5	PVC Components .....	18
Installation in a Garage.....	5	Typical Orientation.....	18
Clearances to Combustible Materials.....	5	Alternate Orientation.....	18
<b>COMBUSTION AIR &amp; VENTING REQUIREMENTS .....</b>	<b>6</b>	Optional PVC Pipe Installation.....	19
Operation of Furnace During Construction.....	6	Condensate Drain Lines .....	19
Direct Vent Furnaces.....	7	Bottom Panel Removal.....	19
Conventional Vent Systems - Confined Spaces.....	7	Alternate Bottom Panel Removal .....	19
Air From Inside .....	7	<b>GAS SUPPLY &amp; PIPING.....</b>	<b>20</b>
Outdoor Air from a Crawl Space or Vented Attic .....	8	Leak Check.....	20
Outdoor Air Using Vertical Ducts .....	8	High Altitude Application (Natural Gas Only).....	20
Outdoor Air Using Horizontal Ducts.....	8	Converting from Natural Gas to LP / Propane.....	21
Air Directly Through An Exterior Wall .....	9	<b>ELECTRICAL WIRING .....</b>	<b>24</b>
Alternate Method of Providing Air from Outside .....	9	Line Voltage Wiring .....	24
Conventional Vent Systems - Unconfined Spaces.....	9	Grounding.....	24
Category IV Venting .....	9	Thermostat / Low Voltage Connections.....	25
Vent Pipe Material .....	10	Twinning .....	25
Vent Pipe Length & Diameter .....	10	One stage heating .....	25
Vent Pipe Installation .....	10	Two stage heating .....	26
Outdoor Terminations - Horizontal Venting .....	11	Heat Anticipator.....	26
Outdoor Terminations - Vertical Venting.....	12	<b>START-UP &amp; ADJUSTMENTS.....</b>	<b>26</b>
Vent Freezing Protection .....	12	Pre-Start Check List .....	26
Existing Installations .....	12	Start-up Procedures .....	26
Condensate Disposal .....	12	Verifying & Adjusting Input Rate.....	26
<b>CIRCULATING AIR REQUIREMENTS.....</b>	<b>13</b>	Verifying & Adjusting Temperature Rise.....	27
Plenums & Air Ducts.....	13	Verifying Burner Operation.....	27
Return Air Connections .....	13	Verifying Operation of the Supply Air Limit Switch .....	27
Upflow & Horizontal Furnaces .....	13	Configuring The Blower.....	27
Downflow Furnaces .....	14	Selecting the (Gas) Heating Speed .....	27
Supply Air Connections .....	14	Determining Nominal System Capacity .....	28
Acoustical Treatments.....	14	Selecting the Cooling/Heat Pump Speed .....	28
<b>FURNACE INSTALLATION.....</b>	<b>14</b>	System Operation.....	28
General Requirements .....	14	(Gas) Heating Mode .....	28
Upflow Furnaces.....	14	Cooling or Heat Pump Mode .....	28
Horizontal Furnaces .....	14	Manual Fan.....	28
Downflow Furnaces .....	15	Fault Conditions.....	28
Installation on a Concrete Slab.....	15	<b>OPERATING SEQUENCE .....</b>	<b>28</b>
Inducer & Venting Options.....	15	Heating Cycle .....	28
Inducer Assembly Rotation.....	16	Cooling Cycle .....	28
Pressure Switch Tubing.....	16	Fan Mode .....	28
Alternate Pressure Switch Location.....	16	<b>MAINTENANCE .....</b>	<b>29</b>

<b>FIGURES &amp; TABLES.....</b>	<b>30</b>
Figure 30. *SL & *SM Cabinet Dimensions .....	30
Figure 31. *SC, *SD & *SD-E Cabinet Dimensions .....	31
Table 6. *SC Upflow / Horizontal Furnaces .....	32
Table 7. *SL Downflow Furnaces .....	33
Table 8. *SD & *SD-E Upflow / Horizontal Furnaces (ECM Motor).....	34
Table 9. *SD Upflow / Horizontal Furnaces (PSC Motor).....	36
Table 10. *SM Downflow Furnaces .....	37
Figure 32. Wiring Diagram.....	38
Figure 33. Wiring Diagram (Fixed Speed) .....	39
Table 11. Gas Flow Rates .....	40
Table 12. Gas Pipe Capacities .....	40
Table 13. High Altitude Deration – Propane Gas.....	41
Table 14. Natural Gas Heating Values .....	41
Table 15. High Altitude Deration – Natural Gas with HIGH Heating Value .....	42
Table 16. High Altitude Deration – Natural Gas with LOW Heating Value .....	42
Table 17. Vent Termination Clearances .....	43
<b>*SC &amp; *SL Series</b>	
Figure 34. Horizontal & Vertical Venting.....	44
Figure 35. Venting Options for Upflow Installations (*SC Series).....	45
Figure 36. Venting Options for 1 Pipe Horizontal Installations (*SC Series).....	46
Figure 37. Venting Options for 2-Pipe Horizontal Installations (*SC Series).....	47
Figure 38. Venting Options for Downflow Installations (*SL Series).....	48
<b>*SD, *SD-E &amp; *SM Series</b>	
Figure 39. Horizontal & Vertical Venting.....	49
Figure 40. Venting Options for Upflow Installations (*SD & *SD-E Series).....	50
Figure 41. Venting Options for Horizontal Installations (*SD & *SD-E Series).....	51
Figure 42. Venting Options for Downflow Installations (*SM Series).....	52
<b>TROUBLESHOOTING .....</b>	<b>53</b>
Table 18. Control Board Fault Conditions.....	53
<b>FURNACE COMPONENTS .....</b>	<b>53</b>
Table 19. Motor Control Board Fault Conditions .....	53
Figure 43. *SC & *SD & *SD-E Component Locations.....	54
Figure 44. *SL & *SM Component Locations.....	55
<b>INSTALLATION CHECKLIST.....</b>	<b>56</b>

## 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.

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### **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.**

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### **WARNING:**

**Unless otherwise noted in these instructions, only factory authorized kits or accessories may be used with or when modifying this product.**

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### **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.**

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### **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.**

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- To minimize equipment failure or personal injury, it is essential that only qualified individuals install, service, or maintain this equipment. If you do not possess 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 32 \(page 38\)](#), [Figure 33 \(page 39\)](#), 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 [Table 6 \(page 32\)](#), [Table 7 \(page 33\)](#), [Table 8 \(page 34\)](#), [Table 9 \(page 36\)](#), & [Table 10 \(page 37\)](#) and 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](http://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

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### CAUTION:

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#### Combustion air must not be drawn from a corrosive atmosphere.

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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

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### WARNING:

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**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.**

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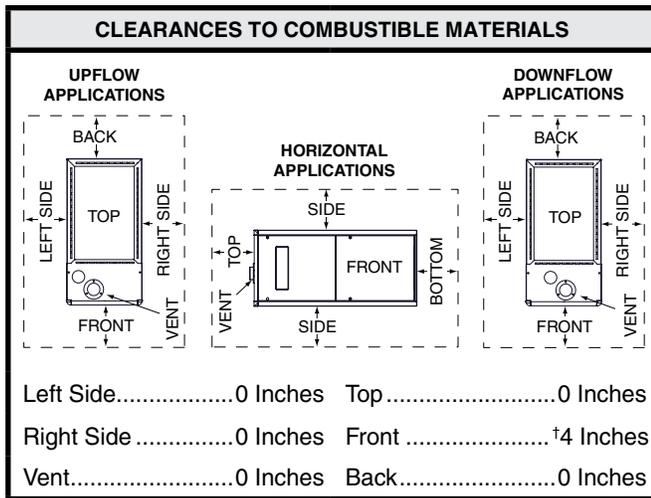
This gas-fired furnace may be installed in a residential garage with the provision that the burners and igniter are located no less than 18 inches (457mm) above the floor. The furnace must be located or protected to prevent physical damage by vehicles.

#### Clearances to Combustible Materials

This furnace is Design Certified in the U.S. and Canada by CSA International 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. Downflow models must use the appropriate subbase kit when installing over a wood floor. 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.

## COMBUSTION AIR & VENTING REQUIREMENTS



†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:**

Operating gas furnaces in construction environments can cause a variety of problems within the furnace and may significantly reduce the life or the performance of the furnace. Therefore operating the furnace during construction is not permitted and will void the warranty.

#### **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](#).

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### 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.

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### 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.

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### 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.

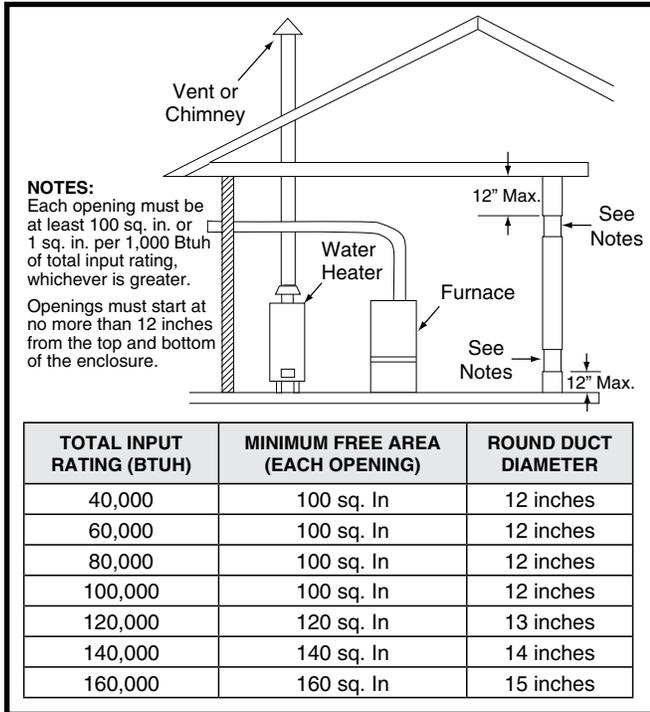
The required sizing of these openings is determined by whether inside or outside air is used to support combustion, the method by which the air is brought to the space, and by the total input rate of all appliances in the space. In all cases, the minimum dimension of any combustion air opening is 3 inches.

#### 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**

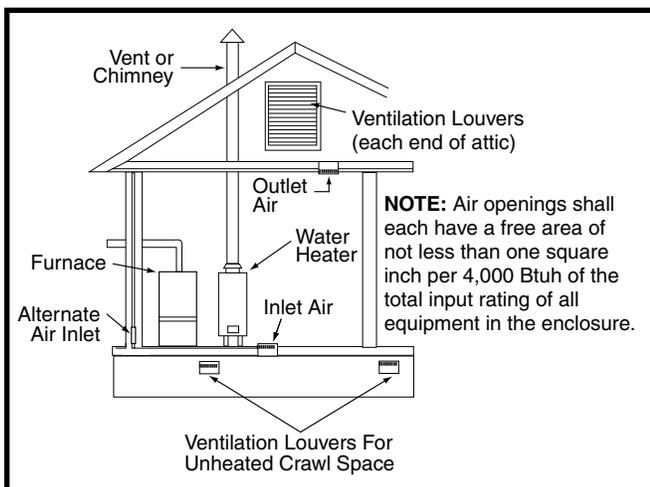
If the combined input rate of all appliances is less than or equal to 100,000 Btuh, each opening must have a free area of at least 100 in<sup>2</sup>. If the combined input rate of all appliances is 120,000 Btuh, each opening must have a free area of at least 120 in<sup>2</sup>.



**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).



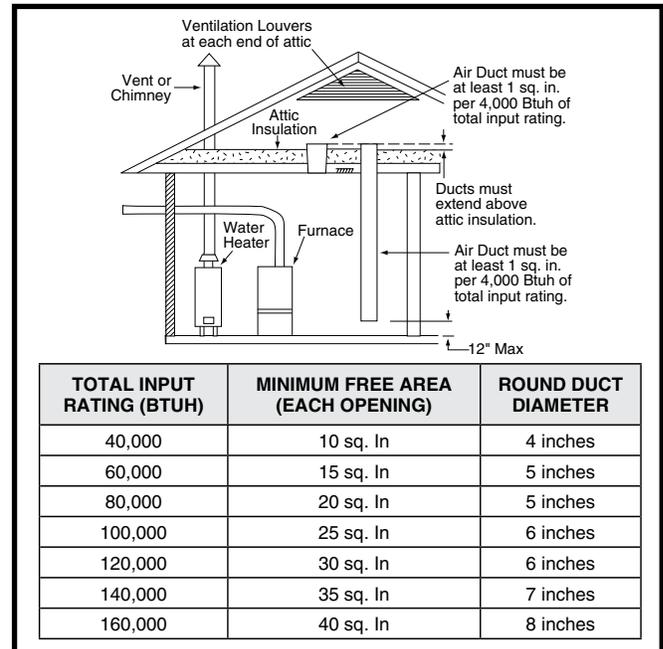
**Figure 4. Combustion Air Drawn from a Crawl Space or Vented Attic**

**Outdoor Air Using Vertical Ducts**

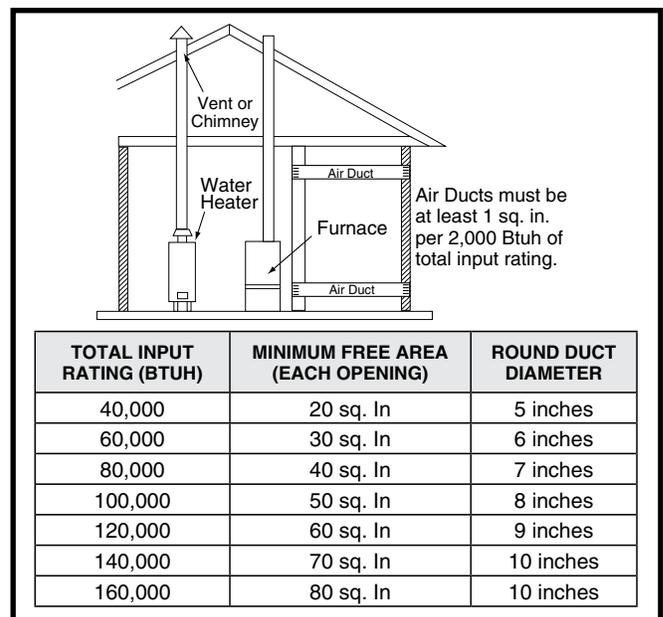
If combustion air is taken from outdoors through vertical ducts, the openings and ducts must have a minimum free area of one square inch per 4,000 Btuh of total appliance input. See Figure 4 (page 8).

**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.



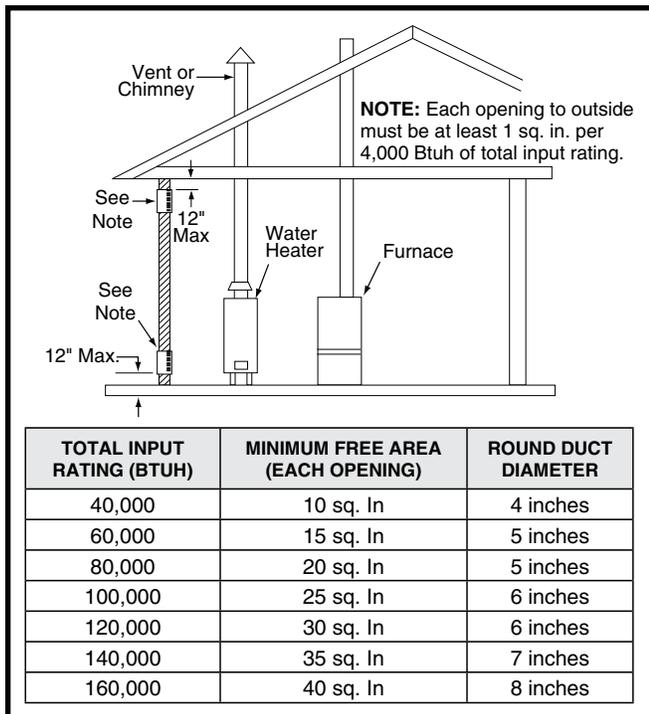
**Figure 3. Combustion Air Drawn from Outside Through Vertical Ducts**



**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](#).



**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 [ $50 \times (45 + 75) = 6,000$ ] to be considered unconfined. If the space has an 8 foot ceiling, the floor area of the space must be 750 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 listed in [Table 1](#).

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.

MATERIALS	STANDARDS
Schedule 40PVC .....	D1785
CPVC.....	D1784
PVC-DWV.....	D2665
SDR-21 & SDR-26.....	D2241
ABS-DWV.....	D2661
Schedule 40 ABS .....	F628
Foam / Cellular Core PVC.....	F891
*PolyPro® by DuraVent.....	ULC-S636
CPVC.....	D1784

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

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

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

## Vent Pipe 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 1 (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 1. 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.

## 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).

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	Upflow	70	90	70	90
	Downflow	70	90	70	90
72,000	Upflow	50	90	50	90
	Downflow	50	90	50	90
90,000	Upflow	60	90	60	90
	Downflow	60	90	60	90
108,000	Upflow	N/A	90	N/A	90
118,000	Downflow	N/A	90	N/A	90
120,000	Upflow	N/A	90	N/A	90
	Downflow	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.

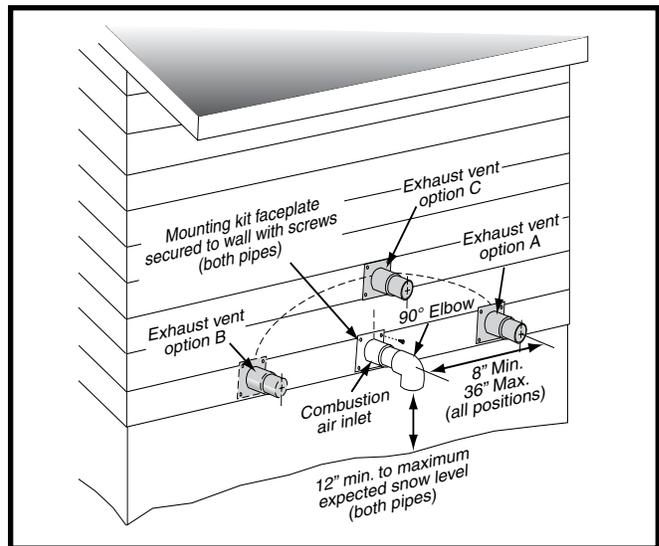
**Table 1. Vent Pipe Lengths**

- 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 34 \(page 44\)](#) or [Figure 39 \(page 49\)](#).
- 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 34](#) or [Figure 39](#)). 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:

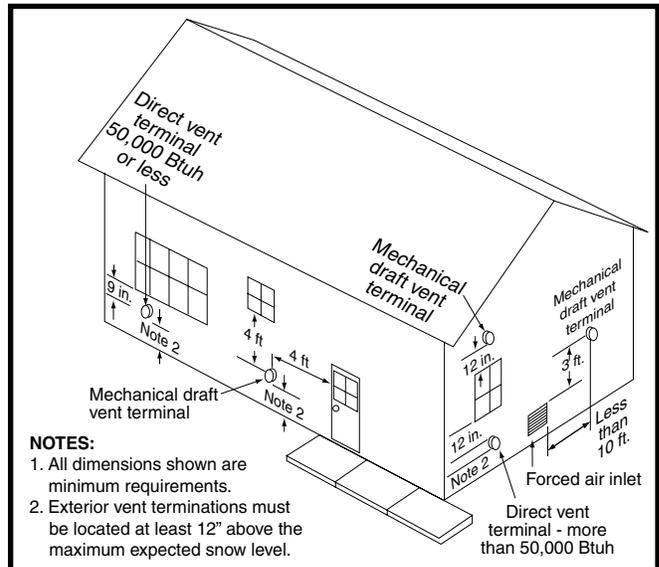
1. Slide the rubber coupling over the end of the pipe that is attached to the furnace and secure it with one of the hose clamps.
2. Slide the other end of the rubber coupling onto the other pipe from the vent.
3. Secure the coupling with the second hose clamp, ensuring that the connection is tight and 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 16 (page 43) lists the necessary distances from the vent termination to windows and building air intakes.
- 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 17 \(page 43\)](#).
- All minimum clearances must be maintained to protect building materials from degradation by flue gases. See ([Figure 8](#)).
- 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.
- Do not install the vent terminal such that exhaust is directed into window wells, stairwells, under decks or into



**Figure 7. Inlet & Exhaust Pipe Clearances**

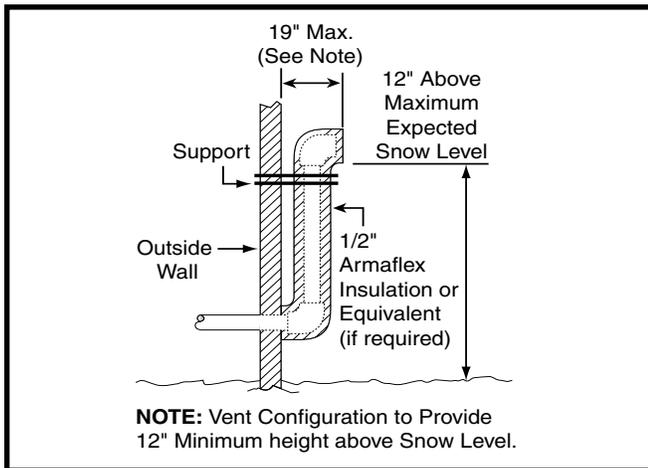


**NOTES:**

1. All dimensions shown are minimum requirements.
2. Exterior vent terminations must be located at least 12" above the maximum expected snow level.

**Figure 8. Vent Locations**

- alcoves or similar recessed areas, and do not terminate above any public walkways.
- If venting horizontally, a side wall vent kit is available according to the pipe diameter size of the installation. For 2 inch pipe use side wall vent kit #904617, and for 3 inch pipe use kit #904347. **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.
  - 2 Inch pipe: U.S. use kit #904177 / Canada use kit #904952
  - 3 inch pipe: U.S. use kit # 904176 / Canada use kit #904953
- 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 3 \(page 15\)](#) for vent freezing protection.



**Figure 9. Alternate Horizontal Vent Installation**

### 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:

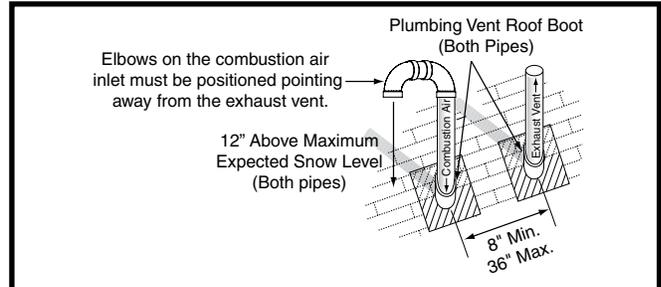
**When the vent pipe is exposed to temperatures below freezing (i.e., when it passes through unheated spaces, chimneys, etc.) the pipe must be insulated with 1/2 inch thick sponge rubber insulation, Armaflex-type insulation or equivalent. Insulating pipe is important to avoid condensate icing.**

- Table 2 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 1 (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 1. 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.

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 2. Vent Protection**



**Figure 10. Vertical Vent Termination**

- 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 36 (page 46) & Figure 37 (page 47). For \*SD & \*SD-E series, see Figure 41 (page 51).
- 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 P/N 902377 is available for use with this furnace. **Please follow the instructions provided with the kit.**

This furnace has multiple options for positioning the vent pipe as described in the, Vent and Inducer Assembly Options section (page 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 \(page 15\)](#).

## 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).
- [Table 6 \(page 32\)](#), [Table 7 \(page 33\)](#), [Table 8 \(page 34\)](#), [Table 9 \(page 36\)](#), & [Table 10 \(page 37\)](#) contain the maximum airflow and temperature rise data for each furnace input rate. If the maximum airflow is 1,600 CFM or more, it is recommended that two openings be used for return air on upflow furnaces. Downflow furnaces can only use one return opening.
- It is recommended that the outlet duct contain a removable access panel. The opening should be accessible when the furnace is installed in service and shall be of a size that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover for the opening shall be attached in 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 30 \(page 30\)](#) or [Figure 31 \(page 31\)](#) 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 32](#)) 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.**

- **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 31](#)). 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 31](#)) 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.

## Downflow Furnaces

- To attach the return air duct to the furnace, bend the flanges on the furnace upward 90° with wide duct pliers. See [Figure 30](#) for furnace flange locations. **NOTE:** If system installation includes AC coil casing, bend the flanges on the coil casing upward 90° before attaching the return air duct.
- Secure the return air ductwork to the furnace or coil casing (if installed) with sheet metal screws. Make sure the screws penetrate the sheet metal casing and flanges.

## 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 31](#) 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 30 \(page 30\)](#) and [Figure 31 \(page 31\)](#) 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 & \*SD-E 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. \*SL & \*SM series gas furnaces may only be installed as a downflow application.

### General Requirements

- The furnace must be leveled at installation and attached to a properly installed duct system. See [Figure 1 \(page 6\)](#) 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 10](#), [page 11](#), & [page 12](#) for venting guidelines and specifications.

### Upflow Furnaces

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#### **WARNING:**

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

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\*SC, \*SD & \*SD-E series gas furnaces are shipped with the bottom panel installed as shown in [Figure 31 \(page 31\)](#). 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

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#### **WARNING:**

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

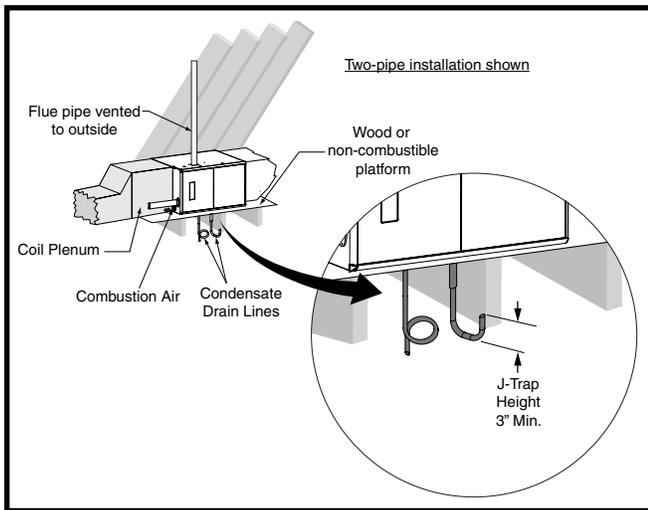
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\*SC, \*SD & \*SD-E series gas furnaces can be installed horizontally ([Figure 11](#)) in an attic, basement, crawl space or alcove. It can also be suspended from a ceiling in a basement or utility room in either a right to left airflow or left to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

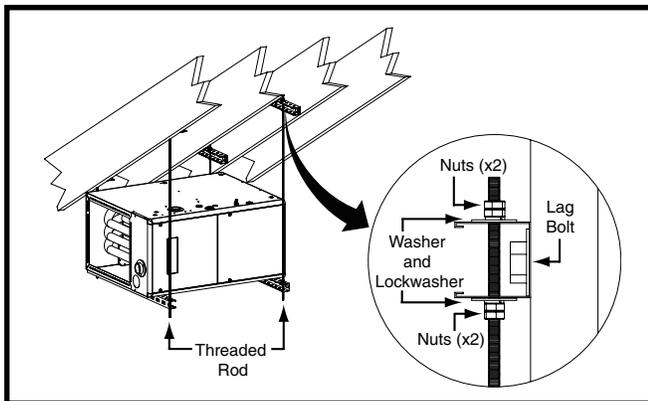
These furnaces are shipped with the bottom panel installed. If the furnace is installed horizontally, remove the bottom panel from the furnace before attaching the duct system. See Bottom Panel Removal on [page 19](#).

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.

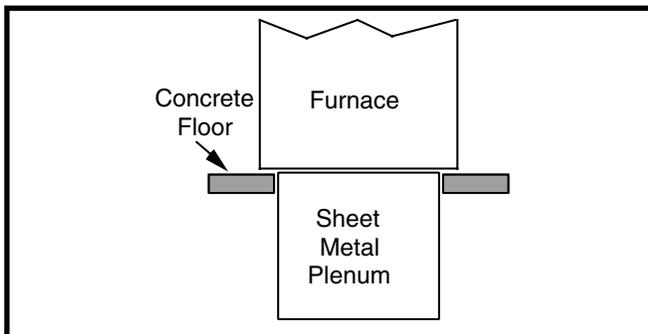
**NOTE:** Although it is not required to use a drip pan for heat only applications, state and local codes may require it.



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



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



**Figure 13. Furnace on a Concrete Slab**

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.

## Downflow Furnaces

### **⚠ WARNING:**

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

### **⚠ WARNING:**

Failure to install the downflow sub-base kit may result in fire, property damage or personal injury.

To install an \*SL & \*SM series gas furnace on combustible flooring, a special sub-base is required. Downflow sub-base kits are factory supplied accessories and are listed according to the cabinet letter of the furnace. For 'B', 'C', and 'D' size cabinets use Kit #904911. Please follow the instructions provided with the kit.

A downflow sub-base kit is not necessary if the furnace is installed on a factory or site-built cased air conditioning coil. However, the plenum attached to the coil casing must be installed so that its surfaces are at least 1" from combustible construction.

### Installation on a Concrete Slab

1. Create an opening in the floor according to the dimensions in Table 3.
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-24B1	16 5/8	19 1/4
072D-24B1	16 5/8	19 1/4
072D-35C1	20 1/8	19 1/4
090D-35C1	20 1/8	19 1/4
118D-45D1	23 5/8	19 1/4
120D-45D1	23 5/8	19 1/4

NOTE: Dimensions shown in Inches.

**Table 3. Cutout Dimensions**

Before using [Table 4](#), the number of pipes (1-pipe or 2-pipe) connected to the furnace must be known. Find the proper furnace style (upflow, horizontal, or downflow) and then the side that the pipes will exit from the furnace. Finally select the option that properly matches your installation type. For \*SC & \*SL series, [Figure 34](#), [Figure 35](#), [Figure 36](#), [Figure 37](#), or [Figure 38](#). For \*SD, \*SD-E & \*SM series, see [Figure 39](#), [Figure 40](#), [Figure 41](#), or [Figure 42](#).

**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](#) and [Figure 31](#).

### 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 & *SL SERIES - CONVENTIONAL (1 PIPE)				
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT	DOWNFLOW
Up	Option 1	Option 7	Option 10	Option 15
Right	Option 2	Option 8	N/A	Option 16
Left	Option 3	N/A	Option 9	Option 17

*SC & *SL SERIES - DIRECT VENT (2-PIPE)				
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT	DOWNFLOW
Up	Option 4	Option 12	Option 14	Option 18
Right	Option 5	Option 11	N/A	Option 19
Left	Option 6	N/A	Option 13	Option 20

*SD, *SD-E & *SM SERIES - CONVENTIONAL (1 PIPE)				
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT	DOWNFLOW
Right	Option 21	N/A	N/A	Option 29
Up	N/A	Option 25	Option 26	Option 30
Left	Option 22	N/A	N/A	Option 31

*SD, *SD-E & *SM SERIES - DIRECT VENT (2-PIPE)				
VENT DIRECTION	UPFLOW	HORIZONTAL RIGHT	HORIZONTAL LEFT	DOWNFLOW
Right	Option 23	N/A	N/A	Option 32
Up	N/A	Option 27	Option 28	Option 33
Left	Option 24	N/A	N/A	Option 34

**Table 4. 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 & \*SL series, refer to [Figure 34](#), [Figure 35](#), [Figure 36](#), [Figure 37](#), or [Figure 38](#). For \*SD, \*SD-E & \*SM series, refer to [Figure 39](#), [Figure 40](#), [Figure 41](#), or [Figure 42](#).
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 & \*SD-E furnaces. Downflow (\*SL & \*SM) furnaces require only one switch connected to the inducer's static tap as shown in [Figure 16](#) (page 17).

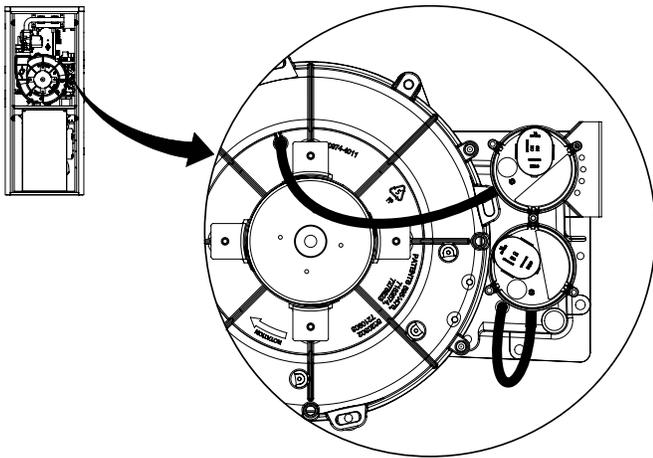
### Alternate Pressure Switch Location

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:

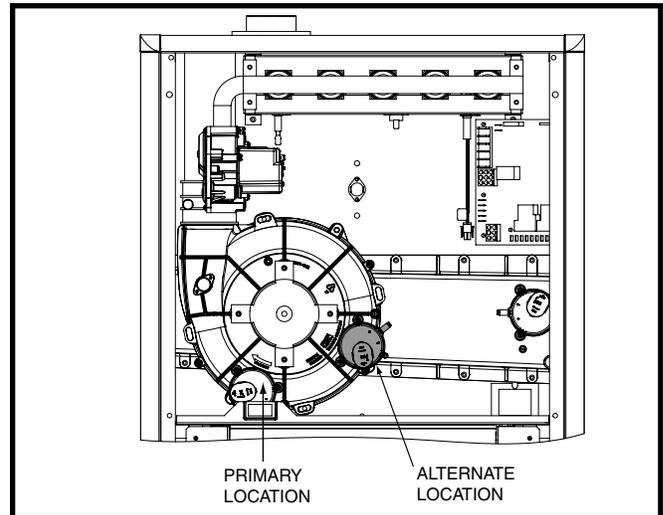
1. Shut off any electrical power to the furnace.
2. Label and disconnect the tubing and wires from the pressure switch ([Figure 17](#) (page 17)).
3. Remove two screws securing the pressure switch to the inducer housing.
4. Remove the pressure switch from the mounts on the inducer housing and relocate 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

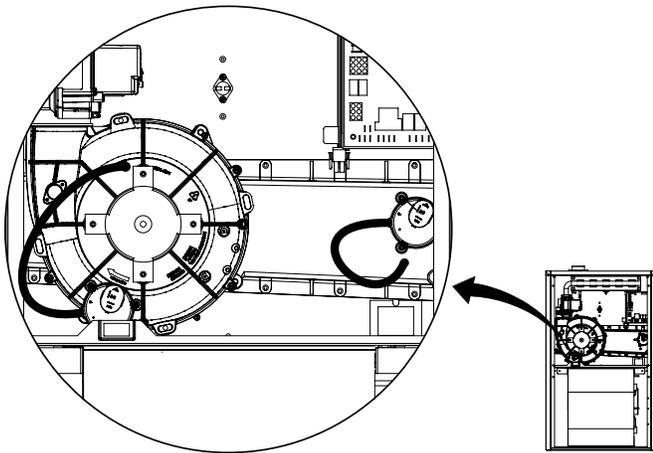
The components below are included in the extra parts bag that is supplied with the purchase of your furnace. Depending on your particular installation, some of these components are optional and may not be used. Please refer to the descriptions and accompanying figures when installing these items. **NOTE:**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



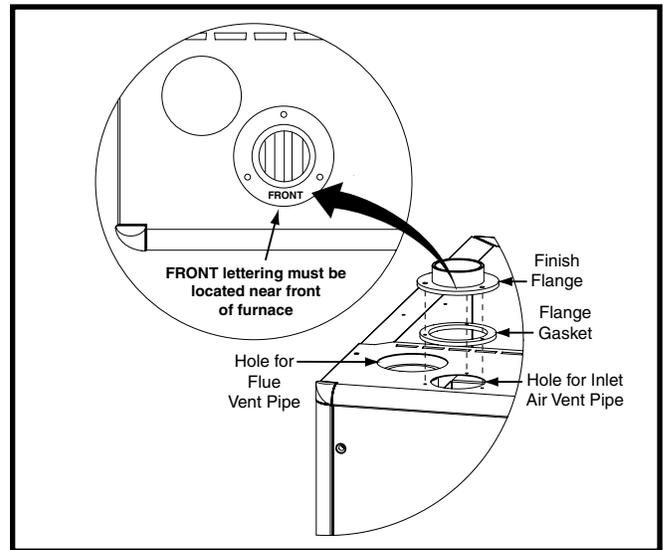
**Figure 14. Pressure Switch Tubing for \*SD038 Furnaces Only**



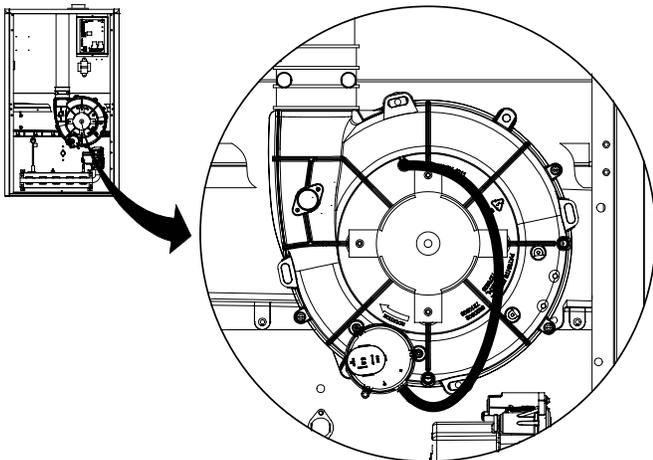
**Figure 17. Alternate Pressure Switch Location**



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



**Figure 18. Finish Flange**



**Figure 16. Pressure Switch Tubing for Downflow Furnaces**  
 Models \*SL054, \*SL072, \*SL090, & \*SL120  
 Models \*SM054, \*SM072, \*SM090, & \*SM118

**Finish Flange**

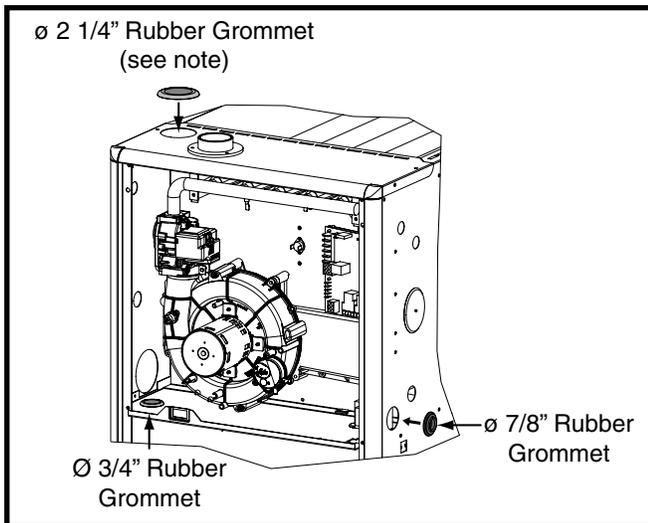
The finish flange must be installed to vent the combustion air pipe through the top of the furnace. **NOTE:** For proper installation it is important that the pipe and screw holes in the finish flanges, gasket, and cabinet are aligned. See [Figure 18](#).

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 18](#).
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 19](#) (page 18).

The 7/8" rubber grommet is used to seal the opening between the furnace cabinet and the gas pipe. The rubber grommet



**Figure 19. Rubber Grommets**

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.

### PVC Components

#### **IMPORTANT NOTES:**

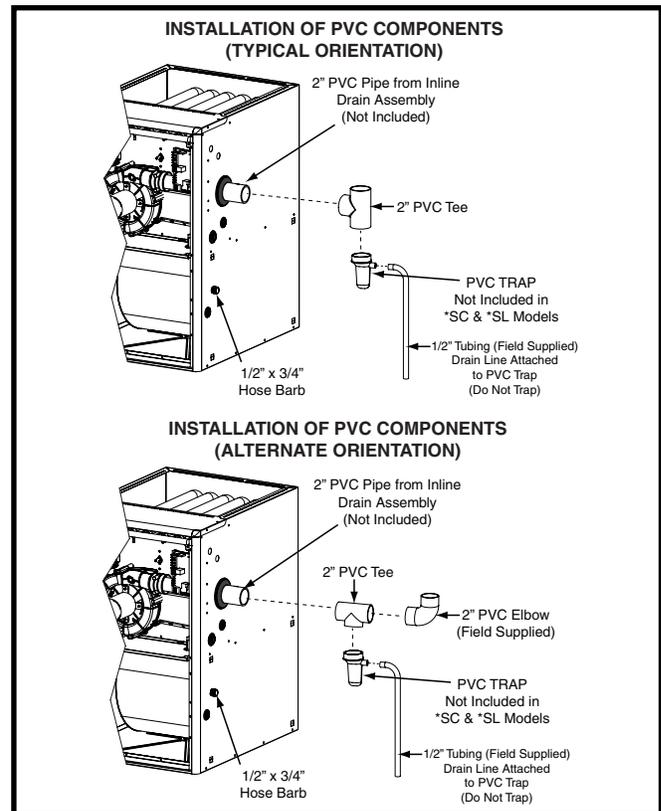
- Before permanently installing these components, it is recommended you dry-fit them first to ensure proper fit and alignment with other vent pipes.
- The 2" PVC components shown in Figure 20 are not provided in the extra parts bag for \*SC & \*SL models. However the PVC Trap (P/N 664659) can be purchased 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 20.

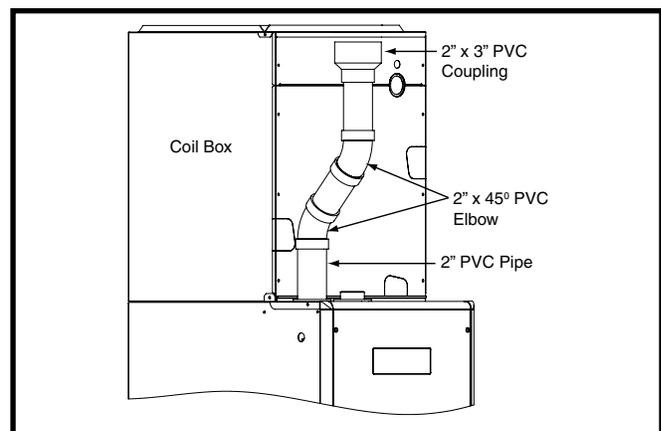
The 1/2" X 3/4" hose barb can be used to route the condensate drain to the outside of the cabinet. It must be installed from inside the cabinet with the threaded end inserted thru the 1 1/16" hole. The condensate drain should be connected to the barbed end. Attach 1" PVC drain line to the threaded end. See Figure 30 (page 30) or Figure 31 (page 31) 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 20.
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 20. PVC Components**



**Figure 21. 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 20.
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 or \*SD-E 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 21 \(page 18\)](#).
- 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 4 \(page 16\)](#). 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 & \*SL series, see [Figure 35 \(page 45\)](#) [Figure 36 \(page 46\)](#), [Figure 37 \(page 47\)](#), & [Figure 38 \(page 48\)](#). For \*SD, \*SD-E & \*SM series, see [Figure 40 \(page 50\)](#) [Figure 41 \(page 51\)](#), & [Figure 42 \(page 52\)](#). To rotate the J-trap, loosen the clamp on the drain tube, rotate the J-trap to either side, and retighten 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 22](#).

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

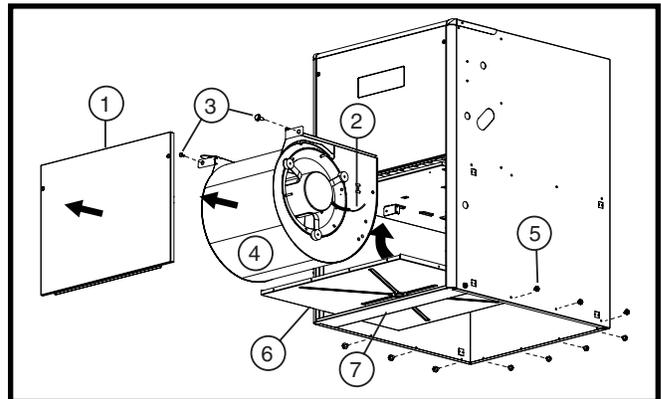


Figure 22. Bottom Panel Removal

### Alternate Bottom Panel Removal

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

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

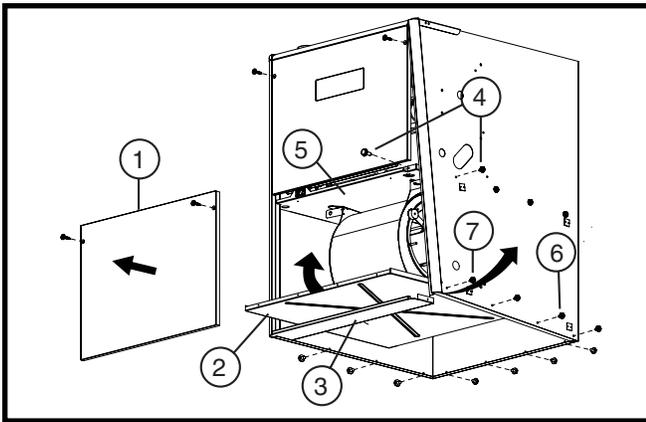


Figure 23. Alternate Removal Method

## GAS SUPPLY & PIPING

### ⚠ WARNING:

#### FIRE OR EXPLOSION HAZARD

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

#### WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a 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 24 \(page 22\)](#) & [Figure 25 \(page 23\)](#). 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 24](#) or [Figure 25](#).

Table 11 (page 40) lists gas flow capacities for standard pipe sizes as a function of length in typical applications based on nominal pressure drop in the line.

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 24](#) & [Figure 25](#).

### Leak Check

### ⚠ WARNING:

#### FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury 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 retightened. Repeat the tightening and soap check process until bubbling ceases.

#### IMPORTANT NOTE:

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

#### High Altitude Application (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 15 & Table 16 \(page 42\)](#) contain the manifold pressure and orifice sizes to use at various altitudes. [Table 15 \(HIGH\)](#) is for natural gas installations with a heating value of more than 1,000 Btu per cubic foot and [Table 16 \(LOW\)](#) 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 14 \(page 41\)](#), find your local heating value as supplied by the utility company. Follow down the column and stop at your altitude level.
3. If your sea level heating value is HIGH, use [Table 15](#) or if it’s LOW, use [Table 16](#). See [Example](#) below.

<b>EXAMPLE</b>	
<b>Elevation:</b> .....	5,000 feet
<b>Type of Gas:</b> .....	Natural Gas
<b>Local Heating Value of Gas:</b> .....	750
From <a href="#">Table 14</a> , find 750 and follow down the column, stop at the 5,000 feet row. The heating value listed is LOW. <a href="#">Table 16</a> 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:

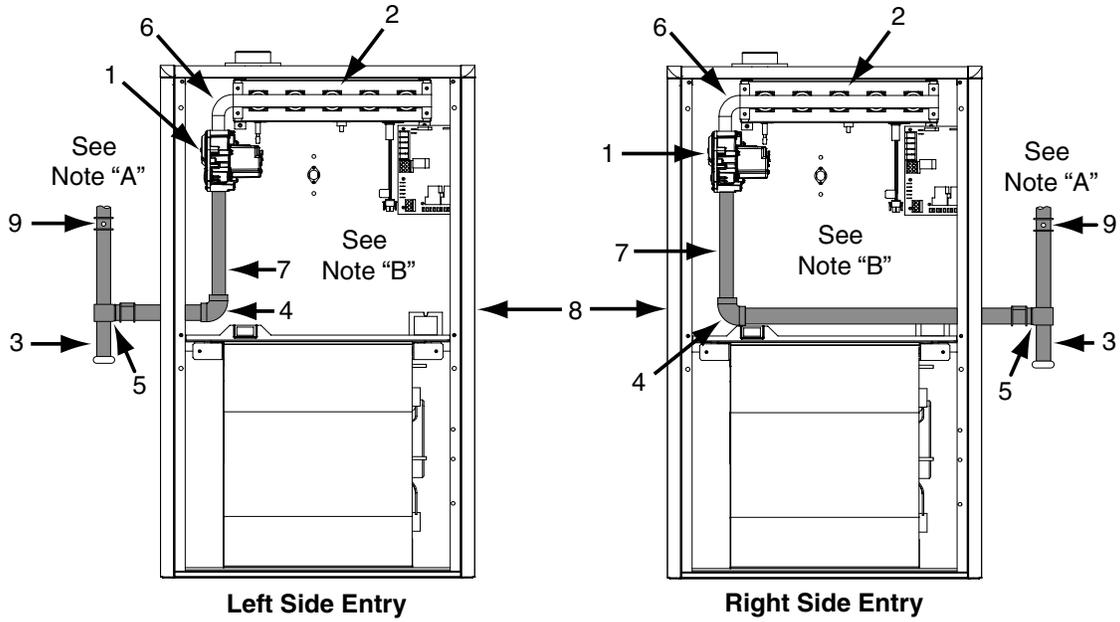
- **Installations in the United States:** For Propane (LP) conversion or for LP gas installations in altitudes between 2,000 ft. and 10,000 ft. above sea level, use the LP & High Altitude LP Gas Conversion Kit (P/N 905028) for Installations in the United States. **Please follow the instructions provided 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 13 \(page 41\)](#) to determine the correct orifice size and regulator pressure. See [Example](#) below.

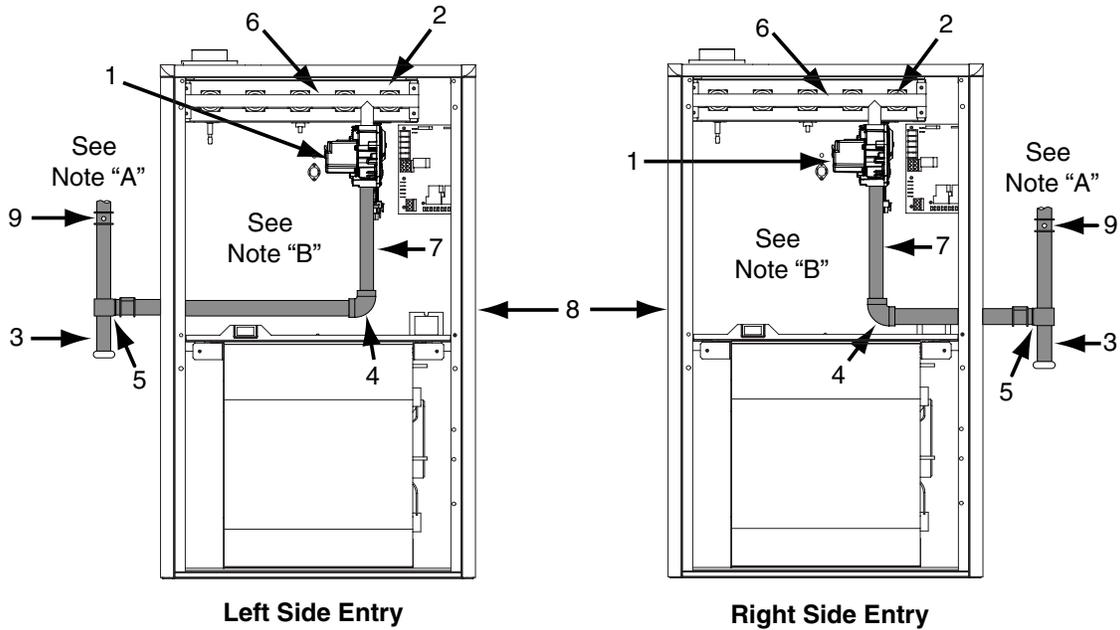
<b>EXAMPLE</b>	
<b>Elevation:</b> .....	5,000 feet
<b>Type of Gas:</b> .....	Propane Gas
<b>Input BTUH of Furnace:</b> .....	72,000
From <a href="#">Table 13</a> , find 5,000 and follow across the row, stop at the 72,000 btu column. The manifold pressure listed is 10.0 and the orifice size is 57.	

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

**\*SC SERIES**



**\*SD & \*SD-E SERIES**



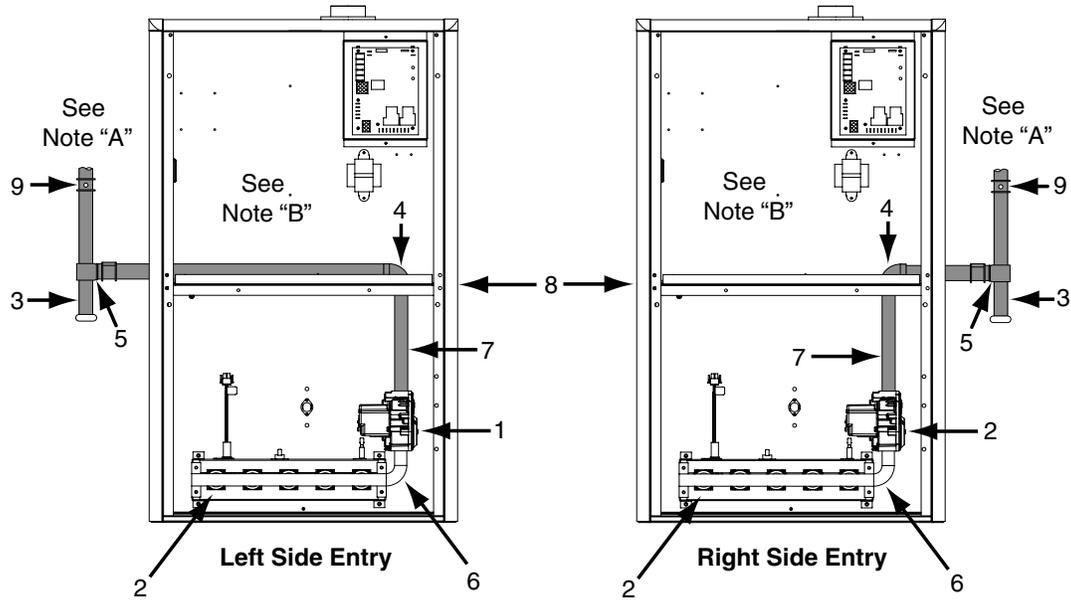
**COMPONENTS:**

- |   |                       |                   |
|---|-----------------------|-------------------|
| 1. Automatic Gas Valve w/ manual shut-off | 2. Burner Assembly    | 3. Drip Leg       |
| 4. Elbow                                  | 5. Ground Joint Union | 6. Manifold       |
| 7. Pipe Nipple                            | 8. Plug               | 9. Shut-Off Valve |

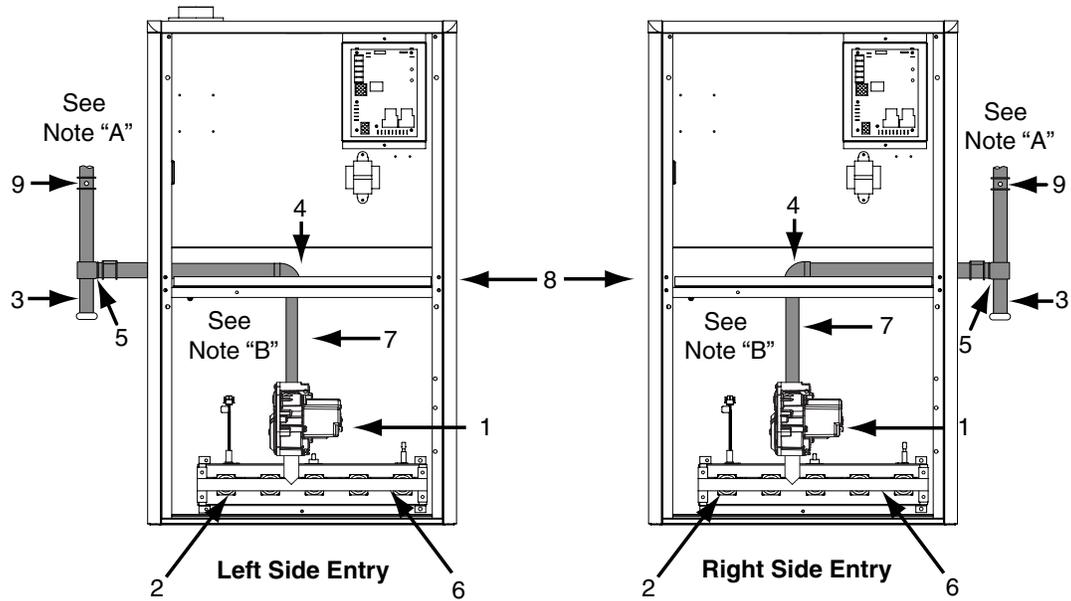
**NOTE A:** Consult local codes for Shut-Off Valve location requirements  
**NOTE B:** Inducer assembly omitted for clarity of pipe installation

**Figure 24. Typical Gas Connections - Upflow Models**

**\*SL SERIES**



**\*SM SERIES**



**COMPONENTS:**

- |   |                       |                   |
|---|-----------------------|-------------------|
| 1. Automatic Gas Valve w/ manual shut-off | 2. Burner Assembly    | 3. Drip Leg       |
| 4. Elbow                                  | 5. Ground Joint Union | 6. Manifold       |
| 7. Pipe Nipple                            | 8. Plug               | 9. Shut-Off Valve |

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

**Figure 25. Typical Gas Connections - Downflow Models**

## ELECTRICAL WIRING

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury 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 5 \(page 24\)](#).

## Line Voltage Wiring

It is recommended that the line voltage (115 VAC) to the furnace be supplied from a dedicated branch circuit containing the correct fuse or circuit breaker for the furnace as listed in [Table 5 \(page 24\)](#).

The installer should become familiar with the units wiring diagram before making any electrical connections to the unit. See [Figure 32 \(page 38\)](#), [Figure 33 \(page 39\)](#), 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 26 \(page 25\)](#) 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 26](#).

## Grounding

### **WARNING:**

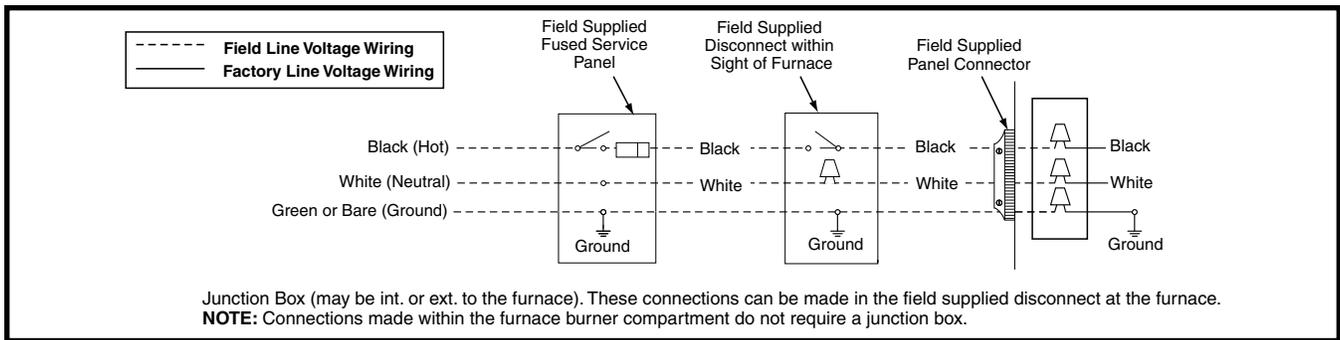
**To minimize personal injury, the furnace cabinet must have an uninterrupted or unbroken electrical ground. The controls used in this furnace require an earth ground to operate properly. Acceptable methods include electrical wire or conduit approved for ground service. Do not use gas piping as an electrical 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*
038D-24A1	38,000	14 ¼	115-60-1	127	103	6.6	15
038D-23EB1	38,000	17 ½	115-60-1	127	103	8.2	15
054D-24B1	54,000	17 ½	115-60-1	127	103	11.6	15
054D-23EB1	54,000	17 ½	115-60-1	127	103	6.2	15
072D-24B1	72,000	17 ½	115-60-1	127	103	11.6	15
072D-35C1	72,000	21	115-60-1	127	103	10.9	15
072D-35EC1	72,000	21	115-60-1	127	103	8.7	15
090D-35C1	90,000	21	115-60-1	127	103	15.3	20
090D-35EC1	90,000	21	115-60-1	127	103	8.7	15
108D-45D1	108,000	24 ½	115-60-1	127	103	17.2	20
108D-35ED1	108,000	24 ½	115-60-1	127	103	11.7	15
118D-45D1	118,000	24 ½	115-60-1	127	103	17.2	20
120D-45D1	120,000	24 ½	115-60-1	127	103	17.2	20
120D-35ED1	120,000	24 ½	115-60-1	127	103	11.7	15

\* Time-delay fuses or circuit breakers are required.

THERMOSTAT WIRE GAUGE	RECOMMENDED THERMOSTAT WIRE LENGTH	
	2 - WIRE - HEATING	4 OR 5 WIRE - COOLING
24	55 ft.	25 ft.
22	90 ft.	45 ft.
20	140 ft.	70 ft.
18	225 ft.	110 ft.

**Table 5. Wire Length & Voltage Specifications**



**Figure 26. 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 27](#) 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 5 \(page 24\)](#).
- 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.
- The six pin terminal marked “Expansion Port” ([Figure 27](#)) is not used in the single stage furnace as shipped from the factory. It is used for the furnace control board to communicate to a fixed speed or variable speed high efficiency motor that may be optionally installed. Please contact your distributor for the proper upgrade motor kit.

**Twinning**

Single stage furnaces are not supplied with a built-in twinning capability. Other valuable features and enhancements were made to the new control that made it necessary to remove the twinning capability. For twinning of single stage furnaces with PSC motors, a twinning kit (1010035) is available for purchase. **Please follow the instructions provided with the kit.**

If both single stage furnaces are upgraded to the fixed speed iSEER™ blower, the twin terminal on both blower control boards ([Figure 28](#)) may be used to twin the single stage furnaces. The twinning system requires a relay (P/N 624843) in the secondary furnace for proper twinning.

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

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

**Furnaces equipped with variable speed iSEER™ motors may not be twinned under any circumstances.**

**⚠ WARNING:**

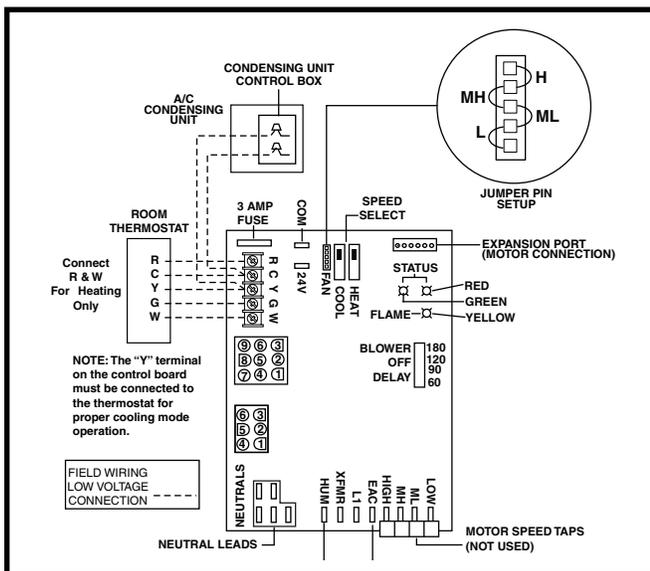
**When servicing either twinned furnace, power must be turned off on both furnaces. Failure to comply may result in improper operation leading to damage to the furnaces or personal injury!**

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.

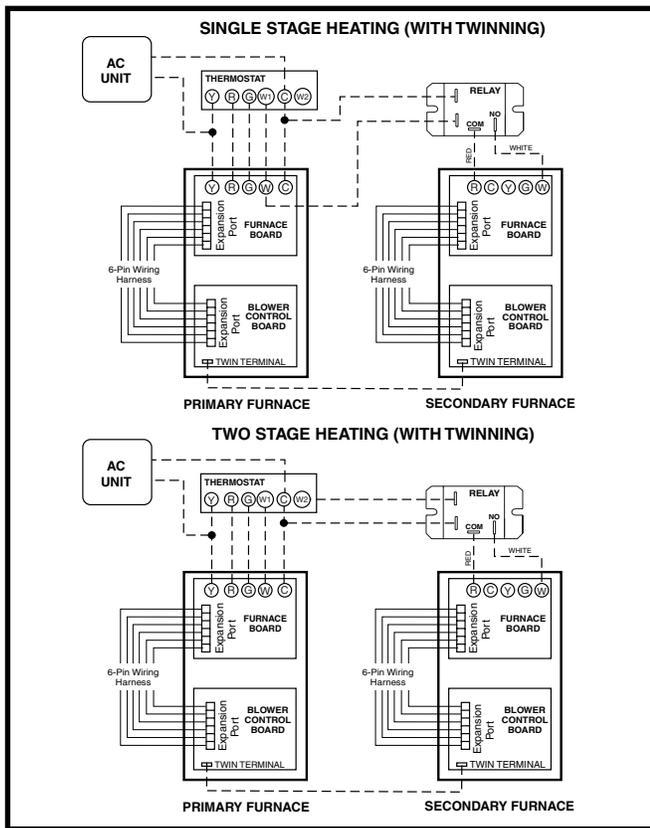
**NOTE:** One furnace can be used for one stage of heating and the other furnace can be used for the second stage of heating. The installer also has the choice of running one furnace only or both furnaces. In both cases the blowers will run at the same time and at the same speeds:

**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).



**Figure 27. Low Voltage Field, Four-wire Heating/Cooling Applications**



**Figure 28. Single & Two Stage Twinning**

- 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 setting (for fan speed) on the control board. To select fan speed, see [Figure 27 \(page 25\)](#) and set the jumper on the control board.
- ✓ Verify the gas line service pressure does not exceed 10.0 inches of W.C., and is not less than 4.5 inches W.C. for natural gas. For LP gas the line service pressure must not exceed 14 in. W.C., and must not be less than 11.0 in. W.C.
- ✓ Verify the roll-out and manual reset switch is closed. If necessary, press the red button to reset a switch. **DO NOT** install a jumper wire across a switch to defeat its function. If a switch reopens on startup, **DO NOT** reset the switch without identifying and correcting the fault condition.
- ✓ Verify the blower door is in place, closing the door switch in the line voltage circuit.
- ✓ Verify the gas line has been purged and all connections are leak free.

### Start-up Procedures

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

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the furnace.
3. Follow the Operating Instructions on the label attached to the furnace.
4. Set the thermostat above room temperature and verify the Operating Sequence ([page 28](#)).
5. After 5 minutes of operation, set the thermostat below room temperature and verify steps 9 - 10 of the Operating Sequence.

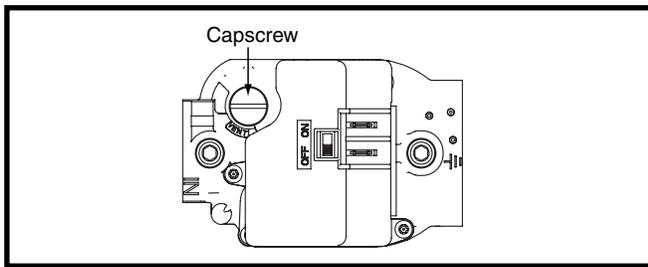
### Verifying & Adjusting Input Rate

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 11 \(page 40\)](#).
5. Multiply the gas flow rate in cubic ft per hr by the heating value of the gas in Btu per cubic ft to obtain the input rate in Btuh. See example.

#### EXAMPLE:

- Time for 1 revolution of a gas meter with a 1 cubic ft dial = 40 seconds.
- From [Table 11](#) 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.



**Figure 29. Regulator Capscrew**

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

### **WARNING:**

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

- Obtain the manifold pressure setting required for this installation by referring to [Table 13 \(page 41\)](#) for Propane or [Table 15 \(page 42\)](#) or [Table 16 \(page 42\)](#) for Natural Gas.
- Remove the regulator capscrew ([Figure 29](#)) from the INLET side of the regulator.
- 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.

- 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.

- 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.
- Adjust all registers and duct dampers to the desired position and run the furnace for 10 to 15 minutes before taking any temperature readings. The temperature rise is the difference between the supply and return air temperatures.

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

**NOTE:** Lowering the blower speed will increase the temperature rise and a higher blower speed will decrease the temperature rise.

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

### **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.**

- Remove the burner compartment door.
- 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.
- After validating the flame, change thermostat setting to below room temperature.
- Verify the burner flame is completely extinguished.
- 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.

- Verify the blower door is securely mounted in place and that there is power to the furnace.
- Block the return airflow to the furnace by installing a close-off plate in place of or upstream of the filter(s).
- Set the thermostat above room temperature and observe the Operating Sequence.
- 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.

### **Configuring The Blower**

The fixed speed high efficiency blower kit is equipped with a microprocessor control which is designed to provide a variety of system airflows and comfort options. Before operation, the fixed speed high efficiency blower must be configured to match the unit with the system, system options, and climate conditions. The blower is configured by setting the 8 switches located on the motor control board as described below.

#### **IMPORTANT NOTE:**

**The fixed speed high efficiency blower kit is designed to give the installer maximum flexibility to optimize system performance, efficiency, and comfort. Because there are so many way to configure the kit, it is important to read and follow these instructions carefully.**

### **Selecting the (Gas) Heating Speed**

The motor torque during heating is selected by setting switches 1 through 4 (also marked as HEAT) on the motor control board. Refer to [Table 8 \(page 34\)](#) and select an airflow to allow the furnace to reach an appropriate heat rise as shown on the unit rating plate. **NOTE:** To reduce the heat rise, select a higher airflow; to increase the heat rise, select a lower airflow. Make sure that the selected rise is within the specification of the furnace as shown on the furnace rating label.

## Determining Nominal System Capacity

In order to select the appropriate airflow for the AC and HP operation, the nominal system capacity must be known. The nominal system capacity is ALWAYS the nominal capacity of the outdoor unit. In some cases, the nominal system capacity is not the same as the nominal capacity of the indoor coil.

## Selecting the Cooling/Heat Pump Speed

The motor torque during cooling/heat pump is selected by setting switches 5 through 8 (also marked as COOL) on the motor control board. All motor torques for other modes of operation, except for gas heat, are determined by this setting. Refer to [Table 8 \(page 34\)](#) and select an airflow in the range recommended for the nominal system capacity.

For maximum capacity and energy efficiency, generally a selection at or near the top of the CFM range for that nominal system capacity is best. For maximum dehumidification, select an airflow near the middle or bottom of the CFM range for that nominal system capacity.

**NOTE:** If coil icing is observed, the cooling/heat pump airflow may be set too low. Make sure the setting selected is within the range shown. Also, verify the system is properly charged (see outdoor unit installation instructions). If icing continues to occur, raise the selected torque one or two steps.

## **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 slowly ramp up to the selected motor torque. 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 or Heat Pump 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 slowly ramps up to the selected cooling motor torque. If there is a humidistat connected to the motor control board calling for humidity control, the motor will operate at 70% of the torque setting. Or, if the system is installed where humidity control is desired but a humidistat is not available, the **DEHUM** and **R** terminals on the motor control board may be jumpered. In this case, the blower will operate at 60% torque for the first 10 minutes of the cycle and then return to normal torque for the remainder of the cooling cycle. After the call for cooling or heat pump is satisfied, the blower continues to operate for 60 seconds at half of the selected torque.

### Manual Fan

If equipped with an ECM motor, the manual fan switch on the thermostat is on, (energizing **G** only) the blower will ramp up to 50% of the selected cooling / heat pump motor torque. If equipped with a PSC motor, select the speed using the jumper on the control board

## **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 19 \(page 53\)](#) 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 26 \(page 25\)](#), [Figure 27 \(page 25\)](#), [Figure 32 \(page 38\)](#), and [Figure 33 \(page 39\)](#).

### **Heating Cycle**

1. The thermostat calls for heat by energizing the **W** terminal with 24VAC.
2. The control verifies the pressure switch is open.
3. If the pressure switch is open, the control energizes the inducer and waits for the pressure switch to close. The pressure switch must close within 10 seconds.
4. The control runs the inducer for a 30 second pre-purge.
5. The control energizes the Hot Surface Igniter (HSI) output for the appropriate warm-up time limit.
6. The control energizes the 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. The control will operate at the selected HEAT speed of 60, 90, 120, or 180 seconds. If the blower off delay jumper is not present, the fan should still operate for 120 seconds at the selected HEAT speed. The Indoor blower motor is de-energized after a blower off delay as selected by the movable jumper.

### **Cooling Cycle**

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

### **Fan Mode**

- When the thermostat energizes the **G** terminal for continuous fan (without calling for heat or cooling), the indoor fan is energized on the selected FAN speed. See [Figure 27 \(page 25\)](#) 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.
- The blower will operate at 50% of the selected high cooling speed for continuous fan operation in fixed speed configuration and 35% of the selected high cooling speed in variable speed configurations.

## MAINTENANCE

### **WARNING:**

#### **ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD**

**Failure to follow safety warnings exactly could result in serious injury 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 43 \(page 54\)](#) or [Figure 44 \(page 55\)](#) 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.

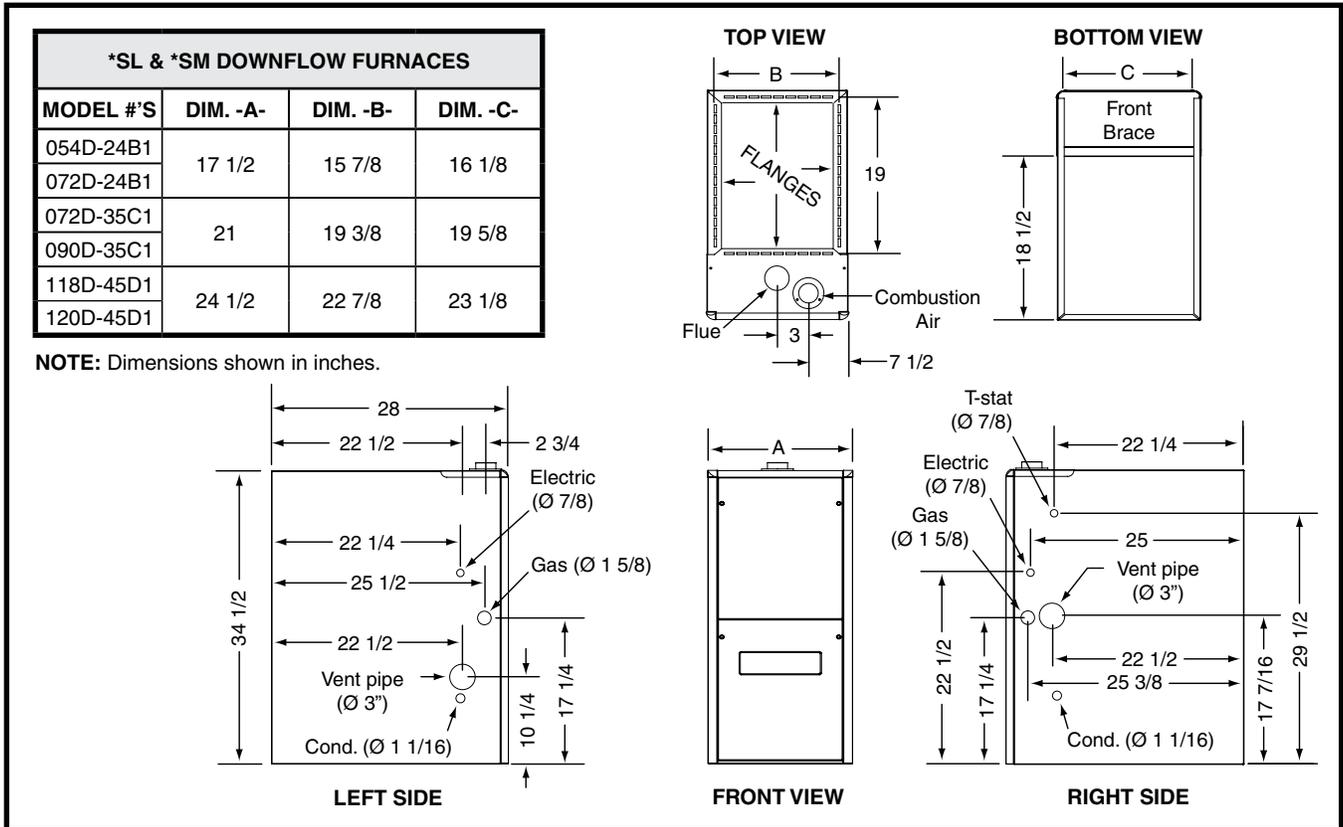
**Heat Exchanger & Burner Maintenance** - The furnace should operate for many years without soot buildup in the flue passageways, however, the flue, vent system, and burners should be inspected and cleaned (if required) by a qualified service technician annually to ensure continued safe operation. Pay 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.

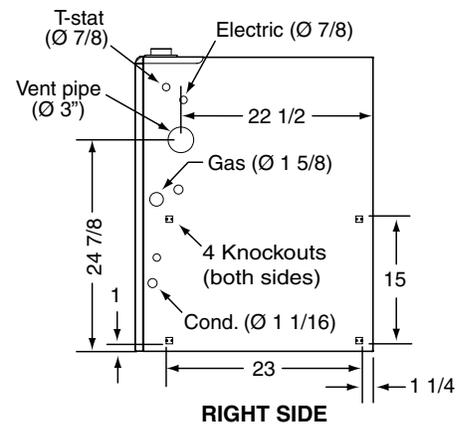
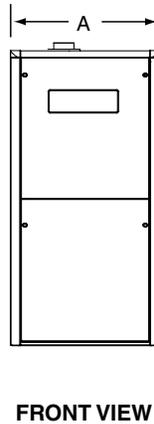
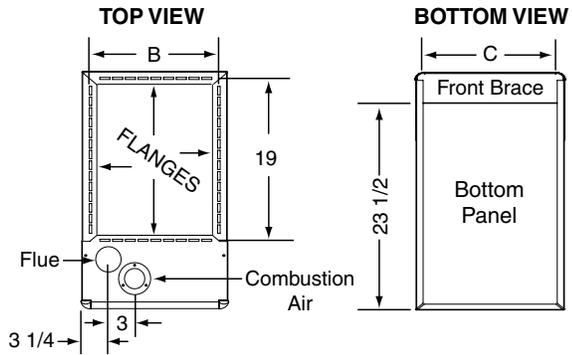
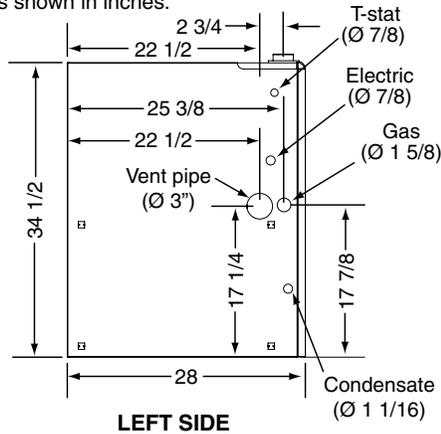
## FIGURES & TABLES



**Figure 30. \*SL & \*SM Cabinet Dimensions**

*SC UPFLOW / HORIZONTAL FURNACES			
MODEL #S	DIM. -A-	DIM. -B-	DIM. -C-
038D-23A1	14 1/4	12 5/8	12 7/8
054D-24B1	17 1/2	15 7/8	16 1/8
072D-24B1			
072D-35C1	21	19 3/8	19 5/8
090D-35C1			
108D-45D1	24 1/2	22 7/8	23 1/8
120D-45D1			

NOTE: Dimensions shown in inches.



*SD & *SD-E UPFLOW / HORIZONTAL FURNACES			
MODEL #S	DIM. -A-	DIM. -B-	DIM. -C-
038D-24B1	17 1/2	15 7/8	16 1/8
038D-23EB1			
054D-24B1	21	19 3/8	19 5/8
054D-23EB			
072D-35C1	24 1/2	22 7/8	23 1/8
072D-35EC1			
090D-35C1			
090D-35EC1			
108D-45D1			
108D-35ED1			
120D-45D1			
120D-35ED1			

NOTE: Dimensions shown in inches.

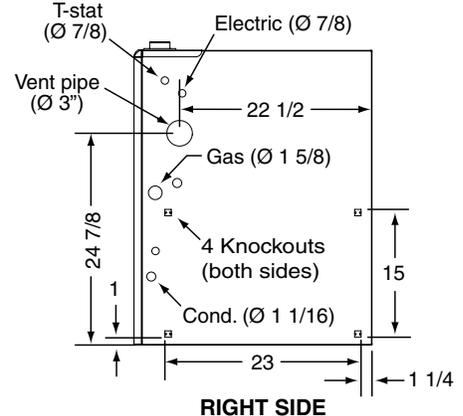
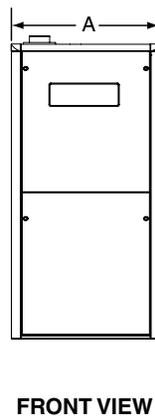
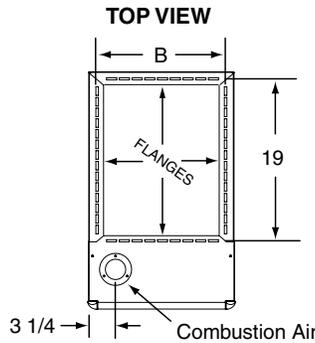
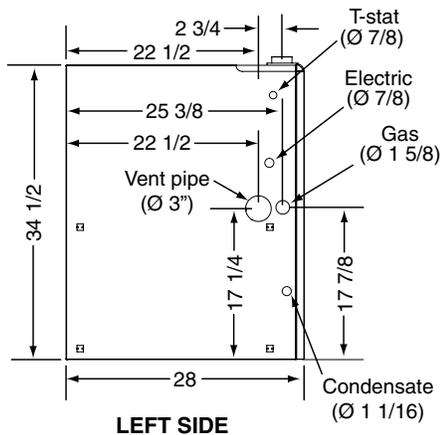


Figure 31. \*SC, \*SD & \*SD-E Cabinet Dimensions

## Airflow Data

MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR *SC SERIES UPFLOW / HORIZONTAL FURNACES																	
MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SPEED	EXTERNAL STATIC PRESSURE (INCHES WATER COLUMN)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
<b>SC 038D-23A2 Bottom Return (38,000)</b>	High*	1,388	23	1,330	24	1,273	25	1,225	26	1,172	28	1,112	29	1,057	31	987	33
	Med-High	1,109	29	1,071	30	1,040	31	1,000	32	960	34	913	35	868	37	805	40
	Med-Low**	843	38	816	40	783	41	742	44	705	46	662	49	621	52	577	56
	Low	717	45	678	48	643	50	610	53	574	56	533	61	485	67	452	72
<b>SC 038D-23A2 Side Return (38,000)</b>	High*	1,339	24	1,305	25	1,256	26	1,224	26	1,181	27	1,139	28	1,084	30	1,022	32
	Med-High	1,065	30	1,027	32	1,005	32	974	33	940	34	905	36	865	37	819	40
	Med-Low**	832	39	807	40	780	42	752	43	711	46	682	48	644	50	594	55
	Low	718	45	690	47	654	50	620	52	582	56	542	60	500	65	456	71
<b>SC 054D-24B1 Bottom Return (54,000)</b>	High*	1,550	30	1,520	30	1,485	31	1,450	32	1,410	33	1,360	34	1,300	35	1,255	37
	Med-High	1,250	37	1,220	38	1,200	38	1,170	39	1,140	40	1,105	42	1,065	43	1,010	46
	Med-Low**	935	49	910	51	880	52	850	54	815	56	785	59	735	—	680	—
	Low	720	—	690	—	655	—	620	—	585	—	550	—	520	—	485	—
<b>SC 054D-24B1 Side Return (54,000)</b>	High*	1,630	—	1,595	—	1,560	—	1,525	30	1,480	31	1,430	32	1,365	34	1,320	35
	Med-High	1,315	35	1,280	36	1,260	37	1,230	37	1,200	38	1,160	40	1,120	41	1,060	43
	Med-Low**	980	47	955	48	925	50	890	52	855	54	825	56	775	59	715	—
	Low	755	—	725	—	690	—	650	—	615	—	580	—	545	—	510	—
<b>SC 072D-24B1 Bottom Return (72,000)</b>	High*	1,590	39	1,550	40	1,525	40	1,475	42	1,425	43	1,380	44	1,325	46	1,240	49
	Med-High**	1,260	49	1,240	49	1,220	50	1,185	52	1,160	53	1,110	55	1,085	57	1,030	60
	Med-Low	1,125	55	1,110	55	1,085	57	1,050	58	1,025	60	990	—	940	—	865	—
	Low	895	—	865	—	830	—	795	—	775	—	750	—	693	—	665	—
<b>SC 072D-24B1 Side Return (72,000)</b>	High*	1,670	37	1,630	38	1,600	38	1,550	40	1,495	41	1,450	42	1,390	44	1,300	47
	Med-High**	1,325	46	1,300	47	1,280	48	1,245	49	1,220	50	1,165	53	1,140	54	1,080	57
	Med-Low	1,180	52	1,165	53	1,140	54	1,100	56	1,075	57	1,040	59	985	—	910	—
	Low	940	—	910	—	870	—	935	—	815	—	790	—	730	—	640	—
<b>SC 072D-35C2 Bottom Return (72,000)</b>	High*	2,141	29	2,045	30	1,973	31	1,903	32	1,832	34	1,743	35	1,658	37	1,569	39
	Med-High**	1,675	37	1,622	38	1,581	39	1,529	40	1,467	42	1,403	44	1,340	46	1,271	48
	Med-Low	1,304	47	1,244	49	1,197	51	1,153	53	1,099	56	1,038	59	978	63	909	68
	Low	920	67	877	70	824	75	771	80	702	87	648	95	591	104	536	115
<b>SC 072D-35C2 Side Return (72,000)</b>	High*	2,054	30	1,990	31	1,923	32	1,853	33	1,788	34	1,721	36	1,627	38	1,543	40
	Med-High**	1,655	37	1,608	38	1,563	39	1,506	41	1,455	42	1,394	44	1,333	46	1,258	49
	Med-Low	1,272	48	1,224	50	1,187	52	1,138	54	1,094	56	1,040	59	981	63	920	67
	Low	975	63	928	66	878	70	823	75	776	79	719	85	662	93	605	101
<b>SC 072D-35C2 Side + Bottom or 2 Sides (72,000)</b>	High*	2,139	29	2,066	30	2,010	31	1,947	32	1,875	33	1,808	34	1,729	36	1,649	37
	Med-High**	1,656	37	1,616	38	1,575	39	1,526	40	1,476	42	1,423	43	1,362	45	1,290	48
	Med-Low	1,296	47	1,243	49	1,205	51	1,160	53	1,104	56	1,058	58	998	62	927	66
	Low	928	66	878	70	816	75	759	81	703	87	648	95	582	105	534	115
<b>SC 090D-35C1 Bottom Return (90,000)</b>	High*	2,155	36	2,090	37	2,015	38	1,960	39	1,910	40	1,835	42	1,755	44	1,660	46
	Med-High**	2,015	38	1,960	39	1,920	40	1,860	41	1,805	42	1,755	44	1,695	45	1,615	47
	Med-Low	1,705	45	1,675	46	1,640	47	1,590	48	1,555	49	1,495	51	1,435	53	1,340	57
	Low	1,410	54	1,390	55	1,365	56	1,330	58	1,310	59	1,275	60	1,235	62	1,210	63
<b>SC 090D-35C1 Side Return (90,000)</b>	High*	2,240	—	2,175	35	2,100	37	2,040	38	1,985	39	1,910	40	1,825	42	1,725	44
	Med-High**	2,095	37	2,040	38	2,000	38	1,935	40	1,875	41	1,825	42	1,765	43	1,680	46
	Med-Low	1,775	43	1,740	44	1,705	45	1,655	46	1,615	47	1,555	49	1,490	51	1,335	57
	Low	1,465	52	1,445	53	1,420	54	1,385	55	1,360	56	1,325	58	1,285	60	1,260	61
<b>SC 090D-35C1 Side + Bottom or 2 Sides (90,000)</b>	High*	2,265	—	2,195	35	2,115	36	2,060	37	2,005	38	1,930	40	1,845	42	1,745	44
	Med-High**	2,115	36	2,060	37	2,015	38	1,955	39	1,895	40	1,845	42	1,780	43	1,695	45
	Med-Low	1,790	43	1,760	44	1,725	44	1,670	46	1,635	47	1,570	49	1,510	51	1,410	54
	Low	1,480	52	1,460	53	1,435	53	1,400	55	1,375	56	1,340	57	1,300	59	1,270	60

**Table 6. \*SC Upflow / Horizontal Furnaces**

MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR *SC SERIES UPFLOW / HORIZONTAL FURNACES																	
MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SPEED	EXTERNAL STATIC PRESSURE (INCHES WATER COLUMN)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
SC 108D-45D1 Bottom only or 2 openings (108,000)	High*	2,135	43	2,095	44	2,040	45	1,975	47	1,910	48	1,840	50	1,735	53	1,675	55
	Med-High**	2,000	46	1,955	47	1,900	48	1,845	50	1,800	51	1,735	53	1,665	55	1,570	59
	Med-Low	1,665	55	1,660	55	1,625	57	1,590	58	1,530	60	1,500	61	1,415	65	1,340	69
	Low	1,385	66	1,360	68	1,310	70	1,300	—	1,275	—	1,250	—	1,200	—	1,150	—
SC 108D-45D1 Side Return (108,000)	High*	2,115	43	2,075	44	2,020	46	1,955	47	1,890	49	1,822	50	1,720	53	1,660	55
	Med-High**	1,980	46	1,935	48	1,880	49	1,830	50	1,780	52	1,720	53	1,650	56	1,555	59
	Med-Low	1,650	56	1,645	56	1,610	57	1,575	58	1,515	61	1,485	62	1,400	66	1,330	69
	Low	1,370	67	1,345	68	1,300	—	1,290	—	1,260	—	1,240	—	1,190	—	1,140	—
SC 120D-45D1 Bottom only or 2 openings (120,000)	High*	2,135	48	2,095	49	2,040	50	1,975	52	1,910	54	1,840	56	1,735	59	1,675	61
	Med-High**	2,000	51	1,955	52	1,900	54	1,845	55	1,800	57	1,735	59	1,665	61	1,570	65
	Med-Low	1,665	61	1,660	62	1,625	63	1,590	64	1,530	67	1,500	68	1,415	—	1,340	—
	Low	1,385	—	1,360	—	1,310	—	1,300	—	1,275	—	1,250	—	1,200	—	1,150	—
SC 120D-45D1 Side Return (120,000)	High*	2,115	48	2,075	49	2,020	51	1,955	52	1,890	54	1,822	56	1,720	59	1,660	62
	Med-High**	1,980	52	1,935	53	1,880	54	1,830	56	1,780	57	1,720	59	1,650	62	1,555	66
	Med-Low	1,650	62	1,645	62	1,610	63	1,575	65	1,515	67	1,485	69	1,400	—	1,330	—
	Low	1,370	—	1,345	—	1,300	—	1,290	—	1,260	—	1,240	—	1,190	—	1,140	—

**NOTES:**

- \* Factory Set Cooling Speed
- \*\* Factory Set Heating Speed
- 1. Two openings are required for airflows above 1,600 CFM if filter(s) is(are) adjacent to furnace
- 2. Temperature rises in the table are approximate. Actual temperature rises may vary.
- 3. Cells shaded in gray indicate a temperature rise outside of the recommended range.

**Table 6. Continued**

MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR *SL SERIES DOWNFLOW GAS FURNACES																	
Model Number & Heating Input (Btuh)	Motor Speed	External Static Pressure (Inches Water Column)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise
SL 054D-24B1 54,000	HIGH*	1,580	29	1,550	30	1,520	30	1,485	31	1,460	32	1,425	32	1,375	33	1,320	35
	MED-HIGH	1,240	37	1,230	37	1,210	38	1,185	39	1,165	39	1,135	41	1,100	42	1,045	44
	MED-LOW**	1,145	40	1,120	41	1,100	42	1,080	43	1,055	44	1,030	45	985	47	940	49
	LOW	895	51	870	53	850	54	825	—	800	—	770	—	740	—	715	—
SL 072D-24B1 72,000	HIGH*	1,560	39	1,530	40	1,500	41	1,480	41	1,435	43	1,400	44	1,360	45	1,310	47
	MED-HIGH**	1,245	49	1,225	50	1,205	51	1,180	52	1,150	53	1,125	55	1,090	56	1,045	59
	MED-LOW	1,085	57	1,070	57	1,045	59	1,025	60	1,000	—	970	—	930	—	880	—
	LOW	850	—	830	—	800	—	780	—	760	—	730	—	710	—	685	—
SL 090D-35C1 90,000	HIGH*	1,955	39	1,905	40	1,835	42	1,795	43	1,730	44	1,620	47	1,545	50	1,450	53
	MED-HIGH**	1,845	42	1,790	43	1,750	44	1,680	46	1,515	51	1,540	50	1,475	52	1,410	54
	MED-LOW	1,320	58	1,290	59	1,250	61	1,215	63	1,180	65	1,120	—	1,050	—	970	—
	LOW	1,190	64	1,165	—	1,125	—	1,080	—	1,055	—	1,000	—	945	—	875	—
SL 120D-45D1 120,000	HIGH*	2,215	46	2,150	48	2,075	49	2,035	50	1,970	52	1,905	54	1,800	57	1,745	59
	MED-HIGH**	2,050	50	2,015	51	1,955	52	1,900	54	1,860	55	1,795	57	1,720	59	1,620	63
	MED-LOW	1,720	59	1,690	60	1,655	62	1,640	62	1,610	63	1,560	—	1,505	—	1,465	—
	LOW	1,420	—	1,410	—	1,400	—	1,365	—	1,350	—	1,335	—	1,290	—	1,260	—

**NOTES:**

- \* Factory Set Cooling Speed
- \*\* Factory Set Heating Speed
- 1. Temperature rises in the table are approximate. Actual temperature rises may vary.
- 2. Cells shaded in gray indicate a temperature rise outside of the recommended range.

**Table 7. \*SL Downflow Furnaces**

**MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR  
\*SD & \*SD-E SERIES UPFLOW / HORIZONTAL FURNACES WITH ECM MOTOR**

MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SWITCH SETTINGS (0 =OFF,1 =ON)				EXTERNAL STATIC PRESSURE (IN.W.C.)																
					0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		
	1/5	2/6	3/7	4/8	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	
<b>*SD-038D-23EA (38,000)</b>	0	0	0	0	570	55	530	58	500	—	450	—	400	—	350	—	—	—	—	—	—
	1	0	0	0	635	51	605	54	555	56	520	—	480	—	435	—	390	—	—	—	—
	0	1	0	0	710	46	670	48	625	50	590	53	550	57	515	—	460	—	425	—	—
	1	1	0	0	805	41	765	43	725	44	680	47	645	49	605	52	570	56	515	—	—
	0	0	1	0	865	39	830	41	790	42	755	44	715	46	675	48	635	50	590	53	—
	1	0	1	0	945	36	910	38	875	39	835	41	800	42	755	44	715	45	675	48	—
	0	1	1	0	975	34	940	36	910	37	875	38	840	40	795	42	755	43	675	45	—
	1	1	1	0	1,020	34	985	35	955	36	920	37	880	38	845	40	805	42	765	42	—
	0	0	0	1	1,080	33	1,050	33	1,020	34	980	35	950	36	910	37	875	39	835	41	—
	1	0	0	1	1,120	32	1,085	31	1,045	32	1,025	33	990	35	955	35	915	37	880	39	—
	0	1	0	1	1,180	31	1,145	31	1,110	32	1,080	32	1,040	33	1,010	34	975	35	940	36	—
	1	1	0	1	1,210	—	1,180	30	1,145	31	1,115	31	1,085	32	1,050	33	1,015	34	980	35	—
	0	0	1	1	1,250	—	1,215	—	1,185	30	1,155	30	1,120	31	1,090	32	1,050	33	1,015	34	—
	1	0	1	1	1,295	—	1,265	—	1,235	—	1,205	—	1,175	30	1,140	30	1,110	32	1,080	32	—
	0	1	1	1	1,330	—	1,295	—	1,270	—	1,240	—	1,205	—	1,175	30	1,145	30	1,110	31	—
	1	1	1	1	1,385	—	1,350	—	1,315	—	1,285	—	1,245	—	1,210	—	1,180	30	1,150	31	—
<b>*SD-054D-24EB (54,000)</b>	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	0	1	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1	1	0	0	725	59	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	0	0	1	0	810	57	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1	0	1	0	940	51	890	54	845	57	795	58	750	60	700	—	—	—	—	—	—
	0	1	1	0	990	48	945	51	905	53	860	56	820	58	775	—	735	—	690	—	—
	1	1	1	0	1,055	44	1,015	46	970	48	930	50	890	52	845	55	805	58	760	—	—
	0	0	0	1	1,135	43	1,095	45	1,055	46	1,010	48	960	50	930	53	890	55	850	58	—
	1	0	0	1	1,185	40	1,145	41	1,105	43	1,065	44	1,030	46	990	48	950	51	910	55	—
	0	1	0	1	1,250	40	1,210	41	1,170	41	1,135	43	1,095	44	1,055	46	1,020	48	980	51	—
	1	1	0	1	1,290	38	1,255	38	1,220	39	1,180	40	1,145	42	1,110	44	1,075	46	1,040	49	—
	0	0	1	1	1,315	37	1,275	38	1,240	39	1,200	40	1,160	41	1,120	43	1,085	45	1,045	47	—
	1	0	1	1	1,350	36	1,315	36	1,280	37	1,245	38	1,205	39	1,170	42	1,135	44	1,100	45	—
	0	1	1	1	1,390	36	1,350	36	1,315	36	1,275	38	1,240	39	1,200	41	1,160	42	1,125	42	—
	1	1	1	1	1,420	34	1,380	35	1,345	35	1,310	36	1,270	37	1,235	39	1,200	40	1,160	41	—
<b>*SD-72D-35EC1 (72,000)</b>	0	0	0	0	1,125	—	1,040	—	960	—	880	—	795	—	—	—	—	—	—	—	—
	1	0	0	0	1,205	59	1,120	61	1,040	63	960	—	875	—	795	—	—	—	—	—	—
	0	1	0	0	1,305	56	1,225	59	1,150	61	1,070	64	995	—	915	—	840	—	—	—	—
	1	1	0	0	1,430	52	1,350	54	1,270	55	1,190	58	1,110	60	1,030	61	950	62	865	—	—
	0	0	1	0	1,525	51	1,450	53	1,375	54	1,300	56	1,225	57	1,150	59	1,075	61	1,000	64	—
	1	0	1	0	1,620	48	1,540	49	1,465	50	1,390	51	1,315	53	1,240	54	1,165	56	1,090	61	—
	0	1	1	0	1,695	48	1,620	49	1,545	49	1,465	51	1,390	52	1,315	54	1,235	55	1,160	57	—
	1	1	1	0	1,770	44	1,700	45	1,630	46	1,555	47	1,485	48	1,410	50	1,340	51	1,265	55	—
	0	0	0	1	1,875	43	1,805	44	1,730	45	1,655	46	1,580	47	1,510	49	1,435	50	1,340	52	—
	1	0	0	1	1,905	41	1,840	42	1,775	42	1,710	43	1,640	44	1,575	46	1,510	48	1,445	50	—
	0	1	0	1	1,980	40	1,910	41	1,845	41	1,780	42	1,715	43	1,650	46	1,580	47	1,515	48	—
	1	1	0	1	2,025	39	1,960	39	1,895	40	1,830	41	1,765	42	1,700	44	1,635	45	1,570	47	—
	0	0	1	1	2,085	38	2,025	39	1,960	40	1,900	41	1,840	42	1,775	43	1,715	44	1,655	45	—
	1	0	1	1	2,135	37	2,070	38	2,010	39	1,945	39	1,880	40	1,815	41	1,750	42	1,685	43	—
	0	1	1	1	2,200	37	2,145	38	2,090	38	2,035	39	1,980	39	1,925	40	1,870	40	1,820	41	—
	1	1	1	1	2,280	36	2,225	37	2,170	37	2,115	38	2,065	38	2,010	39	1,955	39	1,900	40	—

**NOTES:**

- 1 Motor Switch Settings are for heating speeds using HEAT switches 1,2,3, & 4 and cooling speeds using COOL switches 5, 6, 7, & 8
- 2 Two openings are required for airflows above 1,600 CFM if the filter(s) is (are) adjacent to the furnace
- 3 Data is shown without filter
- 4.Temperature rises in the table are approximate. Actual temperature rises may vary
- 5.Cells shaded in gray indicate a temperature rise outside of the recommended range.
- 6 When in low stage,the circulating airflow is 70% of the tables high value (2-stage furnaces only).

**Table 8. \*SD & \*SD-E Upflow / Horizontal Furnaces (ECM Motor)**

**MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR  
\*SD & \*SD-E SERIES UPFLOW / HORIZONTAL FURNACES WITH ECM MOTOR**

MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SWITCH SETTINGS (0=OFF,1=ON)				EXTERNAL STATIC PRESSURE (IN.W.C.)																	
					0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8			
	1/5	2/6	3/7	4/8	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE		
<b>*SD-090D-35EC1 (90,000)</b>	0	0	0	0	1,125	—	1,040	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1	0	0	0	1,205	—	1,120	—	1,040	—	—	—	—	—	—	—	—	—	—	—	—	—
	0	1	0	0	1,305	—	1,225	—	1,150	—	1,070	—	995	—	—	—	—	—	—	—	—	—
	1	1	0	0	1,430	—	1,350	—	1,270	—	1,190	—	1,110	—	1,030	—	—	—	—	—	—	—
	0	0	1	0	1,525	63	1,450	65	1,375	—	1,300	—	1,225	—	1,150	—	1,075	—	1,000	—	—	—
	1	0	1	0	1,620	60	1,540	61	1,465	63	1,390	63	1,315	64	1,240	—	1,165	—	1,090	—	—	—
	0	1	1	0	1,695	57	1,620	58	1,545	59	1,465	61	1,390	62	1,315	—	1,235	—	1,160	—	—	—
	1	1	1	0	1,770	55	1,700	56	1,630	57	1,555	59	1,485	60	1,410	63	1,340	65	1,265	—	—	—
	0	0	0	1	1,875	53	1,805	54	1,730	55	1,655	57	1,580	58	1,510	59	1,435	60	1,340	62	—	—
	1	0	0	1	1,905	51	1,840	52	1,775	53	1,710	54	1,640	55	1,575	56	1,510	58	1,445	60	—	—
	0	1	0	1	1,980	49	1,910	50	1,845	51	1,780	52	1,715	52	1,650	54	1,580	55	1,515	57	—	—
	1	1	0	1	2,025	48	1,960	49	1,895	50	1,830	50	1,765	51	1,700	52	1,635	54	1,570	56	—	—
	0	0	1	1	2,085	47	2,025	48	1,960	48	1,900	49	1,840	50	1,775	51	1,715	52	1,655	54	—	—
	1	0	1	1	2,135	46	2,070	46	2,010	47	1,945	48	1,880	49	1,815	50	1,750	51	1,685	53	—	—
	0	1	1	1	2,200	44	2,145	45	2,090	45	2,035	46	1,980	47	1,925	48	1,870	49	1,820	51	—	—
	1	1	1	1	2,280	42	2,225	43	2,170	44	2,115	45	2,065	46	2,010	47	1,955	48	1,900	49	—	—
<b>*SD-108D-45ED (108,000)</b>	0	0	0	0	1,395	62	1,350	64	1,305	66	1,260	68	1,210	—	1,165	—	1,120	—	—	—	—	—
	1	0	0	0	1,465	58	1,420	60	1,375	62	1,330	64	1,290	—	1,245	—	1,200	—	1,155	—	—	—
	0	1	0	0	1,555	57	1,510	59	1,470	61	1,425	63	1,380	—	1,340	—	1,295	—	1,250	—	—	—
	1	1	0	0	1,625	54	1,585	56	1,540	58	1,500	59	1,460	—	1,415	—	1,375	—	1,335	—	—	—
	0	0	1	0	1,690	53	1,650	55	1,610	56	1,570	58	1,530	—	1,485	—	1,445	—	1,405	—	—	—
	1	0	1	0	1,760	51	1,715	52	1,670	54	1,625	56	1,575	64	1,530	—	1,485	—	1,440	—	—	—
	0	1	1	0	1,835	50	1,790	52	1,745	54	1,695	56	1,650	62	1,605	—	1,555	—	1,510	—	—	—
	1	1	1	0	1,885	49	1,840	50	1,790	52	1,745	53	1,700	60	1,655	63	1,610	65	1,565	—	—	—
	0	0	0	1	1,945	49	1,900	51	1,850	52	1,805	53	1,760	58	1,710	59	1,665	60	1,620	62	—	—
	1	0	0	1	1,950	47	1,905	49	1,860	50	1,820	51	1,775	55	1,735	56	1,690	58	1,650	60	—	—
	0	1	0	1	2,075	47	2,030	49	1,990	50	1,945	51	1,900	52	1,855	54	1,810	55	1,770	57	—	—
	1	1	0	1	2,125	45	2,085	47	2,040	49	2,000	50	1,955	51	1,910	52	1,870	54	1,825	56	—	—
	0	0	1	1	2,170	45	2,130	47	2,090	48	2,045	49	2,005	50	1,965	51	1,925	52	1,880	54	—	—
	1	0	1	1	2,215	44	2,180	45	2,140	47	2,105	48	2,070	49	2,035	50	2,000	51	1,965	53	—	—
	0	1	1	1	—	—	—	—	—	—	—	—	—	—	2,225	47	2,165	48	2,100	49	2,040	51
	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2,170	47	2,120	48	2,065	49
<b>*SD-120D-45ED (120,000)</b>	0	0	0	0	1,395	69	1,350	68	1,305	—	1,260	—	1,210	—	1,165	—	1,120	—	—	—	—	—
	1	0	0	0	1,465	66	1,420	66	1,375	—	1,330	—	1,290	—	1,245	—	1,200	—	1,155	—	—	—
	0	1	0	0	1,555	62	1,510	64	1,470	69	1,425	—	1,380	—	1,340	—	1,295	—	1,250	—	—	—
	1	1	0	0	1,625	61	1,585	62	1,540	67	1,500	69	1,460	—	1,415	—	1,375	—	1,335	—	—	—
	0	0	1	0	1,690	59	1,650	60	1,610	64	1,570	66	1,530	68	1,485	70	1,445	—	1,405	—	—	—
	1	0	1	0	1,760	58	1,715	59	1,670	63	1,625	64	1,575	66	1,530	68	1,485	70	1,440	—	—	—
	0	1	1	0	1,835	57	1,790	59	1,745	61	1,695	63	1,650	64	1,605	66	1,555	68	1,510	70	—	—
	1	1	1	0	1,885	57	1,840	58	1,790	60	1,745	62	1,700	63	1,655	65	1,610	66	1,565	69	—	—
	0	0	0	1	1,945	57	1,900	56	1,850	59	1,805	61	1,760	62	1,710	63	1,665	64	1,620	67	—	—
	1	0	0	1	1,950	55	1,905	55	1,860	58	1,820	59	1,775	61	1,735	62	1,690	63	1,650	65	—	—
	0	1	0	1	2,075	53	2,030	54	1,990	56	1,945	58	1,900	59	1,855	60	1,810	61	1,770	63	—	—
	1	1	0	1	2,125	52	2,085	53	2,040	55	2,000	56	1,955	58	1,910	59	1,870	60	1,825	62	—	—
	0	0	1	1	2,170	51	2,130	52	2,090	54	2,045	55	2,005	56	1,965	58	1,925	59	1,880	60	—	—
	1	0	1	1	2,215	51	2,180	51	2,140	53	2,105	54	2,070	55	2,035	56	2,000	58	1,965	59	—	—
	0	1	1	1	—	—	—	—	—	—	—	—	—	—	2,225	54	2,165	55	2,100	56	2,040	58
	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2,170	54	2,120	55	2,065	57

**NOTES:**

- 1 Motor Switch Settings are for heating speeds using HEAT switches 1,2,3, & 4 and cooling speeds using COOL switches 5, 6, 7, & 8
- 2 Two openings are required for airflows above 1,600 CFM if the filter(s) is (are) adjacent to the furnace
- 3 Data is shown without filter
4. Temperature rises in the table are approximate. Actual temperature rises may vary
5. Cells shaded in gray indicate a temperature rise outside of the recommended range.
- 6 When in low stage, the circulating airflow is 70% of the tables high value (2—stage furnaces only).

**Table 8. Continued**

**MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR  
\*SD SERIES UPFLOW / HORIZONTAL FURNACES WITH PSC MOTOR**

MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SPEED	EXTERNAL STATIC PRESSURE (INCHES WATER COLUMN)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
<b>SD038D-24B1 Bottom Return (38,000)</b>	HIGH*	1,519	—	1,483	—	1,433	—	1,397	—	1,335	—	1,272	—	1,214	—	1,130	—
	MED-H**	1,238	—	1,216	—	1,188	—	1,164	—	1,136	30	1,092	31	1,043	32	973	34
	MED-L	1,094	31	1,082	32	1,052	32	1,034	33	1,021	34	977	34	928	36	865	37
	LOW	841	40	817	42	801	43	786	45	750	46	720	48	683	49	639	53
<b>SD038D-24B1 Side Return (38,000)</b>	HIGH*	1,664	—	1,631	—	1,596	—	1,546	—	1,489	—	1,433	—	1,366	—	1,285	—
	MED-H	1,272	—	1,255	—	1,249	—	1,217	—	1,189	—	1,145	30	1,096	31	1,036	33
	MED-L**	1,130	—	1,114	31	1,100	31	1,079	31	1,048	33	1,025	33	987	35	944	36
	LOW	869	39	839	42	809	42	790	44	764	45	739	47	711	48	664	52
<b>SD 054D-24B1 Bottom Return (54,000)</b>	HIGH*	1,519	33	1,483	34	1,433	35	1,397	36	1,335	37	1,272	39	1,214	41	1,130	44
	MED-H	1,238	40	1,216	41	1,188	42	1,164	43	1,136	44	1,092	46	1,043	48	973	51
	MED-L**	1,094	46	1,082	46	1,052	48	1,034	48	1,021	49	977	51	928	54	865	58
	LOW	841	59	817	—	801	—	786	—	750	—	720	—	683	—	639	—
<b>SD 054D-24B1 Side Return (54,000)</b>	HIGH*	1,664	30	1,631	31	1,596	31	1,546	32	1,489	34	1,433	35	1,366	37	1,285	39
	MED-H	1,272	39	1,255	40	1,249	40	1,217	41	1,189	42	1,145	44	1,096	46	1,036	48
	MED-L**	1,130	44	1,114	45	1,100	45	1,079	46	1,048	48	1,025	49	987	51	944	53
	LOW	869	58	839	60	809	—	790	—	764	—	739	—	711	—	664	—
<b>SD 072D-35C2 Bottom Return (72,000)</b>	HIGH*	2,030	31	1,974	32	1,915	33	1,842	34	1,773	36	1,706	37	1,617	39	1,529	41
	MED-H**	1,594	40	1,548	41	1,506	42	1,464	43	1,412	45	1,346	47	1,280	49	1,244	51
	MED-L	1,295	49	1,253	51	1,200	53	1,159	55	1,102	57	1,044	61	1,006	63	938	68
	LOW	985	64	937	68	891	71	845	75	797	79	722	88	675	94	625	101
<b>SD 072D-35C2 Side Return (72,000)</b>	HIGH*	2,032	31	1,970	32	1,906	33	1,844	34	1,764	36	1,699	37	1,616	39	1,529	41
	MED-H**	1,638	39	1,590	40	1,542	41	1,505	42	1,445	44	1,382	46	1,321	48	1,258	50
	MED-L	1,266	50	1,228	52	1,181	54	1,136	56	1,091	58	1,046	61	991	64	929	68
	LOW	972	65	931	68	880	72	831	76	780	81	723	88	677	94	617	103
<b>SD 072D-35C2 Side + Bottom or 2 Sides (72,000)</b>	HIGH*	2,121	30	2,063	31	2,004	32	1,945	33	1,884	34	1,814	35	1,741	36	1,669	38
	MED-H**	1,682	38	1,639	39	1,604	39	1,558	41	1,501	42	1,451	44	1,395	45	1,302	49
	MED-L	1,281	49	1,241	51	1,194	53	1,153	55	1,116	57	1,065	59	1,002	63	921	69
	LOW	984	64	939	67	887	71	843	75	786	81	731	87	674	94	613	103
<b>SD 090D-35C1 Bottom Return (90,000)</b>	HIGH*	2,288	36	2,236	37	2,161	39	2,092	40	2,017	41	1,934	43	1,841	45	1,748	48
	MED-H**	2,144	39	2,093	40	2,049	41	1,985	42	1,912	44	1,842	45	1,764	47	1,668	50
	MED-L	1,874	44	1,845	45	1,806	46	1,766	47	1,717	49	1,661	50	1,582	53	1,503	55
	LOW	1,541	54	1,516	55	1,509	55	1,486	56	1,456	57	1,402	59	1,361	61	1,294	64
<b>SD 090D-35C1 Side Return (90,000)</b>	HIGH*	2,273	37	2,222	38	2,164	39	2,098	40	2,025	41	1,947	43	1,864	45	1,780	47
	MED-H**	2,084	40	2,039	41	2,007	42	1,955	43	1,895	44	1,832	45	1,750	48	1,665	50
	MED-L	1,784	47	1,777	47	1,749	48	1,725	48	1,679	50	1,629	51	1,576	53	1,501	56
	LOW	1,482	56	1,470	57	1,444	58	1,432	58	1,405	59	1,375	61	1,339	62	1,286	65
<b>SD 090D-35C1 Side + Bottom or 2 Sides (90,000)</b>	HIGH*	2,328	36	2,273	37	2,224	37	2,151	39	2,082	40	2,005	42	1,920	43	1,825	46
	MED-H**	2,124	39	2,108	40	2,052	41	2,018	41	1,954	43	1,884	44	1,813	46	1,725	48
	MED-L	1,825	46	1,809	46	1,781	47	1,752	48	1,706	49	1,676	50	1,615	52	1,535	54
	LOW	1,509	55	1,488	56	1,468	57	1,440	58	1,422	59	1,379	60	1,351	62	1,292	64

**Table 9. \*SD Upflow / Horizontal Furnaces (PSC Motor)**

MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR *SD SERIES UPFLOW / HORIZONTAL FURNACES PSC MOTOR																	
MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SPEED	EXTERNAL STATIC PRESSURE (INCHES WATER COLUMN)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
SD 108D-45D1 Bottom Return (108,000)	HIGH*	2276	44	2228	45	2173	46	2108	47	2035	49	1961	51	1876	53	1778	56
	MED-H**	2113	47	2078	48	2019	50	1970	51	1904	53	1840	54	1768	57	1677	60
	MED-L	1819	55	1789	56	1757	57	1706	59	1666	60	1610	62	1551	64	1486	67
	LOW	1496	67	1484	67	1459	69	1430	70	1402	—	1363	—	1330	—	1262	—
SD 108D-45D1 Side Return (108,000)	HIGH*	2306	43	2247	45	2192	46	2121	47	2044	49	1979	51	1892	53	1787	56
	MED-H**	2135	47	2103	50	2050	51	1995	53	1935	54	1858	57	1778	59	1690	62
	MED-L	1845	54	1834	57	1805	58	1776	59	1719	61	1663	63	1605	66	1533	69
	LOW	1543	65	1521	69	1502	70	1477	—	1452	—	1412	—	1368	—	1314	—
SD 120D-45D1 Bottom Return (120,000)	HIGH*	2276	49	2228	50	2173	51	2108	53	2035	55	1961	57	1876	59	1778	62
	MED-H**	2113	53	2078	53	2019	55	1970	56	1904	58	1840	60	1768	63	1677	66
	MED-L	1819	61	1789	62	1757	63	1706	65	1666	67	1610	69	1551	—	1486	—
	LOW	1496	—	1484	—	1459	—	1430	—	1402	—	1363	—	1330	—	1262	—
SD 120D-45D1 Side Return (120,000)	HIGH*	2306	48	2247	49	2192	51	2121	52	2044	54	1979	56	1892	59	1787	62
	MED-H**	2135	52	2103	53	2050	54	1995	56	1935	57	1858	60	1778	62	1690	66
	MED-L	1845	60	1834	61	1805	62	1776	63	1719	65	1663	67	1605	69	1533	—
	LOW	1543	—	1521	—	1502	—	1477	—	1452	—	1412	—	1368	—	1314	—

Table 9. Continued

MAXIMUM AIRFLOW & TEMPERATURE RISES (° F) FOR DOWNFLOW FURNACES (*SM SERIES)																	
MODEL NUMBER & HEATING INPUT (BTUH)	MOTOR SPEED	EXTERNAL STATIC PRESSURE (INCHES WATER COLUMN)															
		0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE	CFM	RISE
SM 054D-24B1 Top Return (54,000)	HIGH*	1590	31	1563	32	1538	33	1513	33	1477	34	1430	35	1370	36	1312	38
	MED-H	1228	41	1207	41	1193	42	1169	43	1157	43	1127	44	1084	46	1037	48
	MED-L**	1096	46	1079	46	1061	47	1038	48	1010	50	986	51	957	52	919	54
	LOW	855	58	825	—	800	—	777	—	753	—	723	—	696	—	665	—
SM 072D-35C1 Top Return (72,000)	HIGH*	2235	—	2176	—	2121	—	2067	—	2010	—	1936	—	1864	36	1783	37
	MED-H**	2095	—	2052	—	2005	—	1957	—	1906	35	1852	36	1781	37	1709	39
	MED-L	1871	36	1838	36	1797	37	1761	38	1716	39	1667	40	1602	42	1536	43
	LOW	1568	43	1552	43	1527	44	1485	45	1457	46	1418	47	1370	49	1343	50
SM 090D-35C1 Top Return (90,000)	HIGH*	2208	38	2150	39	2089	40	2026	41	1959	43	1893	44	1825	46	1738	48
	MED-H**	2065	40	2015	41	1970	42	1910	44	1866	45	1805	46	1737	48	1668	50
	MED-L	1802	46	1773	47	1750	48	1703	49	1670	50	1623	51	1556	54	1490	56
	LOW	1490	56	1482	56	1464	57	1436	58	1407	59	1380	60	1329	63	1271	—
SM 118D-45D1 Top Return (118,000)	HIGH*	2358	46	2299	48	2253	48	2191	50	2130	51	2060	53	1990	55	1903	57
	MED-H**	2176	50	2135	51	2102	52	2046	53	1985	55	1932	57	1862	59	1777	61
	MED-L	1873	58	1852	59	1816	60	1790	61	1750	62	1699	64	1643	66	1571	70
	LOW	1544	—	1528	—	1514	—	1499	—	1462	—	1441	—	1429	—	1386	—

NOTES:

- \* Factory Set Cooling Speed
- \*\* Factory Set Heating Speed
- 1. Two openings are required for airflows above 1,600 CFM if filter(s) is(are) adjacent to furnace
- 2. Temperature rises in the table are approximate. Actual temperature rises may vary.
- 3. Cells shaded in gray indicate a temperature rise outside of the recommended range.

Table 10. \*SM Downflow Furnaces

# Electrical Information

## WIRING DIAGRAM

### For 80+ and 90+ Single Stage Furnaces

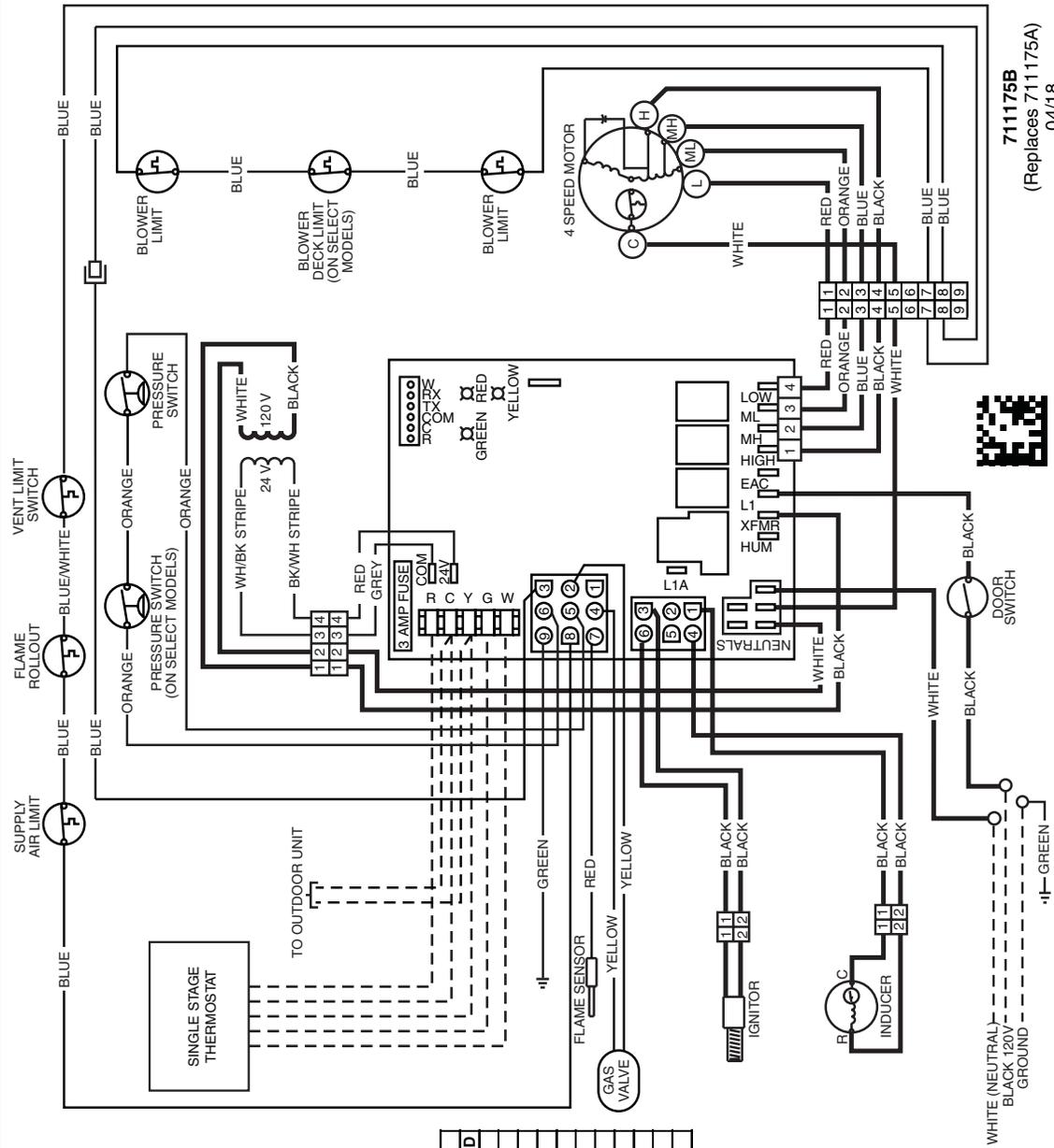
Refer to the installation instructions provided with the furnace for the proper heating and cooling speeds for your application.

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

If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature of at least 105° C.

Use copper conductors only.

#### LEGEND:



711175B  
(Replaces 711175A)  
04/18

Figure 32. Wiring Diagram

# WIRING DIAGRAM

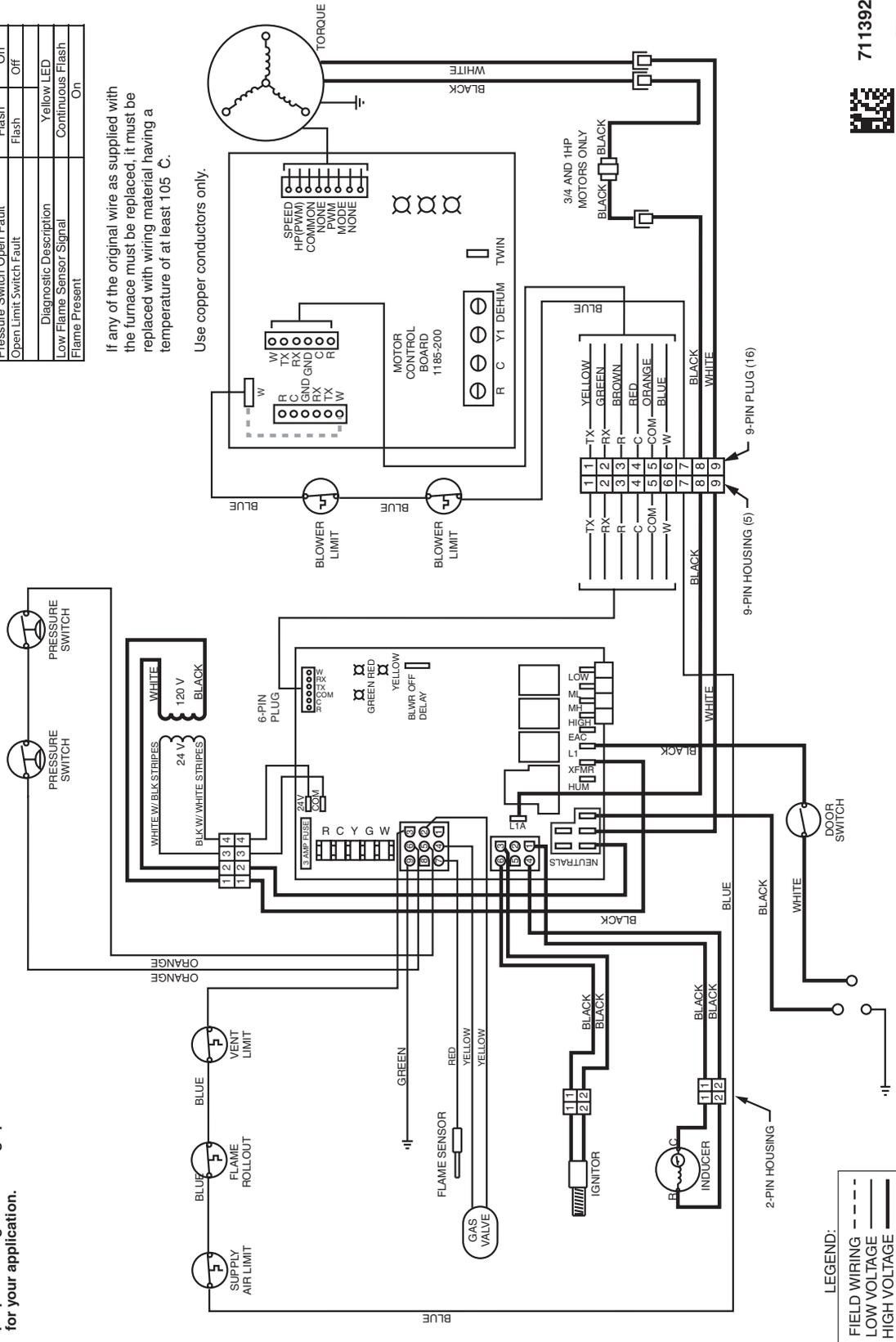
## For High Efficiency Fixed Speed Blower 90+ Single Stage Furnaces

Refer to the installation instructions provided with the furnace for the proper heating and cooling speeds for your application.

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

If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature of at least 105 °C.

Use copper conductors only.



7113920

0714

Figure 33. Wiring Diagram (Fixed Speed)

## 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 11. 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		

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 12. 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 13. 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 14. Natural Gas Heating Values

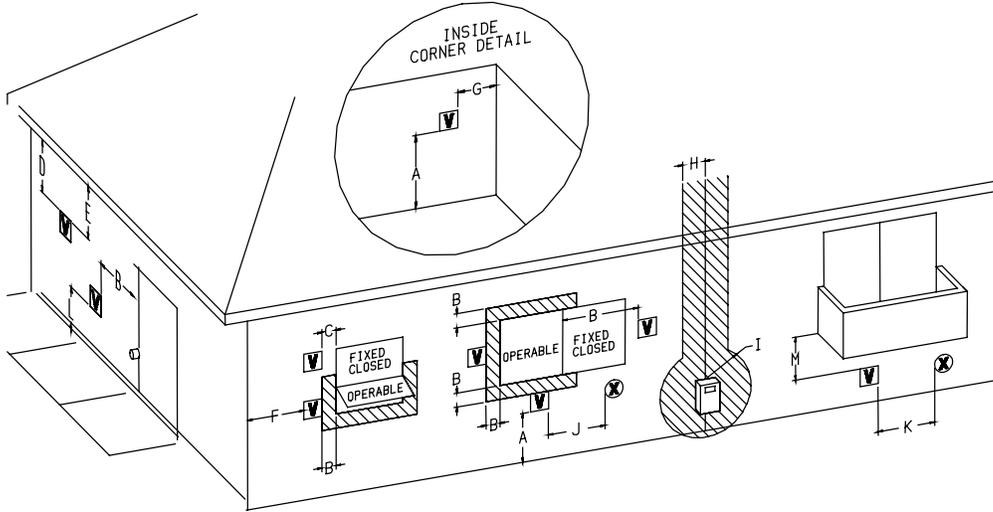
HIGH ALTITUDE DERATION – NATURAL GAS WITH HIGH HEATING VALUE									
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU)								
	38,000 (SC MODELS)	38,000 (SD MODELS)	54,000	72,000	90,000	108,000	118,000	120,000	
0 to 1,999 FT	45	51	47	47	47	47	46	45	ORIFICE SIZE
	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	MANIFOLD PRESSURE
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 15. 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 16. High Altitude Deration – Natural Gas with LOW Heating Value

## Venting Information



VENT TERMINAL

AIR SUPPLY INLET

AREA WHERE TERMINAL IS NOT PERMITTED

CLEARANCE LOCATION	CANADIAN INSTALLATIONS <sup>A</sup>	US INSTALLATIONS <sup>B</sup>	
	DIRECT VENT (2-PIPE) & CONVENTIONAL VENT (1-PIPE) FURNACES	DIRECT VENT (2-PIPE) FURNACES	CONVENTIONAL VENT (1-PIPE) FURNACES
A = Clearance above grade, veranda, porch, deck, balcony, or maximum expected snow level.	12 inches (30cm)	12 inches (30cm)	12 inches (30cm)
B = Clearance to window or door that may be opened.	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW) 36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW) 12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
C = Clearance to permanently closed window	*	*	*
D = Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61cm) from the center line of the terminal.	*	*	*
E = Clearance to unventilated soffit.	*	*	*
F = Clearance to outside corner.	*	*	*
G = Clearance to inside corner.	*	*	*
H = Clearance to each side of center line extended above meter/regulator assembly.	3 feet (91cm) within a height 15 feet above the meter/regulator assembly	*	*
I = Clearance to service regulator vent outlet.	3 feet (1.83m)	*	*
J = Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance.	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 12 inches (30cm) for appliances 10,000 Btuh - 100,000 Btuh (30kW) 36 inches (91cm) for appliances > 100,000 Btuh (30Kw)	6 inches (15cm) for appliances < 10,000 Btuh (3kW) 9 inches (23cm) for appliances 10,000 Btuh - 50,000 Btuh (30kW) 12 inches (30cm) for appliances > 50,000 Btuh (30Kw)	4 ft. (1.2m) below or to side of opening; 1 ft. (300mm) above opening
K = Clearance to mechanical air supply inlet.	6 feet (1.83m)	3 feet (91cm) above if within 10 feet (3m) horizontally	3 ft. (91cm) above if within 10 feet (3m) horizontally
L = Clearance above paved sidewalk or driveway located on public property.	7 feet (2.13m) <sup>c</sup>	*	7 ft. (2.13m)
M = Clearance under veranda, porch, deck, or balcony.	12 inches (30cm) <sup>d</sup>	*	*

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.

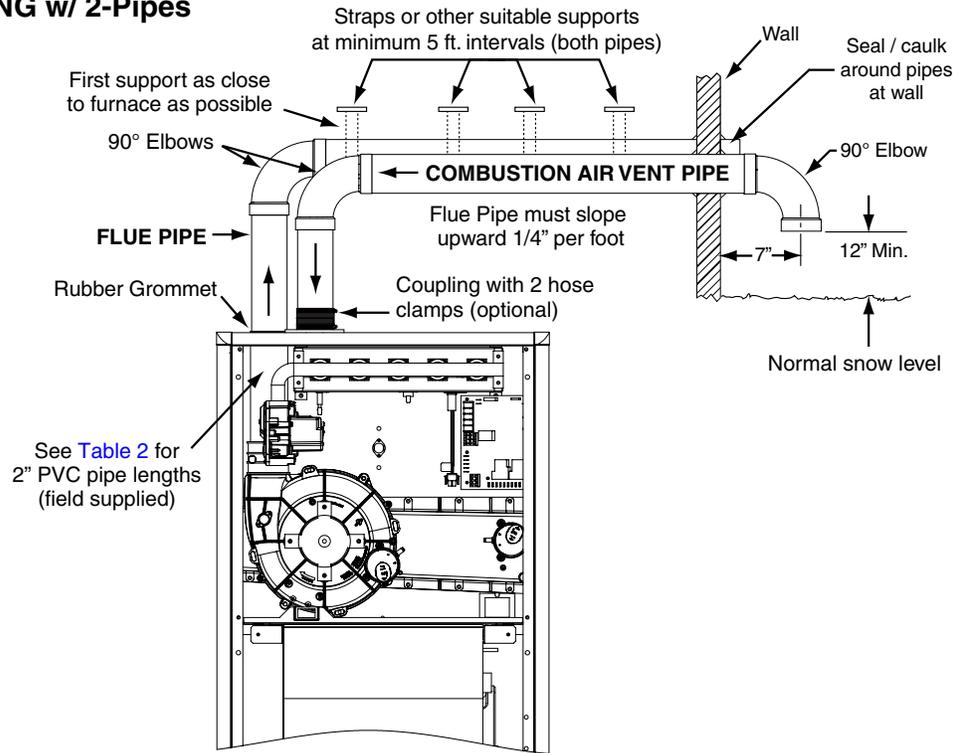
d: Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

\* 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"

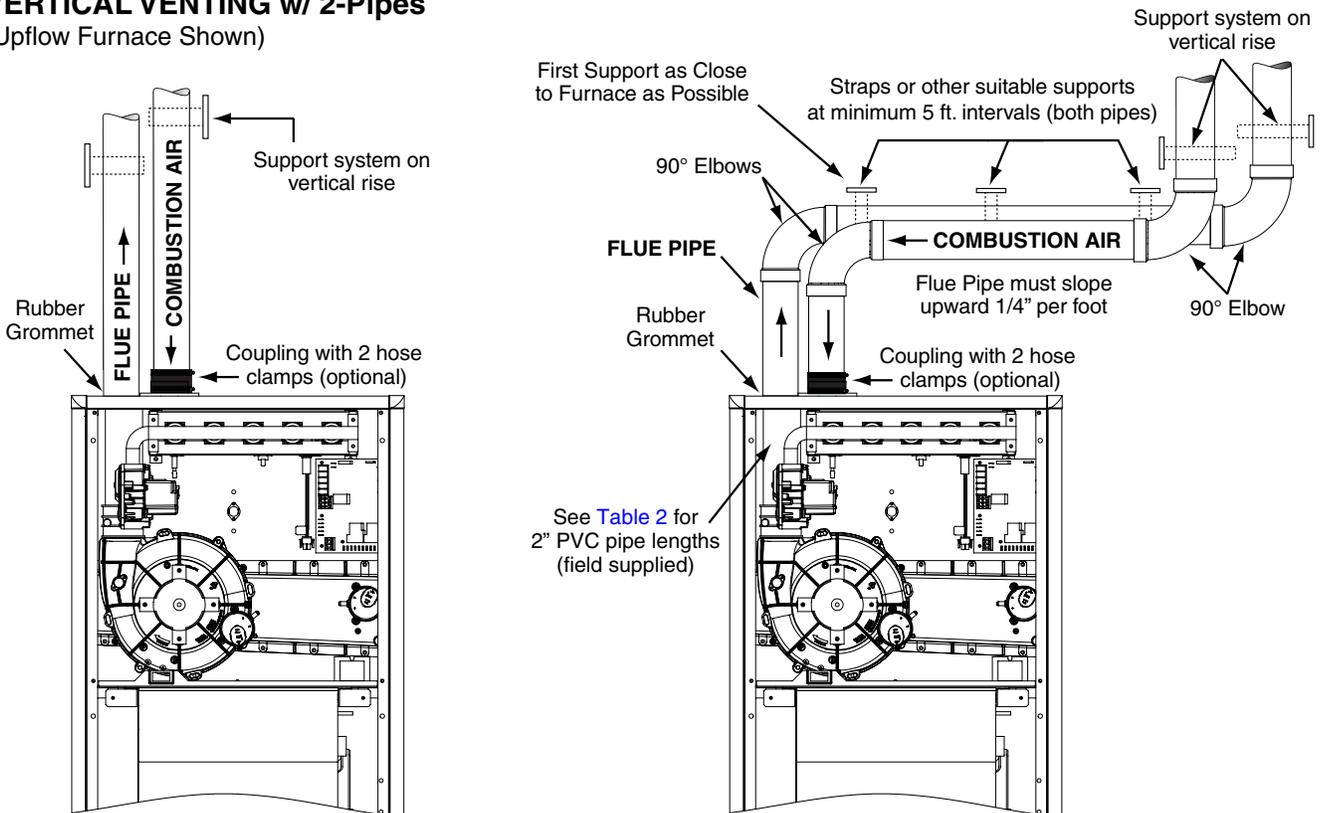
**Table 17. Vent Termination Clearances**

**\*SC & \*SL Series**

**HORIZONTAL VENTING w/ 2-Pipes**  
(Upflow Furnace Shown)

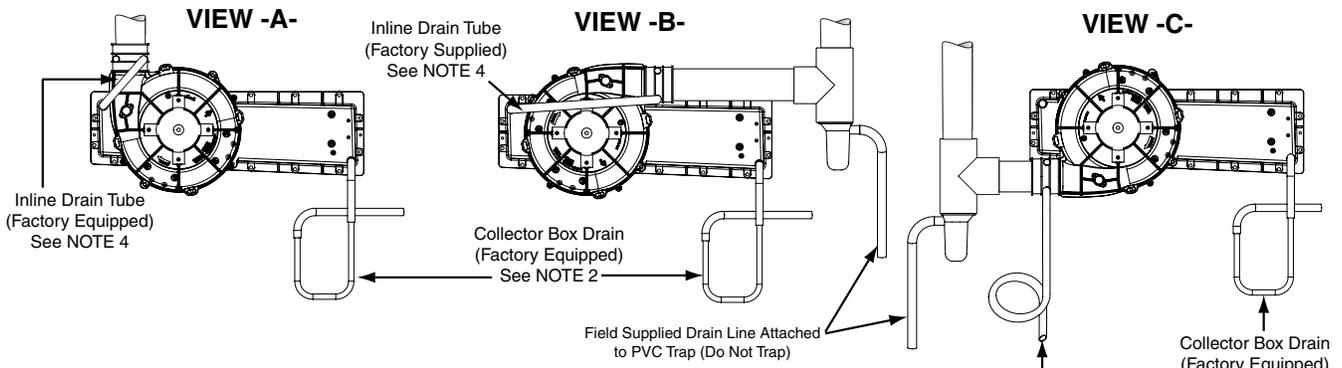
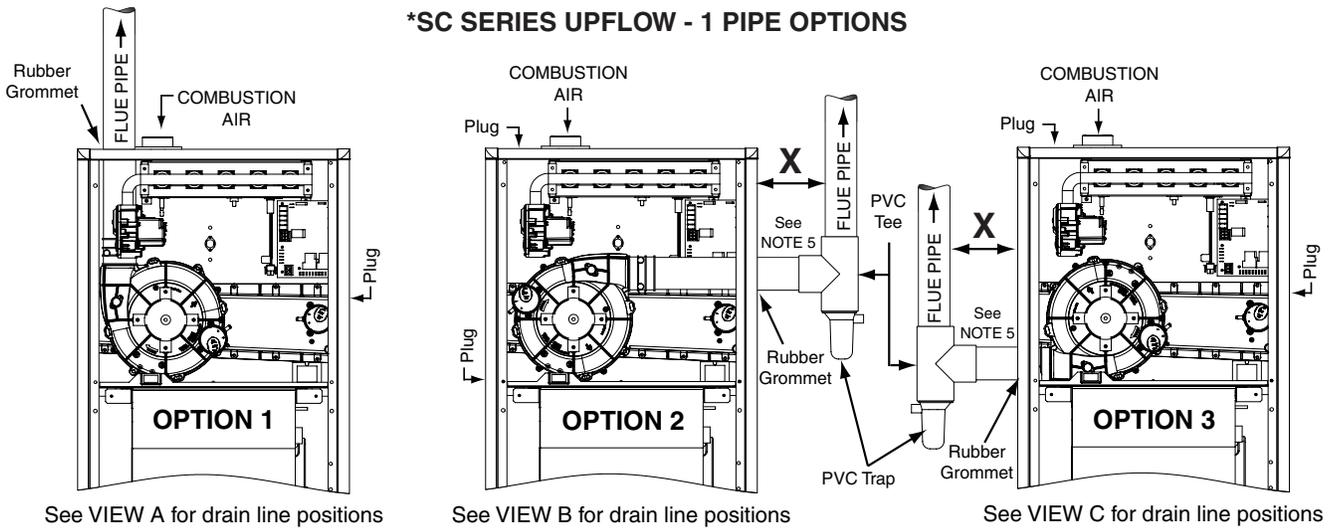


**VERTICAL VENTING w/ 2-Pipes**  
(Upflow Furnace Shown)



**Figure 34. Horizontal & Vertical Venting**

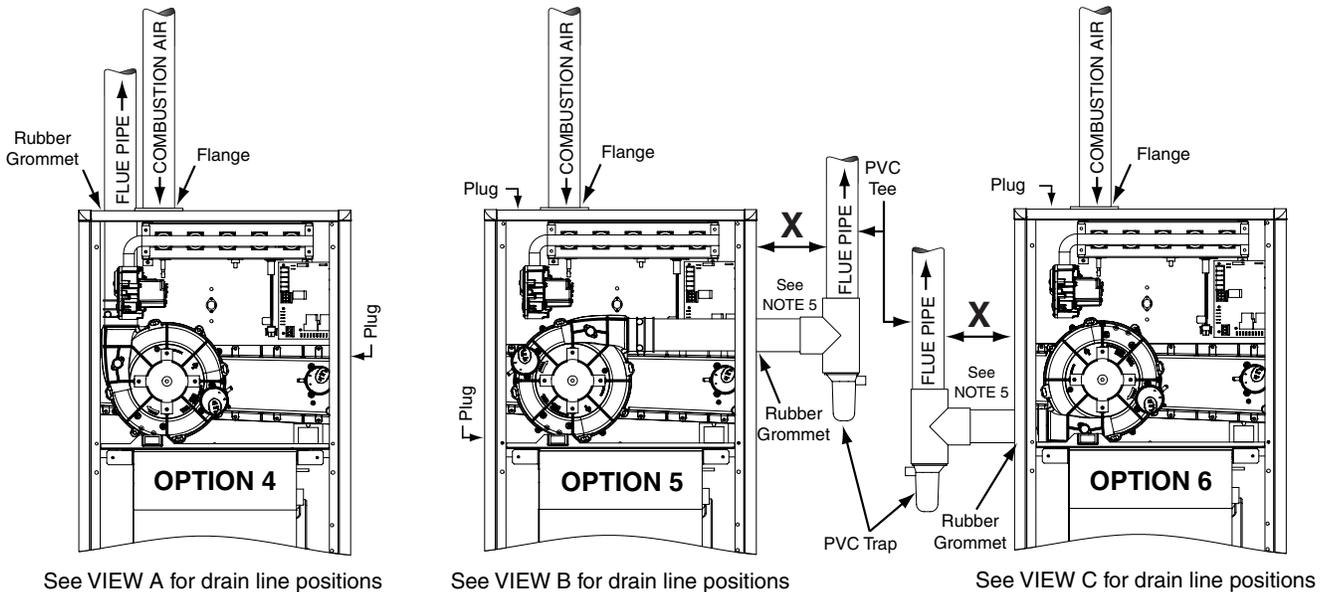
**\*SC SERIES UPFLOW - 1 PIPE OPTIONS**



**NOTES:**

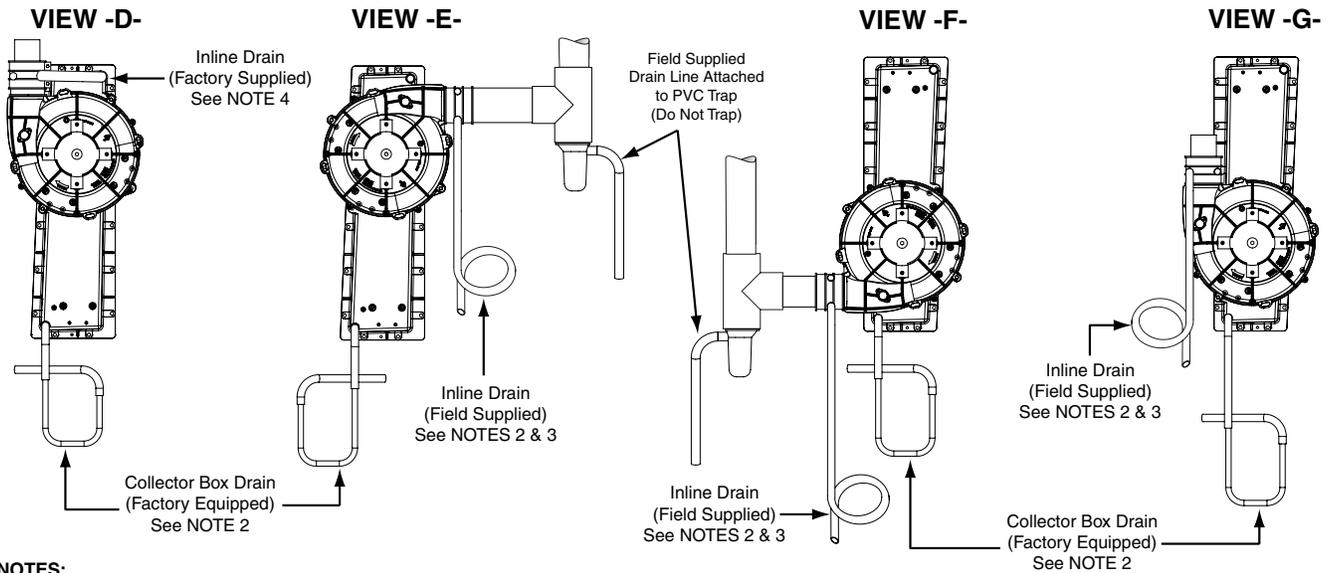
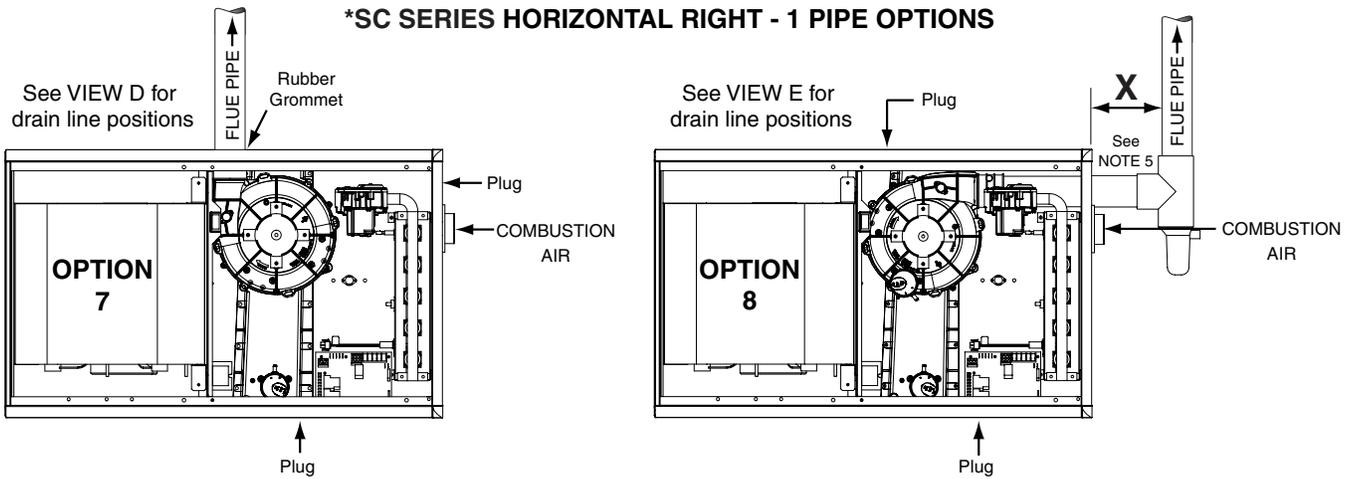
1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required 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.

**\*SC SERIES UPFLOW - 2 PIPE OPTIONS**



**Figure 35. Venting Options for Upflow Installations (\*SC Series)**

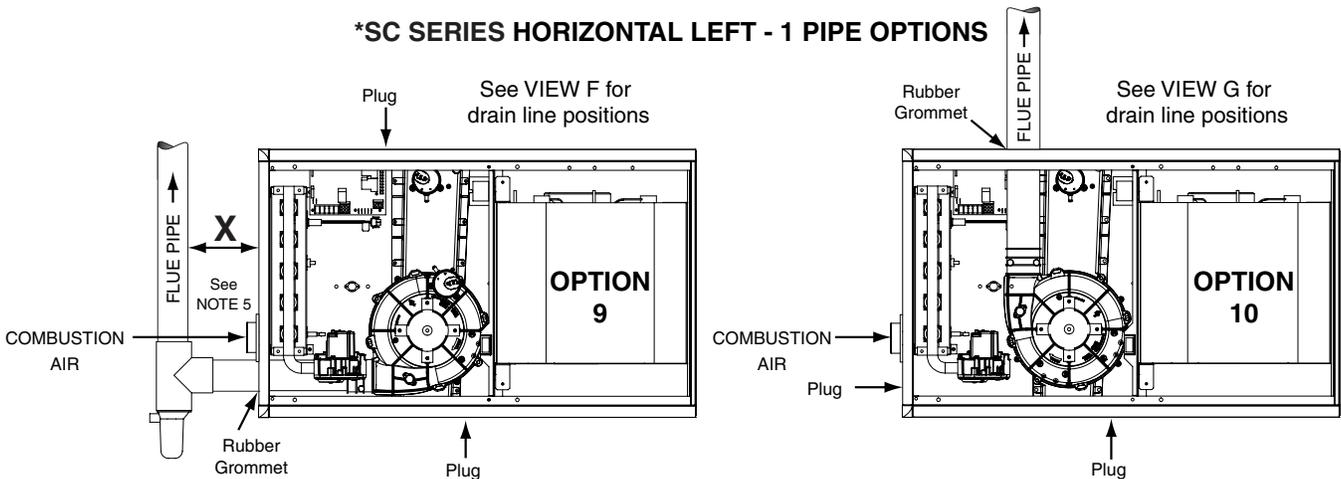
**\*SC SERIES HORIZONTAL RIGHT - 1 PIPE OPTIONS**



**NOTES:**

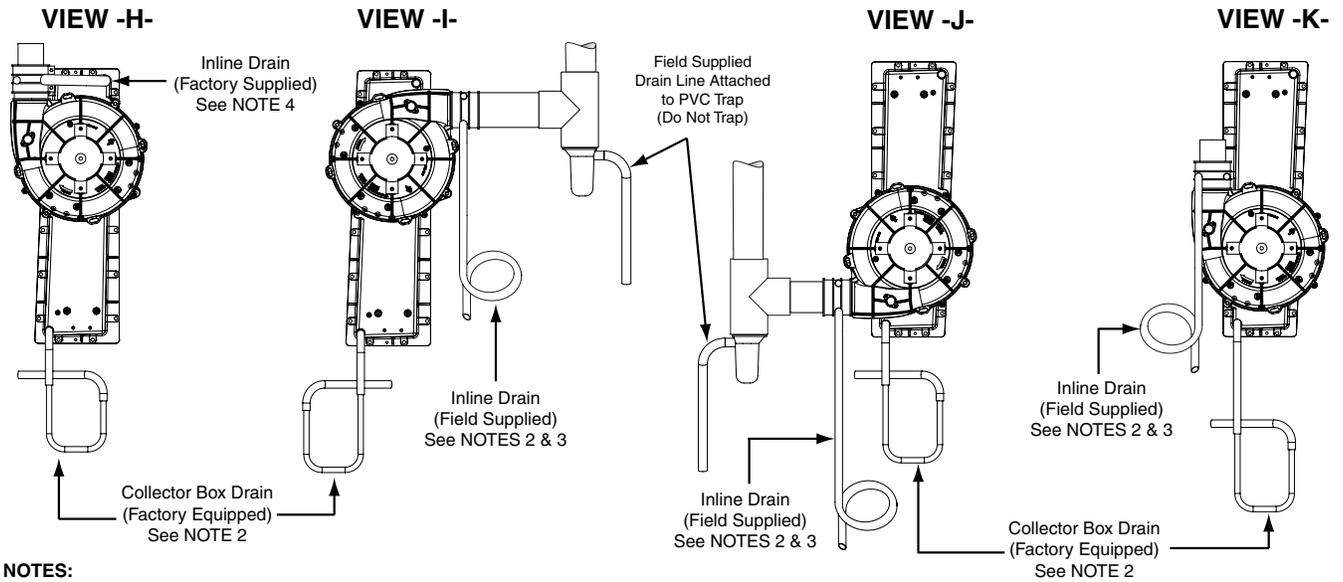
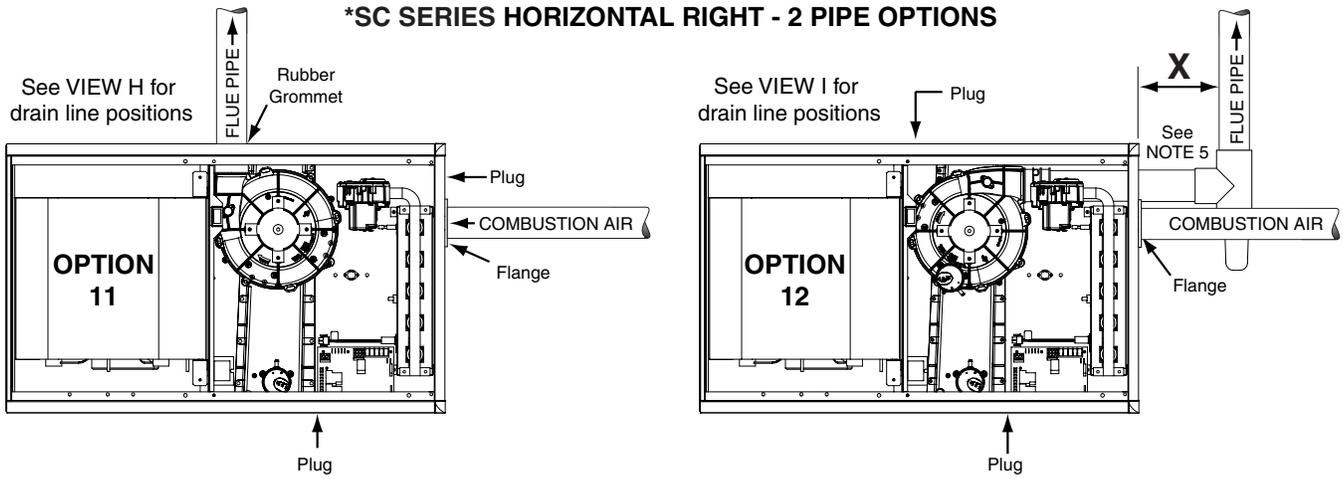
1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
3. Inline drain is required 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.

**\*SC SERIES HORIZONTAL LEFT - 1 PIPE OPTIONS**



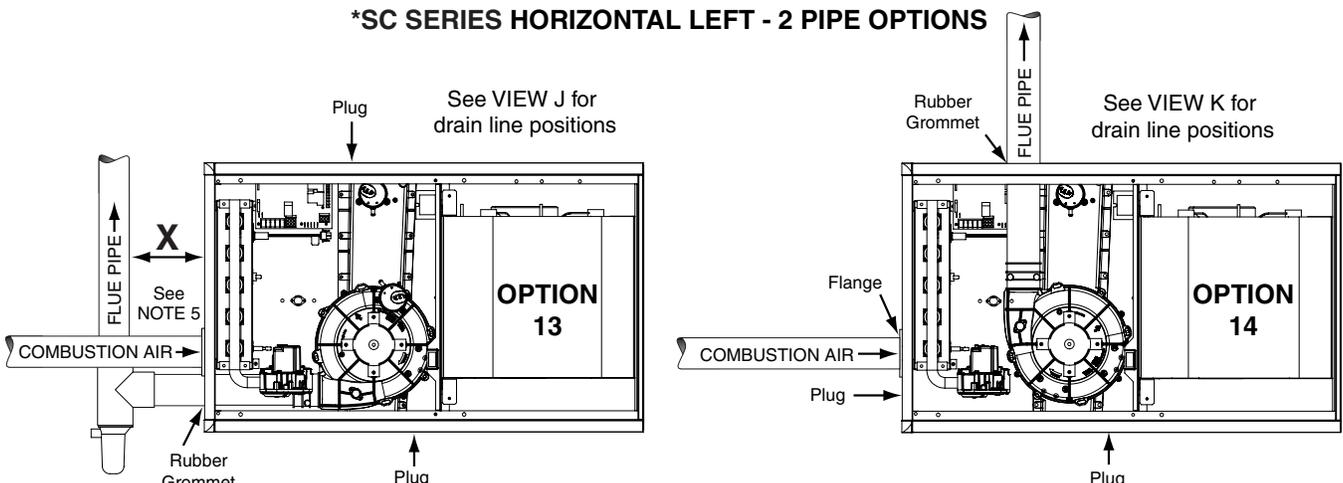
**Figure 36. Venting Options for 1 Pipe Horizontal Installations (\*SC Series)**

**\*SC SERIES HORIZONTAL RIGHT - 2 PIPE OPTIONS**



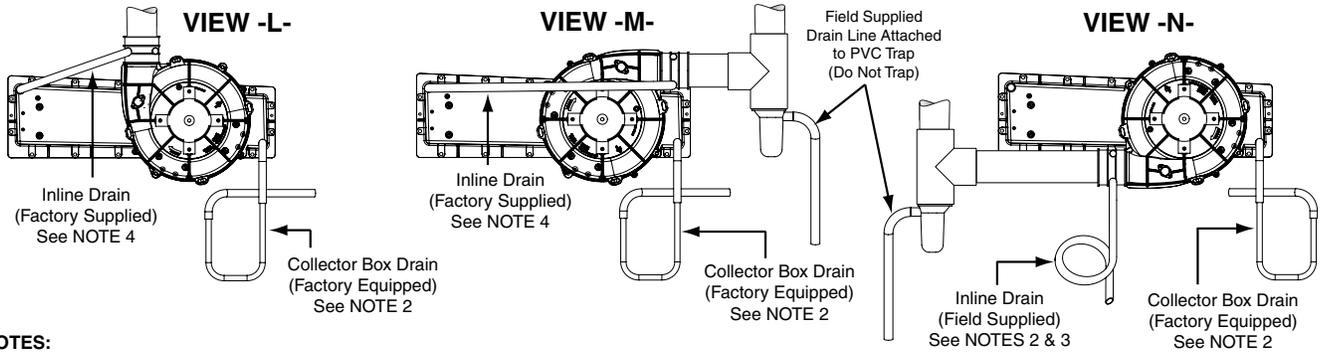
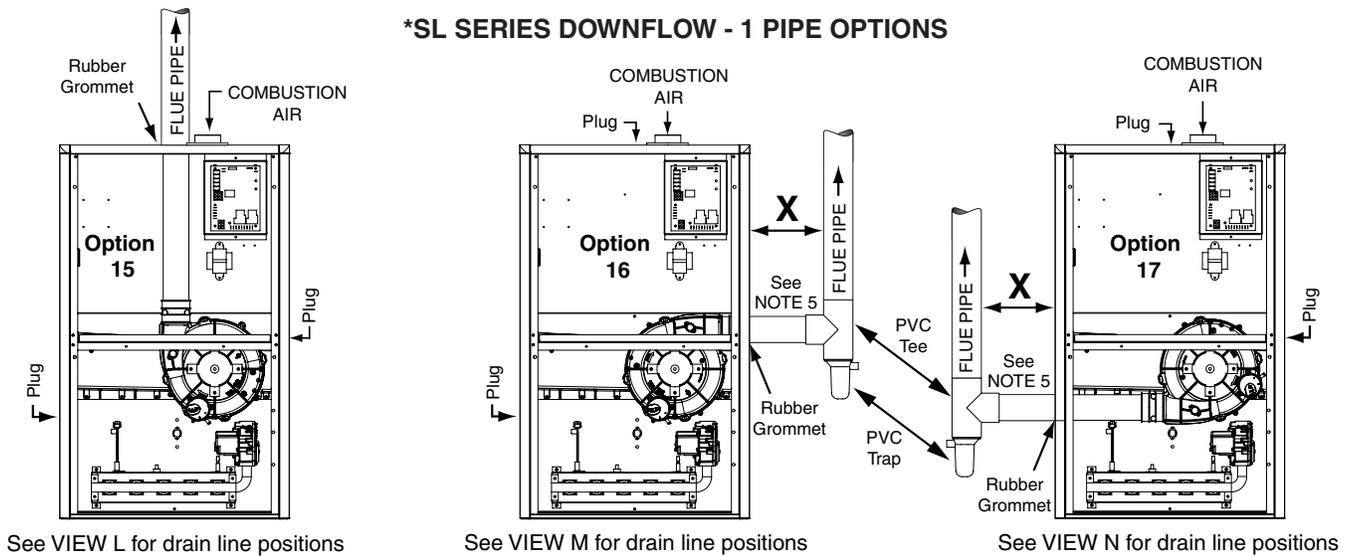
- NOTES:**
1. See Accessories section (page 16) for optional PVC Tee configurations and drainage options.
  2. Drain lines must be trapped with a J-Trap or field supplied loop. Traps may be positioned inside or outside the cabinet. All drain lines must be routed externally from the cabinet.
  3. Inline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

**\*SC SERIES HORIZONTAL LEFT - 2 PIPE OPTIONS**



**Figure 37. Venting Options for 2-Pipe Horizontal Installations (\*SC Series)**

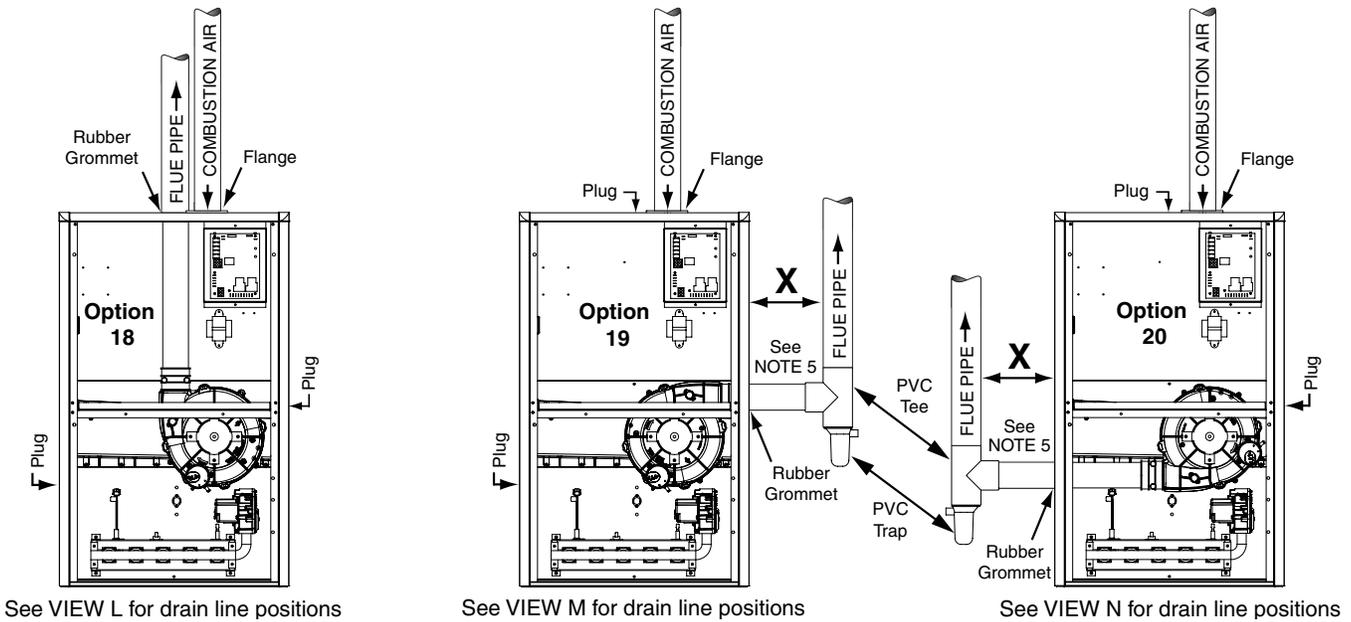
### \*SL SERIES DOWNFLOW - 1 PIPE OPTIONS



**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.

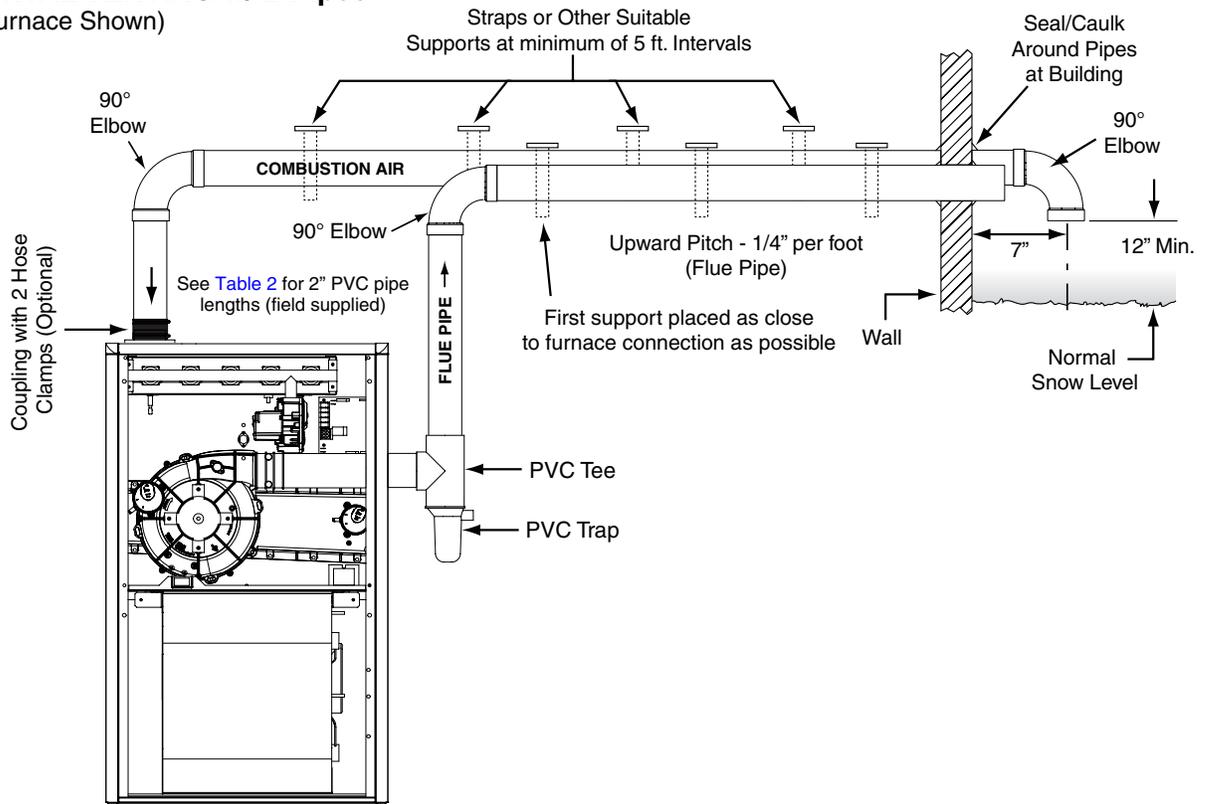
### \*SL SERIES DOWNFLOW - 2 PIPE OPTIONS



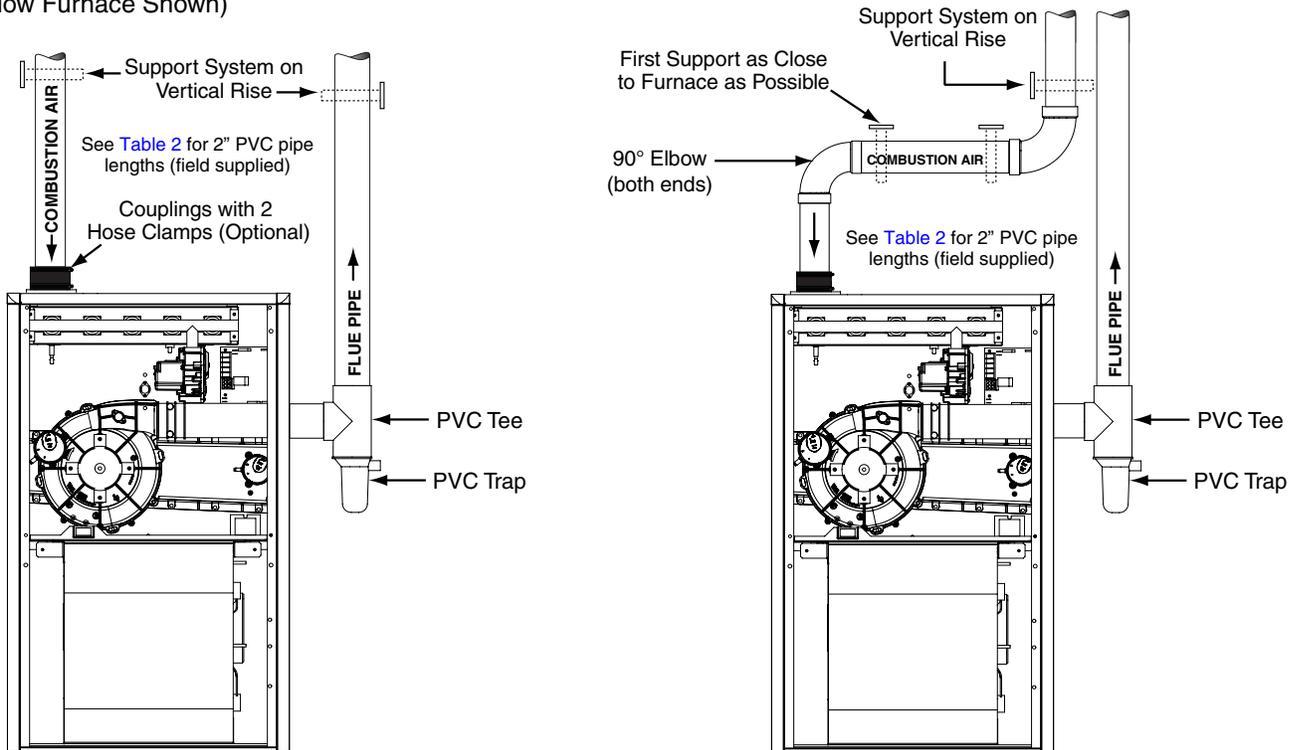
**Figure 38. Venting Options for Downflow Installations (\*SL Series)**

**\*SD, \*SD-E & \*SM Series**

**HORIZONTAL VENTING w/ 2-Pipes**  
(Upflow Furnace Shown)

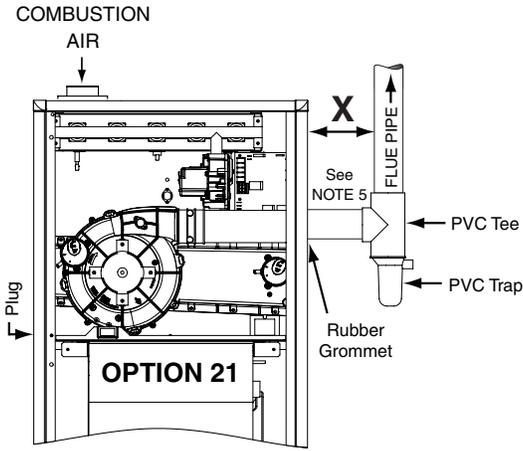


**VERTICAL VENTING w/ 2-Pipes**  
(Upflow Furnace Shown)

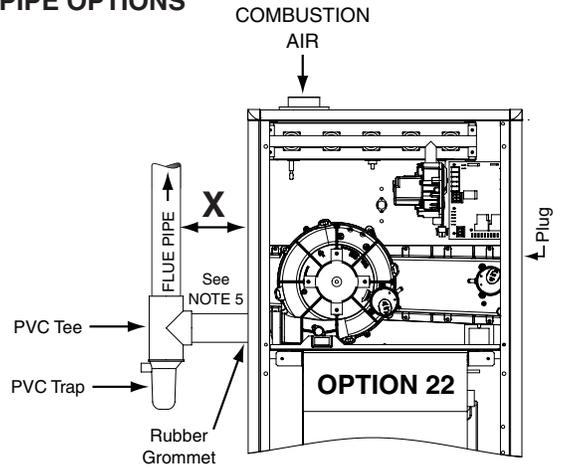


**Figure 39. Horizontal & Vertical Venting**

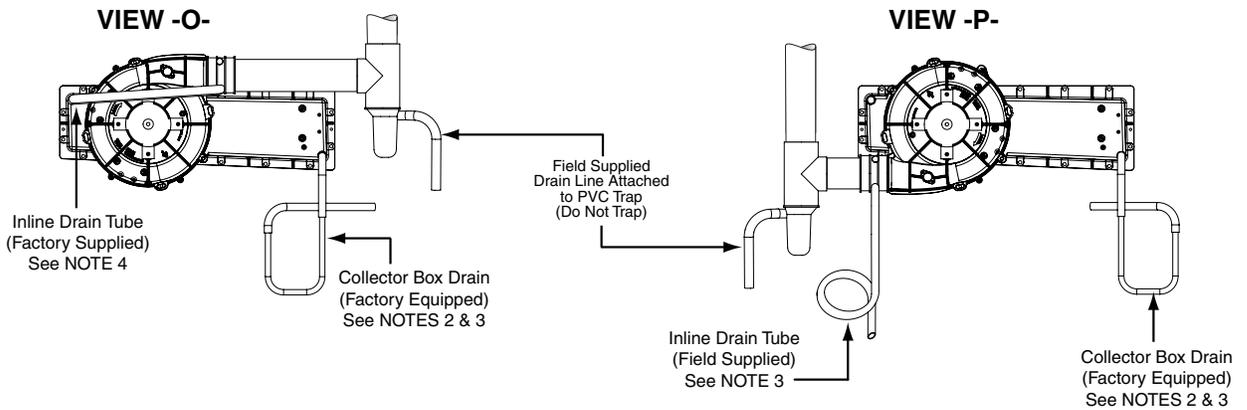
**\*SD & SD-E SERIES UPFLOW - 1 PIPE OPTIONS**



See VIEW O for drain line positions



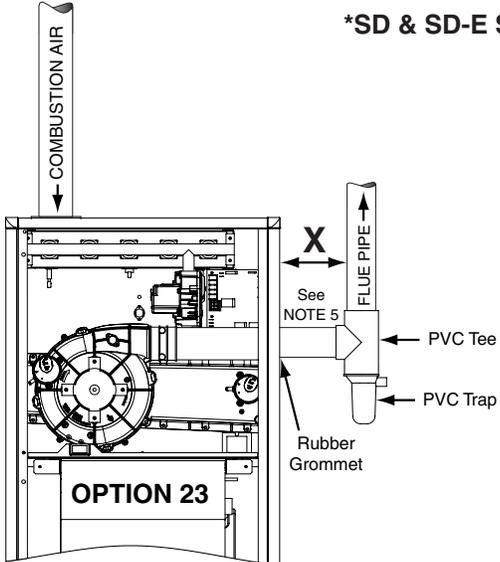
See VIEW P for drain line positions



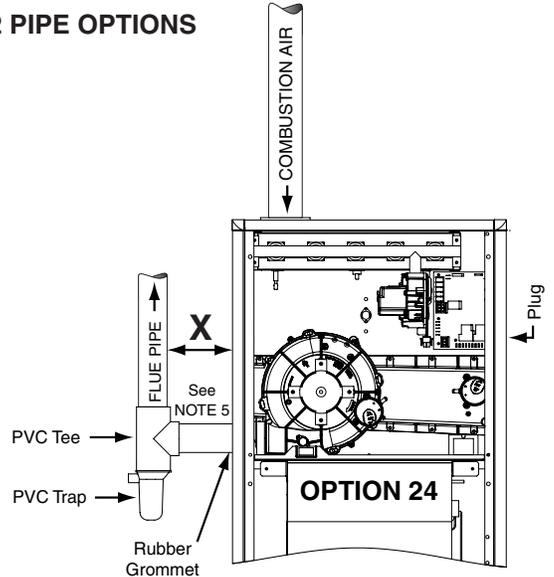
**NOTES:**

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.

**\*SD & SD-E SERIES UPFLOW - 2 PIPE OPTIONS**



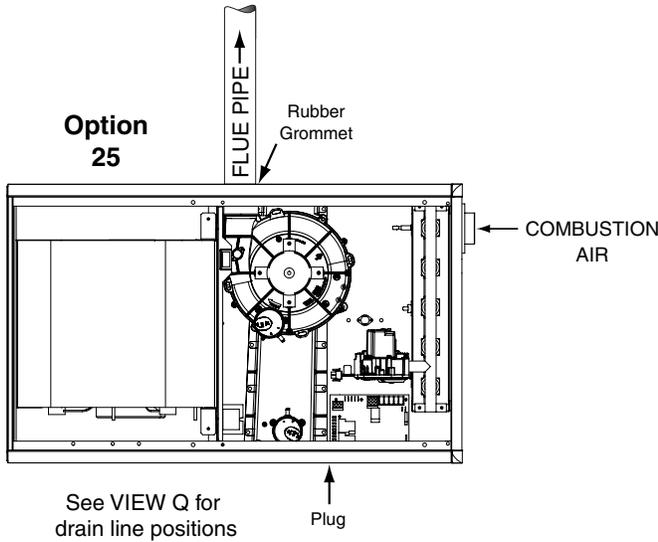
See VIEW O for drain line positions



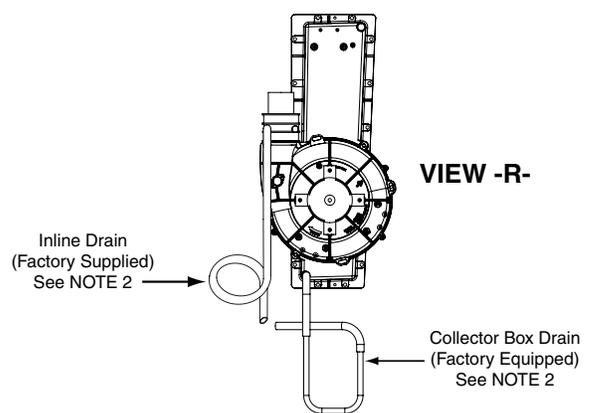
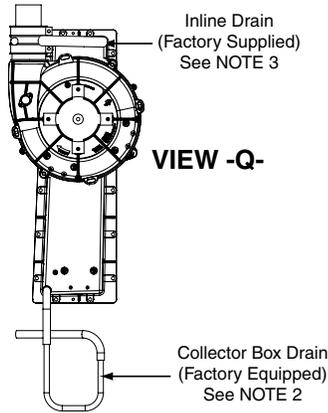
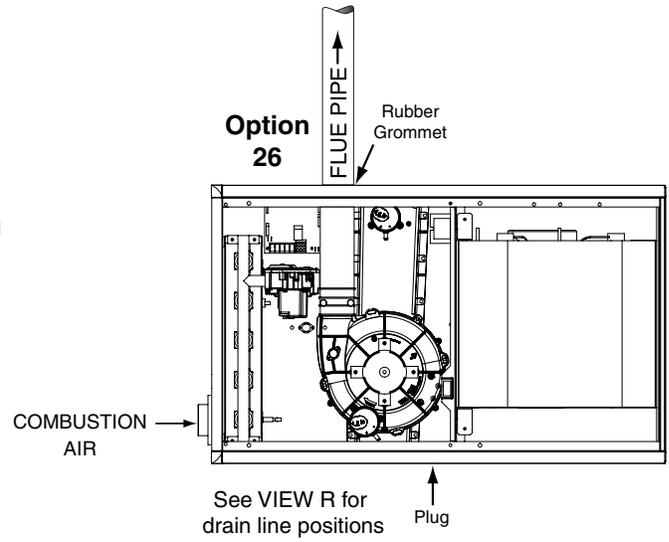
See VIEW P for drain line positions

**Figure 40. Venting Options for Upflow Installations (\*SD & \*SD-E Series)**

**\*SD & SD-E SERIES HORIZONTAL RIGHT - 1 PIPE OPTION**



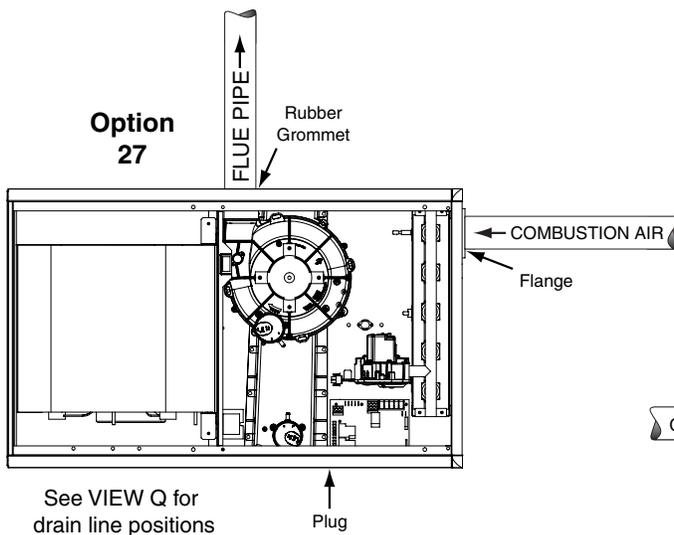
**\*SD & SD-E SERIES HORIZONTAL LEFT - 1 PIPE OPTION**



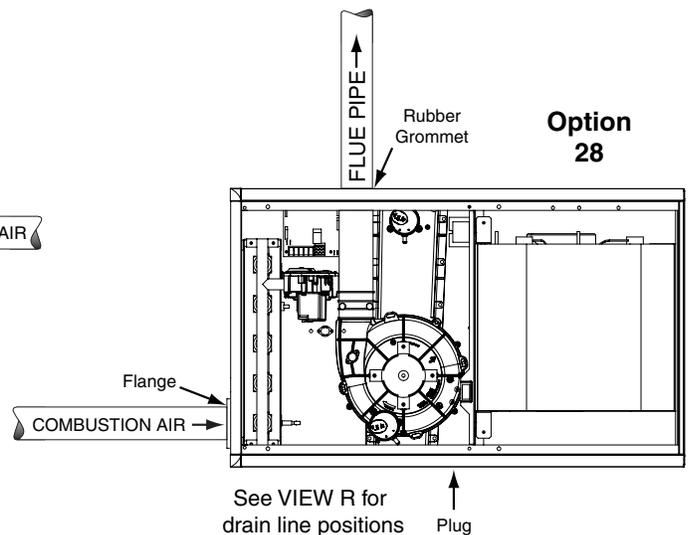
**NOTES:**

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.

**\*SD & SD-E SERIES HORIZONTAL RIGHT - 2 PIPE OPTION**

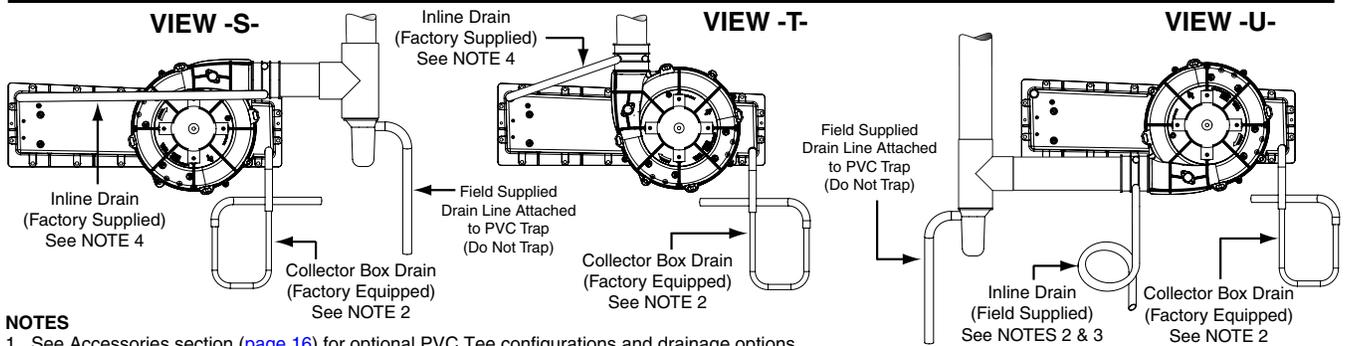
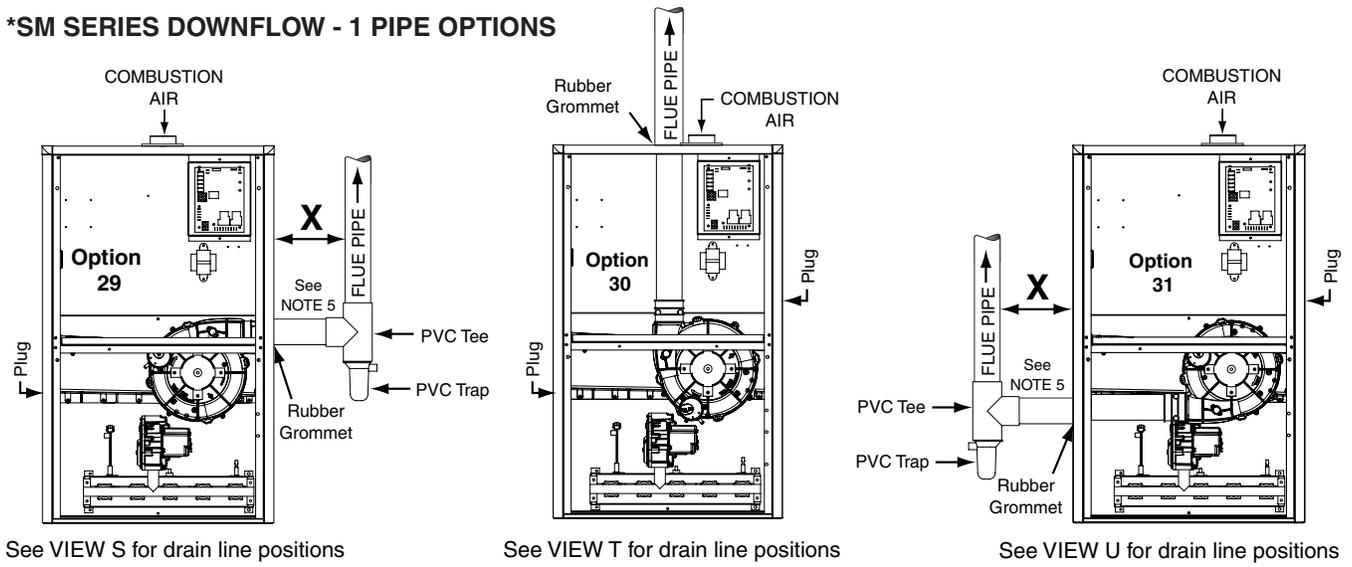


**\*SD & SD-E SERIES HORIZONTAL LEFT - 2 PIPE OPTION**



**Figure 41. Venting Options for Horizontal Installations (\*SD & \*SD-E Series)**

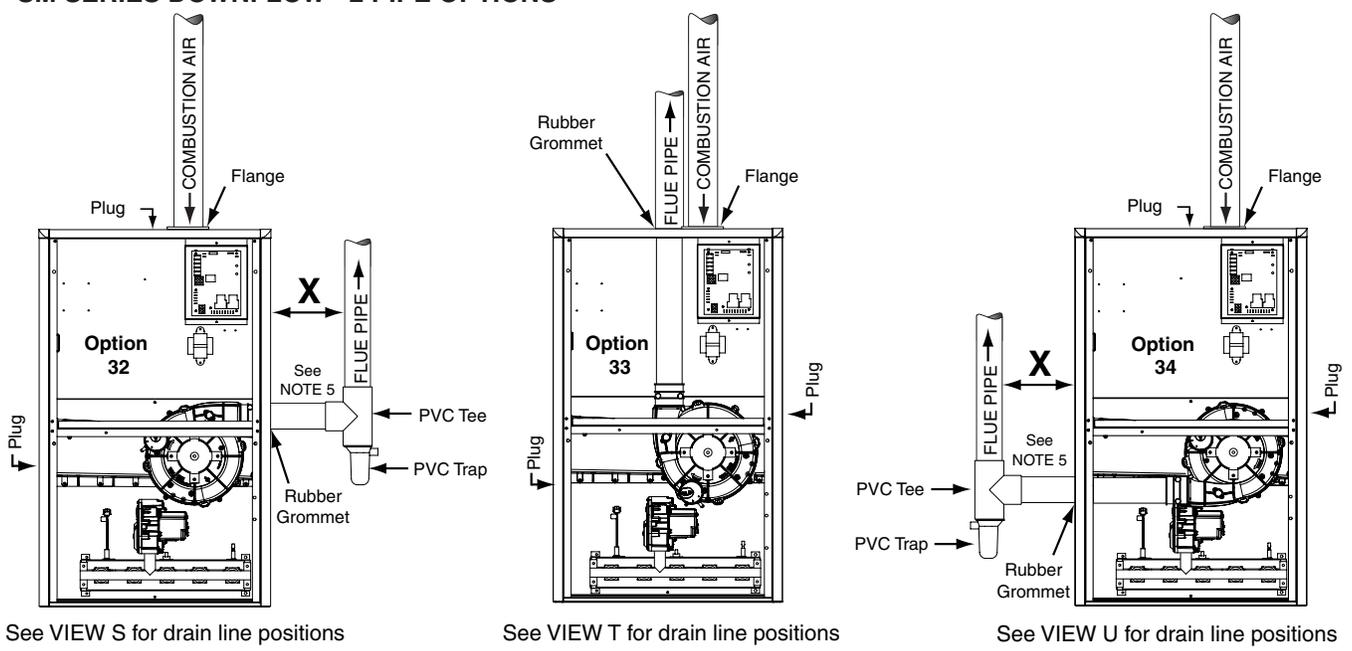
**\*SM SERIES DOWNFLOW - 1 PIPE OPTIONS**



**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. In-line 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.

**\*SM SERIES DOWNFLOW - 2 PIPE OPTIONS**



**Figure 42. Venting Options for Downflow Installations (\*SM 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 18](#) or the wiring diagram, [Figure 32](#) (page 38) & [Figure 33](#) (page 39) to determine fault condition.
- Are all the LED's on the motor control board constantly ON? If not, refer to [Table 19](#) 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 43](#) (page 54) or [Figure 44](#) (page 55) 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.

DIAGNOSTIC DESCRIPTION	GREEN LED	RED LED
Control Fault (No Power)	Off	Off
L1/Neutral Polarity Fault	Flash	Flash
1 Hour Lockout	Alternating Flash	
Normal Operation	On	On
Pressure Switch Closed Fault	On	Flash
Pressure Switch Open Fault	Flash	On
Open Limit Switch Fault	Flash	Off
DIAGNOSTIC DESCRIPTION	YELLOW LED	
Low Flame Sensor Signal	Continuous Flash	
Flame Present	On	

**Table 18. Control Board Fault Conditions**

DIAGNOSTIC DESCRIPTION	RED LED	GREEN LED
Control Fault (No Power)	Off	Off
Normal Operation	On	On
Motor Fault	On	Flash
Twin Fault (No Motor Fault)	Flash	On
Communications Fault	Flash	Flash

**Table 19. Motor Control Board Fault Conditions**

## FURNACE COMPONENTS

The descriptions below are various functional components that affect the operation and shutting down of this furnace. Some of these components and their locations are shown in [Figure 43](#) (page 54) or [Figure 44](#) (page 55). 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.

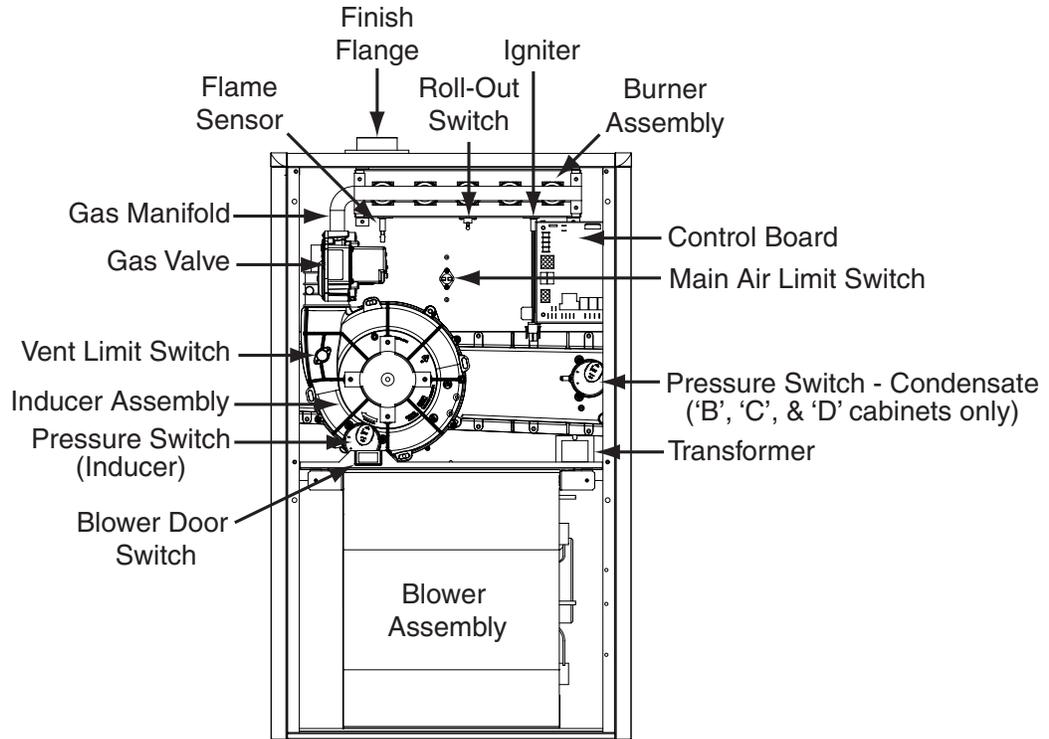
**Gas Valve:** Controls the flow of gas to the burners. When the gas valve is energized it automatically opens and regulates the gas pressure in the manifold.

**Inducer Assembly:** Vents products of combustion to the outside.

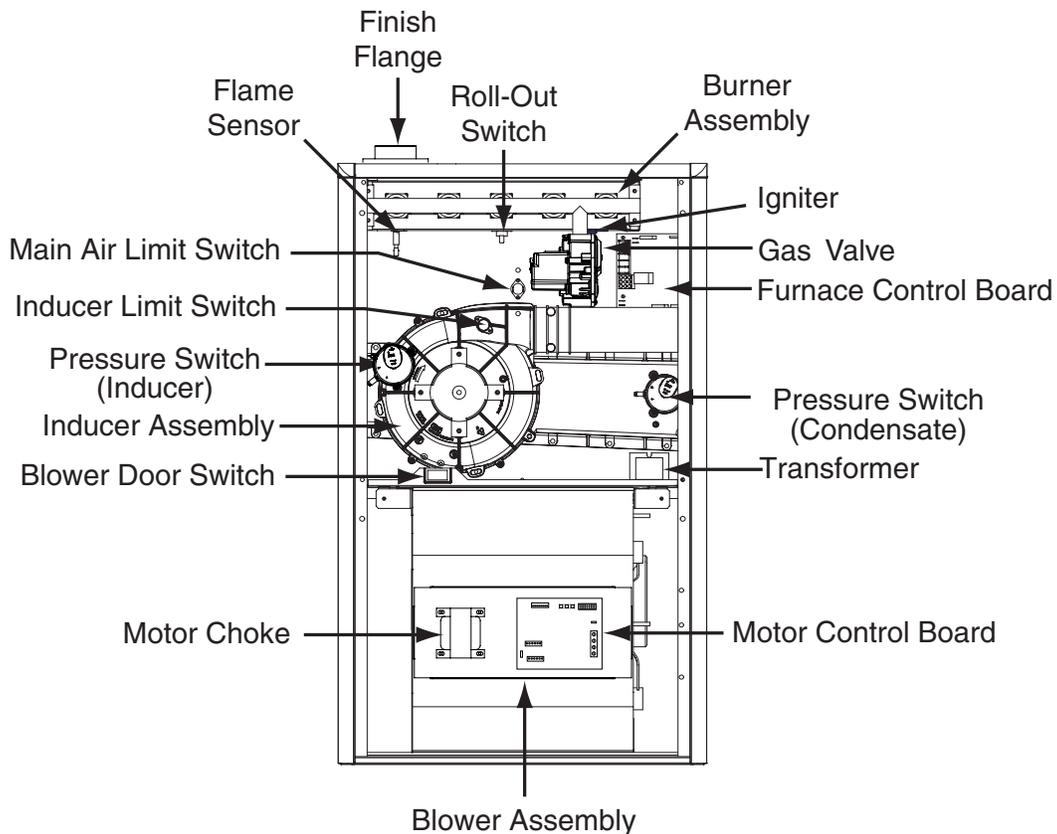
**Pressure Switches:** Verifies that the inducer is drawing the combustion gases through the heat exchanger. The pressure switch prevents furnace operation with excessive flue/condensate blockage or improper inducer operation.

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

**UPFLOW / HORIZONTAL FURNACE (\*SC SERIES)**

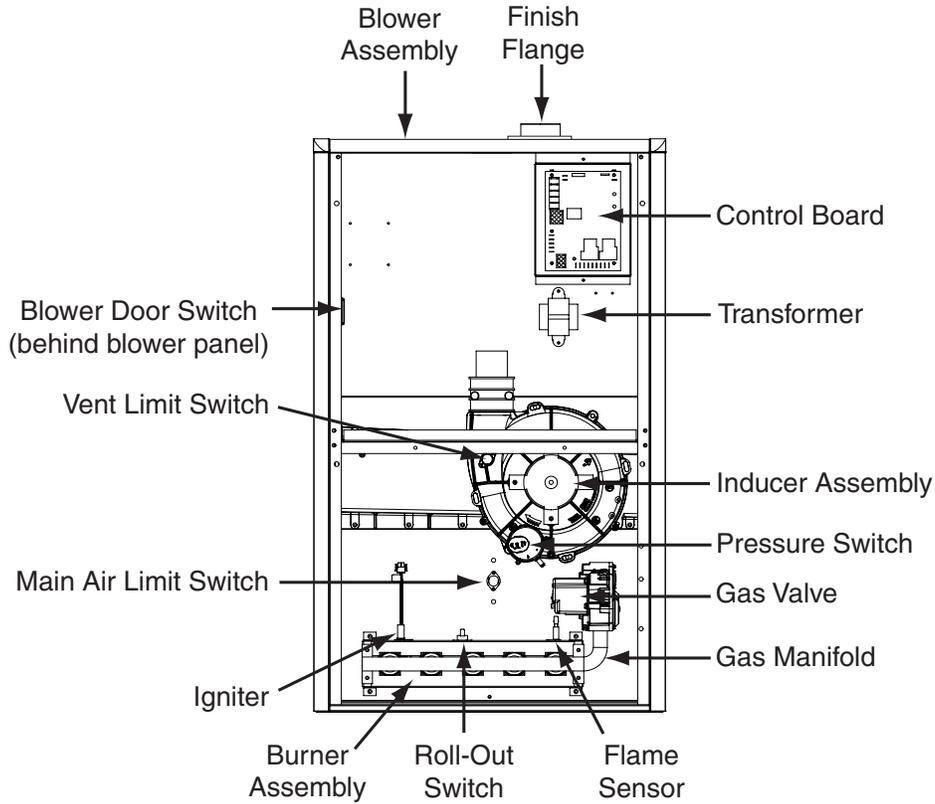


**UPFLOW / HORIZONTAL FURNACE (\*SD & SD-E SERIES)**

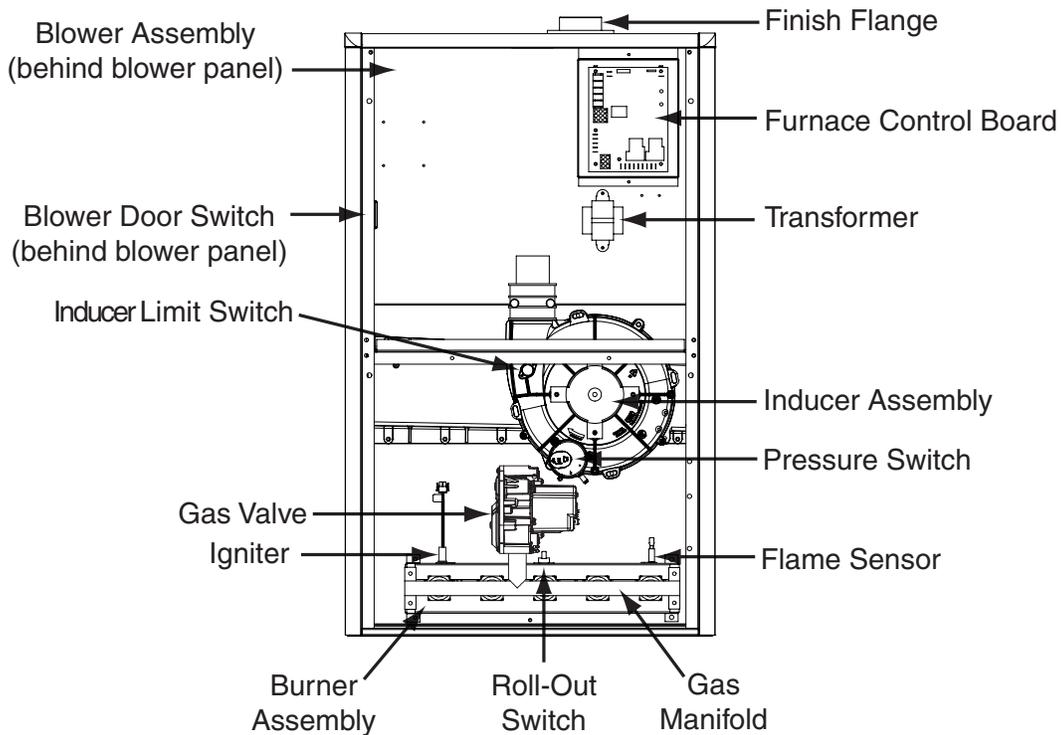


**Figure 43. \*SC & \*SD & \*SD-E Component Locations**

**DOWNFLOW FURNACE (\*SL SERIES)**



**DOWNFLOW FURNACE (\*SM SERIES)**



**Figure 44. \*SL & \*SM Component Locations**

## INSTALLATION CHECKLIST

<b>INSTALLER NAME:</b>		
CITY:	STATE:	
<b>INSTALLATION ADDRESS:</b>		
CITY:	STATE:	
UNIT MODEL #		
UNIT SERIAL #		
Minimum clearances per <a href="#">Figure 1 (page 6)</a> ?	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

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

### 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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