

Installation Instructions



*TA UPFLOW / HORIZONTAL FURNACE



*TK 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 neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

AVERTISSEMENT

RISQUE D'INCENDIE OU D'EXPLOSION

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

QUE FAIRE S'IL Y A UNE ODEUR DE GAZ

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

TABLE OF CONTENTS

IMPORTANT SAFETY INFORMATION	3	Variable Speed Blowers	22
REQUIREMENTS & CODES	3	Dehumidification Options	22
Combustion Air Quality	4	Heat Anticipator	23
Clearances to Combustible Materials	4	START-UP & ADJUSTMENTS	23
Heating Load	4	Pre-Start Checklist	23
Installation in a Garage	5	Start-Up Procedures.....	23
Operation of Furnace During Construction	5	Verifying & Adjusting Input Rate	23
COMBUSTION AIR & VENTING REQUIREMENTS ...	6	Verifying & Adjusting Temperature Rise	23
Important Information.....	7	Verifying Burner Operation	24
Installation in a Confined Space	7	Verify Operation of the Supply Air Limit Switch....	24
Air From Inside	7	OPERATING SEQUENCE	25
Outdoor Air from a Crawl Space or		Heating Cycle	25
Vented Attic	7	Cooling Cycle	25
Outdoor Air Using Vertical Ducts.....	7	Fan Mode.....	25
Outdoor Air Using Horizontal Ducts	7	MAINTENANCE	26
Air Directly Through an Exterior Wall	8	FIGURES & TABLES	28
Alternate Method of Providing Air from		Figure 21 - Furnace Dimensions.....	28
Outside.....	9	Airflow Data	29
Installation in an Unconfined Space	9	Table 3 - Heating / Cooling Airflows &	
Category I Venting	9	Temperature Rises - Fixed Speed	29
Horizontal Venting.....	10	Table 4 - Nominal CFM & Temperature Rises -	
Flexible Vent Systems	10	Variable Speed	31
CIRCULATING AIR REQUIREMENTS	11	Table 5 - Nominal Cooling / Heat Pump CFM -	
Plenums & Air Ducts.....	11	Variable Speed	32
Return Air Connections	11	Electrical Information	33
Upflow / Horizontal Furnaces	11	Figure 22 - Two-Stage Fixed Speed Motor	
Downflow Furnaces.....	12	Control Board.....	33
Supply Air Connections	12	Figure 23 - Two-Stage Variable Speed	
Acoustical Treatments	12	Motor Control Board	33
FURNACE INSTALLATION	12	Figure 24 - Two-Stage Furnace Control Board..	33
About the Furnace	12	Figure 25 - Wiring Diagram - 2 Stage Fixed	
Before you Install the Furnace.....	12	Speed Upflow/Horiz. Furnaces	34
Locating the Furnace	13	Figure 26 - Wiring Diagram - 2 Stage Fixed	
Upflow Furnaces.....	13	Speed Downflow Furnaces	35
Horizontal Furnaces.....	13	Figure 27 - Wiring Diagram - 2 Stage Variable	
Downflow Furnaces	14	Speed Upflow/Horiz. Furnaces	36
Installation on a Concrete Slab	14	Figure 28 - Wiring Diagram - 2 Stage Variable	
Pressure Switches	15	Speed Downflow Furnaces	37
Bottom Panel Removal	15	Gas Information	38
Alternate Bottom Panel Removal	15	Table 6 - Gas Flow Rates.....	38
GAS SUPPLY & PIPING	16	Table 7 - Gas Pipe Capacities	38
Leak Check	16	Table 8 - High Altitude Deration Chart for	
High-Altitude Application	18	Propane Gas	39
Conversion to LP / Propane.....	19	Table 9 - Natural Gas Heating Values	39
ELECTRICAL WIRING	19	Table 10 - High Altitude Deration Chart for	
Line Voltage Wiring.....	19	Nat. Gas - High Heating Value.....	40
Grounding	20	Table 11 - High Altitude Deration Chart for	
Thermostat / Low Voltage Connections.....	20	Nat. Gas - Low Heating Value	40
Single Stage AC & Single Stage Heat		Troubleshooting	41
Thermostat	21	Table 12 - Furnace Control Board Faults	41
Single Stage AC & Two - Stage Heat		Table 13 - Motor Control Board Faults.....	41
Thermostat	21	Furnace Components	41
Two - Stage AC & Two - Stage Heat		Figure 29 - Component Locations.....	42
Thermostat	21	INSTALLATION / PERFORMANCE CHECKLIST	44
Autostaging for Single Stage Thermostats	21		
Autostaging for Two-Stage Thermostats	22		
Blower Speed Configuration.....	22		
Fixed Speed Blowers.....	22		

IMPORTANT SAFETY INFORMATION

INSTALLER: Please read all instructions before servicing this equipment. Pay attention to all safety warnings and any other special notes highlighted in the manual. Safety markings are used frequently throughout this manual to designate a degree or level of seriousness and should not be ignored.

WARNING - indicates a potentially hazardous situation that if not avoided, could result in personal injury or death.

CAUTION - indicates a potentially hazardous situation that if not avoided, may result in minor or moderate injury or property damage.

WARNING:

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

WARNING:

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

WARNING:

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

WARNING:

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

- To minimize equipment failure or personal injury, it is essential that only qualified individuals install, service, or maintain this equipment. If you do not 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 the units label or Figs. 25-28 (pgs 34-37).
- Always reinstall the doors on the indoor blower after servicing or cleaning/changing the filters. Do not operate the indoor blower 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/CGA 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 pages 6 - 10.
- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified on pages 9 & 10.
- Never test for gas leaks with an open flame. Use a commercially available soap solution to check all connections. See pages 16 & 17.
- This furnace is designed to operate with a maximum external pressure rise of 0.5 inches of water column. Consult Tables 3 - 5 (pages 29 - 32), and the rating plate for the proper circulating air flow and temperature rise. It is important that the duct system be designed to handle the desired flow rate and temperature rise. An

improperly designed duct system can result in nuisance shutdowns, and comfort or noise issues.

- When supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. See pages 11 & 12.
- This furnace may be used for temporary heating of buildings or structures under construction. See the guidelines listed on page 5.
- 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 information listed below is for reference purposes only and does not necessarily have jurisdiction over local or state codes. Always consult with local authorities before installing any gas appliance.

Combustion & Ventilation Air

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

Duct Systems

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

Electrical Connections

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

Gas Piping & Gas Pipe Pressure Testing

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

General Installation

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

Safety

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

Combustion Air Quality

CAUTION:

Combustion air must not be drawn from a corrosive atmosphere.

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

- If the furnace is installed 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 pages 7 - 8 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
- 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

Clearances to Combustible Materials

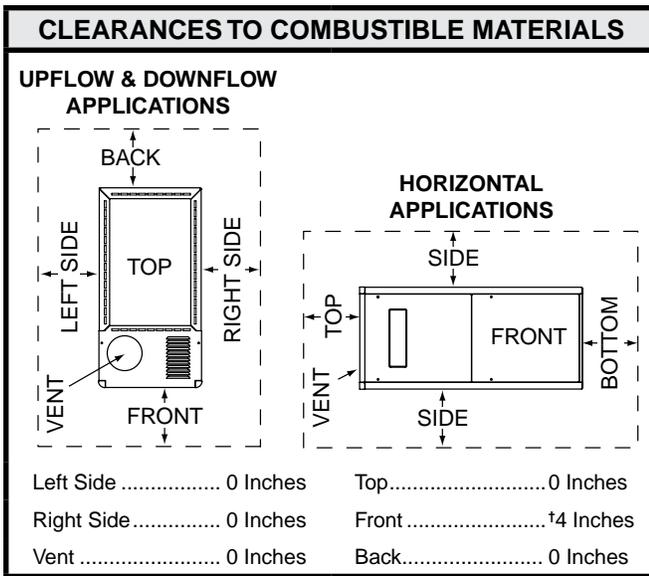
This furnace is Design Certified in the U.S. and Canada by CSA International for the minimum clearances to combustible materials. **NOTE:** The furnace is listed for installation on combustible or non-combustible flooring. However, wood is the only combustible flooring allowed for installation. Downflow 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 (page 5) for minimum clearance requirements.

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.



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

Figure 1. Minimum Clearances to Combustible Materials

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.

Two-stage furnaces operate at two input rates to better meet heating loads. The lower heating rate (low fire) is 65% of the high fire rate. The greatest degree of control over the furnace can be gained by controlling it with a two stage thermostat. This allows the thermostat to directly request either high or low fire. However, it is possible to operate the furnace using a single stage thermostat. In this application the furnace control can be set to increase from low to high fire, based on a timer. See Autostaging for Single Stage Thermostats (page 21).

Furnaces are properly sized to meet the expected maximum heating load. But this load occurs infrequently. So, during more moderate weather, the furnace is likely to use low fire a considerable part of the time. This is normal and has the benefit of quieter and more efficient operation.

Installation in a Garage

⚠ WARNING:

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

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

Operation of Furnace During Construction

⚠ CAUTION:

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

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

- The installation must meet all applicable codes. The furnace must be permanently installed according to the instructions supplied with the furnace including electrical supply, gas supply, duct work and venting. The furnace must be controlled by a thermostat properly installed according to the instructions supplied with the furnace and thermostat. The installation must include a properly installed filter in the return air system with no by-pass air. The filter must be inspected frequently and replaced when necessary.
- Combustion air must be supplied from outside the structure and located such that dust and gases from construction activity are not introduced into the combustion system.
- Before occupying the structure: The filter must be replaced or cleaned, the duct work must be inspected and cleaned of any construction debris, and the furnace must be cleaned and/or repaired if found to be dirty, damaged, or malfunctioning in any way by a qualified HVAC technician. The furnace shall be inspected and approved by applicable local authority even if this requires redundant inspections.
- Serial numbers for furnaces used during construction must be submitted in writing (fax and email also acceptable). This information will be used to track the long-term affects of the use during construction on furnaces. Proof of this submittal shall be available for the final inspection of the furnace prior to occupancy.
- This furnace is designed to operate with return air temperatures in ranges normally found in occupied residences, including setbacks. Minimum continuous return temperature must not be below 60° F (15° C). Occasionally a temporary return temperature of 55° F (12° C) is acceptable. However, operation with a return temperature below 55° F (12° C) is not allowed.

COMBUSTION AIR & VENTING REQUIREMENTS

WARNING:

CARBON MONOXIDE POISONING HAZARD

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

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

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

AVERTISSEMENT:

RISQUE D'EMPOISONNEMENT AU MONOXYDE DE CARBONE

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

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

Important Information

- Provisions must be made during the installation of this furnace that provide an adequate supply of air for combustion. Furnace installation using methods other than those described in the following sections must comply with the National Fuel Gas Code (NFPA) and all applicable local codes.
- Instructions for determining the adequacy of combustion air for an installation can be found in the current revision of the NFPA (ANSI Z223.1/NFPA54). Consult local codes for special requirements. These requirements are for US installations as found in the NFPA.
- The requirements in Canada (B149.1) are structured differently. Consult with B149.1 and local code officials for Canadian installations.

⚠ 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 testing negative pressure problems can be found in the National Fuel Gas Code.

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. **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.**

Installation In A Confined Space

A confined space is an area with volume less than 50 cubic feet per 1,000 Btuh of the combined input rates of all appliances drawing combustion air from that space. Furnace closets, small equipment rooms and garages are confined spaces. Furnaces installed in a confined space which supply heated air to areas outside the space must draw return air from outside the space and must have the return air ducts tightly sealed to the furnace.

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

Air From Inside

If combustion air is taken from the heated space, the two openings must each have a free area of at least one square inch per 1,000 Btuh of total input of all appliances in the confined space, but **not less than 100 square inches** of free area. See Figure 2 and the example below.

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 in². If the combined input rate of all appliances is 120,000 Btuh, each opening must have a free area of at least 120 in².

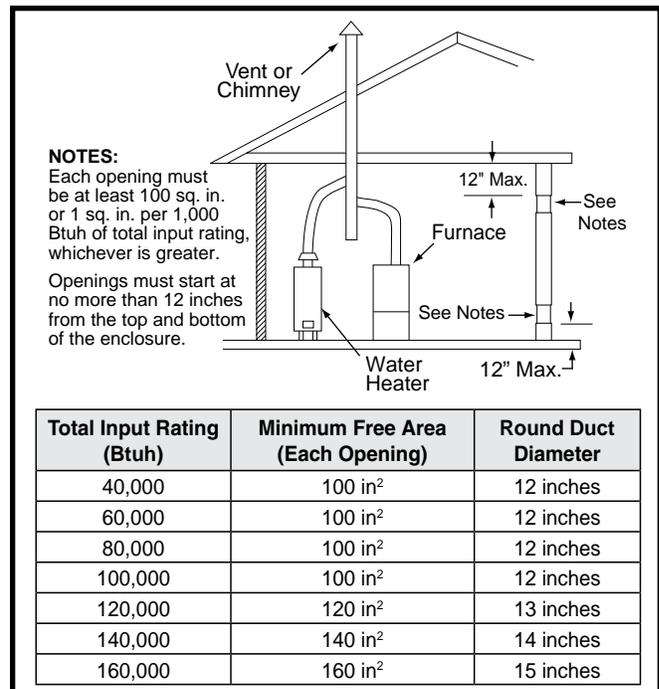


Figure 2. Combustion Air Drawn from Inside

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 (Figure 3, page 8).

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. In installations drawing combustion air from a ventilated attic, both air ducts must extend above the attic insulation (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 (Figure 5, page 8).

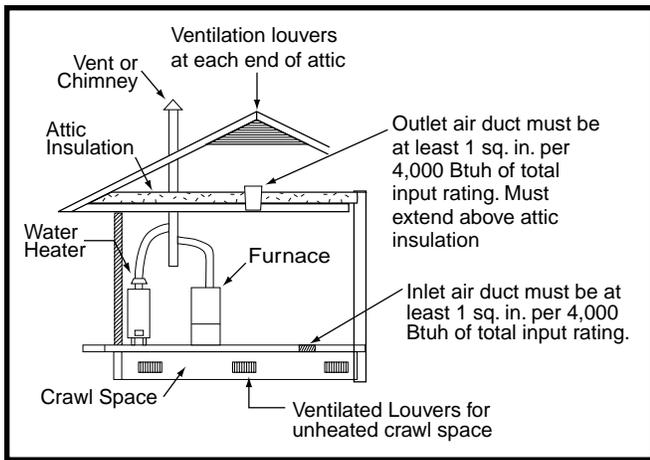
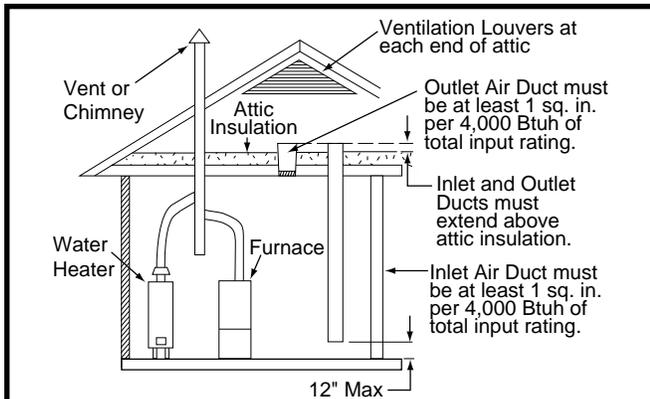


Figure 3. Combustion Air Drawn from a Crawl Space or Vented Attic



Total Input Rating (Btuh)	Minimum Free Area (Each Opening)	Round Duct Diameter
40,000	100 in ²	12 inches
60,000	100 in ²	12 inches
80,000	100 in ²	12 inches
100,000	100 in ²	12 inches
120,000	120 in ²	13 inches
140,000	140 in ²	14 inches
160,000	160 in ²	15 inches

Figure 4. Combustion Air Drawn from Outside Through Vertical Ducts

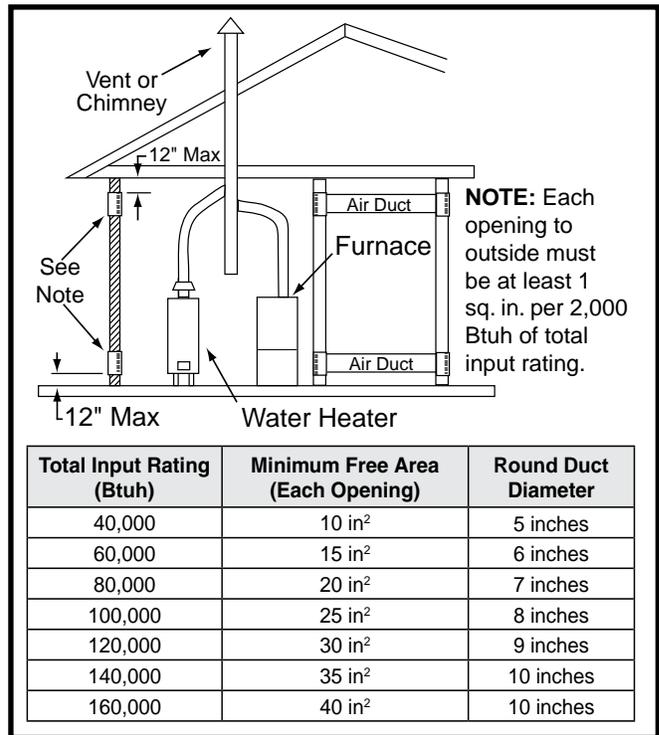


Figure 5. Combustion Air Drawn from Outside Through Horizontal Ducts

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 1 in² per 4,000 Btuh of total appliance input (Figure 6).

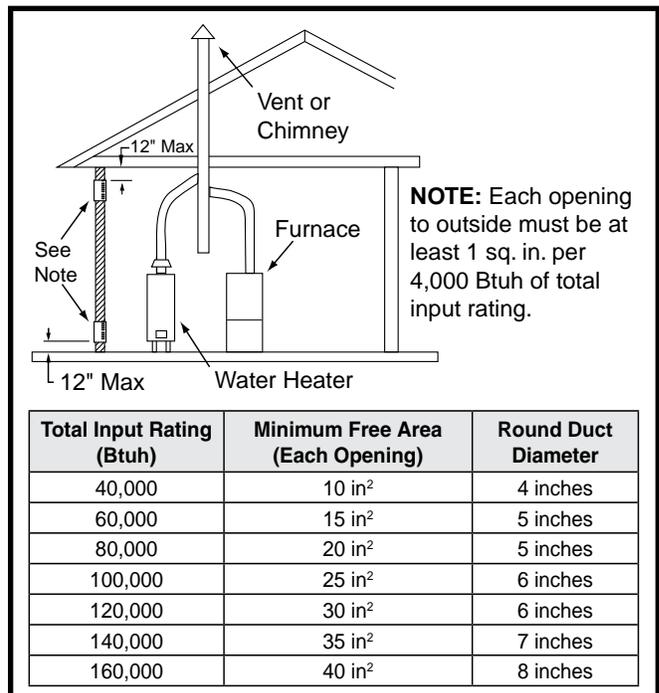


Figure 6. Combustion Air Drawn from Outside Through an Exterior Wall

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 2 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 in² per 3,000 Btu per hour of the total input rating of all equipment located in the enclosure.
3. The free area must not be less than the sum of all the areas of the vent connectors in the enclosure.

Installation In An Unconfined Space

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

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

Example:

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

Category I Venting

This furnace is listed as a Category I vented appliance. Category I furnaces generally operate with a slight negative pressure (draft) and must be vented vertically or near vertical. Additionally it is important to guard against excessive condensation.

WARNING:

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

WARNING:

Venting into an unlined masonry chimney or concrete chimney is prohibited. This may result in improper draft and excess condensation forming in the chimney.

- **This furnace must be vented in compliance with the current revision of the National Fuel Gas Code (ANSI-Z223.1/NFPA54) and the instructions provided below. Consult local codes for special requirements.**
- **In Canada, venting shall conform to the requirements of the current (CAN/CGA B149.1 or .2) installation codes. Consult local codes for special requirements.**
- **Category I furnace installations must be connected to a factory built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the authority having jurisdiction.**
- **In the U.S., this furnace must never be vented to a chimney or flue that services a fireplace or other appliance designed to burn solid fuel. If the furnace vent is to be connected to a chimney serving a fireplace, the fireplace must be sealed off from the chimney. In Canada, common venting with a fireplace is permitted. Consult B149.1 and your local code authority.**
- This furnace may be vented with a dedicated venting system or common vented with other Category I appliances. The vent system dimensions and material must conform to the NFGC or local Codes. Generally, this means using Type B vent pipe or a lined masonry chimney. When consulting the vent sizing tables in the NFGC, the MAX capacity of the vent must be greater than the furnaces high fire rate. The MIN capacity must be lower than the low fire rate. If the venting system

is inappropriate for the furnace, the venting system will need to be modified to comply with NFGC or local codes. **The minimum diameter of any vent pipe is 4 inches.**

- The venting system should be designed to have the minimum number of elbows or turns. All horizontal runs shall slope upwards from the furnace at ¼ inch per running foot of vent. Supports for the vent pipe must be installed a minimum of every five feet along the vent run to ensure no displacement after installation. Under no circumstances shall any portion of the vent system extend into or pass through any return air duct, supply air duct, or plenum.
- Single wall vent connectors may be used under the limited capacity ranges found in the vent sizing tables. It is recommended that Type B double wall vent be used for the connector whenever possible. An existing masonry chimney should be inspected and relined if necessary.
- Single wall metal vertical vents shall not be used for Category I venting. The furnace vent, if metal, may be insulated if local codes allow. Any part of the vent system, (metal vent only) not exposed to weather, but exposed to temperatures below 35° F (1° C) must be insulated to prevent condensation. All vent insulation shall be foil backed fiberglass of 1 inch minimum thickness.
- Sheet metal fasteners should be used to secure the vent pipe to the furnace flue. However, the NFGC states that alternative vent products may be attached according to the vent manufacturers instructions.
- When an existing furnace is removed from a vent system serving other appliances, the existing vent system may no longer be sized to properly vent the remaining appliances. An improperly sized venting system can result in the formation of condensate, leakage, or spillage. The existing vent system should also be checked to make sure it remains in compliance with the National Fuel Gas Code. If it isn't, the vent system must be brought into compliance before installing the furnace.

Horizontal Venting

- Horizontal vent systems must be sealed with a high temperature sealant that can withstand temperatures of 450° F. Recommended sealants: Dow Corning Sealant 736 RTV; GE 106 RTV; High Tech Ind., High TEMP RED.
- This furnace is not approved for horizontal venting without the use of an add-on power venter. Power venters establish negative pressure in the vent piping and the furnace operates as if connected to a Category I vertical vent. The power venter is only for use when exhausting through an exterior wall.
- The power venter must be installed according to the instructions provided by the power venter manufacturer and applicable requirements of local codes. For Canadian installations please refer to the Canadian Installation Code (CAN/CGA-B149.1 or 2) and/or local codes.
- The outlet of the vent must be at least 12 inches above the highest expected snow accumulation.

Flexible Vent Systems

Flexible venting systems are approved for use providing they are listed for the application and meet all local Code requirements. These systems are primarily used to line existing masonry chimneys. They must be sized to the application according to the sizing tables in the National Fuel Gas Code, including the required 20% reduction in maximum capacity.

Flexible venting systems are permitted to be used as the vent connector. However, great care must be taken to ensure that there are no sags in the venting system which could accumulate condensate. The flexible vent system must be supported at no more than 5 foot intervals and maintain a minimum slope of ¼ inch per foot of horizontal run.

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).
- Tables 5 - 7 (pages 30 - 33) contain the maximum airflow and temperature rise data for fixed and variable speed motors. If the maximum airflow is 1,600 CFM or more, it is recommended that two openings be used for return air on upflow furnaces. Downflow furnaces can only use one return opening.
- It is recommended that the outlet duct contain a removable access panel. The opening should be accessible when the furnace is installed in service and shall be of a size that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover for the opening shall be attached in such a manner as to prevent leaks.
- If outside air is used as return air to the furnace for ventilation or to improve indoor air quality, the system must be designed so that the return air is not less than 60° F (15° C) during operation. If a combination of indoor

and outdoor air is used, the ducts and damper system must be designed so that the return air supply to the furnace is equal to the return air supply under normal, indoor return air applications.

- When a cooling system is installed which uses the furnace blower to provide airflow over the indoor coil, the coil must be installed downstream (on the outlet side) of the furnace or in parallel with the furnace.
- If a cooling system is installed in parallel with the furnace, a damper must be installed to prevent chilled air from entering the furnace and condensing on the heat exchanger. If a manually operated damper is installed, it must be designed so that 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 21 (page 28) for return air opening size.

Upflow & Horizontal Furnaces

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

WARNING:

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

- **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 21, page

28). Using sharp metal cutters, cut an opening between all 4 knockouts to expose the blower assembly. Position the return air duct over the opening and secure to the side with sheet metal screws.

- **Bottom Return Installations:** If using the bottom of the furnace for return air, the bottom panel (Figure 21) must be removed from the bottom of the furnace. See page 15 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 downflow furnace, bend the flanges on the furnace upward 90° with wide duct pliers. See Figure 21 (page 28) for furnace flange locations. **NOTE:** If system installation includes AC coil casing, bend the flanges on the coil casing upward 90° before attaching the 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 21 (page 28) for furnace flange locations. **NOTE:** If system installation includes AC coil casing, bend the flanges on the coil casing upward 90° before attaching the supply air duct.
- Position the supply air ductwork onto the furnace ensuring even alignment of furnace air opening and supply air duct. **NOTE:** The ductwork must have an opening equal to that of the supply air opening of the furnace. See Figure 21 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, be sure to install all the needed gaskets and grommets around penetrations into the furnace, such as for electrical wiring.

FURNACE INSTALLATION

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

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

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

About The Furnace

The *TA / *TK series furnace is designed only for indoor installations and can be readily connected to the high static duct system of a home. *TA series gas furnaces are shipped ready for installation in the upflow or horizontal right or left positions. *TK series gas furnace may only be used for downflow operation. Units are approved for single / multistory residential structures in freestanding / closet / alcove configurations.

This appliance will provide many years of safe and dependable comfort, providing it is properly installed and maintained. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards. Please read all instructions before installing the unit.

Approved installation, operation, and maintenance of this appliance must be in accordance with the listed specifications contained in these instructions and other documents supplied with the furnace and/or optional air conditioning equipment. Unless it is noted differently in this manual, only use factory authorized kits and accessories on this appliance. Refer to local authorities having jurisdiction for further information.

Before You Install the Furnace

- ✓ This equipment is securely packaged at the time of shipment and upon arrival should be carefully inspected for damage prior to installing the equipment at the job site. Claims for damage (apparent or concealed) should be filed immediately with the carrier.
- ✓ Check the electrical supply and verify the power supply is adequate for unit operation. The system must be wired and provided with circuit protection in accordance with local building codes. If there is any question concerning the power supply, contact the local power company.
- ✓ Verify the air delivery of the furnace is adequate to handle the static pressure drop of the coil, filter, and duct work.

Locating the Furnace

- The dimensions of the room or alcove must be able to accommodate the overall size of the furnace and required clearances to combustible materials listed in Figure 1 (page 5). Access for positioning and servicing must also be considered when locating the unit. To determine the required clearances needed for installation, refer to Figure 21 (page 28) for overall dimensions.
- The furnace must be installed on a solid surface and must be level front-to-back and side-to-side at installation. The surface that the furnace is mounted on must provide sound physical support of the unit.
- The furnace should be installed as close to the center of the air distribution system as possible and attached to a properly installed duct system. **Do not use the back of the furnace for return air.** See pages 11 - 12 for circulating requirements.
- The furnace must be installed so that all electrical components are protected from water.
- The plenum attached to the A/C coil box and ductwork within 3 ft. of the furnace must be installed so that surfaces are at least 1" from combustible construction.
- When installed in a residential garage, the furnace must be positioned so the burners and the source of the ignition are located no less than 18 inches above the floor and protected from physical damage by vehicles.
- The furnace must be installed upstream from a refrigeration system.
- The furnace requires special venting materials and installation procedures. See pages 9 & 10 for venting guidelines and specifications.

Upflow Furnaces

WARNING:

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

*TA series gas furnaces are shipped with the bottom panel installed as shown in Figure 21. If the furnace is installed with 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 15.

Horizontal Furnaces

WARNING:

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

The *TA series gas furnace can be installed horizontally in an attic, basement, crawl space or alcove (Figure 7). 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 8 (page 14).

*TA series furnaces are shipped with the bottom panel installed. If furnace is installed horizontally, remove the bottom panel from the furnace before attaching the duct system. See Bottom Panel Removal on page 15.

If installing the furnace in an attic, it is required that a drip pan be placed under the furnace. If the installation is on a combustible platform (Figure 7), it is recommended that the drip pan extend at least 12 inches past the top and front of the furnace.

If suspending the furnace from the ceiling, assemble a support frame (Figure 8) 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.

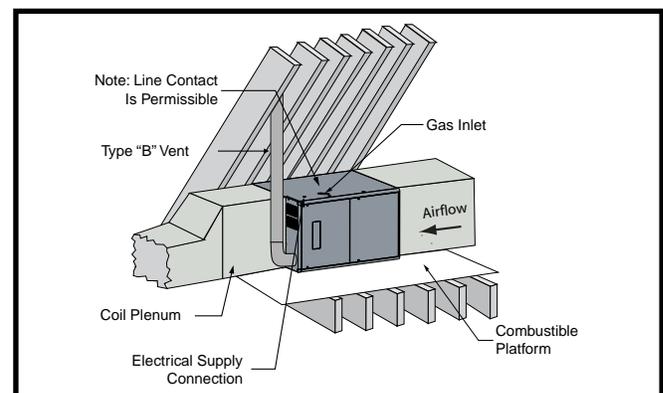


Figure 7. *TA Horizontally Installed on a Platform

Downflow Furnaces

The furnace must not be installed directly on carpeting, tile, or any combustible material other than wood flooring. To install the furnace on combustible flooring, a special sub-base is required.

WARNING:

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

WARNING:

The downflow sub-base kit must not be installed directly on carpeting, tile, or any combustible material other than wood flooring. Failure to comply may result in fire, property damage or personal injury.

Downflow sub-base kits are factory supplied accessories and are listed according to the cabinet letter of the furnace. For 'A' size cabinets use Sub-Base kit #902974 only. 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 1.
2. Position the plenum and the furnace as shown in Figure 9.

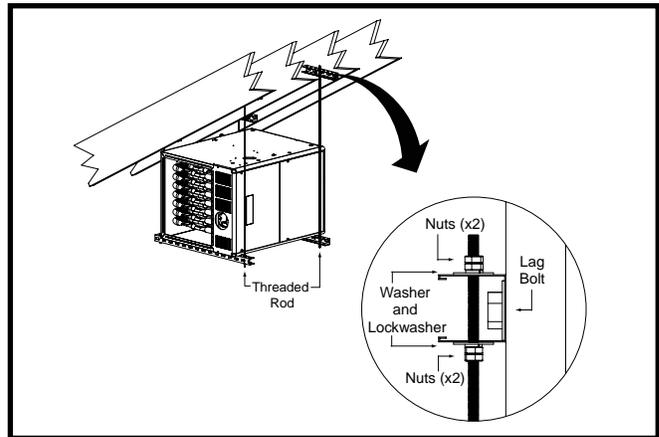


Figure 8. *TA Horizontally Suspended in Attic

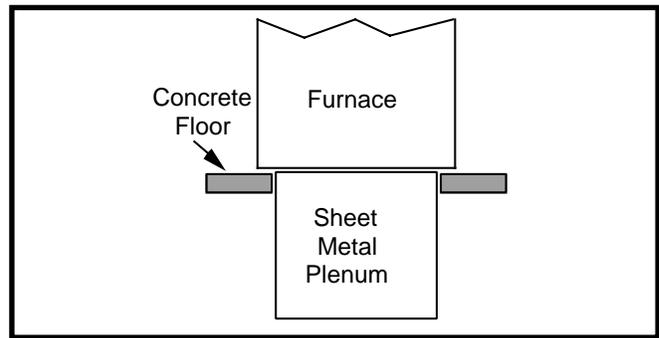
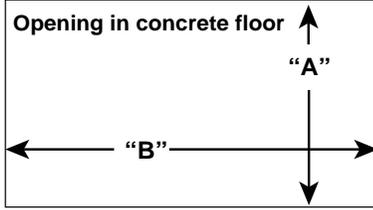


Figure 9. Furnace on a Concrete Slab



Cabinet Size	Dim. "A"	Dim. "B"
A	13 1/4	19 1/4
B	16 5/8	19 1/4
C	20 1/8	19 1/4
D	23 5/8	19 1/4

NOTE: Dimensions shown in Inches.

Table 1. Cutout Dimensions

Pressure Switch Tubing

Figure 10 displays the proper routing of pressure switch tubing for *TA & *TK furnaces. On both furnaces, the tubing connects at one end of the pressure switch and is routed directly to the static tap on the inducer assembly. **NOTE:** The control board in the *TA illustration has been omitted for clarity of tubing installation. There is no need to remove the control board to install your pressure switch tube.

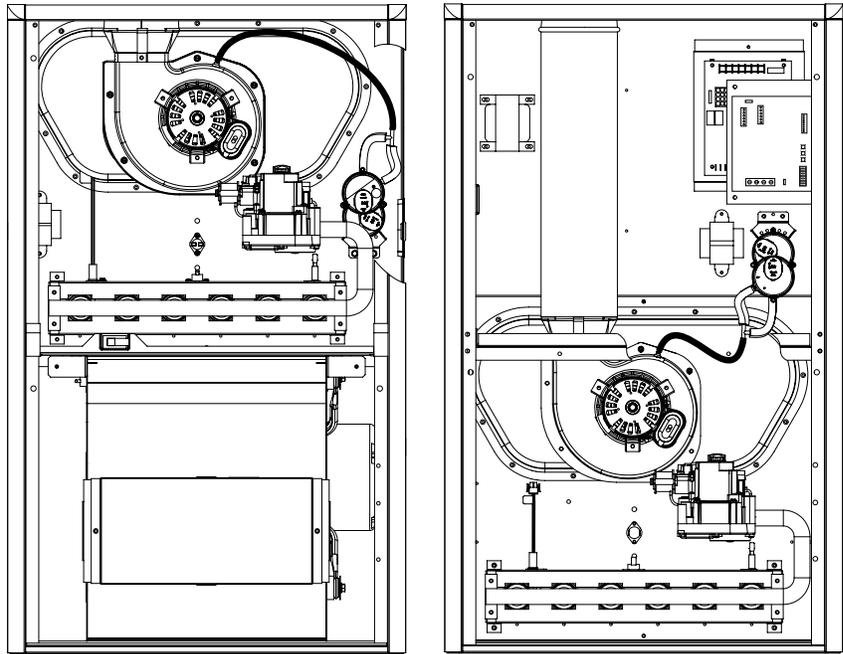


Figure 10. Pressure Switch Tubing for *TA & *TK Furnaces

Bottom Panel Removal

The steps listed below explain the proper method for removing the bottom panel from the furnace. See Figure 11.

1. Remove the blower door (1) from bottom of furnace.
2. Disconnect the wiring harness (2) from the connector.
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 it was removed.

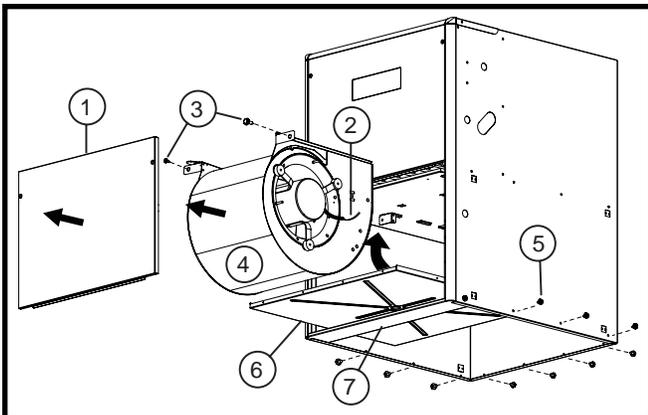


Figure 11. Bottom Panel Removal

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 12.

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.

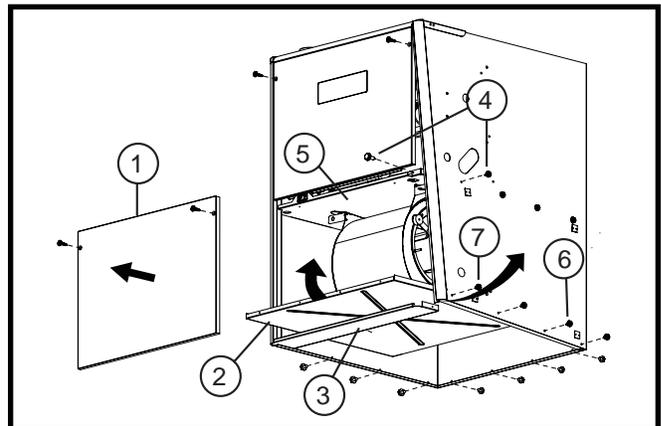


Figure 12. Alternate Removal Method

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.

AVERTISSEMENT:

RISQUE D'INCENDIE OU D'EXPLOSION

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

QUE FAIRE S'IL Y A UNE ODEUR DE GAZ

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

- 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/CGA B149.1 or .2) Installation Codes.
- Some local regulations require the installation of a manual main shut-off valve and ground joint union external to the furnace. 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. See Figure 13 (page 17).
- Gas piping must never run in or through air ducts, chimneys, gas vents, or elevator shafts.
- Compounds used to seal joints on 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. The flexible gas connector must be agency approved and certified for the type of gas being used. Only new flexible connectors may be used. Do not reuse old flexible gas connectors.
- A drip leg should be installed in the vertical pipe run to the unit. See Figure 13.

Table 7 (page 38) lists gas pipe 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 for either left or right side gas entry. When connecting the gas supply, provide clearance between the gas supply line and the entry hole in the furnace casing to avoid unwanted noise and/or damage to the furnace. Typical gas hookups are shown in Figure 13.

Leak Check

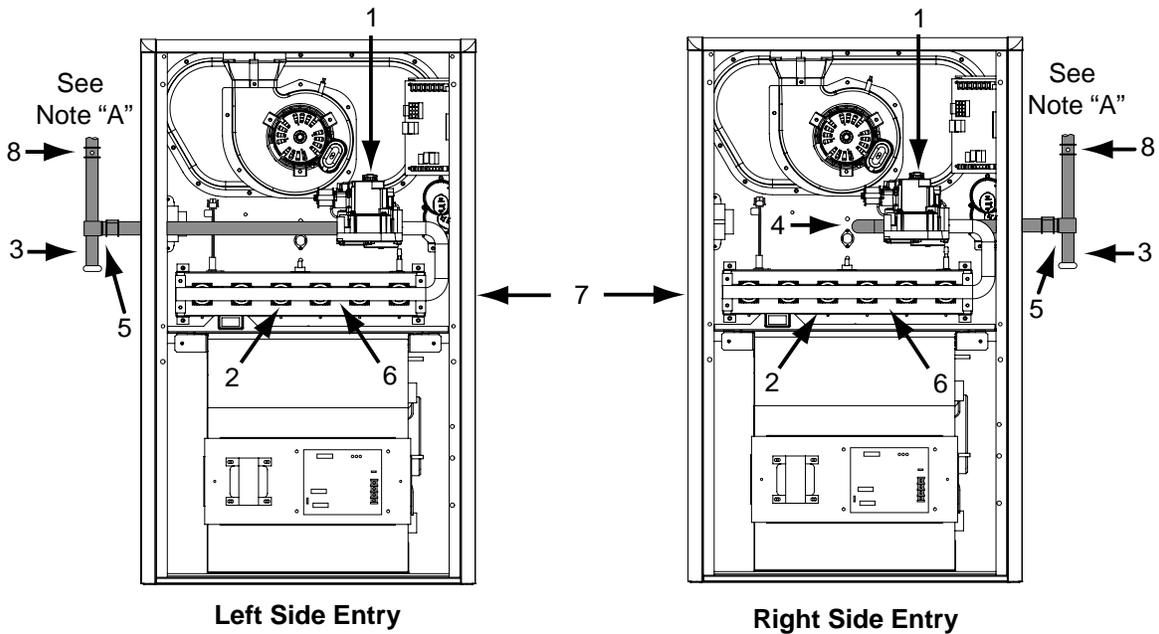
WARNING:

FIRE OR EXPLOSION HAZARD

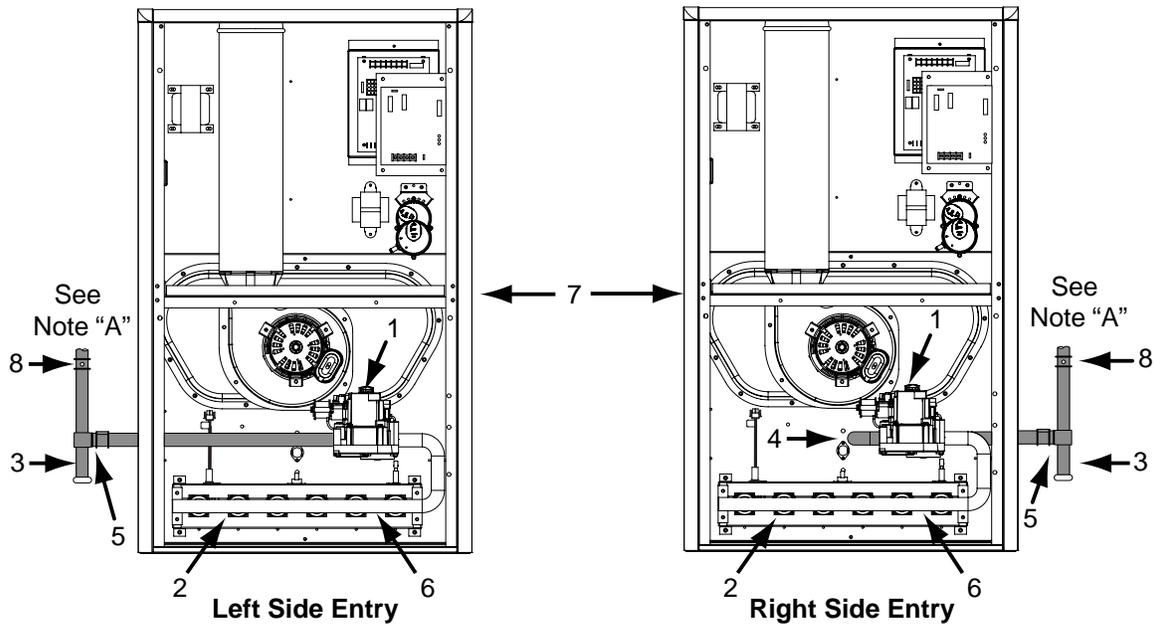
Failure to follow safety warnings exactly could result in serious injury or property damage.

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.

UPFLOW MODELS



DOWNFLOW MODELS



COMPONENTS:

- | | | | |
|---|---------------------|-------------|----------------------|
| (1) Automatic Gas Valve
(w/ manual shut-off) | (2) Burner Assembly | (3) Dripleg | (4) Elbow |
| (5) Ground Joint Union | (6) Manifold | (7) Plug | (8) Shut - Off Valve |

NOTE: Some utilities require Shut- Off Valve to be 4 to 5 feet above floor.

Figure 13. Typical Gas Connections

⚠️ AVERTISSEMENT:

RISQUE D'INDENDIE OU D'EXPLOSION

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

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

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

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

⚠️ WARNING:

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

The furnaces are shipped from the factory with orifices and gas regulator settings for natural gas operation at sea level altitudes. At 2000 feet, the NFGC requires that this appliance be derated 4% for each 1000 feet of altitude.

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

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

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

For added flexibility, two tables have been provided for natural gas installations with HIGH or LOW heating values at sea level. Tables 10 & 11 (page 40) contain the orifice sizes and manifold pressure to use at various altitudes. Table 10 (HIGH) is for natural gas installations with a heating value of more than 1,000 Btu per cubic foot and Table 11 (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 9 (page 39), 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 10 or if it's LOW, use Table 11.

INSTALLATION EXAMPLE

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

From Table 9, find 750 and follow down the column, stop at the 5,000 feet row. The heating value listed is LOW. Table 11 will be used to determine orifice size and manifold pressure.

After changing the regulator pressure or changing 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 & Adjusting the Input Rate section (page 23).

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

Conversion 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/stem assembly in the pressure regulator. In the U.S. if installation is above 2,000 ft., refer to Table 8 (page 39) to determine the correct orifice size and regulator pressure. See example below.

INSTALLATION EXAMPLE

Elevation: 5,000 feet
Type of Gas: Propane Gas
Input BTUH of Furnace: 80,000

From Table 8, find 5,000 and follow across the row, stop at the 80,000 feet column. At first stage, the manifold pressure listed is 4.2, but at 2nd stage the pressure is 10.0. The listed orifice size is 56.

When conversion is complete, verify the manifold pressure and input rate are correct as listed in the Table 8. Approved conversion kits are listed below:

- The United States LP / Propane Gas Sea Level and High Altitude Conversion Kit (P/N 904914) is for LP / Propane conversion in the United States at altitudes between zero and 10,000 ft. above sea level. **Please follow the instructions provided with the kit.**
- The Canadian LP / Propane Gas Sea Level and High Altitude Conversion Kit (P/N 904915) is for LP / Propane conversions in Canada at altitudes between zero and 4,500 ft. above sea level. **Please follow the instructions provided with the kit.**

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.”

AVERTISSEMENT:

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

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

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

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

- Electrical connections must be in compliance with all applicable local codes and 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).

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. See Table 2 (page 22).

IMPORTANT NOTES:

- An electrical disconnect must be installed readily accessible from and located within sight of the furnace. See Figure 14 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 14
- 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 2.

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!

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.
- NORDYNE no longer supports twinning of two stage furnaces. Please contact your furnace distributor for details.
- The thermostat must be installed according to the instructions supplied by the thermostat manufacturer.

Furnace Input (Btuh)	Cabinet Width (in.)	Nominal Electrical Supply	Maximum Operating Voltage	Minimum Operating Voltage	Maximum Furnace Amperes	Minimum Wire Gauge	Maximum Fuse or Circuit Breaker Amps*
60,000	14 ¼	115-60-1	127	103	6.3	14	15
80,000	17 ½	115-60-1	127	103	6.3	14	15
100,000	17 ½	115-60-1	127	103	8.5	14	15
100,000	21	115-60-1	127	103	8.5	14	20
120,000	21	115-60-1	127	103	8.5	14	20
140,000	24 ½	115-60-1	127	103	11	14	20

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

* Time-delay fuses or circuit breakers are required.

Table 2. Wire Length & Voltage Specifications

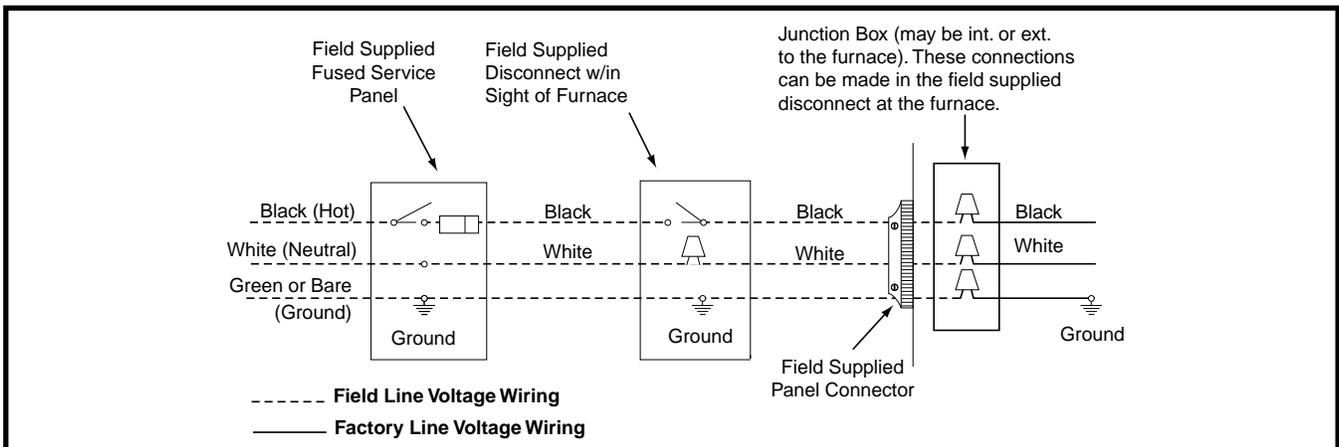


Figure 14. Line Voltage Field Wiring

Low voltage connections (24 VAC) from the thermostat are wired to the terminal strip on the integrated control in the furnace. Recommended minimum wire gauge for thermostat wiring is shown in Table 2.

- 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.
- Depending on the type of air conditioning unit and thermostat used, both blower applications utilize three basic wiring configurations:

Single Stage AC & Single Stage Thermostat

This option does not use the full two-stage control capability of the furnace, but the possibility of timed autostaging is available. See also Autostaging for Single Stage Thermostats:

- Connect the thermostat's **W** output to the furnace control boards **W1** terminal. This allows the furnace to always run in low output mode. See Figure 15.
- Always connect the thermostat **C** & **R** to the furnace control board **C** & **R**.
- For cooling, connect the thermostat's **Y** signal to the furnace control board's **Y / Y2** terminal.
- Field supplied wires should also connect **Y / Y2** & **C** to the outdoor unit's **Y** & **C** terminals.

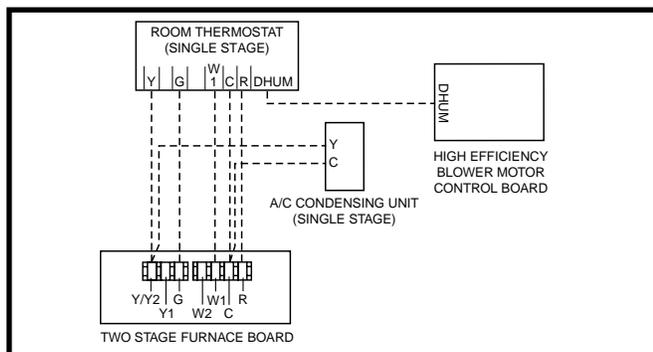


Figure 15. Wiring Configuration 1

Single Stage AC & Two-Stage Thermostat

This option uses the full two-stage heating capability of the furnace with a single stage outdoor unit. See Figure 16.

- Connect the thermostat's **W1** & **W2** outputs to the furnace control board's **W1** & **W2** terminals.
- Always connect the thermostat **C** & **R** to the furnace control board **C** & **R**.
- For cooling, connect the thermostat's **Y** signal to the furnace control board's **Y / Y2** terminal.
- Field supplied wires should also connect **Y / Y2** & **C** to the outdoor unit's **Y** & **C** terminals.

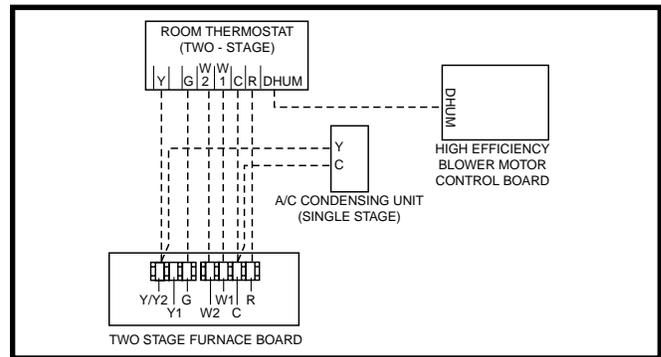


Figure 16. Wiring Configuration 2

Two-Stage AC & Two-Stage Thermostat

This option uses the full two-stage heating capability of the furnace with a two-stage outdoor unit. See Figure 17.

- Connect the thermostat's **W1** & **W2** outputs to the furnace control board's **W1** & **W2** terminals.
- Always connect the thermostat **C** & **R** to the furnace control board **C** & **R**.
- For cooling, connect the thermostat's **Y** & **Y1** signals to the furnace control board's **Y / Y2** & **Y1** terminal's.
- Field supplied wires should also connect **Y / Y2** & **Y1** signals to the outdoor unit's **Y** & **Y1** terminals.
- Connect terminal **C** to the outdoor unit's **C**.

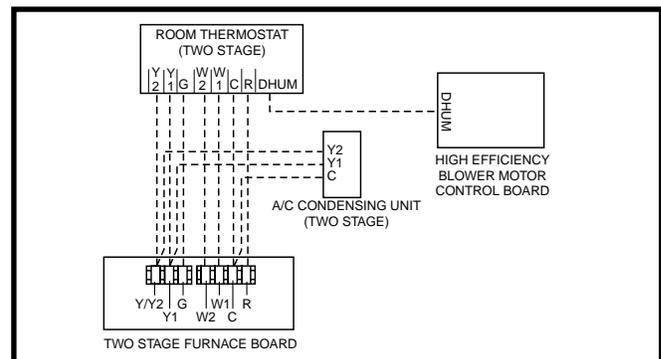


Figure 17. Wiring Configuration 3

Autostaging for Single Stage Thermostats

The Autostaging feature included make it possible to use a single stage thermostat and still receive some of the benefits of 2-stage furnace operation. If Autostage is enabled, the furnace will drop to **LOW** fire after initially starting in **HIGH** fire. After a period of 10 minutes, the furnace will then stage up to **HIGH** fire, until the heating load is met. See Figure 15 and the Thermostat / Low Voltage Connection section.

The Autostaging option is selected using the autostage jumper located near the thermostat terminal block. See Figure 24 (page 33).

Setting the Autostage jumper in the **ON** position signals the control to utilize a 10 minute delay between **LOW** fire and **HIGH** fire when a call for heat is supplied via 24V signal to **W1**. This setting is the same as jumping **R** to **W2**.

NOTE: If the autostage jumper is in the **ON** position and a **W1** demand is present when power is applied to the furnace, the first heat cycle will run in second stage heat with no autostaging. After the first cycle, the furnace will resume normal autostaging operation.

Autostaging for Two-Stage Thermostats

The Autostage setting on the furnace control board (Figure 24, page 33) is disabled when shipped from the factory. This feature will be not used when paired with a two-stage thermostat. The autostage jumper setting (**P7**) must be kept on **OFF** to allow the thermostat to adjust stages.

Blower Speed Configuration

Two-stage furnaces use high efficiency circulating air motors that come in two variations and both are controlled differently. The fixed speed motor control board (Figure 22, page 33) controls the torque and the variable speed motor control board (Figure 23,) controls the airflow at a constant CFM. Both boards use the same furnace control board.

Fixed Speed Blowers

NOTE: This section applies only to furnaces with model numbers suffixed with two numbers, followed by a letter, such as 35C1 or 45D1. If your model has suffix VA1, VB1, VC1, or VD1, please consult the Variable Speed Blower Application section.

The fixed speed motor control board (Figure 22) contains a set of dip switches for setting the blower speed. Use pins 1 to 4 to set the blower speed for heating and pins 5 to 8 to set the speed for cooling. To determine the appropriate switch settings for your installation, see Table 4 (page 31) for heating or Table 5 (page 32) for cooling.

For thermostats with a dehumidifier output, use a field supplied wire to connect the thermostat's dehumidifier

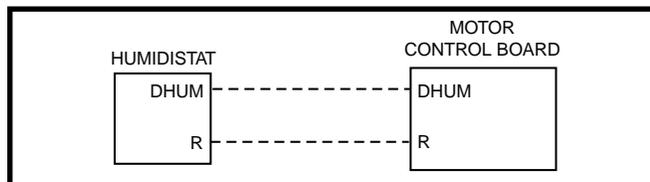


Figure 18. DHUM Wiring Configuration

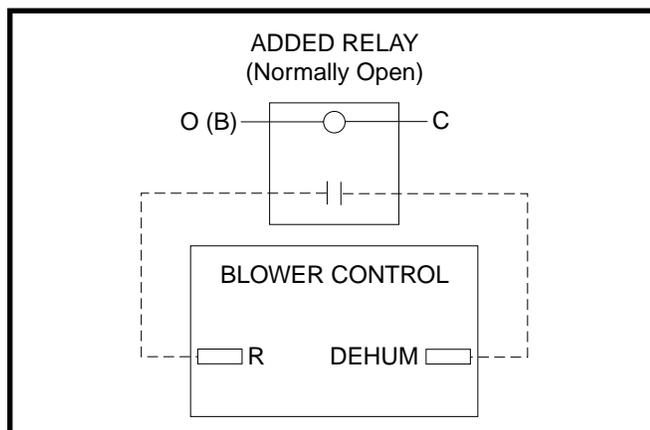


Figure 19. DHUM Wiring Configuration

output to the terminal marked **DEHUM**. The thermostat should be set so that the **DEHUM** output should be high (positive) when dehumidification is needed. See also Dehumidification Options section.

CAUTION:

The terminal marked “Y1_IN” on the variable speed motor control board is not an output to drive the outdoor unit. DO NOT connect Y1_IN on the motor control board to the outdoor unit.

Variable Speed Blowers

CAUTION:

The variable speed control board is used by other appliances. Many of the terminals and connections on the board are for other appliances and are not used in two-stage applications. The only two-stage field connection to this board is the DHUM terminal, used to reduce blower speed during cooling.

NOTE: This section applies only to models ending with the suffixes VA1, VB1, VC1, or VD1.

The variable speed motor control board (Figure 23, page 33) has a set of dip switches for setting the base blower speed (CFM). Use pins 1 to 4 to set the blower speed for heating and pins 5 to 8 to set the speed for cooling. To determine the appropriate switch settings for your installation, see Table 4 (page 31) for heating or Table 5 (page 32) for cooling.

Use field supplied wire to connect the thermostat's dehumidifier output to the terminal marked **DEHUM**. The thermostat should be set so that the **DEHUM** output is high (positive) when dehumidification is needed. See also Dehumidification Options section.

Dehumidification Options

Both motor control boards (Figures 22 & 23, page 33) have a **DEHUM** connection that allows the system to increase the amount of humidity that is removed from the circulating air. This is accomplished by reducing the CFM and allowing the cooling coil to become colder. This will only occur when there is a call for cooling. There are many ways that this can be electrically wired.

- If the room thermostat incorporates a humidity sensor and **DEHUM** output, connect the **DEHUM** on the thermostat to the **DEHUM** terminal on the motor control board. See Figure 18.
- If using a separate humidistat, connect the **DEHUM** & **R** terminals on the humidistat to the **DEHUM** & **R** terminals on the motor control board. In this option, the **DEHUM** output of the humidistat must be set to be normally open

- and closed when there is a call for humidification.
- If a humidistat is not available, it is an acceptable option to connect the **R & DEHUM** via a field supplied normally open relay. See Figure 19 (page 22). The **R & DEHUM** terminals should be connected across the normally open relay terminals. The O (B) & C terminals should then be connected across the relay coil. This option causes the blower to run at a reduced CFM for 10 minutes after a call for cooling.

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 that all needed thermostat wires are securely connected to the correct leads on the terminal strip of the circuit board. See Figures 15 - 17 (page 21).
- ✓ 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 furnace label.
4. Set the thermostat above room temperature and verify the Operating Sequence (page 25).
5. After 5 minutes of operation, set the thermostat below room temperature and verify steps 11 - 12 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 and run the furnace in high fire 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 6 (page 38).
5. Multiply the gas flow rate in cubic feet per hr by the heating value of the gas in Btu per cubic ft to obtain the firing rate in Btuh. See example.

Example:

- Time for 1 revolution of a gas meter with a 1 cubic ft dial = 40 seconds.
- From Table 6 read 90 cubic ft gas per hr.
- Local heating value of the gas (obtained from gas supplier) = 1,040 Btu per cubic ft.
- Input rate = 1,040 x 90 = 93,600 Btuh.

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

WARNING:

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

- a.) Remove plastic cap from pressure regulator.
- b.) Obtain the manifold pressure setting required for this installation by referring to Table 8 (page 39) for Propane or Tables 10 or 11 (page 40) for Natural Gas.
- c.) Using an Allen wrench, turn the the LO Input Adjusting Screw on the LO side of the regulator to adjust the reduced input setting or turn the HI Input Adjusting Screw (Figure 20, page 24) on the side of the regulator to adjust the full input setting.

NOTE: Turning the adjusting screw clockwise increases the pressure and counterclockwise reduces the pressure.

- d.) Reinstall plastic cap after adjustment is complete.

Verifying & Adjusting Temperature Rise

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

WARNING:

To prevent electric shock, personal injury, or death, disconnect the electric power before performing any maintenance.

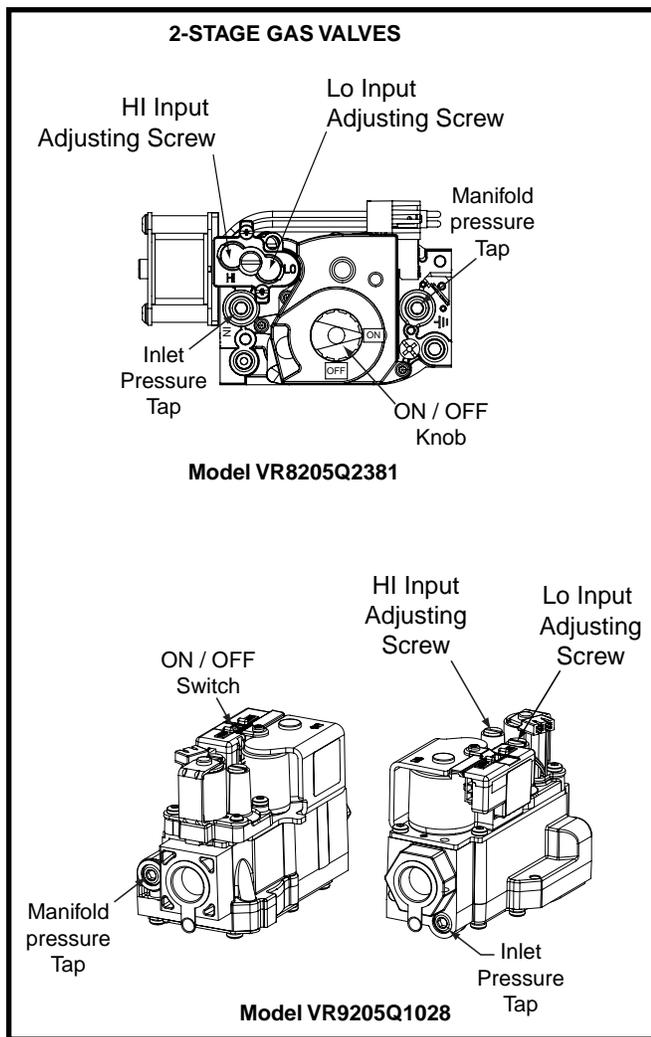


Figure 20. HI & LO Input Adjusting Screws

1. Place thermometers in the return and supply air stream as close to the furnace as possible. The thermometer on the supply air side must be shielded from direct radiation from the heat exchanger to avoid false readings.
2. Adjust all registers and duct dampers to the desired position and run the furnace in high fire 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 increases the temperature rise and a higher blower speed will decrease the temperature rise.

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

1. Remove the burner compartment door.
2. Set the thermostat above room temperature and observe the ignition sequence. The burner flame should carry over immediately between all burners without lifting off, curling, or floating. The flames should be blue, without yellow tips.
3. After validating flame characteristics, change thermostat setting to below room temperature.
4. Verify burner flame is completely extinguished.
5. Replace the burner compartment door.

Verifying Operation of the Supply Air Limit Switch

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

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

OPERATING SEQUENCE

The operating sequences for the heating, cooling, and fan modes are described below. Refer to the field and furnace wiring diagrams: (Figure 14, page 20) , (Figures 15 - 17, page 21), & (Figures 25 - 28, pages 34 - 37).

Heating Cycle

1. The thermostat calls for heat by energizing the **W1** terminal with 24VAC.
2. The control checks to see the pressure switch is open. If the switch is closed, the furnace will shut down for 5 minutes before retrying
3. If the pressure switch is open, the control energizes the inducer motor and waits for the pressure switch to close. The pressure switch must close within 12 seconds.
4. The control runs the inducer for a 30 second pre-purge time.
5. The control energizes the igniter output for the appropriate adaptive warm-up time limit.
6. The furnace always ignites the burners in **high** fire. If the call for heat is for **low** rate, the furnace will move down to **low** fire after the flames stabilize.
7. If the flame is proved and ignites the gas, the control de-energizes the igniter. The gas valve and inducer remains energized. The control goes to blower on delay.
8. 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. If there is a call for **high** fire, the gas valve moves to the **high** fire position and the blower speeds are increased. The furnace will remain in **high** fire until the demand for heat is satisfied.
10. If autostaging is enabled (single stage thermostat) the demand for heat has lasted more than the selected

time, the furnace automatically moves up to **high** fire. Autostage times are either **SHORT** (8 minutes), **LONG** (12 minutes), or **OFF**, depending on the Jumper (**P7**) setting on the furnace control board.

11. 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.
12. The circulating air blower will continue to run for the selected Blower Off Delay(**P5**). This may be 60, 90, or 120 seconds depending on the jumper setting on the furnace control board.

Cooling Cycle

1. The thermostat calls for cooling by energizing the **Y/Y2** or **Y1** terminal with 24VAC.
2. The control energizes the blower in the cooling speed and sends 24VAC to the contactor in the condensing unit.
3. When the thermostat removes the call for cooling, the contactor in the outdoor condensing unit is de-energized and the control continues to run the fan for a period of 60 seconds.

Fan Mode

- When the thermostat energizes the **G** terminal for continuous fan (without calling for heat or cooling), the indoor fan is energized on the selected FAN speed.
- If a call for cooling occurs during continuous fan, the blower will switch over to the selected COOL speed.
- If the **W** terminal receives a call for heat during continuous fan, the blower will de energize.
- A call for fan is ignored while in lockout.
- The blower will operate at 50% of the selected high cooling speed for continuous fan operation.

MAINTENANCE

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

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.”**

AVERTISSEMENT:

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

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

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

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

- 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 or cleaning/changing the filters. Do not operate the furnace without all doors and covers in place.

- Verify that the thermostat is properly installed and is not being 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 and rack for a filter in the return air duct adjacent to the furnace, or in a return air grill to the furnace.

WARNING:

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

It is recommended that filters be 1" or 2" thick and be cleaned or replaced monthly. New or newly renovated homes may require more frequent changing until the construction dust has minimized.

Filters designed to remove smaller particles such as pollen, may require additional maintenance. Filters for side return and bottom return applications are available from most local distributors.

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 the steps below and see Figure 29 (page 42) for component location.

1. Shut off gas supply to the furnace either 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 its lowest setting.
3. Remove the burner door from the furnace.
4. Turn the gas control knob 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 burner assembly to the furnace.
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 that they were removed.
12. Follow the lighting instructions found on the furnace door to return the furnace to operation. Verify proper operation after servicing.

Cleaning Of Flue Passages - If the flue passages must be cleaned, follow the steps below. See Figure 29 for component location.

1. Shut off the gas supply to the furnace at the meter or at the manual valve in the gas supply piping.
2. Turn off all power to the furnace and set the thermostat to the lowest temperature setting.
3. Remove the blower door from the furnace.
4. Turn the gas control switch to the OFF position.
5. Disconnect the wires from the gas valve, flame sensor, inducer, flame roll-out switch, limit switch, pressure switch and igniter.
6. Remove the silicone rubber tube from the inducer.
7. Using two wrenches, separate the ground-joint union in the gas supply piping at the furnace.
8. Remove the piping between the gas valve and the ground-joint union. (If applicable).
9. Remove all screws securing the burner assembly to the furnace.
10. Carefully remove the burner assembly from the furnace. **DO NOT DAMAGE THE IGNITER WHILE REMOVING THE BURNER ASSEMBLY.**
11. *TA models - Remove all screws securing the inducer assembly to the vent pipe running out of the furnace
*TK models - Remove all screws securing the combustion air tube assembly to the vent pipe running out of the furnace.
12. Remove all screws securing the inducer assembly to the collector pan.
13. *TA models - Carefully remove the inducer assembly from the furnace.
*TK models - Carefully remove the inducer assembly and combustion tube assembly from the furnace. **DO NOT BREAK THE SEALS AT EACH END OF THE COMBUSTION AIR TUBE.**
14. Remove all screws securing the collector pan to the furnace.

15. Remove the collector pan and gasket from the furnace.
16. Attach a round wire brush to a length of high grade stainless steel cable. Attach the other end of the cable to a variable speed reversible drill. Slowly insert and rotate the cable into the top portion of the heat exchanger. Operate the drill alternating between forward and reverse, working the cable in and out several times to obtain sufficient cleaning. Repeat this sequence for each heat exchanger tube.
17. Remove all loosened debris from the heat exchanger tubes using a vacuum cleaner.
18. Using a bright light, check the condition of the upper and lower sections of the heat exchanger tubes.
19. Inspect the burners for accumulated dust or debris. If burners must be cleaned, see Cleaning of Burners
20. Replace all the parts in reverse order that they were removed.
21. Check gaskets for damage. Replace if needed.
22. Follow the lighting instructions found on the furnace door to return the furnace to operation. Verify proper operation after servicing.

Heat Exchanger & Burner Maintenance - The furnace should operate for many years without soot buildup in the flue passageways, however, the flue, vent system, and the 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.

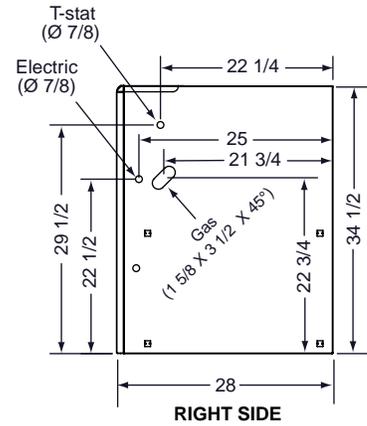
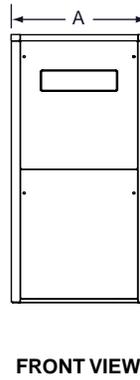
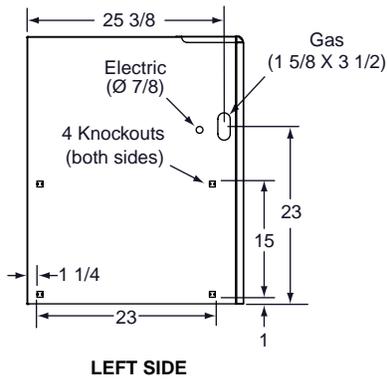
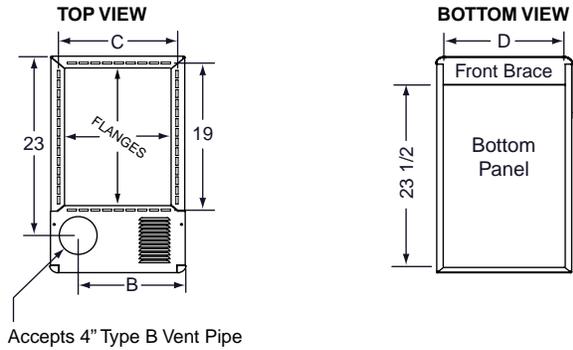
Vent System - Check the vent pipe and/or chimney to ensure that it is not corroded or blocked by debris. Any corroded section of vent pipe must be replaced, and any obstruction or blockage must be removed prior to operating the furnace.

FIGURES & TABLES

*TA 80+ Upflow / Horizontal Furnace

Cabinet Size	Dim. -A-	Dim. -B-	Dim. -C-	Dim. -D-
'A' Cabinet	14 1/4	10 3/4	12 5/8	12 7/8
'B' Cabinet	17 1/2	11 3/4	15 7/8	16 1/8
'C' Cabinet	21	14	19 3/8	19 7/8
'D' Cabinet	24 1/2	15 1/4	22 7/8	23 1/8

NOTE: Dimensions shown in Inches.



*TK 80+ Downflow Furnace

Cabinet Size	Dim. -A-	Dim. -B-	Dim. -C-	Dim. -D-
'A' Cabinet	14 1/4	10 3/4	12 5/8	12 7/8
'B' Cabinet	17 1/2	11 3/4	15 7/8	16 1/8
'C' Cabinet	21	14	19 3/8	19 5/8
'D' Cabinet	24 1/2	15 1/4	22 7/8	23 1/8

NOTE: Dimensions shown in Inches.

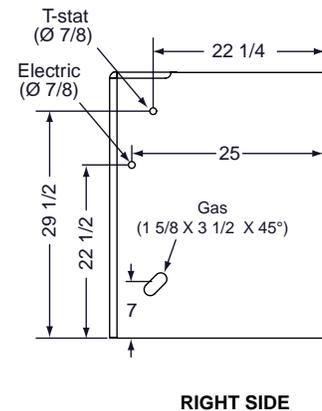
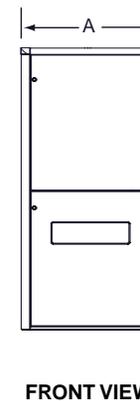
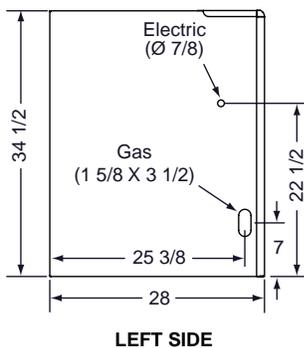
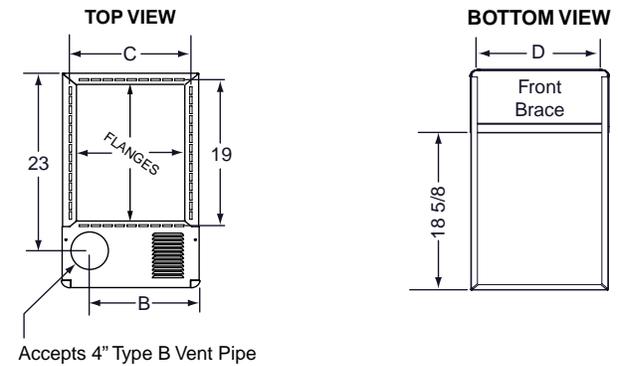


Figure 21. Furnace Dimensions

AIRFLOW DATA

*TA / *TK FURNACES WITH FIXED SPEED BLOWERS																				
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
*TA / TK - 060C - 23A1 (60,000)	0	0	0	0																
	1	0	0	0																
	0	1	0	0	600	74	555	80	510											
	1	1	0	0	705	63	670	66	635	70	600	74								
	0	0	1	0	775	57	740	60	705	63	665	67								
	1	0	1	0	900	49	870	51	835	53	800	56	765	58	730	61	695	64	660	67
	0	1	1	0	950	47	920	48	890	50	855	52	825	54	795	56	765	58	730	61
	1	1	1	0	1,000	44	970	46	940	47	910	49	880	51	850	52	820	54	790	56
	0	0	0	1	1,075	41	1,045	43	1,015	44	985	45	960	46	925	48	900	49	870	51
	1	0	0	1	1,110	40	1,080	41	1,055	42	1,025	43	1,000	44	975	46	945	47	920	48
	0	1	0	1	1,170	38	1,140	39	1,115	40	1,090	41	1,060	42	1,035	43	1,010	44	985	45
	1	1	0	1	1,210	37	1,185	38	1,160	38	1,130	39	1,105	40	1,080	41	1,055	42	1,025	43
	0	0	1	1	1,520	29	1,225	36	1,200	37	1,175	38	1,150	39	1,120	40	1,095	41	1,070	42
	1	0	1	1	1,305	34	1,280	35	1,255	35	1,230	36	1,205	37	1,180	38	1,155	38	1,130	39
0	1	1	1	1,350	33	1,230	36	1,305	34	1,285	35	1,260	35	1,240	36	1,215	37	1,195	37	
1	1	1	1	1,440	31	1,400	32	1,365	33	1,230	36	1,295	36	1,255	35	1,220	36	1,185	38	
*TA / TK - 080C - 24B1 (80,000)	0	0	0	0																
	1	0	0	0																
	0	1	0	0																
	1	1	0	0	725	82														
	0	0	1	0	810	73														
	1	0	1	0	940	63	890	67	845	70	795	75	750	79	700	85				
	0	1	1	0	990	60	945	63	905	65	860	69	820	72	775	76	735	81	690	86
	1	1	1	0	1,055	56	1,015	58	970	61	930	64	890	67	845	70	805	74	760	78
	0	0	0	1	1,135	52	1,095	54	1,055	56	1,010	59	960	62	930	64	890	67	850	70
	1	0	0	1	1,185	50	1,145	52	1,105	54	1,065	56	1,030	58	990	60	950	62	910	65
	0	1	0	1	1,250	47	1,210	49	1,170	51	1,135	52	1,095	54	1,055	56	1,020	58	980	60
	1	1	0	1	1,290	46	1,255	47	1,220	49	1,180	50	1,145	52	1,110	53	1,075	55	1,040	57
	0	0	1	1	1,315	45	1,275	46	1,240	48	1,200	49	1,160	51	1,120	53	1,085	55	1,045	57
	1	0	1	1	1,350	44	1,315	45	1,280	46	1,245	48	1,205	49	1,170	51	1,135	52	1,100	54
0	1	1	1	1,390	43	1,350	44	1,315	45	1,275	46	1,240	48	1,200	49	1,160	51	1,125	53	
1	1	1	1	1,420	42	1,380	43	1,345	44	1,310	45	1,270	47	1,235	48	1,200	49	1,160	51	
*TA - 100C - 24B1 (100,000)	0	0	0	0																
	1	0	0	0																
	0	1	0	0																
	1	1	0	0																
	0	0	1	0	1230	60	1195	62												
	1	0	1	0	1315	56	1275	58	1240	60										
	0	1	1	0	1345	55	1310	57	1280	58	1250	59								
	1	1	1	0	1445	51	1390	53	1350	55	1315	56	1280	58	1250	59	1230	60		
	0	0	0	1	1490	50	1430	52	1420	52	1380	54	1340	55	1310	57	1280	58	1275	58
	1	0	0	1	1550	48	1510	49	1475	50	1450	51	1420	52	1375	54	1340	55	1325	56
	0	1	0	1	1600	46	1570	47	1540	48	1500	49	1475	50	1445	51	1425	52	1385	53
	1	1	0	1	1640	45	1605	46	1570	47	1550	48	1525	49	1490	50	1460	51	1430	52
	0	0	1	1	1690	44	1665	44	1630	45	1600	46	1570	47	1550	48	1515	49	1490	50
	1	0	1	1	1755	42	1730	43	1680	44	1660	45	1640	45	1610	46	1575	47	1550	48
0	1	1	1	1805	41	1770	42	1740	43	1715	43	1690	44	1655	45	1645	45	1605	46	
1	1	1	1	1860	40	1825	41	1790	41	1765	42	1745	42	1710	43	1695	44	1660	45	

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 recommended 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. Temperature rises that are shaded in grey are for reference only. These conditions are not recommended.
6. When in low stage, the circulating airflow (2-stage furnaces only) is 70% of the tables high value.

Table 3. Heating / Cooling Airflows (CFM) & Temperature Rises (° F)

*TA / *TK FURNACES WITH FIXED SPEED BLOWERS																						
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		
*TA / TK - 100C - 35C1 (100,000)	0	0	0	0	1,125	66	1,040	71	960	77												
	1	0	0	0	1,205	61	1,120	66	1,040	71	960	77										
	0	1	0	0	1,305	57	1,225	60	1,150	64	1,070	69	995	74	915	81						
	1	1	0	0	1,430	52	1,350	55	1,270	58	1,190	62	1,110	67	1,030	72	950	78	865	86		
	0	0	1	0	1,525	49	1,450	51	1,375	54	1,300	57	1,225	60	1,150	64	1,075	69	1,000	74		
	1	0	1	0	1,620	46	1,540	48	1,465	51	1,390	53	1,315	56	1,240	60	1,165	64	1,090	68		
	0	1	1	0	1,695	44	1,620	46	1,545	48	1,465	51	1,390	53	1,315	56	1,235	60	1,160	64		
	1	1	1	0	1,770	42	1,700	44	1,630	45	1,555	48	1,485	50	1,410	53	1,340	55	1,265	59		
	0	0	0	1	1,875	40	1,805	41	1,730	43	1,655	45	1,580	47	1,510	49	1,435	52	1,340	55		
	1	0	0	1	1,905	39	1,840	40	1,775	42	1,710	43	1,640	45	1,575	47	1,510	49	1,445	51		
	0	1	0	1	1,980	37	1,910	39	1,845	40	1,780	42	1,715	43	1,650	45	1,580	47	1,515	49		
	1	1	0	1	2,025	37	1,960	38	1,895	39	1,830	40	1,765	42	1,700	44	1,635	45	1,570	47		
	0	0	1	1	2,085	36	2,025	37	1,960	38	1,900	39	1,840	40	1,775	42	1,715	43	1,655	45		
	1	0	1	1	2,135	35	2,070	36	2,010	37	1,945	38	1,880	39	1,815	41	1,750	42	1,685	44		
0	1	1	1	2,200	34	2,145	35	2,090	35	2,035	36	1,980	37	1,925	38	1,870	40	1,820	41			
1	1	1	1	2,280	32	2,225	27	2,170	34	2,115	35	2,065	22	2,010	37	1,955	38	1,900	39			
*TA / TK - 120C - 35C1 (120,000)	0	0	0	0	1,125	79	1,040															
	1	0	0	0	1,205	74	1,120	79	1,040	85												
	0	1	0	0	1,305	68	1,225	73	1,150	77	1,070	83										
	1	1	0	0	1,430	62	1,350	66	1,270	70	1,190	75	1,110	80	1,030	86						
	0	0	1	0	1,525	58	1,450	61	1,375	65	1,300	68	1,225	73	1,150	77	1,075	83	1,000	89		
	1	0	1	0	1,620	55	1,540	58	1,465	61	1,390	64	1,315	68	1,240	72	1,165	76	1,090	82		
	0	1	1	0	1,695	52	1,620	55	1,545	58	1,465	61	1,390	64	1,315	68	1,235	72	1,160	77		
	1	1	1	0	1,770	50	1,700	52	1,630	55	1,555	57	1,485	60	1,410	63	1,340	66	1,265	70		
	0	0	0	1	1,875	47	1,805	49	1,730	51	1,655	54	1,580	56	1,510	59	1,435	62	1,340	66		
	1	0	0	1	1,905	47	1,840	48	1,775	50	1,710	52	1,640	54	1,575	56	1,510	59	1,445	62		
	0	1	0	1	1,980	45	1,910	47	1,845	48	1,780	50	1,715	52	1,650	54	1,580	56	1,515	59		
	1	1	0	1	2,025	44	1,960	45	1,895	47	1,830	49	1,765	50	1,700	52	1,635	54	1,570	57		
	0	0	1	1	2,085	43	2,025	44	1,960	45	1,900	47	1,840	48	1,775	50	1,715	52	1,655	54		
	1	0	1	1	2,135	42	2,070	43	2,010	44	1,945	46	1,880	47	1,815	49	1,750	51	1,685	53		
0	1	1	1	2,200	40	2,145	41	2,090	43	2,035	44	1,980	45	1,925	46	1,870	48	1,820	49			
1	1	1	1	2,280	39	2,225	40	2,170	41	2,115	42	2,065	43	2,010	44	1,955	45	1,900	47			
*TA / TK - 140C - 45D1 (140,000)	0	0	0	0	1,395	74	1,350	77	1,305	79	1,260	82	1,210	86	1,165	89						
	1	0	0	0	1,465	71	1,420	73	1,375	75	1,330	78	1,290	80	1,245	83	1,200	86				
	0	1	0	0	1,555	67	1,510	69	1,470	71	1,425	73	1,380	75	1,340	77	1,295	80	1,250	83		
	1	1	0	0	1,625	64	1,585	65	1,540	67	1,500	69	1,460	71	1,415	73	1,375	75	1,335	78		
	0	0	1	0	1,690	61	1,650	63	1,610	64	1,570	66	1,530	68	1,485	70	1,445	72	1,405	74		
	1	0	1	0	1,760	59	1,715	60	1,670	62	1,625	64	1,575	66	1,530	68	1,485	70	1,440	72		
	0	1	1	0	1,835	57	1,790	58	1,745	59	1,695	61	1,650	63	1,605	65	1,555	67	1,510	69		
	1	1	1	0	1,885	55	1,840	56	1,790	58	1,745	59	1,700	61	1,655	63	1,610	64	1,565	66		
	0	0	0	1	1,945	53	1,900	55	1,850	56	1,805	57	1,760	59	1,710	61	1,665	62	1,620	64		
	1	0	0	1	1,950	53	1,905	54	1,860	56	1,820	57	1,775	58	1,735	60	1,690	61	1,650	63		
	0	1	0	1	2,075	50	2,030	51	1,990	52	1,945	53	1,900	55	1,855	56	1,810	57	1,770	59		
	1	1	0	1	2,125	49	2,085	50	2,040	51	2,000	52	1,955	53	1,910	54	1,870	55	1,825	57		
	0	0	1	1	2,170	48	2,130	49	2,090	50	2,045	51	2,005	52	1,965	53	1,925	54	1,880	55		
	1	0	1	1	2,215	47	2,180	48	2,140	48	2,105	49	2,070	50	2,035	51	2,000	52	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	48	2,120	49	2,065	50			

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 recommended 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. Temperature rises that are shaded in grey are for reference only. These conditions are not recommended.
6. When in low stage, the circulating airflow is 70% of the tables high value. (2-stage furnaces only)

Table 3. Continued

*TA / TK FURNACES WITH VARIABLE SPEED BLOWERS						
"A" CABINET	Switch Settings For Heat (0 = OFF, 1 = ON)				*TA / TK - 060C - VA1 Input (BTU) 60,000	
	1	2	3	4	CFM	Temp Rise (° F)
	0	0	0	0	640	69
	0	0	0	1	720	62
	0	0	1	0	800	56
	0	0	1	1	880	51
	0	1	0	0	960	46
	0	1	0	1	1,040	43
	0	1	1	0	1,120	40
0	1	1	1	1,200	37	

"B" CABINET	Switch Settings For Heat (0 = OFF, 1 = ON)				*TA / TK - 080C - VB1 Input (BTU) 80,000		*TA - 100C - VB1 Input (BTU) 100,000	
	1	2	3	4	CFM	Temp Rise (°F)	CFM	Temp Rise (° F)
	1	0	0	0	1,000	59	1,000	74
	1	0	0	1	1,100	54	1,100	67
	1	0	1	0	1,200	49	1,200	62
	1	0	1	1	1,300	46	1,300	57
	1	1	0	0	1,400	42	1,400	53
	1	1	0	1	1,500	40	1,500	49
	1	1	1	0	1,600	37	1,600	46
1	1	1	1	1,700	35	1,700	44	

"C" CABINET	Switch Settings For Heat (0 = OFF, 1 = ON)				*TA / TK - 100C - VC1 Input (BTU) 100,000		*TA / TK - 120C - VC1 Input (BTU) 120,000	
	1	2	3	4	CFM	Temp Rise (° F)	CFM	Temp Rise (° F)
	#	0	0	0	1,000	74	1,000	89
	#	0	0	1	1,115	66	1,115	80
	#	0	1	0	1,230	60	1,230	72
	#	0	1	1	1,345	55	1,345	66
	#	1	0	0	1,460	51	1,460	61
	#	1	0	1	1,575	47	1,575	56
	#	1	1	0	1,690	44	1,690	53
#	1	1	1	1,805	41	1,805	49	

"D" CABINET	Switch Settings For Heat (0 = OFF, 1 = ON)				*TA / TK - 140C - VD1 Input (BTU) 140,000	
	1	2	3	4	CFM	Temp Rise (° F)
	#	0	0	0	1,500	69
	#	0	0	1	1,615	64
	#	0	1	0	1,730	60
	#	0	1	1	1,845	56
	#	1	0	0	1,960	53
	#	1	0	1	2,075	50
	#	1	1	0	2,190	47
#	1	1	1	2,305	45	

NOTES:

Switch not used - can be 0 or 1

1. Two openings are recommended for airflows above 1,600 CFM if the filter(s) is (are) adjacent to the furnace.
2. Temperature rises in the table are approximate. Actual temperature rises may vary.
3. Temperature rises shaded in grey are for reference only. These conditions are not recommended.

Table 4. Nominal Heating Airflows (CFM) & Temperature Rise (° F)

***TA / TK FURNACES WITH VARIABLE SPEED BLOWERS**

"A" CABINET									
Switch Settings (0 = OFF, 1 = ON)					CFM		Nominal A/C & HP Capacity		
HEAT		COOL			LOW	HIGH			
1-4	5	6	7	8					
0	0	0	0	0	360	525	3 TON	2 TON	
0	0	0	0	1	400	580			1.5 TON
0	0	0	1	0	440	635			
0	0	0	1	1	475	690			
0	0	1	0	0	515	745			
0	0	1	0	1	550	800			
0	0	1	1	0	590	855			
0	0	1	1	1	630	910			
0	1	0	0	0	665	965			
0	1	0	0	1	705	1,020			
0	1	0	1	0	740	1,075			
0	1	0	1	1	780	1,130			
0	1	1	0	0	820	1,185			
0	1	1	0	1	855	1,240			
0	1	1	1	0	895	1,295			
0	1	1	1	1	930	1,350			

"B" CABINET								
Switch Settings (0 = OFF, 1 = ON)					CFM		Nominal A/C & HP Capacity	
HEAT		COOL			LOW	HIGH		
1-4	5	6	7	8				
1	0	0	0	0	485	700	3.5 TON	2 TON
1	0	0	0	1	525	760		
1	0	0	1	0	565	820		
1	0	0	1	1	605	880		
1	0	1	0	0	650	940		
1	0	1	0	1	690	1,000		
1	0	1	1	0	730	1,060		
1	0	1	1	1	775	1,120		
1	1	0	0	0	815	1,180		
1	1	0	0	1	855	1,240		
1	1	0	1	0	895	1,300		
1	1	0	1	1	940	1,360		
1	1	1	0	0	980	1,420		
1	1	1	0	1	1,020	1,480		
1	1	1	1	0	1,065	1,540		
1	1	1	1	1	1,105	1,600		

"C" CABINET									
Switch Settings (0 = OFF, 1 = ON)					CFM		Nominal A/C & HP Capacity		
HEAT		COOL			LOW	HIGH			
1-4	5	6	7	8					
#	0	0	0	0	705	1,025	5 TON	3 TON	
#	0	0	0	1	750	1,090			2.5 TON
#	0	0	1	0	795	1,155			
#	0	0	1	1	840	1,220			
#	0	1	0	0	885	1,285			
#	0	1	0	1	930	1,350			
#	0	1	1	0	975	1,415			
#	0	1	1	1	1,020	1,480			
#	1	0	0	0	1,065	1,545			
#	1	0	0	1	1,110	1,610			
#	1	0	1	0	1,155	1,675			
#	1	0	1	1	1,200	1,740			
#	1	1	0	0	1,245	1,805			
#	1	1	0	1	1,290	1,870			
#	1	1	1	0	1,335	1,935			
#	1	1	1	1	1,380	2,000			

"D" CABINET								
Switch Settings (0 = OFF, 1 = ON)					CFM		Nominal A/C & HP Capacity	
HEAT		COOL			LOW	HIGH		
1-4	5	6	7	8				
#	0	0	0	0	965	1,400	5 TON	3.5 TON
#	0	0	0	1	995	1,440		
#	0	0	1	0	1,020	1,480		
#	0	0	1	1	1,050	1,520		
#	0	1	0	0	1,075	1,560		
#	0	1	0	1	1,105	1,600		
#	0	1	1	0	1,130	1,640		
#	0	1	1	1	1,160	1,680		
#	1	0	0	0	1,185	1,720		
#	1	0	0	1	1,215	1,760		
#	1	0	1	0	1,240	1,800		
#	1	0	1	1	1,270	1,840		
#	1	1	0	0	1,295	1,880		
#	1	1	0	1	1,325	1,920		
#	1	1	1	0	1,350	1,960		
#	1	1	1	1	1,380	2,000		

Switch not used - can be 0 or 1

Switch not used - can be 0 or 1

Table 5. Nominal Cooling / Heat Pump Airflows (CFM) for Variable Speed Furnaces

ELECTRICAL INFORMATION

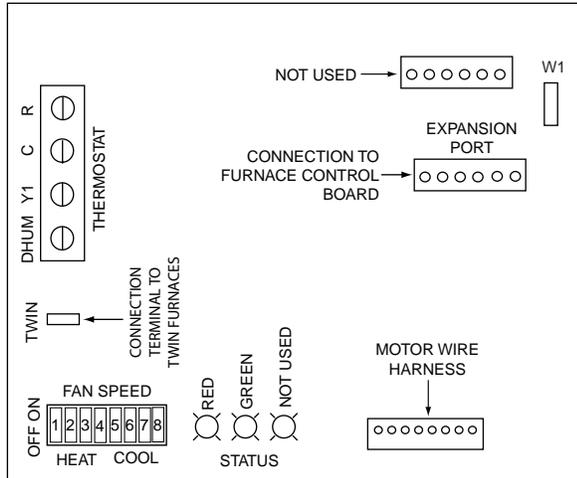


Figure 22. Two-Stage Fixed Speed Motor Control Board

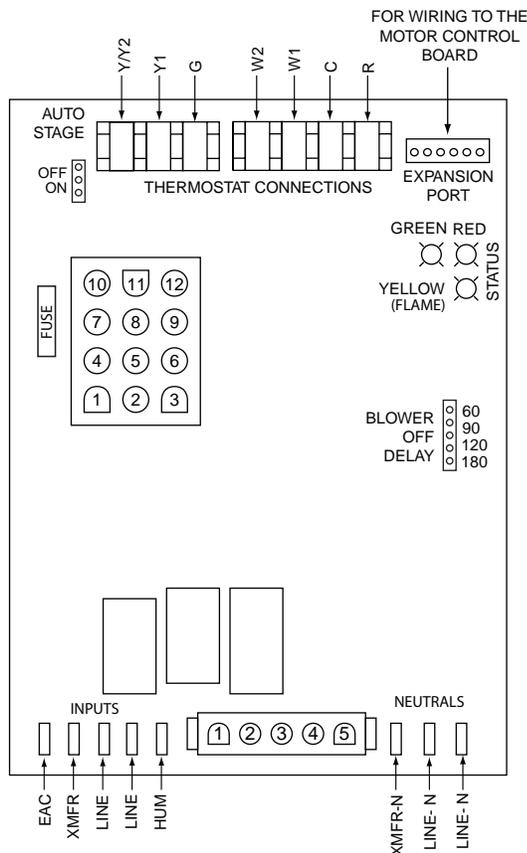


Figure 24. Two-Stage Furnace Control Board

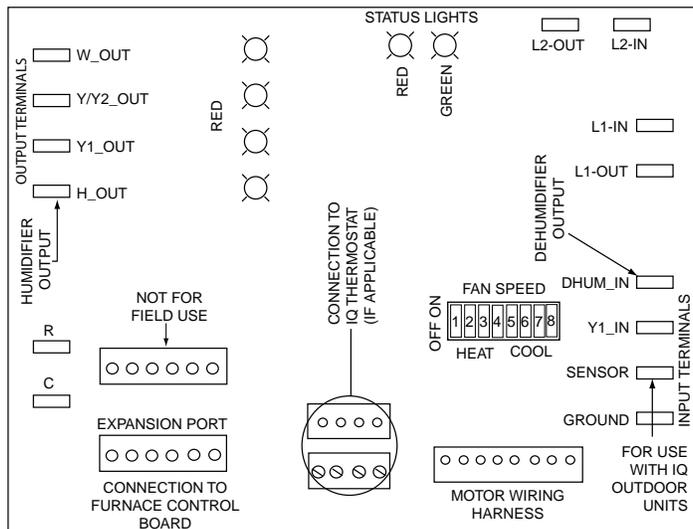


Figure 23. Two-Stage Variable Speed Motor Control Board

WIRING DIAGRAM

For 80+ and 90+ 2-Stage Fixed Speed Upflow Furnaces

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

This wiring diagram shows connections and termination required for the blower kit only. Use in addition to the wiring diagram for the furnace.

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

Use copper conductors only.

FAULT CONDITIONS		
Diagnostic Description	Green LED	Red LED
Control Fault (No Power)	Off	Off
L1/7 Neutral Polarity Fault	Flash	Flash
1 Hour Lockout	Alternating Flash	Flash
Normal Operation	On	On
Pressure Switch Closed Fault	On	Flash
Pressure Switch Open Fault	Flash	On
Open Limit Switch Fault	Flash	Off
Motor Fault	On	Off
Diagnostic Description		
Low Flame Sensor Signal	Continuous Flash	
Flame Present	On	

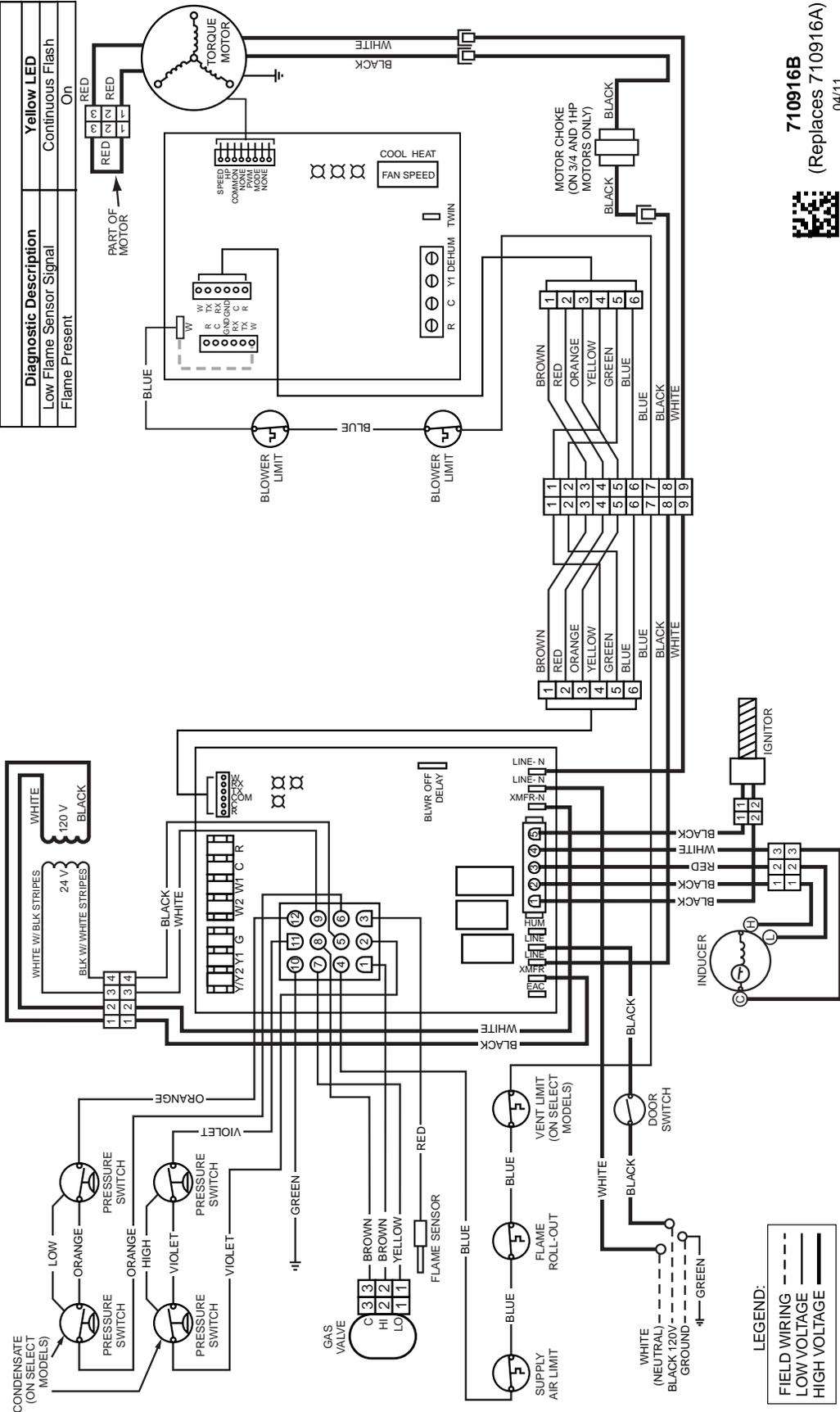


Figure 25. Wiring Diagram for Two-Stage, Fixed Speed Upflow Furnaces

710916B
(Replaces 710916A)



04/11

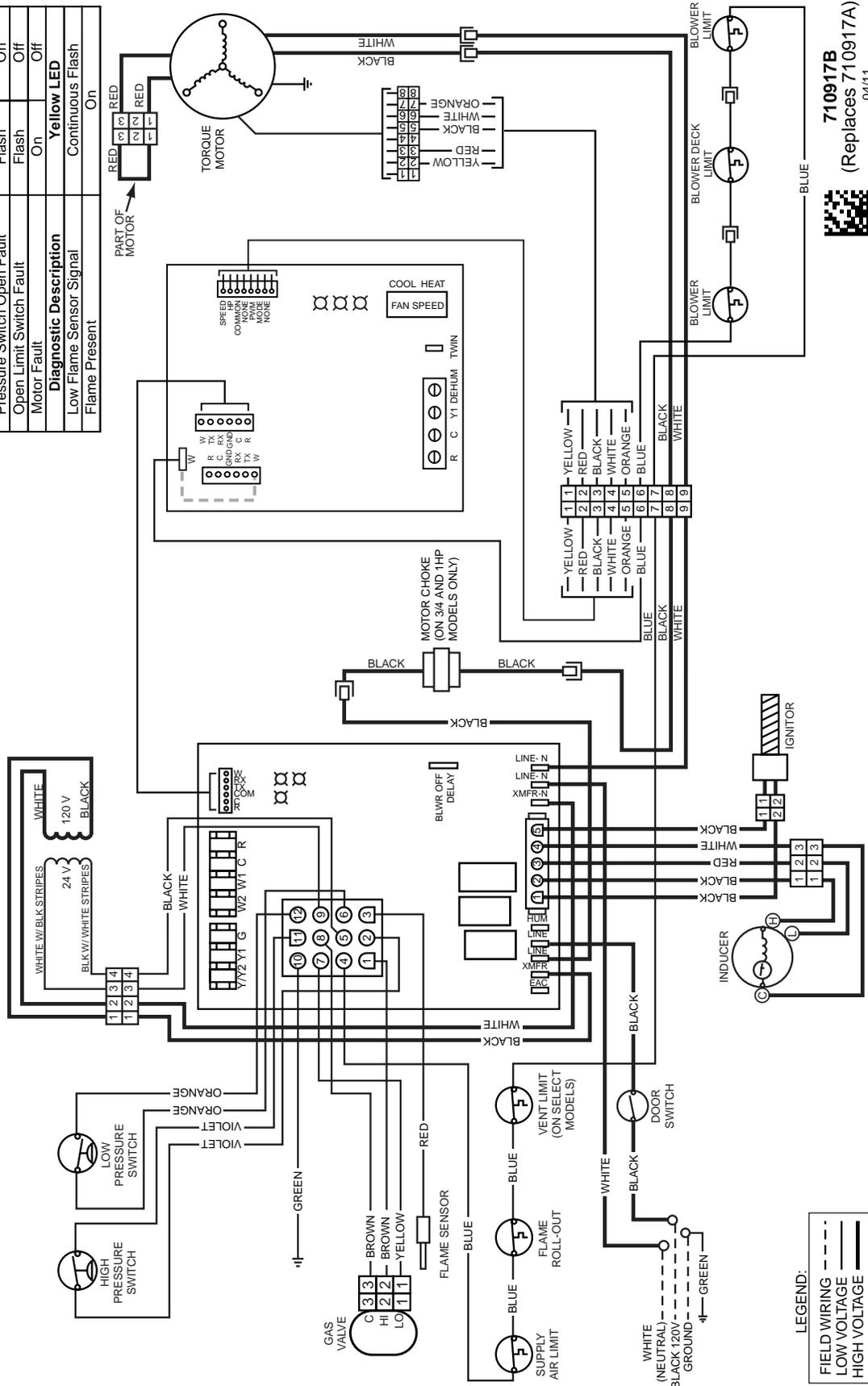
WIRING DIAGRAM

For 80+ and 90+ 2-Stage Fixed Speed Downflow Furnaces

Refer to the Installation Instructions provided with the kit for the proper heating and cooling speeds for your application. This wiring diagram shows connections and termination required for the blower kit only. Use in addition to the wiring diagram for the furnace.

Use copper conductors only.

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	Flash
Normal Operation	On	On
Pressure Switch Closed Fault	On	Flash
Pressure Switch Open Fault	Flash	On
Open Limit Switch Fault	Flash	Off
Motor Fault	On	Off
Yellow LED		
Low Flame Sensor Signal	Continuous Flash	
Flame Present	On	



710917B
(Replaces 710917A)
04/11

Figure 26. Wiring Diagram for Two-Stage, Fixed Speed Downflow Furnaces

WIRING DIAGRAM

For 80+ and 90+ 2-Stage Variable Speed Upflow Furnaces

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

This wiring diagram shows connections and termination required for the blower kit only. Use in addition to the wiring diagram for the furnace.

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

Use copper conductors only.

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

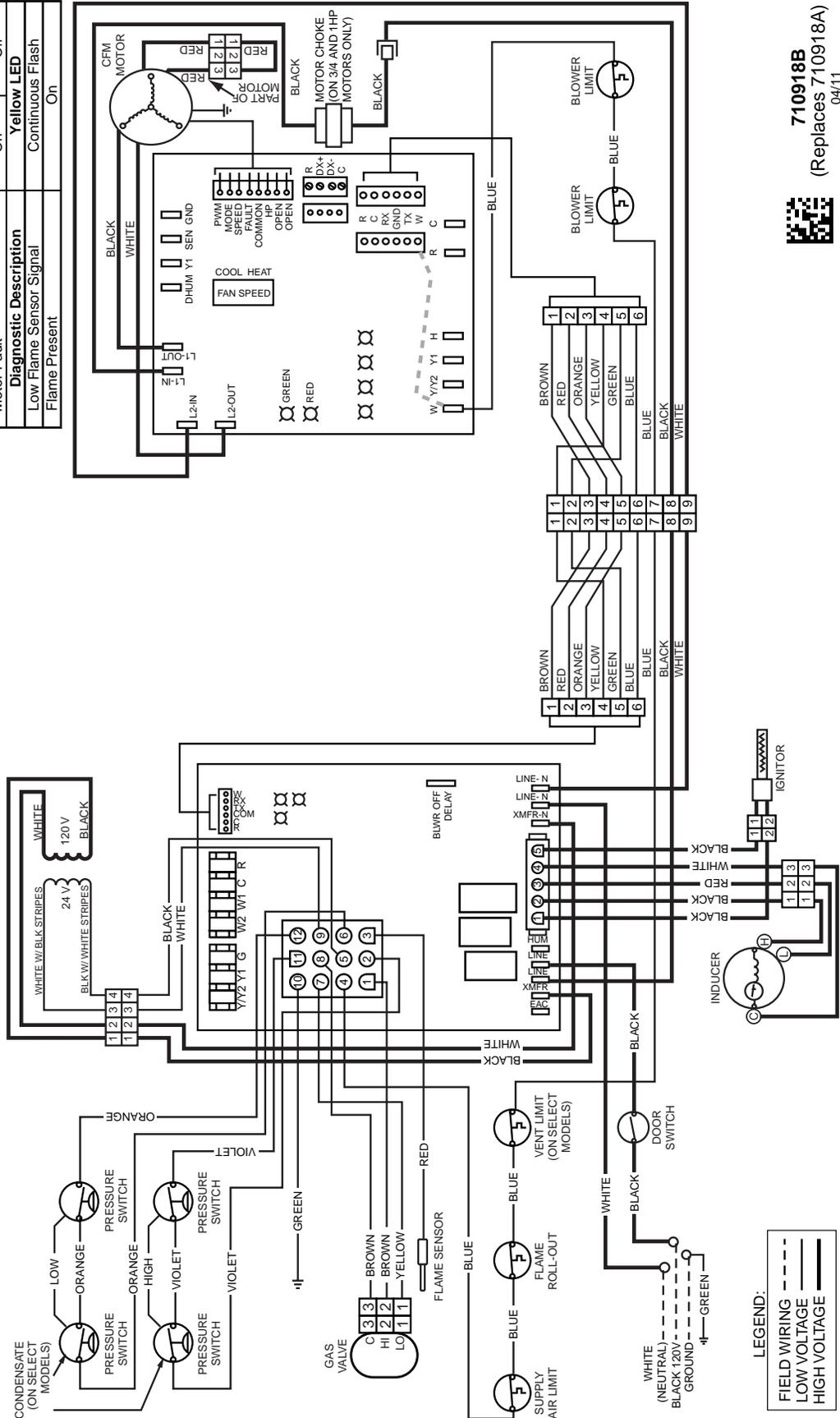


Figure 27. Wiring Diagram for Two-Stage, Variable Speed Upflow Furnaces

710918B
(Replaces 710918A)
04/11

WIRING DIAGRAM

For 80+ and 90+ 2-Stage Variable Speed Downflow Furnaces

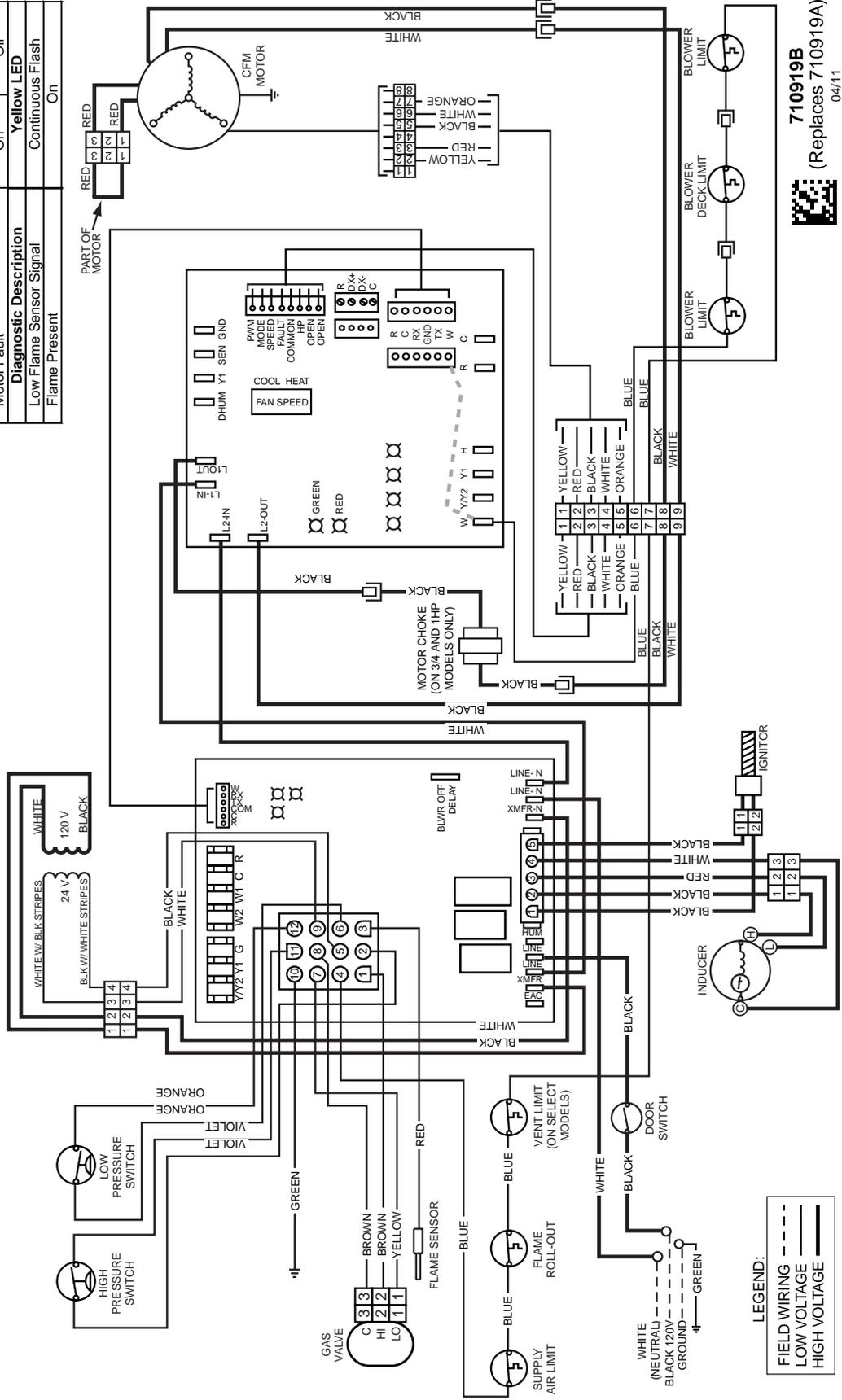
Refer to the installation instructions provided with the kit for the proper heating and cooling speeds for your application.

This wiring diagram shows connections and termination required for the blower kit only. Use in addition to the wiring diagram for the furnace.

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

Use copper conductors only.

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



LEGEND:
 FIELD WIRING - - -
 LOW VOLTAGE - - -
 HIGH VOLTAGE —

710919B
 (Replaces 710919A)
 04/11

Figure 28. Wiring Diagram for Two-Stage, Variable Speed Downflow Furnaces

GAS INFORMATION

GAS FLOW RATES			
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			
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 6. Gas Flow Rates (Cubic Feet per Hour)

GAS PIPE CAPACITIES								
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 7. Capacity of Black Iron Gas Pipe (cu. ft. per hour)
for Natural Gas w/ Specific Gravity = 0.60**

PROPANE DERATION CHART											
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU) & STAGE										
	60,000		80,000		100,000		120,000		140,000		
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	
0 to 1,999 FT	55		55		55		55		55		ORIFICE SIZE
	4.2	10.0	4.2	10.0	4.2	10.0	4.2	10.0	4.2	10.0	MANIFOLD PRESSURE
2,000 to 2,999 FT	55		55		55		55		55		ORIFICE SIZE
	4.2	9.0	4.2	9.0	4.2	9.0	4.2	9.0	4.2	9.0	MANIFOLD PRESSURE
3,000 to 4,999 FT	55		55		55		55		55		ORIFICE SIZE
	4.2	8.5	4.2	8.5	4.2	8.5	4.2	8.5	4.2	8.5	MANIFOLD PRESSURE
5,000 to 5,999 FT	56		56		56		56		56		ORIFICE SIZE
	4.2	10.0	4.2	10.0	4.2	10.0	4.2	10.0	4.2	10.0	MANIFOLD PRESSURE
6,000 to 7,999 FT	56		56		56		56		56		ORIFICE SIZE
	4.2	9.0	4.2	9.0	4.2	9.0	4.2	9.0	4.2	9.0	MANIFOLD PRESSURE
8,000 to 10,000 FT	56		56		56		56		56		ORIFICE SIZE
	4.2	8.5	4.2	8.5	4.2	8.5	4.2	8.5	4.2	8.5	MANIFOLD PRESSURE

Table 8. High Altitude Deration Chart for 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 9. Natural Gas Heating Values

NATURAL GAS WITH HIGH HEATING VALUE											
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU) & STAGE										
	60,000		80,000		100,000		120,000		140,000		
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	
0 to 1,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	MANIFOLD PRESSURE
3,000 to 3,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	MANIFOLD PRESSURE
4,000 to 4,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	2.9	1.7	2.9	1.7	2.9	1.7	2.9	1.7	2.9	MANIFOLD PRESSURE
5,000 to 5,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	2.8	1.7	2.8	1.7	2.8	1.7	2.8	1.7	2.8	MANIFOLD PRESSURE
6,000 to 6,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	MANIFOLD PRESSURE
7,000 to 7,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	MANIFOLD PRESSURE
8,000 to 8,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.0	1.7	3.0	1.7	3.0	1.7	3.0	1.7	3.0	MANIFOLD PRESSURE
9,000 to 9,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	2.8	1.7	2.8	1.7	2.8	1.7	2.8	1.7	2.8	MANIFOLD PRESSURE

Table 10. High Altitude Deration Chart for Natural Gas - High Heating Value

NATURAL GAS WITH LOW HEATING VALUE											
ALTITUDE ABOVE SEA LEVEL	INPUT (BTU) & STAGE										
	60,000		80,000		100,000		120,000		140,000		
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	
0 to 1,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	MANIFOLD PRESSURE
2,000 to 2,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	MANIFOLD PRESSURE
3,000 to 3,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.4	1.7	3.4	1.7	3.4	1.7	3.4	1.7	3.4	MANIFOLD PRESSURE
4,000 to 4,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.2	1.7	3.2	1.7	3.2	1.7	3.2	1.7	3.2	MANIFOLD PRESSURE
5,000 to 5,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	MANIFOLD PRESSURE
6,000 to 6,999 FT	45		45		45		45		45		ORIFICE SIZE
	1.7	2.9	1.7	2.9	1.7	2.9	1.7	2.9	1.7	2.9	MANIFOLD PRESSURE
7,000 to 7,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	1.7	3.5	MANIFOLD PRESSURE
8,000 to 8,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	1.7	3.3	MANIFOLD PRESSURE
9,000 to 9,999 FT	48		48		48		48		48		ORIFICE SIZE
	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	1.7	3.1	MANIFOLD PRESSURE

Table 11. High Altitude Deration Chart for Natural Gas - Low Heating Value

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!**)
- Are all the LED's on the furnace and motor control boards constantly ON? If not, refer to Tables 12 & 13 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 (Figure 29, page 42) and reset if necessary.
- If the furnace operates when the Blower Limit Switch is reset, contact a qualified service technician to identify and repair the problem.
- If the furnace still doesn't operate, check the Flame Roll-out Switches (Figure 29) and reset if necessary.
- If the furnace operates when the Flame Rollout Switch is reset, contact a qualified service technician to identify and repair the problem.

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

Table 12. Furnace Control Board Fault Conditions

	Diagnostic Description	Green LED	Red LED
Fixed Speed Furnaces	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
Variable Speed Furnaces	Control Fault (No Power)	Off	Off
	Normal Operation	On	On
	Motor Fault	On	Flash
	Communications Fault	Flash	Flash

Table 13. 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 29 (page 42). If any component of the furnace must be replaced, use only factory authorized replacement parts specified in the Replacement Parts List provided online.

Blower Limit Switch: 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 Switch: Verifies that the inducer is drawing the combustion gases through the heat exchanger. The pressure switch prevents furnace operation with excessive flue blockage or improper inducer operation.

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

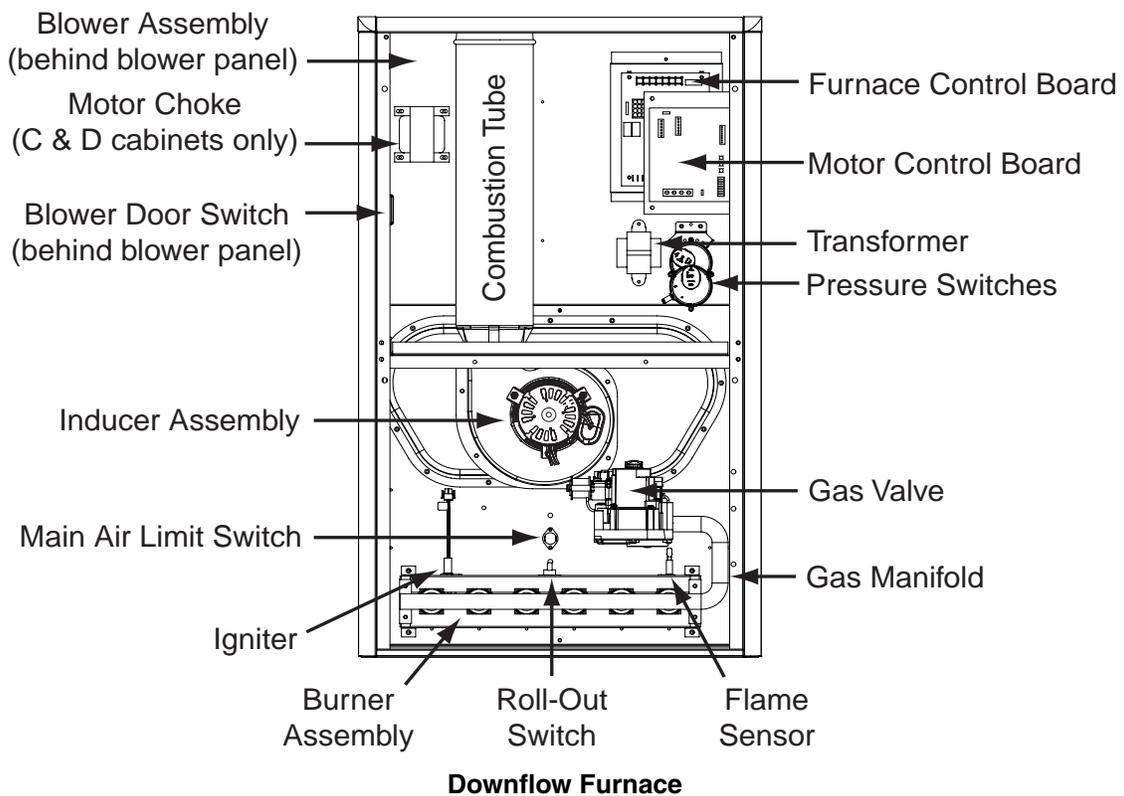
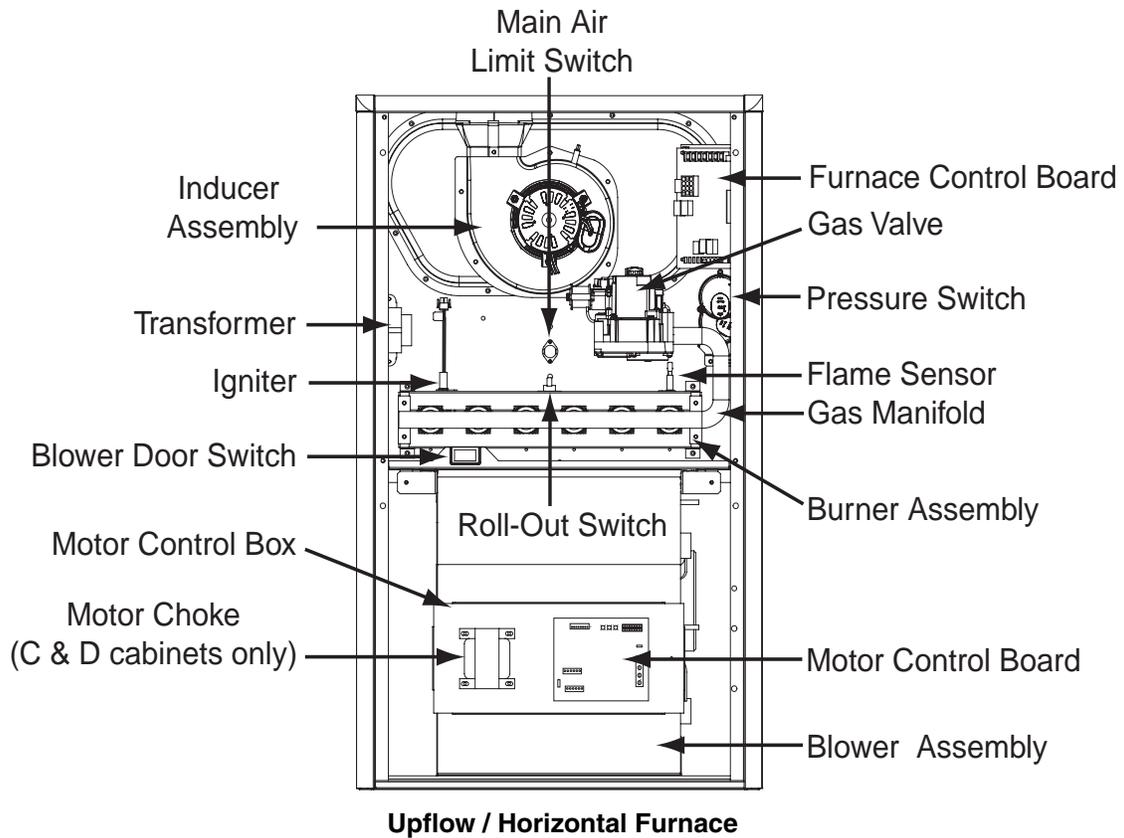


Figure 29. Component Locations

INSTALLATION / PERFORMANCE CHECK LIST

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.

INSTALLER NAME:

CITY:	STATE:
-------	--------

INSTALLATION ADDRESS:

CITY:	STATE:
-------	--------

UNIT MODEL #

UNIT SERIAL #

Minimum clearances as shown in Figure 1 (page 5)?	YES	NO
Has the owner's information been reviewed with the home-owner?	YES	NO
Has the literature package been left near the furnace?	YES	NO

⚠ WARNING:

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

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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