

AIRE-FLO  
PO BOX 794297  
DALLAS, TX 75379  
AF88MPA SERIES



**INSTALLATION INSTRUCTIONS  
UPFLOW, DOWNFLOW OR  
HORIZONTAL GAS-FIRED  
NON-CONDENSING  
WARM AIR FURNACE**



Issue 0024

**WARNING**

These instructions are intended to be used by qualified personnel who have been trained in installing this type of furnace. Installation of this furnace by an unqualified person may lead to equipment damage and/or a hazardous condition which may cause bodily injury and harm and, as such, at the sole discretion of the manufacturer, the entire warranty may be voided and be of no further force and effect.

**WARNING**

The furnace cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury in the event an electrical fault should occur. The unit must also be electrically grounded in accordance with local codes. In the absence of local codes, with the latest edition of the (U.S.) National Electrical Code ANSI/NFPA No. 70 or CSA Standard C22.1; Part 1 Canadian Electrical Code, if an external electrical source is utilized. DO NOT use gas piping as an electrical ground.

**GENERAL INSTRUCTIONS**

This furnace is design certified by CSA International as a category I furnace and maybe used with either natural or liquefied petroleum gases (propane - when installed with the proper propane conversion kit). This furnace uses air from inside the structure for combustion.

It is shipped as a packaged unit, complete with burners and controls, and requires a line voltage (115V) connection to the junction box, a thermostat hook-up as per the wiring diagram and a gas line connection. **This furnace can be installed in either upflow, downflow or horizontal airflow positions.** Do not install this furnace outdoors or use for temporary construction heating.

This furnace has been designed to interface with split system cooling equipment (approved by a nationally recognized testing laboratory) so as to provide "year round air conditioning". The blower has been sized for both heating and cooling and the furnace controls include a cooling fan relay.

The furnace installation must conform with local building codes or in the absence of local codes, with the latest edition of the (U.S.) National Fuel Gas Code ANSI Z223.1 (NFPA-54) or Canadian Installation Codes CAN/CGA-B149.

For complete information on installation standards consult the (U.S.) National Fuel Gas Code, obtainable from the National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269 or the American Gas Association, 1515 Wilson Boulevard Arlington, VA 22209 or the Canadian installation codes obtainable from Canadian Standards Association, 178 Rexdale Boulevard Etobicoke, Ontario, Canada M9W1R3.

This furnace is designed for a minimum continuous return-air temperature of 60°F dB or intermittent operation down to 55°F dB such as when used with a night setback thermostat. Return-air must not exceed a maximum continuous temperature of 85°F dB.

## LOCATION / PLACEMENT

**Site Selection:** This furnace may be located in an attic, closet, basement, crawl space, alcove, garage or suspended from the ceiling of a utility room or basement. Select a location that will meet all requirements for safety, clearances, ventilation and combustion air, ductwork design, gas piping, electrical wiring and venting.

**Clearances:** The following minimum clearances, or greater, must be provided between the furnace and adjacent construction.

Table 1.2 **MINIMUM INSTALLATION CLEARANCES**

"UPFLOW" POSITION		"DOWNFLOW" POSITION			"HORIZONTAL" POSITION
Suitable for alcove or closet installation† on combustible flooring at minimum clearance from adjacent construction not less than the following:		Suitable for alcove or closet installation† on non-combustible flooring at minimum clearance from adjacent construction not less than the following: * Installation on combustible flooring only when installed on special base (see model & rating label for proper special base).			Suitable for attic, alcove or closet installation† on combustible flooring at minimum clearance from adjacent construction not less than the following: * Line contact only permissible between lines formed by intersection of the top and two sides of the furnace jacket and building joist, studs, or framing.
Top	Sides	Back	Front	Vent	
2"	1"	1"	6"	6" with single wall vent	
2"	1"	1"	3"	1" with B1 vent	

† For closet installation see Air for Combustion and Ventilation.

### WARNING

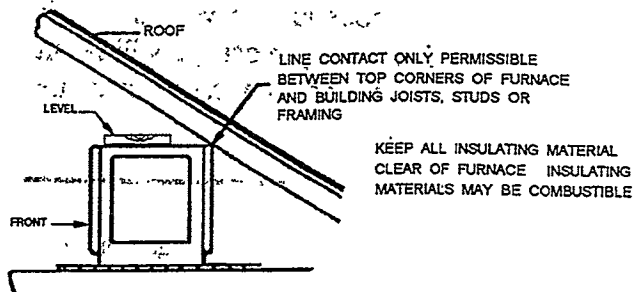
Failure to comply with all of the above clearances will create a fire hazard.

The furnace should not be connected to an operational chimney that also serves a solid fuel burning appliance. The furnace should also be located as near to the center of the air distribution system as possible, and should be installed level.

This furnace may be installed on non-combustible flooring or on wood flooring, however, it must not be installed directly on carpeting, tile or any other combustible material. In the downflow position, it must be installed on non-combustible flooring or on the special base listed on the rating label.

In a horizontal position, line contact is only permissible between lines formed by the intersection of the furnace top and the front and back sides and building joists, studs or framing (See Figure 2.2).

Figure 2.2 **LEVELING AND ATTIC INSTALLATION SHOWING LINE CONTACT**



A clearance of at least 30" should be provided at the front of the unit for servicing. For attic installations, the passageway and servicing area adjacent to the furnace should be floored.

If the furnace is to be installed in a crawl space, consult local codes. (Use of a concrete pad 1" to 2" thick is recommended.) If the furnace is to be suspended from the ceiling, it will be necessary to use steel pipe straps around each end of the furnace. These straps should be attached to the furnace with sheet metal screws and to the rafters with bolts. The furnace may also be suspended by using an angle iron frame bolted to the rafters. (See Table 1.18 for size and weight of furnace.) Care must be taken to allow for service access.

If a furnace is to be installed in a residential garage, it must be installed so the burners and the ignition source are located not less than 18" above the floor and the furnace must be located or protected to avoid physical damage by vehicles.

### WARNING

Do not place combustible material on the furnace jacket. Failure to comply with this warning will create a fire hazard.

### WARNING

This furnace is not watertight and is not designed for outdoor installation. This furnace shall be installed in such a manner as to protect the electrical components from water. Outdoor installation would lead to a hazardous electrical condition and to premature furnace failure.

## Air for Combustion and Ventilation:

**Contaminated Combustion Air** Do not install this furnace in a structure defined as having contaminated combustion air. Allowing exposure to substances containing chlorine or fluoride could harm the furnace. Substances to avoid include, but are not limited to:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemical
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials

### **WARNING**

Contaminated combustion air may cause premature failure of the heat exchanger that may lead to a hazardous condition and/or bodily harm, or loss of life.

**Adequate Ventilation and Combustion Air** This section is provided to give guidelines for the introduction of air for ventilation and combustion air. The total quantity of air provided to the installation area must equal the requirements of all gas appliances in the area.

Adequate facilities for providing air for combustion and ventilation must be provided in accordance with the latest edition of section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code ANSI Z223.1 or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149 Installation Codes, or applicable provisions of the local building codes.

The furnace shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting and maintenance of ambient temperature at safe limits under normal conditions of use. The furnace shall be located so as not to interfere with proper circulation of air.

In addition to air needed for combustion, ventilation in the form of process air must be provided as required for: cooling of equipment or material, controlling dew point, heating, drying, oxidation or dilution, safety exhaust and odor control. Air must be supplied for ventilation, including all air required for comfort and proper working conditions for personnel. For purposes of this instruction the following definitions apply:

**Unconfined Space:** A space whose volume is not less than 50 cubic feet per 1000 Btu per hour of the

aggregate input rating of all appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

**Confined Space:** A space whose volume is less than 50 cubic feet per 1000 Btu per hour of the aggregate input rating of all appliances installed in that space.

If the installation area meets the definition of "Unconfined Space" and does not have additional air requirements as described, the furnace may be installed without making special provisions for combustion and ventilation air.

### **CAUTION**

Whenever this furnace is installed in an area along with one or more gas appliances, the total Btu input of all appliances must be included when determining the free area requirements for combustion and ventilation air openings.

If ventilation and/or combustion air must be supplied to the "Confined Space" from inside the building structure, two permanent openings to an additional room of sufficient volume as to combine the volumes of the spaces to meet the criteria for an "Unconfined Space" must be created. Each opening must have a free area of not less than one square inch per 1000 Btu per hour of total input of all appliances within the "Confined Space" (but not less than 100 square inches). These openings must be located 12 inches from the top and bottom of the furnace area respectively and must be at least 3 inches long on the smaller side of the opening. Neither opening can be blocked at any time.

If ventilation and/or combustion air must be supplied to the "Confined Space" from outside the building structure, two permanent openings to the outdoors must be created. Each opening must have a free area of not less than one square inch per 4000 Btu per hour of total input of all appliances within the "Confined Space". These openings must be located 12 inches from the top and bottom of the furnace area respectively. Neither opening can be blocked at any time.

When ducts are used to supply air, they must be of the same cross sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts must not be less than 3 inches.

### **WARNING**

Do not block the combustion or ventilation air openings in the furnace. Any blockage will result in improper combustion and may result in a fire hazard or unsafe condition.

## CAUTION

For an attic installation it is important to keep insulation 12" or more away from any furnace openings. Some types of insulating materials may be combustible.

### Checking For Vent Oversizing:

If this furnace is replacing a furnace that is attached to a venting system serving other appliances, the venting system is likely to be too large to properly vent all of the attached appliances. An improperly sized venting system can lead to condensation, leakage, or spillage.

Each appliance connected to the common venting system should be individually checked for proper operation while the other appliances connected to the common venting system are not in operation. The following steps must be followed:

- Seal any unused opening in the common venting system.
- Visually inspect the venting system for the proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

- Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.
- If applicable, test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
- If improper venting is observed during any of the above tests, the common venting system must be corrected. The vent system or vent connectors may need to be resized.
- When re-sizing any part of the common vent system or vent connectors, the common vent system or connector must be sized to approach the minimum size as determined using the appropriate venting table found in the (U.S.) National Fuel Gas Code ANSI Z223.1, or CAN1-B149 Installation Codes.

## INSTALLATION

When installed, the furnace must be electrically grounded in accordance with local codes or, in the absence of local codes, with the (U.S.) National Electrical Codes, ANSI/NFPA 70 or CSA Standard C22.1; Part 1 Canadian Electrical Code. To properly install the field wiring of this unit refer to Figure 1.19 & 1.20. In all instances, the wiring to be done, and any replacement of wire shall conform with the temperature limitation for Type T wire [63°F rise (35°C)].

### To Prepare Unit for Installation:

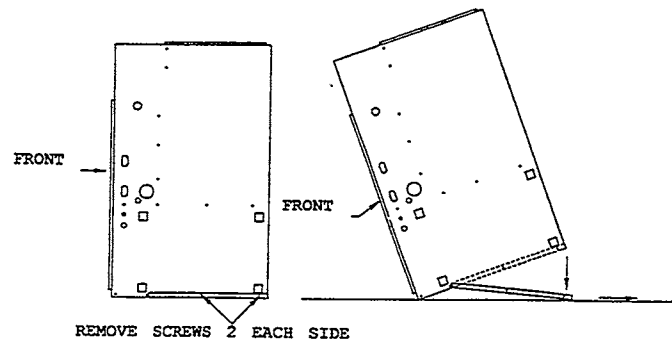
#### General Requirements:

Regardless of which airflow direction that the furnace is installed, the following steps are required:

- The electrical connections and the thermostat connections are made at the openings on either side panel of the unit in the control box area. Either side may be used, as convenient, but the provided hole plugs should be inserted in the unused holes.
- The left, right, or bottom return air opening must be used for return air. An externally mounted air filter must be used with this furnace.
- This furnace has a two piece bottom panel. For bottom or end duct return, remove the back portion of the bottom panel by removing the four (4) screws—2 on each side toward the back of the furnace. (See Figure 1.4) Tilt furnace toward the front, the back portion of the panel will drop down. Then the back

portion can be removed by pulling toward the back of the furnace. Refer to Figure 2.18 for ductwork sizing.

Figure 1.4 BOTTOM PANEL REMOVAL



- The flue may exit the cabinet either through the right or the top panel, depending on the requirements of the installation. See figure 1.8 for configurations.

### Ductwork Recommendation:

The proper sizing of warm air ducts is necessary to insure satisfactory heating operation. Ductwork should be in accordance with the latest editions of U.S. NFPA-90A (Air Conditioning

Systems) and NFPA-90B (Warm Air Heating and Air Conditioning Systems) or Canadian equivalent.

The supply ductwork should be attached to the flanged opening provided at the discharge end of the furnace. See Figure 2.18 for the dimensions of this opening.

Knockouts are provided on both sides of the furnace to facilitate the side cutout required to the return air ductwork. **Furnace cutouts must be the full size specified by the corner markers. Undersized cutouts will adversely affect the airflow capability of the furnace and could cause overheating of the heat exchanger.**

The following recommendations should be followed when installing the ductwork:

1. Install locking-type dampers in all branches of the individual ducts to balance out the system. Dampers should be adjusted to impose the proper static at the outlet of the furnace.
2. Noncombustible flexible duct connectors are recommended to connect both the supply and return ducts to the furnace.
3. In cases where the return air grille is located close to the blower inlet, there should be at least one 90° air turn between blower and return grille. Further reduction in sound can be accomplished by installing acoustical air turning vanes and/or lining the inside of the duct with acoustical material.
4. It is recommended that the supply duct be provided with a removable access panel. This opening shall be accessible when the furnace is installed and shall be of such a size that the heat exchanger can be viewed for possible openings using light assistance or a probe can be inserted for sampling the air stream. The access panel shall be designed so as to prevent leaks when locked in position. If an air conditioning coil is installed, the access panel to the coil can be used for this purpose.

### WARNING

When supply ducts carry air circulated by the furnace to areas outside the spaces containing the furnace, the return air shall also be handled by a duct sealed to the furnace casing and terminating outside the space containing the furnace. Incorrect ductwork termination and sealing will create a hazardous condition that could lead to bodily harm.

### CAUTION

Air openings, intake and outlet pipes, return air grilles and warm air registers must not be obstructed.

When installing the furnace with cooling equipment for year round operation, the following recommendations must be followed for series or parallel air flow:

1. In series flow applications, the coil is mounted after the furnace in an enclosure in the supply air stream. The furnace blower is used for both heating and cooling airflow.
2. In parallel flow installation, dampers must be provided to direct air over the furnace heat exchanger when heat is desired and over the cooling when cooling is desired.

**IMPORTANT:** The dampers should be adequate to prevent cooled air from entering the furnace, and if manually operated, must be equipped with means to prevent operation of either the cooling unit or furnace unless the damper is in the full cool or full heat position.

### WARNING

The coil **MUST** be installed on the air discharge side of the furnace. Under no circumstances should the air flow be such that cooled, conditioned air can pass over the furnace heat exchanger. This will cause condensation in the heat exchanger and possible failure of the heat exchanger that could lead to a fire hazard and/or hazardous conditions that may lead to bodily harm. Heat exchanger failure due to improper installation may not be covered by warranty.

### Gas Piping:

Gas piping shall be of such size and so installed as to provide a supply of gas sufficient to meet maximum demands without undue loss of pressure between the gas meter and the furnace. It is recommended that the gas line to the furnace shall be a separate line direct from the meter, unless the existing gas line is of ample capacity. Refer to gas pipe capacity table in the National Fuel Gas Code (ANSI Z223.1) or the CAN1-B149 Installation Code.

Use a joint compound (pipe dope) that is resistant to the action of liquefied petroleum gases or any other chemical constituents of the gases to be conducted through the piping.

**NOTE:** In order to make proper input adjustments, minimum and maximum gas supply pressure limits shown on the rating plate must not be exceeded.

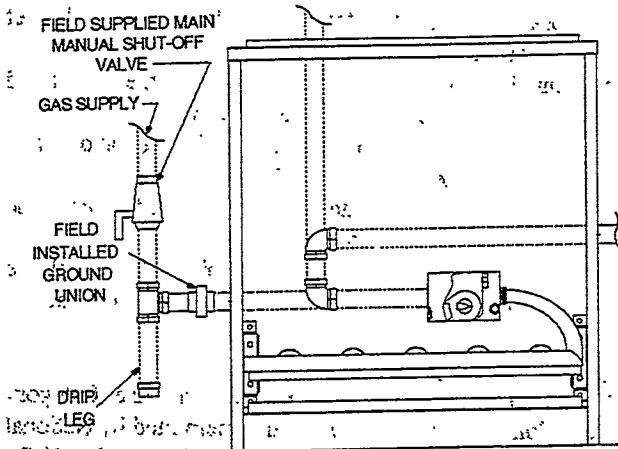
Before any system of gas piping is finally put into service, it should be carefully tested to determine if it is gas tight. Check all piping for leaks using soapy water and a brush. The piping must stand a pressure of six (6) inches of mercury for a period of ten (10) minutes or as required by local authority.

## WARNING

The furnace and its individual shutoff valve must be **disconnected** from the supply piping system during any pressure testing of that system at test pressures in excess of 1/2 PSIG (3.5kPa or 14" w.c.).

The furnace must be **isolated** from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at pressures equal to or less than 1/2-PSIG (3.5kPa or 14" w.c.). Failure to follow the above procedures could lead to a hazardous condition and bodily harm.

Figure 1.6 GAS CONNECTION METHODS



This furnace is manufactured for use with Natural gas and must be converted using the proper LP conversion kit for use with LP (Propane) gas. For LP (Propane) gas, a tank regulator is required to reduce supply pressure to 12"-13" w.c. For manifold pressure, see Table 1.11.

A main manual shut off valve must be used in the gas piping. The type and location of shutoff valve must follow local codes or in the absence of local codes, install gas piping as recommended in Figure 1.6.

The gas valve contains two threaded ports for a 1/8" NPT tap in order to test incoming gas pressure and outgoing manifold pressure (See Figure 1.9).

## CAUTION

Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

## WARNING

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion.

### Electrical:

The control system depends on the correct polarity of the power supply. Connect "hot" wire (H) and "ground" wire "G" as shown in Figures 1.19 & 1.20. Reference table 1.18 for furnace over current protection, current rating and wire size. Use copper wire only for 115V-supply service to unit. When replacing any original internal furnace wiring, use only 105°C, 16 AWG copper wire.

Instructions for wiring the thermostat are packed in the thermostat (field supplied) box. Make the thermostat connections as shown in Figures 1.19 & 1.20 at the 24-volt terminal board located in the control box.

When installing optional accessories to this appliance, follow the manufacturer's installation instructions included with the accessory. Other than wiring for the thermostat, a minimum of type T (63°F rise) must be used.

## WARNING

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or approved conduit when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground. Failure to follow this warning can result in an electrical shock, fire, bodily harm, or loss of life.

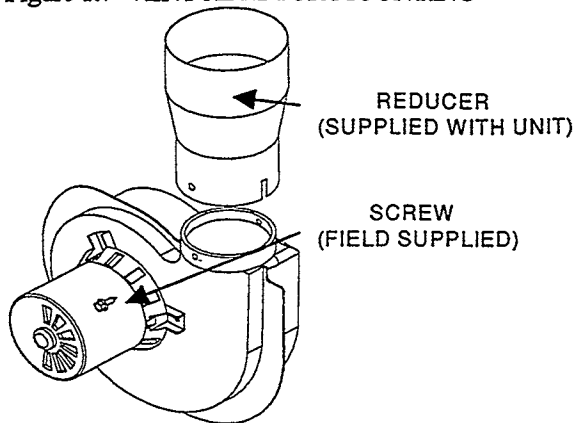
### Venting Instructions:

Venting for the furnace should be to the outside and in accordance with local codes or requirements of the local utility. In the absence of local codes, venting must conform to the applicable sections of the latest edition of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149. Installation Codes, and the vent manufacturers instructions.

This furnace is CSA International approved as a Category I forced air appliance and can not be vented into a vent system with any Category II, III or IV appliance. It must be vented vertically, or nearly vertically, unless installed with a listed mechanical venter in accordance with horizontal venting instructions on Page 7. It must not be connected to any portion of a mechanical draft system operating under positive pressure.

The 3" (in.) to 4" (in.) vent adaptor coupling (supplied with unit) **MUST BE USED**. It must be connected directly to the outlet of the combustion blower using a field supplied corrosion resistant sheet metal screw (see figure 1.7).

Figure 1.7 VENT ADAPTOR MOUNTING



**Pre-Installation Vent System Inspection:**

Before this furnace is installed, it is highly recommended that any existing vent system be completely inspected.

For a chimney or "B" vent, this should include the following:

1. Inspection for any deterioration in the chimney or "B" vent. If deterioration is discovered, the chimney must be repaired or the "B" vent must be replaced.
2. Inspection to ascertain that the vent system is clear and free of obstructions. Any blockage must be cleared before installing this furnace.
3. Cleaning the chimney or "B" vent if previously used for venting a solid fuel burning appliance or fireplace.
4. Confirming that all unused chimney or "B" vent connections are properly sealed.
5. Verification that the chimney is properly lined and sized per the applicable codes.

**Masonry Chimney:**

This furnace can be common vented into an existing tile lined masonry chimney provided:

1. The chimney is currently serving at least one drafthood equipped appliance.
2. The vent connectors and chimney are sized in accordance with the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN /CGA-B149, Installation Codes.

This furnace must not be vented **ALONE** into an existing masonry chimney (either tile lined or unlined) unless the chimney is also lined with either a type B vent system or a listed single wall, metal lining system. Both of these systems must be sized in accordance with the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149, Installation Codes.

Before venting this furnace into a chimney, check the chimney for deterioration and repair if necessary. This furnace must not be vented into a chimney serving a separate appliance designed to burn solid fuel. Type "B" vent connector must be used on all installations and it must be sized per the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149, Installation Codes.

**Type "B" Vent:**

The furnace is also approved for use with a "B" vent that terminates through the roof. Refer to the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149, Installation Codes for proper sizing and set-up of this furnace with "B" vent for a dedicated-vent system or a common vented system.

**Horizontal Venting:**

This furnace is design certified by CSA International for horizontal venting through an outside wall by use of the following auxiliary draft inducers:

1. Field Controls Company Model #DGF-2.
2. Tjernlund Company Model #SS1.

The minimum vent length is twelve (12) feet and the maximum is sixty (60) feet. **(FOLLOW INSTRUCTIONS SUPPLIED WITH INDUCER KITS.)**

**Location Requirements for Horizontal Venting:**

Locate the vent terminal adhering to the following minimum clearances:

1. Vent terminal must be located at least one (1') foot above the grade or at least one (1') foot above the normal expected snowfall.
2. Avoid installing vent terminal above public walkways. If this is not possible, install the terminal at least seven (7) feet above the walkway.
3. Vent terminal should be at least four (4') feet to the side of and at least one (1') foot above doors and windows.
4. Vent terminal should be at least three (3') feet above any forced air inlet located within ten (10') feet.
5. Vent terminal should be located at least six (6') feet from the combustion air intake of another appliance.
6. Vent terminal should be located at least four (4') feet above any electric or gas meters, regulators, and relief equipment.

**General Venting Requirements:**

This furnace may be common vented only with other Category I appliances. Common venting is allowed as permitted by National and/or local codes. Refer to the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149, Installation Codes for proper sizing and set up.

The vent must be terminated with a listed vent cap or roof assembly. This venting must be installed in accordance with the vent manufacturer's instructions and be in accordance with all local codes and/or National Codes.

The following requirements are provided for a proper venting system:

1. Be sure that the chimney flue is clear of any dirt or debris.
2. Be sure that the chimney is not servicing an open fireplace.
3. Never reduce the pipe size below the outlet size of the furnace without checking the applicable sections of the (U.S.) National Fuel Gas Code (NFPA 54 / ANSI Z223.1), and/or CAN/CGA-B149, Installation Codes.
4. All pipe should be supported using the proper clamps and/or straps. These supports should be at least every four (4) feet.
5. All horizontal runs of pipe should have at least a 1/4" (in.) per foot of upward slope from the furnace to the vent terminal.

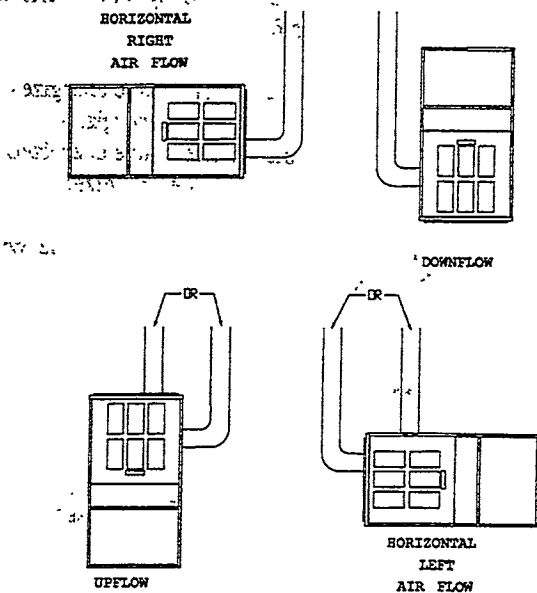
All runs of pipe should be as short as possible with as few turns as possible.

Seams should be tightly joined and checked for leaks.

The flue pipe must not extend into the chimney but be flush with the inside wall.

The chimney or vent pipe must extend at least three (3') feet above the highest point where it passes through a roof of a building and at least two (2') feet higher than any portion of a building within a horizontal distance of ten (10') feet. It shall also extend at least five (5') feet above highest connected equipment flue collar.

FIGURE 1.8 VENT EXIT OPTIONS



The 3" to 4" vent adaptor coupling must be used to connect to the combustion blower outlet. It must be installed directly to the combustion blower outlet (see figure 1.7).

**To Convert to Side Flue Exit:**

1. Remove the louver door from the furnace. (Be sure the side vent exit knock-out is removed from the right side panel of the cabinet.)
2. Disconnect the pressure switch tubing from the combustion blower.
3. Remove the four screws that secure the combustion blower adaptor plate to the flue collector box, taking care to support the blower assembly so that it does not fall.
4. Rotate the blower 90° (degrees) clockwise, so that the outlet of the blower is pointing toward the right side panel of the furnace.
5. Insure that the gasket is in place between the blower adaptor plate and the flue collector box. Reattach the blower assembly to the flue collector box, using the four screws removed in step 3. Be sure that the screws are properly tightened and that the gasket seals the plate to the box.
6. Reconnect the pressure switch tubing to the combustion blower.

**To Convert to Downflow Position:**

1. Convert the combustion blower to side exit, as outlined above when required.
2. Install proper special base per table 2.8 for installation on combustible flooring (follow instructions supplied with special base).
4. It is recommended that the return air be connected to the bottom panel of the furnace when it is installed in the downflow position on non-combustible flooring.

Table 2.8 SPECIAL BASE INSTALLATION

MODEL	SPECIAL BASE NUMBER	CAT. NO.
A050B3 A075B3	20066501	68L77
A075B4 A100B4	20066502	68L78
A100B5 A125B5	20066503	68L79

**NOTE:** Installation on combustible flooring only when installed on one of the above listed special bases or as identified on the furnace model & rating label.

**For Horizontal Positions:**

It is not necessary to reposition any of the components of the furnace in order to install it in either horizontal position. As outlined above, it is permissible to use the side vent exit for the horizontal-left position, if desired.

**Filters:**

Air filters must be used in every installation. For side return installations, air filters must be installed external to the furnace casing. For external filter rack kits see Table 3.8.

For bottom (end) return installations, the above optional external rack may be used, if the unit was not provided with an internal filter. Minimum filter size and suggested filter materials are shown in Table 3.8. (If different type filter is used, it must be an equivalent high airflow capacity.)

Table 3.8 FILTER SIZE SELECTION & FILTER KIT ACCESSORY

MODEL	*SIDE-RETURN	*END-RETURN	KIT NO.	CAT. NO.
A050B3 A075B3	15 1/2 X 25	12 X 25	20069901	68L75
A075B4 A100B4	15 1/2 X 25	15 1/2 X 25	20069901	68L75
A100B5 A125B5	15 1/2 X 25	19 X 25	20069902	68L76

\* Use DuraLast semi permanent, washable, Hi velocity filter or equivalent.

**Here's How Your Heating System Works:**

The furnace operates automatically. A thermostat that you set at the temperature most comfortable to you controls the furnace. When the inside temperature drops below this setting, your thermostat will turn on the heating system.



When the thermostat calls for heat, power from the transformer energizes the fan control board. The fan control energizes the induced draft blower motor. The pressure switch closes and initiates the ignition sequence. The SmartValve™ will energize the pilot gas valve. The SmartValve™ will light the pilot automatically. If the pilot flame is sensed, the main valve will open and the pilot flame will light the burners.

The electronic fan control will automatically turn on the blower after 30 seconds. Fan ON control is not adjustable. The air moved over the heating element by the blower is warmed and passes through the ducts to the room registers.

When the thermostat is satisfied, the circuit is de-energized and the main gas valve stops gas flow to the burners. The blower continues to run until the selectable fan OFF time period has expired. (See Figure 1.12 for setting the fan OFF time.)

### WARNING

Should overheating occur, or the gas supply fail to shut OFF, turn off the manual gas valve to the appliance BEFORE turning off the electrical supply. A failure to adhere to this warning can result in a fire or explosion and bodily harm.

The heat-sensing switch performs as the high temperature limit switch. If the furnace overheats for any reason, the limit switch opens, breaking the circuit to the main gas valve. If the limit is activated, check for a restriction in the duct system (i.e., dirty filters, blocked ductwork, closed registers, etc.). The blower motor and inducer motor will be energized as the unit cools. As soon as the limit switch closes the burners will relight, but unless the overheating condition is corrected, the furnace will cycle on limit. If the furnace is cycling on the limit switch corrective action must be taken. Failure to correct this condition could possibly damage the heat exchangers and may not be covered by the warranty.

This furnace is equipped with a Honeywell SV9501 "Hot-Surface Pilot" ignition control. If the unit does not light due to a gas interruption, the system will continue attempting to light until the gas is restored and the unit lights or the system is turned "OFF". The sequence of lighting is as follow:

- |         |  |
|---------|--|
| 30 sec. | Trial for ignition - igniter & pilot valve energizes |
| 25 sec. | Lockout - igniter & pilot valve de-energized         |
| 30 sec. | Trial for ignition - igniter & pilot valve energized |
| 5 min.  | Lockout - igniter & pilot valve de-energized         |

As long as the thermostat is calling for heat this cycle will repeat indefinitely until the pilot lights.

## STARTUP AND OPERATIONAL CHECKOUT

### WARNING

Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes the furnace to abnormal conditions, contaminated combustion air and the lack of air filters. Failure to follow this warning can lead to premature furnace failure and/or vent failure which could result in a fire hazard and/or bodily harm.

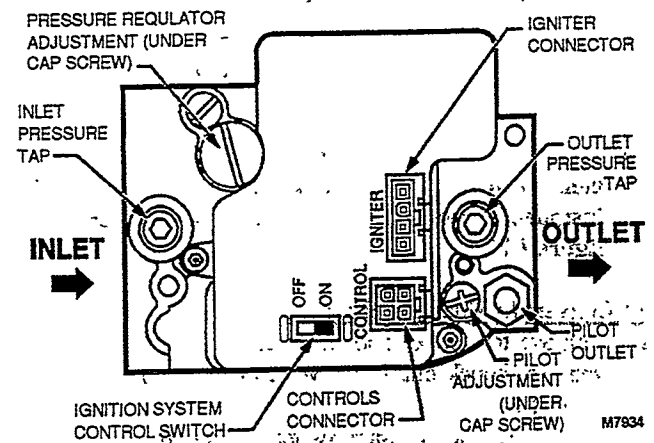
The automatic gas valve controls the flow of gas to both the pilot and main burners. The ignition system control switch built into the automatic valve body has 2 positions: "OFF" and "ON" (Figure 1.9). To shut off gas manually: Slide switch from "ON" to "OFF" position. When in "OFF" position, the main burners and the pilot are extinguished.

### WARNING

Do not attempt to manually light the pilot. Failure to follow this warning can lead to electrical shock that could result in bodily harm.

This furnace is equipped with an automatic hot-surface pilot ignition control and does not require the manual lighting of a pilot for furnace operation.

Figure 1.9 GAS CONTROL DIAGRAM



After the ductwork connections have been made, gas piping and electrical wiring completed and the furnace has been properly vented, the unit should be started and adjusted for proper operation. Check off the following steps as they are completed:

1. Be sure all electrical power is OFF.
2. Check all wiring using proper wiring diagram on inside of the control box cover.
3. Turn on the electrical power.
4. Set the ignition system control switch in the "ON" position.
5. Set the thermostat above room temperature.

6. The hot-surface igniter will heat-up to an "orange" glow, and ignite the pilot. If the flame sensor detects a proper pilot flame, the main burners will ignite. If the main burners do not ignite, follow step 7. Otherwise, go to step 8.
7. Adjust the pilot flame to envelop the flame sensor for a distance of 3/8" to 1/2" (See Figure 1.10). The adjusting screw for the pilot flame is located on the main gas control (See Figure 1.9). It will be necessary to remove the burner access panel to properly observe the pilot. See Instructions on Page 13 for removal/replacement information.
8. Recheck for leaks in the manual shut off valve, gas control valve and gas connections using a soap solution.

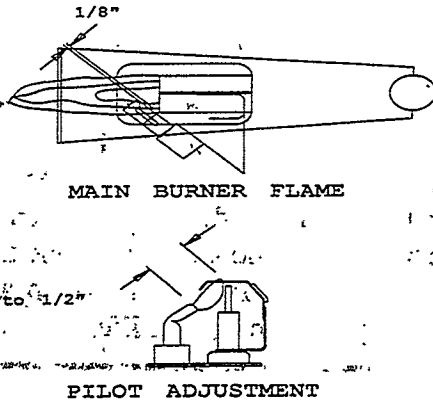
### WARNING

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion.

### CAUTION

Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

Figure 1.10 PILOT BURNER ADJUSTMENT



9. Check the unit's input rate. When checking rate, make sure all other gas appliances are shut OFF except for pilot burners.

Use the following formula to determine the furnace's input rate:

$$\text{Input} = \frac{\text{Heating Value Gas (BTU/cu. ft.)} \times 7200 \text{ sec/2hr}}{\text{time in seconds for 2 cu. ft. of gas.}}$$

Example: If the heating value of the natural gas is 1015 Btu/cu. ft. and it takes 75 seconds to burn 2 cu. ft. of gas then:

$$\text{Input} = \frac{1015 \text{ Btu/cu. ft.} \times 7200 \text{ sec/2 hr.}}{75 \text{ sec/2 cu. ft.}}$$

$$\text{Input} = 97,440 \text{ Btu/hr.}$$

### WARNING

Never set the furnace input rate above that shown on the rating plate. Failure to follow this warning could lead to premature heat exchanger failure and a hazardous furnace operating condition and result in serious bodily injury or loss of life.

### Manifold Pressure Adjustment:

Turn OFF the gas and electrical before proceeding!

Remove the manifold pressure tap pipe plug from the gas valve and install a pressure tap and connect it to a manometer.

Turn on the gas and electrical supplies, then measure the manifold pressure with the furnace in operation.

Remove the cap to access the screw for input adjustment (Figure 1.9 Pressure Regulator). Turn regulator-adjusting screw **IN** to increase pressure, **OUT** to decrease pressure. The input rate must be maintained within  $\pm 2\%$  of the value in the rating plate.

For Natural gas, best results are obtained with a manifold pressure of 3.2" to 3.5" water column. For units that have been converted to LP (Propane) gases, a manifold pressure of 10" water column is necessary. After proper adjustment, turn OFF gas, replace pipe plug and turn ON gas.

### WARNING

If it is necessary to adjust the manifold pressure more than  $\pm 0.3$ " w.c., then the orifice must be changed. Failure to follow this warning could lead to a hazardous furnace operating condition and result in serious bodily injury or loss of life.

### Burner Orificing:

The furnace is supplied with standard orifices for the gas shown on the rating plate. Table 1.11 shows combinations of heating values and specific gravities for various gases, from which proper input can be obtained.

1. Remove the manifold from the furnace, following the instructions found on page 13.
2. Orifices may now be removed/replaced.

## CAUTION

Care must be taken when removing the pilot burner in order not to damage the pilot gas line or the hot surface igniter.

**Table 1.11 BURNER ORIFICE SELECTION**

Type of Gas (Heating Value-SP Gr) Btu per Cu. Ft.	Orifice Size (Drill #)
Natural-Manifold Pr. 3.5" w.c.	
800-0.6	40
900-0.6	41
1000-0.6	42
1100-0.6	43
Propane-Manifold Pr. 10" w.c.	
2500-1.53	54

After securing the manifold assembly, replace all other components and/or wiring, being sure that all connections and screws are tightened properly.

### Altitude Derating (U.S. ONLY):

The following information is provided as guidelines for altitude derating and is not meant to supersede any state or local codes. The first guideline is to check any appropriate state or local codes. These codes would have priority over any others and in some case might limit your options in dealing with an altitude derate situation. The second guideline is to check with your local gas company to find out if the gas supply in your area is derated. Gas deration negates the necessity of performing any adjustment on the furnace.

If your gas supply is not derated, and regardless of the type of gas used, installation of this furnace at an elevation above 2,000 ft. requires an input reduction at the rate of four percent (4%) for each 1,000 ft. above sea level.

Unless an orifice change is specified by an applicable code, or the furnace is to be installed above 6,000 feet the recommended method of altitude derating this furnace is to appropriately lower your manifold pressure. The appropriate manifold pressures based on the elevation and the heating value can be found in Table 2.11.

**Table 2.11 HIGH ALTITUDE MANIFOLD PRESSURE DERATE**

Altitude (Feet)	*Heating Value of Natural Gas (BTU/FT3)					L.P. Propane
	900	950	1000	1050	1100	2500
0	4.32	3.88	3.50	3.16	2.84	10
1000	4.32	3.88	3.50	3.16	2.84	10
2000	3.67	3.29	2.97	2.68	2.41	8.46
3000	3.38	3.04	2.74	2.47	2.22	7.74
4000	3.11	2.79	2.52	2.27	2.04	7.05
5000	2.88	2.58	2.33	2.10	1.89	6.4
6000	2.64	2.37	2.14	1.93	1.73	5.77

\* Heating-Value based on atmospheric pressure of 30 inhg and 60°F temperature.

If local codes require an orifices change or if the furnace installation is above 6,000 feet, field drilling of "blank" orifices will be required. The appropriate orifice size based on the elevation and the heating value can be found in Table 3.11. Sizing of the orifice must be based on the previously mentioned 4% derate for each 1,000 feet for installations at/or above 2,000 feet rule and the orifices must be drilled in such a way as to assure concentricity. **Hand drilling of orifices is totally unacceptable.**

**Table 3.11 HIGH ALTITUDE ORIFICE SIZE DERATE**

Altitude (Feet)	*Heating Value of Natural Gas (BTU/FT3)					L.P. Propane
	900	950	1000	1050	1100	2500
2000	N.C.	N.C.	43	43	44	N.C.
3000	N.C.	N.C.	43	44	44	N.C.
4000	43	43	44	44	45	55
5000	43	44	44	45	46	55
6000	44	44	45	46	47	55
7000	44	45	46	47	48	56
8000	45	46	47	48	48	56
9000	46	47	48	48	49	56
10000	47	48	49	49	50	57

\* Heating-Value based on atmospheric pressure of 30 inhg and 60°F temperature.

### Altitude Installation (Canada ONLY):

Check with your local gas company and check for local code requirements on altitude derating.

For installation of this furnace at an elevation above 2,000 ft. (610m) see the rating label on the front of this furnace for proper input and orifices size.

## WARNING

Hand drilling of orifices is never acceptable since it could lead to delayed ignition, overfiring, improper combustion, flashback and flame rollout. All these conditions could lead to a fire hazard and bodily harm, or loss of life.

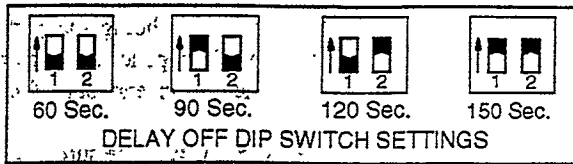
### Fan Adjustment Check:

This furnace is equipped with a 3 speed direct drive motor to deliver a temperature rise within the range specified on the rating label, between the return and supply plenums, at the external duct static pressure noted on the rating label.

Adjust the fan speed so that the temperature rise is within the rise specified on the rating plate. Consult the wiring diagram for speed changes on the direct drive motor.

To adjust fan OFF time, set the DIP switches on the control board as shown to obtain the desired timing (See Figure 1.12).

Figure 1.12 FAN OFF TIME ADJUSTMENT



**Limit Control Check:**

After the furnace has been in operation for at least 15 minutes, restrict the return air supply by blocking the filters or closing the return registers and allow the furnace to shut down on high limit. The main burners will shut OFF and the main blower and combustion blower should continue to run. Remove the restriction and the burners should come back on in a few minutes.

**Flame Rollout Switch:**

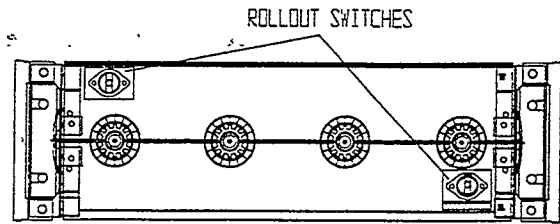
This unit is equipped with two manual reset flame-rollout switches. They protect against improper venting of the flue gases from the heat exchanger due to blockage within the furnace or vent system. If such a blockage causes heat (or flames) to "rollout" into the burner box from the heat exchangers, either safety device will activate and shut off power to the automatic gas valve before there is damage to the furnace. The loss of power to the gas valve will shut off the gas burners. Should this occur, it will be necessary to determine the cause of the rollout, correct the condition that caused it, and reset the flame-rollout switch.

The switches (as shown in figure 2.12) are accessed by removing the louvered front door from the furnace, and are reset by pushing in the button in the middle of the switch (between the two wire connections). Very little force is required to push the reset button, and a "click" should be heard when the switch resets.

**WARNING**

The furnace should be allowed to cool-off before attempting to reset the flame rollout switch. Failure to follow these instructions could result in injury due to burns!

Figure 2.12 FLAME ROLLOUT SWITCHES



**Blocked Vent Shutoff Pressure Switch Check:**

To check the operation of the vent safety switch, remove the vent adaptor from the combustion blower (see figure 1.7). Place the furnace into operation. Gradually cover up the outlet of the combustion blower; the main burners should shut OFF. Remove the restriction and the unit should relight. Replace the vent adaptor.

**SERVICING THE FURNACE**

**CAUTION**

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

**VERIFY PROPER OPERATION AFTER SERVICING.**

**WARNING**

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you are at all uncertain, contact your dealer for qualified maintenance and service since improper service could lead to furnace shutdown or a hazardous condition which could lead to an unsafe condition and bodily harm.

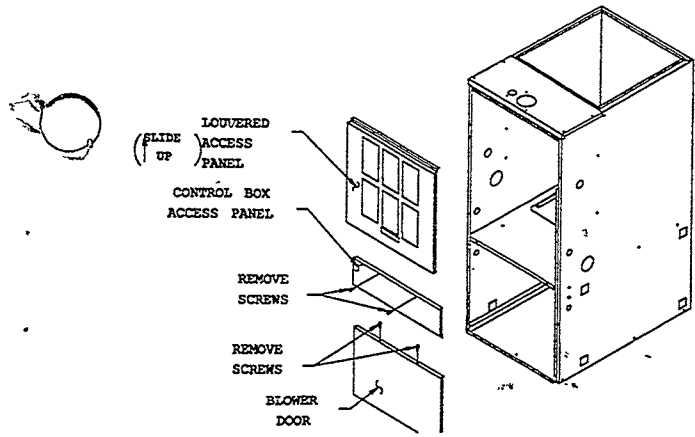
**Combustion Component Check:**

The heat exchanger, gas burners and venting system must be checked each year, prior to the heating season, by a qualified dealer/serviceman. The following procedures should be performed:

1. Remove appropriate access panel or door (see Figure 1.13).
2. Remove the burner/manifold assembly from the furnace, following the instructions found on page 13.

3. Place the burner/manifold assembly on a flat work area and vacuum the burners. It might be necessary to use a soft bristly brush to remove dirt and then vacuum. While manifold assembly is out, check pilot location.
4. Disconnect wiring to combustion blower.

Figure 1.13 FURNACE PANEL REMOVAL



5. Disconnect wiring to pressure switch, and remove pressure switch.
6. Remove the burner opening inlet plate and the flue collector box with the combustion blower attached. This will expose both the burner and flue openings of the primary heat exchangers.
7. Vacuum the length of each heat exchanger tube using a straight attachment into the burner openings and the flue openings.
8. Replace the flue collector box, burner opening inlet plate, and burner/manifold assembly. Insure that all gaskets are properly positioned and that no leaks exist.
9. Reattach all wiring and piping as per the wiring diagram and installation instructions.
10. Turn on utilities and check for leaks using soapy water and a brush.
11. A visual check of the main burner and pilot flame should be made at the beginning of each heating season. See Figure 1.10 for proper pilot flame.

**WARNING**

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion!

**CAUTION**

Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

**Manifold (or Burner/Manifold) Removal/Replacement:**

1. Make sure that all utilities (gas and electricity) are turned off upstream of the furnace.
2. Remove the louvered access panel by sliding the panel straight up, swinging the bottom of the panel away from the furnace, and pulling the panel down and out of the furnace.
3. Disconnect the gas line from the gas valve. Be sure that a wiring diagram is available, or be ready to mark any wires that are disconnected. Unplug the four-wire connector from the gas valve.
4. Remove manifold or burner/manifold assembly.

**Manifold ONLY**

- a. Remove the two screws that mount the pilot assembly to the burner bracket.
- b. Remove the No. 10 screws that secure the manifold pipe to both legs of the manifold assembly. **The manifold pipe must be supported during this step, or it could fall and damage the furnace or cause bodily injury!!**
- c. Slide the manifold pipe (with valve and orifice) forward, out of the furnace, being careful not to damage the pilot assembly.

**Burner/Manifold Assembly**

- a. Remove the No. 10 screws that secure the burner/manifold assembly legs to the furnace. **The manifold pipe must be supported during this step, or it could fall and damage the furnace or cause bodily injury!!**
  - b. Slide the burner/manifold assembly forward, out of the furnace, until the assembly is clear of the manifold retention pins.
  - c. Rotate the assembly slightly, in order for the legs to clear the sides of the cabinet, and remove through the front of the furnace.
7. To reinstall the manifold pipe or burner/manifold assembly, reverse the above steps.

**Blower Removal/Replacement:**

**Removal**

1. Turn OFF all electrical power to the furnace.
2. Remove the control box access panel and blower door.
3. Unplug the six-pin plug from the blower control board and the six pin plug from the blower motor to the control box.
4. Remove the four screws securing the control box in the unit (two in the cabinet at the sides of the blower door opening and two at the top rear of the control box). **Be sure to support the control box so that it does not fall!**
5. Rotate the control box out of the cabinet and support it so that no strain is placed on any wiring. It may be necessary to disconnect the electrical supply and thermostat wiring from the control board.
6. Remove the blower retaining screws from the front of each blower leg (See Figure 1.14). These are the two black screws located in the blower compartment that secure the blower legs to the blower partition panel.

12. Check the input rate and adjust if necessary.
13. Perform a safety check of the limit control and blocked vent shutoff switch.
14. Check the air filter, clean and/or replace as necessary.
15. Replace the appropriate access panel or door.

- Slide the blower forward about two inches. This will disengage the rear of the blower legs from the blower partition. Rotate the front of the blower down to clear the control box mounting tabs on the underside of the blower partition, and continue sliding the blower forward until it is out of the unit. Take care to clear the control box mounting tabs. If necessary, disconnect the auxiliary limit leads on the side of the blower housing.

#### Replacement

- Place the blower in the blower door opening of the unit and reconnect the auxiliary limit leads.
- Slide the blower back into the unit, taking care to clear the control box mounting tabs.
- When the blower is about halfway into the cabinet, rotate the rear of the blower UP so that the rear of the blower legs engage the side rails in the blower partition.
- Continue sliding the blower into the unit until the front of the blower housing is behind the control box mounting tabs. Rotate the front of the blower UP until the legs lie flat against the bottom of the blower partition, then slide blower fully into position. The rear of the blower should be against the stop in the partition and the rear of the blower legs should be under the partition.
- Reattach the two blower securing screws, the control box, any disconnected wiring, the two six pin plugs, the blower door, and the control box access panel.

#### Lubricating Motors:

Direct drive motor and blower assemblies are factory lubricated and normally do not require oiling. If oiling is required lubrication of the blower motor is to be preformed only by a qualified service agency.

If the blower motor on this furnace is to be replaced it must only be replaced with one of the motors as listed in Table 1.15.

Figure 1.14 BLOWER REMOVAL AND REPLACEMENT

