

# Ducane<sup>®</sup>

## Heating and Air Conditioning

Ducane Heating Division, The Ducane Company Inc., Blackville, SC 29817



### CMP "A" SERIES INSTALLATION INSTRUCTIONS UPFLOW OR LEFT HORIZONTAL GAS-FIRED CONDENSING WARM AIR FURNACE



Issue 9939

#### WARNING

These instructions are intended to be used by qualified personnel who have been trained in installing this type of furnace. Installation 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 if an electrical fault should occur. The unit must also be electrically grounded in accordance with local codes, or 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 IV furnace and is dual certified as direct vent furnace (two pipe system) using outside air for combustion or as a non-direct vent furnace (one pipe system) using 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, a gas line connection, and a condensate drain connection. **This furnace can be installed in either upflow or horizontal (left) 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 M9W 1R3.

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.

**These instructions are written for individual residential installation only. For multi-unit installations, please contact manufacturer for recommendations.**

## 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			“HORIZONTAL (LEFT)” POSITION	
Suitable for alcove or closet installation† on combustible flooring at minimum clearance from adjacent construction not less than the following:			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.	
<b>Top</b>	<b>Sides</b>	<b>Back</b>	<b>Front</b>	<b>Vent</b>
<b>2”</b>	<b>1”</b>	<b>1”</b>	<b>3”</b>	<b>0”</b>

† For closet installation see Air for Combustion and Ventilation.

### WARNING

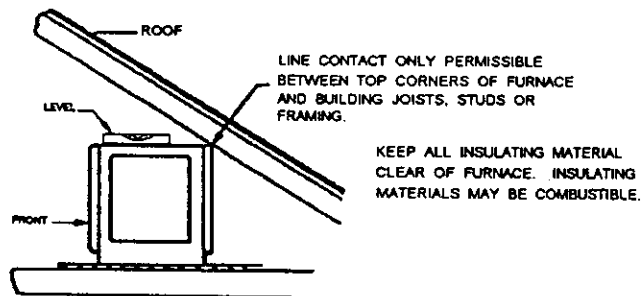
Failure to comply with all of the above clearances will create a fire hazard.

The furnace should not be connected to an operational chimney. 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 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**



Furnace must not lean back. It must be level or tilt up to 2° to the front (See Figure 2.2).

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.

### WARNING

If furnace is tilted back condensate will collect in the secondary heat exchanger which will result in improper combustion, fire hazard, or other unsafe conditions which could result in property damage, personal injury or death.

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 1.20 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

If this furnace is installed in a garage and/or any unconditioned space, a thermostatically controlled heat tape must be installed along the entire length of the condensate drain in the unconditioned space. Any blockage of the condensate drain will result in improper combustion, fire hazard, or other unsafe conditions that could result in property damage, personal injury or death.

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### WARNING

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

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### 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.

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#### Air for Combustion and Ventilation:

**Contaminated Combustion Air** If the furnace is to be installed in a structure defined as having contaminated combustion air, the furnace must use the direct vent (two pipe) configuration using non-contaminated outside air for combustion. 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

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### 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.

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**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 permits 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. **Direct venting (two pipe)** allows for the combustion air to be supplied directly to the furnace from the outdoors. Ventilation needs only to be considered when furnace is installed as direct vent (two pipe). **Non-direct venting (one pipe)** requires both combustion and ventilation air requirements from the furnace location. 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.

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### 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.

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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.

**Blocked Vent & Blocked Drain Pressure Switches** This furnace is equipped with two (2) pressure switches that perform several safety functions. The pressure switches are located in the vestibule of the unit (see Figure 1.4). The switch labeled P1 will turn the burners OFF in the event of a blocked inlet or a blocked outlet condition. The switch labeled P2 will turn OFF the burners in the event of a blocked drain condition. In addition, the P2 switch insures that the unit has combustion air flowing through the unit prior to initiating the ignition sequence.

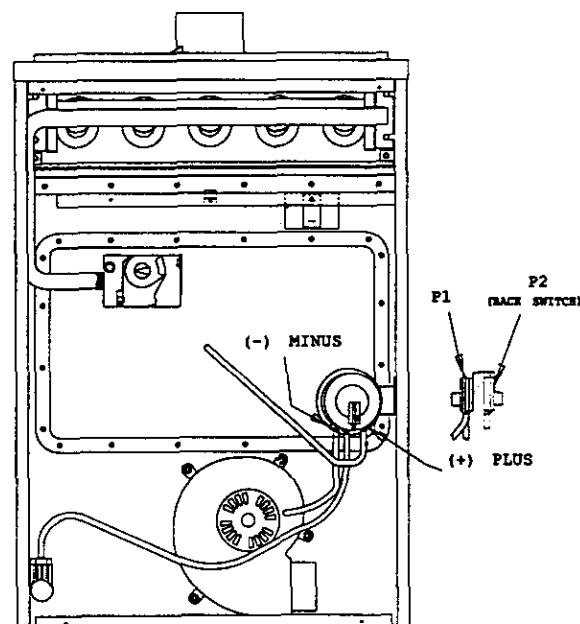
### WARNING

If the blocked vent pressure switch (P1) activates to shut the furnace down, the vent system must be checked and cleared. Failure to do so may result in serious bodily harm or nuisance furnace shutdown and/or a hazardous condition that may lead to property damage, personal injury or death.

### WARNING

If the blocked drain pressure switch (P2) activates to shut the furnace down, do not attempt to operate the furnace until the drain line is checked for blockage. Failure to clear the drainage system could lead to nuisance furnace shutdown and/or hazardous conditions that may lead to property damage, personal injury or death.

Figure 1.4 PRESSURE SWITCH LOCATION AND CONNECTION



# INSTALLATION

In all direct vent (two pipe) instances, the vent outlet shall be installed so as to be in the same atmospheric pressure zone as the combustion air intake. 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 Figures 1.21 & 1.22. 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)].

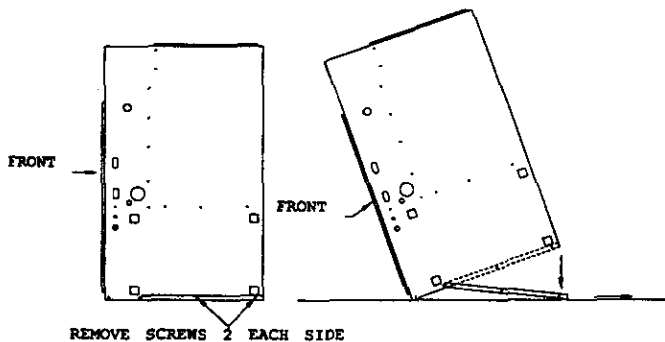
## To Prepare Unit for Installation:

### General Requirements

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

1. 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.
2. A left, right, or bottom return air opening must be used as determined by the layout of the installation. An externally mounted air filter is required.
3. 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 1.5) 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 2.20 for ductwork sizing.

Figure 1.5 BOTTOM PANEL REMOVAL



4. The flue may exit the cabinet either through the right or the left side panel, depending on the requirements of the installation. If the unit is installed in a horizontal-left discharge position, it is required to exit through the right side panel, so the flue is pointing straight up when the unit is installed. See figures 2.8 and 3.8 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 2.20 for the dimensions of this opening.

Knockouts are provided on both sides of the furnace to facilitate the 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.

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## **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.

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## **CAUTION**

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

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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.

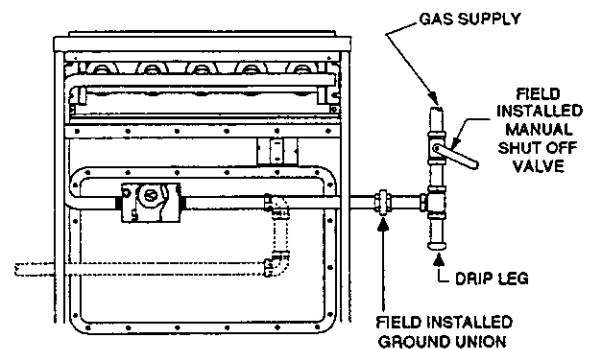
Before any system of gas piping is finally put into service, it should be carefully tested to determine if it is gas tight. Check all piping for leaks using soapy water and a brush. The piping must stand a pressure of six (6) inches of mercury for a period of ten (10) minutes or as required by local 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 2.13.

A main manual shut off valve must be used in the gas piping. The shut off type and location must follow local codes and should always be in an accessible but protected location. In the absence of local codes the recommended methods for installing the gas piping to the furnace are shown 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 1.12).

### 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 1.21 & 1.22. Reference table 1.20 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 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 1.21 & 1.22 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.

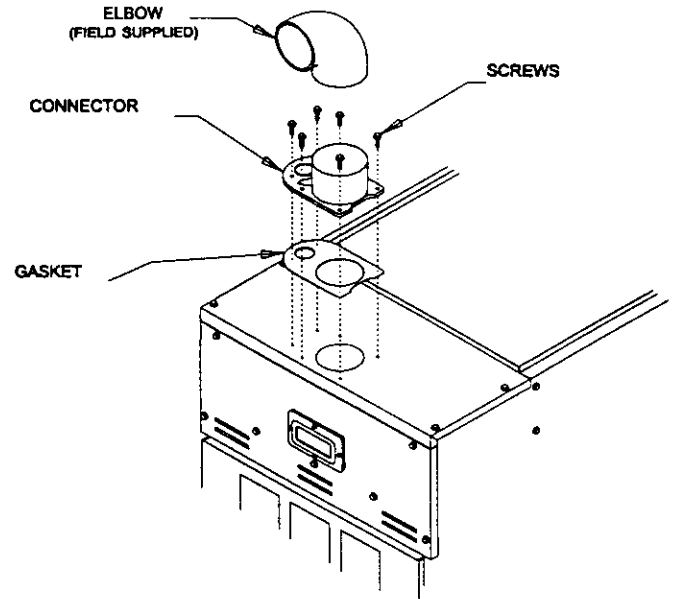
**Installation of Air Inlet Connector:**

The air inlet connector must be installed on the top panel of the furnace (See Figure 1.7). The connector, gasket, and mounting screws are shipped in a bag located in the vestibule of the furnace. The gasket is placed over the hole pattern in the top panel and the connector is then secured to the top panel using the No. 10 X 5/8 sheet metal screws. The screws should be tightened securely, so that the gasket seals the connector to the top panel in order to prevent air leakage into the burner box. When installing furnace as non-direct vent (one pipe), a field supplied PVC elbow (see Table 1.8 for size required) must be attached to the air inlet connector with the elbow open end facing front (Figure 1.7). When installing furnace as direct vent (two pipe), air inlet piping must match vent pipe in length and configuration.

**CAUTION**

Terminate the combustion air intake in the same pressure zone as the vent outlet and as far as possible from the air conditioning unit or heat pump, swimming pools, swimming pool pumping units and dryer vents.

Figure 1.7 AIR INLET CONNECTOR ASSEMBLY



**Venting & Termination Instructions:**

Venting for this category IV furnace must be with schedule 40 PVC, CPVC or ABS pipe including all elbows and vent terminals. All pipe and fittings must conform to the American Society for Testing and Material (ASTM), and American National Standards Institute (ANSI) Standards. PVC primer and solvent cement used to secure all PVC joints must conform to ASTM D2564. **Common venting with other condensing appliances or non-condensing appliances is not allowed.**

All combustion air and exhaust piping must be installed in accordance with local codes and these instructions. For additional venting information refer to ANSI/NFPA 211 Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances or Canadian equivalent.

Refer to Tables 2.7 and 1.8 for the proper pipe diameters and the minimum and maximum allowable vent lengths.

Table 2.7 DIRECT VENT (TWO PIPE) ALLOWABLE VENT LENGTHS

MODEL	PIPE DIAM.	MIN. VENT	MAX. VENT
50	2 IN.	5 FT.	* 50 FT.
75U2 75U3A	2 1/2 IN.	5 FT.	* 50 FT.
75U3	2 IN.	5 FT.	* 50 FT.
100	3 IN.	5 FT.	* 50 FT.
125	3 IN.	5 FT.	* 50 FT.

\* - Up to (5) 90 degree elbows may be used. Sweep elbows are preferable but not required.  
2 - 45 degree elbows = 1-90 degree elbow.

Table 1.8 NON-DIRECT VENT (ONE PIPE) ALLOWABLE VENT LENGTHS

MODEL	INTAKE ELBOW DIA.	PIPE DIAM.	MIN. VENT	MAX. VENT
50	2 IN.	2 IN.	5 FT.	* 50 FT.
75U2 75U3A	3 IN.	2 1/2 IN.	5 FT.	* 50 FT.
75U3	2 IN.	2 IN.	5 FT.	* 50 FT.
100	3 IN.	3 IN.	5 FT.	* 50 FT.
125	3 IN.	3 IN.	5 FT.	* 50 FT.

\* - Up to (5) 90 degree elbows may be used. Sweep elbows are preferable but not required.  
2 - 45 degree elbows = 1-90 degree elbow.

The following requirements are necessary for a safe venting system:

- 1) All pipe should be supported using clamps and/or straps. These supports should be at least every four (4) feet, or as required by local codes.
- 2) All horizontal vent runs must be sloping upwards to obtain 1/4" (in.) rise per foot of pipe from the furnace to the vent terminal. This insures proper drainage of the condensate back to the condensate drain. Failure to maintain this rise will cause condensate to accumulate in the pipe.
- 3) Direct Vent (two pipe) units may have either a 90° elbow or a straight coupling attached to the air inlet plate. **Do not seal the top joint of the fitting.** This joint must be left unglued to facilitate unit access during any required maintenance.
- 4) All units regardless of vent configuration must use the secondary exhaust pipe drain (supplied) as shown in Figures 2.8 and 3.8 or the alternate arrangements as shown in the vent/drain instructions packed in the vent kit in the furnace.
- 5) Joints in PVC should be sealed with PVC cement and checked for leaks. ABS or CPVC venting should use sealant as specified by the pipe manufacturer.
- 6) Check all local codes for any variance.

**NOTE:** If 2 1/2" or 3" vent pipe is required, the appropriate supplied adapter must be used. Install the adapter at the vent outlet of the vent/drain tee (see instructions in vent kit).

Figure 2.8 UPFLOW VENTING OPTIONS

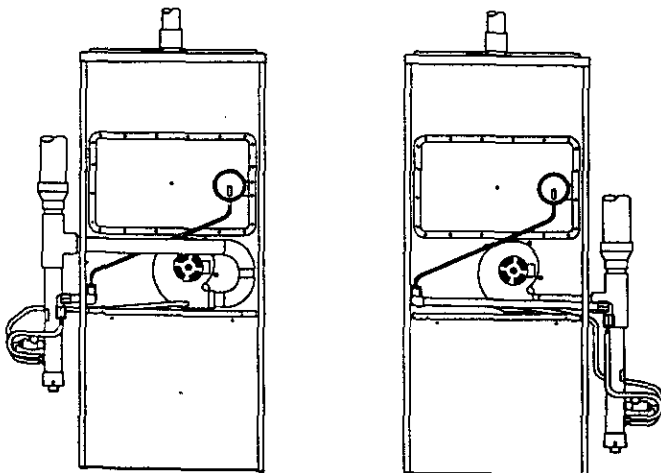
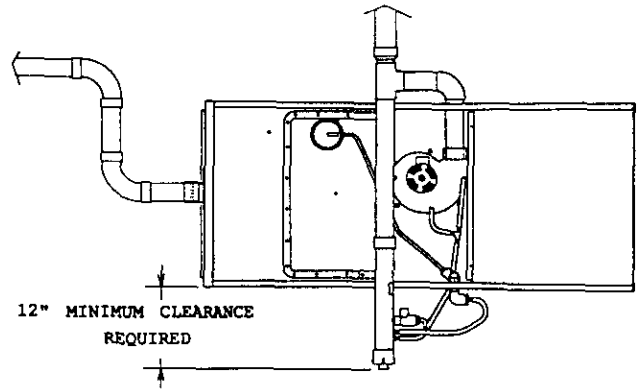


Figure 3.8 LEFT HORIZONTAL VENTING



The vent system can be installed through an existing chimney provided that:

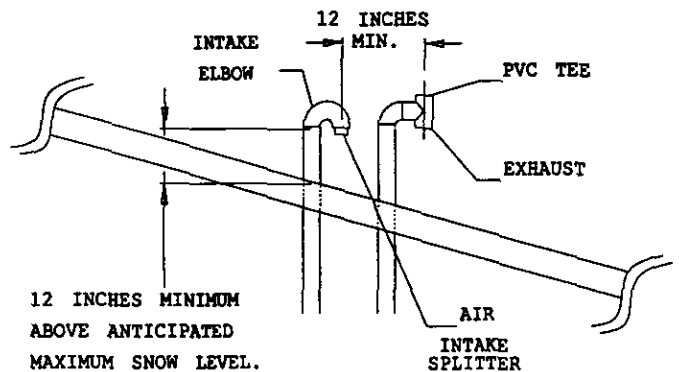
- a) No other appliance is vented into the chimney.
- b) The termination clearances shown in Figure 4.8 are maintained.
- c) Both the air intake and exhaust vent run the length of the chimney.
- d) The top of the chimney is sealed and weather proofed.

**Vertical Vent Termination:**

The vertical vent terminations should be sealed with a plumbing roof boot or equivalent flashing.

The inlet of the intake pipe and the end of the exhaust vent must terminate no less than 12" (in.) above the roof or snow accumulation level, and 12" (in.) away from a vertical wall or other protrusion (See Figure 4.8). In all venting configurations it is required to use the vent terminations specified in the vent and drain kit. The intake elbow and the exhaust tee are field supplied. **The intake splitter supplied must be cemented into the intake elbow (see instructions in vent kit).**

Figure 4.8 VERTICAL VENT TERMINATION



The minimum horizontal distance between the exhaust tee and the intake elbow is twelve (12) inches. Further spacing is allowable but **both air intake and vent termination must be in the same pressure zone.**



**Horizontal (Side Wall) Vent Termination:**

To prevent blockage of the combustion air and exhaust vent by snow, vent termination must be made 12" (in.) above the anticipated maximum snow accumulation level (See Figure 1.9).

**WARNING**

Failure to terminate vent runs above the annual snow accumulation level may result in nuisance furnace shutdown and/or hazardous condition that may lead to bodily harm or loss of life.

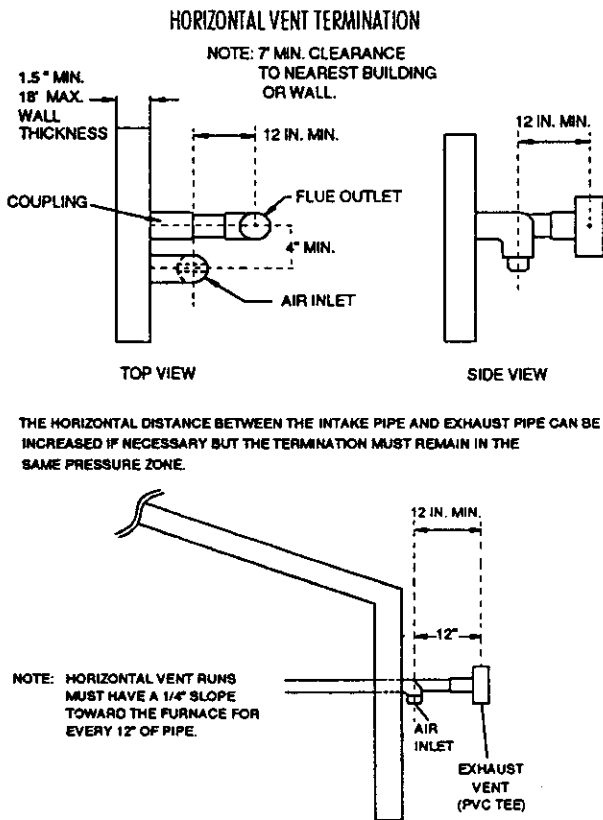
A minimum of 4' (ft.) clearance must be provided from electric meters, gas meters, regulators and relief equipment. In Canada refer to the current CAN/CGA B149.1 and 2.

Direct vent (two pipe) terminations must terminate not less than one-foot above, below or horizontal from any inlet to building.

Non-direct vent (one pipe) termination must terminate at least 4 feet below, 4 feet horizontally from, or 1 foot above any inlet to building.

Do not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard. In Canada refer to the current CAN/CGA B149.1 and 2.

Figure 1.9 HORIZONTAL VENT TERMINATION



**Condensate Disposal Drain:**

This furnace must use the condensate trap supplied with the unit (See Figure 2.9) or alternate condensate drain/trap

arrangement (See Figure 3.9) for proper drain installation. The alternate arrangement should be used for upflow installations when the vent and condensate drain must be on opposite sides of the furnace or for horizontal installation when space below the unit to put the drain trap is at a minimum (order alternate condensate drain/trap kit #20280001). The drain must terminate at a floor drain, sewer system, or drain vent for proper condensate removal. Drain installation must conform to local building codes.

**NOTE:** The condensate trap (supplied) must be connected to the PVC tee provided on the unit. Failure to place the trap, as per these instructions, may cause erratic unit operation and nuisance furnace shutdown.

In addition the trap must be filled with water on the initial start-up of the unit. Installation location may require that the trap be filled at the beginning of each heating season.

In addition, if this unit is placed in an unconditioned space such as an attic or crawlspace where the temperature could be at freezing or below; a thermostatically controlled heat tape must be installed along the entire length of condensate drain in the unconditioned space.

**WARNING**

Failure to install a heat tape on condensate drain lines in unconditioned spaces could lead to nuisance furnace shut-down, water damage, and/or a hazardous condition which may lead to bodily harm, or loss of life.

Figure 2.9 STANDARD CONDENSATE TRAP

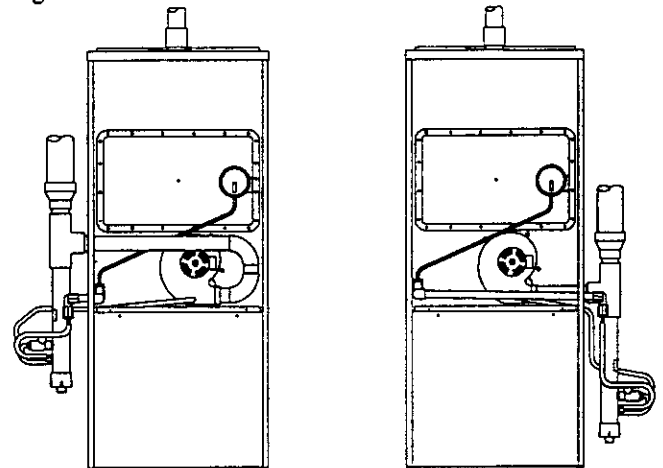
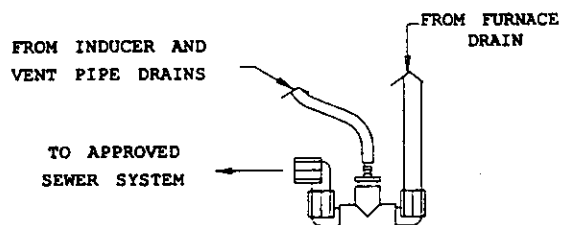


Figure 3.9 OPTIONAL CONDENSATE TRAP



### Flue Pipe Installation:

**NOTE:** Make sure of alignment and fit, before gluing pieces in place!

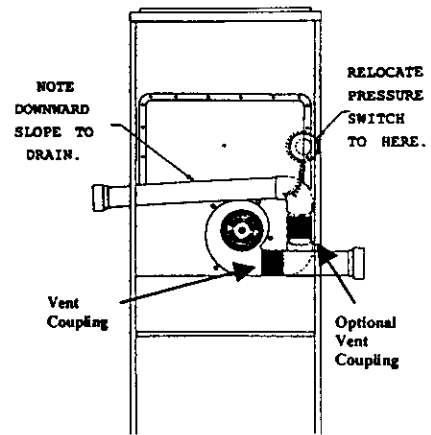
#### To Install With Right Flue Exit:

1. Remove the large diameter knockout in the right-side panel of the furnace wrapper.
2. Using 2" diameter PVC (ABS or CPVC) pipe, install a short piece of pipe in the outlet of the vent coupling (Figure 1.10). The pipe should be long enough to leave approximately one inch (1") protruding out of the right side of the furnace. The 2" tee supplied in the vent/drain kit is then attached to this pipe as shown in Figure 2.9.
3. On the models 50 and 75U3, the 2" diameter vent pipe fittings will connect directly to the top of the tee installed in step 2. On the models 75U2 and 75U3A the 2" to 2-1/2" adapter (supplied) and on Models 100 and 125, the 2" to 3" adapter (supplied) will connect to the top of the tee. The 2 1/2" (models 75U2 and 75U3A) or the 3" (models 100 and 125) vent pipe will connect to the adapter. Mounted adapters must allow condensate to flow to drain tee.
4. After proving alignment of parts and fit, glue all the joints.

#### To Install With Left Flue Exit:

1. Remove the large diameter knockout in the left-side panel of the furnace wrapper that is closest to the front of the unit. Relocate pressure switch assembly as required (Figure 1.10).
2. Remove vent coupling from PVC inducer starter. Connect a 2" diameter PVC (or ABS) street elbow directly onto PVC inducer starter. If size permits substitution of a short piece of 2" diameter PVC (or ABS) pipe and standard elbow may be substituted for the street elbow. Install this first elbow pointing up and toward the front of the unit (Figure 1.10). The vent coupling must then be relocated to the optional location as shown in Figure 1.10.
3. Insert a 3 1/2" long piece of pipe into the vent coupling, and connect to a second elbow. The second elbow should face toward the left side of the unit.
4. Cut a piece of 2" pipe that is long enough to insert through the knockout (from step 1) and be inserted into the second elbow in step 3, leave approximately one inch (1") protruding out of the left side of the furnace. This piece of pipe will pass over the top of the combustion air blower motor, and in front of the combustion air blower housing. The 2" tee supplied in the vent/drain kit is then attached to this pipe as shown in Figure 2.9.
5. On the models 50 and 75U3, the 2" diameter vent pipe fittings will connect directly to the top of the tee installed in step 4. On the models 75U2 and 75U3A the 2" to 2-1/2" adapter (supplied) and on Models 100 and 125, the 2" to 3" adapter (supplied with the unit) will connect to the top of the tee. The 2 1/2" (models 75U2 and 75U3A) or the 3" (models 100 and 125) vent pipe will connect to the adapter.
6. Provide slope toward 2" tee for drainage (Figure 1.10).
7. After proving alignment of parts and fit, glue all the joints.

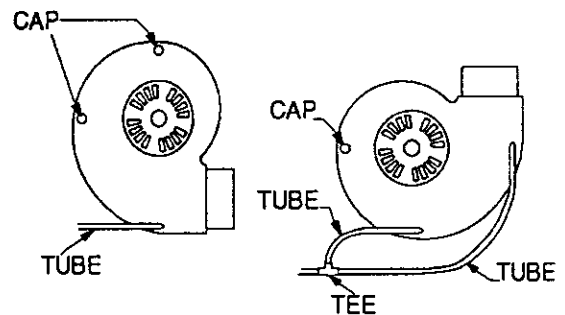
Figure 1.10 VENT ROUTING



#### To "Convert" from Upflow to Horizontal (Left) Airflow:

This furnace is shipped for installation in the upflow configuration, but may be installed in a horizontal right-to-left airflow direction. The only change needed to "convert" to the horizontal position is to remove the plastic cap on the auxiliary drain connection in the combustion air blower. Attach tubing to both drain connections and tee together. (See Figure 2.10) The tubing must always slope downward and make sure the tubing does not sag.

Figure 2.10 HORIZONTAL LEFT CONDENSATE TUBING



**NOTE:** A material list and more detailed instructions are included in the vent/drain package located in the vestibule of this furnace.

#### Filters:

Air filters must be used in every installation. For side return installations, air filters must be installed external to the furnace casing. An external filter rack kit with filter (parts No. 20069901 for 50,000 - 100,000 sizes and 20069902 for 125,000 size) is available as an optional accessory.

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 1.11: (If different type filter is used, it must be an equivalent high airflow capacity).

Table 1.11 FILTER SIZE SELECTION

BTU INPUT	FILTER SIZE SIDE-RETURN	END RETURN
50,000 75,000	15 1/2 X 25	12 X 25
100,000	15 1/2 X 25	15 1/2 X 25
125,000	15 1/2 X 25	19 X 25



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

The furnace operates automatically. A thermostat that you set at the temperature most comfortable to you controls it. 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 switches will close and initiate 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 2.14 for setting the desired fan OFF time.)

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.

**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.

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**

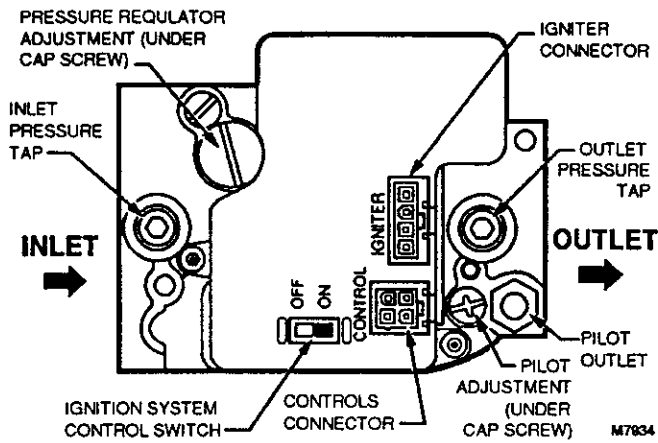
**WARNING**

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 1.12). To shut off gas manually: Slide switch from "ON" to "OFF" position. When in "OFF" position, the main burners and the pilot are extinguished.

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 1.12 GAS CONTROL DIAGRAM



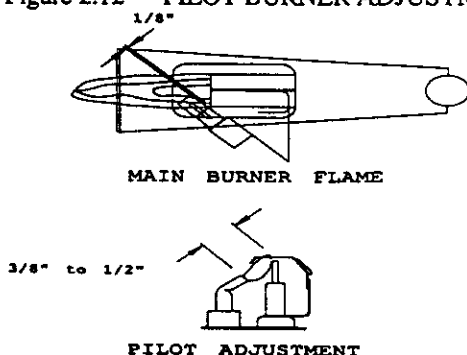
**WARNING**

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

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 2.12). The adjusting screw for the pilot flame is located on the main gas control (See Figure 1.12). It will be necessary to remove the burner access panel to properly observe the pilot. See Instructions on Page 16 for removal/replacement information.

Figure 2.12 PILOT BURNER ADJUSTMENT



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.

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. 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**

If it is necessary to adjust the manifold pressure more than ±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.

**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 preceding! 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 1.12 Pressure Regulator). Turn regulator-adjusting screw IN to increase pressure, OUT to decrease pressure. The input rate must be maintained within ± 2% of the value on 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.

**Burner Orificing:**

The furnace is supplied with standard orifices for the gas shown on the rating plate. Table 1.13 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 15.
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 1.13 BURNER ORIFICE SELECTION

Type of Gas @ Manifold Press. (Heating Value – Specific Gravity) Btu per Cu. Ft.	Orifice Size (Drill #)
<b>Natural</b> Manifold Press. = 3.5" w.c.	
800 - 0.6	40
900 - 0.6	41
1000 - 0.6	42
1100 - 0.6	43
<b>Propane</b> Manifold Press. = 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. Local 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 2.13.

Table 2.13 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 60F 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 (Ref Ducane P/N 2006608 for "blank" orifices). The appropriate orifice size based on the elevation and the heating value can be found in Table 3.13. 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 3.13 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 60F temperature.

### CAUTION

At elevations above 4,000 feet a change to the P1 (blocked vent) pressure switch may be required. If a pressure switch change is necessary use the proper Ducane pressure switch kit shown in Table 1.14.

Table 1.14 HIGH ALTITUDE PRESSURE SWITCH KITS

Model	Kit Number
50	20274501
75U2	
75U3A	
75U3	
100	20274503
125	

### 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.

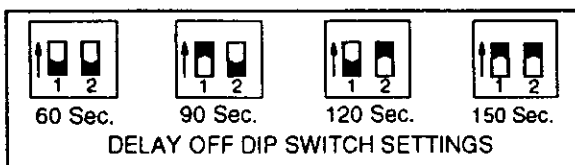
### Fan Adjustment Check:

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 2.14).

Figure 2.14 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:

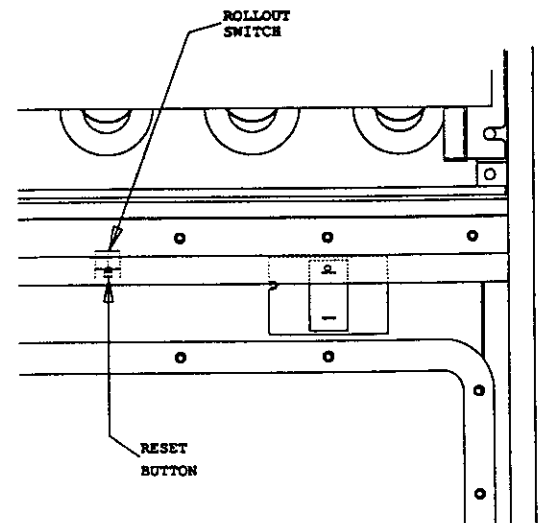
This unit is equipped with a manual reset flame-rollout switch that protects against improper venting of the flue gases from the heat exchanger due to blockage within the furnace or vent system. If such a blockage causes heat (or flames) to "rollout" into the burner box from the heat exchangers, this 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.

### WARNING

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

The switch located on the bottom of the burner box enclosure, is accessed by removing the louvered front door from the furnace, and is reset by pushing in the button in the middle of the switch (between the two wire connections - see Figure 3.14). Very little force is required to push the reset button, and a "click" should be heard when the switch resets.

Figure 3.14 FLAME ROLLOUT SWITCH



### Blocked Vent Shutoff Pressure Switch Check:

To check the operation of the vent safety switch (P1), remove the inlet pipe from the air inlet connector and remove the exhaust vent from the induced draft motor vent coupling. Place the furnace into operation. Gradually cover up the air inlet; the main burners should shut OFF. Remove the restriction and the unit should relight. Repeat the procedure, restricting the vent coupling outlet. Replace the vent piping and reseal the opened joints as required.

### Blocked Drain Safety Pressure Switch Check:

The blocked drain safety switch (P2) has only one tube connected to it. To check the operation of the blocked drain safety switch, place the unit into operation and gradually pinch the tube closed. The unit should shut OFF. Release the restriction on the tubing and the unit should relight.

The operational checkout is now complete. Be sure to adjust the thermostat to the desired setting and inform the homeowner how to operate the furnace system before leaving the job site.

## SERVICING THE FURNACE

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### CAUTION

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

### VERIFY PROPER OPERATION AFTER SERVICING.

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### 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.

7. Reattach all wiring and piping as per the wiring diagram and installation instructions.
8. Turn on utilities and check for leaks using soapy water and a brush.
9. A visual check of the main burner and pilot flame should be made at the beginning of each heating season. See Figure 2.12 for proper pilot flame.
10. Check the input rate and adjust if necessary.
11. Perform a safety check of the limit control and blocked vent shutoff switches and the blocked drain shut off switch.
12. Check the air filter, clean and/or replace as necessary.
13. Periodic cleaning of condensing coil and drain lines maybe necessary for proper operation.
14. Replace the appropriate access panel or door.

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### WARNING

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

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### 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.

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### 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.

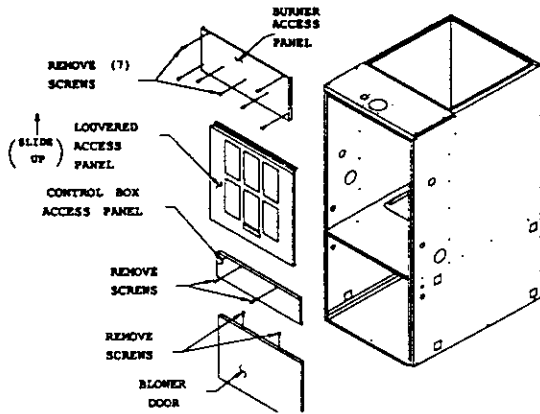
The following procedures should be performed:

1. Remove appropriate access panel or door (see Figure 1.16).
2. Remove the burner/manifold assembly from the furnace, following the instructions found on this page.
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. Remove the burner opening inlet plate and the flue collector box. This will expose both the burner and flue openings of the primary heat exchangers.
5. Vacuum the length of each heat exchanger tube using a straight attachment into the burner openings and the flue openings.
6. 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.

### 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.

Figure 1.16 FURNACE PANEL REMOVAL



4. Remove the burner access panel by removing the seven (7) No. 10 sheet metal screws that secure the panel to the cabinet. Be careful not to damage the rubber seal strips that are attached to the cabinet (behind the access panel).
5. Remove the No. 10 sheet metal screws that secure the manifold seal plate and gasket to the bottom of the burner box. The plate and gasket are assembled onto the manifold pipe and will not come completely loose, but will slide down the manifold pipe in order to provide clearance for manifold removal.
6. 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. When replacing the manifold seal plate to the bottom of the burner box, be sure the gasket is not torn so a proper seal is achieved. Also insure that the sealing strips for the burner access door are in position and undamaged, in order to prevent air leaks around the door.

**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 2.16). These are the two black screws located in the blower compartment that secure the blower legs to the blower partition panel.
7. 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.

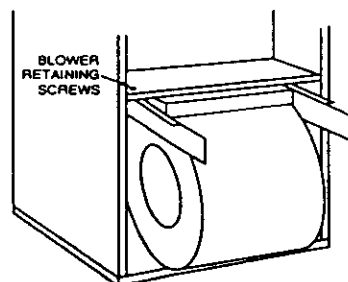
**Replacement**

1. Place the blower in the blower door opening of the unit and reconnect the auxiliary limit leads.
2. Slide the blower back, into the unit, taking care to clear the control box mounting tabs.
3. 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.
4. 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.
5. 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 1.17.

Figure 2.16 BLOWER REMOVAL AND REPLACEMENT





# FURNACE BLOWER SPECIFICATIONS AND AIR FLOW DATA (CFM)

Table 1.17

BLOWER SYSTEM	BLOWER SPEED	EXTERNAL STATIC									
		(INWC)									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
<b>CMPA050U2</b>											
(10 X 6 WHEEL)	LOW	720	680	650	590	540	480	440	360	270	170
(1/4 HP MOTOR)	MED	920	880	830	780	720	650	580	460	380	300
Mtr P/N 20278901	HIGH	1100	1060	1010	960	900	790	680	570	470	350
<b>CMPA050U3</b>											
(10 X 6 WHEEL)	LOW	1080	1060	1030	1000	965	905	840	765	655	525
(1/3 HP MOTOR)	MED	1330	1280	1225	1175	1110	1040	965	875	770	630
Mtr P/N 20054901	HIGH	1490	1420	1360	1285	1205	1125	1070	985	880	750
<b>CMPA075U2</b>											
(10 X 6 WHEEL)	LOW	780	770	760	750	730	700	685	620	520	390
(1/4 HP MOTOR)	MED	950	940	930	920	900	825	775	695	605	480
Mtr P/N 20279001	HIGH	1255	1225	1195	1155	1110	1040	960	865	760	620
<b>CMPA075U3</b>											
(10 X 6 WHEEL)	LOW	1080	1060	1030	1000	965	905	840	765	655	525
(1/3 HP MOTOR)	MED	1330	1280	1225	1175	1110	1040	965	875	770	630
Mtr P/N 20054901	HIGH	1490	1420	1360	1285	1205	1125	1070	985	880	750
<b>CMPA100U3</b>											
(10 X 9 WHEEL)	LOW	1270	1235	1190	1140	1080	1050	950	850	675	395
(1/3 HP MOTOR)	MED	1510	1465	1410	1350	1260	1210	1115	990	810	550
Mtr P/N 20279901	HIGH	1685	1655	1615	1540	1450	1330	1235	1130	960	720
<b>CMPA100U4</b>											
(12 X 9 WHEEL)	LOW	1420	1400	1360	1335	1290	1245	1190	1120	1060	995
(1/2 HP MOTOR)	MED	1715	1690	1665	1610	1550	1480	1400	1320	1245	1145
Mtr P/N 20062501	HIGH	2055	2020	1945	1865	1795	1710	1640	1535	1410	1340
<b>CMPA125U5</b>											
(12 X 12 WHEEL)	LOW	1425	1400	1375	1345	1320	1290	1245	1185	1120	1035
(3/4 HP MOTOR)	MED	1980	1940	1895	1835	1785	1720	1645	1575	1475	1385
Mtr P/N 20055001	HIGH	2395	2340	2275	2210	2115	2025	1925	1825	1720	1610

- NOTES:**
1. Airflow values in cubic feet per minute (CFM) rounded to nearest five (5) CFM.
  2. Data taken without filters in place.

### WARNING

When operating the furnace in the heating mode, the static pressure and the temperature rise (supply air temperature minus return air temperature) must be within those limits specified on the rating label. Failure to follow this warning could lead to severe furnace damage.

### WARNING

Turn OFF all gas and electrical power to furnace before performing any maintenance or service on unit (unless specific test requires gas and electrical supplies). Failure to take this precaution may result in personal injury due to electrical shock or uncontrolled gas leakage.

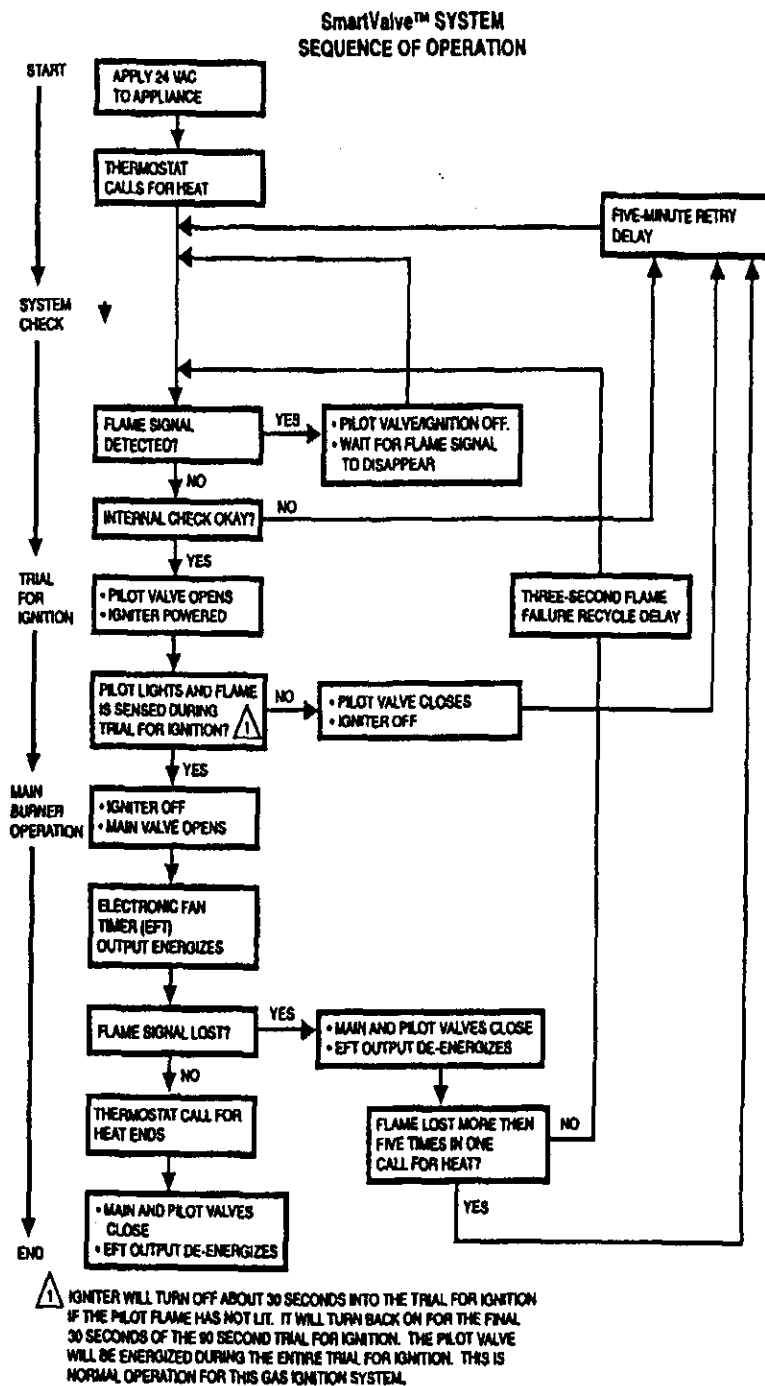
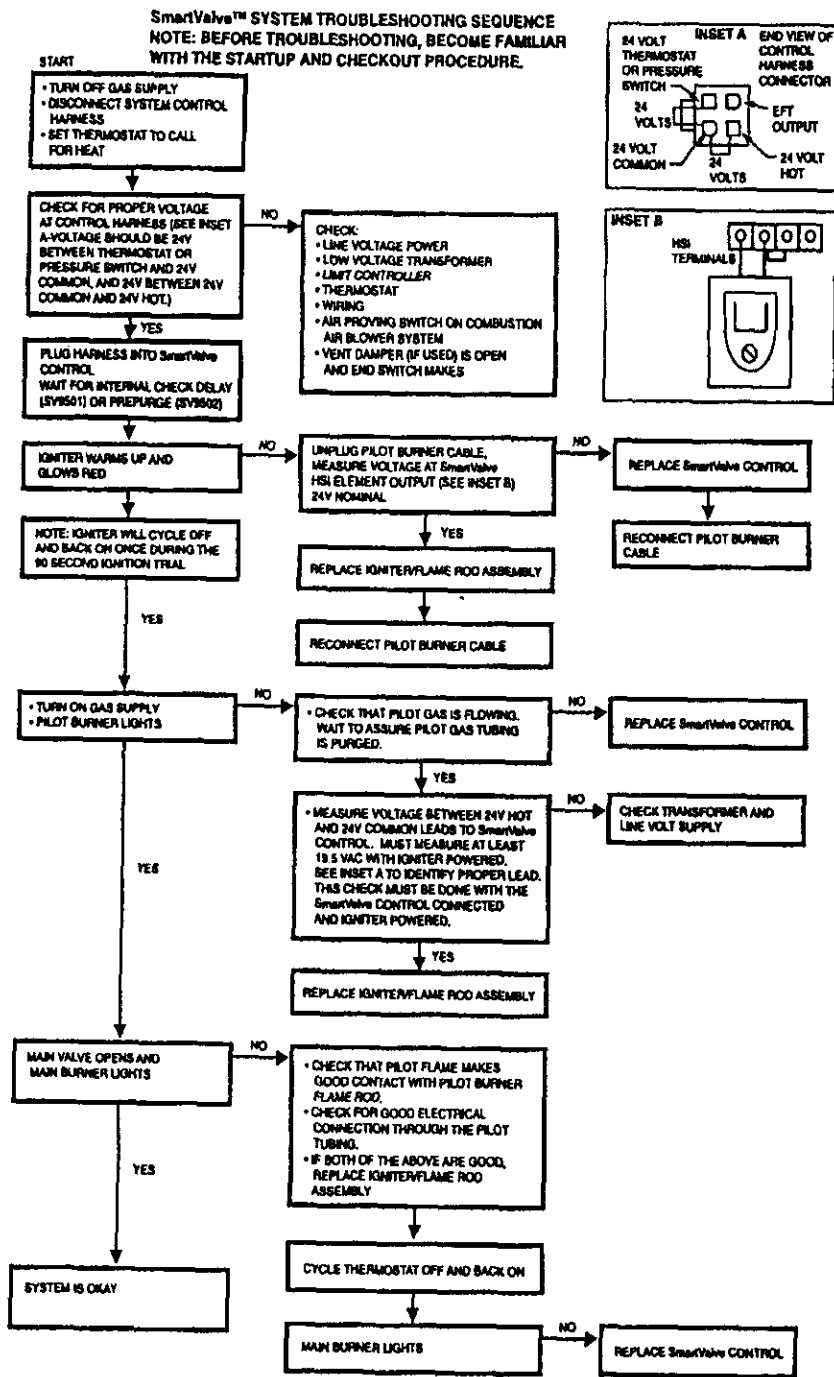
**"TROUBLE SHOOTING" GUIDE FOR GAS-FIRED FURNACES  
WITH SmartValve™ AND HSI PILOT**

Table 1.18

<b>TROUBLE ANALYSIS CHART</b>		
<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>	<b>ACTION</b>
Pilot will not light.	No pilot flame  Problem with SV9501 control/valve.	Check to see if main valve is turned "ON". Check pilot H.S.I for breakage. Check pilot orifice for blockage.  See Figure 1.19 (SmartValve™ Trouble Shooting Guide).
Burners will not ignite.	No 115 volt power to furnace.  No 24 volt power to control circuit.  Miswired or loose connections.  No gas at main burners.  Flame rollout, blocked vent shutoff, or blocked drain safety switches open (activated).  Problem with SV9501 control/valve.	Connect to power supply. Check fuse, wiring, or circuit breaker.  Check transformer - replace. Check fuse on fan timer board - replace.  Check all wiring and wiring connections.  Check to see if main valve is opening or turned "ON". Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly.  Check heat exchanger, venting system and condensate removal tubing for blockage.  See Figure 1.19 (SmartValve™ Trouble Shooting Guide).
Inadequate heating.	Furnace undersized for application.  Gas input to furnace too low.  Limit switch cycles main burners.  Furnace cycles too often.	Replace with proper size furnace.  Check gas pressure at manifold. Check gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.  Dirty air filters - clean and reinstall. Blower speed too low - use faster speed tap. Registers closed, restricted ductwork - open or remove restriction.  Check heat anticipator setting on thermostat - readjust.
Aldehyde odors, (CO), sooting flame, floating flame.	Incomplete combustion - poor flame characteristics.	Check all screws around flue outlets and burner compartment - tighten. LACK OF COMBUSTION AIR - see instructions. Cracked heat exchanger - replace. Overfired furnace - reduce input or change orifices. Check vent for restriction - clean as required.

SEQUENCE OF OPERATION AND TROUBLESHOOTING GUIDE FOR SmartValve™ SYSTEM

Figure 1.19



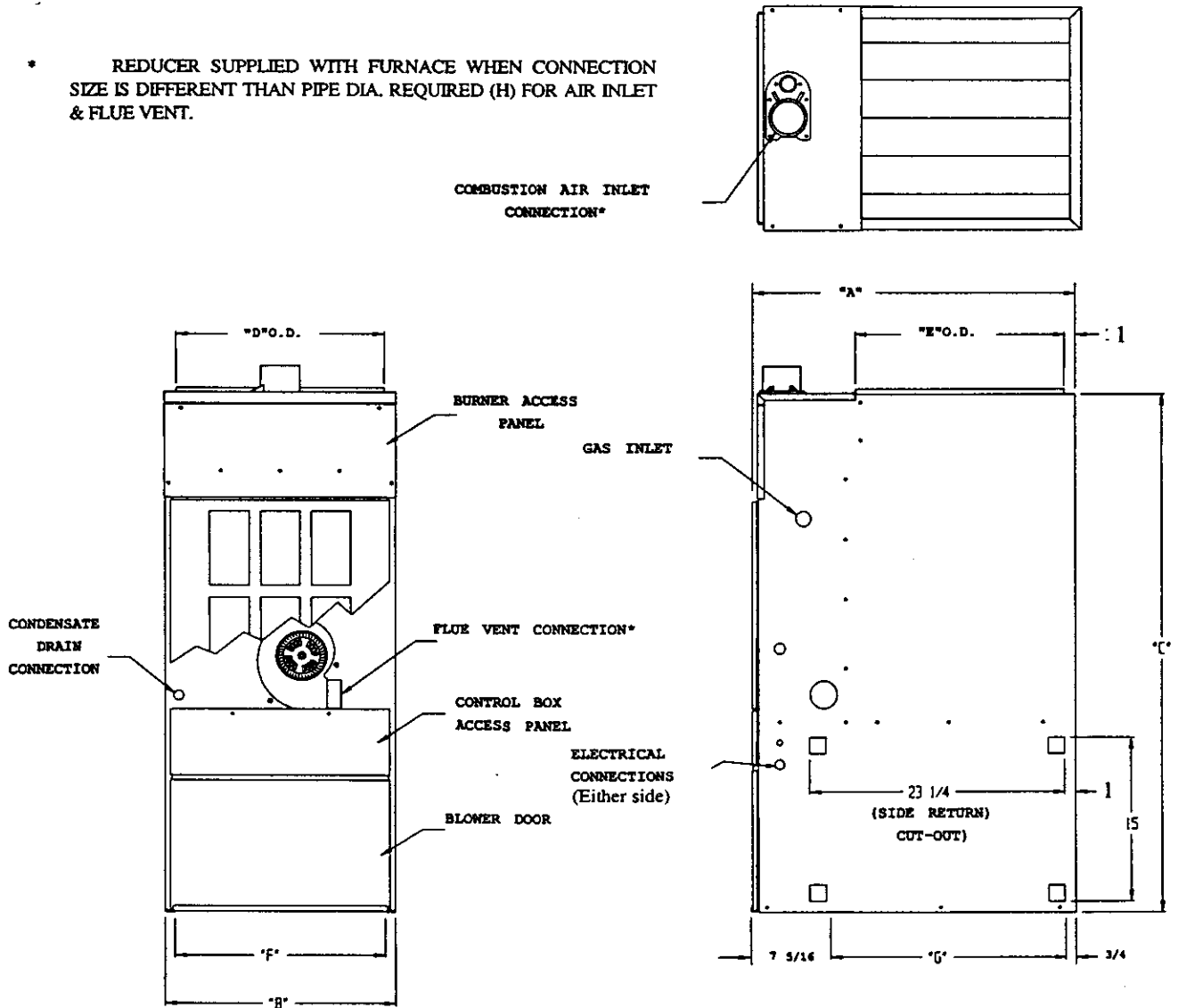
# GENERAL LAYOUT

Table 1.20

MODEL	UNIT DIMENSIONS			DUCT SUPPLY OPENING		DUCT RETURN OPENING		AIR INLET & VENT PIPE DIA.	MAX. OVER CURRENT PROTECTION	MAX. UNIT AMPS	ELECTRICAL SUPPLY MIN. WIRE SIZE (AWG)	NET WEIGHT LBS
	LENGTH	WIDTH	HEIGHT	D	E	F	G					
	A	B	C									
CMPA050U2	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	5.7	14	131
CMPA050U3	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	9.2	14	131
CMPA075U2	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2 1/2	15	6.5	14	140
CMPA075U3	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	9.2	14	140
CMPA075U3A	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2 1/2	15	9.2	14	140
CMPA100U3	29 1/2	17	47 3/8	15	18 15/16	15 1/2	21 5/8	3	15	8.4	14	167
CMPA100U4	29 1/2	17	47 3/8	15	18 15/16	15 1/2	21 5/8	3	15	10.6	14	167
CMPA125U5	29 1/2	20 1/2	47 3/8	18 1/2	18 15/16	19	21 5/8	3	20	12.7	12	193

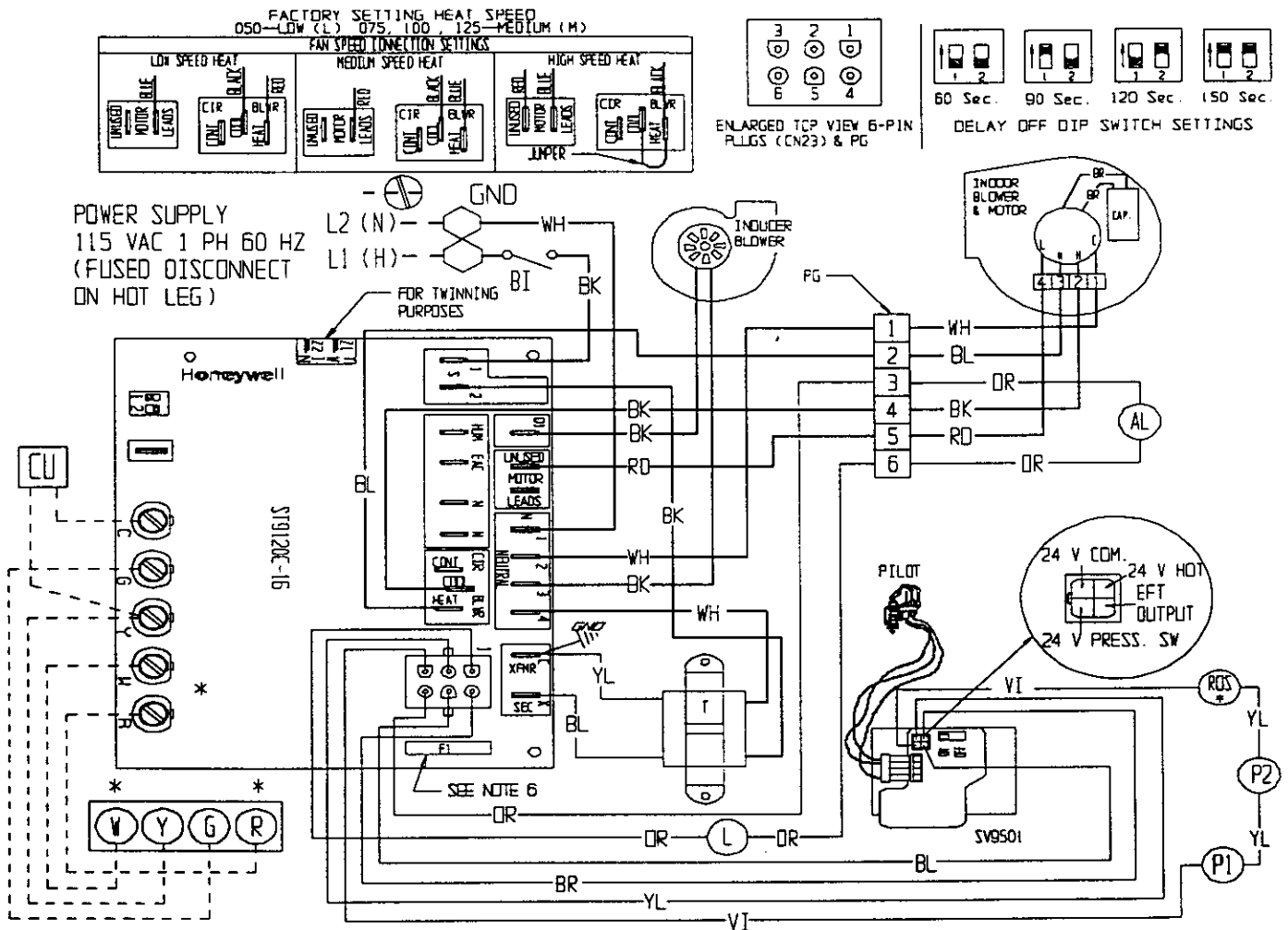
Figure 2.20

\* REDUCER SUPPLIED WITH FURNACE WHEN CONNECTION SIZE IS DIFFERENT THAN PIPE DIA. REQUIRED (H) FOR AIR INLET & FLUE VENT.



# GENERAL WIRING

Figure 1.21  
SEE FIGURE 1.22 FOR IMPORTANT NOTES.



\* FOR HEAT ONLY (TWO WIRE) THERMOSTAT, CONNECT TO R & W  
MULTI-POISE CONDENSING GAS FURNACE WITH HONEYWELL ST9120C FAN TIMER & SV9501 SMARTVALVE™

