

INSTALLATION INSTRUCTIONS		
INSTALLATION	OPERATION	MAINTENANCE
INDUCED DRAFT "A" SERIES	HORIZONTAL GAS FOUR-PASS WARM AIR FURNACE	ISSUE 9142

AFFIX LABEL HERE

CAUTION

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 lead to bodily harm.

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 National Electrical Code ANSI/NFPA No. 70, if an external electrical source is utilized. **DO NOT** use gas piping as an electrical ground.

GENERAL INSTRUCTIONS

This is a category I furnace designed for use with either natural or liquefied petroleum gases (propane) when installed with the proper propane conversion kit and has been design certified by the American Gas Association.

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 is designed to facilitate various installation requirements. To accomplish this, the pilot burner, gas valve, controls and flue outlet can remain assembled on the same side of the furnace as shipped or all these components may be reversed to the opposite side of the furnace. (Refer to Field Reversing section for details on reversing).

This furnace has been designed to interface with split system cooling equipment (approved by U.L.) 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 National Fuel Gas Code, ANSI Z223.1 (NFPA-54).

For complete information on installation standards consult the National Fuel Gas Code obtainable at a nominal cost from the National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269 or the American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209.

LOCATION

Site Selection:

This furnace may be located in an attic, closet, basement crawl space, alcove or suspended from the ceiling of a utility room or basement. The following minimum clearances, or greater must be provided between the furnace and adjacent construction:

†† CLOSET OR ATTIC/ALCOVE CLEARANCES				
TOP	SIDES	BACK	FRONT	VENT PIPING
2"	6"	6"	* 6"	6"

* From back of inducer motor.

†† 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.

Since this furnace is suitable for attic installation, it may be installed on combustible wood flooring; however, it must not be installed directly on carpeting, tile or other combustible material other than wood flooring.

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 1).

Air for Combustion and Ventilation:

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 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, 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:

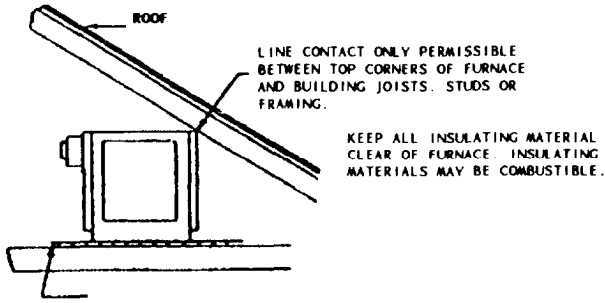
Confined space: A space whose volume is less than 50 cubic feet per 1000 Btu per hour of the aggregate input rating of all appliances installed in that space.

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.

If combustion and ventilation air must be supplied to an unconfined space from outside, an opening with a **free area** of not less than one square inch per 1000 BTU per hour of total input of all appliances within the unconfined space (but not less than 100 square inches) must be provided. This opening must be located such that it can not be blocked at any time.

If the furnace is located in a confined space, two permanent openings must be provided and 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 each).

These openings should be located such that one is within 12 inches of the top and the other is within 12 inches of the bottom of the confined space. If these openings are to interior areas, these areas must have adequate infiltration from the outside.



ATTIC INSTALLATION SHOWING POINT CONTACT

FIGURE 1

A clearance of at least 30" should be provided at the front of the unit for combustion air and 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 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 could also be suspended by an angle iron frame bolted to the rafters (See chart below for size and weight of furnace). Care must be taken to allow for blower door 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.

BTU INPUT	LENGTH	WIDTH	HEIGHT	NET WEIGHT
50,000	50	13-1/2	23-1/8	112
75,000	50	13-1/2	23-1/8	121
100,000	50	17	23-1/8	141
125,000	50	20-1/2	23-1/8	161

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.

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.

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.

For additional information refer to the latest edition of the National Fuel Gas Code.

WARNING

Do not block the combustion 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 Over-sizing

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 the remaining attached appliances.

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

- (a) Seal any unused opening in the common venting system.
- (b) 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.
- (c) 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.

(d) Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.

(e) If applicable, test for spillage at the drafthood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.

(f) 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.

(g) 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.

(h) 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 table found in Appendix G of the National Fuel Gas Code for the United States.

Contaminated Combustion Air

Contaminated combustion air must be avoided in order not to adversely affect the long term life of the furnace, especially the heat exchanger and burners.

The recommended source of combustion air is to use the outdoor air supply option indicated in the next section. However, the use of indoor air in most applications is acceptable if these guide lines are followed.

1. If the furnace is installed in a confined space, the necessary combustion air must come from the outdoors by way of attic, crawl space, air duct or direct opening.
2. If indoor combustion air option is used, there must be no exposure to the installations or substances listed below.
3. All provisions for indoor combustion air must meet the requirements for combustion air supply indicated in the latest edition of the National Fuel Gas Code, Z223.1, Section 5.3, and/or any applicable local codes.
4. The following types of installation will require **OUTDOOR AIR** for combustion, due to chemical exposures:

Commercial Buildings

Buildings with indoor pools

Furnaces installed in laundry rooms

Furnaces installed in hobby or craft rooms

Furnaces installed near chemical storage areas

Exposure to the following substances in the combustion air supply will also require OUTDOOR AIR for combustion:

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

INSTALLATION

When installed, the furnace must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Codes, ANSI/NFPA 70-1990.

To properly install the field wiring of this unit refer to Figure 16. If field reversing of the controls is required refer to the field reversal procedure. 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)].

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 NFPA-90A (Air Conditioning Systems) and NFPA-90B (Warm Air Heating and Air Conditioning Systems).

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 fan inlet, there should be at least one 90 degree air turn between fan and inlet 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.

CAUTION

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

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 which could lead to bodily harm.

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.

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 which could lead to a fire hazard and/or a hazardous condition which may lead to bodily harm. Heat Exchanger failure due to improper installation may not be covered by warranty.

- 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 coil 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.

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 Figure 2 for sizing gas piping.

CAPACITY IN CU. FT. OF GAS PER HOUR					
Length of pipe in ft.	Nominal iron pipe size, in.				
	1/2	3/4	1	1 1/4	1 1/2
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	890
40	63	130	245	500	760
50	56	115	215	440	670
75	53	93	175	360	545
100	38	79	150	305	460
150	--	64	120	250	380

Based on gas pressures of 0.5 PSIG or less and pressure drop of 0.3"w.c. and 0.60 specific gravity gas.

GAS PIPE CAPACITY TABLE
FIGURE 2

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. The piping must stand a pressure of six inches of mercury for a period of ten 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 (3.5 kPa or 14" wc).

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 (3.5 kPa or 14" wc). Failure to follow the above procedures could lead to a hazardous condition and bodily harm.

The recommended method for installing the gas piping to the furnace is shown in Figure 3. Figure 4 shows the correct piping for the furnace if the gas valve and controls have been reversed. (See FIELD REVERSING). Support all gas piping independent of the unit.

This furnace is manufactured for use with Natural Gas and must be converted using the proper LP conversion kit to be used with LP gas.

For LP (propane) gas, a tank regulator is required to reduce supply pressure to 12"-13" W.C. For manifold pressure, see Figure 6.

Check all piping for leaks using soapy water and a brush.

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.

The main manual shut off valve must be used in the gas piping for a safe piping system. It must be located as required by local codes, but should always be in an accessible but protected location.

A 1/8 inch NPT plugged tap, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the furnace if one is not supplied on the gas valve.

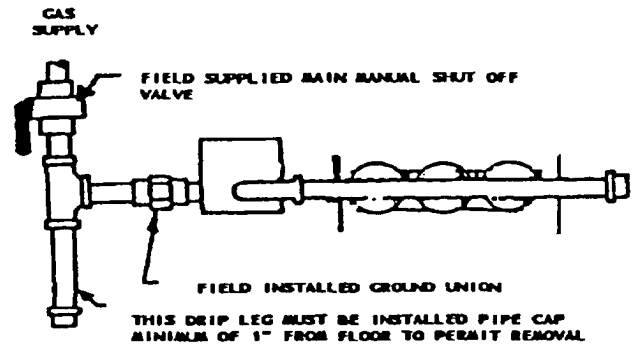


Figure 3

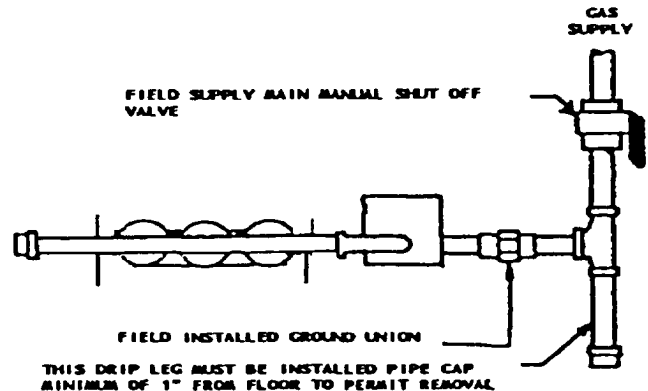


Figure 4

Electrical:

The control system depends on the correct polarity of the power supply. Connect "hot" wire (H) and "ground" wire "G" as shown in Figure 12.

Input	Max. Over Current Protection	Ampacity	Min. Wire Size (AWG)
50	15	10.5	14
75	15	10.5	14
100	20	15	12
125	20	15	12

WARNING

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur.

Use copper wire only for 115V supply service to unit.

When replacing any original wiring, use only 105 degree C, 16 GA. AWG. copper wire.

Venting Instruction:

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 should conform to the latest edition of the National Fuel Gas Code (NFPA 54-1988/ANSI Z223.1) Part 7.

For additional venting information refer to ANSI/NFPA 211 Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances.

This furnace is AGA approved as a Category I forced air appliance and can not be vented into a vent system with any Category II, III or IV appliances.

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 National Fuel Gas Code.

Masonry Chimney:

This furnace can be vented into an existing masonry chimney. This furnace must not be connected to a chimney flue servicing a separate appliance designed to burn solid fuel. Before venting this furnace into a chimney, the chimney must be checked for deterioration and repaired if necessary. The chimney must be properly lined and sized per the AGA/GAMA Venting Tables supplied with these instructions. The use of an unlined chimney for venting is prohibited.

This furnace may be vented into a common chimney with other Category I appliances as allowed by the AGA/GAMA Venting Tables supplied with these instructions and/or local codes.

If this furnace is vented into a common chimney, the chimney must be of sufficient area to accommodate the total flue products of all appliances vented into the chimney.

Type "B" vent connectors must be used on all installations and it must be sized per the AGA/GAMA Venting Tables supplied with these instructions.

Type "B" Vent:

The furnace is also approved for use with a "B" vent that terminates through the roof. Refer to the AGA/Gama Venting Tables supplied with these instructions for proper sizing and set-up of this furnace with "B" vent for a dedicated vent system or a common vented system.

This furnace may be common vented only with other Category I appliances. Common venting is allowed as permitted by the National Fuel Gas Code and/or local codes. Refer to the AGA/Gama Venting Tables supplied with these instructions 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 the National Fuel Gas Code.

The following requirements are provided for a safe 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 AGA/GAMA Venting Tables supplied with these instructions.
4. All pipe should be supported using the proper clamps and/or straps. These supports should be at least every four feet.
5. All horizontal runs of pipe should have at least a 1/4" per foot of upward slope from the furnace to the vent terminal.
6. All runs of pipe should be as short as possible with as few turns as possible.
7. Seams should be tightly joined and checked for leaks.
8. The flue pipe must not extend into the chimney but be flush with the inside wall.
9. The chimney or vent pipe must extend at least three feet above the highest point where it passes through a roof of a building and at least two feet higher than any portion of a building within a horizontal distance of ten feet. It shall also extend at least five feet above highest connected equipment flue collar.

Horizontal Venting:

This furnace is design certified by the American Gas Association for horizontal venting through an outside wall with the use of a Field Controls Company Model #DGF-2 side wall venting kit. No other Field's venting kit or any other manufacturer's venting kit is acceptable. Horizontal venting of this furnace without the use of the above stated kit is prohibited.

Here's How Your Heating System Works

The furnace operates automatically. It is controlled by a thermostat which you set at the temperature most comfortable to you. 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 P1 pressure switch (N.O.) will close and initiate the ignition sequence. The ignition control will energize the pilot gas valve. The ignition control will light the pilot automatically. If the pilot flame is sensed, the main valve will open and the pilot flame will light the burners. If the pilot flame is not sensed, the

control module will lock out after 90 seconds. The ignition control may be reset by turning the thermostat to the OFF position for 1 minute and resetting the thermostat to call for heat.

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 6 for selecting the desired fan off timing.

The heat sensing switch performs as the furnace 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 duct work, closed registers, etc.). The blower motor will be energized and as the unit cools the limit switch will close. This will relight the main burners and unless the overheating condition is corrected, the furnace will cycle on limit. If the furnace is cycling on the high temperature 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, shut off the manual gas valve to the appliance before shutting off the electrical supply. Failure to follow this warning will lead to a hazardous condition and bodily harm.

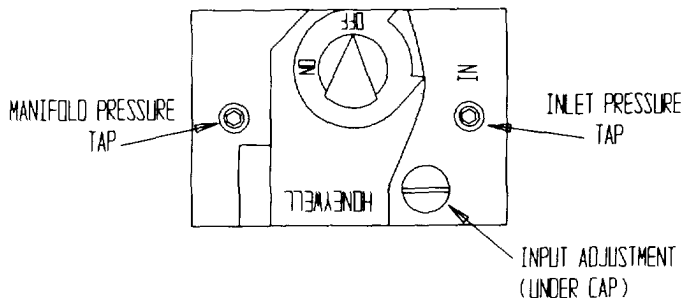
Startup and Operational Checkout

IMPORTANT

THIS FURNACE IS EQUIPPED WITH A METAL BLOWER WHEEL SHIPPING BRACKET WHICH MUST BE REMOVED BEFORE PUTTING THIS FURNACE INTO OPERATION. TO REMOVE THIS BRACKET - 1. REMOVE THE BLOWER ACCESS PANEL. 2. REMOVE THE TWO MOUNTING SCREWS. 3. SLIDE BRACKET OFF BLOWER WHEEL HUB.

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 manual valve built into the automatic valve body has 2 positions: OFF and ON.

To shut off gas manually: Turn knob from "ON" to "OFF" position. When in "OFF" position, the main burners and the pilot flame are extinguished.

This furnace is equipped with an automatic intermittent electronic ignition control and does not require the lighting of a pilot for furnace operation.

WARNING

Do not attempt to manually light the pilot. Failure to follow this warning can lead to electrical shock which 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). Disconnect the MV wire at the ignition control module. This will disconnect the main gas valve but will allow pilot operation.
- 4). Turn on the electrical power.
- 5). Set the manual gas shut-off valve in the "ON" position.
- 6). Set the thermostat above room temperature. (Main burners should not light).

7). Adjust the pilot flame to envelop the flame sensor for a distance of $3/8"$ to $1/2"$. The adjusting screw for the pilot flame is located on the main gas control. (See Figure 5).

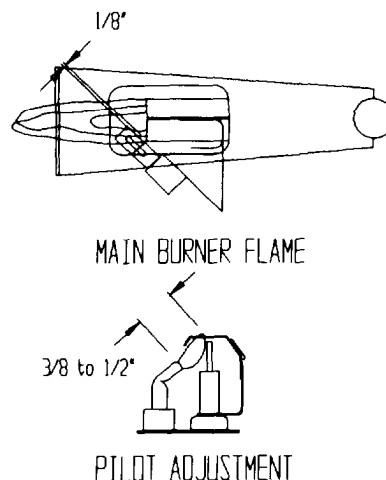


FIGURE 5

8). Turn off the power and replace the MV wire. Turn on the power supply to the furnace. Set the thermostat above room temperature.

9). The pilot and main burners should light.

10). Recheck for leaks in the manual cut 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.

11. Check the units 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:

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

Example: If the heating value of 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.

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.

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 then measure the manifold pressure with the furnace in operation.

Remove the cap to access the screw for input adjustment. Turn regulator adjusting screw in to increase pressure, out to decrease pressure. The input rate must be maintained $\pm 2\%$.

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 gases (propane), a 10" water column pressure 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. Figure 6 shows combinations of heating values and specific gravities for various gases, from which proper input can be obtained.

To change orifices, remove the manifold pipe cover and the burner removal cover/air inlet plate. Remove the manifold retention plate. Pull the manifold/burner assembly out past the support pins and remove the assembly.

NOTE: It is only necessary to remove one manifold retention plate to gain access to the burners. Remove the burners from the assembly and change the orifices as required. To reinstall the assembly, reverse the procedure listed above making sure that the assembly is securely mounted under the manifold retention plate on the opposite side of the unit.

CAUTION

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

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

FIGURE 6

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

Altitude Derating

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 cases might limit your options in dealing with an altitude derate situation.

The second recommendation 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.

If local codes require an orifice change, field drilling of "blank" orifices will be required. Sizing of the orifice must be based on the above mentioned 4% rule and the orifices must be drilled in such a way as to assure concentricity.

HAND DRILLING OF ORIFICES IS TOTALLY UNACCEPTABLE.

WARNING

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

Fan Adjustment Check:

13). This furnace is equipped with a 2 or 3 speed direct drive motor to deliver a temperature rise within the range specified on the rating plate, between the return and supply plenums, at the external duct static pressure noted on the AGA 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, the A and B screws may be adjusted to obtain the desired timing (See Figure 7).

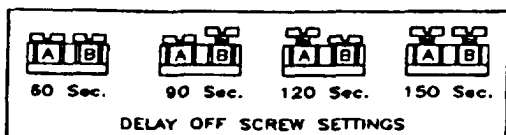


Figure 7

Limit Control Check:

14). 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 fan should continue to run. Remove the restriction and the burners should come back on in a few minutes.

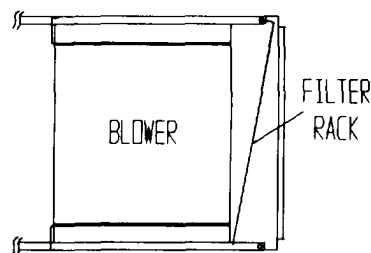
Filters:

A filter and filter rack may be supplied with the furnace or may be supplied as optional equipment. In either case it is:

NECESSARY THAT ALL FURNACES BE EQUIPPED WITH A FILTER.

If the filter is optional, follow the instructions with the filter rack. If the filter rack is supplied with the furnace the following instructions will apply. To remove the filter for cleaning when using the optional filter kit:

- Remove the blower door located at the inlet end (return duct) of the furnace.
- Bend the wire formed filter retainer until it clears the unit.
- Swing the filter retainer toward the blower as shown below.



TOP VIEW OF THE UNIT WITH THE OPTIONAL FILTER RACK INSTALLED

- Remove and clean filter, allow the filter to dry before re-installing it into the furnace.

To re-install the filter, reverse the preceding steps.

Minimum filter size and suggested filter material. If different type filter is used, it must be an equivalent high airflow capacity.

BTU INPUT	FILTER SIZE
50,000	13 X 23
75,000	13 X 23
100,000	16½ X 23
125,000	20 X 23



The washable permanent filters supplied with this unit should be cleaned periodically to prevent nuisance tripping of the high limit switch and failure to provide adequate filter media can cause equipment malfunction, uneven room temperature and excessive fuel usage.

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 performed only by a qualified service agency.

Servicing the Furnace:

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

The following procedures should be performed:

- 1). Make sure that all utilities (gas and electricity) to the furnace are turned off.
- 2). Disconnect the gas line from the valve. Remove all wiring from the gas valve.
- 3). Remove the burner removal cover and the manifold retention plate.
- 4). Remove the burner manifold assembly.
- 5). Place the burner/manifold assembly on a flat work area and vacuum the burner ports. It might be necessary to use a soft bristle brush to remove dirt and then vacuum. While manifold assembly is out, check pilot location.
- 6). Remove the manifold retention plate from the back side of the unit.
- 7). Remove the burner opening inlet plate.
- 8). Using a small rubber mallet, gently tap the burner opening of each tube in order to break loose any possible obstruction within each tube.
- 9). Using a straight attachment on the vacuum, vacuum the length of each heat exchanger tube and the burner box.
- 10). Replace the burner opening inlet plate, the back manifold retention plate, the burners and the front manifold retention plate and burner removal covers.
- 11). Reattach all piping and wiring as per wiring diagram (See Figure 12).
- 12). Turn on utilities and check for leaks using soapy water and a brush.

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.

13). A visual check of the main burner and pilot flame should be made at the beginning of each heating season. See Figure 5 for proper flame.

14). Check the input rate and adjust if necessary.

15). Perform a safety check of the limit control and blocked vent shutoff switches and the blocked drain shut off switch.

16). Check the air filter clean and/or replace as necessary.

FIELD REVERSING

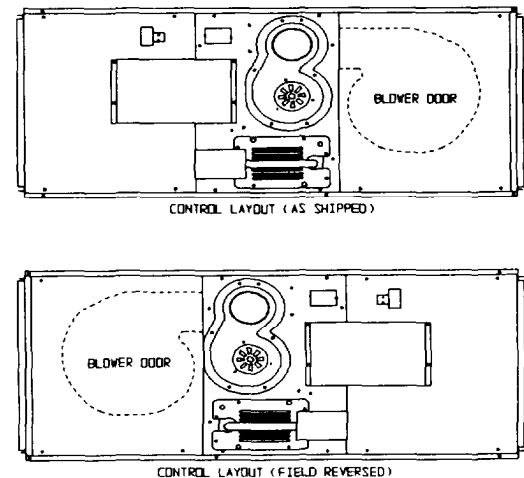


FIGURE 8

NOTE: Due to the complexity and time required for field reversing this furnace, it is recommended that this unit be reversed prior to the actual installation offsite.

WARNING

Before proceeding with field reversal, be sure that all electrical power to the furnace is turned OFF and that all gas piping is shut OFF and disconnected from the furnace. Failure to do so would result in an extremely hazardous condition and bodily harm.

CAUTION

Before proceeding with field reversal, be sure that a correct wiring diagram is available and/or be prepared to mark all wires as they are disconnected.

The gas valve, pilot burner, controls and the induced draft motor may be reversed as follows:

- 1). Remove the manifold cover plate and the air inlet plate/burner removal covers.
- 2). Disconnect all wires to the gas valve and the ignition wire.
- 3). Remove both manifold retention plates and remove the burner assembly.
- 4). Place manifold on a flat work area and disconnect the pilot tubing from the valve and the pilot. Be careful not to lose the pilot orifice.
- 5). Remove the ignition and pilot tubing from the grommet.
- 6). Using two pipe wrenches (one on the gas valve and one on the manifold extension pipe) remove the gas valve.
- 7). Remove the manifold extension pipe from the manifold (it may be necessary to put a pipe wrench on the manifold pipe while turning the extension).
- 8). Using two pipe wrenches (one on the manifold pipe between the pipe cap and burner orifices and one on the pipe cap) remove the pipe cap.
- 9). Clean the threads on the manifold pipes, gas valve and pipe cap of any old joint compound.
- 10). Reapply a joint compound to the threads of the manifold extension pipe and the manifold.

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

- 11). Using two pipe wrenches install the manifold extension on the opposite side of the manifold. The pipe extension should be positioned so that it is pointing away from the burners.
- 12). Install the gas valve such that the manual knob is in the 12 o'clock position.
- 13). Using two pipe wrenches (one on the pipe cap and the other on the manifold pipe) tighten the pipe cap onto the other end of the manifold pipe.
- 14). Remove the screws holding the pilot bracket to the burner support between the first two burners.

15). Mount the pilot bracket between the crossovers of the first two burners on the side of the manifold where the valve is now mounted.

16). Rebind the pilot tubing to connect the tubing to the new location of the pilot and gas valve making sure that there are no kinks in the tubing.

17). Run the pilot tubing through the grommet and reattach the tubing to the pilot and the gas valve.

18). Inspect the pilot assembly to make sure that the pilot orifice is in place.

19). Run the ignition cable through the grommet and reattach the plug connector on the pilot assembly.

20). Check the pilot position per dimensions shown in Figure 4.

21). Remove the tubing attached to the P1 pressure switch.

22). Remove the wires connected to the pressure switch and remove the pressure switch.

23). Remove the control box cover and disconnect the blower leads from the fan control board.

24). Remove the screws on the limit and remove the limit.

25). Disconnect the induced draft motor leads and remove the push in connector from the control box.

26). Remove the control box.

27). Remove the center panel from the back side of the unit.

28). Remove the indoor motor wire strain relief and tubing from the front center panel.

29). Remove the front center panel.

30). From the back panel side and using a 12" to 14" long 5/16" screw extension, remove four screws that hold the exhaust transition box to the internal exhaust pipe.

31). Remove four 7/16" nuts with a socket and remove internal exhaust pipe from header box of heat exchanger.

WARNING

The following steps are critical to insure the proper functioning of the furnace. A pressure test procedure is required before this furnace may be placed in operation. Failure to follow the pressure test procedure outlined in the section titled "PRESSURE TEST PROCEDURE" may result in bodily harm.

- 32). Rotate internal exhaust pipe 180° from original position and secure to header box with four nuts.
- 33). Replace exhaust transition box with four screws to internal exhaust pipe.
- 34). Remove the blower door that has the lighting instructions attached to it. Disconnect wires to blower door interlock switch. Remove blower door interlock switch.
- 35). Install blower door interlock switch on the side of the furnace that the control box will be mounted. Reconnect wires to blower door interlock switch. Install blower door with lighting instructions on the side of the furnace that the control box will be mounted.
- 36). The gasket/seals that were broken in steps 27 and 28 must be resealed properly to insure safe unit operation.

WARNING

If any gasket/seal integrity is questionable due to separation of the gasket material, malformed appearance, or any noticeable deformity; **YOU MUST REPLACE THE GASKET MATERIAL.** Failure to replace the gasket material may result in nuisance tripping of safety devices, failure of the unit to operate and/or a condition which may lead to bodily harm.

- 37). Route the motor leads to the same opening on the back center panel.
- 38). Replace the rear center panel.
- 39). Replace the front center panel and seal the holes with sheetmetal patch plates.

- 40). Remove the blower door with the lighting instructions on it and place it on the side of the furnace that the control box will be mounted.
- 41). Install the control box, limit, and pressure switch.
- 42). Inspect the gasket material on the induced draft blower assembly. Replace if necessary (refer to step 37).
- 43). Install the induced draft blower assembly.
- 44). Install the manifold retention plate on the front side of the unit.
- 45). Install the burner assembly making sure that manifold bracket slides under the front manifold retention plate.
- 46). Install the rear manifold retention plate. The burner assembly should be firmly attached to the unit.
- 47). Replace pressure switch tubing.
- 48). Rewire the unit using the schematic in this manual or on the control box cover.

WARNING

Field reversal is not complete without the lighting instructions, controls and gas valve being on the same side of the unit.

- 49). Upon completing the installation you must pressure test the furnace since critical gasket/seals have been broken.

FURNACE BLOWER SPECIFICATIONS AND AIR FLOW DATA

INPUT	HP	RPM	WHEEL	SPEED	CFM - EXTERNAL STATIC PRESSURE (IN. OF W.C.)									
					.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
50	1/3	1075	10 X 8	HIGH	1455	1390	1315	1250	1200	1100	1000	850	755	420
75	1/3	1075	10 X 8	HIGH	1565	1490	1425	1355	1280	1195	1095	1000	870	570
100	1/2	1075	12 X 9	HIGH	1945	1885	1795	1710	1615	1530	1415	1290	1130	745
125	3/4	1075	12 X 12	HIGH	2265	2210	2160	2090	2015	1940	1870	1790	1695	1545

DATA WITHOUT FILTERS IN PLACE

WARNING

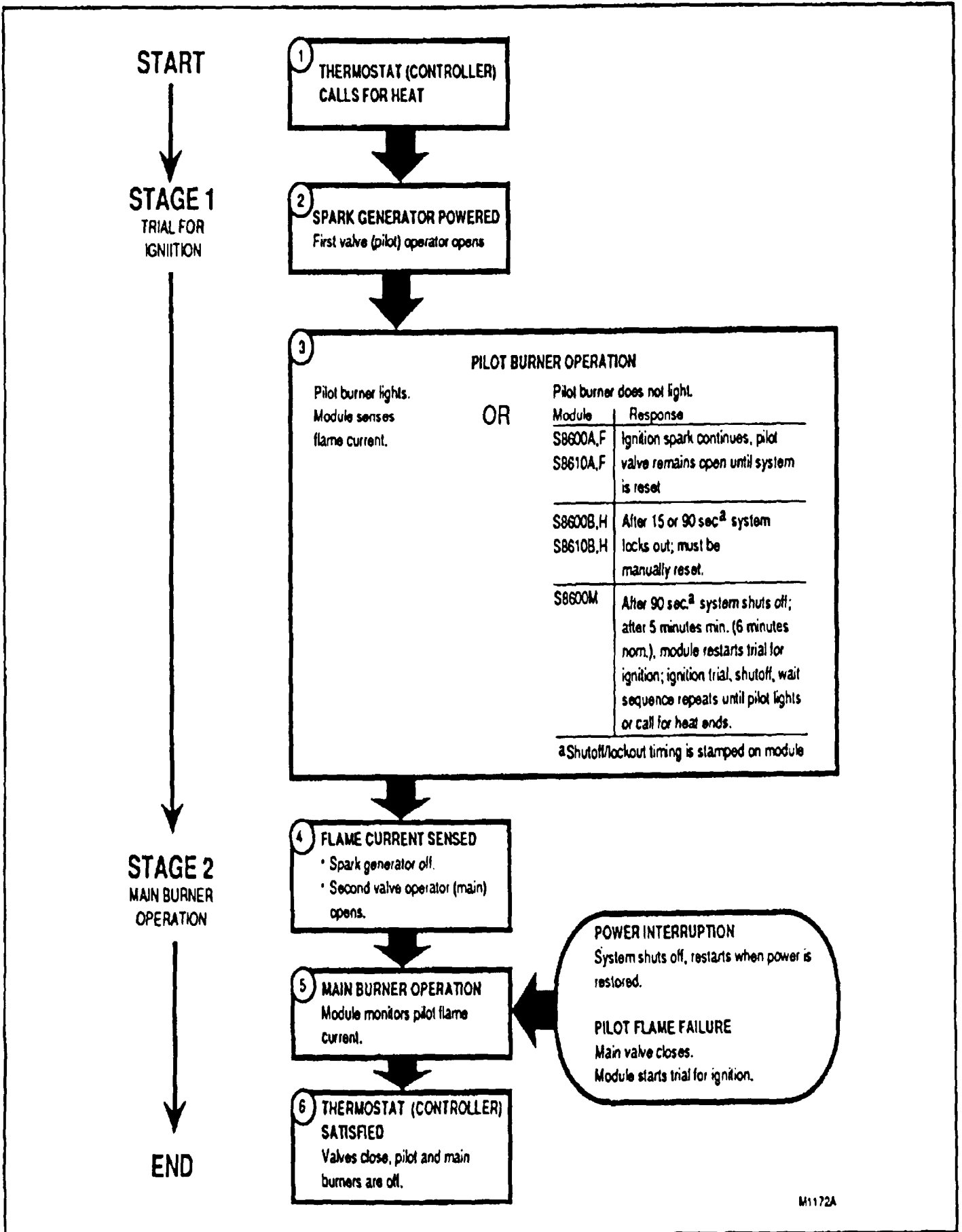
When operating the furnace in the heating mode, the static pressure and the temperature rise (supply air temperature minus return air temperature) must be within whose limits specified on the AGA rating label. Failure to follow this warning could lead to severe furnace damage.

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 ELECTRONIC IGNITION**

TROUBLE ANALYSIS CHART		
SYMPTOM	PROBABLE CAUSE	REMEDY
<p>Pilot will not light.</p>	<p>No spark at electrode.</p> <p>Spark shorting out to main burner.</p> <p>No gas at pilot burner.</p>	<p>REMEDY</p> <p>Check spark gap - refer to installation instructions.</p> <p>Check if induced draft motor is operating. If not, then check power to motor.</p> <p>Check for any blockage in flue venting system and chimney, thereby preventing pressure switch from closing.</p> <p>Unblock if necessary.</p> <p>Check moisture or dirt accumulation on electrode ceramic -- clean ceramic with cloth.</p> <p>Cracked ceramic -- replace pilot electrode assembly.</p> <p>Check for loose or broken wiring at and between electronic control box and electrode. Replace wire as necessary.</p> <p>Check fuse or circuit breaker for 115-volt supply to furnace.</p> <p>Check 24 volt input to electronic control box. If you read 24 volts and above steps have been completed, replace electronic control box assembly.</p> <p>Check pressure switch and tube assembly for any blockage that will prevent the pressure switch from operating.</p> <p>Realign electrode tip away from main burner but maintain spark gap to pilot burner as noted above.</p> <p>Check to see if pilot valve is opening.</p> <p>Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly.</p>
<p>Burners will not ignite</p>	<p>No 115-volt power to furnace.</p> <p>No 24-volt power to control circuit.</p> <p>Miswired or loose connections.</p> <p>No gas at main burners.</p> <p>Flame rollout shutoff switch activated.</p> <p>Flame probe or connecting lead is shorted or open.</p> <p>Dirty pilot - yellow flame.</p>	<p>Connect to power supply. Check fuse, wiring, or circuit breaker.</p> <p>Check transformer-replace.</p> <p>Check all wiring and wiring connections.</p> <p>Check to see if main valve is opening.</p> <p>Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly.</p> <p>Check heat exchanger venting system for blockage.</p> <p>Correct electrical shorting or open circuit.</p> <p>Clean pilot orifice.</p>
<p>Inadequate heating.</p>	<p>Furnace undersized for application.</p> <p>Gas input to furnace too low.</p> <p>Limit switch cycles main burner.</p>	<p>Replace with proper size furnace.</p> <p>Check gas pressure at manifold. Check gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.</p> <p>OFF setting of fan controls set too high-reset.</p> <p>Dirty air filters - clean and reinstall.</p> <p>Blower speed too low - use faster speed tap.</p> <p>Registers closed, restricted ductwork - open or remove restriction.</p> <p>Check heat anticipator setting on thermostat - readjust.</p>
<p>Aldehyde odors, (CO), sooting flame, floating flame.</p>	<p>Incomplete combustion - poor flame characteristics.</p>	<p>Check all screws around flue outlets and burner compartment - tighten.</p> <p>LACK OF COMBUSTION AIR-see instructions.</p> <p>Cracked heat exchanger-replace.</p> <p>Overfired furnace - reduce input or change orifices.</p> <p>Check vent for restriction - clean as required.</p>



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FIGURE 9

NORMAL OPERATING SEQUENCE

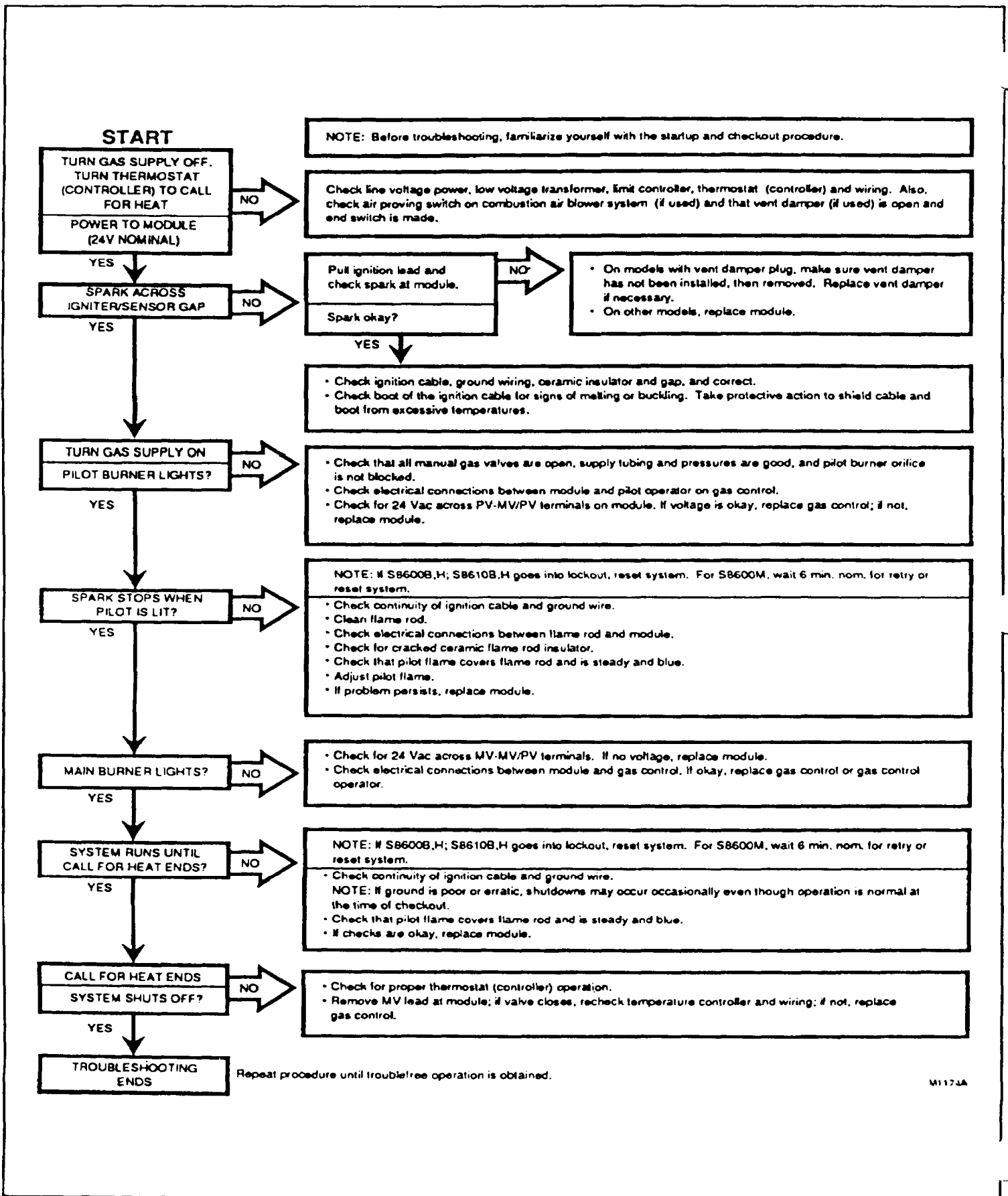
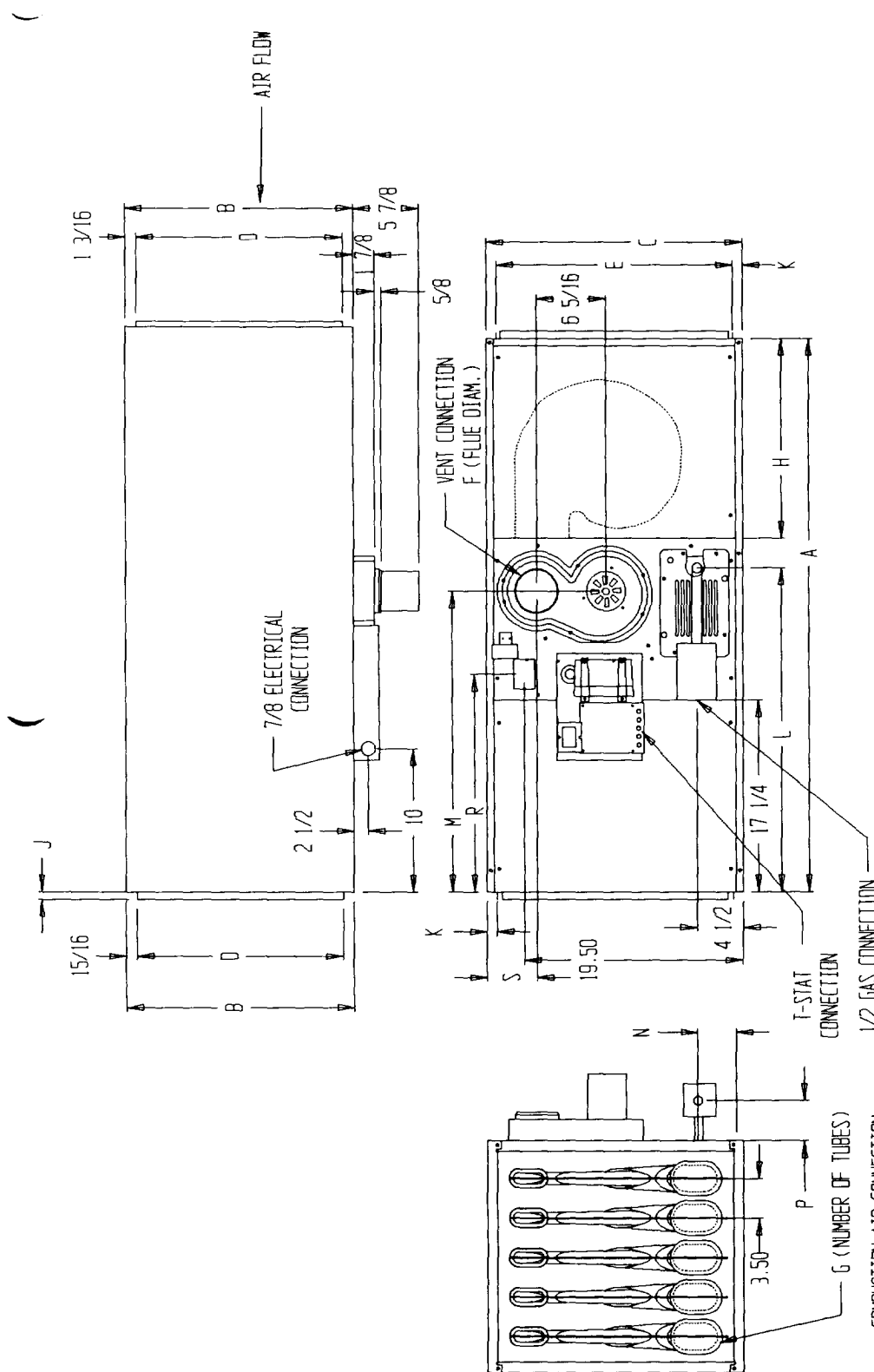
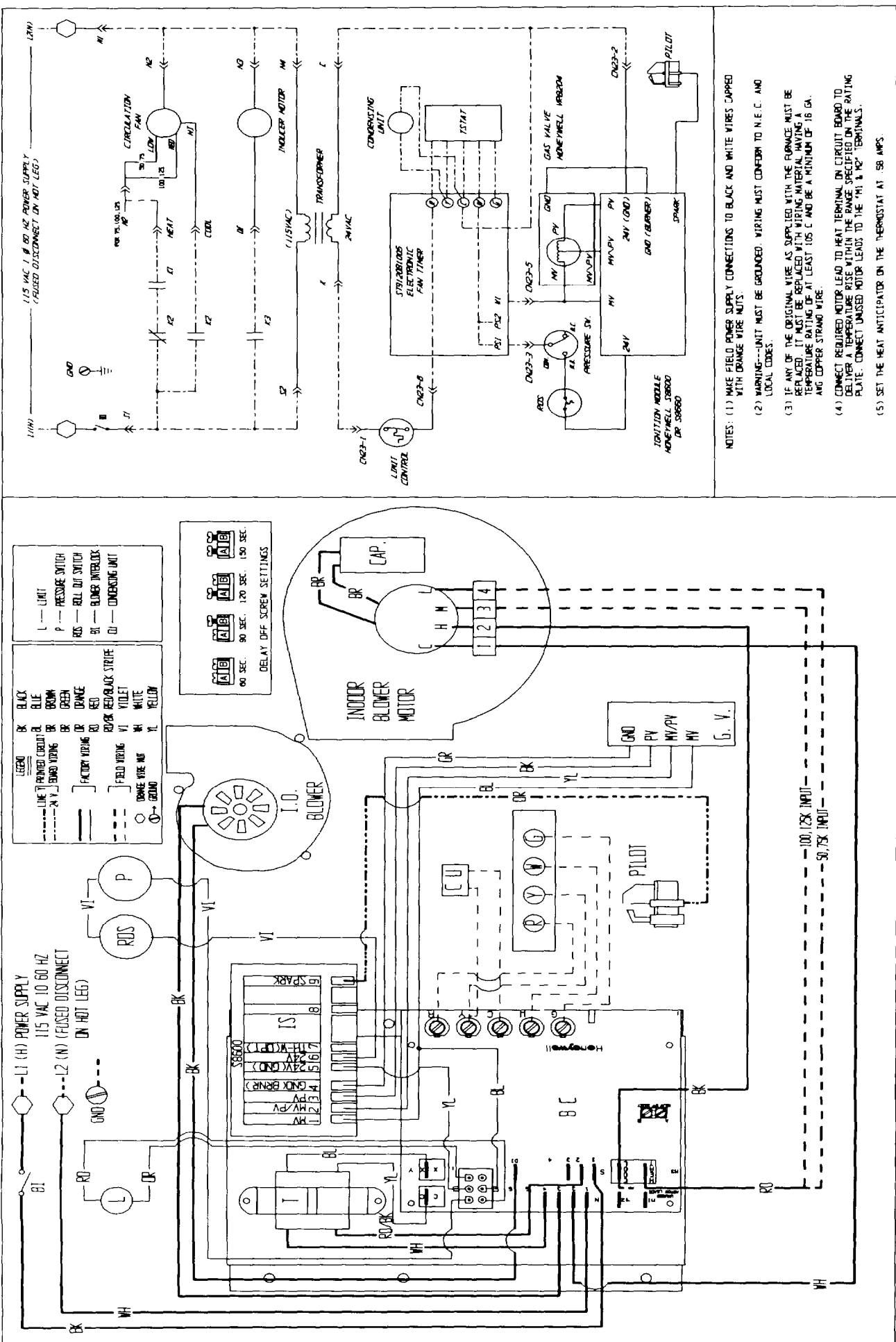


FIGURE 10



INPUT B.T.U./HR	UNIT DIMENSIONS		DUCT SUPPLY AND RETURN OPENINGS		FLUE DIA.	GENERAL LAYOUT													
	LENGTH	WIDTH	HEIGHT	HEIGHT		A	B	C	D	E	G	H	J	K	L	M	N	P	R
50,000	50	13 1/2	23 1/8	11 5/8	21 3/8	4	2	18	5/8	7/8	7/8	28 7/8	26 5/8	4 1/4	4 1/4	19 1/4	2 3/4	19 1/4	4 9/16
75,000	50	13 1/2	23 1/8	11 5/8	21 3/8	4	3	18	5/8	7/8	7/8	28 7/8	26 5/8	4 1/4	4 1/4	19 1/4	2 3/4	19 1/4	4 9/16
100,000	50	17	23 1/8	15 1/8	21 3/8	4	4	18	5/8	7/8	7/8	28 7/8	26 5/8	4 1/4	4 1/4	19 1/4	2 3/4	19 1/4	4 9/16
125,000	50	20 1/2	23 1/8	18 5/8	21 3/8	4	5	18	5/8	7/8	7/8	28 7/8	26 5/8	4 1/4	4 1/4	19 1/4	2 3/4	19 1/4	4 9/16

GENERAL LAYOUT FIG. 11



STANDARD HEAT/COOL WIRING DIAGRAM WITH ST9120B ELECTRONIC FAN TIMER

FIGURE 12

1

2

3

4

5

Supersedes: Nothing

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