INSTALLATION INSTRUCTIONS FOR HORIZONTAL GAS FURNACE

WARNING:

improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

FOR YOUR SAFETY

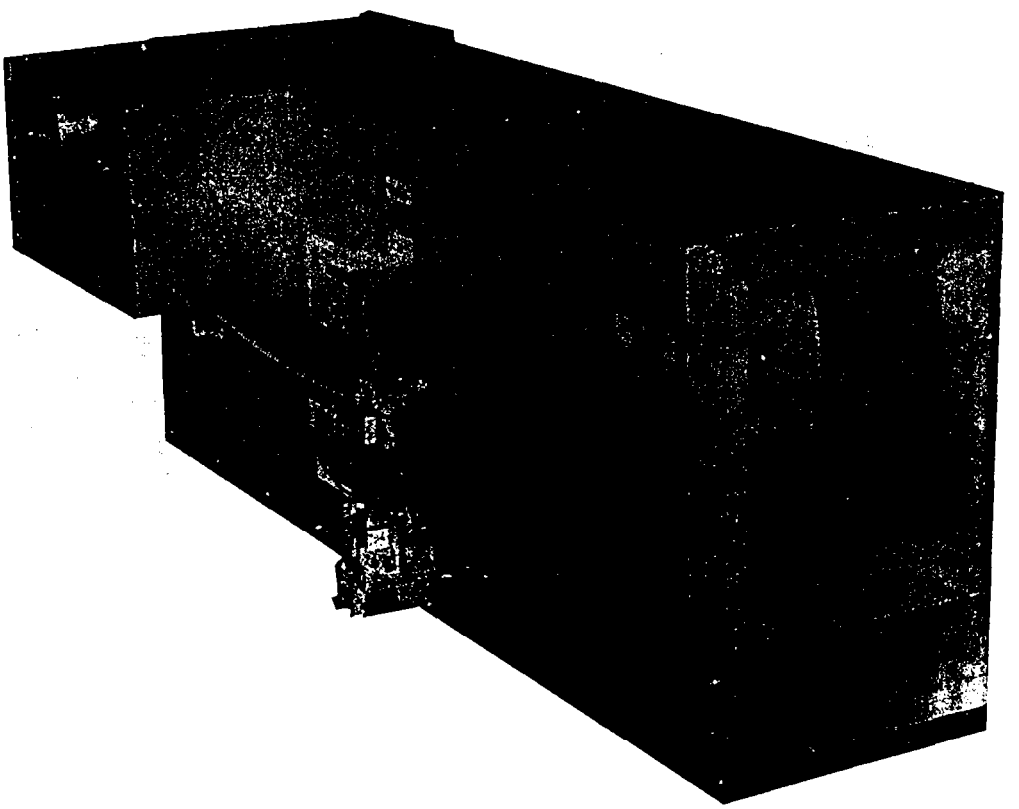
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

FOR YOUR SAFETY

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- @Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- *If you cannot reach your gas supplier, call the fire department.

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



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***CAUTION:** TO ENSURE PROPER INSTALLATION AND OPERATION OF THIS PRODUCT, COMPLETELY READ ALL INSTRUCTIONS PRIOR TO ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE, MAINTAIN OR REPAIR THE PRODUCT.*

GENERAL

This furnace is shipped with the burner and controls in place and completely wired to facilitate its installation. In order to accommodate all the field installations that may exist, the unit has been designed so that the controls and draft hood may be assembled on either side of the furnace. All controls must be located on the same side (see illustration below). The burners, controls, and flue outlet are assembled on the side of the furnace having the air discharge on the left facing the front side of the unit. For installation where only a limited access to the unit is available, the connections may be field converted to the opposite side when required. Please refer to the section on "reversing" for specific details.

Codes and local utility requirements governing the installation of gas fired equipment, wiring, plumbing and flue connections must be followed.

LOCATION

This furnace may be located in an attic, basement or a crawl space and is therefore desirable for use where economy of floor space is either desired or required. The furnace is designed for indoor installation only. The furnace should be installed near the chimney to reduce the length of the horizontal run of flue pipe, and should be centralized with respect to the heat distribution system as much as practicable. When installed in a utility room, the door should be wide enough to allow the largest furnace part to enter, or to permit the replacement of another appliance, such as a water heater. Since this furnace is approved for attic installation, it may be installed on combustible flooring. It is recommended, however, that fire resistant sheet protection be used under the combustion chamber area and extended 12" beyond the combustion area on all sides. **WARNING: COMBUSTIBLE MATERIAL MUST NOT BE PLACED ON OR AGAINST THE DRAFT HOOD OR ON THE FURNACE JACKET WITHIN 6" OF THE DRAFT HOOD.**

THE AREA AROUND THE FURNACE MUST BE KEPT CLEAR AND FREE OF ALL COMBUSTIBLE MATERIALS INCLUDING GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS

A gas-fired furnace for installation in a residential garage should be installed so that the burner(s) and the ignition source are located not less than 18" above the floor and the furnace is located or protected to avoid physical damage by vehicles.

A gas-fired furnace must not be installed directly on carpeting, tile or other combustible material other than wood flooring.

NOTE: Line contact only permissible between lines formed by intersections of the top and two sides of the furnace jacket, and building joists, studs or framing. See Figure 1.

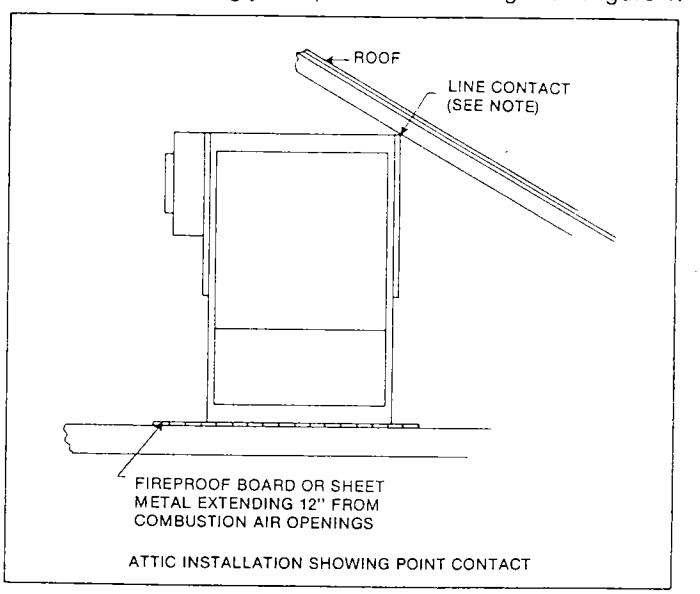
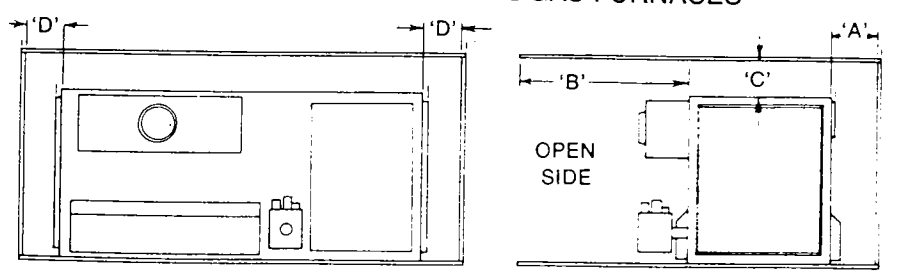
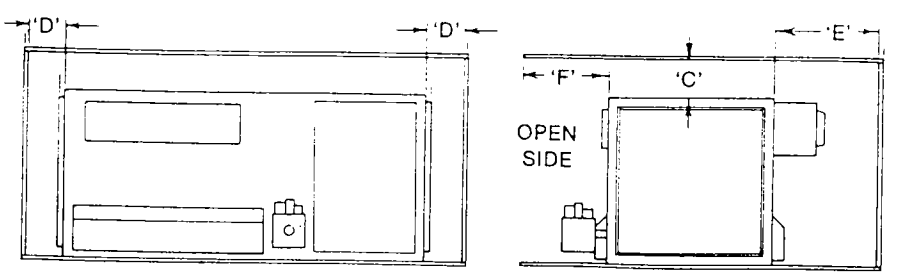


FIGURE 1

ALCOVE CLEARANCES HORIZONTAL GAS FURNACES



DRAFT HOOD AND CONTROLS ON SAME SIDE



DRAFT HOOD AND CONTROLS INSTALLED ON OPPOSITE SIDES FROM EACH OTHER

Designed for maximum outlet air temperature of: (SEE CHART BELOW).

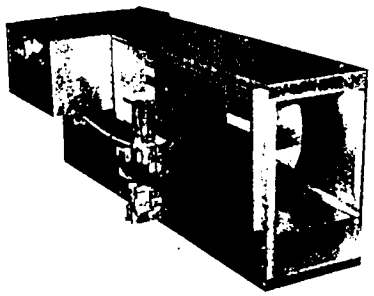
Line contact only permissible between the jacket top or sides and building joists, studs or framing.

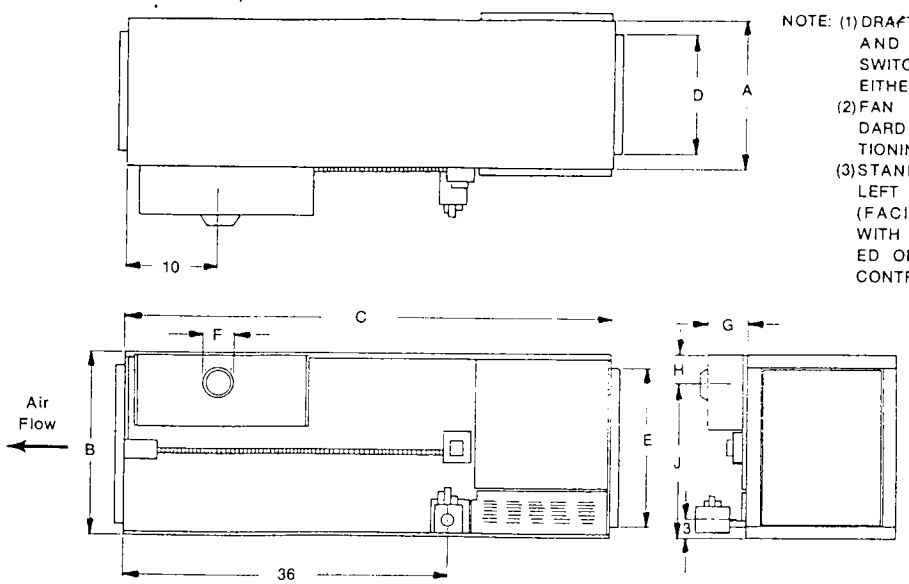
Listed for use with single wall or Type "B-1" vent.

Clearance from combustible material for:
Single wall vent = 6 inches
Type "B-1" vent = 1 inch

GAS INPUT BTU/HR	CABINET WIDTH	MINIMUM VALUES SHOWN IN INCHES					
		A	B	C	D	E	F
34M	14	6	18	8	6	18	18
50M	14	6	18	8	6	18	18
70M	17½	6	18	8	6	18	18
85M	21	6	18	8	6	18	18
100M	24½	6	18	8	6	18	18

FIGURE 2





INPUT BTU/HR	A	B	C	D	E	F	G	H	J
34M/50M	14	24½	59	13	21	4	9	3½	21
70M	17½	24½	59	16½	21	5	9	3½	21
85M	21	24½	59	20	21	5	9	3½	21
100M	24½	24½	59	23½	21	6	9	3½	21

FIGURE 3

COMBUSTION AIR SUPPLY

Adequate facilities for providing air for combustion and ventilation must be provided in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1-1984 and addendum Z223.1a-1987, or applicable provisions of the local building codes, and not obstructed so as to prevent the flow of air to the furnace.

In unconfined spaces (well ventilated attic, crawl space, full basement) in buildings of conventional frame, masonry, or metal construction, infiltration normally is adequate to provide air for combustion, ventilation, and dilution of flue gases.

When the furnace is installed in areas other than a full basement, attic or crawl space, and the source of combustion air is limited or taken from within the heated space, the supply must be through two permanent openings of equal area, one located within 12" of the ceiling and one within 12" of the floor. Total free area of each opening shall be equal to 1 square inch per 1,000 BTU/Hr. of total input rating of all appliances in the enclosure, and in no case less than 100 square inches. Where appliances are installed in a confined space within a building of unusually tight construction, air for combustion must be obtained from outdoors or from spaces or ducts freely communicating with the outdoors. If vertical ducts are used, two openings of approximately equal area (one located near the top and one located near the bottom of the enclosure) must be provided each with a total free area of not less than 1 square inch per 4,000 BTU/Hr. of total input rating of all appliances in the enclosure. If horizontal ducts are used, each opening shall have a free area of not less than 1 square inch per 2,000 BTU/Hr. of total input rating of all appliances in the enclosure.

When ducts are used, they shall 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 shall be not less than 3 inches.

Louvers and Grilles: In calculating free area, consideration shall be given to the blocking effect of louvers, grilles or screens protecting openings. Screens used shall not be smaller than ¼ inch mesh. If the free area through a design of louver or grille is known, it should be used in calculating the size opening required to provide the free area specified. If the design and free area are not known, it may be assumed that wood louvers will have 20-25 percent free area and metal louvers and grilles will have 60-75 percent free area. Louvers and grilles shall be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

For information regarding locating the draft hood on the opposite side of the unit, please refer to Figure 2. Also a minimum of 18" access for passage to the rear should be provided for cleaning and servicing the furnace (including draft hood). 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 appliance should be floored.

ACCESSIBILITY CLEARANCES, WHERE GREATER, MUST TAKE PRECEDENCE OVER FIRE PROTECTION CLEARANCES. The draft hood must be installed so as to be in the same atmospheric pressure zone as the combustion air inlet to the furnace.

INSTALLATION

The furnace should be installed in accordance with The American National Standard Z223.1-1984 and addendum Z223.1a-1987 Booklet entitled "National Fuel Gas Code" (National Fire Protection Association No. 54), and the requirements or codes of the local utility or other authority having jurisdiction.

DRAFTHOOD ASSEMBLY

1. Assemble drafthood sides over the drafthood wrap and attach with screws provided. See Figure 4.
2. Attach baffle assembly to drafthood wrap.
3. Place rear flange of drafthood behind support clip on furnace and slide drafthood down until the flange seats. See Detail "A". Attaching holes in drafthood sides must align with holes in furnace.
4. Attach drafthood to furnace with screws provided,
5. Mount vent safety switch on end of drafthood nearest controls.

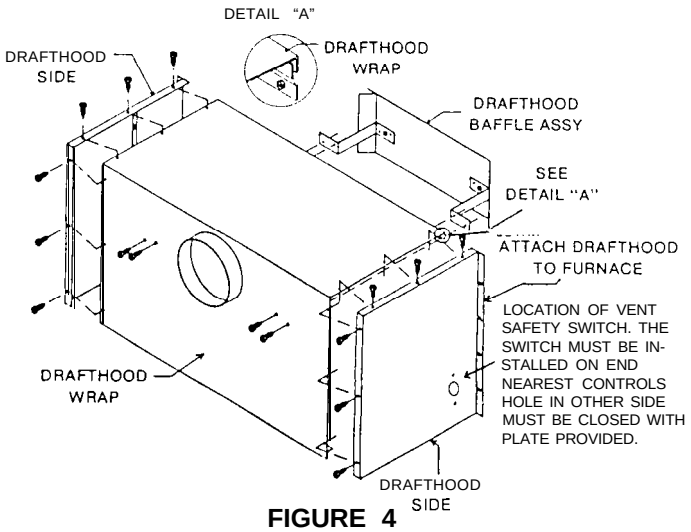


FIGURE 4

DUCT WORK

Attach the supply and return duct work to the flanged openings provided on either end of the furnace. Non-combustible flexible duct connectors are recommended to connect both the supply and return ducts to the furnace. CAUTION: Air *openings in the casing front, return air grilles and warm air registers must not be obstructed.*

When the furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall be handled by a duct or ducts sealed to the furnace casing and terminated outside the space containing the furnace.

WARNING: IF THERE IS NO COMPLETE RETURN AIR DUCT SYSTEM, THE RETURN AIR CONNECTION MUST BE SEALED TO THE FURNACE CASING AND RUN FULL SIZE TO A LOCATION OUTSIDE THE UTILITY ROOM OR SPACE HOUSING THE FURNACE TO PREVENT A NEGATIVE PRESSURE ON THE VENTING SYSTEMS.

CONSULT LOCAL CODES FOR SPECIAL REQUIREMENT. Blower speed should be adjusted to maintain the air rise range shown on the rating plate.

CIRCULATING AIR SUPPLY

WARNING: NEVER ALLOW THE PRODUCTS OF COMBUSTION OR THE FLUE PRODUCTS TO ENTER THE RETURN AIR DUCTWORK, OR THE CIRCULATING AIR SUPPLY. ALL RETURN DUCTWORK MUST BE ADEQUATELY SEALED AND SECURED TO THE FURNACE WITH SHEET METAL SCREWS, AND JOINTS TAPED. ALL OTHER DUCT JOINTS MUST BE SECURED WITH APPROVED CONNECTIONS AND SEALED AIRTIGHT.

FAILURE TO PREVENT PRODUCTS OF COMBUSTION FROM BEING CIRCULATED INTO THE LIVING SPACE CAN CREATE POTENTIALLY HAZARDOUS CONDITIONS, INCLUDING CARBON MONOXIDE POISONING THAT COULD RESULT IN PERSONAL INJURY OR DEATH.

DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT RETURN OR SUPPLY DUCTWORK TO OR FROM ANY OTHER HEAT PRODUCING DEVICE SUCH AS A FIREPLACE INSERT, STOVE, ETC. DOING SO MAY RESULT IN FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PERSONAL INJURY OR PROPERTY DAMAGE.

The circulating air supply may be taken either (1) from outside the building, (2) from return air ducts from several rooms (100% return air) or (3) any combination of the two. When outside air is utilized, the system should bedesigned and adjusted such that the temperature of the supply air to the furnace will not be below 50°F during the heating season. When using a combination of outside air and return air, be sure the ducts are so designed and a diverting damper so installed that the volume of circulating air entering the furnace cannot be reduced or restricted below that which would normally enter through the circulating air intake of the furnace. Furnaces when used in connection with cooling units must be installed on the upstream side of cooling units to avoid condensation in the heating element or installed in parallel if required. If installed in parallel with a cooling unit, the damper or other means used to control the flow of air shall be adequate to prevent chilled air from entering the furnace, and if manually operated must be equipped with means to prevent operation of either unit unless the damper is in the full heat or cool position.

CHIMNEY

Devices attached to the flue or vent for the purpose of reducing heat loss up the chimney have not been tested and have not been included in the design certification of this furnace. We, the manufacturer, cannot and will not be responsible for injury or damage caused by the use of such untested and/or uncertified devices, accessories or components.

Unit must be vented through a good chimney or an approved vent in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1-1984 and addendum Z223.1a-1987, or applicable provisions of the load building codes. Check chimney for soot, leaks, obstruction and proper height to prevent down draft. If it is necessary to construct a new chimney, local conditions such as necessary height, draft, and number of appliances served should be checked with gas company requirements and local building codes.

WARNING: DO NOT CONNECT THIS FURNACE TO A CHIMNEY FLUE SERVING A SEPARATE APPLIANCE DESIGNED TO BURN SOLID FUEL (WOOD OR COAL).

The design of this unit is A.G.A. certified for use with "B-1" or single wall vent. Check clearance label on blower door for clearances for both types. Minimum clearances for various vent pipe materials must be as specified by Underwriters' Laboratories. The vent pipe must be of the same size as the flue outlet of the furnace. The vent pipe should run to the outside as directly as possible, keeping turns to a minimum. Vent outlet must extend above the roof surface and through its flashing, terminating in an approved cap. A single-wall metal vent pipe shall terminate at least 5 feet in vertical height above the highest connected equipment drafthood outlet or flue collar. The vent outlet must extend above the roof surface and through its flashing terminating in an approved cap. The vent pipe shall extend at least 3 feet above the highest point where it passes through a roof of a building and at least 2 feet higher than any portion of a building within a distance of 10 feet. An approved cap which does not obstruct the pipe outlet shall be attached to the end of single-wall metal pipe. (See Figure 5.)

VENTED THRU A ROOF
NON-COMBUSTIBLE MATERIAL
CUT AWAY.

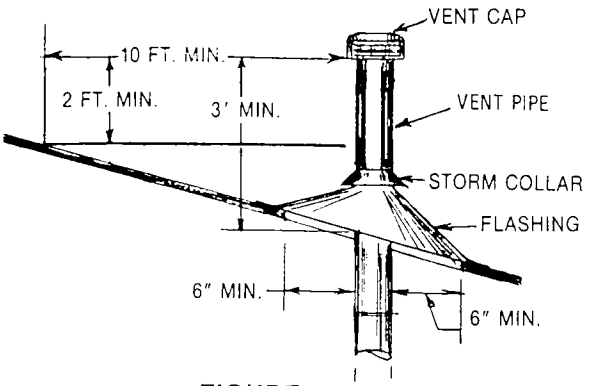


FIGURE 5.

Type B gas vents shall be installed and terminate above the roof surface with a listed cap or listed roof assembly in accordance with the terms of their respective listings and the manufacturers instructions. A Type B gas vent shall terminate at least 5 feet in vertical height above the highest connected equipment drafthood outlet of flue collar. Horizontal runs should maintain a pitch of ¼" per lineal foot and should not exceed in length 75% of the vertical run. Vent pipe crossovers in the attic space must not extend at any angle of more than 60° from the vertical. Vent pipe must be rigidly supported by straps or hangers at least every 3 feet.

The vent connector must be fastened to the outlet collar of the furnace with at least 2 sheet metal screws.

Joints between sections of single wall piping must be fastened by sheet metal screws. "B-1" type material must be assembled in accordance with the manufacturer's instructions.

Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

Where more than one appliance is vented into a common flue, the area of the common flue should be equal to the area of the largest flue or vent connector plus 50% of the areas of the additional flue or vent connectors.

The vent connectors must be inserted into but not beyond the inside wall of the chimney flue. Do not install damper in flue pipe or reduce size of flue outlet. Protect combustible ceiling or walls near the vent pipe with fireproof insulation.

CONSULT LOCAL CODES FOR SPECIAL REQUIREMENTS.

VENT SAFETY SHUT OFF SYSTEM

Furnaces manufactured after November 1, 1987, will be equipped with a limit switch to protect against over temperature conditions in the vent system caused by blockage of the vent. This switch is located on the lower left side of the draft diverter behind the upper front panel. On horizontal furnaces it is on the lower side of the draft diverter, adjacent to the furnace panel.

Do not reset this switch without taking corrective action to assure that the vent system is open without any restrictions.

If the switch trips (opens), call a qualified furnace installer or service technician to inspect the vent system.

GAS SUPPLY

CAUTION: *Check rating plate to make certain unit is equipped to burn the type of gas supplied. Care should be taken after installation of this equipment that gas control valve not be subjected to high gas supply line pressure. The furnace and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 PSIG. The furnace must be isolated from the gas supply piping system by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressure equal to or less than 1/2 PSIG.*

CONVERSIONS

Any additions, changes or conversions required in order for the furnace to satisfactorily meet the application needs should be made by a qualified factory distributor or local service dealer, using factory specified or approved parts.

WARNING: THIS FURNACE WAS EQUIPPED AT THE FACTORY FOR USE ON NATURAL GAS ONLY. CONVERSION TO LP GAS REQUIRES A SPECIAL KIT SUPPLIED BY THE DISTRIBUTOR OR MANUFACTURER. MAILING ADDRESSES ARE LISTED ON THE FURNACE RATING PLATE, PARTS LIST AND WARRANTY. FAILURE TO USE THE PROPER CONVERSION KIT CAN CAUSE FIRE, CARBON MONOXIDE POISONING, EXPLOSION, PERSONAL INJURY OR PROPERTY DAMAGE.

GAS PIPE SIZING

Gas piping shall be of such size and so installed as to provide a supply of gas sufficient to meet maximum demand without undue loss of pressure between the 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, and never smaller than the pipe size to the manual shut-off valve. Select the size of the pipe from the gas pipe capacity table below.

GAS PIPE CAPACITY TABLE

Capacity of gas pipe of different diameters and lengths in cu. ft. per hr. with pressure drop of 0.3 in. and specific gravity of 0.60 (natural gas).

Nominal Iron Pipe Size, Inches	Length of Pipe, Feet							
	10	20	30	40	50	60	70	80
½	132	92	73	63	56	50	46	43
¾	278	190	152	130	115	105	96	90
1	520	350	285	245	215	195	180	170
1 ¼	1,050	730	590	500	440	400	370	350
1 ½	1,600	1,100	890	760	670	610	560	530

After the length of pipe has been determined, select the pipe size which will provide the minimum cubic feet per hour required for the gas input rating of the furnace. By formula:

$$\text{Ft. Per Hr. Required} = \frac{\text{Gas Input of Furnace (BTU/HR)}}{\text{Heating Valve of Gas (BTU/FT}^3\text{)}}$$

The gas input of the furnace is marked on the furnace rating plate. The heating value of the gas (BTU/FT³) may be determined by consulting the local natural gas utility or the L.P. gas supplier.

Gas piping should be installed as shown below:

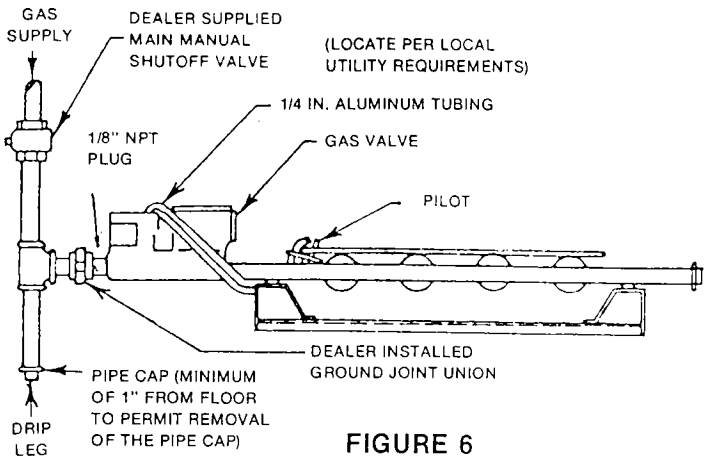


FIGURE 6

GAS PIPING

In making gas connections, avoid piping strains as they may cause noise and may damage controls. A manual gas shut-off valve should be installed in the gas line upstream of the furnace gas controls. Valve should be readily accessible for turning on or off. A drip leg should be installed in the gas line as close to the furnace as possible. A ground joint union must be installed immediately upstream of the furnace combination gas control valve, and a 1/8" NPT plug on the supply pipe to the valve for the purpose of making measurements of the inlet gas pressure. **A pipe compound resistant to the action of liquefied petroleum gases must be used at all threaded pipe connections.** LP gas will dissolve white lead or most commercial compounds. 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. Support all gas piping independent of unit. Check all piping for leaks, using soapy water and brush. **WARNING: AN OPEN FLAME SHOULD NEVER BE USED FOR TESTING.**

BURNER ORIFICES

The furnace is supplied with standard orifices for the gas shown on the rating plate. When the installation is at an elevation of 2,000 feet or more above sea level, orifices must be changed. For operation at elevations above 2,000 feet, input ratings should be reduced at the rate of four percent (4%) for each 1,000 feet above sea level.

To change orifices, remove the burner cover and support for cover and burner pan. Disconnect wire connections from gas control. Slide entire burner pan and manifold assembly from heat exchanger burner box. Make sure burners and orifices are properly seated and secured when replaced. ***CAUTION:*** *Burner flames must be centered in tube openings. Make sure that all screws have been replaced and properly tightened. Replace wire connections on gas control.*

ELECTRICAL CONNECTIONS (See Wiring Diagrams)

An electrical disconnect must be readily accessible and located within sight of the furnace. Use a separate branch electrical circuit containing a properly sized fuse or circuit breaker. Run this circuit directly from the main switch box to the junction box on the left side of the furnace, inside the control compartment.

The black and white test lead wires can be used or discarded. If discarded, connect the line voltage wires in their place. All wiring to the furnace which is installed separate and external to the unit shall be type "T" wire rated at 63°F rise (35°C).

WARNING: CABINET MUST BE PERMANENTLY GROUNDED. A GROUND SCREW IS PROVIDED IN THE JUNCTION BOX FOR THIS PURPOSE.

INSTALLATION OF THE ELECTRICAL SUPPLY LINE SHOULD BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, NFPA NO. 70-1984 AND LOCAL BUILDING CODES.

FILTERS

The furnace must be field supplied with a washable high velocity type filter based on a nominal air flow rating of 500 FPM or a disposable low velocity type based on 300 FPM air flow for heating only. Filters which comply with the specifications in Figure 7 are recommended. Disposable low velocity filters may be replaced with washable high velocity filters providing they meet the minimum size areas listed in Figure 7. Washable high velocity filters may not be replaced unless equivalent in size and type.

CAUTION: *If filters provided are suitable for heating applications only, be sure to advise homeowner so they are aware that filter size will have to be increased if air conditioning is added.*

Where servicing of filters is not convenient for the particular installation, the 1" thick filters may be located behind the return air intake openings with provisions made for easy replacement. The use of filter grilles at all return air inlets is recommended for ease of access to air filters. The minimum square inches of total filter area required for each unit size is as follows:

Minimum filter sizes using a disposable (300 ft. per min. air flow) for heating and a washable high velocity (500 ft. per min. air flow) for cooling application.

FURNACE INPUT RATING	MINIMUM FILTER SIZE/QTY
34,000	20 x 20/1
50,000	20 x 24/1
70,000	20 x 25/1
85,000	20 x 25/1 or 14 x 20/2
100,000	25 x 25/1 or 16 x 20/2

FIGURE 7

CAUTION: *Do not operate your system for extended periods without filters. A portion of the dust entrained in the air may temporarily lodge in the air duct runs and at the supply registers. Any recirculated dust particles will be heated and charred by contact with the furnace heat exchanger. This residue will soil ceilings, walls, drapes, carpets, and other household articles.*

MAINTENANCE

It is recommended that at the beginning of the heating season and approximately midway in the heating season that a visual inspection be made of the main burner flames and the pilot flame. The appearance of the flames should be similar to illustration on page 8.

WARNING: DISCONNECT THE MAIN POWER TO THE UNIT BEFORE ATTEMPTING ANY MAINTENANCE.

1. Keep the air filters clean. There are several types of material used in air filter construction and there are many possible locations for air filters. Consult with your contractor as to the location of the filters and type of material in use.

2. How to Clean Filters:

Glass Fiber (Throwaway) — This is a disposable type of filter. Inspect monthly and replace when necessary with filters of the same type and size. A new home will normally require more frequent attention to the filters.

Aluminum Mesh — Wash with detergent and water. Air dry thoroughly and renew the coating in compliance with the manufacturer's instructions.

Plastic Impregnated Fiber — Vacuum clean and reinstall.

The furnace should operate for many years without the need for inspecting the flue passageways. If there is a need or an inspection is to be made, follow this procedure. It is recommended that this cleaning procedure be performed by a qualified serviceman.

1. Turn off all power to the furnace and set the thermostat lever to the lowest temperature.
2. Shut off the gas supply to the furnace either at the meter or at a manual valve in the supply piping.
3. Turn the furnace gas control knob to the "OFF" position.
4. Mark the individual wires to the gas control for identifying purposes when they are to be reconnected.
5. Remove wires from gas control. If the system contains electric ignition, disconnect the ignition wire to the ignitor from its supply end at the control box mounted on the furnace.
6. Remove the burner cover from the front of the furnace by loosening the (4) screws at its upper edge, slide cover towards outlet end of furnace to allow keyholes in cover to slip over screws. Slide cover toward outlet end of furnace until it clears bracket retainer at bottom of furnace.
7. Remove (2) screws holding burner tray and cover bracket retainer located along bottom edge of furnace.
8. Disconnect gas pipe supply at union located near the furnace.
9. The vent pipe to the draft hood can be removed and the draft hood itself unfastened by removing (4) screws and lifting the hood upward from its top support hanger or remove cover plates on opposite side whichever is more convenient.
10. Remove the burner tray assembly by pulling it out through the burner tray opening.
11. Using a brush or vacuum remove any loose scale from the top restrictor plate in the top of the unit.
12. Using a drop cord light or flashlight and mirror through the burner tray opening, inspect the vertical flue passages for evidence of any heavy concentration of scale. There will be one flue passage for each burner.
13. If this inspection indicates that cleaning is necessary, it may be accomplished with the use of a wire "bottle type" brush having a flexible wire handle.
14. Any rust or scale that falls down can be removed by brushing or vacuuming. Inspect the heat exchanger cells for excessive rusting and/or holes. Replace cells as necessary to ensure proper operation of the furnace.
15. While the burner tray is out of the unit, inspect the burner ports to be sure that they are in good clean condition. Remove rust or scale by brushing or vacuuming.
16. Replace the burner tray into unit and the tray retainer.
17. Reconnect the gas piping and all wiring.
18. Reinstall the draft hood and vent piping to furnace.

WARNING: HOLES IN THE VENT PIPE CAN CAUSE TOXIC FUMES TO ENTER THE HOME, WHICH MAY CAUSE INJURY OR DEATH. THE VENT PIPE MUST BE REPLACED IF IT LEAKS.

19. If the system contains a standing pilot, this is the time to follow the lighting procedures and light the pilot (first turn on the manual gas valve that was previously turned off).
20. Replace the burner cover and tighten cover screws.
21. Turn electric power on and set thermostat to call for heat.
22. Check operation of unit. (Due to the disturbance of the furnace parts during cleaning, the burner flames may have flecks of yellow until the unit operates for a short period of time).
23. Set the room thermostat to the desired temperature.

SYSTEM OPERATION INFORMATION

1 Keep the air filters clean. Your fine heating system will operate more efficiently and provide better heating more economically.

2 Arrange your furniture and drapes so that the supply air registers and the return air grilles are unobstructed.

3 Close doors and windows. This will reduce the heating load on your system and increase the efficiency of the furnace.

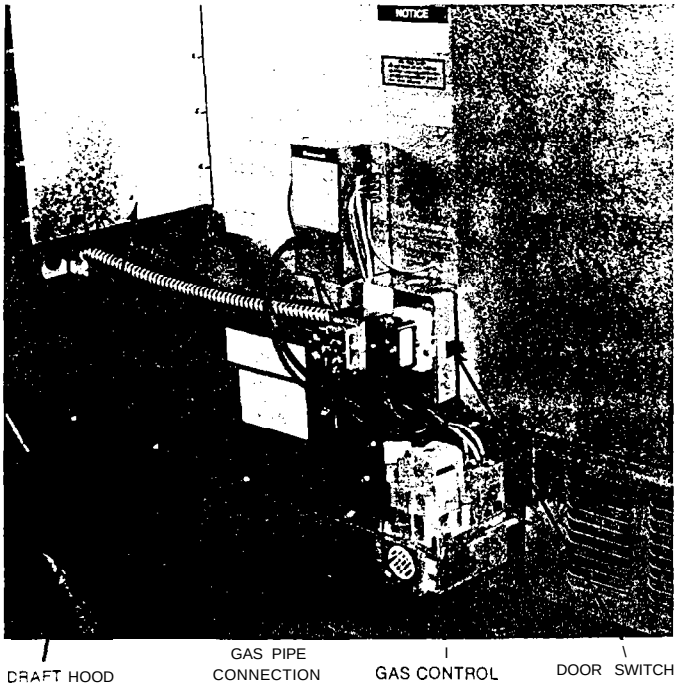


FIGURE 8

4 Avoid excessive use of kitchen exhaust fans.

5 Do not permit the heat generated by television, lamps or radios to influence the thermostat operation.

6 If you have a standing pilot system, you may elect to extinguish the pilot burner during the summer months. Some authorities have calculated a savings in excess of 3,000 cubic feet of gas without the pilot operation during the summer months.

Turn the gas valve to the "Off" position. This will prevent any further flow of gas to the pilot burner. Reread the lighting instructions prior to establishing a pilot flame at the beginning of the next heating season.

7 . Exclusive of the mounting platform, keep all combustible articles three feet from the furnace draft diverter and vent stack.

8. If you desire to operate your system with constant air circulation, please ask advice from your servicing contractor.

WARNING: BLOWER AND BURNERS MUST NEVER BE OPERATED WITHOUT BLOWER DOOR IN PLACE. THIS IS TO PREVENT DRAWING GAS FUMES (WHICH COULD CONTAIN HAZARDOUS CARBON MONOXIDE) INTO THE HOME THAT COULD RESULT IN PERSONAL INJURY OR DEATH.

LUBRICATION

The blower motor sleeve bearings are prelubricated by the motor manufacturer and may not require attention for an indefinite period of time. However, our recommendations are as follows:

A . Motors without oiling ports —

Prelubricated and sealed. No further lubrication should be required, but in case of bearing noise problems, the blower and the motor end bells can be disassembled and the bearings relubricated by a qualified service person.

B. Motors with oiling ports —

Add from 10 to 25 drops of Electric Motor Oil or an SE grade of non-detergent SAE-10 or 20 motor oil to each bearing every two years for somewhat continuous duty, or at least every five years for light duty. Take care not to over oil, because excessive lubrication can damage the motor.

In any event, clean motor periodically to prevent the possibility of overheating due to an accumulation of dust and dirt on the windings or on the motor exterior. And, as suggested elsewhere in these instructions, the air filters should be kept clean because dirty filters can restrict airflow and the motor depends upon sufficient air flowing across and through it to keep from overheating.

THERMOSTAT

Install room thermostat in accordance with instruction sheet in box with the thermostat. Connect thermostat as shown on wiring diagram. Never install thermostat on an outside wall or where it will be influenced by drafts, concealed hot or cold water pipe or ducts, lighting fixtures, radiation from fireplace, rays of sun, lamps, television, radios or air streams from register.

HEAT ANTICIPATOR SETTINGS

For thermostat heat anticipator setting; (a) add the current draw of the various components in the system or (b) measure the current flow on either the R or W thermostat circuits and set the thermostat heat anticipator according to the current flow measured.

For additional information on units with electric ignition, refer to supplemental electric ignition instructions.

Wiring to.be done in the field between the furnace and devices attached to the furnace, or between separate devices which are field installed and located, shall conform with the temperature limitations of type ''T'' wire 63°F rise (35°C) when installed in accordance with the manufacturer's instructions.

LIGHTING INSTRUCTIONS

This appliance is equipped with an intermittent type ignition device. This device lights the pilot and main burners each time the room thermostat (closes) calls for heat.

TO START FURNACE

1. CAUTION: Be *sure that the manual gas control knob has been in the ''OFF'' position for at least 5 minutes. Do not attempt* to manually *light pilot.*
2. Set room thermostat to the lowest setting.
3. Turn on gas to the automatic pilot and main gas burner(s) by turning the Manual Gas Control Knob counterclockwise to the "ON" position. (It may be necessary to depress the knob to turn on.)
4. Replace control access door (except on horizontal furnaces).
5. Turn on electrical power.
6. Set room thermostat to a point above room temperature to light pilot and main burners. After burners are lighted, set room thermostat to desired temperature.

TO SHUT DOWN FURNACE

1. Set thermostat to lowest setting.
2. Shut off gas to the automatic pilot and main gas burner(s) by turning the Manual Gas Control Knob clockwise to "OFF". (It may be necessary to depress the knob to turn off.)

SAFETY PILOT CHECK

After a run of 15 minutes, turn the valve to the "Off" position. The pilot switch should snap open between 20 seconds and 3 minutes later. To reignite pilot, follow instructions on lighting instruction label.

MANIFOLD PRESSURE ADJUSTMENT

Manifold Pressure should be set at 3.5" W.C. for natural gas. Only small variations in the gas flow should be made by means of the pressure regulator adjustment. In no case should the final manifold pressure vary more than plus or minus 0.3" W.C. from the above specified pressures. Any necessary major change in the flow should be made by changing the size of the burner orifice. Follow instructions listed previously for burner orifices. To check the manifold gas pressure, remove the 1/8'' pipe plug from the gas valve and connect to a water manometer to measure gas pressure. The gas pressure is measured with the unit operating. Turn regulator adjusting screw clockwise to increase pressure, counterclockwise to decrease pressure.

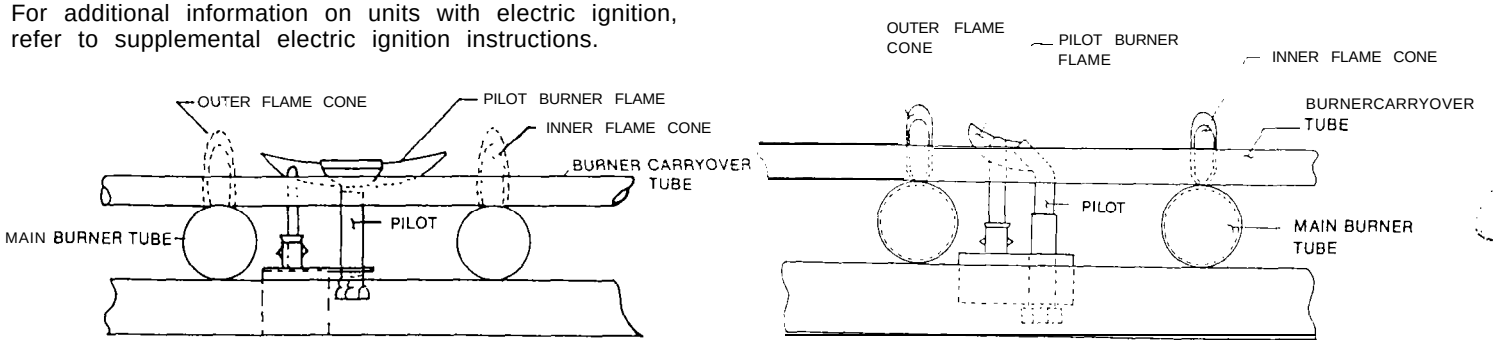


FIGURE 9

PILOT ADJUSTMENT

The pilot flame should be adjusted to provide a soft flame that surrounds the tip of the thermocouple or flame sensor, a pilot flame Of approximately one inch in length is usually adequate for ignition and maintaining the operating circuit.

A constant burning pilot will consume approximately one cubic foot of gas per hour. An electric ignition system will consume not in excess of 7 watts per hour of operation.

GAS INPUT TO FURNACE

Check of input is important to prevent over firing of the furnace beyond its design-rated input. NEVER SET INPUT ABOVE THAT SHOWN ON THE RATING PLATE. Use the following table or formula to determine input rate:

METER TIME IN MINUTES AND SECONDS FOR NORMAL INPUT RATING OF FURNACES EQUIPPED FOR NATURAL OR PROPANE GAS.

INPUT BTU/HR	METER SIZE CU. FT.	HEATING VALUE OF GAS BTU PER CU. FT.									
		900		1000		1040		1100		2500	
		MIN.	SEC.	MIN.	SEC.	MIN.	SEC.	MIN.	SEC.	MIN.	SEC.
34,000	ONE	1	35	1	45	1	50	1	56	4	24
	TEN	15	50	17	30	18	20	19	10	44	0
50,000	ONE	1	5	1	12	1	15	1	19	3	0
	TEN	10	50	12	0	12	30	13	10	30	0
70,000	ONE	0	46	0	51	0	53	0	56	2	8
	TEN	7	40	8	30	a	50	9	20	21	20
85,000	ONE	0	38	0	42	0	44	0	46	1	45
	TEN	6	32	6	35	7	20	7	40	17	30
100,000	ONE	5	30	5	50	0	36	0	39	I	28
	TEN					6	0	6	30	16	40

$$\text{Input BTU/HR.} = \frac{\text{Heating Value of Gas (BTU/Ft}^3\text{)} \times 3600}{\text{Time in Seconds (for 1cu. ft.) of Gas}}$$

Prior to checking furnace input, make certain that all other gas appliances are shut off, with the exception of pilot burners.

NOTE: Remove shipping block from direct drive blower wheels, before operating blower.

Blower speed should be adjusted to maintain the air rise range shown on the rating plate.

FAN CONTROL (See Wiring Diagrams)

The fan control starts the blower circulating warm air when the bonnet temperature reaches a predetermined temperature setting stopping it when the bonnet temperature falls below the "Off" setting. Set fan-off and fan-on temperature points as follows:

Set fan-off at 100°F and fan-on at 130°F. These settings are suggested for average installations and may be varied if necessary after heating system is in operation. (Max. fan setting permitted 130°.) If a Camstat control is used, the fan setting is fixed, not adjustable.

SAFETY CHECKS — CONTROL CIRCUIT (See Wiring Diagrams)

The safety features of the control system should be checked to assure proper operation of the furnace. After checking the firing rate of the furnace as previously outlined and finding that the system appears to be properly operating, proceed with the safety check as follows:

1 PILOT BURNER CHECK — The pilot burner safety control does not permit gas to flow through the main gas burner unless there is a pilot flame present to ignite the gas. To check this function on furnaces equipped with combination gas manifold controls remove cap from over pilot valve, adjusting screw located on top of the manifold gas control. With the main gas burner operating, use a small screwdriver and turn the adjustment screw clockwise until the pilot gas is turned off. (Note the number of turns required to do this.) Within 90 seconds of the extinguishing of the pilot flame, the main gas control should operate closing the main gas valve. Return the pilot adjustment screw to its original position and replace cap. Follow the lighting instruction in relighting the pilot.

2 FAN — LIMIT CONTROL CHECK — High limit cut-off is set at factory and needs no further adjustment for normal operation.

The limit control is calibrated to prevent the air temperature leaving the furnace from exceeding the maximum outlet temperature rating. The actual setting on the limit control to accomplish this will vary on the furnaces depending on the particular furnace and its blower and motor combination. The limit control temperature setting is factory set and should not be changed. The high limit control prevents excessive outlet air temperature by shutting off the automatic main gas valve when the maximum outlet air temperature has been reached. To check the control operation, block the air flow through the unit temporarily. The limit switch should function to turn off the automatic gas valve within a few minutes. The blower must continue to run. Remove blockage immediately after switch operates.

FIELD REVERSING CONTROLS AND FLUE PIPE CONNECTIONS

Gas Valve and Pilot Burner May be Reversed as Follows:

1. Remove the burner covers from both sides of furnace.
2. Remove burner and manifold assembly from unit.
3. Remove pilot assembly bracket from burner and 1/4'' tubing and the thermocouple connections from gas valve.

   DO NOT REVERSE BURNER TRAY ASSEMBLY.
4. Remove 4 screws holding manifold to mounting bracket and reverse to other side. Gas valve will have to be rotated 1/2 turn.
5. Install pilot assembly bracket on opposite end of burner. A new piece of 1/4'' aluminum tubing (26" long) with fittings will be required. The tubing can be routed from the pilot to the valve. The thermocouple with the unit is to be rerouted and connected to the valve.
6. Replace the burner cover supports and covers to both sides of furnace.

7. Remove the electrical controls and assemble them for installation on the opposite side of the unit. The blower door switch, which is installed in the junction box, must be installed such that it will engage the blower door. The blower switch is located to interrupt power to the furnace when the blower access door is not in place. Cut holes where impressions are located in the side pan for the fan and limit control, junction box and low voltage wiring into the blower compartment.
   Locate junction box on side of panel, drill screw holes for securing box in place. When the main junction box is reversed to the opposite side of the cabinet, the motor wires are not long enough to cross over to the new location; therefore, an additional junction box is required and can be mounted on the back of the blower housing. Run wiring into blower compartment using strain relief in box and on low voltage wiring. Drill mounting holes for fan and limit control and screw the control in place. Plug buttons must be placed into the vacated holes on the side panel. (1/2" dia. No. 45-18232-01, 7/8" dia. No. 45-18232-02, 1-1/8" dia. No. 45-18232-11).

THE DRAFT HOOD MAY BE REVERSED AS FOLLOWS:

1. Remove draft hood and support clip.
2. Relocate the flue box shield and cover plate to the opposite side of furnace.
3. Assemble the draft hood support clip at the new draft hood location.
4. Drill holes for fastening hood in position and secure in place with sheet metal screws.

REPLACEMENT PARTS

Replacement parts for service are listed in the parts folder included with these instructions.

INSTALLATION WITH COOLING EQUIPMENT FOR YEAR-ROUND AIR CONDITIONING

Furnaces with oversized motors and cooling/heating relays are designed for use in conjunction with cooling equipment to provide year round air conditioning. The blower-motor must be sized for both heating and cooling.

Heating: The blower speed is factory set to deliver required air flow at normal duct static pressure.

Cooling: When used in conjunction with a cooling unit, the furnace shall be installed parallel with or on the upstream (ahead of) side of the cooling coil to avoid condensation in the heating element. With a parallel flow arrangement, the dampers or other means used to control flow of air shall be adequate to prevent chilled air from entering furnace, and if manually operated must be equipped with means to prevent operation of either unit unless damper is in the full heat or cool position. UNITS INSTALLED IN PARALLEL REQUIRE USE OF MOTOR OPERATORS ON DAMPER FOR AUTOMATIC CHANGE OVER, OR CONTROLS — SWITCHES TO PREVENT OPERATION OF OPPOSITE CYCLE UNTIL DAMPERS HAVE BEEN REVERSED.

BLOWER ADJUSTMENT DATA

This furnace is equipped with a multi-speed direct drive motor. The air temperature rise between the return and supply plenums is noted on the rating plate. The furnace should be adjusted to obtain an air temperature rise in the range specified on the rating plate.

BLOWER PERFORMANCE

FURNACE INPUT	BLOWER SIZE	MOTOR HP	BLOWER SPEED	CFM AIR DELIVERY EXTERNAL STATIC PRESSURE INCHES WATER COLUMN							
				0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
34,000	10x7	1/6	HIGH	535	640	715	765	790	795	775	742
			LOW*	445	540	600	625	630	620	600	570
50,000	10x7	1/4	HIGH	940	1030	1105	1170	1220	1265	1300	1330
			MED	790	875	945	990	1025	1045	1055	1060
			LOW*	715	785	840	875	900	912	912	905
70,000	10x9	1/2	HIGH	1400	1545	1665	1770	1855	1930	2005	2075
			MED-HI	1355	1505	1625	1725	1805	1875	1935	1995
			MED-LO	1240	1390	1505	1590	1660	1710	1750	1785
			LOW*	1080	1195	1280	1340	1380	1405	1415	1415
85,000	11x10	3/4	HIGH	1710	1810	1905	1950	2030	2090	2160	2200
			MED-HI	1465	1580	1670	1735	1785	1815	1835	1835
			MED-LO	1185	1280	1350	1400	1435	1455	1455	1460
			LOW*	1010	1075	1125	1155	1180	1190	1195	1190
100,000	11x10	3/4	HIGH	1765	1865	1950	2025	2090	2145	2185	2210
			MED-HI	1540	1600	1655	1705	1740	1770	1780	1780
			MED-LO*	1200	1285	1345	1385	1410	1425	1435	1435
			LOW	990	1050	1095	1125	1145	1155	1155	1155

*Heating Speed

Motor Wire Colors
- Common - White
- High Speed - Black
- Medium High or Medium Speed - Blue
- Medium Low Speed - Yellow
- Low Speed - Red