INSTALLATION MANUAL

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CAUTION: READ ALL SAFETY GUIDES BEFORE YOU START TO INSTALL YOUR FURNACE.

SAVE THIS MANUAL

ALL POSITION AUTOMATIC IGNITION FURNACES

G8C / FG8 SERIES MODELS
50 - 125 MBH INPUT

UPFLOW / HORIZONTAL AUTOMATIC IGNITION FURNACES

G8C / FG8 SERIES MODELS
150 MBH INPUT



EFFICIENCY RATING CERTIFIED
Gama

DESIGN CERTIFIED

CERTIFIED

⚠WARNING

IMPROPER INSTALLATION MAY CREATE A CONDITION WHERE THE OPERATION OF THE PRODUCT COULD CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

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.

⚠WARNING

THIS PRODUCT MUST BE INSTALLED IN STRICT COMPLIANCE WITH THE ENCLOSED INSTALLATION INSTRUCTIONS AND ANY APPLICABLE LOCAL, STATE, AND NATIONAL CODES INCLUDING BUT NOT LIMITED TO, BUILDING, ELECTRICAL AND MECHANICAL CODES.

⚠WARNING

The furnace area must not be used as a broom closet or for any other storage purposes, as a fire hazard may be created. Never store items such as the following on, near or in contact with the furnace.

1. *Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners or other cleaning tools.*
2. *Soap powders, bleaches, waxes or other cleaning compounds; plastic items or containers; gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids or other volatile fluid.*
3. *Paint thinners and other painting compounds.*
4. *Paper bags, boxes or other paper products*

Never operate the furnace with the blower door removed. To do so could result in serious personal injury and/or equipment damage.

GENERAL INFORMATION

IMPORTANT - These instructions are for the use of qualified individuals specially trained and experienced in installation of this type equipment and related system components.

Installation and service personnel are required by some states to be licensed. **Persons not qualified shall not install this equipment nor interpret these instructions.**

NOTE: The words "shall" or "must" indicate a requirement which is essential to satisfactory and safe performance.

The words "should" or "may" indicate a recommendation or advice which is not essential and not required but which may be useful or helpful.

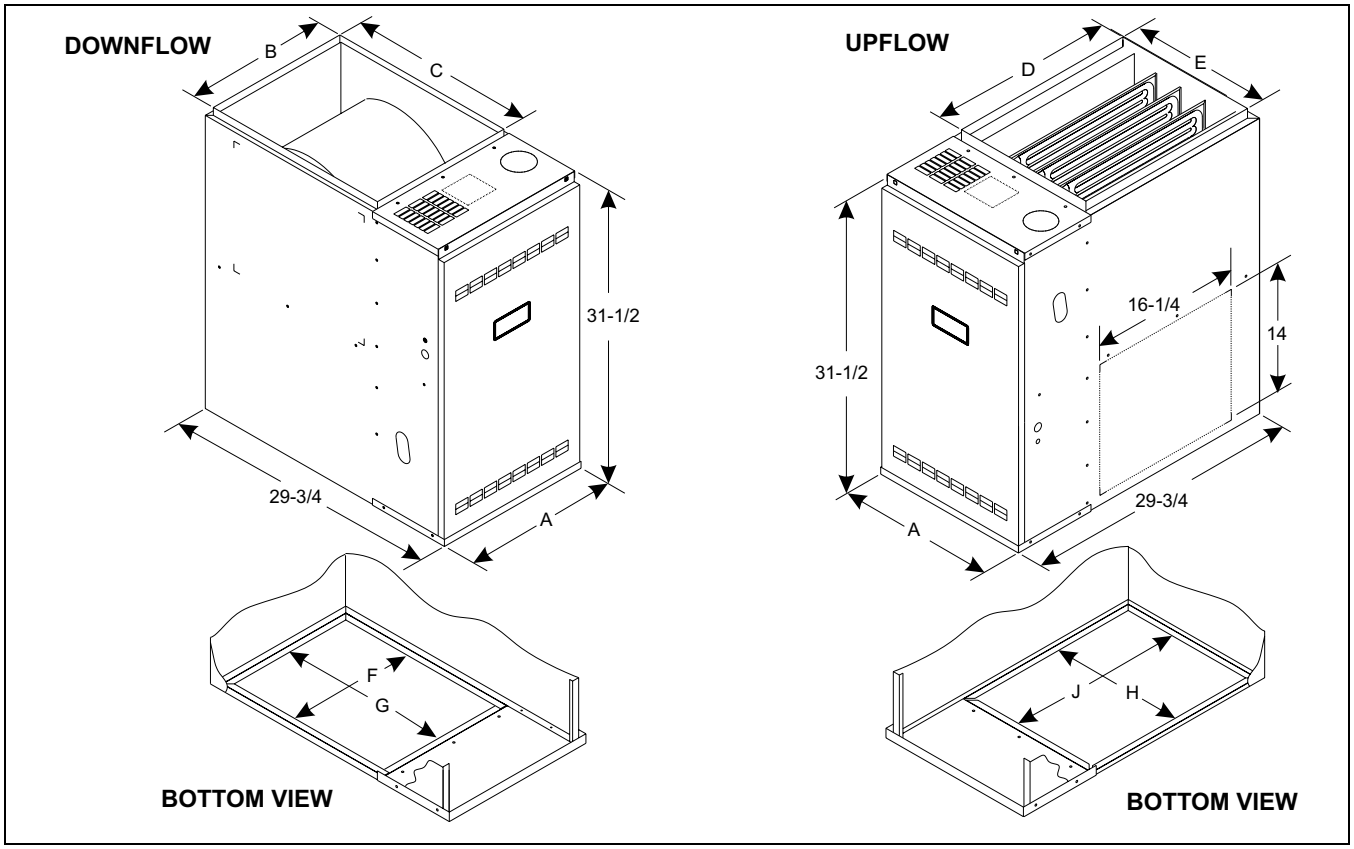
NOTE: After installing the furnace, show the user how to turn off the electrical power and gas supply to the furnace. Make sure that the user understands the importance of following all safety rules.

FURNACE SPECIFICATIONS

BTUH INPUT	BTUH OUTPUT	NOMINAL CFM	FURNACE WIDTH "A"	BLOWER WHEEL SIZE	TEMP. RISE °F	MAX OUTLET TEMP. °F	MOTOR HP	VENT DIA.	DOWNFLOW SUB-BASE
50,000	40,000	1200	17-1/2	10 x 8	30-60	160	1/3	3"	1FB0318
75,000	60,000	1200	17-1/2	10 x 8	35-65	165	1/3	4"	1FB0318
75,000	60,000	1600	21	10 x 10	30-60	160	1/2	4"	1FB0319
100,000	80,000	1600	21	10 x 10	40-70	170	1/2	4"	1FB0319
100,000	80,000	2000	24-1/2	(2) 10 x 6	35-65	165	3/4	4"	1FB0320
125,000	100,000	2000	24-1/2	(2) 10 x 6	40-70	170	3/4	5"	1FB0320
150,000**	120,000**	2000	24-1/2	(2) 10 x 6	40-70	170	3/4	5"	NA

* All models are supplied with 3" vent connections. An installer supplied transition to 4" or 5" diameter must be used where necessary.

** Upflow / Horizontal applications only.



MODEL	A	B	C	D	E	F	G	H	J
50/40/1200 75/60/1200	17-1/2	16-1/2	20-3/8	20	16	14-1/2	18-5/8	15-1/8	19
75/60/1600 100/80/1600	21	20	20-3/8	20	19-1/2	18	18-5/8	18-5/8	19
100/80/2000 125/100/2000	24-1/2	23-1/2	20-3/8	20	23	21-1/2	18-5/8	22-1/8	19
150/120/2000	24-1/2	–	–	20	23	–	–	22-1/8	19

FIGURE 1: Furnace Dimensions and Specifications

PRE-INSTALLATION INSPECTION

Inspect the shipping container and furnace for any evidence of shipping damage.

If furnace damage is found, notify freight carrier and file claim.

NOTE: Some models are equipped with a shipping strap on the blower motor shaft which supports the blower motor during shipping. This strap must be removed before the furnace is operated for the first time. It can be removed by removing the two fastening screws.

CODE COMPLIANCE

The furnaces described in these instructions are design certified to be in compliance with the latest edition of American National Standard Z21.47. In Canada, these furnaces are design certified by the Canadian Gas Association to be in compliance with the latest edition of CSA 2.3.

These furnaces are forced air type and may be utilized for indoor installation in manufactured buildings (modular only), or buildings constructed on site. These furnaces are not certified for installation in mobile homes, trailers or recreational vehicles.

The installer must conform to all state, local and provincial building codes when installing these appliances. In the absence of state, local or provincial codes, these furnaces and related equipment must be installed in accordance with the latest issue of the following:

NATIONAL FUEL GAS CODE - ANSI Z223.1
NATIONAL ELECTRICAL CODE, ANSI/NFPA 70.

Applicable codes take precedence over any recommendation made in these instructions.

In Canada, the installer must conform to the CAN/CGA-B149 Installation Codes, the Canadian Electrical Code, Part I, CSA C22.1, local plumbing or waste water codes, and other applicable local codes.

INSTALLATION POSITION (50-125 MBH MODELS)

This furnace may be installed in an upflow, downflow or horizontal position. Depending on the configuration shipped from the factory, it may be necessary to convert the furnace from downflow to upflow or from upflow to downflow configuration. Use conversion instructions in this document.

INSTALLATION POSITION (150 MBH MODELS)

This furnace may be installed in an upflow or horizontal poision. No conversion is necessary. This furnace is not approved for downflow application.

CONVERSION INFORMATION (50-125 MBH MODELS)

This furnace may be shipped in either the upflow or the downflow configuration. To convert from upflow to downflow or vice-versa it is necessary only to exchange the top and bottom casing caps and to rotate the vent blower 180 degrees. Use the step by step instructions on Pages 4, 5 & 6.

TO CONVERT FROM DOWNFLOW TO UPFLOW CONFIGURATION (50-125 MBH MODELS)

1. Lay the furnace on its back.
2. Remove the front door.
3. Remove the seven sheet metal screws that are used to fasten the top cap to the casing. Remove the top cap and save the screws.
4. Remove the four sheet metal screws that are used to fasten the bottom cap to the casing. Remove the bottom cap and save the screws.
5. Unplug the vent blower wires.
6. Disconnect the pressure hose from the vent blower.
7. Remove the four machine screws that fasten the vent blower to the vent pan and save the screws. Leave the gasket in place on the pan.
8. Remove the two extra machine screws in the vent pan front and save the screws.
9. Rotate the vent blower and transition 180° so that its outlet points to the outlet air end of the furnaces as shown in Figure 2.
10. Line up the vent blower mounting holes with the holes in the vent pan and screw it into place. Use the same machine screws that held the vent blower in place previously.
11. Install the two extra machine screws in the two open holes in the front of the vent pan See Figure 2.
12. Plug in the vent motor wires.
13. Plug the pressure hose into the vent blower.
14. Remove the rectangular knockout in the center of the top cap. See Figure 5.
15. Install the top cap at the same end of the furnace as the vent blower, using the sheet metal screws saved earlier. See Figure 2.
16. Install the bottom cap on the bottom of the furnace using the sheet metal screws saved earlier. See Figure 2.
17. The conversion is now complete. The furnace may now be installed in the upflow position or in the horizontal position on either side.

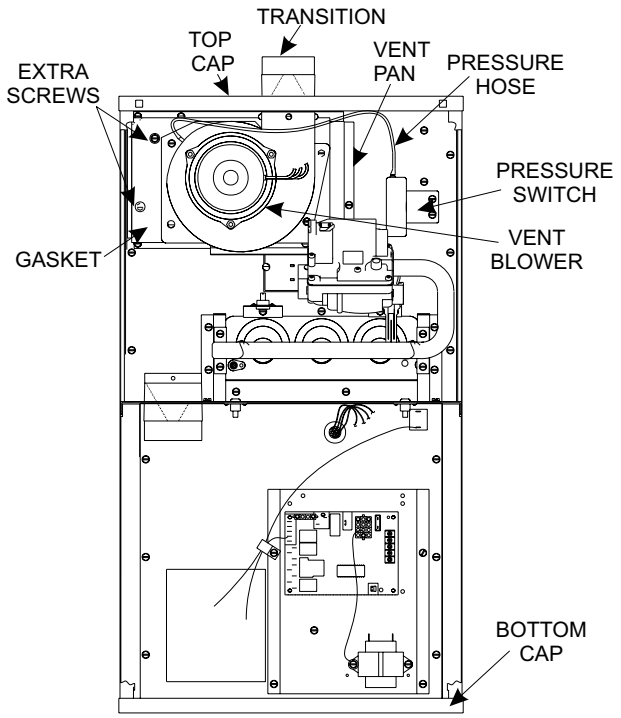


FIGURE 2 : UPFLOW/HORIZONTAL CONFIGURATION

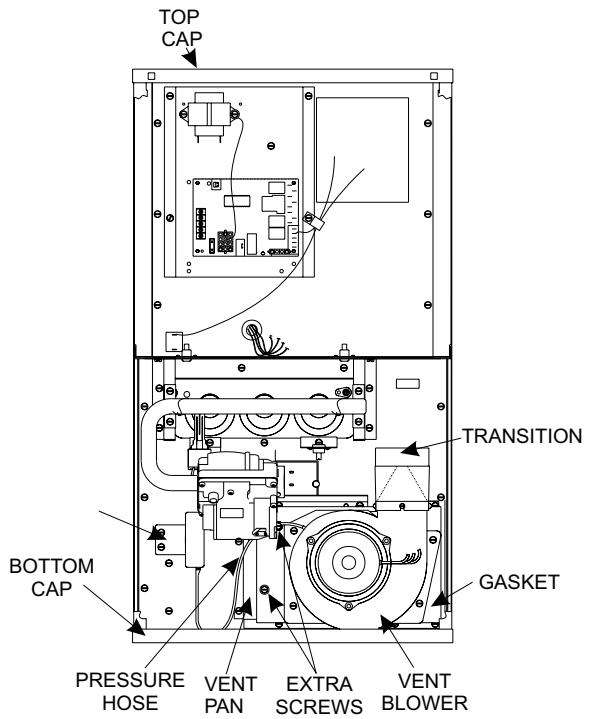


FIGURE 3 : DOWNFLOW/HORIZONTAL CONFIGURATION

TO CONVERT FROM UPFLOW TO DOWNFLOW CONFIGURATION (50-125 MBH MODELS)

1. Lay the furnace on its back.
2. Remove the front door.
3. Remove the seven sheet metal screws that are used to fasten the top cap to the casing.
4. Remove the four sheet metal screws that are used to fasten the bottom cap to the casing. Remove the bottom cap and save the screws.
5. Unplug the vent blower wires.
6. Disconnect the pressure hose from the vent blower.
7. Remove the four machine screws that fasten the vent blower to the vent pan and save the screws. Leave the gasket in place on the vent pan.
8. Remove the two extra machine screws in the vent pan front and save the screws.
9. Install the cast aluminum transition on the vent blower, using the three screws supplied on the vent blower. See Figure 4.

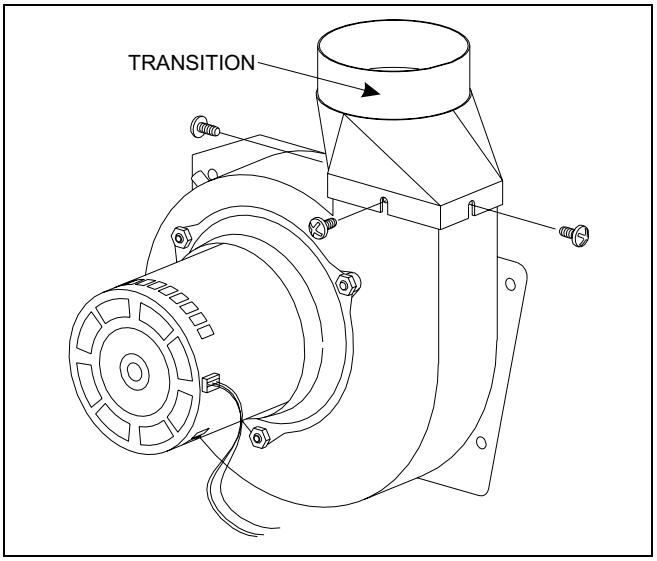


FIGURE 4: VENT BLOWER

10. Rotate the vent blower 180º so that its outlet points toward the inlet air end of the furnace. See Figure 3.
11. Line up the vent blower mounting holes with the holes in the vent pan and screw it into place. Use the same machine screws that held the vent blower in place previously.

12. Install the two extra machine screws in the two open holes in the front of the vent pan. See Figure 3.
13. Plug in the vent motor wires.
14. Plug the pressure hose into the vent blower.
15. Remove the round knockout at the right side of the top cap. See Figure 5.

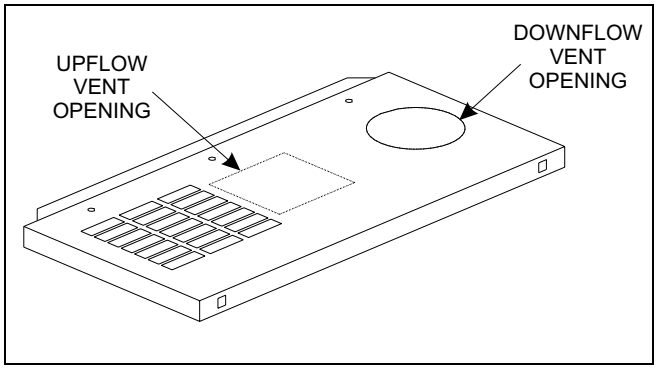


FIGURE 5 : Top Cap

16. Install the top cap at the opposite end of furnace from the vent blower, using the seven sheet metal screws saved earlier. See Figure 3.
17. Install the bottom cap on the bottom of the furnace using the sheet metal screws saved earlier. See Figure 3.
18. The conversion is now complete. The furnace may now be installed in the downflow position or in the horizontal position on either side.

FURNACE LOCATION

This furnace is design certified for installation in an alcove, closet, basement, attic, garage or utility room. The 50-125 MBH models may be installed in an upflow, downflow or horizontal position on either side. The 150 MBH model may be installed in an upflow or a horizontal left or right position. It is certified only for use in a home constructed on-site or a manufactured home completed at the final site. This furnace is not design certified to be installed outdoors, in a mobile home, trailer or recreational vehicle.

The furnace should be located as close to the chimney or vent as possible and as close to the center of the warm air distribution system as possible.

When the furnace is installed in a residential garage it must be located and installed such that it will be protected from damage by vehicles. The furnace must be installed so that the burners are a minimum of 18" above the floor.

CLEARANCES TO COMBUSTIBLE MATERIALS

Proper clearances from the furnace to any combustible materials must be maintained. These required minimum clearances are shown below and on a label in the furnace.

Minimum Clearances - Upflow

Front: . . . . . 2 inches
Back:. . . . . 0 inches
Sides: . . . . . 0 inches
Top:. . . . . 1 inch
B-1 Vent:. . . . . 1 inch
Single-wall Vent:. . . . . 6 inches
Floor . . . . . combustible:

Minimum Clearances - Downflow

Front: . . . . . 2 inches
Back:. . . . . 0 inches
Sides: . . . . . 0 inches
Top:. . . . . 1 inch
B-1 Vent:. . . . . 1 inch
Single-wall Vent:. . . . . 6 inches
Floor: . . . . . non-combustible

For installation on combustible flooring only when installed on the special downflow sub-base listed in the Specifications Table on Page 3.

Minimum Clearances - Horizontal

Front: . . . . . 2 inches
Back:. . . . . 0 inches
Ends: . . . . . 1 inch
Top:. . . . . 1 inch
B-1 Vent:. . . . . 1 inch
Single-wall Vent:. . . . . 6 inches
Floor: . . . . . combustible

When the furnace is installed in the horizontal position, line contact is permissible. The line formed by the intersection of the top and sides of the furnace may be in contact with combustible material.

⚠WARNING

Do not install the furnace on its back. Doing so could cause a fire, resulting in damage, injury or death.

Provide sufficient space around and in front of the furnace for service and cleaning. Allow a minimum of 24 inches from the front of the furnace for service clearance. If the furnace is to be installed in a close clearance closet, the door should be of adequate size to allow for removal of the furnace should it become necessary.

⚠WARNING

Failure to maintain proper clearances to combustible materials can cause a fire, which could result in damage, death or personal injury.

NOTE: This furnace must be installed so the electrical components are protected from water.

INSTALLATIONS ON COMBUSTIBLE FLOORING (50-125 MBH Models)

This furnace may not be installed directly on combustible materials in the downflow position. It may be installed directly on floors made of concrete or other-non-combustible materials. If it is necessary to install the furnace in the downflow position on a combustible floor, it is required that a combustible sub-base be used. The part number of the correct sub-base accessory is shown in the specification Table on Page 3.

COMBUSTION AND VENTILATION AIR

Provide ventilation and combustion air in accordance with 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. In Canada, refer to the latest edition of the CAN/CGA-B149 Installation Code and local codes for specifics.

⚠WARNING

Adequate ventilation and combustion air must be provided to insure satisfactory and safe operation of the furnace. Air openings in front panel and top panel must not be obstructed. Failure to observe this recommendation could result in asphyxiation.

Do not store or use halogen emitting substances in the vicinity of this appliance. Such substances include chlorine based cleaners and swimming pool chemicals, water softening chemicals, deicing salts and chemicals, cleaning solvents such as carbon tetrachloride or perchloroethylene, halogen type refrigerants, printing inks, paint and paint removers, varnishes, hydrochloric acid, cements and glues, and masonry acid washing materials. The air used by the burner for combustion must be free of halogens to avoid possible corrosion to the heating surfaces, which could result in asphyxiation.

IMPORTANT - This furnace is not to be used as a construction heater to supply heat to an unfinished building during the finishing phases of construction. This practice exposes the furnace to abnormally low return air temperatures, which can cause condensation in the furnace or vent leading to premature failure. This practice also exposes the furnace to an abnormally corrosive atmosphere from sources such as paint, varnish and adhesives, which can lead to premature heat exchanger or vent failure. The practice also allows foreign materials such as sawdust or sheet rock dust to enter the furnace blower, burner, heat exchanger, motors, and vent system resulting in shorter life of the furnace. **Use of this furnace as a construction heater will void the warranty.**

INSTALLATIONS IN A CONFINED SPACE

A confined space is defined as a space whose volume is less than 50 cubic feet per 1000 BTUH of the total input ratings of all appliances installed in the space. If the furnace is to be installed in a confined space such as a small closet or room, provisions must be made for supplying combustion and ventilation air to the space surrounding the furnace. (See Figure 6). This air must come from the outside or from some larger area in the building which meets the requirements of an unconfined space.

Two openings of equal area must be provided; one starting within twelve inches of the ceiling and one starting within twelve inches of the floor of the confined space. The upper opening must always be above the top of the furnace casing. The lower opening, if in the sidewall, floor or door, shall be located below the level of the burner in the furnace.

If all air is from inside building, the total free area of each opening must be at least one square inch for each 1,000 BTUH of furnace input but not less than 100 square inches.

If all air is from outdoors, when communicating directly with the outdoors through vertical ducts, the total free area of each opening must be at least one square inch for each 4,000 BTUH of furnace input. When communicating directly with the outdoors through horizontal ducts, the total free area of each duct must be at least one square inch for each 2,000 BTUH of furnace input.

When ducts are used, 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 three inches.

INSTALLATION IN AN UNCONFINED SPACE

An unconfined space is defined as a space whose volume is more than 50 cubic feet per 1000 BTUH of the total input ratings of all appliances installed in the space. In unconfined spaces in a building of conventional frame, masonry, or metal construction, infiltration is normally adequate to provide air for combustion and ventilation.

In buildings of tight construction, all air must be obtained from outdoors or from spaces communicating freely with outdoors. A permanent opening or openings having a total free area of not less than one square inch for each 5000 BTUH of furnace input must be provided.

If the furnace is to be installed in a commercial building, a building with an indoor pool, a laundry room, hobby or craft room, or chemical storage area, all air must be brought in from outside as described above.

Further details on supplying outdoor air for combustion may be obtained from Section 5.3 of the National Fuel Gas Code ANSI Z223.1. In Canada, refer to the latest edition of the CAN/CGA-B149 Installation Code and local codes for specifics.

⚠WARNING

When the furnace is installed in an attic or other insulated space, make sure that all insulation is at least 12" away from furnace combustion air openings. Failure to do this could cause asphyxiation or fire.

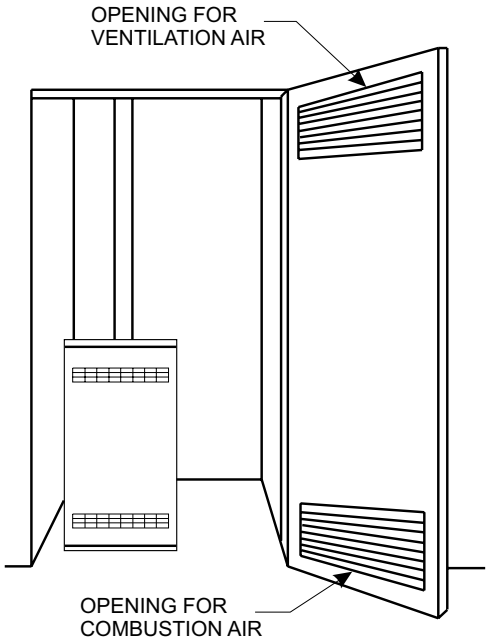


FIGURE 6: AIR OPENINGS

FURNACE SIZING AND DUCT SYSTEM DESIGN

The duct system must be installed in conformance with ASHRAE/NFPA 90, Standard for Installation of Warm Air Heating and Air Systems and other applicable local codes. Failure to adhere to proper duct system design standards can reduce airflow, resulting in reduced system performance and possible furnace damage.

Consideration should be given to the heating capacity required and also to the air quantity (CFM) required if A/C is to be installed along with the furnace or at some future time. These factors can be determined by calculating the heat loss and heat gain of the home or structure.

If these calculations are not performed and the furnace is oversized, the following may result:

1. Short cycling of the furnace.
2. Wide temperature fluctuations from the thermostat setting.
3. Reduced overall operating efficiency of the furnace.

The supply and return duct system must be of adequate size and designed such that the furnace will operate within the designed air temperature rise range and not exceed the maximum designed static pressure. These values are listed in the table below.

	EXT. STATIC IN. W.C.	
INPUT BTUH	**MINIMUM**	**MAXIMUM**
50,000	.10	.50
75,000	.12	.50
100,000	.15	.50
125,000	.20	.50
150,000	.20	.50

Additional information, values and data necessary for heat loss, heat gain and duct system design may be found in the ASHRAE HANDBOOK OF FUNDAMENTALS or in other nationally recognized publications recognized by municipal, state, provincial and federal code authorities.

If possible, it is recommended that the supply air duct attached to the furnace be provided with a removable access panel. The opening should be accessible when the furnace is installed in service and should be large enough that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover panel for this opening should be attached in such a manner as to prevent leaks.

A/C USAGE DUCT SYSTEMS

1. When a single (common) duct system is used, one of the following methods shall be used:
   a. A plenum type cooling coil must be installed on the air discharge side, or
   b. A blower-coil type cooling coil must be installed in parallel with and isolated from the furnace, or
   c. A self-contained A/C unit must be in parallel with and isolated from the furnace.

⚠WARNING

Dampers must be installed when a coil-blower or self-contained unit is employed to prevent conditioned cool air from coming in contact with the heat exchanger to avoid moisture condensation and rust-out. This can allow products of combustion to be circulated into the living area by the furnace blower resulting in possible asphyxiation. If dampers are of a manually operated type, a means must be provided to prevent either the furnace or A/C unit from operating unless dampers are in full heat or cool position.

2. If two duct systems are used as could be the case with a coil-blower or a self-contained A/C unit, the furnace and A/C unit should be controlled by a single combination heating and cooling thermostat which will prevent the furnace and A/C unit from operating simultaneously.

⚠ CAUTION

If a separate heating and separate cooling thermostat is used, a manually operated electrical interlock switch must be installed to prevent simultaneous operation of both systems and to avoid a possible hazardous condition due to overheating of the conditioned space.

RETURN AIR AND FILTERS

RETURN AIR TEMPERATURE

This furnace design is to be operated in normal household temperatures. The continuous return air temperature must not be below 60°F or above 85°F.

RETURN AIR CONNECTION - UPFLOW (All Models)

The return air may be brought in through the bottom of the furnace or through one or both sides of the furnace casing. The furnace casing may be cut out so that side return air connections may be used. The furnace is supplied with flanges on the top of the furnace to which the return air duct may be fastened. The casing top is embossed to indicate where to bend the flanges. If a side return is to be used, cut out the side of the casing 14" high by 16 1/4" wide using the lances in the casing side as a guide. **DO NOT CUT THE OPENING LARGER THAN 14"x 16 1/4".** It is not permissible to cut out the back of the furnace.

⚠WARNING

When side return air ducts are used, a solid metal block-off panel must be used to block the bottom opening in the furnace. Failure to do so could cause flue gases to be drawn into the living space, which could result in asphyxiation.

The return air ducts to the furnace must have a total cross sectional area of not less than two square inches per 1000 BTUH of furnace input rating for heating operation. **If air conditioning is to be installed with the furnace, or if it may be added at a later time, larger return air ducts may be required, depending on the capacity of the air conditioner and the airflow required.**

⚠WARNING

For applications requiring more than 1800 CFM, it is required to use the bottom return, both side returns or one side plus the bottom return.

- No single side return allowed on 5 Ton models
- 18” minimum height for return air box for bottom return only on Heating only applications with furnace in the upflow configuration.
- 24” minimum height for return air box for bottom return only on A/C applications with furnace in the upflow configuration.

RETURN AIR CONNECTION - DOWNFLOW (50-125 MBH Models Only)

The return air connection to the furnace must be attached to the top of the furnace. It is not permissible to cut out the side of the furnace casing for side return ducts. The furnace is supplied with flanges on the top of the furnace to which the return air duct may be fastened. The casing top is embossed to indicate where to bend the flanges.

The return air ducts to the furnace must have a total cross sectional area of not less than two square inches per 1000 BTUH of furnace input rating for heating operation. If air conditioning is to be installed with the furnace, or if it may be added at a later time, larger return air ducts may be required, depending on the capacity of the air conditioner and the airflow required. The return air opening in the top of the furnace is large enough for the largest capacity air conditioner for which the furnace blower is rated.

RETURN AIR CONNECTION - HORIZONTAL (All Models)

The return air duct must be connected to the inlet end of the furnace. It is not permissible to cut out the side of the furnace casing for side return ducts. The furnace is supplied with flanges on both ends of the furnace to which the supply and return air ducts may be fastened. The casing is embossed on both ends to indicate where to bend the flanges.

The return air ducts to the furnace must have a total cross sectional area of not less than two square inches per 1000 BTUH of furnace input rating for heating operation. If air conditioning is to be installed with the furnace, or if it may be added at a later time, larger return air ducts may be required, depending on the capacity of the air conditioner and the airflow required. The return air opening in the top of the furnace is large enough for the largest capacity air conditioner for which the furnace blower is rated.

⚠WARNING

When the furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air must also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. Failure to do so can result in asphyxiation.

FILTERS

Air filters must be used with this furnace. Failure to do so will cause dirt to accumulate on the furnace blower motor, blower wheel, heat exchanger and air conditioning coil, resulting in reduced system efficiency, erratic control performance and possible equipment damage.

Air velocity must not exceed 300 feet per minute through low velocity disposable filters. Air velocity must not exceed 650 feet per minute through high velocity cleanable permanent filters. Use of a filter that is too small will cause static pressure in the duct system to be too high, which will have an adverse effect on heating and cooling operation.

DOWNFLOW (50-125 MBH Models Only)

Filters must be mounted in a location where they are easily accessible for replacement, either behind a central return air grille or in a filter box mounted on top of the furnace as shown in Figure 7. A filter rack is supplied with the furnace. The table below lists the minimum filter sizes.

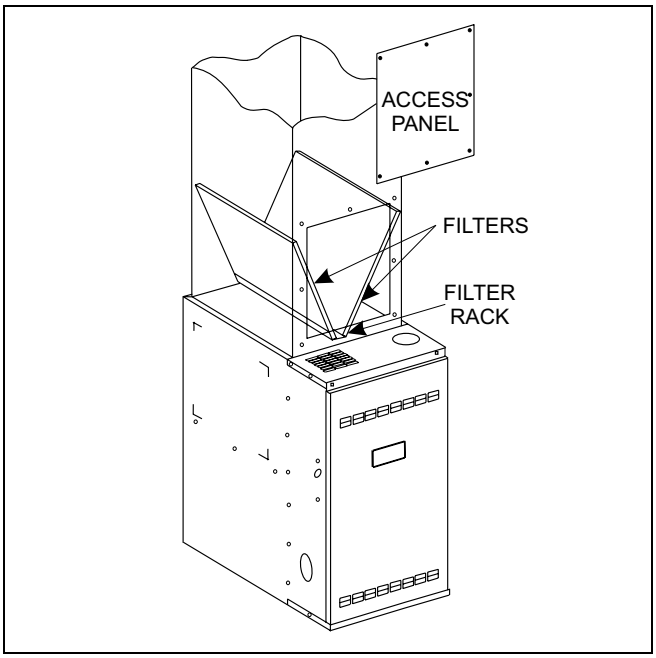


FIGURE 7: Downflow Filters (50-125 MBH models only)

BTUH INPUT	BTUH OUTPUT	NOMINAL CFM	FURNACE WIDTH	CLEANABLE FILTER	DISPOSABLE FILTER
50,000	40,000	1200	17-1/2	14 x 20	(2) 10 x 20
75,000	60,000	1200	17-1/2	14 x 20	(2) 14 x 20
75,000	60,000	1600	21	16 x 20	(2) 16 x 20
100,000	80,000	1600	21	16 x 20	(2) 16 x 20
100,000	80,000	2000	24-1/2	20 x 20	(2) 20 x 20
125,000	100,000	2000	24-1/2	20 x 20	(2) 20 x 20

UPFLOW

An appropriately sized permanent cleanable or disposable filter shall be used. The filter should be installed in a side return filter rack or, if bottom return is to be used, in a suitable filter box under the furnace. Filters must be located external to the furnace casing. See Figure 8.

HORIZONTAL

An appropriately sized permanent cleanable or disposable filter shall be used. The filter should be installed behind a return grille or other location with easy access for filter change. Locating the filter in a crawl space, attic or other inaccessible location will result in filters not being changed as frequently as recommended.

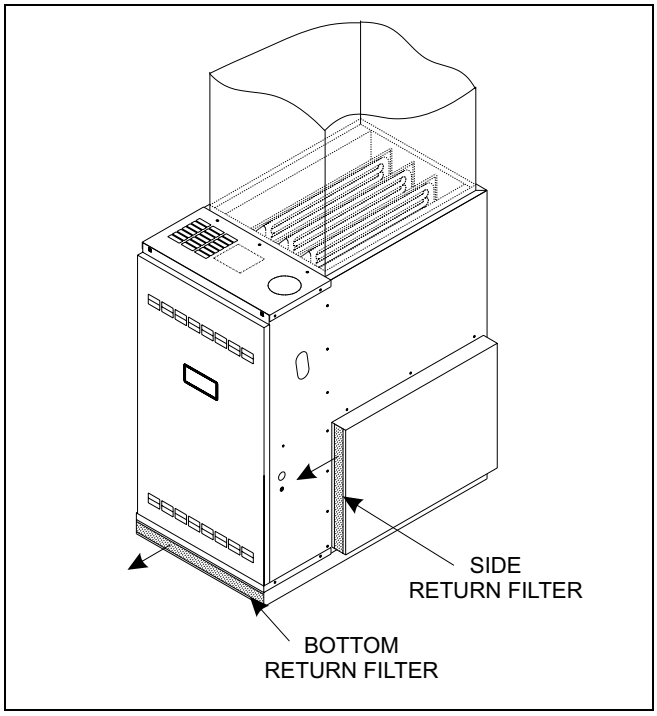


FIGURE 8: Upflow Filters

GAS PIPING

⚠WARNING

Use only the type of gas for which the furnace is equipped. Using the wrong gas could create a hazard, resulting in damage, personal injury or death.

Before installing gas piping, check with local code authorities for requirements concerning gas piping.

In the absence of local codes, follow the recommendations contained in NATIONAL FUEL GAS CODE ANSI Z223.1 for gas piping materials, pipe sizing, and the requirements for installation. In Canada, refer to the latest edition of the CAN/CGA-B149 Installation Code and local codes for specifics. It is recommended that a gas cock shutoff valve be installed in the gas supply line outside the casing, where it is readily accessible, as close to the furnace as is practicable, as shown in Figures 9, 10 and 11.

An 1/8 in. NPT (plugged) pressure tap for test gauge connection must be installed in the gas supply line immediately upstream from the furnace, if local authorities do not allow use of the pressure tap in the gas valve for this purpose.

Install a dirt leg at the bottom of any vertical riser or drop, as close to the furnace as possible, to collect moisture and foreign material. Install a ground joint union just ahead of the gas control valve. A typical downflow arrangement is shown in Figure 9. A typical upflow arrangement is shown in Figures 10, 11.

When making the connection at the gas control valve, use a wrench on the inlet side of the valve to prevent any possible twisting of the valve body, which could cause damage and leaks. When making up pipe joints, use pipe thread compound which is resistant to natural and LP (propane) gases.

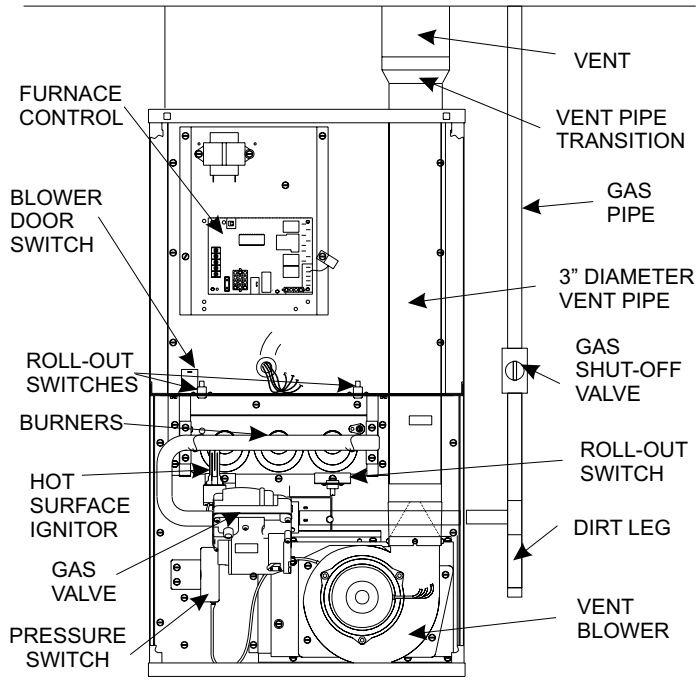


FIGURE 9: Downflow Configuration (50-125 MBH Models Only)

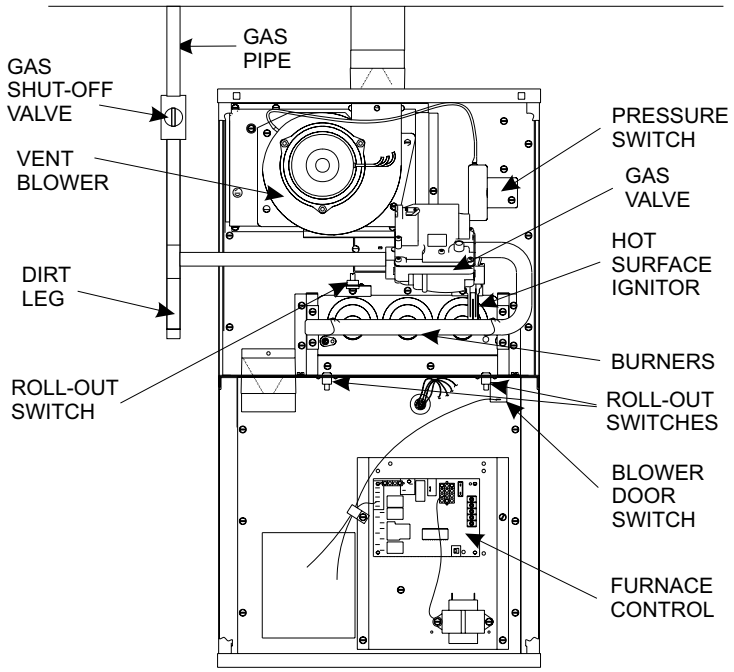


FIGURE 10: Upflow Configuration (50-125 MBH Models Only)

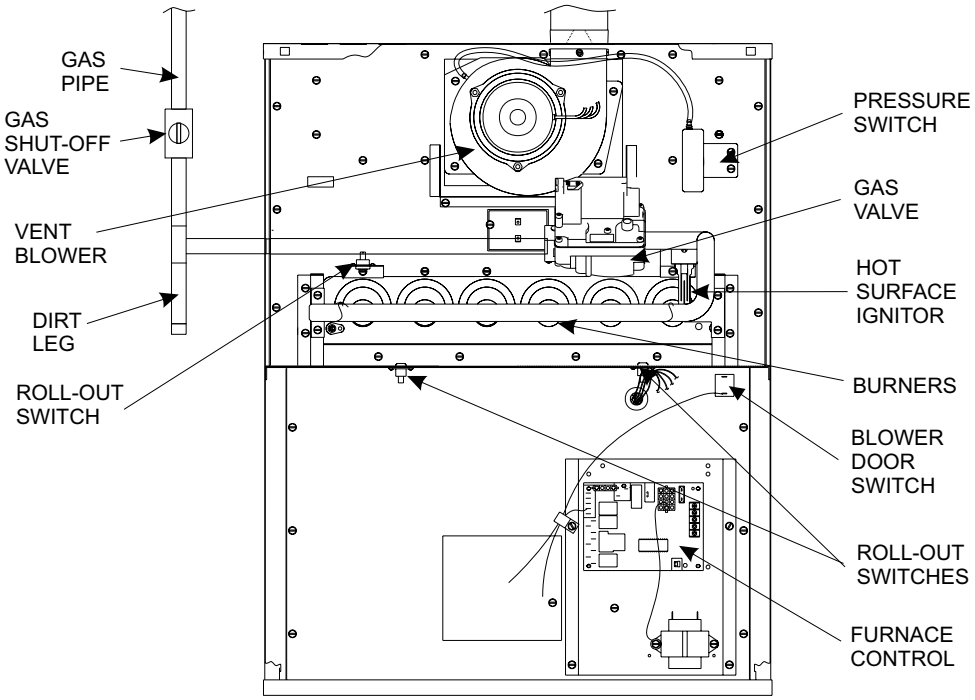


FIGURE 11: Upflow/Horizontal (150 MBH Model Only)

Unless prohibited by local codes, it is permissible to use a flexible corrugated metal gas connector for the last section of gas piping connected to the furnace gas valve. If a flexible connector is used, it must be certified to be in compliance with ANSI Standard Z21.24 or, in Canada, with Standard CAN1-6.10.

Following installation of the piping, first ensure that the gas control lever or switch on the gas valve is in the off position and then pressurize the system with gas. Thoroughly check the piping system for leaks.

⚠ CAUTION

During pressure testing of the gas supply piping system, observe the following to avoid fire, explosion, asphyxiation, or damage to the appliance.

a. If test pressure is less than or equal to 1/2 psig (3.48 kPa)(14" W.C.), isolate the furnace by closing its individual manual shutoff valve.

b. If test pressure is greater than 1/2 psig (3.48 kPa)(14" W.C.), the furnace and its individual shutoff valve must be disconnected from the gas supply system.

⚠ CAUTION

Never use an open flame to check for leaks. Fire or explosion could occur. Since some leak solutions, including soap and water, may cause corrosion or stress cracking, the piping must be rinsed with water after testing unless it has been determined that the leak solution is non-corrosive.

The maximum and minimum gas supply pressure required at the inlet of the gas control valve is shown on the unit rating plate. When the furnace is in operation, the inlet pressure must be within the limits shown.

VENTING (CATEGORY I)

This furnace is a fan-assisted Category I furnace which operates with a non-positive vent static pressure and has a flue loss of not less than 17 percent. It may be vented vertically using B-vent (Category I) or it may be vented horizontally through a sidewall by using an approved accessory power venter. For sidewall venting, follow the instructions accompanying the power venter and the additional instructions in the section on sidewall venting beginning on Page 16.

The vent installation shall be in accordance with Part 7, Venting of Equipment, of the NATIONAL FUEL GAS CODE, ANSI Z223.1, or applicable provisions of the local building codes. In Canada, for more information regarding vent design and installation, refer to the latest edition of the CAN/CGA-B149 Installation Code.

1. This furnace must be connected to a factory built chimney or vent complying with a recognized standard, or a masonry or concrete chimney lined with a lining material acceptable to the authority having jurisdiction.
2. The vent material can be single wall or B-1 (type B vent with one-inch clearance) for the first five feet from the furnace. Beyond five feet it must be B-1 or a permanent, lined chimney.
3. Maintain minimum six-inch clearance to combustible material for single wall vent and one inch clearance for B-1 vent.
4. When using listed B-1 vent materials and/or a listed Manufactured chimney, they must be installed in accordance with the manufacturer's installation instructions and the terms of the listing.
5. If horizontal vent pipe is required, it should be as short as possible and pitch upward toward the vertical riser or chimney inlet at least 1/4" per foot to help insure proper venting.
6. Where two or more appliances are connected to a common vent or flue, use the vent tables in the venting booklet supplied with this furnace to determine the proper vent connector size.
7. DO NOT USE dampers or restrictors in vent piping or flue.
8. Vent pipe sections must be securely fastened together and fastened to the furnace flue collar using screws where required.
9. Joints in the vent pipe must be securely made and any horizontal run of the vent pipe must be supported less than one support every three feet to prevent sagging.
10. This furnace may be common vented with a water heater or other gas-fired naturally vented appliance

⚠ CAUTION

This furnace must not be connected into any portion of a mechanical draft system operating under positive pressure.

This furnace must not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

VENT SYSTEM SIZING

Refer to the venting tables in the NATIONAL FUEL GAS CODE, ANSI Z223.1 for details on proper sizing of the vent system for this furnace. The furnace is supplied with a three-inch diameter vent connection. Some models require four inch or five inch diameter vent pipe. The “Furnace Specification” Table on Page 3 lists the proper size of vent connector pipe for each model of furnace. If a vent pipe of more than three inch diameter is required for the furnace being installed, the installer must supply a suitable transition.

VENTING INTO AN EXISTING CHIMNEY

Whenever possible, B-1 metal pipe should be used for venting. Where use of an existing chimney is unavoidable, the following rules must be followed:

1. The masonry chimney must be built and installed in accordance with nationally recognized building codes or standards and must be lined with approved fire clay tile flue liners or other approved liner material that will resist corrosion, softening, or cracking from flue gases. THIS FURNACE IS NOT TO BE VENTED INTO AN UNLINED MASONRY CHIMNEY.
2. This furnace may be vented into a fire clay tile lined masonry chimney only if a source of dilution air is provided, such as by common venting with a draft hood equipped water heater. If no such source of dilution air is available, Type B vent must be used, or masonry chimney vent kit 1CK0603 or 1CK0604 must be used. See instruction 035-17452-000 to properly apply these masonry chimney kits. The existing chimney may also be used as a chase for the Type B vent.
3. The chimney 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 the building within a horizontal distance of ten feet.
4. The chimney must extend at least five feet above the highest equipment draft hood or flue collar.

INSPECTION OF EXISTING CHIMNEY

1. Before connecting the vent connector to a chimney, the chimney passageway must be examined to ascertain that it is clear and free of obstructions and must be cleaned if previously used for venting solid or liquid fuel-burning appliances or fireplaces.
2. Clean-outs must be examined to determine that they will remain tightly closed when not in use.
3. When inspection reveals that an existing chimney is not safe for this application, it must be rebuilt to conform to nationally recognized standards, lined or relined with a suitable liner, or replaced with a suitable vent or chimney.

VENTING WITH METAL PIPE

Type B (double wall) vents must extend in a generally vertical direction with offsets exceeding 45 degrees, except that one horizontal run may be allowed. Any angle greater than 45 degrees from the vertical is considered horizontal. The total horizontal run of a vent, plus any horizontal vent connector, must not be greater than 75% of the vertical height of the vent. A Type B vent must terminate at least five feet in vertical height above the highest connected equipment draft hood or flue collar.

VENT CONNECTION

The furnace is supplied with a three-inch diameter vent connection at the vent blower. For installations where the vent passes in front of the blower compartment (downflow and some horizontal), a two-foot long section of three-inch diameter single-wall vent pipe should be used to extend the vent outside of the furnace casing. This section of the vent pipe may be installer supplied, or factory accessory part number 2802-312P may be used. If a transition to type B vent is to be done, the transition should be outside of the furnace casing. If a transition to a larger size vent pipe is required, the transition should be outside of the furnace casing.

VENT CONNECTOR SIZING

A vent connector must be sized properly for the equipment connected to it. The furnace is supplied with a three-inch diameter vent connection. Some models require four inch or five inch diameter vent pipe. The specification table on Page 3 lists the proper size of vent connector pipe for each model of furnace. If a vent pipe of more than three inch diameter is required for the furnace being installed, the installer must supply a suitable transition. Use the vent tables in the NATIONAL FUEL GAS CODE, ANSI Z223.1 to determine the proper vent connector size.

The vent connector must be as short as possible and the furnace should be located as close as practicable to the chimney or vent.

The horizontal run of a vent connector must not be more than 75% of the height of the vertical portion of the chimney or vent above the connector.

A vent connector must not pass through any ceiling, floor, firewall, or fire partition. A single-wall metal pipe vent connector must not pass through any interior wall.

CONDENSATION

These furnaces are not intended to have condensation occur in the furnace or in the venting system. Such condensation can cause corrosion and premature failure of the vent system, leading to possible asphyxiation. In most cases, condensation is a result of an oversized vent system. When sizing the vent system for this furnace, the vent pipe size should be kept to the minimum allowable according to the vent tables in the National Fuel Gas Code. Where local experience indicates that condensation may be a problem, the following steps should be taken:

1. Usage of single-wall vent pipe should kept to a minimum and should never be used in any unheated space.
2. As noted above, all masonry chimneys must be lined with the liner sized no larger than is necessary for the capacity of the attached appliances.
3. If local codes permit, the outside of metal vent pipe may be insulated with a noncombustible insulating material.
4. If necessary, the furnace-circulating blower may be set to a lower speed, which will raise the flue temperature slightly. However, the temperature rise across the furnace must not exceed the maximum listed in the specification table in these instructions and on the furnace rating plate.

In certain conditions, condensation in a lined masonry chimney may be unavoidable. In such cases, provisions must be made to drain off and dispose of condensate to avoid damage to the chimney.

FURTHER INSTRUCTIONS

For more details on venting or other aspects of gas appliance installation, consult the NATIONAL FUEL GAS CODE, ANSI Z223.1. In Canada, consult the CAN/CGA-B149 Installation Code. It is highly recommended that all gas appliance installers and servicemen have a copy of this manual.

REPLACEMENT OF EXISTING FURNACE ON COMMON VENT SYSTEM

When this furnace is installed as a replacement for an old furnace, which is common vented with a water heater or other gas appliance, and the new furnace is no longer connected to the common venting system, the common vent system may be too large for the appliances remaining on the vent system after the old furnace is removed. To test for an oversized vent system, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

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

3. 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.

4. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after five minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. 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 condition of use.
7. If improper venting is observed during any of the above tests, the common venting system must be corrected. Any changes to the venting system must be in accordance with the National Fuel Gas Code, ANSI Z223.1. In Canada, any changes to the venting system must be in accordance with the latest edition of the CAN/CGA-B149 Installation Codes and applicable local codes. If any portion of the common venting system must be resized, it should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1 or in Canada, the latest edition of the CAN/CGA-B149 Installation Code.

SIDEWALL VENTING

For applications where vertical Category I venting is not possible, the only recommended method of sidewall venting is through the use of an accessory power venter. Only power venters approved by a nationally recognized approval agency may be used.

Approved power venters are Tjernlund Models GPAK-JT or GPAK-1T and Field Controls Models PVG-2 or SWG-4HD. For installation details, follow the installation instructions supplied with the power venter.

⚠WARNING

When sidewall venting these furnaces with a power venter, it is required that a barometric draft damper be installed in the vent near the furnace. Failure to do so could cause a malfunction of the furnace resulting in asphyxiation.

NOTE: It is recommended that a post-purge timer be used. This is a device that keeps the power venter in operation for a short period at the end of each burner cycle in order to clear out all flue gases from the vent. Manufacturers of power venters also can supply post-purge timers.

ELECTRICAL WIRING

All internal wiring has been made at the factory. Field wiring requires only the connection of line voltage supply wiring and low voltage thermostat wiring.

Service wiring and control wiring may be brought into the furnace through either side using the holes provided.

Refer to the unit rating plate and specification tables found in these instructions for applicable electrical characteristics and requirements. A complete wiring diagram is supplied on Page 19.

SERVICE WIRING

Field wiring connections should be made inside the furnace casing and a suitable strain relief should be used at the point the wires exit the furnace casing. In order for the electrical controls in the furnace to operate properly, correct electrical polarity must be observed. If the furnace does not work on initial start-up and the diagnostic light on the furnace control flashes nine times, the polarity is reversed. Field wiring of the unit should conform to local codes or in the absence of local codes with the National Electrical Code ANSI/NFPA 70. In Canada, field wiring of the unit should conform to local codes or in the absence of local codes with the Canadian Electrical Code.

A separate fused circuit from the main electrical panel should serve only the furnace.

ELECTRICAL GROUNDING

The furnace casing must have an uninterrupted electrical ground in accordance with the National Electrical Code ANSI/NFPA 70 or, in Canada, with the Canadian Electrical Code, CSA C22.1. DO NOT use gas piping as an electrical ground.

CONTROL WIRING

The thermostat should be installed in accordance with the manufacturer's instructions, furnished with the thermostat, and make connections to the unit as shown on the unit-wiring diagram. It is recommended that size 18 AWG wire be used.

HEAT ANTICIPATOR

If the wall thermostat has an adjustable heat anticipator, the setting should be .48 amps. If any accessories are to be connected to the furnace, the heat anticipator setting may change. Use a suitable ammeter to measure the actual anticipator current.

ACCESSORIES

A humidifier or electronic air cleaner may be used with this furnace. All accessories should be wired according to the manufacturer's instructions.

The furnace control board has a terminal marked EAC, which may be used to power an electronic air cleaner accessory. This terminal is energized with 115 volts whenever the furnace circulating air blower is operating in either heating or cooling speed.

The furnace control board has a terminal marked HUM, which may be used to power an humidifier accessory. This terminal is energized with 115 volts whenever the wall thermostat calls for heat.

Make sure that the total load on the furnace transformer does not exceed 40 VA, including gas valve, furnace relays, accessories, and air conditioner loads.

Do not attempt to wire an electronic air cleaner into the furnace blower relay. Damage to the furnace blower motor may result.

TWINNING

When two furnaces are installed using the same duct system, it is very important that the two furnace circulating air blowers operate simultaneously. If one blower starts before the second blower, the duct system will become pressurized with air and the second blower will be made to turn backwards. During heating operation, this will cause overheating of the second furnace, possibly causing an unsafe condition and damage to the furnace. The furnace control board has a terminal marked TWIN which can be used to cause two furnace blowers to operate together.

If two furnaces are to be twinned using a single wall thermostat, connect an isolation relay as shown in Figure 12 below.

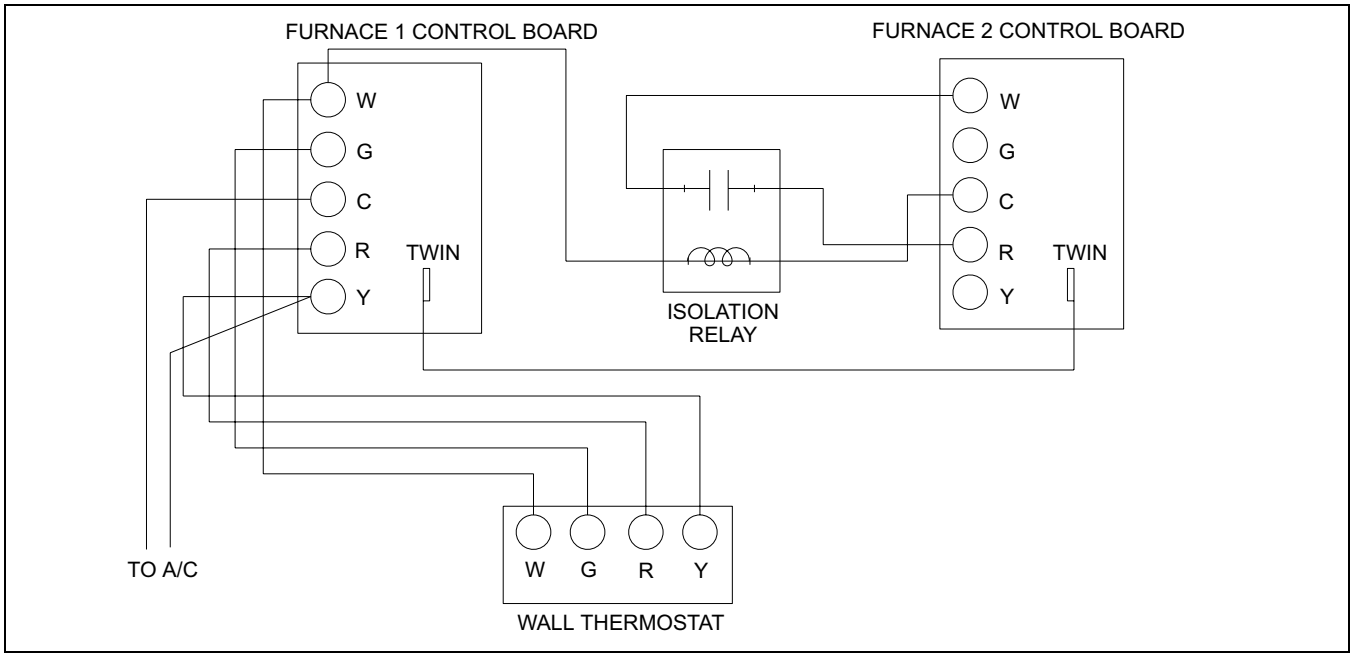


FIGURE 12: Twin Connection Diagram

BLOWER MOTOR SPEED SELECTION

These furnaces are equipped with blowers, which have multi-speed direct drive motors.

The blower speed selected is dependent upon the design and static pressure loss of the duct system. The duct system external static pressure includes the combined total of the supply and return ducts and any plenum type air conditioning coil if used.

The furnace must be adjusted to operate at or below the maximum external static (in. W.C.), and within the air temperature rise range as shown on the unit rating plate and in the specification table.

Dependent upon the conditions in a particular installation, the blower speeds may need to be changed to give the proper operation on cooling or heating. The table above shows the proper blower speed to use for cooling operation.

These leads should be connected in the control box to either the heating terminal or the cooling terminal, depending on the airflow desired. The unused motor speed lead(s) should be connected to the terminals marked PARK on the blower control board in the furnace control box.

⚠WARNING

SHOCK HAZARD - *Be sure electrical power to furnace is turned off before changing motor speeds.*

BLOWER PERFORMANCE

Table 1: SINGLE SIDE RETURN -

All airflow is expressed in standard cubic feet per minute. Motor rated at 115 volts. No air filters.

MODEL	SPEED TAP	EXTERNAL STATIC PRESSURE, INCHES W.C.							
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
G8C05012MUB12A G8C05012MDB12A FG8B05012MU12A	HIGH	1411	1360	1289	1218	1154	1075	983	882
	MEDIUM	1213	1177	1134	1085	1022	960	880	782
	LOW	887	884	871	848	814	775	726	656
G8C07512MUB12A G8C07512MDB12A FG8B07512MU12A	HIGH	1535	1470	1408	1343	1275	1202	1115	1014
	MEDIUM	1215	1199	1182	1151	1106	1039	976	887
	LOW	875	874	864	847	827	799	736	658
G8C07516MUC12A G8C07516MDC12A FG8C07516MU12A	HIGH	1792	1724	1630	1552	1462	1367	1264	1152
	MEDIUM	1597	1555	1496	1444	1372	1287	1190	1086
	LOW	1115	1140	1167	1183	1149	1093	1023	939
G8C10016MUC12A G8C10016MDC12A FG8C10016MU12A	HIGH	1868	1781	1690	1600	1498	1396	1277	1156
	MEDIUM	1602	1553	1503	1447	1376	1287	1181	1060
	LOW	1147	1147	1147	1147	1132	1078	1009	918
G8C10020MUD11A G8C10020MDD11A FG8D10020MU11A	HIGH	NOT APPROVED							
	MED. HI								
	MED.LO								
	LOW								
G8C12520MUD11A G8C12520MDD11A FG8D12520MU11A	HIGH								
	MED. HI								
	MED.LO								
	LOW								
G8C15020UHD11A FG8D15020UH11A	HIGH								
	MED. HI								
	MED.LO								
	LOW								

Table 2: DUAL RETURN (TWO SIDES OR ONE SIDE & BOTTOM)-

All airflow is expressed in standard cubic feet per minute. Motor rated at 115 volts. No air filters.

MODEL	SPEED TAP			EXTERNAL STATIC PRESSURE, INCHES W.C.					
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
G8C05012MUB12A G8C05012MDB12A FG8B05012MU12A	HIGH	1507	1433	1371	1300	1223	1132	1040	938
	MEDIUM	1239	1215	1175	1144	1085	1012	938	838
	LOW	907	907	891	875	849	800	741	672
G8C07512MUB12A G8C07512MDB12A FG8B07512MU12A	HIGH	1634	1562	1484	1417	1340	1238	1154	1030
	MEDIUM	1243	1228	1214	1184	1133	1079	999	912
	LOW	886	886	886	886	865	823	777	700
G8C07516MUC12A G8C07516MDC12A FG8C07516MU12A	HIGH	1978	1896	1803	1693	1589	1478	1366	1235
	MEDIUM	1682	1657	1606	1530	1455	1366	1265	1137
	LOW	1235	1235	1235	1235	1198	1154	1083	987
G8C10016MUC12A G8C10016MDC12A FG8C10016MU12A	HIGH	2122	2027	1916	1821	1717	1590	1462	1312
	MEDIUM	1667	1696	1656	1597	1523	1438	1330	1191
	LOW	1130	1145	1177	1194	1181	1146	1077	982
G8C10020MUD11A G8C10020MDD11A FG8D10020MU11A	HIGH	2350	2248	2129	2015	1876	1745	1596	1425
	MED. HI	2122	2018	1926	1824	1722	1606	1458	1311
	MED.LO	1958	1875	1782	1690	1608	1491	1364	1213
	LOW	1820	1757	1664	1594	1506	1405	1287	1137
G8C12520MUD11A G8C12520MDD11A FG8D12520MU11A	HIGH	2483	2392	2282	2161	2032	1887	1739	1567
	MED. HI	2198	2123	2039	1930	1830	1708	1550	1413
	MED.LO	1999	1916	1859	1778	1684	1576	1451	1315
	LOW	1832	1775	1709	1642	1556	1450	1335	1209
G8C15020UHD11A FG8D15020UH11A	HIGH	2570	2462	2361	2244	2128	1983	1826	1655
	MED. HI	2205	2105	2033	1952	1865	1738	1617	1459
	MED.LO	1993	1931	1869	1880	1708	1590	1485	1330
	LOW	1831	1782	1722	1660	1575	1477	1364	1231

Table 3: BOTTOM END RETURN -
All airflow is expressed in standard cubic feet per minute. Motor rated at 115 volts. No air filters.

MODEL	SPEED TAP	EXTERNAL STATIC PRESSURE, INCHES W.C.							
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
G8C05012MUB12A G8C05012MDB12A FG8B05012MU12A	HIGH	1419	1357	1297	1212	1131	1050	942	846
	MEDIUM	1221	1185	1145	1092	1036	961	879	780
	LOW	920	902	883	860	818	761	711	639
G8C07512MUB12A G8C07512MDB12A FG8B07512MU12A	HIGH	1552	1491	1420	1348	1271	1185	1080	970
	MEDIUM	1229	1237	1198	1164	1105	1039	956	861
	LOW	889	892	879	866	846	807	760	689
G8C07516MUC12A G8C07516MDC12A FG8C07516MU12A	HIGH	1946	1862	1775	1620	1518	1409	1291	1160
	MEDIUM	1683	1611	1551	1484	1388	1300	1190	1080
	LOW	1110	1138	1175	1190	1175	1126	1041	937
G8C10016MUC12A G8C10016MDC12A FG8C10016MU12A	HIGH	1997	1920	1822	1723	1620	1500	1355	1211
	MEDIUM	1728	1679	1635	1556	1465	1359	1249	1117
	LOW	1131	1156	1181	1190	1171	1126	1049	926
G8C10020MUD11A G8C10020MDD11A FG8D10020MU11A	HIGH	2327	2232	2121	1999	1888	1763	1628	1473
	MED. HI	2050	1967	1868	1757	1658	1525	1403	1260
	MED.LO	1911	1839	1758	1675	1593	1468	1340	1189
	LOW	1780	1712	1642	1566	1465	1366	1249	1094
G8C12520MUD11A G8C12520MDD11A FG8D12520MU11A	HIGH	2397	2304	2192	2063	1955	1822	1678	1521
	MED. HI	2151	2063	1977	1881	1774	1652	1528	1377
	MED.LO	1972	1906	1838	1748	1660	1551	1419	1282
	LOW	1845	1794	1721	1646	1559	1451	1344	1208
G8C15020UHD11A FG8D15020UH11A	HIGH	2488	2389	2276	2151	2024	1883	1730	1577
	MED. HI	2164	2084	2024	1920	1816	1692	1558	1395
	MED.LO	1998	1934	1868	1773	1673	1567	1445	1294
	LOW	1843	1793	1728	1653	1553	1453	1328	1192

FILTER PERFORMANCE

The airflow capacity data published in Tables 1, 2 & 3 represents blower performance WITHOUT filters. To determine the approximate blower performance of the system, apply the filter drop value for the filter being used or select an appropriate value from the Table 4.

NOTE: The filter pressure drop values in Table 4 are typical values for the type of filter listed and should only be used as a guideline. Actual pressure drop ratings for each filter type vary between filter manufacturer.

Table 4: FILTER PERFORMANCE - PRESSURE DROP INCHES W.C.

Airflow Range	Minimum Opening Size ($in.^2$)		Filter Type					
			Disposable		Hogs Hair		Pleated	
	1 Opening	2 Openings	1 Opening	2 Openings	1 Opening	2 Openings	1 Opening	2 Openings
0 - 750	230		0.01		0.01		0.15	
751 - 1000	330		0.05		0.05		0.20	
1001 - 1250	330		0.10		0.10		0.20	
1251 - 1500	330		0.10		0.10		0.25	
1501 - 1750	380	658	0.15	0.09	0.14	0.08	0.30	0.17
1751 - 2000	380	658	0.19	0.11	0.18	0.10	0.30	0.17
2001 & Above	463	658	0.19	0.11	0.18	0.10	0.30	0.17

APPLYING FILTER PRESSURE DROP TO DETERMINE SYSTEM AIRFLOW

To determine the approximate airflow of the unit with a filter in place, follow the steps below:

1. Select the filter type.
2. Select the number of return air openings or calculate the return opening size in square inches to determine the proper filter pressure drop.
3. Determine the External System Static Pressure (ESP) without the filter.
4. Select a filter pressure drop from the table based upon the number of return air openings or return air opening size and add to the ESP from Step 3 to determine the total system static.
5. If total system static matches a ESP value in the airflow table (i.e. 0.20, 0.60, etc.,) the system airflow corresponds to the intersection of the ESP column and Model/ Blower Speed row.
6. If the total system static falls between ESP values in the table (i.e. 0.58, 0.75, etc.), the static pressure may be rounded to the nearest value in the table determining the airflow using Step 5 or calculate the airflow by using the following example.

Example: For a 100,000 BTUH furnace with 2 return openings and operating on high speed blower, it is found that total system static is 0.58" w.c. To determine the system airflow, complete the following steps:

1. Obtain the airflow values at 0.50" & 0.60" ESP.

   Airflow @ 0.50": 1717 CFM
   Airflow @ 0.60": 1590 CFM

2. Subtract the airflow @ 0.50" from the airflow @ 0.60" to obtain airflow difference.

   1590 - 1717 = -127 CFM

3. Subtract 0.50” from the total system static, and divide this difference by the difference in ESP values in the table, 0.60" - 0.50", to obtain a percentage.

   (0.58 - 0.50) / (0.60 - 0.50) = 0.8

4. Multiply percentage by airflow difference to obtain airflow reduction.

   (0.8)x(-127) = -102

5. Subtract airflow reduction value from airflow @ 0.50" to obtain actual airflow @ 0.58" ESP.

   1717 - 102 = 1615

BLOWER TIMINGS

The electronic furnace control supplied on this furnace controls the blower delay timings.

The heating on delay, from when the gas valve opens to when the circulating blower comes on, is fixed at 30 seconds and is not adjustable.

The heating off delay, from when the gas valve closes, to when the circulating blower shuts off, is factory set at 120 seconds. This timing may be adjusted to 60, 90, 120 or 150 seconds on the electronic furnace control. The furnace control has four pins and a small jumper plug, which is used to adjust the blower off delay. See Figure 13.

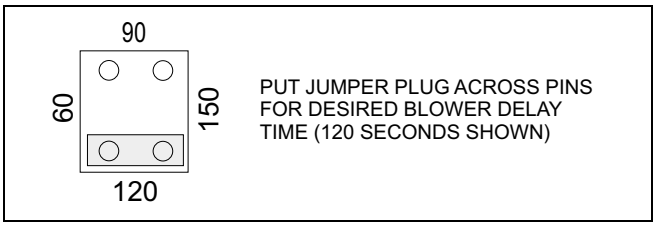


FIGURE 13: BLOWER TIMING CHANGE

DIAGNOSTICS

The electronic furnace control supplied on this furnace is equipped with a diagnostic light, which flashes when there is a service problem with the furnace. The number of times the light flashes indicates the location of the problem, as listed below:

Steady off - Normal operation

One flash - False flame sense - Check for stuck open gas valve.

Two flashes - Pressure switch stuck closed. Check for shorted wires, bad pressure switch.

Three flashes - Pressure switch failed to close - Check vent blower, pressure switch, vent blockage, disconnected pressure hose.

Four flashes - Limit switch open - Check for open limit switch, loose connections in limit circuit.

Five flashes - Rollout switch open - Check for open rollout switches, loose connections in rollout switch circuit.

Six flashes - One hour pressure switch lockout - Pressure switch has cycled four times in a single call for heat - Check for vent blockage, loose connections in pressure switch circuit.

Seven flashes - One-hour ignition lockout - Burner failed to light in three tries - Check gas flow, gas pressure, gas valve operation, flame sensor.

Eight flashes - One-hour ignition lockout - Five recycles in a single call for heat. Check gas flow, gas pressure, and gas valve operation, flame sensor.

Nine flashes - Reversed line voltage polarity - Check incoming power wiring for proper polarity.

Eleven flashes - This fault will be indicated if the rollout jumper wire connection soldered into the board, is broken. If this fault occurs the control will have to be replaced. This fault may also occur in installations where an improper ground is present. Prior to replacing control, verify that unit is properly grounded.

Steady on - Gas valve energized with no call for heat from thermostat, or, control failure.

WIRING DIAGRAM

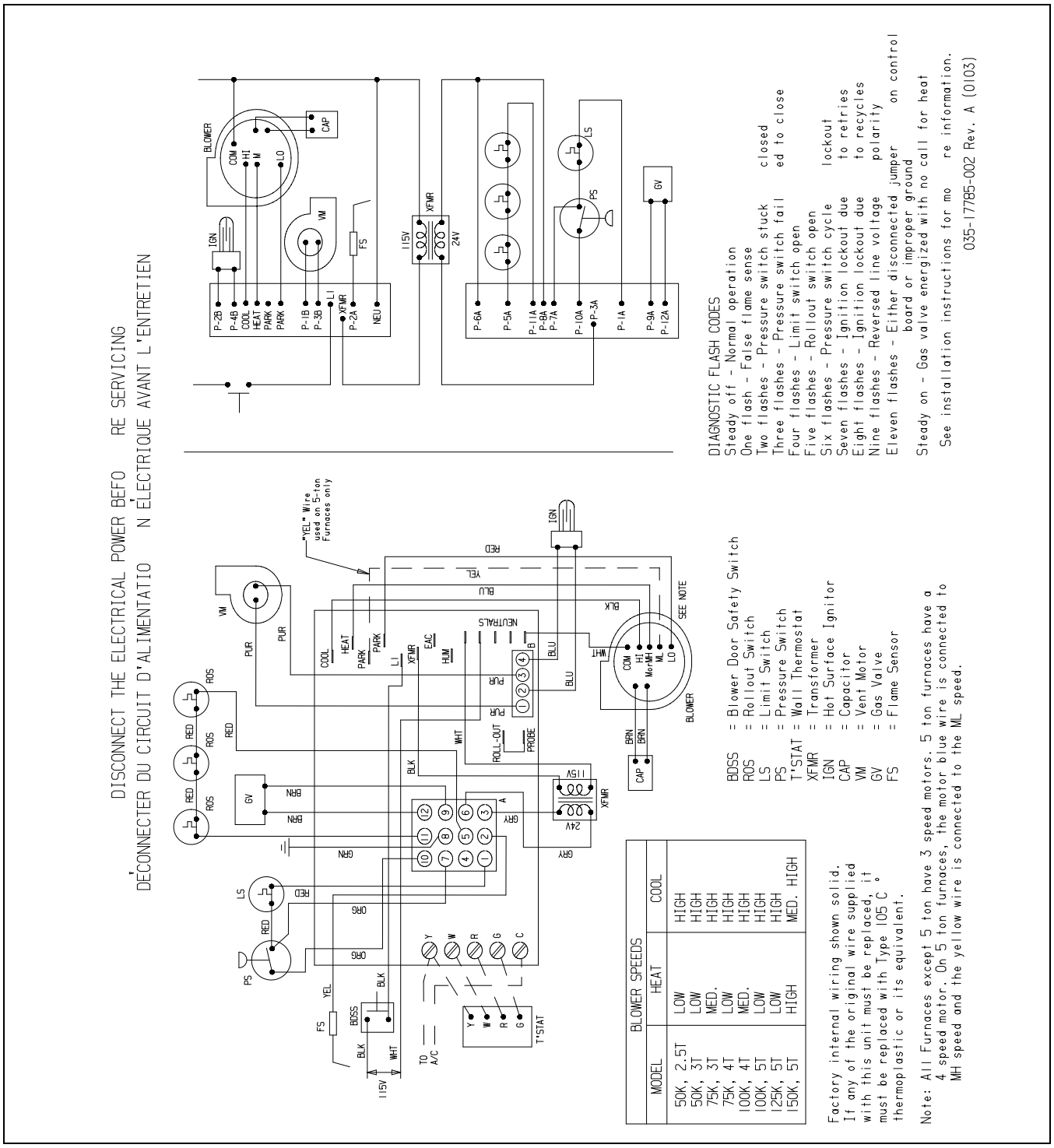


FIGURE 14: Wiring Diagram

PRE-OPERATIONAL CHECKS

⚠WARNING

SHOCK HAZARD - *Be sure electrical power to furnace is turned off before performing the pre-operational checks.*

1. Be sure that the furnace is equipped for the type of gas being supplied to the furnace. See unit rating plate. **If LP (propane) gas is to be used, make sure that the furnace has been properly converted.**
2. Manually spin circulating air blower wheel to ensure that it turns freely and does not strike the blower housing.
3. Was the gas piping tested and/or purged of air then checked for leaks? See instructions for gas piping. Even the smallest leak must be eliminated before attempting to light the furnace.

SEQUENCE OF OPERATION

These furnaces are equipped with an electric hot surface burner ignition system. In response to a call for heat by the room thermostat, a hot glowing ignitor lights the burners at the beginning of each operation cycle. The burners will continue to operate until the thermostat is satisfied at which time all burner flame is extinguished. During the off cycle no gas is consumed. With the room thermostat set below room temperature and with the electrical power and gas supply to the furnace on, the normal sequence of operation is as follows:

1. When the room temperature falls below the setting of the room thermostat, the thermostat energizes the furnace control board.
2. When the furnace control board is activated, the vent blower is turned on. A circuit is also made through the normally open pressure switch contacts.
3. As the vent blower increases in speed, the contacts of the pressure switch will close and complete the electrical circuit to the ignitor.
4. During the next 30 seconds, the vent blower will bring fresh air into the heat exchanger and the ignitor will begin to glow. At the end of this period, the gas valve will open and the burners will light.
5. After the burners light, a separate sensor acts as a flame probe to check for the presence of flame. As long as a flame is present, the system will monitor it and hold the gas valve open.
6. If the burners fail to light within 6-8 seconds after the gas valve opens, the gas valve will close and the ignitor will be turned off. After a short pause, the system will recycle and try again for ignition. If the burners fail to light after three tries, the ignition system will lock out. The system will remain in lockout mode until one hour has passed, or until the room thermostat is cycled off, then back on. The furnace will then try for ignition again.
7. The lapsed time from the moment the room thermostat closes to when the burners light may be 30-40 seconds. This delay is caused by the time required for the vent blower to come to full speed, the time required for the ignitor to heat up and the time required for fresh air to be brought into the heat exchanger.
8. About thirty seconds after the burners have lighted, the fan switch will close and the furnace air circulation blower will run.
9. When room thermostat is satisfied the circuit to the furnace control board is broken. The circuit to the gas valve is broken and the burners are extinguished. The vent blower will continue to run for a few seconds. Then the furnace control board will keep the circulating blower running for a period of time to allow additional heat to be drawn from the heat exchanger.

FURNACE OPERATION

FOR YOUR SAFETY READ BEFORE OPERATING

⚠WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

1. This appliance does not have a pilot. It is equipped with an ignition device, which automatically lights the burners. DO NOT try to light the burners by hand.
2. Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

- Don't try to light any appliance.
- Don't touch any electric switch; don't use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you can not reach your gas supplier, call the fire department.

3. USE ONLY YOUR HAND TO MOVE THE GAS CONTROL LEVER OR SWITCH. NEVER USE TOOLS. IF THE LEVER OR SWITCH WILL NOT MOVE BY HAND, DON'T TRY TO REPAIR IT, CALL A QUALIFIED SERVICE TECHNICIAN. FORCE OR ATTEMPTED REPAIR MAY RESULT IN A FIRE OR EXPLOSION.
4. DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN UNDER WATER. IMMEDIATELY CALL A QUALIFIED SERVICE TECHNICIAN TO INSPECT THE APPLIANCE AND TO REPLACE ANY PART OF THE CONTROL SYSTEM AND ANY GAS CONTROL WHICH HAS BEEN UNDER WATER.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information listed above.
2. Set the thermostat to the lowest setting, or OFF.
3. Turn off all electric power to the furnace.
4. This appliance does not have a pilot. It is equipped with an ignition device, which automatically lights the burners. DO NOT try to light the burners by hand.
5. Remove front door panel.
6. Move gas valve control lever or switch to "OFF". See Figure 16.
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "2" in the safety information above. If you don't smell gas, go to the next step.
8. Move gas control lever or switch to "ON".
9. Replace front door panel.
10. Turn on all electric power to the furnace.
11. Set thermostat to desired setting.

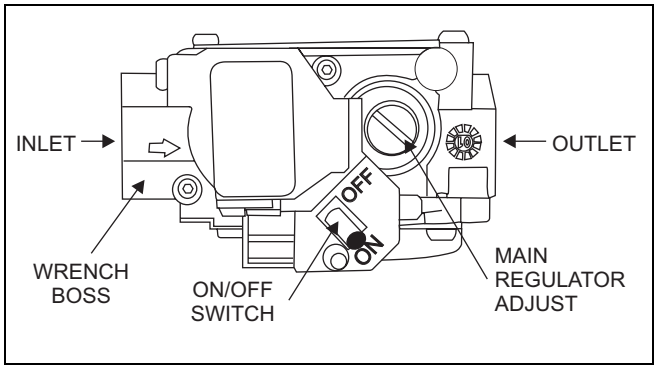


FIGURE 15: WHITE RODGERS GAS VALVE

GAS SHUT-OFF

This furnace is equipped with a gas shutoff lever or switch on the gas valve, which can be used to prevent gas from flowing to the furnace. Figure 16 shows the location of the shutoff lever or switch. To turn off gas to the furnace, move the lever or switch to the "OFF" position.

The furnace installation should also have a manual shutoff valve in the gas piping to the furnace, similar to what is shown in Figure 17. To turn off the gas to the furnace, use a wrench and turn the switch or lever so that it is pointing 90 degrees from the gas pipe, as shown in Figure 17.

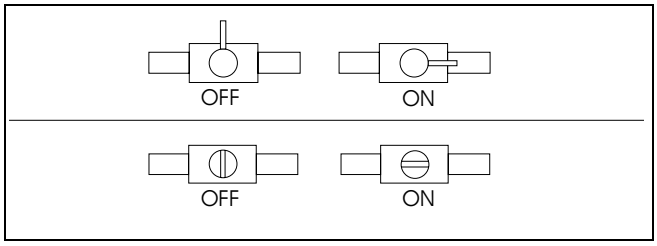


FIGURE 16: MANUAL GAS SHUTOFF VALVE

INSTALLATION CHECKS

CHECKING GAS INPUT RATE

⚠WARNING

Natural gas heating values can vary widely. It is the responsibility of the installer to make sure that the input rate to the furnace as installed does not exceed the nameplate rating of the furnace. Failure to do so can cause heat exchanger failure, resulting in injury or death.

The maximum BTUH input capacity for each model is shown on the furnace rating plate and in the specification table. This input must not be exceeded.

The input shown may be used in geographic areas where the elevation is from 0 to 2000 feet. The BTU input depends on the calorific heating value of the gas, orifice size, and manifold pressure. Orifice sizes are based on gas values of 1050 BTU/cu. ft. for natural gas and 2500 BTU/cu. ft. for LP (propane) gas. The orifice sizes supplied with the furnace should provide satisfactory input capacity for installations in most areas, except at high altitude.

HIGH ALTITUDE ADJUSTMENT

In areas above 2000 feet elevation, the furnace BTU input must be reduced 4% for each 1000 feet of elevation above sea level. For minor input adjustments, it is permissible to adjust the manifold pressure at the gas valve pressure regulator. Do not adjust the manifold pressure more than (.3" W.C. from the specified regulator settings (3.5" for natural gas and 10" for LP (propane gas). In many cases, adjusting the gas valve manifold pressure may not be enough to reduce the gas input enough for high altitudes. In such cases, the gas orifices must be changed to a smaller size. The chart below shows the proper gas orifice to use at various altitudes for either natural or LP (propane) gas.

HIGH ALTITUDE GAS ORIFICES					
	ALTITUDE ABOVE SEA LEVEL IN FEET				
	0-2000	2000-4500	4500-8000	8000-9000	9000-10,000
Natural Gas	#42 .093	#43 .089	#44 .086	#45 .082	#46 .081
LP Gas	#54 .055	#55 .052	#55 .052	#56 .046	#56 .046

HOW TO DETERMINE GAS INPUT RATE

Where gas is metered, the input rate may be determined by the following method:

Contact the gas supplier, Public Utility Company or LP (propane) gas distributor to obtain the calorific gas value of the gas being used. When checking the gas input rate, any other gas burning appliances connected to the same meter should be completely off. The furnace should be allowed to operate for five minutes before attempting to check the gas-input rate.

To check flow rate, observe the one cubic foot dial on the gas meter and determine the number of seconds required for the dial hand to complete one revolution (seconds to flow one cubic foot).

To determine the number of seconds per cubic foot that is necessary to achieve the correct input rate, use the following formula: GAS VALUE X 3600 ÷

DESIRED INPUT = SECONDS NEEDED

Example: 1000 BTU gas, furnace input 100,000 BTUH

Seconds for one cubic foot = 1000 X 3600 ÷

100,000 = 36 seconds.

When clocking the meter, if the one cubic foot dial makes a complete revolution in less time than was calculated that it should, the furnace is overfired and should be derated. If it takes more time for the meter to make one revolution than was calculated, the furnace is underfired.

The orifice size must be changed to correct an overfired or underfired condition. If it is determined that different orifices are needed, please contact your distributor for assistance in selecting the correct replacement.

MINOR INPUT ADJUSTMENT

The input may be adjusted slightly by adjusting the pressure in the gas valve in order to change manifold pressure.

To adjust pressure regulator, remove cover screw (See location on Figure 14) on valve. Turn adjusting screw counterclockwise to decrease pressure, turn clockwise to increase pressure. IN NO CASE SHOULD THE FINAL MANIFOLD PRESSURE VARY MORE THAN ± .3" W.C. FROM THE SPECIFIED REGULATOR PRESSURE SETTINGS (3.5" FOR NATURAL GAS AND 10" FOR LP, PROPANE GAS).

MEASURING AIR TEMPERATURE RISE

For proper furnace operation, the air temperature rise must be within the range shown on the furnace rating plate.

⚠ CAUTION

Operating the furnace outside of the proper air temperature rise range may cause poor heating performance and shorter heat exchanger life.

1. Place thermometer in the supply air plenum about two feet from the furnace outlet. If an air conditioning coil is installed, the thermometer should be placed downstream of the coil. The thermometer tip should be as near as possible to the center of the plenum for proper measurement.
2. Place thermometer in return air duct about two feet from furnace, with the tip of the thermometer as near as possible to the center of the duct.
3. Set thermostat to highest temperature setting and allow furnace to run for at least five minutes before checking temperatures.
4. Calculate air temperature rise by subtracting supply air temperature from the return air temperature.
5. If temperature rise is not within the range shown on the furnace rating plate, the blower speed may need to be changed.
6. If the blower speed is changed, recheck the temperature rise by repeating steps 1 through 4 above.
7. If the air temperature rise is not within the proper range even after changing blower speeds, check ductwork design with a qualified heating engineer. It may be necessary to re-size the ductwork.

BALANCE THE SYSTEM

The air distribution system should be balanced, using in-line duct dampers if employed, to provide for satisfactory air delivery to room. It is recommended that dampers in registers not be used for balancing the system.

SERVICE INSTRUCTIONS

⚠WARNING

Never attempt to modify this furnace - fire, explosion, or asphyxiation may result. If malfunction is apparent, contact a qualified service agency and/ or gas utility for assistance.

⚠ CAUTION

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

Verify proper operation after servicing.

MOTOR LUBRICATION

The circulating air blower motor and vent blower are permanently lubricated and do not require periodic lubrication.

BURNER CLEANING

The burners used in this furnace are specially designed to be non-linting and should not require periodic cleaning. In the event that cleaning does become necessary, use the suction hose of a suitable vacuum cleaner to remove dirt and lint. Be careful not to damage the ignitor or sensor rod during cleaning.

FLUE GAS PASSAGEWAYS

Periodic cleaning of the heat exchanger and flue gas passageways is not necessary and is not recommended under normal circumstances.

REPLACEMENT PARTS

Should it be necessary to replace any component parts, these may be obtained through an authorized dealer, who is experienced and can be of assistance. Information on the nearest Distributor may be obtained directly from the company shown on the furnace rating plate.

⚠ CAUTION

Only genuine Source One *authorized replacement parts should be used. Substitute parts should not be used, as they may not be the same in operational and safety characteristics.*

Following major service or replacement of functional parts, it is recommended that the furnace be operated in the various modes to insure that performance is normal and control components are functioning properly.

The parts listed below are only those that are functional parts and those that might require replacement. The parts listed are by part name (description) only and CODE reference NUMBER. The CODE number is used to determine the location of the part in the generalized, pictorial illustration provided. See Figure 16.

When ordering parts - order by name and description. Do not order by code number. Also when ordering parts please provide:

1. Complete furnace Model Number and Serial Number. These may be found on the rating plate located behind the front panel (door) of the furnace.
2. Type of gas being used.
3. Is furnace being used in conjunction with air conditioning or heat pump?

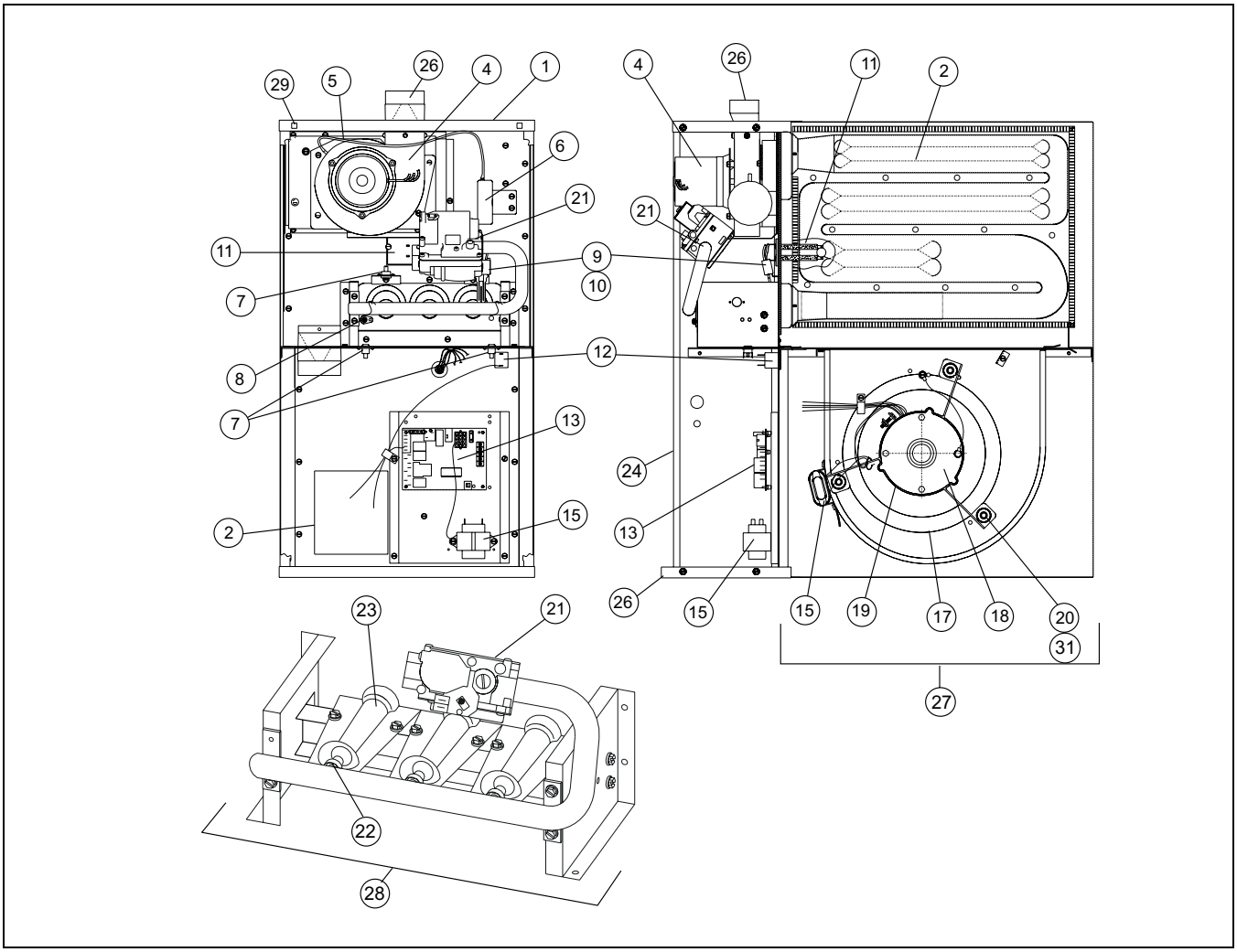


FIGURE 17: REPAIR PARTS VIEW (UPFLOW CONFIGURATION SHOWN)

1 Casing, Top Cap
2 Heat Exchanger Assembly
3 Gasket, Vent Blower
4 Blower, Vent
5 Tube, Pressure
6 Switch, Pressure
7 Switch, Rollout (3 Req'd)
8 Rod, Sensor
9 Ignitor
10 Bracket, Ignitor
11 Switch, Limit (Open 140 Deg.)
Switch, Limit (Open 155 Deg.)
Switch, Limit (Open 175 Deg.)
Switch, Limit (Open 180 Deg.)
12 Switch, Door
13 Control, Integrated
14* Harness, Wire*
15 Transformer (40VA)
16 Capacitor (7.5MFD, 370V)
Capacitor (10MFD, 370V)
17 Wheel, Blower
18 Motor, Blower
19 Mount, 1-PC. Motor
20 Motor Mounts, Rubber (3 Req'd)
21 Valve, Gas
22 Orifice, Gas (Natural-0-2,000 Ft.)
Orifice, Gas (LP-0-2,000 Ft.)
Orifice, Gas (Natural-High Altitude-2,000-5,000 Ft.)
Orifice, Gas (Natural-High Altitude-5,000-7,000 Ft.)
Orifice, Gas (LP-High Altitude-2,000-7,000 Ft.)
23 Burner
24 Panel, Door
25 Casing, Bottom Cap
26 Transition, 3"
27 Blower Assembly
28 Burner Assembly
29 Clip, Door Latch (2 per pkg.)
30* Diagram, Wiring
31 Spacer (Ferrule) (3 Req'd)

NOTES

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