Installation Instructions

80+ SINGLE STAGE GAS FURNACE

Category I Furnace

H8UH5, MUF, HL

220V-1 ph-50Hz

See section 5 for Category I definition.

SAFETY REQUIREMENTS

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the furnace and in instruction manuals be alert to the potential for personal injury.

Understand the signal words *DANGER, WARNING,* or *CAUTION.* These words are used with the safety-alert symbol. *DANGER* identifies the most serious hazards, those that **will** result in severe personal injury or death. *WARNING* signifies a hazard that **could** result in personal injury or death. *CAUTION* is used to identify unsafe practices that **may** result in minor personal injury or product and property damage. Note is used to highlight suggestions that will result in enhanced installation, reliability, or operation.

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment.

Untrained service personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the furnace and other safety precautions that may apply.

Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code (NFGC) ANSI Z223.1-2006/NFPA 54-2006. Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with changing residential construction practices. We require these instructions as a minimum for a safe installation.

International Comfort Products, LLC
Lewisburg, TN 37091 U.S.A.

INSTALLER: Affix these instructions on or adjacent to the furnace.

CONSUMER: Retain these instructions for future reference.

CERTIFIED ®

DESIGN CERTIFIED ®

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⚠ WARNING

ELECTRIC SHOCK HAZARD

Failure to follow this warning could result in injury or death.

Turn Off All Power Before Servicing.

⚠ WARNING

CARBON MONOXIDE POISONING AND FIRE HAZARD.

Failure to follow this warning could result in injury, death, and/or property damage.

This furnace is not designed for use in mobile homes, trailers or recreational vehicles.

Printed in U.S.A.

441 01 5003 01 July 2007

START-UP CHECK SHEET
For 80+ Furnace

(This sheet is optional. Keep this page for future reference.)

Date of Start-Up:_____

Dealer Name:_____

Address:_____

City, State(Province), Zip or Postal Code:_____

_____

Phone:_____

Owner Name:_____

Address:_____

City, State(Province), Zip or Postal Code:_____

_____

Model Number:_____

Serial Number:_____

Setup Checks

Check the box when task is complete

Thermostat: Heat ❑ Cooling ❑ Fan ❑

Subbase level: ❑

Anticipator Set: ❑ Setting of Anticipator _____

All Electrical Connections Tight: ❑

Supply voltage: _____

Blower Motor H.P.: _____

Fan "Time ON" setting: ____ Fan "Time OFF" Setting ___

Manual Gas Shut-Off Upstream of Furnace/Drip-Leg? ❑

Gas Valve turned ON? ❑

Type of Gas: Natural: ❑ Propane: ❑

Filter Type and Size:_____

Calculated Firing Rate:(See *Checks and Adjustments* Section).____

Heating Check

Measured Line Pressure when Firing Unit: _____

Measured Manifold Gas Pressure: _____

Temperature of Supply Air: (°)_____

Temperature of Return Air: (°)_____

Temperature Rise (supply-return temperature): (°)_____

In Rise (see furnace rating plate)? (°)_____

Static Pressure (Ducts): Supply Air_____ Return _____

Blower speed tap used for heating _____

Limit Opens: (°)_____ Limit Closes: (°)_____

Optional Check: CO ? _____ CO2 ? _____

Cooling Check

Temperature of Supply Air: (°)_____

Temperature of Return Air: (°)_____

Temperature Difference: (°)_____

Static Pressure (Ducts) cooling: Supply Air___ Return __

Blower Speed Tap used for cooling: _____

Dealer Comments:_____

_____

_____

_____

_____

_____

_____

1. Safe Installation Requirements

⚠ WARNING

FIRE, EXPLOSION, AND ASPHYXIATION HAZARD.

Improper adjustment, alteration, service, maintenance or installation could cause personal injury, death and/or property damage.

Installation or repairs made by unqualified persons could result in hazards to you and others. Installation MUST conform with local codes or, in the absence of local codes, with codes of all governmental authorities having jurisdiction.

The information contained in this manual is intended for use by a qualified service agency that is experienced in such work, is familiar with all precautions and safety procedures required in such work, and is equipped with the proper tools and test instruments.

NOTE: This furnace is design-certified by the CSA International (formerly AGA and CGA) for installation in the United States and Canada. Refer to the appropriate codes, along with this manual, for proper installation.

- Use only the Type of gas approved for this furnace (see **Rating Plate** on furnace). Overfiring will result in failure of heat exchanger and cause dangerous operation. (Furnaces can be converted to Propane gas with approved kit as noted on rating plate.)
- Install this furnace only in a location and position as specified in "*Installation"* of these instructions.
- Provide adequate combustion and ventilation air to the furnace as specified in "*Combustion and Ventilation Air"* of these instructions.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow this warning could result in personal injury and or death.

Do NOT install this furnace in DOWNFLOW applications.

⚠ AVERTISSEMENT

RISQUE D'EMPOISONNEMENT PAR MONOXYDE DE CARBONE.

Si les conseils de cette avertissement ne sont pas suivi, cela peut entraîner des blessures et/ou la mort.

Ne pas installer cette fournaise avec un débit DESCENDANT.

- Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in "*Gas Vent Installation, Horizontal Venting and Masonry Chimney Venting"* of these instructions.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in "*Gas Supply and Piping, Final Check"* of these instructions.
- Always install furnace to operate within the furnace's intended temperature-rise range with a duct system which has an external static pressure within the allowable range, as specified in "*Technical Support Manual"* of these instructions.
- When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.
- A gas-fired furnace for installation in a residential garage must be installed as specified in "*Installation"* of these instructions.
- This furnace is not to be used for temporary heating of buildings or structures under construction. See "*Installation "*
- **This furnace is NOT approved for installation in mobile homes, trailers or recreation vehicles.**
- Seal around supply and return air ducts.
- Install correct filter type and size.
- Furnace **MUST** be installed so electrical components are protected from direct contact with water.

Safety Rules

Your furnace is built to provide many years of safe and dependable service providing it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the furnace and create hazards for you, the owner.

A. The U.S. Consumer Product Safety Commission encourages installation of carbon monoxide alarms. There can be various sources of carbon monoxide in a building or dwelling. The sources could be gas-fired clothes dryers, gas cooking stoves, water heaters, furnaces, gas-fired fireplaces, wood fireplaces.

Carbon monoxide can cause serious bodily injury and/or death. Carbon monoxide or "CO" is a colorless and odorless gas produced when fuel is not burned completely or when the flame does not receive sufficient oxygen.

Therefore, to help alert people of potentially dangerous carbon monoxide levels, you should have a commercially available carbon monoxide alarm that is listed by a nationally recognized testing agency in accordance with Underwriters Laboratories Inc. Standard for Single and Multiple Station Carbon Monoxide Alarms, ANSI/UL 2034 or the CSA 6.19-01 Residential Carbon Alarming Devices installed and maintained in the building or dwelling concurrently with the gas-fired furnace installation (see Note below). The alarm should be installed as recommended by the alarm manufacturer's installation instructions.

B. There can be numerous sources of fire or smoke in a building or dwelling. Fire or smoke can cause serious bodily injury, death, and/or property damage. Therefore, in order to alert people of potentially dangerous fire or smoke, you should have fire extinguisher and smoke alarms listed by Underwriters Laboratories installed and maintained in the building or dwelling (see Note below).

Note: The manufacturer of your furnace does not test any alarms and makes no representations regarding any brand or type of alarms.

C. To ensure safe and efficient operation of your furnace, you should do the following:

1. **Thoroughly read this manual and labels on the furnace.** This will help you understand how your furnace operates and the hazards involved with gas and electricity.
2. **Do not use this furnace if any part has been under water.** Immediately call a qualified service agency to inspect the

furnace and to replace any part of the control system and any gas control which has been under water.

3. **Never obstruct the vent grilles, or any ducts that provide air to the furnace.** Air must be provided for proper combustion and ventilation of flue gases.

Frozen Water Pipe Hazard

⚠ WARNING

WATER DAMAGE TO PROPERTY HAZARD.

Failure to follow this warning could result in property damage.

Do not leave your home unattended for long periods during freezing weather without turning off water supply and draining water pipes or otherwise protecting against the risk of frozen pipes and resultant damage.

Your furnace is designed solely to provide a safe and comfortable living environment. The furnace is NOT designed to ensure that water pipes will not freeze. It is equipped with several safety devices that are designed to turn the furnace off and prevent it from restarting in the event of various potentially unsafe conditions.

If your furnace remains off for an extended time, the pipes in your home could freeze and burst, resulting in serious water damage.

If the structure will be unattended during cold weather you should take these precautions.

1. Turn off the water supply to the structure and drain the water lines if possible and add an antifreeze for potable water to drain traps and toilet tanks. Open faucets in appropriate areas.

-or-

2. Have someone check the structure frequently during cold weather to make sure it is warm enough to prevent pipes from freezing. Instruct them on a service agency to call to provide service, if required.

-or-

3. Install a reliable remote sensing device that will notify somebody of freezing conditions within the home.

2. Installation

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow this warning could result in personal injury or death.

If this furnace is replacing a previously common-vented furnace, it may be necessary to resize the existing vent system to prevent oversizing problems for the other remaining appliances(s). See *Venting and Combustion Air Check* in the *Gas Vent Installation* section of this instruction.

Location and Clearances

If furnace is a replacement, it is usually best to install the furnace where the old one was. Choose the location or evaluate the existing location based upon the minimum clearance and furnace dimensions **(Figure 1)**.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow this warning could result in personal injury or death.

Do NOT operate furnace in a corrosive atmosphere containing chlorine, fluorine or any other damaging chemicals, which could harm the furnace and vent system and permit spillage of combustion products into an occupied space.

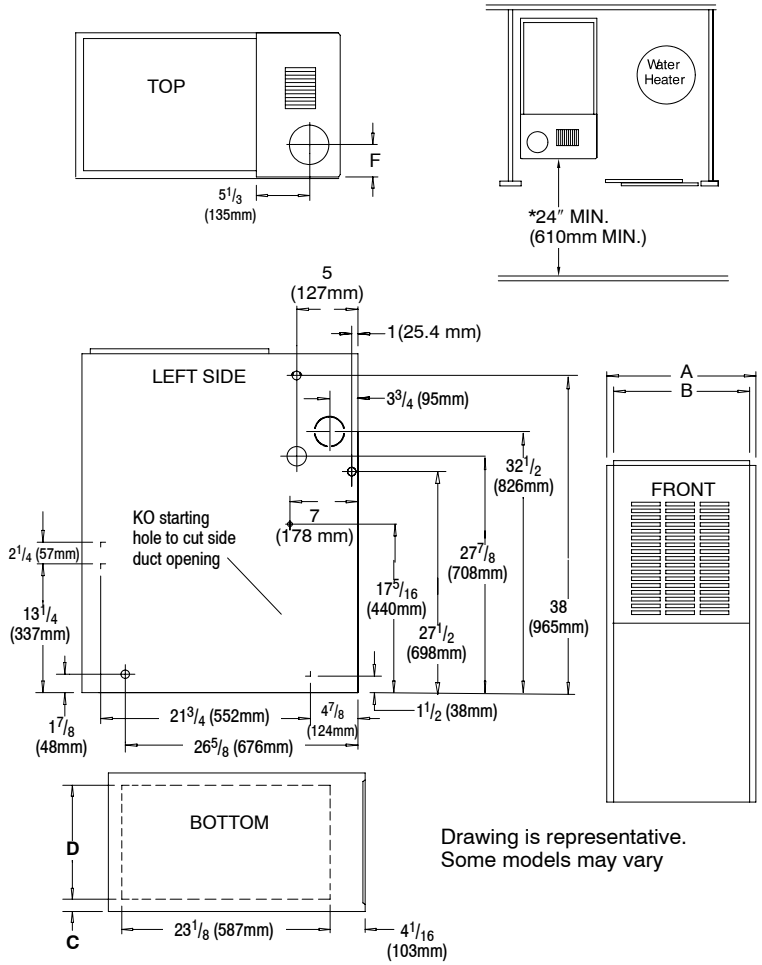
Refer to *Combustion & Ventilation Air* section, Contaminated Combustion Air for combustion air evaluation and remedy.

Installation Requirements

1. Install furnace level.
2. This furnace is **NOT** to be used for temporary heat of buildings or structures under construction.
3. Install furnace as centralized as practical with respect to the heat distribution system.
4. Install the vent pipes as short as practical. (See **Gas Vent Installation** section).
5. Do **NOT** install furnace directly on carpeting, tile or other combustible material other than wood flooring.
6. Maintain clearance for fire safety and servicing. A front clearance of 24″ (610mm) is minimum for access to the burner, controls and filter. See clearance requirements in **Figure 1.**
7. Use a raised base if the floor is damp or wet at times.
8. Residential garage installations require:
   - Burners and ignition sources installed at least 18″ (457 mm) above the floor.
   - Furnace must be located or physically protected from possible damage by a vehicle.
9. If the furnace is to be suspended from the floor joists in a basement or a crawl space or the rafters in an attic, it is necessary to use steel pipe straps or an angle iron frame to attach the furnace. These straps should be attached to the furnace bottom side with sheet metal screws and to the rafters or joists with bolts. The preferred method is to use an angle iron frame bolted to the rafters or joists.
10. This furnace may be used for construction heat provided that:
    - The furnace is permanently installed with all electrical wiring, piping, venting, air filters and ducting installed according to these installation instructions. A return air duct is provided, sealed to the furnace casing, and terminated outside the space containing the furnace. This prevents a negative pressure condition as created by the circulating air blower, causing a flame rollout and/or drawing combustion products into the structure.
    - The furnace is controlled by a thermostat. It may not be “hot wired” to provide heat continuously to the structure without thermostatic control.
    - Clean outside air is provided for combustion. This is to minimize the corrosive effects of adhesives, sealers and other construction materials. It also prevents the entrainment of drywall dust into combustion air, which can cause fouling and plugging of furnace components.
    - The temperature of the return air to the furnace is maintained between 55° F (13° C) and 80° F (27° C) , with no evening setback or shutdown. The use of the furnace while the structure is under construction is deemed to be intermittent operation per our installation instructions.

- The air temperature rise is within the rated rise range on the furnace rating plate, and the firing rate has been set to the rating plate value.
- The filters used to clean the circulating air during the construction process must be either changed or thoroughly cleaned prior to occupancy.
- The furnace, ductwork and filters are cleaned as necessary to remove drywall dust and construction debris from all HVAC system components after construction is completed.
- Verify proper furnace operating conditions including ignition, gas input rate, air temperature rise, and venting according to these installation instructions.

Figure 1 **Dimensions and Clearances (H8UH5, MUF, HL Models)**

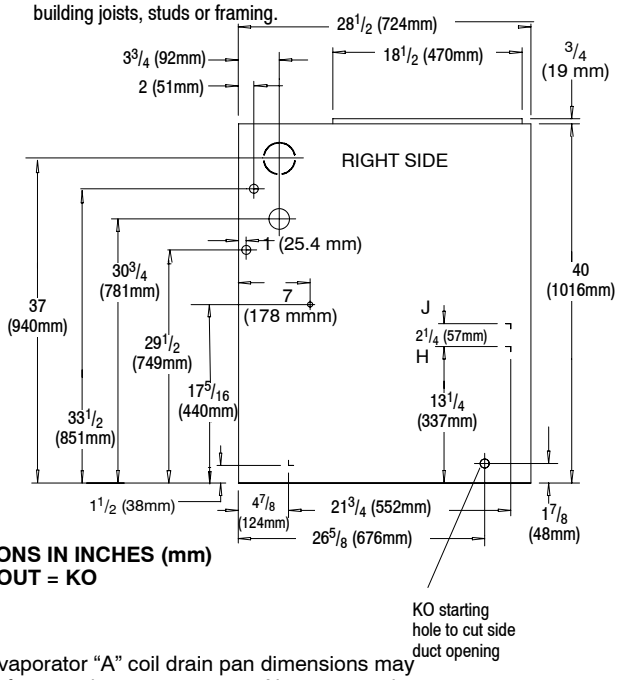


Drawing is representative. Some models may vary

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS FOR ALL MODELS	
REAR	0
FRONT (combustion air openings in furnace and structure)	3″ (76mm)
Required For Service	*24″ (610mm)
ALL SIDES Of SUPPLY PLENUM	1″ (25.4mm)
SIDES	0
VENT	
Single-Wall Vent	6″ (152mm)
Type B-1 Double Wall Vent	1″ (25.4mm)
TOP OF FURNACE	1″ (25.4mm)

*30″ (762 mm) clearance recommended for casing removal.

Horizontal position: Line contact is permissible only between lines formed by intersections of top and two sides of furnace jacket, and building joists, studs or framing.



DIMENSIONAL INFORMATION

Furnace Capacity	Cabinet		Top	Bottom		Return Air Opening
	A	B	F	C	D	
H8UH5050/075B12 MUF050/075W3C HL12/18H3TRC	15 1/2 (394)	14 (356)	6 (152)	1 3/8 (35)	12 5/8 (321)	H
H8UH5100F14 MUF100W3C HL25H3TRC	19 1/8 (486)	17 5/8 (447)	7 3/4 (197)	2 1/8 (54)	14 3/4 (375)	J
H8UH5125/140J20 MUF125/140W5C HL31H4TRC HL34H5TRC	22 3/4 (578)	21 1/4 (540)	9 1/2 (241)	1 15/16 (49)	18 3/4 (476)	J

DIMENSIONS IN INCHES (mm)
KNOCK-OUT = KO

NOTE: Evaporator "A" coil drain pan dimensions may vary from furnace duct opening size. Always consult evaporator specifications for duct size requirements.

Furnace is designed for bottom return or side return.

Return air through back of furnace is NOT allowed.

Installation Positions

This furnace can be installed in an upflow, horizontal (either left or right) airflow position. DO NOT install this furnace on its back. For the upflow position, the return air ductwork can be attached to either the left or right side panel and/or the bottom. For horizontal position, the return air ductwork must be attached to the bottom. The return air ductwork must **never** be attached to the back of the furnace.

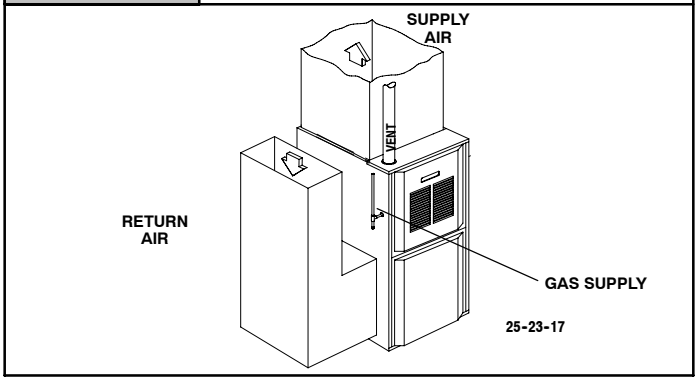
Furnace Installation

Inspect the rating plate to be certain the model number begins with **"H8UH5", "MUF"**, or **"HL"**. This identifies the furnace as a multi-position furnace and can be Installed in an Upflow, Horizontal Right or Horizontal Left position. This furnace is NOT approved to be installed in the downflow position.

Upflow

No modifications are required for upflow installation. (See **Figure 2**)

Figure 2 **Typical Upflow Installation**



Pressure Switch Relocation

If the furnace is installed in the upflow position, the pressure switch will remain in the same position as installed by the factory unless the inducer is rotated. If the furnace is installed in an orientation that places the pressure switch below the pressure tap on the inducer housing, then the switch **MUST** be relocated. In order to relocate the switch, locate 2 mounting holes or drill above the inducer pressure tap. When drilling the 2 holes make sure to keep the switch and tubing far enough away from the burners or hot surfaces as to not melt the hose, switch, or wires. To prevent possible kinking of the pressure switch hose, trim the hose to remove excess length.

Note: When drilling new holes make sure metal shavings do not fall on or in components, as this can shorten the life of the furnace.

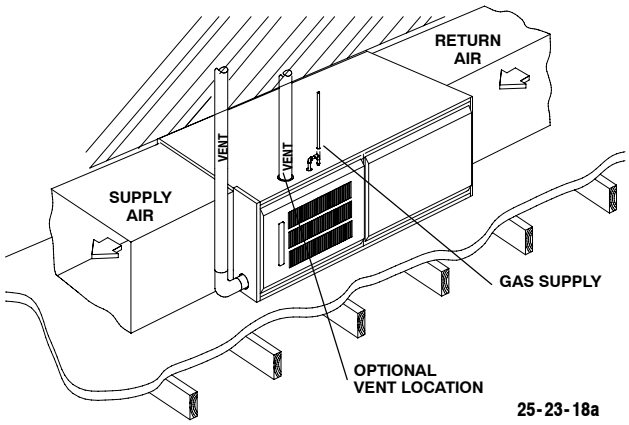
Horizontal

If you purchased a multi-position furnace, it can be installed horizontally in an attic, basement, crawl space, alcove, or suspended from a ceiling in a basement or utility room in either a right or left airflow position. (see **Figure 3**)

Horizontally installed furnaces may be vented out the top of the furnace or out the side facing up. See "**Side venting"** for instructions to rotate the vent to the side.

The minimum clearances to combustibles **MUST** be maintained between the furnace and adjacent construction, as shown in **Figure 1**. **ONLY** the corner of the cabinet is allowed to contact the rafters as shown in **Figure 3**. All other clearances **MUST** be observed as shown in **Figure 1.**

Figure 3 **Typical Horizontal Installation**



If the furnace is to be suspended from the floor joists in a basement or crawl space or the rafters in an attic, it is necessary to use steel pipe straps or an angle iron frame to attach the furnace. These straps should be attached to the furnace bottom side with sheet metal screws and to the rafters or joists with bolts. The preferred method is to use an angle iron frame bolted to the rafters or joists.

If the furnace is to be installed at ground level in a crawl space, consult local codes. A concrete pad 1″ (25.4 mm) to 2″ (51 mm) thick is recommended.

Twenty-four inches (24″ or 610 mm) is required between the front of the furnace and adjacent construction or other appliances. This should be maintained for service clearance.

Keep all insulating materials clear from louvered door. Insulating materials may be combustible.

The horizontal furnaces may be installed directly on combustible wood flooring or supports, however, it is recommended for further fire protection cement board or sheet metal is placed between the furnace and the combustible wood floor and extend 12″ (305 mm) beyond the front of the furnace louver door. (This is a recommendation only, not a requirement).

This furnace **MUST NOT** be installed directly on carpeting, tile or other combustible material other than wood flooring or supports.

3. Side Venting

This furnace is shipped from the factory in the upflow configuration (top vent). It can easily be converted to a side vent configurations for horizontal installations by rotating the venter assembly.

When using a side vent configuration (side outlet instead of top outlet), it may be necessary to relocate the pressure switch to the alternate position on the opposite side of the top panel. Two screw holes are provided at the alternate position. Route the pressure switch tubing so the tubing is not kinked and not touching the hot collector box, venter housing, or motor. It may be necessary to shorten the length of the tubing to properly route the tubing and eliminate kinks.

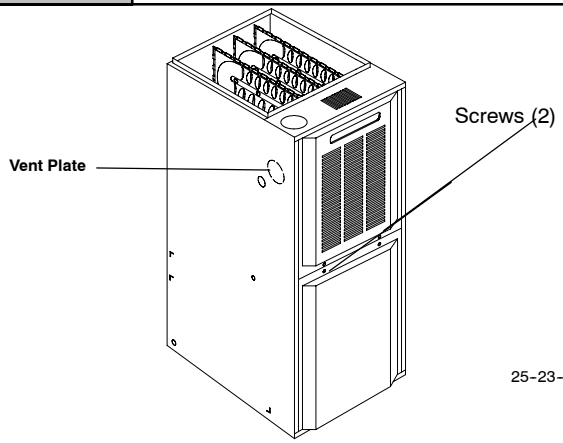
Rotating the Venter Assembly

1. If gas and electrical power have already been connected to furnace, shut off gas and remove power from furnace. Unscrew screws on burner compartment door and remove burner compartment door. (see **Figure 4.**)

2. Disconnect power leads to the venter motor and hose to pressure switch. Remove four (4) screws which secure the venter to the collector box, (see **Figure 5**).

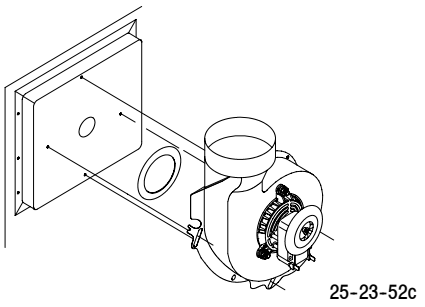
3. Cut webbing with a pair of snips holding the vent plate to the cabinet on either the left or right side of furnace depending on right or left venting as desired. Discard vent plate, (see **Figure 4**).

Figure 4 **Furnace with Screws**



4. Replace venter gasket (part # 1013540, if needed) to venter assembly with adhesive in the same location as the old one.
5. Clip the wire tie for the venter wires, if needed.
6. Rotate venter assembly 90° right or left from original location depending on venting configurations.

Figure 5 **Venter Gasket**



7. Tighten the four (4) screws that secure the venter assembly to the collector box. Do tighten screws enough to compress venter gasket.
8. Replace power leads to venter motor and reconnect hose to pressure switch.

NOTE: Unused open vent hole must be covered. A 5 $^{5}/_{16}$″ (135 mm) diameter Vent Cover is available separately from your distributor, or one can be fabricated with sheet metal for side vent installations.

4. Combustion & Ventilation Air

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow this warning could result in personal injury or death.

Use methods described here to provide combustion and ventilation air.

Furnaces require ventilation openings to provide sufficient air for proper combustion and ventilation of flue gases. All duct or openings for supplying combustion and ventilation air must comply with the gas codes, or in the absence of local codes, the applicable national codes.

Combustion and ventilation air must be supplied in accordance with one of the following:

Note: The Combustion & Ventilation Air Section in this document, uses tables and information from the ANSI Z223.1/NFPA 54. For use in Canada, use CSA B149.1 for this information.

1. Section 9.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, (NFGC), ANSI Z223.1-2006/NFPA 54-2006.
2. Sections 8.2, 8.3, 8.5, 8.6, 8.7, and 8.8 of National Standard of Canada, Natural Gas and Propane Installation Code (NSCNGPIC), CSA B149.1-05 in Canada,
3. Applicable provisions of the local building code.

When the installation is complete, check that all appliances have adequate combustion air and are venting properly. See *Venting And Combustion Air Check* in "*Gas Vent Installation"* Section in this manual.

Contaminated Combustion Air

Installations in certain areas or types of structures could cause excessive exposure to contaminated air having chemicals or halogens that will result in safety and performance related problems and may harm the furnace. These instances must use only outdoor air for combustion.

The following areas or types of structures may contain or have exposure to the substances listed below. The installation must be evaluated carefully as it may be necessary to provide outdoor air for combustion.

- Commercial buildings.
- Buildings with indoor pools.
- Furnaces installed in laundry rooms.
- Furnaces installed in hobby or craft rooms.
- Furnaces installed near chemical storage areas.
- Permanent wave solutions for hair.
- Chlorinated waxes and cleaners.
- Chlorine based swimming pool chemicals.
- Water softening chemicals.
- De-icing salts or chemicals.
- Carbon tetrachloride.
- Halogen type refrigerants.
- Cleaning solvents (such as perchloroethylene).
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid.
- Sulfuric Acid.
- Solvent cements and glues.
- Antistatic fabric softeners for clothes dryers.
- Masonry acid washing materials.

Outdoor Combustion Air Method

A space having less than 50 cubic feet per 1,000 BTUH input rating for all gas appliances installed in the space requires outdoor air for combustion and ventilation.

Air Openings and Connecting Ducts

1. Total input rating for all gas appliances in the space **MUST** be considered when determining free area of openings.
2. Connect ducts or openings directly to the outdoors.
3. When screens are used to cover openings, the openings **MUST** be no smaller than $^{1}/_{4}$″ (6.4 mm) mesh.
4. The minimum dimension of air ducts **MUST NOT** be less than 3″ (76 mm).
5. When sizing a grille, louver or screen use the free area of opening. If free area is **NOT** stamped or marked on grill or louver, assume a 20% free area for wood and 60% for metal. Screens shall have a mesh size not smaller than $^{1}/_{4}$″ (6 mm).

Requirements

1. Provide the space with sufficient air for proper combustion and ventilation of flue gases using horizontal or vertical ducts or openings.
2. **Figure 6** illustrates how to provide combustion and ventilation air when two permanent openings, one inlet and one outlet, are used.
   a. One opening **MUST** commence within 12″ (305 mm) of the floor and the second opening **MUST** commence within 12″ (305 mm) of the ceiling.
   b. Size openings and ducts per **Table 1**.
   c. Horizontal duct openings require 1 square inch of free area per 2,000 BTUH (1,100 mm^2/kW) of combined input for all gas appliances in the space **(**see **Table 1)**.
   d. Vertical duct openings or openings directly communicating with the outdoors require 1 square inch of free area per 4,000 BTUH (550 mm^2/kW) for combined input of all gas appliances in the space **(**see **Table 1).**
3. When one permanent outdoor opening is used, the opening requires:
   a. 1 sq. in of free area per 3,000 BTUH (700 mm^2/kW) for combined input of all gas appliances in the space (see **Table 1**) and
   b. not less than the sum of the areas of all vent connectors in the space.

The opening shall commence within 12″ (305 mm) of the top of the enclosure. Appliances shall have clearances of at least 1″ (25.4 mm) from the sides and back and 6″ (152 mm) from the front. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

4. Combination of Indoor and Outdoor Air shall have:
   a. Indoor openings that comply with the **Indoor Combustion Air** Method below and
   b. Outdoor openings located as required in the **Outdoor Combustion Air** Method above and
   c. Outdoor openings sized as follows.

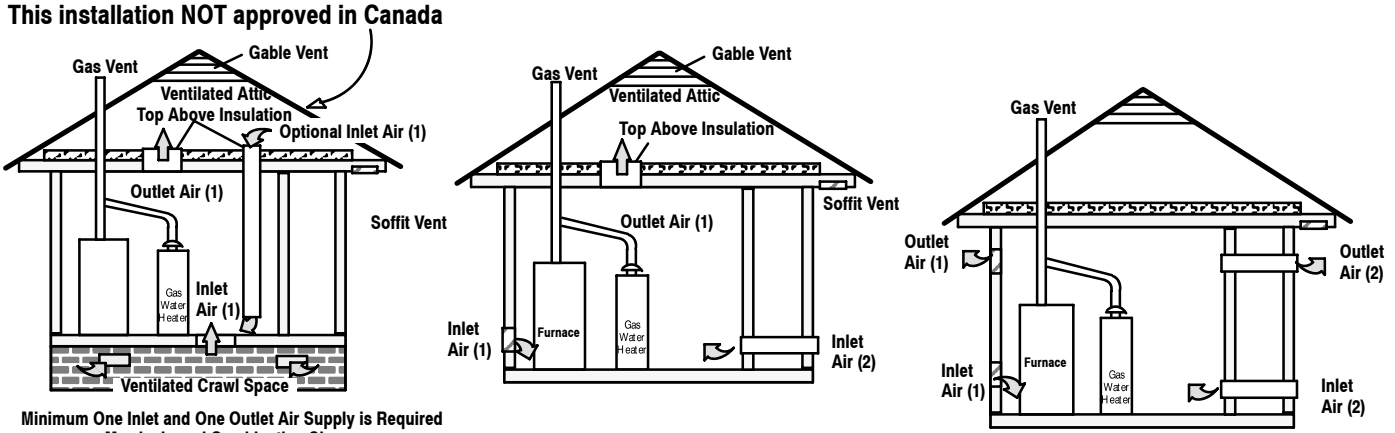
      1) Calculate the **Ratio** of all Indoor Space volume divided by required volume for **Indoor Combustion Air** Method. Outdoor openings sized as follows.

      2) Outdoor opening size reduction **Factor** is **1** minus the **Ratio** in 1) above.

      3) Minimum size of Outdoor openings shall be the size required in **Outdoor Combustion Air** Method above multiplied by reduction **Factor**.

Figure 6 **Outside Air (This is ONLY a guide. Subject to codes of country having jurisdiction.)**

This installation NOT approved in Canada



Minimum One Inlet and One Outlet Air Supply is Required May be in and Combination Shown

Inlet Air Opening Must be Within12″(305mm) of floor

Outlet Air Opening Must be Within12″(305mm) of ceiling

(1) 1 Square Inch (6cm^2) per 4000 BTUH

(2) 1 Square Inch (6cm^2) per 2000 BTUH

Table 1 **Free Area**

BTUH Input Rating	Minimum Free Area Required for Each Opening or Duct to Outdoors			
	Two Horizontal Ducts (sq. in./2,000 BTUH)	Single Opening (sq. in./3,000 BTUH)	Two Vertical Ducts or Openings (sq. in./4,000 BTUH)	Rd Duct (sq. in. /4,000 BTUH)
50,000	25 sq. in.	16.7 sq. in.	12.5 sq. in.	4″
75,000	37.5 sq. in.	25 sq. in.	18.75 sq. in.	5″
100,000	50 sq. in.	33.3 sq. in.	25 sq. in.	6″
125,000	62.5 sq. in.	41.7 sq. in.	31.25 sq. in.	7″
140,000	70 sq. in.	46.7 sq. in.	35 sq. in.	7″

EXAMPLE: Determining Free Area

Furnace		Water Heater		Total Input		
100,000	+	30,000	=	(130,000 ÷ 4,000)	=	32.5 Sq. In. Vertical
Furnace		Water Heater		Total Input		
100,000	+	30,000	=	(130,000 ÷ 2,000)	=	65 Sq. In. Horizontal

Indoor Combustion Air

Standard and **Known-Air-Infiltration Rate** Methods

Indoor air is permitted for combustion and ventilation, if the **Standard** or **Known-Air-Infiltration Rate** Method is used.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to supply adequate combustion air could result in personal injury or death.

Most homes will require additional air from outdoors for combustion and ventilation. A space with at least 50 cubic feet per 1,000 BTUH input rating or homes with tight construction may need outdoor air, supplied through ducts, to supplement air infiltration for proper combustion and ventilation of flue gases.

The **Standard** Method may be used, if the space has no less volume than 50 cubic feet per 1,000 BTUH of the maximum input ratings for all gas appliances installed in the space. The **standard** method permits indoor air to be used for combustion and ventilation air.

The **Known Air Infiltration Rate** Method shall be used if the infiltration rate is known to be less than 0.40 air changes per hour (ACH) and equal to or greater than 0.10 ACH. Infiltration rates greater than 0.60 ACH shall not be used. The minimum required volume of the space varies with the number of ACH and shall be determined per **Table 2** or **Equations 1 and 2**. Determine the minimum required volume for each appliance in the space, and add the volumes together to get the total minimum required volume for the space.

Table 2	MINIMUM SPACE VOLUME FOR 100% COMBUSTION AND VENTILATION AIR FROM INDOORS (ft^3)							
	Other Than Fan-Assisted Total (1,000's Btuh)			Fan-assisted Total (1,000's Btuh)				
ACH	30	40	50	50	75	100	125	150
0.60	1,050	1,400	1,750	1,250	1,875	2,500	3,125	3,750
0.50	1,260	1,680	2,100	1,500	2,250	3,000	3,750	4,500
0.40	1,575	2,100	2,625	1,875	2,813	3,750	4,688	5,625
0.30	2,100	2,800	3,500	2,500	3,750	5,000	6,250	7,500
0.20	3,150	4,200	5,250	3,750	5,625	7,500	9,375	11,250
0.10	6,300	8,400	10,500	7,500	11,250	15,000	18,750	22,500
0.00	NP	NP	NP	NP	NP	NP	NP	NP

NP = Not Permitted

Table 2 Minimum Space Volumes were determined by using the following equations from the *National Fuel Gas Code ANSI Z223.1/NFPA 54-2006*, 9.3.2.2:

1. For **other than fan-assisted appliances** such as a draft hood-equipped water heater,

$$\text{Volume}_{\text{other}} = \frac{21\ ft^3}{ACH}\left(\frac{I_{\text{other}}}{1000\ Btu/hr}\right)$$

2. For **fan-assisted appliances** such as this furnace,

$$\text{Volume}_{\text{fan}} = \frac{15\ ft^3}{ACH}\left(\frac{I_{\text{fan}}}{1000\ Btu/hr}\right)$$

If:

I_{other} = combined input of all **other than fan-assisted appliances** in Btu/hr

I_{fan} = combined input of all **fan-assisted appliances** in Btu/hr

ACH = air changes per hour (ACH shall not exceed 0.60.)

The following requirements apply to the **Standar**d Method and to the **Known Air Infiltration** Rate Method.

- Adjoining rooms can be considered part of a space, if there are no closable doors between rooms.
- An attic or crawl space may be considered a space that freely communicates with the outdoors provided there are adequate ventilation openings directly to outdoors. Openings **MUST** remain open and **NOT** have any means of being closed off. Ventilation openings to outdoors **MUST** be at least 1 square inch of free area per 4,000 BTUH of total input rating for all gas appliances in the space.
- In spaces that use the **Indoor Combustion Air** Method, infiltration should be adequate to provide air for combustion, ventilation and dilution of flue gases. However, in buildings with unusually tight construction, additional air **MUST** be provided using the methods described in section titled ***Outdoor Combustion Air Method***:
- Unusually tight construction is defined as Construction with:
  1. Walls and ceilings exposed to the outdoors have a continuous, sealed vapor barrier. Openings are gasketed or sealed and
  2. Doors and openable windows are weather stripped and
  3. Other openings are caulked or sealed. These include joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and gas lines, etc.

Ventilation Air

Some provincial codes and local municipalities require ventilation or make-up air be brought into the conditioned space as replacement air. Whichever method is used, the mixed return air temperature across the heat exchanger **MUST** not fall below 60° F so that flue gases will not condense excessively in the heat exchanger. Excessive condensation will shorten the life of the heat exchanger and possibly void your warranty.

5. Gas Vent Installation

⚠ WARNING

CARBON MONOXIDE POISONING, FIRE AND EXPLOSION HAZARD.

Failure to properly vent this furnace could result in personal injury, death and/or property damage.

Read and follow all instructions in this section.

Install the vent in compliance with codes of the country having jurisdiction, local codes or ordinances and these instructions.

This Category I furnace is fan-assisted.

A fan assisted appliance is an appliance equipped with an integral mechanical means to either draw or force products of combustion through the heat exchanger.

Category I furnace definition: A central furnace which operates with a non-positive vent static pressure and with a flue loss not less than 17 percent. These furnaces are approved for common-venting and multi-story venting with other fan-assisted or draft hood-equipped appliances in accordance with the NFGC.

Category I Safe Venting Requirements

Category I furnace vent installations shall be in accordance with Parts 10 and 13 of the National Fuel Gas Code (NFGC), ANSI Z223.1-2006/NFPA 54-2006; and/or Section 7 and Appendix C of the CSA B149.1-05, National Standard of Canada, Natural Gas and Propane Installation Code; the local building codes; furnace and vent manufacturer's instructions.

NOTE: The following instructions comply with the ANSI Z223.1/NFPA 54 National Fuel Gas Code, based on the input rate on the furnace rating plate.

1. If a Category I vent passes through an attic, any concealed space or floor, use **ONLY** Type B or Type L double wall vent pipe. If vent pipe passes through interior wall, use Type B vent pipe with ventilated thimble **ONLY**.
2. Do **NOT** vent furnace into any chimney serving an open fireplace or solid fuel burning appliance.
3. Use the same diameter Category I connector or pipe as permitted by the **National Fuel Gas Code** Code (NFGC) ANSI Z223.1-2006 / NFPA 54-2006 Sections 12 and 13 venting requirements.
4. Push the vent connector onto the furnace flue collar of the venter assembly until it touches the bead [at least $^5/_8$″ (16 mm) overlap] and fasten with at least two field-supplied, corrosion-resistant, sheet metal screws located at least 140° apart.
5. Keep vertical Category I vent pipe or vent connector runs as short and direct as possible.
6. Vertical outdoor runs of Type-B or **ANY** single wall vent pipe below the roof line are **NOT** permitted.
7. Slope all horizontal runs up from furnace to the vent terminal a minimum of $^1/_4$″ per foot (6 mm/305 mm).
8. Rigidly support all horizontal portions of the venting system every 6′ (1.8 m) or less using proper clamps and metal straps to prevent sagging and ensure there is no movement after installation.
9. Check existing gas vent or chimney to ensure they meet clearances and local codes. See **Figure 1**
10. The 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. **Venting into an unlined masonry chimney or concrete chimney is prohibited. See the 6. *Masonry Chimney Venting* section in these instructions.**
11. Fan-assisted combustion system Category I furnaces shall not be vented into single-wall metal vents.
12. Category I furnaces must be vented vertically or nearly vertically, unless equipped with a listed mechanical venter.
13. Vent connectors serving Category I furnaces shall not be connected into any portion of mechanical draft systems operating under positive pressure.

Venting and Combustion Air Check

NOTE: When an existing Category I furnace is removed or replaced, the original venting system may no longer be sized to properly vent the attached appliances, and to make sure there is adequate combustion air for all appliances, **MAKE THE FOLLOWING CHECK.**

⚠ WARNING

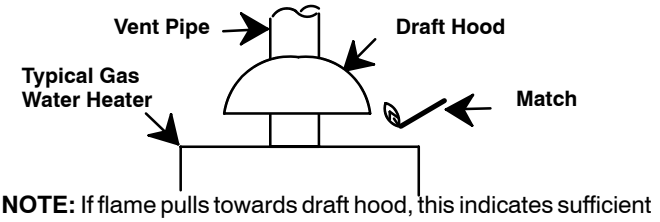
CARBON MONOXIDE POISONING HAZARD.

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation, could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* or the *CSA B149.1, Natural Gas and Propane Installation Code* and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle. (**Figure 7**)
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or *CSA B149.1, Natural Gas and Propane Installation Code.*
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

Figure 7	Vent Check



NOTE: If flame pulls towards draft hood, this indicates sufficient infiltration air.

Venting to Existing Masonry Chimney

Dedicated venting of one fan assisted furnace into any masonry chimney is restricted. A chimney must first be lined with either Type B vent sized in accordance with NFGC tables 13.1 or 13.2 or a listed, metal lining system. (See Section *Masonry Chimney Venting* of these instructions)

Listed, corrugated metallic chimney liner systems in masonry chimneys shall be sized by using **NFGC** tables per 13.1.7 for dedicated venting and per 13.2.20 for common venting with the maximum capacity reduced by 20% (0.80 X maximum capacity) and the minimum capacity as shown in the applicable table. In Canada, use the **NSCNGPIC**, appendix C, Section 10. Corrugated metal vent systems installed with bends or offsets require additional reduction of 5% of the vent capacity for each bend up to 45° and 10% of the vent capacity for each bend from 45° up to 90°.

NOTE: Two (2) 45° elbows are equivalent to one (1) 90° elbow.

Combined Venting into an Interior Masonry Chimney

Venting into an interior masonry or concrete chimney is only permitted as outlined in the NFGC venting tables. Follow all safe venting requirements.

Note: See section "*Masonry Chimney Venting*".

6. Horizontal Venting

Category I Furnaces With External Power Venters

In order to maintain a Category I classification of fan-assisted furnaces when vented horizontally with sidewall termination, a power venter is **REQUIRED** to maintain a negative pressure in the venting system.

In the U.S.: Per the NFGC, a listed power venter may be used, when approved by the authority having jurisdiction.

In Canada: Only power venters approved by the appliance manufacturer and where allowed by the authority having jurisdiction may be used.

Please consult the Fields Controls Co. or Tjernlund Products, Inc. for power venters certified for use with our furnaces.

Vent Termination

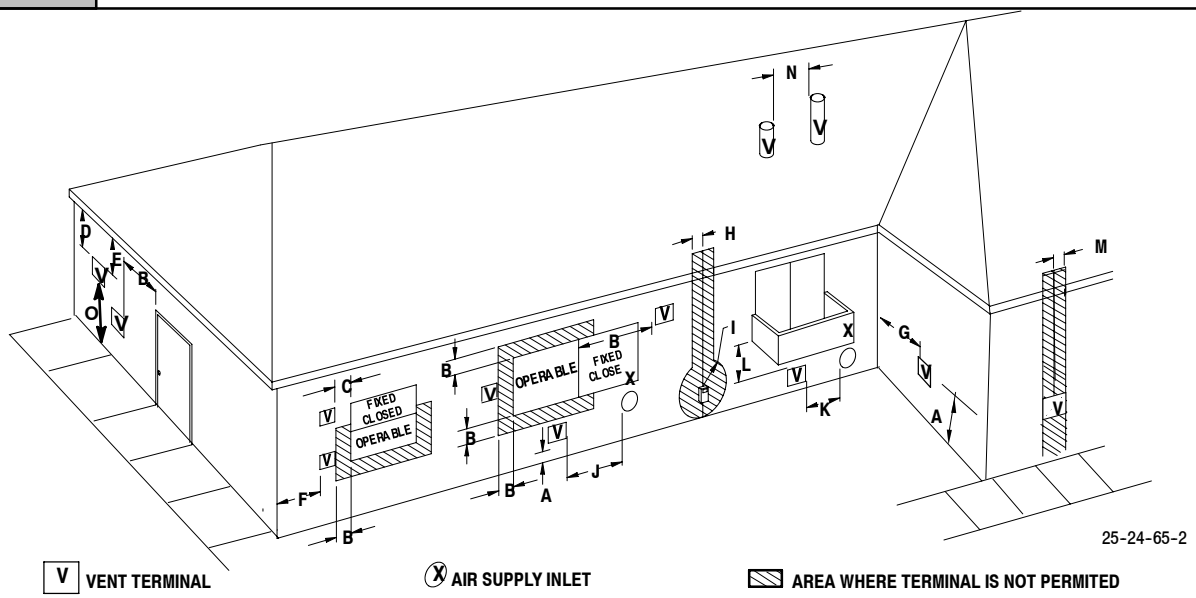
Venting Through a Non-Combustible and Combustible Wall

Consult External Power Venter manufacturer instructions.
Select the power venter to match the Btuh input of the furnace being vented. Follow all of the power venter manufacturer's installation requirements included with the power venter for:

- venting installation,
- vent terminal location,
- preventing blockage by snow,
- protecting building materials from degradation by flue gases,
- see **Figure 8** for required vent termination.

NOTE: It is the responsibility of the installer to properly terminate the vent and provide adequate shielding. This is essential in order to avoid water/ice damage to building, shrubs and walkways.

Figure 8 Other than Direct Vent Termination Clearance



Item	Clearance Descriptions	Canadian Installation (1)	U.S. Installation (2)
A	Clearance above grade, veranda, porch, deck, balcony, or anticipated snow level	12″ (30cm) #	12″ (30 cm)
B	Clearance to a window or door that may be opened	6″ (15 cm) for appliances ≤ 10,000 BTUH (3kW), 12″ (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36″ (91 cm) for appliances > 100,000 Btuh (30 kW)	4′ (1.2 m) below or to the side of the opening. 1′ (30 cm) above the opening.
C	Clearance to a permanently closed window	*	*
D	Vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2′ (61cm) from the centerline of the terminal	*	*
E	Clearance to an unventilated soffit	*	*
F	Clearance to an outside corner	*	*
G	Clearance to an inside corner	*	*
H	Clearance to each side of the centerline extended above electrical meter or gas service regulator assembly	3′ (91 cm) within 15′ (4.5 m) above the meter/regulator assembly	*
I	Clearance to service regulator vent outlet	3′ (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6″ (15 cm) for appliances ≤ 10,000 BTUH (3kW), 12″ (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36″ (91 cm) for appliances > 100,000 Btuh (30 kW)	4′ (1.2 m) below or to the side of opening: 1′ (30 cm) above opening.
K	Clearance to a mechanical air supply inlet	6′ (1.83 m)	3′ (91 cm) above if within 10′ (3m) horizontally
L	Clearance under a veranda, porch, deck, or balcony	12″ (30 cm) ‡	*
M	Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance's direct vent intake or exhaust.	*	*
N	Clearance from a plumbing vent stack	3′ (91 cm)	3′ (91 cm)
O	Clearance above a paved sidewalk or paved driveway located on public property.	7′ (2.13 m) +	7′ (2.13 m)

(1.) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

(2.) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code

\# 18″ (46 cm) above roof surface

\+ A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

* For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacture's installation instructions.

Notes:

1. The vent for this appliance shall not terminate
   a. Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or property damage; or
   b. Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
2. When locating vent terminations, consideration must be given to prevailing winds, location, and other conditions which may cause recirculation of the combustion products of adjacent vents. Recirculation can cause poor combustion, inlet condensate problems, and accelerated corrosion of the heat exchangers.

7. Masonry Chimney Venting

⚠ WARNING

CARBON MONOXIDE POISONING, FIRE AND EXPLOSION HAZARD.

Failure to properly vent this furnace could result in personal injury, death and/or property damage.

Follow these installation instructions.

Chimney Inspection

All masonry chimney construction must conform to the Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances ANSI/NFPA 211-2006 and to any state or local codes applicable. The chimney must be in good condition and a complete chimney inspection must be conducted prior to furnace installation. If the inspection reveals damage or abnormal conditions, make necessary repairs or seek expert help. See "The Chimney Inspection Chart" **Figure 9.** Measure inside area of tile-liner and exact height of chimney from the top of the chimney to the highest appliance flue collar or drafthood outlet.

Connector Type

To reduce flue gas heat loss and the chance of condensate problems, the vent connector **must** be double-wall Type B vent.

Venting Restrictions for Chimney Types

Interior Chimney - has no sides exposed to the outdoors below the roofline. Venting is permitted into an interior masonry chimney in accordance with Table 13.8 and section 13.2 of the National Fuel Gas Code ANSI Z223.1/NFPA 54-2006, if the furnace is common-vented with at least one draft hood-equipped water heater or furnace.

These furnaces are NOT permitted to be vented into interior masonry chimneys singly (not common-vented with a draft hood-equipped water heater or furnace).

Exterior Chimney - has one or more sides exposed to the outdoors below the roof line. All installations with a 99% Winter Design Temperature* below 17° F (-8° C) must be common vented only with a draft hood equipped Category I appliance.

* The 99.6% Winter Design Dry-Bulb (db) temperatures are found in the 1997 or 2001 ASHRAE Climatic Design Information chapter, Table 1A (United States) and 2B (Canada), or the 2005 ASHRAE Fundamentals Handbook, Climatic Design Information chapter, and the CD-ROM included with the 2005 ASHRAE Fundamentals Handbook.

Chimneys shall conform to the Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances ANSI/NFPA 211-2006 and must be in good condition.

Refer to Sections 13.1.9 or 13.2.20 of the NFGC or the authority having jurisdiction to determine whether relining is required.

If relining is required, use a properly sized listed metal liner or Type-B vent to reline the chimney.

Inspections before the sale and at the time of installation will determine the acceptability of the chimney or the need for repair and/or (re)lining. Refer to the Chimney Inspection Chart to perform a chimney inspection.

If the inspection of a previously used tile-lined chimney:

a. Shows signs of vent gas condensation, the chimney should be relined in accordance with local codes and the authority having jurisdiction. The chimney should be relined with a listed metal liner or Type-B vent to reduce condensation. If a condensate drain is required by local code, refer to the NFGC, Section 12.1 for additional information on condensate drains.

b. Indicates the chimney exceeds the maximum permissible size in the tables, the chimney should be rebuilt or relined to conform to the requirements of the appliances being installed and the authority having jurisdiction.

A chimney without a clay tile liner, which is otherwise in good condition, shall be rebuilt to conform to ANSI/NFPA 211 or be lined with a UL listed metal liner or UL listed Type-B vent. Relining with a listed metal liner or Type-B vent is considered to be a vent-in-a-chase.

If a metal liner or Type-B vent is used to line a chimney, no other appliance shall be vented into the annular space between the chimney and the metal liner.

APPLIANCE APPLICATION REQUIREMENTS

Appliance operation has a significant impact on the performance of the venting system. If the appliances are sized, installed, adjusted, and operated properly, the venting system and/or the appliances should not suffer from condensation and corrosion. The venting system and all appliances shall be installed in accordance with applicable listings, standards, and codes.

The furnace should be sized to provide 100 percent of the design heating load requirement plus any margin that occurs because of furnace model size capacity increments. Heating load estimates can be made using approved methods available from Air Conditioning Contractors of America (Manual J); American Society of Heating, Refrigerating, and Air-Conditioning Engineers; or other approved engineering methods. Excessive oversizing of the furnace could cause the furnace and/or vent to fail prematurely.

When a metal vent or metal liner is used, the vent or liner must be in good condition and be installed in accordance with the vent or liner manufacturer's instructions.

To prevent condensation in the furnace and vent system, the following precautions must be observed:

1. This furnace is designed for minimum continuous return-air temperature of 60° F (155° C) db or intermittent operation down to 55° F (13° C) db such as when used with a night setback thermostat.
2. Adjust the gas input rate per the installation instructions. Low gas input rate causes low vent gas temperatures, causing condensation and corrosion in the furnace and/or venting system. Derating is permitted only for altitudes above 2000' (610 m).
3. Adjust the air temperature rise to the midpoint of the rise range or slightly above. Low air temperature rise can cause low vent gas temperature and potential for condensation problems.
4. Set the thermostat heat anticipator or cycle rate to reduce short cycling.

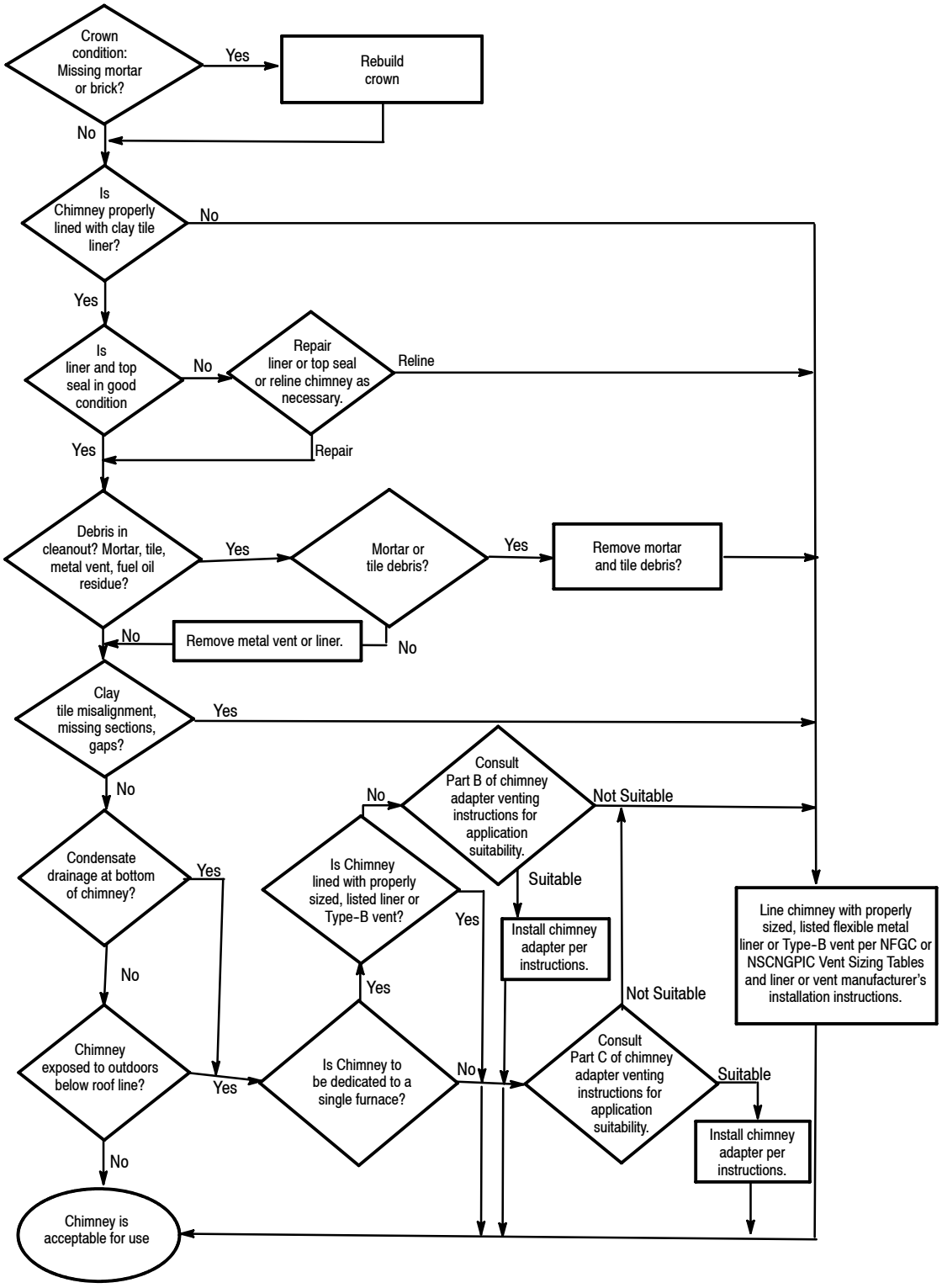
Air for combustion must not be contaminated by halogen compounds, which include chlorides, fluorides, bromides, and iodides.
These compounds are found in many common home products such as detergent, paint, glue, aerosol spray, bleach, cleaning solvent, salt, and air freshener, and can cause corrosion of furnaces and vents. Avoid using such products in the combustion-air supply. Furnace use during construction of the building could cause the furnace to be exposed to halogen compounds, causing premature failure of the furnace or venting system due to corrosion.

Vent dampers on any appliance connected to the common vent can cause condensation and corrosion in the venting system. Do not use vent dampers on appliances common vented with this furnace.

Figure 9

CHIMNEY INSPECTION CHART

For additional requirements refer to the National Fuel Gas Code NFPA 54/ANSI Z223.1-2006 and ANSI/NFPA 211-2006 Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances in the U.S.A. or to the Canadian Installation Code CSA B149.1-05 in Canada.



8. Gas Supply and Piping

⚠ WARNING

CARBON MONOXIDE POISONING, FIRE AND EXPLOSION HAZARD.

Failure to follow this warning could result in personal injury, death, and/or property damage.

Models designated for Natural Gas are to be used with Natural Gas ONLY, unless properly converted to use with Propane gas.

Gas Supply Requirements

- Use only the Type of gas approved for this furnace. See rating plate for approved gas type.
- Gas input must not exceed the rated input shown on the rating plate. Overfiring will result in failure of heat exchanger and cause dangerous operation.
- Do **NOT** allow minimum supply pressure to vary downward. Doing so will decrease input to furnace. Refer to **Table 3** for gas supply. Refer to **Table 7** or **Table 8** for manifold pressures.

Table 3 Gas Pressures

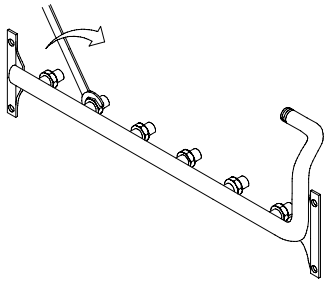
Gas Type	Supply Pressure in wc		
	Recommended	Max.	Min.
Natural	7″	14″	4.5″
Propane	11″	14″	11″

Natural to Propane Gas Conversion

Note: An accessory kit shall be used to convert to propane gas use, see the furnace rating plate for the Propane conversion accessory kit part number.

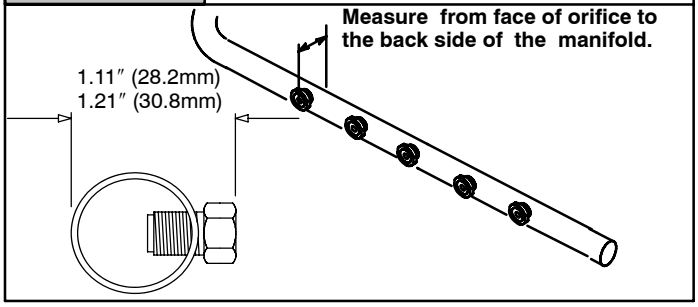
1. After disconnecting power and gas supply to the furnace, remove the access door, exposing gas valve and burner compartment.
2. Disconnect gas line from gas valve so manifold assembly can be removed.
3. Disconnect wiring at gas valve. Be sure to note the proper location of any and all electrical wiring disconnected.
4. Remove the four (4) screws holding the manifold and gas valve to the manifold supports. Do Not discard any screws.
5. Carefully remove the manifold assembly.
6. Remove the Natural gas (brass) burner orifices from the manifold assembly and replace them with the appropriate Propane (silver) orifices furnished in the conversion kit unless converting high altitude unit, then see **Table 6** or **Table 8** for appropriate orifices. (**Figure 10**)

Figure 10 Remove Orifices



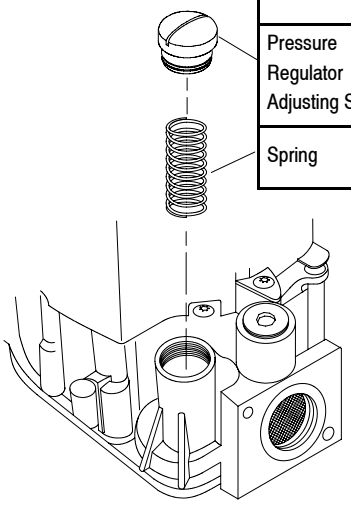
7. Tighten the orifices so they are seated and gas tight about 1 $^{1}/_{8}$″ from the face of the orifice to the back of the manifold pipe (**Figure 11**). Make sure orifice is installed straight so that it forms a right angle (90°) to the manifold.

Figure 11 Changing Orifices



8. Remove the cap screw and pressure regulator adjusting screw from valve. (see **Figure 12**)
9. Remove the existing regulator spring from the regulator housing.
10. Insert the replacement spring (red color) contained in this kit into regulator housing.
11. Install the pressure regulator adjusting screw and give it eleven (11) full clockwise turns. This will set the manifold pressure close to required setting for normal operation.
12. Replace the regulator cap screw.
13. Attach the Yellow Attention Label contained in the kit to the Gas Valve where it can be readily seen.

Figure 12 Typical Regulator Assembly



	Color Code For	
	Propane Gas	Natural Gas
Pressure Regulator Adjusting Screw	Black	Black
Spring	Red	Stainless Steel

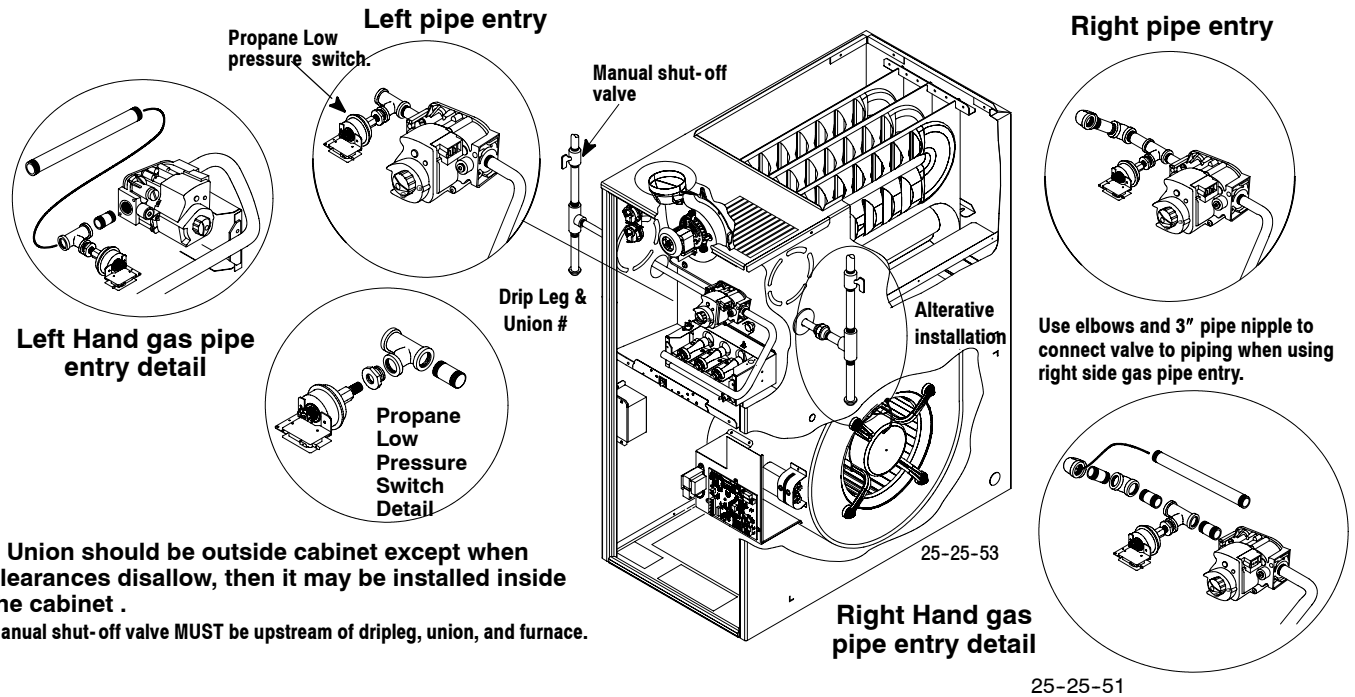
Note: A low gas pressure switch is required for conversion.

14. Using pipe joint compound that is resistant to Propane gas, tighten the fitting assembly into the inlet side of the gas valve. (**Figure 13**). Position fitting assembly as shown.
15. Screw the Propane pressure switch into the bushing. Use pipe dope on connection. Tighten securely.

Note: Do not block inlet port of pressure switch with pipe dope. Switch will not operate if inlet port is blocked.

16. Remove one yellow wire from the air pressure switch. Connect this wire to the male insulated yellow wire in the wire harness provided.
17. Connect the other yellow wire in the harness to the open termination on the air pressure switch.
18. Connect the other end of the wire harness to the two terminals on the Propane switch.
19. Reassemble all parts in reverse order as removed. Attach Propane Conversion Label next to the furnace rating plate or to the front exterior of the furnace.
20. Be sure to engage the main burner orifices in the proper openings in the burners.
21. After reassembly, turn the gas on and check all joints for gas leaks using a soapy solution. All leaks must be repaired immediately.
22. Affix Propane Gas Conversion Rating plate next to furnace rating plate.
23. Fill and attach Conversion Label to front exterior of furnace.
24. Check operation in Section *Checks and Adjustments*.

Figure 13 **Typical Gas Piping and Adding Propane Low Pressure Switch**



Gas Piping Requirements

NOTE: The gas supply line must be installed by a qualified service technician in accordance with all building codes.

1. Install gas piping in accordance with local codes, or in the absence of local codes, the applicable national codes.
2. It is recommended that a manual equipment shutoff valve be installed in the gas supply line outside the furnace. Locate valve as close to the furnace as possible where it is readily accessible. Refer to **Figure 13.**
3. Use black iron or steel pipe and fittings or other pipe approved by local code.
4. Use pipe thread compound which is resistant to natural and Propane gases.
5. Use ground joint unions and install a drip leg no less than 3″ (76mm) long to trap dirt and moisture before it can enter gas valve inside furnace.
6. Provide a $^1/_8$″ (3mm) NPT plugged tapping for test gauge connection immediately up stream of gas supply connection to furnace.

⚠ WARNING

FIRE HAZARD.

Failure to follow this warning could result in personal injury or death.

Use wrench to hold furnace gas valve when turning elbows and gas line to prevent damage to the gas valve and furnace.

7. Use two pipe wrenches when making connections to prevent furnace gas valve from turning.

NOTE: If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector which has previously served another gas appliance.

8. Flexible corrugated metal gas connector may **NOT** be used inside the furnace or be secured or supported by the furnace or ductwork.
9. Properly size gas pipe to handle combined appliance load or run gas pipe directly from gas meter or Propane gas regulator.
10. Install correct pipe size for run length and furnace rating.

11. Measure pipe length from gas meter or Propane second stage regulator to determine gas pipe size.

Left Side Gas Supply Piping

Gas line can be installed directly to the gas valve through the hole provided in the left side of the cabinet. See **Figure 13**

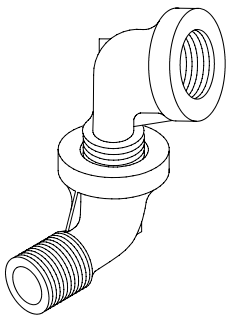
Right Side Gas Supply Piping

Two(2) 90° street elbows or two(2) 90° standard elbows and two(2) close nipples are required for right side gas supply. See **Figure 13.**

Piping with Street Elbows

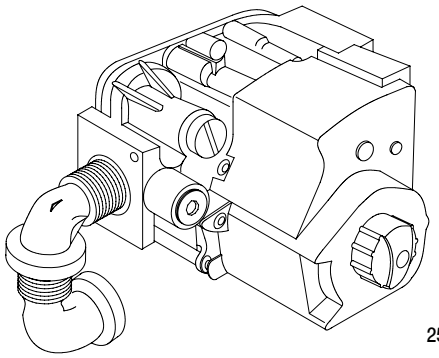
1. Assemble the elbows so that the outlet of one(1) elbow is 90° from the inlet of the other. The elbows should be tight enough to be leak proof. An additional $^1/_4$ turn will be required at the end of step 2, see **Figure 14**.

Figure 14 **Elbows**



2. Screw elbow assembly into gas valve far enough to be leak proof. Position elbow assembly so that the inlet of the elbow is at the bottom of the gas valve. An additional $^1/_2$ turn will be required in step 3. Turn open end of inlet elbow to face the right side of the furnace ($^1/_4$ turn), see **Figure 15**.

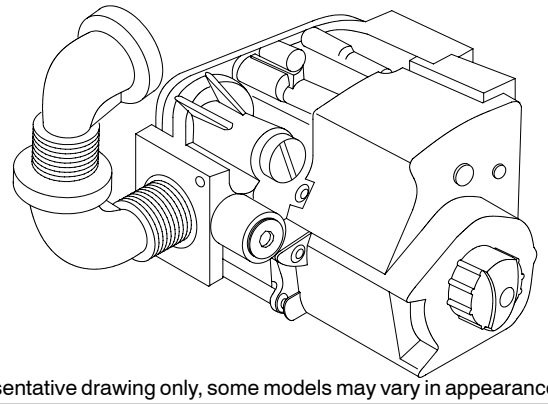
Figure 15 **Gas Valve with Elbows**



Representative drawing only, some models may vary in appearance.

3. Turn assembly an additional $^3/_8$ turn to position inlet near the top of the gas valve in line with gas opening on right side of furnace, see **Figure 16**.

Figure 16 **Gas Valve with Elbows**



Representative drawing only, some models may vary in appearance.

4. Gas supply line then can be run directly into opening of elbow.

Piping with Close Nipples and Standard Elbows

1. Assemble elbows and nipples similar to street elbows shown in **Figure 14**.
2. Follow steps 2 through 4 of **Piping with Street Elbows.**

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

Failure to follow this warning could result in personal injury, death and/or property damage.

A flexible corrugated metal gas connector must be properly installed, shall not extend through the side of the furnace, and shall not be used inside the furnace.

Black iron pipe shall be installed at the furnace gas valve and extend a minimum of 2″ (50.8mm) outside furnace.

Additional Propane Piping Requirements

- Have a licensed Propane gas dealer make all connections at storage tank and check all connections from tank to furnace.
- If copper tubing is used, it **MUST** comply with limitation set in local codes, or in the absence of local codes, the gas codes of the country having jurisdiction.
- Two–stage regulation of Propane gas is recommended.

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

Failure to follow this warning could result in personal injury, death and/or property damage.

A natural gas or Propane gas leak ignited by an open flame or spark could result in personal injury, death and/or property damage.

Natural gas is lighter than air and will rise. Propane gas is heavier than air and will settle and remain in low areas and open depressions.

Thoroughly ventilate area and dissipate gas. Do NOT use a match or open flame to test for leaks, or attempt to start up furnace before thoroughly ventilating area.

Final Check

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

Failure to follow this warning could result in personal injury, death and/or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

- Test all pipe for leaks.
- If orifices were changed, make sure they are checked for leaks.
- During pressure testing of gas supply piping system:
  a. If test pressure does not exceed $^1/_2$″ psi, isolate the furnace from the gas supply piping system by closing the equipment shutoff valve.
  b. If test pressure exceeds $^1/_2$″ psi, the furnace and its manual equipment shutoff valve must be disconnected from the gas supply piping system.
- To check for leaks apply soap suds or a liquid detergent to each joint. Bubbles forming indicate a leak.
- Correct even the smallest leak at once.

9. Electrical Wiring

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

Failure to follow this warning could result in personal injury or death.

Turn OFF electrical power at fuse box or service panel before making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

Power Supply Wiring

The furnace **MUST** be electrically wired and grounded in accordance with local codes, or in the absence of local codes, with the National Electrical Code (NEC), ANSI/NFPA 70-2005.

The power supply to the furnace connections must be between 198 VAC and 242 VAC during furnace operation for acceptable performance.

Field wiring connections must be made inside the furnace connection box. A suitable strain relief should be used at the point the wires exit the furnace casing.

Copper conductors shall be used. Line voltage wires should conform to temperature limitation of 63° F (35° C) rise. Wire and circuit breaker sizing shall be based on the ampacity of the furnace electrical components plus the amps for all installed accessories (1.0 amps total for EAC and HUM). Ampacity can be determined by using the NEC or CEC.

Furnace must be installed so the electrical components are protected from water and connected to its own separate circuit.

Junction Box (J-Box) Relocation

The J-Box is installed in the burner compartment on left side of casing. An alternate J-Box location on right side can be used.

1. Remove and save two screws holding J-Box to casing.
2. Move large hole plug from right to left J-Box location.
3. Clip wire tie holding the J-Box wires.
4. Move J-Box to alternate location and attach using two screws removed from left side location.
5. Position all wires away from sharp edges, hot surfaces, and moving parts. Do not pinch J-Box wires or other wires when reinstalling burner compartment door.

Thermostat

Thermostat location has an important effect on the operation of the furnace. Follow instructions included with thermostat for correct mounting and wiring.

Low voltage connections to furnace must be made on terminal board to fan control. (See **Figure 17**)

If cooling is used, the **Y** from the thermostat must be connected to the control board **Y** to energize cooling blower speed.

Heat anticipator setting will need to be measured if 24VAC humidifier is installed. Measure current in series from R to W at the thermostat. Be sure 24VAC humidifier is wired up to control. Allow furnace to operate for 2 minutes before recording the AC amperage reading. Set anticipator on thermostat to recorded value.

Optional Equipment

All wiring from furnace to optional equipment **MUST** conform to local codes or, in the absence of local codes, the applicable national codes. Install wiring in accordance with manufacturer's instructions.

Humidifier/Electronic Air Cleaner

The furnace is wired for 220 VAC humidifier and/or electronic air cleaner connection.

⚠ CAUTION

REDUCED FURNACE LIFE HAZARD.

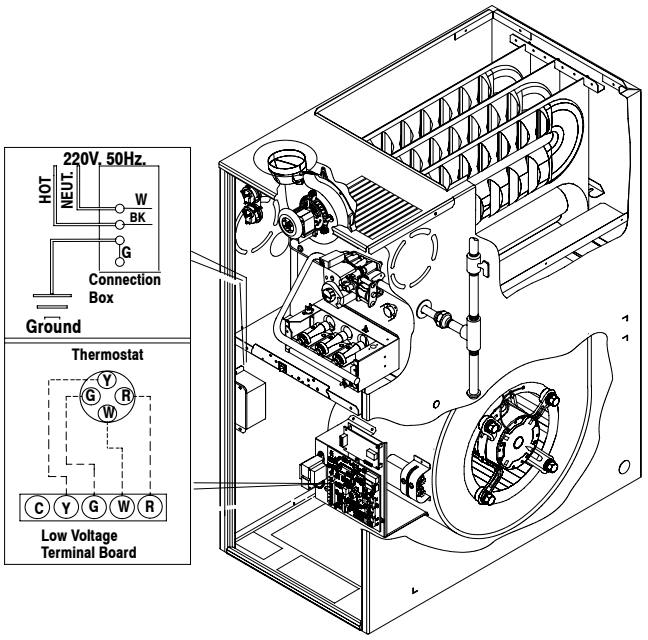
Failure to follow this caution may result in reduced furnace life.

Do NOT exceed 220V/0.8 amp. maximum current load for both the EAC terminal and the HUM terminal combined.

HUMIDIFIER - The 24VAC HUM is energized when the pressure switch closes on a call for heat. The HUM (220VAC) is energized when the inducer is energized.

ELECTRONIC AIR CLEANER - EAC is energized when there is a blower speed call, except is NOT energized when blower operates in the hard-wired continuous fan mode.

Figure 17 **Electrical Connections**



NOTE: 220 VAC/50Hz/single-phase
Operating voltage range*: 242 max, 198 min.

* Permissible limits of voltage at which furnace will operate satisfactorily

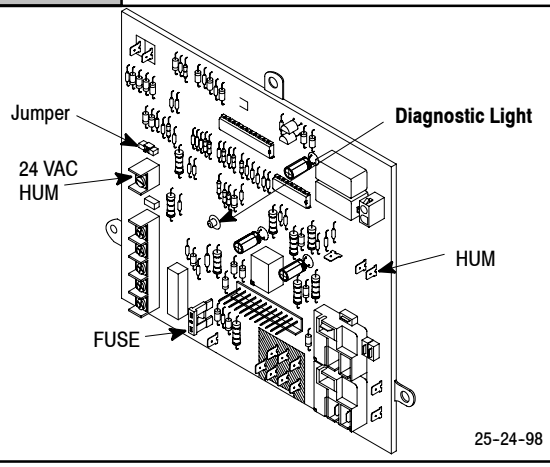
Furnace Control

The furnace control is preset at the factory with ON delay of 36 seconds in the heating mode. The blower OFF timing is preset at 168 seconds. If desired, the fan OFF delay can be reset to obtain the longest delay times while still maintaining comfort levels. See "Furnace Wiring Diagram".

Furnace Control Fuse

The 24V circuit contains a 5-amp, automotive-type fuse located on furnace control. (See **Figure 18**) Any electrical shorts of 24V wiring during installation, service, or maintenance may cause fuse to blow. If fuse replacement is required, use only a fuse of identical size (5 amp.).

Figure 18 **Control Connections**



10. Ductwork and Filter

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow this warning could result in personal injury or death.

Do NOT draw return air from inside a closet or utility room where furnace is located. Return air duct MUST be sealed to furnace casing.

⚠ WARNING

FIRE HAZARD.

Failure to follow this warning could result in personal injury, death and/or property damage.

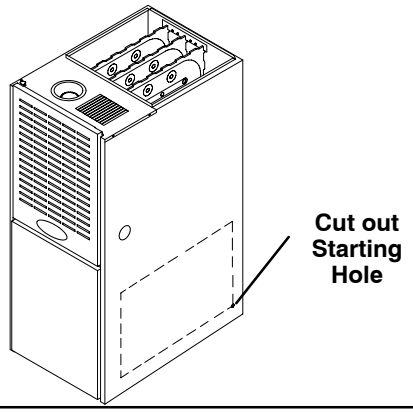
Place furnace on noncombustible subbase on downflow applications, unless installing on non-combustible flooring.

Duct Connections

This furnace may be installed in only a bottom or side return application. Return air duct connection through the back of the furnace is **NOT** allowed.

Upflow ONLY: Side return-air duct connections can be made by cutting out the embossed area shown in **Figure 19.** A plugged hole is provided at each furnace side duct location to help start cutting the opening. Side duct connections are NOT permitted in horizontal flow applications.

Figure 19 **Cut out Side Return Air Opening**



Upflow and Horizontal Flow: Bottom return-air duct connections can be made by removing the knockout panel in the furnace base. Do **NOT** remove knock-out except for a bottom return-air duct connection.

Duct Design

Design and install air distribution system to comply with Air Conditioning Contractors of America manuals or other approved methods that conform to local codes and good trade practices.

When the furnace is located in an area near or adjacent to the living area, the system should be carefully designed with returns to minimize noise transmission through the return air grille. Any blower moving a high volume of air will produce audible noise which could be objectionable when the furnace is located very close to a living area. It is often advisable to route the return air ducts under the floor or through the attic.

- Refer to furnace **Technical Support Manual** (Blower Data) for air flow information.
- Size ductwork to handle air flow for heating (and air conditioning if so equipped).

Duct Installation Requirements

- When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside of the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD.

Failure to follow warning could result in personal injury or death.

Install cooling coil on furnace discharge. Cool air passing over heat exchanger could cause condensate to form resulting in heat exchanger failure.

- When the furnace is used with a cooling unit, the furnace shall be installed parallel with or on the upstream side of the cooling unit 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 the furnace. Chilled air going through the furnace could cause condensation and shorten furnace life. Dampers (purchased locally) can be either automatic or manual. Manually or automatically operated dampers **MUST** be equipped with a means to prevent furnace and air conditioning operation, unless damper is in the full heat or cool position.
- Installation of locking-type dampers are recommended in all branches, or in individual ducts to balance system's air flow.
- Non-combustible, flexible duct connections are recommended for return and supply connections to furnace.
- If air return grille is located close to the fan inlet, install at least one 90° air turn between fan and inlet grille to reduce noise.
- Ductwork installed in attic, or exposed to outside temperatures requires a minimum of 2″ of insulation with outdoor type vapor barrier.
- Ductwork installed in an indoor unconditioned space requires a minimum of 1″ of insulation with indoor type vapor barrier.

Inspection Panel on some models

For a furnace not equipped with a cooling coil, the outlet duct shall be provided with a removable access panel. This opening shall be accessible when the furnace is installed and shall be of such a size that the heat exchanger can be viewed for possible openings using light assistance or a probe can be inserted for sampling the air stream. This access cover shall be attached in such a manner as to prevent air leaks.

Filters

A filter MUST be used.

A high-velocity filter(s) and rack(s) is supplied with these furnaces.

See **Table 4** for required high-velocity filter sizes.

Table 4 High-Velocity Air Filter Sizes (max. 600 FPM)

Cabinet Width	Internal Filter	External Filter Rack	
	Bottom	Bottom	Side+
$15^1/_2$″ (39 cm)	14″X25″ (36 cm X 64 cm)	14″X25″	14″X25″ or 16″X25″
$19^1/_2$″ (50 cm)	16″X25″* (41 cm X 64 cm)	16″X25″*	16″X25″*
$22^3/_4$″ (59 cm)	20″X25″* (51 cm X 64 cm)	20″X25″*	16″X25″*

* Greater than 1600 CFM requires both (left and right) side return filter racks in upflow position.
\+ Side return air duct(s) is not permitted with horizontal furnace installation.

Use either filter type:

- Washable, high-velocity filters are based on a maximum air flow rating of 600 FPM.
- Disposable, low velocity filters are based on a maximum air flow of 300 FPM when used with external filter grille.

⚠ CAUTION

RISK OF REDUCED FURNACE LIFE.

Failure to follow this caution may result in premature furnace component failure.

Use of excessively dirty and/or restrictive air filters may increase furnace operating temperatures and shorten the life of the furnace.

Filters specified for the furnace are rated at a maximum of 600 FPM air velocity and sized for the furnace's airflow rate. Replacement filters must be of equivalent type, size, and rating except as described below.

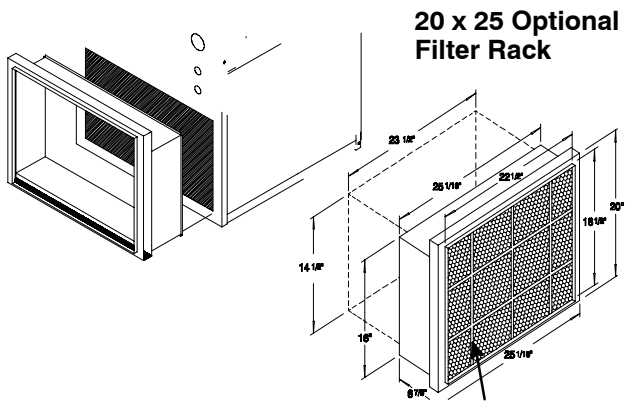
Disposable, low-velocity filters may be used to replace washable, high-velocity filters, providing they are sized for 300 FPM or less.

- The furnaces with 1600 or less CFM rating use a 16" x 25" high-velocity filter. On these models the filter may be mounted internally for bottom return or a filter and rack may be mounted externally for bottom return.
- The furnaces with greater than 1600 CFM may require that both (left and right) side returns are used. Two side return filters and racks are required. Filter racks must be mounted externally. See **Figure 22.**
- If return air must be on one side only, an optional 20″ x 25″ filter standoff rack kit can be used. (See **Figure 20.)** For bottom return, an internal filter can be used or a filter rack kit can be mounted externally (NAHA001TK).
- See *Circulator Air Blower Data* for additional data.

NOTE: The 20″ x 25″ (51 cm X 64 cm) standoff side filter rack gives more filter area but does not provide more air. See **Figure 20.** To achieve 2000 CFM 2 side returns are still needed. See **Figure 22.**

NOTE: Disposable low-velocity filters may be replaced with washable, high-velocity filters. Washable, high-velocity filters can be replaced **ONLY** with same type and size filter unless low-velocity filters meet the minimum size areas for 300 FPM or less.

Figure 20 **Optional Duct Standoff**



Optional Filter Rack Installation: Side Return

Center the filter rack on the side panel, flush with the bottom edge of the furnace. Mark the fastening holes. Drill the fastening holes in the side panel and fasten the filter rack in place with sheet metal screws. See **Figure 21** and **Figure 22**.

Figure 21 **Side Return Filter Rack**

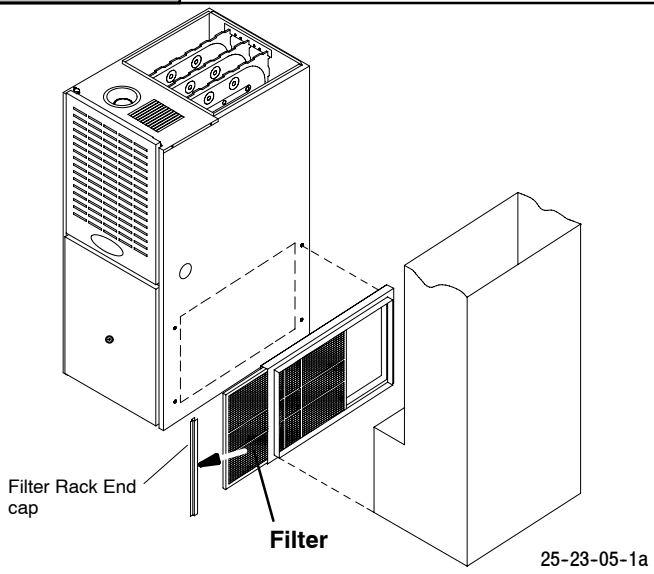
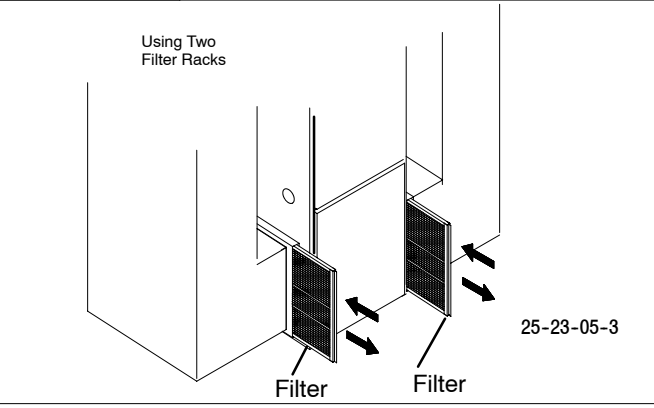


Figure 22 **Filters Installed on Two Sides**



Internal Filter in Bottom- Return Installation

When installing a bottom–mounted filter inside the furnace, install the filter clips on the edge of the bottom duct opening with the wider end of the clips toward the blower, as shown in **Figure 23.** Clips may be obtained from your distributor or fabricated from sheet metal (**Figure 24**). Insert filter into side clips first and push filter back until it is fully engaged into back clip.

Figure 23 **Bottom Mounted Filter**

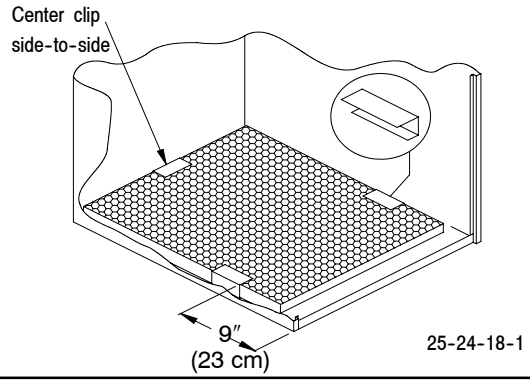
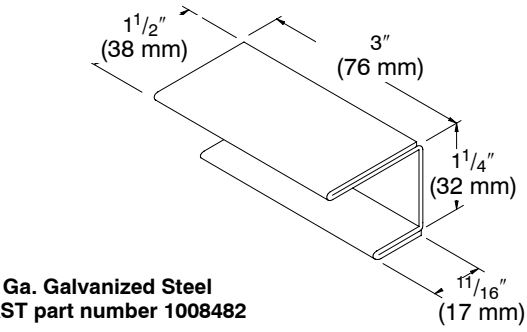


Figure 24 **Filter Clip Construction**



NOTE: If filters are only suitable for heating application, advise homeowner that filter size may need to be increased if air conditioning is added.

Filter Rack with Flanges Downward:

Position the rack with the duct flanges downward so that they extend below the furnace to attach to ductwork.

The supply duct work should have 90° flanges at the connection end. Screw the duct to the rack flange and not to the furnace bottom. (Screws in the furnace bottom could lift or penetrate the filter rack to displace and distort the rack or interfere with filter removal and insertion in the rack.) The 90° duct flange will prevent the duct from being pushed into the furnace and lifting the rack, which would cause a duct air leak. Seal the duct flanges to the furnace. See **Figure 28.**

Figure 25 Rack Flanges Downward

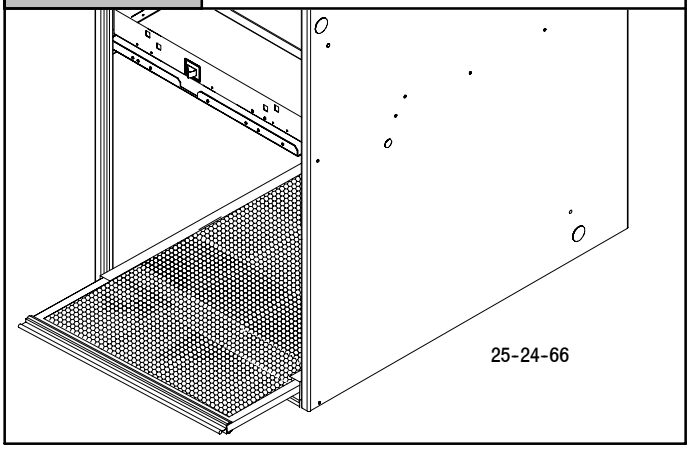
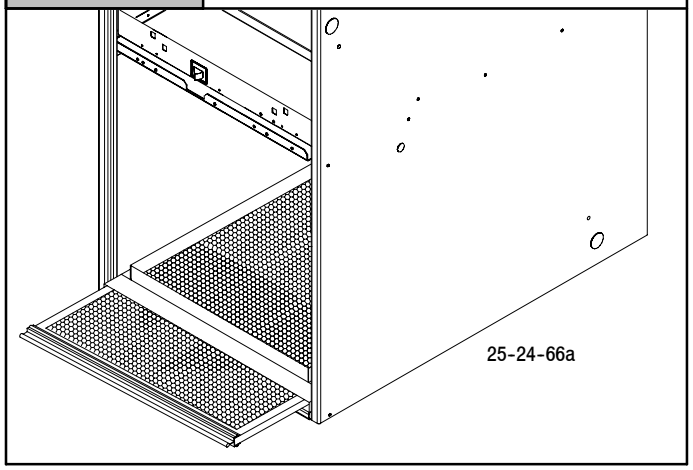


Figure 26 Rack Flanges Upward



The space in front of the filter rack inside the furnace bottom front flange will provide about $2^1/_2$″ (69 mm) to remove the filter retainer (filter rack end cap), and to withdraw the filter from the rack and reinsert it. The filter must be flexed as it is withdrawn from the rack in order to clear the front bottom flange of the furnace.

Filter Rack with Flanges Upward:

Place the rack inside the furnace bottom with the duct flanges upward. Center the filter rack over the furnace bottom opening and secure it with the three(3) filter clips provided in the parts bag. See **Figure 26.** The ductwork (with 90° end flanges) should fit against the furnace bottom. Secure and seal the ductwork flanges directly to the furnace bottom. The screws should be driven into the furnace bottom outboard of the rack so that the screws do not penetrate the rack in order to prevent interference during withdraw and insertion of the filter in the rack.

Insert the filter into the rack, and insert the plastic filter retainer (filter rack end cap) into the rack to close the rack opening.

Clips are supplied with the furnace or can be fabricated from sheet metal (**Figure 24**). When installing a bottom–mounted filter inside the furnace without the filter rack, install the filter clips on the edge of the bottom duct opening with the wider end of the clips toward the blower as shown in **Figure 23**. Insert filter into side clips first and push filter back until it is fully engaged into back clip.

Addition Of Air Conditioning

When a refrigeration coil is used in conjunction with this furnace, it must be installed on the discharge side of the furnace to avoid condensation in the heat exchanger. All furnaces are designed with a break–away duct flange on the supply air side of the furnace. This allows for installation in the horizontal right or downflow applications. The coil installation instructions must be consulted for proper coil location and installation procedures. With a parallel flow arrangement, dampers must be installed to prevent chilled air from entering the furnace. If manually operated dampers are used, they must be equipped with a means to prevent operation of either unit unless the damper is in full heat or full cool position.

Copper or plastic tubing may be used for the condensate drain line.

11. Checks and Adjustments

Startup

NOTE: Refer to startup procedures in the ***Users Information Manual*.**

⚠ WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD.

Failure to follow this warning could result in personal injury, death, and/or property damage.

If any sparks, odors or unusual noises occur, immediately shut OFF gas and power to furnace. Check for wiring errors or obstruction to blower.

Gas Supply Pressure

Gas supply pressure should be within minimum and maximum values listed on rating plate. Pressures are usually set by gas suppliers.

(See Propane Gas Conversion Kit rating plate and instruction manual for furnaces converted to Propane gas)

Manifold Gas Pressure Adjustment

NOTE: Make adjustment to manifold pressure with burners operating.

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

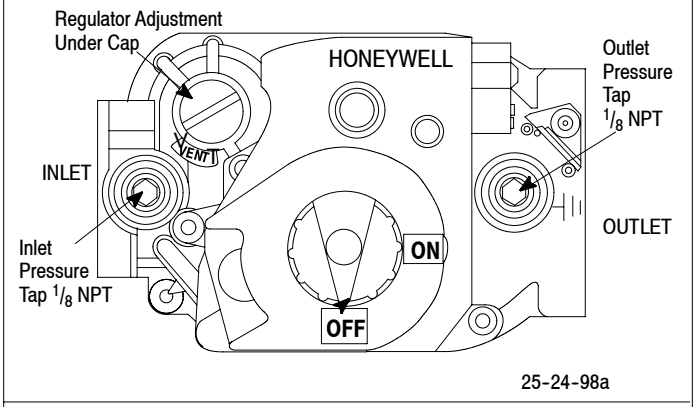
Failure to follow this warning could result in personal injury, death and/or property damage.

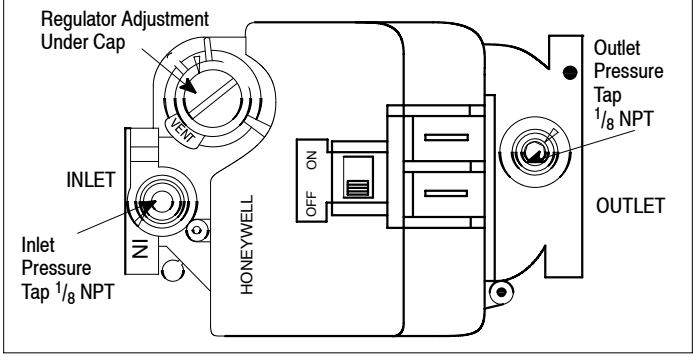
Turn OFF gas at shut off before connecting manometer.

1. With gas **OFF**, connect manometer to manifold pressure tap on outlet of gas valve. See **Figure 27**. Use manometer with a 0 in wc to 12 in wc range.
2. Turn gas **ON**. Operate the furnace by using a jumper wire on the R to W thermostat connections on the control board.

3. **Remove** manifold pressure adjustment screw cover on furnace gas valve. Turn adjusting screw counterclockwise to decrease manifold pressure and clockwise to increase pressure.

Figure 27 **Typical Gas Valve Honeywell**





NOTE: Adjustment screw cover **MUST** be replaced on gas valve before reading manifold pressure and operating furnace.

4. Set manifold pressure to value shown in **Table 7** or **Table 8**.
5. When the manifold pressure is properly set, replace the adjustment screw cover on the gas valve.
6. Remove jumper wire from thermostat connection on control board. Remove manometer connection from manifold pressure tap, and replace plug in manifold.
7. Check for leaks at plug.

Natural Gas Input Rating Check

The gas meter can be used to measure input to furnace.

Check with gas supplier for actual BTU content.

1. Turn **OFF** gas supply to all appliances other than furnace and start furnace. Use jumper wire on R to W.
2. Time how many seconds it takes the smallest dial on the gas meter to make one complete revolution.

Note: If meter uses a 2 cubic foot dial, divide results (seconds) by two.

Refer to **Example.** The Example is based on a natural gas BTU content of 1,000 BTU's per cubic foot.

Example			
Natural Gas BTU Content	**No. of Seconds Per Hour**	**Time Per Cubic Foot in Seconds**	**BTU Per Hour**
1,000	3,600	48	75,000
1,000 x 3,600 ÷ 48 = 75,000 BTUH			

3. Remove jumper wire from R to W.
4. Relight all appliances.

Orifice Sizing

NOTE: Factory sized orifices for natural and Propane gas are listed in the furnace Technical Support Manual.

Ensure furnace is equipped with the correct main burner orifices. Refer to **Table 5**, **Table 6**, **Table 7** or **Table 8** for correct orifice size and manifold pressure for a given heating value and specific gravity for natural and propane gas.

Operation Above 2000′ Altitude

⚠ WARNING

FIRE, EXPLOSION, CARBON MONOXIDE POISONING HAZARD.

Failure to follow these instructions exactly could result in personal injury, death and/or property damage.

This high-altitude gas-conversion shall be done by a qualified service agency in accordance with the Manufacturer's instructions and all applicable codes and requirements, or in the absence of local codes, the applicable national codes.

These furnace may be used at full input rating when installed at altitudes up to 2000′. When installed above 2000′, the input must be decreased 2% (natural) or 4% (Propane) for each 1000′ above sea level. This may be accomplished by a simple adjustment of manifold pressure or an orifice change, or a combination of a pressure adjustment and an orifice change. The changes required depend on the installation altitude and the heating value of the fuel. **Table 5** & **Table 6** or **Table 7** & **Table 8** show the proper furnace manifold pressure and gas orifice size to achieve proper performance based on elevation above sea level for both natural gas and propane gas.

To use the natural gas table, first consult your local gas utility for the heating value of the gas supply. Select the heating value in the first column and follow across the table until the appropriate elevation for the installation is reached. The value in the box at the intersection of the altitude and heating value provides not only the manifold pressure but also the orifice size. In the natural gas tables the factory-shipped orifice size is in bold (**42**). Other sizes must be obtained from service parts.

High Altitude Input Rate =
Nameplate Sea Level Input Rate x (Multiplier)

Elevation	High Altitude Multiplier	
	Natural Gas	**Propane Gas**
0 - 2000′	1.00	1.00
2001′ - 3000′	0.95	0.90
3001′ - 4000′	0.93	0.86
4001′ - 5000′	0.91	0.82
5001′ - 6000′	0.89	0.78
6001′ - 7000′	0.87	0.74
7001′ - 8000′	0.85	0.70

***** Based on mid-range of elevation.

MANIFOLD PRESSURE AND ORIFICE SIZE FOR HIGH ALTITUDE APPLICATIONS

Table 5	NATURAL GAS MANIFOLD PRESSURE (in wc) For Models 050 thru 125													
	MEAN ELEVATION FEET ABOVE SEA LEVEL													
HEATING VALUE at ALTITUDE BTU/CU. FT.	0 to 2000		2001 to 3000		3001 to 4000		4001 to 5000		5001 to 6000		6001 to 7000		7001 to 8000	
	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure
700	--	--	--	--	--	--	--	--	--	--	--	--	41	3.7
725	--	--	--	--	--	--	--	--	--	--	41	3.7	41	3.4
750	--	--	--	--	--	--	--	--	--	--	41	3.5	**42**	**3.6**
775	--	--	--	--	--	--	--	--	41	3.6	**42**	**3.6**	**42**	**3.3**
800	--	--	--	--	--	--	41	3.6	**42**	**3.7**	**42**	**3.4**	**42**	**3.1**
825	--	--	--	--	41	3.7	41	3.4	**42**	**3.5**	**42**	**3.2**	**42**	**2.9**
850	--	--	--	--	41	3.5	**42**	**3.6**	**42**	**3.3**	**42**	**3.0**	**42**	**2.8**
875	--	--	41	3.6	**42**	**3.6**	**42**	**3.4**	**42**	**3.1**	**42**	**2.8**	**42**	**2.6**
900	--	--	**42**	**3.7**	**42**	**3.4**	**42**	**3.2**	**42**	**2.9**	**42**	**2.7**	**42**	**2.5**
925	41	3.7	**42**	**3.5**	**42**	**3.3**	**42**	**3.0**	**42**	**2.8**	**42**	**2.5**	44	3.3
950	41	3.5	**42**	**3.3**	**42**	**3.1**	**42**	**2.9**	**42**	**2.6**	**42**	**2.4**	44	3.1
975	**42**	**3.7**	**42**	**3.2**	**42**	**2.9**	**42**	**2.7**	**42**	**2.5**	44	3.2	45	3.6
1000	**42**	**3.5**	**42**	**3.0**	**42**	**2.8**	**42**	**2.6**	**42**	**2.4**	45	3.7	45	3.4
1050	**42**	**3.2**	**42**	**2.7**	**42**	**2.5**	**44**	**3.3**	45	3.6	--	--	--	--
1100	43	3.6	**42**	**2.5**	44	3.2	45	3.6	--	--	--	--	--	--

Conversion: 1 in wc = .25 kPa

NOTE: Natural gas data is based on 0.60 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2006/NFPA 54-2006 or National Standard of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

Table 6	PROPANE GAS MANIFOLD PRESSURE (in wc) For Models 050 thru 125						
HEATING VALUE at ALTITUDE BTU/CU. FT.	MEAN ELEVATION FEET ABOVE SEA LEVEL						
	0 to 2000	2001 to 3000	3001 to 4000	4001 to 5000	5001 to 6000	6001 to 7000	7001 to 8000
2500	10.0	10.0	9.0	10.0	9.4	8.5	10.0
Orifice Size	**#54**	**#54**	**#54**	#55	#55	#55	#56

Conversion: 1 in wc = .25 kPa

NOTE: Propane data is based on 1.53 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2006/NFPA 54-2006 or National Standard Of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

Table 7	NATURAL GAS MANIFOLD PRESSURE (in wc) For Models 140													
	MEAN ELEVATION FEET ABOVE SEA LEVEL													
HEATING VALUE at ALTITUDE BTU/CU. FT.	0 to 2000		2001 to 3000		3001 to 4000		4001 to 5000		5001 to 6000		6001 to 7000		7001 to 8000	
	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure
700	--	--	--	--	--	--	--	--	--	--	--	--	**42**	**3.6**
725	--	--	--	--	--	--	--	--	--	--	**42**	**3.6**	**42**	**3.3**
750	--	--	--	--	--	--	--	--	--	--	**42**	**3.4**	**42**	**3.1**
775	--	--	--	--	--	--	--	--	**42**	**3.4**	**42**	**3.2**	**42**	**2.9**
800	--	--	--	--	--	--	**42**	**3.5**	**42**	**3.2**	**42**	**3.0**	**42**	**2.7**
825	--	--	--	--	**42**	**3.6**	**42**	**3.3**	**42**	**3.0**	**42**	**2.8**	**42**	**2.6**
850	--	--	--	--	**42**	**3.4**	**42**	**3.1**	**42**	**2.8**	**42**	**2.6**	**42**	**2.4**
875	--	--	**42**	**3.4**	**42**	**3.2**	**42**	**2.9**	**42**	**2.7**	**42**	**2.5**	44	3.2
900	--	--	**42**	**3.2**	**42**	**3.0**	**42**	**2.8**	**42**	**2.6**	44	3.3	45	3.6
925	**42**	**3.6**	**42**	**3.1**	**42**	**2.8**	**42**	**2.6**	**42**	**2.4**	44	3.1	46	3.6
950	**42**	**3.4**	**42**	**2.9**	**42**	**2.7**	**42**	**2.5**	44	3.2	45	3.6	46	3.4
975	**42**	**3.2**	**42**	**2.8**	**42**	**2.6**	**42**	**2.4**	45	3.7	46	3.5	47	3.7
1000	**42**	**3.1**	**42**	**2.6**	**42**	**2.4**	44	3.1	46	3.7	46	3.4	47	3.5
1050	43	3.4	**42**	**2.4**	45	3.7	46	3.6	46	3.3	--	--	--	--
1100	44	3.6	45	3.7	46	3.6	47	3.7	--	--	--	--	--	--

Conversion: 1 in wc = .25 kPa

NOTE: Natural gas data is based on 0.60 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2006/NFPA 54-2006 or National Standard of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

Table 8	PROPANE GAS MANIFOLD PRESSURE (in wc) For Models 140						
HEATING VALUE at ALTITUDE BTU/CU. FT.	MEAN ELEVATION FEET ABOVE SEA LEVEL						
	0 to 2000	2001 to 3000	3001 to 4000	4001 to 5000	5001 to 6000	6001 to 7000	7001 to 8000
2500	10.0	8.7	9.0	9.0	8.5	10.0	10.0
Orifice Size	**#54**	**#54**	#55	#55	#55	#56	#56

Conversion: 1 in wc = .25 kPa

NOTE: Propane data is based on 1.53 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2006/NFPA 54-2006 or National Standard Of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

NOTE: **Bold** number indicates factory shipped size.

NOTE: The derating of these furnaces at 2% (Natural Gas) and 4% (Propane Gas) has been tested and design-certified by CSA.

The burner orifice part nos. are as follows:

Orifice #41	1096942	Orifice #42	1011351
Orifice #43	1011377	Orifice #44	1011352
Orifice #45	1011353	Orifice #47	1011378
Orifice #46	1011744	Orifice #54	1011376
Orifice #55	1011354	Orifice #56	1011355

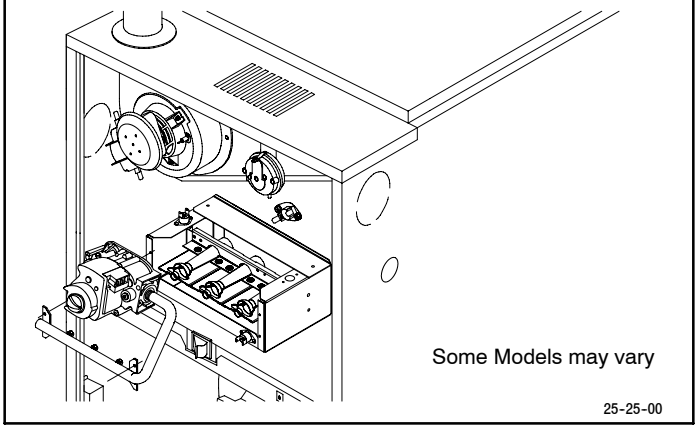
High Altitude Air Pressure Switch

The factory-installed pressure switch need NOT be changed for any furnace installations from sea level up to and including 8,000′ altitude.

Changing Orifices

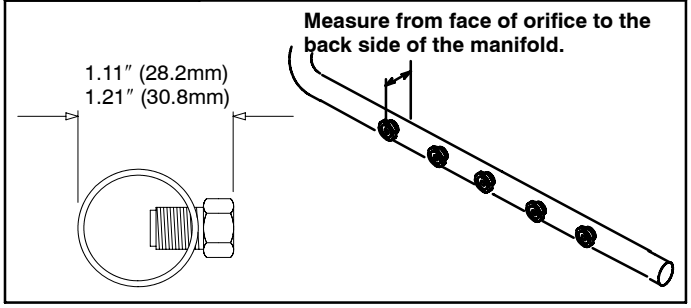
1. After disconnecting power and gas supply to the furnace, remove the burner compartment door, exposing the burner compartment.
2. Disconnect gas line from gas valve so manifold can be removed.
3. Disconnect wiring at gas valve. Be sure to note the proper location of all electrical wiring before being disconnected.
4. Remove the four (4) screws holding the manifold and gas valve to the manifold supports. Do not discard any screws. See **Figure 28.**
5. Carefully remove the manifold assembly.

Figure 28 **Manifold**



6. Remove the orifices from the manifold and replace them with proper sized orifices. See **Figure 29.**
7. Tighten orifices so they are seated and gas-tight. See **Figure 29.**

Figure 29 **Clearances**



8. Reassemble all parts in reverse order as removed. Be sure to engage the main burner orifices in the proper openings in the burners.
9. After reassembling, turn gas on and check all joints for gas leaks using a soapy solution. All leaks must be repaired immediately.

Main Burner Flame Check

Allow the furnace to run approximately 10 minutes. Then inspect the main burner flames. See **Figure 30**.

Check for the following (**Figure 30**):

- Stable and blue flames. Dust may cause orange tips or wisps of yellow, but flames **MUST NOT** have solid, yellow tips.
- Flames extending directly from burner into heat exchanger.
- Flames do **NOT** touch sides of heat exchanger

If any problems with main burner flames are noted, it may be necessary to adjust gas pressures or check for drafts.

Figure 30 **Main Burner**

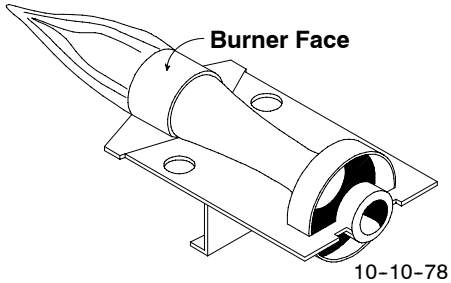
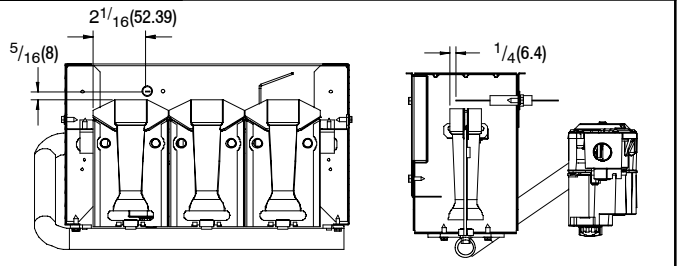


Figure 31	Ignitor Location in (mm)



NOTE: Flame sensor has a different orientation in all 050 models.

Air Temperature Rise Check

⚠ CAUTION

REDUCED FURNACE LIFE HAZARD.

Failure to follow this caution may result in reduced furnace life.

Use **ONLY** the blower motor speed taps insert indicated in the **Circulation Air Blower Data** for setting air temperature rise.

The blower speed **MUST** be set to give the correct air temperature rise through the furnace as marked on the rating plate. Temperature rise is the difference between supply and return air temperatures.

To check temperature rise, use the following procedure:

1. Place thermometers in supply and return air registers as close to furnace as possible, avoiding direct radiant heat from heat exchangers.
2. Operate furnace for 10 minutes with all the registers and duct dampers open by using a jumper wire on R to W thermostat connections on the control board.
3. Take readings and compare with range specified on rating plate.
4. If the air temperature rise is not in the correct range, the blower speed must be changed. A higher blower speed will lower the temperature rise. A lower blower speed will increase the temperature rise.
5. Remove the jumper wire after the adjustments are complete.

Changing Blower Speed

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

Failure to disconnect power could result in personal injury or death.

Turn OFF power to furnace before changing speed taps.

NOTE: The speed taps that the manufacturer sets at the factory for this furnace are based on a nominal 400 CFM per ton cooling and the basic mid range on the temperature rise for heating.

Since the manufacturer cannot predict the static pressure that will be applied to the furnace, it is the responsibility of the installer dealer/contractor to select the proper speed tap leads for the application when the furnace is installed.

If it is necessary to change speeds, refer to steps below.

1. Refer to *Furnace Wiring Diagram* for location of the heating and cooling speed taps located on the electronic furnace control as well as location of unused blower motor speed leads. Use the chart (**Table 9**) to determine the blower motor speed settings.

Table 9	Blower Speed Chart
Wire Color	**Motor Speed**
Black	High
Orange*	Med-High
Blue	Med-Low
Red	Low
* Med-High speed may not be provided on all models.	

2. Change the heat or cool blower motor speed by removing the motor speed lead from the "**Heat**" or "**Cool**" terminal and replace it with the desired motor speed lead from the **"M1" or "M2**" location. Connect the wire previously removed from the "**Heat**" or "**Cool**" terminal to the vacated **"M1" or "M2**" terminal.
3. If the same speed must be used for both heating and cooling, remove the undesired motor speed lead from the **"Heat"** or **"Cool"** terminal and connect that lead to the open terminal at **"M1" or "M2"** location or tape off. Attach a jumper between the **"Heat"** and **"Cool"** terminals and the remaining motor speed lead.

Note: When using the same speed on motors with (4) speed leads, it will be necessary to tape off the terminal of the motor speed lead removed from the **"Heat"** or **"Cool"** terminal with electrical tape since an open terminal will not be available at the **"M1" or "M2"** location.

Thoroughly check the system after modification to ensure the proper operation of the circulating air blower in all modes of operation.

Continuous-Fan Operation using "G"

Energizing the "G" terminal on the furnace control provides continuous fan operation. This is done by connecting the G terminal of the thermostat to the G terminal on the furnace control. When the FAN switch is turned from auto to ON the fan will operate continuously at "HEAT" speed. EAC will be energized in this mode.

NOTE: In heating, the fan will turn off during furnace ignition and warm up then restart at heating speed.

Hard Wired Continuous-Fan Operation

A terminal is provided on the furnace control board located in the circulating air blower compartment for operation of the continuous-fan option. This connection is intended for the low speed motor tap, and has a lower contact rating (8 amps) than the heat and cool taps. When the low speed blower lead is connected to this terminal, this will provide low speed blower operation whenever the other two speeds (**Heat** or **Cool**) are not energized. EAC is not powered in this mode.

Thoroughly check the system after modification to ensure the proper operation of the circulating air blower in all modes of operation.

Separate speed selections for Heat, Cool, and Continuous-Fan

Connect low speed lead from circulating air motor to the **"Cont"** terminal at the furnace control board. The appropriate motor leads should already be connected to the **"Heat"** and **"Cool"** terminals.

Heating and Continuous- Fan Speed the Same

If it is necessary to operate the heating speed and continuous-fan speed using the same blower speed, connect a jumper between the "**Heat**" and "**Cont**" terminals on the electronic fan control.

Note: There should be only **ONE** motor lead going to the "**Heat**" and "**Cont**" terminals.

12. Furnace Maintenance

⚠ WARNING

FIRE, EXPLOSION, OR CARBON MONOXIDE POISONING HAZARDS.

Failure to follow this warning could result in personal injury, death and/or property damage.

It is recommended that the furnace be inspected and serviced on an annual basis (before the heating season) by a qualified service agency.

See "User's Information Manual".

⚠ WARNING

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD.

Failure to follow this warning could result in dangerous operation, personal injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

13. Sequence of Operation & Diagnostics

The following is the normal operating sequence.

Cooling (Y) Request:

24VAC signals applied to Y & G terminals of FCB (furnace control board)

- Cool motor speed is energized after 6 second Cool Fan On Delay time.

Y & G signals removed from FCB

- Cool motor speed is de-energized after 108 second Cool Fan Off Delay time.

Continuous Circulating Fan (G) Request:

24 VAC signal is applied to G terminal of the FCB.

- Heat motor speed is energized without delay.

G signal removed from FCB.

- Heat motor speed is de-energized after 6 second delay.

NOTE 1) Furnace de-energizes the fan during the heat exchanger warm-up period on a call for Heating that occurs during a G request unless a blower motor lead is connected to the Cont terminal on the FCB, in which case see NOTE 2).

NOTE 2) Heating or Cooling requests received during a Fan request cause the fan speed to change to the appropriate heat or cool speed after the Fan on Delay time expires. The fan returns to continuous circulating speed after the selected Fan Off Delay time expires following loss of the Heating or Cooling request.

Continuous Circulating Fan Hard-Wired (Cont) Request:

Field selected low speed motor tap installed on “CONT” terminal.

- Low speed is energized when power applied to furnace. Operates at this speed continuously while there are no other blower demands from furnace control. Fan demands from furnace control for heat, cool or “G” will override hard-wired speed tap.

NOTE 3) EAC is NOT active for hard-wired mode but IS active for fan demands from furnace control for heat, cool and “G”.

Heating (W) Request:

Heating (W) Request:

- 24 VAC signal applied to W terminal of FCB.
- Inducer motor turns on and the pressure switch(es) close(s).
- Following a 18 second prepurge delay after the pressure switches closes, the igniter begins a 20 second warm-up.
- The igniter is powered by a 220V to 115V autotransformer located on the bottom of the control bracket.
- The gas valve is energized, the main burners light and flame is sensed.
- The igniter is de-energized after the main burners ignite.
- FCB will delay blower operation for the 36 seconds timed from the opening of the gas valve.

W signal removed from FCB.

- The gas valve de-energizes and the main burners go out.
- The inducer runs for a 18 second postpurge period.
- The fan stays at Heat speed.
- The fan de-energizes after the selected Heat Fan Off Delay time expires, timed from the gas valve de-energizing.

HUMIDIFIER - The 24V HUM is energized when the pressure switch closes on a call for heat. The 220V HUM (called HUM on Control) is energized when the inducer is energized.

ELECTRONIC AIR CLEANER - EAC is energized when there is a blower speed call. It is NOT energized when blower operates in the hard-wired continuous fan mode.

NOTE 4) If a new Heating request arrives while the control is waiting in the Heat Fan Off Delay time, the FCB will wait for the selected Heat Fan Off Delay then start a new heating cycle as long as the heat call remains.

Heating Request with Gas Shut Off:

24 VAC signal applied to W terminal of FCB.
The FCB will attempt 4 cycles for ignition then go to soft lockout for 3 hours then try for ignition again as long as the heat call remains. Power reset will clear lockout.

- Inducer motor turns on
- Following a 18 second prepurge delay, the igniter begins warm up.
- The igniter glows red-hot for 26 seconds, then turns off. The FCB flashes error code 6.
- The igniter stays off for 20 seconds, then begins to warm up again.
- The igniter glows red hot for 26 seconds then turns off. The FCB continues flashing error code 6.
- The igniter stays off for 20 seconds, then begins to warm up again.
- The igniter glows red hot for 26 seconds then turns off. The FCB continues flashing error code 6.
- The igniter stays off for 20 seconds, then begins to warm up again.
- The igniter glows red hot for 26 seconds then turns off. The FCB proceeds to soft lockout and stops flashing error code 6 and begins flashing error code 6 + 1.
- The inducer motor de-energizes after a 15 second post purge.

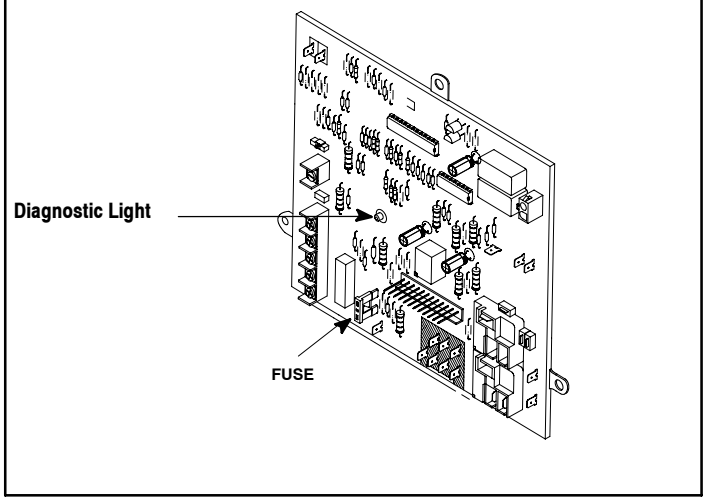
Control Board Diagnostic Codes (See Figure 32)

OFF	= 24VAC or 220VAC is off, fuse is open
Heartbeat	= Normal operation or no previous Diagnostic Code
ON SOLID	= Soft Lockout - Furnace Control Error (1 hr delay) If code repeats immediately following power reset then replace control
1 Flash	= Not used
2 Flashes	= Pressure switch(es) closed when should be open
3 Flashes	= Pressure switch open when should be closed
4 Flashes	= Limit or roll-out switch open (less than 2 minutes)
5 Flashes	= Flame sensed out of sequence
6 Flashes	= Failure to ignite or flame sense lost while running
6 + 1 Flashes	= Soft Lockout - Max trials for ignition reached (3hr delay)
7 Flashes	= Soft Lockout - Limit or roll-out switch open longer than 2 minutes (1 hr delay) (roll-out switch requires manual reset)
8 Flashes	= Permanent Lockout - Gas valve relay contact stuck closed or miswired gas valve (power reset only)
10 Flashes	= Line voltage (220VAC) polarity reversed. If twinned, refer to twinning kit instructions

***** If status code recall is needed, briefly (2-3 seconds) remove then reconnect one limit switch wire (main or rollout) to display last stored status code. Do not remove power or blower door before initiating status code recall or code will be lost. Code is automatically cleared after 72 hours or upon power reset.

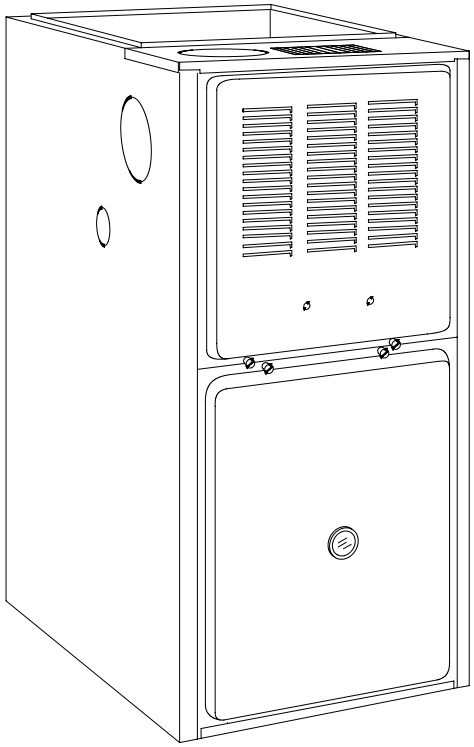
***** Proper flame sense microamps: 0.7 microamps D.C. minimum, 2.0 - 4.0 microamps nominal

Figure 32 **Control Board**



Technical Support Manual

Save This Manual For Future Reference



Models

H8UH5050B12C2
H8UH5075B12C2
H8UH5100F14C2
H8UH5125J20C2
H8UH5140J20C2

MUF050W3C2
MUF075W3C2
MUF100W3C2
MUF125W5C2
MUF140W5C2

HL12H3TRC2
HL18H3TRC2
HL25H3TRC2
HL31H4TRC2
HL34H5TRC2

International Comfort Products, LLC
Lewisburg, TN 37091 U.S.A.

FAN ASSISTED COMBUSTION GAS FURNACES

Model Specifications

Manufacturers Number (Mfr No - See Rating Plate**)**
ALL Models (H8UH5/MUF/HL)

Specifications

	H8UH5050B12C2 MUF050W3C2 HL12H3TRC2		H8UH5075B12C2 MUF075W3C2 HL18H3TRC2		H8UH5100F14C2 MUF100W3C2 HL25H3TRC2		H8UH5125J20C2 MUF125W5C2 HL31H4TRC2		H8UH5140J20C2 MUF140W5C2 HL34H5TRC2	
General										
Input (Btuh)	50,000		75,000		100,000		125,000		140,000	
Temp. Rise (°F/°C)	30-60/17-33		35-65/19-36		35-65/19-36		35-65/19-36		45-75/25-41	
Electrical (Volts/Hz)	220/50		220/50		220/50		220/50		220/50	
Rating Plate	6.1		6.1		6.1		11.5		11.5	
Gas Type	Nat	Propane	Nat	Propane	Nat	Propane	Nat	Propane	Nat	Propane
Transformer Size (VA)	40	40	40	40	40	40	40	40	40	40
T'stat Heat Anticipator	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Gas & Ignition										
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	4/#42	4/#54	5/#42	5/#54	6/#42	6/#54
Gas Valve Honeywell	VR8205S									
Regulation Type	SNAP									
Manifold Press. (in wc)	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0
Ignition Type/Series	Hot Surface									
Combustion										
Flue Outlet Size (Inches)	4		4		4		4		4	
Limits & Controls										
Thermal Sensor (°F)	300		300		300		300		300	
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List	
Std. Pressure Sw. (Part No)	1014051		1014051		1014051		1014051		1014051	
Press (Close)	-0.57		-0.57		-0.57		-0.57		-0.57	
Press (Open)	-0.47		-0.47		-0.47		-0.47		-0.47	
Furnace Control (Type)	Intergrated									
Furnace Control On	30									
(Timed-secs) Off	72,120,168,216									
Blower Data										
Blower Size Inches (D x W)	11-8		11-8		11-10		11-10		12-12	
Motor Type/H.P.	PSC/1/2		PSC/1/2		PSC/1/2		PSC/3/4		PSC/3/4	
Cap. Mfd/Volts	7.5/370		7.5/370		7.5/370		10/370		10/370	
Filter Type (600 FPM)	Washable		Washable		Washable		Washable		Washable	
Filter Size (") less than 1600 CFM	14x25x1+		14x25x1+		16x25x1+		---		---	
	---		---		---					
1600 CFM and over*	---		---		---		16x25x1 (2)* side returns		16x25x1 (2)* side returns	
							20x25x1*+ bottom return		20x25x1*+ bottom return	
Min. Cool Cap. (Tons)	1.5		1.5		2		3		3	
Max. Cool Cap. (Tons)	3		3		3.5		5		5	
Nat to Propane NAHA001LP										

* Two side filter racks (left and right) required for upflow applications with 1600 CFM or greater. Side returns are not permitted with horizontal furnace applications.

**Must be ordered from Service Parts.

\+ Supplied

Conversion

1 in = 25.4 mm

1 in wc = 249.0 Pa

Circulation Air Blower Data

H8UH5050B12, MUF050W3, HL12H3TR (1)

External Static Pressure Pa	Air Delivery in Liters Per Second (L/S) (Furnace Rated @ 249.0 Pa ESP)				
	TAP	LOW	MED L	MED H	HIGH
	24.9	402	448	524	618
	49.8	383	433	508	600
	74.4	365	414	491	583
	99.6	345	396	473	565
	124.5	325	378	454	546
	149.5	312	358	437	526
	174.3	291	336	416	504
	199.3	274	316	397	482
	224.1	251	295	377	462
	249.0	226	273	356	439

H8UH5050B12, MUF050W3, HL12H3TR (1)

External Static Pressure (in wc)	Air Delivery in CFM (Furnace Rated @ 0.5 in wc ESP)				
	TAP	LOW	MED L	MED H	HIGH
	0.1	852	949	1110	1309
	0.2	812	918	1076	1271
	0.3	773	877	1040	1235
	0.4	732	840	1003	1197
	0.5	689	801	962	1157
	0.6	662	758	925	1114
	0.7	617	712	881	1068
	0.8	580	669	841	1022
	0.9	532	625	799	979
	1.0	479	578	754	930

H8UH5075B12, MUF075W3, HL18H3TR (1)

External Static Pressure Pa	Air Delivery in Liters Per Second (L/S) (Furnace Rated @249.0 Pa ESP)				
	TAP	LOW	MED L	MED H	HIGH
	24.9	424	463	545	663
	49.8	403	446	528	648
	74.4	384	427	510	631
	99.6	362	406	493	613
	124.5	340	385	472	593
	149.5	320	363	453	571
	174.3	298	342	431	550
	199.3	281	320	404	528
	224.1	259	299	382	504
	249.0	235	276	366	482

H8UH5075B12, MUF075W3, HL18H3TR (1)

External Static Pressure (in wc)	Air Delivery in CFM (Furnace Rated @ 0.5 in wc ESP)				
	TAP	LOW	MED L	MED H	HIGH
	0.1	898	981	1155	1405
	0.2	853	944	1119	1373
	0.3	814	905	1081	1337
	0.4	767	860	1045	1299
	0.5	720	816	1000	1257
	0.6	677	770	960	1210
	0.7	631	725	913	1165
	0.8	596	679	857	1119
	0.9	549	634	809	1068
	1.0	498	585	776	1021

H8UH5100F14, MUF100W3, HL25H3TR (1)

External Static Pressure Pa	Air Delivery in Liters Per Second (L/S) (Furnace Rated @ 249.0 Pa ESP)				
	TAP	LOW	MED L	MED H	HIGH
	24.9	477	533	615	766
	49.8	444	508	593	744
	74.4	417	479	567	722
	99.6	388	454	540	700
	124.5	359	424	515	670
	149.5	324	395	487	643
	174.3	290	362	457	613
	199.3	264	328	427	587
	224.1	236	293	392	552
	249.0	204	266	362	523

H8UH5100F14, MUF100W3, HL25H3TR (1)

External Static Pressure (in wc)	Air Delivery in CFM (Furnace Rated @ 0.5 in wc ESP)				
	TAP	LOW	MED L	MED H	HIGH
	0.1	1011	1129	1303	1623
	0.2	941	1076	1256	1576
	0.3	884	1015	1201	1530
	0.4	823	962	1145	1483
	0.5	761	898	1091	1420
	0.6	687	836	1032	1363
	0.7	614	767	968	1299
	0.8	560	695	904	1243
	0.9	500	621	831	1170
	1.0	432	564	767	1108

NOTE: (1) Data based on Bottom Only return.
(2) Data based on Both Sides or Bottom Plus One Side.
(3) Reduce Airflow by 5% if Bottom ONLY return.
(4) Gray area is above maximum temperature rise range.

Filter Size	CFM	L/S
14″ X 25″	1400	661
16″ X 25″	1600	755
20″ X 25″	2000	944
24″ X 25″	2500	1180
Max CFM based on 600 FPM		Max L/S based on 305 CM/s

Filter required for each return-air inlet. Airflow performance includes 1″ washable (600 FPM max) filter media.

H8UH5125J20, MUF125W5, HL31H4TR (1)

External Static Pressure Pa	Air Delivery in Liters Per Second (L/S) (Furnace Rated @ 249.0 Pa ESP)				
	TAP	LOW	MED L	MED H	HIGH
	24.9	587	673	803	1050
	49.8	561	660	788	1033
	74.4	542	647	773	1021
	99.6	524	631	756	999
	124.5	510	614	741	983
	149.5	497	600	726	968
	174.3	470	579	707	948
	199.3	448	557	686	914
	224.1	420	535	661	888
	249	392	510	632	857

H8UH5125J20, MUF125W5, HL31H4TR (1)

External Static Pressure (in wc)	Air Delivery in CFM (Furnace Rated @ 0.5 in wc ESP)				
	TAP	LOW	MED L	MED H	HIGH
	0.1	1244	1426	1701	2225
	0.2	1189	1399	1670	2189
	0.3	1148	1371	1638	2163
	0.4	1110	1337	1602	2117
	0.5	1081	1301	1570	2083
	0.6	1053	1271	1539	2052
	0.7	996	1227	1498	2009
	0.8	949	1180	1454	1937
	0.9	890	1134	1401	1882
	1.0	831	1081	1339	1816

H8UH5140J20, MUF140W5, HL34H5TR (2)(3)

External Static Pressure Pa	Air Delivery in Liters Per Second (L/S) (Furnace Rated @ 249.0 Pa ESP)				
	TAP	LOW	MED L	MED H	HIGH
	24.9	607	688	804	1052
	49.8	580	664	788	1032
	74.4	552	641	768	1088
	99.6	524	615	741	983
	124.5	495	587	713	955
	149.5	465	557	686	927
	174.3	433	521	657	896
	199.3	406	488	625	869
	224.1	375	460	591	838
	249.0	349	429	557	804

H8UH5140J20, MUF140W5, HL34H5TR (2)(3)

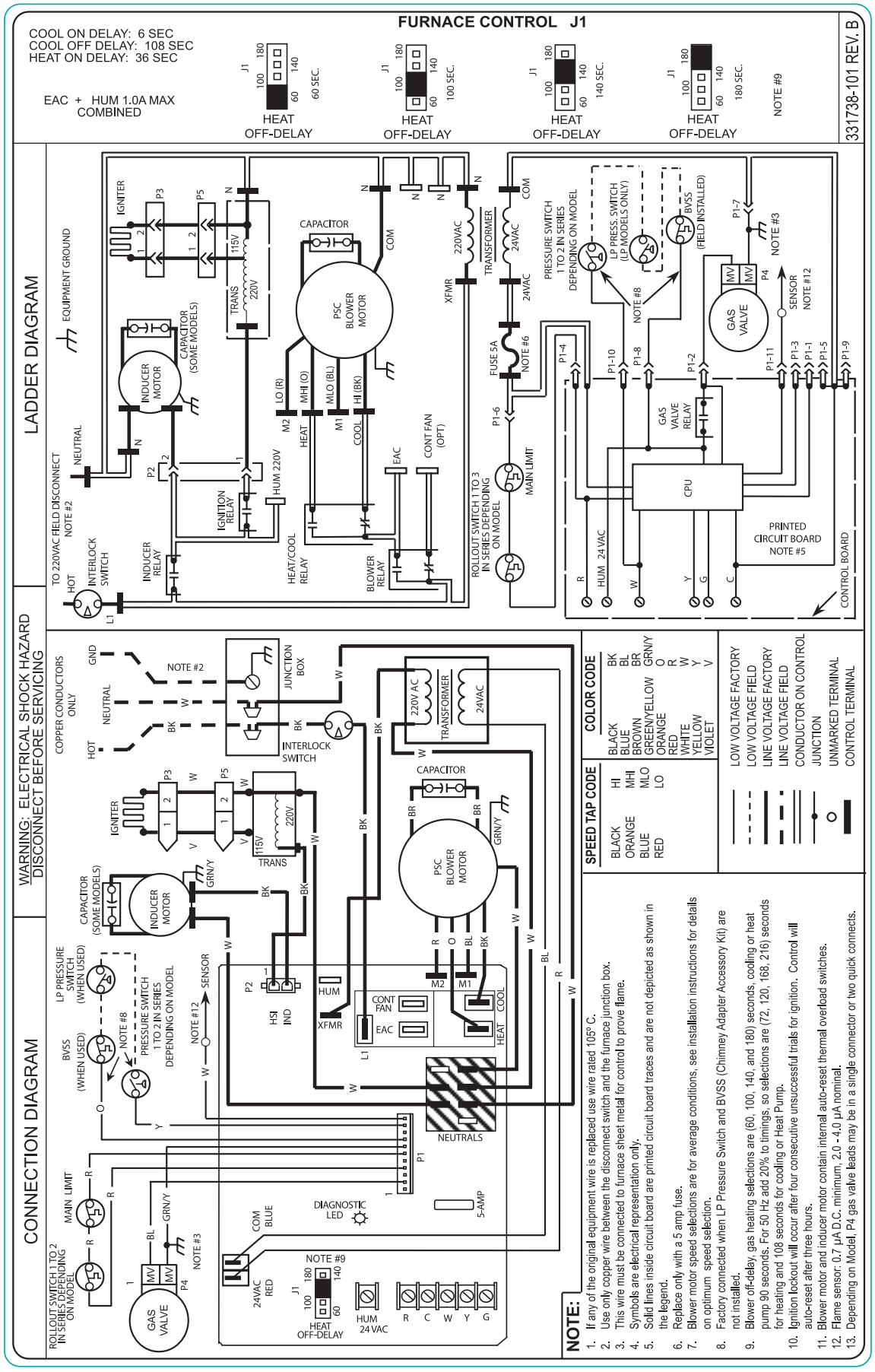
External Static Pressure (in wc)	Air Delivery inCFM (Furnace Rated @ 0.5 in wc ESP)				
	TAP	LOW	MED L	MED H	HIGH
	0.1	1287	1457	1703	2230
	0.2	1228	1407	1669	2187
	0.3	1170	1359	1628	2136
	0.4	1111	1303	1571	2083
	0.5	1049	1243	1511	2024
	0.6	985	1180	1454	1964
	0.7	918	1103	1392	1899
	0.8	860	1035	1325	1842
	0.9	794	974	1253	1776
	1.0	739	909	1181	1703

NOTE: (1) Data based on Bottom Only return.
(2) Data based on Both Sides or Bottom Plus One Side.
(3) Reduce Airflow by 5% if Bottom ONLY return.
(4) Gray area is above maximum temperature rise range.

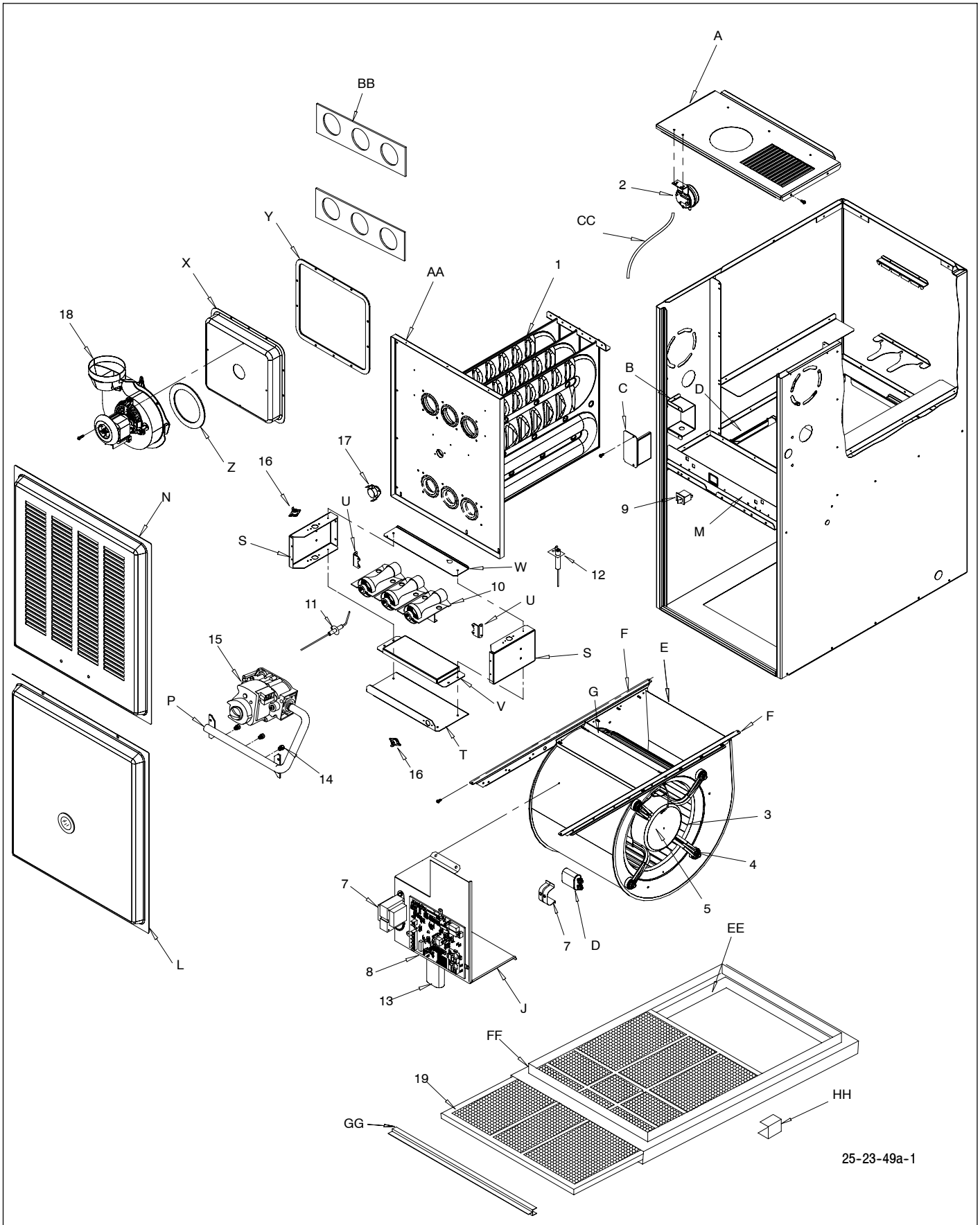
Filter Size	CFM	L/S
14″ X 25″	1400	661
16″ X 25″	1600	755
20″ X 25″	2000	944
24″ X 25″	2500	1180
Max CFM based on 600 FPM		Max L/S based on 305 CM/s

Filter required for each return-air inlet. Airflow performance includes 1″ washable (600 FPM max) filter media.

Wiring Diagram H8UH5, MUF, HL



Parts for H8UH5, MUF, HL



Representative drawing only, some models may vary in appearance.

Replacement Parts - H8UH5, MUF, HL (Natural Gas)

Models – H8UH5050B12C2, H8UH5075B12C2, H8UH5100F14C2, H8UH5125J20C2, H8UH5140J20C2
MUF050W3C2, MUF075W3C2, MUF100W3C2, MUF125W5C2, MUF140W5C2
HL12H3TRC2, HL18H3TRC2, HL25H3TRC2, HL31H4TRC2, HL34H5TRC2

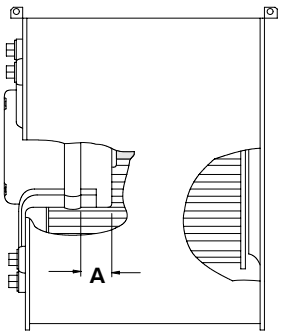
Replacement part supplied will be current active part. For parts not listed, consult place of purchase.

Key No.	Description Functional	Part Number	H8UH5050 B12C2 / MUF050W3C2 / HL12H3TRC2	H8UH5075 B12C2 / MUF075W3C2 / HL18H3TRC2	H8UH5100 F14C2 / MUF100W3C2 / HL25H3TRC2	H8UH5125 J20C2 / MUF125W5C2 / HL31H4TRC2	H8UH5140 J20C2 / MUF140W5C2 / HL34H5TRC2
1	Heat Exchanger	1013551	1	–	–	–	–
		1013519	–	1	–	–	–
		1013552	–	–	1	–	–
		1013554	–	–	–	1	–
		1013555	–	–	–	–	1
2	Switch, Pressure	1014051	1	1	1	1	1
3	Wheel, Blower	1013011	1	1	–	–	–
		1011420	–	–	1	1	–
		1011433	–	–	–	–	1
4	Mount, Motor kit*	1014824	1	1	–	–	–
		1014822	–	–	1	1	1
5	Mtr, Blr 1/115 1/2 CCW	1172492	1	1	1	–	–
	1/115 3/4 CCW	1172491	–	–	–	1	1
6	Capacitor	1171728	1	1	1	–	–
		1171729	–	–	–	1	1
7	Transformer, 220 to 24V	1173414	1	1	1	1	1
8	Furnace Control	1172550	1	1	1	1	1
9	Switch, Interlock	1171981	1	1	1	1	1
10	Burner Assembly	1172884	1	–	–	–	–
		1172965	–	1	–	–	–
		1172966	–	–	1	–	–
		1172967	–	–	–	1	–
		1172968	–	–	–	–	1
11	Flame Sensor	1172827	1	1	1	1	1
12	Ignitor	1172533	1	1	1	1	1
13	Transformer 220 to 115V	1173413	1	1	1	1	1
14	Orifice, Burner # 42	1011351	2	3	4	5	6
15	Valve, Gas	1175705	1	1	1	1	1
16	Switch, Limit (Rollout)	1013102	2	2	2	2	2
17	Switch, Limit (Main)	1320362	1	1	–	–	–
		1065294	–	–	1	1	–
		1320364	–	–	–	–	1
18	Blower, Combustion (Inducer)	1014384	1	1	1	1	1
19	Filter 14X25X1	1010364	1+ (bottom or side return)	1+ (bottom or side return)	–	–	–
	16x25x1	1010365	–	–	1+ (bottom or side return)	2 (side return)	2 (side return)
	20X25X1	1010366	–	–	-	1+ (bottom return)	1+ (bottom return)

See Installation Instructions for application requirements.
+ Filter Supplied

*See Table below for bellyband location on motor

Bellyband Location on Motor			Bellyband Location on Motor			Bellyband Location on Motor		
Model H8UH5	A(in.)	A(mm)	Model HL	A(in.)	A(mm)	Model MUF	A(in.)	A(mm)
050B12C2	1.81	46	12H3TRC2	1.81	46	050W3C2	1.81	46
075B12C2	1.81	46	18H3TRC2	1.81	46	075W3C2	1.81	46
100F14C2	1.06	27	25H3TRC2	1.06	27	100W3C2	1.06	27
125J20C2	1.06	27	31H4TRC2	1.06	27	125W5C2	1.06	27
140J20C2	2.64	67	34H5TRC2	2,64	67	140W5C2	2.64	67



Replacement Parts - H8UH5, MUF, HL (Natural Gas)

Models – H8UH5050B12C2, H8UH5075B12C2, H8UH5100F14C2, H8UH5125J20C2, H8UH5140J20C2
MUF050W3C2, MUF075W3C2, MUF100W3C2, MUF125W5C2, MUF140W5C2
HL12H3TRC2, HL18H3TRC2, HL25H3TRC2, HL31H4TRC2, HL34H5TRC2

Replacement part supplied will be current active part. For parts not listed, consult place of purchase.

Key No.	Description Functional	Part Number	H8UH5050 B12C2	H8UH5075 B12C2	H8UH5100 F14C2	H8UH5125 J20C2	H8UH5140 J20C2
			MUF050W3C2	MUF075W3C2	MUF100W3C2	MUF125W5C2	MUF140W5C2
			HL12H3TRC2	HL18H3TRC2	HL25H3TRC2	HL31H4TRC2	HL34H5TRC2
A	Panel, Top	1013982	1	1	–	–	–
		1013983	–	–	1	–	–
		1013984	–	–	–	1	1
B	Box, Junction	1172860	1	1	1	1	1
C	Cover, Junction box	1012350	1	1	1	1	1
D	Partition, Blower	1014009	1	1	–	–	–
		1014010	–	–	1	–	–
		1014011	–	–	–	1	–
		1014013	–	–	–	–	1
E	Housing, Blower	1172885	1	1	–	–	–
		1172969	–	–	1	1	–
		1172970	–	–	–	–	1
F	Hanger, Blower	1012328	2	2	2	2	2
G	Panel, Blower Cutoff	721020013	1	1	–	–	–
		721020008	–	–	1	1	–
		721020015	–	–	–	–	1
H	Clamp, Capacitor	1170643	1	1	1	1	1
J	Bracket, Control Mounting	1172845	1	1	1	1	1
L	Door, Blower (H8UH5)	1173014	1	1	–	–	–
	(H8UH5)	1173015	–	–	1	–	–
	(H8UH5)	1173016	–	–	–	1	1
	(MUF)	1173011	1	1	–	–	–
	(MUF)	1173012	–	–	1	–	–
	(MUF)	1173013	–	–	–	1	1
	(HL)	1173008	1	1	–	–	–
	(HL)	1173009	–	–	1	–	–
	(HL)	1173010	–	–	–	1	1
M	Bracket, Door	1172231	1	1	–	–	–
		1172232	–	–	1	–	–
		1172233	–	–	–	1	–
		1172266	–	–	–	–	1
N	Door, Louver (H8UH5)	1013609	1	1	–	–	–
	(H8UH5)	1013610	–	–	1	–	–
	(H8UH5)	1013611	–	–	–	1	1
	(MUF)	1173005	1	1	–	–	–
	(MUF)	1173006	–	–	1	–	–
	(MUF)	1173007	–	–	–	1	1
	(HL)	1173002	1	1	–	–	–
	(HL)	1173003	–	–	1	–	–
	(HL)	1173004	–	–	–	1	1
P	Manifold, Gas	1013478	1	–	–	–	–
		1013479	–	1	–	–	–
		1013480	–	–	1	–	–
		1013481	–	–	–	1	–
		1013482	–	–	–	–	1
S	Bracket, Manifold Support	1012377	2	2	2	2	2
T	Top, Burner Box	1013705	1	1	–	–	–
		1013015	–	–	1	–	–
		1013016	–	–	–	1	–
		1013859	–	–	–	–	1
U	Bracket, Burner Box Sides	1012532	2	2	2	2	2

Replacement Parts - H8UH5, MUF, HL (Natural Gas)

Models – H8UH5050B12C2, H8UH5075B12C2, H8UH5100F14C2, H8UH5125J20C2, H8UH5140J20C2
MUF050W3C2, MUF075W3C2, MUF100W3C2, MUF125W5C2, MUF140W5C2
HL12H3TRC2, HL18H3TRC2, HL25H3TRC2, HL31H4TRC2, HL34H5TRC2

Replacement part supplied will be current active part. For parts not listed, consult place of purchase.

Key No.	Description Functional	Part Number	H8UH5050 B12C2 / MUF050W3C2 / HL12H3TRC2	H8UH5075 B12C2 / MUF075W3C2 / HL18H3TRC2	H8UH5100 F14C2 / MUF100W3C2 / HL25H3TRC2	H8UH5125 J20C2 / MUF125W5C2 / HL31H4TRC2	H8UH5140 J20C2 / MUF140W5C2 / HL34H5TRC2
V	Baffle, Burner Box	1012338	1	1	–	–	–
		1012339	–	–	1	–	–
		1012340	–	–	–	1	–
		1013533	–	–	–	–	1
W	Bottom, Burner Box	1172847	1	–	–	–	–
		1172848	–	1	–	–	–
		1172849	–	–	1	–	–
		1172850	–	–	–	1	–
		1172851	–	–	–	–	1
X	Collector Box	1013483	1	–	–	–	–
		1014387	–	1	–	–	–
		1014388	–	–	1	–	–
		1014389	–	–	–	1	–
		1014390	–	–	–	–	1
Z	Gasket, Combustion Blower	1014385	1	1	1	1	1
AA	Partition, Front Ht Exchanger	1013543	1	–	–	–	–
		1013521	–	1	–	–	–
		1013546	–	–	1	–	–
		1013548	–	–	–	1	–
		1013549	–	–	–	–	1
BB	Gaskets, Heat Exchanger	1013991	2	–	–	–	–
		1013992	–	2	–	–	–
		1013993	–	–	2	–	–
		1013994	–	–	–	2	–
		1012546	–	–	–	–	2
CC	Tubing, Silicone	1172195	1	1	1	–	–
		1172196	–	–	–	1	1
EE	Wrapper, Filter Rack 14x25x1	741010042	1+ (bottom or side return)	1+ (bottom or side return)	–	–	–
	16x25x1	741010039	–	–	1+ (bottom or side return)	2 (side return)	2 (side return)
	20x25x1	741010040	–	–	–	1+ (bottom return)	1+ (bottom return)
FF	Front, Filter Rack 14x25x1	741020004	1	1	–	–	–
	16x25x1	741020001	–	–	1	2 (side return)	2 (side return)
	20x25x1	741020002	–	–	–	1+ (bottom return)	1+ (bottom return)
GG	Front, Filter Plastic 14x25x1	2791042	1	1	–	–	–
	16x25x1	2791043	–	–	1	2 (side return)	2 (side return)
	20x25x1	2791044	–	–	–	1+ (bottom return)	1+ (bottom return)
HH	Clip, Filter	1008482	3	3	3	3	3
)(	**PART NOT ILLUSTRATED**						
)(	Fuse, 5 Amp	1083348	1	1	1	1	1
)(	Harness, Wire	1175878	1	1	–	–	–
		1175879	–	–	1	1	1
)(	Manual, Installation	44101500301	1	1	1	1	1
)(	Manual, Users	44102500301	1	1	1	1	1

See Installation Instructions for application requirements.

+ Supplied