INSTALLATION INSTRUCTIONS FOR *MES96 SINGLE-STAGE GAS FURNACE

(Type FSP CATEGORY IV Direct or Non Direct Vent Air Furnace)

These furnaces comply with requirements embodied in the American National Standard/National Standard of Canada ANSI Z21.47·CSA-2.3 Gas Fired Central Furnaces.

Installer: Affix all manuals adjacent to the unit.

WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

PROP 65 WARNING FOR CALIFORNIA CONSUMERS

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

0140M00517-A

As a professional installer you have an obligation to know the product better than the customer. This includes all safety precautions and related items.

Prior to actual installation, thoroughly familiarize yourself with this Instruction Manual. Pay special attention to all safety warnings. Often during installation or repair it is possible to place yourself in a position which is more hazardous than when the unit is in operation.

Remember, it is your responsibility to install the product safely and to know it well enough to be able to instruct a customer in its safe use.

Safety is a matter of common sense...a matter of thinking before acting. Most dealers have a list of specific good safety practices...follow them.

The precautions listed in this Installation Manual are intended as supplemental to existing practices. However, if there is a direct conflict between existing practices and the content of this manual, the precautions listed here take precedence.

RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION.

*NOTE: Please contact your distributor or our website for the applicable Specification Sheet referred to in this manual.

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IOG-2013B
07/2019

Safety Considerations

IMPORTANT NOTE: This unit is designed to meet the NOx requirement of 14Ng/J maximum as required by the South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District, both in the State of California, and is intended for installation in those districts only.

This unit has a control system that compensates for certain installation and environmental conditions. This unit must:

- Be properly installed, operated, and maintained per the instructions.
- Be serviced only by properly trained service technicians.

Units that are not installed, maintained, or operated properly may result in “noisy” operation during the heating cycle. If this unit is making unusual or objectionable noises during the heating cycle, turn the heat off at the thermostat and contact a qualified service organization right away.

Adhere to the following warnings and cautions when installing, adjusting, altering, servicing, or operating the furnace. To ensure proper installation and operation, thoroughly read this manual for specifics pertaining to the installation and application of this product.

This furnace is manufactured for use with natural gas only.

Install this furnace only in a location and position as specified in **LOCATION REQUIREMENTS & CONSIDERATIONS section and INSTALLATION POSITIONS section** of this manual.

Provide adequate combustion and ventilation air to the furnace as specified in **COMBUSTION & VENTILATION AIR REQUIREMENTS section of this manual.**

Combustion products must be discharged to the outdoors. Connect this furnace to an approved vent system only, as specified in **VENT/FLUE PIPE & COMBUSTION AIR PIPE** section of this manual.

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** section of this manual.

Always install a furnace to operate within the furnace's intended temperature-rise range with a duct system which has external static pressure within the allowable range, as specified on the furnace rating plate and **OPERATIONAL CHECKS section** 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 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 the **LOCATION REQUIREMENTS AND CONSIDERATIONS section** of this manual.

This furnace cannot be used as a construction site heater.

⚠ CAUTION

FROZEN AND BURST WATER PIPE HAZARD

FAILURE TO PROTECT AGAINST THE RISK OF FREEZING MAY RESULT IN PROPERTY DAMAGE.

SPECIAL PRECAUTIONS MUST BE MADE IF INSTALLING FURNACE IN AN AREA WHICH MAY DROP BELOW FREEZING. THIS CAN CAUSE IMPROPER OPERATION OR DAMAGE TO EQUIPMENT. IF THE FURNACE ENVIRONMENT HAS THE POTENTIAL OF FREEZING, THE DRAIN TRAP AND DRAIN LINE MUST BE PROTECTED. THE USE OF ACCESSORY DRAIN TRAP HEATERS, ELECTRIC HEAT TAPE AND/OR RV ANTIFREEZE IS RECOMMENDED FOR THESE INSTALLATIONS.

⚠ WARNING

TO PREVENT PERSONAL INJURY OR DEATH DUE TO IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE, REFER TO THIS MANUAL. FOR ADDITIONAL ASSISTANCE OR INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICER AGENCY OR THE GAS SUPPLIER.

⚠ WARNING

IF THE INFORMATION IN THESE INSTRUCTIONS IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

— DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

— **WHAT TO DO IF YOU SMELL GAS:**

DO NOT TRY TO LIGHT ANY APPLIANCE.

DO NOT TOUCH ANY ELECTRICAL SWITCH; DO NOT USE ANY PHONE IN YOUR BUILDING.

IMMEDIATELY CALL YOUR GAS SUPPLIER FROM A NEIGHBOR'S PHONE. FOLLOW THE GAS SUPPLIER'S INSTRUCTIONS.

IF YOU CANNOT REACH YOUR GAS SUPPLIER, CALL THE FIRE DEPARTMENT.

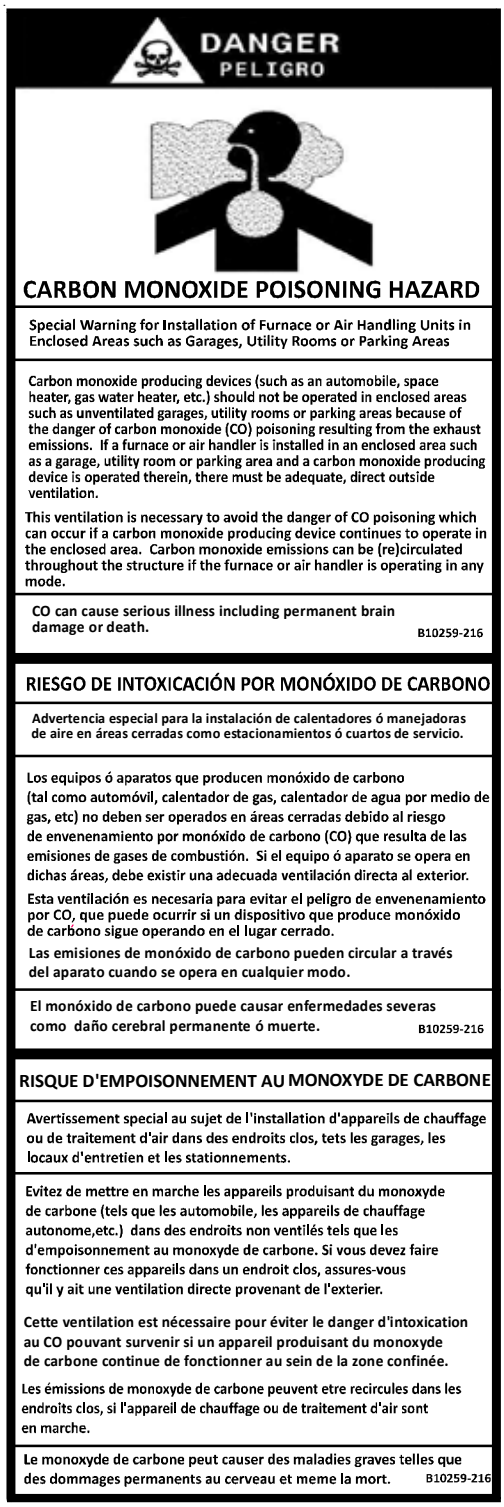
— INSTALLATION AND SERVICE MUST BE PERFORMED BY A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

⚠ WARNING

THIS PRODUCT CONTAINS OR PRODUCES A CHEMICAL OR CHEMICALS WHICH MAY CAUSE SERIOUS ILLNESS OR DEATH AND WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

⚠ WARNING

HEATING UNIT SHOULD NOT BE UTILIZED WITHOUT REASONABLE, ROUTINE, INSPECTION, MAINTENANCE AND SUPERVISION. IF THE BUILDING IN WHICH ANY SUCH DEVICE IS LOCATED WILL BE VACANT, CARE SHOULD BE TAKEN THAT SUCH DEVICE IS ROUTINELY INSPECTED, MAINTAINED AND MONITORED. IN THE EVENT THAT THE BUILDING MAYBE EXPOSED TO FREEZING TEMPERATURES AND WILL BE VACANT, ALL WATER-BEARING PIPES SHOULD BE DRAINED, THE BUILDING SHOULD BE PROPERLY WINTERIZED, AND THE WATER SOURCE CLOSED. IN THE EVENT THAT THE BUILDING MAY BE EXPOSED TO FREEZING TEMPERATURES AND WILL BE VACANT, ANY HYDRONIC COIL UNITS SHOULD BE DRAINED AS WELL AND, IN SUCH CASE, ALTERNATIVE HEAT SOURCES SHOULD BE UTILIZED.



⚠ WARNING

POSSIBLE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH DUE TO FIRE, EXPLOSION, SMOKE, SOOT, CONDENSATION, ELECTRICAL SHOCK OR CARBON MONOXIDE MAY RESULT FROM IMPROPER INSTALLATION, REPAIR OPERATION, OR MAINTENANCE OF THIS PRODUCT.

⚠ WARNING

SHOULD OVERHEATING OCCUR OR THE GAS SUPPLY FAIL TO SHUT OFF, TURN OFF THE MANUAL GAS SHUTOFF VALVE EXTERNAL TO THE FURNACE BEFORE TURNING OFF THE ELECTRICAL SUPPLY.

SHIPPING INSPECTION

All units are securely packed in shipping containers tested according to International Safe Transit Association specifications. The carton must be checked upon arrival for external damage. If damage is found, a request for inspection by carrier's agent must be made in writing immediately.

The furnace must be carefully inspected on arrival for damage and bolts or screws which may have come loose in transit. In the event of damage the consignee should:

1. Make a notation on delivery receipt of any visible damage to shipment or container.
2. Notify carrier promptly and request an inspection.
3. With concealed damage, carrier must be notified as soon as possible - preferably within five days.
4. File the claim with the following support documents within a nine month statute of limitations.
   - Original or certified copy of the Bill of Lading, or indemnity bond.
   - Original paid freight bill or indemnity in lieu thereof.
   - Original or certified copy of the invoice, showing trade and other discounts or reductions.
   - Copy of the inspection report issued by carrier's representative at the time damage is reported to carrier.

The carrier is responsible for making prompt inspection of damage and for a thorough investigation of each claim. The distributor or manufacturer will not accept claims from dealers for transportation damage.

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

NOTE: Discharge your body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and non-installed (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnaces near the control. Any tools held in a person's hand during grounding will be discharged.

3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

To The Installer

Before installing this unit, please read this manual thoroughly to familiarize yourself with specific items which must be adhered to, including but not limited to: unit maximum external static pressure, gas pressures, BTU input rating, proper electrical connections, circulating air temperature rise, minimum or maximum CFM, and motor speed connections.

⚠ WARNING

To prevent property damage, personal injury or death due to fire, do not install this furnace in a mobile home, trailer, or recreational vehicle.

Product Application

This furnace is primarily designed for residential home-heating applications. It is NOT designed or certified for use in mobile homes, trailers or recreational vehicles. Neither is it designed or certified for outdoor applications. The furnace **must** be installed indoors (i.e., attic space, crawl space, or garage area provided the garage area is enclosed with an operating door).

This furnace can be used in the following non-industrial commercial applications:

Schools, Office buildings, Churches, Retail stores, Nursing homes, Hotels/motels, Common or office areas.

In such applications, the furnace must be installed with the following stipulations:

- It must be installed per the installation instructions provided and per local and national codes.
- It must be installed indoors in a building constructed on site.
- It must be part of a ducted system and not used in a free air delivery application.
- It must not be used as a "make-up" air unit.
- It must be installed as a two-pipe systems for combustion air.
- All other warranty exclusions and restrictions apply This furnace is an ETL certified appliance and is appropriate for use with natural gas.

Dual certification means that the combustion air inlet pipe is optional and the furnace can be vented as a:

- Non-direct vent (single pipe) central forced air furnace in which combustion air is taken from the installation area or from air ducted from the outside or,
- Direct vent (dual pipe) central forced air furnace in which all combustion air supplied directly to the furnace burners through a special air intake system outlined in these instructions.

This furnace cannot be used as a construction site heater.

To ensure proper furnace operation, install, operate and maintain the furnace in accordance with these installation and operation instructions, all local building codes and ordinances. In their absence, follow the latest edition of the National Fuel Gas Code (NFPA 54/ANSI Z223.1), Installation Codes, local plumbing or waste water codes, and other applicable codes.

A copy of the National Fuel Gas Code (NFPA 54/ANSI Z223.1) can be obtained from any of the following:

American National Standards Institute
23 West 43rd Street, 4th Floor
New York, NY 10036

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

CSA International
8501 East Pleasant Valley
Independence, OH 441311

The rated heating capacity of the furnace should be greater than or equal to the total heat loss of the area to be heated. The total heat loss should be calculated by an approved method or in accordance with "ASHRAE Guide" or "Manual J-Load Calculations" published by the Air Conditioning Contractors of America.

Location Requirements & Considerations

⚠ WARNING

To prevent possible equipment damage, property damage, personal injury or death, the following bullet points must be observed when installing this unit.

⚠ WARNING

Possible property damage, personal injury or death due to fire, explosion, smoke, soot, condensation, electrical shock or carbon monoxide may result from improper installation, repair operation, or maintenance of this product.

Follow the instructions listed below and the guidelines provided in the *Combustion and Ventilation Air Requirements* section when selecting a furnace location.

- Centrally locate the furnace with respect to the proposed or existing air distribution system.
- Ensure the temperature of the return air entering the furnace is between 55°F and 100°F when the furnace is heating.
- Provide provisions for venting combustion products outdoors through a proper venting system. Special consideration should be given to vent/flue pipe routing and combustion air intake pipe when applicable. Refer to *Vent/Flue Pipe and Combustion Air Pipe -Termination Locations* for appropriate termination locations and to determine if the piping system from furnace to termination can be accomplished within the guidelines given. **NOTE:** The length of flue and/or combustion air piping can be a limiting factor in the location of the furnace.
- Locate the furnace so condensate flows downwards to the drain. Do not locate the furnace or its condensate drainage system in any area subject to below freezing temperatures without proper freeze protection. Refer to *Condensate Drain Lines and Trap* for further details.
- Ensure adequate combustion air is available for the furnace. Improper or insufficient combustion air can expose building occupants to gas combustion products that could include carbon monoxide. Refer to *Combustion and Ventilation Air Requirements.*
- Set the furnace on a level floor to enable proper condensate drainage. If the floor becomes wet or damp at times, place the furnace above the floor on a concrete base sized approximately 1-1/2" larger than the base of the furnace. Refer to the *Horizontal Applications and Considerations* for leveling of horizontal furnaces.
- Ensure upflow or horizontal furnaces are not installed directly on carpeting, or any other combustible material. The only combustible material allowed is wood.
- Exposure to contaminated combustion air will result in safety and performance-related problems. Do not install the furnace where the combustion air is exposed to the following substances:
- Permanent wave solutions
- Chlorinated waxes or cleaners
- Chlorine-based swimming pool chemicals
- Carbon tetrachloride
- Water softening chemicals
- Swimming pool chemicals
- Deicing salts or chemicals
- Halogen type refrigerants
- Printing inks
- Cleaning solutions (such as perchloroethylene)
- Paint removers
- Varnishes
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials
- Seal off a *non-direct vent* furnace if it is installed near an area frequently contaminated by any of the above substances. This protects the *non-direct vent* furnace from airborne contaminants. To ensure that the enclosed *non-direct vent* furnace has an adequate supply of combustion air, vent from a nearby uncontaminated room or from outdoors. Refer to the *Combustion and Ventilation Air Requirements* for details.
- If the furnace is used in connection with a cooling coil unit, install the furnace upstream or in parallel with the cooling coil unit. Premature heat exchanger failure will result if the cooling unit is placed ahead of the furnace.

  For vertical (upflow) applications, the minimum cooling coil width shall not be less than furnace width minus 1". Additionally, a coil installed above an upflow furnace may be the same width as the furnace or may be one size larger than the furnace. *Example: a "C" width coil may be installed with a "B" width furnace.*

  For upflow applications, the front of the coil and furnace must face the same direction.
- If the furnace is installed in a residential garage, position the furnace so that the burners and ignition source are located not less than 18" above the floor. Protect the furnace from physical damage by vehicles.
- If the furnace is installed horizontally, ensure the access doors are not on the "up/top" or "down/bottom" side of the furnace.
- Do not connect this furnace to a chimney flue that serves a separate appliance designed to burn solid fuel.

CLEARANCES AND ACCESSIBILITY

NOTES:

- For servicing or cleaning, a 24" front clearance is required.
- Unit connections (electrical, flue and drain) may necessitate greater clearances than the minimum clearances listed above.
- In all cases, accessibility clearance must take precedence over clearances from the enclosure where accessibility clearances are greater.

***MES96 MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS (INCHES)**

POSITION*	SIDES	REAR	FRONT	BOTTOM	FLUE	TOP
Upflow	0"	0"	3"	C	0"	1"
Horizontal	6"	0"	3"	C	0"	6"

C = If placed on combustible floor, floor MUST be wood only.

Table 1

Installations must adhere to the clearances to combustible materials to which this furnace has been design certified. The minimum clearance information for this furnace is provided on the unit's clearance label. These clearances must be permanently maintained. Clearances must also accommodate an installation's gas, electrical, and drain trap and drain line connections. If the alternate combustion air intake or vent/flue connections are used additional clearance must be provided to accommodate these connections. Refer to *Vent/Flue Pipe and Combustion Air Pipe* for details.

NOTE: In addition to the required clearances to combustible materials, a minimum of 24" service clearance must be available in front of the unit.

A furnace installed in a confined space (i.e., a closet or utility room) must have two ventilation openings with a total minimum free area of 0.25 square inches per 1,000 BTU/hr of furnace input rating. Refer to Specification Sheet applicable to your model for minimum clearances to combustible surfaces. One of the ventilation openings must be within 12" of the top; the other opening must be within 12" of the bottom of the confined space. In a typical construction, the clearance between the door and door frame is usually adequate to satisfy this ventilation requirement.

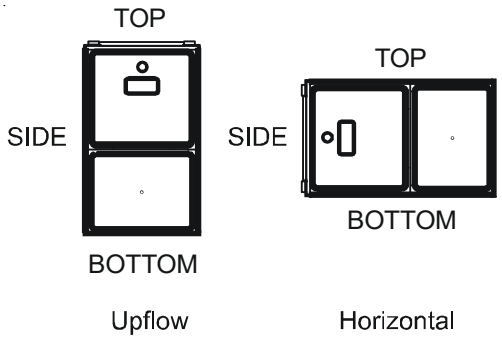


Figure 1

Existing Furnace Removal

The following vent testing procedure is reproduced from the **American National Standard/National Standard of Canada for Gas-Fired Central Furnaces ANSI Z21.47, CSA-2.3 latest edition Section 1.23.1.**

The following steps shall be followed with each appliance connected to the venting system placed in operation, while any 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 by the National Fuel Gas Code, ANSI Z223.1 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 shall operate at maximum speed. Do not operate a summer exhaust fan.

6. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance shall operate continuously.

7. 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.

8. 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 burning appliance to their previous conditions of use.

If resizing is required on any portion of the venting system, use the appropriate table in Appendix G in the latest edition of the National Fuel Gas Code ANSI Z223.1 Installation Codes.

Thermostat Location

The thermostat should be placed approximately five feet from the floor on a vibration-free, inside wall in an area having good air circulation. Do not install the thermostat where it may be influenced by any of the following:

- Drafts, or dead spots behind doors, in corners, or under cabinets.
- Hot or cold air from registers.
- Radiant heat from the sun.
- Light fixtures or other appliances.
- Radiant heat from a fireplace.
- Concealed hot or cold water pipes, or chimneys.
- Unconditioned areas behind the thermostat, such as an outside wall.

Consult the instructions packaged with the thermostat for mounting instructions and further precautions.

Combustion & Ventilation Air Requirements

WARNING

To avoid property damage, personal injury or death, sufficient fresh air for proper combustion and ventilation of flue gases must be supplied. Most homes require outside air be supplied into the furnace area.

Improved construction and additional insulation in buildings have reduced heat loss by reducing air infiltration and escape around doors and windows. These changes have helped in reducing heating/cooling costs but have created a problem supplying combustion and ventilation air for gas fired and other fuel burning appliances. Appliances that pull air out of the house (clothes dryers, exhaust fans, fireplaces, etc.) increase the problem by starving appliances for air.

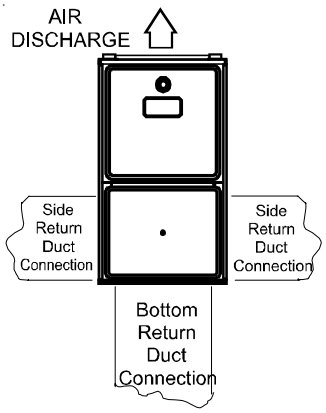
House depressurization can cause back drafting or improper combustion of gas-fired appliances, thereby exposing building occupants to gas combustion products that could include carbon monoxide.

If this furnace is to be installed in the same space with other gas appliances, such as a water heater, ensure there is an adequate supply of combustion and ventilation air for all appliances. Refer to the latest edition of the National Fuel Gas Code NFPA 54/ANSI Z223.1 or applicable provisions of the local building codes for determining the combustion air requirements for the appliances.

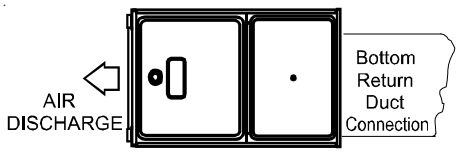
Most homes will require outside air be supplied to the furnace area by means of ventilation grilles or ducts connecting directly to the outdoors or spaces open to the outdoors such as attics or crawl spaces.

Installation Positions

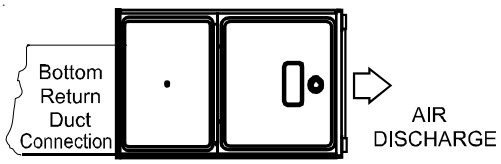
This furnace may be installed in an upright position or horizontal on either the left or right side panel. Do not install this furnace on its back. For *upright upflow* furnaces, return air ductwork may be attached to the side panel(s) and/or basepan. For *horizontal upflow* furnaces, return air ductwork must be attached to the basepan. For both *upright or horizontal* furnaces, return ductwork must be attached to the basepan (top end of the blower compartment). **NOTE:** Ductwork must never be attached to the back of the furnace. Contact your distributor for proper airflow requirements and number of required ductwork connections. Refer to "Recommended Installation Positions" figure for appropriate installation positions, ductwork connections, and resulting airflow arrangements.



UPFLOW
UPRIGHT
Alternate Vent/Flue Location
Figure 2A



UPFLOW HORIZONTAL
LEFT AIR DISCHARGE
Figure 2B



UPFLOW HORIZONTAL
RIGHT AIR DISCHARGE
Figure 2C

Recommended Installation Positions

Horizontal Applications & Considerations

When installing a furnace horizontally, additional consideration must be given to the following:

Furnace Suspension

If suspending the furnace from rafters or joists, use 3/8" threaded rod and 2"x2"x1/8" angle iron as shown in the following diagram. The length of rod will depend on the application and the clearances necessary.

If the furnace is installed in a crawl space it must be suspended from the floor joist or supported by a concrete pad. Never install the furnace on the ground or allow it to be exposed to water.

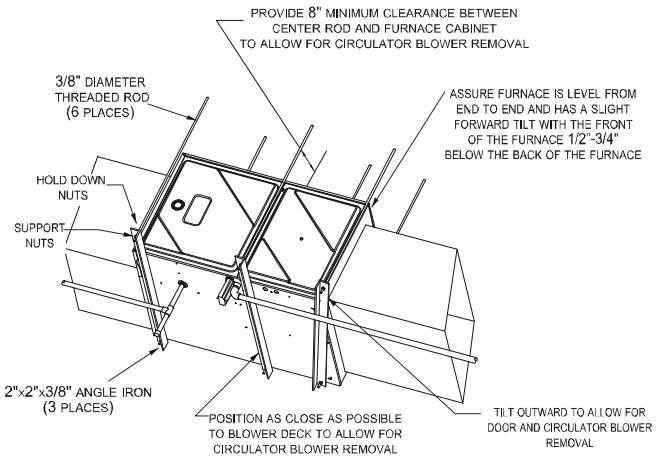


Figure 3

Front Cover Pressure Switch Tube Location

When a furnace is installed horizontally with left side down, the front cover pressure switch tube must be re-located to the lower port of the collector box cover.

1. Remove tube from front cover pressure switch and collector box cover.
2. Remove rubber plug from bottom collector box port and install on top collector box port.
3. Locate 24" x 1/4" tube in bag assembly.
4. Install one end on front cover pressure switch.
5. Route tube to lower port on collector box cover and cut off excess tubing.

Drain Trap and Lines

In horizontal applications the condensate drain trap is secured to the furnace side panel, suspending it below the furnace. A minimum clearance of 5.5" below the furnace must be provided for the drain trap. Additionally, the appropriate downward piping slope must be maintained from the drain trap to the drain location. Refer to *Condensate Drain Trap and Lines* for further details. If the drain trap and drain line will be exposed to temperatures near or below freezing, adequate measures must be taken to prevent condensate from freezing.

Leveling

Leveling ensures proper condensate drainage from the heat exchanger. For proper flue pipe drainage, the furnace must be level lengthwise from end to end. The furnace should have a slight tilt from back to front with the access doors downhill from the back panel approximately 1/2" to 3/4". The slight tilt allows the heat exchanger condensate, generated in the recuperator coil, to flow forward to the recuperator coil frontcover.

Alternate Vent/Flue and Combustion Air Connectons

In horizontial installations provisions for alternate flue and combustion air piping are available for upflow furnaces with left discharge. This configuration allows the flue and combustion air piping to be run vertically through the side of the furnace. Refer to the "Recommended Installation Positions" figure for further detail. The standard piping connections may also be used in these positions. Refer to *Vent/Flue Pipe and Combustion Air Pipe* for details concerning the conversion to the alternate vent/flue and combustion air connections.

When using the horizontal alternate vent configuration, you must use the RF000142 vent drain kit. See Figure 9.

Alternate Electrical and Gas Line Connections

This furnace has provisions allowing for electrical and gas line connections through either side panel. In horizontal applications the connections can be made either through the "top" or "bottom" of the furnace.

Drain Pan

A drain pan must be provided if the furnace is installed above a conditioned area. The drain pan must cover the entire area under the furnace (and air conditioning coil if applicable).

Freeze Protection

Refer to *Horizontal Applications and Conditions - Drain Trap and Lines.*

High Altitude Installation

High Altitude Insallation Unit can be installed from 0-4500 ft only. See table 2.

Gas	Altitude	Kit	Manifold Pressure	Pressure Switch Change
Natural	0-4500'	None	3.0" WC	None

Table 2

Vent/Flue Pipe & Combustion Air Pipe

This manual will refer to the pipe that discharges products of combustion to the outdoors as the "vent" pipe or "flue" pipe. The pipe that supplies air for combustion to the furnace will be referred to as the "intake" pipe or "combustion air" pipe. A condensing gas furnace achieves its high level of efficiency by extracting almost all of the heat from the products of combustion and cooling them to the point where condensation takes place. Because of the relatively low flue gas temperature and water condensation requirements, PVC or ABS pipe is typically used as venting and intake pipe materials.

In addition to PVC and ABS pipe and fittings, Innoflue® by Centrotherm Eco Systems and PolyPro® by M&G Duravent are also approved vent and combustion air materials for installations in the U.S.A. Manufacturers Installation instructions for these products must be followed. These products have specific instructions for installing, joining and terminating. Do not mix materials or components of onemanufacturer with materials or components of another manufacturer.

All furnaces are manufactured with 2" vent/intake pipe and connectors. For furnaces requiring installation of 3" pipe, the transition from 2" to 3" should be done as close to the furnace as practically possible, and only in the vertical sections.

This furnace must not be connected to Type B, BW, or L vent or vent connector, and must not be vented into any portion of a factory built or masonry chimney except when used as a pathway for PVC as described later in this section. Never common vent this appliance with another appliance or use a vent which is used by a solid fuel appliance. Do not use commercially available "no hub connectors" other than those shipped with this product.

It is the responsibility of the installer to follow the manufacturers' recommendations and to verify that all vent/flue piping and connectors are compatible with furnace flue products. Additionally, it is the responsibility of the installer to ensure that all piping and connections possess adequate structural integrity and support to prevent flue pipe separation, shifting, or sagging during furnace operation.

⚠ WARNING

UPON COMPLETION OF THE FURNACE INSTALLATION, CAREFULLY INSPECT THE ENTIRE FLUE SYSTEM BOTH INSIDE AND OUTSIDE OF THE FURNACE TO ASSURE IT IS PROPERLY SEALED. LEAKS IN THE FLUE SYSTEM CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH DUE TO EXPOSURE TO FLUE PRODUCTS, INCLUDING CARBON MONOXIDE.

⚠ WARNING

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN BODILY INJURY OR DEATH. CAREFULLY READ AND FOLLOW ALL INSTRUCTIONS GIVEN IN THIS SECTION.

DUAL CERTIFICATION: NON-DIRECT/DIRECT VENT

This furnace is dual certified and may be installed as a non-direct vent (single pipe) or direct vent (dual pipe) appliance. A *non-direct vent* installation requires only a vent/flue pipe, while a *direct vent* installation requires both a vent/flue pipe and a combustion air intake pipe. Refer to the appropriate section for details concerning piping size, length, number of elbows, furnace connections, and terminations.

⚠ WARNING

TO AVOID BODILY INJURY, FIRE OR EXPLOSION, SOLVENT CEMENTS MUST BE KEPT AWAY FROM ALL IGNITION SOURCES (I.E., SPARKS, OPEN FLAMES, AND EXCESSIVE HEAT) AS THEY ARE COMBUSTIBLE LIQUIDS. AVOID BREATHING CEMENT VAPORS OR CONTACT WITH SKIN AND/OR EYES.

MATERIALS AND JOINING METHODS

2" to 3" nominal diameter PVC Schedule 40 pipe meeting ASTM D1785, PVC primer meeting ASTM F656, and PVC solvent cement meeting ASTM D2564 specifications must be used. Fittings must be DWV type fittings meeting ASTM D2665 and ASTM D3311. Carefully follow the manufacturer's instructions for cutting, cleaning, and solvent cementing of PVC.

The use of Schedule 40 PVC cellular core DWV meeting ASTM F891-1 or ABS cellular core (Foam Core) plastic pipe is also acceptable as a flue/vent and intake pipe material. PVC primer meeting ASTM F656 and PVC solvent cement meeting ASTM D2564 specifications must be used. Fittings must be DWV type fittings meeting ASTM D2665 and ASTM D3311. Carefully follow the manufactures instructions for cutting, cleaning and solvent cementing of PVC.

NOTE: Requirement does not apply to the combustion air pipe.

As an alternative to PVC pipe, primer, solvent cement, and fittings, ABS materials which are in compliance with the following specifications may be used. 2" to 3" ABS Schedule 40 pipe must meet ASTM D1527. Solvent cement for ABS to ABS joints must meet ASTM D2235. The solvent cement for the PVC to ABS transition joint must meet ASTM D3138. Fittings must be DWV type fittings meeting ASTM D2661 and ASTM D3311. Carefully follow the manufacturers' instructions for cutting, cleaning, and solvent cementing PVC and/or ABS.

All 90° elbows must be medium radius (1/4 bend DWV) or long radius (Long sweep 1/4 bend DWV) types conforming to ASTM D3311. A medium radius (1/4 bend DWV) elbow measures 3-1/16" minimum from the plane of one opening to the center line of the other opening for 2" diameter pipe, and 4-9/16" minimum for 3" pipe.

PROPER VENT/FLUE AND COMBUSTION AIR PIPING PRACTICES

Adhere to these instructions to ensure safe and proper furnace performance. The length, diameter, and number of elbows of the vent/flue pipe and combustion air pipe (when applicable) affects the performance of the furnace and must be carefully sized. All piping must be installed in accordance with local codes and these instructions.

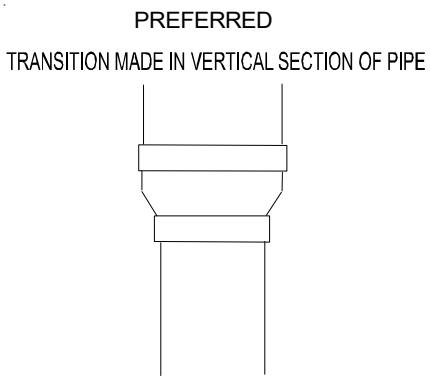


Figure 4

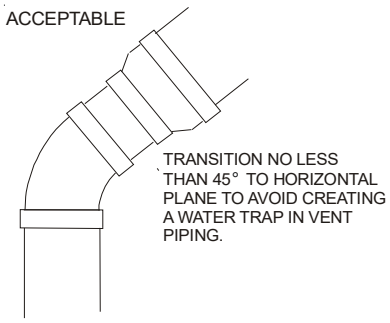


Figure 5

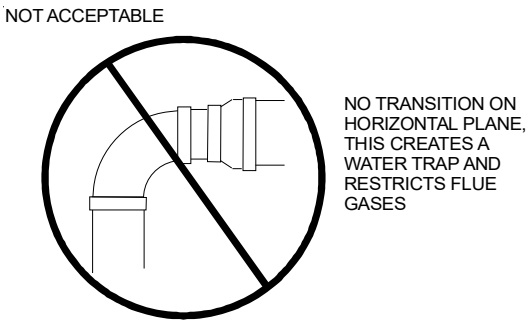


Figure 6

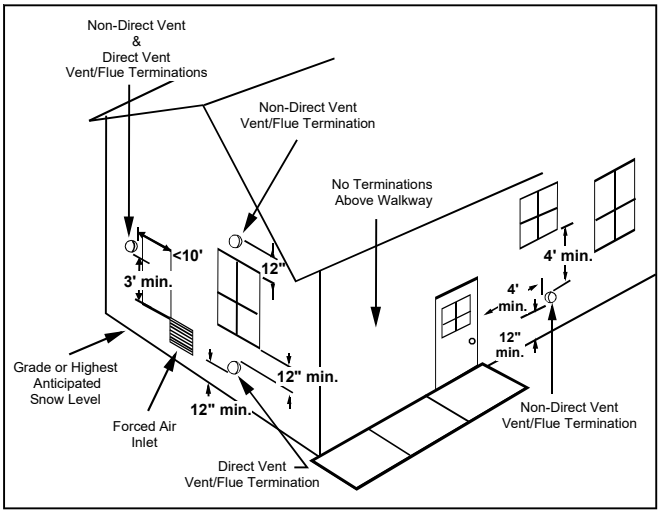
Some models require the use of 3" pipe. Do not transition from a 2" to 3" pipe in a horizontal section of pipe as this may create a water trap.

Piping must be adequately secured and supported to prohibit sagging, joint separation, and/or detachment from the furnace. Horizontal runs of vent/flue piping must be supported every three to five feet and must maintain a 1/4" per foot downward slope, back towards the furnace, to properly return condensate to the furnace's drain system. Allowances should be made for minor expansion and contraction due to temperature variations. For this reason, particular care must be taken to secure piping when a long run is followed by a short offset of less than 40".

Precautions should be taken to prevent condensate from freezing inside the vent/flue pipe and/or at the vent/flue pipe termination. All vent/flue piping exposed to freezing temperatures below 35°F for extended periods of time must be insulated with 1/2" thick closed cell foam. Also all vent/flue piping exposed outdoors in excess of the terminations shown in this manual (or in unheated areas) must be insulated with 1/2" thick closed cell foam. Inspect piping for leaks prior to installing insulation.

Termination Locations

NOTE: Refer to *Location Requirements and Considerations* for combustion air contaminant restrictions.



Vent Termination Clearances
Figure 7

The following bullets and diagram describe the restrictions concerning the appropriate location of vent/flue pipe and combustion air intake pipe (when applicable) terminations. Refer to *Non-Direct Vent (Single Pipe) Piping* and *Direct Vent (Dual Pipe) Piping* located in this section for specific details on termination construction.

- All terminations (flue and/or intake) must be located at least 12" above ground level or the anticipated snow level.
- Vent terminations (non-direct and direct vent) must terminate at least 3 feet above any forced air inlet located within 10 feet.

  NOTE: This provision does not apply to the combustion air intake termination of a direct vent application.
- The vent termination of a *non-direct vent* application must terminate at least 4 feet below, 4 feet horizontally from, or 1 foot above any door, window, or gravity air inlet into any building.

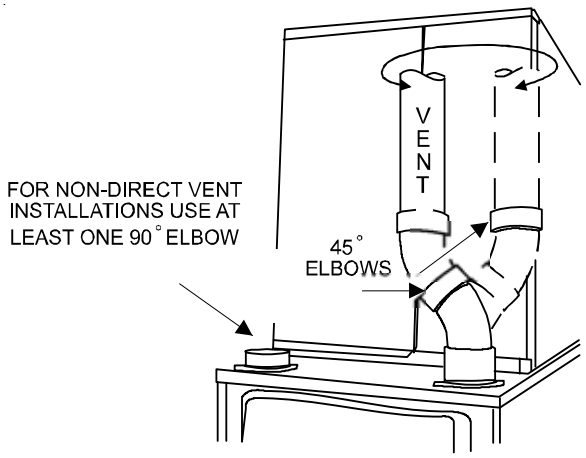
- The vent termination of a *direct vent* application must terminate at least 12" from any opening through which flue gases may enter a building (door, window, or gravity air inlet).
- The vent termination of vent pipe run vertically through a roof must terminate at least 12" above the roof line (or the anticipated snow level) and be at least 12" from any vertical wall (including any anticipated snow build up).
- A vent termination shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.
- The combustion air intake termination of a direct vent application should not terminate in an area which is frequently dusty or dirty.

Standard Furnace Connections

It is the responsibility of the installer to ensure that the piping connections to the furnace are secure, airtight, and adequately supported.

Vent/Flue Pipe

The vent pipe outlet is sized to accept 2" pipe. Secure vent/flue pipe directly into the furnace fitting with the appropriate glue. Alternately, a small section of 2" pipe may be glued in the furnace socket and a rubber coupling installed to allow removal for future service. Combustion Air and Vent piping should be routed in a manner to avoid contact with refrigerant lines, metering devices, condensate drain lines, etc. If necessary, clearances may be increased by creating an offset using two 45° elbows (Figure 8A).



Increased Clearance Configuration
Figure 8A

This joint can be rotated on the fitting to establish maximum clearance between refrigerant lines, metering devices, and condensate drain lines, etc. This joint is the equivalent of one 90° elbow when considering elbow count.

NOTE: For *non-direct vent* installations, a minimum of one 90° elbow should be installed on the combustion air intake coupling to guard against inadvertent blockage. Figure 8A

⚠ WARNING

EDGES OF SHEET METAL HOLES MAY BE SHARP. USE GLOVES AS A PRECAUTION WHEN REMOVING HOLE PLUGS.

Combustion Air Pipe

Direct Vent Installations

On *upflow* units secure the combustion air intake pipe to the air intake coupling by using a take apart rubber coupling supplied with the furnace or a plastic coupling. Also, the intake coupling may be inverted to allow the intake pipe to be glued directly to it. After inverting the coupling, secure it to the furnace top with screws.

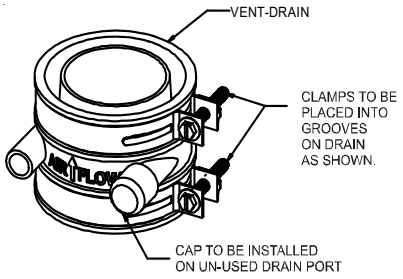


Figure 8B

COMBUSTION AIR INTAKE OPTIONS: The RF000142 coupling (Figure 8B) can be secured directly to the furnace intake coupling if condensation/rain water is a concern. If the RF000142 is used on the combustion air inlet, it must be installed with the arrow pointing up. It should be noted, the combustion air will actually be moving in a direction opposite of the arrow on the RF000142 coupling. It must have a field supplied, trapped drain tube free-draining to proper condensate disposal location. A loop in the drain tube can serve as a trap. The unused RF000142 drain fitting should be capped. A tee installed in the intake pipe is also an acceptable method of catching condensation. It must have a field supplied, trapped drain tube or pipe, free-draining to proper condensate disposal location. A loop in the drain tube can serve as a trap.

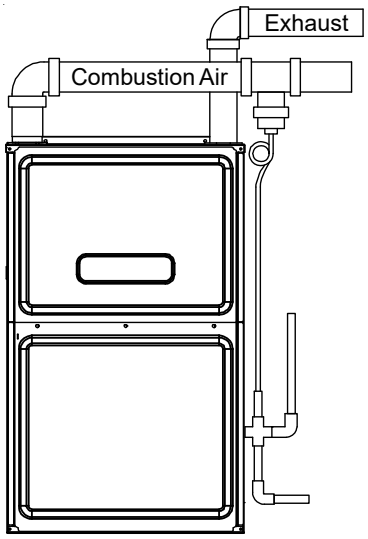


Figure 8C

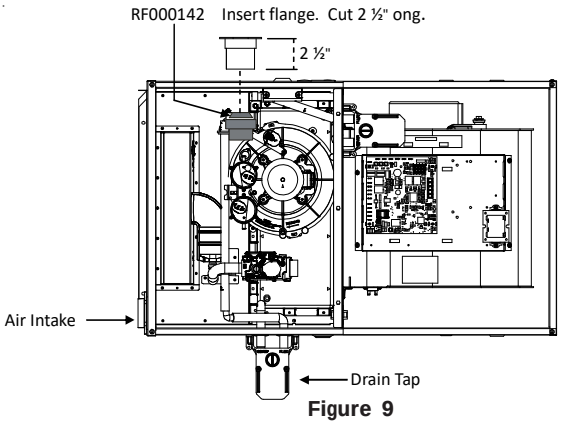


Figure 9

⚠ WARNING

THE RUBBER ELBOW IS NOT DESIGNED TO SUPPORT A LOAD. WHEN THE RUBBER ELBOW IS MOUNTED EXTERNALLY TO THE FURNACE CABINET, EXTREME CARE MUST BE TAKEN TO ADEQUATELY SUPPORT FIELD-SUPPLIED VENT/FLUE PIPING, AS DAMAGE CAN RESULT IN LEAKS CAUSING BODILY INJURY OR DEATH DUE TO EXPOSURE TO FLUE GASES, INCLUDING CARBON MONOXIDE

NON-DIRECT VENT INSTALLATIONS

A minimum of one 90° elbow should be installed on the combustion air intake "coupling" to guard against inadvertent blockage. (Figure 8A)

ALTERNATE VENT/FLUE LOCATION

The alternate vent/flue location is the large hole directly in line with the induced draft blower outlet. To use the alternate vent/flue location refer to the following steps and the "Alternate Vent/Flue Location" Figure 9.

NOTE: In the horizontal left installation position, a means of condensate collection must be provided to keep vent pipe condensate from entering the draft inducer housing. If the vent drain elbow is eliminated from the installation, an RF000142 kit must be used.

1. Remove the four screws from the vent pipe flange on top the furnace.
2. Remove the internal elbow and vent pipe
3. Cut 2 1/2" from the flange .
4. Remove plastic plug in line with the inducer outlet
5. Install cut end of the flanged section and connect to inducer with rubber coupling supplied with furnace.
6. Install screws removed in step 1 securing flange to cabinet.

⚠ CAUTION

BE SURE NOT TO DAMAGE INTERNAL WIRING OR OTHER COMPONENTS WHEN REINSTALLING COUPLING AND SCREWS.

RF000142 coupling must have a filed supplied , trapped drain tube free draining to proper condensate disposal location. A loop in the drain tube can serve as a trap. The unused RF000142 drain fitting should be capped.

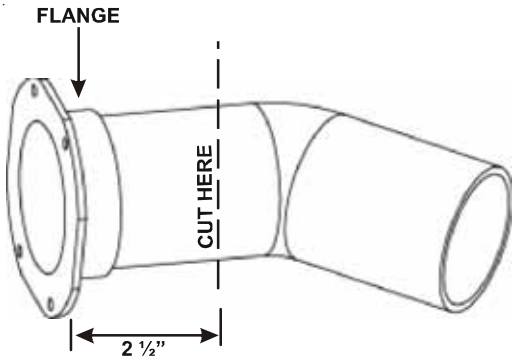


Figure 10

ALTERNATE COMBUSTION AIR PROVISION

(Upflow/Horizontal models only)

When using the alternate venting location, either in a horizontal left side down installation or a vertical installation using down – venting, an alternate combustion air opening can be used. A locating dimple is located on the right side of the furnace cabinet. The locating dimple is 1-7/8" measured from the front edge of the cabinet in line with the knock out. To use the alternate combustion air location:

1. Remove screws and combustion air flange from cabinet.
2. Insert cabinet plug in unused combustion air hole.
3. Drill a pilot hole at the cabinet dimple (size dictated by knockout tool used).
4. Use a knockout tool to create a 3" diameter hole
5. Install combustion air flange and secure with screws removed in step one.

NON-DIRECT VENT (SINGLE PIPE) PIPING

Non-direct vent installations require only a vent/flue pipe. The vent pipe can be run horizontally with an exit through the side of the building or run vertically with an exit through the roof of the building. The vent can also be run through an existing *unused* chimney; however, it must extend a minimum of 12" above the top of the chimney. The space between the vent pipe and the chimney must be closed with a weather-tight, corrosion-resistant flashing.

Although *non-direct vent* installations do not require a combustion air intake *pipe*, a minimum of one 90° elbow should be attached to the furnace's combustion air intake *if*: an upright

installation uses the standard intake location, or a horizontal installation uses the alternate air intake location. This elbow will guard against inadvertent blockage of the air intake.

VENT/FLUE PIPE LENGTHS AND DIAMETERS

Refer to the Direct and Non-Direct Vent Table 3 for applicable length, elbows, and pipe diameter for construction of the vent/flue pipe system of a non-direct vent installation. In addition to the vent/flue pipe, a single 90° elbow should be secured to the combustion air intake to prevent inadvertent blockage. The tee used in the vent/flue termination must be included when determining the number of elbows in the piping system.

MAXIMUM ALLOWABLE VENT LENGTH OF VENT/FLUE PIPE & COMBUSTION AIR PIPE (Ft)

MODEL	Pipe Size (in)	Number of Elbows							
		1	2	3	4	5	6	7	8
*MES960403BU	2	95	90	85	80	75	70	65	60
	3	103	96	89	82	75	68	61	54
*MES960603BU	2	90	85	80	75	70	65	60	55
	3	158	151	144	137	130	123	116	109
*MES960805CU	2	55	50	45	40	35	30	25	20
	3	151	144	137	130	123	116	109	102

Table 3

VENT/FLUE PIPE TERMINATIONS

NOTE: If either a 90°or 45°elbow is used for termination, it must be pointed downward.

The vent/flue pipe may terminate vertically, as through a roof, or horizontally, as through an outside wall.

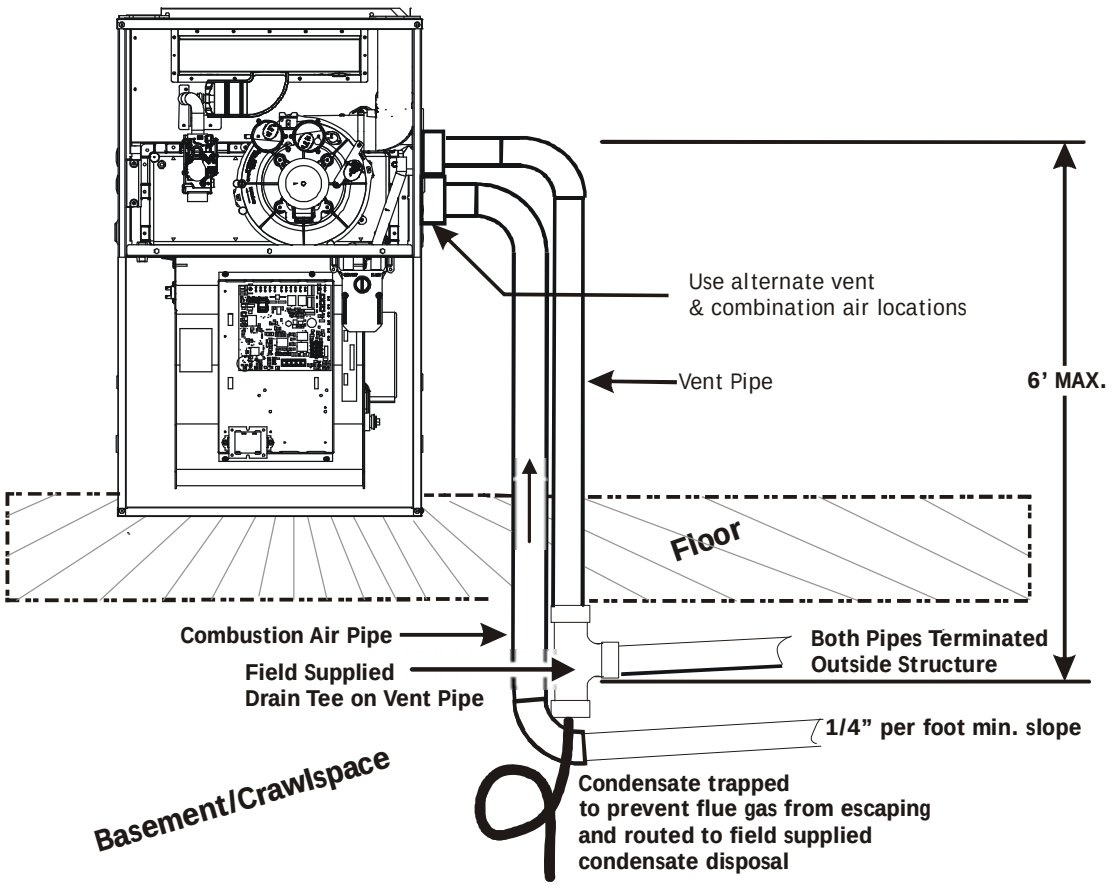
Vertical vent/flue pipe terminations should be as shown in figure 12. Refer to *Vent/Flue Pipe and Combustion Air Pipe - Termination Locations* for details concerning location restrictions. The penetration of the vent through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.

Horizontal vent/flue pipe terminations should be as shown in the following figure. Refer to *Vent/Flue Pipe and Combustion Air Pipe.* To secure the pipe passing through the wall and prohibit damage to piping connections, a coupling should be installed on either side of the wall and solvent cemented to a length of pipe connecting the two couplings. The length of pipe should be the wall thickness plus the depth of the socket fittings to be installed on the inside and outside of the wall. The wall penetration should be sealed with silicone caulking material.

NOTE: Terminate both pipes in the same pressure zone (same side of roof, no major obstacles between pipes, etc.).

A heat pump thermostat with two stages of heat is required to properly use a furnace in conjunction with a heat pump. Refer to the fossil fuel kit installation instructions for additional thermostat requirements.

DOWN VENTING UPFLOW MODEL FURNACES ONLY



All piping and fittings must be joined per material manufacturer's specifications to prevent separation and flue gas leaks.

Figure 11

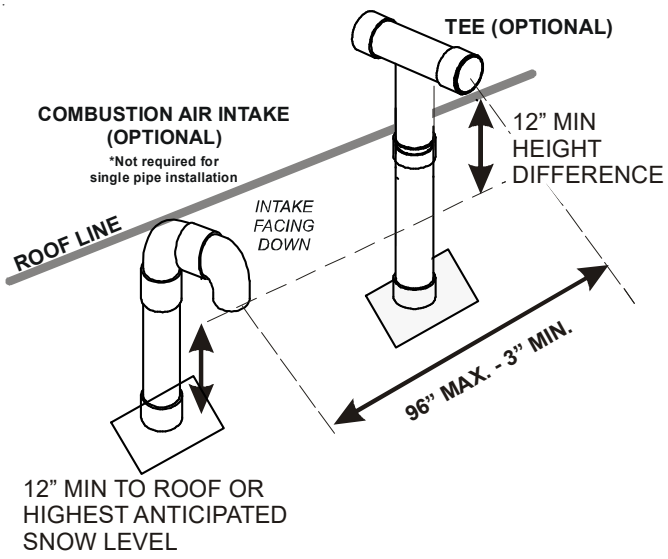
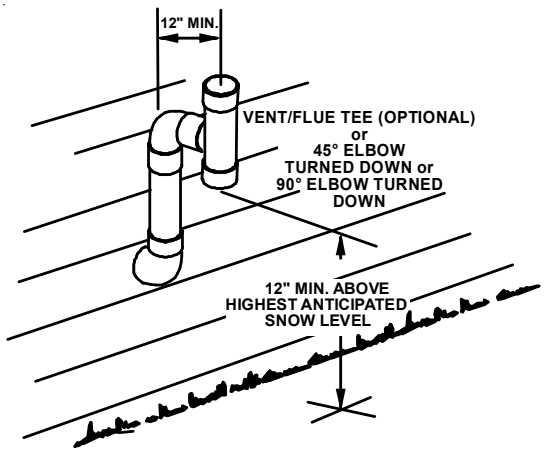


Figure 12 - Vertical Termination



Horizontal Termination (Single Pipe)
Above Highest Anticipated Snow Level
Figure 14

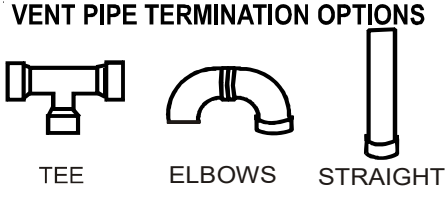
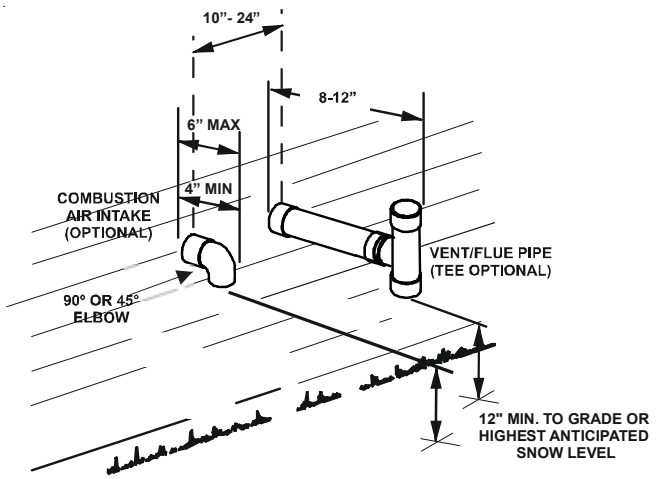


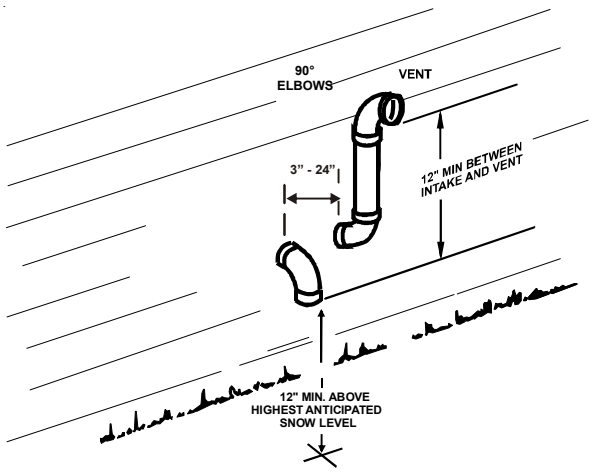
Figure 13

DIRECT VENT (DUAL PIPE) PIPING

Direct vent installations require both a combustion air intake and a vent/flue pipe. The pipes may be run horizontally and exit through the side of the building or run vertically and exit through the roof of the building. The pipes may be run through an existing *unused* chimney; however, they must extend a minimum of 12" above the top of the chimney. The space between the pipes and the chimney must be closed with a weather tight, corrosion resistant flashing. Both the combustion air intake and a vent/flue pipe terminations must be in the same atmospheric pressure zone. Refer to *Vent/Flue and Combustion Air Pipe - Termination Locations* or *Concentric Vent Termination* for specific details on termination construction. For details concerning connection of pipes to the furnace, refer to the *Vent/Flue Pipe and Combustion Pipe - Standard Furnace Connections* or *Alternate Furnace Connections.*



Standard Horizontal Terminations (Dual Pipe)
Figure 15

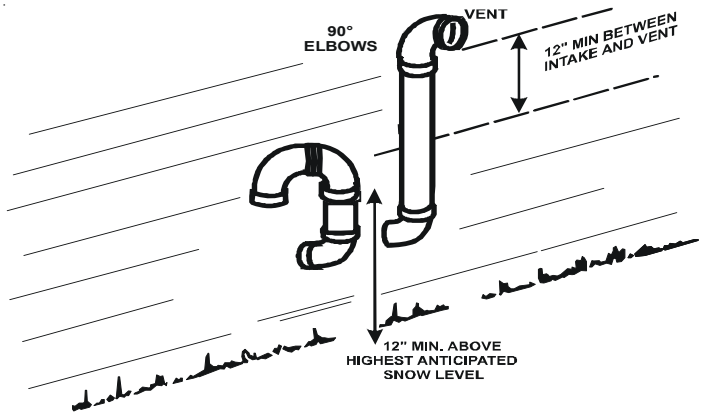


Alternate Horizontal Vent Termination (Dual Pipe)
Figure 16

VENT/FLUE & COMBUSTION AIR PIPE LENGTHS & DIAMETERS

Refer to the table 3 on page 14 for applicable length, elbows, and pipe diameter for construction of the vent/flue and combustion air intake pipe systems of a direct vent (dual pipe) installation. The number of elbows tabulated represents the number of elbows and/or tees in each (Vent/Flue & Combustion Air Intake) pipe. Elbows and/or tees used in the terminations must be included when determining the number of elbows in the piping systems.

If the combustion air intake pipe is to be installed above a finished ceiling or other area where dripping of condensate will be objectionable, insulation of the combustion air pipe may be required.



Combustion Air Intake may also be snorkeled

to obtain 12" min ground clearance.

Alternate Vent Termination Above Anticipated Snow Level
(Dual Pipe)
Figure 17

Use ½" thick closed cell foam insulation such as Armaflex™ or Insultube™ where required.

VENT/FLUE AND COMBUSTION AIR PIPE TERMINATIONS

The vent/flue and combustion air pipes may terminate vertically, as through a roof, or horizontally, as through an outside wall.

Vertical pipe terminations should be as shown in figure 12. *Refer to Vent/Flue Pipe and Combustion Pipe - Termination Locations* for details concerning location restrictions. The penetrations through the roof must be sealed tight with proper flashing such as is used with a plastic plumbing vent.

Vent & Combustion Air Intake Measurements for Standard Horizontal Terminations (Dual Pipe)

Center to center = 10" min / 24" max.

Vertical separation: 0" - 24"

Vent termination from wall = 8" min/ 12" max.

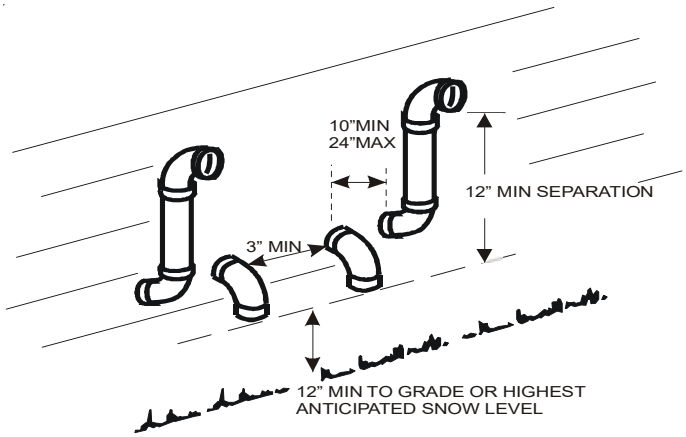
Combustion air intake from wall = 4" min/6" max.

Vent and intake clearance to ground or anticipated snow level = 12" min.

VENT/INTAKE TERMINATIONS FOR INSTALLATION OF MULTIPLE DIRECT VENT FURNACES

If more than one direct vent furnace is to be installed vertically through a common roof top, maintain the same minimum clearances between the exhaust vent and air intake terminations of adjacent units as with the exhaust vent and air intake terminations of a single unit.

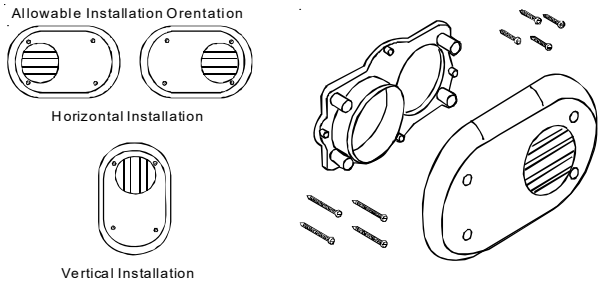
If more than one direct vent furnace is to be installed horizontally through a common side wall, maintain the clearances as in the following figure. Always terminate all exhaust vent outlets at the same elevation and always terminate all air intakes at the same elevation.



Termination of Multiple Direct Vent Furnaces
Figure 18

CONCENTRIC VENT TERMINATION

Refer to the directions provided with the Concentric Vent Kit (DCVK) for installation specifications.



Side Wall Vent Kit
Figure 19

SIDE WALL VENT KIT

This kit is to be used with 2" or 3" direct vent systems. The vent kit must terminate outside the structure and may be installed with the intake and exhaust pipes located side-by-side or with one pipe above the other. These kits are **NOT** intended for use with single pipe (non-direct vent) installations.

Refer to the directions furnished with the Side Wall Vent Kit (p/n 0170K00000S or 0170K00001S) for installation specifications.

CONDENSATE DRAIN LINES & DRAIN TRAP

A condensing gas furnace achieves its high level of efficiency by extracting heat from the products of combustion to the point where condensation takes place. The condensate must be collected in the furnace drain trap and routed to an appropriate drain location in compliance with local and national codes.

Follow the bullets listed below when installing the drain system. Refer to the following sections for specific details concerning furnace drain trap installation and drain hose hook ups.

- The drain trap supplied with the furnace must be used.
- The drain trap must be primed at time of installation.
- The drain line between furnace and drain location must meet local and nation codes.
- The drain line between furnace and drain location must maintain a 1/4" per foot downward slope toward the drain.
- Do not trap the drain line in any other location than at the drain trap supplied with the furnace.
- If the drain line is routed through an area which may see temperatures near or below freezing, precautions must be taken to prevent condensate from freezing within the drain line.
- If an air conditioning coil is installed with the furnace, a common drain may be used. An open tee must be installed in the drain line, near the cooling coil, to relieve positive air pressure from the coil's plenum. This is necessary to prohibit any interference with the function of the furnace's drain trap.

NOTE: In vertical installations, air conditioning coil condensate may drain into the furnace trap as long as there is a trap between the coil and the furnace trap and the drain pipe is not terminating below the water level of the furnace trap.

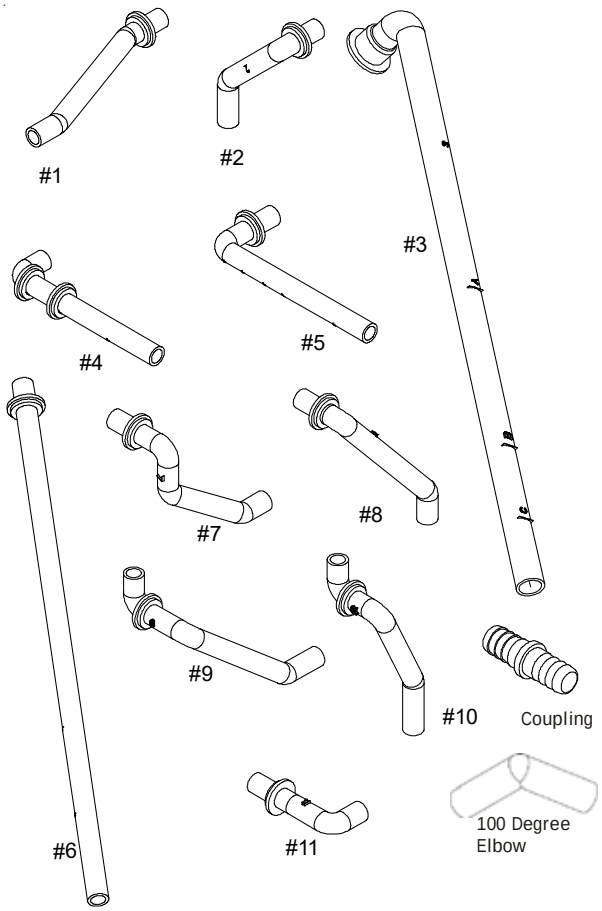


Figure 20

NOTE: Drain components shown for information purposes only.

General Drain Information

All furnace models come with a factory installed drain trap. For vertical installations, the trap will remain in the factory position. All furnace models installed horizontally require the trap to be relocated. Many drain hoses have a built–in grommet which will provide a cabinet seal when installed. See instructions below for your model and installation position.

NOTE: Both sides of the drain trap must be primed prior to initial furnace start up

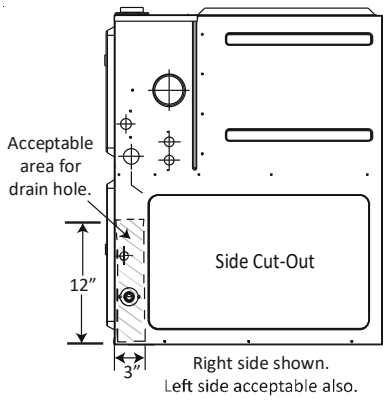


Figure 21

Field Supplied Drain

Drain the furnace and air conditioning coil if applicable, in compliance with code requirements. In horizontal installations, a field installed rubber coupling will allow the drain trap to be removed for cleaning. The drain trap must be primed before initial furnace start up. When an air conditioning coil drain is connected to the field supplied furnace drain, it must be vented. An open tee must be installed at a height no higher than the bottom of the furnace collector box to prevent air conditioning condensate from backing up into the furnace, if the common drain was blocked.

Upflow Model Installed Vertically

The trap and factory installed hoses remain as shipped. The furnace drain may exit either the right or left side of the furnace cabinet. Both sides of the cabinet have two .875" diameter holes which can be used interchangeably for drain and low voltage wiring purposes. If a higher drain exit is needed, a .875" diameter hole may be added in the area shown in Figure 21. Any unused cabinet opening must be sealed. Do not allow drain hose to sag or trap water.

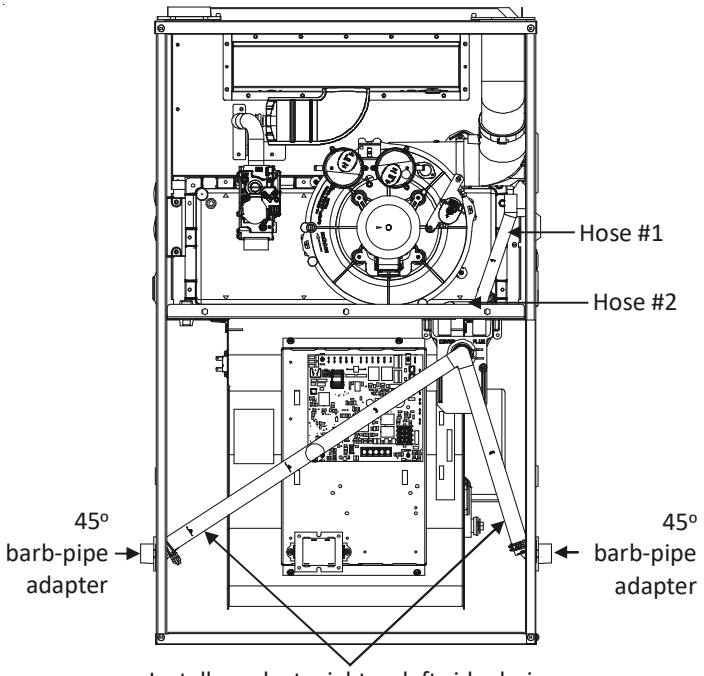


Figure 22

Drain Exiting Right Side

1. Locate and Install the 45º pipe/hose drain coupling from the outside of the cabinet (barbed end goes in the cabinet) through hole in the right side of the cabinet and secure with two field supplied #8 self-tapping screws (see Figure 22).
2. Locate the long drain hose #3 and cut at line "A".
3. Install large end of hose #3 to trap outlet and secure with 1.25" clamp.
4. Install smaller end of hose #3 on 45º elbow and secure with 1" clamp.
5. Refer to Field Supplied Drain section for instructions on field supplied/installed drain on outlet of furnace trap.

Drain Exiting Left Side

1. Install the 45º pipe/hose drain coupling from the outside of the cabinet (barbed end goes in the cabinet) through the hole in the left side of the cabinet and secure with two field supplied #8 self-tapping screws (see Figure 22).
2. Locate the long drain hose #3 and cut at "B" line for a 17.5" cabinet; cut at line "C" for a 21" cabinet; do not cut for a "D" width cabinet.
3. Install large end of hose #3 to trap outlet and secure with 1.25" clamp.
4. Install smaller end of hose #3 on 45º elbow and secure with 1" clamp.
5. Refer to Field Supplied Drain section for instructions on field supplied/installed drain on outlet of furnace trap.

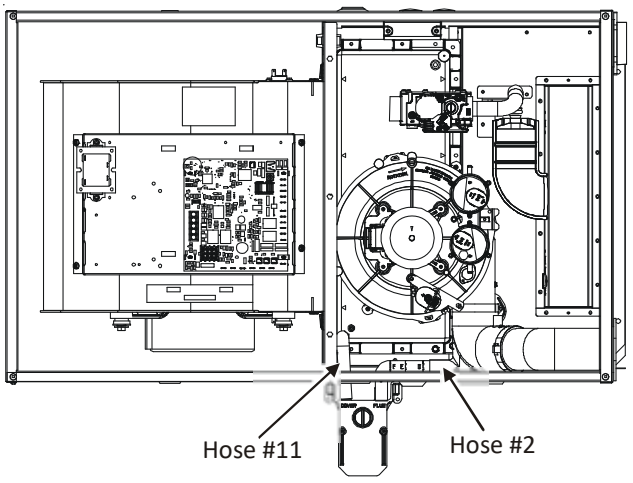


Figure 23

Upflow Model Installed Horizontally with Right Side Down

Minimum 5 ½" clearance is required for the drain trap beneath the furnace.

1. Remove the clamps from both ends of the drain hoses.
2. Remove the two screws holding the drain trap to the blower deck.
3. Remove the trap and two hoses from the blower deck
4. Remove the two plugs from the right side of the cabinet and install them in the blower deck.
5. Draining the Vent Elbow: Locate hose #2 (factory installed) and cut 1" away from the 45º bend, discard the 45º section. Insert hose #2 from outside the cabinet through the cabinet drain hole nearest the top, secure it to the barbed fitting in the elbow with a red clamp.
6. Draining the Collector Box: Install the non-grommet end of hose #11 from outside the cabinet in the bottom drain hole. Install on collector box and secure with a silver clamp.
7. Use two silver clamps and secure the hoses to drain trap. The trap outlet faces the front of the furnace. Secure the trap to the cabinet using two screws removed in step 2 by inserting the two screws through the large set of holes in the top mounting tabs of the trap into the two predrilled holes in the side of the cabinet.
8. Refer to Field Supplied Drain section for instructions on field supplied/installed drain on outlet of furnace trap.

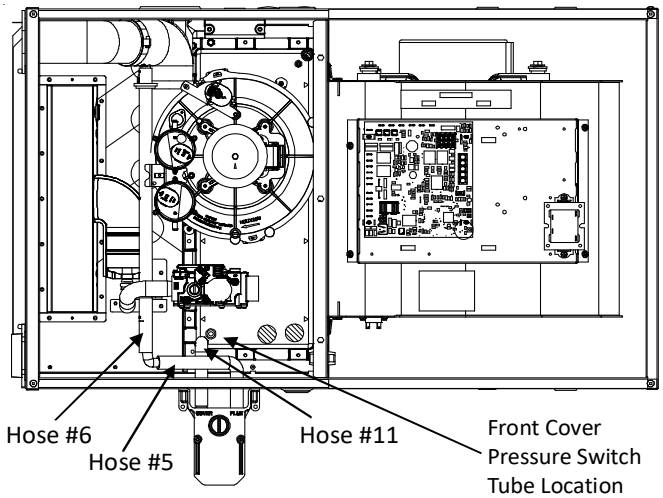


Figure 24

Upflow Model Installed Horizontally with Left Side Down

Minimum 5 ½" clearance is required for the drain trap beneath the furnace.

**See Front Cover Pressure Switch Tube Location on Figure 24.*

1. Remove the clamps from the two drain tubes on the trap.
2. Remove the two screws holding the drain trap to the blower deck.
3. Remove the trap and hoses from the blower deck.
4. Remove the two plugs from the left side of the cabinet and install them in the blower deck.
5. Draining the Vent Elbow: Locate hose #6. Measuring from the non-grommet end; cut off and discard 1 ½" for a "D" width cabinet, 5" for a "C" width cabinet, 8 ½" for a "B" width cabinet.

6. Remove the rubber plug from vent – drain elbow side port. Place hose #6 on the vent – drain elbow side port and secure with a silver clamp .
7. ***Unused vent-drain elbow drip leg port must be sealed to prevent flue gases from escaping. Insert the rubber plug removed in step 6 into the unused elbow drain port. Inserting a blunt tool such as a 3/16" Allen wrench into the center of the rubber plug will stretch the plug and allow complete insertion.***
8. Locate hose #5 and cut 3" from the non-grommet end. Discard the section without the grommet.
9. Insert the cut end of tube #5 through the lower cabinet drain hole.
10. Connect hose #6 & hose #5 using 100º elbow and secure with two red clamps
11. Draining the Collector Box: Remove cap from left side collector box drain port (bottom in horizontal left position) and install it on right side (top) collector box drain port.
12. Install the non-grommet end of hose #11 from outside the cabinet in the upper drain hole. Install on collector box and secure with a silver clamp.
13. Use two silver clamps and secure the hoses to drain trap. The trap outlet faces the front of the furnace. Secure the trap to the cabinet using two screws removed in step 2 by inserting the two screws through the large set of holes in the top mounting tabs of the trap into the two pre-drilled holes in the side of the cabinet.
14. Refer to Field Supplied Drain section for instructions on field supplied/installed drain on outlet of furnace trap.

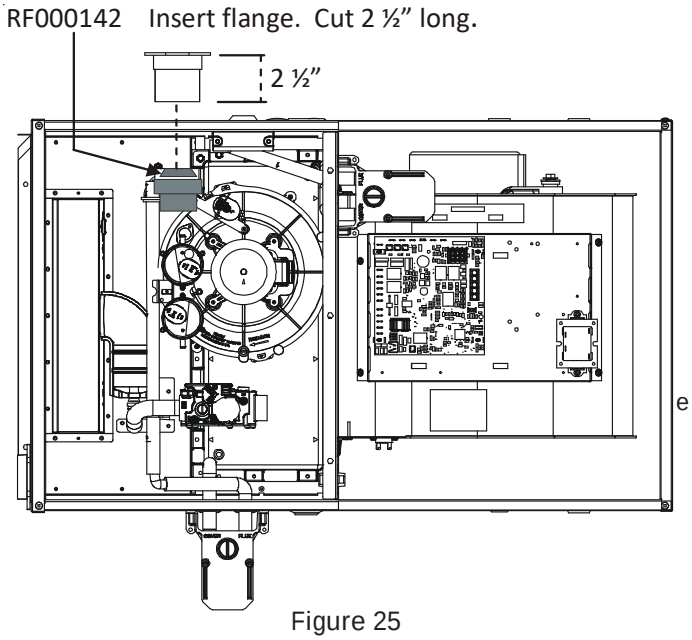


Figure 25

Upflow Model Installed Horizontally With Left Side Down - Alternate

****See Front Cover Pressure Switch Tube Location on Figure 24.***

1. Draining the RF000142 Coupling: Locate hose #2 (factory installed). Cut off and discard the 45° radius end.
2. Install 90°radius end of hose #2 on RF000142 drain outlet and secure with a red clamp.
3. Insert coupling in hose #2 and secure with a red clamp.
4. Locate hose #5 and cut 3" from the non-grommet end. Discard the section without the grommet.
5. Insert the cut end of tube #5 through the lower cabinet drain hole.
6. Insert 100° elbow in the cut end of hose #5.
7. Locate hose #6. Using red clamps, connect between the coupling and 100° elbow, cutting off excess tubing.
8. Draining the Collector Box: Remove cap from left side collector box drain port (bottom in horizontal left position) and install it on right side (top) collector box drain port and secure with a red clamp.
9. Install the non-grommet end of hose #11 from outside the cabinet in the upper drain hole. Install on collector box and secure with a silver clamp.
10. Use two silver clamps and secure the hoses to drain trap. The trap outlet faces the front of the furnace. Secure the trap to the cabinet using two screws removed in step 2 by inserting the two screws through the large set of holes in the top mounting tabs of the trap.

Electrical Connections

⚠ WARNING

Edges of sheet metal holes may be sharp. Use gloves as a precaution when removing hole plugs.

Wiring Harness

The wiring harness is an integral part of this furnace. Wires are color coded for identification purposes. Refer to the wiring diagram for wire routings. If any of the original wire as supplied with the furnace must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C. Any replacement wiring must be a copper conductor.

115 Volt Line Connections

Before proceeding with electrical connections, ensure that the supply voltage, frequency, and phase correspond to that specified on the unit rating plate. Power supply to the furnace must be NEC Class 1, and must comply with all applicable codes. The furnace must be electrically grounded in accordance with local codes or, in their absence, with the latest edition of The National Electric Code, ANSI NFPA 70.

Use a separate fused branch electrical circuit containing properly sized wire, and fuse or circuit breaker. The fuse or circuit breaker must be sized in accordance with the maximum overcurrent protection specified on the unit rating plate. An electrical disconnect must be provided at the furnace location.

Connect hot, neutral, and ground wires as shown in the wiring diagram located on the unit's blower door. For direct vent applications, the cabinet opening to the junction box must be sealed air tight using either an UL approved bushing such as Heyco Liquid Tight or by applying non-reactive UL approved sealant to bushing.

Line polarity must be observed when making field connections. Line voltage connections can be made through either the right or left side panel. The furnace is shipped configured for a left side electrical connection with the junction box located inside the burner compartment. To make electrical connections through the opposite side of the furnace, the junction box must be relocated to the other side of the burner compartment prior to making electrical connections. To relocate the junction box, follow the steps shown in the Junction Box Relocation section.

⚠ WARNING

HIGH VOLTAGE !

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR CHANGING ANY ELECTRICAL WIRING.

⚠ CAUTION

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. VERIFY PROPER OPERATION AFTER SERVICING.

⚠ WARNING

HIGH VOLTAGE !

TO AVOID THE RISK OF INJURY, ELECTRICAL SHOCK OR DEATH, THE FURNACE MUST BE ELECTRICALLY GROUNDED IN ACCORDANCE WITH LOCAL CODES OR IN THEIR ABSENCE, WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.

115 Volt Line Voltage Connection of Accessories (Humidifier and Electronic Air Cleaner)

The furnace integrated control module is equipped with line voltage accessory terminals for controlling power to an optional field-supplied humidifier and/or electronic air cleaner.

The accessory load specifications are as follows:

Turn OFF power to the furnace before installing any accessories. Follow the humidifier and/or air cleaner manufacturers' instructions for locating, mounting, grounding, and controlling these accessories. Accessory wiring connections are to be made through the 1/4" quick connect terminals provided on the furnace integrated control module. The humidifier and electronic air cleaner hot terminals are identified as HUM and EAC. The humidifier and electronic air cleaner neutral terminals are identified as NEUTRAL. All field wiring must conform to applicable codes.

Humidifier	1.0 Amp maximum at 120 VAC
Electronic Air Cleaner	1.0 Amp maximum at 120 VAC

Table 4

If it is necessary for the installer to supply additional line voltage wiring to the inside of the furnace, the wiring must conform to all local codes, and have a minimum temperature rating of 105°C. All line voltage wire splices must be made inside the furnace junction box.

The integrated control module single humidifier terminal (HUM) is energized with 115 volts whenever the induced draft blower is energized. This terminal can also be used to provide 115 volt power to a humidifier transformer. The remaining primary transformer wire would be connected to the Line N on the control board. The integrated control module electronic air cleaner terminals (EAC) are energized with 115 volts whenever the circulator blower is energized.

NOTE: Wire routing must not to interfere with circulator blower operation, filter removal, or routine maintenance.

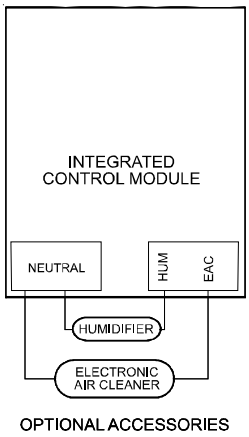


Figure 26

Junction Box Relocation

Line voltage connections can be made through either the right or left side panel. The furnace is shipped configured for a left side electrical connection. To make electrical connections through the opposite side of the furnace, the junction box must be relocated to the left side prior to making electrical connections. To relocate the junction box, perform the following steps.

1. Remove the burner compartment door.
2. Remove and save the two screws securing the junction box to the side panel.
3. Relocate junction box and associated plugs and grommets to opposite side panel. Secure with screws removed in step 2.

IMPORTANT NOTE

WIRE ROUTING MUST NOT INTERFERE WITH CIRCULATOR BLOWER OPERATION, FILTER REMOVAL OR ROUTINE MAINTENANCE.

To ensure proper unit grounding, the ground wire should run from the furnace ground screw located inside the furnace junction box all the way back to the electrical panel. **NOTE:** Do not use gas piping as an electrical ground. To confirm proper unit grounding, turn off the electrical power and perform the following check.

1. Measure resistance between the neutral (white) connection and any unpainted surface.
2. Resistance should measure 10 ohms or less.

This furnace is equipped with a blower door interlock switch which interrupts unit voltage when the blower door is opened for servicing. Do not defeat this switch.

24 Volt Thermostat Wiring

NOTE: Wire routing must not interfere with circulator blower operation, filter removal or routine maintenance.

Low voltage connections can be made through either the right or left side panel. Thermostat wiring entrance holes are located in the blower compartment. The following figure shows connections for a "heat/cool system".

This furnace is equipped with a 40 VA transformer to facilitate use with most cooling equipment. Consult the wiring diagram, located on the blower compartment door, for further details of 115 Volt and 24 Volt wiring.

⚠ WARNING

HIGH VOLTAGE !

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE SERVICING OR CHANGING ANY ELECTRICAL WIRING.

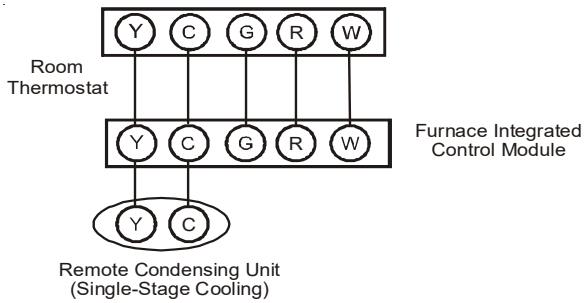


Figure 27

Single-Stage Heating Thermostat Application

A single-stage thermostat with only one heating stage is needed to control this furnace.

Fossil Fuel Applications

This furnace can be used in conjunction with a heat pump in a fossil fuel application. A fossil fuel application refers to a combined gas furnace and heat pump installation which uses an outdoor temperature sensor to determine the most cost efficient means of heating (heat pump or gas furnace).

Strictly follow the wiring guidelines in the fossil fuel kit installation instructions. All furnace connections must be made to the furnace integrated control module and the "FURNACE" terminal strip on the fossil fuel control board.

Gas Supply and Piping

⚠ CAUTION

TO PREVENT UNRELIABLE OPERATION OR EQUIPMENT DAMAGE, THE GAS MANIFOLD PRESSURE MUST BE AS SPECIFIED ON THE UNIT RATING PLATE. ONLY MINOR ADJUSTMENTS SHOULD BE MADE BY ADJUSTING THE GAS VALVE PRESSURE REGULATOR.

⚠ WARNING

POSSIBLE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH MAY OCCUR IF THE CORRECT CONVERSION KITS ARE NOT INSTALLED. THE APPROPRIATE KITS MUST BE APPLIED TO ENSURE SAFE AND PROPER FURNACE OPERATION. ALL CONVERSIONS MUST BE PERFORMED BY A QUALIFIED INSTALLER OR SERVICE AGENCY.

The furnace rating plate includes the approved furnace gas input rating and gas types. The furnace must be equipped to operate on the type of gas applied. This includes any conversion kits required for alternate fuels and/or high altitude.

INLET GAS SUPPLY PRESSURE		
Natural Gas	**Minimum: 4.5" W.C.**	**Maximum: 10.0" W.C.**

Table 5

Inlet gas supply pressures must be maintained within the ranges specified in the table 5. The supply pressure must be constant and available with all other household gas fired appliances operating. The minimum gas supply pressure must be maintained to prevent unreliable ignition. The maximum must not be exceeded to prevent unit overfiring.

⚠ WARNING

TO AVOID POSSIBLE UNSATISFACTORY OPERATION OF EQUIPMENT DAMAGE DUE TO UNDERFIRING OR EQUIPMENT, USE THE PROPER SIZE OF NATURAL GAS PIPING NEEDED WHEN RUNNING PIPE FROM THE METER/TANK TO THE FURNACE.

High Altitude Derate

The furnace shall be installed within 0-4500' of altitude.

Gas Valve

This unit is equipped with a 24 volt gas valve controlled during furnace operation by the integrated control module. As shipped, the valve is configured for natural gas. Taps for measuring the gas supply pressure and manifold pressure are provided on the valve.

The gas valve has a manual ON/OFF control located on the valve itself. This control may be set only to the "ON" or "OFF"

position. Refer to the lighting instructions label or *Startup Procedure & Adjustment* for use of this control during start up and shut down periods.

Gas Piping Connections

WARNING

To avoid possible unsatisfactory operation of equipment damage due to underfiring or equipment, use the proper size of natural gas piping needed when running pipe from the meter/tank to the furnace.

When sizing gas lines, be sure to include all appliances which will operate simultaneously. The gas piping supplying the furnace must be properly sized based on the gas flow required, specific gravity of the gas, and length of the run. The gas line installation must comply with local codes, or in their absence, with the latest edition of the National Fuel Gas Code, NFPA 54/ ANSI Z223.1

To connect the furnace to the building's gas piping, the installer must supply a ground joint union, drip leg, manual shutoff valve, and line and fittings to connect to gas valve. In some cases, the installer may also need to supply a transition piece from 1/2" pipe to a larger pipe size.

The following stipulations apply when connecting gas piping. Refer to *Gas Piping Connections* figures 28 and 29 for typical gas line connections to the furnace.

- Gas piping must be supported external to the furnace cabinet so that the weight of the gas line does not distort the burner rack, manifold or gas valve.
- Use black iron or steel pipe and fittings for building piping. Where possible, use new pipe that is properly chamfered, reamed, and free of burrs and chips. If old pipe is used, be sure it is clean and free of rust, scale, burrs, chips, and old pipe joint compound.
- Use pipe joint compound on male threads ONLY. Always use pipe joint compound (pipe dope) that is APPROVED FOR ALL GASSES. DO NOT apply compound to the first two threads.
- Use ground joint unions.
- Install a drip leg to trap dirt and moisture before it can enter the gas valve. The drip leg must be a minimum of 3" long.
- Install a 1/8" NPT pipe plug fitting, accessible for test gauge connection, immediately upstream of the gas supply connection to the furnace.
- Always use a back-up wrench when making the connection to the gas valve to keep it from turning. The orientation of the gas valve on the manifold must be maintained as shipped from the factory. Maximum torque for the gas valve connection is 375 in-lbs; excessive over-tightening may damage the gas valve.
- Install a manual shutoff valve between the gas meter and unit within six feet of the unit. If a union is installed, the union must be downstream of the manual shutoff valve, between the shutoff valve and the furnace.
- Tighten all joints securely.

Natural Gas Capacity of Pipe
In Cubic Feet of Gas Per Hour (CFH)

Length of Pipe in Feet	Nominal Black Pipe Size				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	980
40	63	130	245	500	760
50	56	115	215	440	670
60	50	105	195	400	610
70	46	96	180	370	560
80	43	90	170	350	530
90	40	84	160	320	490
100	38	79	150	305	460

(Pressure 0.5 psig or less and pressure drop of 0.3" W.C.; Based on 0.60 Specific Gravity Gas)

$$CFH = \frac{\text{BTUH Furnace Input}}{\text{Heating Value of Gas (BTU/Cubic Foot)}}$$

Table 6

- Connection method must be in compliance with all local and national codes. US: National Fuel Gas Code (NFGC) NFPA 54-2012/ANSI Z223.1-2012 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B.

  Connect the furnace to the building piping by one of the following methods:

  – Rigid metallic pipe and fittings.

  – Semi-rigid metallic tubing and metallic fittings. Aluminum alloy tubing must not be used in exterior locations. In order to seal the grommet cabinet penetration, rigid pipe must be used to reach the outside of the cabinet. A semi-rigid connector to the gas piping may be used from there.
- Use listed gas appliance connectors in accordance with their instructions. Connectors must be fully in the same room as the furnace.
- Protect connectors and semirigid tubing against physical and thermal damage when installed. Ensure aluminum-alloy tubing and connectors are coated to protect against external corrosion when in contact with masonry, plaster, or insulation, or subjected to repeated wetting by liquids such as water (except rain water), detergents, or sewage.

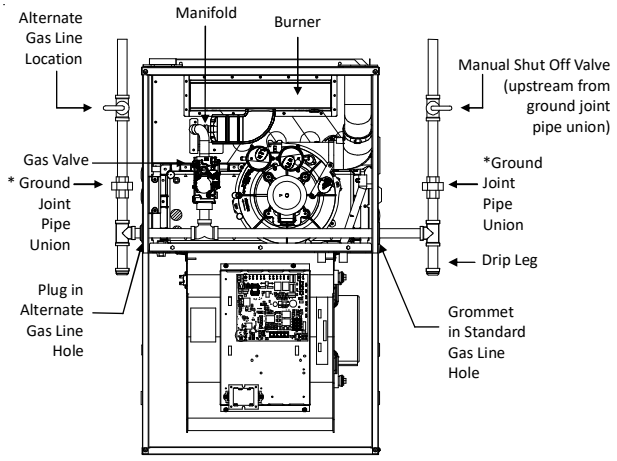
The gas piping may enter the left or right side of the furnace cabinet. The installer must supply following fittings starting from the gas valve.

- 1/2" dia x 2" long nipple
- 90 degree elbow
- Additional length of rigid piping enough to reach the outside of the cabinet
- Grounded joint union
- Drip leg

- Manual gas shut off valve

A semi-rigid connector to the gas piping can be used outside the cabinet per local codes. ½" NPT pipe and fittings are required. Model requires one 90 degree elbow, one 2" nipple and additional nipple to reach outside the cabinet.

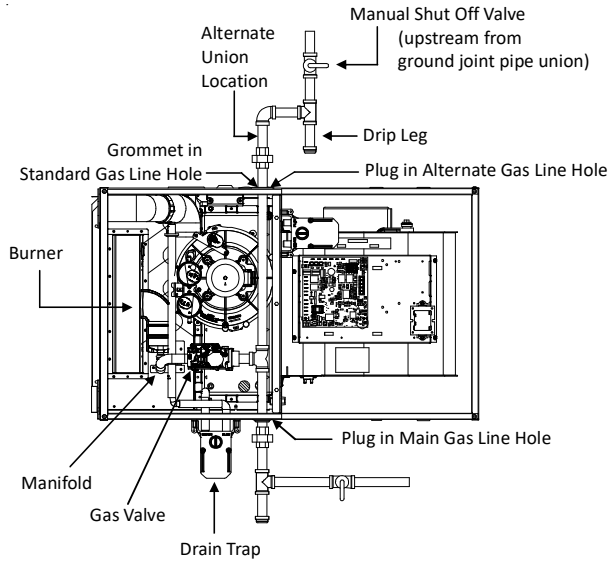
A semi-rigid connector to the gas piping can be used outside the cabinet per local codes. From the elbow, the length of pipe and the fittings required will vary by the side chosen, location of union and cabinet width. The union may be placed inside or outside of the cabinet.



* NOTE: Union may be inside furnace cabinet where allowed by local codes.

UPFLOW

Figure 28



UPFLOW - HORIZONTAL LEFT

Figure 29

GAS PIPING CHECKS

WARNING

TO AVOID THE POSSIBILITY OF EXPLOSION OR FIRE, NEVER USE A MATCH OR OPEN FLAME TO TEST FOR LEAKS.

Before placing unit in operation, leak test the unit and gas connections.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved testing methods.

CAUTION

TO PREVENT PROPERTY DAMAGE OR PERSONAL INJURY DUE TO FIRE, THE FOLLOWING INSTRUCTIONS MUST BE PERFORMED REGARDING GAS CONNECTIONS, PRESSURE TESTING, LOCATION OF SHUTOFF VALVE AND INSTALLATION OF GAS PIPING.

NOTE: Never exceed specified pressures for testing. Higher pressure may damage the gas valve and cause subsequent overfiring, resulting in heat exchanger failure.

Disconnect this unit and shutoff valve from the gas supply piping system before pressure testing the supply piping system with pressures in excess of ½ psig (3.48 kPa).

Isolate this unit from the gas supply piping system by closing its external manual gas shutoff valve before pressure testing supply piping system with test pressures equal to or less than ½ psig (3.48 kPA).

WARNING

IF THE GAS FURNACE IS INSTALLED IN A BASEMENT, AN EXCAVATED AREA OR CONFINED SPACE, IT IS STRONGLY RECOMMENDED TO CONTACT A CERTIFIED CONTRACTOR TO INSTALL A GAS DETECTING WARNING DEVICE IN CASE OF A GAS LEAK.

CIRCULATING AIR & FILTERS

DUCT WORK - AIR FLOW

WARNING

NEVER ALLOW THE PRODUCTS OF COMBUSTION, INCLUDING CARBON MONOXIDE, TO ENTER THE RETURN DUCT WORK OR CIRCULATION AIR SUPPLY.

Duct systems and register sizes must be properly designed for the CFM and external static pressure rating of the furnace. Ductwork should be designed in accordance with the recommended methods of "Air Conditioning Contractors of America" Manual D.

Install the duct system in accordance with Standards of the National Board of Fire Underwriters for the Installation of Air Conditioning, Warm Air Heating and Ventilating Systems. Pamphlets No. 90A and 90B.

A closed return duct system must be used, with the return duct connected to the furnace. **NOTE:** Ductwork must never be attached to the back of the furnace. For upflow installations requiring 1800 CFM or more, use either two side returns or bottom return or a combination of side/bottom. Flexible joints may be used for supply and return connections to reduce noise transmis-

sion. To prevent the blower from interfering with combustion air or draft when a central return is used, a connecting duct must be installed between the unit and the utility room wall. Never use a room, closet, or alcove as a return air chamber.

Checking Duct Static

Refer to your furnace rating plate for the maximum ESP (external duct static) rating.

Total external static refers to everything external to the furnace cabinet. Cooling coils, filters, ducts, grilles, registers must all be considered when reading your total external static pressure. The supply duct pressure must be read between the furnace and the cooling coil. This reading is usually taken by removing the "A" shaped block off plate from the end on the coil; drilling a test hole in it and reinstalling the block off plate. Take a duct static reading at the test hole. Tape up the test hole after your test is complete. The negative pressure must be read between the filter and the furnace blower.

Too much external static pressure will result in insufficient air that can cause excessive temperature rise. This can cause limit switch tripping and heat exchanger failure.

To determine total external duct static pressure, proceed as follows;

1. With clean filters in the furnace, use a draft gauge (inclined manometer) to measure the static pressure of the return duct at the inlet of the furnace. (Negative Pressure)
2. Measure the static pressure of the supply duct. (Positive Pressure)
3. The difference between the two numbers is .4" w.c.

Example:

static reading from return duct = -.1" w.c.

static reading from supply duct = .3" w.c.

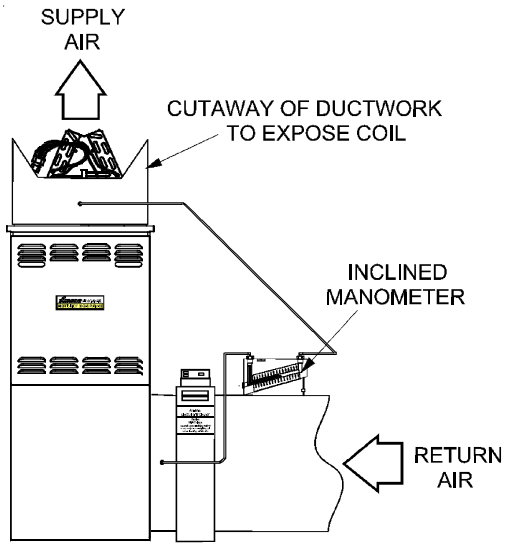
total external static pressure on this system = .4" w.c.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired. If an air conditioner coil or Electronic Air Cleaner is used in conjunction with the furnace, the readings must also include theses components, as shown in the following drawing.

4. Consult proper tables for the quantity of air.

If the total external static pressure exceeds the maximum listed on the furnace rating plate, check for closed dampers, registers, undersized and/or oversized poorly laid out duct work.

The temperature rise of the furnace must be within the temperature rise range listed on the furnace rating plate.



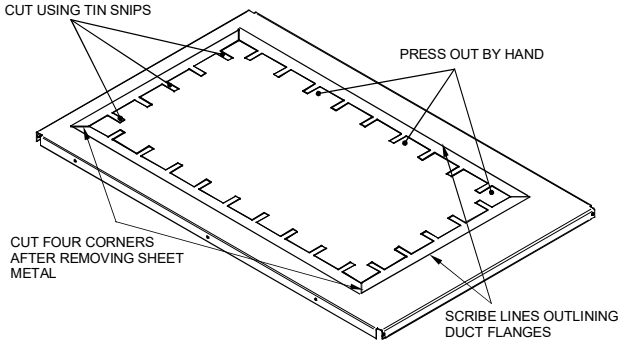
Checking Static Pressure
(80% Furnace Shown, 90% Similar)
Figure 30

WARNING

EDGES OF SHEET METAL HOLES MAY BE SHARP. USE GLOVES AS A PRECAUTION WHEN REMOVING SHEET METAL FROM RETURN AIR OPENINGS.

Bottom Return Air Opening [Upflow Models]

The bottom return air opening on upflow models utilizes a "lance and cut" method to remove sheet metal from the duct opening in the base pan. To remove, simply press out the lanced sections by hand to expose the metal strips retaining the sheet metal over the duct opening. Using tin snips, cut the metal strips and remove the sheet metal covering the duct opening. In the corners of the opening, cut the sheet metal along the scribe lines to free the duct flanges. Using the scribe line along the duct flange as a guide, unfold the duct flanges around the perimeter of the opening using a pair of seamer pliers or seamer tongs. **NOTE:** Airflow area will be reduced by approximately 18% if duct flanges are not unfolded. This could cause performance issues and noise issues.



Duct Flange Cut Outs
Figure 31

When the furnace is used in connection with a cooling unit, the furnace should be installed in 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 the flow of air must be adequate to prevent chilled air from entering the furnace and, if manually operated, must be equipped with means to prevent operation of either unit unless the damper is in the full heat or cool position.

When the furnace is installed without a cooling coil, it is recommended that a removable access panel be provided in the outlet air duct. 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 visual light inspection or such that a sampling probe can be inserted into the airstream. The access panel must be made to prevent air leaks when the furnace is in operation.

NOTE: In a horizontal installation the air conditioning coil must be adequately supported by proper brackets and supports. Inadequate coil support can result in furnace cabinet distortion and air leakage.

When the furnace is heating, the temperature of the return air entering the furnace must be between 55°F and 100°F.

Filters - Read This Section Before Installing The Return Air Duct work

Filters must be used with this furnace. Discuss filter maintenance with the building owner. Filters do not ship with this furnace, but must be provided, sized and installed externally by the installer. Filters must comply with UL900 or CAN/ULCS111 standards. Damage or repairs due to the installation of the furnace without filters is not covered under the warranty.

On upflow units, guide dimples locate the side return cutout locations. Use a straight edge to scribe lines connecting the dimples. Cut out the opening on these lines. **NOTE:** An undersized opening will cause reduced airflow.

Refer to the Filter Sizing Chart to determine filter area requirements.

Filter Sizing Chart

Model	Minimum Recommended Filter Size^
*MES960403BU	1 - 16 X 25 Side or Bottom
*MES960603BU	1 - 16 X 25 Side or Bottom
*MES960805CU	1 - 20 X 25 Bottom/2 - 16 X 25 Side Return

^ Larger filters may be used, filters may also be centrally located.

Table 7

Change filters before occupants take ownership of a new home!

One of the most common causes of a problem in a forced air heating system is a blocked or dirty filter. Circulating air filters must be inspected monthly for dirt accumilation and replaced if necessary. Failure to maintain clean filters can cause premature heat exchanger failure. A new home may require more frequent replacement until all construction dust and dirt is removed. Circulating air filters are to be installed in the return air duct external to the furnace cabinet. Consider installing an air cleaner with deep-pleated media filter at the time of furnace installation. A deep-pleated filter with a MERV rating of 8 (minimum) will often provide better filtration to protect equipment and the air distribution system than a standard 1" filter and often has lower static pressure loss than a 1" filter. Also a deep-pleated filter will typically require less frequent replacement intervals. Avoid using highly restrictive 1" filters which produce static pressure loss greater than .25" W.C. In some installations the minimum filter size required (consult filter sizing chart above) will not lend itself to a filter installation on the side of the furnace. The installation of a centrally installed air cleaner cabinet or a return duct filter installation may offer more practicality.

Clean Comfort™ brand MERV 11 air cleaners have 5¼" media filters and are available in the following configurations shown in Table 8. Consult your distributor for information on our complete line of IAQ Clean Comfort™ products.

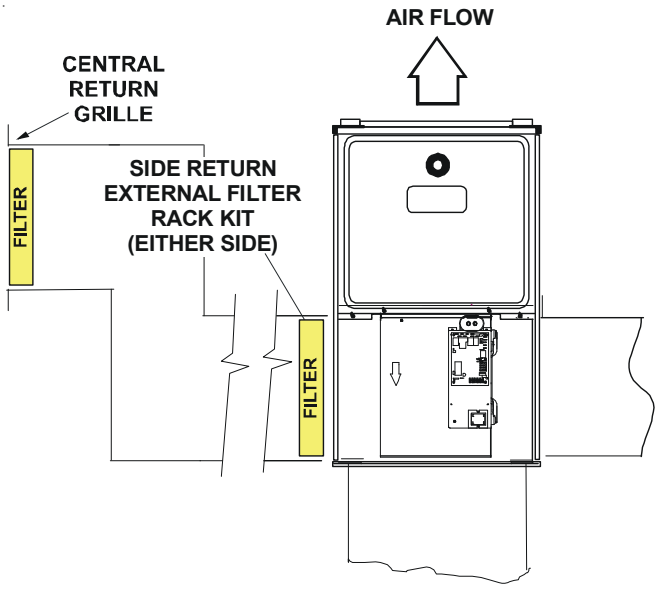
Air Cleaner Installation Location	Maximum Heating Airflow	Filter (Media) Dimensions	Part Number	Air Cleaner Family
Side or bottom return	1200 CFM	16 in X 20 in x 5¼"	AM11-1620-5	AM11-5
Side or bottom return	1600 CFM	16 in X 25 in x 5¼"	AM11-1625-5	
Side or bottom return	1600 CFM	20 in X 20 in x 5¼"	AM11-2020-5	
Side or bottom return	2000 CFM	20 in X 25 in x 5¼"	AM11-2025-5	
Side return (for 2 separate returns)	2 X 1600 CFM	2, 16 in X 25 in x 5¼"	AM11-3225-5	AM11-3225
Side return (Right angle)	2000 CFM	20 in X 25 in x 5¼"	AM11-2025-5RA	AM11-5RA
Bottom return (platform)	2000 CFM	20 in X 25 in x 5¼"	AM11-2832-5PP	AM11-5PP
Bottom return (platform)	2000 CFM	20 in X 25 in x 5¼"	AM11-2843-5PP	

Table 8

Upright Installations

Depending on the installation and/or customer preference, differing filter arrangements can be applied. Filters can be installed in the central return register or a side panel external filter rack kit (upflows). As an alternative a media air filter or electronic air cleaner can be used as the requested filter.

The following figure shows possible filter locations.



Possible Upright Upflow
Figure 32

HORIZONTAL INSTALLATIONS

Filters must be installed in either the central return register or in the return air duct work.

STARTUP PROCEDURE & ADJUSTMENT

Furnace must have a 115 VAC power supply properly connected and grounded. Proper polarity must be maintained for correct operation. In addition to the following start-up and adjustment items, refer to further information in *Operational Checks* section.

DRAIN TRAP PRIMING

The drain trap MUST be primed prior to furnace startup. To prime, fill both sides of the drain trap with water. This ensures proper furnace drainage upon startup and prohibits the possibility of flue gases escaping through the drain system.

FURNACE OPERATION

Purge gas lines of air prior to startup. Be sure not purge lines into an enclosed burner compartment. Follow NFPA 54, National Fuel Gas Code 8.1.

Check for leaks using an approved chloride-free soap and water solution, an electronic combustible gas detector, or other approved method.

FURNACE STARTUP

1. Close the manual gas shutoff valve external to the furnace.
2. Turn off the electrical power to the furnace.
3. Set the room thermostat to the lowest possible setting.
4. Remove the burner compartment door.

NOTE: This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

5. Move the furnace gas valve manual control to the OFF position.
6. Wait five minutes then smell for gas. Be sure check near the floor as some types of gas are heavier than air.
7. If you smell gas after five minutes, immediately follow the safety instructions in the *Safety Considerations* on page 3 of this manual. If you do not smell gas after five minutes, move the furnace gas valve manual control to the ON position.
8. Replace the burner compartment door.
9. Open the manual gas shutoff valve external to the furnace.
10. Turn on the electrical power to the furnace.
11. Adjust the thermostat to a setting above room temperature.
12. After the burners are lit, set the thermostat to desired temperature.

FURNACE SHUTDOWN

1. Set the thermostat to the lowest setting.
   The integrated control will close the gas valve and extinguish flame. Following a 30 second delay, the induced draft blower will be de-energized. The circulator blower will shut down when the time delay expires (Time delay is selectable on all models).
2. Remove the burner compartment door and move the furnace gas valve manual control to the OFF position.
3. Close the manual gas shutoff valve external to the furnace.
4. Replace the burner compartment door.

GAS SUPPLY PRESSURE MEASUREMENT

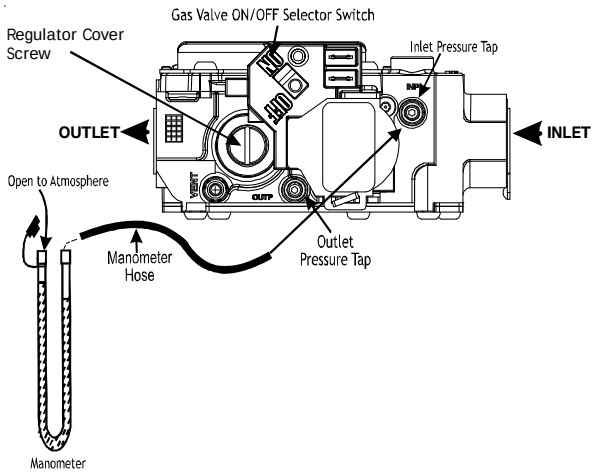
GAS PRESSURE TEST

⚠ CAUTION

TO PREVENT UNRELIABLE OPERATION OR EQUIPMENT DAMAGE, THE INLET GAS SUPPLY PRESSURE MUST BE AS SPECIFIED ON THE UNIT RATING PLATE WITH ALL OTHER HOUSEHOLD GAS FIRED APPLIANCES OPERATING.

The line pressure supplied to the gas valve must be within the range specified on Table 5 on page 22. The supply pressure can be measured at the gas valve inlet pressure tap or at a hose fitting installed in the gas piping drip leg. The supply pressure must be measured with the burners operating. To measure the gas supply pressure, use the following procedure.

1. Turn OFF gas to furnace at the manual gas shutoff valve external to the furnace. Back inlet pressure test port screw turn counter clockwise, not more than one turn.
2. Connect a calibrated water U tube manometer (or appropriate gas pressure gauge) at either the gas valve inlet pressure tap or the gas piping drip leg. See White-Rodgers 36J22Y-204 gas valve figure below for location of inlet pressure tap.



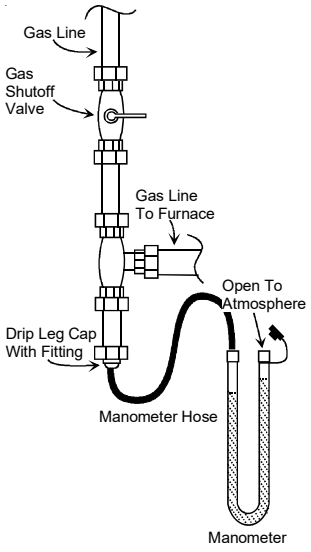
White-Rodgers Model 36J22Y-204
Connected to Manometer
Figure 33

NOTE: If measuring gas pressure at the drip leg, a field-supplied hose barb fitting must be installed prior to making the hose connection. If using the inlet pressure tap on the White-Rodgers 36J22 gas valve, then use the 36G/J Valve Pressure Check Kit, Part No. 0151K00000S.

3. Turn ON the gas supply and operate the furnace and all other gas consuming appliances on the same gas supply line.
4. Measure furnace gas supply pressure with burners firing. Supply pressure must be within the range specified in the *Inlet Gas Supply Pressure* table 5, on page 22.

If supply pressure differs from table, make the necessary adjustments to pressure regulator, gas piping size, etc., and/or consult with local gas utility.

5. Turn OFF gas to furnace at the manual shutoff valve and disconnect manometer. Reinstall plug and tighten as needed before turning on gas to furnace.
6. Turn OFF any unnecessary gas appliances stated in step 3.



Measuring Inlet Gas Pressure (Alt. Method)
Figure 34

Gas Manifold Pressure Measurement and Adjustment

Only small variations in gas pressure should be made by adjusting the gas valve pressure regulator. The manifold pressure must be measured with the burners operating. To measure and adjust the manifold pressure, use the following procedure.

1. Turn OFF gas to furnace at the manual gas shutoff valve external to the furnace.
2. Turn off all electrical power to the system.
3. Outlet pressure tap connections:
   White-Rodgers 36J22 valve: Back outlet pressure test screw (outlet pressure tap) out one turn (counterclockwise, not more than one turn).
4. Connect calibrated U tube manometer (or appropriate pressure gauge) at the gas valve outlet pressure tap. See White-Rodgers 36J22Y-204 gas valve Figure 33 for location of outlet pressure tap.
5. Turn ON the gas supply.
6. Turn on power and close thermostat "R" and "W" contacts to provide a call for heat.
7. Measure the gas manifold pressure with burners firing. Adjust manifold pressure using the *Manifold Gas Pressure* table 9 shown below.

Manifold Gas Pressure		
Gas	**Range**	**Nominal**
Natural	2.8 - 3.2" w.c.	3.0" w.c.

Table 9

8. Remove regulator cover screw from the outlet pressure regulator adjust tower and turn screw clockwise to increase pressure or counterclockwise to decrease pressure. Replace regulator cover screw.
9. Turn off all electrical power and gas supply to the system.
10. Remove the manometer hose from the hose barb fitting or outlet pressure tap.
11. Replace outlet pressure tap: White-Rodgers 36J22 valve: Turn outlet pressure test screw in to seal pressure port (clockwise, 7 in-lb minimum).
12. Turn on electrical power and gas supply to the system.
13. Close thermostat contacts "R" and "W" to energize the valve.

Using a leak detection solution or soap suds, check for leaks at outlet or screw (White-Rodgers valve). Bubbles forming indicate a leak. SHUT OFF GAS AND REPAIR ALL LEAKS IMMEDIATELY!

⚠ CAUTION

TO PREVENT UNRELIABLE OPERATION OR EQUIPMENT DAMAGE, THE INLET GAS SUPPLY PRESSURE MUST BE AS SPECIFIED ON THE UNIT RATING PLATE WITH ALL OTHER HOUSEHOLD GAS FIRED APPLIANCES OPERATING.

Gas Input Rate Measurement (Natural Gas Only)

The actual gas input rate to the furnace must never be greater than that specified on the unit rating plate. To measure natural gas input using the gas meter, use the following procedure.

1. Turn OFF the gas supply to all other gas-burning appliances except the furnace.
2. While the furnace is operating at high fire rate, time and record one complete revolution of the gas meter dial, measuring the smallest quantity, usually the dial that indicates 1/2 cu. ft. per revolution. You will use this number to calculate the quantity of gas in cubic ft. if the furnace would consume if it ran steadily for one hour (3600 seconds).
3. If the 1/2 cu. ft. dial was used, multiply your number x 2.

   EXAMPLE: If it took 23 seconds to complete one revolution of the 1/2 ft. dial (23 x 2 = 46).

This tells us that at this rate, it would take 46 seconds to consume one cu. ft. of gas.

This tells us that in one hour, the furnace would consume 78 cu. ft. of gas. (3600 / 46 = 78)

The typical value range for 1 cu. ft. of natural gas is around 1025 BTU. Check with your gas utility, if possible. In this example, the furnace is consuming 80,000 BTUH.

NOTE: The final manifold pressure cannot vary by more than ± 0.2" w.c. for Natural gas from the specified setting. Consult your local gas supplier if additional input rate adjustment is required.

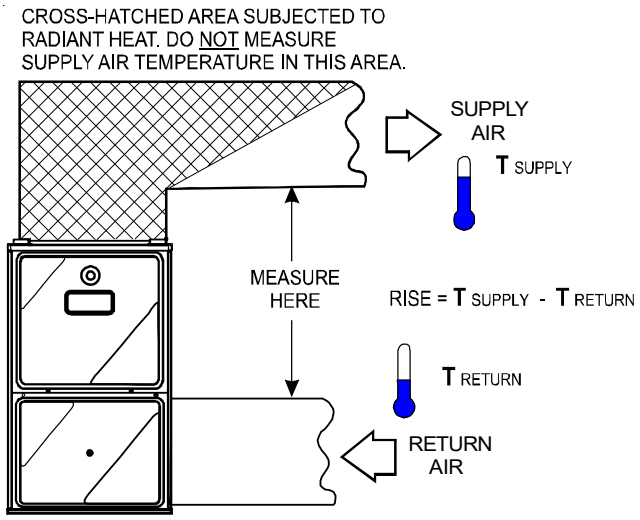
4. Turn ON gas to and relight all other appliances turned off in step 1. Be certain that all appliances are functioning properly and that all pilot burners (if applicable) are operating.

Temperature Rise

Air temperature rise is the temperature differench between supply and return air. The proper amount of temperature rise is usually obtained when the unit is operated at the rated input with the "as shipped" blower speed. If the correct amount of temperature rise is not obtained, it may be necessary to change the blower speed.

Temperature rise must be within the range specified on the unit rating plate. An incorrect temperature rise may result in condensing in or overheating of the heat exchanger. An airflow and temperature rise table is provided in the Specification Sheet on page 33 applicable to your model. Determine and adjust temperature rise as follows:

1. Operate furnace with burners firing for approximately ten minutes. Ensure all registers are open and all duct dampers are in their final (fully or partially open) position.
2. Place thermometers in the return and supply ducts as close to the furnace as possible. Thermometers must not be influenced by radiant heat by being able to "see" the heat exchanger.
3. Subtract the return air temperature from the supply air temperature to determine the air temperature rise. Allow adequate time for thermometer readings to stabilize.
4. Adjust temperature rise by adjusting the circulator blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise. Refer to *Startup Procedure and Adjustment -Circulator Blower Speeds* for speed changing details.



Temperature Rise Measurement
Figure 35

Circulator Blower Speeds

This furnace is equipped with a multi-speed circulator blower. This blower provides ease in adjusting blower speeds. The Specification Sheet applicable to your model provides an airflow table, showing the relationship between airflow (CFM) and external static pressure (E.S.P.), for the proper selection of heating and cooling speeds.

⚠ WARNING

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, TURN OFF POWER TO THE FURNACE BEFORE CHANGING SPEED TAPS.

1. Determine the tonnage of the cooling system installed with the furnace. If the cooling capacity is in BTU/hr divide it by 12,000 to convert capacity to tons.
   Example: Cooling Capacity of 30,000 BTU/hr.
   30,000/12,000 = 2.5 Tons
2. Determine the proper air flow for the cooling system. Most cooling systems are designed to work with air volume between 350 and 450 CFM per ton. Most manufacturers recommend an air flow of about 400 CFM per ton.
   Example: 2.5 tons X 400 CFM per ton = 1000 CFM
3. Select the heating speed for your model from the heating speed chart in the Specification Sheet. The selected speed must provide a temperature rise within the rise range listed with the particular model.

Blower Speed Adjustment

To adjust the circulator blower speed, proceed as follows:

1. Turn OFF power to the furnace.
2. Select the heating and cooling blower speeds that match the installation requirements from the *airflow table 10 in the Specification Sheet*.
3. Relocate desired motor leads to the circulator blower heat and cool speed terminals on the integrated control module. (Terminals are identified as HEAT and COOL). If heating and cooling blower speeds are the same, a jumper wire must be used between the heat and cool terminals.
4. Connect all unused blower motor leads to the "PARK" terminals on the integrated control module. Any leads not connected to the "PARK" terminals must be taped.
5. Turn ON power to furnace.
6. Verify proper temperature rise as outlined in the *Temperature Rise* section of *Startup Procedure and Adjustment.*

In general lower heating speeds will: reduce electrical consumption, lower operating sound levels of the blower, and increase the outlet air temperature delivered to the home. The speeds available allow the blower performance to be optimized for the particular homeowner's needs.

Blower Heat Off Delay Timings

NOTE: Items in this section refer to the **air circulator blower fan**, NOT to the induced draft blower. The induced draft blower timing sequence is not adjustable.

The integrated control module on all models provides a selectable heat off delay function. The delay is factory shipped at 150 seconds but may be changed to suit the installation requirements and/or homeowner preference. Other timings available are 90, 120 and 180 seconds. Heat cycle jumper settings on the integrated control board are A, B, and D respectively.

Normal Sequence of Operation

Power Up

The normal power up sequence is as follows:

- 115 VAC power applied to furnace.
- Integrated control module performs internal checks.
- LED will flash once at power up then remain on.
- Integrated control module monitors safety circuits continuously.
- Furnace awaits call from thermostat.

Heating Mode

The normal operational sequence in heating mode is as follows:

- R and W thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized for 30 second pre-purge period causing pressure switch contacts to close.
- Igniter warm up begins after 15 second pre-purge expires.
- Gas valve opens at the end of igniter warm up period, delivering gas to burners and establishing flame.
- Integrated control module monitors flame presence. Gas valve will remain open only if flame is detected.
- Circulator blower is energized on high heat speed following a fixed five second blower on delay. Electronic air cleaner terminals are energized with circulator blower.
- Furnace operates; integrated control module monitors safety circuits continuously.
- R and W thermostat contacts open, completing the call for heat.
- Gas valve closes, extinguishing flame.
- Induced draft blower is de-energized following a thirty second post purge.
- HUM terminal is de-energized.
- Circulator blower continues running for the selected heat off delay period. Factory set at 150 seconds. If required this can be changed in the field.
- EAC terminal is de-energized
- Furnace awaits next call from thermostat.

Cooling Mode

The normal operational sequence in cooling mode is as follows:

- R,Y and G thermostat contacts close, initiating a call for cool.
- Integrated control module performs safety circuit checks.
- Outdoor fan and compressor are energized.
- Circulator blower is energized on the cool speed. Following a fixed 6 second delay. Other timing available is 45 seconds. Jumper settings on the integrated control board is B for 45 seconds delay.
- EAC terminal is energized.
- Furnace circulator blower and outdoor cooling unit run their appropriate speeds, integrated control module monitors safety circuits continuously.
- R,Y and G thermostat contacts open, completing the call for cool.
- Outdoor fan and compressor are de-energized.
- Circulator blower continues running during a cool off delay period of 45 seconds. EAC terminals are denergized.
- Furnace awaits next call from thermostat.

Fan Only Mode

The normal operational sequence in fan only mode is as follows:

- R and G thermostat contacts close, initiating a call for fan.
- Integrated control module performs safety circuit checks.
- Circulator blower is energized on heat speed.
- EAC terminal is energized.

- Circulator blower runs, integrated control module monitors safety circuits continuously.
- R and G thermostat contacts open, completing the call for fan.
- Circulator blower is de-energized.
- EAC terminal is de-energized.
- Furnace awaits next call from thermostat.

Operational Checks

Safety Circuit Description

CAUTION

To avoid personal injury or death, do not remove any internal compartment covers or attempt any adjustment. Electrical components are contained in both compartments. Contact a qualified service agent at once if an abnormal operation should develop.

A number of safety circuits are employed to ensure safe and proper furnace operation. These circuits serve to control any potential safety hazards and serve as inputs in the monitoring and diagnosis of abnormal function. These circuits are continuously monitored during furnace operation by the integrated control module.

Integrated Control Module

The integrated control module is an electronic device which, if a potential safety concern is detected, will take the necessary precautions and provide diagnostic information through an LED.

Primary Limit

The primary limit control is located on the partition panel and monitors heat exchanger compartment temperatures. It is a normally-closed (electrically), automatic reset, temperature-activated sensor. The limit guards against overheating as a result of insufficient conditioned air passing over the heat exchanger.

Auxiliary Limit

The auxiliary limit controls are located on or near the circulator blower and monitors blower compartment temperatures. They are a normally-closed (electrically), manual-reset sensors. These limits guard against overheating as a result of insufficient conditioned air passing over the heat exchanger.

Burner Temperature Switch

The burner temperature switch is mounted on the burner assembly to monitor the burner box temperature. It is normally closed (electrically), auto-reset sensor. This switch guards against the burner flames not being properly drawn into the heat exchanger.

Pressure Sensor

Pressure sensor is mounted on the induced draft blower. Its function is to regulate the induced draft blower's speed in order to maintain proper air-fuel ratio for clean and reliable combustion.

Pressure Switches

The pressure switches are normally-open (closed during operation) negative air pressure-activated switches. They monitor the airflow (combustion air and flue products) through the heat exchanger via pressure taps located on the induced draft blower and the coil front cover. These switches guard against insufficient airflow (combustion air and flue products) through the heat exchanger and/or blocked condensate drain conditions.

Flame Sensor

The flame sensor is a probe mounted to the burner assembly which uses the principle of flame rectification to determine the presence or absence of flame.

Troubleshooting

Electrostatic Discharge (ESD) Precautions

NOTE: Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnace away from the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

Troubleshooting Chart

Refer to the *Troubleshooting Codes chart* for assistance in determining the source of unit operational problems.

Fault Code Retrieval

The ignition control is equipped with a push button (SW1) that can be used to display on the diagnostic LED the last five faults detected by the control. The control must be in Standby Mode (no thermostat inputs) to use the feature. Depress the push button once for less than 5 seconds. Release the push button. The diagnostic LED will then display the flash codes associated with the last five detected faults. The order of display is the most recent fault to the least fault. See trouble shooting guide for fault description.

Clear Fault Memory

Replace the following "The push button (SW1) on the ignition control can be used to erase the fault code as well. The control must be in Standby Mode (no thermostat inputs) to use the feature. Press and hold SW1 button for more than 5 seconds, but less than 10 seconds and the control will erase the stored fault code history. LED will display rapid green flash to indicate the fault history has been cleared.

Resetting From Lockout

Furnace lockout results when a furnace is unable to achieve ignition after three attempts during a single call for heat. It is characterized by a non-functioning furnace and a fault code displayed. If the furnace is in "lockout", it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.
2. Manual power interruption. Interrupt 115 volt power to the furnace.
3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat for 1 -20 seconds then reset to previous setting.

NOTE: If the condition which originally caused the lockout still exists, the control will return to lockout. Refer to the *Troubleshooting Chart* for aid in determining the cause.

Maintenance

⚠ WARNING

HIGH VOLTAGE !

To avoid personal injury or death due to electrical shock, disconnect electrical power BEFORE performing any service or maintenance.

Annual Inspection

The furnace should be inspected by a qualified installer, or service agency at least once per year. This check should be performed at the beginning of the heating season. This will ensure that all furnace components are in proper working order and that the heating system functions appropriately. Pay particular attention to the following items. Repair or service as necessary.

- Flue pipe system: Check for blockage and/or leakage. Check the outside termination and the connections at and internal to the furnace.
- Heat exchanger: Check for corrosion and/or buildup within the heat exchanger passageways.
- Burners: Check for proper ignition,and flame sense.
- Drainage system: Check for blockage and/or leakage. Check hose connections at and internal to furnace.
- Wiring: Check electrical connections for tightness and/or corrosion. Check wires for damage.
- Filters: Check for Blockage

Filters

Filter Maintenance

A return air filter is not supplied with this furnace; however, there must be a means of filtering all of the return air. The installer will supply filter(s) at the time of installation.

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every two months or as required. When replacing a filter, it must be replaced with a filter of the same type and size.

Become familiar with filter location and procedures for removal, cleaning and replacing them. If help is needed, contact the installer of the furnace or a qualified servicer.

Filter Removal

⚠ WARNING

HIGH VOLTAGE!

To prevent property damage, personal injury or death due to electrical shock, disconnect electrical power to the furnace BEFORE removing the filter or performing any other maintenance.

Depending on the installation, differing filter arrangements can be applied. Filters can be installed in either the central return register or a side panel external filter rack (upflow only). A media air filter or electronic air cleaner can be used as an alternate filter. Follow the filter sizes given in the Recommended Minimum Filter size table 7 or instruction provided by the media or electronic air cleaner manufacturer to ensure proper unit performance.

To remove filters from an external filter rack in an upright upflow installation, follow the directions provided with external filter rack kit.

Horizontal Unit Filter Removal

Filters in horizontal installations are located in the central return register or the ductwork near the furnace.

To remove:

1. Turn OFF electrical power to furnace.
2. Remove filter(s) from the central return register or ductwork.
3. Replace filter(s) by reversing the procedure for removal.
4. Turn ON electrical power to furnace.

Media Air Filter or Electronic Air Cleaner Removal

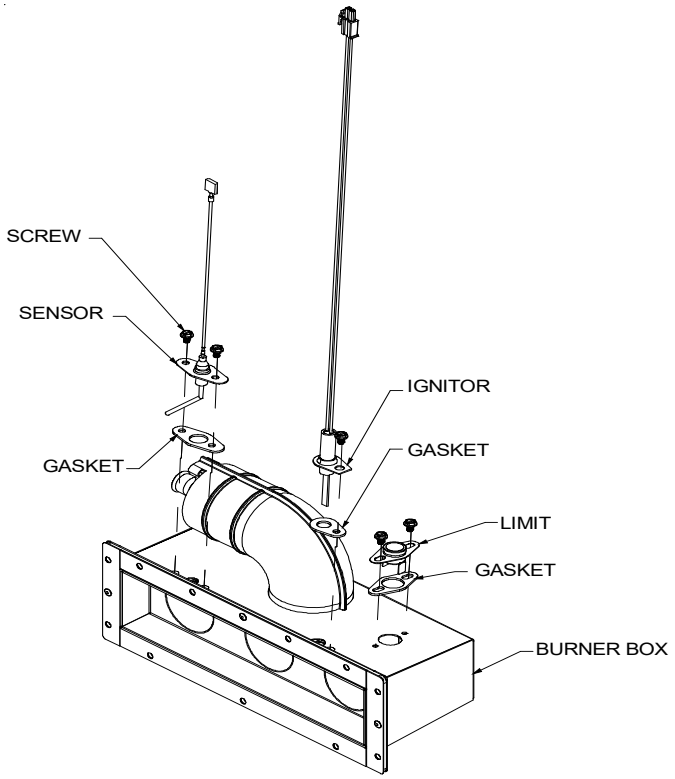
Follow the manufacturer's directions for service.

Burner

⚠ WARNING

TO PREVENT PERSONAL INJURY OR DEATH, DO NOT REMOVE ANY INTERNAL COMPARTMENT COVERS OR ATTEMPT ANY ADJUSTMENT. ELECTRICAL COMPONENTS ARE CONTAINED IN BOTH COMPARTMENTS. CONTACT A QUALIFIED SERVICE AGENT AT ONCE IF AN ABNORMAL FLAME APPEARANCE SHOULD DEVELOP.

The Ultra Low NOx furnace uses a premix burner. The burner box is sealed to achieve safe and reliable operation.



Burner Box
Figure 36

NOTE: Location of flame sensor, igniter and burner limit switch may vary depending on the model.

Induced Draft and Circulator Blowers

The bearings in the induced draft blower and circulator blower motors are permanently lubricated by the manufacturer. No further lubrication is required. Check motor windings for accumulation of dust which may cause overheating. Clean as necessary.

Condensate Trap and Drain System (Qualified Servicer Only)

Annually inspect the drain tubes, drain trap, and field-supplied drain line for proper condensate drainage. Check drain system for hose connection tightness, blockage, and leaks. Clean or repair as necessary.

Flame Sensor (Qualified Servicer Only)

Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator causing a drop in the flame sense signal. If the flame sense signal drops too low the furnace will not sense flame and will lock out. The flame sensor should be carefully cleaned by a qualified servicer using emery cloth or steel wool. Following cleaning, the flame sense signal should be above 3 micro amps.

Flue Passages (Qualified Servicer Only)

The heat exchanger flue passageways should be inspected at the beginning of each heating season.

Before Leaving an Installation

- Cycle the furnace with the thermostat at least three times. Verify cooling and fan only operation.
- Review the Owner's Manual with the homeowner and discuss proper furnace operation and maintenance.
- Leave literature packet near furnace.

Repair and Replacement Parts

- When ordering any of the listed functional parts, be sure to provide the furnace model, manufacturing, and serial numbers with the order.
- Although only functional parts are shown in the parts list, all sheet metal parts, doors, etc. may be ordered by description.
- Parts are available from your distributor.

Functional Parts List-

Gas Valve
Gas Manifold
Natural Gas Orifice
Igniter
Flame Sensor
Burner Temperature Switch
Primary Limit Switch
Coil Front Cover
Auxiliary Limit Switch
Transformer
Door Switch
Induced Draft Blower
Heat Exchanger with Recuperator Coil
Blower Motor
Blower Wheel
Blower Mounting Bracket
Blower Cutoff
Blower Housing
Pressure Switches
Burner Assembly
Drain Trap
Burner Box Gasket
Integrated Control Module
Pressure Sensor

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation	Associated LED Code[2] & Color	Fault Description(s)	Possible Causes	Corrective Action	Cautions & Notes
· Furnace fails to operate.	· None	· No 115 volt power to furnace, or no 24 volt power to integrated control module. · Integrated control module has an internal fault.	· Manual disconnect switch OFF, door switch open, or 24 volt wires improperly connected or loose. · Bad integrated control module.	· Assure 115 and 24 volt power to furnace integrated control module. · Check for possible shorts in 115 and 24 volt circuits. Repair as necessary. · Replace bad integrated control module.	· Turn power OFF prior to repair. · Read precautions in "Electrostatic Discharge" section of manual.
· Furnace fails to operate. · Integrated control module diagnostic **LED** is flashing **ONE** (1) flash.	☼ 1 Flash **LED** color is **RED**.	· Furnace lockout due to an excessive number of ignition attempts. (3 total retries)[1] · No limits to number of recycles.	· Failure to establish flame. Cause may be no gas to burner, bad igniter or igniter alignment, improper orifices, or coated/oxidized or improperly connected or shorted flame sensor. · Loss of flame after establishment. Cause may be interrupted gas supply, lazy burner flames (improper gas pressure or restriction in flue or improper induced draft blower performance). · Improperly connected igniter. · Bad igniter. · Poor unit or burner ground. · Faulty integrated control module.	· Locate and correct gas interruption. · Replace bad gas valve or gas orifice size. · Replace igniter. · Check flame sense signal. Clean sensor if coated and/or oxidized. · Replace induced draft blower pressure switch. Inspect pressure switch hose. Repair, if necessary. Inspect flue, burner or condensate for blockage, proper length, elbows, and termination. · Check and correct wiring. · Compare igniter resistance to spec. Replace if necessary. · Check and correct unit ground wiring. · Replace bad integrated control module.	· Turn power and gas OFF prior to repair. · Igniter is fragile, handle with care. · Clean flame sensor with steel wool. · Replace igniter with proper replacement part. · Read precautions in "Electrostatic Discharge" section of manual.
· Furnace Fails to operate · Integrated control module diagnostic **LED** is flashing **TWO** (2) flashes.	☼ 2 Flashes **LED** color is **RED**.	· Pressure sensor indicates pressure reading when it should be zero. 5 minute lockout. Unlimited retries. Fault is displayed until fault condition is corrected or CFH is removed.	· Faulty wiring to the pressure sensor. · Faulty pressure sensor.	· Check and correct pressure sensor wiring. · Replace pressure sensor.	· Turn power OFF prior to repair. · Replace pressure sensor with proper replacement part.
· Induced draft blower runs continuously with no further furnace operation. · Integrated control module diagnostic **LED** is flashing **THREE** (3) flashes.	☼ 3 Flashes **LED** color is **RED**.	· Inducer not making pressure setting. · Induced draft blower is operating properly. 5 minute lockout. Unlimited retries. Fault is displayed until fault condition is corrected or CFH is removed.	· Pressure sensor hoses blocked, pinched or connected improperly. Bad wire connection. · Blocked intake, blocked flue outlet or weak induced draft blower.	· Replace induced draft blower pressure sensor and hoses. Repair, if necessary. Check and correct wiring. · Inspect intake and flue for blockage, proper length, elbows, and termination. · Replace induced draft blower.	· Turn power OFF prior to repair. · Replace with proper replacement parts. · See "Combustion and Ventilation Air Requirements" and "Category I Venting (Vertical Venting)" section for details.

[1] Integrated control module will automatically attempt to reset from lockout after one hour.

[2] LED Flash code will cease if power to the control module is interrupted through the disconnect or door switch.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation	Associated LED Code[2] & Color	Fault Description(s)	Possible Causes	Corrective Action	Cautions & Notes
· Circulator blower runs continuously. No furnace operation. · Integrated control module diagnostic **LED** is flashing **FOUR** (4) flashes.	☼ 4 Flashes **LED** color is **RED**.	· Primary limit circuit is open. · 5 minute lockout. 1 hour lockout after three faults in a single CFH.	· Insufficient conditioned air over the heat exchanger. Blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower. · Faulty primary limit switch. · Loose or improperly connected wiring.	· Check circulator blower speed and performance. Correct speed or replace blower if necessary. · Check filters and ductwork for blockage. Clean filters or remove obstruction. · Check primary limit. Replace if necessary. · Check position of heat exchanger shield. · Tighten or correct wiring connection.	· Turn power OFF prior to repair. · Replace blower with correct replacement part. · Replace primary switch with proper replacement part.
· Induced draft blower and circulator blower runs continuously. No furnace operation. · Integrated control module diagnostic **LED** is flashing **FIVE** (5) flashes.	☼ 5 Flashes **LED** color is **RED**.	· Flame sensed with no call for heat. · 5 minute lockout. Control continues normal operation when fault condition is corrected.	· Faulty integrated control module..	· Replace bad integrated control module.	· Turn power OFF prior to repair.
· Furnace fails to operate. · Integrated control module diagnostic **LED** is flashing **SIX** (6) flashes.	☼ 6 Flashes **LED** color is **RED**.	· Burner temperature switch open. · 5 minute lockout. Control continues normal operation when fault condition is corrected.	· Excessive flame. · Blocked flue, air inlet pipe, and/or burner intake and mesh, or failed induced draft blower. · Loose or improperly connected wiring. · Faulty burner temperature switch.	· Check and correct gas supply pressure. · Replace bad gas valve or gas orifice size. · Check flue, air inlet piping, and burner intake and mesh for blockage, proper length, elbows, and termination. Correct as necessary. · Check induced draft blower for proper performance. Replace, if necessary. · Check burner temperature switch. Replace if necessary. · Check induced draft blower for proper performance. Replace, if necessary. · Tighten or correct wiring connection.	· See "Vent/Flue Pipe" section for piping details. · Replace induced draft blower with proper replacement part. · Replace burner temperature switch with correct replacement part.
· No furnace operation. · Integrated control module diagnostic **LED** is flashing **SEVEN** (7) flashes.	☼ 7 Flashes **LED** color is **RED.**	· Gas valve circuit shorted. · 5 minute lockout.	· Bad wiring · Faulty integrated control module.	· Inspect and replace wiring as needed. · Replace bad integrated control module.	· Turn power OFF prior to repair. · Read precautions in "Electrostatic Discharge" section of manual.

[2] LED Flash code will cease if power to the control module is interrupted through the disconnect or door switch.

TROUBLESHOOTING CHART

Symptoms of Abnormal Operation	Associated LED Code[2] & Color	Fault Description(s)	Possible Causes	Corrective Action	Cautions & Notes
· **LED** is steady on	Steady **LED** color **AMBER.**	· OEM test mode	· N/A		
· Integrated control module diagnostic **LED** is flashing **ONE** (1) flash.	☼ 1 Flash **LED** color is **AMBER.**	· Low flame sense	· Flame sensor incorrectly positioned in burner flame. · Flame sensor is coated/oxidized. · Lazy burner flame due to improper gas pressure or combustion air.	· Inspect for proper sensor alignment. · Clean flame rod. · Compare current gas pressure to rating plate info. Adjust as needed.	· Turn power OFF prior to repair. · Clean flame sensor with steel wool. · See rating plate for proper gas pressure.
· Integrated control module diagnostic **LED** is flashing **TWO** (2) flash.	☼ 2 Flash **LED** color is **AMBER.**	· ID plug failure (Applies only to certain models with ID plug).	· Improper ID plug.	· Replace ID plug.	· Turn power OFF prior to repair.
· Integrated control module diagnostic **LED** is flashing **THREE** (3) flash.	☼ 3 Flash **LED** color is **AMBER.**	· Integrated control module fuse is blown.	· Blown fuse.	· Replace integrated control module fuse (3A).	· Turn power OFF prior to repair.
· **LED** is steady on	Steady **LED** color **GREEN.**	· Normal operation.	· N/A		
· Integrated control module diagnostic **LED** is flashing rapidly.	Rapid flash **LED** color is **GREEN.**	· Clear error history.	· N/A	· Press and hold the SW1 button for more than 5 secs results in the display of this mode. Releasing the Button during this indication will cause the Error History to be cleared.	· The button must be released within 5 seconds after the LED begins this flash sequence.
· Integrated control module diagnostic **LED** is flashing **ONE** (1) flash.	☼ 1 Flash **LED** color is **GREEN.**	· Call for heating.	· N/A		
· Integrated control module diagnostic **LED** is flashing **TWO** (2) flash.	☼ 2 Flash **LED** color is **GREEN.**	· Call for cooling.	· N/A		
· Integrated control module diagnostic **LED** is flashing **THREE** (3) flash.	☼ 3 Flash **LED** color is **GREEN.**	· Continuous fan operation.	· N/A		
· Integrated control module diagnostic **LED** has **THREE** (3) **rapid** flash's.	☼ 3 Rapid Flash's **LED** color is **GREEN.**	· ID plug installed (Applies only to certain models with ID plug).	· N/A	· For control with unit-specific programming imbedded in the CPU, this indicates at power-up that an valid ID plug is installed.	· The control will use the alternate parameters.
· Abnormal high pitch noise during burner operation.	· None	· Abnormal combustion noise.	· Insufficient combustion air or high input. · Blocked flue and/or air inlet pipe, or faulty induced draft blower or pressure sensor.	· Check and correct gas supply and manifold pressures. See Table 5 and Table 9 for additional information. · Replace bad gas valve or gas orifice size. · Check flue and air inlet piping for blockage, proper length, elbows, and termination. Correct as necessary. · Check induced draft blower and pressure sensor for proper performance. Replace, if necessary.	· Turn power and gas OFF prior to repair. · See "Vent/Flue Pipe" section for piping details. · Replace induced draft blower or pressure sensor with proper replacement part.

[2] LED Flash code will cease if power to the control module is interrupted through the disconnect or door switch.

				EXTERNAL STATIC PRESSURE (inches water column)												
				0.1		0.2		0.3		0.4		0.5		0.6	0.7	0.8
	Wire Color	Function	Tons AC	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	CFM	CFM
*MES960403BU	Red	High-Cool	3	1350	NA	1310	NA	1273	NA	1234	NA	1198	NA	1156	1117	1078
	Blue	Med Hi - Heat	2.5	1247	29	1212	30	1167	31	1129	32	1087	33	1043	997	952
	Brown	Med Low	2	1151	31	1107	32	1067	35	1021	35	977	36	928	880	835
	Black	Low	1.5	922	39	870	41	819	43	763	NA	704	NA	643	592	539
	Orange	Fan Only	1	779	NA	661	NA	588	NA	516	NA	455	NA	394	352	N/A
*MES960603BU	Red	High-Cool	3	1364	NA	1332	NA	1285	NA	1246	NA	1206	NA	1170	1127	1083
	Blue	Med Hi - Heat	2.5	1259	42	1214	44	1175	45	1135	47	1091	49	1053	1008	957
	Brown	Med Low	2	1165	46	1121	48	1073	50	1033	52	984	54	929	876	832
	Black	Low	1.5	936	57	884	60	829	NA	770	NA	706	NA	645	593	539
	Orange	Fan only	1	815	NA	665	NA	596	NA	517	NA	451	NA	396	345	Na
*MES960805CU	Red	High-Cool	5	2298	NA	2260	NA	2222	NA	2182	NA	2149	NA	2114	2087	2022
	Blue	Med Hi - Heat	4	1701	42	1641	43	1600	45	1548	46	1502	47	1454	1411	1366
	Brown	Med Low	3.5	1575	45	1528	47	1478	48	1426	50	1373	52	1323	1272	1220
	Black	Low	2.5	1302	55	1220	60	1187	NA	1126	NA	1063	NA	1004	936	871
	Orange	Fan only	1.5	1056	NA	981	NA	915	NA	842	NA	764	NA	683	604	540

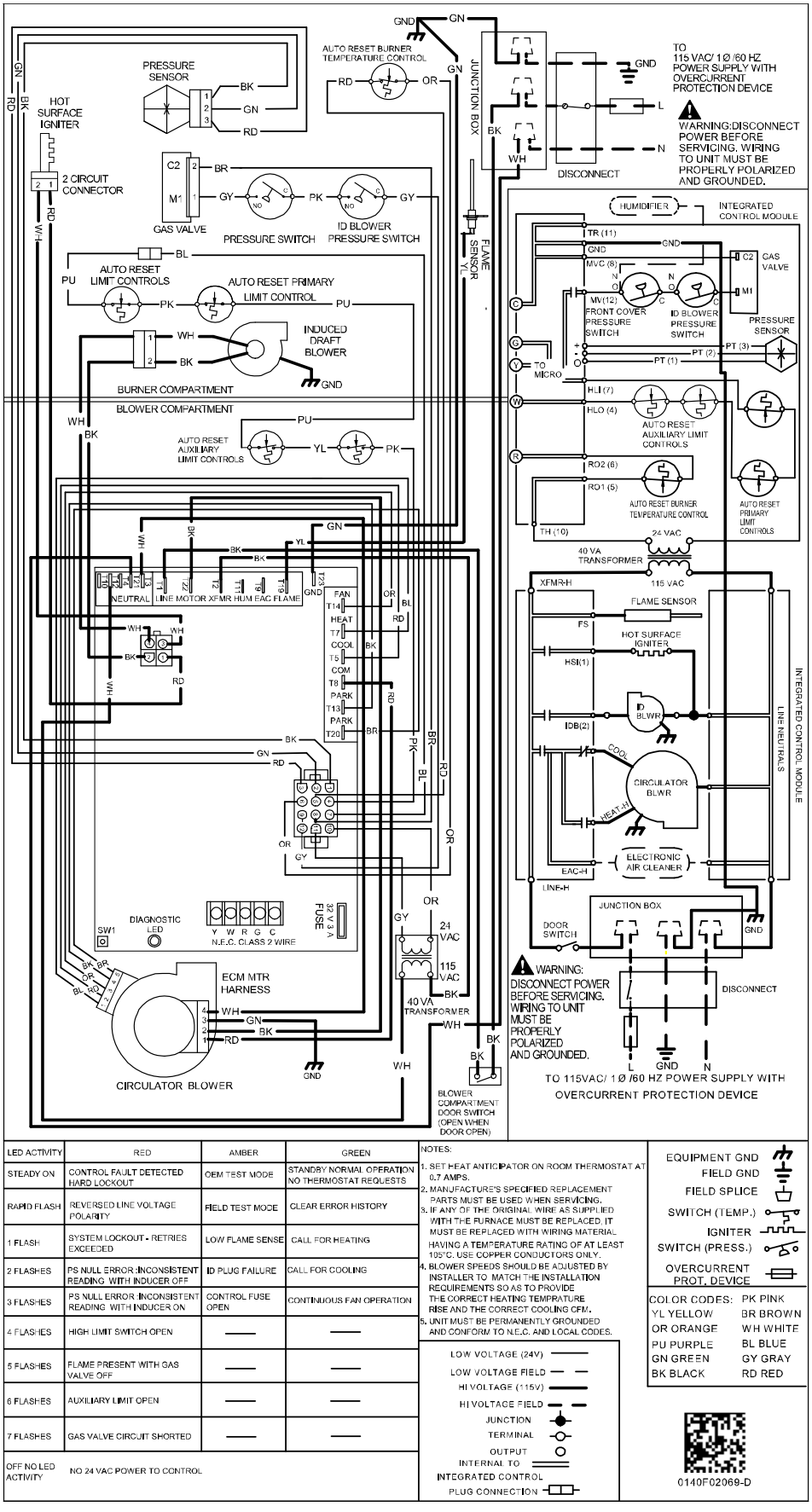
AIRFLOW AND TEMPERATURE RISE SPECIFICATION SHEET FOR *MES96* MODELS**

Table 10

1. CFM in chart is without filter(s). Filters do not ship with this furnace, but must be provided by the installer. If the furnace requires two return filters, this chart assumes both filters are installed.
2. For most jobs, about 400 CFM per ton when cooling is desirable.
3. INSTALLATION and/or BLOWER SPEED CAN BE ADJUSTED TO OBTAIN TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING PLATE.
4. The chart is for information only. For satisfactory operation, external static pressure must not exceed value shown on rating plate. The shaded area indicates ranges in excess of maximum external static pressure allowed when heating. The data for 0.6" w.c. to 0.8" w.c. is shown for air conditioning purposes only.
5. At higher altitudes, a properly derated unit will have approximately the same temperature rise at a particular CFM, while the ESP at that CFM will be lower.

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

WARNING



LED ACTIVITY	RED	AMBER	GREEN
STEADY ON	CONTROL FAULT DETECTED HARD LOCKOUT	OEM TEST MODE	STANDBY NORMAL OPERATION NO THERMOSTAT REQUESTS
RAPID FLASH	REVERSED LINE VOLTAGE POLARITY	FIELD TEST MODE	CLEAR ERROR HISTORY
1 FLASH	SYSTEM LOCKOUT - RETRIES EXCEEDED	LOW FLAME SENSE	CALL FOR HEATING
2 FLASHES	PS NULL ERROR :INCONSISTENT READING WITH INDUCER OFF	ID PLUG FAILURE	CALL FOR COOLING
3 FLASHES	PS NULL ERROR :INCONSISTENT READING WITH INDUCER ON	CONTROL FUSE OPEN	CONTINUOUS FAN OPERATION
4 FLASHES	HIGH LIMIT SWITCH OPEN	——	——
5 FLASHES	FLAME PRESENT WITH GAS VALVE OFF	——	——
6 FLASHES	AUXILIARY LIMIT OPEN	——	——
7 FLASHES	GAS VALVE CIRCUIT SHORTED	——	——
OFF NO LED ACTIVITY	NO 24 VAC POWER TO CONTROL		

NOTES:
1. SET HEAT ANTICIPATOR ON ROOM THERMOSTAT AT 0.7 AMPS.
2. MANUFACTURE'S SPECIFIED REPLACEMENT PARTS MUST BE USED WHEN SERVICING.
3. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE FURNACE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105°C. USE COPPER CONDUCTORS ONLY.
4. BLOWER SPEEDS SHOULD BE ADJUSTED BY INSTALLER TO MATCH THE INSTALLATION REQUIREMENTS SO AS TO PROVIDE THE CORRECT HEATING TEMPRATURE RISE AND THE CORRECT COOLING CFM.
5. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C. AND LOCAL CODES.

LOW VOLTAGE (24V)
LOW VOLTAGE FIELD
HI VOLTAGE (115V)
HI VOLTAGE FIELD
JUNCTION
TERMINAL
OUTPUT
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION

EQUIPMENT GND
FIELD GND
FIELD SPLICE
SWITCH (TEMP.)
IGNITER
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE

COLOR CODES:	
YL YELLOW	PK PINK
OR ORANGE	BR BROWN
PU PURPLE	WH WHITE
GN GREEN	BL BLUE
BK BLACK	GY GRAY
	RD RED

0140F02069-D

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

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