Installation, Start-up, Operating and Service and Maintenance Instructions

NOTE: Read the entire instruction manual before starting the installation.

SAFETY CONSIDERATIONS .................................. 3
INTRODUCTION ........................................... 4
CODES AND STANDARDS .................................. 4
ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS ........ 4
ACCESSORIES ............................................. 5
LOCATION .................................................. 5
AIR FOR COMBUSTION AND VENTILATION ................. 9
CONDENSATE TRAP ....................................... 12
  Upflow ................................................. 12
  Downflow .............................................. 12
  Horizontal .......................................... 12
CONDENSATE DRAIN ..................................... 16
INSTALLATION .......................................... 19
  Upflow ................................................. 19
  Downflow .............................................. 19
  Horizontal .......................................... 20
  Filter Arrangement .................................. 20
AIR DUCTS ............................................... 27
  Ductwork Acoustical Treatment ......................... 27
GAS PIPING ............................................... 31
ELECTRICAL CONNECTIONS ............................. 32
  115-V Wiring ......................................... 32
  J-Box Installation .................................... 33
  24-V Wiring ........................................... 33
  Accessories .......................................... 33
  Alternate Power Supplies ............................. 34
VENTING .................................................. 40
  Special Venting Requirements for Installations in Canada 40
  Materials .............................................. 41
  Venting Systems ..................................... 41
  Locating Vent Termination ............................ 41
  Size the Vent and Combustion Air Pipes ............... 42
  Combustion Air and Vent Piping Insulation Guidelines 42
  Configure the Furnace ................................ 43
  Installing the Vent Termination ....................... 44
  Venting System Length Calculations ................... 48
START-UP, ADJUSTMENT, AND SAFETY CHECK ............ 61
  Select Setup Switch Positions ........................ 61
  Prime Condensate Trap ................................ 61
  Purge Gas Lines ..................................... 61
  Adjustments ......................................... 62
  Check Safety Controls ................................ 64
  Checklist .............................................. 64
SERVICE AND MAINTENANCE PROCEDURES .................. 72
  Cleaning Heat Exchangers ............................ 77
SEQUENCE OF OPERATION .................................. 81
PARTS REPLACEMENT GUIDE ................................ 88

TABLE

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose Parts Bag Contents</td>
<td>6</td>
</tr>
<tr>
<td>Minimum Clearances to Combustible Materials</td>
<td>6</td>
</tr>
<tr>
<td>Minimum Free Area Required</td>
<td>11</td>
</tr>
<tr>
<td>Minimum Space Volumes</td>
<td>11</td>
</tr>
<tr>
<td>Filter Size Information</td>
<td>21</td>
</tr>
<tr>
<td>Opening Dimensions</td>
<td>23</td>
</tr>
<tr>
<td>Air Delivery CFM</td>
<td>28</td>
</tr>
<tr>
<td>Maximum Capacity of Pipe</td>
<td>32</td>
</tr>
<tr>
<td>Electrical Data</td>
<td>35</td>
</tr>
<tr>
<td>Vent Termination Kit for Direct Vent (2-Pipe) Systems</td>
<td>41</td>
</tr>
<tr>
<td>Combustion-Air Vent Pipe, Fitting &amp; Cement Material</td>
<td>45</td>
</tr>
<tr>
<td>Maximum Allowable Exposed Vent Lengths Insulation</td>
<td>46</td>
</tr>
<tr>
<td>Maximum Equivalent Vent Length</td>
<td>47</td>
</tr>
<tr>
<td>Deductions from Maximum Equivalent Vent Length</td>
<td>47</td>
</tr>
<tr>
<td>Altitude Derate Multiplier for U.S.A.</td>
<td>69</td>
</tr>
<tr>
<td>Blower Off Delay Setup Switch</td>
<td>69</td>
</tr>
<tr>
<td>Gas Rate</td>
<td>69</td>
</tr>
<tr>
<td>Orifice Size and Manifold Pressure</td>
<td>70</td>
</tr>
</tbody>
</table>

Use of the AHRI Certified™ Mark indicates a manufacturer’s participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

Portions of the text and tables are reprinted from NFPA 54/ANSI Z223.1-2009©, with permission of National Fire Protection Association, Quincy, MA 02269 and American Gas Association, Washington DC 20001. This reprinted material is not the complete and official position of the NFPA or ANSI on the referenced subject, which is represented only by the standard in its entirety.
IMPORTANT

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR as follows:
5.08: Modifications to NFPA-54, Chapter 10
2) Revise 10.8.3 by adding the following additional requirements:

a. For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) in. in size, “GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS”.

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

5. EXEMPTIONS: The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

   (1.) The equipment listed in Chapter 10 entitled “Equipment Not Required To Be Vented” in the most current edition of NFPA 54 as adopted by the Board; and

   (2.) Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

   c. MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

      1. Detailed instructions for the installation of the venting system design or the venting system components; and

      2. A complete parts list for the venting system design or venting system.

   d. MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies “special venting systems”, the following requirements shall be satisfied by the manufacturer:

      1. The referenced “special venting system” instructions shall be included with the appliance or equipment installation instructions; and

      2. The “special venting systems” shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

      e. A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

For questions regarding these requirements, please contact the Commonwealth of Massachusetts Board of State Examiners of Plumbers and Gas Fitters, 239 Causeway Street, Boston, MA 02114. 617-727-9952.
SAFETY CONSIDERATIONS

⚠️ WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISONING HAZARD

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

Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified service agency must use only factory-authorized and listed kits or accessories when modifying this product.

CAUTION

FURNACE RELIABILITY HAZARD

Failure to follow this caution may result in unit component damage.

Application of this furnace should be indoors with special attention given to vent sizing and material, gas input rate, air temperature rise, unit leveling, and unit sizing.

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment. Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, on tags, and on labels attached to or shipped with furnace and other safety precautions that may apply.

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

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit.

CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces.

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

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

1. Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
2. Install this furnace only in a location and position as specified in the “Location” section of these instructions.
3. Provide adequate combustion and ventilation air to the furnace space as specified in “Air for Combustion and Ventilation” section.
4. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in the “Venting” section of these instructions.
5. 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 the “Gas Piping” section.
6. Always install furnace to operate within the furnace’s intended temperature-rise range with a duct system which has an external static pressure within the allowable range, as specified in the “Start-Up, Adjustments, and Safety Check” section. See furnace rating plate.
7. 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. See “Air Ducts” section.
8. A gas-fired furnace for installation in a residential garage must be installed as specified in the warning box in the “Location” section.
9. The furnace may be used for construction heat provided that the furnace installation and operation complies with the first CAUTION in the LOCATION section of these instructions.
10. These Multipoise Gas-Fired Furnaces are CSA design-certified for use with natural and propane gases (see furnace rating plate) and for installation in alcoves, attics, basements, closets, utility rooms, crawlspaces, and garages. The furnace is factory-shipped for use with natural gas. A CSA (A.G.A. and C.G.A.) listed accessory gas conversion kit is required to convert furnace for use with propane gas.
11. See Table 2 for required clearances to combustible construction.
12. Maintain a 1-in. (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36 in. (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.
13. These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring. In downflow installations, factory accessory floor base MUST be used when installed on combustible materials and wood flooring. Special base is not required when this furnace is installed on manufacturer’s Coil Assembly Part No. CNRV, CNPV, CAP, or CAR or when Coil Box Part No. KCACK is used. See Table 2 for clearance to combustible construction information.
INTRODUCTION

This 4-way multipoise Category IV condensing furnace is CSA design-certified as a direct (2-pipe) or non-direct vent (1-pipe) furnace. (See Fig. 2.) The furnace is factory-shipped for use with natural gas. The furnace can be converted in the field for use with propane gas when a factory-supplied conversion kit is used. Refer to the furnace rating plate for conversion kit information.

This furnace is not approved for installation in mobile homes, recreational vehicles, or outdoors.

This furnace is designed for minimum continuous return-air temperature of 60°F (15°C) db or intermittent operation down to 55°F (13°C) db such as when used with a night setback thermostat. Return-air temperature must not exceed 80°F (27°C) db. Failure to follow these return-air temperature limits may affect reliability of heat exchangers, motors, and controls. (See Fig. 3.)

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

For accessory installation details, refer to the applicable instruction literature.

NOTE: Remove all shipping materials, loose parts bag, and literature before operating the furnace. (See Table 1).

CODES AND STANDARDS

Follow all national and local codes and standards in addition to these instructions. The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes. In absence of local codes, the installation must comply with the national codes listed below and all authorities having jurisdiction.

In the United States and Canada, follow all codes and standards for the following:

Safety
- CANADA: National Standard of Canada, Natural Gas and Propane Installation Code (NSCNGPIC) CAN/CSA B149.1-2010

General Installation
- US: NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or for only the NFPG contact the American Gas Association, 400 N. Capitol, N.W., Washington DC 20001
- CANADA: NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3, Canada

Combustion and Ventilation Air
- US: Section 9.3 of the NFPA54/ANSI Z223.1-2009 Air for Combustion and Ventilation
- CANADA: Part 8 of the CAN/CSA B149.1-2010, Venting Systems and Air Supply for Appliances

Duct Systems

Acoustical Lining and Fibrous Glass Duct
- US and CANADA: current edition of SMACNA, NFPA 90B as tested by UL Standard 181 for Class I Rigid Air Ducts

Gas Piping and Gas Pipe Pressure Testing
- US: NFPA 54/ANSI Z223.1-2009 NFGC; Chapters 5, 6, 7, and 8 and national plumbing codes.
- CANADA: CAN/CSA-B149.1-2010, Parts 4, 5, 6, and 9.

In the state of Massachusetts:
- This product must be installed by a licensed plumber or gas fitter.
- When flexible connectors are used, the maximum length shall not exceed 36 in. (914 mm).
- When lever type gas shutoffs are used they shall be T-handle type.
- The use of copper tubing for gas piping is not approved by the state of Massachusetts.

Electrical Connections
- CANADA: Canadian Electrical Code CSA C22.1

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS PROCEDURE

FURNACE RELIABILITY HAZARD

Failure to follow this caution may result in unit component damage.

Electrostatic discharge can affect electronic components. Take precautions during furnace installation and servicing to protect the furnace electronic control. Precautions will prevent electrostatic discharges from personnel and hand tools which are held during the procedure. These precautions will help to avoid exposing the control to electrostatic discharge by putting the furnace, the control, and the person at the same electrostatic potential.

1. Disconnect all power to the furnace. Multiple disconnects may be required. **DO NOT TOUCH THE CONTROL OR ANY WIRE CONNECTED TO THE CONTROL PRIOR TO DISCHARGING YOUR BODY'S ELECTROSTATIC CHARGE TO GROUND.**

2. Firmly touch the clean, unpainted, metal surface of the furnace chassis which is close to the control. Tools held in a person's hand during grounding will be satisfactorily discharged.

3. After touching the chassis, you may proceed to service the control or connecting wires as long as you do nothing to recharge your body with static electricity (for example: **DO NOT move or shuffle your feet, do not touch ungrounded objects, etc.**).

4. If you touch ungrounded objects (and recharge your body with static electricity), firmly touch a clean, unpainted metal surface of the furnace again before touching control or wires.

5. Use this procedure for installed and uninstalled (ungrounded) furnaces.

6. Before removing a new control from its container, discharge your body's electrostatic charge to ground to protect the control from damage. If the control is to be installed in a furnace, follow items 1 through 4 before bringing the control or yourself in contact with the furnace. Put all used and new controls into containers before touching ungrounded objects.
7. An ESD service kit (available from commercial sources) may also be used to prevent ESD damage.

ACCESSORIES
See Product Data Sheet for a list of accessories for this product

LOCATION

PERSONAL INJURY AND/OR PROPERTY DAMAGE HAZARD
Improper use or installation of this furnace may result in premature furnace component failure. This gas furnace may be used for heating buildings under construction provided that:
- The furnace is permanently installed with all electrical wiring, piping, venting and ducting installed according to these installation instructions. A return air duct is provided, sealed to the furnace casing, and terminated outside the space containing the furnace. This prevents a negative pressure condition as created by the circulating air blower, causing a flame rollout and/or drawing combustion products into the structure.
- The furnace is controlled by a thermostat. It may not be “hot wired” to provide heat continuously to the structure without thermostatic control.
- Clean outside air is provided for combustion. This is to minimize the corrosive effects of adhesives, sealers and other construction materials. It also prevents the entrainment of drywall dust into combustion air, which can cause fouling and plugging of furnace components.
- The temperature of the return air to the furnace is maintained between 55°F (13°C) and 80°F (27°C), with no evening setback or shutdown. The use of the furnace while the structure is under construction is deemed to be intermittent operation per our installation instructions.
- The air temperature rise is within the rated rise range on the furnace rating plate, and the gas input rate has been set to the nameplate value.
- The filters used to clean the circulating air during the construction process must be either changed or thoroughly cleaned prior to occupancy.
- The furnace, ductwork and filters are cleaned as necessary to remove drywall dust and construction debris from all HVAC system components after construction is completed.
- Verify proper furnace operating conditions including ignition, gas input rate, air temperature rise, and venting according to these installation instructions.

WARNING
CARBON MONOXIDE POISONING / COMPONENT DAMAGE HAZARD
Failure to follow this warning could result in personal injury or death and unit component damage.
Corrosive or contaminated air may cause failure of parts containing flue gas, which could leak into the living space. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products. Do not install furnace in a corrosive or contaminated atmosphere. Make sure all combustion and circulating air requirements are met, in addition to all local codes and ordinances.

The following types of furnace installations may require OUTDOOR AIR for combustion due to chemical exposures:
- Commercial buildings
- Buildings with indoor pools
- Laundry rooms
- Hobby or craft rooms
- Chemical storage areas
If air is exposed to the following substances, it should not be used for combustion air, and outdoor air may be required for combustion:
- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials
All fuel-burning equipment must be supplied with air for fuel combustion. Sufficient air must be provided to avoid negative pressure in the equipment room or space. A positive seal must be made between the furnace cabinet and the return-air duct to prevent pulling air from the burner area.

General
These furnaces are shipped with materials to assist in proper furnace installation. These materials are shipped in the main blower compartment. See Table 1 for loose parts bag contents. This furnace must:
- be installed so the electrical components are protected from water.
- not be installed directly on any combustible material other than wood flooring (refer to SAFETY CONSIDERATIONS).
- be located close to the chimney or vent and attached to an air distribution system. Refer to Air Ducts section.
- be provided ample space for servicing and cleaning. Always comply with minimum fire protection clearances shown in Table 2 or on the furnace clearance to combustible construction label.
**WARNING**

**FIRE, INJURY OR DEATH HAZARD**

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

When the furnace is installed in a residential garage, the burners and ignition sources must be located at least 18 in. (457 mm) above the floor. The furnace must be located or protected to avoid damage by vehicles. When the furnace is installed in a public garage, airplane hangar, or other building having a hazardous atmosphere, the furnace must be installed in accordance with the NFPA 54/ANSI Z223.1-2009 or CAN/CSA B149.2-2010. (See Fig. 5.)

**FIRE HAZARD**

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

Do not install the furnace on its back or hang furnace with control compartment facing downward. Safety control operation will be adversely affected. Never connect return-air ducts to the back of the furnace. (See Fig. 4.)

**Location Relative to Cooling Equipment**

The cooling coil must be installed parallel with, or on the downstream side of the unit to avoid condensation in the heat exchangers. When installed parallel with the furnace, dampers or other flow control must prevent chilled air from entering the furnace. If the dampers are manually operated, they must be equipped with means to prevent operation of either unit unless the damper is in the full-heat or full-cool position.

<table>
<thead>
<tr>
<th>Table 1 – Factory-Supplied Installation Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESCRIPTION</strong></td>
</tr>
<tr>
<td>Outlet Choke Plate (provided with 40K BTUH furnaces only; see Note)</td>
</tr>
<tr>
<td>Air Intake Pipe Flange</td>
</tr>
<tr>
<td>Vent Pipe Flange</td>
</tr>
<tr>
<td>Pipe Flange Gaskets</td>
</tr>
<tr>
<td>Sharp Tip Screws (Vent and Inlet Flanges)</td>
</tr>
<tr>
<td>Vent Pipe Coupling</td>
</tr>
<tr>
<td>Vent Pipe Coupling Clamps</td>
</tr>
<tr>
<td>Pressure Switch Tube</td>
</tr>
<tr>
<td>Rubber Drain Elbow</td>
</tr>
<tr>
<td>Drain Tube Clamps</td>
</tr>
<tr>
<td>1/2–in. CPVC to 3/4–in. PVC Pipe Adapter</td>
</tr>
<tr>
<td>Gas Line Grommet</td>
</tr>
<tr>
<td>Junction Box Cover</td>
</tr>
<tr>
<td>Junction Box Base</td>
</tr>
<tr>
<td>Green Ground Screw</td>
</tr>
<tr>
<td>Blunt Tip Screws (Junction Box)</td>
</tr>
<tr>
<td>Thermostat Wire Grommet</td>
</tr>
<tr>
<td>Drain Extension Tube (Z-pipe) (Provided separately in furnace)</td>
</tr>
</tbody>
</table>

**NOTE:** Only used for 40K BTUH furnaces from 0–2000 ft. (0 to 610 M) above sea level for total equivalent vent lengths under 10 ft. (3 M)

<table>
<thead>
<tr>
<th>Table 2 – Minimum Clearances to Combustible Materials for All Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POSITION</strong></td>
</tr>
<tr>
<td>Rear</td>
</tr>
<tr>
<td>Front (Combustion air openings in furnace and in structure)</td>
</tr>
<tr>
<td>Required for service</td>
</tr>
<tr>
<td>All Sides of Supply Plenum</td>
</tr>
<tr>
<td>Sides</td>
</tr>
<tr>
<td>Vent</td>
</tr>
<tr>
<td>Top of Furnace</td>
</tr>
</tbody>
</table>

* Recommended
**FURNACE SIZE (MODELS)**  

<table>
<thead>
<tr>
<th>A (CABINET WIDTH)</th>
<th>B (OUTLET WIDTH)</th>
<th>C (BOTTOM INLET WIDTH)</th>
<th>D</th>
<th>SHIPPING WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(91TN6) inches</td>
<td>(17 1/2)</td>
<td>(446)</td>
<td>(15 7/8)</td>
<td>(403)</td>
</tr>
<tr>
<td>060-14</td>
<td>17 1/2</td>
<td>446</td>
<td>15 7/8</td>
<td>403</td>
</tr>
<tr>
<td>080-14</td>
<td>21</td>
<td>533</td>
<td>19 3/8</td>
<td>482</td>
</tr>
<tr>
<td>100-22</td>
<td>24 1/2</td>
<td>622</td>
<td>22 7/8</td>
<td>581</td>
</tr>
</tbody>
</table>

**NOTE:** ALL DIMENSIONS IN INCH [MM]
Fig. 1 - Multipoise Orientations

The blower is located to the right of the burner section, and conditioned air is discharged to the left. The blower is located above the burner section, and conditioned air is discharged downward. The blower is located to the left of the burner section, and conditioned air is discharged to the right. The blower is located below the burner section, and conditioned air is discharged upward.

Fig. 2 - Freeze Protection and Return Air Temperature

Supply air maximum 80°F / 27°C. Min 60°F / 16°C minimum installed ambient or freeze protection required.

Fig. 3 - Prohibited Installations

Fig. 4 - Installation in a Garage

Min 18-in. (457.2 mm) minimum to burners.
AIR FOR COMBUSTION AND VENTILATION

Introduction

Direct Vent (2-pipe) Applications
When the furnace is installed as a direct vent (2-pipe) furnace, no special provisions for air for combustion are required. However, other gas appliances installed in the space with the furnace may require outside air for combustion. Follow the guidelines below to ensure that other gas appliances have sufficient air for combustion.

Non-Direct Vent (1-pipe) Applications
When the furnace is installed as a non-direct vent (1-pipe) furnace, it will be necessary to insure there is adequate air for combustion. Other gas appliances installed with the furnace may also require air for combustion and ventilation in addition to the amount of combustion air and ventilation air required for the furnace. Follow the guidelines below to insure that the furnace and other gas appliances have sufficient air for combustion.

Ventilated Combustion Air Applications
When the furnace is installed using the ventilated combustion air option, the attic or crawlspace must freely communicate with the outdoors to provide sufficient air for combustion. The combustion air pipe cannot be terminated in attics or crawlspaces that use ventilation fans designed to operate during the heating season. If ventilation fans are present in these areas, the combustion air pipe must terminate outdoors as a Direct Vent/2-Pipe system.

All air for combustion is piped directly to the furnace from a space that is well ventilated with outdoor air (such as an attic or crawl space) and the space is well isolated from the living space or garage. In addition, other gas appliances installed in the space with the furnace may require outside air for combustion. Follow the guidelines below to insure that the roof or crawlspace walls have sufficient free area to provide sufficient air for combustion and ventilation for the furnaces. The guidelines below can be used to insure that other gas appliances have sufficient air for combustion. Provisions for adequate combustion, ventilation, and dilution air must be provided in accordance with:


CAUTION

FURNACE CORROSION HAZARD
Failure to follow this caution may result in furnace damage. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products.

WARNING

CARBON MONOXIDE POISONING HAZARD
Failure to follow this warning could result in personal injury or death. The operation of exhaust fans, kitchen ventilation fans, clothes dryers, attic exhaust fans or fireplaces could create a NEGATIVE PRESSURE CONDITION at the furnace. Make-up air MUST be provided for the ventilation devices, in addition to that required by the furnace. Refer to the Carbon Monoxide Poisoning Hazard warning in the venting section of these instructions to determine if an adequate amount of make-up air is available.

The requirements for combustion and ventilation air depend upon whether or not the furnace is located in a space having a volume of at least 50 cubic feet per 1,000 Btuh input rating for all gas appliances installed in the space.

- Spaces having less than 50 cubic feet per 1,000 Btuh (4.8 cubic meters per kW) require the Outdoor Combustion Air Method.
- Spaces having at least 50 cubic feet per 1,000 Btuh (4.8 cubic meters per kW) may use the Indoor Combustion Air, Standard or Known Air Infiltration Method.

Outdoor Combustion Air Method

1. Provide the space with sufficient air for proper combustion, ventilation, and dilution of flue gases using permanent horizontal or vertical duct(s) or opening(s) directly communicating with the outdoors or spaces that freely communicate with the outdoors.
2. Fig. 6 illustrates how to provide TWO OUTDOOR OPENINGS, one inlet and one outlet combustion and ventilation air opening, to the outdoors.
   a. One opening MUST commence within 12 in. (300 mm) of the ceiling and the second opening MUST commence within 12 in. (300 mm) of the floor.
   b. Size openings and ducts per Fig. 6 and Table 3.
   c. TWO HORIZONTAL DUCTS require 1 sq. in. (645 sq. mm) of free area per 2,000 Btuh (1,100 mm²/kW) of combined input for all gas appliances in the space per Fig. 6 and Table 3.
   d. TWO OPENINGS OR VERTICAL DUCTS require 1 sq. in. (645 sq. mm) of free area per 4,000 Btuh (550 mm²/kW) for combined input of all gas appliances in the space per Fig. 6 and Table 3.
3. ONE OUTDOOR OPENING requires:
   a. 1 sq. in. (645 sq. mm) of free area per 3,000 Btuh (734 mm²/kW) for combined input of all gas appliances in the space per Fig. 6 and Table 3.
   b. Not less than the sum of the areas of all vent connectors in the space.

The opening shall commence within 12 in. (300 mm) of the ceiling. Appliances in the space shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (150 mm) from the front. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.
Indoor Combustion Air® NFPA & AGA
Standard and Known-Air-Infiltration Rate Methods

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

⚠️ WARNING

CARBON MONOXIDE POISONING HAZARD

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

Many homes require air to be supplied from outdoors for furnace combustion, ventilation, and dilution of flue gases.

The furnace combustion air supply must be provided in accordance with this instruction manual.

Standard Method

1. The space has no less volume than 50 cubic feet per 1,000 Btuh of the maximum input ratings for all gas appliances installed in the space and
2. The air infiltration rate is not known to be less than 0.40 air changes per hour (ACH).

The Known Air Infiltration Rate Method shall be used, if the infiltration rate is known to be:
1. Less than 0.40 ACH and
2. Equal to or greater than 0.10 ACH

Infiltration rates greater than 0.60 ACH shall not be used. The minimum required volume of the space varies with the number of ACH and shall be determined per Table 4 or Equations 1 and 2. Determine the minimum required volume for each appliance in the space and add the volumes together to get the total minimum required volume for the space.

Table 4 - Minimum Space Volumes were determined by using the following equations from the current edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54, 9.3.2.2:

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

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

2. For fan-assisted appliances such as this furnace:

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

If: \(I_{\text{other}}\) = combined input of all other than fan-assisted appliances in Btuh/hr
\(I_{\text{fan}}\) = combined input of all fan-assisted appliances in Btuh/hr
ACH = air changes per hour (ACH shall not exceed 0.60.)

The following requirements apply to the Standard Method and to the Known Air Infiltration Rate Method.
1. Adjoining rooms can be considered part of a space if:
   a. There are no closeable doors between rooms.
   b. Combining spaces on same floor level. Each opening shall have free area of at least 1 in.\(^2\)/1,000 Btuh (2,000 mm\(^2\)/kW) of the total input rating of all gas appliances in the space, but not less than 100 in.\(^2\) (0.06 m\(^2\)). One opening shall commence within 12 in. (300 mm) of the ceiling and the second opening shall commence within 12 in. (300 mm) of the floor. The minimum dimension of air openings shall be at least 3 in. (80 mm). (See Fig. 7.)
   c. Combining space on different floor levels. The volumes of spaces on different floor levels shall be considered as communicating spaces if connected by one or more permanent openings in doors or floors having free area of at least 2 in.\(^2\)/1,000 Btuh (4,400 mm\(^2\)/kW) of total input rating of all gas appliances.
2. An attic or crawlspace may be considered a space that freely communicates with the outdoors provided there are adequate permanent ventilation openings directly to outdoors having free area of at least 1 in.\(^2\)/4,000 Btuh of total input rating for all gas appliances in the space.
3. In spaces that use the Indoor Combustion Air Method, infiltration should be adequate to provide air for combustion, permanent ventilation and dilution of flue gases. However, in buildings with unusually tight construction, additional air MUST be provided using the methods described in the Outdoor Combustion Air Method section.
4. Unusually tight construction is defined as Construction with:
   a. Walls and ceilings exposed to the outdoors have a continuous, sealed vapor barrier. Openings are gasketed or sealed and
   b. Doors and openable windows are weatherstripped and
   c. Other openings are caulked or sealed. These include joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and gas lines, etc.

Combination of Indoor and Outdoor Air

1. Indoor openings shall comply with the Indoor Combustion Air Method below and,
2. Outdoor openings shall be located as required in the Outdoor Combustion Air Method mentioned previously and,
3. Outdoor openings shall be sized as follows:
   a. Calculate the Ratio of all Indoor Space volume divided by required volume for Indoor Combustion Air Method below.
   b. Outdoor opening size reduction Factor is 1 minus the Ratio in a. above.
   c. Minimum size of Outdoor openings shall be the size required in Outdoor Combustion Air Method above multiplied by reduction Factor in b. above. The minimum dimension of air openings shall be not less than 3 in. (80 mm).
### Table 3 – Minimum Free Area Required for Each Combustion Air Opening or Duct to Outdoors

<table>
<thead>
<tr>
<th>FURNACE INPUT (BTUH)</th>
<th>TWO HORIZONTAL DUCTS (1 SQ. IN./2,000 BTUH)</th>
<th>SINGLE DUCT OR OPENING (1 SQ. IN./3,000 BTUH)</th>
<th>TWO OPENINGS OR VERTICAL DUCTS (1 SQ. IN./4,000 BTUH)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FREE AREA OF OPENING AND DUCT SQ. IN. (SQ. MM)</td>
<td>FREE AREA OF OPENING AND DUCT SQ. IN. (SQ. MM)</td>
<td>FREE AREA OF OPENING AND DUCT SQ. IN. (SQ. MM)</td>
</tr>
<tr>
<td></td>
<td>FREE DUCT IN. (MM) DIA</td>
<td>FREE DUCT IN. (MM) DIA</td>
<td>FREE DUCT IN. (MM) DIA</td>
</tr>
<tr>
<td>40,000*</td>
<td>20 (12904) 5 (127)</td>
<td>14 (6696) 5 (127)</td>
<td>10 (6452) 4 (102)</td>
</tr>
<tr>
<td>60,000</td>
<td>30 (19355) 6 (152)</td>
<td>20 (13043) 5 (127)</td>
<td>15 (6676) 5 (127)</td>
</tr>
<tr>
<td>80,000</td>
<td>40 (25807) 7 (178)</td>
<td>27 (17391) 6 (152)</td>
<td>20 (12904) 5 (127)</td>
</tr>
<tr>
<td>100,000</td>
<td>50 (32258) 8 (203)</td>
<td>34 (21739) 7 (178)</td>
<td>25 (16130) 6 (152)</td>
</tr>
<tr>
<td>120,000</td>
<td>60 (38709) 9 (229)</td>
<td>40 (28067) 7 (178)</td>
<td>30 (19355) 6 (152)</td>
</tr>
<tr>
<td>140,000*</td>
<td>70 (45161) 10 (254)</td>
<td>47 (30435) 8 (203)</td>
<td>35 (22581) 7 (178)</td>
</tr>
</tbody>
</table>

**NOTES:**
- Minimum dimensions of 3-in. (76 mm).
- Not all families have these models.

#### EXAMPLES: Determining Free Area

**EXAMPLES:**

- **FURNACE WATER HEATER TOTAL INPUT**
  - 100,000 + 30,000 = (130,000 divided by 4,000) = 32.5 Sq. In. for each two Vertical Ducts or Openings
  - 60,000 + 40,000 = (100,000 divided by 3,000) = 33.3 Sq. In. for each Single Duct or Opening
  - 80,000 + 30,000 = (110,000 divided by 2,000) = 55.0 Sq. In. for each two Horizontal Ducts

### Table 4 – Minimum Space Volumes for 100% Combustion, Ventilation and Dilution Air from Outdoors

<table>
<thead>
<tr>
<th>OTHER THAN FAN-ASSISTED TOTAL (1,000'S BTUH GAS INPUT RATE)</th>
<th>FAN-ASSISTED TOTAL (1,000'S BTUH GAS INPUT RATE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACH</td>
<td>Space Volume Ft³ (M³)</td>
</tr>
<tr>
<td>30</td>
<td>1,050 + 1,400 = 2,450</td>
</tr>
<tr>
<td>40</td>
<td>1,750 + 1,400 = 3,150</td>
</tr>
<tr>
<td>50</td>
<td>2,000 + 1,400 = 3,400</td>
</tr>
<tr>
<td>60</td>
<td>2,500 + 1,400 = 3,900</td>
</tr>
<tr>
<td>70</td>
<td>3,000 + 1,400 = 4,400</td>
</tr>
<tr>
<td>80</td>
<td>3,500 + 1,400 = 4,900</td>
</tr>
<tr>
<td>90</td>
<td>4,000 + 1,400 = 5,400</td>
</tr>
<tr>
<td>100</td>
<td>4,500 + 1,400 = 5,900</td>
</tr>
<tr>
<td>120</td>
<td>6,000 + 1,400 = 7,400</td>
</tr>
<tr>
<td>140</td>
<td>7,500 + 1,400 = 8,900</td>
</tr>
</tbody>
</table>

**NOTES:**
- NP = Not Permitted

---

**Fig. 6 – Air for Combustion, Ventilation, and Dilution for Outdoors**

**Fig. 7 – Air for Combustion, Ventilation, and Dilution from Indoors**
CONDENSATE TRAP

Condensate Trap - Upflow Orientation
When the furnace is installed in the upflow position, it is not necessary to relocate the condensate trap or associated tubing. Refer to Fig. 8 for upflow condensate trap information. Refer to Condensate Drain section for information how to install the condensate drain.

Condensate Trap - Downflow Orientation.
When the furnace is installed in the downflow position, the factory-installed trap will be located at the upper left corner of the collector box. When the furnace is installed in the downflow orientation, the factory-installed trap must be relocated for proper condensate drainage.

To Relocate the Condensate Trap:
• Orient the furnace in the downflow position.
• Fig. 9 shows the condensate trap and tubing before and after relocation. Refer to Fig. 9 to begin the trap conversion.
• Refer to Condensate Drain section for information how to install the condensate drain.

Condensate Trap - Horizontal Orientation.
When the furnace is installed in the horizontal right position, the factory-installed trap will be located at the bottom of the collector box. When the furnace is installed in the horizontal left position, the factory-installed trap will be located at the top of the collector box. The trap must be repositioned on the collector box for proper condensate drainage.

When the furnace is installed as a direct-vent furnace, a field supplied, accessory Horizontal Installation Kit (trap grommet) is required for all direct-vent horizontal installations (only). The kit contains a rubber casing grommet designed to seal between the furnace casing and the condensate trap. (See Fig. 16.)

NOTE: The Horizontal Installation Kit (trap grommet) is NOT required for single-pipe, ventilated combustion air, or other non-direct vent applications.

NOTE: The condensate trap extends below the side of the casing in the horizontal position. A minimum of 2 in. (51 mm) of clearance is required between the casing side and the furnace platform for the trap to extend out of the casing in the horizontal position. Allow at least 1/4-in. (6 mm) per foot of slope away from the furnace in horizontal sections of drain line.

To Relocate the Condensate Trap:
• Remove the knockout in the casing for the condensate trap.
• Install the grommet in the casing when required.
• Orient the furnace in the desired position.
• Allow for 2 in. (51 mm) of clearance underneath the furnace for the condensate trap and drain line.
• Fig. 10 shows the condensate trap and tubing before and after relocation in the horizontal right position.
• Fig. 11 shows the condensate trap and tubing before and after relocation in the horizontal left position.
• Refer to the appropriate figure to begin the trap conversion.
• Refer to Condensate Drain section for information how to install the condensate drain.

Fig. 8 - Upflow Trap Configuration
(Appearance may vary)
1. Remove relief tube from relief port on condensate trap.
2. Remove the screw that secures the trap to the collector box and remove trap.
3. Remove the screw that secures the trap to the collector box and remove trap.
4. Remove pressure switch tube from front pressure switch and discard. A new tube is shipped in the loose parts bag.
5. Loosen clamp on inlet to vent elbow.
6. Remove middle and bottom plugs. DO NOT DISCARD.
7. Connect the new pressure switch tube from Loose Parts bag to port on front pressure switch.
8. Route tube through inducer stand-offs to adjust position of the tube.
9. Trim excess tube. Connect pressure switch tube to port on collector box.
10. Install the two plugs previously removed on the open ports of the collector box.

**Unconverted Factory Configuration as Viewed in the Downflow Orientation**

**Downflow Trap Configuration**

Fig. 9 - Downflow Trap Configuration
(Apppearance may vary)
Remove screw that secures trap to collector box and remove trap.

If alternate vent position is required, loosen clamp on inlet of vent elbow.

Remove plug from collector box. DO NOT DISCARD.

3
(1 AND 2 STAGE UNITS)

Unconverted Factory Configuration
As Viewed in the Horizontal Right Orientation

NOTE: Remove knockout in casing before re-installing the condensate trap.

Attach condensate trap with screw to collector box.

3
(1 AND 2 STAGE UNITS)

Horizontal Right Trap Configuration

Slide relief tube in stand-offs to adjust length.

4

Vent elbow shown in alternate orientation. Tighten clamp on inlet to vent elbow 15 lb.-in.

Align trap over middle and right-hand port on collector box.

5

Install plug on open port of collector box.
If alternate vent position is required, loosen clamp on vent elbow inlet.

Remove the screw that secures the condensate trap to the collector box and remove trap.

Remove relief tube from relief port on condensate trap.

Remove front pressure switch tube and discard. A new tube is shipped in the Loose Parts bag.

Remove relief tube from port on collector box.

Remove middle and right plug from collector box. DO NOT DISCARD.

NOTE: Remove knockout in casing before re-installing the condensate trap.

Unconverted Factory Trap Configuration
As Viewed in the Horizontal Left Orientation

NOTE: Remove knockout in casing before re-installing the condensate trap.

Rotate elbow to desired position and torque clamp on inlet 15 lb.-in.

Slide relief tube in stand-offs to adjust length.

Attach condensate trap with screw to collector box.

Align trap over middle and right-hand port on collector box.

Install two plugs previously removed in open ports on collector box.

Connect relief tube to port on collector box.

Connect the new pressure switch tube from Loose Parts bag to port on front pressure switch.

Route pressure switch tube underneath relief tube and connect to port on collector box.

Connect relief tube to relief port on condensate trap.

Horizontal Left Trap Configuration

Fig. 11 - Horizontal Left Configuration
(Appearance may vary)
CONDENSATE DRAIN CONNECTION

[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 furnace environment has the potential of freezing, the drain trap and drain line must be protected. The use of electric heat tape or RV antifreeze is recommended for these installations.

[Caution] PROPERTY DAMAGE HAZARD
Failure to follow this caution may result in burst water pipes and/or property damage. If a condensate pump is installed, a plugged condensate drain or a failed pump may cause the furnace to shut down. Do not leave the home unattended during freezing weather without turning off water supply and draining water pipes or otherwise protecting against the risk of frozen pipes.

DO NOT trap the drain line in any other location than at the condensate drain trap supplied with the furnace. If possible, DO NOT route the drain line where it may freeze. The drain line must terminate at an inside drain to prevent freezing of the condensate and possible 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 the equipment. If the furnace environment has the potential of freezing, the drain trap and drain line must be protected. A self-regulating, shielded and waterproof heat tape rated at 3 to 6 watt per foot at 115 volt, 40°F (4°C) may be used to help provide freeze protection. Wrap the drain trap and drain line with the heat tape and secure with the ties. Follow the heat tape manufacturer’s recommendations. Prime the trap before furnace operation.

Upflow/Downflow Orientation
In the Upflow or Downflow orientation, the condensate trap is inside the furnace casing. The condensate drain must be routed from the trap through the furnace casing. The condensate drain can be routed through the left or right side of the casing. (The left or right side is as you are viewing/facing the furnace from the front.) The furnace condensate drain can be connected to the Air Conditioning condensate drain as shown in Fig. 13.

NOTE: On narrower casings, it may be easier to remove the condensate trap, connect the drain line components and re-install the condensate trap. Read the steps thoroughly to familiarize yourself with the required steps.

For Right Side Condensate Drain:
1. Remove the 7/8-in. knock-out from the right side of the casing. (See Fig. 12.)
2. Remove the pre-formed rubber drain elbow and two spring clamps from the loose parts bag.
3. Slide a spring clamp 1 inch (25 mm) down the plain end (the end without the formed grommet) of the drain elbow.
4. From inside the casing, insert the formed grommet end of the elbow through the 7/8-in. knockout in the casing.
5. Pull the grommet through the casing from the outside until it is seated in the knockout.
6. Attach the plain end of the drain elbow to the outlet stub on the drain trap. Secure the drain tube to the trap with the spring clamp.

For Left Side Condensate Drain Connection:
1. For left side condensate drainage, the drain line is routed from the condensate trap, behind the inducer (upflow) or gas valve (downflow) and out through the left side of the furnace casing. A pre-formed 1/2-in. CPVC "Z-pipe" is provided with the furnace. The Z-pipe is long enough to extend across the casing for drain connections.
2. The Z-pipe is connected to the condensate trap and the outside of the furnace by modifying the formed rubber drain elbow as shown in Fig. 17.
3. Locate the Z-pipe. Remove the pre-formed drain elbow and four spring clamps from the loose parts bag.
4. Remove the formed grommet from the rubber drain elbow by cutting the elbow along the vertical line located about 1-3/8 in. (35 mm) away from the formed grommet. See Fig. 15. DO NOT DISCARD THE FORMED GROMMET OR THE RUBBER ELBOW. Both of these pieces will be used.

Assemble and route the drain line to the opposite side of the furnace as detailed below:
5. Remove the knock-out from the left side of the casing. (See Fig. 12.)
6. From the outside of the casing, insert the angled end of the Z-pipe through drain hole in the side left of the casing and behind the inducer or gas valve. Allow the Z-pipe to temporarily rest on the blower shelf (upflow) or burner box (downflow).
7. After inserting the Z pipe through the casing, slide a spring clamp over each end of the Z pipe.
8. From inside the casing, insert the short end of the formed grommet cut from the rubber drain elbow through the 7/8-in. drain knockout in the casing.
9. Pull the grommet through the casing from the outside until it is seated in the knockout.
10. Align the Z-pipe with the long end of the grommet inside the furnace and insert slightly. The angled end of the tube at the other side of the casing should be facing the front of the furnace.
11. Slide a spring clamp over the end of the remaining rubber drain elbow.
12. Attach the drain elbow to the angled end of Z-pipe and the drain trap outlet stub. Adjust the length of Z-pipe inserted into the grommet at the opposite side of the furnace as necessary for proper fit and positioning. In both upflow and downflow orientations, the Z-pipe should NOT be resting on any sheet metal parts.

The remaining drain line can be constructed from field supplied 1/2-in. CPVC or 3/4-in. PVC pipe, in compliance with local building codes. A factory-supplied 1/2-in. CPVC to 3/4-in. PVC adapter is supplied in the loose parts bag for use as required.
7. Install the adapter or connect the 1/2-in. CPVC pipe by sliding a spring clamp over the open end of the grommet on the outside the furnace casing.
8. Open the spring clamp and insert the long end of the adapter or the 1/2-in. CPVC pipe into the outlet stub on the drain tube.
9. Connect additional condensate piping to a code-approved drain, or to a condensate pump approved for use with acidic furnace condensate and compatible with mineral and vegetable oils, such as canola oil.

Allow at least 1/4-in. (6 mm) per foot of slope away from the furnace in horizontal sections of drain line.
13. Secure the rubber elbow to the drain trap and the Z-pipe with spring clamps.

14. Secure the grommet to the Z-pipe with the spring clamp.

The remaining drain line can be constructed from field supplied 1/2-in. CPVC or 3/4-in. PVC pipe, in compliance with local building codes. A factory-supplied 1/2-in. CPVC to 3/4-in. PVC adapter is supplied in the loose parts bag for use as required.

15. Install the adapter or connect the 1/2-in. CPVC pipe by sliding a spring clamp over the open end of the grommet on the outside the furnace casing.

16. Open the spring clamp and insert the long end of the adapter or the 1/2-in. CPVC pipe into the outlet stub on the drain tube.

17. Connect additional condensate piping to a code-approved drain, or to a condensate pump approved for use with acidic furnace condensate and compatible with mineral and vegetable oils, such as canola oil.

Allow at least 1/4-in. (6 mm) per foot of slope away from the furnace in horizontal sections of drain line.

**Horizontal Orientation**

1. In the Horizontal orientation, a field supplied accessory drain trap grommet is required to seal the gap between the casing and the condensate trap for direct vent applications, only. The grommet is NOT required for single-pipe, or other non-direct-vent applications.

2. The condensate trap outlet extends 2 in. (51 mm) below the furnace casing. To allow for servicing the trap, the condensate drain tube in the loose parts bag can be modified to make a coupler to allow for future service of the condensate trap and drain line.

3. Remove the knock-out for the condensate trap in the side of the casing.

4. Install the drain trap grommet in the casing if required for direct vent applications. If necessary, remove the trap, install the grommet and re-install the trap.

5. Remove the pre-formed rubber drain elbow, and two spring clamps from the loose parts bag.

6. Remove the formed grommet on the elbow to create an elbow or straight connector. (See Fig. 15.)

7. Connect the cut elbow or grommet to the outlet of the condensate trap with 1 spring clamp.

The remaining drain line can be constructed from field-supplied 1/2-in. CPVC or 3/4-in. PVC pipe, in compliance with local building codes. A factory-supplied 1/2-in. CPVC to 3/4-in. PVC adapter is supplied in the loose parts bag for use as required.

8. Install the adapter or connect the 1/2-in. CPVC pipe by sliding a spring clamp over the open end of the elbow or grommet on the outside the furnace casing.

9. Open the spring clamp and insert the long end of the adapter or the 1/2-in. CPVC pipe into the outlet stub on the drain tube.

10. Connect additional condensate piping to a code-approved drain, or to a condensate pump approved for use with acidic furnace condensate and compatible with mineral and vegetable oils, such as canola oil.

Allow at least 1/4-in. (6 mm) per foot of slope away from the furnace in horizontal sections of drain line.

---

**CAUTION**

*CUT HAZARD*

Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces.

---

**Fig. 12 - Knockout Removal**

---

**Fig. 13 - Example of Field Drain Attachment**
INSTALL CLAMPS ON DRAIN TUBE
ATTACH DRAIN TUBE TO CONDENSATE DRAIN TRAP
FULL DRAIN STUB THROUGH CASING.

NOTE: Trap grommet is required only for direct-vent applications.

Fig. 14 - Formed Tube Grommet

RIGHT SIDE DRAIN INSTALLATION

Fig. 15 - Modify Drain Tube

OPEN SPRING CLAMP
INSERT FACTORY-SUPPLIED 1/2-IN. CPVC TO 3/4-IN. PVC ADAPTER OR 1/2-IN. CPVC PIPE
*CLAMP MAY BE LOCATED ON OUTSIDE OF DRAIN TUBE

Fig. 16 - Horizontal Drain Trap Grommet

Cut line for left side condensate drain.
Do not discard parts after cutting.

Fig. 17 - Drain Trap Connection and Routing
(Appearance May Vary)

Remove knockout. Install grommet before relocating condensate trap.
INSTALLATION

NOTE: This furnace is certified to leak 2% or less of nominal air conditioning CFM delivered when pressurized to 1-inch water column with all present air inlets, air outlets, and plumbing and electrical ports sealed, including bottom closure in upflow and horizontal applications.

Uplow Installation

NOTE: The furnace must be pitched as shown in Fig. 23 for proper condensate drainage.

Supply Air Connections

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

Connect supply-air duct to flanges on furnace supply-air outlet. Bend flange upward to 90° with wide duct pliers. (See Fig. 20.) The supply-air duct must be connected to ONLY the furnace supply-outlet-air duct flanges or air conditioning coil casing (when used). DO NOT cut main furnace casing side to attach supply air duct, humidifier, or other accessories. All accessories MUST be connected to duct external to furnace main casing.

Return Air Connections

WARNING
FIRE HAZARD
A failure to follow this warning could cause personal injury, death, and/or property damage. Never connect return-air ducts to the back of the furnace. Follow instructions below.

The return-air duct must be connected to bottom, sides (left or right), or a combination of bottom and side(s) of main furnace casing. Bypass humidifier may be attached into unused return air side of the furnace casing. (See Fig. 24, 25, 26.)

Bottom Return Air Inlet

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. Remove and discard this panel when bottom return air is used. To remove bottom closure panel, perform the following:
1. Tilt or raise furnace and remove 4 screws holding bottom plate. (See Fig. 22.)
2. Remove bottom plate.
3. Remove bottom closure panel.
4. Reinstall bottom plate and screws.

Side Return Air Inlet

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. This panel MUST be in place when only side return air is used.

NOTE: Side return-air openings can be used in UPFLOW and some HORIZONTAL configurations. Do not use side return-air openings in DOWNFLOW configuration. (See Fig. 24, 25, 26.)

Leveling Legs (If Desired)

In upflow position with side return inlet(s), leveling legs may be used. (See Fig. 21.) Install field-supplied, 5/16 x 1-1/2 in. (8 x 38 mm) (max) corrosion-resistant machine bolts, washers and nuts.

NOTE: Bottom closure must be used when leveling legs are used. It may be necessary to remove and reinstall bottom closure panel to install leveling legs. To remove bottom closure panel, see Item 1 in Bottom Return Air Inlet section in Step 1 above.

To install leveling legs:
1. Position furnace on its back. Locate and drill a hole in each bottom corner of furnace.
2. For each leg, install nut on bolt and then install bolt with nut in hole. (Install flat washer if desired.)
3. Install another nut on other side of furnace base. (Install flat washer if desired.)
4. Adjust outside nut to provide desired height, and tighten inside nut to secure arrangement.
5. Reinstall bottom closure panel if removed.

Downflow Installation

NOTE: The furnace must be pitched as shown in Fig. 23 for proper condensate drainage.

Supply Air Connections

NOTE: For downflow applications, this furnace is approved for use on combustible flooring when any one of the following 3 accessories are used:
• Special Base, KGASB
• Cased Coil Assembly Part No. CNPV, CNRV, CAR, or CAR
• Coil Box Part No. KCARK

1. Determine application being installed from Table 6.
2. Construct hole in floor per Table 6 and Fig. 19.
3. Construct plenum to dimensions specified in Table 6 and Fig. 19.
4. Install special base coil assembly or coil box as shown in Fig. 19.

NOTE: It is recommended that the perforated supply-air duct flanges be completely removed from furnace when installing the furnace on a factory-supplied cased coil or coil box. To remove the supply-air duct flange, use wide duct pliers or hand seamers to bend flange back and forth until it breaks off. Be careful of sharp edges. (See Fig. 20.)

CAUTION
CUT HAZARD
Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces.

Connect supply-air duct to supply-air outlet on furnace. Bend flange inward past 90° with wide duct pliers (See Fig. 20.) The supply-air duct must be connected to ONLY the furnace supply outlet or air conditioning coil casing (when used). When installed on combustible material, supply-air duct must be connected to ONLY the factory-approved accessory subbase, or a factory-approved air conditioning coil casing. DO NOT cut main furnace casing to attach supply side air duct, humidifier, or other accessories. All accessories MUST be connected to duct external to furnace casing.

Return Air Connections

WARNING
FIRE HAZARD
A failure to follow this warning could cause personal injury, death, and/or property damage. Never connect return-air ducts to the back of the furnace. Follow instructions below.

The return-air duct must be connected to return-air opening (bottom inlet). DO NOT cut into casing sides (left or right).
Bypass humidifier connections should be made at ductwork or coil casing sides exterior to furnace. (See Fig. 25.)

**Bottom Return Air Inlet**

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. Remove and discard this panel when bottom return air is used. To remove bottom closure panel, perform the following:

1. Tilt or raise furnace and remove 4 screws holding bottom plate. (See Fig. 22.)
2. Remove bottom plate.
3. Remove bottom closure panel.
4. Reinstall bottom plate and screws.

**Horizontal Installation**

**WARNING**

FIRE, EXPLOSION, AND CARBON MONOXIDE POISONING HAZARD

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

Do not install the furnace on its back or hang furnace with control compartment facing downward. Safety control operation will be adversely affected. Never connect return-air ducts to the back of the furnace.

**CAUTION**

MINOR PROPERTY HAZARD

Failure to follow this caution may result in minor property damage.

Local codes may require a drain pan under entire furnace and condensate trap when a condensing furnace is used in an attic application or over a finished ceiling.

The furnace can be installed horizontally in an attic or crawlspace on either the left-hand (LH) or right-hand (RH) side. The furnace can be hung from floor joists, rafters or trusses or installed on a non-combustible platform, blocks, bricks or pad.

**Platform Furnace Support**

Construct working platform at location where all required furnace clearances are met. (See Table 2 and Fig. 27.) For furnaces with 1-in. (25 mm) clearance requirement on side, set furnace on non-combustible blocks, bricks or angle iron. For crawlspace installations, if the furnace is not suspended from the floor joists, the ground underneath furnace must be level and the furnace set on blocks or bricks.

**Suspended Furnace Support**

The furnace must be supported under the entire length of the furnace with threaded rod and angle iron. (See Fig. 28.) Secure angle iron to bottom of furnace as shown.

**Roll-Out Protection**

Provide a minimum 12-in. x 22-in. (305 x 559 mm) piece of sheet metal for flame roll-out protection in front of burner area for furnaces closer than 12-in. (305 mm) above the combustible deck or suspended furnaces closer than 12-in. (305 mm) to joists. The sheet metal MUST extend underneath the furnace casing by 1-in. (25 mm) with the door removed.

The bottom closure panel on furnaces of widths 17-1/2-in. (445 mm) and larger may be used for flame roll-out protection when bottom of furnace is used for return air connection. See Fig. 27 for proper orientation of roll-out shield.

**Supply Air Connections**

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

Connect supply-air duct to flanges on furnace supply-air outlet. Bend flange upward to 90° with wide duct pliers. (See Fig. 20.) The supply-air duct must be connected to ONLY the furnace supply-outlet-air duct flanges or air conditioning coil casing (when used). DO NOT cut main furnace casing side to attach supply air duct, humidifier, or other accessories. All accessories MUST be connected to duct external to furnace main casing.

**Return Air Connections**

The return-air duct must be connected to bottom of the furnace. The side of casing that faces downward may also be used for return air connection. A combination of the bottom and downward facing side may also be used. The side of the casing cannot be used as a return air connection. Bypass humidifier may be attached into unused return air side of the furnace casing. (See Fig. 26.)

**Bottom Return Air Inlet**

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. Remove and discard this panel when bottom return air is used. To remove bottom closure panel, perform the following:

1. Tilt or raise furnace and remove 4 screws holding bottom plate. (See Fig. 22.)
2. Remove bottom plate.
3. Remove bottom closure panel.
4. Reinstall bottom plate and screws.

**Side Return Air Inlet**

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. This panel MUST be in place when side return air inlet(s) are used without a bottom return air inlet.

Not all horizontal furnaces are approved for side return air connections (See Fig. 26.)

**Filter Arrangement**

**WARNING**

FIRE, CARBON MONOXIDE AND POISONING HAZARD

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

Never operate a furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.

There are no provisions for an internal filter rack in these furnaces. An external filter is required.

The furnace is shipped with a factory-supplied Media Filter Cabinet. The Media Filter Cabinet uses either a standard 1-in. (25 mm) filter or 4-in. (102 mm) wide Media Filter which can be purchased separately. A field supplied accessory air cleaner may also be used in place of the media cabinet.

The Media Cabinet is sized for bottom return applications for use in upflow, downflow and horizontal applications. A 16-in. (406 mm) Media Cabinet is shipped with the 14-3/16-in. (360 mm) furnace and includes block-off plates.

For upflow side return applications, the Media Cabinet (or field supplied accessory air cleaner) can be installed on the side of the furnace or side and bottom when a bottom plenum is used. (See Fig. 18 and 24.)
For downflow applications, the Media Cabinet (or field supplied accessory air cleaner) must only be connected to the bottom opening on the furnace. See Fig. 18 and 25.

For horizontal applications, the Media Cabinet (or field supplied accessory air cleaner) for all models can be connected to the bottom opening on the furnace. For side return use in the horizontal position, refer to Fig. 26. If both side and bottom openings are used in Fig. 26, each opening used will require a filter.

The media cabinet (or field supplied accessory air cleaner) can also be installed in the common return duct prior to entering the return air opening in any orientation.

Refer to the instructions supplied with Media Cabinet or accessory air filter for assembly and other details.

See Table 5 for filter size details.

Table 5 – Filter Size Information - In. (mm)

<table>
<thead>
<tr>
<th>FURNACE CASING WIDTH</th>
<th>FILTER SIZE</th>
<th>FILTER TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIDE RETURN</td>
<td>BOTTOM RETURN</td>
</tr>
<tr>
<td>14 3/16† (360)</td>
<td>16 x 25 x 3/4 (406 x 635 x 19)</td>
<td>14 x 25 x 3/4 (356 x 635 x 19)</td>
</tr>
<tr>
<td>17 1/2 (445)</td>
<td>16 x 25 x 3/4 (406 x 635 x 19)</td>
<td>16 x 25 x 3/4 (406 x 635 x 19)</td>
</tr>
<tr>
<td>21 (533)</td>
<td>16 x 25 x 3/4 (406 x 635 x 19)</td>
<td>20 x 25 x 3/4 (508 x 635 x 19)</td>
</tr>
<tr>
<td>24 1/2 (622)</td>
<td>16 x 25 x 3/4 (406 x 635 x 19)</td>
<td>24 x 25 x 3/4 (610 x 635 x 19)</td>
</tr>
</tbody>
</table>

* Recommended to maintain air filter face velocity. See Product Data for part number.
† Not all families have these models.

Air Filter Located in Filter Cabinet

<table>
<thead>
<tr>
<th>FILTER CABINET HEIGHT – IN (MM)</th>
<th>FILTER SIZE – IN (MM)</th>
<th>FILTER TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 (406)</td>
<td>(1) 16 x 25 x 3/4* (406 x 635 x 19) or (1) 16 x 25 x 4 5/16 (406 x 635 x 110)</td>
<td>Washable or Media*</td>
</tr>
<tr>
<td>20 (508)</td>
<td>(1) 20 x 25 x 3/4* (508 x 635 x 19) or (1) 20 x 25 x 4 5/16 (508 x 635 x 110)</td>
<td>Washable or Media*</td>
</tr>
<tr>
<td>24 (610)</td>
<td>(1) 24 x 25 x 3/4* (610 x 635 x 19) or (1) 24 x 25 x 4 5/16 (610 x 635 x 110)</td>
<td>Washable or Media*</td>
</tr>
</tbody>
</table>

* Filters with a side return – air may have a different filter size. Measure the filter to obtain the correct size.
* Recommended to maintain air filter face velocity. See Product Data for part number.
14-3/16 and 17-1/2-in. Furnace

16-in. Media Cabinet

Media Cabinet Installation
Side Return

21- or 24-1/2-in. Furnace
Up to 5-Ton AC capacity airflow

20- or 24-in. Media Cabinet

Bottom Return Plenum

20- or 24-in. Media Cabinet Installation for Combination Side and Bottom Return

14-3/16-in. Furnace

Screw

Filler plates

14-3/16-in. Furnace with Filler Plates, Centered

20-in. Media Cabinet

Media Cabinet Installation Option for 4-Ton or Less A/C Capacity

21-in. Furnace
4-Ton or less, AC capacity airflow

1/2-in. Screws

24-1/2-in. Furnace up to 4-Ton AC Capacity

≤ 45°

Transition

20- or 24-in. Media Cabinet

20- or 24-in. Media Cabinet Installation with Angled Transition

14-3/16-in. Furnace

Screws

Filler plate

14-3/16-in. Furnace with Filler Plates, Off-Set to Right

Fig. 18 - Media Filter
Table 6 – Opening Dimensions - In. (mm)

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>PLENUM OPENING</th>
<th>FLOOR OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uplow Applications on Combustible or Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow applications on combustible flooring (KGASB subbase required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Combustible Flooring with CNPV, CNRV, CAR or CAP Coil Assembly or KCAKC coil box (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upflow Applications on Combustible or Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow applications on combustible flooring (KGASB subbase required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Combustible Flooring with CNPV, CNRV, CAR or CAP Coil Assembly or KCAKC coil box (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplow Applications on Combustible or Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow applications on combustible flooring (KGASB subbase required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Combustible Flooring with CNPV, CNRV, CAR or CAP Coil Assembly or KCAKC coil box (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplow Applications on Combustible or Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Noncombustible Flooring (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow applications on combustible flooring (KGASB subbase required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downflow Applications on Combustible Flooring with CNPV, CNRV, CAR or CAP Coil Assembly or KCAKC coil box (KGASB subbase not required)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Not all families have these models.
UPFLOW  

DOWNFLOW  

HORIZONTAL

Fig. 20 - Duct Flanges

Fig. 21 - Leveling Legs

Fig. 22 - Removing Bottom Closure Panel

Fig. 23 - Furnace Pitch Requirements
Fig. 24 - Upflow Return Air Configurations and Restrictions

Fig. 25 - Downflow Return Air Configurations and Restrictions

Fig. 26 - Horizontal Return Air Configurations and Restrictions
A 12-IN. (305 mm) MIN HORIZONTAL PIPE SECTION IS RECOMMENDED WITH A SHORT (5 TO 8 FT / 1.5 TO 2.4 M) VENT SYSTEM TO REDUCE EXCESSIVE CONDENSATE DROPLETS FROM EXITING THE VENT PIPE.

NOTE: FURNACE SHOWN AS DIRECT VENT APPLICATION, REFER TO THE VENTING SECTION FOR ALLOWABLE VENT CONFIGURATIONS

Fig. 27 - Working Platform for Attic Installation
NOTE: Local codes may require a drain pan and condensate trap when a condensing furnace is installed over a finished ceiling.

NOTE: EXTEND ANGLE IRON OUT FOR COIL SUPPORT

NOTE: 1. A 1 In. (25mm) clearance minimum between top of furnace and combustible material
2. The entire length of furnace must be supported when furnace is used in horizontal position to ensure proper drainage.
3. Furnace shown is a direct vent application. Refer to the Venting section for allowable vent configurations.

Fig. 28 - Suspended Furnace Installation
NOTE: Local codes may require a drain pan and condensate trap when a condensing furnace is installed over a finished ceiling.
AIR DUCTS

General Requirements

The duct system should be designed and sized according to accepted national standards such as those published by: Air Conditioning Contractors Association (ACCA), Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) or consult The Air Systems Design Guidelines reference tables available from your local distributor. The duct system should be sized to handle the required system design CFM at the design external static pressure. The furnace airflow rates are provided in Table 7-Air Delivery-CFM (With Filter). When a furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

Secure ductwork with proper fasteners for type of ductwork used. Seal supply- and return-duct connections to furnace with code approved tape or duct sealer.

NOTE: Flexible connections should be used between ductwork and furnace to prevent transmission of vibration.

Ductwork passing through unconditioned space should be insulated to enhance system performance. When air conditioning is used, a vapor barrier is recommended.

Maintain a 1-in. (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36-in. (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.

Ductwork Acoustical Treatment

NOTE: Metal duct systems that do not have a 90 degree elbow and 10 ft. (3 M) of main duct to the first branch take-off may require internal acoustical lining. As an alternative, fibrous ductwork may be used if constructed and installed in accordance with the latest edition of SMACNA construction standard on fibrous glass ducts. Both acoustical lining and fibrous ductwork shall comply with NFPA 90B as tested by UL Standard 181 for Class 1 Rigid air ducts.

NOTE: For horizontal applications, the top most flange may be bent past 90° to allow the evaporator coil to hang on the flange temporarily while the remaining attachment and sealing of the coil are performed.
<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Clg/CF Switch Settings</th>
<th>External Static Pressure (ESP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SWx-3</td>
<td>SWx-2</td>
</tr>
<tr>
<td>080-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clg Default:</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>CF Default:</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling (SW2)</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cont Fan (SW3)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

| Clg SW2: | Maximum Clg Airflow | 1425 | 1425 | 1405 | 1370 | 1335 | 1300 | 1280 | 1225 | 1190 | 1155 |
| Heating (SW1) | High Heat Airflow | 1075 | 1085 | 1095 | 1095 | 1090 | 1080 | 1065 | 1050 | 1035 | 1020 |
|            | Low Heat Airflow | 855  | 855  | 860  | 870  | 870  | 865  | 860  | 855  | 845  | 785  |

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Clg/CF Switch Settings</th>
<th>External Static Pressure (ESP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SWx-3</td>
<td>SWx-2</td>
</tr>
<tr>
<td>080-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clg Default:</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>CF Default:</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling (SW2)</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cont Fan (SW3)</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

| Clg SW2: | Maximum Clg Airflow | 1520 | 1485 | 1450 | 1415 | 1375 | 1335 | 1300 | 1265 | 1225 | 1190 |
| Heating (SW1) | High Heat Airflow | 1520 | 1485 | 1450 | 1415 | 1375 | 1335 | 1300 | 1265 | 1225 | 1190 |
|            | Low Heat Airflow | 1055 | 1065 | 1080 | 1075 | 1065 | 1050 | 1045 | 1035 | 1025 | 1005 |

*See Notes following table*
<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Clg/CF Switch Settings</th>
<th>External Static Pressure (ESP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SW-3</strong></td>
<td></td>
<td>0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0</td>
</tr>
<tr>
<td><strong>080-20</strong></td>
<td></td>
<td>1745 1755 1755 1750 1755 1745 1725 1705 1685</td>
</tr>
<tr>
<td>Clg Default: OFF OFF OFF</td>
<td></td>
<td>See note 4</td>
</tr>
<tr>
<td>CF Default: OFF OFF OFF</td>
<td></td>
<td>See note 4</td>
</tr>
<tr>
<td><strong>Cooling (SW2)</strong></td>
<td></td>
<td>700 710 750 725 750</td>
</tr>
<tr>
<td><strong>Cont Fan (SW3)</strong></td>
<td></td>
<td>1215 1220 1245 1235 1225 1220 1235 1235</td>
</tr>
<tr>
<td>Clg SW2:</td>
<td></td>
<td>1920 1920 1945 1945 1945 1960 1950 1940 1915 1900</td>
</tr>
<tr>
<td>Heating (SW1)</td>
<td></td>
<td>1340 1355 1370 1385 1380 1400 1400 1385 1380</td>
</tr>
<tr>
<td>Low Heat Airflow</td>
<td></td>
<td>1080 1115 1115 1120 1125 1135 1125 1120 1125 1110</td>
</tr>
<tr>
<td><strong>Unit Size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>100-22</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clg Default: OFF OFF OFF</td>
<td></td>
<td>See note 4</td>
</tr>
<tr>
<td>CF Default: OFF OFF OFF</td>
<td></td>
<td>See note 4</td>
</tr>
<tr>
<td><strong>Cooling (SW2)</strong></td>
<td></td>
<td>750 740 745 730 715</td>
</tr>
<tr>
<td><strong>Cont Fan (SW3)</strong></td>
<td></td>
<td>1280 1285 1305 1305 1305 1305 1295 1300 1290 1285</td>
</tr>
<tr>
<td>Clg SW2:</td>
<td></td>
<td>2160 2185 2175 2170 2160 2150 2135 2120 2085 2020</td>
</tr>
<tr>
<td>Heating (SW1)</td>
<td></td>
<td>1570 1575 1595 1595 1600 1605 1600 1600 1590 1575</td>
</tr>
<tr>
<td>Low Heat Airflow</td>
<td></td>
<td>1365 1385 1395 1395 1395 1395 1395 1395 1395 1380</td>
</tr>
</tbody>
</table>

*See Notes following table
Table 7 - Cooling and Heating Air Delivery - CFM (Bottom Return with Filter) (Continued)

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Clg/CF Switch Settings</th>
<th>External Static Pressure (ESP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWx-3</td>
<td>SWx-2</td>
<td>SWx-1</td>
</tr>
<tr>
<td>120-22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clg Default: OFF OFF OFF

<table>
<thead>
<tr>
<th>CF Default:</th>
<th>OFF OFF OFF</th>
<th>930 925 915 900 885</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>660</td>
</tr>
</tbody>
</table>

|                  |             | 680                 |
|                  |             | 700                 |
|                  |             | 720                 |
|                  |             | 740                 |

|                  |             | 760                 |
|                  |             | 780                 |
|                  |             | 800                 |
|                  |             | 820                 |

|                  |             | 840                 |
|                  |             | 860                 |
|                  |             | 880                 |
|                  |             | 900                 |

|                  |             | 920                 |
|                  |             | 940                 |
|                  |             | 960                 |
|                  |             | 980                 |

|                  |             | 1000                |
|                  |             | 1020                |
|                  |             | 1040                |
|                  |             | 1060                |

|                  |             | 1080                |
|                  |             | 1100                |
|                  |             | 1120                |
|                  |             | 1140                |

|                  |             | 1160                |
|                  |             | 1180                |
|                  |             | 1200                |
|                  |             | 1220                |

|                  |             | 1240                |
|                  |             | 1260                |
|                  |             | 1280                |
|                  |             | 1300                |

|                  |             | 1320                |
|                  |             | 1340                |
|                  |             | 1360                |
|                  |             | 1380                |

|                  |             | 1400                |
|                  |             | 1420                |
|                  |             | 1440                |
|                  |             | 1460                |

|                  |             | 1480                |
|                  |             | 1500                |

|                  |             | 1520                |
|                  |             | 1540                |
|                  |             | 1560                |
|                  |             | 1580                |

|                  |             | 1600                |

|                  |             | 1620                |
|                  |             | 1640                |
|                  |             | 1660                |
|                  |             | 1680                |

|                  |             | 1700                |

|                  |             | 1720                |
|                  |             | 1740                |
|                  |             | 1760                |
|                  |             | 1780                |

|                  |             | 1800                |
|                  |             | 1820                |
|                  |             | 1840                |
|                  |             | 1860                |

|                  |             | 1880                |
|                  |             | 1900                |
|                  |             | 1920                |
|                  |             | 1940                |

|                  |             | 1960                |
|                  |             | 1980                |

1. Set SW1-5 to ON for nominal 400 CFM/ton (+15% airflow).
   Set SW4-3 to ON for nominal 325 CFM/ton (-7% airflow).
   Set both SW1-5 and SW4-3 to ON for nominal 370 CFM/ton (+7% airflow).
   The above adjustments in airflow are subject to motor horsepower range/capacity.

2. Maximum cooling airflow is achieved when switches SW2-1, SW2-2, SW2-3 and SW1-5 are set to ON, and SW4-3 is set to OFF.
3. All heating CFM's are when low heat rise adjustment switch (SW1-3) and comfort/efficiency adjustment switch (SW1-4) are both set to OFF.
4. Ductwork must be sized for high-heating CFM within the operational range of ESP. Operation within the blank areas of the chart is not recommended because high-heat operation will be above 1.0 ESP.
5. All airflows on 21” (533 mm) casing size furnaces are 5% less on side return only installations.
6. Side returns for 24.5” (622 mm) casing sizes require two sides, or side and bottom, to allow sufficient airflow at the return of the furnace.
7. Airflows over 1800 CFM require bottom return, two-side return, or bottom and side return; otherwise excessive watt draws may result. A minimum filter size of 20” x 25” (508 x 635 mm) is required.
**GAS PIPING**

**WARNING**

**FIRE OR EXPLOSION HAZARD**

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

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

**WARNING**

**FIRE OR EXPLOSION HAZARD**

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

Use proper length of pipe to avoid stress on gas control manifold and gas valve.

**WARNING**

**FIRE OR EXPLOSION HAZARD**

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

Gas valve inlet and/or inlet pipe must remain capped until gas supply line is permanently installed to protect the valve from moisture and debris. Also, install a sediment trap in the gas supply piping at the inlet to the gas valve.

Gas piping must be installed in accordance with national and local codes. Refer to current edition of NFPA in Canada. Refer to current edition of the NFPA in Canada. Installations must be made in accordance with all authorities having jurisdiction. If possible, the gas supply line should be a separate line running directly from the meter to the furnace.

**NOTE:** In the state of Massachusetts:

1. Gas supply connections MUST be performed by a licensed plumber or gas fitter.
2. When flexible connectors are used, the maximum length shall not exceed 36 in. (915 mm).
3. When lever handle type manual equipment shutoff valves are used, they shall be T-handle valves.
4. The use of copper tubing for gas piping is NOT approved by the state of Massachusetts.

Refer to Table 8 for recommended gas pipe sizing. Risers must be used to connect to the furnace and to the meter. Support all gas piping with appropriate straps, hangers, etc. Use a minimum of 1 hanger every 6 ft. (1.8 M). Joint compound (pipe dope) should be applied sparingly and only to male threads of joints. Pipe dope must be resistant to the action of propane gas.

An accessible manual equipment shutoff valve MUST be installed external to the furnace casing and within 6 ft. (1.8 M) of the furnace.

Install a sediment trap in riser leading to the furnace as shown in Fig. 30. Connect a capped nipple into lower end of tee. Capped nipple shall extend below level of furnace gas controls. Place a ground joint union between furnace gas control valve and exterior manual equipment gas shutoff valve.

A 1/8-in. (3 mm) NPT plugged tapping, accessible for test gauge connection, MUST be installed immediately upstream of gas supply connection to the furnace. Place a ground joint union between furnace gas control valve and exterior manual equipment shutoff valve.

Piping should be pressure and leak tested in accordance with the current edition of the NFPA in the United States, local, and national plumbing and gas codes before the furnace has been connected. Refer to current edition of the NFPA in Canada. After all connections have been made, purge lines and check for leakage at the furnace prior to operating the furnace.

**NOTE:** The furnace gas control valve inlet pressure tap connection is suitable to use as test gauge connection providing test pressure DOES NOT exceed maximum 0.5 psig (14-In. W.C.) stated on gas control valve. (See Fig. 51.)

If pressure exceeds 0.5 psig (14-In. W.C.), gas supply pipe must be disconnected from the furnace and capped before and during supply pipe pressure test. If test pressure is equal to or less than 0.5 psig (14-In. W.C.), turn off electric shutoff switch located on furnace gas control valve and accessible manual equipment shutoff valve before and during supply pipe pressure test. After all connections have been made, purge lines and check for leakage at the furnace prior to operating the furnace.

The gas supply pressure shall be within the maximum and minimum inlet supply pressures marked on the rating plate with the furnace burners ON and OFF.

Some installations require gas entry on the right side of the furnace (as viewed in upflow). (See Fig. 29.)

**Gas Pipe Grommet**

For direct vent (2-pipe) applications, the knockout for the gas pipe must be sealed to prevent air leakage. Remove the knockout, install the grommet in the knockout, then insert the gas pipe. The grommet is included in the loose parts bag. See Fig. 29.
Table 8 – Maximum Capacity of Pipe

<table>
<thead>
<tr>
<th>NOMINAL LENGTH OF PIPE</th>
<th>NOMINAL IRON PIPE SIZE (IN. (MM))</th>
<th>10 (3.0)</th>
<th>20 (6.0)</th>
<th>30 (9.1)</th>
<th>40 (12.1)</th>
<th>50 (15.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Pipe</td>
<td>1/2 (13)</td>
<td>175</td>
<td>120</td>
<td>97</td>
<td>82</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>3/4 (19)</td>
<td>360</td>
<td>250</td>
<td>200</td>
<td>170</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td>1 (25)</td>
<td>680</td>
<td>465</td>
<td>375</td>
<td>320</td>
<td>285</td>
</tr>
<tr>
<td></td>
<td>1-1/4 (32)</td>
<td>1400</td>
<td>950</td>
<td>770</td>
<td>680</td>
<td>580</td>
</tr>
<tr>
<td></td>
<td>1-1/2 (39)</td>
<td>2100</td>
<td>1460</td>
<td>1180</td>
<td>990</td>
<td>900</td>
</tr>
</tbody>
</table>

* Cubic ft of gas per hr for gas pressures of 0.5 psig (14-in. W.C.) or less and a pressure drop of 0.5-in. W.C. (based on a 0.60 specific gravity gas). Ref: Table 8 above and 6.2 of NFPA54/ANSI Z223.1–2009.

![Fig. 29 - Gas Entry](image)


**ELECTRICAL CONNECTIONS**

**WARNING**

**ELECTRICAL SHOCK HAZARD**

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

Blower door switch opens 115-v power to control. No component operation can occur. Do not bypass or close switch with blower door removed.

See Fig. 34 for field wiring diagram showing typical field 115-v wiring. Check all factory and field electrical connections for tightness.

Field-supplied wiring shall conform with the limitations of 63°F (33°C) rise.

**WARNING**

**ELECTRICAL SHOCK AND FIRE HAZARD**

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

The cabinet MUST have an uninterrupted or unbroken ground according to NEC ANSI/NFPA 70–2011 or local codes to minimize personal injury if an electrical fault should occur. In Canada, refer to Canadian Electrical Code CSA C22.1. This may consist of electrical wire, conduit approved for electrical ground or a listed, grounded power cord (where permitted by local code) when installed in accordance with existing electrical codes. Refer to the power cord manufacturer’s ratings for proper wire gauge. Do not use gas piping as an electrical ground.

**CAUTION**

**FURNACE MAY NOT OPERATE HAZARD**

Failure to follow this caution may result in intermittent furnace operation.

Furnace control must be grounded for proper operation or else control will lock out. Control must remain grounded through green/yellow wire routed to gas valve and manifold bracket screw.

**115-V Wiring**

Furnace must have a 115-v power supply properly connected and grounded.

**WARNING**

**ELECTRICAL SHOCK HAZARD**

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

Blower door switch opens 115-v power to control. No component operation can occur. Do not bypass or close switch with blower door removed.

Verify that the voltage, frequency, and phase correspond to that specified on unit rating plate. Also, check to be sure that service provided by utility is sufficient to handle load imposed by this equipment. Refer to rating plate or Table 9 for equipment electrical specifications.

**U.S.A. Installations:** Make all electrical connections in accordance with the current edition of the National Electrical Code (NEC) ANSI/NFPA 70 and any local codes or ordinances that might apply.

**Canada Installations:** Make all electrical connections in accordance with the current edition of the Canadian Electrical Code CSA C22.1 and any local codes or ordinances that might apply.

**FIRE HAZARD**

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

Do not connect aluminum wire between disconnect switch and furnace. Use only copper wire. See Fig. 32.
The J-Box is used when field line voltage electrical connections are made to the furnace wiring harness inside the furnace casing. The J-Box is not required if a field-supplied electrical box is attached to the outside of the furnace casing and the box is grounded to the green ground wire of the main wiring harness and the earth ground of the field electrical supply.

The J-Box cover, mounting bracket and screws are shipped in the loose parts bag included with the furnace. The J-Box can be mounted on the left or right side of the casing, as viewed from the upflow position.

Remove the J-Box cover and mounting bracket from the loose parts bag. Select a 7/8-in. (22 mm) knockout on the desired side of the casing. Remove the knockout from the casing. Drill two (2) 1/8-in. (3 mm) pilot holes in the casing dimples by the desired 7/8-in. (22 mm) knockout.

Align the J-Box mounting bracket against the inside of the casing and secure the mounting bracket with the screws. (See Fig. 31.)

Electrical Box on Furnace Casing Side

NOTE: Check that duct on side of furnace will not interfere with installed electrical box.

1. Fasten a field-supplied external electrical box to the outside of the casing by driving two field-supplied screws from inside electrical box into casing. (See Fig. 32.)

2. Route field power wiring into external electrical box.

3. Pull furnace power wires through 1/2-in. (12 mm) diameter hole in J-Box. If necessary, loosen power wires from strain-relief wire-tie on furnace wiring harness.

4. Connect any code required external disconnect(s) to field power wiring.

5. Route external field power wires through holes in electrical box and casing.

6. Connect field ground wire and factory ground wire to green ground screw on J-Box mounting bracket as shown in Fig. 31.

7. Connect field power and neutral leads to furnace power leads as shown in Fig. 34.

8. Attach furnace J-Box cover to mounting bracket with screws supplied in loose parts bag. Do not pinch wires between cover and bracket.

9. Complete external disconnect wiring and installation. Connect line voltage leads as shown in Fig. 32. Use best practices (NEC in U.S.A. for wire bushings, strain relief, etc., CANADA: Canadian Electrical Code CSA C22.1)

Power Cord Installation in Furnace J-Box

NOTE: Power cords must be able to handle the electrical requirements listed in Table 9. Refer to power cord manufacturer's listings.

1. Install J-Box mounting bracket to inside of furnace casing. (See Fig. 31.)

2. Route listed power cord through 7/8-in. (22 mm) diameter hole in casing and J-Box bracket.

3. Secure power cord to J-Box bracket with a strain relief bushing or a connector approved for the type of cord used.

4. Pull furnace power wires through 1/2-in. (12 mm) diameter hole in J-Box. If necessary, loosen power wires from strain—relief wire—tie on furnace wiring harness.

5. Connect field ground wire and factory ground wire to green ground screw on J-Box mounting bracket as shown in Fig. 31.

6. Connect power cord power and neutral leads to furnace power leads as shown in Fig. 34.

7. Attach furnace J-Box cover to mounting bracket with screws supplied in loose parts bag. Do not pinch wires between cover and bracket. (See Fig. 31.)

BX Cable Installation in Furnace J-Box

1. Install J-Box mounting bracket to inside of furnace casing. See Fig. 31.

2. Route BX connector through 7/8-in. (22 mm) diameter hole in casing and J-Box bracket.

3. Secure BX cable to J-Box bracket with connectors approved for the type of cable used.

4. Connect field ground wire and factory ground wire to green ground screw on J-Box mounting bracket as shown in Fig. 31.

5. Connect field power and neutral leads to furnace power leads, as shown in Fig. 34.

6. Attach furnace J-Box cover to mounting bracket with screws supplied in loose parts bag. Do not pinch wires between cover and bracket.

24-V Wiring

Make field 24-v connections at the 24-v terminal strip. (See Fig. 35.) Connect terminal Y/Y2 as shown in Fig. 34 for proper cooling operation. Use only AWG No. 18, color-coded, copper thermostat wire.

NOTE: Use AWG No. 18 color-coded copper thermostat wire for lengths up to 100 ft. (30.5 m). For wire lengths over 100 ft., use AWG No. 16 wire.

The 24-v circuit contains an automotive-type, 3-amp, fuse located on the control. Any direct shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use ONLY a 3-amp. fuse of identical size. See Fig. 35.

Thermostats

A single stage heating and cooling thermostat can be used with the furnace. The furnace control board CPU will control the furnace and outdoor unit staging. A two stage heating and cooling thermostat can also be used to control the staging. For two stage thermostat control of the furnace staging, turn SW1-2 ON at the furnace control board. For two stage thermostat control of a 2-stage outdoor unit, remove the ACRD jumper from the furnace control board. Refer to typical thermostat wiring diagrams and the Sequence of Operation section for additional details. Consult the thermostat installation instructions for specific information about configuring the thermostat. See Fig. 35 and 36.

Accessories (See Fig. 33 and 35.)

1. Electronic Air Cleaner (EAC)
   Connect an accessory Electronic Air Cleaner (if used) using 1/4-in. female quick connect terminals to the two male 1/4-in. quick-connect terminals on the control board marked EAC-1 and EAC-2. The terminals are rated for 115VAC, 1.0 amps maximum and are energized during blower motor operation.

2. Humidifier (HUM)
   The HUM terminal is a 24 VAC output, energized when the blower is operating during a call for heat.
Connect an accessory 24 VAC, 0.5 amp. maximum humidifier (if used) to the ¼-in. male quick-connect HUM terminal and COM-24V screw terminal on the control board thermostat strip.

**NOTE:** If the humidifier has its own 24 VAC power supply, an isolation relay may be required. Connect the 24 VAC coil of the isolation relay to the HUM and COM/24V screw terminal on the control board thermostat strip. (See Fig. 33.)

3. **Communication Connector (communication connection)**
   This connection is used when the furnace is controlled by an optional communicating User Interface instead of a standard thermostat. The communication plug is supplied with the User Interface. Refer to the instructions supplied with the User Interface for complete details. See Fig. 35.

4. **Outside Air Thermistor (OAT)**
   The OAT connection is used in conjunction with communicating User Interface. It is not required when the furnace is controlled by a standard type thermostat. Refer to the instructions supplied with the User Interface for complete details.

**Alternate Power Supplies**

This furnace is designed to operate on utility generated power which has a smooth sinusoidal waveform. If the furnace is to be operated on a generator or other alternate power supply, the alternate power supply must produce a smooth sinusoidal waveform for compatibility with the furnace electronics. The alternate power supply must generate the same voltage, phase, and frequency (Hz) as shown in Table 9 or the furnace rating plate.

Power from an alternate power supply that is non-sinusoidal may damage the furnace electronics or cause erratic operation.

Contact the alternate power supply manufacturer for specifications and details.
### Table 9 – Electrical Data

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>VOLTS–HERTZ–PHASE</th>
<th>OPERATING VOLTAGE RANGE*</th>
<th>MAXIMUM UNIT AMPS</th>
<th>UNIT AMPACITY#</th>
<th>MINIMUM WIRE SIZE AWG</th>
<th>MAXIMUM WIRE LENGTH FT (M)†</th>
<th>MAXIMUM FUSE OR CKT BKR AMPS†</th>
</tr>
</thead>
<tbody>
<tr>
<td>080–14</td>
<td>115–60–1</td>
<td>127</td>
<td>8.5</td>
<td>11.5</td>
<td>14</td>
<td>32 (9.8)</td>
<td>15</td>
</tr>
<tr>
<td>080–14</td>
<td>115–60–1</td>
<td>127</td>
<td>8.5</td>
<td>11.5</td>
<td>14</td>
<td>32 (9.8)</td>
<td>15</td>
</tr>
<tr>
<td>080–20</td>
<td>115–60–1</td>
<td>127</td>
<td>13.6</td>
<td>17.9</td>
<td>12</td>
<td>32 (9.8)</td>
<td>20</td>
</tr>
<tr>
<td>100–22</td>
<td>115–60–1</td>
<td>127</td>
<td>13.7</td>
<td>18.0</td>
<td>12</td>
<td>31 (9.4)</td>
<td>20</td>
</tr>
<tr>
<td>120–22</td>
<td>115–60–1</td>
<td>127</td>
<td>13.7</td>
<td>18.0</td>
<td>12</td>
<td>31 (9.4)</td>
<td>20</td>
</tr>
</tbody>
</table>

* Permissible limits of the voltage range at which the unit operates satisfactorily.

# Unit ampacity = 125 percent of largest operating component's full load amps plus 100 percent of all other potential operating components' (EAC, humidifier, etc.) full load amps.

† Time–delay type is recommended.

‡ Length shown is as measured one way along wire path between furnace and service panel for maximum 2 percent voltage drop.

---

**Fig. 31 - Installing J-Box (When Used)**

**Fig. 32 - Field-Supplied Electrical Box on Furnace Casing**
Fig. 33 - Field-supplied Isolation Relay for Humidifiers with Internal Power Supply

Fig. 34 - Typical Two-Stage Field Wiring Diagram
Fig. 35 - Example of Variable Speed Furnace Control
# Thermostat Wiring Diagrams

**Modulating and 2-Stage Furnace with Single-Speed Air Conditioner**

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>Two-Stage Furnace</th>
<th>Single-Speed Air Conditioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stage 2</td>
<td>OW2</td>
<td>Y2</td>
</tr>
<tr>
<td>Heat Stage 1</td>
<td>Y1W2</td>
<td>Y1</td>
</tr>
<tr>
<td>Cool Stage 1</td>
<td>Y1W1</td>
<td>Y1</td>
</tr>
<tr>
<td>Cool Stage 2</td>
<td>Y1Y2</td>
<td>Y2</td>
</tr>
<tr>
<td>Fan</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>24 VAC Hot</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Dehumidify</td>
<td>D</td>
<td>Com</td>
</tr>
<tr>
<td>24 VAC Comm</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Humidify</td>
<td>HUM</td>
<td>Humidifier (24 VAC)</td>
</tr>
</tbody>
</table>

See notes 2, 5, 7, 10, 11, and 16

**Modulating and 2-Stage Furnace with Single-Speed Heat Pump**

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>Two-Stage Furnace</th>
<th>Single-Speed Heat Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stage 1</td>
<td>Y1W2</td>
<td>W2</td>
</tr>
<tr>
<td>Heat Stage 2</td>
<td>Y1W1</td>
<td>W1</td>
</tr>
<tr>
<td>Heat Stage 3</td>
<td>Y1Y2</td>
<td>Y1</td>
</tr>
<tr>
<td>Fan</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>24 VAC Hot</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Dehumidify</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>24 VAC Comm</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Humidify</td>
<td>HUM</td>
<td>Humidifier (24 VAC)</td>
</tr>
</tbody>
</table>

See notes 1, 2, 4, 6, 7, 9, 10, 11, 15, and 16

**Modulating and 2-Stage Furnace with Two-Speed Air Conditioner**

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>Two-Stage Furnace</th>
<th>Two-Speed Air Conditioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stage 2</td>
<td>OW2</td>
<td>W2</td>
</tr>
<tr>
<td>Cool Stage 1</td>
<td>Y1W2</td>
<td>Y1</td>
</tr>
<tr>
<td>Heat Stage 1</td>
<td>Y1W1</td>
<td>Y1</td>
</tr>
<tr>
<td>Cool Stage 2</td>
<td>Y1Y2</td>
<td>Y2</td>
</tr>
<tr>
<td>Fan</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>24 VAC Hot</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Dehumidify</td>
<td>D</td>
<td>Com</td>
</tr>
<tr>
<td>24 VAC Comm</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Humidify</td>
<td>HUM</td>
<td>Humidifier (24 VAC)</td>
</tr>
</tbody>
</table>

See notes 2, 5, 8, 10, 11, 12 and 16

**Modulating and 2-Stage Furnace with Two-Speed Heat Pump**

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>Two-Stage Furnace</th>
<th>Two-Speed Heat Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Stage 2</td>
<td>OW2</td>
<td>Y2</td>
</tr>
<tr>
<td>Heat Stage 1</td>
<td>Y1W2</td>
<td>Y1</td>
</tr>
<tr>
<td>Heat Stage 3</td>
<td>Y1W1</td>
<td>W2</td>
</tr>
<tr>
<td>Heat Stage 2</td>
<td>Y1Y2</td>
<td>Y1</td>
</tr>
<tr>
<td>Fan</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>24 VAC Hot</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Dehumidify</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>24 VAC Comm</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Humidify</td>
<td>HUM</td>
<td>Humidifier (24 VAC)</td>
</tr>
</tbody>
</table>

See notes 1, 2, 3, 4, 6, 8, 9, 10, 12, 13, 15, and 16

---

Fig. 36 - Thermostat Wiring Diagrams
NOTES FOR THERMOSTAT WIRING DIAGRAMS

1. Heat pump MUST have a high pressure switch for dual fuel applications.
2. Refer to outdoor equipment Installation Instructions for additional information and setup procedure.
3. If the heat pump date code is 1501E or earlier, select the “ZONE” position on the two speed heat pump control. Heat pumps with date code 1601E and later do not have or require a “ZONE” selection.
4. Outdoor Air Temperature Sensor must be attached in all dual fuel applications.
5. Configure the thermostat for air conditioner installations. Refer to thermostat instructions.
6. Configure thermostat for heat pump installations. Refer to thermostat instructions.
7. Configure thermostat for single-stage compressor operation. Refer to thermostat instructions.
8. Configure thermostat for two-stage compressor operation. Refer to thermostat instructions.
10. NO connection should be made to the furnace HUM terminal when using a thermostat with a 24 volt humidifier output.
11. Optional connection - If wire is connected to W2 on furnace control board, either dip switch SW1-2 or SW1-LHT on furnace control should be set in ON position to allow thermostat to control furnace staging.
12. Optional connection - If wire is connected, ACRDJ jumper on furnace control should be removed to allow thermostat to control outdoor unit staging.
13. Furnace must control its own staging operation via furnace control algorithm. This is factory default.
14. The RVS Sensing terminal “L” should not be connected. This is used internally to sense defrost operation.
15. If thermostat has internal control of heat pump balance point, DO NOT SELECT the “FURNACE INTERFACE” or “BALANCE POINT” option on the two-speed heat pump control board. Refer to thermostat instructions.
16. Configure Dehumidify function to remove 24 VAC from Dehum terminal on a demand to dehumidify.
VENTING

Furnace is set in place in the required orientation.

Special Venting Requirements for Installations in Canada

Installation in Canada must conform to the requirements of CAN/CSA B149 code. Vent systems must be composed of pipe, fittings, cements, and primers listed to ULC S636. The special vent fittings and accessory concentric vent termination kits and accessory external drain trap have been certified to ULC S636 for use with those Royal Pipe and IPEX PVC vent components which have been certified to this standard. In Canada, the primer and cement must be of the same manufacturer as the vent system – GVS-65 Primer (Purple) for Royal Pipe or IPEX System 636, PVC/CPVC Primer, Purple Violet for Flue Gas Venting and GVS-65 PVC Solvent Cement for Royal Pipe or IPEX System 636(1/4), PVC Cement for Flue Gas Venting, rated Class IIA, 65 deg C. must be used with this venting system - do not mix primers and cements from one manufacturer with a vent system from a different manufacturer. Follow the manufacturer’s instructions in the use of primer and cement and never use primer or cement beyond its expiration date.

The safe operation, as defined by ULC S636, of the vent system is based on following these installation instructions, the vent system manufacturer’s installation instructions, and proper use of primer and cement. All fire stop and roof flashing used with this system must be UL listed material. Acceptability under Canadian standard CAN/CSA B149 is dependent upon full compliance with all installation instructions. Under this standard, it is recommended that the vent system be checked once a year by qualified service personnel.

The authority having jurisdiction (gas inspection authority, municipal building department, fire department, etc) should be consulted before installation to determine the need to obtain a permit.

*“IPEX System 636” is a trademark of IPEX Inc.

Consignes spéciales pour l’installation de ventilation au Canada


Bien suivre les indications du manufacturier lors de l’utilisation de l’appât et du ciment et ne pas utiliser ceux-ci si la date d’expiration est atteinte.

L’opération sécuritaire, tel que défini par ULC S636, du système de ventilation est basé sur les instructions d’installation suivantes, ainsi que l’usage approprié de l’appât et ciment. Tout arrêt feu et solin de toit utilisés avec ce système doivent être des matériaux listés UL. L’acceptation du standard Canadien CAN/CSA B149 est directement relié à l’installation conforme aux instructions citées ci-haut mentionnées. Le standard Canadien recommande l’inspection par un personnel qualifié et ce, une fois par année.

Les autorités ayant juridiction (inspecteurs de gaz, inspecteurs en bâtiments, département des incendies, etc) devraient être consultées avant l’installation afin de déterminer si un permis est requis.

WARNING

CARBON MONOXIDE POISONING HAZARD

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

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

1. Seal any unused openings in venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, NFPA 54/ANSI Z223.1–2009 and these instructions. In Canada, refer to CAN/CSA-B149.1–2010. 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.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, NFPA 54/ANSI Z223.1–2009. In Canada, refer to CAN/CSA–B149.1–2010.
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas–fired burning appliance to their previous conditions of use.

General

If this furnace replaces a furnace that was connected to a vent system or chimney, the vent or vent connectors of other remaining appliances may need to be re-sized. Vent systems or vent connectors of other appliances must be sized to the minimum size as determined using appropriate table found in the current edition of National Fuel Gas Code NFPA 54/ANSI Z–223.1. In Canada, refer to CAN/CSA–B149.1.

An abandoned masonry chimney may be used as a raceway for properly insulated and supported combustion-air (when applicable) and vent pipes. Each furnace must have its own set of combustion-air and vent pipes and be terminated individually, as shown in Fig. 47 for Direct Vent (2-Pipe) system or Fig. 48 for ventilated combustion air option.
A furnace shall not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

Other gas appliances with their own venting system may also use the abandoned chimney as a raceway providing it is permitted by local code, the current edition of the National Fuel Gas Code and the vent or liner manufacturer’s installation instructions. Care must be taken to prevent the exhaust gases from one appliance from contaminating the combustion air of other gas appliances.

Do not take combustion air from inside the chimney when using ventilated combustion air or single pipe vent option. These furnaces can be vented as either direct vent furnace, ventilated combustion air system or non-direct (single pipe) vent system. Each type of venting system is described below. Common venting between furnaces or other appliances prohibited.

**Materials**

**U.S.A.**

Combustion air and vent pipe, fittings, primers, and solvents must conform to American Standards Institute (ANSI) standards and American Society for Testing and Materials (ASTM) standards. See Table 11 for approved materials for use in the U.S.A.

**Canada**

Special Venting Requirements for Installations in Canada. Installation in Canada must conform to the requirements of CAN/CSA B149 code. Vent systems must be composed of pipe, fittings, cements, and primers listed to ULC S636.

**Venting Systems**

A factory accessory KGAVT vent termination kit must be used for all direct vent terminations. Termination kits are available for 2-in. or 3-in. pipe. See Table 10 for available options.

**Table 10 – Vent Termination Kit for Direct Vent (2-pipe) Systems**

<table>
<thead>
<tr>
<th>DIRECT VENT (2-PIPE) TERMINATION KIT</th>
<th>TERMINATION SYSTEM</th>
<th>DIAM. OF COMBUSTION AIR AND VENT PIPES – IN. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-in. (51 mm) Concentric Vent Kit</td>
<td>1-1/2 penetration of wall or roof</td>
<td>1.1-1/2, 2, or 2-1/2 (24, 51, 64 mm)</td>
</tr>
<tr>
<td>3-in. (76 mm) Concentric Vent Kit</td>
<td>2-1/2 penetration of wall or roof</td>
<td>2-1/2, 3 or 4 (64, 76, 102 mm)</td>
</tr>
<tr>
<td>2-in. (51 mm) Termination Bracket Kit</td>
<td>2-Pipe Termination System</td>
<td>1, 1-1/2 or 2 (25, 36, 51 mm)</td>
</tr>
<tr>
<td>3-in. (76 mm) Termination Bracket Kit</td>
<td>2-Pipe Termination System</td>
<td>2-1/2, 3 or 4 (64, 76, 102 mm)</td>
</tr>
</tbody>
</table>

**Direct Vent / 2-Pipe System**

In a direct-vent (2-pipe) system, all air for combustion is taken directly from outdoor atmosphere, and all flue products are discharged to outdoor atmosphere. Combustion-air and vent pipes must terminate outside structure, either through sidewall or roof. For vent termination clearance, refer to Fig. 45 for Direct Vent/2-Pipe system and Fig. 46 for Non-direct Vent/1-Pipe system. For exterior termination arrangements, refer to Fig. 47 for Direct Vent/2-Pipe system and Fig. 48 for Non-direct Vent/1-Pipe system.

Roof termination is preferred since it is less susceptible to damage or contamination, and it has less visible vent vapors. Sidewall terminations require sealing or shielding of building surfaces with a corrosive resistance material due to corrosive combustion products of vent system.

**NOTE:** (Direct Vent/2-Pipe system ONLY) A factory accessory termination kit MUST be used. See Table 10 for available options.

When determining appropriate location for termination, consider the following guidelines:

1. Comply with all clearance requirements stated in Fig. 45 or Fig. 46 per application.
2. Termination or termination kit should be positioned where vent vapors will not damage plants/shrubs or air conditioning equipment.
3. Termination or termination kit should be positioned so that it will not be affected by wind eddy, such as inside building corners, nor by recirculation of flue gases, airborne leaves, or light snow.
4. Termination or termination kit should be positioned where it will not be damaged by or subjected to foreign objects such as stones, balls, etc.
5. Termination or termination kit should be positioned where vent vapors are not objectionable.

**Direct Vent / 2-Pipe System**

Direct vent (2-pipe) vent and combustion air pipes must terminate outside the structure. Follow all clearances as shown Fig. 45.
Allowable vent and combustion air terminations are shown in Fig. 47.  

**Ventilated Combustion Air**  
The vent pipe for a Ventilated Combustion Air System must terminate outdoors. Follow all vent termination clearances shown in Fig. 46. Allowable vent terminations are shown in Fig. 48. The combustion air pipe terminates in a well-ventilated attic or crawl space. Follow the clearances as shown in Fig. 50.  
The combustion air pipe cannot terminate in attics or crawl spaces that use ventilation fans designed to operate in the heating season. If ventilation fans are present in these areas, the combustion air pipe must terminate outdoors as a Direct Vent System.  

**Non-Direct Vent / 1-Pipe System**  
The vent pipe for a Non Direct Vent (1-pipe) system must terminate outdoors. Follow all vent termination clearances shown in Fig. 46. Allowable vent terminations are shown in Fig. 48.  

A combustion air pipe to the outdoors is not required for a Non-Direct Vent System. A 12-in. long section of pipe with a tight radius 2-in. (50.8 mm) 90 degree elbow is required to be attached to the furnace.  

**Termination Requirements for the Provinces of Alberta and Saskatchewan**  
The Provinces of Alberta and Saskatchewan require a minimum unobstructed distance of 4 ft. (1.2 M) from the foundation to the property line of the adjacent lot for vent termination of any appliance with an input over 35,000 btuh. If there is less than 4 ft. (1.2 M) of unobstructed distance to the property line of the adjacent lot, no type of vent termination is permitted for appliances with inputs greater than 35,000 btuh.  

There are no additional restrictions on unobstructed distances greater than 8 ft. (2.4 M). All single, two-pipe and concentric vents may be used, providing all other Code and manufacturer’s requirements in these instructions are adhered to. Refer to the appropriate Vent Termination section above for locating the vent termination.  

If the unobstructed distance from the foundation to the property line of the adjacent lot is no less than 4 ft. (1.2 M) and no greater than 8 ft. (2.4 M), it will be necessary to redirect the flue gas plume. In this situation, a concentric vent kit cannot be used. A 2-pipe termination (or single pipe termination when permitted) that re-directs the flue gas away by use of an elbow or tee, certified to ULC S636 from the adjacent property line must be used. See Fig. 49.  

The concentric vent kit currently cannot be modified to attach an elbow to the vent portion of the rain cap. A tee attached to the rain cap could potentially direct the flue gas plume toward the intake air stream and contaminate the incoming combustion air for the furnace.  

Refer to Fig. 49 for terminations approved for use in Alberta and Saskatchewan.  

**Size the Vent and Combustion Air Pipes**  
**General**  
Furnace combustion air and vent pipe connections are sized for 2-in. (51 mm) pipe. Any pipe diameter change should be made outside furnace casing in vertical pipe. Any change in diameter to the pipe must be made as close to the furnace as reasonably possible.  

The Maximum Vent Length for the vent and combustion air pipe (when used) is determined from the Maximum Equivalent Vent Length in Table 13 or 15, minus the number of fittings multiplied by the deduction for each type of fitting used from Table 14.  

The measured length of pipe used in a single or 2-pipe termination is included in the total vent length. Include a deduction for a Tee when used for Alberta and Saskatchewan terminations. Concentric vent terminations, pipe lengths or elbows do not require a deduction from the Maximum Equivalent Vent Length.  

1. Measure the individual distance from the furnace to the termination for each pipe.  
2. Select a Maximum Equivalent Vent Length (MEVL) longer than the measured distance of the individual vent and combustion air connections to the vent termination.  
3. Count the number of elbows for each pipe.  
4. For each pipe, multiply the number of elbows by the equivalent length for the type of elbow used. Record the equivalent length of all the elbows for each pipe.  
5. If a Tee is used on the termination (Alberta and Saskatchewan, when required) record the equivalent length of the Tee used.  
6. Calculate each individual Maximum Vent Length by subtracting the equivalent lengths of the fittings of the individual vent and combustion air pipes from the Maximum Equivalent Vent Length shown in Table 13 and 15.  
7. If the Maximum Vent Length calculated is longer than the individual measured length of the vent pipe and combustion air pipe, then the diameter of pipe selected may be used.  
8. If the Maximum Vent Length calculated is shorter than the individual measured length of either the vent pipe or the combustion air pipe, recalculate the Maximum Vent Length using the next larger diameter pipe.  

**Note:** If the calculated Maximum Vent Length results in different diameter pipes for the vent and combustion air, select the larger diameter for both pipes.  

**Note:** If the Maximum Vent Length for diameter of the pipe selected is longer than the measured length and the equivalent length of all the fittings and terminations, recalculate using the next smaller diameter. If the recalculated Maximum Vent Length is longer than the measured length of the vent pipe and combustion air pipe, then that diameter of pipe selected may be used.  

When installing vent systems pipe lengths of 10 ft. (3.0 M) or less, use the smallest allowable pipe diameter. Do not use pipe size greater than required or incomplete combustion, flame disturbance, or flame sense lockout may occur.  

For vent systems longer than 10 ft. (3.0 M), any larger diameter show in Table 13 or 15 may be used.  

**Combustion Air and Vent Piping Insulation Guidelines**  
**Note:** Use closed cell, neoprene insulation or equivalent.  
The vent pipe may pass through unconditioned areas. The amount of exposed pipe allowed is shown in Table 12.  

1. Using winter design temperature (used in load calculations), find appropriate temperature for your application and furnace model.  
2. Determine the amount of total and exposed vent pipe.  
3. Determine required insulation thickness for exposed pipe length(s).  
4. When combustion air inlet piping is installed above a suspended ceiling, the pipe **MUST** be insulated with moisture resistant insulation such as Armaflex or other equivalent type of insulation.  
5. Insulate combustion air inlet piping when run in warm, humid spaces.  
6. Install the insulation per the insulation manufacturer’s installation instructions.
NOTE: Pipe length (ft. / M) specified for maximum pipe lengths located in unconditioned spaces cannot exceed total allowable pipe length as calculated from Table 13 or 15.

Configure the Furnace

**WARNING**

CARBON MONOXIDE POISONING HAZARD

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

To route the vent pipe and combustion air pipe through the furnace, the manufacturer supplied kit must be used. Failure to properly seal the blower compartment from the furnace vestibule could result in the circulation of carbon monoxide throughout the structure. The vent pipe and combustion air pipe must be a continuous pipe while passing through the blower compartment. Seals supplied in this kit must be installed per the instructions provided. Follow all procedures outlined in these instructions.

Install the Vent and Combustion Air Pipe

With the furnace installed in the required position, remove the desired knockouts from the casing. It will be necessary to remove one knockout for the vent pipe and the other knockout for the combustion air connection. (See Fig. 12.)

Use a flat blade screwdriver and tap on the knockout on opposite sides, where the knockout meets the casing. Fold the knockout down with duct pliers and work the knockout back and forth until it is removed. Trim any excess metal from the knockout with tin snips.

The vent elbow can be rotated to the required location on the casing if necessary. See Fig. 38. To rotate the vent elbow:

1. Loosen the clamp on the inlet of the vent elbow attached to the inducer.
2. Rotate the vent elbow to the required position. There are rounded notches in the vent elbow to align it with the inducer housing for each orientation.
3. Tighten the clamp around the vent elbow. Torque the clamp to 15 lb-in. See Fig. 39-42.

Installing the Vent Pipe Adapter and Combustion Air Pipe Adapter

**WARNING**

CARBON MONOXIDE POISONING HAZARD

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

To route the vent pipe and combustion air pipe through the furnace, the manufacturer supplied kit must be used. Failure to properly seal the blower compartment from the furnace vestibule could result in the circulation of carbon monoxide throughout the structure. The vent pipe and combustion air pipe must be a continuous pipe while passing through the blower compartment. Seals supplied in this kit must be installed per the instructions provided. Follow all procedures outlined in these instructions.

NOTE: The rubber coupling that attaches to the vent pipe adapter must be used. The adapter seals the vent pipe to the casing and reduces the strain on the vent elbow attached to the inducer.

1. Apply the gaskets to the vent pipe and combustion air pipe adapters. See Fig. 37.

NOTE: The vent pipe adapter has a larger ID than the combustion air pipe adapter.

2. Align the screw holes in the plastic vent pipe adapter with the dimples in the casing.
3. Pilot drill the screw holes for the adapter in the casing and attach the vent pipe adapter to the furnace with sheet metal screws.
4. Slide the end of the rubber vent coupling with notches in it over the standoffs on the vent pipe adapter.
5. Insert a length of vent pipe through the coupling into the outlet of the vent elbow.
6. Tighten the clamp around the outlet of the vent elbow. Torque the clamp to 15 lb-in.

Install the remaining vent and combustion air pipes as shown below. It is recommended that all pipes be cut, prepared, and preassembled before permanently cementing any joint.

1. Working from furnace to outside, cut pipe to required length(s).
2. Deburr inside and outside of pipe.
3. Chamfer outside edge of pipe for better distribution of primer and cement.
4. Clean and dry all surfaces to be joined.
5. Check dry fit of pipe and mark insertion depth on pipe.
6. Insert the vent pipe into the vent elbow.
7. Torque clamp on vent elbow 15 lb-in.
8. Torque clamp on vent coupling 15 lb-in.
9. Insert the combustion air pipe into the adapter.
10. Pilot drill a screw hole through the adapter into the combustion air pipe and secure the pipe to the adapter with sheet metal screws.
11. Seal around the combustion air pipe with silicone or foil tape.
12. After pipes have been cut and preassembled, apply generous layer of cement primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply approved cement to end of pipe and fitting socket (over primer). Apply cement in a light, uniform coat on inside of socket to prevent buildup of excess cement. Apply second coat.
13. While cement is still wet, twist pipe into socket with 1/4-in. turn. Be sure pipe is fully inserted into fitting socket.
14. Wipe excess cement from joint. A continuous bead of cement will be visible around perimeter of a properly made joint.
15. Handle pipe joints carefully until cement sets.
16. Horizontal portions of the venting system shall be supported to prevent sagging. Support combustion air piping and vent piping a minimum of every 5 ft. (1.5M) for SDR-21 or -26 PVC using perforated metal hanger or commercially available hangars designed to support plastic pipe.
17. Prevent condensate from accumulating in the pipes by sloping the combustion air piping and vent piping downward towards furnace a minimum of 1/4-in. per linear ft. with no sags between hangers.
18. Complete the vent and combustion air pipe installation by connecting the concentric vent or by installing the required termination elbows as shown in Fig. 47, 48 and 49.

For Ventilated Combustion Air Termination, See Fig. 50.

19. Use appropriate methods to seal openings where combustion air pipe and vent pipe pass through roof or sidewall.

Optional Installation of the vent pipe

This option provides a disconnect point for the vent pipe. The vent pipe must be cemented to the plastic vent pipe adapter to maintain a sealed vestibule. See Fig. 43.

1. Insert a length of vent pipe through the casing into the outlet of the vent elbow.
2. Slide the plastic vent pipe adapter over the length of the vent pipe down to the furnace casing. Mark the pipe where it is flush with the outlet of the adapter.

3. Remove the pipe from the furnace and the adapter and cut off any excess pipe.

4. Clean and prime the end of the pipe that is flush with the vent adapter with a primer that is appropriate for the type of pipe being used.

5. Re-insert the pipe through the casing into the vent elbow.

6. Tighten the clamp around the outlet of the vent elbow. Torque the clamp to 15 lb-in.

7. Apply cement to the end of the pipe and to the inside of the plastic vent adapter.

8. Slide the adapter over the vent pipe and align the screw holes in the adapter with the dimples in the furnace casing.

9. Pilot drill 1/8-in. screw holes for the adapter in the casing and secure the adapter to the furnace with sheet metal screws.

10. Loosen the clamps on the rubber vent coupling.

11. Slide the end of the coupling with notches in it over the standoff in the vent pipe adapter.

12. Tighten the clamp of the coupling over the vent pipe adapter. Torque the lower clamp around the vent pipe adapter to 15 lb-in.

13. Pilot drill a 1/8-in. hole in the combustion air pipe adapter.

14. Complete the vent and combustion air pipe as shown in "Install the Vent and Combustion Air Pipe"

### Installing the Vent Termination

#### Roof Terminations

A roof termination of any type will require a 4-in. (102 mm) flashing for a 2 in. (51 mm) concentric vent or a 5-in. diameter (127 mm) flashing for a 3-in. (76 mm) concentric vent kit. For two-pipe or single pipe vent systems, a flashing for each pipe of the required diameter will be necessary.

It is recommended that the flashing be installed by a roofer or competent professional prior to installing the concentric vent. The terminations can be installed on a flat or pitched roof.

#### Concentric Vent

Single or multiple concentric vent must be installed as shown in Fig. 47. Maintain the required separation distance between vents or pairs of vents as shown in Fig. 47 and all clearance shown in Fig. 45. Cut one 4-in. (102 mm) diameter hole for 2-in. (51 mm) kit, or one 5-in. (127 mm) diameter hole for 3-in. (76 mm) kit in the desired location.

Loosely assemble concentric vent/combustion air termination components together using instructions in kit.

Slide assembled kit with rain shield REMOVED through hole in wall or roof flashing.

**NOTE:** Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole.

Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

#### Two-Pipe and Single-Pipe Terminations

Single and two pipe vent must be installed as shown in Fig. 47 and 48. Maintain the required separation distance between vents or pairs of vents as shown in Fig. 47 and 48, and all clearance shown in Fig. 45 and 46.

Cut the required number of holes in the roof or sidewall for vent and (when used) combustion air pipes. Sidewall holes for two-pipe vent terminations should be side-by-side, allowing space between the pipes for the elbows to fit on the pipes.

Holes in the roof for two pipe terminations should be spaced no more than 18 in. (457 mm) apart.

Termination elbows will be installed after the vent and (if used) combustion air pipe is installed.

### Sidewall Terminations

#### Concentric Vent

Determine an appropriate location for termination kit using the guidelines provided in section “Locating The Vent Termination” in this instruction.

1. Cut one 4-in. diameter hole for 2-in. kit, or one 5-in. diameter hole for 3-in. kit.

2. Loosely assemble concentric vent/combustion air termination components together using instructions in kit.

3. Slide assembled kit with rain shield REMOVED through hole.

**NOTE:** Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole.

4. Locate assembly through sidewall with rain shield positioned no more than 1-in. (25 mm) from wall as shown in Fig. 47.

5. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

#### 2-Pipe and 1-Pipe Vent Termination

Determine an appropriate location for termination kit using the guidelines provided in section “Locating The Vent Termination” in this instruction.

1. Cut 2 holes, 1 for each pipe, of appropriate size for pipe size being used.

2. Loosely install elbow in bracket and place assembly on combustion-air pipe.

3. Install bracket as shown in Fig. 47 and 49.

**NOTE:** For applications using vent pipe option indicated by dashed lines in Fig. 47 and 48, rotate vent elbow 90° from position.

4. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

#### (Direct Vent / 2-Pipe System ONLY)

When 2 or more furnaces are vented near each other, 2 vent terminations may be installed as shown in Fig. 47, but next vent termination must be at least 36 in. (914 mm) away from first 2 terminations. It is important that vent terminations be made as shown in Fig. 47 to avoid recirculation of flue gases.

#### Inducer Outlet Restrictor

To improve efficiency and operation of 40,000 BTUH input models on very short vent systems, an inducer outlet restrictor is required to be installed on the outlet of the inducer assembly. The outlet restrictor is shipped in the loose parts bag.

To determine if the outlet restrictor is required, see Table 13 and Table 15. Failure to use an outlet choke when required may result in flame disturbance or flame sense lockout.

To install the outlet restrictor:

1. Remove the vent elbow from the inducer outlet.

2. Align the lock tabs on the outlet restrictor with the slots on inside outlet of the inducer assembly.

3. Snap the outlet restrictor in place.

4. Re-install the vent elbow.

5. Torque vent elbow clamp 15-lb-in.
<table>
<thead>
<tr>
<th>ASTM SPECIFICATION (MARKED ON MATERIAL)</th>
<th>MATERIAL</th>
<th>PIPE</th>
<th>FITTINGS</th>
<th>SOLVENT CEMENT AND PRIMERS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1527</td>
<td>ABS</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>Schedule-40</td>
</tr>
<tr>
<td>D1785</td>
<td>PVC</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>Schedule-40</td>
</tr>
<tr>
<td>D2235</td>
<td>For ABS</td>
<td>—</td>
<td>—</td>
<td>Solvent Cement</td>
<td>For ABS</td>
</tr>
<tr>
<td>D2241</td>
<td>PVC</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>SDR–21 &amp; SDR–26</td>
</tr>
<tr>
<td>D2466</td>
<td>PVC</td>
<td>—</td>
<td>Fittings</td>
<td>—</td>
<td>Schedule–40</td>
</tr>
<tr>
<td>D2468</td>
<td>ABS</td>
<td>—</td>
<td>Fittings</td>
<td>—</td>
<td>Schedule-40</td>
</tr>
<tr>
<td>D2564</td>
<td>For PVC</td>
<td>—</td>
<td>—</td>
<td>Solvent Cement</td>
<td>For PVC</td>
</tr>
<tr>
<td>D2661</td>
<td>ABS</td>
<td>Pipe</td>
<td>Fittings</td>
<td>—</td>
<td>DWV at Schedule–40 IPS sizes</td>
</tr>
<tr>
<td>D2665</td>
<td>PVC</td>
<td>Pipe</td>
<td>Fittings</td>
<td>—</td>
<td>DWV</td>
</tr>
<tr>
<td>F438</td>
<td>CPVC</td>
<td>—</td>
<td>Fittings</td>
<td>—</td>
<td>Schedule–40</td>
</tr>
<tr>
<td>F441</td>
<td>CPVC</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>Schedule–40</td>
</tr>
<tr>
<td>F442</td>
<td>CPVC</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>SDR</td>
</tr>
<tr>
<td>F493</td>
<td>For CPVC</td>
<td>—</td>
<td>—</td>
<td>Solvent Cement</td>
<td>For CPVC</td>
</tr>
<tr>
<td>F626</td>
<td>ABS</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>Cellular Core DWV at Schedule–40 IPS sizes</td>
</tr>
<tr>
<td>F656</td>
<td>For PVC</td>
<td>—</td>
<td>—</td>
<td>Primer</td>
<td>For PVC</td>
</tr>
<tr>
<td>F891</td>
<td>PVC</td>
<td>Pipe</td>
<td>—</td>
<td>—</td>
<td>Cellular Core Schedule–40 &amp; DWV</td>
</tr>
</tbody>
</table>
**Table 12 – Maximum Allowable Exposed Vent Lengths Insulation Table - Ft. / M**

<table>
<thead>
<tr>
<th>Ventilation Open Area (sq. ft. / m²)</th>
<th>Winter Design Temp °F (°C)</th>
<th>No Insulation</th>
<th>3/8-in. (9.5 mm)</th>
<th>1/2-in. (12.7 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe Diameter-inches (mm)</strong></td>
<td>*(38)</td>
<td>*(51)</td>
<td>*(64)</td>
<td>*(76)</td>
</tr>
<tr>
<td>20 (-10)</td>
<td>Pt.</td>
<td>40.0</td>
<td>35.0</td>
<td>35.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>12.2</td>
<td>10.7</td>
<td>10.7</td>
</tr>
<tr>
<td>0 (-20)</td>
<td>Pt.</td>
<td>19.0</td>
<td>14.0</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>5.8</td>
<td>4.3</td>
<td>3.7</td>
</tr>
<tr>
<td>-20 (-30)</td>
<td>Pt.</td>
<td>9.0</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2.7</td>
<td>0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>-40 (-40)</td>
<td>Pt.</td>
<td>3.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Pipe Diameter-inches (mm)</strong></td>
<td>*(76)</td>
<td>*(102)</td>
<td>*(124)</td>
<td>*(152)</td>
</tr>
<tr>
<td>20 (-10)</td>
<td>Pt.</td>
<td>30.0</td>
<td>51.0</td>
<td>51.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>9.1</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>0 (-20)</td>
<td>Pt.</td>
<td>30.0</td>
<td>24.0</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>9.1</td>
<td>7.3</td>
<td>7.0</td>
</tr>
<tr>
<td>-20 (-30)</td>
<td>Pt.</td>
<td>18.0</td>
<td>11.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>5.5</td>
<td>3.4</td>
<td>2.7</td>
</tr>
<tr>
<td>-40 (-40)</td>
<td>Pt.</td>
<td>10.0</td>
<td>3.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>3.0</td>
<td>0.9</td>
<td>0.0</td>
</tr>
<tr>
<td>40000*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not all families have these models.
* Pipe length (ft) specified for maximum pipe lengths located in unconditioned spaces. Pipes located in unconditioned space cannot exceed total allowable pipe length calculated from Table 13 or 15.
† Insulation thickness based on R value of 3.5 per in.
NOTE: Maximum Equivalent Vent Length (MEVL) includes standard and concentric vent termination and does NOT include elbows. Use Table 14 - Deductions from Maximum Equivalent Vent Length to determine allowable vent length for each application.

Table 13 – Maximum Equivalent Vent Length - Ft. (M)
0 to 4500 Ft. (0 to 1370 M) Altitude

<table>
<thead>
<tr>
<th>Altitude FT (M)</th>
<th>Unit Size BTU/Hr</th>
<th>DIRECT VENT (2-PIPE) AND NON-DIRECT VENT (1-PIPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/2</td>
<td>2</td>
</tr>
<tr>
<td>0 to 2000</td>
<td>40,000</td>
<td>50</td>
</tr>
<tr>
<td>(0 to 610)</td>
<td>60,000</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>80,000</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>120,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>140,000</td>
<td>NA</td>
</tr>
<tr>
<td>2001 to 3000</td>
<td>40,000</td>
<td>45</td>
</tr>
<tr>
<td>(610 to 914)</td>
<td>60,000</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>80,000</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>120,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>140,000</td>
<td>NA</td>
</tr>
<tr>
<td>3001 to 4000</td>
<td>40,000</td>
<td>39</td>
</tr>
<tr>
<td>(914 to 1219)</td>
<td>60,000</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>80,000</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>120,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>140,000</td>
<td>NA</td>
</tr>
<tr>
<td>4001 to 4500</td>
<td>40,000</td>
<td>38</td>
</tr>
<tr>
<td>(1219 to 1370)</td>
<td>60,000</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>80,000</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>100,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>120,000</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>140,000</td>
<td>NA</td>
</tr>
</tbody>
</table>

NOTES: See notes at end of venting tables. See Table 15 for altitudes over 4500 ft. (1370 M)

<table>
<thead>
<tr>
<th>ELBOW CONFIGURATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>Mitered</td>
</tr>
</tbody>
</table>

Table 14 – Deductions from Maximum Equivalent Vent Length - Ft. (M)

<table>
<thead>
<tr>
<th>Pipe Diameter (in):</th>
<th>1-1/2</th>
<th>2</th>
<th>2-1/2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitered 90° Elbow</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Medium Radius 90° Elbow</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Long Radius 90° Elbow</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mitered 45° Elbow</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Medium Radius 45° Elbow</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Long Radius 45° Elbow</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Tee</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Concentric Vent Termination</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Standard Vent Termination</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**Venting System Length Calculations**

The maximum length for each vent pipe (inlet or exhaust) equals the Maximum Equivalent Vent Length (MEVL) from Table 13 or Table 15 minus the number of elbows multiplied by the deduction for each elbow in Table 14.

Standard vent terminations and concentric vent terminations count for zero deductions.

See Vent Manufacturers’ data for equivalent lengths of flexible vent piping.

DO NOT ASSUME that one foot of flexible vent pipe is equivalent to one foot of standard PVC vent pipe.

**Example**

A direct-vent 60,000 Btu/h furnace installed at 2100 ft. (640 M) with 2-in. (51 mm) vent piping. Venting system includes, FOR EACH PIPE, (3) 90° long radius elbows, (2) 45° long radius elbows and a concentric vent kit.

<table>
<thead>
<tr>
<th>Maximum Equivalent Vent Length</th>
<th></th>
<th>=</th>
<th>127 ft. (From Table 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deduct (3) 90 long radius</td>
<td>3</td>
<td>3 ft.</td>
<td>- 9 ft. (From Table 14)</td>
</tr>
<tr>
<td>Deduct (2) 45 long radius</td>
<td>2</td>
<td>1.5 ft.</td>
<td>- 3 ft. (From Table 14)</td>
</tr>
<tr>
<td>No deduction for Concentric Vent Kit</td>
<td>0 ft.</td>
<td>=</td>
<td>- 0 ft. (From Table 14)</td>
</tr>
<tr>
<td>Maximum Vent Length</td>
<td></td>
<td>=</td>
<td>115 ft. For EACH vent or inlet pipe</td>
</tr>
</tbody>
</table>
NOTE: Maximum Equivalent Vent Length (MEVL) includes standard and concentric vent termination and does NOT include elbows.
Use Table 14 - Deductions from Maximum Equivalent Vent Length to determine allowable vent length for each application.

<table>
<thead>
<tr>
<th>Altitude FT (M)</th>
<th>Unit Size</th>
<th>DIRECT VENT (2-PIPE) AND SINGLE-PIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vent Pipe Diameter (in.)</td>
</tr>
<tr>
<td>4501 to 5000 (1371 to 1524)</td>
<td>40,000</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>20</td>
</tr>
<tr>
<td>5001 to 6000 (1524 to 1829)</td>
<td>40,000</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>10</td>
</tr>
<tr>
<td>6001 to 7000 (1829 to 2134)</td>
<td>40,000</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>10</td>
</tr>
<tr>
<td>7001 to 8000 (2134 to 2438)</td>
<td>40,000</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>10</td>
</tr>
<tr>
<td>8001 to 9000 (2438 to 2743)</td>
<td>40,000</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>7</td>
</tr>
<tr>
<td>9001 to 10,000 (2743 to 3048)</td>
<td>40,000</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>10</td>
</tr>
</tbody>
</table>

Notes:
1. Use only the vent pipe sizes shown for each furnace. It is NOT necessary to choose the smallest diameter pipe possible for venting.
2. NA - Not allowed. Pressure switch will not close, or flame disturbance may result.
3. Total equivalent vent lengths under 10' for 40,000 BTUH furnaces from 0 to 2000 ft. (0 to 610 M) above sea level require use of an outlet choke plate. Failure to use an outlet choke when required may result in flame disturbance or flame sense lockout.
4. Not all furnace families include 140,000 BTUH input models.
5. Vent sizing for Canadian installations over 4500 ft (1370 M) above sea level are subject to acceptance by local authorities having jurisdiction.
6. Size both the combustion air and vent pipe independently, then use the larger size for both pipes.
7. Assume the two 45° elbows equal one 90° elbow. Wide radius elbows are desirable and may be required in some cases.
8. Elbow and pipe sections within the furnace casing and at the vent termination should NOT be included in vent length or elbow count.
9. The minimum pipe length is 5 ft. (1.5 M) linear feet (meters) for all applications.
10. Use 3-in. (76 mm) diameter vent termination kit for installations requiring 4-in. (102 mm) diameter pipe.
Attach gaskets to vent pipe and combustion air adapters.

Fig. 37 - Vent Coupling and Adapter with Gaskets

Fig. 38 - Inducer Vent Elbow
Any other unused knockout may be used for combustion air connection. Rotate vent elbow to required position.

**UPFLOW LEFT CONFIGURATION**

Any other unused knockout may be used for combustion air connection. Rotate vent elbow to required position.

**UPFLOW RIGHT CONFIGURATION**

Any other unused knockout may be used for combustion air connection.

**UPFLOW VERTICAL VENT**

1. Attach vent pipe adapter with gasket to furnace casing.
2. Align notches in rubber coupling over standoffs on adapter. Slide clamps over the coupling.
3. Slide vent pipe through adapter and coupling into vent elbow.
4. Insert vent pipe into vent elbow.
5. Torque all clamps 15 lb.-in.
6. Attach combustion air pipe adapter with gasket to furnace.
7. Attach combustion air pipe to adapter with silicone. Pilot drill a 1/8-in. hole in adapter and secure with a #7 x 1/2-in sheet metal screw.

**Fig. 39 - Upflow Configurations (Appearance may vary)**
Rotate vent elbow to required position.

Any other unused knockout may be used for combustion air connection.

Downflow Vertical
Requires Accessory Internal Vent Kit.
See Product Data for current kit number.

1. Attach vent pipe adapter with gasket to furnace casing.
2. Align notches in rubber coupling over standoffs on adapter. Slide clamps over the coupling.
3. Slide vent pipe through adapter and coupling into vent elbow.
4. Insert vent pipe into vent elbow.
5. Torque all clamps 15 lb.-in.
6. Attach combustion air pipe adapter with gasket to furnace.
7. Attach combustion air pipe to adapter with silicone. Pilot drill a 1/8-in. hole in adapter and secure with a #7 x 1/2-in. sheet metal screw.

Fig. 40 - Downflow Configurations (Appearance may vary)
Attach vent pipe adapter with gasket to furnace casing.
2. Align notches in rubber coupling over standoffs on adapter. Slide clamps over the coupling.
3. Slide vent pipe through adapter and coupling into vent elbow.
4. Insert vent pipe into vent elbow.
5. Torque all clamps 15 lb.-in.
6. Attach combustion air pipe adapter with gasket to furnace.
7. Attach combustion air pipe to adapter with silicone. Pilot drill a 1/8-in. hole in adapter and secure with a #7 x 1/2-in sheet metal screw.

Fig. 41 – Horizontal Left (Appearance may vary)
**HORIZONTAL RIGHT - VERTICAL VENT CONFIGURATION**

**HORIZONTAL RIGHT - LEFT VENT CONFIGURATION**
*Requires Internal Vent Kit
See Product Data for Current Kit Number

---

1. Attach vent pipe adapter with gasket to furnace casing.
2. Align notches in rubber coupling over standoffs on adapter. Slide clamps over the coupling.
3. Slide vent pipe through adapter and coupling into vent elbow.
4. Insert vent pipe into vent elbow.
5. Torque all clamps 15 lb.-in.
6. Attach combustion air pipe adapter with gasket to furnace.
7. Attach combustion air pipe to adapter with silicone. Pilot drill a 1/8-in. hole in adapter and secure with a #7 x 1/2-in sheet metal screw.

*Fig. 42 - Horizontal Right (Appearance may vary)*
VENT PIPE ADAPTER WITH GASKET INSTALLED ON FURNACE VENT PIPE IS CUT FLUSH WITH TOP OF ADAPTER.

ALIGN NOTCHES IN VENT PIPE COUPLING OVER STAND-OFF ON ADAPTER. TORQUE LOWER CLAMP 15 LB-IN. WHEN REMAINING VENT PIPE IS INSTALLED, TORQUE UPPER CLAMP TO 15 LB-IN.

Fig. 43 - Vent Pipe Flush with Adaptor

Point elbow down towards back of furnace

CASING SIDE ATTACHMENT COMBUSTION AIR PIPE (NON-DIRECT VENT) TOP PLATE ATTACHMENT COMBUSTION AIR PIPE (NON-DIRECT VENT)

12" 256.0 mm

Fig. 44 - Combustion Air Pipe Attachment
<table>
<thead>
<tr>
<th>Item</th>
<th>Clearance Description</th>
<th>Canadian Installation (1)</th>
<th>U.S. Installation (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clearance above grade, veranda, porch, deck, balcony or anticipated snow level</td>
<td>12 in. (305 mm)</td>
<td>12 in. (305 mm)</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to a window or door that may be opened</td>
<td>12 in. (305 mm) for appliances &gt; 10,000 Btuh (3kW) and &lt;/= 100,000 Btuh (30 kW), 36 in. (914 mm) for appliances &gt; 100,000 Btuh (30 kW) and &lt;/= 500,000 Btuh (15 kW), 12 in. (305 mm) for appliances &gt; 500,000 Btuh (15 kW)</td>
<td>9 in. (229 mm) for appliances &gt; 10,000 Btuh (3kW) and &lt;/= 50,000 Btuh (15 kW), 12 in. (305 mm) for appliances &gt; 50,000 Btuh (15 kW)</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to a permanently closed window</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Vertical clearance to a ventilated sofit located above the terminal within a horizontal distance of 2 feet (61 cm) from the centerline of the terminal</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.</td>
</tr>
<tr>
<td>E</td>
<td>Clearance to an unventilated sofit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Clearance to a permanently closed window</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Clearance to an inside corner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance's direct vent intake or exhaust</td>
<td>3 ft. (9 M) within 15 ft. (4.6 M) above the meter/ regulator assembly</td>
<td>3 ft. (9 M) within 15 ft. (4.6 M) above the meter/ regulator assembly</td>
</tr>
<tr>
<td>I</td>
<td>Clearance to service regulator vent outlet</td>
<td>3 ft. (9 M)</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>12 in. (305 mm) for appliances &gt; 10,000 Btuh (3kW) and &lt;/= 100,000 Btuh (30 kW), 36 in. (914 mm) for appliances &gt; 100,000 Btuh (30 kW) and &lt;/= 500,000 Btuh (15 kW), 12 in. (305 mm) for appliances &gt; 500,000 Btuh (15 kW)</td>
<td>9 in. (229 mm) for appliances &gt; 10,000 Btuh (3kW) and &lt;/= 50,000 Btuh (15 kW), 12 in. (305 mm) for appliances &gt; 50,000 Btuh (15 kW)</td>
</tr>
<tr>
<td>K</td>
<td>Clearance to a mechanical air supply inlet</td>
<td>6 ft. (1.8 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>L</td>
<td>Clearance under a veranda, porch, deck, or balcony</td>
<td>12 in. (305 mm). Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.</td>
</tr>
<tr>
<td>M</td>
<td>Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance's direct vent intake or exhaust</td>
<td>12 in. (305 mm)</td>
<td>12 in. (305 mm)</td>
</tr>
<tr>
<td>N</td>
<td>Clearance to the vent terminal of a dryer vent, water heater vent, or other appliance's direct vent intake or exhaust</td>
<td>3 ft. (9 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>O</td>
<td>Clearance from a plumbing vent stack</td>
<td>3 ft. (9 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>P</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>7 ft. (2.1 M). A vent shall not terminate above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.</td>
</tr>
</tbody>
</table>

Notes:
1. The vent for this appliance shall not terminate:
   a. Over public walkways;
   b. Near soffit vents of crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or property damage;
   c. Where condensate vapor could cause damage or could be detrimental to the operation of regulating, relief valves, or other equipment.
2. When locating vent terminations, consideration must be given to prevailing winds, location, and other conditions which may cause recirculation of the combustion products of adjacent vents. Recirculation can cause poor combustion, inlet condensate problems, and accelerated corrosion of the heat exchangers.
3. Avoid venting under a deck or large overhang. Recirculation could occur and cause performance or system problems.

Fig. 45 - Direct Vent Termination Clearance
<table>
<thead>
<tr>
<th>Item</th>
<th>Clearance Description</th>
<th>Canadian Installation (1)</th>
<th>U.S. Installation (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clearance above grade, veranda, porch, deck, balcony or anticipated snow level</td>
<td>12 in. (305 mm) above roof surface.</td>
<td>12 in. (305 mm)</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to a window or door that may be opened</td>
<td>6 in. (152 mm) for appliances $&lt;\sim 10,000$ Btuh (3kW), 12 in. (305 mm) for appliances $&gt;10,000$ Btuh (3kW), and $&lt;\sim 100,000$ Btuh (30kW), and $&lt;\sim 36$ in. (914 mm) for appliances $&gt;100,000$ Btuh (30kW)</td>
<td>4 ft. (1.2 M) below or to the side of the opening. 1 ft. (0.3 M) above the opening.</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to a permanently closed window</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2 feet (61 cm) from the centerline of the terminal</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer’s installation instructions.</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer’s installation instructions.</td>
</tr>
<tr>
<td>E</td>
<td>Clearance to an unventilated soffit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Clearance to an outside corner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Clearance to an inside corner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Clearance to each side of the centerline extended above electrical meter or gas service regulator assembly</td>
<td>3 ft. (9 M) within 15 ft. (4.6 M) above the meter/regulator assembly</td>
<td>3 ft. (9 M) within 15 ft. (4.6 M) above the meter/regulator assembly.</td>
</tr>
<tr>
<td>I</td>
<td>Clearance to service regulator vent outlet</td>
<td>3 ft. (9 M)</td>
<td>* 3 ft. (9 M) * * For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer’s installation instructions.</td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>6 in. (152 mm) for appliances $&lt;\sim 10,000$ Btuh (3kW), 12 in. (305 mm) for appliances $&gt;10,000$ Btuh (3kW), and $&lt;\sim 100,000$ Btuh (30kW), and 36 in. (914 mm) for appliances $&gt;100,000$ Btuh (30kW)</td>
<td>4 ft. (1.2 M) below or to the side of the opening. 1 ft. (0.3 M) above the opening.</td>
</tr>
<tr>
<td>K</td>
<td>Clearance to a mechanical air supply inlet</td>
<td>6 ft. (1.8 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>L</td>
<td>Clearance under a veranda, porch, deck, or balcony</td>
<td>12 in. (305 mm). Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.</td>
<td>For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer’s installation instructions.</td>
</tr>
<tr>
<td>M</td>
<td>Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance’s direct vent intake or exhaust</td>
<td>12 in. (305 mm)</td>
<td>12 in. (305 mm)</td>
</tr>
<tr>
<td>N</td>
<td>Clearance to the vent terminal of a dryer vent, water heater vent, or other appliances direct vent intake or exhaust</td>
<td>3 ft. (9 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>O</td>
<td>Clearance from a plumbing vent stack</td>
<td>3 ft. (9 M)</td>
<td>3 ft. (9 M)</td>
</tr>
<tr>
<td>P</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>7 ft. (2.1 M). A vent shall not terminate above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.</td>
<td>7 ft. (2.1 M).</td>
</tr>
</tbody>
</table>

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

Fig. 46 - Ventilated Combustion Air and Non-Direct Vent Termination Clearance
Fig. 47 - Combustion Air and Vent Pipe Termination for Direct Vent (2-Pipe) System

- Roof Termination (Preferred)
  - Maintain 12 in. (305 mm) minimum clearance above highest anticipated snow level or grade, whichever is greater.
  - Maintain 12 in. (305 mm) minimum clearance between wall and end of vent pipe.
  - 13 in. (330 mm) minimum clearance between wall and end of vent pipe.
  - 8 in. (203 mm) minimum clearance above highest anticipated snow level or grade, whichever is greater.

- Side wall termination with 2 elbows (preferred)
  - Maintain 12 in. (305 mm) minimum clearance above highest anticipated snow level or grade, whichever is greater.

Fig. 48 - Vent Pipe Termination for Non-Direct Vent and Ventilated Combustion Air System

- Roof Termination (Preferred)
  - Maintain 12 in. (305 mm) minimum clearance above highest anticipated snow level or grade, whichever is greater.
  - 13 in. (330 mm) minimum clearance between wall and end of vent pipe.
  - 8 in. (203 mm) minimum clearance between wall and end of vent pipe.

- Side wall termination with 2 elbows (preferred)
  - Maintain 12 in. (305 mm) minimum clearance above highest anticipated snow level or grade, whichever is greater.
NOTE: This illustration is for reference only. Your unit may differ in appearance or may not include all components shown.

OVERHANG OR ROOF

VENT

BRACKET

COUPLING

OVER 12 IN. SEPARATION BETWEEN BOTTOM OF COMBUSTION AIR AND BOTTOM OF VENT

COMBUSTION AIR (ELBOW PARALLEL TO WALL)

Maintain 12 in. clearance above highest anticipated snow level or grade, whichever is greater.

Fig. 49 - Alberta and Saskatchewan Vent Termination
Fig. 50 - Vent Terminations for Ventilated Combustion Air
START-UP, ADJUSTMENT, AND SAFETY CHECK

General

1. Furnace must have a 115-v power supply properly connected and grounded.

NOTE: Proper polarity must be maintained for 115-v wiring. Control status indicator light flashes rapidly and furnace does not operate if polarity is incorrect.

2. Thermostat wire connections at terminals R, W/W1, G, and Y/Y2 must be made at 24-v terminal block on furnace control.

3. Natural gas service pressure must not exceed 0.5 psig (14-in. w.c.), but must be no less than 0.16 psig (4.5-in. w.c.).

4. Blower door must be in place to complete 115-v electrical circuit to furnace.

CAUTION

UNIT OPERATION HAZARD
Failure to follow this caution may result in intermittent unit operation or performance satisfaction.

These furnaces are equipped with a manual reset limit switch in burner assembly. This switch opens and shuts off power to the gas valve is an overheat condition (flame rollout) occurs in burner assembly. Correct inadequate combustion-air supply or improper venting condition before resetting switch. DO NOT jumper this switch.

Before operating furnace, check flame rollout manual reset switch for continuity. If necessary, press button to reset switch. EAC-I terminal is energized whenever blower operates. HUM terminal is only energized when blower is energized in heating.

Select Setup Switch Positions
There are four sets of setup switches on the furnace control board. These switches configure the furnace for correct application requirement. They also select the airflow settings for Air Conditioning and Continuous Fan CFMs.

The Setup Switch locations are shown and described on Fig. 55. The set up switches are also shown on the unit wiring label.

Setup Switches (SW1)
The furnace control has 8 setup switches that may be set to meet the application requirements. To set these setup switches for the appropriate requirement:

• Remove blower door.
• Locate setup switches on furnace control.
• Configure the set-up switches as necessary for the application.
• Replace blower door.

NOTE: If a bypass humidifier is used, setup switch SW1-3 (Low Heat Rise Adjust) should be in ON position. This compensates for the increased temperature in return air resulting from bypass.

NOTE: If modulating dampers are used, blower motor automatically compensates for modulating dampers.

Air Conditioning (A/C) Setup Switches (SW2)
The air conditioning setup switches are used to match furnace airflow to cooling unit used.

To set the desired cooling airflow:

1. Remove upper and middle collector box drain plugs opposite of the condensate trap. (See Fig. 59.)
2. Connect field-supplied 1/2-in. (13 mm) OD tube to upper collector box drain connection.
3. Insert field-supplied funnel into tube.
4. Pour one quart of water into funnel/tube. Water should run through collector box, overfill condensate trap, and flow into open field drain.
5. Remove funnel; replace collector box drain plug.
6. Connect field-supplied 1/2-in. (13 mm) OD tube to middle collector box drain port.
7. Pour one quart of water into funnel/tube. Water should run through collector box, overfill condensate trap, and flow into open field drain.
8. Remove funnel and tube from collector box and replace collector box drain plug.

Purge Gas Lines
If not previously done, purge the lines after all connections have been made and check for leaks.

Continuous Fan (CF) Setup Switches (SW3)
The CF setup switches are used to select desired airflow when thermostat is in continuous fan mode or to select low-cooling airflow for two-speed cooling units. This setup feature allows continuous fan airflow or low-cooling airflow to be adjusted. To set desired continuous fan airflow or low-cooling airflow:

1. Remove blower door.
2. Locate CF setup switches on furnace control.
3. Determine desired continuous fan airflow or low-cooling airflow.
4. Configure the switches for the required continuous fan or low-cooling airflow.
5. Replace blower door.

Setup Switch (SW4)
Setup switches SW4 are used for applications using a communicating User Interface and to adjust airflow. Refer to Fig. 55 for configuration of SW4 airflow options.

Prime Condensate Trap with Water

CAUTION

UNIT OPERATION HAZARD
Failure to follow this caution may result in intermittent unit operation or performance satisfaction.

Condensate trap must be PRIMED or proper draining may not occur. The condensate trap has two internal chambers which can ONLY be primed by pouring water into the inducer drain side of condensate trap.

1. Remove burner door.
2. Locate A/C setup switches on furnace control.
3. Determine air conditioning tonnage used.
4. Configure the switches for the required cooling airflow.

NOTE: Excessive airflow caused by improper A/C switch setup may cause condensate blow-off in cooling mode.
5. Replace burner door.
Adjustments

**WARNING**

**FIRE OR EXPLOSION HAZARD**
Failure to follow this warning could result in personal injury, death, and/or property damage.

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

For proper operation and long term reliability, the Furnace input rate must be within +/-2 percent of input rate on furnace rating plate.

The gas input rate on rating plate is for installations at altitudes up to 2900 ft. (690.6M).

In the USA, the input rating for altitudes above 2000 ft. (609.6M) must be reduced by 2 percent for each 1000 ft. (304.8M) above sea level. Refer to Table 16.

In Canada, the input rating must be derated by 5 percent for altitudes of 2000 ft. (609.6M) to 4500 ft. (1371.6M) above sea level.

The gas input rate on rating plate is for installations at altitudes up to 2000 ft. (609.6M). If manifold pressure is outside this range, change main burner orifices.

**CAUTION**

**FURNACE DAMAGE HAZARD**
Failure to follow this caution may result in reduced furnace life.

DO NOT redrill orifices. Improper drilling (burrs, out-of-round holes, etc.) can cause excessive burner noise and misdirection of burner flames. This can result in flame impingement of heat exchangers, causing failures. (See Fig. 52.)

To adjust manifold pressure to obtain the proper input rate, first, determine if the furnace has the correct orifice installed. At higher altitudes or different gas heat contents, it may be necessary to change the factory orifice to a different orifice. Tables have been provided in the furnace installation instructions to match the required orifice to the manifold pressure to the heat content and specific gravity of the gas. To do this:

- Obtain average yearly gas heat value (at installed altitude) from local gas supplier.
- Obtain average yearly gas specific gravity from local gas supplier.
- Find installation altitude in Table 19.
- Find closest natural gas heat value and specific gravity in Table 19.
- Follow heat value and specific gravity lines to point of intersection to find orifice size and low- and high-heat manifold pressure settings for proper operation.

Furnace is shipped with No. 44 orifices. In this example, all main burner orifices are the correct size and do not need to be changed to obtain proper input rate.

1. Adjust manifold pressure to obtain low fire input rate. (See Fig. 51.)
   - a. Turn gas valve ON/OFF switch to OFF.
   - b. Remove manifold pressure tap plug from gas valve.
   - c. Connect a water column manometer or similar device to manifold pressure tap.
   - d. Turn gas valve ON/OFF switch to ON.
   - e. Move setup SW1–2 on furnace control to ON position to lock furnace in low-heat operation. (See Fig. 55 and Fig. 35.)
   - f. Check and verify burner orifice size in furnace. NEVER ASSUME ORIFICE SIZE. ALWAYS CHECK AND VERIFY.
   - g. Replace orifice with correct size, if required by Table 19.
   - h. Remove regulator adjustment cap from low heat gas valve pressure regulator (See Fig. 51) and turn low-heat adjusting screw (3/16-in. or smaller flat-tipped screwdriver) counterclockwise (out) to decrease input rate or clockwise (in) to increase input rate.

NOTE: DO NOT set low-heat manifold pressure less than 1.3-in. W.C. or more than 1.7-in. W.C. for natural gas. If manifold pressure is outside this range, change main burner orifices.

   i. Install low-heat regulator adjustment cap.
   j. Move setup switch SW1–2 to off position after completing low-heat adjustment.
   k. Leave manometer or similar device connected and proceed to Step 4.

2. Adjust manifold pressure to obtain high fire input rate. (See Fig. 51.)
   - a. Jumper R to W/W1 and W2 thermostat connections on control to start furnace. (See Fig. 35.)
   - b. Remove regulator adjustment cap from high-heat gas valve pressure regulator (See Fig. 51) and turn high-heat adjusting screw (3/16-in. or smaller flat-tipped screwdriver) counterclockwise (out) to decrease input rate or clockwise (in) to increase input rate.

NOTE: DO NOT set high-heat manifold pressure less than 3.2-in. W.C. or more than 3.8 in. W.C. for natural gas. If manifold pressure is outside this range, change main burner orifices to obtain manifold pressure in this range.
c. When correct input is obtained, replace caps that conceal gas valve regulator adjustment screws. Main burner flame should be clear blue, almost transparent (See Fig. 57.)

d. Remove jumpers R to W/W1 and R to W2.

3. Verify natural gas input rate by clocking meter.
   a. Turn off all other gas appliances and pilots served by the meter.
   b. Move setup switch SW1-2 to ON position. This keeps furnace locked in low-heat operation.
   c. Jumper R to W/W1.
   d. Run furnace for 3 minutes in low-heat operation.
   e. Measure time (in sec) for gas meter to complete 1 revolution and note reading. The 2 or 5 cubic feet dial provides a more accurate measurement of gas flow.
   f. Refer to Table 18 for cubic ft. of gas per hr.
   g. Multiply gas rate cu ft./hr by heating value (Btu/h/cu ft.) to obtain input. If clocked rate does not match required input from Step 1, increase manifold pressure to increase input or decrease manifold pressure to decrease input. Repeat steps b through e until correct low-heat input is achieved. Re-install low heat regulator seal cap on gas valve.
   h. Move setup switch SW1-2 to OFF position and jumper R to W/W1, and W2. Repeat items d through g for high-heat operation.

Adjust Temperature Rise

NOTE: Blower door must be installed when taking temperature rise reading. Leaving blower door off will result in incorrect temperature measurements.

**CAUTION**

**Furnace Damage Hazard**

Failure to follow this caution may result in:
- Overheating the heat exchangers or condensing flue gases in heat exchanger areas not designed for condensate.
- Shortened furnace life
- Component damage.

Temperature rise must be within limits specified on furnace rating plate. Recommended operation is at midpoint of rise range or slightly above.

When setup switch SW1-4 is ON, operation will be near the high end of the rise range for improved comfort.

Furnace must operate within ranges of temperature rise specified on the furnace rating plate. Determine air temperature rise as follows:

a. Place thermometers in return and supply ducts as near furnace as possible. Be sure thermometers do not see heat exchanger so that radiant heat does not affect readings. This practice is particularly important with straight-run ducts.

b. When thermometer readings stabilize, subtract return-air temperature from supply-air temperature to determine air temperature rise.

**NOTE:** Temperature rise can be determined for low-heat operation by placing setup switch SW1-2 on furnace control in ON position. For high-heat operation, place setup switch SW1-2 in OFF position and jumper R-W2 on furnace control. DO NOT forget to return setup switch to OFF position and remove R-W2 jumper upon completion of testing.

   c. This furnace is capable of automatically providing proper airflow to maintain the temperature rise within the range specified on furnace rating plate. If temperature rise is outside this range, proceed as follows:

1. Check gas input for low- and high-heat operation.
2. Check derate for altitude if applicable.
3. Check all return and supply ducts for excessive restrictions causing static pressure greater than 0.5-In. W.C.
4. Ensure Low Heat Rise Adjust switch SW1-3 on furnace control is in ON position when a bypass humidifier is used. (See Fig. 35 for switch location.)
5. Make sure proper model plug is installed.

   d. Remove thermostat jumpers and release blower door switch.
   e. Repeat Steps a through c as required to adjust for high heat temperature rise.
   f. When correct high heat input rate and temperature rise is achieved, turn gas valve ON/OFF switch to OFF.
   g. Release blower door switch.
   h. Remove manometer or similar device from gas valve.
   i. Re-install manifold pressure tap plug in gas valve. (See Fig. 51.)

**WARNING**

**Fire Hazard**

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

Reinstall manifold pressure tap plug in gas valve to prevent gas leak.

   j. Remove thermostat jumper wire from furnace control board.
   k. Turn gas valve ON/OFF switch to ON.
   l. Proceed to “Set Blower Off Delay” before installing blower door.

Adjust Blower Off Delay (Heat Mode)

   a. Remove blower door if installed.
   b. Turn Dip switch SW-7 or SW-8 ON or OFF for desired blower off delay. (See Table 17 and Fig. 35, Fig. 55 and Fig. 64.)

Adjust Cooling Airflow – High-Speed and Low-Speed Cooling

The ECM blower can be adjusted for a range of airflow for low-speed or high-speed cooling. See Table 7 – Air Delivery – CFM (With Filter) and Fig. 55 – Furnace Setup Switches and Descriptions. Depending on the model size, the cooling airflow can be adjusted from 1.5 to 6 tons based on 350 CFM ton.

**NOTE:** 6 ton airflow will truncate at 2200 CFM on applicable models.

   a. Remove blower door if installed.
   b. Turn Dip switch SW-7 or SW-8 ON or OFF for desired blower off delay. (See Table 17 and Fig. 35, Fig. 55 and Fig. 64.)

The high-speed or single-speed cooling airflow is adjusted by turning Setup switches SW2-1, SW2-2 and SW2-3 either ON or OFF. Select the required airflow from Table 7. Table 7 is based upon 350 CFM per ton. For other CFM per ton Setup switch selections, see Fig. 35, Fig. 55 and Fig. 64.

The Continuous Fan airflow selection via Setup switches SW3 is also the airflow for low-speed cooling when the furnace is used with a 2-speed cooling or heat pump unit. Adjust the Continuous Fan CFM Setup switches SW3 to match the airflow required for low-speed cooling. Select the required airflow from Table 7 and Fig. 55.
NOTE: The airflow selected via SW3 (Low-Speed Cooling Airflow) cannot exceed the airflow selected via SW2 (High-Speed Cooling Airflow). For other CFM per ton Setup switch selections, see Fig. 35 and Fig. 55.

NOTE: The airflow settings for SW2 and SW3 selections are the same, EXCEPT for the default values. See Table 7.

For a complete explanation of cooling airflow, refer to the section titled “Sequence of Operation.”

Adjust Continuous Fan Airflow (and Low-Speed Cooling Airflow)

NOTE: When the furnace is used with a 2-speed cooling or heat pump unit, the airflow selected for continuous fan via Setup switch SW3 will also be the airflow used for low-speed cooling, and vice versa. The continuous fan speed can be further adjusted at a conventional thermostat using the continuous fan speed select function. Changing the continuous fan speed at a conventional thermostat DOES NOT change the low-speed cooling airflow selected via SW3 at the control board.

NOTE: When the furnace is used with a 2-speed cooling or heat pump unit, adjust the Continuous Fan CFM Setup switches SW3 to match the airflow required for low-speed cooling.

Select the required continuous fan airflow using Setup switches SW3 as shown in Fig. 55 and Table 7.

Adjust Thermostat Heat Anticipator:

a. Mechanical thermostat. Set thermostat heat anticipator to match the amp. draw of the electrical components in the R-W/W1 circuit. Accurate amp. draw readings can be obtained at the wires normally connected to thermostat subbase terminals, R and W. The thermostat anticipator should NOT be in the circuit while measuring current.

(1.) Set SW1-2 switch on furnace control board to ON.
(2.) Remove thermostat from subbase or from wall.
(3.) Connect an amp. meter as shown in Fig. 53 across the R and W subbase terminals or R and W wires at wall.
(4.) Record amp. draw across terminals when furnace is in low heat and after blower starts.
(5.) Set heat anticipator on thermostat per thermostat instructions and install on subbase or wall.
(6.) Turn SW1-2 switch OFF.
(7.) Install blower door.

b. Electronic thermostat: Set cycle rate for 3 cycles per hr.

Check Safety Controls

The flame sensor, gas valve, and pressure switch were all checked in the Start-up procedure section as part of normal operation.

1. Check Main Limit Switch
   This control shuts off combustion system and energizes air-circulating blower motor, if furnace overheats. By using this method to check limit control, it can be established that limit is functioning properly and will operate if there is a restricted return-air supply or motor failure. If limit control does not function during this test, cause must be determined and corrected.
   a. Run furnace for at least 5 minutes.
   b. Gradually block off return air with a piece of cardboard or sheet metal until the limit trips.
   c. Unblock return air to permit normal circulation.
   d. Burners will re-light when furnace cools down.

2. Check Pressure Switch(es)
   This control proves operation of the draft inducer blower.
   a. Turn off 115-v power to furnace.
   b. Disconnect inducer motor lead wires from wire harness.

   c. Turn on 115-v power to furnace.
   d. Set thermostat to “call for heat” and wait 1 minute. When pressure switch is functioning properly, hot surface igniter should NOT glow and control diagnostic light flashes a status code 32. If hot surface igniter glows when inducer motor is disconnected, shut down furnace immediately.
   e. Determine reason pressure switch did not function properly and correct condition.
   f. Turn off 115-v power to furnace.
   g. Reconnect inducer motor wires, replace door, and turn on 115-v power.
   h. Blower will run for 90 sec before beginning the call for heat again.
   i. Furnace should ignite normally.

Checklist

1. Put away tools and instruments. Clean up debris.
2. Verify that switches SW1-1 and SW1-6 are OFF and other setup switches are set as desired. Verify that switches SW1-7 and SW1-8 for the blower OFF DELAY are set as desired per Table 17.
3. Verify that blower and control doors are properly installed.
5. Check operation of accessories per manufacturer’s instructions.
7. Attach literature packet to furnace.
Fig. 51 - Gas Valve

A11152

Fig. 52 - Orifice Hole

A08059

Fig. 53 - Amp. Draw Check with Ammeter

A08316
SERVICE

If status code recall is needed disconnect the "R" thermostat lead, reset power, and put setup switch "SW1-1" in the ON position. To clear the status code history put setup switch "SW1-1" in the ON position and jumper thermostat terminals "R", "W1-W2", and "Y-Y2" simultaneously, until status code #11 is flashed.

LED CODE STATUS

CONTINUOUS OFF - Check for 115 VAC at L1 and L2, and 24 VAC at SEC-1 and SEC-2.
CONTINUOUS ON - Control uses 24 VAC power.
RAPID FLASHING - Line voltage (115 VAC) polarity is reversed.

Each of the following status codes is a single or two digit number with the first number determined by the number of short flashes and the second number after the plus (+) sign is the number of long flashes.

11 NO PREVIOUS CODE - Status codes are erased automatically after 72 hours or as specified above.
12 BLOWER ON AFTER POWER UP - (115 VAC or 24 VAC) - Blower runs for 30 seconds, if unit is powered up during a call for heat (R-W1-W2) closed) or (R-W1-W2 opens) during the blower on delay period.
13 LIMIT CIRCUIT LOCKOUT - Lockout occurs if the limit or flame rollout switch is open longer than 3 minutes or 10 successive limit trips occurred during high-heat. Control will auto reset after 3 hours. Refer to status code #43.
14 IGNITION LOCKOUT - Control will auto-reset after 3 hours. Refer to status code #6.
15 BLOWER MOTOR LOCKOUT - Indicates the blower failed to reach 250 RPM or the blower failed to communicate within 30 seconds after being turned ON in two successive heating cycles. Control will auto reset after 3 hours. Refer to status code #41.
21 GAS HEATING LOCKOUT - Control will NOT auto reset. Check for - Mis-wired gas valve. - Defective control (voltage relay)
22 ABNORMAL FLAME-PROVING SIGNAL - Flame is proved while gas valve is de-energized. Inducer will run until shut off. Check for - Gas valve opened or closed.
23 PRESSURE SWITCH DID NOT OPEN - Check for - Obstructed pressure tubing. - Pressure switch stuck closed.
24 SECONDARY VOLTAGE FUSE IS OPEN - Check for - Short circuit in secondary voltage (24 VAC) wiring.
25 MODEL SELECTION OR SETUP ERROR - Either indicates the model plug (PL4) is missing or incorrect or setup switch "SW1-I" is not closed. Check for: - Improper limit switch or connections.
26 LOW HEAT PRESSURE SWITCH DID NOT CLOSE OR REOPENED - Indicates the low-heat pressure switch input failed to close or reopen during low-heat. Control relay may be defective or gas valve is mis-wired. Refer to status code #42.
27 LIMIT CIRCUIT FAULT - Indicates the limit, or flame rollout switch is open or the furnace is operating in high-heat only mode due to 2 successive low heat limit trips. Control will auto reset after 4 minutes or until open limit switch remains closed longer than 3 minutes. Code changes to lockout #11. If open less than 3 minutes status code #32 continues to flash until limit switch shuts off. Flame rollout switch requires manual reset. Check for: - Improper limit switch or no limit against - Defective switch or connections.
28 BLOWER ON AFTER POWER UP - (24 VAC) - Blower runs for 90 seconds if unit is powered up during a call for heat (R-W1-W2 closed). Replace control if status code continues.
29 AFTER POWER UP - (24VAC) - Blower runs for 90 seconds if unit is powered up during a call for heat (R-W1-W2 closed). Replace control if status code continues.
31 HIGH HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPENED - Indicates the high-heat pressure switch input failed to close or open during high-heat. Control relay may be defective or gas valve is mis-wired. Refer to status code #32.
32 LOW HEAT PRESSURE SWITCH DID NOT CLOSED OR REOPENED - Indicates the low-heat pressure switch input failed to close or open during low-heat. If unit is powered up during a call for heat (R-W1-W2 closed) or (R-W1-W2 opens) during the blower on delay period.
33 LIMIT CIRCUIT FAULT - Indicates the limit, or flame rollout switch is open longer than 3 minutes, code changes to lockout #13. If open less than 3 minutes status code #33 continues to flash until limit switch shuts off. Flame rollout switch requires manual reset. Check for: - Improper limit switch or no limit against - Defective switch or connections.
34 IGNITION PROVING FAULT - Control will try three more times before a lockout #14 occurs. If flame signal is lost during blower on-delay period, blower will come on for the selected blower off-delay. Check for: - Gas valve defective or turned OFF.
35 GAS VALVE RELAY STUCK OPEN - - Manual valve shut off.
36 IGNITION PROVING FAULT - Control will try three more times before a lockout #14 occurs. If flame signal is lost during blower on-delay period, blower will come on for the selected blower off-delay. Check for: - Gas valve defective or turned OFF.
37 LOW HEAT PRESSURE SWITCH DID NOT CLOSED OR REOPENED - Indicates the low-heat pressure switch input failed to close or open during low-heat. If unit is powered up during a call for heat (R-W1-W2 closed). Replace control if status code continues.
38 IGNITION PROVING FAULT - Control will try three more times before a lockout #14 occurs. If flame signal is lost during blower on-delay period, blower will come on for the selected blower off-delay. Check for: - Gas valve defective or turned OFF.
39 IGNITION PROVING FAULT - Control will try three more times before a lockout #14 occurs. If flame signal is lost during blower on-delay period, blower will come on for the selected blower off-delay. Check for: - Gas valve defective or turned OFF.
40 IGNITION PROVING FAULT - Control will try three more times before a lockout #14 occurs. If flame signal is lost during blower on-delay period, blower will come on for the selected blower off-delay. Check for: - Gas valve defective or turned OFF.
41 BLOWER MOTOR FAULT - Indicates the blower failed to reach 290 RPM or the blower failed to communicate within the prescribed time limits. Thirty seconds after being turned ON or ten seconds during steady-state operation.
42 BLOWER MOTOR FAULT - Indicates the blower failed to reach 290 RPM or the blower failed to communicate within the prescribed time limits. Thirty seconds after being turned ON or ten seconds during steady-state operation.
43 LOW HEAT PRESSURE SWITCH OPEN WHILE HIGH HEAT PRESSURE SWITCH IS CLOSED - Check for: - Gas valve defective or turned OFF.
44 LIMIT CIRCUIT FAULT - Indicates the limit, or flame rollout switch is open longer than 3 minutes, code changes to lockout #13. If open less than 3 minutes status code #32 continues to flash until limit switch shuts off. Flame rollout switch requires manual reset. Check for: - Improper limit switch or no limit against - Defective switch or connections.
45 CONTROL CIRCUITRY LOCKOUT - Auto-reset after 1 hour lockout due to: - Flame sense circuit failure.
- Gas valve relay stuck open.
- Software check error.
- Replace control or status code resets.

COMPONENT TEST

To initiate the component test sequence, shut "OFF" the room thermostat or disconnect the "R" thermostat lead. Reset power and then put setup switch "SW1-1" in the ON position to start the component test sequence. Once initiated the furnace control will turn the inducer ON. The inducer motor will run for the entire test. The hot surface igniter and blower motor will be turned ON for 15 seconds each. When the blower is turned OFF the inducer will be turned OFF. When the component test is completed put setup switch "SW1-1" in the OFF position and reconnect the "R" thermostat lead.

CODE - DESCRIPTION
11 Indicates blower motor tested OK. Visual check of hot surface igniter and inducer required.
20 SETUP ERROR - Same as code 35 above.
41 BLOWER MOTOR FAULT - Indicates blower motor failed test. Check blower, wiring, and furnace control.
To repeat component test turn setup switch "SW1-1" OFF and then back ON. After component test is completed put setup switch "SW1-1" in the OFF position and reconnect the "R" thermostat lead.

Fig. 54 - Service Label Information
### NOMINAL AIRFLOW BASED ON 350 CFM/TON (Factory Default - SW1-5 = OFF, SW4-3 = OFF)

<table>
<thead>
<tr>
<th>Model Size</th>
<th>SW2 Clg Default</th>
<th>SW3 CF Default</th>
<th>COOLING (SW2) AND CONTINUOUS FAN (SW3) AIRFLOW: SET-UP SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>060-14</td>
<td>1050</td>
<td>525</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
<tr>
<td>080-14</td>
<td>1050</td>
<td>525</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
<tr>
<td>060-20</td>
<td>1750</td>
<td>700</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
<tr>
<td>080-20</td>
<td>1750</td>
<td>700</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
<tr>
<td>100-22</td>
<td>1750</td>
<td>700</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
<tr>
<td>120-22</td>
<td>1750</td>
<td>675</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1225 1225</td>
</tr>
</tbody>
</table>

### NOMINAL AIRFLOW BASED ON 400 CFM/TON (SW1-5 = ON, SW4-3 = OFF)

<table>
<thead>
<tr>
<th>Model Size</th>
<th>SW2 Clg Default</th>
<th>SW3 CF Default</th>
<th>COOLING (SW2) AND CONTINUOUS FAN (SW3) AIRFLOW: SET-UP SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>060-14</td>
<td>1200</td>
<td>600</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
<tr>
<td>080-14</td>
<td>1200</td>
<td>600</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
<tr>
<td>060-20</td>
<td>2000</td>
<td>800</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
<tr>
<td>080-20</td>
<td>2000</td>
<td>800</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
<tr>
<td>100-22</td>
<td>2000</td>
<td>800</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
<tr>
<td>120-22</td>
<td>2000</td>
<td>1000</td>
<td>3 2 1 N 5 7 0 8 7 5 1050 1225 1400 1400 1400</td>
</tr>
</tbody>
</table>

### NOMINAL AIRFLOW BASED ON 325 CFM/TON (SW1-5 = OFF, SW4-3 = ON)

<table>
<thead>
<tr>
<th>Model Size</th>
<th>SW2 Clg Default</th>
<th>SW3 CF Default</th>
<th>COOLING (SW2) AND CONTINUOUS FAN (SW3) AIRFLOW: SET-UP SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>060-14</td>
<td>976</td>
<td>488</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
<tr>
<td>080-14</td>
<td>976</td>
<td>488</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
<tr>
<td>060-20</td>
<td>1627</td>
<td>651</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
<tr>
<td>080-20</td>
<td>1627</td>
<td>651</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
<tr>
<td>100-22</td>
<td>1627</td>
<td>651</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
<tr>
<td>120-22</td>
<td>1627</td>
<td>614</td>
<td>3 2 1 N 5 7 0 8 7 5 976 1139 1139 1139</td>
</tr>
</tbody>
</table>

### NOMINAL AIRFLOW BASED ON 370 CFM/TON (SW1-5 = ON, SW4-3 = ON)

<table>
<thead>
<tr>
<th>Model Size</th>
<th>SW2 Clg Default</th>
<th>SW3 CF Default</th>
<th>COOLING (SW2) AND CONTINUOUS FAN (SW3) AIRFLOW: SET-UP SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>060-14</td>
<td>1116</td>
<td>558</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
<tr>
<td>080-14</td>
<td>1116</td>
<td>558</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
<tr>
<td>060-20</td>
<td>1860</td>
<td>744</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
<tr>
<td>080-20</td>
<td>1860</td>
<td>744</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
<tr>
<td>100-22</td>
<td>1860</td>
<td>744</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
<tr>
<td>120-22</td>
<td>1860</td>
<td>930</td>
<td>3 2 1 N 5 7 0 8 7 5 930 1116 1302 1302 1302</td>
</tr>
</tbody>
</table>

---

Fig. 55 - Furnace Setup Switches and Description
<table>
<thead>
<tr>
<th>SETUP SWITCH</th>
<th>SWITCH NAME</th>
<th>NORMAL POSITION</th>
<th>DESCRIPTION OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1-1</td>
<td>Status Code Recovery</td>
<td>OFF</td>
<td>Turn ON to retrieve up to 7 stored status codes for troubleshooting assistance when R thermostat lead is disconnected.</td>
</tr>
<tr>
<td>SW1-2</td>
<td>Low Heat Only (Adaptive Heat Mode when SW1-2 is OFF)</td>
<td>OFF</td>
<td>When SW1-2 is OFF allows low heat operation with a single stage thermostat. Turn ON when using two-stage thermostat to allow Low Heat operation when R to W/W1 closes and High Heat operation when R to W/W1 and W2 close.</td>
</tr>
<tr>
<td>SW1-3</td>
<td>Low Heat Rise Adjustment</td>
<td>OFF</td>
<td>Turn ON to increase Low Heat airflow by 18 percent. This compensates for increased return air temperature caused with bypass humidifier. This also increases the low heat inducer speed 15 percent.</td>
</tr>
<tr>
<td>SW1-4</td>
<td>Comfort/Efficiency Adjustment</td>
<td>ON</td>
<td>Turn ON to decrease low heat airflow by 7 percent, and high heat airflow 10 percent for maximum comfort.</td>
</tr>
<tr>
<td>SW1-5</td>
<td>CFM per ton adjust</td>
<td>OFF</td>
<td>Turn ON for 400 CFM per ton, Turn OFF for 350 CFM per ton. See also SW4.</td>
</tr>
<tr>
<td>SW1-6</td>
<td>Component Self Test</td>
<td>OFF</td>
<td>Turn ON to initiate Component Self Test for troubleshooting assistance when R thermostat lead is disconnected. Turn OFF when Self Test is completed.</td>
</tr>
<tr>
<td>SW1-7 &amp; SW1-8</td>
<td>Blower OFF delay</td>
<td>ON or OFF</td>
<td>Blower OF Delay time – adjustable 90 seconds to 180 seconds. See table in Adjustments section or refer to unit wiring diagram.</td>
</tr>
<tr>
<td>SW4-3</td>
<td>Intermediate CFM per ton Adjust</td>
<td>OFF</td>
<td>Allows additional CFM per ton selections when used with SW 1-5.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>325 CFM per ton (nominal) when SW 4-3 ON and SW 1-5 OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>350 CFM per ton (nominal) when SW 4-3 OFF and SW 1-5 OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>370 CFM per ton (nominal) when SW4-3 ON and SW 1-5 ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>400 CFM per ton (nominal) when SW 1-5 ON and SW 4-3 OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>See Air Delivery Tables for model specific CFM vs. static pressure.</td>
</tr>
</tbody>
</table>

**AIR CONDITIONING (A/C) SETUP SWITCHES**

<table>
<thead>
<tr>
<th>SETUP SWITCH</th>
<th>SWITCH NAME</th>
<th>NORMAL POSITION</th>
<th>DESCRIPTION OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW2</td>
<td>AC (Cooling Airflow) SETUP SWITCHES</td>
<td></td>
<td>The AC setup switch selects desired cooling or high stage cooling (two stage units) airflow. See Air Delivery Tables for specific switch settings</td>
</tr>
<tr>
<td>SW3</td>
<td>CF (Continuous Fan) SETUP SWITCHES</td>
<td></td>
<td>The CF setup switch selects desired Continuous Fan Airflow. The CF switch position is the low cooling airflow selection for two stage cooling units. The CFM values in the Air Delivery Tables for SW 3 settings are the same as SW 2 settings. SW 3 cannot be set for airflow higher than SW 2. See Air Delivery Tables for specific switch settings</td>
</tr>
</tbody>
</table>

Fig. 55 - Furnace Setup Switches and Description (Continued)
Table 16 – Altitude Derate Multiplier for U.S.A.

<table>
<thead>
<tr>
<th>ALTITUDE</th>
<th>PERCENT OF DERATE</th>
<th>DERATE MULTIPLIER FACTOR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT.</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>0–2000</td>
<td>0–610</td>
<td>0</td>
</tr>
<tr>
<td>2001–3000</td>
<td>610–914</td>
<td>4–6</td>
</tr>
<tr>
<td>3001–4000</td>
<td>914–1219</td>
<td>6–8</td>
</tr>
<tr>
<td>4001–5000</td>
<td>1219–1524</td>
<td>8–10</td>
</tr>
<tr>
<td>5001–6000</td>
<td>1524–1829</td>
<td>10–12</td>
</tr>
<tr>
<td>6001–7000</td>
<td>1829–2134</td>
<td>12–14</td>
</tr>
<tr>
<td>7001–8000</td>
<td>2134–2438</td>
<td>14–16</td>
</tr>
<tr>
<td>8001–9000</td>
<td>2438–2743</td>
<td>16–18</td>
</tr>
<tr>
<td>9001–10,000</td>
<td>2743–3048</td>
<td>18–20</td>
</tr>
</tbody>
</table>

*Derate multiplier factors are based on midpoint altitude for altitude range.

Table 17 – Blower Off Delay Setup Switch

<table>
<thead>
<tr>
<th>DESIRED HEATING MODE</th>
<th>BLOWER OFF DELAY (SEC.)</th>
<th>SETUP SWITCH (SW1–7 AND –8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td></td>
<td>SW1–7 OFF</td>
</tr>
<tr>
<td>120</td>
<td></td>
<td>SW1–8 OFF</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>SW1–7 OFF</td>
</tr>
<tr>
<td>180</td>
<td></td>
<td>SW1–8 ON</td>
</tr>
</tbody>
</table>

Table 18 – Gas Rate (CU ft./hr)

<table>
<thead>
<tr>
<th>SIZE OF TEST DIAL</th>
<th>SECONDS FOR 1 REVOLUTION</th>
<th>1 Cu Ft.</th>
<th>2 Cu Ft.</th>
<th>5 Cu Ft.</th>
<th>SECONDS FOR 1 REVOLUTION</th>
<th>1 Cu Ft.</th>
<th>2 Cu Ft.</th>
<th>5 Cu Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>360</td>
<td>720</td>
<td>1800</td>
<td>50</td>
<td>72</td>
<td>144</td>
<td>360</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>120</td>
<td>240</td>
<td>600</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>20</td>
</tr>
<tr>
<td>30</td>
<td>116</td>
<td>232</td>
<td>551</td>
<td>18</td>
<td>48</td>
<td>97</td>
<td>243</td>
<td>18</td>
</tr>
<tr>
<td>40</td>
<td>113</td>
<td>225</td>
<td>553</td>
<td>16</td>
<td>43</td>
<td>86</td>
<td>214</td>
<td>16</td>
</tr>
<tr>
<td>50</td>
<td>109</td>
<td>218</td>
<td>545</td>
<td>15</td>
<td>42</td>
<td>84</td>
<td>209</td>
<td>15</td>
</tr>
<tr>
<td>60</td>
<td>106</td>
<td>212</td>
<td>529</td>
<td>14</td>
<td>41</td>
<td>82</td>
<td>205</td>
<td>14</td>
</tr>
<tr>
<td>70</td>
<td>103</td>
<td>206</td>
<td>514</td>
<td>13</td>
<td>40</td>
<td>80</td>
<td>200</td>
<td>13</td>
</tr>
<tr>
<td>80</td>
<td>100</td>
<td>200</td>
<td>500</td>
<td>12</td>
<td>39</td>
<td>78</td>
<td>196</td>
<td>12</td>
</tr>
<tr>
<td>90</td>
<td>97</td>
<td>195</td>
<td>486</td>
<td>11</td>
<td>38</td>
<td>76</td>
<td>192</td>
<td>11</td>
</tr>
<tr>
<td>100</td>
<td>95</td>
<td>189</td>
<td>474</td>
<td>10</td>
<td>38</td>
<td>75</td>
<td>188</td>
<td>10</td>
</tr>
<tr>
<td>110</td>
<td>92</td>
<td>185</td>
<td>462</td>
<td>9</td>
<td>37</td>
<td>74</td>
<td>184</td>
<td>9</td>
</tr>
<tr>
<td>120</td>
<td>90</td>
<td>180</td>
<td>450</td>
<td>8</td>
<td>36</td>
<td>72</td>
<td>180</td>
<td>8</td>
</tr>
<tr>
<td>130</td>
<td>88</td>
<td>176</td>
<td>439</td>
<td>7</td>
<td>35</td>
<td>71</td>
<td>178</td>
<td>7</td>
</tr>
<tr>
<td>140</td>
<td>86</td>
<td>172</td>
<td>429</td>
<td>6</td>
<td>34</td>
<td>68</td>
<td>170</td>
<td>6</td>
</tr>
<tr>
<td>150</td>
<td>84</td>
<td>167</td>
<td>419</td>
<td>5</td>
<td>33</td>
<td>67</td>
<td>167</td>
<td>5</td>
</tr>
<tr>
<td>160</td>
<td>82</td>
<td>164</td>
<td>409</td>
<td>4</td>
<td>32</td>
<td>66</td>
<td>164</td>
<td>4</td>
</tr>
<tr>
<td>170</td>
<td>80</td>
<td>160</td>
<td>400</td>
<td>4</td>
<td>31</td>
<td>65</td>
<td>161</td>
<td>3</td>
</tr>
<tr>
<td>180</td>
<td>78</td>
<td>157</td>
<td>391</td>
<td>3</td>
<td>30</td>
<td>64</td>
<td>158</td>
<td>2</td>
</tr>
<tr>
<td>190</td>
<td>76</td>
<td>153</td>
<td>383</td>
<td>3</td>
<td>29</td>
<td>63</td>
<td>155</td>
<td>2</td>
</tr>
<tr>
<td>200</td>
<td>75</td>
<td>150</td>
<td>375</td>
<td>2</td>
<td>28</td>
<td>62</td>
<td>152</td>
<td>1</td>
</tr>
</tbody>
</table>

5971NA

69
<table>
<thead>
<tr>
<th>ALTITUDE RANGE</th>
<th>AVG. GAS HEAT VALUE AT ALTITUDE (Btu/cu ft)</th>
<th>0.58</th>
<th>0.60</th>
<th>0.62</th>
<th>0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Orifice No.</td>
<td>Mnfd Press High/Low</td>
<td>Orifice No.</td>
<td>Mnfd Press High/Low</td>
<td>Orifice No.</td>
</tr>
<tr>
<td>0 (Canada)</td>
<td>900</td>
<td>43 3.8 / 1.6</td>
<td>42 3.2 / 1.4</td>
<td>42 3.3 / 1.4</td>
<td>42 3.4 / 1.4</td>
</tr>
<tr>
<td></td>
<td>925</td>
<td>43 3.6 / 1.5</td>
<td>43 3.7 / 1.6</td>
<td>43 3.8 / 1.6</td>
<td>43 3.2 / 1.4</td>
</tr>
<tr>
<td></td>
<td>950</td>
<td>43 3.4 / 1.4</td>
<td>43 3.5 / 1.5</td>
<td>43 3.6 / 1.5</td>
<td>43 3.7 / 1.6</td>
</tr>
<tr>
<td>1000</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
<td>43 3.4 / 1.5</td>
<td>43 3.6 / 1.5</td>
<td>43 3.4 / 1.4</td>
</tr>
<tr>
<td>1025</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>43 3.4 / 1.4</td>
</tr>
<tr>
<td>2000 (610)</td>
<td>44 3.3 / 1.4</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.7 / 1.6</td>
</tr>
<tr>
<td>4500 (1372)</td>
<td>44 3.2 / 1.3</td>
<td>44 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
</tr>
<tr>
<td>U.S.A. Only</td>
<td>3001 (915)</td>
<td>42 3.5 / 1.5</td>
<td>42 3.7 / 1.6</td>
<td>43 3.6 / 1.5</td>
<td>43 3.6 / 1.5</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>43 3.8 / 1.6</td>
<td>42 3.3 / 1.4</td>
<td>42 3.4 / 1.4</td>
<td>42 3.4 / 1.4</td>
</tr>
<tr>
<td></td>
<td>825</td>
<td>43 3.6 / 1.5</td>
<td>43 3.7 / 1.6</td>
<td>43 3.8 / 1.6</td>
<td>43 3.2 / 1.3</td>
</tr>
<tr>
<td></td>
<td>850</td>
<td>43 3.4 / 1.4</td>
<td>43 3.5 / 1.5</td>
<td>43 3.7 / 1.5</td>
<td>43 3.8 / 1.6</td>
</tr>
<tr>
<td>4000 (1219)</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
<td>43 3.5 / 1.5</td>
<td>43 3.6 / 1.5</td>
<td>43 3.7 / 1.6</td>
</tr>
<tr>
<td>5000 (1524)</td>
<td>44 3.2 / 1.1</td>
<td>44 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
<td>44 3.5 / 1.5</td>
</tr>
<tr>
<td>925</td>
<td>45 3.7 / 1.6</td>
<td>45 3.8 / 1.6</td>
<td>45 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.4 / 1.4</td>
</tr>
<tr>
<td>4001 (1220)</td>
<td>42 3.3 / 1.4</td>
<td>42 3.4 / 1.4</td>
<td>42 3.5 / 1.5</td>
<td>42 3.6 / 1.5</td>
<td>42 3.6 / 1.5</td>
</tr>
<tr>
<td>775</td>
<td>42 3.5 / 1.5</td>
<td>42 3.6 / 1.5</td>
<td>42 3.7 / 1.6</td>
<td>42 3.8 / 1.6</td>
<td>42 3.8 / 1.6</td>
</tr>
<tr>
<td>750</td>
<td>44 3.8 / 1.6</td>
<td>44 3.9 / 1.6</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
</tr>
<tr>
<td>800</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
<td>44 3.8 / 1.6</td>
</tr>
<tr>
<td>825</td>
<td>44 3.8 / 1.6</td>
<td>44 3.9 / 1.6</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
</tr>
<tr>
<td>5000 (1524)</td>
<td>44 3.3 / 1.4</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.7 / 1.6</td>
</tr>
<tr>
<td>900</td>
<td>44 3.2 / 1.3</td>
<td>44 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
</tr>
<tr>
<td>925</td>
<td>46 3.7 / 1.6</td>
<td>46 3.8 / 1.6</td>
<td>45 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.3 / 1.4</td>
</tr>
<tr>
<td>5001 (1525)</td>
<td>42 3.2 / 1.4</td>
<td>42 3.3 / 1.4</td>
<td>42 3.4 / 1.5</td>
<td>42 3.5 / 1.5</td>
<td>42 3.5 / 1.5</td>
</tr>
<tr>
<td>775</td>
<td>42 3.3 / 1.5</td>
<td>42 3.4 / 1.4</td>
<td>42 3.5 / 1.5</td>
<td>42 3.6 / 1.5</td>
<td>42 3.5 / 1.5</td>
</tr>
<tr>
<td>800</td>
<td>42 3.4 / 1.4</td>
<td>42 3.5 / 1.5</td>
<td>42 3.6 / 1.5</td>
<td>42 3.7 / 1.6</td>
<td>42 3.5 / 1.5</td>
</tr>
<tr>
<td>825</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.8 / 1.6</td>
</tr>
<tr>
<td>6000 (1829)</td>
<td>44 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.6 / 1.5</td>
</tr>
<tr>
<td>875</td>
<td>45 3.7 / 1.6</td>
<td>45 3.8 / 1.6</td>
<td>45 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.3 / 1.4</td>
</tr>
<tr>
<td>900</td>
<td>46 3.7 / 1.6</td>
<td>46 3.8 / 1.6</td>
<td>45 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.2 / 1.4</td>
</tr>
<tr>
<td>6001 (1830)</td>
<td>42 3.4 / 1.4</td>
<td>42 3.5 / 1.5</td>
<td>42 3.6 / 1.5</td>
<td>42 3.8 / 1.6</td>
<td>42 3.8 / 1.6</td>
</tr>
<tr>
<td>775</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>43 3.4 / 1.4</td>
<td>43 3.5 / 1.5</td>
<td>43 3.5 / 1.5</td>
</tr>
<tr>
<td>800</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
<td>44 3.6 / 1.5</td>
<td>44 3.7 / 1.6</td>
<td>44 3.7 / 1.6</td>
</tr>
<tr>
<td>825</td>
<td>44 3.2 / 1.3</td>
<td>44 3.3 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.4 / 1.4</td>
<td>44 3.5 / 1.5</td>
</tr>
<tr>
<td>850</td>
<td>46 3.8 / 1.6</td>
<td>46 3.8 / 1.6</td>
<td>45 3.2 / 1.4</td>
<td>44 3.3 / 1.4</td>
<td>44 3.3 / 1.4</td>
</tr>
</tbody>
</table>
Table 19 - Orifice Size and Manifold Pressure (In. W.C.) for Gas Input Rate (Continued)

TWO-STAGE FURNACE
(TABULATED DATA BASED ON 20,000 BTUH HIGH-HEAT / 13,000 BTUH LOW-HEAT PER BURNER, DERATED 2%/1000 FT (305M) ABOVE SEA LEVEL)

<table>
<thead>
<tr>
<th>ALTITUDE RANGE ft (m)</th>
<th>AVG. GAS HEAT VALUE AT ALTITUDE (Btu/cu ft)</th>
<th>SPECIFIC GRAVITY OF NATURAL GAS</th>
<th>0.58</th>
<th>0.60</th>
<th>0.62</th>
<th>0.64</th>
</tr>
</thead>
<tbody>
<tr>
<td>7001 (2134)</td>
<td>675</td>
<td>43</td>
<td>3.8 / 1.6</td>
<td>42</td>
<td>3.5 / 1.5</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>43</td>
<td>3.5 / 1.5</td>
<td>43</td>
<td>3.4 / 1.5</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>725</td>
<td>44</td>
<td>3.8 / 1.6</td>
<td>43</td>
<td>3.4 / 1.5</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td>44</td>
<td>3.5 / 1.5</td>
<td>44</td>
<td>3.4 / 1.4</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>775</td>
<td>44</td>
<td>3.3 / 1.4</td>
<td>44</td>
<td>3.1 / 1.4</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>45</td>
<td>3.8 / 1.6</td>
<td>44</td>
<td>3.2 / 1.4</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>825</td>
<td>46</td>
<td>3.7 / 1.6</td>
<td>46</td>
<td>3.8 / 1.6</td>
<td>45</td>
</tr>
<tr>
<td>8001 (2438)</td>
<td>625</td>
<td>42</td>
<td>3.4 / 1.4</td>
<td>42</td>
<td>3.5 / 1.5</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>650</td>
<td>43</td>
<td>3.8 / 1.6</td>
<td>42</td>
<td>3.2 / 1.4</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>675</td>
<td>43</td>
<td>3.5 / 1.5</td>
<td>43</td>
<td>3.6 / 1.5</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>44</td>
<td>3.7 / 1.6</td>
<td>43</td>
<td>3.4 / 1.4</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td>44</td>
<td>3.5 / 1.5</td>
<td>44</td>
<td>3.6 / 1.5</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>775</td>
<td>44</td>
<td>3.3 / 1.4</td>
<td>44</td>
<td>3.4 / 1.4</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>45</td>
<td>3.8 / 1.6</td>
<td>44</td>
<td>3.2 / 1.4</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>825</td>
<td>46</td>
<td>3.7 / 1.6</td>
<td>46</td>
<td>3.8 / 1.6</td>
<td>45</td>
</tr>
<tr>
<td>9001 (2744)</td>
<td>600</td>
<td>42</td>
<td>3.3 / 1.4</td>
<td>42</td>
<td>3.4 / 1.5</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>625</td>
<td>43</td>
<td>3.7 / 1.6</td>
<td>42</td>
<td>3.2 / 1.3</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>650</td>
<td>43</td>
<td>3.5 / 1.5</td>
<td>43</td>
<td>3.6 / 1.5</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>675</td>
<td>44</td>
<td>3.7 / 1.6</td>
<td>44</td>
<td>3.8 / 1.6</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>44</td>
<td>3.4 / 1.4</td>
<td>44</td>
<td>3.5 / 1.5</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>725</td>
<td>44</td>
<td>3.2 / 1.3</td>
<td>44</td>
<td>3.3 / 1.4</td>
<td>44</td>
</tr>
</tbody>
</table>

* Orifice numbers shown in BOLD are factory-installed.
**SERVICE AND MAINTENANCE PROCEDURES**

**WARNING**

**FIRE, INJURY OR DEATH HAZARD**

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

Failure to properly perform maintenance on this equipment requires certain knowledge, mechanical skills, tools, and equipment. If you do not possess these, do not attempt to perform any service and maintenance on this equipment other than those procedures recommended in the Owner’s Manual.

**ENVIRONMENTAL HAZARD**

Failure to follow this caution may result in environmental pollution.

Remove and recycle all components or materials (i.e., oil, refrigerant, control board, etc.) before unit final disposal.

**WARNING**

**ELECTRICAL SHOCK HAZARD**

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

There may be more than one electrical supply to the furnace. Check accessories and cooling unit for additional electrical supplies that must be shut off during furnace servicing. Lock out and tag switch with a suitable warning label.

The electrical ground and polarity for 115-v wiring must be properly maintained. Refer to Fig. 34 for field wiring information and to Fig. 64 for furnace wiring information.

**NOTE:** If the polarity is not correct, the STATUS LED on the control will flash rapidly and prevent the furnace from heating. The control system also requires an earth ground for proper operation of the control and flame-sensing electrode.

The 24-v circuit contains an automotive-type, 3-amp. fuse located on the control. (See Fig. 35.) Any shorts of the 24-v wiring during installation, service, or maintenance will cause this fuse to blow. If fuse replacement is required, use ONLY a 3-amp. fuse. The control LED will display status code 24 when fuse needs to be replaced.

**Troubleshooting**

Refer to the service label. (See Fig. 54—Service Label.)

The Troubleshooting Guide (See Fig. 63) can be a useful tool in isolating furnace operation problems. Beginning with the word “Start,” answer each question and follow the appropriate arrow to the next item.

The Guide will help to identify the problem or failed component. After replacing any component, verify correct operation sequence.

Proper instrumentation is required to service electrical controls. The control in this furnace is equipped with a Status Code LED (Light-Emitting Diode) to aid in installation, servicing, and troubleshooting. Status codes can be viewed at the indicator in the blower door. The amber furnace control LED is either constantly ON (a code composed of 2 digits. The digit is the number of short flashes, the second digit is the number of long flashes.)

For an explanation of status codes, refer to service label located on control door or Fig. 54, and the troubleshooting guide which can be obtained from your distributor.

**Retrieving Stored Fault Codes**

The stored status codes will NOT be erased from the control memory, when 115-v or 24-v power is interrupted. The control will store up to the last 7 Status Codes in order of occurrence.

1. To retrieve status codes, proceed with the following:
   a. Leave 115-v power to furnace turned on.
   b. Look into blower door indicator for correct LED status.
   c. Remove blower door.

**NOTE:** The Status Codes cannot be retrieved by disconnecting the limit switch. To retrieve Status Codes, follow the procedure below.

**CAUTION**

**ELECTRICAL OPERATION HAZARD**

Failure to follow this caution may result in improper furnace operation or failure of furnace.

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

General

These instructions are written as if the furnace is installed in an upflow application. An upflow furnace application is where the blower is located below the combustion and controls section of the furnace, and conditioned air is discharged upward. Since this furnace can be installed in any of the 4 positions shown in Fig. 2, you must revise your orientation to component location accordingly.
2. Turn Setup Switch, SWI-1 “ON.”
3. Manually close blower door switch.
4. Control will flash up to 7 Status Codes.
5. The last Status Code, or 8th Code, will be Code 11.
6. Turn SWI-1 “OFF.”
7. A continuously-lit Amber LED will appear and indicates proper operation.
8. Release blower door switch, install blower door and refer to the SERVICE label on the control door for more information.

Component Self-Test
Component Test can ONLY be initiated by performing the following:
1. Remove blower door.
2. Remove the wire from the “R” terminal of the control board.
3. Turn Setup Switch, SW-1-6 “ON.”
4. Manually close blower door switch.

Blower door switch opens 115-v power to control. No component operation can occur unless switch is closed. Caution must be taken when manually closing this switch for service purposes.

5. Component Test sequence will function as follows:
   a. The furnace control CPU turns the inducer motor ON at high-heat speed and keeps it ON through step c.
   b. After waiting 10 sec the furnace control CPU turns the hot surface igniter ON for 15 sec, then OFF.
   c. The furnace control CPU then turns the blower motor BLWM on at mid-range airflow for 15 sec, then OFF.
   d. After shutting the blower motor OFF the furnace control CPU switches the inducer to low-heat speed for 10 sec, then OFF.

NOTE: The EAC terminals are energized when the blower is operating.

After the component test is completed, 1 or more status codes (11 or 25) will flash. See component test section or Service Label (Fig. 54) for explanation of status codes.

NOTE: To repeat component test, turn setup switch SWI-6 OFF then back ON.

6. RELEASE BLOWER DOOR SWITCH, reattach wire to “R” terminal on furnace control board and replace blower door.

Care and Maintenance

**WARNING**

**FIRE OR EXPLOSION HAZARD**

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

Never store flammable or combustible materials on, near, or in contact with the furnace, such as:
1. Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners, or other cleaning tools.
2. Soap powders, bleaches, waxes or other cleaning compounds, plastic or plastic containers, gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids, or other volatile fluids.
3. Paint thinners and other painting compounds, paper bags, or other paper products. Exposure to these materials could lead to corrosion of the heat exchangers.

For continuing high performance and to minimize possible furnace failure, periodic maintenance must be performed on this furnace. Consult your local dealer about proper frequency of maintenance and the availability of a maintenance contract.

**WARNING**

**ELECTRICAL SHOCK HAZARD**

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

Blower door switch opens 115-v power to furnace control. No component operation can occur unless switch is closed. Exercise caution to avoid electrical shock from exposed electrical components when manually closing this switch for service purposes.

**WARNING**

**ELECTRICAL SHOCK AND FIRE HAZARD**

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

Turn off the gas and electrical supplies to the furnace and install lockout tag before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace.

**WARNING**

**CARBON MONOXIDE POISONING AND FIRE HAZARD**

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

Never operate furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.

**CAUTION**

**CUT HAZARD**

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces.

The minimum maintenance on this furnace is as follows:
1. Check and clean air filter each month or more frequently if required. Replace if torn.
2. Check blower motor and wheel for cleanliness each heating and cooling season. Clean as necessary.
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.
4. Inspect burner compartment before each heating season for rust, corrosion, soot or excessive dust. If necessary, have furnace and burner serviced by a qualified service agency.
5. Inspect the vent pipe/vent system before each heating season for water leakage, sagging pipes or broken fittings. Have vent pipes/vent system serviced by a qualified service agency.
6. Inspect any accessories attached to the furnace such as a humidifier or electronic air cleaner. Perform any service or maintenance to the accessories as recommended in the accessory instructions.

Cleaning and/or Replacing Air Filter
The air filter type may vary depending on the application or orientation. The filter is external to the furnace casing. There are no provisions for an internal filter with this furnace. See “Filter Arrangement” under the “Installation” section of this manual.

WARNING
CARBON MONOXIDE POISONING AND FIRE HAZARD
Failure to follow this warning could result in personal injury, death and/or property damage.
Never operate furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.

NOTE: If the filter has an airflow direction arrow, the arrow must point toward the blower.
To clean or replace filters, proceed as follows:

1. Turn off electrical supply to furnace.
2. Remove filter cabinet door.
3. Slide filter out of cabinet.
4. If equipped with permanent, washable filter, clean filter by spraying cold tap water through filter in opposite direction of airflow. Rinse filter and let dry. Oiling or coating of the filter is not recommended.
5. If equipped with factory specified disposable media filter, replace only with a factory specified media filter of the same size.
6. Slide filter into cabinet.
7. Replace filter cabinet door.
8. Turn on electrical supply to furnace.

Blower Motor and Wheel Maintenance
To ensure long life, economy, and high efficiency, clean accumulated dirt and grease from blower wheel and motor annually.
The inducer and blower motors are pre-lubricated and require no additional lubrication. These motors can be identified by the absence of oil ports on each end of the motor.
The following items should be performed by a qualified service technician. Clean blower motor and wheel as follows:
1. Turn off electrical supply to furnace.
2. Remove blower door.
3. All factory wires can be left connected, but field thermostat and accessory wiring may need to be disconnected depending on their length and routing.
4. If the vent and combustion air pipe passes through the blower compartment, it will be necessary to remove the pipes from the blower compartment.

Disconnect the vent and combustion air pipe by:
2. Remove blower door.
8. Reassemble motor and blower wheel by reversing items 7b through 7f. Ensure wheel is positioned for proper rotation.

NOTE: Blower wheel is fragile. Use care.
6. Clean blower wheel and motor by using a vacuum with soft brush attachment. Be careful not to disturb balance weights (clips) on blower wheel vanes. Do not bend wheel or blades as balance will be affected.
7. If greasy residue is present on blower wheel, remove wheel from the blower housing and wash it with an appropriate degreaser. To remove wheel:
3. Slide filter out of cabinet.
5. Remove screws securing blower assembly to blower shelf and slide blower assembly out of furnace. Detach ground wire and disconnect blower motor harness plugs from blower motor.

NOTE: Mark blower mounting arms and blower housing so each arm is positioned at the same hole location during reassembly.
6. Inspect any accessories attached to the furnace such as a humidifier or electronic air cleaner. Perform any service or maintenance to the accessories as recommended in the accessory instructions.
8. Reassemble motor and blower wheel by reversing items 7b through 7f. Ensure wheel is positioned for proper rotation.
9. Torque motor mounting bolts to 40 +/- 10 lb-in. when reassembling.
10. Torque blower wheel set screw to 160 +/- 20 lb-in when reassembling.
11. Verify that blower wheel is centered in blower housing and set screw contacts the flat portion of the motor shaft. Loosen set screw on blower wheel and reposition if necessary.
12. Spin the blower wheel by hand to verify that the wheel does not rub on the housing.
13. Reinstall blower assembly in furnace.
14. Reinstall 2 screws securing blower assembly to blower deck.
15. Reconnect blowers leads to furnace control. Refer to furnace wiring diagram, and connect thermostat leads if previously disconnected.

NOTE: Be sure to attach ground wire and reconnect blower harness plugs to blower motor.
Refer to Fig. 62.

16. Downflow or horizontal furnaces with vent pipe through furnace only:
   a. Install and connect short piece of vent pipe inside furnace to existing vent.
   b. Connect vent connector to vent elbow.
17. Turn on electrical supply. Manually close blower door switch. Use a piece of tape to hold switch closed. Check for proper rotation and speed changes between heating and cooling by jumpering R to G and R to Y/Y2 on furnace control thermostat terminals. If outdoor temperature is below 70°F, turn off circuit breaker to outdoor unit before running furnace in the cooling cycle. Turn outdoor circuit breaker on after completing cooling cycle. (See Fig. 35.)

**NOTE:** If R-W/W1 thermostat terminals are jumpered at the time blower door switch is closed, blower will run for 90 sec before beginning a heating cycle.
   a. Perform component self-test as shown at the bottom of the SERVICE label, located on the control door.
   b. Verify blower is rotating in the correct direction.
18. If furnace is operating properly, RELEASE BLOWER DOOR SWITCH. Remove any jumpers or reconnect any disconnected thermostat leads. Replace blower door.
19. Turn on gas supply and cycle furnace through one complete heating cycle. Verify the furnace temperature rise as shown in Adjustments Section. Adjust temperature rise as shown in Adjustments Section.

**Cleaning Burners and Flame Sensor**
The following items must be performed by a qualified service technician. If the burners develop an accumulation of light dirt or dust, they may be cleaned by using the following procedure:

**NOTE:** Use a back-up wrench on the gas valve to prevent the valve from rotating on the manifold or damaging the mounting to the burner assembly.

**WARNING**

**ELECTRICAL OPERATION HAZARD**
Failure to follow this warning could result in personal injury or death.
Blower door switch opens 115-v power to control. No component operation can occur unless switch is closed. Caution must be taken when manually closing this switch for service purposes.

Refer to Fig. 62.

1. Disconnect power at external disconnect, fuse or circuit breaker.
2. Turn off gas at external shut-off or gas meter.
3. Remove control door and set aside.
4. Turn electric switch on gas valve to OFF.
5. Disconnect the gas pipe from gas valve and remove pipe from the furnace casing.
6. Remove individual wires from terminals on gas valve.
7. Disconnect Hot Surface Igniter (HSI) wires from HSI.
9. Remove the flame sensor from the burner assembly.
10. Inspect the orifices in the manifold assembly for blockages or obstructions. Remove orifice and clean or replace orifice.
11. Raise top plate up slightly and prop it up with a small piece of wood or folded cardboard.
12. Support the burner assembly and remove the screws that attach the burner assembly to the heat exchanger cell panel.
13. Remove wires from both rollout switches.
14. Slide one-piece burner out of slots on sides of burner assembly.
15. Clean burner with a brush and a vacuum.

**To reinstall burner assembly:**

1. Install the Hot Surface Igniter (HSI) and bracket in burner assembly.
2. Install flame sensor on burner.
3. Align the edges of the one-piece burner with the slots in the burner assembly and slide the burners forward until they are fully seated in the burner assembly.
4. Align the orifices in the manifold assembly with the support rings on the end of the burner.
5. Insert the orifices in the support rings of the burners.

**NOTE:** If manifold does not fit flush against the burner, do not force the manifold on the burner assembly. The burners are not fully seated forward in the burner assembly. Remove the manifold and check burner positioning in the burner assembly assembly before re-installing the manifold.

6. Attach the green/yellow wire and ground terminal to one of the manifold mounting screws.
7. Install the remaining manifold mounting screws.
8. Check the igniter alignment. See Fig. 56, 58 and 62.
9. Attach the wires to the roll-out switches.
10. Attach the burner assembly to the primary cell inlet panel and attach the burner assembly to the cell panel.
11. Connect the wire for the flame sensor.
12. Connect the wire for the Hot Surface Igniter.

**NOTE:** Use propane-resistant pipe dope to prevent leaks. Do not use Teflon tape.
13. Install the gas pipe to the gas valve.

**WARNING**

**ELECTRICAL SHOCK AND FIRE HAZARD**
Failure to follow this warning could result in personal injury, death, and/or property damage.

Turn off the gas and electrical supplies to the furnace and install lockout tag before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace.

14. Check for gas leaks with a commercially available soap solution made specifically for the detection of leaks.
15. Turn gas on at electric switch on gas valve and at external shut-off or meter.
16. Turn power on at external disconnect, fuse or circuit breaker.
17. Run the furnace through two complete heating cycles to check for proper operation.
18. Install control door when complete.

Servicing Hot Surface Igniter
The igniter does NOT require annual inspection. Check igniter resistance before removal. Refer to Fig. 56, 58 and 62.
1. Turn off gas and electrical supplies to furnace.
2. Remove control door.
3. Disconnect igniter wire connection.
4. Check igniter resistance. Igniter resistance is affected by temperature. Only check resistance when the igniter is at room temperature.
   a. Using an ohm meter, check resistance across both igniter leads in connector.
   b. Cold reading should be between 40 ohms and 70 ohms.
5. Remove igniter assembly.
   a. Using a 1/4-in. driver, remove the two screws securing the igniter mounting bracket to the burner assembly (See Fig. 62.)
   b. Carefully withdraw the igniter and bracket assembly through the front of the burner assembly without striking the igniter on surrounding parts.
   c. Inspect igniter for signs of damage or failure.
   d. If replacement is required, remove the screw that secures the igniter on igniter bracket and remove the igniter.
6. To replace igniter and bracket assembly, reverse items 5a through 5d.
7. Reconnect igniter harness to the igniter, dressing the igniter wires to ensure there is no tension on the igniter itself. (See Fig. 62.)
8. Turn on gas and electrical supplies to furnace.
9. Verify igniter operation by initiating control board self-test feature or by cycling thermostat.
10. Replace control door.

Flushing Collector Box and Drainage System

**WARNING**

**ELECTRICAL SHOCK AND FIRE HAZARD**
Failure to follow this warning could result in personal injury, death, and/or property damage.

Turn off the gas and electrical supplies to the furnace and install lockout tag before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace.

1. Turn off gas and electrical supplies to furnace.
2. Remove control door.
3. Disconnect pressure switch tube from pressure switch port.

**NOTE:** Ensure the pressure switch tube disconnected from the pressure switch is higher than the collector box opening or water will flow out of tube.
4. Remove the collector box plug from the top port on the upper corner of the collector box. (See Fig. 59)
5. Attach a funnel with a flexible tube to port on the collector box.
6. Flush inside of collector box with water until discharge water from condensate trap is clean and runs freely.
7. Repeat steps 4 thru 6 with middle plug on upper corner of collector box.
8. Remove the pressure switch tube from the collector box.

**NOTE:** Do NOT blow into tube with tube connected to the pressure switch.

9. Clean pressure switch port on collector box with a small wire. Shake any water out of pressure switch tube.
10. Reconnect tube to pressure switch and pressure switch port.
11. Remove the relief tube from the port on the collector box and the trap.
12. Clean the relief port on collector box and the trap with a small wire. Shake any water out of the tube.
13. Reconnect relief tube to trap and collector box ports.

Cleaning Condensate Drain and Trap

**NOTE:** If the condensate trap is removed, a new gasket between the trap and collector box is required. Verify a condensate trap gasket is included in the service kit or obtain one from your local distributor.

1. Disconnect power at external disconnect, fuse or circuit breaker.
2. Turn off gas at external shut-off or gas meter.
3. Remove control door and set aside.
4. Turn electric switch on gas valve to OFF.
5. Disconnect external drain from condensate drain elbow or drain extension pipe inside the furnace and set aside.
6. Disconnect the condensate trap relief hose from collector box port and condensate trap.

**NOTE:** If condensate has a heat pad attached to the trap, trace the wires for the pad back to the connection point and disconnect the wires for the heat pad.
7. Remove the screw that secures the condensate trap to the collector box, remove the trap and set aside.
8. Remove the trap gasket from the collector box if it did not come off when the trap was removed.
9. Discard the old trap gasket.
10. Rinse condensate trap in warm water until trap is clean.
11. Flush condensate drain lines with warm water. Remember to check and clean the relief port on the collector box.
12. Shake trap dry.
13. Clean port on collector box with a small wire.

To re-install Condensate Drain and Trap:

1. Remove adhesive backing from condensate trap gasket
2. Install gasket on collector box
3. Align the condensate trap with the drain opening on the collector box and secure the trap with the screw
4. Attach the relief hose to the relief port on the condensate trap and collector box.
5. Secure tubing to prevent any sags or traps in the tubing.
6. Connect condensate drain elbow or drain extension elbow to the condensate trap
7. Connect the leads of the condensate heat pad (if used)
8. Connect external drain piping to the condensate drain elbow or drain extension pipe.
9. Turn gas on at electric switch on gas valve and at external shut-off or meter
10. Turn power on at external disconnect, fuse or circuit breaker.
11. Run the furnace through two complete heating cycles to check for proper operation.
12. Install control door when complete.

Checking Heat Pad Operation (If Applicable)

In applications where the ambient temperature around the furnace is 52°F or lower, freeze protection measures are required. If this application is where heat tape has been applied, check to ensure it will operate when low temperatures are present.
NOTE: The Heat Pad, when used, should be wrapped around the condensate drain trap. There is no need to use heat tape within the furnace casing. Most heat tapes are temperature activated, and it is not practical to verify the actual heating of the tape. Check the following:

1. Check for signs of physical damage to heat tape such as nicks, cuts, abrasions, gnawing by animals, etc.
2. Check for discolored heat tape insulation. If any damage or discolored insulation is evident, replace heat tape.
3. Check that heat tape power supply circuit is on.

Cleaning Heat Exchangers
The following items must be performed by a qualified service technician.

Primary Heat Exchangers
If the heat exchangers get an accumulation of light dirt or dust on the inside, they may be cleaned by the following procedure:

NOTE: If the heat exchangers get a heavy accumulation of soot and carbon, both the primary and secondary heat exchangers should be replaced rather than trying to clean them thoroughly due to their intricate design. A build-up of soot and carbon indicates that a problem exists which needs to be corrected, such as improper adjustment of manifold pressure, insufficient or poor quality combustion air, improper vent termination, incorrect size or adjustment of manifold pressure, insufficient or poor quality products.

1. Turn off gas and electrical supplies to furnace.
2. Remove control door.
3. Disconnect wires or connectors to flame rollout switch, gas valve, igniter, and flame sensor.
4. Using backup wrench, disconnect gas supply pipe from furnace gas control valve.
5. Remove two screws attaching top filler plate and rotate upwards to gain access to screws attaching burner assembly to cell panel.
6. Remove screws attaching burner assembly to cell panel. (See Fig. 62.)

NOTE: Burner cover, manifold, gas valve, and burner assembly should be removed as one assembly.

7. Clean heat exchanger openings with a vacuum and a soft brush. (See Fig. 60.)

NOTE: If the heat exchangers get an accumulation of light dirt or dust on the inside, they may be cleaned by the following procedure:

8. Reverse items 6 through 1 for reassembly.
9. Refer to furnace wiring diagram and reconnect wires to flame rollout switch, gas valve, igniter, and flame sensor.
10. Turn on gas and electrical supplies to furnace.
11. Check furnace operation through 2 complete heat operating cycles. Look at burners. Burner flames should be clear blue, almost transparent. (See Fig. 57.)
12. Check for gas leaks.
13. Replace main furnace door.

Secondary Heat Exchangers
The condensing side (inside) of the secondary heat exchanger CANNOT be serviced or inspected without complete removal of the heat exchanger assembly. Detailed information on heat exchanger removal can be obtained from your Distributor.

WINTERIZATION

UNIT AND PROPERTY DAMAGE HAZARD
Failure to follow this caution may result in unit component or property damage.

If the furnace is installed in an unconditioned space where the ambient temperatures may be 32°F (0°C) or lower, freeze protection measures must be taken to prevent minor property or product damage.

Since the furnace uses a condensing heat exchanger, some water will accumulate in the unit as a result of the heat transfer process. Therefore, once it has been operated, it cannot be turned off and left off for an extended period of time when temperatures will reach 32°F (0°C) or lower unless winterized. Follow these procedures to winterize your furnace:

1. Obtain propylene glycol (RV/swimming pool antifreeze or equivalent).
2. Turn off gas and electrical supplies to your furnace.
3. Remove furnace control door.

CAUTION

UNIT COMPONENT DAMAGE HAZARD
Failure to follow this caution may result in damage to the furnace and other property damage.

Do not use ethylene glycol (automotive antifreeze coolant or equivalent). Failure of plastic components may occur.
4. Remove the top unused rubber plug from the port on the collector box opposite the condensate trap. See Fig. 59.
5. Connect a field supplied 3/8-in. (9.5-mm) ID tube to the open port on the collector box.
6. Insert a field supplied funnel into the tube.
7. Pour 1 quart of anti-freeze solution into the funnel/tube. Antifreeze should run through the inducer housing, overfill condensate trap and flow to an open drain.
8. Replace the rubber plug in the port on the collector box.
9. Remove the middle unused rubber plug from the port on the collector box opposite the condensate trap. See Fig. 59.
10. Repeat Steps 5 through 8.
11. If a condensate pump is used, check with pump manufacturer to verify pump is safe for use with antifreeze used. Allow pump to start and pump anti-freeze to open drain.
12. Replace main door.
13. When furnace is re-started, flush condensate pump with clear water to check for proper operation before re-starting furnace.
14. Propylene glycol need not be removed before re-starting furnace.
Fig. 61 - Blower Assembly
Fig. 62 - Burner Assembly
SEQUENCE OF OPERATION

NOTE: Furnace control must be grounded for proper operation or else control will lock out. Control is grounded through green/yellow wire routed to gas valve and burner box screw. Using the schematic diagram in Fig. 64, follow the sequence of operation through the different modes. Read and follow the wiring diagram very carefully.

NOTE: If a power interruption occurs during a call for heat (W/W1 or W/W1-and-W2), the control will start a 90-sec blower-only ON period two sec after power is restored, if the thermostat is still calling for gas heating. The amber LED light will flash code 12 during the 90-sec period, after which the LED will be ON continuous, as long as no faults are detected. After the 90-sec period, the furnace will respond to the thermostat normally.

The blower door must be installed for power to be conducted through the blower door interlock switch ILK to the furnace control CPU, transformer TRAN, inducer motor IDM, blower motor BLWM, hot-surface igniter HSI, and gas valve GV.

1. Two-Stage Heating (Adaptive Mode) with Single-Stage Thermostat

See Fig. 35 and 36 for thermostat connections

NOTE: The low-heat only switch SW1-2 selects either the low-heat only operation mode when ON, (see item 2. below) or the adaptive heating mode when OFF in response to a call for heat. (See Fig. 55.) When the W2 thermostat terminal is energized it will always cause high-heat operation when the R-to-W circuit is closed, regardless of the setting of the low-heat only switch. This furnace can operate as a two-stage furnace with a single-stage thermostat because the furnace control CPU includes a programmed adaptive sequence of controlled operation, which selects low-heat or high-heat operation. This selection is based upon the stored history of the length of previous gas-heating periods of the single-stage thermostat.

The furnace will start up in either low- or high-heat. If the furnace starts up in low-heat, the control CPU determines the low-heat on-time (from 0 to 16 minutes) which is permitted before switching to high-heat. If the power is interrupted, the stored history is erased and the control CPU will select low-heat for up to 16 minutes and then switch to high-heat, as long as the thermostat continues to call for heat. Subsequent selection is based on stored history of the thermostat cycle times.

The wall thermostat "calls for heat", closing the R-to-W circuit. The furnace control performs a self-check, verifies the low-heat and high-heat pressure switch contacts LPS and HPS are open, and starts the inducer motor IDM in high-speed.

   a. Inducer Prepurge Period

(1.) If the furnace control CPU selects low-heat operation the inducer motor IDM comes up to speed, the low-heat pressure switch LPS closes, and the furnace control CPU begins a 15-sec purge period. If the high-heat pressure switch LPS fails to remain closed the inducer motor IDM will remain running at high-speed. After the low-heat pressure switch re-closes the furnace control CPU will begin a 15-sec prepurge period, and continue to run the inducer motor IDM at high-speed.

(2.) If the furnace control CPU selects high-heat operation, the inducer motor IDM remains running at high-speed, and the high-heat pressure switch relay HPSR is de-energized to close the NC contact. When sufficient pressure is available the high-heat pressure switch HPS closes, and the high-heat gas valve solenoid GV-HI is energized. The furnace control CPU begins a 15-sec prepurge period after the low-heat pressure switch LPS closes. If the high-heat pressure switch HPS fails to close and the low-heat pressure switch LPS closes, the furnace will operate at low-heat gas flow rate until the high-heat pressure switch closes for a maximum of 2 minutes after ignition.

b. Igniter Warm-Up - At the end of the prepurge period, the Hot-Surface Igniter HSI is energized for a 17-sec igniter warm-up period.

c. Trial-For-Ignition Sequence - When the igniter warm-up period is completed the main gas valve relay contact GVR closes to energize the gas valve solenoid GV-M. The gas valve solenoid GV-M permits gas flow to the burners where it is ignited by the HSI. Five sec after the GVR closes, a 2-sec flame proving period begins. The HSI igniter will remain energized until the flame is sensed or until the 2-sec flame proving period begins. If the furnace control CPU selects high-heat operation, the high-heat gas valve solenoid GV-HI is also energized.

d. Flame-Proving - When the burner flame is proved at the flame-proving sensor electrode FSE, the inducer motor IDM switches to low-speed unless the furnace is operating in high-heat, and the furnace control CPU begins the blower-ON delay period and continues to hold the gas valve GV-M open. If the burner flame is not proved within two sec, the control CPU will close the gas valve GV-M, and the control CPU will repeat the ignition sequence for up to three more Trials-For-Ignition before going to Ignition-Lockout. Lockout will be reset automatically after three hours, or by momentarily interrupting 115 vac power to the furnace, or by interrupting 24 vac power at SEC1 or SEC2 to the furnace control CPU (not at W/W1, G, R, etc.). If flame is proved when flame should not be present, the furnace control CPU will lock out of Gas-Heating mode and operate the inducer motor IDM on high speed until flame is no longer proved.

e. Blower-ON delay - If the burner flame is proven the blower-ON delays for low-heat and high-heat are as follows:

Low-heat - 45 sec after the gas valve GV-M is opened the blower motor BLWM is turned ON at low-heat airflow.

High-heat - 25 sec after the gas valve GV-M is opened the BLWM is turned ON at high-heat airflow. Simultaneously, the humidifier terminal HUM and electronic air cleaner terminal EAC-1 are energized and remain energized throughout the heating cycle.

f. Switching from Low- to High-Heat - If the furnace control CPU switches from low-heat to high-heat, the furnace control CPU will switch the inducer motor IDM speed from low to high. The high-heat pressure switch relay HPSR is de-energized to close the NC contact. When sufficient pressure is available the high-heat pressure switch HPS closes, and the high-heat gas valve solenoid GV-HI is energized. The blower motor BLWM will transition to high-heat airflow five sec after the furnace control CPU switches from low-heat to high-heat.

g. Switching from High- to Low-Heat - The furnace control CPU will not switch from high-heat to low-heat while the thermostat R-to-W circuit is closed when using a single-stage thermostat.

h. Blower-Off Delay - When the thermostat is satisfied, the R to W circuit is opened, de-energizing the gas valve GV-M, stopping gas flow to the burners, and de-energizing the humidifier terminal HUM. The inducer motor IDM will remain energized for a 15-sec post-purge period. The blower motor BLWM and air cleaner terminal EAC-1 will remain energized at low-heat airflow or transition to low-heat airflow for 90, 120, 150, or 180 sec (depending on se-
2. Two-Stage Thermostat and Two-Stage Heating

See Fig. 35 and 36 for thermostat connections.

NOTE: In this mode the low-heat only switch SW1-2 must be ON to select the low-heat only operation mode in response to closing the thermostat R-to-W1 circuit. Closing the thermostat R-to- W1-and-W2 circuits always causes high-heat operation, regardless of the setting of the low-heat only switch.

The wall thermostat “calls for heat”, closing the R-to-W1 circuit for low-heat or closing the R-to-W1-and-W2 circuits for high-heat. The furnace control performs a self-check, verifies the low-heat and high-heat pressure switch contacts LPS and HPS are open, and starts the induced motor IDM in high-speed.

The start up and shut down functions and delays described in item 1. above apply to the 2-stage heating mode as well, except for switching from low- to high-Heat and vice versa.

a. Switching from Low- to High-Heat - If the thermostat R-to-W1 circuit is closed and the R-to-W2 circuit closes, the furnace control CPU will switch the induced motor IDM speed from low to high. The high-heat pressure switch relay HPSR is de-energized to close the NC contact. When sufficient pressure is available the high-heat pressure switch HPS closes, and the high-heat gas valve solenoid GV-HI is energized. The blower motor BLWM transition to high-heat airflow five sec after the R-to-W2 circuit closes.

b. Switching from High- to Low-Heat - If the thermostat R-to-W1 circuit opens, and the R-to-W1 circuit remains closed, the furnace control CPU will switch the induced motor IDM speed from high to low. The high-heat pressure switch relay HPSR is energized to open the NC contact and de-energize the high-heat gas valve solenoid GV-HI. When the induced motor IDM reduces pressure sufficiently, the high-heat pressure switch HPS will open. The gas valve solenoid GV-M will remain energized as long as the low-heat pressure switch LPS remains closed. The blower motor BLWM will transition to low-heat airflow five sec after the R-to-W2 circuit opens.

3. Cooling mode

The thermostat “calls for cooling”.

a. Single-Speed Cooling -

See Fig. 35 and 36 for thermostat connections.

The thermostat closes the R-to-G-and-Y circuits. The R-to-Y circuit starts the outdoor unit, and the R-to-G-and-Y/Y2 circuits start the furnace blower motor BLWM on cooling airflow. Cooling airflow is based on the A/C selection shown in Fig. 55. The electronic air cleaner terminal EAC-1 is energized with 115 vac whenever the blower motor BLWM is operating. When the thermostat is satisfied, the R-to-G-and-Y circuit are opened. The outdoor unit stops, and the furnace blower motor BLWM transitions to run at high-cooling airflow.

b. Single-Stage Thermostat and Two-Speed Cooling (Adaptive Mode) -

See Fig. 35 and 36 for thermostat connections.

This furnace can operate a two-speed cooling unit with a single-stage thermostat because the furnace control CPU includes a programmed adaptive sequence of controlled operation, which selects low-cooling or high-cooling operation. This selection is based upon the stored history of the length of previous cooling period of the single-stage thermostat.

NOTE: The air conditioning relay disable jumper ACRDJ must be connected to allow thermostat control of the outdoor unit staging. (See Fig. 35.)

The furnace control CPU can turn on the air conditioning relay ACR to energize the Y/Y2 terminal and switch the outdoor unit to high-cooling.

The furnace control CPU can start up the cooling unit in either low- or high-cooling. If starting up in low-cooling, the furnace control CPU determines the low-cooling on-time (from 0 to 20 minutes) which is permitted before switching to high-cooling. If the power is interrupted, the stored history is erased and the furnace control CPU will select low-cooling for up to 20 minutes and then energize the air conditioning relay ACR to energize the Y/Y2 terminal and switch the outdoor unit to high-cooling, as long as the thermostat continues to call for cooling. Subsequent selection is based on stored history of the thermostat cycle times.

The wall thermostat “calls for cooling”, closing the R-to-G-and-Y circuits. The R-to-Y1 circuit starts the outdoor unit on low-cooling speed, and the R-to-G-and-Y1 circuits starts the furnace blower motor BLWM at low-cooling airflow which is the true on-board CF selection as shown in Fig. 35.

If the furnace control CPU switches from low-cooling to high-cooling, the furnace control CPU will energize the air conditioning relay ACR. When the air conditioning relay ACR is energized the R-to-Y1-and-Y2 circuits switch the outdoor unit to high-cooling speed, and the R-to-G-and-Y1-and-Y2 circuits transition the furnace blower motor BLWM to high-cooling airflow. High-cooling airflow is based on the A/C selection shown in Fig. 35.

NOTE: When transitioning from low-cooling to high-cooling the outdoor unit compressor will shut down for 1 minute while the furnace blower motor BLWM transitions to run at high-cooling airflow.

The electronic air cleaner terminal EAC-1 is energized with 115 vac whenever the blower motor BLWM is operating. When the thermostat is satisfied, the R-to-G-and-Y circuit are opened. The outdoor unit stops, and the furnace blower motor BLWM and electronic air cleaner terminal EAC-1 will remain energized for an additional 90 sec. Jumper Y1 to DHUM to reduce the cooling off-delay to 5 sec. (See Fig. 35.)

C. Two-Stage Thermostat and Two-Speed Cooling -

See Fig. 35 and 36 for thermostat connections.

NOTE: The air conditioning relay disable jumper ACRDJ must be disconnected to allow thermostat control of the outdoor unit.

The thermostat closes the R-to-G-and-Y1 circuits for low-cooling or closes the R-to-G-and-Y1-and-Y2 circuits for high-cooling. The R-to-Y1 circuit starts the outdoor unit on low-cooling speed, and the R-to-G-and-Y1 circuit starts the furnace blower motor BLWM at low-cooling airflow which is the true on-board CF (continuous fan) selection as shown in Fig. 55.

The R-to-Y1-and-Y2 circuits start the outdoor unit on high-cooling speed, and the R-to- G-and-Y/Y2 circuits start the furnace blower motor BLWM at high-cooling airflow. High-cooling airflow is based on the A/C (air conditioning) selection shown in Fig. 55.

The electronic air cleaner terminal EAC-1 is energized with 115 vac whenever the blower motor BLWM is operating.

When the thermostat is satisfied, the R-to-G-and-Y circuit are opened. The outdoor unit stops, and the furnace blower motor BLWM and electronic air cleaner terminal EAC-1 will remain energized for an additional 90 sec. Jumper Y1 to DHUM to reduce the cooling off-delay to 5 sec. (See Fig. 35.)

4. Dehumidification Mode

See Fig. 35 and 36 for thermostat connections.

The dehumidification output, D or DHUM on the Thermo-
5. Super-Dehumidify Mode

When there is a dehumidify demand, the DHUM input is activated, which means a 24 vac signal is removed from the DHUM input terminal. In other words, the DHUM input logic is reversed. The DHUM input is turned on when no dehumidify demand exists. Once 24 vac is detected by the furnace control on the DHUM input, the furnace control dehumidification capability is activated. If the DHUM input is removed for more than 48 hours, the furnace control reverts back to non-dehumidification mode.

The cooling operation described in item 3. above also applies to operation with a dehumidification thermostat. The exceptions are listed below:

a. **Low cooling** - when the R-to-G and Y1 circuit is closed and there is a demand for dehumidification, the furnace blower motor BLWM will drop the blower airflow to 86 percent of low-cooling airflow which is the true on-board CF (continuous fan) selection as shown in Fig. 55.

b. **High cooling** - when the R-to-G and Y/Y2 circuit is closed and there is a demand for dehumidification, the furnace blower motor BLWM will drop the blower airflow to 86 percent of high-cooling airflow. High-cooling airflow is based on the A/C (air conditioning) selection shown in Fig. 55.

c. **Cooling off-delay** - when the “call for cooling” is satisfied and there is a demand for dehumidification, the cooling blower-off delay is decreased from 90 sec to 5 sec.

5. **Super-Dehumidify Mode**

Super-Dehumidify mode can only be entered if the furnace control is in the Thermostat mode and there is a demand for dehumidification. The cooling operation described in item 3. above also applies to operation with a dehumidification thermostat. The exceptions are listed below:

a. When the R-to-Y1 circuit is closed, R-to-G circuit is open, and there is a demand for dehumidification, the furnace blower motor BLWM will drop the blower airflow to 65 percent of low-cooling airflow for a maximum of 10 minutes each cooling cycle or until the R-to-G circuit is closed or the demand for dehumidification is satisfied. Low-cooling airflow is the true on-board CF (continuous fan) selection as shown in Fig. 55.

b. When the R-to-Y/Y2 circuit is closed, R-to-G circuit is open, and there is a demand for dehumidification, the furnace blower motor BLWM will drop the blower airflow to 65 percent of high-cooling airflow for a maximum of 10 minutes each cooling cycle or until the R-to-G circuit is closed or the demand for dehumidification is satisfied. High-cooling airflow is based on the A/C (air conditioning) selection shown in Fig. 55.

c. When the “call for cooling” is satisfied and there is a demand for dehumidification, the cooling blower-off delay is decreased from 90 sec to 5 sec.

6. **Continuous Blower Mode**

When the R-to-G circuit is closed by the thermostat, the blower motor BLWM will operate at continuous blower airflow. Continuous blower airflow selection is initially based on the CF (continuous fan) selection shown in Fig. 55. Factory default is shown in Fig. 55. Terminal EAC-I is energized as long as the blower motor BLWM is energized.

During a call for heat, the furnace control CPU will transition the blower motor BLWM to continuous blower airflow, low-heat airflow, or the mid-range airflow, whichever is lowest. The blower motor BLWM will remain on until the main burners ignite then shut OFF and remain OFF for the blower-ON delay (45 sec in low-heat, and 25 sec in high-heat), allowing the furnace heat exchangers to heat up more quickly, then restarts at the end of the blower-ON delay period at low-heat or high-heat airflow, respectively.

The blower motor BLWM will revert to continuous-blower airflow after the heating cycle is completed. In high-heat, the furnace control CPU will drop the blower motor BLWM to low-heat airflow during the selected blower-OFF delay period before transitioning to continuous-blower airflow.

When the thermostat “calls for low-cooling”, the blower motor BLWM will switch off and then shut OFF at low-cooling airflow before transitioning back to continuous-blower airflow.

When the thermostat “calls for high-cooling”, the blower motor BLWM will operate at high cooling airflow. When the thermostat is satisfied, the blower motor BLWM will operate an additional 90 sec at high-cooling airflow before transitioning back to continuous-blower airflow. When the R-to-G circuit is opened, the blower motor BLWM will continue operating for an additional 5 sec. If the thermostat is satisfied, the blower motor BLWM will operate an additional 90 sec at high-cooling airflow before transitioning back to continuous-blower airflow.

When the thermostat “calls for high-cooling”, the blower motor BLWM will operate at high cooling airflow. When the thermostat is satisfied, the blower motor BLWM will operate an additional 90 sec at high-cooling airflow before transitioning back to continuous-blower airflow. When the R-to-G circuit is opened, the blower motor BLWM will continue operating for an additional 5 sec if no other function requires blower motor BLWM operation.

Continuous Blower Speed Selection from Thermostat To select different continuous-blower airflow from the room thermostat, momentarily turn off the FAN switch or push button on the room thermostat for 1-3 sec after the blower motor BLWM is operating. The furnace control CPU will shift the continuous-blower airflow from the factory setting to the next highest CF selection airflow as shown in Fig. 55. Momentarily turning off the FAN switch again at the thermostat will shift the continuous-blower airflow up one more increment. If you repeat this procedure enough, you will eventually shift the continuous-blower airflow to the lowest CF selection as shown in Fig. 55. The selection can be changed as many times as desired and is stored in the memory to be automatically used following a power interruption.

**NOTE:** If the blower-off delay is set to the maximum, the adjustable continuous-fan feature is locked (i.e., fan speed cannot be changed from its current setting).

7. **Heat pump**

See Fig. 35 and 36 for thermostat connections.

When installed with a heat pump, the furnace control automatically changes the timing sequence to avoid long blower off times during demand defrost cycles. Whenever W/W1 is energized along with Y1 or Y/Y2, the furnace control CPU will transition to or bring on the blower motor BLWM at cooling airflow, low-heat airflow, or the mid-range airflow, whichever is lowest. The blower motor BLWM will remain on until the main burners ignite then shut OFF and remain OFF for 25 sec before coming back on at heating airflow. When the W/W1 input signal disappears, the furnace control begins a normal inducer post-purge period while changing the blower airflow. If Y/Y2 input is still energized, the furnace control CPU will transition the blower motor BLWM to cooling airflow. If Y/Y2 input signal disappears and the Y1 input is still energized, the furnace control CPU will transition the blower motor BLWM to low-cooling airflow. If both the Y1 and Y/Y2 signals disappear at the same time, the blower motor BLWM will remain on at low-heat airflow for the selected blower-OFF delay period. At the end of the blower-OFF delay, the blower motor BLWM will shut OFF unless S is still energized, in which case the blower motor BLWM will operate at continuous blower airflow.

**Component Self-Test**

Refer to page 73 for instructions.
Troubleshooting Guide

1. **Is AMBER LED status light on?**
   - **YES**
     - Is there 115V at L1 and L2?
     - **YES**
       - Is there 24V at SEC-1 and SEC-2?
       - **YES**
         - Replace furnace control.
     - **NO**
       - Is door switch closed?
       - **YES**
         - Is there 115V going to switch?
         - **YES**
           - Replace door switch.
         - **NO**
           - Is door switch closed?
       - **NO**
         - Replace furnace control.
   - **NO**
     - Is AMBER LED status blinking rapidly without a pause?
     - **NO**
       - Is AMBER LED status blinking ON/OFF slowly with a combination of short and long flashes?
     - **YES**
       - Determine status code. The status code is a 2 digit number with the first digit determined by the number of short flashes and the second digit by the number of long flashes.
       - Go to section below for the status code that was flashed.
     - **NO**
       - To recall previous status codes disconnect the R thermostat connection, reset power, and put setup switch SW1-1 in the ON position. The AMBER LED will flash the status codes in the order of occurrence. Record status codes until status code #11 flashes (1 short and 1 long flash). After status code #11 flashes the status codes will repeat. Status codes are erased after 72 hours or can be manually erased by putting setup switch SW1-1 in the ON position and jumpering R, W/W1, and Y/Y2 simultaneously until status code #11 is flashed. When done put setup switch SW1-1 in the OFF position.
       - Was there a previous status code other than #11?
       - **YES**
         - Does the control respond to W/W1, W2, Y1, Y/Y2, and G (24V) thermostat signals?
         - **YES**
           - Run system through a low-heat, high-heat, or cooling cycle to check operation. Status codes are erased after 72 hours or can be manually erased by putting setup switch SW1-1 in the ON position and jumpering R, W/W1, and Y/Y2 simultaneously until status code #11 is flashed.
           - Replace furnace control.
         - **NO**
           - Disconnect all the thermostat wires from the furnace control.
           - Does the problem repeat when using a jumper wire?
           - **YES**
             - Replace furnace control.
           - **NO**
             - The thermostat is not compatible with the furnace control. Either install a ballast resistor, connect the Com24V thermostat terminal to the thermostat, or replace the thermostat.
     - **NO**
       - Check room thermostat or interconnecting cable.
25 INVALID MODEL SELECTION OR SETUP ERROR - If status code 25 only flashes 4 times on power-up the control is missing its model plug PL4 and is defaulting to the model selection stored in memory. If status code 25 flashes continuously it could indicate any of the following:
- Model plug PL4 is missing and there is no valid model stored in permanent memory. This will happen if you forget to install the model plug PL4 on a service replacement control.
- Thermostat call with SW1-1 ON.
- Thermostat call with SW1-6 ON.
- SW1-1 and SW1-6 both ON.
- Two different furnace models twinned.
- Service replacement control is incorrect. Need non-modulating board with software version V17 or later.

21 HIGH-HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPEN - Check for:
- Control relay may be defective.
- Gas valve is miswired.
- See status code 32.

41 BLOWER MOTOR FAULT - Indicates the blower failed to reach 250 RPM or the blower failed to communicate within the prescribed time limits. Thirty seconds after being turned ON or ten seconds during steady-state operation. Turn power off and check the following items first before proceeding to the next step.
- Rubbing blower wheel.
- Loose blower wheel.
- Wiring from furnace control to blower motor.
- Remove the R thermostat connection from the furnace control, disconnect both connectors from the blower motor PL13 and PL14. Does the blower wheel turn freely?

Replace the blower control module attached to the blower motor. Follow the instructions with the blower control module to make sure the entire blower motor does not need to be replaced.

41 BLOWER MOTOR FAULT - Indicates the blower failed to reach 250 RPM or the blower failed to communicate within the prescribed time limits. Thirty seconds after being turned ON or ten seconds during steady-state operation. Turn power off and check the following items first before proceeding to the next step.
- Rubbing blower wheel.
- Loose blower wheel.
- Wiring from furnace control to blower motor.
- Replace the furnace control.

31 BLOWER MOTOR FAULT - Indicates the blower failed to reach 250 RPM or the blower failed to communicate within the prescribed time limits. Thirty seconds after being turned ON or ten seconds during steady-state operation. Turn power off and check the following items first before proceeding to the next step.
- Rubbing blower wheel.
- Loose blower wheel.
- Wiring from furnace control to blower motor.
- Remove the R thermostat connection from the furnace control, disconnect both connectors from the blower motor PL13 and PL14. Does the blower wheel turn freely?

Replace the blower control module attached to the blower motor. Follow the instructions with the blower control module to make sure the entire blower motor does not need to be replaced.
NOTES:
1. If any of the original equipment wire is replaced use wire rated for 105°C.
2. Use only copper wire between the disconnect switch and the furnace junction box (JB).
3. This wire must be connected to furnace sheet metal for control to prove flame.
4. Symbols are electrical representation only.
5. Solid lines inside PCB are printed circuit board conductors and are not included in legend.
6. Replace only with a 3 amp fuse.
7. Inducer motor (IDM) contains internal auto-reset thermal overload switch.
9. Blower off-delay, gas heating selections are (90, 120, 150, 180) seconds, cooling or heat pump 90 seconds or 5 seconds when dehumidify call is active.
10. Ignition lockout will occur after four consecutive unsuccessful trials for ignition. Control will auto-reset after three hours.
11. Inducer motor (IDM) contains internal auto-reset thermal overload switch.
12. Any of the 5 wires shown within the NEUTRAL L2 box can be connected to any terminal within the box.
13. Blower motor (BLWM) is locked rotor overload protected by redundant electronic control circuits.

Fig. 64 - Wiring Diagram
PARTS REPLACEMENT INFORMATION GUIDE

Casing Group
Blower door
Bottom plate
Control door
Door knob assembly
Top filler plate

Electrical Group
3-Amp fuse
Circuit board
Control box
Door switch
Junction box
Limit switch(es)
Transformer

Blower Group
Blower housing
Blower motor
Blower wheel
Capacitor (when used)
Capacitor strap (when used)
Cut-off plate
Power choke (where used)

Filter Group
Filter(s)
Media Cabinet (when used)

Gas Control Group
Burner
Flame sensor
Gas valve
Hot surface igniter
Manifold
Orifice

Heat Exchanger Group
Containment plate
Coupling box
Heat exchanger assembly
Primary HX cell panel
Secondary HX assembly
Tubing gaskets

Inducer Group
Collector box
Condensate trap
 Condensate trap elbow
Gaskets
Inducer
Inducer assembly
Inducer motor capacitor (when used)
Inducer motor module (when used)
Pressure switch(es)

TO OBTAIN INFORMATION ON PARTS: Consult your installing dealer or classified section of your local telephone directory under “Heating Equipment” or “Air Conditioning Contractors and Systems” headings for dealer listing by brand name or contact:

CARRIER CORPORATION
Consumer Relations Department
P.O. Box 4808
Syracuse, New York 13221
1-800-CARRIER

Have available the model number, series number, and serial number located on the unit rating plate to ensure correct replacement part.

Model Nomenclature

<table>
<thead>
<tr>
<th>MODEL</th>
<th>HEATING SIZE</th>
<th>MOTOR</th>
<th>WIDTH</th>
<th>VOLTAGE</th>
<th>MINOR SERIES</th>
<th>COOLING AIRFLOW (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>59TN6A</td>
<td>120</td>
<td>V</td>
<td>24</td>
<td>--</td>
<td>--</td>
<td>22</td>
</tr>
</tbody>
</table>

⚠️ WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK AND CARBON MONOXIDE POISONING HAZARD

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

Improper installation, adjustment, alteration, service, or maintenance can cause personal injury, property damage, or death. Consult a qualified installer, service agency, or your local gas supplier for information or assistance. The qualified installer or service agency must use only factory-authorized replacement parts, kits, or accessories when modifying this product.