

INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

MINUTEMAN® II DIRECT VENT GAS - FIRED BOILER / WATER HEATER



For service or repairs to boiler, call your heating contractor. When seeking information on boiler, provide Boiler Model Number and Serial Number as shown on Rating Label.

| | | |
|---|-------------------------------------|-------------------|
| Boiler Model Number MMII _ _ _ _ - _ _ | Boiler Serial Number 6 _ _ _ _ _ | Installation Date |
| Heating Contractor | | Phone Number |
| Address | | |



81404025R13-1/07

Price - \$3.00

The New York City Department of Buildings has approved the Minuteman® II boiler: Approval No. MEA 332-93-E.

The City of New York requires either a Licensed Master Plumber or a Fire Suppression Piping Contractor supervise the installation of this product.

The Massachusetts Board of Plumbers and Gas Fitters has approved the Minuteman® II boiler. See the Massachusetts Board of Plumbers and Gas Fitters website, http://license.reg.state.ma.us/pubLic/pb_pre_form.asp for the latest Approval Code or ask your local Sales Representative.

The Commonwealth of Massachusetts requires this product to be installed by a Licensed Plumber or Gas Fitter.

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

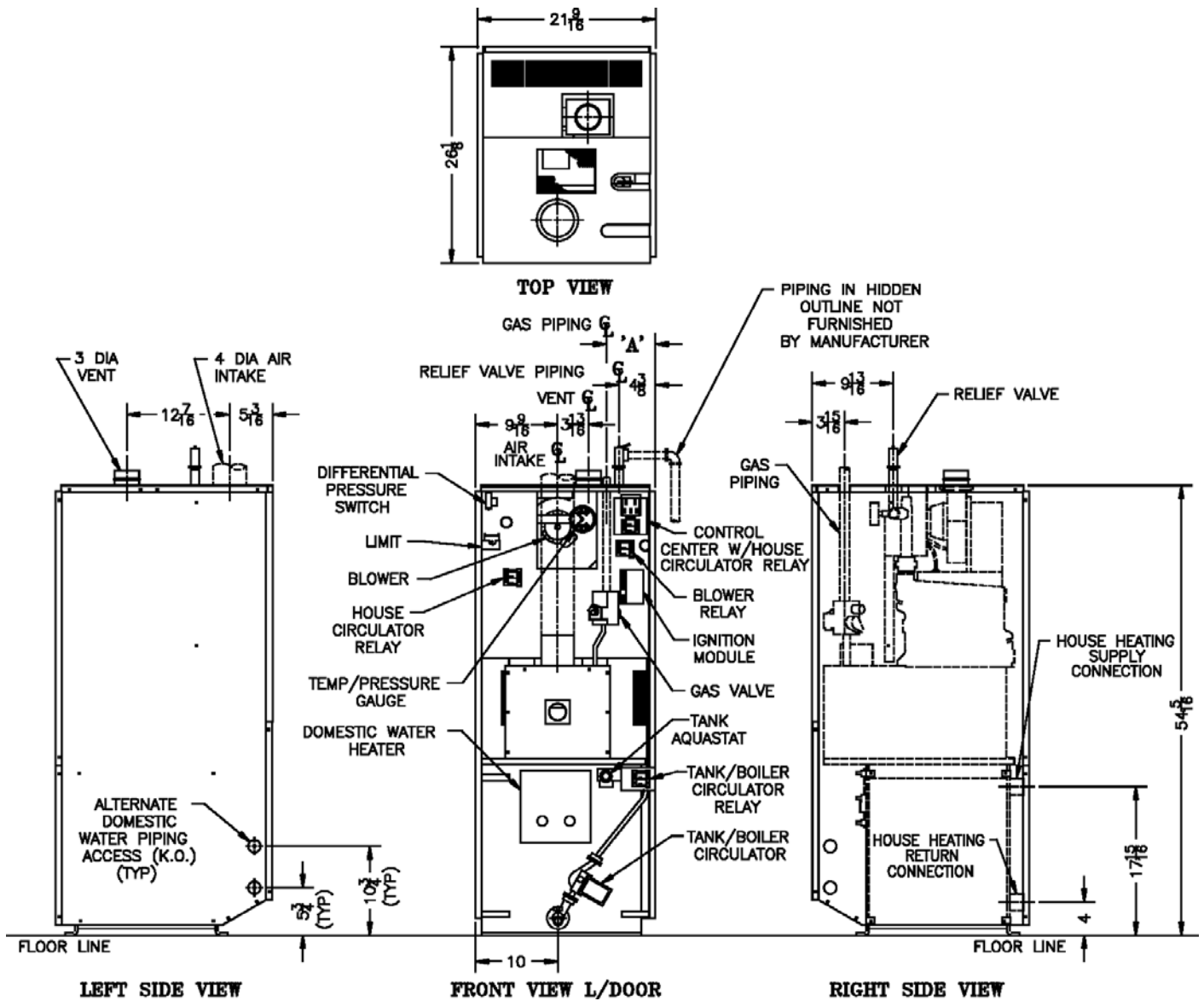
Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

Table of Contents

| | | | |
|------------------------------------|---|------------------------------------|----|
| I. Pre-Installation | 4 | VI. Venting/Air Intake Piping..... | 11 |
| II. Unpack Boiler..... | 5 | VII. Electrical | 17 |
| III. Boiler Water Piping..... | 5 | VIII. System Start-up..... | 18 |
| IV. Domestic Hot Water Piping..... | 8 | IX. Service Instructions..... | 22 |
| V. Gas Piping | 9 | X. Repair Parts | 29 |

CAUTION

This boiler contains controls which may cause the boiler to shut down and not restart without service. If damage due to frozen pipes is a possibility, the heating system should not be left unattended in cold weather; or appropriate safeguards and alarms should be installed on the heating system to prevent damage if the boiler is inoperative.



| BOILER MODEL | HOUSE HEATING PIPING CONNECTION (INCHES) | | DOMESTIC WATER COIL CONNECTION (INCHES) | | GAS SUPPLY CONNECTION (INCHES) | COMBUSTION AIR INTAKE CONNECTION (DIA. - INCHES) | FLUE VENT CONNECTION (DIA. - INCHES) | WATER CAPACITY | | 'A' | APPROX. SHIPPING WEIGHT | | | | | | |
|--------------|--|--------------|---|-----------------|--------------------------------|--|--------------------------------------|------------------|----------------|-------|-------------------------|--|--|--|--|--|--|
| | SUPPLY (NPT) | RETURN (NPT) | WATER IN (NPT) | WATER OUT (NPT) | | | | BOILER (GALLONS) | TANK (GALLONS) | | | | | | | | |
| MMI4-70 | 1-1/4 | 1-1/4 | 1/2 | 1/2 | 1/2 | 4 | 3 | 2-1/2 | 17.6 | 5-7/8 | 307 LB. | | | | | | |
| MMI4-105 | | | | | | | | 3 | | 5-1/8 | 345 LB. | | | | | | |
| MMI5-105 | | | | | | | | | | | | | | | | | |
| MMI5-140 | | | | | | | | | | | | | | | | | |

Figure 1: Dimensional Drawing

I. Pre-Installation

WARNING

Carefully read all instructions before installing boiler. Failure to follow all instructions in proper order can cause personal injury or death.

A. Installation must conform to the requirements of the authority having jurisdiction. In the absence of such requirements, installation must conform to:

USA ANSI Z223.1, *National Fuel Gas Code*.
Where required by the authority having jurisdiction, the installation must also conform to ANSI/ASME CSD-1 *Standard for Controls and Safety Devices for Automatically Fired Boilers*.

CANADA CAN/CGA B149.1 or .2 *Installation Codes for Gas Burning Appliances and Equipment*, and CSA C22.1 *Canadian Electrical Code, Part I*.

- B. Appliance is design certified for installation on combustible flooring. The boiler must not be installed on carpeting.
- C. Provide clearance between boiler jacket and combustible material in accordance with local fire ordinance. Refer to Figure 2 for minimum listed clearance from combustible material. Recommended service clearance is 24 inches from left side, right side, front and rear. Service clearances may be reduced to minimum clearances to combustible materials.
- D. Install on level floor. For basement installation provide concrete base if floor is not perfectly level or if water may be encountered on floor around boiler.
- E. Protect gas ignition system components from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, condensate trap, control replacement, etc.).

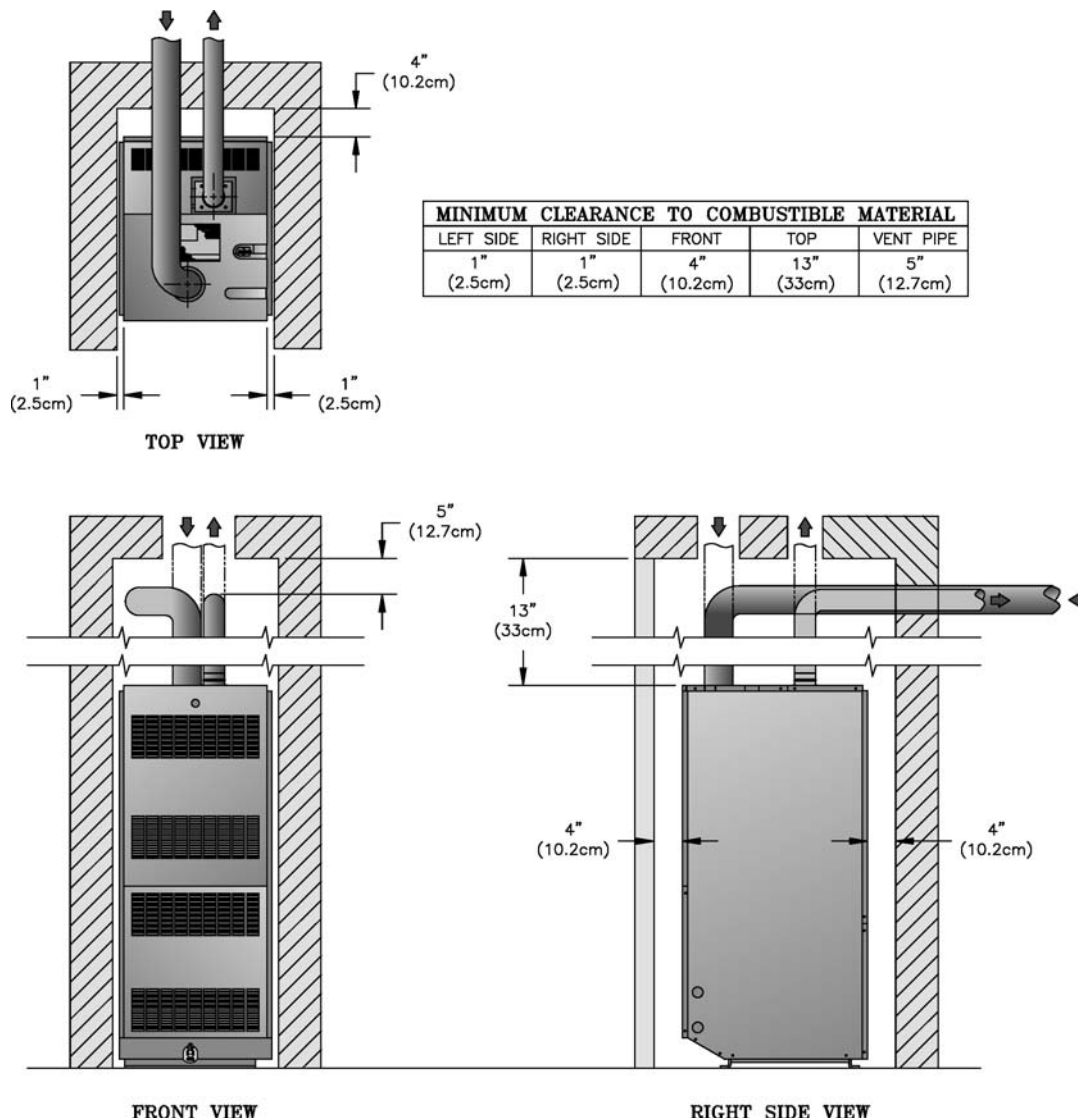


Figure 2: Minimum Clearances to Combustible Surfaces

- F. Provide combustion and ventilation air in accordance with applicable provisions of local building codes, or *National Fuel Gas Code*, ANSI Z223.1, Section 5.3, Air for Combustion and Ventilation.

WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion.

This boiler is equipped with a fan which produces an induced draft through the unit. 100% of combustion air is pulled in from outdoors and the flue gases are exhausted to the outdoors through the intake air/vent system. Refer to Section VI.

- G. Do not install boiler where gasoline or other flammable vapors or liquids, or sources of hydrocarbons (i.e. bleaches, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) are used or stored.

II. Unpack Boiler

CAUTION

Do not drop boiler. Do not bump boiler jacket against floor.

- A. Move boiler to approximate installed position.
B. Remove all crate fasteners.

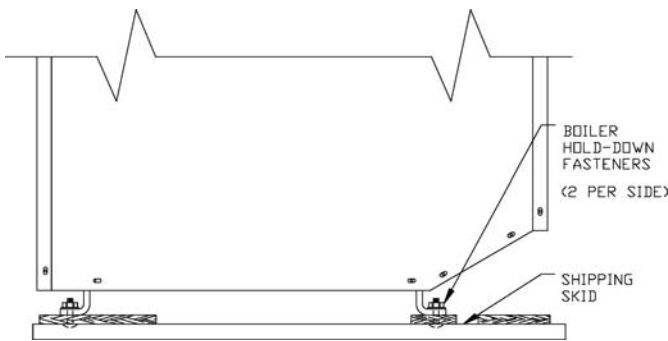


Figure 3: Removal From Skid

- C. Remove outside container with all other inside protective spacers and bracing. Save two of the wooden slats from the container sleeve for use in Steps E and F.
D. Remove four (4) boiler hold-down fasteners. See Figure 3.
E. Tilt the boiler to one side and slide a wooden slat under the two nylon glides.
F. Tilt the boiler to the other side and slide another wooden slat under the two nylon glides.
G. Slide the boiler forward or backward off the skid using the two wooden slats as runners.
H. Move boiler to its permanent location.

III. Water Piping and Trim

CAUTION

**Failure to properly pipe boiler may result in improper operation and damage to boiler or building.
DO NOT USE AUTOMATIC WATER FEEDER WITH THIS BOILER.**

CAUTION

Oxygen contamination of boiler water will cause corrosion of iron and steel boiler components, and can lead to boiler failure. Burnham's standard warranty does not cover problems caused by oxygen contamination of boiler water.

- A. **Design and install boiler and system piping** to prevent oxygen contamination of boiler water.

Oxygen contamination sources are system leaks requiring addition of makeup water, fittings, and oxygen permeable materials in distribution system. Eliminate oxygen contamination by repairing system leaks, repairing fittings, and using nonpermeable materials in distribution system.

- B. **Connect system supply and return piping** to boiler. See Figure 4. Also consult I=B=R Installation and Piping Guides. Maintain a clearance between hot water piping and combustible construction as required by local codes. In the absence of local codes, 1/2" clearance should be used. Note that a system circulator is required and is not supplied with the Minuteman II.

C. Install Safety Relief Valve. See Figure 4. Safety Relief Valve must be installed with spindle in vertical position.

Installation of the relief valve must be consistent with the ASME Boiler and Pressure Vessel Code, Section IV.

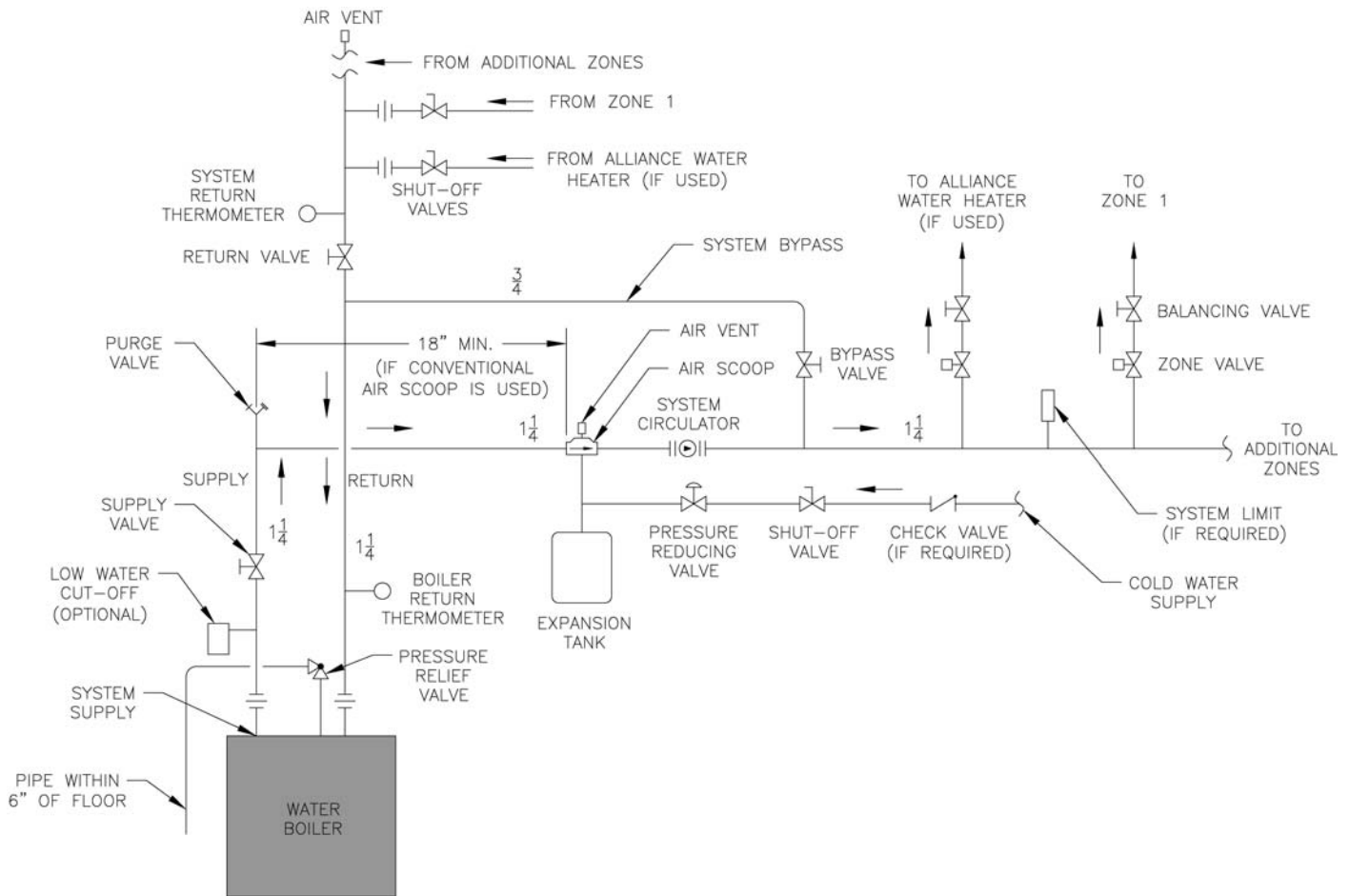


Figure 4: Recommended Water Piping for Zone Valve Zoned Heating Systems

WARNING

Safety relief valve discharge piping must be piped near floor to eliminate potential of severe burns. Do not pipe in any area where freezing could occur. Do not install any shut-off valves.

D. If boiler is used in connection with refrigeration systems, boiler must be installed with chilled medium piped in parallel with the heating boiler using appropriate valves to prevent chilled medium from entering boiler, see Figure 5. Also consult I=B=R Installation and Piping Guides.

Refer to Figure 5a for a diagram of the water piping system inside the Minuteman® II's jacket.

- E. If boiler is connected to heating coils** located in air handling units where they may be exposed to refrigerated air, boiler piping must be equipped with flow control valves to prevent gravity circulation of boiler water during operation of cooling system.
- F. Use a boiler bypass** if the boiler is to be operated in a system which has a large volume or excessive radiation where low boiler water temperatures may be encountered (i.e. converted gravity circulation system, etc.).

Install pipe tee between circulator and boiler return along with second tee in supply piping as shown in Figure 4. Bypass should be same size as the supply and return lines with valves located in bypass and supply outlet as illustrated in Figure 4 in order to regulate water flow to maintain higher boiler water temperatures.

After the boiler is operational (reference Section VII. System Start-Up) set by-pass and boiler supply valves to half throttle position to start. Operate boiler until system water temperature reaches normal operating range.

Adjust valves to provide 180° to 200°F supply water temperature. Opening the boiler supply valve will raise system temperature, while opening the by-pass valve will lower system supply temperature.

G. A hot water boiler installed above radiation level must be provided with a low water cut-off device as part of installation.

If a low water cut-off is required, it must be mounted in the system piping above the boiler.

The minimum safe water level of a hot water boiler is just above the highest water containing cavity of the boiler; that is, a hot water boiler must be full of water to operate safely.

H. Oil, grease, and other foreign materials which accumulate in new hot water boilers and a new or reworked system should be boiled out, and then thoroughly flushed. A qualified water treatment chemical specialist should be consulted for recommendations regarding appropriate chemical compounds and concentrations which are compatible with local environmental regulations.

It is required to perform a long term pressure test of the hydronic system, the boiler should first be isolated to avoid a pressure loss due to the escape of air trapped in the boiler.

To perform a long term pressure test including the boiler, ALL trapped air must first be removed from the boiler.

A loss of pressure during such a test, with no visible water leakage, is an indication that the boiler contained trapped air.

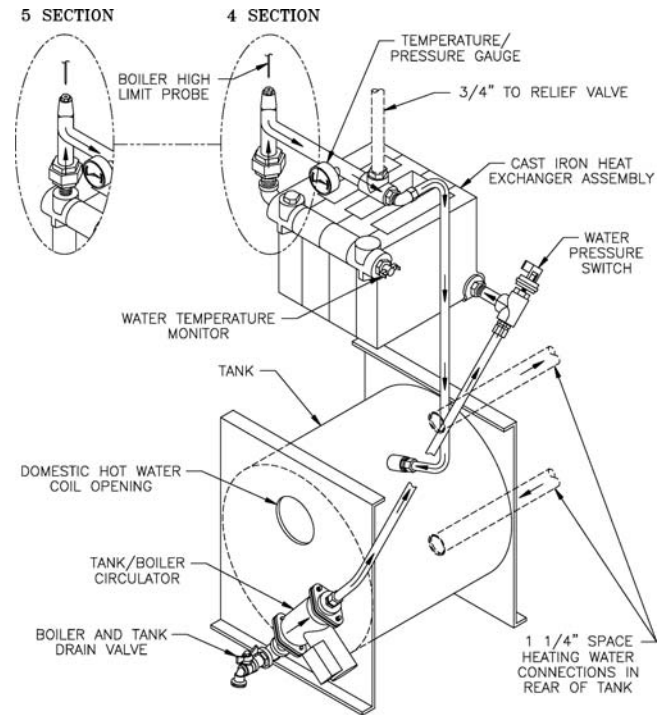


Figure 5a: Internal Water Piping System Diagram

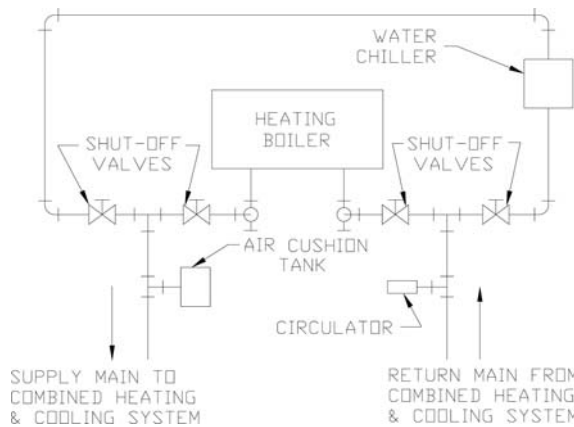


Figure 5: Recommended Piping for Combination Heating & Cooling (Refrigeration) Systems

I. After the boiler and system have been cleaned and flushed, and before refilling the entire system add appropriate water treatment chemicals, if necessary, to bring the pH between 7 and 11.

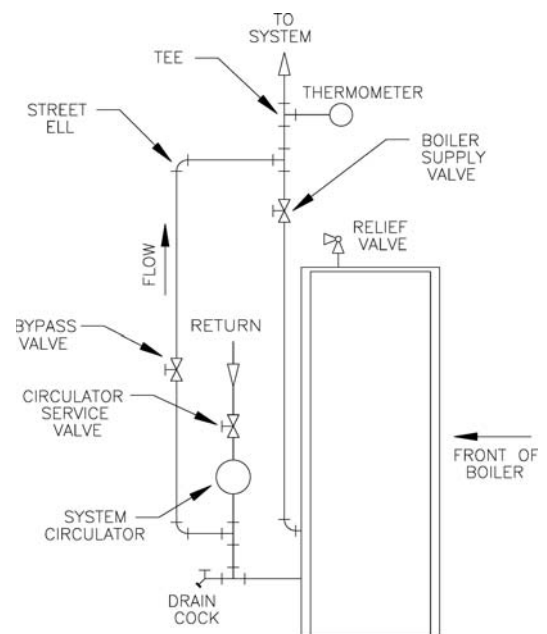


Figure 6: Recommended Bypass Piping

IV. Domestic Hot Water Performance and Piping

A. Domestic hot water ratings for the Minuteman® II are based two 5 minute draws with 10 minute recovery period at 100°F average temperature rise. Refer to Table 1 for ratings.

Table 1: Domestic Hot Water Ratings

| BOILER MODEL | WATER DRAW (GPM) | PRESSURE DROP (PSI) |
|--------------|------------------|---------------------|
| MMII4-70 | 2.9 | 14 |
| MMII4-105 | 3.1 | 16 |
| MMII5-105 | 3.1 | 16 |
| MMII5-140 | 3.3 | 18 |

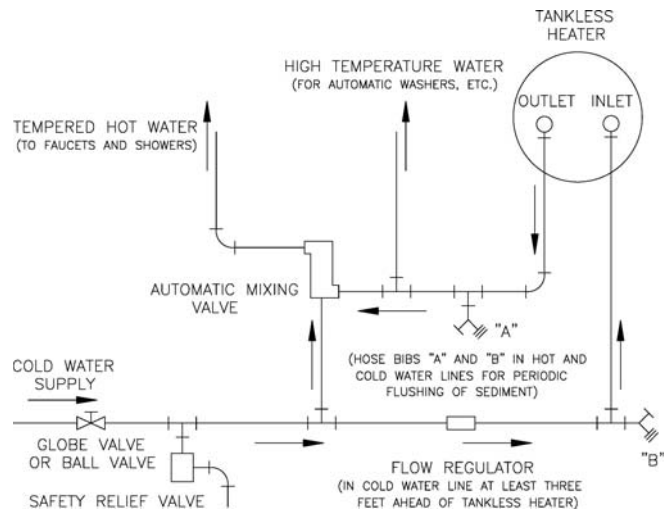


Figure 7: Domestic Hot Water Piping

B. Drain domestic water system.

1. Shut off cold water supply at main shutoff valve.
2. Open 1 or more system faucets to relieve pressure. Open system drain valve, leaving faucets open to relieve vacuum.
3. Disconnect exiting domestic hot water heating system (if applicable).

C. Connect hot water piping to ½" NPT outlet of heater. See Figure 7.

WARNING

Install an automatic mixing valve (tempering valve) at the tankless heater outlet to avoid risk of burns or scalding due to excessively hot water at fixtures. Adjust and maintain the mixing valve in accordance with the manufacturer's instructions.

D. Connect cold water piping to ½" NPT inlet of heater. See Figure 7.

NOTICE

Domestic water temperature has the potential to exceed the desired temperature during a space heating cycle.

E. Fill domestic hot water system.

1. Open all faucets to allow air to purge from heater and piping.
2. Open domestic hot water shutoff valve (if used).
3. Open cold water inlet shutoff valve.
4. Purge air from domestic water system. Close faucets.
5. Check system for leaks. Repair as necessary.

V. Gas Piping

A. Size gas piping. Design system to provide adequate gas supply to boiler. Consider these factors:

1. Allowable pressure drop from point of delivery to boiler. Maximum allowable system pressure is ½ psig. Actual point of delivery pressure may be less; contact gas supplier for additional information. Minimum gas valve inlet pressure is stamped on the rating label located in the boiler's vestibule compartment.
2. Maximum gas demand. Table 2 lists boiler input rate. Also consider existing and expected future gas utilization equipment (i.e. cooking equipment).
3. Length of piping and number of fittings. Refer to Table 3 for maximum capacity of Schedule 40 pipe. Table 4 lists equivalent pipe length for standard fittings.

Table 2: Rated Input

| Boiler Model Number | Input Rate [cubic feet per hour] | | Gas Connection Size (Inches) |
|---------------------|----------------------------------|--------|------------------------------|
| | Natural Gas | LP Gas | |
| MMII4-70 | 70 | 28 | ½ |
| MMII4-105 | 105 | 42 | ½ |
| MMII5-105 | 105 | 42 | ½ |
| MMII5-140 | 140 | 56 | ½ |

4. Specific gravity of gas. Gas piping systems for gas with a specific gravity of 0.70 or less can be sized directly from Table 3, unless authority having jurisdiction specifies a gravity factor be applied. For specific gravity greater than 0.70, apply gravity factor from Table 5. If exact specific gravity is not shown choose next higher value.

For materials or conditions other than those listed above, refer to *National Fuel Gas Code*, NFPA 54/ANSI Z223.1, or size system using standard engineering methods acceptable to authority having jurisdiction.

B. Connect boiler gas valve to gas supply system.

1. Use methods and materials in accordance with local plumbing codes and requirements of gas supplier. In absence of such requirements, follow *National Fuel Gas Code*, ANSI Z223.1.
2. Use thread (joint) compounds (pipe dope) resistant to action of liquefied petroleum gas.
3. Install sediment trap, ground-joint union and manual shut-off valve upstream of boiler gas control valve and outside of jacket. See Figure 8.
4. All above ground gas piping upstream from manual shut-off valve must be electrically continuous and bonded to a grounding electrode. Do not use gas piping as grounding electrode. Refer to *National Electrical Code*, ANSI/NFPA 70.

Table 3: Maximum Capacity of Schedule 40 Pipe in CFH For Gas Pressures of 0.5 psig or Less

| Length [Feet] | 0.3 inch w.c. Pressure Drop | | | | 0.5 inch w.c. Pressure Drop | | | |
|---------------|-----------------------------|-----|-----|-------|-----------------------------|-----|-----|-------|
| | ½ | ¾ | 1 | 1¼ | ½ | ¾ | 1 | 1¼ |
| 10 | 132 | 278 | 520 | 1,050 | 175 | 360 | 680 | 1,400 |
| 20 | 92 | 190 | 350 | 730 | 120 | 250 | 465 | 950 |
| 30 | 73 | 152 | 285 | 590 | 97 | 200 | 375 | 770 |
| 40 | 63 | 130 | 245 | 500 | 82 | 170 | 320 | 660 |
| 50 | 56 | 115 | 215 | 440 | 73 | 151 | 285 | 580 |
| 60 | 50 | 105 | 195 | 400 | 66 | 138 | 260 | 530 |
| 70 | 46 | 96 | 180 | 370 | 61 | 125 | 240 | 490 |
| 80 | 43 | 90 | 170 | 350 | 57 | 118 | 220 | 460 |
| 90 | 40 | 84 | 160 | 320 | 53 | 110 | 205 | 430 |
| 100 | 38 | 79 | 150 | 305 | 50 | 103 | 195 | 400 |

NOTICE

USA boilers built for installation at altitudes greater than 2,000 feet above sea level have been specially orificed to reduce gas input rate 4 percent per 1,000 feet above sea level per the National Fuel Gas Code, ANSI Z223.1, Section 8.1.2 and Appendix F. Canadian boilers' orifice sizing is indicated on the rating label. High altitude boiler models are identifiable by the model number suffix "H" on the rating label.

Table 4: Fitting Equivalent Lengths

| Fitting | Nominal Pipe Size | | | |
|----------------|-------------------|-----|-----|-----|
| | ½ | ¾ | 1 | 1¼ |
| 45° Ell | 0.7 | 1 | 1.2 | 1.6 |
| 90° Ell | 1.6 | 2.1 | 2.6 | 3.5 |
| Tee (As Elbow) | 3.1 | 4.1 | 5.2 | 6.9 |

Table 5: Specific Gravity Correction Factors

| Specific Gravity | Correction Factor | Specific Gravity | Correction Factor |
|------------------|-------------------|------------------|-------------------|
| 0.50 | 1.10 | 1.30 | 1.07 |
| 0.55 | 1.04 | 1.40 | 1.04 |
| 0.60 | 1.00 | 1.50 | 1.00 |
| 0.65 | 0.96 | 1.60 | 0.97 |
| 0.70 | 0.93 | 1.70 | 0.94 |
| 0.75 | 0.90 | | |
| 0.80 | 0.87 | | |

C. Pressure test. The boiler and its gas connection must be leak tested before placing boiler in operation.

1. Protect boiler gas control valve. For all testing over ½ psig, boiler and its individual shutoff valve must be disconnected from gas supply piping. For testing at ½ psig or less, isolate boiler from gas supply piping by closing boiler's individual manual shutoff valve.

2. Locate leaks using approved combustible gas detector, soap and water, or similar nonflammable solution. Do not use matches, candles, open flames, or other ignition source.

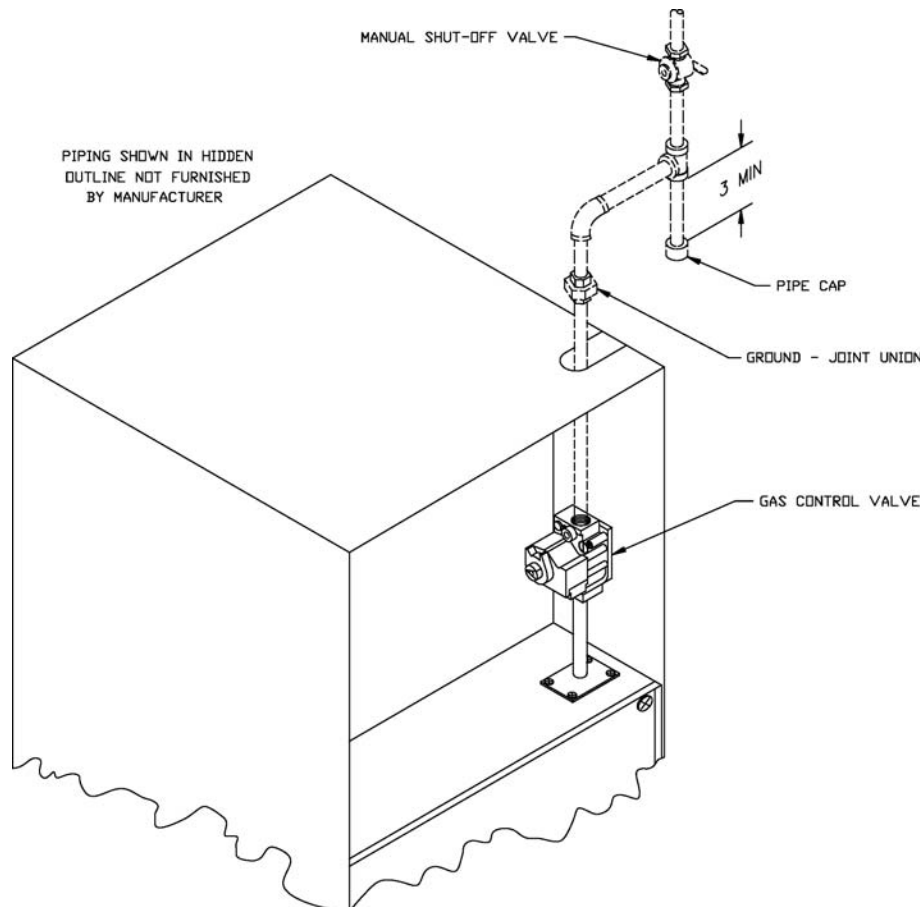


Figure 8: Recommended Gas Piping

VI. Venting / Air Intake Piping

NOTICE

The gasketed vent system components pictured below in Figure A are being phased in and each vent component is interchangeable with the previously supplied gasket-less venting components. The newer vent components are generally quicker and easier to join, as they do not require the sealant application and their clamp bands are attached.

In the event a gasketed vent component and a gasket-less vent component must be interconnected, follow the instructions associated with Figure 10B or 10C. The two guiding principles of these instructions are as follows:

- 1) Any joining of vent components that involves at least one gasket-less vent component always requires the sealant application.
- 2) The female end of a gasket-less vent component always requires a clamp band, regardless of the design of the mating male vent component.

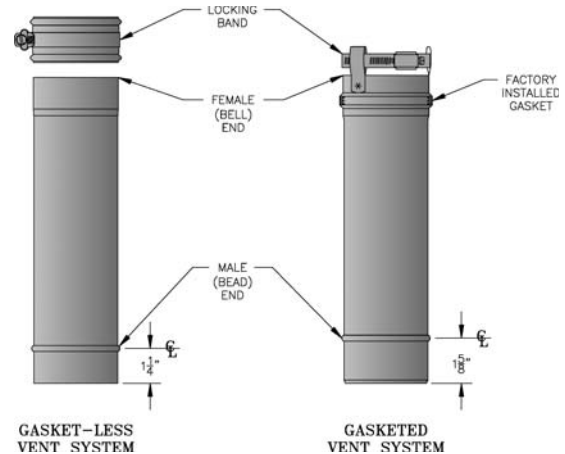


Figure A: Burnham Vent

Each gasket-less vent component is supplied with a clamp band and sealant.

A Vent Transition Kit, part number 6116302, is available that contains one clamp band and one 3 ounce tube of sealant.

A. General Guidelines.

1. Vent system installation must be in accordance with *National Fuel Gas Code*, ANSI Z223.1, Venting of Equipment, or applicable provisions of local building codes. Contact local building or fire officials about restrictions and installation inspection in your area.
2. This appliance requires a Special Gas Vent. The product is designed to use Burnham supplied AL 29-4C® Stainless Steel vent system components. The following manufacturer's offer similar AL 29-4C® components and are approved for use with this product: Heat-Fab Inc. - Saf-T-Vent, Flex-L International Inc. - Star-34, Protech Systems, Inc. - FasNSeal™, and Z-Flex U. S., Inc. - Z-Vent. The use of these alternate manufacturer's venting systems will require adapters to connect to the Burnham supplied vent connector and vent terminal. These adapters are not supplied with this unit and should be obtained from the supplier of the alternate manufacturer's venting system. See Table 7 for complete parts list.

WARNING

Do not use this boiler with galvanized, 304 or 316 stainless steel or any other non AL29-4C® based vent systems.

3. Vent length restrictions are based on equivalent length of vent pipe (total length of straight pipe plus equivalent length of fittings). Maximum vent length is listed in Table 6. Do not exceed maximum vent/air intake lengths. Table 7 lists equivalent length for fittings. Do not include Vent Terminal or Vent Connector in equivalent feet calculation.

Table 6: Vent/Air Intake Length

| 3" Vent Pipe (Equiv. Ft.) | | 4" Air Intake Pipe (Equiv. Ft.) | |
|---------------------------|------|---------------------------------|------|
| Min. | Max. | Min. | Max. |
| 8 | 70 | 8 | 70 |

Table 7: Burnham Vent System Components

| Burnham Vent System Component | Burnham Part Number | Equivalent Feet of Pipe |
|-------------------------------|---------------------|--|
| 3" Dia. Pipe x 1 Ft | 8116296U | 1 |
| 3" Dia. Pipe x 3 Ft | 8116298U | 3 |
| 3" Dia. Pipe x 5 Ft | 8116300U | 5 |
| 3" Dia. Pipe x Adjustable | 8116319U | Equal to Installed Length (1.06 to 1.64) |
| 3" Dia. 90° Elbow | 8116294U | 5 |
| 3" Dia. 45° Elbow | 8116292U | 5 |
| 3" Dia. Horizontal Drain Tee | 8116302U | ½ |
| 3" Dia. Vertical Drain Tee | 8116304U | 7½ |
| 3" Single Wall Thimble | 8116116 | --- |
| 3" Double Wall Thimble | 8116115 | --- |

- Do not install venting system components on the exterior of the building except as specifically required by these instructions.
- Thickness of exterior walls through which vent-air intake system may be installed: Minimum: 3", Maximum: 12".

B. Removal of Existing Boiler. For installations not involving the replacement of an existing boiler, proceed to Step C.

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances. At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

- Seal any unused openings in the common venting system.
- Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
- Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range-hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

- Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.
- Test for spillage at the drafthood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
- Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, ANSI Z223.1 and/or CAN/CGA B149, *Installation Codes*. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 in the *National Fuel Gas Code*, ANSI Z223.1 and/or CAN/CGA B149, *Installation Codes*.

C. Install Vent Connector.

- Remove vent connector from vent accessory carton.
- Remove gaskets, orifice plate and hardware from blower outlet flange.
- Assemble orifice plate gaskets, orifice plate, and vent connector. See Figure 9.

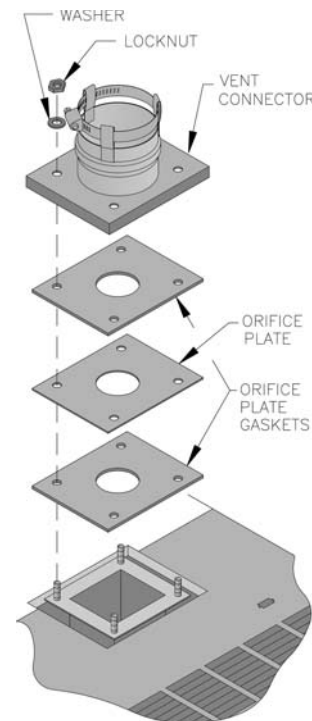


Figure 9: Vent Connector Installation

- Secure vent connector with washers and locknuts. Do not overtighten.

D. Install Vent Pipe, General.

- Plan venting system to avoid possible contact with plumbing or electrical wires. Start at vent connector. Work toward vent terminal.
- Use non-combustible $\frac{3}{4}$ inch pipe strap to support horizontal runs and maintain vent location and slope while preventing sags in pipe. Do not restrict thermal expansion or movement. Maximum support spacing is 5 feet. Do not penetrate any part of the vent system with fasteners.
- Provide and maintain minimum 5 inch clearance to combustible materials. Use double wall thimble (Burnham Part No. 8116115) when penetrating combustible wall. Other wall thimble manufacturers are American Metal Products, Hart & Cooley, and Metal Fab.
- Once a vent pipe manufacturer and system is chosen never mix and match vent systems.
- If a non-standard length pipe is required:
 - The use of the adjustable length pipe (P/N 8116319U) is recommended to complete a non-standard pipe length. This pipe requires a minimum installed length of $12\frac{3}{4}$ inch and can adjust across a 7 inch gap up to a maximum of $19\frac{3}{4}$ inch long. (Note for the adjustable pipe the installed length should be measured from the centerline of the bead on the male end of the first pipe to the end of the female pipe excluding the locking band of the second pipe with a single gasket.) Only in the event the adjustable length pipe is not sufficient a standard length pipe may be cut using the procedure outlined below .

WARNING

Never exceed maximum installed length of $19\frac{3}{4}$ inches for adjustable length pipe. Risk of flue gas leakage is possible.

Carefully cut pipe to length using a hacksaw with minimum 32 teeth per inch or circular saw with metal abrasive wheel. Remove male (bead) end only – female (bell) end accepts next fitting or pipe.

NOTICE

Cut must be square with pipe and filed or sanded smooth before joining. Carefully ensure roundness of cut pipe by hand with gloves before installing. Seal joint with RTV specified in this manual.

- Seal all Burnham Gasket-Less vent, Burnham mixed vent (Gasket-Less and Gasketed) and field cut joints using Dow Corning Silastic 732 RTV, Dow Corning Silastic 736 RTV, GE RTV106, Polybac #500 RTV, Sil-bond RTV 4500 (Acetoxy) and Sil-bond RTV 6500. Do not use other adhesives or sealants.

E. Install Vent Pipe, Burnham Gasket-Less Vent System.

- Procedure for Joining Burnham Gasket-Less Vent Pipe and Fittings. See Figure 10A.

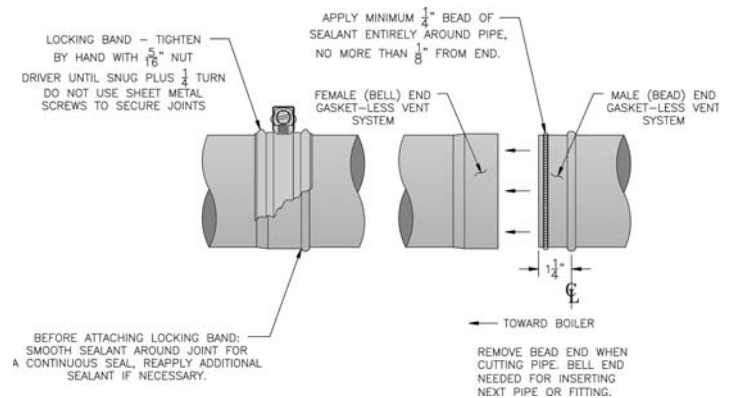


Figure 10A: Burnham Gasket-Less Vent Joint

- Clean joints of pipe or fittings using an alcohol pad to remove any dirt and grease.
- Slip a locking band over female (bell) end of pipe/fitting.
- Apply a continuous $\frac{1}{4}$ inch bead of sealant around male end of joint no more than $\frac{1}{8}$ inch from end.
- Align weld seams and use a slight twisting motion to FULLY insert male end into female end of joint. Ensure bead in male end rest against the end of the female pipe.
- Smooth sealant around joint for a continuous seal. Reapply sealant if necessary.
- Slip the locking band over joint and align closest bead in locking band with bead in male end of pipe.
- Tighten locking band by HAND with a $\frac{5}{16}$ " nut driver until snug plus $\frac{1}{4}$ turn. DO NOT SECURE JOINTS WITH SHEET METAL SCREWS OR POP RIVETS. DO NOT PUNCTURE THE VENT SYSTEM!
- Once the installation is complete, operate appliance and inspect all joints to ensure that flue gases and/or liquid condensate will not escape.

F. Install Vent Pipe, Burnham Gasketed Vent System.

- Procedure for Joining Burnham Gasketed Vent Pipe and Fittings. See Figure 10B.
 - Wipe the male end of each joint using an alcohol pad to remove any dirt and grease.

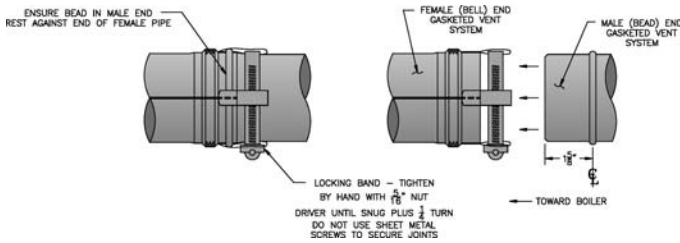


Figure 10B: Burnham Gasketed Vent Joint Detail

- b. Align weld seams in pipes and use a slight twisting motion to FULLY insert male end into female end of joint. Ensure bead in male end of pipe is below locking band and rest against the end of the female pipe. Verify the factory-installed gasket is not dislodged or cut.
- c. Tighten locking band by HAND with a 5/16" nut driver until snug plus ¼ turn. DO NOT SECURE JOINTS WITH SHEET METAL SCREWS OR POP RIVETS. DO NOT PUNCTURE THE VENT SYSTEM!
- d. Once the installation is complete, operate appliance and inspect all joints to ensure that flue gases and/or liquid condensate will not escape.

G. Install Vent Pipe, Burnham Gasket-Less & Gasketed Vent System.

1. Procedure for joining the male end of Burnham Gasket-Less Vent with the female end of Burnham Gasketed Vent. See Figure 10C.

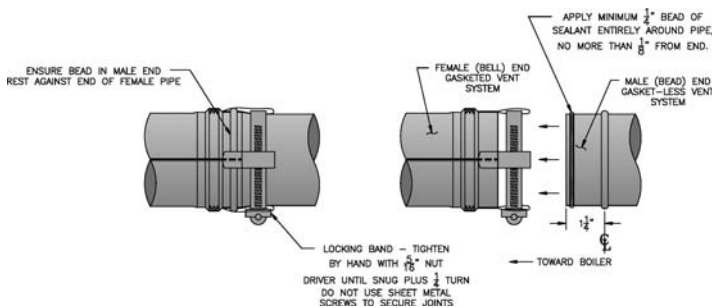


Figure 10C: Burnham Gasket-Less Male and Gasketed Female Vent Joint Detail

- a. Clean the male end of each joint using an alcohol pad to remove any dirt and grease.
- b. Apply a continuous ¼ inch bead of sealant around male end of joint no more than 1/8 inch from end.
- c. Align weld seams in pipes and use a slight twisting motion to FULLY insert male end into female end of joint. Ensure bead in male end of pipe is below locking band and rest against the end of the female pipe. Verify the factory-installed gasket is not dislodged or cut.
- d. Smooth sealant around joint for a continuous seal. Reapply sealant if necessary.

- e. Tighten locking band by HAND with a 5/16" nut driver until snug plus ¼ turn. DO NOT SECURE JOINTS WITH SHEET METAL SCREWS OR POP RIVETS. DO NOT PUNCTURE THE VENT SYSTEM!

- f. Once the installation is complete, operate appliance and inspect all joints to ensure that flue gases and/or liquid condensate will not escape.

2. Procedure for joining the female end of Burnham Gasket-Less Vent with the male end of Burnham Gasketed Vent. See Figure 10D.

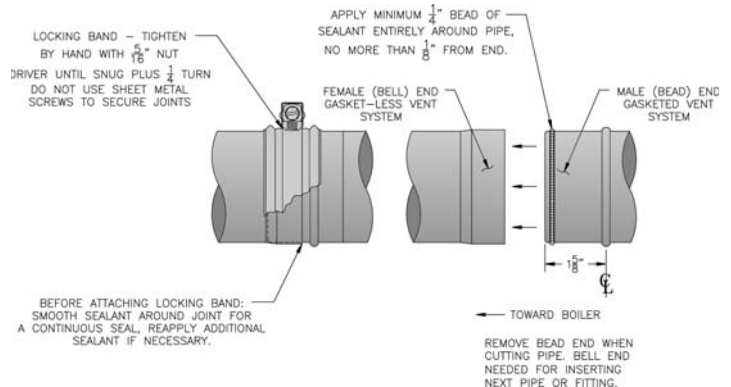


Figure 10D: Burnham Gasket-Less Female and Gasketed Male Vent Joint Detail

- a. Clean joints of pipe or fittings using an alcohol pad to remove any dirt and grease.
- b. Slip a locking band over female (bell) end of pipe/fitting.
- c. Apply a continuous ¼ inch bead of sealant around male end of joint no more than 1/8 inch from end.
- d. Align weld seams in pipes and use a slight twisting motion to FULLY insert male end into female end of joint.
- e. Smooth sealant around joint for a continuous seal. Reapply sealant if necessary.
- f. Slip the locking band over joint and align closest bead in locking band with bead in male end of pipe.
- g. Tighten locking band by HAND with a 5/16" nut driver until snug plus ¼ turn. DO NOT SECURE JOINTS WITH SHEET METAL SCREWS OR POP RIVETS. DO NOT PUNCTURE THE VENT SYSTEM!
- h. Once the installation is complete, operate appliance and inspect all joints to ensure that flue gases and/or liquid condensate will not escape.

H. Horizontal (Through Wall) Vent Installation.

1. Maintain minimum ¼ inch per foot slope in horizontal runs. Position weld seams in vent pipes in all horizontal runs at the top to avoid condensate from lying on the seams.

- a. Recommended Installation: slope toward vent terminal. See Figure 11.
- b. Alternate Installation (where recommended installation is not practical): slope toward boiler. Horizontal vent drain tee (see Table 7 for part number) required. See Figure 12.

CAUTION

Moisture and ice may form on surfaces around vent terminal. To prevent deterioration, surfaces should be in good repair (sealed, painted etc.)

2. Vent terminal location restricted per following:
 - a. Minimum 12 inches above grade or normally expected snow accumulation level, or 7 feet above grade if located adjacent to public walkway. Do not install over public walkways or areas where local experience indicates condensate or vapor from Category III appliances creates a nuisance or hazard .
 - b. Minimum 3 feet above any forced air inlet located within 10 feet.
 - c. Minimum 1 foot below, 1 foot horizontally from, or 1 foot above any door, openable window, gravity air inlet, or building opening through which flue gases could enter any building (including adjacent buildings).

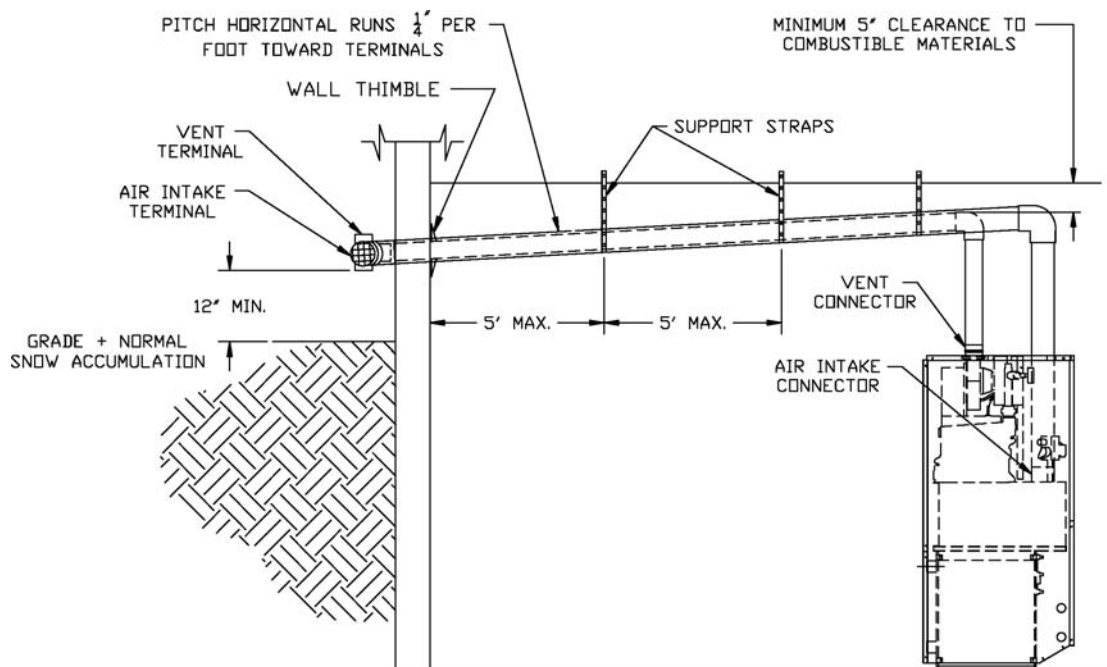


Figure 11: Recommended Horizontal Vent Installation

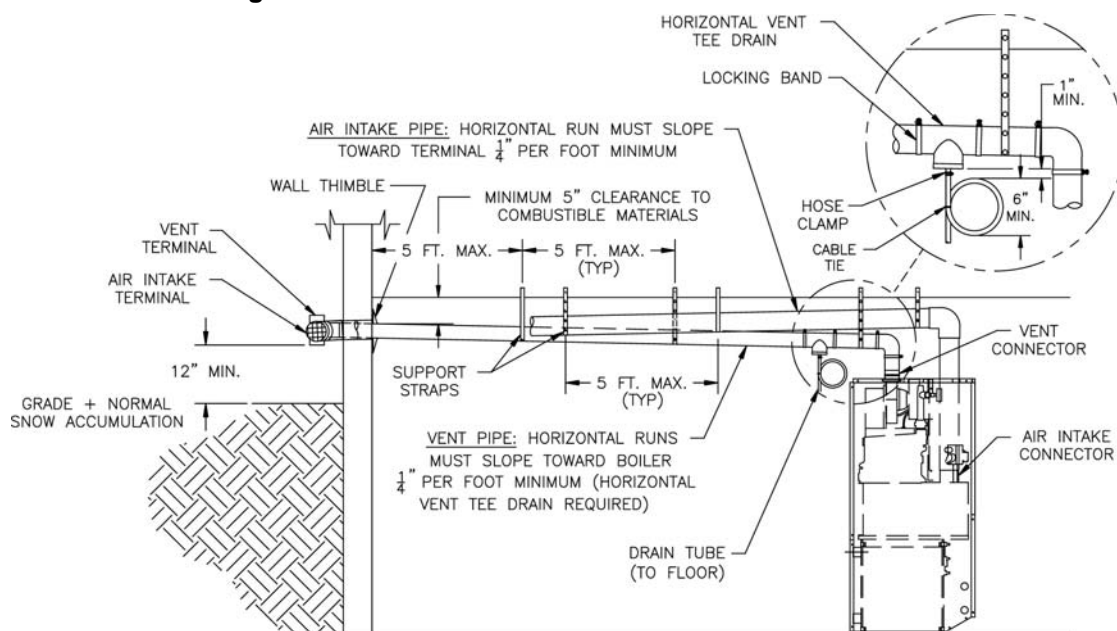


Figure 12: Alternate Horizontal Vent Installation

- d. Minimum 4 feet (6 feet in Canada) horizontally from electric meters, gas meters, regulators, and relief equipment.
 - e. Minimum 12 inches from overhang or corner.
3. Use double wall thimble when passing through combustible outside wall (thimble use optional for noncombustible wall). Insert thimble through wall from outside. Secure outside flange to wall with nails or screws, and seal OD, ID and vent holes with sealant material. Install inside flange to inside wall, secure with nails or screws, and seal with sealant material.
 4. For noncombustible wall when thimble is not used, size opening such that female (bell) end with locking band attached cannot pass through.
 5. Join vent terminal to vent pipe. Locate vent terminal between 3" and 6" from wall when joined to inside vent piping. See Figure 13.

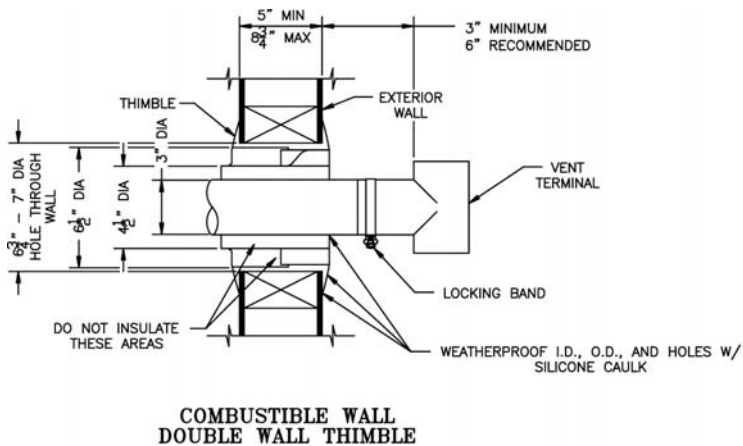


Figure 13: Horizontal Vent Pipe Wall Penetration

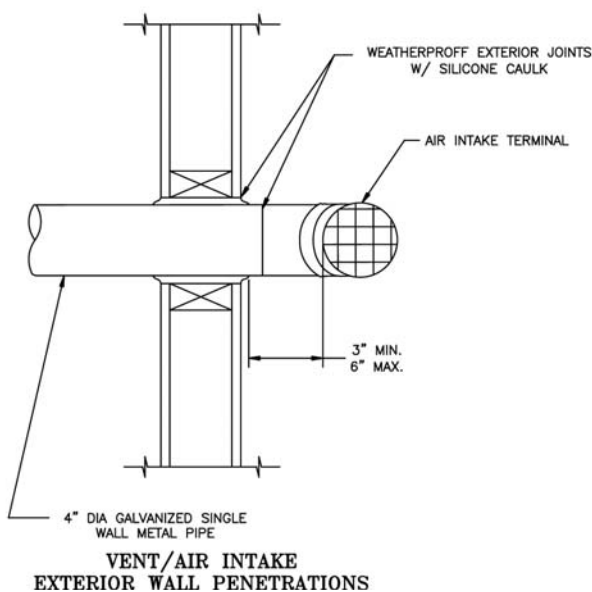


Figure 14: Horizontal Air Intake Pipe Wall Penetration

6. Insert vent pipe through thimble/opening from outside and join to vent system. Apply sealant between vent pipe and opening/thimble to provide weathertight seal.

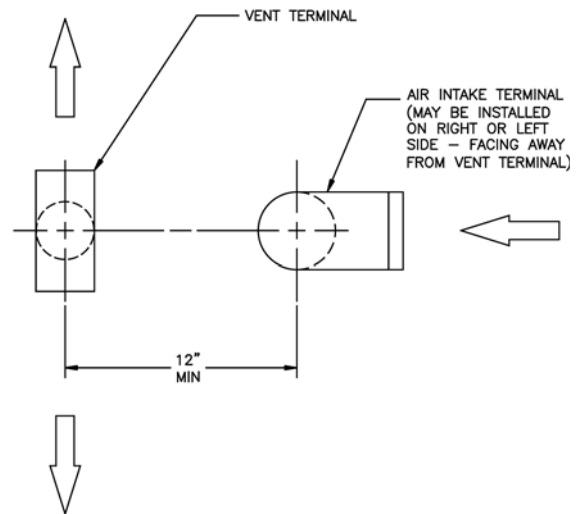
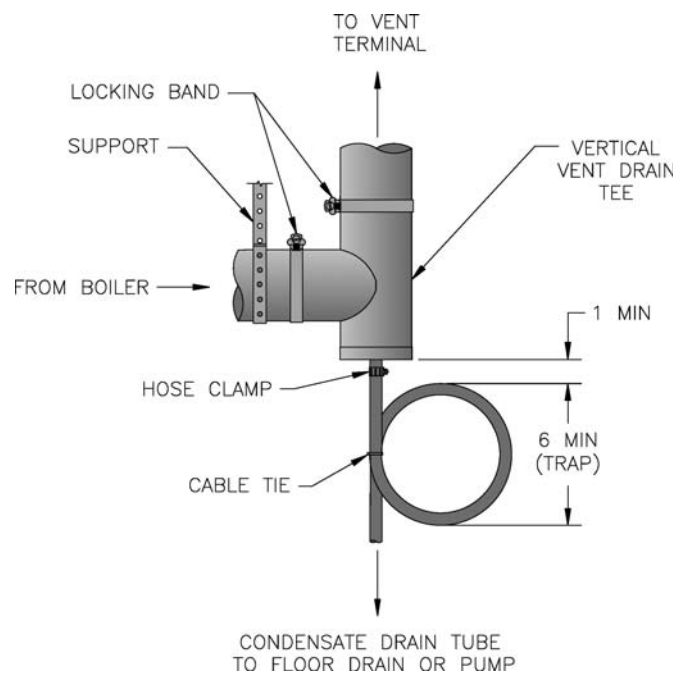


Figure 15: Vent/Air Intake Terminal Relationship Horizontal (thru wall) or Vertical (thru roof)

I. Vertical (Through Roof) Vent Installation

1. Install vertical vent drain tee (see Table 7 for part number). See Figure 16. Attach tee directly to elbow or horizontal pipe from elbow.
2. Install condensate drain line. Use 3/8 inch i.d. high temperature flexible tubing such as silicone rubber or EPDM. See Figure below.
 - a. Form condensate trap with 6 inch diameter loop. Secure loop with plastic cable tie. Fill with water.



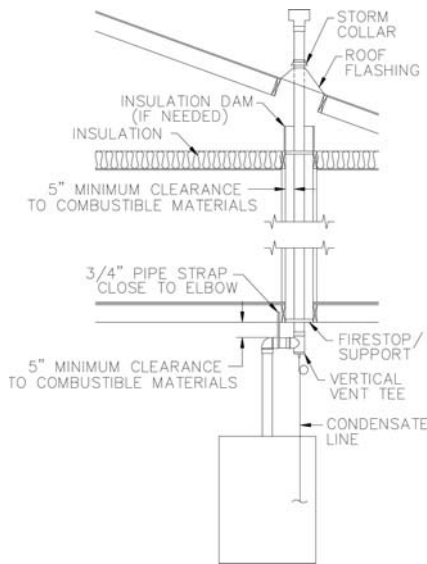


Figure 16: Vertical Vent Installation

- b. Secure to vertical vent tee with hose clamp or plastic cable tie.
- c. Run condensate drain line to floor drain or condensate pump. Condensate disposal must be acceptable to authority having jurisdiction.
3. Slope horizontal runs minimum $\frac{1}{4}$ inch per foot. Slope toward vertical vent drain tee. Position weld seams in vent pipes in all horizontal runs at the top to avoid condensate from lying on the seams.
4. Install firestops at floor and ceiling where vent passes through floor, ceiling, or framed wall. The firestop must close the floor or ceiling opening between vent pipe and structure. Firestop manufacturers are Air-Jet, American Metal Products, Metal-Fab, and Simpson Dura-Vent.
5. Enclose vent passing through unoccupied or occupied spaces above the appliance with materials having a fire resistance rating at least equal to the rating of adjoining floor or ceiling. Maintain 5 inch minimum clearance to combustible materials. Note: For one-or two-family dwellings fire resistance rating requirement may not need to be met, but is recommended.

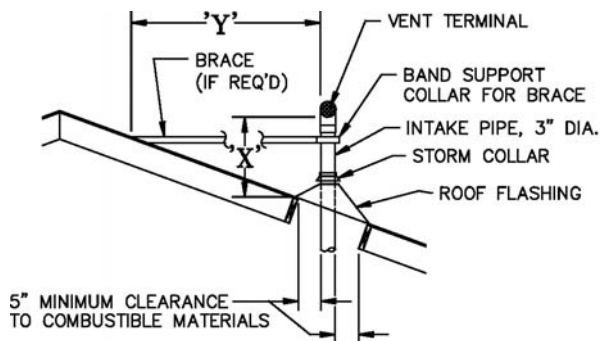


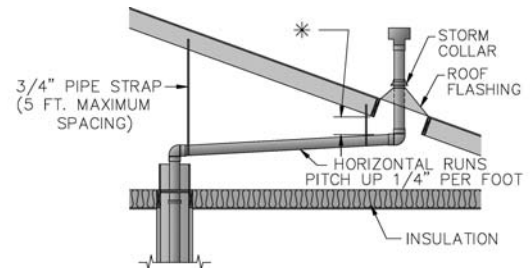
Figure 18: Vertical Vent Termination

Extend Vent/Air Intake Piping to maintain minimum vertical ("X") and minimum horizontal ("Y") distance of twelve (12) inches from roof surface. Allow additional vertical ("X") distance for expected snow

6. Whenever possible install vent straight through roof. Refer to Figure 17 if offset is necessary. Maintain 5 inch minimum clearance to combustible materials.
7. Install Vent Terminal. See Figure 18.
 - a. Locate roof opening to allow vertical vent penetration. Size opening to maintain 5 inch minimum clearance from combustible materials.
 - b. Vertical venting requires use of roof flashing (available from Burnham - P/N 8116250) and storm collar (available from Burnham - P/N 8116251) to prevent moisture from entering the structure.
 - c. Extend vent pipe to maintain minimum vertical and horizontal distance of 12 inches from roof surface. Allow additional vertical distance for expected snow accumulation. Provide brace as required. Refer to Figure 18.
 - d. Install storm collar on vent pipe immediately above roof flashing. Apply Dow Corning Silastic 732 RTV Sealant between vent pipe and storm collar to provide weathertight seal..
 - e. Attach Vent Terminal.

J. Install Air Intake Pipe.

1. Locate air intake termination on the same wall or roof location as the vent termination if possible, to prevent nuisance boiler shutdowns. However, boiler



* VENT PIPE MINIMUM CLEARANCE TO COMBUSTIBLE MATERIAL IS FIVE (5) INCHES WHEN VENT IS INSTALLED IN A FULLY ENCLOSED (CHASE) APPLICATION OR FOUR (4) INCHES WHEN VENT IS INSTALLED WITH AT LEAST ONE SIDE OPEN, SIMILAR TO A JOIST BAY APPLICATION.

Figure 17: Attic Offset

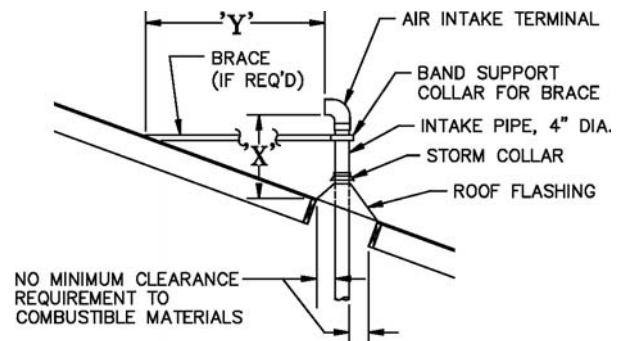


Figure 19: Vertical Air Intake Termination

may be installed with vertical venting and sidewall combustion air inlet if installation conditions do not allow alternate arrangement.

2. Use 4 inch diameter single wall metal pipe, fittings, firestop(s), roof flashing and storm collar available at most heating distributors.
3. Start at air intake connector. Work toward air intake terminal.

4. Maintain minimum of ¼ inch per foot slope in horizontal runs to air intake terminal. Slope down toward air intake terminal.
5. Seal all joints gas-tight, using silicone caulk or self-adhesive aluminum tape.
6. Install air intake terminal. See Figures 14 and 19.

VII. Electrical

A. General. Install wiring and ground boiler in accordance with requirements of authority having jurisdiction, or in absence of such requirements the *National Electrical Code*, ANSI/NFPA 70, and/or the CSA C22.1 Electric Code.

B. Install thermostat. Locate on inside wall approximately 4 feet above floor. Do not install on outside wall, near fireplace, or where influenced by drafts or restricted air flow, hot or cold water pipes, lighting fixtures, television, or sunlight. Allow free air movement by avoiding placement of furniture near thermostat.

C. Wire thermostat. Provide Class II circuit between thermostat and boiler. Set thermostat heat anticipator to 0.6 amps. See Figure 20.

D. Wire boiler. Boiler is rated for 120 VAC, 60 hertz, less than 12 amperes. A separate electrical circuit must be run from the main electrical service with an over-current device/disconnect in the circuit. A service switch is recommended and may be required by some local jurisdictions. Connect circuit to black and white wires and green ground screw. See Figure 20.

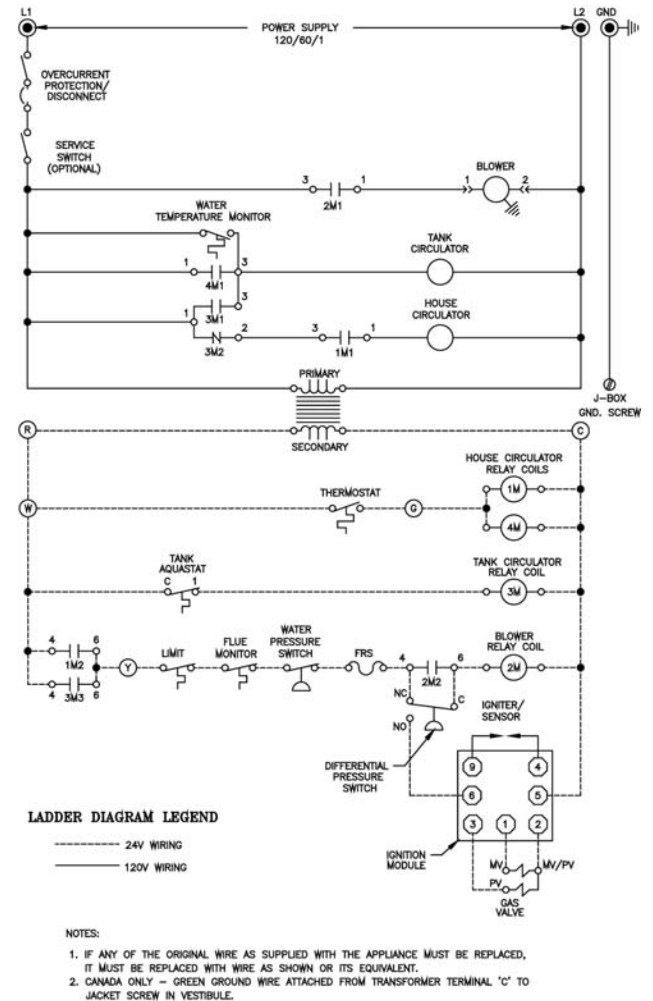
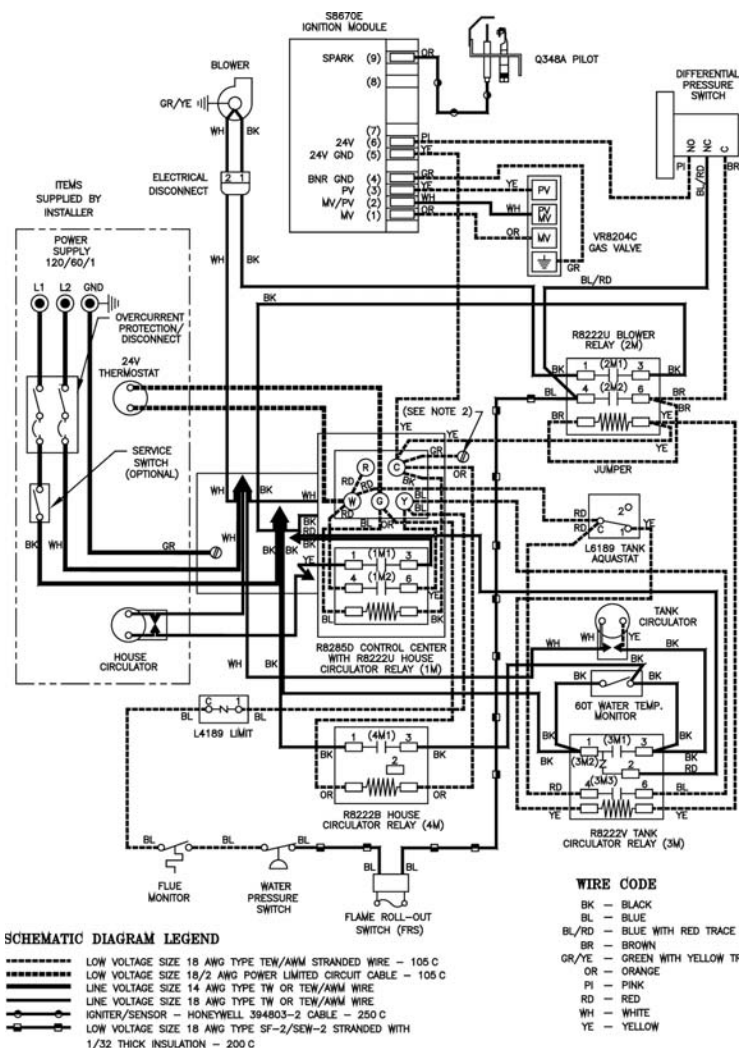


Figure 20: Wiring Diagram

VIII. System Start-up

A. Safe operation and other performance criteria were met with gas manifold and control assembly provided on boiler when boiler underwent tests specified in *American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers, ANSI Z21.13.*

B. FILL ENTIRE HEATING SYSTEM WITH WATER and vent air from system. Use the following procedure on a Series Loop System equipped with zone valves. (See Figure 4).

1. Close isolation valve in boiler supply piping.
2. Isolate all circuits by closing zone valves or balancing valves.
3. Attach a hose to hose bib located just below isolation valve in boiler supply piping. (Note - Terminate hose in five gallon bucket or at a suitable floor drain or outdoor area).
4. Starting with one circuit, open zone valve.
5. Open hose bib.
6. Open manual fill valve (Make-up water line should be located directly above isolation valve in boiler supply piping).
7. Allow water to overflow from bucket until discharge from hose is bubble free for 30 seconds.
8. Open zone valve to the second zone to be purged, then close the first. Repeat this step until all zones have been purged, but always have one zone open. At completion, open all zone valves.
9. Close hose bib, continue filling the system until the pressure gauge reads between 12 and 15 psi. Close fill valve.

WARNING

DO NOT install an automatic fill valve with this boiler.

10. Open isolation valve in boiler supply piping.
11. Remove hose from hose bib.

C. Prepare to check operation.

1. Obtain gas heating value (in BTU per cubic foot) from gas supplier.
2. Connect manometer to pressure tap on gas valve. Use 1/8 NPT tapping provided.
3. Temporarily turn off all other gas-fired appliances.

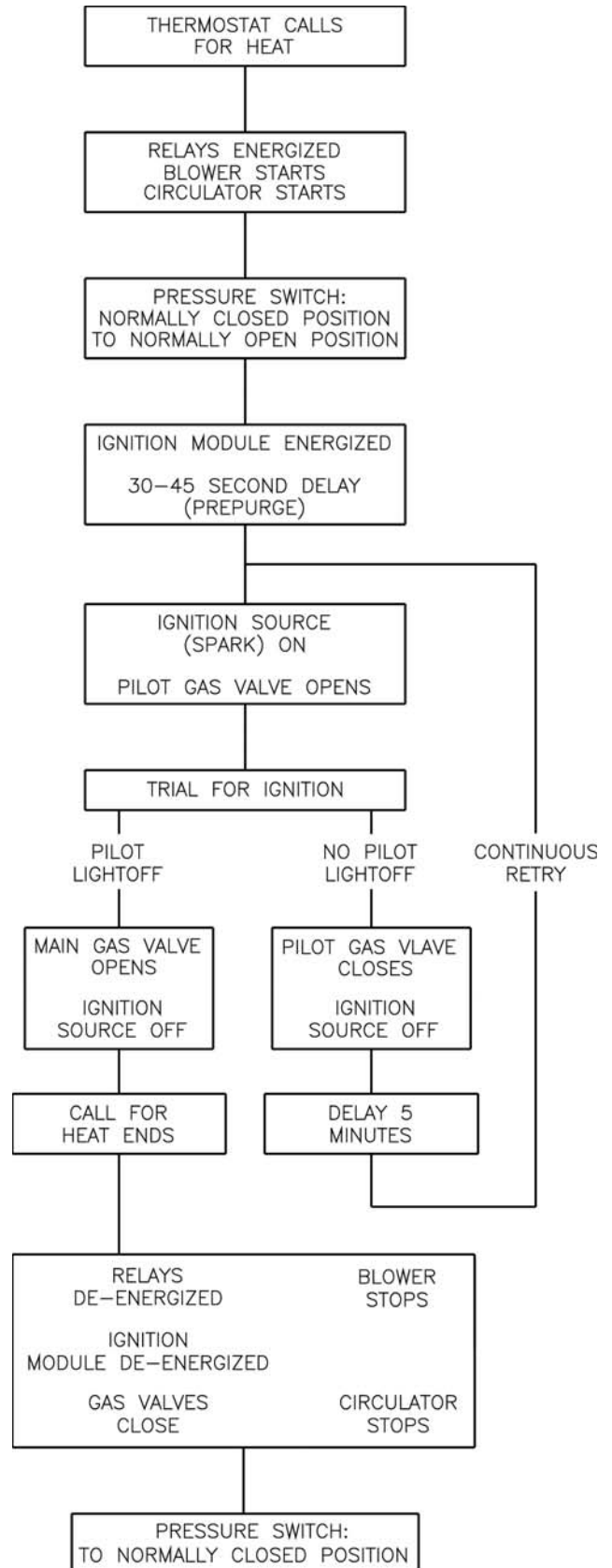


Figure 21: Sequence of Operation

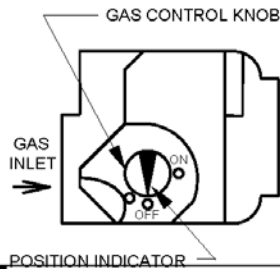
FOR YOUR SAFETY READ BEFORE OPERATING

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

- A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Remove front door.
6. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the brown or blue plastic knob located on top of the gas control valve.
7. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
8. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step.
9. Rotate gas control knob counterclockwise from "OFF" to "ON". Make sure knob rest against stop. Do not force.
10. Replace front door.
11. Turn on all electric power to the appliance.
12. Set thermostat to desired setting.
13. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
5. Replace front door.

Figure 22: Operating Instructions

- D. **Follow Operating Instructions** to place boiler in operation. See Figure 22.
- E. **Sequence of Operation.** See Figure 21. If boiler fails to operate properly, see Troubleshooting Tree on pages 26-27.
- F. **Check pilot burner flame.** See Figure 24. Flame should be steady, medium hard blue enveloping 3/8 to 1/2 inch of sensing probe.

- G. **Check main burner flame.** See Figure 23. Flame should have clearly defined inner cone with no yellow tipping. Orange-yellow streaks should not be confused with true yellow tipping.
- H. **Check thermostat operation.** Raise and lower temperature setting to start and stop boiler operation.
- I. **Check domestic hot water (tank) aquastat operation.** Raise and lower temperature setting to start and stop boiler operation. Tank aquastat should be set at least

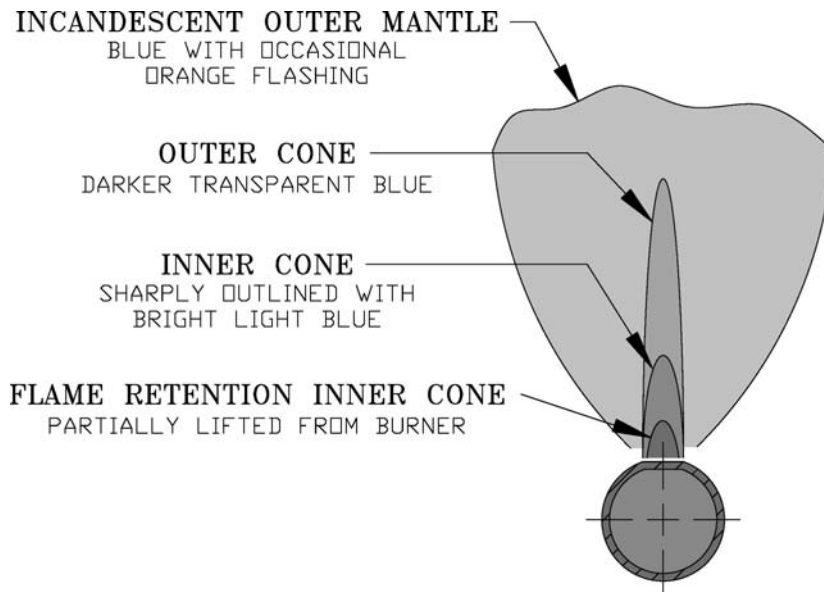


Figure 23: Main Burner Flame

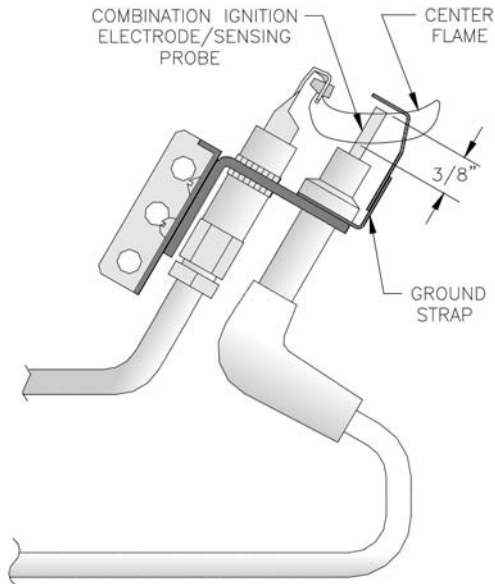


Figure 24: Pilot Burner Flame

20°F below boiler high limit setting to allow tank water to reach desired temperature before boiler water reaches the high limit setting.

J. Ignition system safety device test. Disconnect ignitor/sensor cable from Terminal 9 (SPARK). Gas valve should close and pilot and main burners should extinguish.

K. Check water pressure switch.

1. Adjust thermostat to highest setting.
2. Connect hose to drain valve and run to bucket or floor drain. With boiler operating, partially open drain valve and slowly drain boiler.

3. Main burners and pilot burner will extinguish and blower stop when water pressure drops below 10 psi. Verify limit, thermostat or other controls have not shut off boiler.
4. Close drain valve.
5. Adjust thermostat to lowest setting. Refill boiler.

L. Check Boiler High Limit.

1. Adjust thermostat to highest setting.
2. Observe temperature gauge. When temperature is indicated, adjust limit to setting below observed temperature. Main burners and pilot burner should extinguish, and blower stop.
3. Adjust limit to setting above observed temperature. Ignition sequence should begin.
4. Adjust thermostat to lowest setting. Adjust limit to desired setting, at least 20°F above the tank aquastat setting.

M. Adjust gas input rate to boiler.

1. Adjust thermostat to highest setting.
2. Check manifold gas pressure. Pressure should be stamped on the rating label located in the boiler's vestibule compartment. Adjust gas valve pressure regulator as necessary (turn adjustment screw counterclockwise to decrease manifold pressure, or clockwise to increase manifold pressure). If pressure cannot be attained, check gas valve inlet pressure. If less than minimum indicated on the boiler's rating label, contact gas supplier for assistance.
3. Clock gas meter for at least 30 seconds. Use Table 9 to determine gas flow rate in Cubic Feet per Hour.

4. Determine Input Rate. Multiply gas flow rate by gas heating value.
5. Compare measured input rate to input rate stated on rating plate.
 - a. Boiler must not be overfired. Reduce input rate by decreasing manifold pressure. Do not reduce more than 0.2 inch w.c. If boiler is still overfired, contact your Burnham distributor or Regional Office for replacement Gas Orifices.
 - b. Increase input rate if less than 98% of rating plate input. Increase manifold gas pressure no more than 0.2 inch w.c. If measured input rate is still less than 98% of rated input:
 - i. Remove Main Burners per procedure in Section IX: Service.
 - ii. Remove gas orifices. Drill one (1) drill size larger (drill size is stamped on orifice, or see Key No. 4C in Section X: Repair Parts).
 - iii. Reinstall gas orifices and main burners. Measure input rate.
6. Recheck Main Burner Flame.
7. Return other gas fired appliances to previous conditions of use.

Table 9: Gas Flow Rate in Cubic Feet per Hour

| Seconds for One Revolution | Size of Gas Meter Dial | | |
|----------------------------|------------------------|-------------|-------------|
| | One-Half Cu. Ft. | One Cu. Ft. | Two Cu. Ft. |
| 30 | 60 | 120 | 240 |
| 32 | 56 | 113 | 225 |
| 34 | 53 | 106 | 212 |
| 36 | 50 | 100 | 200 |
| 38 | 47 | 95 | 189 |
| 40 | 45 | 90 | 180 |
| 42 | 43 | 86 | 172 |
| 44 | 41 | 82 | 164 |
| 46 | 39 | 78 | 157 |
| 48 | 37 | 75 | 150 |
| 50 | 36 | 72 | 144 |
| 52 | 35 | 69 | 138 |
| 54 | 33 | 67 | 133 |
| 56 | 32 | 64 | 129 |
| 58 | 31 | 62 | 124 |
| 60 | 30 | 60 | 120 |

N. Review User's Information Manual and system operation with owner or operator.

IX. Service

A. General. Inspection and service should be conducted annually. Turn off electrical power and gas supply while conducting service or maintenance. Follow instructions TO TURN OFF GAS TO APPLIANCE. See Figure 22.

CAUTION

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

B. Inspect domestic hot water coil gasket for water leakage. Tighten nuts or replace gasket if leakage is evident.

C. Low water cut-off (if so equipped).

1. Float Type

- a. Monthly Blowoff. During the heating season, if an external float type low water cut-off is on the boiler, the blow off valve should be opened once a month (use greater frequency where conditions warrant), to flush out the sediment chamber so the device will be free to function properly.
- b. Annual Service. Float type low water cutoffs should be dismantled annually by qualified personnel, to the extent necessary to insure freedom from obstructions and proper functioning of the working parts. Inspect connecting lines to boiler for accumulation of mud, scale, etc., and clean as required. Examine all visible wiring for brittle or worn insulation and make sure electrical contacts are clean and that they function properly. Give special attention to solder joints on bellows and float when this type of control is used. Check float for evidence of collapse and check mercury bulb (where applicable) for mercury separation or discoloration.

2. Probe Type (Annual Service). Probe type LWCO should be removed once a year, examined and cleaned of any dirt accumulations to assure proper operations. Do not attempt to repair mechanisms in the field. Complete replacement mechanisms, including necessary gaskets and installation instructions, are available from the manufacturer.

D. Vent/Air Intake System. Inspect for obstructions, soot accumulation, proper support, and deterioration of pipe, fittings, and joints.

1. Clean terminal screens. Terminals must be free of obstruction, undamaged, with screens securely in place.
2. Terminal and wall thimbles (if used) must be weathertight.
3. Pipe must be full round shape, and show no damage from impact or excessive temperature.
4. Pipe must be supported at minimum 5 foot intervals and must not sag.
5. All vent joints must be secure and watertight.
6. All air intake joints must be secure and airtight. Horizontal vent tee drain (if used) must have minimum 6 inch trap and allow condensate to flow freely. To Clean:
 - a. Disconnect drain tube from drain fitting.
 - b. Flush drain tube with water. Fill trap with water.
 - c. Securely fasten drain tube to drain fitting, providing gas-tight and watertight seal.
7. If pipe must be disassembled for removal of obstructions or resealing of joint:
 - a. Remove locking band (vent pipe only).
 - b. Break skin of sealant with utility knife. Do not cut or score pipe.
 - c. Pull pipe from fitting.
 - d. Clean pipe and fitting of all cured sealant.
 - e. Join pipe and fitting as described in Section VI: Venting/Air Intake Piping.

E. Boiler Flue Passages. Inspect for blockage or soot accumulation.

1. Remove Main Burners. See Figure 25.
 - a. Remove jacket front door.
 - b. Remove combustion air enclosure cover.
 - c. Remove Burner Access Panel by lifting up and out.
 - d. Disconnect Ignitor/Sensor Wire from pilot burner.
 - e. Mark location of Main Burner with Pilot Bracket on gas manifold.
 - f. Remove External Hitch Pin Clips.
 - g. Hold Main Burner on throat. Lift slightly while pushing toward rear of boiler to disengage from Burner Tray and to clear Gas Orifice. Pull Main Burner from combustion chamber.
2. Remove four (4) locknuts securing vent connector.

See Figure 9. Disconnect vent connector and vent pipe from blower outlet.

3. Remove Jacket Top Panels.
4. Disconnect Red and Black Silicone Tubing from Canopy. Pull tubing through Blower Access panel into vestibule.
5. Disconnect wiring harness from Blower Motor.
6. Remove Canopy/Blower Assembly.
 - a. Remove four (4) machine screws securing canopy to heat exchanger.
 - b. Remove ceramic fiber gasketing from top of heat exchanger.
 - c. Pry canopy from boiler sections.
7. Inspect flue passages. Clean with flue brush. See Figure 25.
8. Inspect heating surface in combustion chamber. Clean with straight handle wire brush.
9. Replace Canopy/Blower Assembly and seal using ceramic fiber gasketing. Refer to Key No. 2 in Repair Parts Section for quantity and part number.
10. Connect Silicone Tubing between Pressure Fittings on Canopy Assembly and Pressure Switch. See Figure 26.
11. Install Jacket Top Panels.
12. Connect vent system. See Figure 9.
13. Connect Blower Motor Wiring Harness.

F. Main Burners and Combustion Chamber.

1. Vacuum combustion chamber. Exercise care - do not damage base insulation.
2. Clean main burners. Brush top of burners with soft bristle brush. See Figure 25. Vacuum to remove any dirt and lint.
3. Vacuum tip of pilot burner.
4. Check gas orifices for lint and dirt. Clean as necessary.

5. Install main burners by reversing procedure to remove burners.
 - a. Pilot burner must be installed in original location. See Table 10.
 - b. Main burners must be properly secured in burner tray slot at rear of combustion chamber and over gas orifice with hitch pin in place. See Figure 25.
 - c. Burner access panel must be securely in place.
 - d. Verify that Combustion Air Diffuser is securely in place.
 - e. If Flame Roll-out Switch wires were disconnected, they must be reconnected.
 - f. Air Intake Box Cover must be installed.

G. Check operation. Follow steps C through L from Section VIII: System Start-up.

H. Procedure for Measuring Fan Differential Pressure. (See Figure 27).

1. With boiler off, remove gray and black hoses at differential pressure switch.
2. With tees, connect water manometer as shown with additional tubing.
3. Start boiler and read pressure on manometer when boiler water temperature reaches operating temperature. Refer to Table 11 for minimum readings.

NOTE: If switch drops-out before boiler reaches temperature or if differential pressure readings are below minimums shown in Table 11, check for cracks in hoses or contact your nearest Burnham representative.
4. Stop boiler, remove manometer and reconnect hoses to pressure switch. See Figure 26.

I. Lubrication

There are no parts requiring lubrication on the part of the Service Technician or the User. Circulator bearings are water lubricated. Combustion blower motor uses sealed bearings.

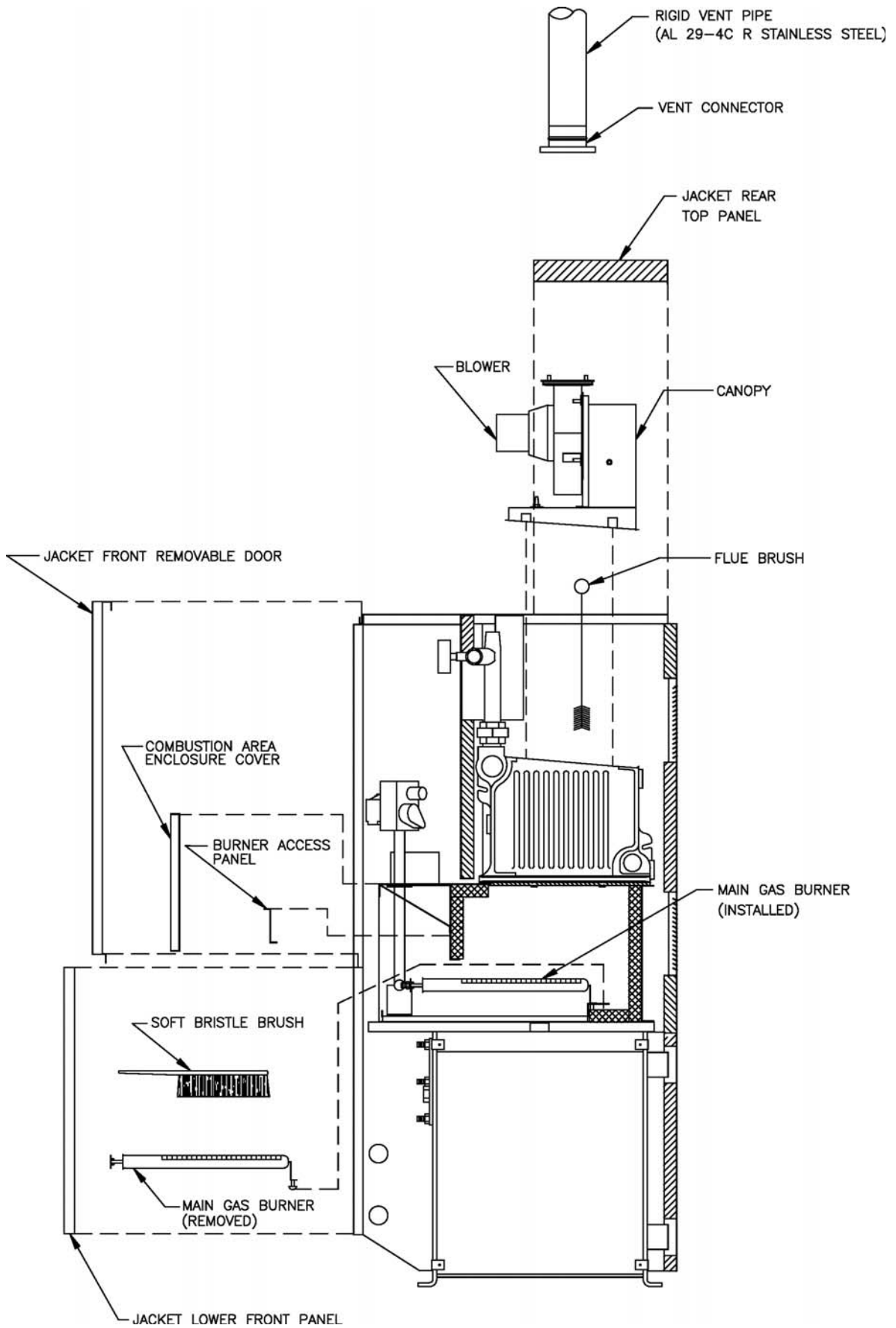


Figure 25: Burner and Flueway Cleaning

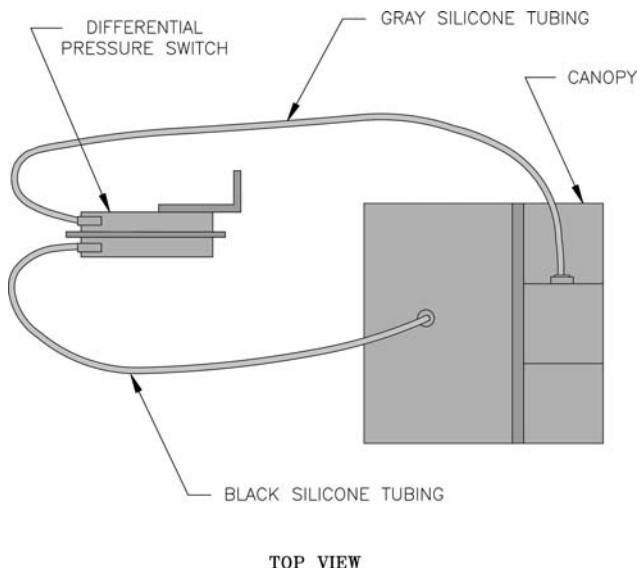


Figure 26: Silicone Tubing Assembly

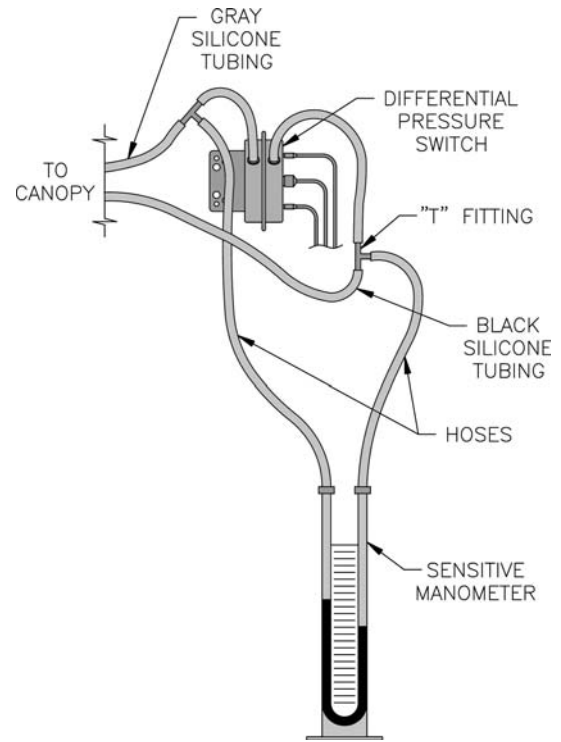


Figure 27: Differential Pressure Measurement

Table 10: Pilot Burner Location

| Boiler Model | Main Burner with 60° Pilot Bracket * | Pilot Burner Located Between Main Burners * |
|-----------------------|--------------------------------------|---|
| MM114-70 & MM114-105 | 3 | 3 & 4 |
| MM115-105 & MM115-140 | 4 | 4 & 5 |

* Main burners numbered left to right as viewed from front of boiler.

Table 11: Differential Pressure Switch Settings

| BOILER MODEL | MINIMUM PRESSURE |
|--------------|------------------|
| MMII4-70 | 0.80"wc |
| MMII4-105 | 0.80"wc |
| MMII5-105 | 0.69"wc |
| MMII5-140 | 0.69"wc |

Important Product Safety Information

Refractory Ceramic Fiber Product

Warning:

This product contains refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. After this product is fired, RCF may, when exposed to extremely high temperature (>1800F), change into a known human carcinogen. When disturbed as a result of servicing or repair, RCF becomes airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

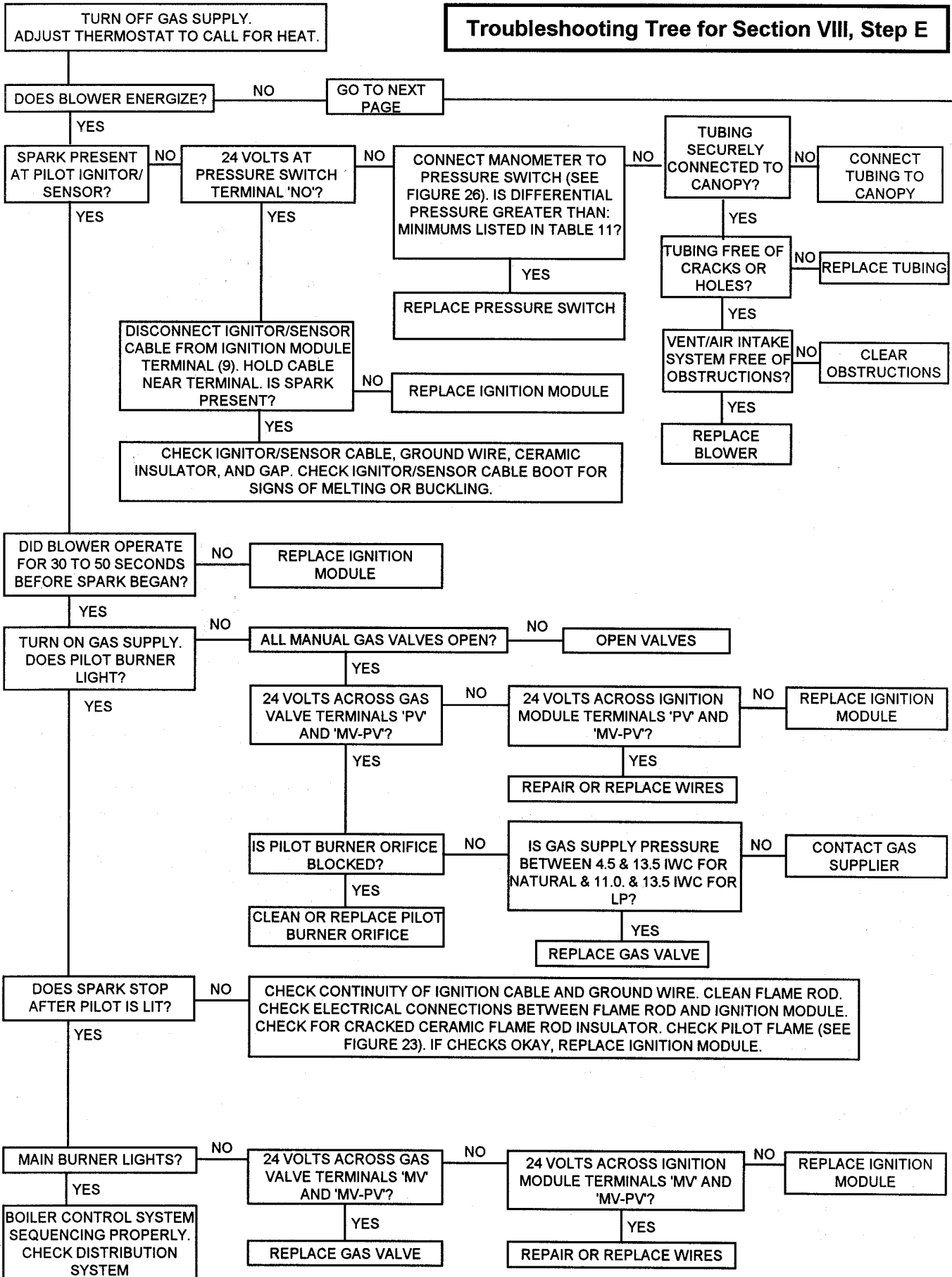
Do not remove or replace previously fired RCF (combustion chamber insulation, target walls, canopy gasket, flue cover gasket, etc.) or attempt any service or repair work involving RCF without wearing the following protective gear:

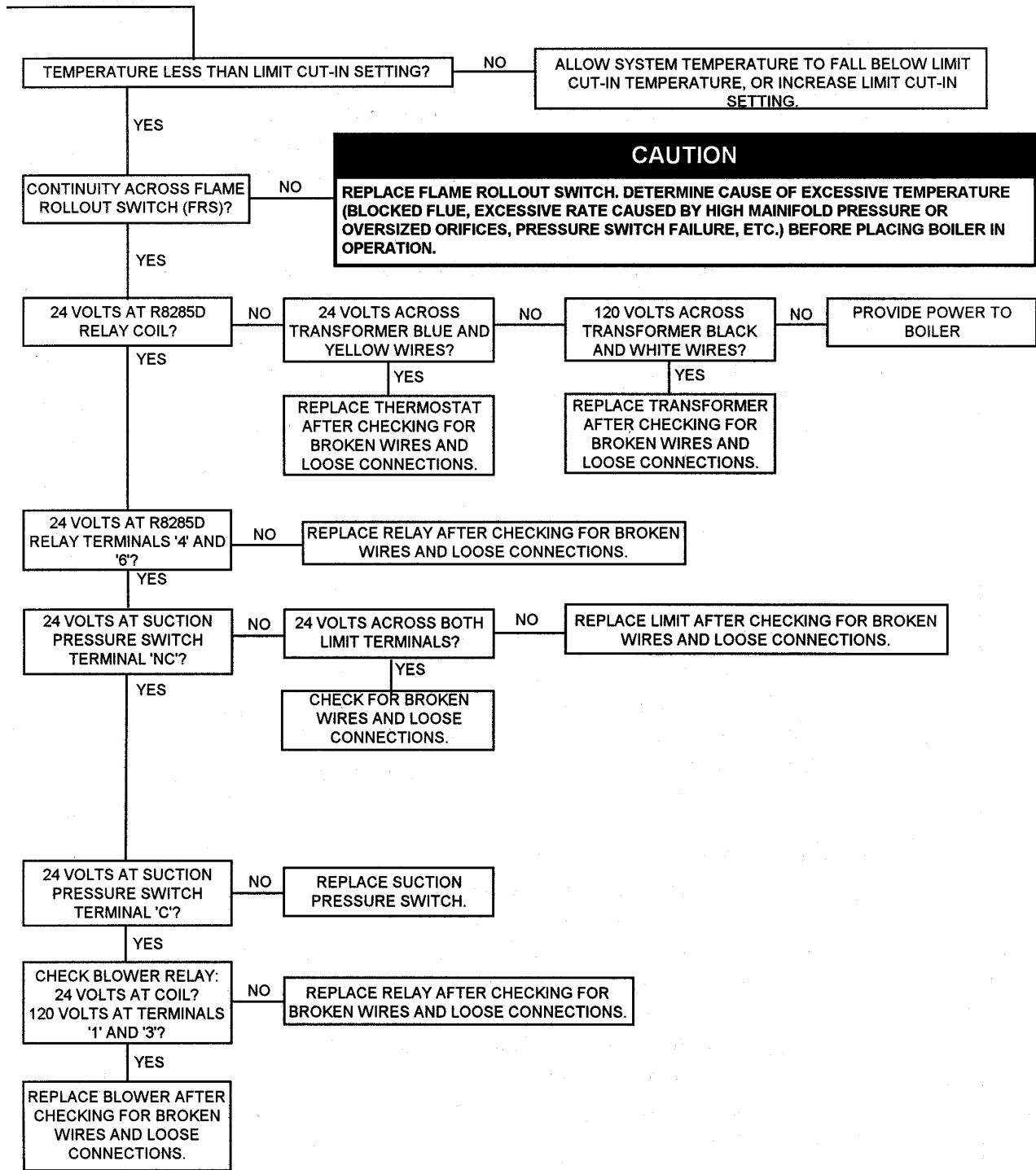
1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
 2. Long sleeved, loose fitting clothing
 3. Gloves
 4. Eye Protection
- Take steps to assure adequate ventilation.
 - Wash all exposed body areas gently with soap and water after contact.
 - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
 - Discard used RCF components by sealing in an air tight plastic bag.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

Troubleshooting Tree for Section VIII, Step E

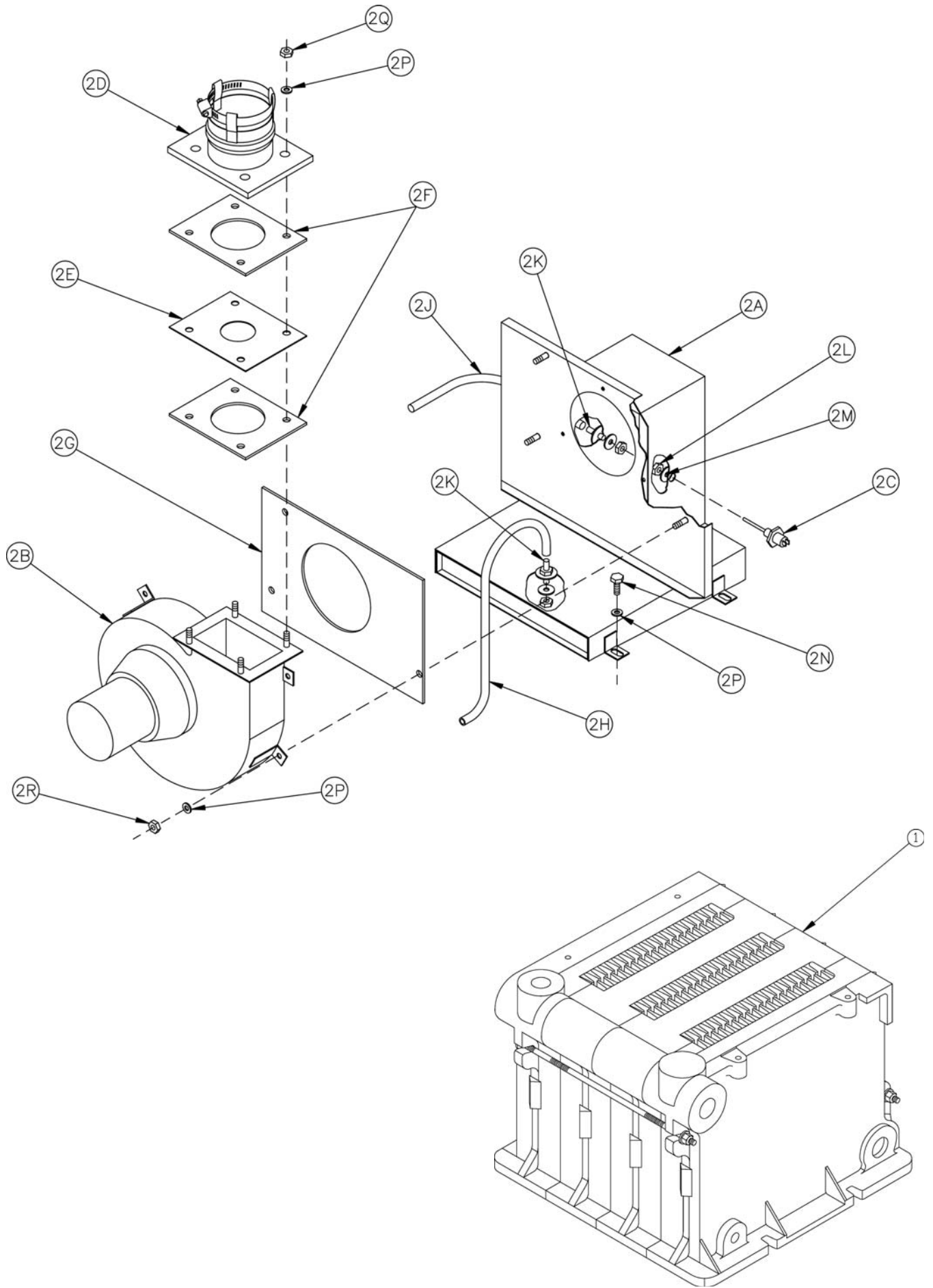


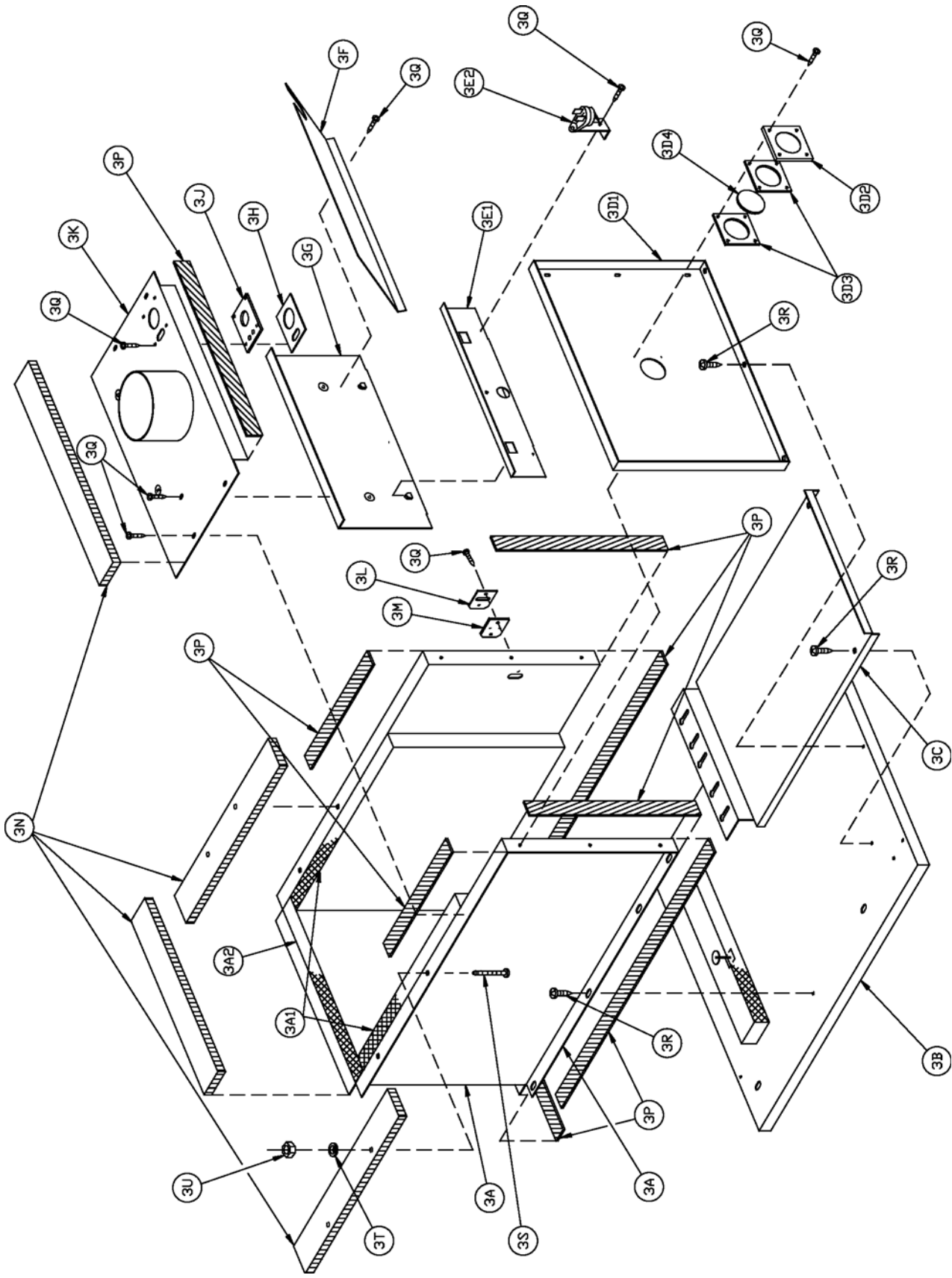


X. Repair Parts

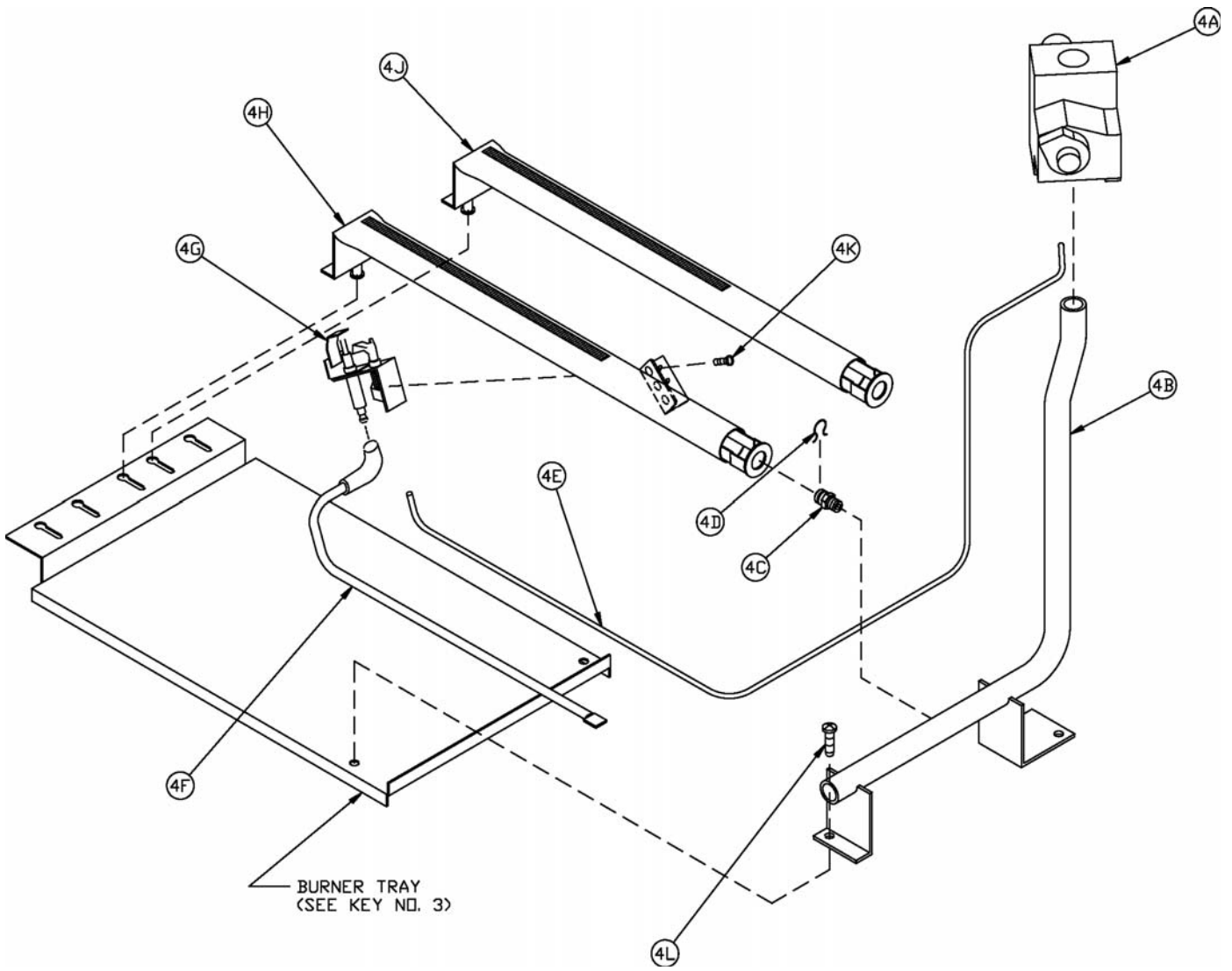
All Minuteman® II Repair Parts may be obtained through your local Burnham Wholesale distributor. Should you require assistance in locating a Burnham Distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.

| Key No. | Description | [Quantity] Part Number | | | |
|--|---|--------------------------|--------------|--------------|--------------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 1. Heat Exchanger Assembly | | [1] 61704042 | | [1] 61704052 | |
| 2. Canopy/Blower Assembly | | | | | |
| 2A | Canopy | [1] 61104044 | [1] 61104043 | [1] 61104053 | [1] 61104054 |
| 2B | Blower, Fasco #7062-3101 | [1] 6111715 | | | |
| 2C | Flue Monitor | [1] 80160622 | | | |
| 2D | Vent Connector | See Key No. 11 | | | |
| 2E | Orifice Plate, Fan Outlet | [1] 71104055 | [1] 71104056 | [1] 71104057 | [1]71104058 |
| 2F | Gasket, Fan Outlet (included w/2B) | [2] 8206035 | | | |
| 2G | Gasket, Blower Mounting (included w/2B) | [1] 8206049 | | | |
| 2H | Silicone Tubing, 3/16" I.D. x 22" Long | 9016006 (Specify Length) | | | |
| 2J | Silicone Tubing, 3/16" I.D. x 18" Long | 9016007 (Specify Length) | | | |
| 2K | Static Pressure Fitting, Dwyer #A308 | [2] 822657 | | | |
| 2L | Nut, Hex Steel Panel, 3/8" -24 | [1] 80860476 | | | |
| 2M | Washer, Flat 3/8" | [1] 80860656 | | | |
| 2N | Cap Screw, Hex Hd., 1/4" -20 x 1" lg. | [4] 80861358 | | | |
| 2P | Washer, Flat 1/4", SAE, Plated | [12] 80860633 | | | |
| 2Q | Lock Nuts 1/4" -20 | [4] 80860456 | | | |
| 2R | Nut, Brass Hex, 1/4" -20 (included w/ 2B) | [4] 80860424 | | | |
| 3. Cerafelt Gasketing (not depicted) Canopy to Heat Exchanger | | [1] 7206016 | | | |





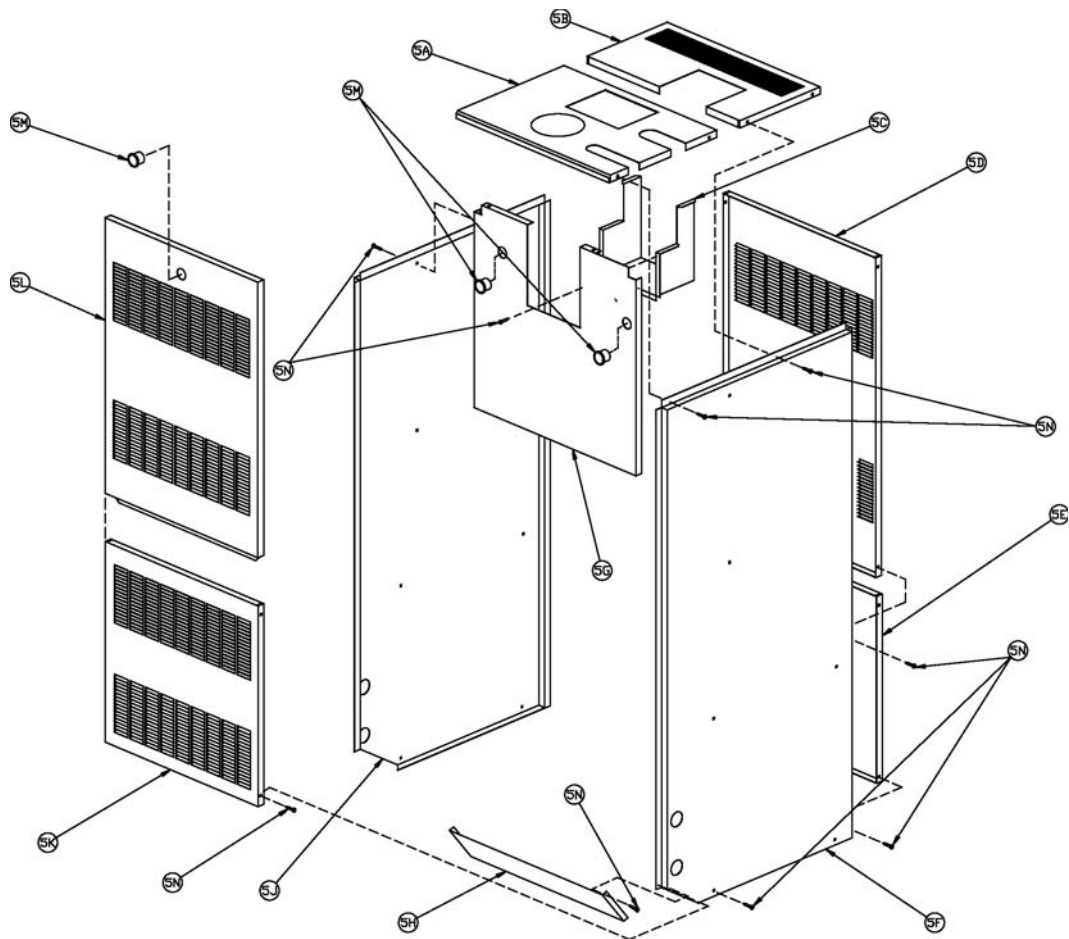
| Key No. | Description | [Quantity] Part Number | | | |
|-------------------------|---|------------------------|---------------|---------------|-----------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 3. Base Assembly | | | | | |
| 3A | Base Wrapper (w/o Insulation) | [1] 718040431 | | [1] 718040531 | |
| 3A1 | Base Left & Right Side Insulation | | [2] 72004024 | | |
| 3A2 | Base Rear Insulation | [1] 72004022 | | [1] 72004023 | |
| 3B | Base Plate Assembly (insulation attached) | [1] 61804046 | | [1] 61804056 | |
| 3C | Burner Tray | [1] 72104044 | | [1] 72104054 | |
| 3D | Burner Enclosure Front Panel Assembly (includes 3D1 thru 3D4) | [1] 62104046 | | [1] 62104056 | |
| 3D1 | Burner Enclosure Front Panel | [1]721040421 | | [1] 721040521 | |
| 3D2 | Observation Port Lens Retainer | | [1] 7186019 | | |
| 3D3 | Observation Port Lens Gasket | | [2] 8206039 | | |
| 3D4 | Observation Port Lens | | [1] 8026082 | | |
| 3E | Burner Access Panel Assembly | [1] 62104045 | | [1] 62104055 | |
| 3E1 | Burner Access Panel | [1] 721040411 | | [1] 721040511 | |
| 3E2 | Flame Roll-Out Switch w/ Mounting Bracket | | [1] 6016060 | | |
| 3F | Combustion Air Diffuser | [1] 72104045 | | [1] 72104055 | |
| 3G | Base Front Panel Assembly (insulation attached) | [1] 61804044 | | [1] 61804054 | |
| 3H | Backing Plate, Manifold Seal | | [1] 71804010 | | |
| 3J | Gasket, Manifold Seal | | [1] 8180402 | | |
| 3K | Burner Enclosure Top Panel (insulation attached) | [1] 62104044 | | [1] 62104054 | |
| 3L | Backing Plate, FRS Wire Gasket | | [1] 7096002 | | |
| 3M | Gasket, FRS Wires | | [1] 8180403 | | |
| 3N | Ceramic Fiber Gasket, 1/2" x 2" x 10 Ft. Lg. | | [1] 6206002 | | |
| 3P | Fiberglass Tape Gasket, 1/8" x 1" x 10 Ft. Lg. | | [1] 6206004 | | |
| 3Q | Sheet Metal Screw, #8 x 1/2" Lg. | | [20] 80860000 | | |
| 3R | Self-Tapping Screw, 1/4" -20 x 1/2" Lg. | | [10] 80860700 | | |
| 3S | Self-Tapping Screw, 5/16" -18 x 1-1/4" Lg. | | [4] 80860717 | | |
| 3T | Washer, 5/16" Flat | | [4] 80860601 | | |
| 3U | Lock Nut, 5/16" -18 | | [4] 80860464 | | |



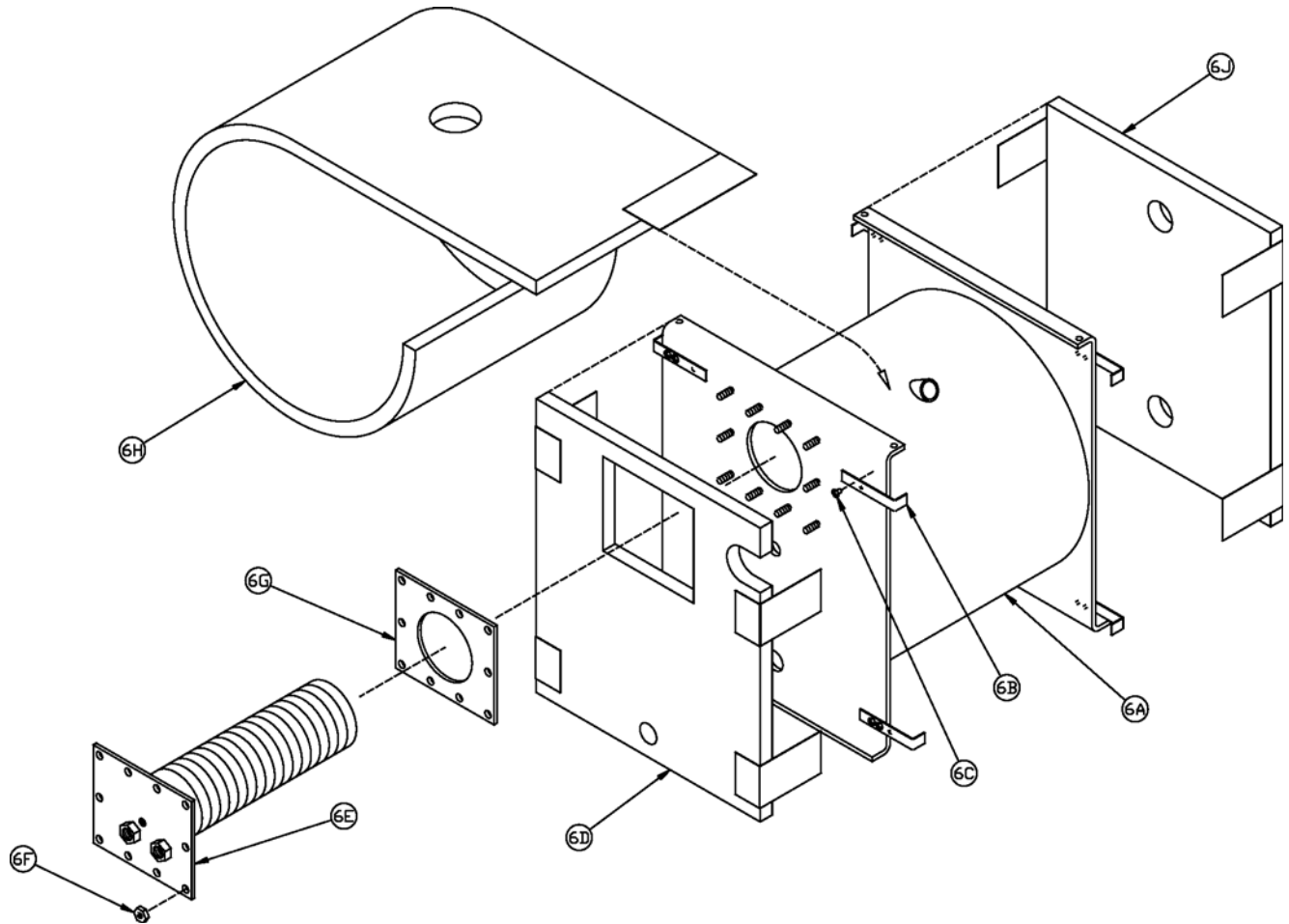
| Key No. | Description | | [Quantity] Part Number | | | | |
|---------|--|---------------------------------|------------------------|------------|--------------|------------|------------|
| | | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 | |
| 4A | Gas Valve | (Nat.) Honeywell VR8204C6000 | [1] 81660176 | | | | |
| | | (LP) Honeywell VR8204C6018 | [1] 81660180 | | N/A | | |
| 4B | Gas Manifold | | [1] 82204041 | | [1] 82204051 | | |
| 4C | Main Burner Orifices | Natural Gas | #49 Drill (Yellow) | [5] 822655 | ---- | [7] 822655 | ---- |
| | | | #43 Drill (Red) | ---- | [5] 822634 | ---- | ---- |
| | | | #44 Drill (Orange) | ---- | ---- | ---- | [7] 822640 |
| | | LP | #57 | [5] 822656 | ---- | ---- | ---- |
| | | | #54 (Black) | ---- | [5] 822635 | ---- | ---- |
| 4D | Hitch Pin Clip | | [5] 822604 | | [7] 822604 | | |
| 4E | Pilot Tubing, 1/8" O.D. x 30" Lg. | | [1] 8236110 | | | | |
| 4F | Ignition/Sensor Cable, Honeywell #394803-2 | | [1] 8236121 | | | | |
| 4G | Pilot Assembly | (Nat. Gas), Honeywell Q348A1333 | [1] 8236104 | | | | |
| | | (LP) Honeywell Q348A1341 | [1] 8236107 | | N/A | | |
| 4H | Main Gas Burner w/Pilot Bracket | | [1] 8236116 | | | | |
| 4J | Main Gas Burner less Pilot Bracket | | [4] 8236115 | | [6] 8236115 | | |
| 4K | Machine Screw, #10-32 x 3/16" Lg. | | [2] 80860800 | | | | |
| 4L | Self-Tapping Screw, 1/4" -20 x 1" Lg. | | [2] 80860720 | | | | |

N/A: MMII5 Models are Not Available for LP gas service

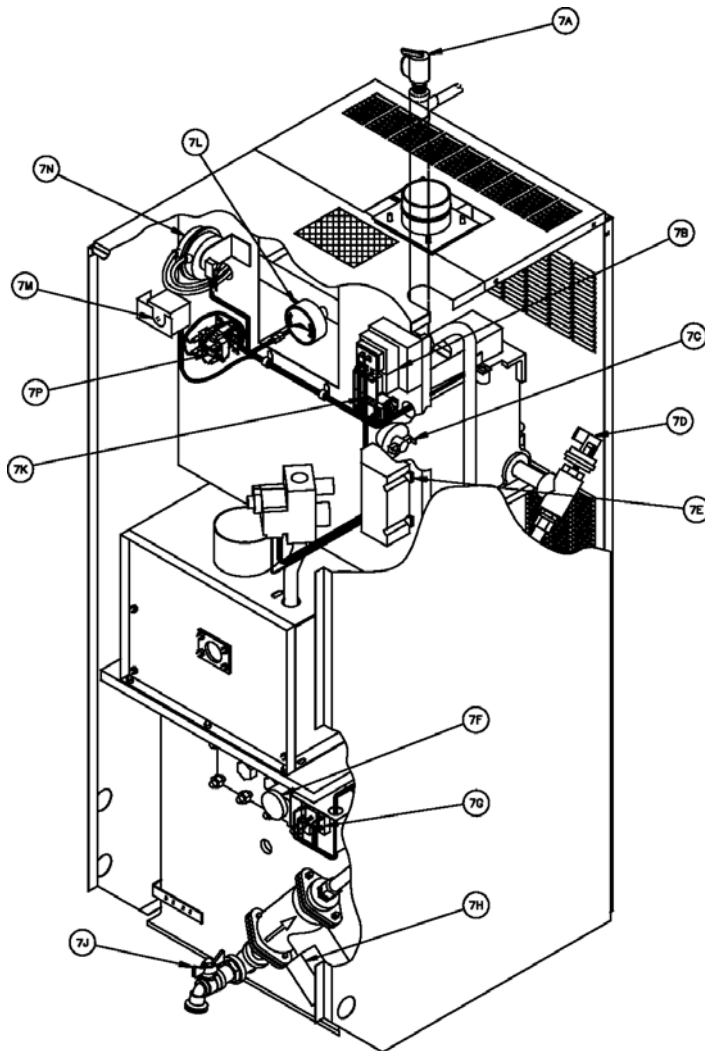
| Key No. | Description | [Quantity] Part Number | | | |
|---------------------------|----------------------------------|------------------------|-----------|-----------|-----------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 5. Jacket Assembly | | | | | |
| 5 | Complete Jacket Assembly | [1] 60404002 | | | |
| 5A | Front Top Panel | [1] 6040415 | | | |
| 5B | Rear Top Panel | [1] 70404091 | | | |
| 5C | Fan Shroud | [1] 71104004 | | | |
| 5D | Upper Rear Panel | [1] 6040414 | | | |
| 5E | Lower Rear Panel | [1] 6040413 | | | |
| 5F | Right Side Panel | [1] 6040411 | | | |
| 5G | Vestibule Panel | [1] 6040417 | | | |
| 5H | Kick Panel | [1] 7040111 | | | |
| 5J | Left Side Panel | [1] 6040412 | | | |
| 5K | Lower Front Panel | [1] 70404021 | | | |
| 5L | Removable Door | [1] 70404041 | | | |
| 5M | Snap Bushing | [3] 8136257 | | | |
| 5N | Sheet Metal Screw, #8 x 1/2" Lg. | [57] 80860000 | | | |



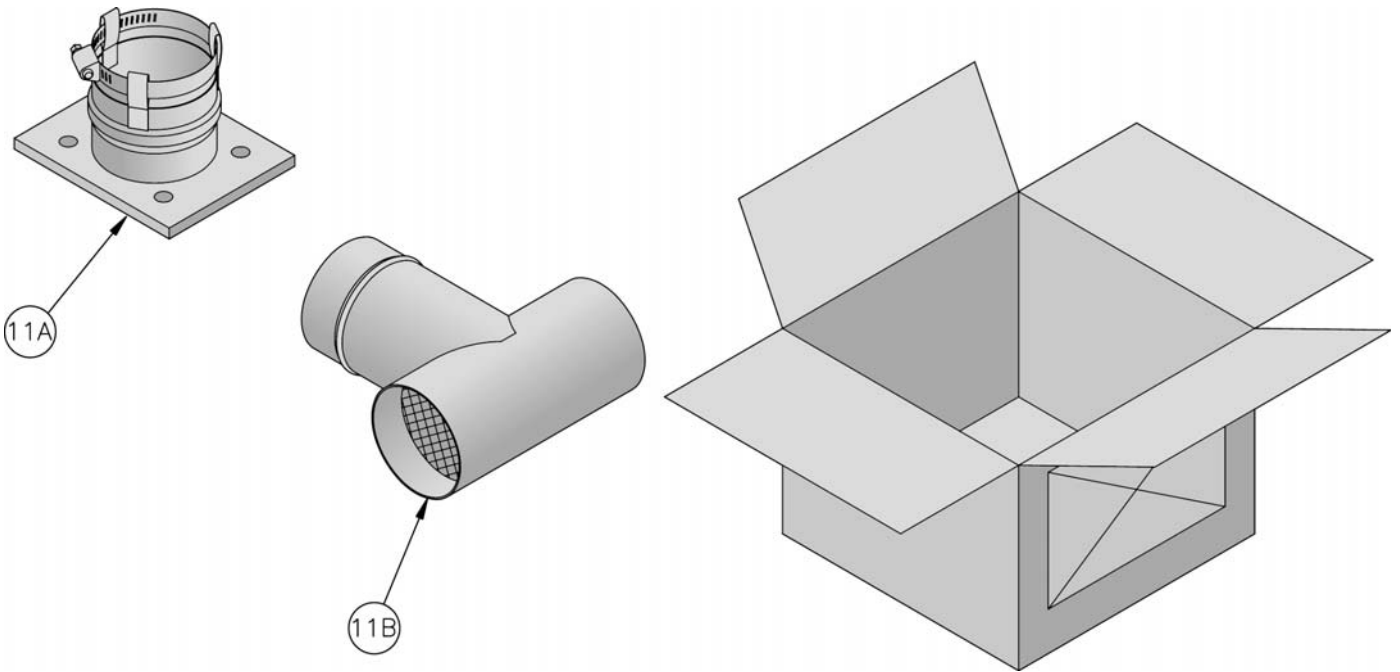
| Key No. | Description | [Quantity] Part Number | | | |
|--|---|------------------------|-----------|---------------|-----------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 6. Domestic Water Tank Assembly | | | | | |
| 6 | Insulated Tank Assembly | | | [1] 60304032 | |
| 6A | Tank Assembly | | | [1] 60304031 | |
| 6B | Jacket Attachment Bracket | | | [8] 70404011 | |
| 6C | Self-Tapping Screw, 1/4" -20 x 1/2" Lg. | | | [16] 80860700 | |
| 6D | Front Insulation | | | [1] 72004067 | |
| 6E | Domestic Hot Water Coil | | | [1] 6030401 | |
| 6F | Hex, Nut, 3/8" -16 | | | [10] 80860423 | |
| 6G | Coil Gasket | | | [1] 8206036 | |
| 6H | Tank Wrapper Insulation | | | [1] 72004069 | |
| 6J | Rear Insulation | | | [1] 72004068 | |



| Key No. | Description | [Quantity] Part Number | | | |
|---|---|------------------------|--------------|-----------|-----------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 7. Miscellaneous Trim and Controls | | | | | |
| 7A | Relief Valve, Conbraco 10-408-05 | [1] 81660319 | | | |
| 7B | Control Center, Honeywell R8285D5001 | [1] 80160155U | | | |
| 7C | Reverse-Acting Thermal Switch | [1] 80160126 | | | |
| 7D | Water Pressure Switch | [1] 80160191 | | | |
| 7E | Ignition Module, Honeywell S8670E1007 | [1] 80160108 | | | |
| 7F | Tank Aquastat, Honeywell L6189A2092 | [1] 80160499 | | | |
| 7G | DPST Relay, Honeywell R8222V1029 | [1] 80160135 | | | |
| 7H | Circulator, Taco 007 | [1] 8056007 | | | |
| 7J | Drain Valve, Conbraco #35-302-03 | [1] 806603061 | | | |
| 7K | DPST Relay, Honeywell R8222U1006 | [1] 80160096U | | | |
| 7L | Pressure/Temperature Gauge | [1] 8056235 | | | |
| 7M | Boiler High Limit, Honeywell L4189B2012 | [1] 80160460 | | | |
| 7N | Differential Pressure Switch | [1] 60160885 | [1] 60160887 | | |
| 7P | SPST Relay, Honeywell R8222B1000 | [1] 80160687 | | | |



| Key No. | Description | [Quantity] Part Number | | | |
|----------------------------------|----------------|------------------------|-----------|-----------|-----------|
| | | MMII4-70 | MMII4-105 | MMII5-105 | MMII5-140 |
| 11. Vent Accessory Carton | | [1] 61110129 | | | |
| 11A | Vent Connector | [1] 8116307 | | | |
| 11B | Vent Terminal | [1] 8116310 | | | |
| 12. Air Intake Terminal | | [1] 8110402 | | | |



Limited Warranty

FOR MINUTEMAN® II BOILER/WATER HEATER

Subject to the terms and conditions set forth below, U.S. Boiler™ Co., Inc., Lancaster, Pennsylvania ("U.S. Boiler Co., Inc.") hereby extends the following limited warranties to the original owner of a Minuteman® II Boiler/Water Heater manufactured and shipped on or after July 1, 1996:

ONE YEAR LIMITED WARRANTY ON MINUTEMAN® II BOILER/WATER HEATER

U.S. Boiler Co., Inc. warrants to the original owner that its Minuteman® II Boiler/Water Heater complies at the time of manufacture with recognized hydronic industry standards and requirements then in effect and will be free of defects in material and workmanship under normal usage for a period of one year from the date of original installation. If any part of a water boiler is found to be defective in material or workmanship during this one year period, U.S. Boiler Co., Inc. will, at its option, repair or replace the defective part.

FIVE YEAR LIMITED WARRANTY ON WATER HEATER RESERVOIR

U.S. Boiler Co., Inc. warrants to the original owner that the water heater reservoir of its Minuteman® II Boiler/Water Heater will remain free from defects in material and workmanship under normal usage for five years from the date of original installation. If the water heater reservoir is found to be defective in material or workmanship during this five year period, U.S. Boiler Co., Inc. will, at its option, repair or replace the defective water heater reservoir.

LIFETIME LIMITED WARRANTY ON CAST IRON HEAT EXCHANGER

U.S. Boiler Co., Inc. warrants to the original owner that the cast iron heat exchanger of its Minuteman® II Boiler/Water Heater will remain free from defects in material and workmanship under normal usage for the lifetime of the original owner at the original place of installation. If a claim is made under this warranty during the first ten years from the date of original installation, U.S. Boiler Co., Inc. will, at its option, repair or replace the cast iron heat exchanger. If a claim is made under this warranty after the expiration of ten years from the date of original installation, U.S. Boiler Co., Inc. will, at its option and upon payment of the pro-rated service charge set forth below, repair or replace the cast iron heat exchanger. The service charge applicable to a cast iron heat exchanger warranty claim is based upon the number of years the cast iron heat exchanger has been in service and will be determined as a percentage of the retail price of the cast iron heat exchanger model involved at the time the warranty claim is made as follows:

| | | | | | | | | |
|-------------------------------------|-----------|----|----|----|----|----|----|--------------|
| Years In Service | 1-10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Service Charge as % of Retail Price | No Charge | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| Years in Service | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 and above |
| Service Charge as % of Retail Price | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 |

NOTE: If the cast iron heat exchanger model involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as shown in the Burnham Hydronics Repair Parts Price Sheet where the cast iron heat exchanger last appeared or the current retail price of the then available nearest equivalent cast iron heat exchanger.

ADDITIONAL TERMS AND CONDITIONS

1. Applicability: The limited warranties set forth above are extended only to the original owner at the original place of installation within the United States and Canada. This warranty is applicable only to the Minuteman® II Boiler/Water Heater installed in a single or two-family residence and does not apply to any commercial installations.

2. Components Manufactured by Others: Upon expiration of the one year limited warranty on the Minuteman® II Boiler/Water Heater, all boiler components manufactured by others but furnished by U.S. Boiler Co., Inc. (such as oil burner, circulator and controls) will be subject only to the manufacturer's warranty, if any.

3. Proper Installation: The warranties extended by U.S. Boiler Co., Inc. are conditioned upon the installation of the Minuteman® II Boiler/Water Heater in

strict compliance with U.S. Boiler Co., Inc. installation instructions. U.S. Boiler Co., Inc. specifically disclaims liability of any kind caused by or relating to improper installation.

4. Proper Use and Maintenance: The warranties extended by U.S. Boiler Co., Inc. are conditioned upon the use of the Minuteman® II Boiler/Water Heater for its intended purpose and its maintenance in accordance with U.S. Boiler Co., Inc.'s recommendations and hydronics industry standards. These warranties will be inapplicable if the Minuteman® II Boiler/Water Heater is used or operated over its rated capacity, is subjected to unauthorized modification, or is damaged as a result of being otherwise improperly operated or serviced including, but not limited to, damage from any of the following: operation with insufficient water, allowing the boiler to freeze, subjecting the boiler to flood conditions, and operation with unapproved water or fuel additives which cause deposits or corrosion.

5. Removal and Installation: These warranties do not cover expenses of removal or reinstallation. The owner is responsible for the cost of removing and reinstalling any defective part and its replacements and all labor and material connected therewith.

6. Exclusive Remedy: U.S. Boiler Co., Inc.'s obligation for any breach of these warranties is limited to the repair or replacement of its parts in accordance with the terms and conditions of these warranties.

7. Limitation of Damages: Under no circumstances shall U.S. Boiler Co., Inc. be liable for incidental, indirect, special or consequential damages of any kind whatsoever under these warranties, including, but not limited to, injury or damage to persons or property and damages for loss of use, inconvenience or loss of time. U.S. Boiler Co., Inc.'s liability under these warranties shall under no circumstances exceed the purchase price paid by the owner for the Minuteman® II Boiler/Water Heater involved. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

8. Limitation of Warranties: These warranties set forth the entire obligation of U.S. Boiler Co., Inc. with respect to any defect, in a Minuteman® II Boiler/Water Heater and U.S. Boiler Co., Inc. shall have no express obligations, responsibilities or liabilities of any kind whatsoever other than those set forth herein. These warranties are given in lieu of all other express warranties.

ALL APPLICABLE IMPLIED WARRANTIES, IF ANY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN DURATION TO A PERIOD OF ONE YEAR, EXCEPT THAT IMPLIED WARRANTIES, IF ANY, APPLICABLE TO THE CAST IRON HEAT EXCHANGER IN A MINUTEMAN® II BOILER/WATER HEATER SHALL EXTEND TO THE ORIGINAL OWNER FOR THE LIFETIME OF THE ORIGINAL OWNER AT THE ORIGINAL PLACE OF INSTALLATION. Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

PROCEDURE FOR OBTAINING WARRANTY SERVICE

In order to assure prompt warranty service, the owner is requested to complete and mail the attached Warranty Card within ten days after the installation of the boiler, although failure to comply with this request will not void the owner's rights under these warranties.

Upon discovery of a condition believed to be related to a defect in material or workmanship covered by these warranties, the owner should notify the installer who will in turn notify the distributor, if this action is not possible or does not produce a prompt response, the owner should write to: Burnham Hydronics, P.O. Box 3079, Lancaster, PA 17604, giving full particulars in support of this claim.

The owner is required to make available for inspection by U.S. Boiler Co., Inc. or its representative the parts claimed to be defective and, if requested by U.S. Boiler Co., Inc., to ship these parts prepaid to Burnham Hydronics at the above address for inspection or repair. In addition, the owner agrees to make all reasonable efforts to settle any disagreement arising with a claim before resorting to legal remedies in the courts.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.



03/03