UTICA BOILERS

# JC SERIES

Gas-Fired Water
BOILER

# INSTALLATION, OPERATION & MAINTENANCE MANUAL

ecr
innovative living™
An ISO 9001-2000 Certified Company

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**IMPORTANT: THIS MANUAL MUST BE KEPT NEAR THE BOILER FOR FUTURE REFERENCE!!**

## WARNINGS AND SAFETY SYMBOLS

**DANGER**

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

**CAUTION**

Indicates an imminently hazardous situation which, if not avoided, may result in injury or property damage.

**WARNING**

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

**NOTICE**

Indicates information which should be followed to ensure proper installation and operation.

**WARNING**

All installations of boilers should be done only by a qualified expert and in accordance with the appropriate manual. Installing a boiler or any other electric appliance with improper methods or materials may result in serious injury or death due to fire.

**NOTICE**

IMPORTANT: Read the following instructions COMPLETELY before installing!!

## Rules For Safe Installation And Operation

1. Read the User's Manual and the Rules for Safe Operation carefully. Failure to follow the rules for safe operation and the instructions could cause a malfunction of the boiler and result in death, serious bodily injury, and/or property damage.
2. Check your local codes and utility requirements before installation. The installation must be in accordance with their directives.
3. Before servicing, allow boiler to cool and always shut off any electricity and gas to boiler when working on it. This will prevent any electrical shocks or burns.
4. Never test for leaks with an open flame. Use soap suds to check all connections. This will avoid any possibility of fire or explosion.
5. Be certain boiler is equipped for type of gas (natural) to be used. Over-firing will result in premature failure of the boiler sections and cause dangerous operation.
6. Never vent this boiler into an enclosed space. Always connect the boiler to a chimney and vent to the outside. Never vent to another room or inside a building.
7. Be sure there is adequate air supply for complete combustion.
8. Follow a regular service and maintenance schedule for efficient and safe operation.
9. Never install the boiler on carpeting.
10. Keep boiler area clear and free from combustible material, such as gasoline and other flammable vapors and liquids.

## When Your Boiler Arrives

When your boiler arrives be sure to save and refer to the instructions.

First, inspect each item received for visible damage. If any parts are damaged, report this to the freight company immediately and request them to call and make an inspection before you make any installation. Have the inspector prepare a signed report. Send a copy of this report to the manufacturer and we will send replacements for the damaged parts. But we must have the signed inspection report of the freight company to prove their liability.

Read these instructions carefully before beginning the installation to be sure all packages have been received. It is recommended that you follow the step-by-step instructions for best assembly results. Before discarding any packing material carefully examine for loose parts. Also store all parts received where they will not be lost or damaged.

## Codes Governing Installation

Boiler should be installed in accordance to the latest edition of American National Standard National Fuel Gas Code Z223.1 (Available from the American Gas Association, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131). Reference should also be made to local gas utility regulations and other codes in effect in the area in which the installation is to be made. The jurisdiction normally covers electrical wiring, gas piping, flue specification, and insulation of adjacent combustible material where required clearance cannot be maintained.

Where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

## Installation

This boiler is designed to provide wide capacity range with multiple burner modules, each equipped with its own set of controls. For purposes of orientation, the manifold side of the boiler is considered the front. The end sections are so designed that the controls may be placed on either the left or right end. These instructions are written for the assembling of the boiler starting with the left side and working to the right side. A hot water boiler installed above radiation level must be provided with a low water cutoff device either as a part of the boiler or at the time of boiler installation.

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.5 kPa).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5 kPa).

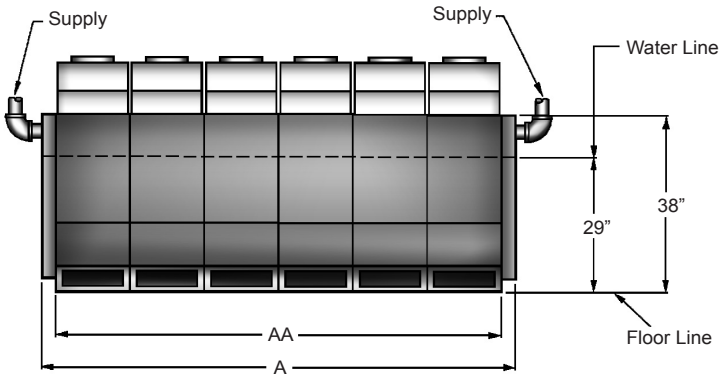
The dimensions of the boiler assembly can be found in **Chart 2** and **Figure 1 through Figure 3**.

**Chart 1 IBR Ratings and Capacities**

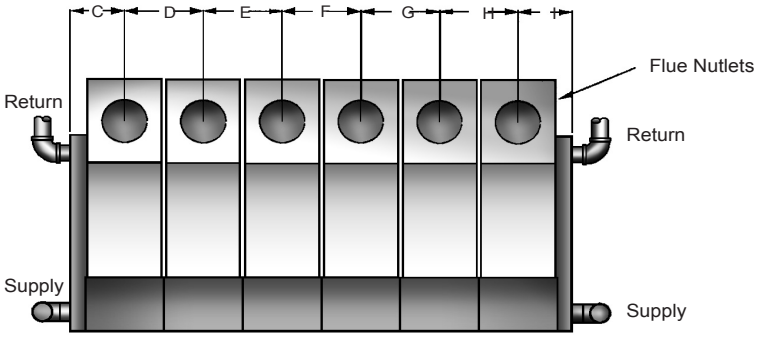
| Boiler Model No. | A.G.A. Input (1) | A.G.A. Output (1) | NET I=B=R Ratings (2) | Fule Outlet No. & Size | | | Chimney Size (6) | Flue Collector Size to Chimney | Horsepower Gross Output (4) | Pressure Drop Thru Water Boiler (5) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MBPH | MBPH | Water MBPH | 8" | 10" | 12" | I.D. x Ht. | | | GPM | In. Water |
| 300 | 300 | 240 | 209 | 1 | | | 8"x20' | 8 | 7.16 | 18.9<br>37.8 | 0.10<br>0.50 |
| 400 | 400 | 320 | 278 | | 1 | | 10"x20' | 10 | 9.55 | 25.2<br>50.4 | 0.27<br>0.86 |
| 500 | 500 | 400 | 348 | | | 1 | 12"x20' | 12 | 11.94 | 31.5<br>63.0 | 0.40<br>1.20 |
| 600 | 600 | 480 | 417 | 2 | | | 12"x20' | 12 | 14.33 | 37.8<br>75.6 | 0.50<br>1.70 |
| 700 | 700 | 560 | 487 | 1 | 1 | | 12"x20' | 12 | 16.72 | 44.1<br>88.2 | 0.70<br>2.50 |
| 800 | 800 | 640 | 557 | | 2 | | 14"x20' | 14 | 19.10 | 50.4<br>100.8 | 0.88<br>2.90 |
| 900 | 900 | 720 | 626 | | 1 | 1 | 14"x20' | 14 | 21.49 | 56.7<br>113.4 | 1.10<br>3.80 |
| 1000 | 1000 | 800 | 696 | | | 2 | 14"x20' | 14 | 23.88 | 63.0<br>126.0 | 1.30<br>4.00 |
| 1100 | 1100 | 880 | 765 | 1 | 2 | | 16"x20' | 16 | 26.27 | 69.3<br>138.6 | 1.50<br>5.00 |
| 1200 | 1200 | 960 | 835 | | 3 | | 16"x20' | 16 | 28.66 | 75.6<br>151.2 | 1.80<br>6.00 |
| 1300 | 1300 | 1040 | 904 | 1 | | 2 | 16"x20' | 16 | 31.04 | 81.9<br>163.8 | 2.00<br>5.60 |
| 1400 | 1400 | 1120 | 974 | | 1 | 2 | 18"x20' | 18 | 33.43 | 88.2<br>176.4 | 2.40<br>7.00 |
| 1500 | 1500 | 1200 | 1043 | | | 3 | 18"x20 | 18 | 35.82 | 94.5<br>189.0 | 2.60<br>8.30 |
| 1600 | 1600 | 1280 | 1113 | | 4 | | 18"x20' | 18 | 83.21 | 100.8<br>201.0 | 2.80<br>9.60 |
| 1700 | 1700 | 1360 | 1183 | 1 | 1 | 2 | 18"x20' | 18 | 40.60 | 107.1<br>214.2 | 3.15<br>10.30 |
| 1800 | 1800 | 1440 | 1252 | | 2 | 2 | 20"x20' | 20 | 42.99 | 113.4<br>226.8 | 3.50<br>11.00 |
| 1900 | 1900 | 1520 | 1322 | | 1 | 3 | 20"x20' | 20 | 45.37 | 119.7<br>239.4 | 4.00<br>12.50 |
| 2000 | 2000 | 1600 | 1391 | | | 4 | 20"x20 | 20 | 47.76 | 126.0<br>252.0 | 4.50<br>14.00 |
| 2100 | 2100 | 1680 | 1461 | 2 | | 3 | 20"x20' | 20 | 50.15 | 132.3<br>264.6 | 4.95<br>16.00 |
| 2200 | 2200 | 7160 | 1530 | | 3 | 2 | 22"x20' | 22 | 52.54 | 138.6<br>277.2 | 5.40<br>18.00 |
| 2300 | 2300 | 1840 | 1600 | | 2 | 3 | 22"x20' | 22 | 54.93 | 144.9<br>289.8 | 5.70<br>17.00 |
| 2400 | 2400 | 1920 | 1670 | | 1 | 4 | 22"x20' | 22 | 57.31 | 151.2<br>302.4 | 8.00<br>19.00 |
| 2500 | 2500 | 2000 | 1739 | | | 5 | 22"x20 | 22 | 59.70 | 157.5<br>315.0 | 8.00<br>20.50 |
| 2600 | 2600 | 2080 | 1809 | 2 | | 4 | 22"x20' | 22 | 62.09 | 163.8<br>327.6 | 7.00<br>24.00 |
| 2700 | 2700 | 2160 | 1878 | 1 | 1 | 4 | 24"x20' | 24 | 64.48 | 170.1<br>340.2 | 7.50<br>24.00 |
| 2800 | 2800 | 2240 | 1948 | | 2 | 4 | 24"x20' | 24 | 66.87 | 176.4<br>352.8 | 8.00<br>26.00 |
| 2900 | 2900 | 2320 | 2017 | | 1 | 5 | 24"x20' | 24 | 69.25 | 182.75<br>365.5 | 8.50<br>27.50 |
| 3000 | 3000 | 2400 | 2087 | | | 6 | 24"x20 | 24 | 71.64 | 189.1<br>378.2 | 9.00<br>9.00 |

1) Ratings are at sea level to 2,000 feet. For altitudes above 2,000 feet, reduce all ratings 4% for each 1,000 feet above sea level
2) Ratings based on selection factors recommended by Hydronics institute for piping and pickup. Net water boiler ratings are based on an allowance of 1.15. For water applications with high piping and pickup requirements.
3) Ratings based on 33,500 Btuh per horsepower.
4) Pressure drop based on given flow from a single outlet and returning to a single inlet at the opposite end of the boiler.
5) Chimney sizes shown are one option based on a typical venting system as shown in ***Figure 32***, and sized according to the National Fuel Gas Code, assuming Type B double wall vent and vent connectors, Other venting system designs are acceptable as shown on ***Flue Connection And Venting section of this manual***. For further chimney design and sizing information, consult the National Fuel Gas Code, ANSI Z223.1/NFPA 54-latest revision, or ASHRAE-1996 HVAC Systems and Equipment Handbook, Chapter 30, Chimney, Gas Vent, and Fireplace Systems, or the Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances. NFPA 211 -latest revision. Follow standard engineering practice.

## Figure 1 - Front View




## Figure 2 - Top View




## Figure 3 - Left Side View

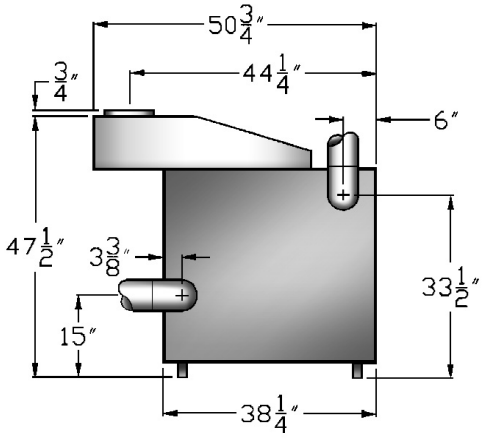



**Chart 2**

| Boiler Model No. | Water Content in Gallons | Shipping Weight Lbs. | A Jacket Width | AA Base Width | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 26 | 922 | 18 3/4 | 16 3/4 | 9 3/8 | – | – | – | – | – | 9 3/8 |
| 400 | 33 | 1133 | 23 | 21 | 11 1/2 | – | – | – | – | – | 11 1/2 |
| 500 | 40 | 1344 | 27 1/4 | 25 1/4 | 13 5/8 | – | – | – | – | – | 13 5/8 |
| 600 | 46 | 1555 | 31 1/2 | 29 1/2 | 9 3/8 | 12 3/4 | – | – | – | – | 9 3/8 |
| 700 | 52 | 1766 | 35 3/4 | 34 3/4 | 9 3/8 | 14 7/8 | – | – | – | – | 11 1/2 |
| 800 | 58 | 1977 | 40 | 38 | 11 1/2 | 17 | – | – | – | – | 11 1/2 |
| 900 | 65 | 2188 | 44 1/4 | 42 1/4 | 11 1/2 | 19 1/8 | – | – | – | – | 13 5/8 |
| 1000 | 71 | 2399 | 48 | 46 1/2 | 13 5/8 | 21 1/4 | – | – | – | – | 13 5/8 |
| 1100 | 78 | 2610 | 52 3/4 | 50 3/4 | 9 3/8 | 14 7/8 | 17 | – | – | – | 11 1/2 |
| 1200 | 84 | 2821 | 57 | 55 | 11 1/2 | 17 | 17 | – | – | – | 11 1/2 |
| 1300 | 91 | 3032 | 61 1/4 | 59 1/4 | 9 3/8 | 17 | 21 1/4 | – | – | – | 13 5/8 |
| 1400 | 97 | 3243 | 65 1/2 | 63 1/2 | 11 1/2 | 19 1/8 | 21 1/4 | – | – | – | 13 5/8 |
| 1500 | 104 | 3454 | 69 3/4 | 67 3/4 | 13 5/8 | 21 1/4 | 21 1/4 | – | – | – | 13 5/8 |
| 1600 | 110 | 3665 | 74 | 72 | 11 1/2 | 17 | 17 | 17 | – | – | 11 1/2 |
| 1700 | 117 | 3876 | 78 1/4 | 76 1/4 | 9 3/8 | 14 7/8 | 19 1/8 | 21 1/4 | – | – | 13 5/8 |
| 1800 | 123 | 4087 | 82 1/2 | 80 1/2 | 11 1/2 | 17 | 19 1/8 | 21 1/4 | – | – | 13 5/8 |
| 1900 | 130 | 4298 | 86 3/4 | 84 3/4 | 11 1/2 | 19 1/8 | 21 1/4 | 21 1/4 | – | – | 13 5/8 |
| 2000 | 136 | 4509 | 91 | 89 | 13 5/8 | 21 1/4 | 21 1/4 | 21 1/4 | – | – | 13 5/8 |
| 2100 | 143 | 4720 | 95 1/4 | 93 1/4 | 9 3/8 | 12 3/4 | 17 | 21 1/4 | 21 1/4 | – | 13 5/8 |
| 2200 | 149 | 4931 | 99 1/2 | 97 1/2 | 11 1/2 | 17 | 17 | 19 1/8 | 21 1/4 | – | 13 5/8 |
| 2300 | 156 | 5142 | 103 3/4 | 101 3/4 | 11 1/2 | 17 | 19 1/8 | 21 1/4 | 21 1/4 | – | 13 5/8 |
| 2400 | 162 | 5353 | 108 | 106 | 11 1/2 | 19 1/8 | 21 1/4 | 21 1/4 | 21 1/4 | – | 13 5/8 |
| 2500 | 169 | 5564 | 112 1/4 | 110 1/4 | 13 5/8 | 21 1/4 | 21 1/4 | 21 1/4 | 21 1/4 | – | 13 5/8 |
| 2600 | 175 | 5775 | 116 1/2 | 114 1/2 | 9 3/8 | 12 3/4 | 17 | 21 1/4 | 21 1/4 | 21 1/4 | 13 5/8 |
| 2700 | 182 | 5986 | 120 3/4 | 118 3/4 | 9 3/8 | 14 7/8 | 19 1/8 | 21 1/4 | 21 1/4 | 21 1/4 | 13 5/8 |
| 2800 | 188 | 6197 | 125 | 123 | 11 1/2 | 17 | 19 1/8 | 21 1/4 | 21 1/4 | 21 1/4 | 13 5/8 |
| 2900 | 195 | 6408 | 129 1/4 | 127 1/4 | 11 1/2 | 19 1/8 | 21 1/4 | 21 1/4 | 21 1/4 | 21 1/4 | 13 5/8 |
| 3000 | 201 | 6619 | 133 1/2 | 131 1/2 | 13 5/8 | 21 1/4 | 21 1/4 | 21 1/4 | 21 1/4 | 21 1/4 | 13 5/8 |

**WARNING**

Enough air ensures proper combustion and assures that no hazard will develop due to the lack of oxygen

**WARNING**

Air openings to combustion area must not be obstructed. Follow chart #3 to insure that adequate combustion air can be maintained.

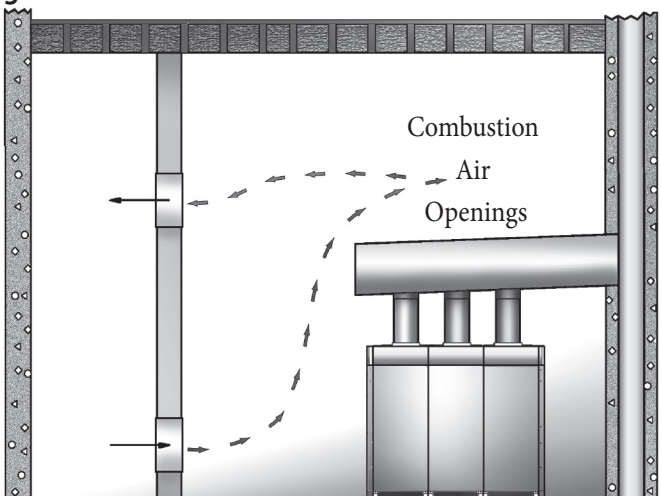
Chart 3

| COMBUSTION AIR REQUIREMENTS (MINIMUM SQUARE INCHES OPENING) | | | | | |
|---|---|---|---|---|---|
| | | *UNCONFINED AREA | | **CONFINED AREA OUTSIDE COMBUSTION AIR | |
| MODEL NUMBER | NUMBER OF MODULES | OUTSIDE COMBUSTION AIR 1 SQ. IN /4000 Btu/hr (SEE FIG. 5) | INSIDE COMBUSTION AIR 1 SQ. IN. /1000 Btu/hr (SEE FIG. 4) | VERT. DUCTS 1 SQ. IN. /4000 Btu/hr | HORZ. DUCTS 1 SQ. IN. /2000 Btu/hr |
| 300 | 1 | 75 | 300 | 75 | 150 |
| 400 | 1 | 100 | 400 | 100 | 200 |
| 500 | 1 | 125 | 500 | 125 | 250 |
| 600 | 2 | 150 | 600 | 150 | 300 |
| 700 | 2 | 175 | 700 | 175 | 350 |
| 800 | 2 | 200 | 800 | 200 | 400 |
| 900 | 2 | 225 | 900 | 225 | 450 |
| 1000 | 2 | 250 | 1000 | 250 | 500 |
| 1100 | 3 | 275 | 1100 | 275 | 550 |
| 1200 | 3 | 300 | 1200 | 300 | 600 |
| 1300 | 3 | 325 | 1300 | 325 | 650 |
| 1400 | 3 | 350 | 1400 | 350 | 700 |
| 1500 | 3 | 375 | 1500 | 375 | 750 |
| 1600 | 4 | 400 | 1600 | 400 | 800 |
| 1700 | 4 | 425 | 1700 | 425 | 850 |
| 1800 | 4 | 450 | 1800 | 450 | 900 |
| 1900 | 4 | 475 | 1900 | 475 | 950 |
| 2000 | 4 | 500 | 2000 | 500 | 1000 |
| 2100 | 5 | 525 | 2100 | 525 | 1050 |
| 2200 | 5 | 550 | 2200 | 550 | 1100 |
| 2300 | 5 | 575 | 2300 | 575 | 1150 |
| 2400 | 5 | 600 | 2400 | 600 | 1200 |
| 2500 | 5 | 625 | 2500 | 625 | 1250 |
| 2600 | 6 | 650 | 2600 | 650 | 1300 |
| 2700 | 6 | 675 | 2700 | 675 | 1350 |
| 2800 | 6 | 700 | 2800 | 700 | 1400 |
| 2900 | 6 | 725 | 2900 | 725 | 1450 |
| 3000 | 6 | 750 | 3000 | 750 | 1500 |

** Unconfined area: A space whose volume is not less than 50 cubic feet per 1000 Btu per hour of all appliances installed in that space (cubic feet of space = height x width x length).*

*** Confined area: A space whose volume is less than 50 cubic feet per 1000 Btu per hour of all appliances installed in that space (cubic feet of space = height x width x length).*

**Figure 4**



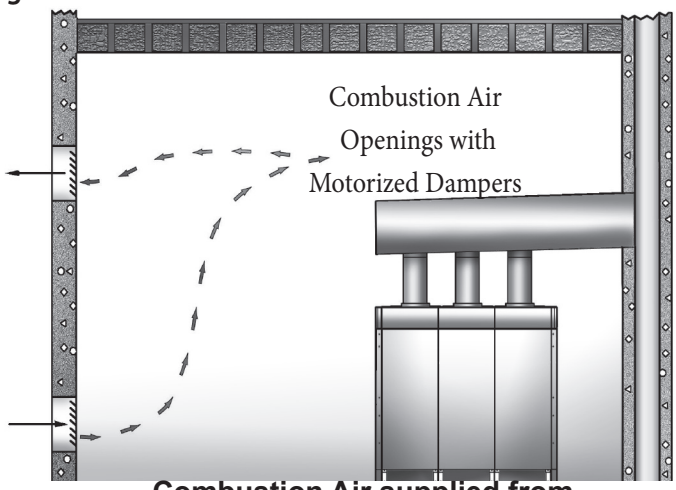

**Combustion Air supplied from inside the building**

**NOTICE**

IMPORTANT: Slope Vent Pipe at least 1/4" for every 1' to the vent terminal.

1. Ventilation of the boiler room must be adequate to provide sufficient air to properly support combustion per the National Fuel Gas Code, ANSI Z223.1-latest edition.
2. When a boiler is located in an unconfined space in a building or conventional construction frame, masonry or metal building, infiltration normally is adequate to provide air for combustion and ventilation. However, if the equipment is located in a building of tight construction (See the national Fuel Gas Code, Ansi Z223.1-latest edition), the boiler area should be considered as a confined space. If there is any doubt, install air supply provisions in accordance with the latest revision of the National Fuel Gas Code.
3. When a boiler is installed in an unconfined space, in a building of tight construction, air for combustion and ventilation must be obtained from outdoors or from spaces freely communicating with the outdoors. A permanent opening or openings having a total free area of not less than 1 square inch per 5,000 Btu per hour of total input rating of all appliances shall be provided. Ducts may be used to convey makeup air from the outdoors and shall have the same cross-sectional area of the openings to which they are connected.
4. When air for combustion and ventilation is from inside buildings, the confined space shall be provided with two permanent openings, one starting 12 inches from the top and one 12 inches from the bottom of the enclosed space. Each opening shall have a minimum free area of 1 square inch per one thousand (1000) Btu per hour of the total input rating of all appliances in the enclosed space, but must not be less than one hundred (100) square inches. These openings must freely communicate directly with other spaces of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. **(See Figure 4)**

**Figure 5**




**Combustion Air supplied from outside the building**

5. When the boiler is installed in a confined space and all air is provided from the outdoors the confined space shall be provided with one or two permanent openings according to methods A or B (listed below). When ducts are used, they shall be of the same cross sectional area as the free area of the area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be not less than 3 x 3 inches or 9 square inches.
   A. When installing two openings, one must commence within 12 inches from the top and the other within 12 inches from the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors. One of the following methods must be used to provide adequate air for ventilation and combustion.
      - When directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 Btu per hour of total input rating of all equipment in the enclosure. (**See Figure 5)**
      - When communicating with the outdoors by means of vertical ducts, each opening shall have a minimum free area 1 square inch per 4,000 Btu per hour of total input rating of all appliances in the enclosed space.
      - If horizontal ducts are used, each opening and duct shall have a minimum free area 1 square inch per 2,000 Btu per hour of total input rating of all appliances in the enclosed space.
   B. One permanent opening, commencing within 12 inches of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 inch from the sides, 1 inch from the back, and 6 inches from the front of the

boiler. 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. The openings must have a minimum free area of 1 square inch per 3000 Btu per hour of the total input rating of all equipment located in the enclosure. The free area must be no less than the sum of the areas of all vent connectors in the confined space.

6. In calculating free area using louvers, grilles or screens for the above, consideration shall be given to their blocking effect. Screens used shall not be smaller than 1/4 inch mesh. If the free area through a design of louver or grill is known, it should be used in calculating the size opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 20-25% free area and metal louvers and grilles will have 60-75% free area. Louvers and grilles should be fixed in the open position or interlocked with the boiler so they are opened automatically during the boiler operation.

## Combustion Air

Provision for combustion and ventilation air must be in accordance with Section 5.3, "Air for Combustion and Ventilation", of the National Fuel Gas Code, ANSI Z223.1 latest revision, and applicable provisions of the local building codes. Consult the code books or boiler manufacturer for specific requirements.

**WARNING**

⚠ Enough air ensures proper combustion and assures that no hazard will develop due to the lack of oxygen.

## Chimney and Vent Pipe Connection

This is a very important part of the heating system. It must be clean, the right size, properly constructed and in GOOD CONDITION. No boiler can function properly with a bad chimney. See **Page 19** for specific venting instructions.

The flue pipe should be the same size as draft hood outlet from boiler to flue collector. See **Page 4** for Typical Chimney Size. Maintain a minimum upward slope of 1/4 inch per linear foot from boiler to the chimney. Fasten joints together with sheet metal screws to prevent sagging.

## Minimum Vent Pipe Clearance

If the vent pipe must go through a crawl space, double wall vent pipe should be used. Where vent passes through a combustible wall or partition, use a ventilated metal thimble. The thimble should be 4 inches larger in diameter than vent pipe. If boiler is installed with single wall galvanized type vent pipe, it must have 6 inches clearance between its surface and any combustible material. If UL listed type B (insulated) vent pipe is used, clearance between it and combustible material to be as listed by pipe manufacturer.

Chart 4

**FOR INSTALLATION ON NON-COMBUSTIBLE FLOORS ONLY, MINIMUM CLEARANCES TO COMBUSTIBLE CONSTRUCTION**

| | Inputs of 400 MBH or less | Inputs over 400 MBH |
|---|---|---|
| Top | 52" | 52" |
| Front | Alcove | Alcove |
| Flue Collector | 6 " | 6" |
| Rear | 18" | 24" |
| Sides | 18" | 24" |

*Greater clearances for access should supersede fire protection clearances.*

## Locating the Boiler

Locate the boiler on a level, non-combustible foundation as near to chimney or flue as possible. Allow 24 inches at front and sides of boiler for servicing and cleaning. When installed in a utility room, the door should be wide enough to allow the largest boiler parts to enter, or permit replacement of any other appliance in the same room.

The installing contractor must provide a ventilated foundation for the boiler when installing:

- Over a room
- Over electrical wiring or cables of any kind
- If the concrete floor is "green," or water is channeled under the concrete floor

The boiler shall be installed such that the automatic gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service.

## Installation

This boiler is designed to provide a wide heating capacity range with multiple burner modules, each equipped with its own set of controls. For purposes of orientation, the gas manifold side of the boiler is considered the front. These instructions are written for the assembling of the boiler starting with the left side and working to the right side.

Boilers with Inputs above 500,000 BTU Per Hour (500 MBPH) are made up of a combination of 300,000, 400,0000 and 500,000 BTU Per Hour Input Module Bases. Each base is equipped with its own gas valve and gas ignition system.

When connecting the cold water supply to the boiler, make sure that a clean water supply is available. When the water supply is from a well, a sand strainer should be installed at the water pump.

## Assembly of Bases

The 300, 400 and 500 boilers are the basic models. The 300 model has (6) burners, the 400 model has (8) burners and the 500 model has (10) burners. Combinations of the basic models are used to assemble the 600 through 3000 models. Refer to **Chart 2** for the proper order of assembly. When two or more bases are used to assemble the boiler, be sure the tops of the bases are even.

IMPORTANT: After Bases are assembled check to be sure they are level.

The bases are fastened together with 5/16 cap bolts and nuts. Insert two bolts in the front posts and two in the rear posts as shown in **Figure 6A** . After bases are fastened together, install the base end panels. These end panels must be installed before assembling sections **Figure 6B**.

**Figure 6A**

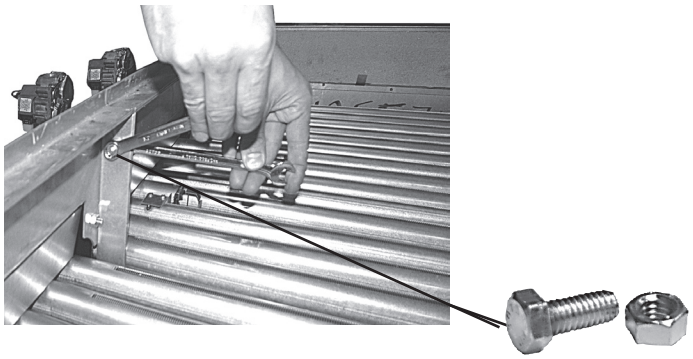
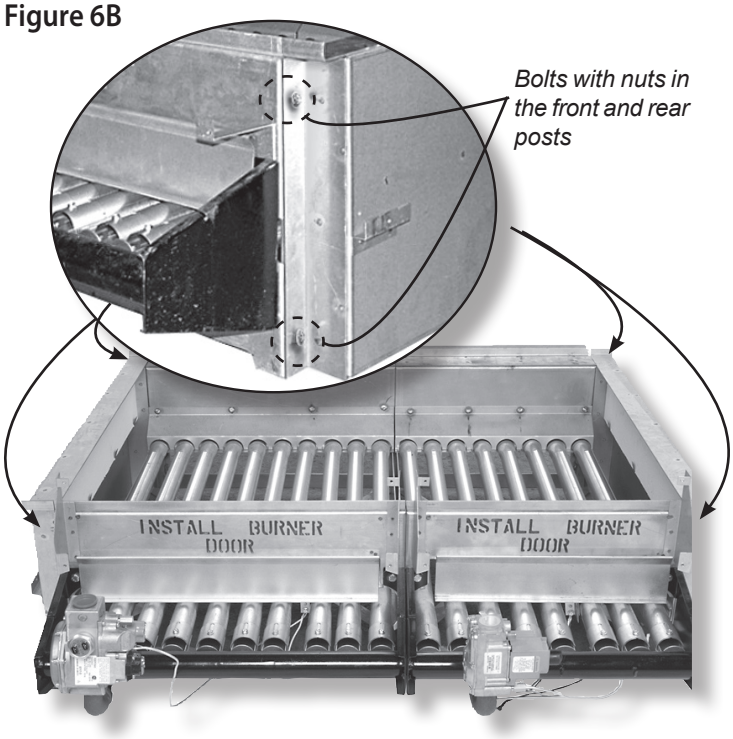


**Figure 6B**




## Starting Section Assembly

The sections may be started from either the left or the right end of the base.

Place the end section on the base with the center-line of the section directly over the joint of the base end closure. With boilers having two or more bases, as you progress be sure the parting line (center-line of section) of the intermediate sections fall on the junction of the two adjacent bases.

## Pulling Sections Together with Tie Rods

Before beginning, clean nipples and nipple ports. Coat nipples and nipple ports with pipe joint compound or other good sealant and keep them clean. **(Figure 7)**

Place nipples in ports and seat them squarely to prevent cocking. Always insert the tie rods into the holes nearest to the nipple ports.

The upper and lower tie rod holes should be used in an alternative fashion. Make sure the tie rods are in proper location before tightening. Washers have to be used between the nuts and cast sections. (**Figure 8**) Oil or lubricate the thread of the tie rod if necessary. When pulling the adjacent sections together, make sure the tie rods are tightened evenly so that the sections are parallel. **(Figure 9)**

**Figure 7**

**Figure 8**

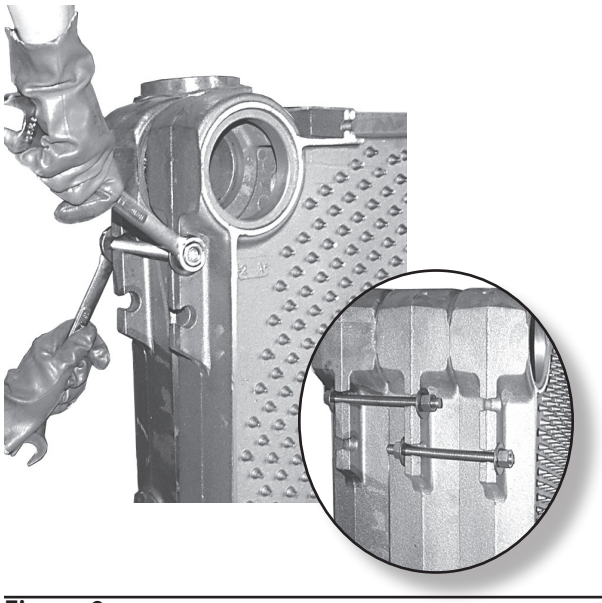
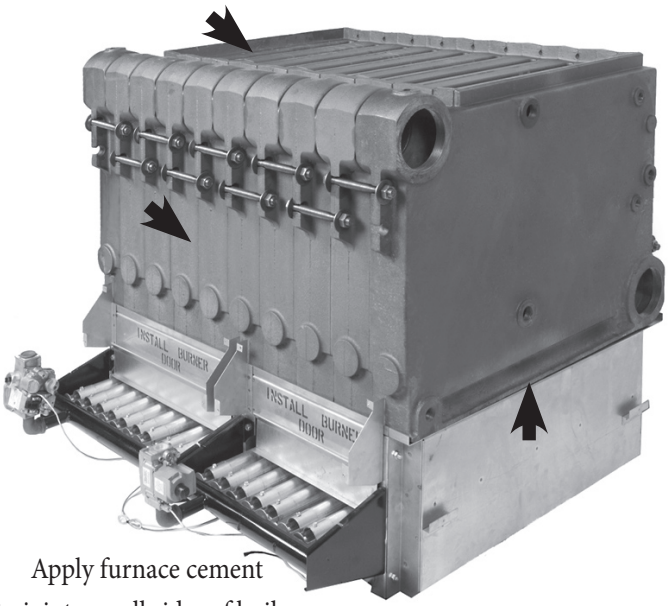


**Figure 9**




Apply furnace cement to joints on all sides of boiler

Be sure both ends of complete section assembly are resting evenly on both ends of base.

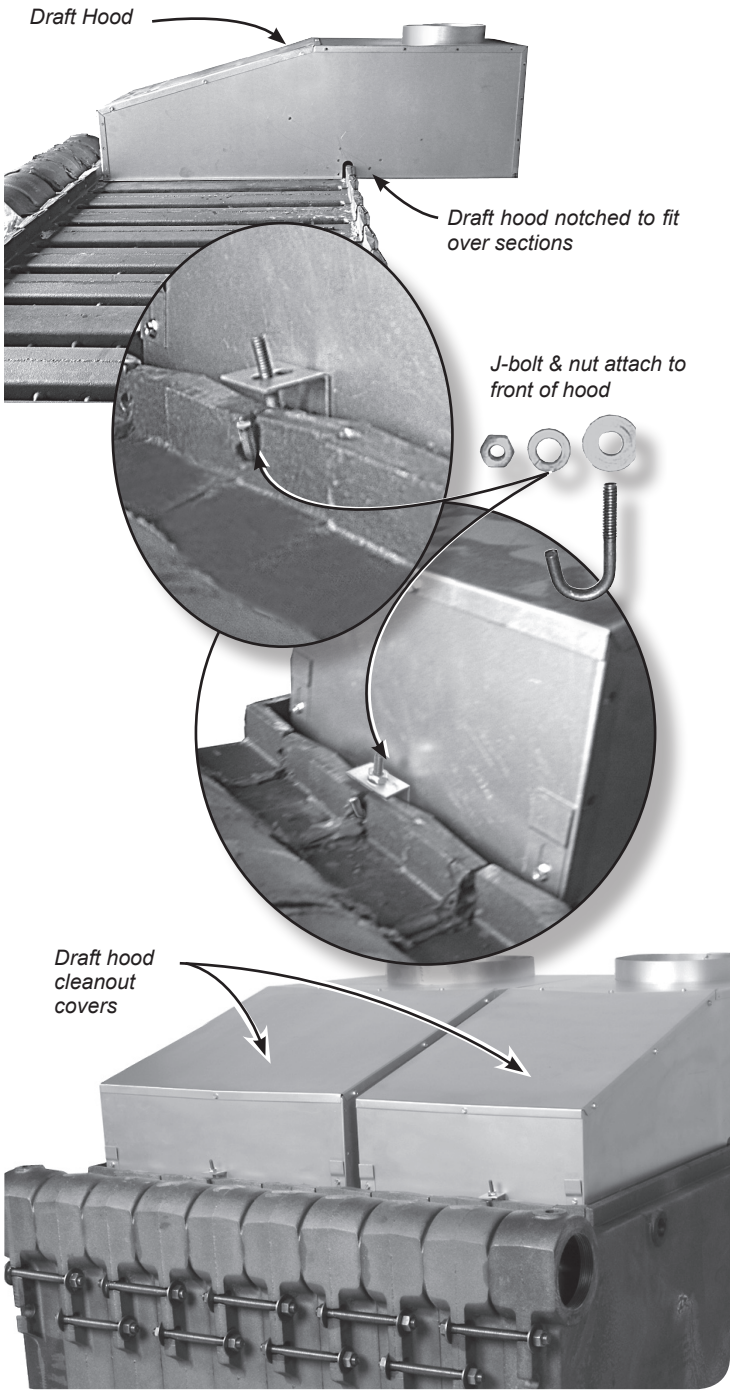
Apply furnace cement at the joints of the sections front, top and back. Putty should also be applied where the sections join the base. **(See Figure 9)**

Place the necessary plugs and control wells in the correct locations. Plug all other tappings, leaving an air vent in the top of one of the end sections, and connect water. Fill the boiler with water until it runs out the air vent. Then hydrostatically test the boiler in accordance with applicable codes. Check for leaks before continuing with the assembly Drain and remove unnecessary plugs.

## Attaching the Draft Hoods

Attach the draft hoods to the boiler sections after applying boiler putty to the top of the boiler sections where the hoods and the sections meet. Use j-bolts to attach the fronts of the draft hoods to the slots in the section flanges. **Figure 10**

**Figure 10**




**WARNING**

DO NOT ALTER OR MODIFY DRAFT HOOD FURNISHED WITH BOILER.

## Connecting Gas Service

Connect gas service from meter to the boiler control assembly(s) in accordance with ANSI Z223.1-latest revision and local codes or utility company. On multiple base boilers, connect gas service with branch lines from common main. Individual branch lines must be the same size as the inlet to the gas valve. A ground joint union should be installed in each branch line for easy servicing of gas controls. A drip leg or trap should be installed at the bottom of a vertical section of piping at the inlet to each branch line, **Figure 11**. A pipe compound resistant to the action of liquefied petroleum gases must be used on all threaded pipe connections.

The main gas supply line should be adequate to prevent undue pressure drop. See **Chart 6** for pipe sizes for gas mains.

To check for leaks in gas piping, use a soapy-water solution or other approved method, **DO NOT USE AN OPEN FLAME.**

The boiler must be disconnected from the gas supply piping system during any pressure testing of that system. Test the gas connection to the boiler before placing the boiler in operation. See **Chart 5** for appropriate minimum and maximum gas supply pressures.

**Figure 11**

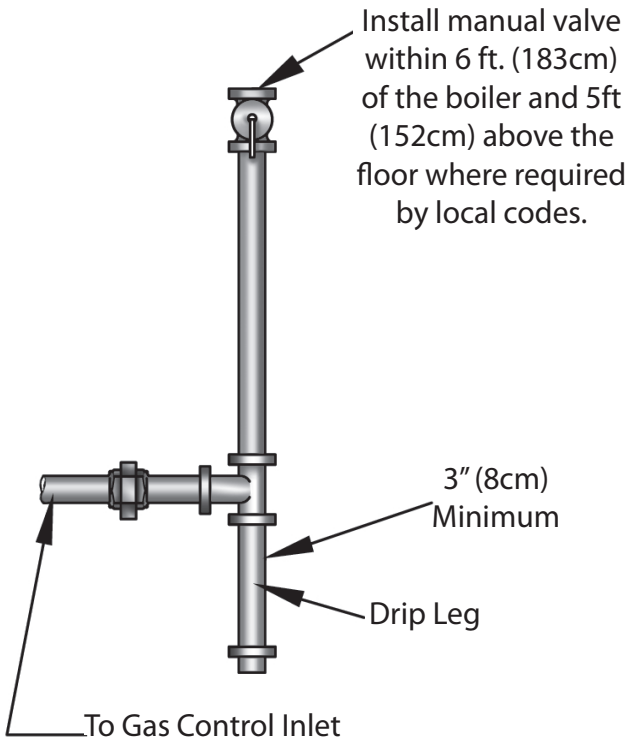


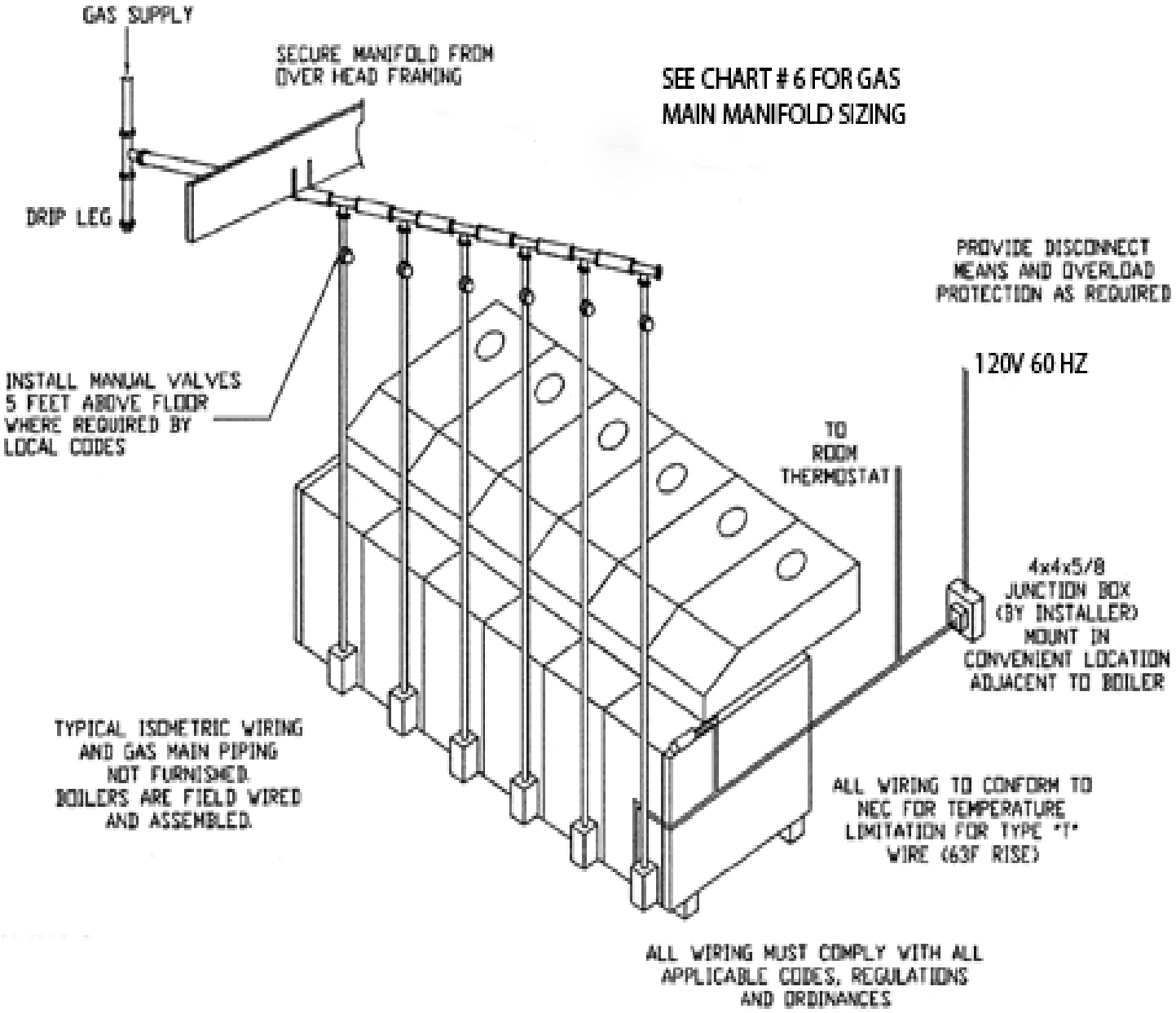

Chart 5

| Minimum Gas Supply Pressure | | | | | | |
|---|---|---|---|---|---|---|
| Models | *5.0 inches w.c.* | | | | | |
| | 300 | 500 | 600 | 1000 | 1300 | 1500 |
| | 2000 | 2100 | 2500 | 2600 | 3000 | |
| Models | *5.3 inches w.c.* | | | | | |
| | 400 | 700 | 800 | 900 | 1100 | 1200 |
| | 1400 | 1600 | 1700 | 1800 | 1900 | 2200 |
| | 2300 | 2400 | 2700 | 2800 | 2900 | |
| All Models | Maximum Gas Supply Pressure | | | | | |
| | *14.0 inches w.c.* | | | | | |
| All Models | Manifold Pressure | | | | | |
| | *3.5 inches w.c.* | | | | | |

Chart 6

| PIPE SIZES IN INCHES FOR GAS MAINS OF VARIOUS LENGTH (NATURAL GAS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Boiler No | 20' | 30' | 40' | 50' | 60' | 80' | 100' | 125' | 150' |
| 300 | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ |
| 400 | 1¼ | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 1½ | 2 |
| 500 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 |
| 600 | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 |
| 700 | 1¼ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ |
| 800 | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ |
| 900 | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ |
| 1000 | 1½ | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ |
| 1100 | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ |
| 1200 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 |
| 1300 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 |
| 1400 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 3 | 3 | 3 |
| 1500 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 | 3 |
| 1600 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 | 3 |
| 1700 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 |
| 1800 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 |
| 1900 | 2 | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 |
| 2000 | 2 | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 |
| 2100 | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 | 4 |
| 2200 | 2½ | 2½ | 2½ | 3 | 3 | 3 | 3 | 4 | 4 |
| 2300 | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 2400 | 2½ | 2½ | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 2500 | 2½ | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| 2600 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 |
| 2700 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |
| 2800 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2900 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 3000 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

**Figure 12**


GAS SUPPLY
SECURE MANIFOLD FROM OVER HEAD FRAMING
SEE CHART # 6 FOR GAS MAIN MANIFOLD SIZING
DRIP LEG
PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED
120V 60 HZ
INSTALL MANUAL VALVES 5 FEET ABOVE FLOOR WHERE REQUIRED BY LOCAL CODES
TO ROOM THERMOSTAT
4x4x5/8 JUNCTION BOX (BY INSTALLER) MOUNT IN CONVENIENT LOCATION ADJACENT TO BOILER
TYPICAL ISOMETRIC WIRING AND GAS MAIN PIPING NOT FURNISHED. BOILERS ARE FIELD WIRED AND ASSEMBLED.
ALL WIRING TO CONFORM TO NEC FOR TEMPERATURE LIMITATION FOR TYPE "T" WIRE (63F RISE)
ALL WIRING MUST COMPLY WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES

**NOTICE**

Note: Jacket Assembly must be started at the left side of the boiler.

1. Attach the lower jacket end panel (left) to the two Z-bars on the base end closures through the two slotted holes on the bottom of the jacket end panel. Use (2) #10 x ½" screws. **(Figure 13)**
2. Attach the middle jacket end panel (left) to the lower jacket end panel with the middle laying over the lower and lining up holes. Use (5) #10 x ½" screws. **(Figure 14)**

**Figure 13**

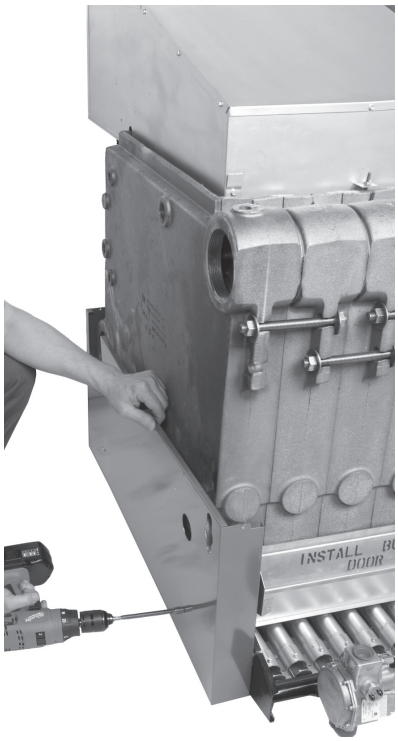
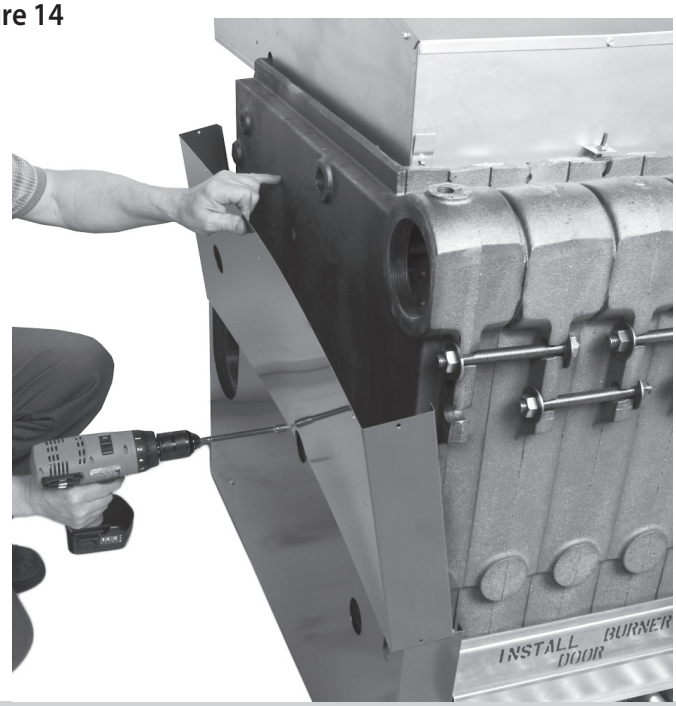



**Figure 14**




3. Attach the upper jacket end panel (left) to the middle jacket end panel with the upper behind the middle and lining up the holes. Use (6) #10 x ½" screws. Attach upper jacket end panel to rear side of the draft hood. Use (1) #8 x ¾" screw. **(Figure 15)**
4. Position top/front intermediate panel so the back edge of the top hangs on adjustable clips on front of draft hood(s); the left edge hangs on bracket on left upper jacket end panel; and the right edge with integral bracket hangs on the tie rod(s). **(Figure 16)**

**Figure 15**

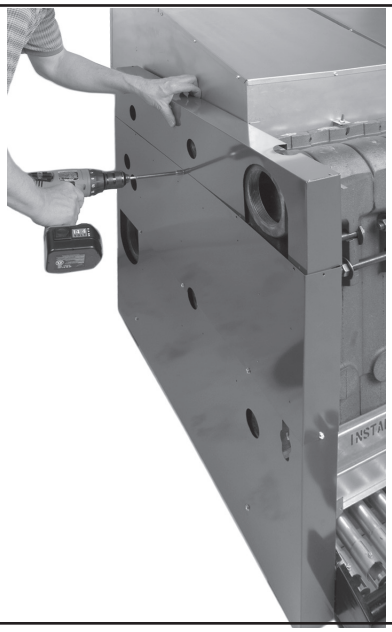
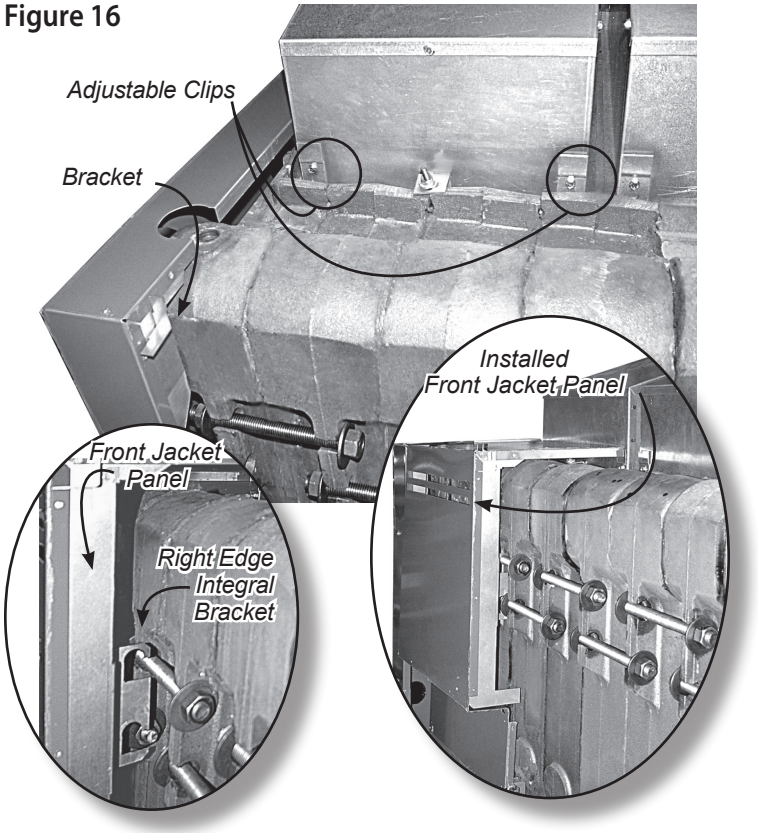


**Figure 16**



5. Attach front panel to the boiler after installing the burner door. **(Figure 17)**
6. On multiple base boilers, all front panels are attached in the same way (working your way from left to right). **(Figure 18)**

Figure 17

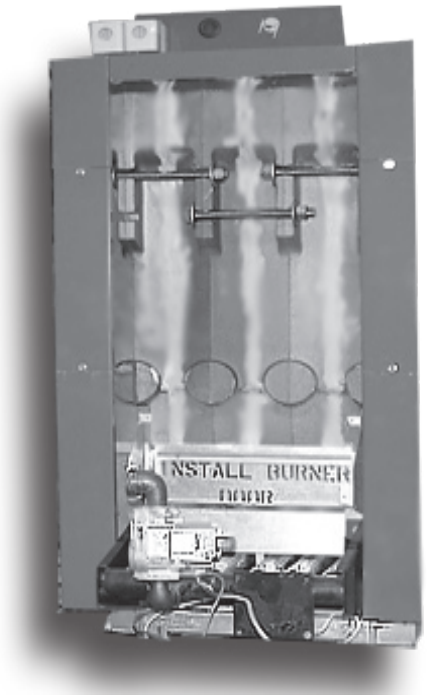



Figure 18

7. Attach the upper jacket end panel (right) so the left edge hangs on bracket on top/front intermediate panel. Attach upper jacket end panel to rear side of draft hood. Use (1) #8 x ¾" screw. **(Figure 19)**
8. Attach the middle jacket end panel (right) to the upper jacket end panel with the middle laying over the upper and lining up holes. Use (6) #10 x ½" screws. **(Figure 20)**

Figure 19

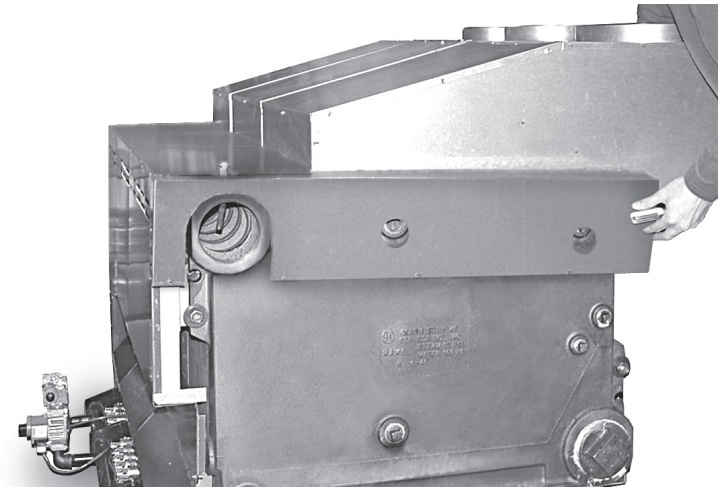


Figure 20

**9.** Attach the lower jacket end panel (right) to the middle jacket end panel with the lower behind the middle and lining up holes. Use (5) #10 x ½" screws. Attach the lower jacket end panel to the two Z-bars on the base end closures through the two slotted holes on the bottom of the jacket end panel. Use (2) #10 x ½" screws. **(Figure 21)**

**10.** Position top of rear jacket panel(s) to draft hood baffle flange and secure with (2) #10 x ½" screws. Secure bottom of rear jacket panel(s) to bracket(s) on boiler base using (2) #10 x ½" screws. **(Figure 22)**

**11.** Attach burner door knobs with #8-32 x ¼" screws and #8-32 hex nuts. Slide bottom of lower access door(s) in slots on top of manifold brackets. **(Figure 23)**

**12.** Position the control access jacket panel so the tabs slide into slots on the panel at the bottom (located next to the burners). **(Figure 24)**

**13.** Lighting Instruction Plates are provided with each boiler base. Each boiler base also includes a data plate indicating the required gas type, firing rate, and gas pressure for that base. These plates are located on the Jacket Top/Front Panels. Boilers also have a rating plate showing the total Input and Output Ratings. This rating plate is shipped in the AC Carton and is to be mounted on the side Jacket End Panel by the installing contractor.

**14.** Attach Local Code Label if applicable.

**NOTICE**

NOTE: The attachment of the control access jacket panels can wait until the controls have been mounted to the top/front intermediate jacket panels.

**Figure 21**

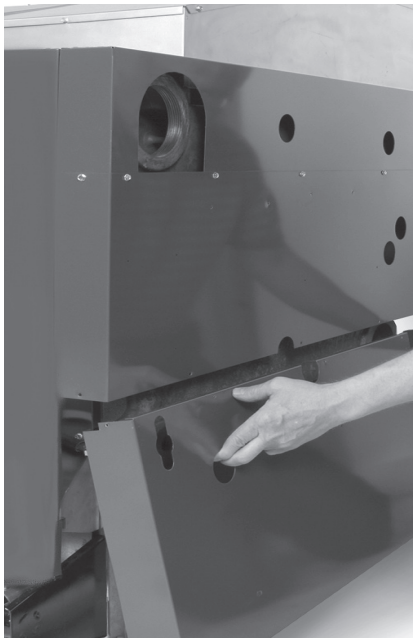


**Figure 22**

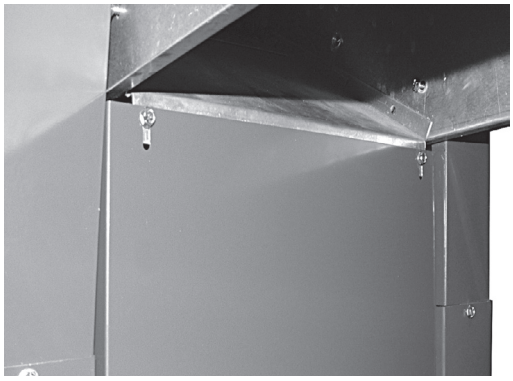


**Figure 23**

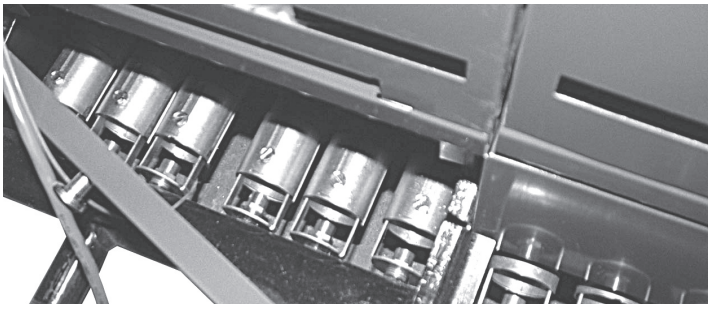


**Figure 24**

## TAPPINGS

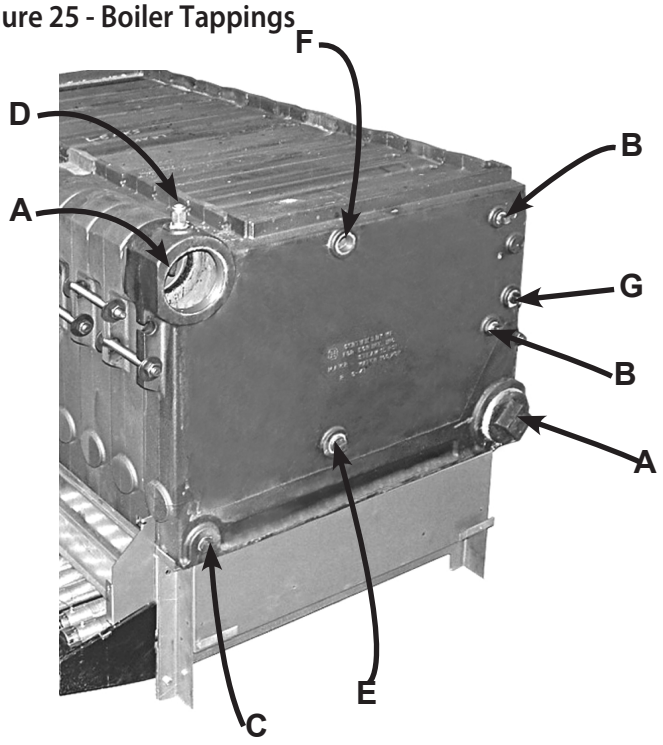
**Figure 25** shows the end section and the various tappings provided. Tappings are the same in both right and left end sections, except for the drain valve tapping which is ¾" left end, and 1 ¼" right end. The openings on the end sections and their functions are listed in **Chart 7**.

Chart 7

| OPENING | SIZE | WATER |
|---|---|---|
| A | 4" | Supply and Return |
| B | ½" | Plugged |
| C | 1 ½" | Drain, Left End |
| C | ¾" | Drain, Right End |
| D | ½" | Limit Control |
| E | 1" | Accessories |
| *F | 1" | Pressure Relief Valve |
| G | ¾" | Plugged |

***If opening F is to be used for something other than the Pop Safety Valve or Pressure Relief Valve, or the Safety/ Relief valve is larger than 1", the Safety/Relief Valve must be installed in the Header Piping as near the boiler as possible.**

**Figure 25 - Boiler Tappings**




## BOILER TRIM

### BOILER TRIM

The following controls are supplied as standard equipment. Details of their function and operation will be found in the section on Controls and Adjustments.

### WATER TRIM

1. Water temperature high limit control
2. Combination temperature - pressure gauge
3. Pressure relief valve (100 psi)

### WATER TRIM ASSEMBLY

Locate water trim controls per chart and as shown above. **(See Figure 25)**

**NOTICE**

NOTE: No shutoff of any description shall be placed between the pressure relief valve and the boiler, or on discharge pipes between such safety valves and the atmosphere. Installation of the pressure relief valve shall conform to the requirements of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV.

## Boilers Used With Refrigeration System

When the boiler is installed in connection with a refrigeration system, the chilled medium must be piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating system. An example of such piping is shown in **Figure 26,** Valve A and B open for heating, closed for cooling. Valves C and D are closed for heating, open for cooling.

When hot water boilers are connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation on the boiler piping, the boiler piping system shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

## Water Boiler Piping (Figure 27)

Supply and return connections to the hot water boiler should be located so that the water will thoroughly circulate throughout the entire boiler. Each installation has a preferred piping arrangement according to the requirements of the particular system and choice of arrangements and sizes of headers should be decided upon by the installer's heating engineer or with standard engineering practice. When using only one supply and one return connection, return must be connected at opposite end of boiler from flow connection, on all boilers 600,000 Btu/hr input and larger.

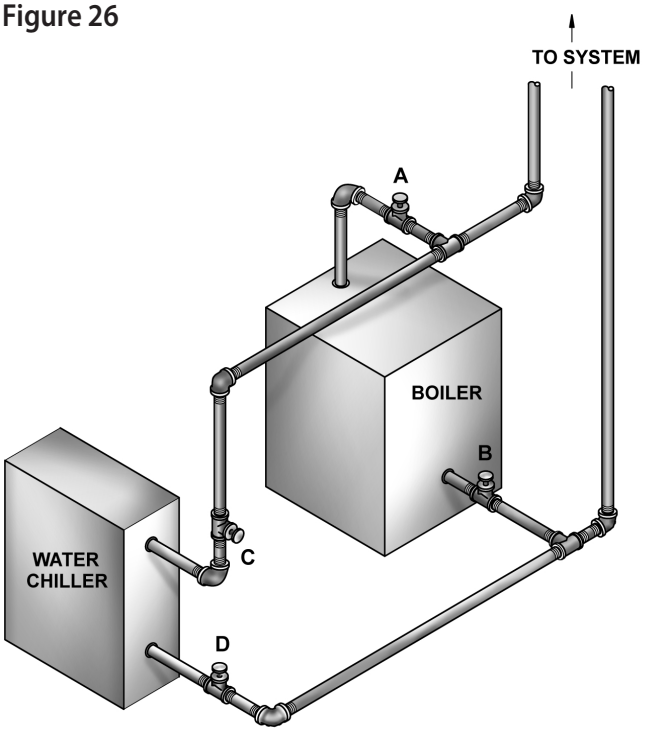
## High Limit

The immersion well for the high limit control must be mounted at flow outlet of boiler. This may be either right or left hand. The temperature and pressure gages should be mounted at the outlet as well, and may be the opposite and of the high limit control.

## Pipe Sizing

Piping connections and sizes are important to control proper water velocity at the inlet and outlet connections to the water boiler. It is

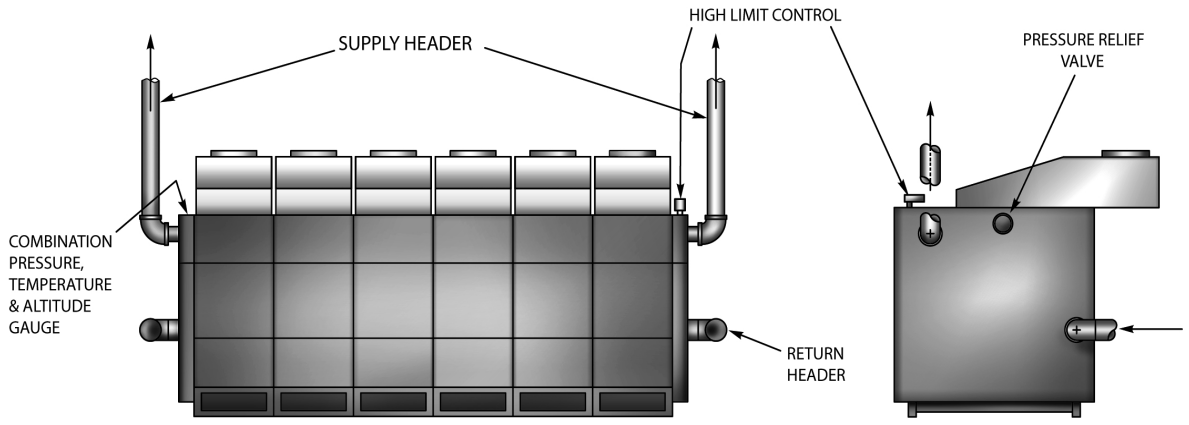
**Figure 26**




recommended that the pipe sizes, presented in **Chart 8**, be used for flow rates shown and that the boiler being headered to tappings at both ends, where one pipe connection will not be adequate to hold water velocities below 3.33 feet per second. See **Figure 28** for Pipe Connections.

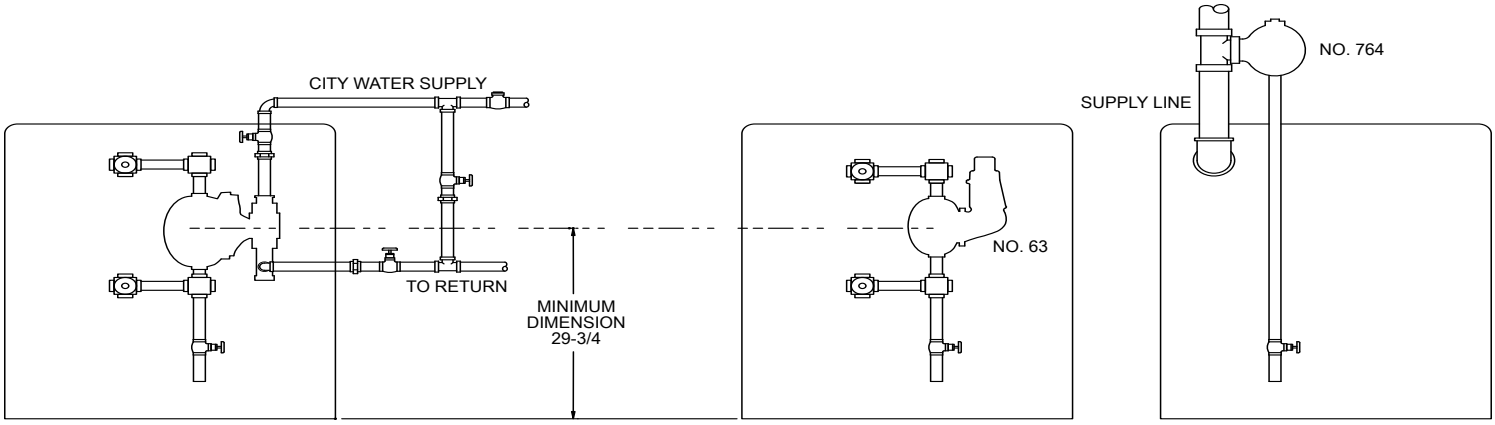
| Chart 8 | |
|---|---|
| FLOW RATE GPM | PIPE SIZE |
| 35-50 | 2-1/2" |
| 51-76 | 3" |
| 77-131 | 4" |
| 132-205 | 5" |
| 206-300 | 6" |

**Figure 27**



## Figure 28 Water Boiler Piping

**BOILER TAPPINGS ARE AVAILABLE FOR ALL CONNECTIONS SHOWN WITH EXCEPTION OF NO. 764 WHICH MOUNTS IN PIPING**




### McDONNELL FEEDER CUT-OFF COMBINATION

| For Boilers With 30-PSI Relief Valve Setting | |
|---|---|
| **BOILER SIZE** | **USE** |
| 300 THRU 1500 | No. 247-2 |
| 1600 THRU 3000 | No. 51-2* |

| For Boilers With Up To 75-Psi Relief Valve Setting | |
|---|---|
| BOILER SIZE | **USE** |
| ALL SIZES | No. 53-2 |

### McDONNELL LOW-WATER CUT-OFF

| For All Boilers Up To 50-PSI Relief Valve Setting | |
|---|---|
| **BOILER SIZE** | **USE** |
| ALL SIZES | No. 63* |
| ALL SIZES | NO. 764* |

| For All Boilers with 75-to 100 PSI Relief Valve Setting | |
|---|---|
| **BOILER SIZE** | **USE** |
| ALL SIZES | No. 150 |

***These items available through your Distributor.**

**** Water supply pressure must exceed relief valve setting by at least 20 psi.**

**WARNING**

This boiler is to be vented by natural draft and shall not be connected into any portion of a mechanical draft system operating under positive pressure.

## Flue Connection and Venting

Consult local codes and gas company requirements. Adhere to the following standard practice recommendations for installing the flue pipe:

1. Consult dimensional drawing for number and size of flue pipes required for each size boiler.
2. Maintain minimum upward slope of 1/4 inch per linear foot from the boiler to chimney.
3. Run flue pipe directly as possible. Keep turns to a minimum. Insert flue pipe into, but not beyond, inside wall of chimney. Do not connect into a chimney serving an open fireplace.
4. Insulate flue pipe where it passes near combustible material.
5. Rigidly support pipe with hangers and straps.
6. Extend chimneys at least 2 feet above any object within radius of 15 feet, including roof.
7. Install a hood on all flue pipes which extend through roof. In most locations, the venting of a boiler relies on natural draft. Inasmuch as the energy available from natural draft is quite low, serious thought should be given to vent system design, i.e., adequate size, use of gradual transitions, tees, elbows, etc., close proximity of boiler and chimney. On all boilers, the vertical risers must be at least as large as the vent openings on the drafthood. The boiler manufacturer makes no specific recommendations regarding the application of draft inducers that may be used with this boiler. If a draft inducer is used, it is up to the installing contractor and the draft inducer manufacturer to determine the proper application.

A simple vent system consists of a 6-foot minimum vertical rise immediately off the draft hood, as shown in **Figure 29**. Terminate this vertical flue above the building roof with a suitable rain cap at least 2 feet above surrounding obstructions, i.e., parapets, adjacent buildings, penthouses, etc. This type of vent system applies to single-drafthood boilers ONLY, and has limited practical use, because it is restricted to single-story boiler rooms and because of the problems encountered in roof flashing.

The vertical venting system shown in **Figure 29** cannot be used on multiple-base boilers because of the physical interference of multiple rain caps.

For multiple-base boilers, the pant leg venting system shown in **Figure 30.**

**Figure 29**

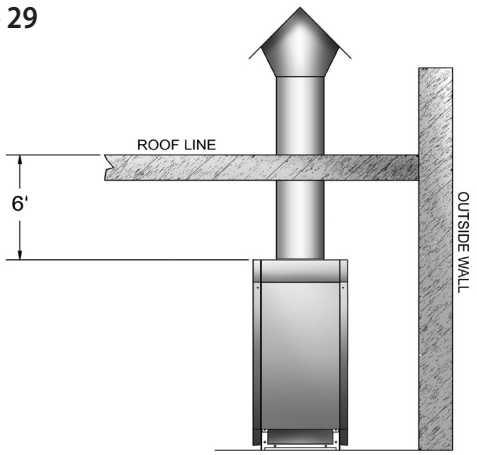



**Figure 30**

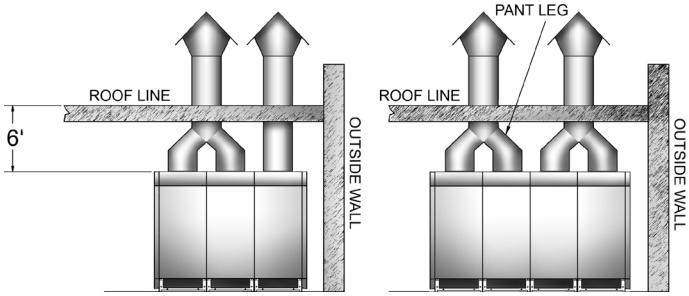
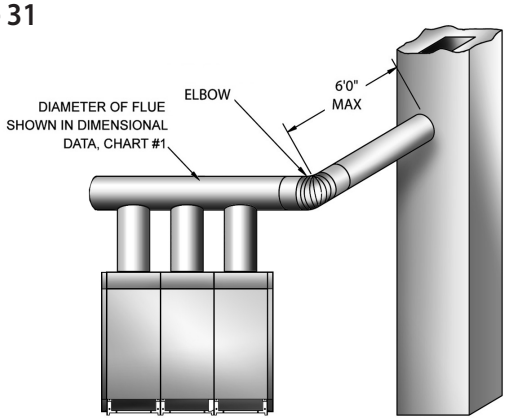



**Figure 31**




The vent system shown in **Figure 31** is commonly used. With the vent diameters sized to match the flue outlets, a minimum vertical rise of 4 feet above the draft hood must be maintained for proper operation. Refer to **Chart 1 (**page 4) for typical chimney sizes. Requirements for this type of system are: an adequately sized chimney, adequate combustion air, and the outlet end of the horizontal run must be no more than 6 feet from the chimney with no more than one 90° elbow in this run as shown.

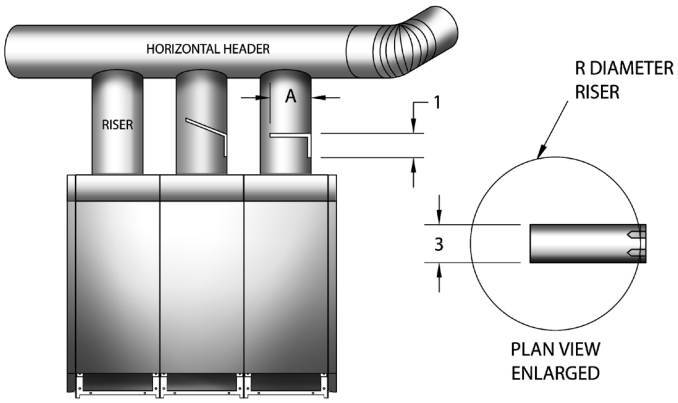
For installations where the required minimum 4-foot vertical rise

cannot be maintained, the diameter of the horizontal run must be increased one inch for each foot of riser reduction. This procedure will reduce the resistance of the system, and if the chimney is adequate the boiler will vent properly.

In certain cases where these short rises of less than 4 feet have been used, spillage of combustion products has occurred at the draft hoods farthest from the chimney. Assuming the chimney is adequately sized, one acceptable method to correct this spillage problem is to permanently baffle the riser(s) closest to the chimney to reduce the excess of room air entering those draft hoods. DO NOT BAFFLE ENOUGH TO CAUSE SPILLAGE. The use of fixed baffles in the short risers above the boiler draft hood are acceptable as spelled out in American National Standard NFPA 54/ANSI Z223.1 National Fuel Gas Code, latest revision.

Fabricate these fixed baffles, using 20-gauge steel. **Figure 32.** Permanently attach the baffle to the inside of the riser(s). Trial and error will dictate the degree to which each should be positioned to avoid drafthood spillage at the far end of the boiler. Be careful to avoid bending the fixed baffle so it will obstruct the flue gas flow in the horizontal collector.

**Figure 32**




| Baffle Size (Inches) | | | |
|---|---|---|---|
| R | 8 | 10 | 12 |
| A | 6 | 8 | 10 |

Shown is suggested size of fixed baffle for different size risers.

**IMPORTANT:** Extend chimneys at least 2 feet above any object within radius of 15 feet, including roof. The dimensions of chimneys and their MBH values can be found in **Chart 9**.

## REMOVING EXISTING BOILER FROM COMMON VENTING SYSTEM

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 appliances remaining connected to it.

1. 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.
2. Seal any unused openings in the common venting system.
3. 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.
4. 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.
5. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
6. Test for spillage at the draft hood 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.
7. 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.
8. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1-latest issue. When re-sizing any portion of the common venting system, the common venting system should be re-sized to approach the minimum size as determined using the appropriate tables in Part 11 in the National Fuel Gas Code, ANSI Z223.1 -latest issue.

## Chart 9 - The Approximate MBH Values of Chimneys

| Chimney Diameter (In) | Chimney Height (Ft) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 7 | 10 | 12 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 | 125 | 150 | 200 |
| 6 | 100 | 120 | 140 | 160 | 170 | 200 | 220 | 250 | 270 | 280 | 300 | 320 | 350 | 380 | 400 | 430 | 450 | 510 | 550 | 640 |
| 7 | 130 | 160 | 190 | 210 | 240 | 270 | 310 | 340 | 360 | 390 | 410 | 430 | 480 | 510 | 550 | 580 | 620 | 690 | 760 | 870 |
| 8 | 180 | 210 | 250 | 280 | 310 | 360 | 400 | 440 | 480 | 510 | 540 | 570 | 620 | 670 | 720 | 760 | 810 | 900 | 990 | 1140 |
| 9 | 220 | 270 | 320 | 350 | 390 | 450 | 510 | 560 | 600 | 640 | 680 | 720 | 790 | 850 | 910 | 970 | 1020 | 1140 | 1250 | 1450 |
| 10 | 280 | 330 | 400 | 430 | 490 | 560 | 630 | 690 | 750 | 800 | 850 | 890 | 980 | 1060 | 1130 | 1200 | 1260 | 1410 | 1550 | 1790 |
| 12 | 400 | 480 | 570 | 630 | 700 | 810 | 910 | 1000 | 1080 | 1150 | 1220 | 1290 | 1410 | 1520 | 1630 | 1730 | 1820 | 2040 | 2330 | 2580 |
| 14 | 550 | 650 | 780 | 860 | 960 | 1110 | 1240 | 1360 | 1470 | 1570 | 1660 | 1750 | 1920 | 2070 | 2220 | 2350 | 2480 | 2770 | 3040 | 3510 |
| 16 | 720 | 850 | 1020 | 1120 | 1250 | 1450 | 1620 | 1770 | 1920 | 2050 | 2170 | 2290 | 2510 | 2710 | 2900 | 3070 | 3240 | 3620 | 3970 | 4590 |
| 18 | 910 | 1080 | 1290 | 1420 | 1590 | 1830 | 2050 | 2250 | 2430 | 2593 | 2750 | 2900 | 3180 | 3430 | 3670 | 3890 | 4100 | 4590 | 5030 | 5810 |
| 20 | 1130 | 1340 | 1600 | 1750 | 1960 | 2260 | 2530 | 2770 | 3000 | 3200 | 3400 | 3580 | 3920 | 4240 | 4530 | 4810 | 5070 | 5670 | 6210 | 7170 |
| 22 | 1370 | 1620 | 1940 | 2120 | 2370 | 2740 | 3060 | 3360 | 3630 | 3880 | 4110 | 4340 | 4750 | 5130 | 5480 | 5820 | 6130 | 6860 | 7510 | 8680 |
| 24 | 1630 | 1930 | 2300 | 2530 | 2820 | 3260 | 3650 | 4000 | 4320 | 4610 | 4900 | 5160 | 5650 | 6110 | 6530 | 6920 | 7300 | 8160 | 8940 | 10330 |
| 26 | 1910 | 2260 | 2710 | 2960 | 3320 | 3830 | 4280 | 4690 | 5070 | 5420 | 5750 | 6060 | 6640 | 7170 | 7660 | 8130 | 8570 | 9580 | 10490 | 12120 |
| 28 | 2220 | 2630 | 3140 | 3440 | 3850 | 4440 | 4970 | 5440 | 5880 | 6280 | 6660 | 7030 | 7700 | 8310 | 8890 | 9430 | 9940 | 11110 | 12170 | 14060 |
| 30 | 2550 | 3010 | 3600 | 3950 | 4420 | 5100 | 5700 | 6250 | 6750 | 7210 | 7650 | 8070 | 8840 | 9540 | 10200 | 10820 | 11410 | 12760 | 13970 | 16140 |
| 32 | 2900 | 3430 | 4100 | 4490 | 5020 | 5800 | 6490 | 7110 | 7680 | 8210 | 8710 | 9180 | 10050 | 10860 | 11610 | 12310 | 12980 | 14510 | 15900 | 18360 |
| 34 | 3270 | 3870 | 4630 | 5070 | 5670 | 6550 | 7320 | 8020 | 8670 | 9270 | 9830 | 10360 | 11350 | 12260 | 13110 | 13900 | 14650 | 16390 | 17950 | 20730 |
| 36 | 3670 | 4340 | 5190 | 5670 | 6360 | 7350 | 8210 | 9000 | 9720 | 10390 | 11020 | 11620 | 12730 | 12750 | 14700 | 15590 | 16430 | 18370 | 20120 | 23240 |
| 48 | 6530 | 7730 | 9230 | 10120 | 11310 | 13060 | 14600 | 16000 | 17280 | 18470 | 19600 | 20600 | 22630 | 24400 | 26130 | 27710 | 29210 | 32660 | 35780 | 41320 |
| 54 | 8260 | 9780 | 11690 | 12810 | 14320 | 16530 | 18480 | 20250 | 21870 | 23380 | 24800 | 26140 | 28540 | 30930 | 33070 | 35080 | 6970 | 41340 | 45290 | 52290 |
| 60 | 10200 | 12070 | 14430 | 15810 | 17680 | 20410 | 22820 | 25000 | 27000 | 28870 | 30620 | 32280 | 35360 | 38190 | 40830 | 43310 | 45650 | 51040 | 55910 | 64560 |
| 72 | 14700 | 17390 | 20780 | 22770 | 25460 | 29400 | 32870 | 36000 | 38890 | 41570 | 44100 | 46480 | 50920 | 55000 | 58800 | 62360 | 65740 | 73600 | 80510 | 92970 |

*The data provided in this table is for double layer insulated chimneys at sea level. When using this data, correction factors for altitude and suction force should be used.*

## Electrical Wiring

Wiring connections are to be made in accordance with the National Electrical Code, ANSI/NFPA 70-2002 and/or local authority having jurisdiction. When an external electrical source is utilized, the boiler must be electrically grounded in accordance with these requirements. Install a fused disconnect switch between boiler and electrical panel in a convenient location. The wiring from high temperature limit control should be secured to the boiler jacket or gas piping to prevent an accidental disconnect from controls.

All wiring to gas valves must be taped securely to the gas supply lines or run in an appropriate conduit.

**WARNING**

TURN OFF ELECTRIC POWER AT FUSE BOX BEFORE MAKING ANY LINE VOLTAGE CONNECTION. FOLLOW LOCAL ELECTRICAL CODES.

## Thermostat Installation

The thermostat location has an important effect on the operation of the boiler system. Be sure to follow the product instructions of the thermostat. Locate the thermostat about 5 feet above the floor on an inside wall. The thermostat should be sensing average temperature. Places that are not recommended for thermostat are given in **Chart 10**.

Keep thermostat(s) at desired room temperature. If windows are to be opened or heat is not needed, set thermostat(s) pointer to a lower setting.

Chart 10

| PLACES TO AVOID LOCATING THERMOSTAT | |
|---|---|
| Dead Spots | Behind Doors |
| | Corners and Alcoves |
| Hot Spots | Concealed Pipes |
| | Fireplaces |
| | TV Sets |
| | Lamps |
| | Direct Sunlight |
| | Kitchens |
| Cold Spots | Concealed Pipes or Ducts |
| | Stairwells |
| | Drafts |
| | Unheated Rooms on other side of wall |

## Adjust Thermostat Heat Anticipator

Suggested heat anticipator settings are shown in the wiring diagrams **Figures 33, 34 & 35**. Then follow instructions packaged with thermostat for the final adjustment, checking thermostat operation. When set above temperature indicated on the thermometer, boiler burners should ignite. Make certain the thermostat(s) turns off the boiler when room temperature reaches the selected setting and starts the boiler operating when room temperature falls a few degrees.

Finally, set the thermostat for the desired temperature. Special conditions in building and the location of the thermostat will govern this setting.

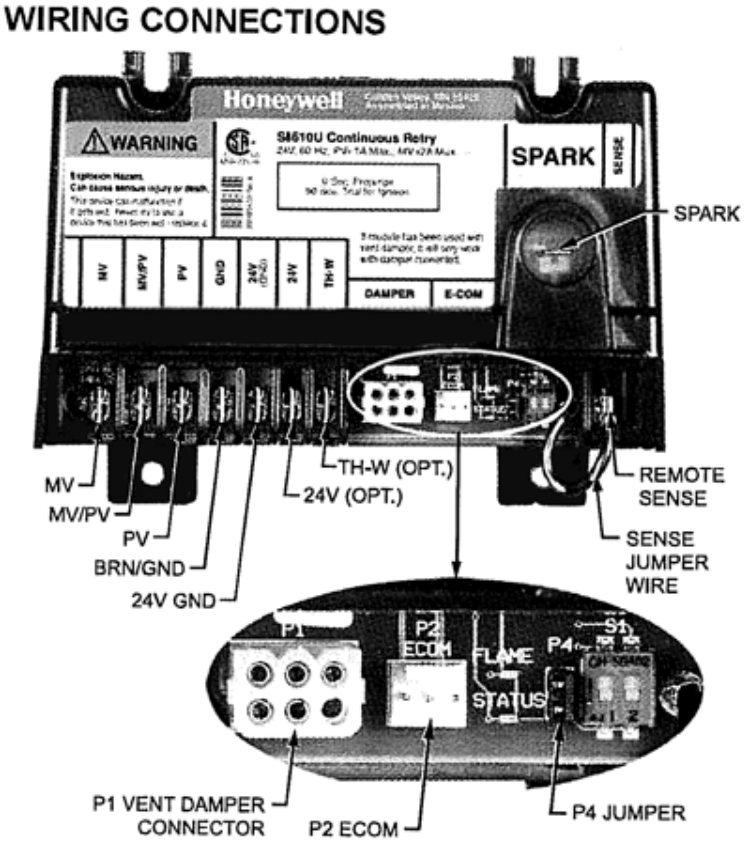
## Stage Firing Multiple Base Boilers

Multiple base hot water boilers are ideal for stage firing. Many controls are available for sequencing or stage firing multiple base hot water boilers. We offer Argo AMB Outdoor Reset Stage Fire Control Packages control that will sequence up to eight bases, with lead boiler rotation, adjustable reset ratio, set point boiler rotation, and microprocessor control. This control will fire bases as required to maintain supply water temperature at a desired set point, which is automatically varied based on outdoor air temperature. Consult the boiler manufacturer for more information.

**CAUTION**

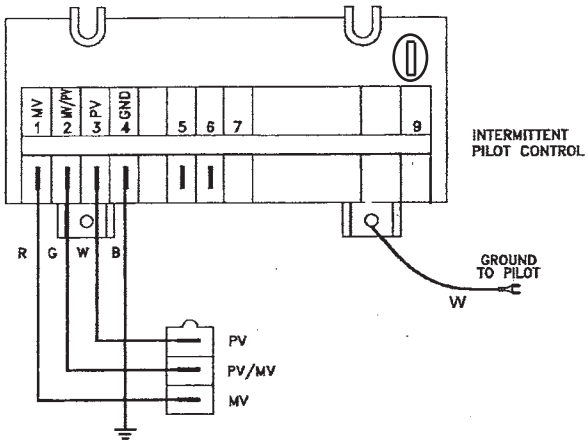
Label all wires prior to disconnection when servicing the controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

**Figure 33 - Schematic Wiring Diagram for S8610U**




SCHEMATIC WIRING DIAGRAM FOR S8610U

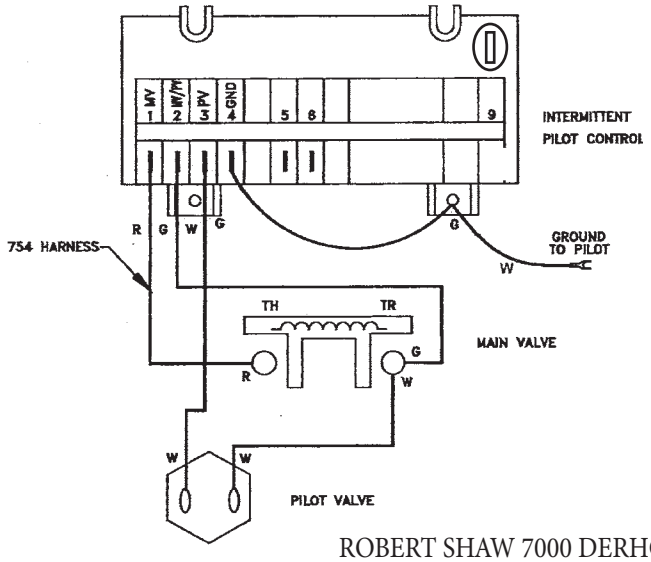
**Figure 34 - Honeywell VR8304M Gas Valve Wiring**




HONEYWELL VR8340M GAS VALVE WIRING

| | |
|---|---|
| R | RED |
| G | GREEN |
| W | WHITE |
| B | BLACK |

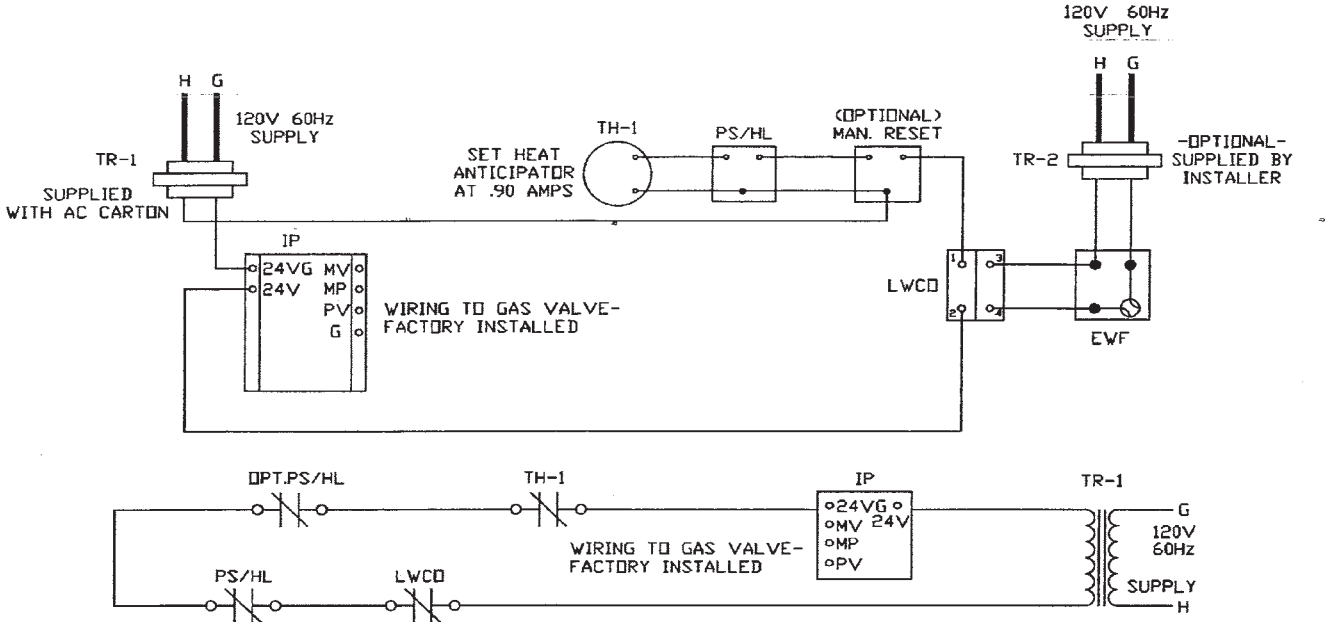
**Figure 35 - Robert Shaw 7000 DERHC Gas Valve Wiring**



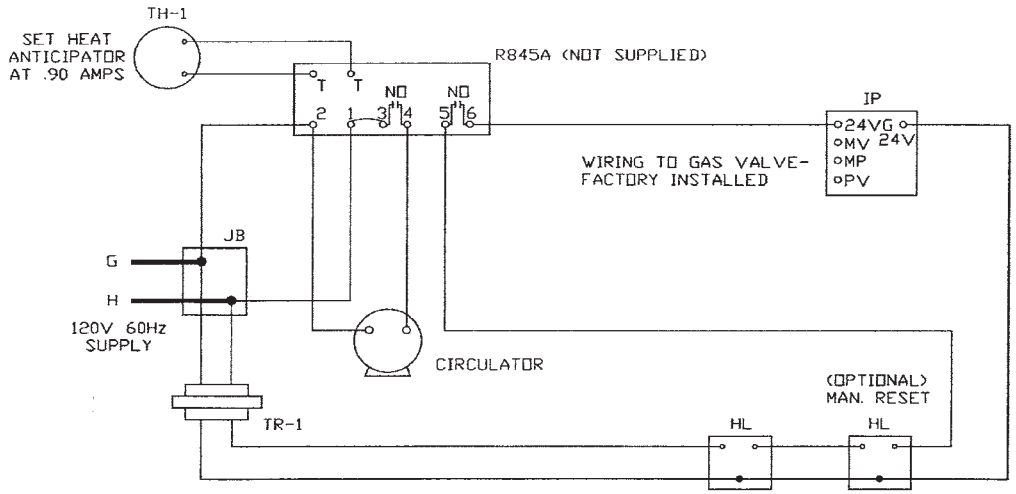

ROBERT SHAW 7000 DERHC GAS VALVE WIRING

| | |
|---|---|
| R | RED |
| G | GREEN |
| W | WHITE |

## Figure 36 - Hot Water Single Base Boilers with Honeywell Intermittent Pilot




## Figure 37 - Hot Water Single Base Boiler with Honeywell Intermittent Pilot - With Thermostat Controlled Circulator Pump



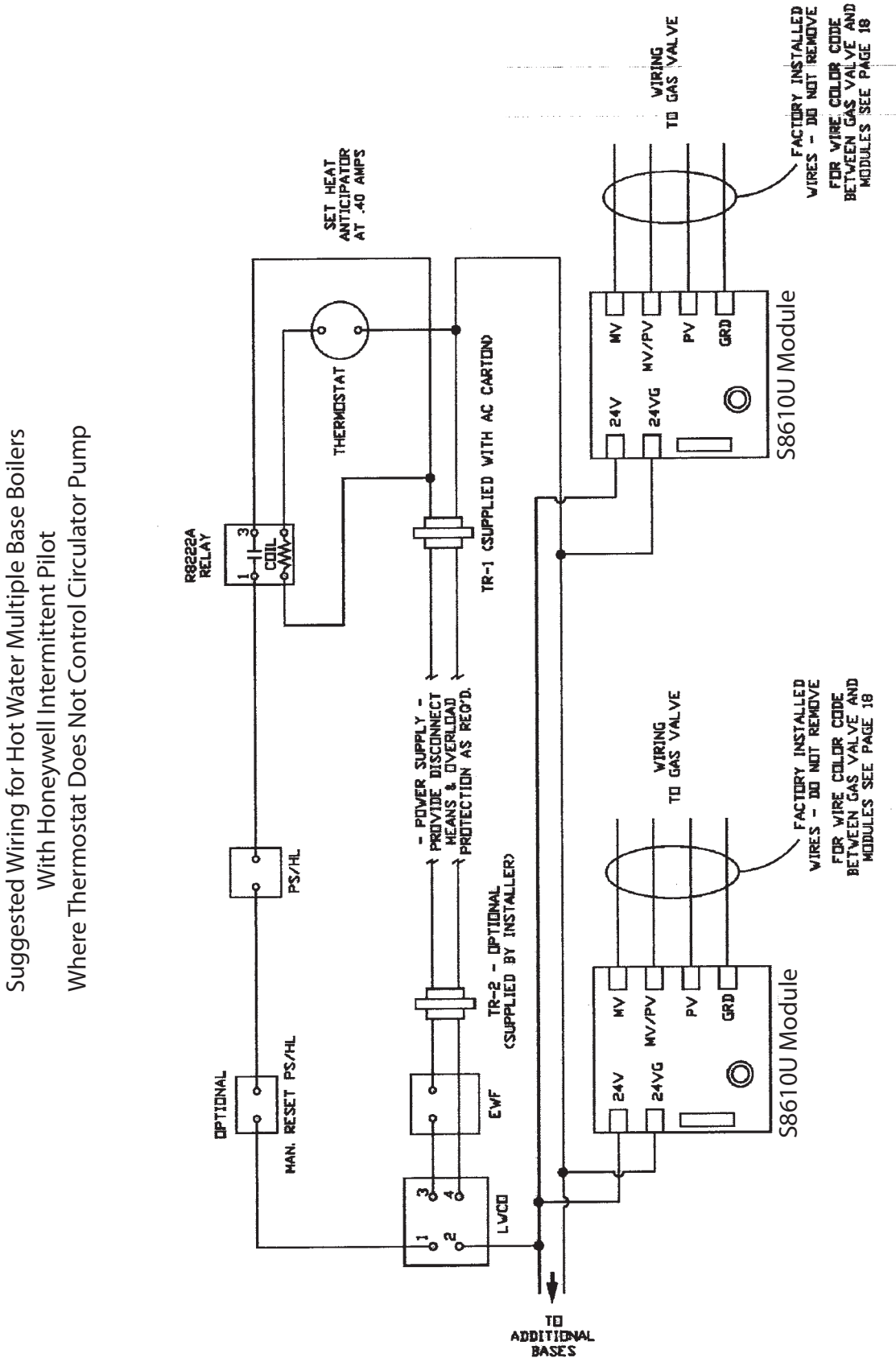

**FOR WIRE COLOR CODE BETWEEN GAS VALVE AND MODULE SEE ABOVE**

### COMPONENT CODING

| | |
|---|---|
| TH-1 | THERMOSTAT (24 VOLT) |
| TR-1 | TRANSFORMER (120V-24V) |
| TR-2 | TRANSFORMER (120V-24V 50VA) |
| PS/HL | PRESSURE SWITCH (STEAM) |
| | HIGH LIMIT (WATER) |

| | |
|---|---|
| —○— | CONTROL TERMINAL |
| —●— | WIRING CONNECTION |
| | OPTIONAL CONTROLS |
| LWCO | LOW WATER CUT-OFF |
| EWF | ELECTRIC WATER FEEDER |
| IP | INTERMITTENT PILOT MODULE |

**Figure 38 - Wiring For Boilers With Two or More Bases and Electronic Ignition**



## Control (S8610U) Functions and Operation

The control module performs the following basic functions:

1. Opens and closes the first (pilot) operator of the gas valve.
2. Provides a spark for igniting pilot burner.
3. Senses the pilot burner flame.
4. Shuts off the spark after pilot flame is lit.
5. Opens and closes the second (main) operator.
6. Opens and Closes the vent damper.

These functions occur in two stages - trial for pilot ignition and main burner operation as described below.

## Trial for Pilot Ignition

On every call for heat (system start), the control performs an internal safe-start check. If a flame simulating condition is present, the system will not start.

During a normal start, the control opens the first (pilot) valve operator of the gas control, which allows gas to flow to the pilot burner. At the same time, the electronic spark generator in the control produces a 15,000 volt spark pulse output (open circuit). This voltage produces a spark at the igniter sensor rod which ignites the pilot burner. If the pilot flame does not light or the presence of the pilot flame is not detected back through the flame-rod, the control will not open the second (Main) valve. The control will continue to try to ignite the pilot burner until either a flame is detected or the thermostat (controller) is set down below a call for heat.

## Main Burner Operation

When the pilot flame is established, a flame rectification circuit is completed to the burner ground. The control flame sensing circuit detects the flame current, shuts off the spark generator and opens the second (Main) valve operator to allow gas to flow to the main burners. The pilot flame ignites the main burner immediately.

**NOTICE**

IMPORTANT: The electronic control module cannot be repaired. If the troubleshooting procedure indicates a malfunction in the control, the control must be replaced. Intermittent Pilot systems should be serviced only by trained, experienced service technicians.

## Preliminary Check

The following visual checks should be made before troubleshooting and after maintenance.

1. Check power switch.
2. Manual shutoff cocks in the gas line to the boiler must be open.
3. Make sure all wiring connections are clean and tight.
4. Review the control's normal sequence of operation.

## System Troubleshooting

Start the system by setting the thermostat or controller above room temperature and observe the system response.

Establish the type of system malfunction or deviation from normal operation by using the Pilot System Troubleshooting Table, **Figure 40** page 28.

Following the questions in the boxes of the table: if the condition is true (answer is yes), go down to next box, if the condition is not true (answer is no), go to the box alongside.

Continue checking and answering conditions in each box until a problem and/or the repair is explained. Use the Component Checks section, see below, as necessary, to perform system checks.

After any maintenance or repair, the troubleshooting sequence should be repeated until the procedure ends with normal system operation.

## Component Checks

1. **Check Spark Ignition Circuit**- The Electronic module and step-up transformer in the control provides spark ignition at 15,000 V (open circuit). This circuit can be checked at the control module as follows:
   A. Turn off manual gas cock to prevent the flow of gas.
   B. Disconnect the ignition cable at the control stud terminal to isolate the circuit from the pilot burner/igniter-sensor, and prepare a short jumper lead using heavily insulated wire, such as ignition wire.
   C. Energize the control and touch one end of the jumper firmly to the control ground terminal (GND). (Do not disconnect the existing ground lead.) Move the free end slowly toward the stud terminal to establish a spark and then pull the lead wire slowly away from the stud. Note the length of the gap at which arcing discontinues.
   D. An arc length of 1/8 inch (3.2 mm) or more indicates satisfactory voltage output. If no arc can be established or the maximum gap is less than 1/8 inch (3.2 mm), replace the control.

**CAUTION**

⚠ DO NOT TOUCH EITHER END OF JUMPER OR STUD TERMINAL. THIS IS A VERY HIGH VOLTAGE CIRCUIT AND ELECTRICAL SHOCK CAN RESULT.

2. **Ignition Cable Check -** Cable must not run in continuous contact with a metal surface or spark voltage will be greatly reduced. Connections to the stud terminal on the control and on the igniter-sensor must be clean and tight. Loose connections may not conduct a flame current even though the ignition spark is satisfactory. Check the electrical continuity of the cable.

3. **Check Grounding -** A common ground is required for the pilot burner/igniter-sensor mounting bracket, and the GND terminal of the control. If the ground is poor or erratic, safety shutdown may occur occasionally even though operation is normal at the time of the checkout. Therefore, if nuisance shutdowns occur, be sure to check the grounding.

## STARTING THE BOILER

**NOTICE**

If any component in the system fails, the system will not operate. If the system does not perform as outlined in Start System, below, refer to the Pilot System Trouble-shooting Table (**Figure 40** page 28).

### Starting the System

1. Turn ON the power to the control(s) and turn OFF the gas supply.
2. Check control(s) operation as follows:
   A. Set the Thermostat or controller above room temperature to call for heat.
   B. Watch for sparks at the pilot burner(s).
3. Turn on gas supply.
4. System should start as follows:
   A. Sparks will be on and pilot gas valve will open at once. Pilot burner(s) should ignite after gas reaches the pilot burner(s).
   B. Spark ignition should be OFF when pilot flame is established.
   C. Main gas valve should open and main burners should ignite after gas reaches the burner ports.

**NOTICE**

Light off may not be satisfactory until the gas input and combustion air have been adjusted.

**WARNING**

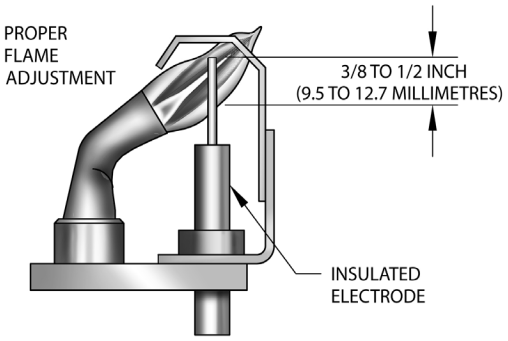
**DO NOT OMIT THIS TEST**

With main burners in operation, paint pipe joints, pilot tubing, connections, screws, and valve(s) gaskets with a rich soapy- water solution. Bubbles indicate gas leakage. To stop leak, tighten joints and screws or replace gaskets. Never use a flame to check for gas leakages.

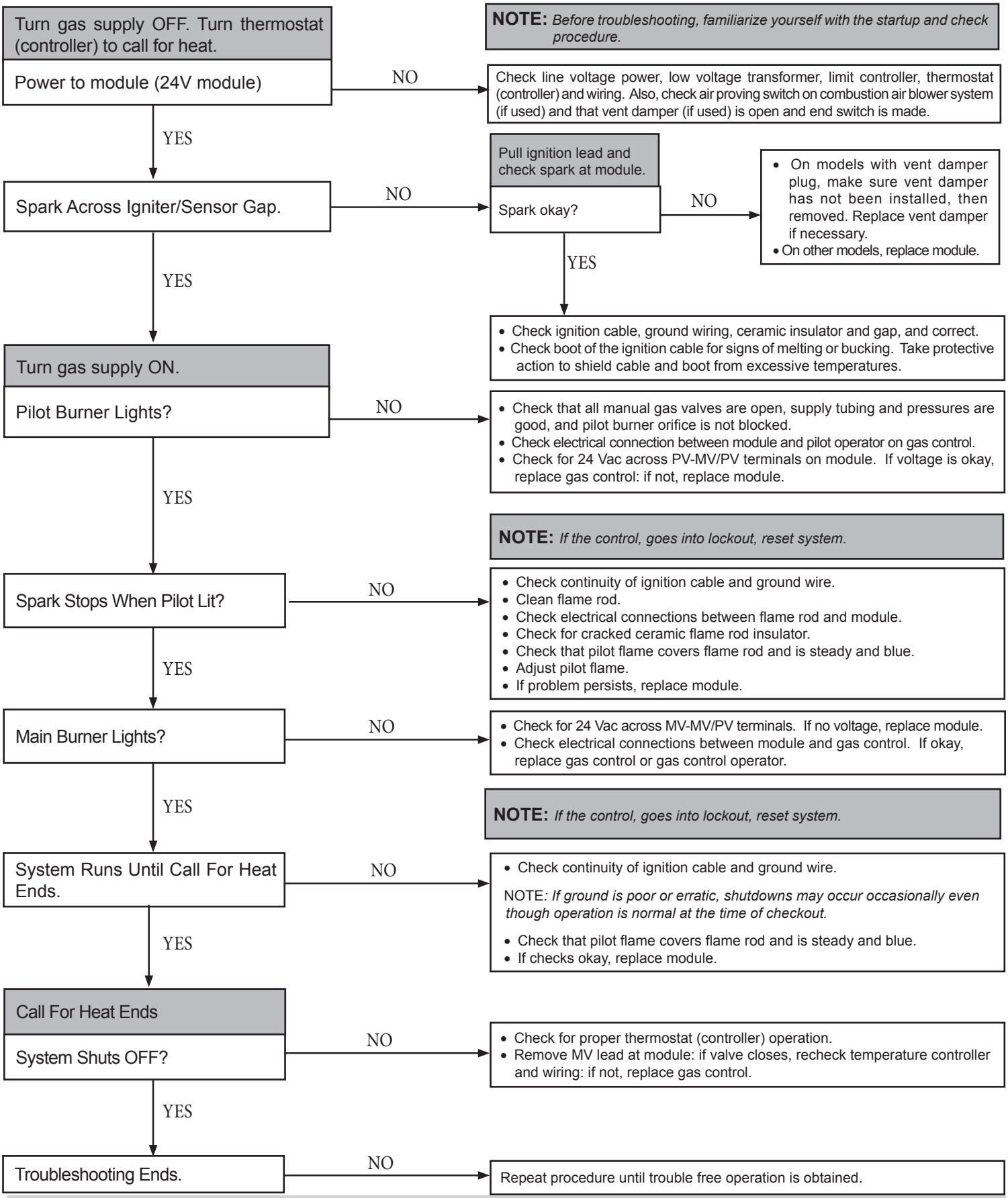
### Pilot Flame Adjustment

The pilot flame should envelop 3/8 to 1/2 inch of the tip of the insulated rod on the igniter-sensor. If an adjustment is required, remove the pilot adjustment cover screw and turn the inner adjustment screw clockwise to decrease or counterclockwise to increase the pilot flame. Be sure to put back cover screw after adjustment to prevent possible gas leakage.

**Figure 39 - Proper Flame Adjustment**



## Figure 40 - Pilot System Troubleshooting Table



## Check Burner Input

Check Boiler for proper BTU input rate.

**CAUTION**

Do not exceed the Input rate stamped on the nameplate of the boiler located on the END Jacket Panel.

**WARNING**

If boiler is shut down for service, the gas and electric must be off for 5 minutes before relighting.

To check boiler for proper BTU input proceed as follows:

With main burners operating, measure the gas Input to the boiler by reading the meter. Be sure all other appliances connected to the same meter are shut OFF. Rate of gas flow (cu. ft. per hour) multiplied by the BTU value of the gas should check with the BTU Input shown on the nameplate of the boiler. If it is within 5%, adjust Pressure Regulator to obtain the desired flow (stem for adjustment is under the cap in the top of the regulator). TURN CLOCKWISE TO INCREASE INPUT AND COUNTER CLOCKWISE TO DECREASE THE INPUT RATE.

**NOTICE**

The adjustment screw is plastic and may require slightly greater turning force than metal threads.

Be sure to replace the regulator cap.

## High Limit Control

While the boiler is operating, setting the high limit control below boiler water temperature should shut off main burners. Return the control to the normal setting, the main burners should start again.

## Pressure Relief Valve

You must have a pressure relief valve on the boiler. The Relief Valve on water boilers is set at 100 psig. Run a pipe from the pressure relief valve outlet to an open drain. This pipe must be of same size as outlet on valve and open end must not be threaded. This drain must be run in an area not subject to freezing. Failure to do so may cause water damage or injury should valve release.

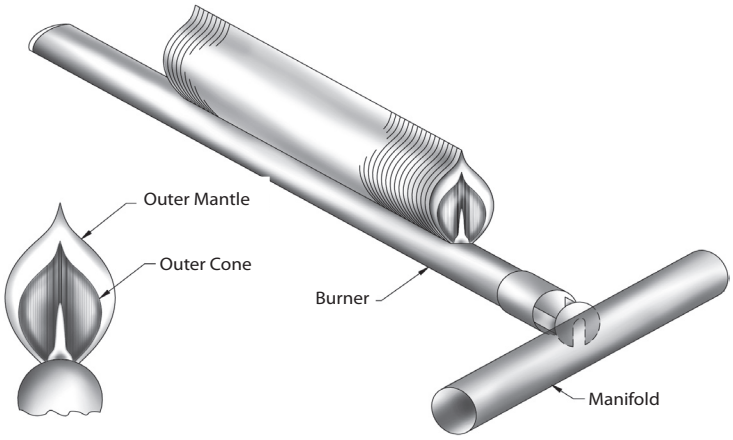
If valve discharge occurs, or if valve fails to open as described above, contact an authorized contractor or qualified service technician to replace the relief valve and inspect the heating system to determine the cause, as this may indicate an equipment malfunction.

This valve should be tested every month during periods of boiler operation, and at the beginning and end of any extended non-service period. Prior to testing, make certain discharge pipe is properly connected to valve outlet and arranged so as to contain and safely dispose of boiler discharge. Test at normal system operating pressure. Hold the trip lever fully open for at least five seconds in order to flush free any sediment that may lodge on the valve seat. Then permit the valve to snap shut.

## Burner and Pilot Flame

We recommend that you make a periodic visual check of the burners and pilot flame **(Figure 41)**. During this visual check look for any deterioration from corrosion or other sources of the burners, pilot burners and boiler base frame. Also be sure the boiler base interior and exterior are clean. This visual check should be made once every month during the heating season by the owner and once a year by a competent service technician to assure safe and trouble-free operation.

**Figure 41 - Pilot Flame**




## Boiler Flue Passages

Under normal operating conditions, with the burners adjusted properly, it should not be necessary to clean the boiler flue gas passages. However, to assure trouble-free operation, we recommend that you have the flue passages, burner adjustments and operation of the boiler controls checked once each year by a competent service technician. If it becomes necessary to clean flue passages, first remove the burners and pilot(s) from the boiler. Next refer to **Figure 10** (page 10) in the Installing Draft Hood Section in the front of this instruction and remove the clean-cut cover panel on the draft hood. This will expose the flue passages. Clean flue passageways between the sections with flexible handle wire brush. Remove all dirt from bottom of boiler and reassemble all parts. Be sure to check tightness of pilot connection(s) and adjustment of pilot(s) and burner flames after reassembly.

## CHECKING AND ADJUSTING

### Venting System

The vent system is a very important part of the heating system. No boiler, however efficient its design, can perform satisfactorily if the chimney that serves it is inadequate. Check your chimney to make sure that it is the right size, properly constructed, clean and in good condition to ensure proper combustion and THAT NO HAZARD WILL DEVELOP You must also provide enough FRESH AIR FOR COMBUSTION. LACK OF ENOUGH OXYGEN WILL CREATE A HAZARD. If your building is of tight construction, it may be necessary to add a FRESH AIR DUCT to provide the OXYGEN required (Refer to Ventilation and Combustion Air).

AT LEAST ONCE A MONTH DURING HEATING SEASON check to see that the sections of vent pipe are secure at all joints and fittings. There should be at least two (2) sheet metal screws per joint.

Check to see that the vent pipe slopes at least 1/4" per foot up from the boiler to the chimney. The vent pipe should be securely fastened to prevent sagging.

The Vent Pipe should also be checked for any deterioration from corrosion or any other sources. Refer to Venting and Combustion Air instructions in the front of this manual.

## CLEANING AND MAINTENANCE

### Boiler Water Treatment

In closed hot water heating systems, negligible amounts of make up water are used, and water treatment is not required.

### Between Heating Seasons

Boilers should not be drained between heating seasons. Boilers in closed hot water heating systems may be left as is.

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Chart 11

| MODEL | SECTIONS | | | COMPONENT CARTON | | | WATER TRIM CARTON | ACCESSORY CARTON | JACKET END PANEL CARTON | BASE END PANEL CARTON |
|---|---|---|---|---|---|---|---|---|---|---|
| | L | INNER | R | QTY 300 | QTY 400 | QTY 500 | | | | |
| 300 | 1 | 2 | 1 | 1 | | | WA-1 | 300 | 1 | 1 |
| 400 | 1 | 3 | 1 | | 1 | | WA-1 | 400 | 1 | 1 |
| 500 | 1 | 4 | 1 | | | 1 | WA-1 | 500 | 1 | 1 |
| 600 | 1 | 5 | 1 | 2 | | | WA-1 | 600 | 1 | 1 |
| 700 | 1 | 6 | 1 | 1 | 1 | | WA-2 | 700 | 1 | 1 |
| 800 | 1 | 7 | 1 | | 2 | | WA-2 | 800 | 1 | 1 |
| 900 | 1 | 8 | 1 | | 1 | 1 | WA-2 | 900 | 1 | 1 |
| 1000 | 1 | 9 | 1 | | | 2 | WA-2 | 1000 | 1 | 1 |
| 1100 | 1 | 10 | 1 | 1 | 2 | | WA-2 | 1100 | 1 | 1 |
| 1200 | 1 | 11 | 1 | | 3 | | WA-3 | 1200 | 1 | 1 |
| 1300 | 1 | 12 | 1 | 1 | | 2 | WA-3 | 1300 | 1 | 1 |
| 1400 | 1 | 13 | 1 | | 1 | 2 | WA-3 | 1400 | 1 | 1 |
| 1500 | 1 | 14 | 1 | | | 3 | WA-3 | 1500 | 1 | 1 |
| 1600 | 1 | 15 | 1 | | 4 | | WA-3 | 1600 | 1 | 1 |
| 1700 | 1 | 16 | 1 | 1 | 1 | 2 | WA-4 | 1700 | 1 | 1 |
| 1800 | 1 | 17 | 1 | | 2 | 2 | WA-4 | 1800 | 1 | 1 |
| 1900 | 1 | 18 | 1 | | 1 | 3 | WA-4 | 1900 | 1 | 1 |
| 2000 | 1 | 19 | 1 | | | 4 | WA-4 | 2000 | 1 | 1 |
| 2100 | 1 | 20 | 1 | 1 | | 3 | WA-4 | 2100 | 1 | 1 |
| 2200 | 1 | 21 | 1 | | 2 | 2 | WA-4 | 2200 | 1 | 1 |
| 2300 | 1 | 22 | 1 | | 2 | 3 | WA-4 | 2300 | 1 | 1 |
| 2400 | 1 | 23 | 1 | | 1 | 4 | WA-4 | 2400 | 1 | 1 |
| 2500 | 1 | 24 | 1 | | | 5 | WA-4 | 2500 | 1 | 1 |
| 2600 | 1 | 25 | 1 | 2 | | 4 | WA-4 | 2600 | 1 | 1 |
| 2700 | 1 | 26 | 1 | 1 | 1 | 4 | WA-5 | 2700 | 1 | 1 |
| 2800 | 1 | 27 | 1 | | 2 | 4 | WA-5 | 2800 | 1 | 1 |
| 2900 | 1 | 28 | 1 | | 1 | 5 | WA-5 | 2900 | 1 | 1 |
| 3000 | 1 | 29 | 1 | | | 6 | WA-5 | 3000 | 1 | 1 |

Chart 12

**WATER TRIM CARTON MATERIAL LIST**

| PARTS DESCRIPTION | PART NO. | UNIT | QUANTITY PER CARTON | | | | |
|---|---|---|---|---|---|---|---|
| | | | WA-1 41200071 | WA-2 41200072 | WA-3 41200073 | WA-4 41200074 | WA-5 41200075 |
| L4006A Aquastat | 240006706 | Ea. | 1 | 1 | 1 | 1 | 1 |
| Well for Aquastat | 14662804 | Ea. | 1 | 1 | 1 | 1 | 1 |
| Water Temperature/Pressure Gauge | 1260006 | Ea. | 1 | 1 | 1 | 1 | 1 |
| 1/2" x 1/4" Bushing | 1060001 | Ea. | 1 | 1 | 1 | 1 | 1 |
| 3/4" x 3/4" Relief Valve | 14622011 | Ea. | 1 | - | - | - | - |
| 3/4" x 1" Relief Valve | 14622311 | Ea. | - | 1 | - | - | - |
| 1" x 1.1/4" Relief Valve | 14622312 | Ea. | - | - | 1 | - | - |
| 1.1/4" x 1.1/2" Relief Valve | 14622313 | Ea. | - | - | - | 1 | - |
| 1.1/2" x 2" Relief Valve | 1570028 | Ea. | - | - | - | - | 1 |

Chart 13

**COMPONENT CARTON MATERIAL LIST**

| PARTS DESCRIPTION | Model 300 | Model 400 | Model 500 |
|---|---|---|---|
| Draft Hood | 42557113 | 42557114 | 42557115 |
| Intermediate Jacket Carton | 42557103 | 42557104 | 42557105 |
| Base Assembly | 41200103 | 41200104 | 41200105 |

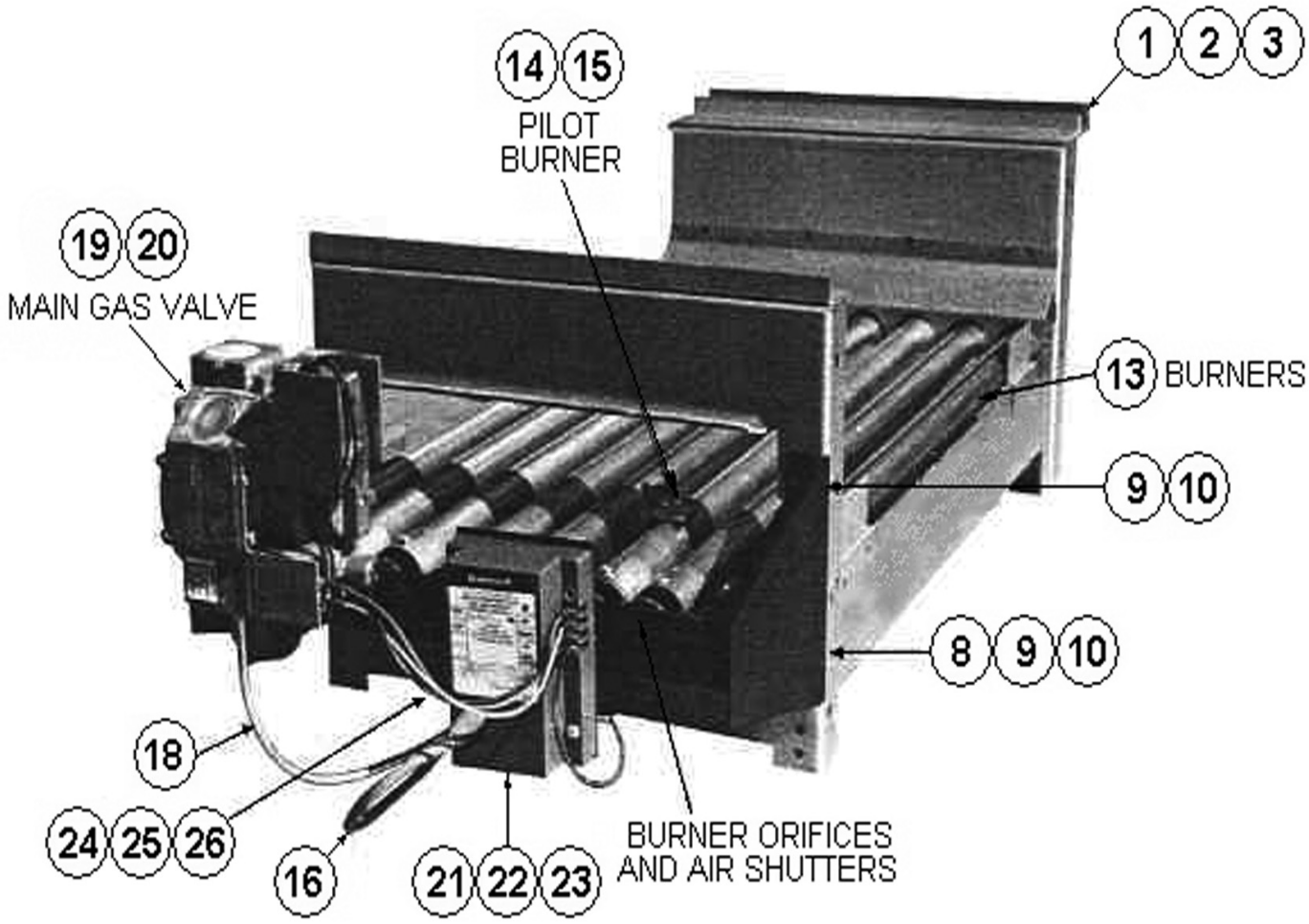
**JACKET END PANEL CARTON MATERIAL LIST**

| | | | |
|---|---|---|---|
| Jacket End Panel | 42557118 | Panel End Left | 42557073 |
| | | Panel End Right | 42557074 |
| Base End Panel | 42557119 | Base End Left | 42557100 |
| | | Base End Right | 42557101 |

**BOILER SECTIONS MATERIAL LIST**

| | | | |
|---|---|---|---|
| | | Left End Section | 41154051 |
| | | Right End Section | 41154050 |
| | | Intermediate Section | 41154052 |

**Figure 42**


14 15
PILOT
BURNER
1 2 3
19 20
MAIN GAS VALVE
13 BURNERS
9 10
8 9 10
18
24 25 26
16
21 22 23
BURNER ORIFICES
AND AIR SHUTTERS

| Chart 14- List of Parts Shown in Figure 42 | | | | | | |
|---|---|---|---|---|---|---|
| NO. | PARTS DESCRIPTION | PART NO. | UNIT | QUANTITY | | |
| | | | | 300 | 400 | 500 |
| 1 | 300 Base | 42557123 | EA. | 1 | | |
| 2 | 400 Base | 42557124 | EA. | | 1 | |
| 3 | 500 Base | 42557125 | EA. | | | 1 |
| 4 | 300 Fire Door | 42557133 | EA. | 1 | | |
| 5 | 400 Fire Door | 42557134 | EA. | | 1 | |
| 6 | 500 Fire Door | 42557135 | EA. | | | 1 |
| 7 | Orifice 30 Natural JC | 14615310 | EA. | 6 | 8 | 10 |
| 8 | 300 Manifold | 14616303 | EA. | 1 | | |
| 9 | 400 Manifold | 14616304 | EA. | | 1 | |
| 10 | 500 Manifold | 14616305 | EA. | | | 1 |
| 11 | 5/16" - 18 x 3/4" Hex Head Machine Crew | 14695302 | EA. | 4 | 4 | 4 |
| 12 | Nut 5/16" x 18 Hex Head | 1330007 | EA. | 4 | 4 | 4 |
| 13 | Main Burner | 14615302 | EA. | 5 | 7 | 9 |
| 14 | Main Burner with Pilot Bracket | 14615301 | EA. | 1 | 1 | 1 |
| 15 | Q348A1275 Electronic Pilot Burner | 14662099 | EA. | 1 | 1 | 1 |
| + | Pilot Mounting Bracket | 42557029 | EA. | 1 | 1 | 1 |
| 16 | #394800-25 Ignition Cable x 25" x Long | 14662074 | EA. | 1 | 1 | 1 |
| 17A | #10-32 x 3/16" Hex Head Screw | 14695301 | EA. | 2 | 2 | 2 |
| 17B | #6 - 32 x 5/16" Hex Head Screw | 14695311 | EA. | 2 | 2 | 2 |
| 18 | 1/8" OD Aluminum Tubing x 24' Long | 14615005 | EA. | 1 | 1 | 1 |
| 19 | 3/4" 90o Street Elbow Black | 14693040 | EA. | 1 | 1 | 1 |
| 20A | 7000 DERHC 3/4" H.C. Electronic Gas Valve | 14663001 | EA. | | | 1 |
| 20B | VR8304M 3/4" x 3/4" Electronic Gas Valve | 14662315 | EA. | | 1 | |
| 20C | VR8304M 1/2" x 3/4" Electronic Gas Valve | 14662058 | EA. | 1 | | |
| 21 | S8610U-3009 Intermittent Pilot Gas Ignition Control | 240008017 | EA. | Optional | | |
| 22 | #10-32 x 1/2" Machine Screw | 14695307 | EA. | 2 | 2 | 2 |
| 23 | #10-32 Hex Nut | 14695308 | EA. | 2 | 2 | 2 |
| 24A | Harness Gas Valve Ignition Control | 43300942 | EA. | 1 | 1 | 1 |
| 24B | Wiring Harness Gas Valve 14" Long | 43300949 | EA. | | | 1 |
| 25 | Ground Wire 4" Long | 43300938 | EA. | | | 1 |
| 26 | Cable Tie 4" Long | 14691002 | EA. | 1 | 1 | 1 |

Chart 15

| ACCESSORY CARTON | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARTS DESCRIPTION | PART NO. | BOILER MODEL NUMBERS AND QUANTITIES | | | | | | | | | | | | |
| | | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 |
| COMPLETE ACCY CRTN # | | 550001676 | 550001677 | 550001679 | 550001680 | 550001681 | 550001682 | 550001683 | 550001684 | 550001684 | 550001685 | 550001686 | 550001687 | 550001688 |
| 4" Push Nipples | 43300977 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 5/8" - 11NC x 7 Stud | 14695304 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 5/8" - 11NC Hex Nut | 1330005 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 |
| 5/8" Flat Washer | 14695306 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 |
| Furnace Cement - Pint | 1440001 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| FB-1 Fitting Bag | 41200051 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| FB-2 Fitting Bag | 41200052 | - | - | - | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - |
| FB-3 Fitting Bag | 41200053 | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 1 | 1 |
| FB-4 Fitting Bag | 41200054 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| FB-5 Fitting Bag | 41200055 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| FB-6 Fitting Bag | 41200056 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Main Rating Plate | 14680901 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12" x 9" Plastic Bag | 14684012 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 |
| Warning Label | 14680108 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Users Information Manual | 19817 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Installation Instructions | 14683004 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Top Support Bracket | 42557037 | | | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 3/4" Drain Valve | 14622001 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| AT87A-1007 Transformer | 14662305 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | |
| AT88A-1005 Transformer | 14662306 | | | | | | | | | 1 | 1 | 1 | 1 | 1 |
| 9T51B5900,250VA Transformer | 1551005 | | | | | | | | | | | | | |
| R8222A-1002 Relay | 14662309 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 129384A Case & Cover | 14662310 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Nipple Paste - 4oz. | 14691302 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Switch High Pressure Gas | 1500001 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1" Sq. Head Plugs | 1395004 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Chart 15 - Continued

| ACCESSORY CARTON continued | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 | 2800 | 2900 | 3000 |
| 550001689 | 550001690 | 550001691 | 550001692 | 550001693 | 550001694 | 550001695 | 550001696 | 550001697 | 550001698 | 550001699 | 550001700 | 550001701 | 550001702 | 550001703 |
| 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 |
| 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 | 60 |
| 64 | 68 | 72 | 76 | 80 | 84 | 88 | 92 | 96 | 100 | 104 | 108 | 112 | 116 | 120 |
| 64 | 68 | 72 | 76 | 80 | 84 | 88 | 92 | 96 | 100 | 104 | 108 | 112 | 116 | 120 |
| 2 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | 1 | 1 | 1 | 1 | 1 | | | | | |
| - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 1 | 1 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

| Chart 16 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **FITTING BAGS MATERIAL LIST** | | | | | | | |
| PARTS DESCRIPTION | PART NO. | FB-1 41200051 | FB-2 41200052 | FB-3 41200053 | FB-4 41200054 | FB-5 41200055 | FB-6 41200056 |
| #10 x 1/2" Self Tap Screws | 14695074 | 10 | 14 | 18 | 22 | 26 | 30 |
| #8 x 3/4" Self Tap Screws | 14695003 | 2 | 2 | 2 | 2 | 2 | 2 |
| #10-32 x 1/2" Slot Head Screws | 14695307 | none | 2 | 4 | 6 | 8 | 10 |
| #10-32 Hex Nuts | 14695308 | none | 2 | 4 | 6 | 8 | 10 |
| 5/16" -18NC 3/4" Hex Head Bolts | 14695302 | 8 | 12 | 16 | 20 | 24 | 28 |
| 5/16" - 18NC Hex Nuts | 1330007 | 8 | 12 | 16 | 20 | 24 | 28 |
| 1/4" - 20NC x 1.1/2" J Bolts | 14695303 | 1 | 2 | 3 | 4 | 5 | 6 |
| 1/4" - 20NC Hex Bolts | 1330002 | 1 | 2 | 3 | 4 | 5 | 6 |
| Jacket Door Knobs | 13702153 | 2 | 4 | 6 | 8 | 10 | 12 |
| Knob Screws | 14695004 | 2 | 4 | 6 | 8 | 10 | 12 |

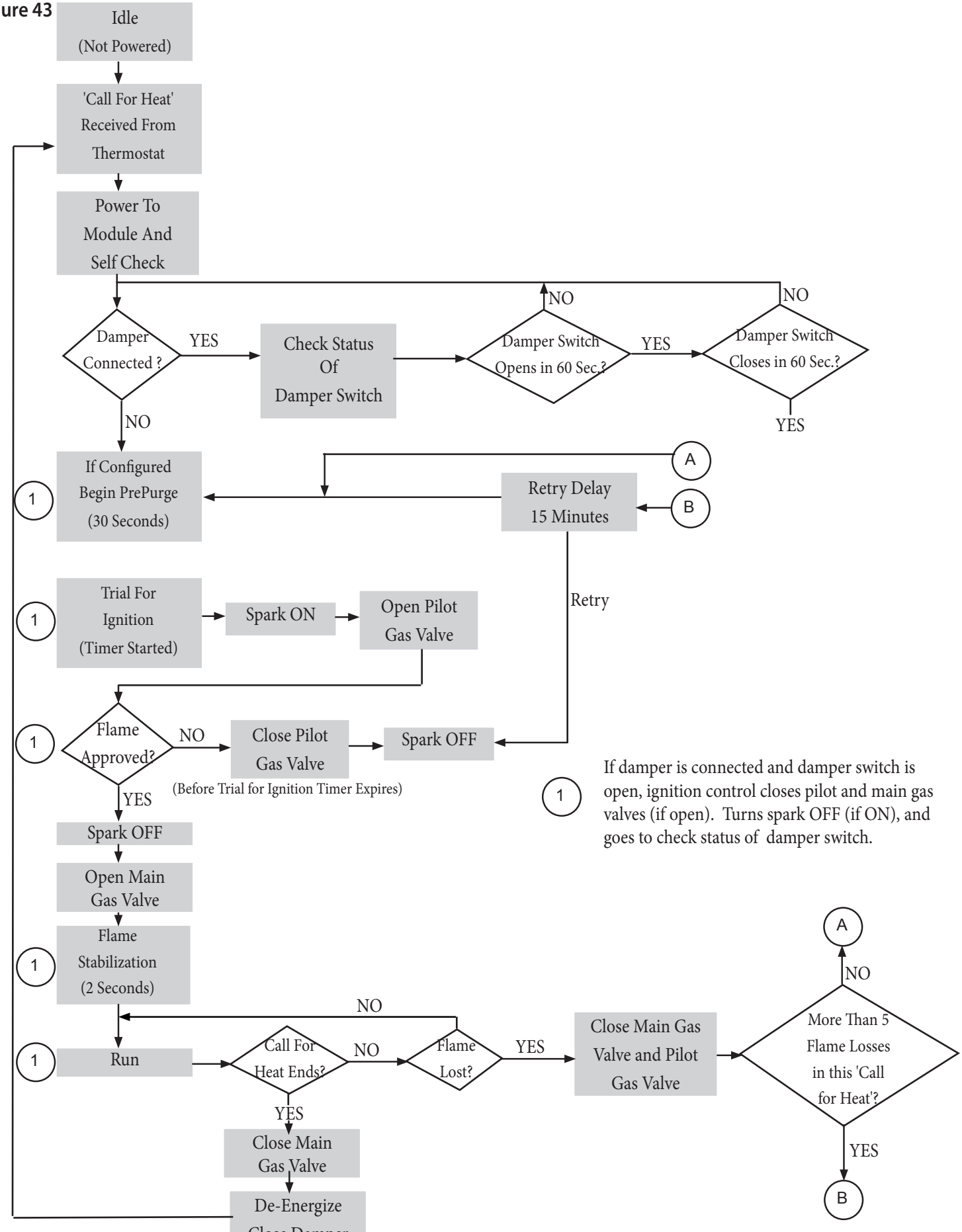
| Chart 17 | |
|---|---|
| **ALTERNATE COMPONENT LIST** | |
| PARTS DESCRIPTION | PART NO. |
| LWCO and Feeder #47-2 (Models 300-1500) | 1280001 |
| Water High Limit Control with Manual Reset – (L4006E-1109) | 43300520 |
| Strap-on Operating Control (L6006C-1034) | 14662313 |
| LWCO with Manual Reset (PS852M-24) – to replace the 67D LWCO | 14626305 |
| ARGO AMB-4 Modular Boiler Control Kit – To allow stage firing of up to 4 bases. Includes outdoor reset, priority override and lead boiler rotation. (Refer to AMB manual for parts list) | 550001730X |
| ARGO AMB-8 Modular Boiler Control Kit – To allow stage firing of up to 8 bases. Includes outdoor reset, priority override and lead boiler rotation. (Refer to AMB manual for parts list) | 550001731X |

## Failed Trial For Pilot Ignition

The S8610U Control Module provides multiple trials for ignition (TFI). If the pilot is not lit or sensed before the end of the trial for ignition time, the ignition control shuts off the spark and pilot gas (100% shutoff ). There is a five minute delay before another TFI is initiated. The pattern of TFI followed by a five minute delay continues until the pilot lights and is proved or the 'Call for Heat' ends. the five minute delay time can be bypassed by cycling the system thermostat or removing and restoring system power.

The Operating Sequence includes vent damper operation ( if connected) and Prepurge (if configured).

**Figure 43**




1 If damper is connected and damper switch is open, ignition control closes pilot and main gas valves (if open). Turns spark OFF (if ON), and goes to check status of damper switch.