INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

Series 2® (model B)

Gas - Fired Boiler

C ETL US LISTED
Intertek
9700609

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	Boiler Serial Number	Installation Date
2		
Heating Contractor		Phone Number
Address		

U.S. Boiler Company

103385-01 - 1/11

Price - $5.00

NOTE: The equipment shall be installed in accordance with those installation regulations in force in the area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

All wiring on boilers installed in the USA shall be made in accordance with the National Electrical Code and/or local regulations.

All wiring on boilers installed in Canada shall be made in accordance with the Canadian Electrical Code and/or local regulations.

The New York City Department of Buildings has approved the Series 2B boiler: Approval No. MEA 96-96-E

The City of New York requires a Licensed Master Plumber supervise the installation of this product.

The Massachusetts Board of Plumbers and Gas Fitters has approved the Series 2B 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.

Table of Contents

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

DANGER

Indicates presence of a hazard which will cause severe personal injury, death or substantial property damage if ignored.

CAUTION

Indicates presence of a hazard which will or can cause minor personal injury or property damage if ignored.

WARNING

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

NOTICE

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

WARNING

FAILURE TO FOLLOW ALL INSTRUCTIONS IN PROPER ORDER CAN CAUSE PERSONAL INJURY OR DEATH. READ ALL INSTRUCTIONS BEFORE INSTALLING.

WARNING

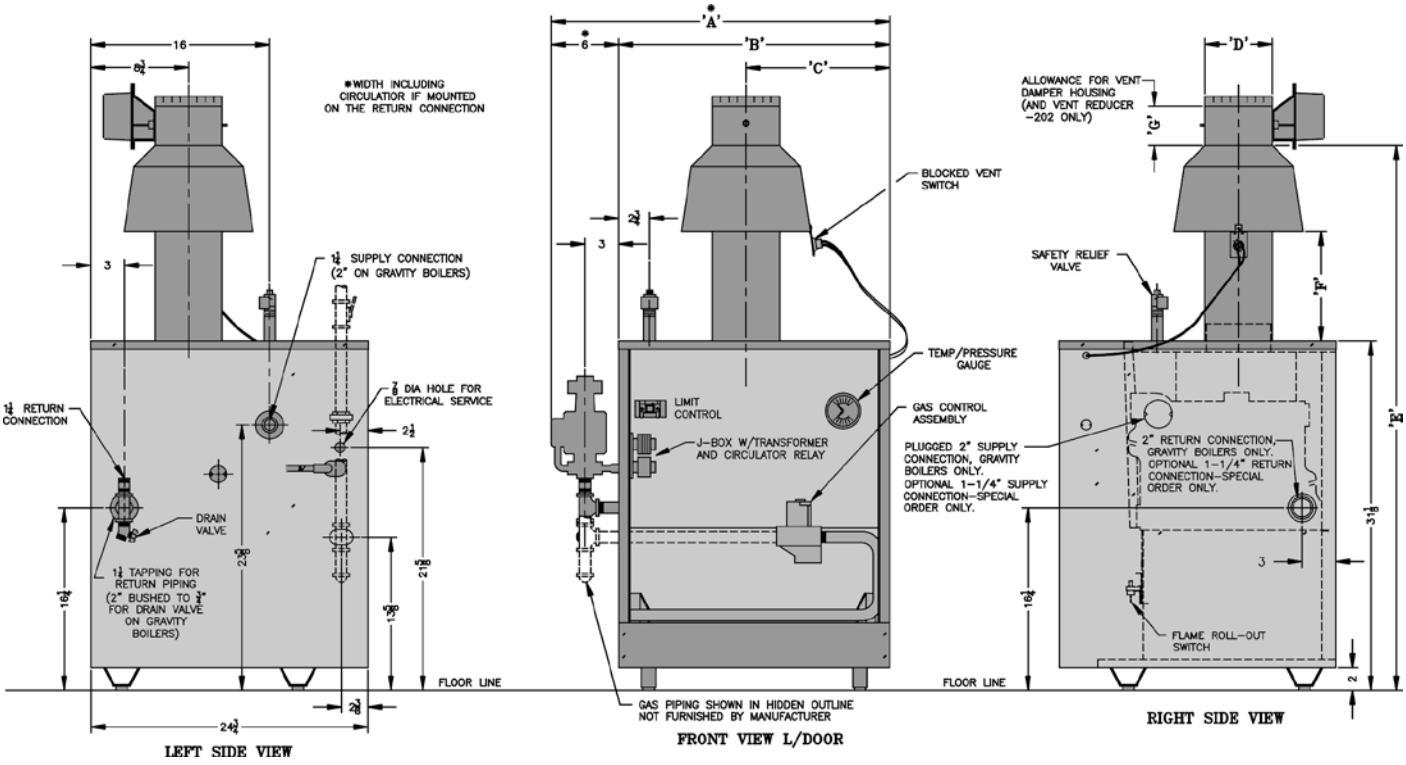
SERVICE ON THIS BOILER SHOULD BE UNDERTAKEN ONLY BY TRAINED AND SKILLED PERSONNEL.

KEEP BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

DO NOT PLACE ANY OBSTRUCTION IN THE BOILER ROOM THAT WILL HINDER THE FLOW OF COMBUSTION AND VENTILATING AIR.

WARNING

READ THESE INSTRUCTIONS CAREFULLY BEFORE PROCEEDING WITH THE INSTALLATION OF BOILER. POST INSTRUCTIONS NEAR BOILER FOR REFERENCE BY OWNER AND SERVICE TECHNICIAN. MAINTAIN INSTRUCTIONS IN LEGIBLE CONDITION.



Boiler Model Number	Dimensions [Inches]							Gas Connection For Automatic Gas Valve	Water Content [gallons]	Recommended Vent Size [1] [2]	Approx. Shipping Weight [lb.]
	A	B	C	D	E	F	G				
202	18-3/4	10-3/4	6-3/8	4	45-5/8	8-1/2	10 [3]	1/2	2.5	3" dia. x 15 ft.	212
202X	20	12	6	4	45-5/8	8-1/2	4-3/4	1/2	3.2	4" dia. x 15 ft.	262
203	20	12	6	4	45-5/8	8-1/2	4-3/4	1/2	3.2	4" dia. x 15 ft.	262
204	23-1/4	15-1/4	7-5/8	5	47-1/8	9-1/8	4-3/4	1/2	4	5" dia. x 15 ft.	306
205	26-1/2	18-1/2	9-1/4	6	48-1/2	9-3/4	5-1/4	1/2	4.7	6" dia. x 15 ft.	354
206	29-3/4	21-3/4	10-7/8	6	48-1/2	9-3/4	5-1/4	1/2	5.5	6" dia. x 15 ft.	414
207	33	25	12-1/2	7	50-1/8	10-3/8	6-5/8	3/4	6.2	7" dia. x 15 ft.	458
208	36-1/4	28-1/4	14-1/8	7	50-1/8	10-3/8	6-5/8	3/4	7	7" dia. x 15 ft.	514
209	39-1/2	31-1/2	15-3/4	8	52	11	7-1/4	3/4	7.7	8" dia. x 15 ft.	550
210	42-3/4	34-3/4	17-3/8	8	52	11	7-1/4	3/4	8.5	8" dia. x 15 ft.	608

[1] 15' chimney height is from bottom of draft hood opening to top of chimney.
[2] Refer to the National Fuel Gas Code for equivalent areas of circular and rectangular flue linings. Maximum Allowable Working Pressure - 30 PSI (Water Only)
[3] 202 only. Dimension 'G' includes allowance for 4" x 3" reducer furnished with boiler. See Figure 8.

Figure 1

I . Installation Instructions

1. INSPECT SHIPMENT carefully for any signs of damage. All equipment is carefully manufactured, inspected and packed. Our responsibility ceases upon delivery of Boiler to the carrier in good condition. Any claims for damage or shortage in shipment must be filed immediately against the carrier by the consignee. No claims for variances or shortages will be allowed by Boiler Manufacturer unless presented within sixty (60) days after receipt of equipment.

2. BOILER INSTALLATION must conform to the requirements of the authority having jurisdiction, or in the absence of such requirements, to:

U.S.A. - *National Fuel Gas Code*, ANSI Z223.1. When required by the authority having jurisdiction, the installation must conform to ANSI/ASME No. CSD-1.

CANADA - Installation Codes for Natural and LP Gas Burning Appliances and Equipment, CAN/CSA-B149.1.

3. These Gas Boilers are DESIGN CERTIFIED FOR INSTALLATION ON COMBUSTIBLE FLOORING. DO NOT INSTALL THESE BOILERS ON CARPETING.

NOTICE

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

4. LOCATE BOILER in front of or behind installation position before removing Crate. Locate on a level floor as close to chimney as possible. For basement installations, provide a solid base such as concrete, if floor is not level or if water may be encountered on floor around Boiler.

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

DANGER

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.

5. REMOVE CRATE -

A. Remove all crate fasteners. Lift off outside container.

B. Remove all screws and brackets securing boiler to skid.

C. Save two of the wooden slats from the container sleeve for use in Steps D & E.

D. Tilt the boiler to one side and slide a wooden slat under the two raised feet.

E. Tilt the boiler to the other side and slide another wooden slat under the two raised feet.

F. Slide the boiler forward or backward off the skid using the two wooden slats as runners.

6. Move boiler to permanent position.

7. PROVIDE CLEARANCE and AIR for COMBUSTION and VENTILATION.

WARNING

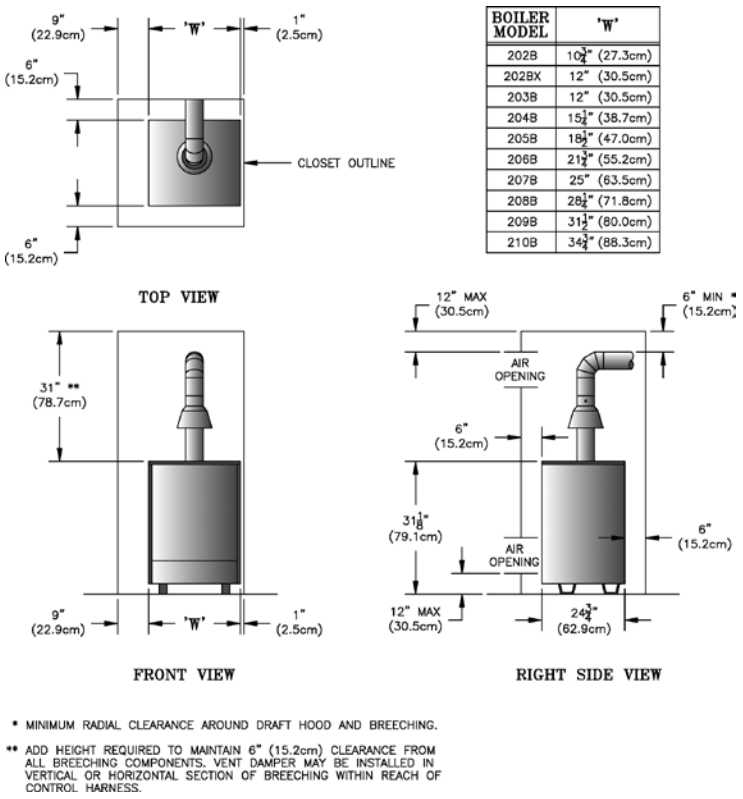
Adequate combustion and ventilation air must be provided to assure proper combustion.

A. CLEARANCES

1. ALL INSTALLATIONS - Practical service clearances must be considered (see Figure 1). A minimum of 24" (6.0cm) from the left side and front jacket panels is recommended for servicing but may be reduced to minimum shown in Figure 2. Subject to boiler and system piping, left side clearance may be reduced to 1" (2.5cm) if right side clearance is increased to 9" (22.9cm).
2. ALCOVE INSTALLATIONS - An alcove is considered a closet as shown in Figure 2 less front. Height clearance may be reduced to 27" (68.6cm).
3. UNCONFINED SPACE (see definition, paragraph (B) below) - Height clearance may be reduced to 27" (68.6cm).

B. PROVIDE COMBUSTION AND VENTILATION AIR in accordance with applicable provisions of local building codes, or: U.S.A. - *National Fuel Gas Code*, NFPA 54/ANSI Z223.1, Canada - *Natural and Propane Gas Installation Code*, CAN/CSA-B149.1.

1. CLOSET INSTALLATIONS (confined space) in a building of *other than unusually tight construction* (see definition below), provide combustion and ventilation air as shown in Figure 2.
2. Installations other than closet in paragraph (1) :
   a. Determine volume of space (boiler room). Rooms communicating directly with space (through openings not furnished with doors) are considered part of space.



BOILER MODEL	'W'
202B	10¾" (27.3cm)
202BX	12" (30.5cm)
203B	12" (30.5cm)
204B	15¼" (38.7cm)
205B	18½" (47.0cm)
206B	21½" (55.2cm)
207B	25" (63.5cm)
208B	28¼" (71.8cm)
209B	31½" (80.0cm)
210B	34¾" (88.3cm)

Figure 2: Minimum Clearances

Volume [ft³](m³) = Length [ft](m) x Width [ft](m) x Height [ft](m)

b. Determine Total Input of all appliances in space. Round result to nearest 1,000 Btu per hour (Btuh).

c. Determine type of space. Divide Volume by Total Input.

i. If result is greater than or equal to 50 ft³ (1.4m3) per 1,000 Btuh, space is considered an *unconfined space*.

ii. If result is less than 50 ft³ (1.4m3) per 1,000 Btuh, space is considered a *confined space*.

d. Determine building type. A building of *unusually tight construction* has the following characteristics:

i. Walls and ceiling exposed to outside atmosphere have a continuous water vapor retarder with a rating of 1 perm or less with openings gasketed and sealed, and

ii. Weather-stripping has been added on openable windows and doors, and

iii. Caulking or sealants applied in joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels, at plumbing and electrical penetrations, and at other openings.

e. For boiler located *in a building of other than unusually tight construction*, adequate combustion and ventilation air is normally provided by fresh air infiltration through cracks around windows and doors.

f. For boiler located *in building of unusually tight construction*, provide outdoor air through two permanent openings which communicate directly or by duct with the outdoors or spaces (crawl or attic) freely communicating with the outdoors. Locate one opening within 12 inches (30.5cm) of top of space. Locate remaining opening within 12 inches (30.5cm) of bottom of space. Minimum dimension of air opening is 3 inches (7.6cm). Size each opening per following:

i. Direct communication with outdoors. Minimum free area of 1 square inch (6.5cm²) per 4,000 Btu per hour input of all equipment in space.

ii. Vertical ducts. Minimum free area of 1 square inch (6.5cm²) per 4,000 Btu per hour input of all equipment in space. Duct cross-sectional area shall be same as opening free area.

iii. Horizontal ducts. Minimum free area of 1 square inch (6.5cm²) per 2,000 Btu per hour input of all equipment in space. Duct cross-sectional area shall be same as opening free area.

g. Ventilation Duct Louvers and Grilles. Equip outside openings with louvers to prevent entrance of rain and snow, and screens to prevent entrance of insects and rodents. Louvers and grilles must be fixed in open position or interlocked with equipment to open automatically before burner operation. Screens must not be smaller than ¼ inch mesh.

Consider the blocking effect of louvers, grilles and screens when calculating the opening size to provide the required free area. If free area of louver or grille is not known, assume wood louvers have 20-25 percent free area and metal louvers and grilles have 60-75 percent free area.

8. CONNECT GAS SERVICE from Meter to gas control assembly in accordance with Local Piping Codes and requirements of Gas Company, see Figure 1. They may require piping of larger size than Control Assembly Connection, especially if run from meter is long or includes several elbows. (See Figure 1 for size of Gas Connection to gas control assembly).

Table 1: Maximum Capacity of Schedule 40 Pipe in CFH For Natural Gas Pressures of ½ 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

Table 2: Equivalent Length of Fittings

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

This piping is to be supplied by the installer and must include a trap, a ground joint union and a manual shutoff valve upstream of the gas control assembly outside of the jacket when codes require, see Figure 1. A pipe thread compound resistant to the action of liquefied petroleum gases should be applied to all threaded joints in the gas piping. Pressure testing of the Gas Supply Piping Boiler and its connections is required before placing the boiler in operation.

The boiler and shutoff valve must be disconnected from the gas supply piping system during any pressure testing at pressures greater than ½ psig (3.5kPa).

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 pressures equal to or less than ½ psig (3.5kPa).

RECOMMENDED SIZING OF GAS SUPPLY PIPING TO BOILER FOR NATURAL GAS - shall be such as to provide the required supply of gas without undue loss of pressure between meter and the boiler. Gas supply piping should be sized in accordance with the Tables 1, 2 and 3. The following shall be taken into account:

Table 3: Specific Gravity Correction Factors for Natural Gas

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	---	---

A. Allowable loss of pressure to assure a burner manifold pressure of 3½" (8.9cm) water for natural gas.

B. Supply of gas to be provided in cubic feet.

C. Length of piping and number of fittings.

D. Specific gravity of gas.

E. Correction factor for specific gravity.

9. BOILER PIPING

CAUTION

Failure to properly pipe boiler may result in improper operation and damage to boiler or building.

A. CLEARANCES - Hot water pipes do not require clearance from combustible construction.

B. Install drain valve and safety relief valve as shown in Figures 1 and 3. Note - Safety relief valve must be in vertical position.

C. Pipe safety relief valve discharge to floor.

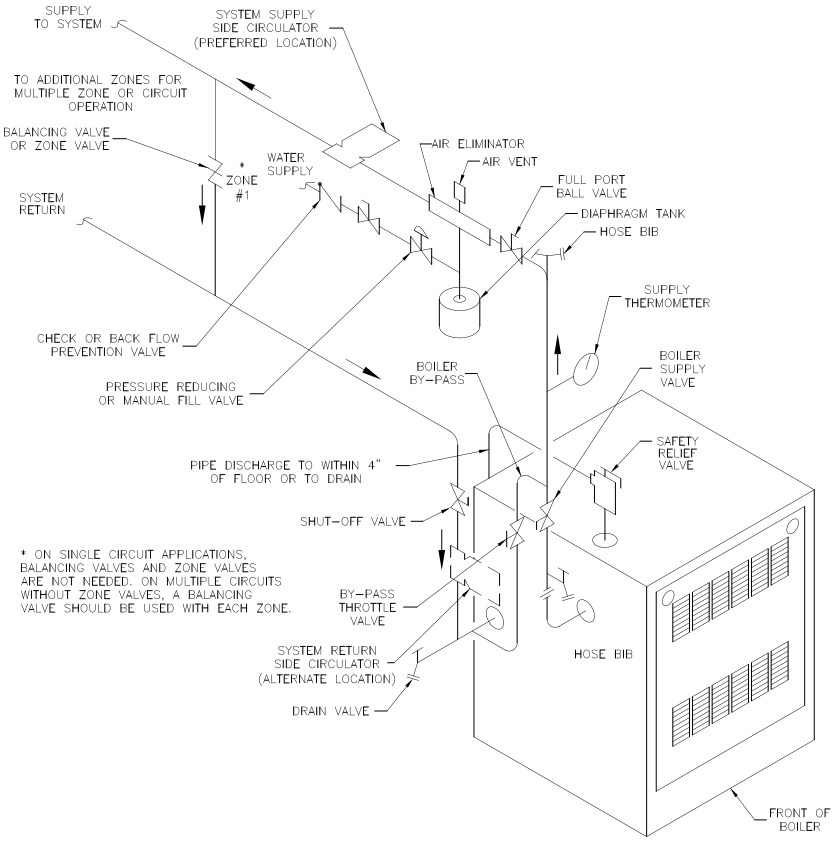


Figure 3: Recommended Water Piping for Zone Valve Zoned Heating Systems

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. Install circulator with flanges, gaskets and bolts provided. Five foot long circulator harness allows circulator to be mounted on supply or return. Connect harness to circulator and secure any excess conduit.

E. For heating only system piping, see Figure 3. Consult also I=B=R Installation Guides.

F. For space heating and domestic water heating with Alliance SL™ water heater (intermittent circulation only); install Alliance SL™ water heater as a separate heating zone. Refer to Alliance SL™ Installation, Operating and Service Instructions for additional information.

G. If this boiler is used in connection with refrigeration systems, the boiler must be installed so that the chilled medium is piped in parallel with the heating boiler using appropriate valves to prevent the chilled medium from entering the boiler, see Figure 4. Also consult I=B=R Installation and Piping Guides.

If this Boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air, the boiler piping must be equipped with flow control valves to prevent gravity circulation of boiler water during the operation of the cooling system.

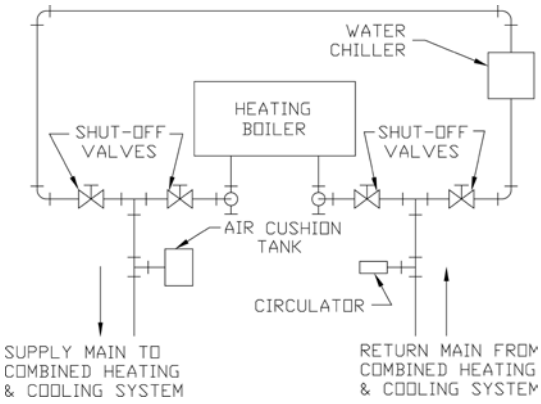


Figure 4: Recommended Piping for Combination Heating & Cooling (Refrigeration) Systems

H. 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 a pipe tee at the boiler return along with a second tee in the supply piping as shown in Figure 3. The bypass should be the same size as the supply and return lines with valves located in the bypass and supply outlet as illustrated in Figure 3 in order to regulate water flow to maintain higher boiler water temperatures.

Set the boiler supply valve to fully open position, and the boiler bypass valve to half throttle. Operate the boiler and adjust the bypass valve to achieve 180°F to 200°F supply water temperature by closing the bypass valve to decrease supply temperature or opening the bypass valve to increase water temperature. If the bypass valve is fully opened and the boiler water temperature is still below 180°F, slowly begin closing the boiler supply valve to achieve 180°F to 200°F supply water temperature. **Caution:** Never fully close the boiler supply valve.

I. A hot water boiler installed above radiation level must be provided with a low water cutoff device as part of the 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.

Refer to Section VI for low water cut-off piping and wiring instructions.

J. If 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.

K. OXYGEN CORROSION:

Oxygen contamination of the boiler water will cause corrosion of the iron and steel boiler components, which can lead to failure. As such, any system must be designed to prevent oxygen absorption in the first place or prevent it from reaching the boiler. Problems caused by oxygen contamination of boiler water are not covered by U.S. Boiler Company's standard warranty.

There are many possible causes of oxygen contamination such as:

1. Addition of excessive make-up water as a result of system leaks.
2. Absorption through open tanks and fittings.
3. Oxygen permeable materials in the distribution system.

In order to insure long product life, oxygen sources should be eliminated. This can be accomplished by taking the following measures:

1. Repairing system leaks to eliminate the need for addition of make-up water.
2. Eliminating open tanks from the system.
3. Eliminating and/or repairing fittings which allow oxygen absorption.
4. Use of non-permeable materials in the distribution system.
5. Isolating the boiler from the system water by installing a heat exchanger.

10. INSTALL DRAFT HOOD without modification on outlet of flue collector (See Figure 1). Secure with sheet metal screws.

WARNING

Do not alter boiler draft hood or place any obstruction or non-approved damper in the breeching or vent system. Flue gas spillage can occur. ETL certification will become void.

11. INSTALL BLOCKED VENT SWITCH

The blocked vent switch assembly shipped taped to the top of the boiler includes a power cord and a switch attached to a mounting bracket. The mounting bracket has a three tooth staggered comb stamping at one end with a #10 sheet metal screw in the center tooth.

A. Untape the blocked vent switch assembly from the top of the boiler and uncoil the power cord.

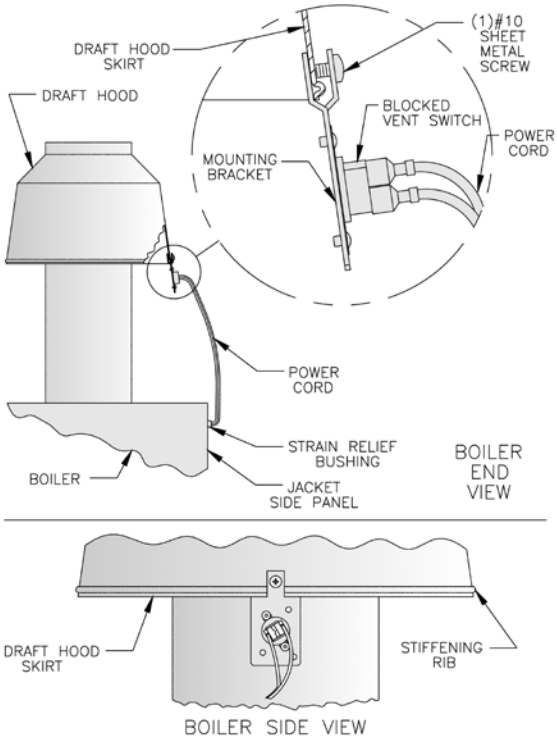


Figure 6

B. Pinch the black strain relief bushing installed in the jacket right side panel to dislodge it from the jacket and pull just enough of the black power cord out so the blocked vent switch will reach the near side of the draft hood skirt. Do not pull out more power cord than necessary.

C. Position the mounting bracket (with switch attached) onto the lower edge of the draft hood skirt by locating the center tooth (with the #10 sheet metal screw) on the outside and the other two teeth inside the draft hood skirt. See Figure 6.

D. Slide the mounting bracket up tight against the lower edge of the draft hood skirt, so that the #10 sheet metal screw is above the skirt's stiffening rib.

E. Secure the bracket in this position by tightening the #10 sheet metal screw against the outer surface of the draft hood skirt.

F. Reinsert the excess power cord through the jacket side panel hole to take the slack out of the power cord running up to the blocked vent switch.

G. Reposition the strain relief bushing around the power cord at the jacket side panel, pinch the two halves of the bushing together, and snap it back into the hole in the jacket side panel to secure the power cord to the jacket.

H. Be sure the power cord, mounting bracket, and switch are secure and located as shown in Figure 6.

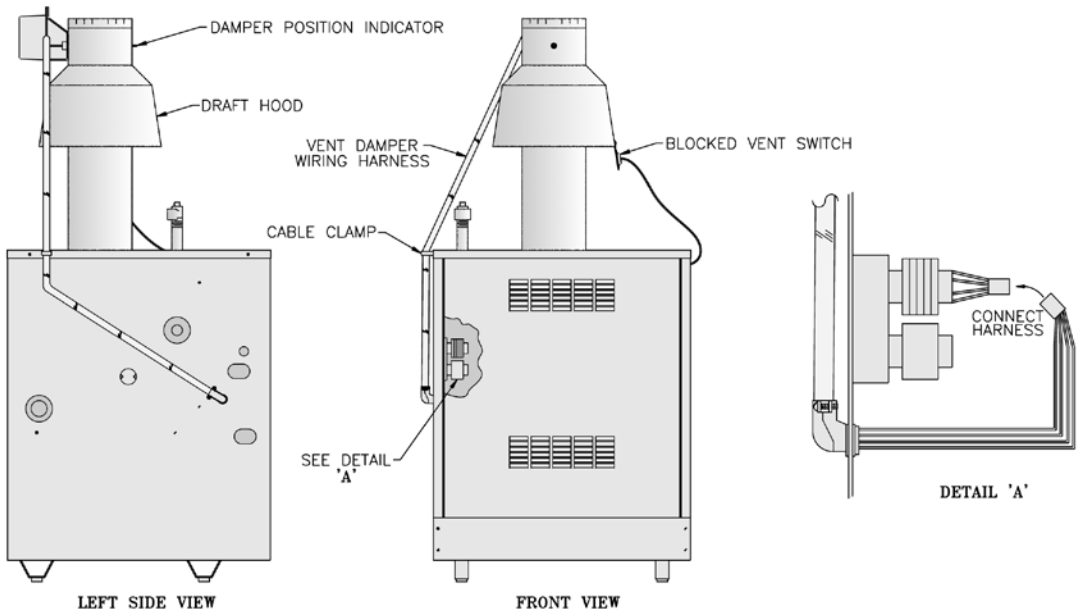


Figure 7: Plug-in Damper Installation

WARNING

Failure to properly install and use this Blocked Vent Switch may result in property damage, personal injury or loss of life.

12. TO MEET FEDERALLY MANDATED EFFICIENCIES, THIS BOILER MUST BE EQUIPPED WITH A VENT DAMPER.

OPEN THE VENT DAMPER CARTON and remove the Installation Instructions. READ THE INSTALLATION INSTRUCTIONS THOROUGHLY before proceeding.

The automatic gas control valve supplied on each Series 2® boiler provides the redundancy referenced in the vent damper Installation Instructions.

CAUTION

Do not use one vent damper to control two heating appliances.

A. The vent damper should be the same size as the outlet of the Draft Hood. (See Figure 1) Unpack the damper carefully - DO NOT FORCE IT CLOSED! Forcing the damper may damage the gear train and void the warranty. The damper assembly includes a prewired connection harness for use on all 24V Standing Pilot or electronic ignition control systems.

B. Mount the vent damper assembly after the draft hood, as close to the draft hood as practicable without modification to the draft hood or vent damper. (Refer to Figure 7 and to instructions packed with the vent damper for specific instructions). This is a must for the wiring harness to fit and the damper position indicator to be visible to the users.

NOTICE

Provide adequate clearance for servicing.

WARNING

Provide 6" (15.2cm) minimum clearance between damper and combustible construction.

C. Install the 90° BX connector attached to the flexible conduit in the 7/8" knockout on the left side of the jacket. Plug the factory wired Vent Damper Harness into the polarized receptacle. Install a cable clamp around the flexible conduit and attach to the Jacket top panel. (See Figure 7).

NOTICE

Please refer to the specifications, installation instructions and troubleshooting guide packed in the vent damper carton for complete detailed installation instructions. Also refer to Figure 7 in this manual.

D Continuous Ignition (Standing Pilot) Only. Remove knockout from vent damper blade.

E. Size 202 Only. Install 4" x 3" reducing fitting on vent damper outlet.

13. INSTALL VENT CONNECTOR from reducing fitting (202 Only), draft hood or damper to chimney, see Figure 8.

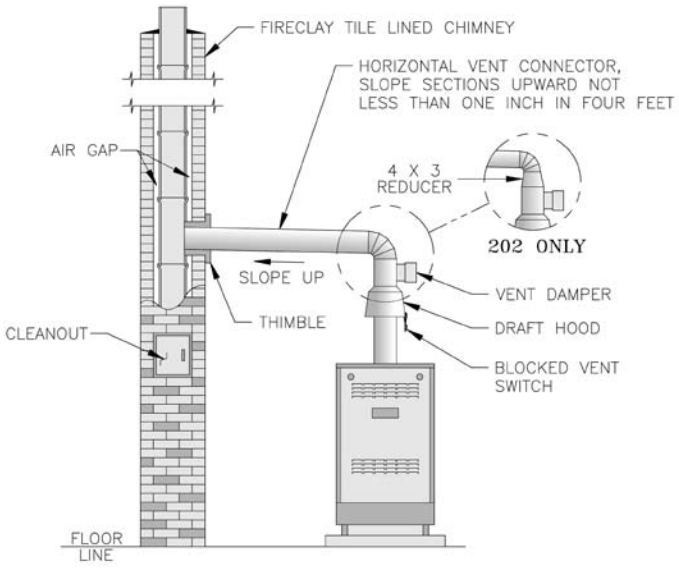


Figure 8: Typical Vent Installation

DANGER

Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe injury or death.

A. Vent installation shall be in accordance with local building codes; or the local authority having jurisdiction; or the National Fuel Gas Code, ANSI Z223.1/NFPA 54; or the Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances, ANSI/NFPA 211. Both of the aforementioned standards, ANSI Z223.1 and ANSI/NFPA 211, specify Type B and Type L double wall metal vents and fire clay tile lined masonry chimneys as suitable chimney constructions for Category I, draft hood equipped appliances, such as this Series 2® boiler. Both standards prohibit the use of unlined masonry construction as a chimney, with the exception in ANSI Z223.1/NFPA 54 that "Where permitted by the authority having jurisdiction, existing chimneys shall be permitted to have their use continued when an appliance is replaced by an appliance of similar type, input rating, and efficiency." ANSI/NFPA 211 prohibits the use of single wall metal vent as a chimney, while ANSI Z223.1 allows it under very restrictive conditions. In Canada refer to the Natural Gas and LP Installation Code, CAN/CSA-B149.1.

B. Do not connect into same leg of chimney serving an open fireplace.

C. Inspect chimney for obstructions or restrictions and remove. Clean chimney if necessary.

D. Vent pipe to chimney must not be smaller than outlet on draft hood or damper. Although single wall vent pipe may be used, Type B is recommended. The venting system must be arranged so that only the boiler is served by the damper device. Installation per paragraph 12 complies with this provision.

E. Where two or more appliances vent into a common vent, the area of the common vent should at least equal the area of the largest vent plus 50% of the area in the additional vents. Do not connect the vent of this appliance into any portion of mechanical draft system operating under positive pressure.

F. Vent pipe should have the greatest possible initial rise above the draft hood consistent with the head room available and the required clearance from adjacent combustible building structure. Vent Pipe should be installed above the bottom of chimney to prevent blockage.

G. Vent pipe should slope upward from draft hood to chimney not less than one inch in four feet. Doivent présenter des tronçons horizontaux dont la pente montante est d'au moins ¼ po par pied (21 mm/m) entre la chaudière et l'évent. No portion of vent pipe should run downward or have dips or sags. Vent pipe must be securely supported. Les sections horizontales doivent être supportées pour prévenir le fléchissement.

H. Vent pipe must be inserted into but not beyond inside wall of chimney liner. Seal tight between vent pipe and chimney.

I. Do not install non-listed (AGA, CGA, CSA, ETL or UL) vent damper or other obstruction in vent pipe.

WARNING

14. IF AN EXISTING BOILER IS REMOVED -

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 to it.

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:

A. Seal any unused openings in the common venting system.

B. 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.

C. 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.

D. Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.

E. 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.

F. 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.

G. 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/CSA B149.1, *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 *National Fuel Gas Code*, ANSI Z223.1 and/or CAN/CSA B149.1, *Installation Codes*.

Au moment du retrait d'une chaudière existante, les mesures suivantes doivent être prises pour chaque appareil toujours raccordé au système d'evacuation commun et qui fonctionne alors que d'autres appareils toujours raccordés au système d'évacuation ne fonctionnent pas:

A. Sceller toutes les ouvertures non utilisées du système d'évacuation.

B. Inspecter de facon visuelle le système d'évcuation pour déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement, de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.

C. Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace où les appareils toujours raccordés au système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sécheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.

D. Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Régler le thermostat de facon que l'appareil fonctionne de facon continue.

E. Faire fonctionner le brùleur principal pendant 5 min ensuite, déterminer si le coupe-tirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allumette ou d'une chandelle ou la fumée d'une cigarette, d'un cigare ou d'une pipe.

F. Une fois qu'il a été déterminé, selon la méthode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de facon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.

G. Tout mauvais fonctionnement du système d'évacuation commun devrat être corrigé de facon que l'installation soit conforme au *National Fuel Gas Code, ANSI Z223.1* et (ou) aux codes *d'installation* CAN/CSA-B149.1. Si la grosseur d'une section du système d'évacuation doit être modifiée, le système devrait être modifié pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du *National Fuel Gas Code, ANSI Z223.1* et (ou) des codes *d'installation CAN/CSA-B149*.1.

15. INSTALL A ROOM THERMOSTAT on an inside wall about four feet above floor. Never install thermostat on an outside wall or where it will be influenced by drafts, hot or cold water pipes, lighting fixtures, television, rays of the sun or near a fireplace. Keep large furniture away from thermostat so there will be free movement of room air around this control.

Table 4: Wiring Diagrams and Heat Anticipator Settings

Ignition Type	Circulation Method	Thermostat Heat Anticipator Setting [Amps]	Wiring Diagram Figure
Continuous (Standing Pilot)	Intermittent	0.6	11
	Constant/Gravity	1.0	14
Electronic	Intermittent	0.6	12
	Constant/Gravity	1.0	15

If system tends to overheat above thermostat's temperature setting, reduce heat anticipator setting by 0.1 or 0.2 amps. If system tends to shortcycle without reaching desired room temperature, increase heat anticipator setting by 0.1 or 0.2 amps.

Heat Anticipator in Thermostat should be set to match the requirements of the control to which it is connected. See Table 4. If system tends to overheat above the thermostat's temperature setting, reduce heat anticipator setting by .1 or .2 amps. If system tends to short cycle without reaching desired room temperature, increase heat anticipator setting by .1 or .2 amps.

16. INSTALL ELECTRIC WIRING in accordance with National Electric Code or the Canadian Electrical Code and local regulations. See Figures 11 through 16 for applicable wiring diagram. 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. When installed, the boiler must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70, and/or the CSA C22.1 Electrical Code, if an external electrical source is utilized.

For zone valve wiring, a separate 24V transformer is required rather than attempting to use the boiler mounted control. Consult zone valve manufacturer for assistance.

17. VENT DAMPER SEQUENCE OF OPERATION. See Figure 9.

A. The Vent Damper is continuously powered at Terminal 1.

B. When there is a call for heat, the damper relay coil is energized through Terminal 5 if all limits ahead of the damper are satisfied.

C. The relay coil closes contacts which energize the damper motor, causing the damper to open.

D. When the damper blade reaches the fully open position, power is sent back to the ignition circuit through Terminal 2 and the damper motor is de-energized.

E. When the call for heat is satisfied, the damper relay coil is de-energized - closing contacts which energize the damper motor. This causes the damper to close. When the damper blade reaches the fully closed position, the damper motor is de-energized.

POWER FAILURE - The damper blade will stop in the position it was in when power failed. (Combustion can never take place unless the damper blade is in the fully open position.)

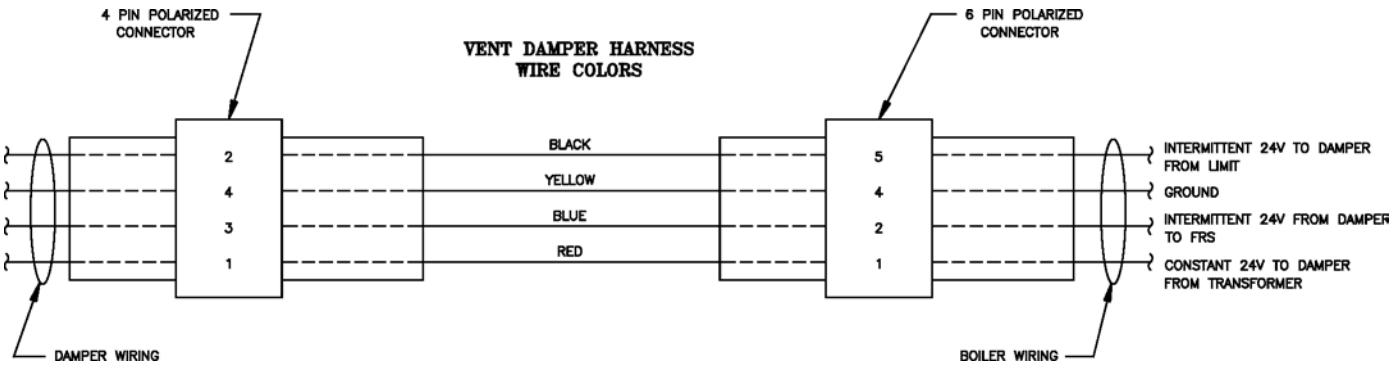


Figure 9: Vent Damper Schematic Wiring Diagram

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.

CAUTION

Avoid operating this boiler in an environment where saw dust, loose insulation fibers, dry wall dust, etc. are present. If boiler is operated under these conditions, the burner interior and ports must be cleaned and inspected daily to insure proper operation.

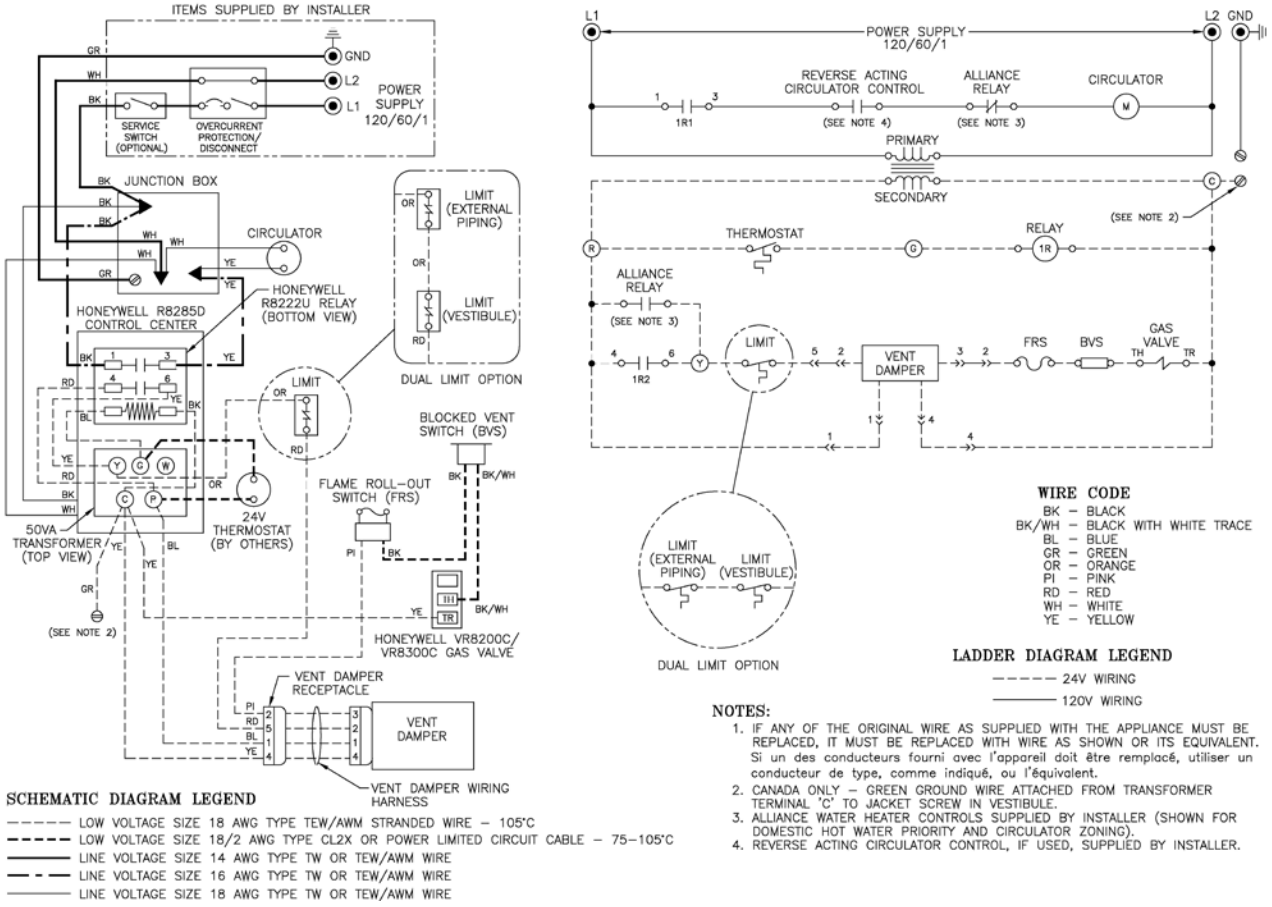


Figure 11: Wiring Diagram, 24 Volt Standing Pilot and Intermittent Circulation

SEQUENCE OF OPERATION

Normal Operation

1. When the thermostat call for heat, the vent damper will open (see paragraphs 17A through 17D). The circulator is started through a relay and at the same time the gas valve is energized allowing main gas flow and ignition of main burners.
2. Where condensation of flue gas is encountered in boiler flues a reverse acting circulator control should be installed to stop the circulator before the boiler water temperature drops to that which flue gas condensation may occur.
3. After the thermostat is satisfied the main valve will close and main burner flames will be extinguished. The vent damper will close (see paragraph 17E).

SAFETY SHUTDOWN

1. High Limit Switch

   In the event excessive boiler water temperature is developed the high limit switch will open interrupting power to the gas valve. The main burners will be extinguished immediately, and the vent damper will close at the same time, but the circulator will continue to operated. Normal operation will be resumed when the boiler water temperature drops to a point where the high limit switch closes.

2. Blocked Vent Switch

   In the event excessive blockage in the vent system is developed the blocked vent switch will open interrupting power to the gas valve. The main burners will be extinguished immediately, the circulator will continue to operate, and the vent damper will remain open until the thermostat is turned off. The source of blockage must be corrected by trained and skilled personnel from a qualified service agency before resetting switch.

3. Flame Rollout Switch

   In the event excessive blockage in the boiler section flue passageways is developed the flame rollout switch will open interrupting power to the gas valve. The main burners will be extinguished immediately, the circulator will continue to operate and the vent damper will remain open until the thermostat is turned off. If the flame rollout switch is activated do not attempt to place the boiler in operation. The source of blockage must be corrected and the flame rollout switch replaced by trained and skilled personnel from a qualified service agency.

4. Pilot

   The thermocouple proves pilot flame and in the absence of such within 45-90 seconds causes the combination gas valve, which is equipped with a 100% shut-off provision, to be de-energized, thus, preventing main gas or pilot gas flow.

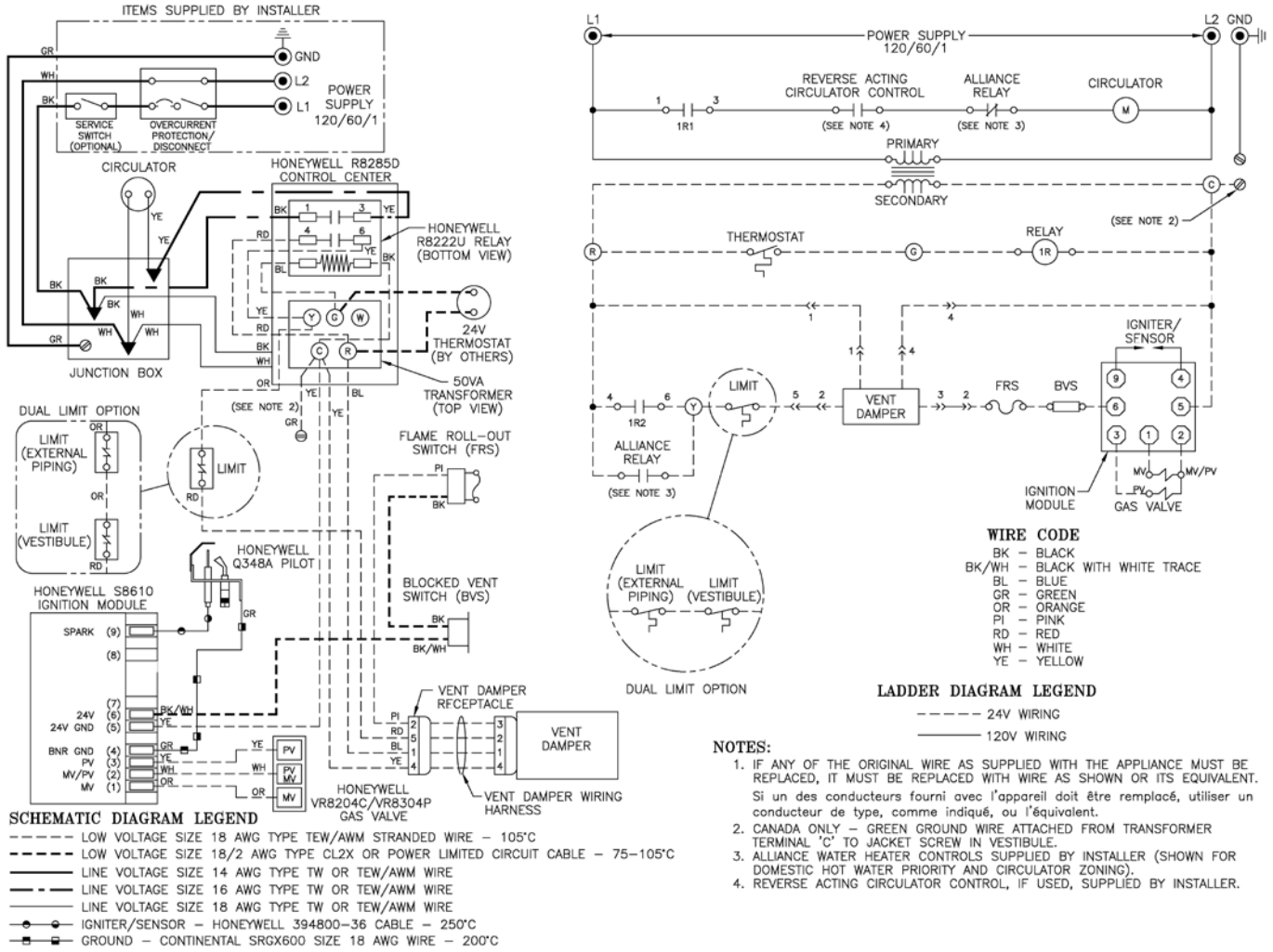


Figure 12: Wiring Diagram, Electronic Ignition (EI), Intermittent Circulation

SEQUENCE OF OPERATION

NORMAL OPERATION

1. When the thermostat calls for heat, the relay is energized. The circulator starts and the vent damper opens (see Paragraphs 17A through 17D). When the damper blade reaches the fully open position, the ignition module is energized opening the pilot valve and energizing the igniter to ignite the pilot burner.
2. Sensor proves presence of pilot flame. Main valve opens to ignite main burners.
3. The burners and circulator will operate simultaneously until the thermostat is satisfied.
4. After thermostat is satisfied, ignition module is de-energized, extinguishing pilot and main flame. Vent damper closes (see paragraph 17E).

SAFETY SHUTDOWN

1. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Normal operation resumes when water temperature falls below set point.
2. Blocked Vent Switch: Automatically interrupts main burner operation when excessive vent system blockage occurs. Control is a multiple use device. If blocked vent switch is activated do not attempt to place boiler in operation. Correct source of blockage and reset blocked vent switch.
3. Flame Roll-out Switch: Automatically interrupts boiler operation when flames or excessive heat are present in vestibule. Control is single use device. If flame roll-out switch is activated do not attempt to place boiler in operation. Correct source of blockage and replace flame roll-out switch.
4. Igniter/Sensor: senses pilot flame and causes ignition module to turn off main burner and pilot burner gas flow should pilot burner flame extinguish. Five to six minutes after shutdown, ignition module restarts ignition sequence.
5. For Electronic Ignition Trouble Shooting Guide, see Page 25 of this manual.

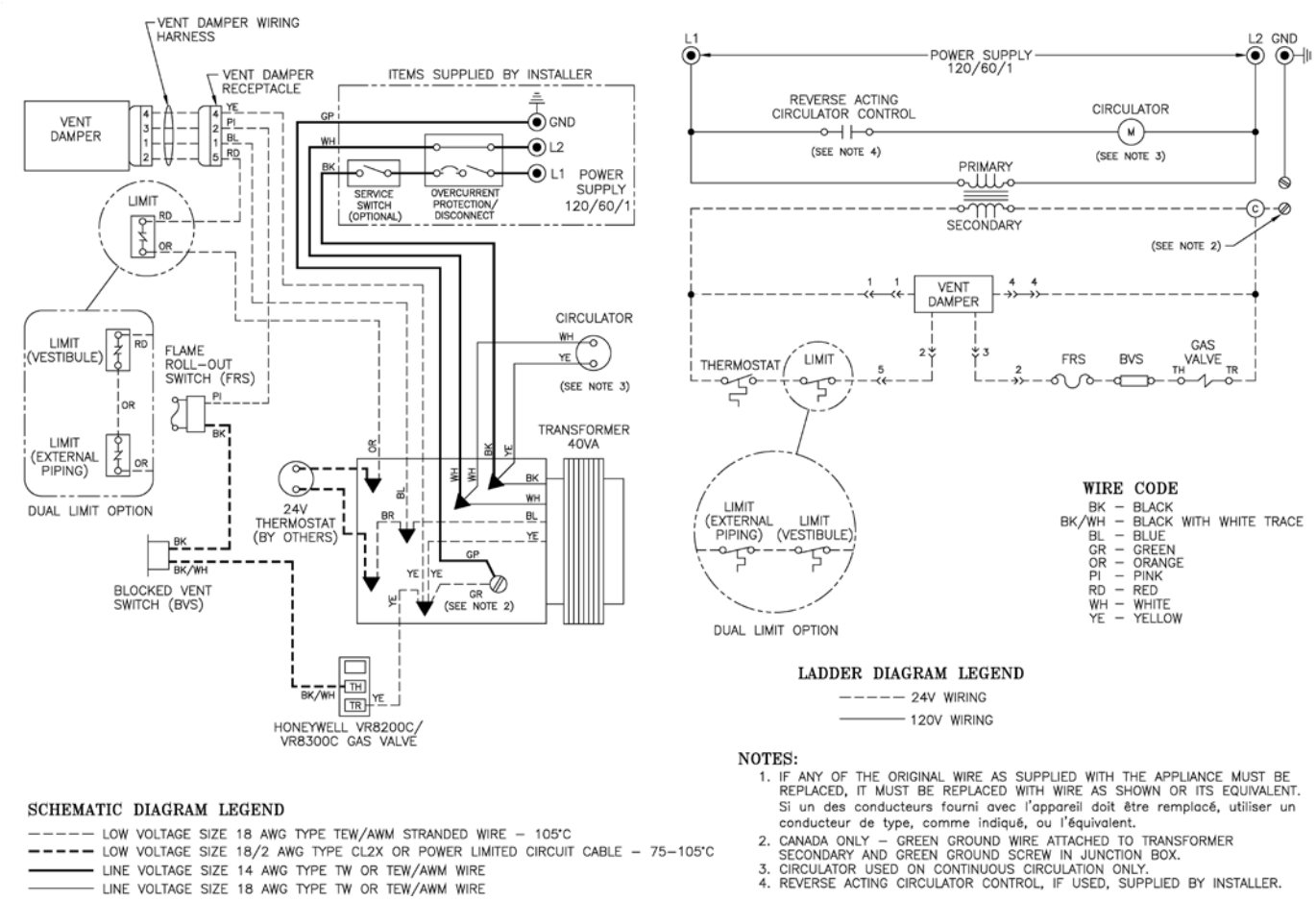


Figure 13: Wiring Diagram, 24 Volt Standing Pilot with Continuous or Gravity Circulation

SEQUENCE OF OPERATION

NORMAL OPERATION

1. When the thermostat call for heat, the vent damper will open (see paragraphs 17A through 17D). The gas valve is energized allowing main gas to flow and operation of the main burners.
2. Where condensation of flue gas is encountered in boiler flues a reverse acting circulator control should be installed to stop the circulator before the boiler water temperature drops to that which flue gas condensation may occur.
3. After the thermostat is satisfied the main valve will close and main burner flames will be extinguished. The vent damper will close (see paragraph 17E). If the boiler is so equipped, circulator will continue to run.

SAFETY SHUTDOWN

1. High Limit Switch: In the event excessive boiler water temperature is developed the high limit switch will open interrupting power to the gas valve. The main burners will be extinguished immediately. Normal operation will be resumed when the boiler water temperature drops to a point where the high limit switch closes.
2. Blocked Vent Switch: In the event excessive blockage in the vent system is developed the blocked vent switch will open interrupting power to the gas valve. The main burners will be extinguished immediately and the vent damper will remain open until the thermostat is turned off. The source of blockage must be corrected by trained and skilled personnel from a qualified service agency before resetting switch.
3. Flame Rollout Switch: In the event excessive blockage in the boiler section flue passageways is developed the flame rollout switch will open interrupting power to the gas valve. The main burners will be extinguished immediately and the vent damper will remain open until the thermostat is turned off. If the flame rollout switch is activated do not attempt to place the boiler in operation. The source of the blockage must be corrected and the flame rollout switch replaced by trained and skilled personnel from a qualified service agency.
4. Pilot: The thermocouple proves pilot flame and in the absence of such within 45-90 seconds causes the combination gas valve, which is equipped with a 100% shut-off provision, to be de-energized, thus, preventing main gas or pilot gas flow.

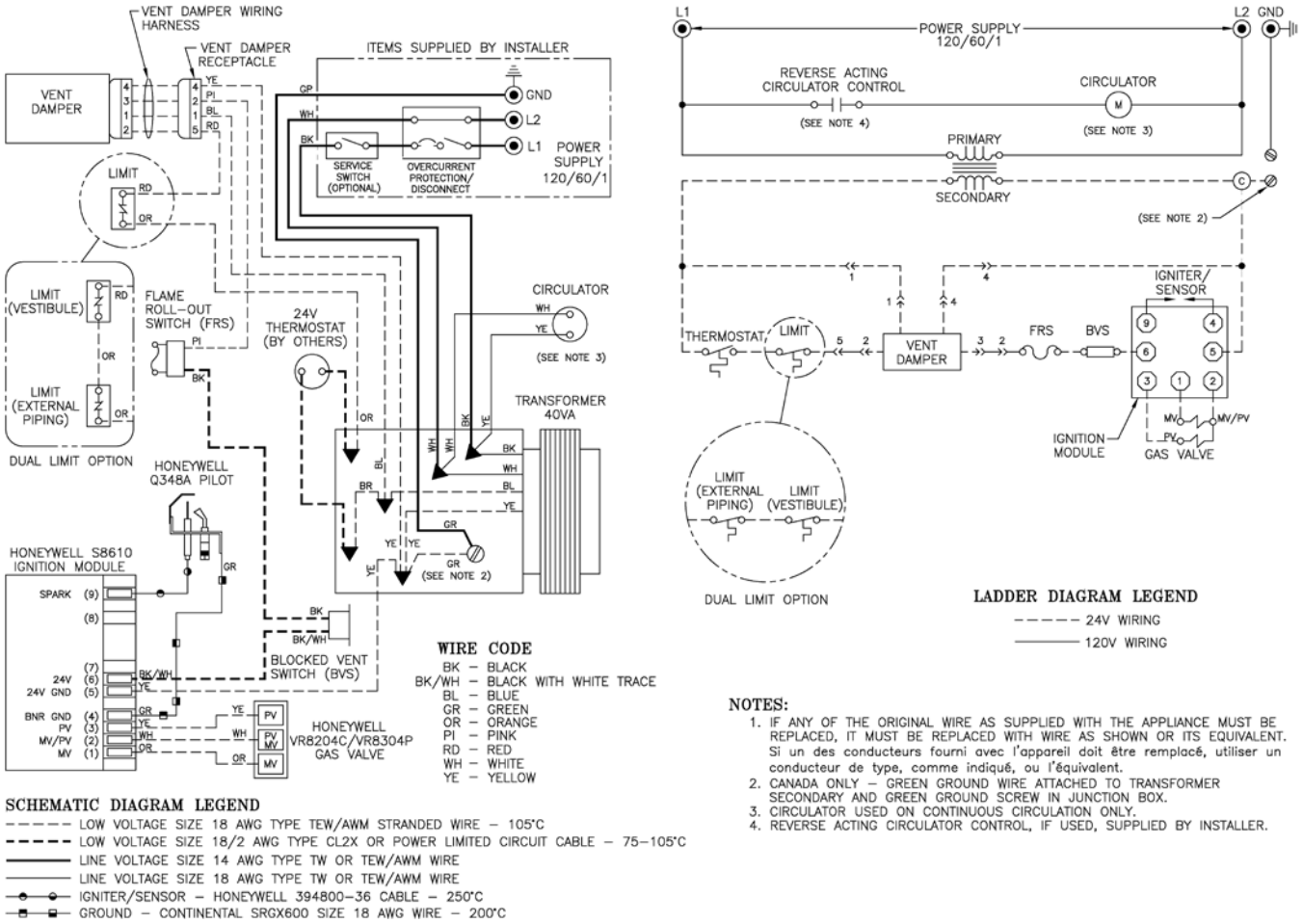


Figure 14: Wiring Diagram, Electronic Ignition (EI), Continuous or Gravity Circulation

SEQUENCE OF OPERATION

NORMAL OPERATION

1. When the thermostat calls for heat the vent damper opens (see Paragraphs 17A through 17D). When the damper blade reaches the fully open position, the ignition module is energized opening the pilot valve and energizing the igniter to ignite the pilot burner.
2. Sensor proves presence of pilot flame. Main valve opens to ignite main burners.
3. The burners will operate until the thermostat is satisfied.
4. When thermostat is satisfied, ignition module is de-energized, extinguishing pilot and main flame. If boiler is equipped with circulator, circulator will continue to run. Vent damper closes (see Para-graph 17E).

SAFETY SHUTDOWN

1. Limit: Automatically interrupts main burner operation when water temperature exceeds set point. Maximum allowable temperature is 250°F. Normal operation resumes when water temperature falls below set point.
2. Blocked Vent Switch: Automatically interrupts main burner operation when excessive vent system blockage occurs. Control is a multiple use device. If blocked vent switch is activated do not attempt to place boiler in operation. Correct source of blockage and reset blocked vent switch.
3. Flame Roll-out Switch: Automatically interrupts boiler operation when flames or excessive heat are present in vestibule. Control is single use device. If flame roll-out switch is activated do not attempt to place boiler in operation. Correct source of blockage and replace flame roll-out switch.
4. Igniter/Sensor: senses pilot flame and causes ignition module to turn off main burner and pilot burner gas flow should pilot burner flame extinguish. Five to six minutes after shutdown, ignition module restarts ignition sequence.
5. For Electronic Ignition Trouble Shooting Guide, see Page 25 of this manual.

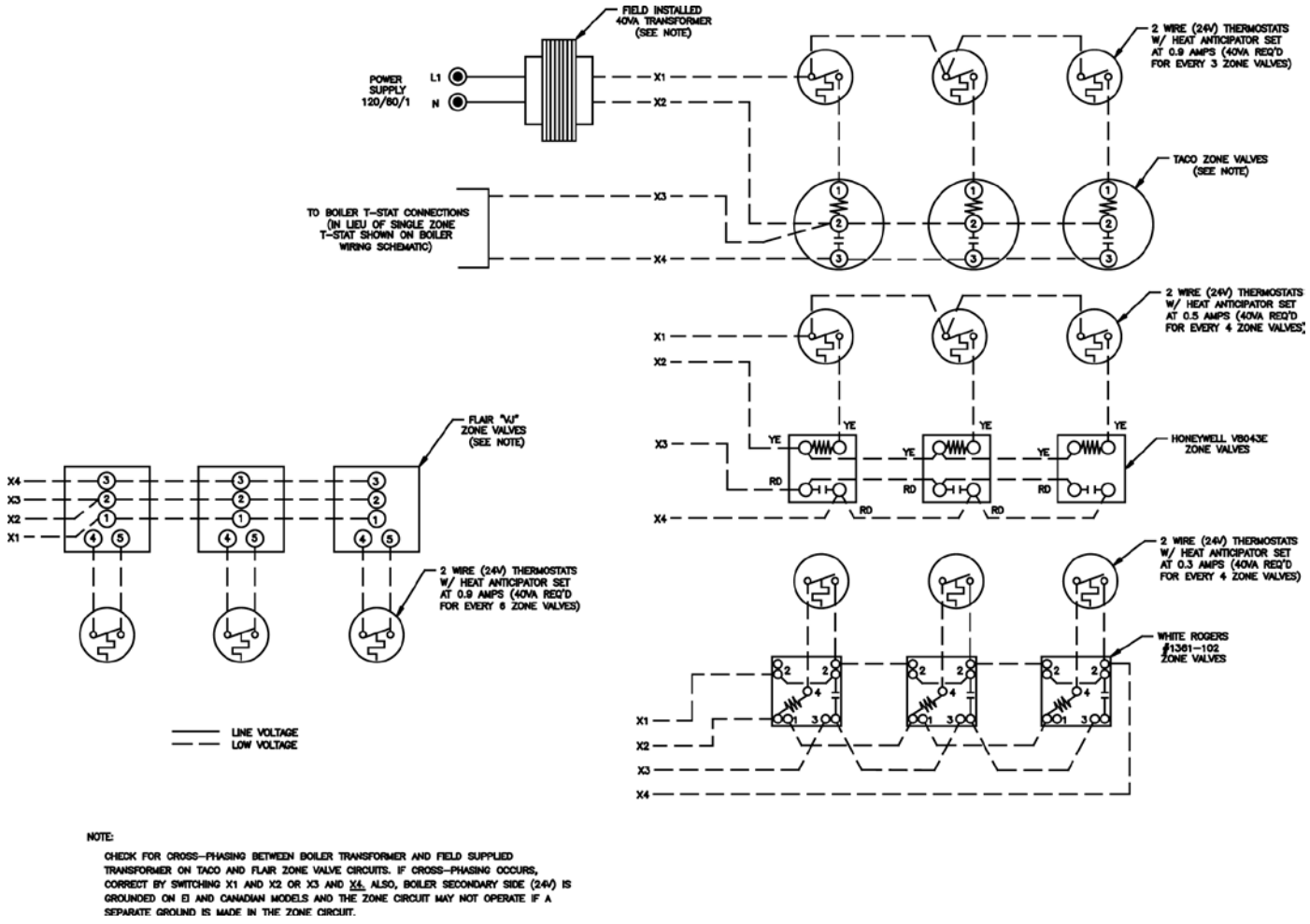


Figure 15: Wiring Schematic, Zone Valves

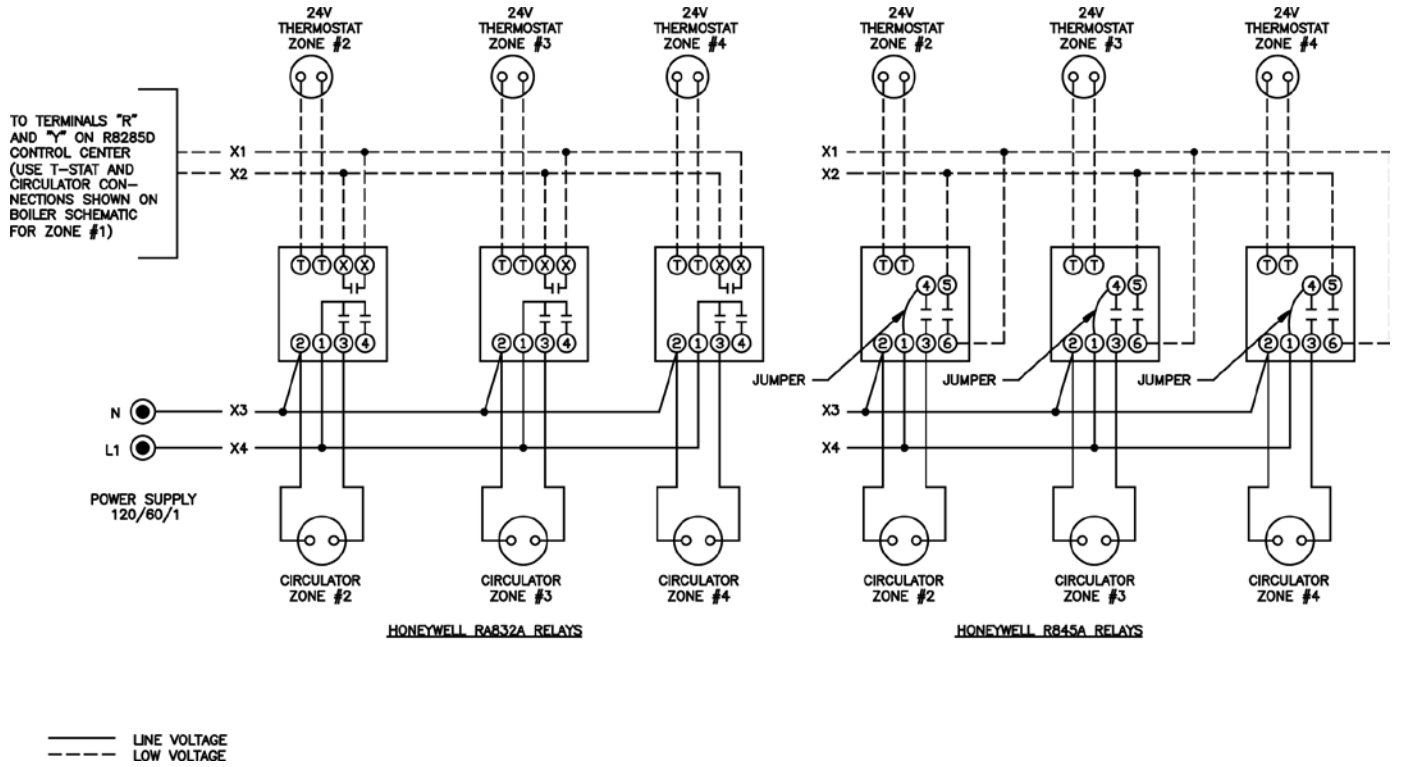


Figure 16: Wiring Schematic, Zone Circulators

II. Operating Instructions

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent tests specified in *American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers*, ANSI Z21.13b-1994.

1. MAIN BURNER CHECK - Check main burners to see that they were not dislodged during shipment. Rear of burners should be in the slots in the rear of burner tray and the front of the burners should be seated completely on the orifices.

2. INITIAL START -

A. 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 3).

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 at a suitable floor drain or outdoor area).
4. Starting with one circuit, open zone valve.
5. Open hose bib.
6. Open 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 12 psi. Close fill valve. (Note - If make-up water line is equipped with pressure reducing valve, system will automatically fill to 12 psi. Leave globe valve open).
10. Open isolation valve in boiler supply piping.
11. Remove hose from hose bib.

B. Turn ROOM THERMOSTAT to lowest setting.

C. Be sure that gas to pilot and main burners has been off for at least five minutes and vent damper (if used) has been in the open position.

D. Turn "OFF" the electric switch serving boiler.

E. Open valve on main gas line at meter.

F. PURGE AIR FROM GAS PIPING. This procedure will vary with equipment furnished but **in all cases adequate ventilation must be provided and no smoking or open flame permitted.** To determine which of the procedures outlined in succeeding paragraphs is applicable, match suffix of boiler model found on Rating Label with paragraph heading:

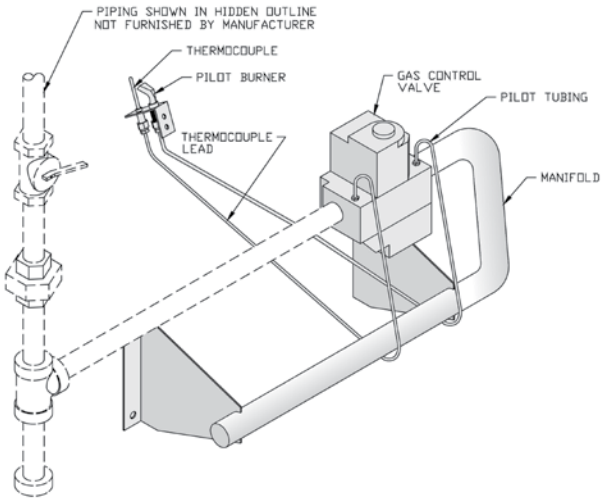


Figure 17: Schematic Pilot and Gas Piping Continuous Ignition (Standing Pilot)

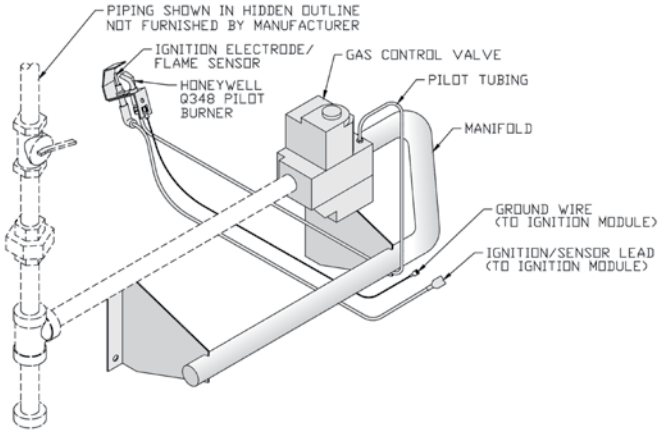


Figure 18: Schematic Pilot and Gas Piping Electronic Ignition (EI)

1. Standing Pilot Models (Suffix C):
   a. Keep electric switch "OFF".
   b. Open Manual Shut-off Valve upstream of Combination Gas Valve.
   c. Disconnect Pilot Tubing at gas valve (Purge **must not** be into combustion chamber).
   d. Turn Main Gas Knob on Combination Gas Valve to "Pilot" Position. Depress and hold in this position until purging is complete. Turn Main Gas Knob to "off" position.

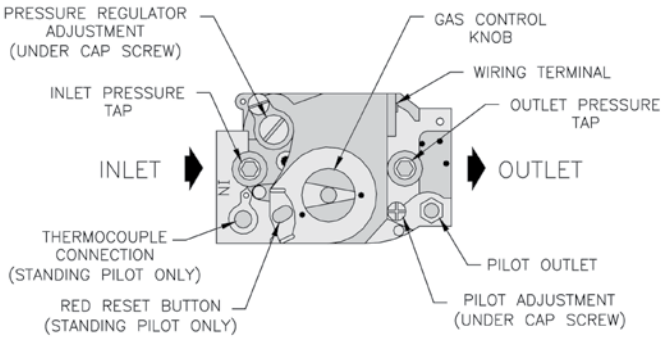


Figure 19: Top View of VR Gas Valves

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.

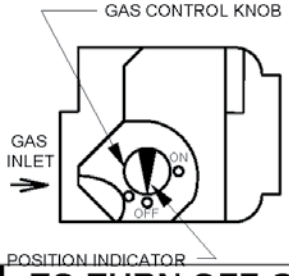
WHAT TO DO IF YOU SMELL GAS
- ➤ Do not try to light any appliance.
- ➤ Do not touch any electric switch; do not use any phone in your building.
- ➤ Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- ➤ If you cannot reach your gas supplier, call the fire 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 20: Operating Instructions, VR8204 and VR8304 Gas Valves

e. Reconnect pilot tubing and check pipe and fittings from meter to combination Gas Valve for leaks using soap solution or other approved method.

2. Electronic Ignition Models (Suffix I):
   a. Turn "ON" electric switch serving boiler.
   b. Open Manual Shut-off Valve upstream of Combination Gas Valve.
   c. Loosen or remove Inlet Pressure Tap Plug in Combination Gas Valve and when purging is complete, tighten or replace plug. See Figure 19.
   d. Check pipe and fittings from meter to Combination Gas Valve using soap solution or other approved methods.

CAUTION

   e. Test gas piping and connections between Combination Gas Valve and manifold, orifices, and pilot piping for leaks after boiler is operating. Use soap solution or other approved method.

3. INSTRUCTIONS TO PUT THE BOILER IN OPERATION.

A. See Figure 20 for electronic ignition (EI). Electronic Ignition Modules with LED indicators. Table 5 cross-references the ignition module terminal designations to the ignition terminal numbers in the wiring ladder diagrams. Table 6 provides green LED status codes and recommended service action where applicable.. See Figure 21A for Location of LED. See Figure 28 for Troubleshooting Guide.

1. Flame Current Measurement Procedure. See Figure 21B "Measuring pilot flame current with micro-ammeter"
   a. Pilot flame current in micro amps can be measured using any standard micro-ammeter by inserting the meter probes into the module holes labeled FLAME CURRENT as shown in Figure 21B.
   b. Flame current **must be measured with pilot valve open/pilot lit but the main valve closed.**
   c. Disconnect MV lead wire from the module before measuring flame current. Trying to measure the pilot flame current in series with the wiring will not yield the accurate reading.

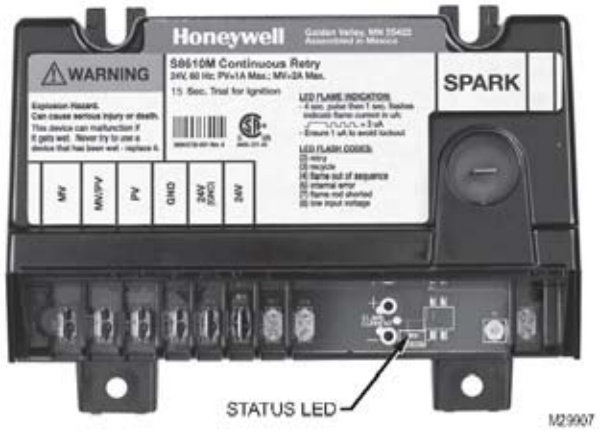


Figure 21A: Location of LED

Table 5: Ignition Module Terminal Cross-Reference

Ignition Module Terminal Designation	Wiring Ladder Diagram Terminal Number
MV	1
MV/PV	2
PV	3
GND	4
24V (GND)	5
24V	6
SPARK	9

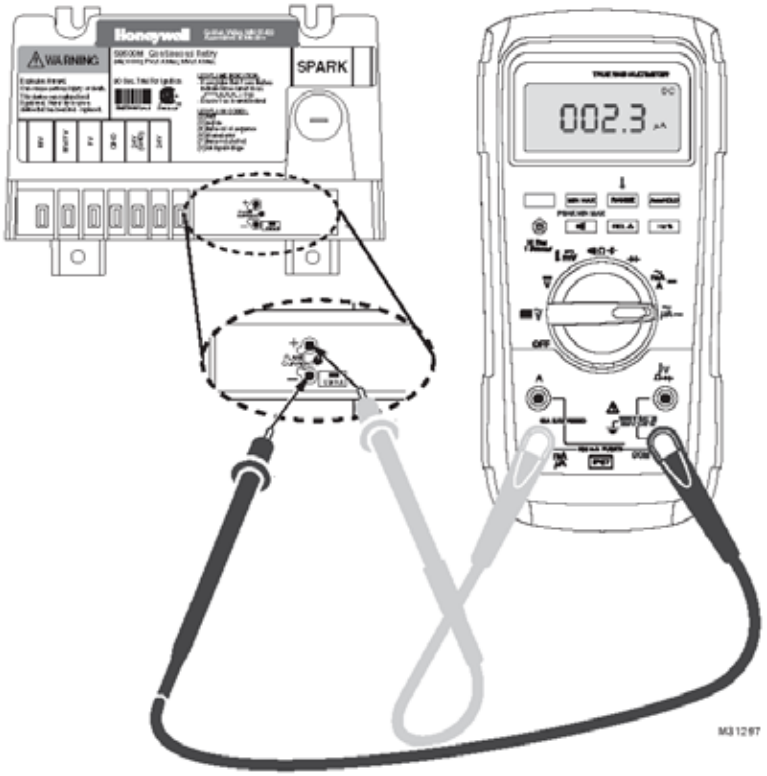


Figure 21B: Measuring Pilot Flame Current with Micro-ammeter

d. The **minimum steady pilot flame signal must be 1 µAmp** (microampere) **DC** (direct current).

e. **For reliable operation** the flame current should be **2 µAmp or greater**.

f. To ensure **adequate flame current**:

i. Turn off boiler power at circuit breaker or fuse box

ii. Clean the flame rod with emery cloth if required

iii. Make sure electrical connections are clean and tight, and wiring not damaged, repair/replace as needed

iv. Check for igniter/sensor cracked ceramic insulator, replace if needed

v. Check the pilot flame. It must be blue, steady and envelop the flame sensing rod 3/8" to ½".

vi. If needed, adjust pilot flame by turning the gas valve pilot adjustment screw clockwise to decrease or counterclockwise to increase pilot flame. Always reinstall pilot adjustment screw cover and tighten securely upon completion to assure proper gas valve operation.

g. Reconnect MV lead wire to the module upon satisfactory completion of pilot flame current measurement.

h. Check the pilot burner operation/ignition sequence during ignition cycle:

i. Restore boiler power at circuit breaker or fuse box.

ii. Set thermostat to call for heat.

iii. Watch ignition sequence at burner.

iv. If spark does not stop after pilot lights, replace ignition module.

v. If main burners do not light or if main burners light but system locks out, check the module ground wire and gas control as described in Figure 28 " Honeywell Electronic Ignition Troubleshooting Guide".

Table 6: Green LED Flame Codes

Green LED Flash Code[a]	Indicates	Next System Action	Recommended Service Action
OFF	No "Call for Heat"	N/A	None
Flash Fast	Power up - internal check	N/A	None
Heartbeat	Normal startup - ignition sequence started (including prepurge)	N/A	None
4 Seconds ON then "x" flashes	Device in run mode. "x" = flame current to the nearest µA.	N/A	None
2	5 minute Retry Delay - Pilot flame not detected during trial for ignition	Initiate new trial for ignition after retry delay completed.	If system fails to light on next trial for ignition check gas supply, pilot burner, spark and flame sense wiring, flame rod contamination or out of position, burner ground connection.
3	Recycle - Flame failed during run	Initiate new trial for ignition. Flash code will remain through the ignition trial until flame is proved.	If system fails to light on next trial for ignition, check gas supply, pilot burner, flame sense wiring, contamination of flame rod, burner ground connection.
4	Flame sensed out of sequence	If situation self corrects within 10 seconds, control returns to normal sequence. If flame out of sequence remains longer than 10 seconds, control will resume normal operation 1 hour after error is corrected.	Check for pilot flame. Replace gas valve if pilot flame present. If no pilot flame, cycle "Call for Heat." If error repeats, replace control.
6	Control Internal Error	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Cycle "Call for Heat". If error repeats, replace control.
7	Flame rod shorted to ground	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check flame sense lead wire for damage or shorting. Check that flame rod is in proper position. Check flame rod ceramic for cracks, damage or tracking.
8	Low secondary voltage supply- (below 15.5 Vac)	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check transformer and AC line for proper input voltage to the control. Check with full system load on the transformer.

[a]Flash Code Descriptions:

- Flash Fast: rapid blinking
- Heartbeat: Constant ½ second bright, ½ second dim cycles.
- 4 second solid on pulse followed by "x" 1 second flashes indicates flame current to the nearest µA. This is only available in run mode.
- A single flash code number signifies that the LED flashes X times at 2Hz, remains off for two seconds, and then repeats the sequence.

FOR YOUR SAFETY READ BEFORE LIGHTING

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 has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly.

B. BEFORE LIGHTING smell all around the appliance for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

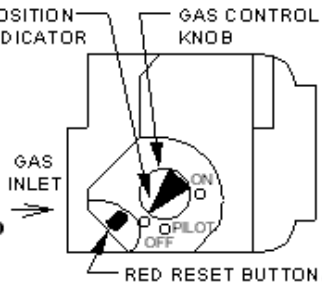
WHAT TO DO IF YOU SMELL GAS
- ➢ Do not try to light any appliance.
- ➢ Do not touch any electric switch; do not use any phone in your building.
- ➢ Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- ➢ If you cannot reach your gas supplier, call the fire 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.

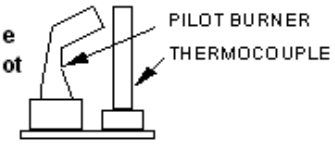
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

LIGHTING INSTRUCTIONS

1. STOP! Read the safety information above.
2. Read the lighting instructions all the way through before starting the procedure.
3. If equipped with a vent damper, set the room thermostat to highest setting and wait two (2) minutes for the damper to open.
4. Turn off all electric power to the appliance.
5. Set the room thermostat to lowest setting.
6. Remove front door.
7. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the blue or brown plastic knob located on top of the gas control valve.



8. Rotate gas control knob clockwise ↷ from "ON" position to "OFF" position.
9. 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. NOTE: Vent damper must be open during this five (5) minute wait period.
10. Remove the burner access panel located above the burners.
11. Find the pilot by following the aluminum tube from the gas control valve to the pilot located between the steel tube burners.



12. Turn gas control knob counterclockwise ↶ to "PILOT" position.
13. Push in red reset button and hold in. Immediately light the pilot with a match. Continue to hold the red reset button for about one (1) minute after the pilot is lit. Release button and it will pop back up. Pilot should remain lit. If it goes out, repeat Steps 8 - 13.
    - ➢ If button does not pop up when released, stop and immediately call your service technician or gas supplier.
    - ➢ If the pilot will not stay lit after several tries, turn gas control knob clockwise ↷ to "OFF" and call your service technician or gas supplier.
14. Replace burner access panel.
15. Turn gas control knob counterclockwise ↶ to "ON" position. Knob can be turned to "ON" only if red reset button is up.
16. Replace front door.
17. Turn on all electric power to the appliance.
18. Set room thermostat to desired setting.

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. Turn gas control knob clockwise ↷ to "OFF". Do not force.
5. Replace front door.

Figure 22: Lighting Instructions

B. See Figure 22 for continuous ignition system (standing pilot).

4. CHECK GAS INPUT RATE TO BOILER

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, NFPA 54/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 fourth digit after the dash in the model number. 2: 0-2000', 4 or 5: above 2000'.

A. Input Rate and Maximum Inlet Pressure shown on Rating Label must not be exceeded. Inlet pressure must not be lower than minimum inlet pressure shown on Rating Label.

B. All Rate checks and all adjustments are to be made while boiler is firing - all other appliances connected to the same meter as the boiler must be off.

C. With boiler off, water Manometer or water column gauge should be connected to a shut-off valve installed in the 1/8" outlet pressure tap in the gas valve (see Figure 19). By installing gas valve upstream of manometer, gas pressure can be introduced gradually - without shut-off valve, surge of pressure when boiler is turned on, could blow liquid out of manometer. Replace plug in gas valve when rate check is finished.

D. LP Gas Input:

Adjust Regulator on Gas Valve so that manifold pressure is 10 inches water column. Turning Regulator Adjusting Screw Clockwise increases pressure. Counterclockwise rotation decreases pressure.

E. Natural Gas Input

1. Appx. Input - Adjust regulator on Gas Valve so that manifold pressure is three and a half (3½) inches water column. Turning Regulator Adjusting Screw Clockwise increases pressure, Counterclockwise rotation decreases pressure. If more accurate check on input is necessary see (2) below.

   For minor input changes readjust Regulator Gas Valve to increase or decrease manifold pressure to obtain corresponding increase or decrease in gas input. If it is necessary to increase manifold pressure more than 0.3" of water to obtain rated input, remove orifices and drill one size larger. Reinstall and recheck input rate.

2. Additional Check on Input - Since input is a function of heating value, specific gravity, and volume of gas flow contact your utility for the first two items in order to utilize the formula below. The gas meter should then be clocked for three (3) minutes with stop watch and substituting the appropriate values in the formula below, determine what the gas flow should be in this 3 minute period to give the input shown on the Rating Label:

$$\text{Gas Input (cu. ft.) per 3 min.} = \frac{\text{Btuh Input}}{\text{Heating Value of Gas (Btu / cu. ft.}} \times \text{Multiplier from Table 3}$$

5. MAIN BURNER FLAMES should have a clearly defined inner cone (see Figure 23 or 24) with no yellow tipping. Orange-yellow streaks caused by dust should not be confused with true yellow tipping.

The main burners in this boiler will not operate cleanly or efficiently if they are contaminated with dirt and/or construction dust. Burners should be cleaned and the combustion chamber vacuumed following instructions in Section IV. Service.

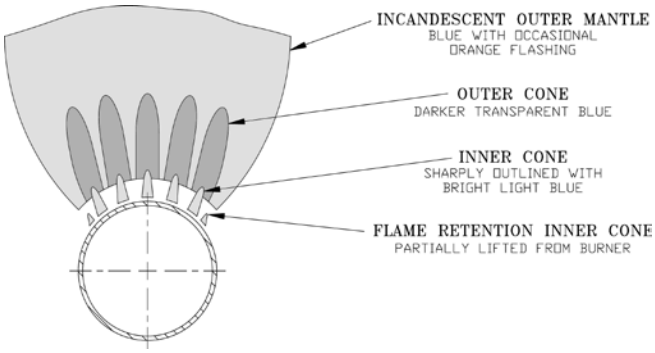


Figure 23: 40mm Main Burner Flame

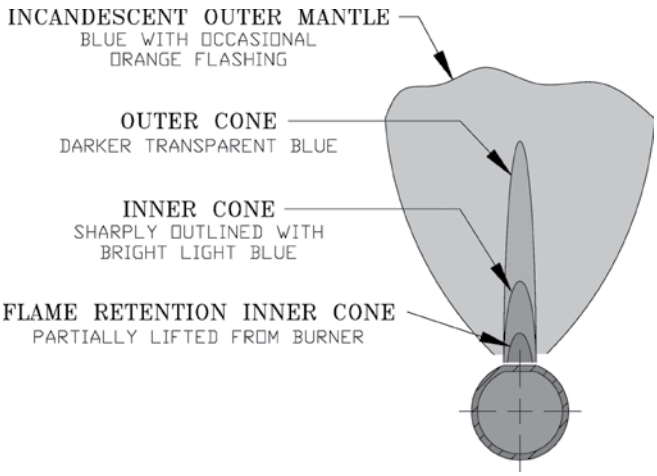


Figure 24: 1 Inch Main Burner Flame

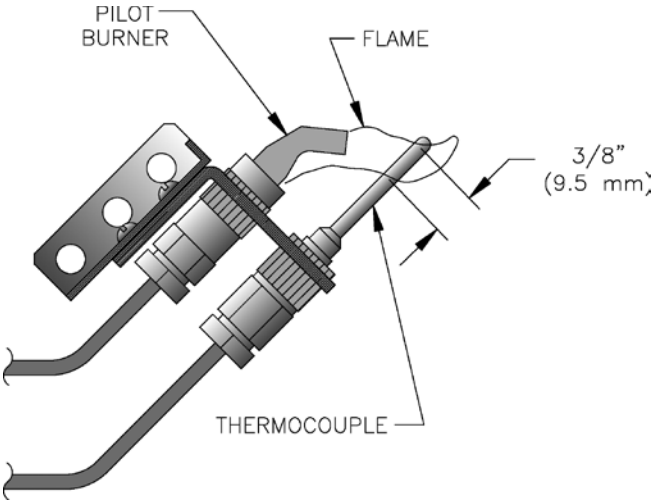


Figure 25: Typical Pilot Flame, Honeywell Q350

6. CHECK PILOT BURNER FLAME.

A. Continuous Ignition (Standing Pilot)

LP gas Models 202 and 202X. See Figure 25.

Natural gas Models 202 through 206 and 207 with 1" diameter burners. See Figure 25.

The pilot produces a single flame. The flame should be steady, medium hard blue enveloping 3/8 to a 1/2 inch of thermocouple.

B. Continuous Ignition (Standing Pilot)

Natural gas Models 207 with 40mm (1-9/16") diameter burners and 208 through 210. See Figure 26.

LP gas Models 203 through 210. See Figure 26.

The pilot produces three (3) flames. The center flame should be steady, medium hard blue enveloping 3/8 to a 1/2 inch of thermocouple.

C. Electronic Ignition (EI), see Figure 27.

The pilot produces three (3) flames. The center flame should be steady, medium hard blue enveloping 3/8 to a ½ inch of sensing probe.

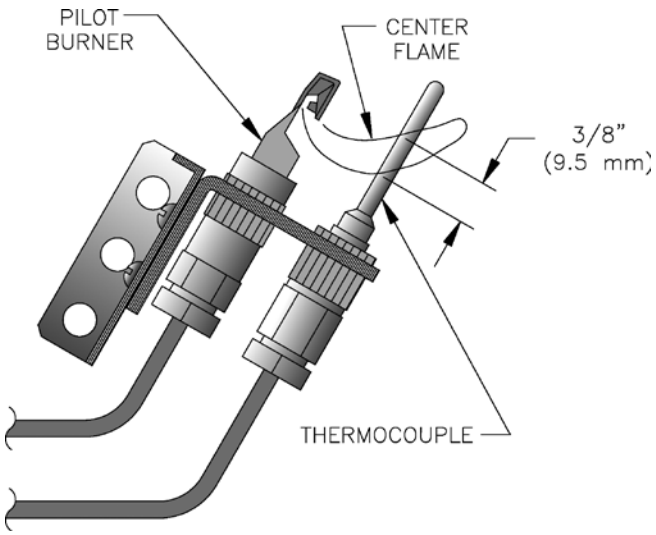


Figure 26: Typical Pilot Flame, Honeywell Q327

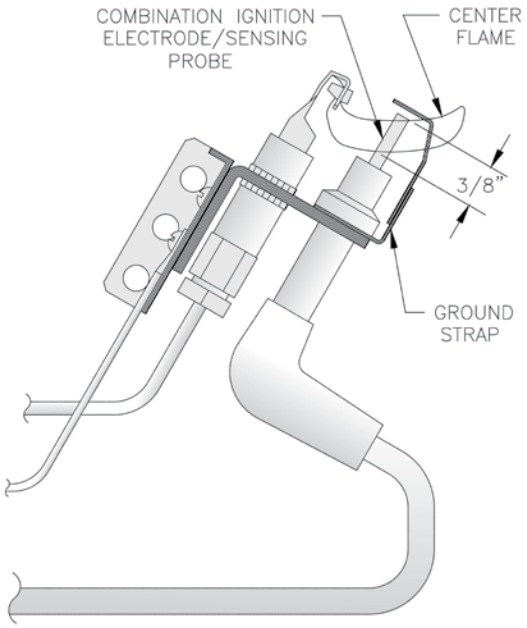


Figure 27: Typical Pilot Flame, Honeywell Q348A

7. CHECK THERMOSTAT OPERATION. Raise and lower temperature setting as required to start and stop burners.

8. CHECK HIGH LIMIT CONTROL. Jumper Thermostat Terminals or Thermostat connections in Limit Control. Allow burners to operate until shutdown by limit. REMOVE JUMPER.

9. CHECK DAMPER OPERATION. Vent Damper must be open when boiler is running. Le registre doit être ouvert lorsque le brûleur principal de l'appareil fonctionne. Start boiler, refer to instructions on damper to determine if damper is in the full open position.

10. CHECK IGNITION SYSTEM SAFETY SHUT-OFF DEVICE.

A. 24 volt-loosen thermocouple at gas valve.

B. Electronic Ignition - Remove pilot lead wires from gas valve.

If burners do not shut down determine cause of malfunction. Replace necessary items and check operation.

11. COMBUSTION CHAMBER BURN-OFF

A. The mineral wool combustion chamber panels may contain a cornstarch based binder that must be burned out at installation to prevent odors during subsequent boiler operation.

B. Ventilate the boiler room, set the high limit to its maximum setting, set the thermostat to call for heat. Allow the boiler to fire for at least an hour or until the odor from the cornstarch has dissipated.

C. Return the high limit and thermostat to their desired settings.

Honeywell Electronic Ignition Troubleshooting Guide

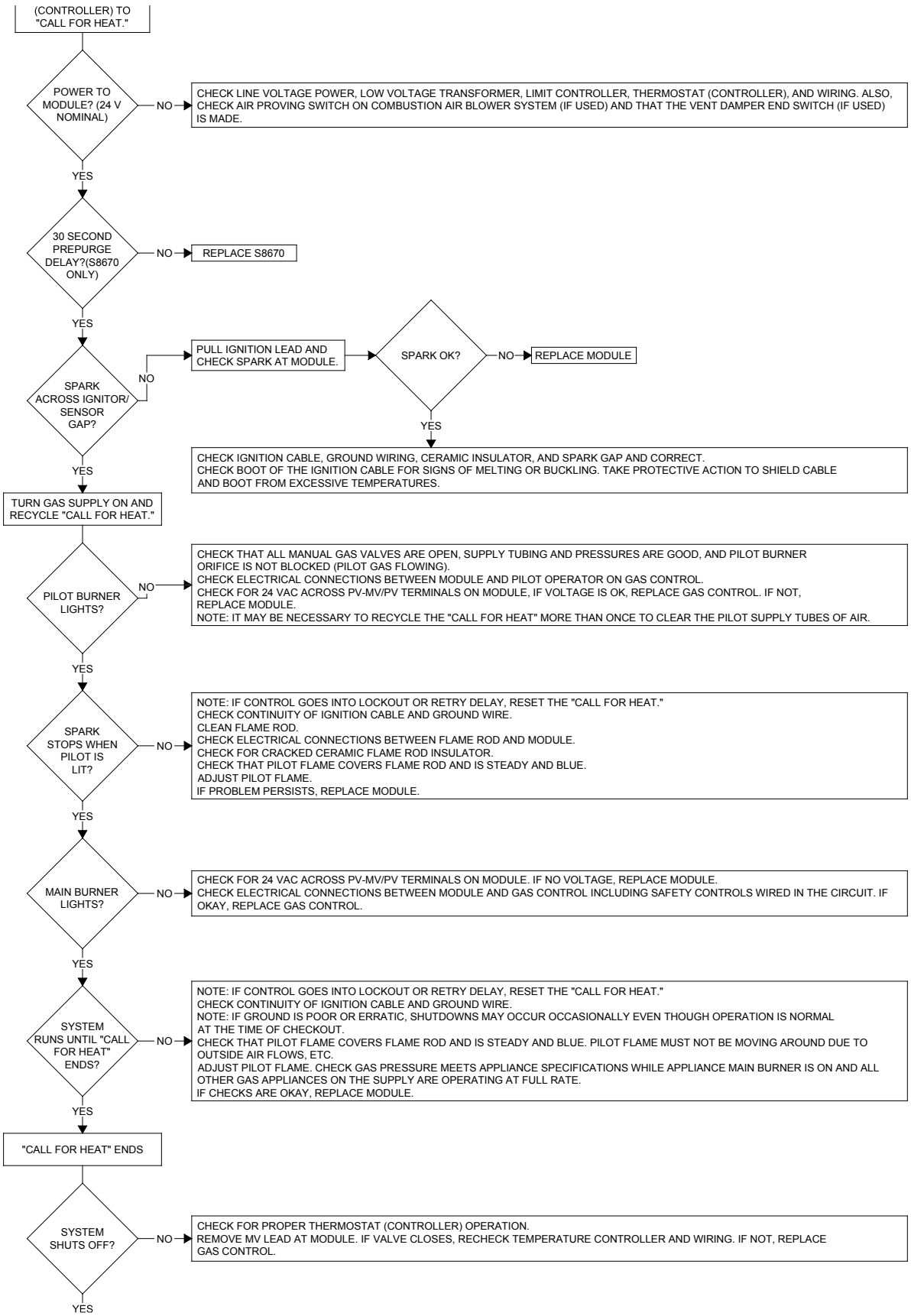


Figure 28: Troubleshooting Guide, Honeywell Electronic Ignition (EI)

1. Inspection should be conducted annually. Service as frequently as specified in paragraphs below. While service or maintenance is being done, Electrical Power and all Gas Supply to the Boiler must be "off".

CAUTION

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

ATTENTION. Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Les erreurs de câblage peuvent nuire au bon fonctionnement et être dangereuses.
S'assurer que l'appareil fonctionne adéquatement une fois l'entretien terminé.

2. VENT SYSTEM. Vent system (see Figure 8 for typical installation) should be checked annually for:

A. Obstructions.

B. Accumulations of soot.

C. Deterioration of vent pipe or vent accessories due to condensation or other reasons.

D. Proper support - no sags, particularly in horizontal runs.

E. Tightness of joints.

F. Proper vent damper operation - see Section II Operating Instructions, paragraph 9.

G. Remove all accumulations of soot with wire brush and vacuum, see Figure 29. Remove all obstructions. Replace all deteriorated parts and support properly. Seal all joints.

3. CLEANING BOILER FLUES, see Figure 29.

Flue passageways in the boiler sections should be checked annually for any blockage or accumulation of soot. To obtain access to flueways:

A. Remove vent pipe, damper (if boiler is so equipped), blocked vent switch, and draft hood.

B. Remove sheet metal screws securing Jacket Top Panel, lift panel and rotate about relief valve piping until top of boiler is exposed.

C. Remove bolts securing Canopy to Boiler Sections. Remove Canopy - flueways are now exposed.

D. Models with flue gas baffles only: Remove baffles by lifting out of flueways.

Using flashlight, examine all flue passageways. If passageways are free of soot and obstruction, replace canopy (and flue gas baffles, if applicable), and seal.

Reinstall Jacket Top Panel, draft hood, blocked vent switch, damper (if boiler is so equipped), and vent pipe.

If the flue passageways need cleaning, remove burners as described in paragraph 4 below. Using long handle wire or bristle flue brush and vacuum, brush flueways thoroughly from top of boiler as illustrated in Figure 29. Replace canopy and seal with boiler putty. Reinstall Jacket Top Panel, draft hood, blocked vent switch, damper (if boiler is so equipped), and vent pipe.

NOTICE

4. BURNERS AND FIREBOX SHOULD BE CLEANED ANNUALLY, AND IF NECESSARY ADJUSTED ONCE A YEAR BY A QUALIFIED SERVICE AGENCY.

A. TO REMOVE BURNERS FOR CLEANING, CHANGING ORIFICE PLUGS, OR REPAIRS.

1. Remove the jacket front panel.
2. Disconnect pilot tubing at the gas valve. See Figure 17.
3. Disconnect thermocouple (standing pilot) or pilot lead wires (electronic ignition) at the gas valve.
4. 40mm burners only. Remove injection shield assembly, where used. See Figure 30.
5. Remove wires to flame roll-out switch.
6. Remove the burner access panel.
7. Mark the location of the pilot main burner on the manifold if the marking on manifold is missing or obliterated.

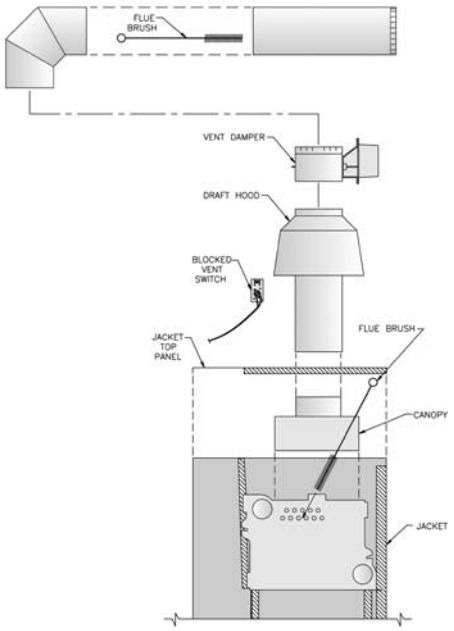


Figure 29: Cleaning of Vent System and Boiler Flues

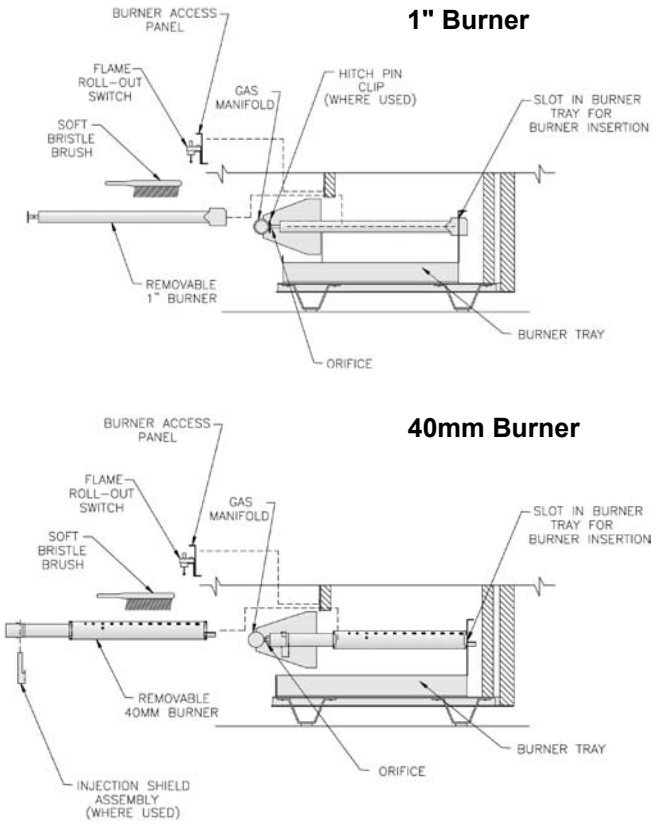


Figure 30: Burner Cleaning and Installation

8. Hold burner at throat. Lift front of burner to clear orifice. Burner which holds pilot can only be removed by lifting the burner adjacent to its right first.
9. Brush top of burners with a soft bristle brush, see Figure 30. Vacuum burners. Check orifices to see that drilled passageways are free of lint or dirt.
10. Vacuum tip of Pilot Burner.

B. CLEAN FIREBOX by vacuuming. Exercise care not to disturb insulation inside the base.

C. INSTALL BURNERS by reversing procedure used to remove burners. Make sure burner with pilot assembly is in same location as original installation - see Table 8.

Check burners to see that they are located properly in slot at rear of burner tray, see Figure 30. Reinstall injection shield assembly (40mm burners only, where used) and burner access panel. Reconnect flame roll-out switch wires, pilot gas supply, thermocouple lead or pilot lead.

D. CHECK MAIN BURNER and PILOT FLAMES, see procedure Section II Operating Instructions, paragraphs 5 and 6.

5. CHECK ALL CONTROL AND DAMPER OPERATION ANNUALLY see procedure in Section II Operating Instructions, paragraphs 7 through 10.

6. REMOVAL OR REPLACEMENT OF PILOT ASSEMBLY OR PILOT ASSEMBLY PARTS

If pilot assembly, thermocouple or pilot orifice need replacing, remove main burner with pilot using procedure described in paragraph 4.

A. To replace orifice:
1. Disconnect pilot tubing. The Honeywell Q350 pilot orifices are insert type retained by the compression fitting. The Honeywell Q327 and Q348A pilot orifices are spud type screwed into pilot burner. Replace with desired orifice. See Key No. 5B.
2. Reconnect pilot tubing and check for leaks.

B. To replace Honeywell Q309A thermocouple in Q327 or Q350 pilot:
1. Loosen attachment nut securing thermocouple to barrel of pilot burner. Disconnect other end at combination gas valve.
2. Remove thermocouple and replace with equal.

C. To replace complete pilot assembly.
1. Remove machine screws holding pilot burner to pilot bracket.
2. Disconnect pilot piping.
3. Disconnect all other leads to pilot.
4. Select pilot assembly with identical model number, reconnect leads and pilot tubing - resecure to pilot bracket.

D. To adjust or check spark gap between electrode and hood on Honeywell Q348A pilot.
1. Use round wire gauge to check spark gap.
2. Spark gap should be 1/8 inch for optimum performance.

E. Reinstall main burner following procedure described in paragraph 4.

7. LUBRICATION

There are no parts requiring lubrication on the part of the service technician or the User. Circulator bearings are water lubricated.

Table 8: Pilot Burner Location

Boiler Model	Main Burner with Pilot Bracket *		Pilot Burner Located Between Main Burners *	
	1 Inch	40mm	1 Inch	40mm
202	1	1	1 & 2	---
202X	1	1	1 & 2	1 & 2
203	1	1	1 & 2	1 & 2
204	2	2	2 & 3	2 & 3
205	3	2	3 & 4	2 & 3
206	4	3	4 & 5	3 & 4
207	6	3	6 & 7	3 & 4
208	7	4	7 & 8	4 & 5
209	8	4	8 & 9	4 & 5
210	9	5	9 & 10	5 & 6

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

Important Product Safety Information
Refractory Ceramic Fiber Product

Warning:

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures about 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace RCF parts 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 airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

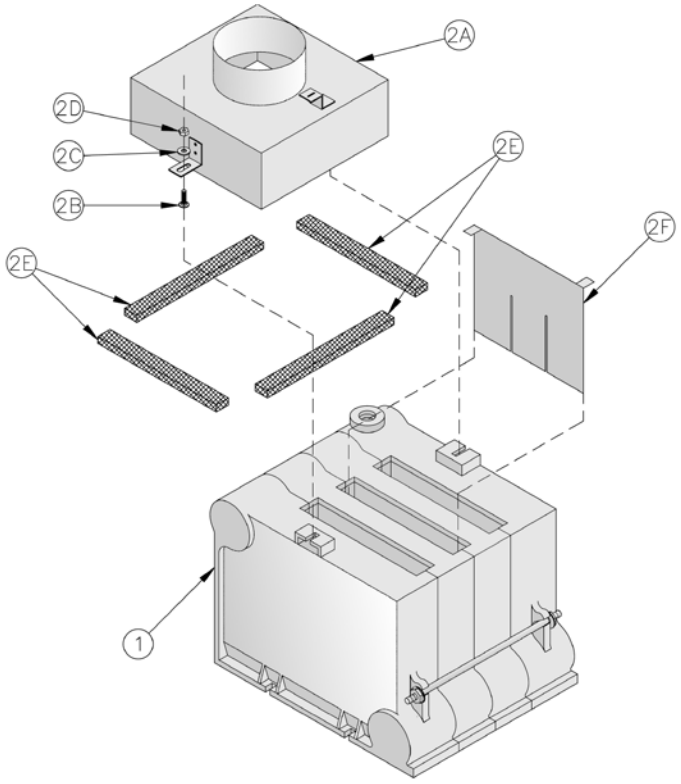
First Aid Procedures:

- 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.

V. Repair Parts

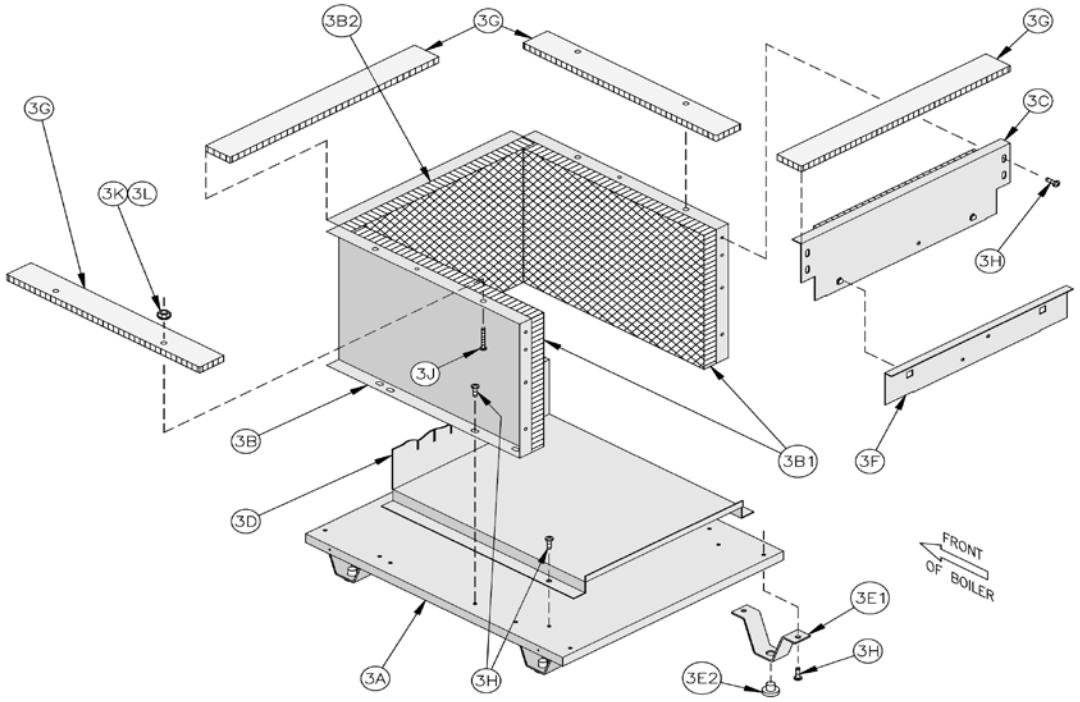
Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
1. Section Assembly (Intermittent and Continuous Circulation Only)												
1	Section Assembly, Complete	617170221	1	---	---	---	---	---	---	---	---	---
		617170321	---	1	1	---	---	---	---	---	---	---
		617170421	---	---	---	1	---	---	---	---	---	---
		617170521	---	---	---	---	1	---	---	---	---	---
		617170621	---	---	---	---	---	1	---	---	---	---
		617170721	---	---	---	---	---	---	1	---	---	---
		617170821	---	---	---	---	---	---	---	1	---	---
		617170921	---	---	---	---	---	---	---	---	1	---
		617171021	---	---	---	---	---	---	---	---	---	1
1. Section Assembly (Gravity Circulation Only)												
1	Section Assembly, Complete	617170231	1	---	---	---	---	---	---	---	---	---
		617170331	---	1	1	---	---	---	---	---	---	---
		617170431	---	---	---	1	---	---	---	---	---	---
		617170531	---	---	---	---	1	---	---	---	---	---
		617170631	---	---	---	---	---	1	---	---	---	---
		617170731	---	---	---	---	---	---	1	---	---	---
		617170831	---	---	---	---	---	---	---	1	---	---
		617170931	---	---	---	---	---	---	---	---	1	---
		617171031	---	---	---	---	---	---	---	---	---	1

Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
2. Canopy Group												
2A	Canopy Assembly (except for 206H)	61117022	1	---	---	---	---	---	---	---	---	---
		611170300	---	1	---	---	---	---	---	---	---	---
		611170302	---	---	1	---	---	---	---	---	---	---
		611170402	---	---	---	1	---	---	---	---	---	---
		611170502	---	---	---	---	1	---	---	---	---	---
		611170602	---	---	---	---	---	1	---	---	---	---
		611170702	---	---	---	---	---	---	1	---	---	---
		611170802	---	---	---	---	---	---	---	1	---	---
		611170902	---	---	---	---	---	---	---	---	1	---
		611171002	---	---	---	---	---	---	---	---	---	1
	Canopy Assembly 206H	6111706010	---	---	---	---	---	1	---	---	---	---
2B	Carriage Bolt, 1/4-20 x 1"	80860115	2	2	2	2	2	2	2	2	2	2
2C	Flat Washer, 1/4"	80860603	2	2	2	2	2	2	2	2	2	2
2D	Nut, Hex, 1/4-20	80860407	2	2	2	2	2	2	2	2	2	2
2E	Cerafelt Sealing Strip, 1/2" x 1" x 10'	6206001	1	1	1	1	1	1	1	1	1	1
2F	Flue Gas Baffle (*Standing Pilot 1" Burners Only) (** LP Standing Pilot 1" Burners Only) (*** Standing Pilot Models Only)	71106001	1***	---	2**	3**	4**	5**	6**	7*	8*	9*



Section Assembly and Canopy Group

THIS PAGE LEFT INTENTIONALLY BLANK



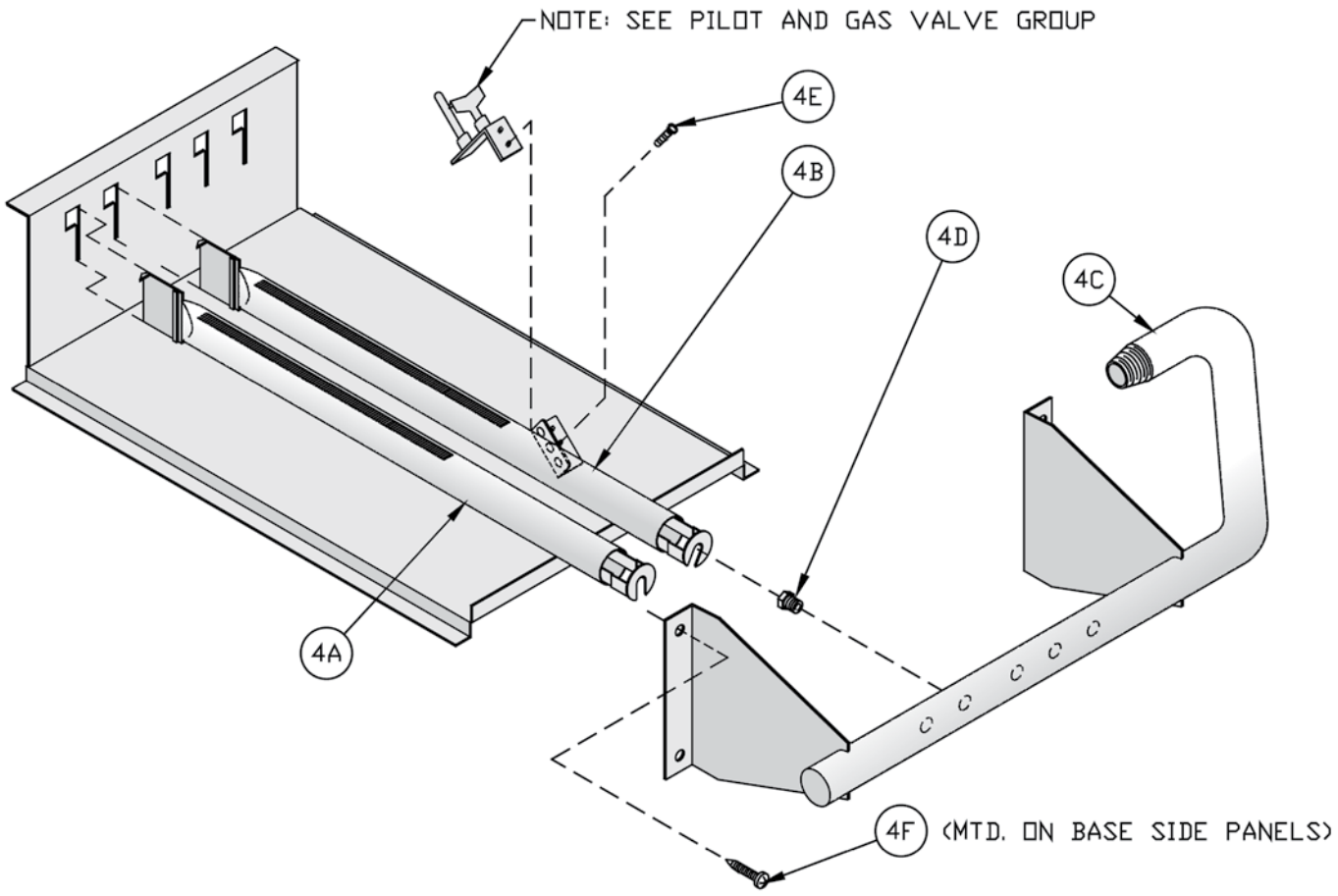
Base Assembly

Key No.	Description	Boiler Size	Part No.	Qty.
3. Base Assembly				
3	Base Assembly (Complete) Available for 1 Inch Burners Only	202	618600291	1
		202X	618600391	1
		203	618600391	1
		204	618600491	1
		205	618600591	1
		206	618600691	1
		207	618600791	1
		208	618600891	1
		209	618600991	1
		210	618601091	1
3A	Base Tray	202	718600291	1
		202X	718600391	1
		203	718600391	1
		204	718600491	1
		205	718600591	1
		206	718600691	1
		207	718600791	1
		208	718600891	1
		209	718600991	1
		210	718601091	1

Key No.	Description	Boiler Size	Part No.	Qty.
3. Base Assembly Continued				
3B	Base Wrapper	202	718600211	1
		202X	718600311	1
		203	718600311	1
		204	718600411	1
		205	718600511	1
		206	718600611	1
		207	718600711	1
		208	718600811	1
		209	718600911	1
		210	718601011	1
3B1	Base End Insulation	All	720601	2
3B2	Base Rear Insulation	202	72060025	1
		202X	72060035	1
		203	72060035	1
		204	72060045	1
		205	72060055	1
		206	72060065	1
		207	72060075	1
		208	72060085	1
		209	72060095	1
		210	72060105	1

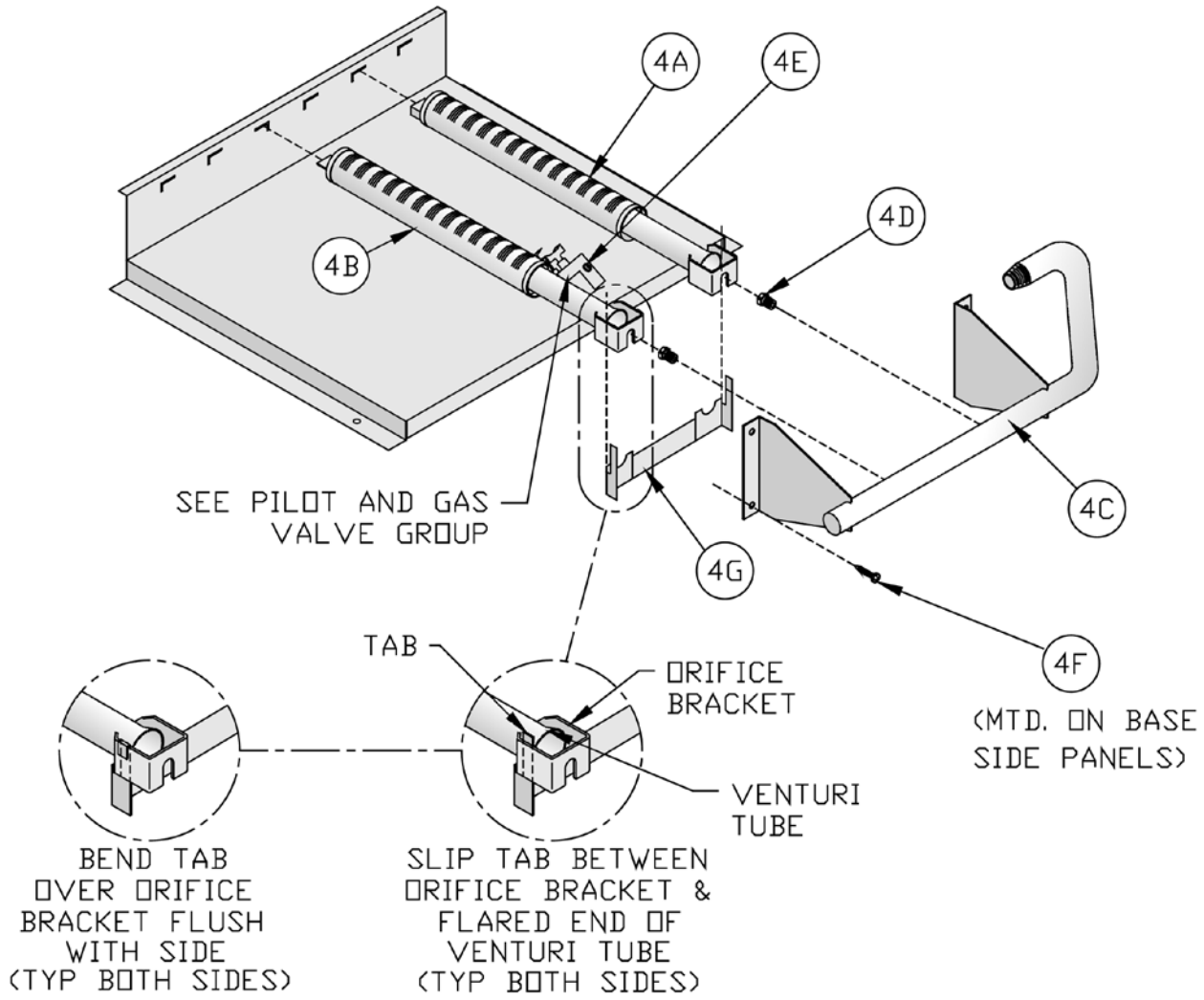
Key No.	Description	Boiler Size	Part No.	Qty.
3. Base Assembly Continued				
3C	Base Front Panel Assembly	202	618600241	1
		202X	618600341	1
		203	618600341	1
		204	618600441	1
		205	618600541	1
		206	618600641	1
		207	618600741	1
		208	618600841	1
		209	618600941	1
		210	618601041	1
3D	Burner Tray (1" Main Burners)	202	718600205	1
		202X	718600305	1
		203	718600305	1
		204	718600405	1
		205	718600505	1
		206	718600605	1
		207	718600705	1
		208	718600805	1
		209	718600905	1
		210	718601005	1
	Burner Tray (40mm Main Burners)	202	718600206	1
		202X	71806037	1
		203	71806037	1
		204	71806047	1
		205	71806057	1
		206	71806067	1
		207	71806077	1
		208	718600806	1
		209	718600906	1
		210	718601006	1

Key No.	Description	Boiler Size	Part No.	Qty.
3. Base Assembly Continued				
3E	Base Leg Assembly	All	6186001	4
3E1	Base Leg	All	71860021	4
3E2	Nylon Glide	All	8186006	4
3F	Burner Access Panel	202	718600261	1
		202X	718600361	1
		203	718600361	1
		204	718600461	1
		205	718600561	1
		206	718600661	1
		207	718600761	1
		208	718600861	1
		209	718600961	1
		210	718601061	1
3G	Cerafelt Sealing Strip, 1" x 2" x 10' (Section Assembly to Base)	All	6206002	1
3H	Self-Tapping Screw, 1/4" -20 x 1/2"	202 thru 206	80860700	20
		207 thru 210	80860700	21
3J	Self-Tapping Screw, 5/16" -18 x 1-1/4"	All	80860717	4
3K	Flat Washer, 5/16", USS	All	80860601	4
3L	Hex Lock Nut, 5/16 -18	All	80860464	4



Manifold and Main Burners
(1 Inch Main Burners)

Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
4. Manifold and Main Burners (1 Inch Main Burners Only)												
4A	Main Burner	8236099	1	2	2	4	6	8	11	13	15	17
4B	Main Burner with Pilot Bracket	-----	See Table Below									
4C	Manifold	82260023	1	---	---	---	---	---	---	---	---	---
		82260033	---	1	1	---	---	---	---	---	---	---
		82260043	---	---	---	1	---	---	---	---	---	---
		82260053	---	---	---	---	1	---	---	---	---	---
		82260063	---	---	---	---	---	1	---	---	---	---
		82260073	---	---	---	---	---	---	1	---	---	---
		82260083	---	---	---	---	---	---	---	1	---	---
		82260093	---	---	---	---	---	---	---	---	1	---
		82260103	---	---	---	---	---	---	---	---	---	1
4D	Main Burner Orifice	-----	See Table Below									
4E	Screw, Machine, Slotted Round Head, #10 -32 x 3/16" (Standing Pilot)	80860800	2	2	2	2	2	2	2	2	2	2
	Screw, Machine, Philips Head w/Captive Lockwasher, #10 -32 x 1/4" (Electronic Ignition)	80860874	1	1	1	1	1	1	1	1	1	1
4F	Screw, Self Tapping, Philips Pan Head, 1/4 - 20 x 1/2"	80860700	4	4	4	4	4	4	4	4	4	4
4B. 1 Inch Main Burner with Pilot Bracket, 24-volt Continuous Ignition (Standing Pilot) Natural Gas Only												
4B	Main Burner with 70° Q350 Pilot Bracket and Offset Lancings	8236097	1	1	1	1	1	1	1	---	---	---
	Main Burner with 60° Pilot Bracket	8236098	---	---	---	---	---	---	---	1	1	1
4B. 1 Inch Main Burner with Pilot Bracket, 24-volt Continuous Ignition (Standing Pilot) LP Gas Only												
4B	Main Burner with 45° Pilot Bracket	8236111	---	---	1	1	1	1	1	1	1	1
4B. 1 Inch Main Burner with Pilot Bracket, Electronic Ignition Only												
4B	Main Burner with 60° Pilot Bracket	8236098	1	1	1	1	1	1	1	1	1	1
4D. 1 Inch Main Burner Orifices, Natural Gas, Normal Altitude, U.S.A. and Canada												
4D	Main Burner Orifice, #47 (White)	822710	2	3	---	---	---	---	12	14	16	18
	Main Burner Orifice, #45 (Pink)	822711	---	---	3	5	7	9	---	---	---	---
4D. 1 Inch Main Burner Orifices, LP/Propane, Normal Altitude, U.S.A. and Canada												
4D	Main Burner Orifice, 1.25 mm (Purple)	822705	2	---	---	5	7	9	---	---	---	---
	Main Burner Orifice, #55 (Green)	822708	---	---	3	---	---	---	---	---	---	---
	Main Burner Orifice, 3/64" (Blue)	822704	---	3	---	---	---	---	12	14	16	18

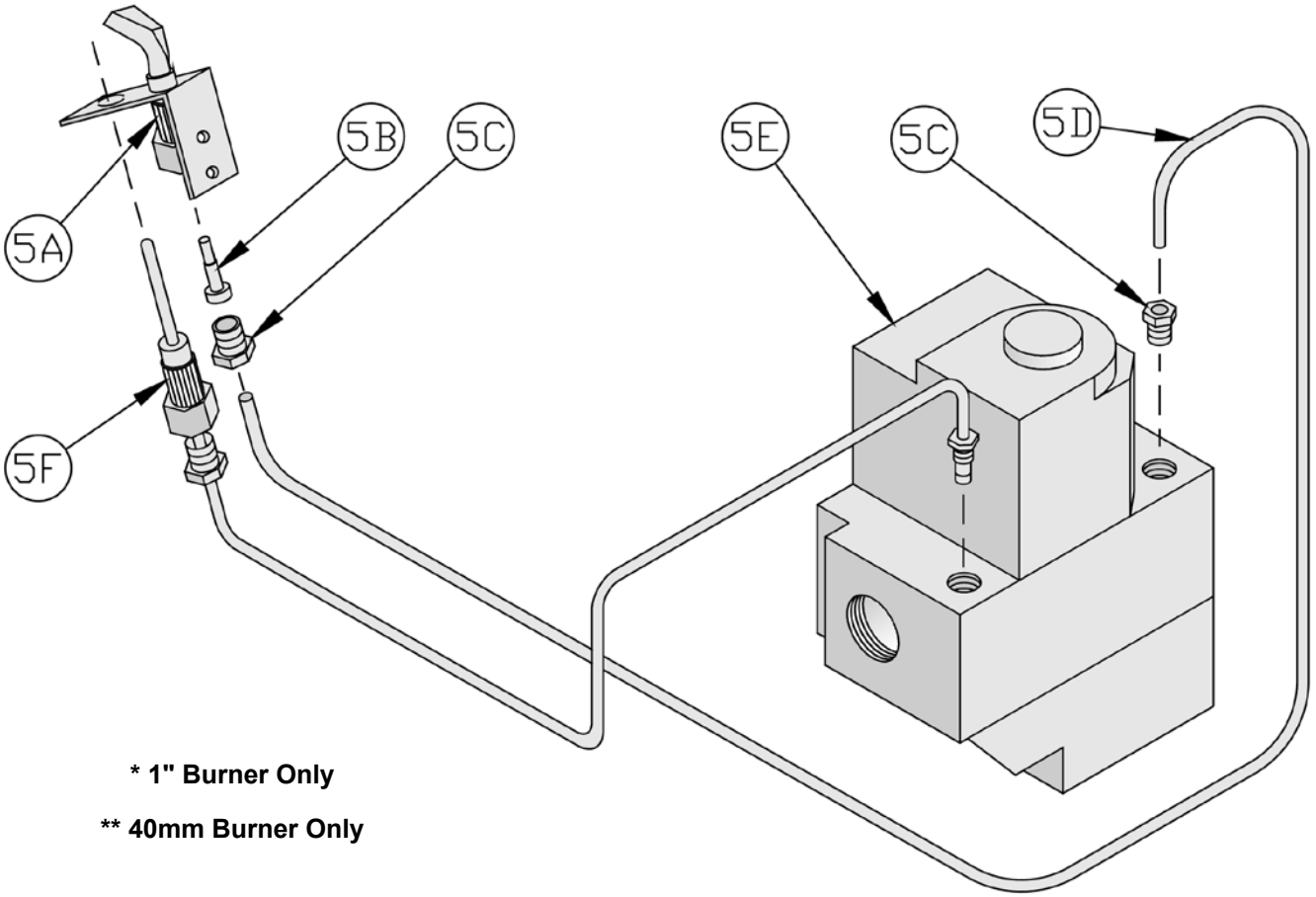


Manifold and Main Burners
(40mm Main Burners)

Key No.	Description	Part No.	Quantity								
			202X	203	204	205	206	207	208	209	210
4. 40 MM Main Burners Only											
4A	Main Burner	8236135	1	1	2	3	4	5	6	7	8
4B. 40 MM Main Burner, Electronic Ignition Only											
4B	Main Burner with 48° Pilot Bracket	8236143	---	---	---	---	---	---	---	---	---
	Main Burner with 41° Pilot Bracket	8236136	1	1	1	1	1	1	1	1	1
4B. 40 MM Main Burner, 24-volt Continuous Ignition (Standing Pilot) Natural Gas Only											
4B	Main Burner with 48° Pilot Bracket	8236143	1	1	1	1	1	1	1	1	1
	Main Burner with 41° Pilot Bracket	8236136	---	---	---	---	---	---	---	---	---
4B. 40 MM Main Burner, 24-volt Continuous Ignition (Standing Pilot) LP Gas Only											
4B	Main Burner with 48° Pilot Bracket	8236143	1	---	---	---	---	---	---	---	---
	Main Burner with 41° Pilot Bracket	8236136	---	1	1	1	1	1	1	1	1

Key No.	Description	Part No.	Quantity								
			202X	203	204	205	206	207	208	209	210
4. 40 MM Main Burners Only (Continued)											
4C. 40MM Main Burner Manifold											
4C	Manifold	82260028	---	---	---	---	---	---	---	---	---
		82260038	1	1	---	---	---	---	---	---	---
		82260048	---	---	1	---	---	---	---	---	---
		82260058	---	---	---	1	---	---	---	---	---
		82260068	---	---	---	---	1	---	---	---	---
		82260078	---	---	---	---	---	1	---	---	---
		82260088	---	---	---	---	---	---	1	---	---
		82260098	---	---	---	---	---	---	---	1	---
		82260108	---	---	---	---	---	---	---	---	1
4D. 40 MM Main Burner Orifices Natural Gas, 2001-5000 Ft. USA Only											
4D	#43	822713	2	---	---	---	---	---	---	---	---
	#39	822727	---	2	3	---	---	---	---	---	---
	#38	822720	---	---	---	4	5	6	7	8	9
4D. 40 MM Main Burner Orifices, LP Gas, 2001-5000 Ft. USA Only											
4D	#54	822734	2	---	---	---	---	---	---	---	---
	#53	822722	---	2	3	4	5	6	7	8	9
4D. 40 MM Main Burner Orifices, Natural Gas, 5001-9000 Ft. USA Only											
4D	#41	822729	N/A	2	3	---	---	---	---	---	---
	#40	822728	---	---	---	4	5	6	7	8	9
4D. 40 MM Main Burner Orifices, LP Gas, 5001-9000 Ft. USA Only											
4D	#54	822734	N/A	2	---	---	---	---	---	---	---
	#53	822722	---	---	3	4	5	6	7	8	9
4D. 40 MM Main Burner Orifices, Natural Gas, 2001-4500 Ft. Canada Only											
4D	#37	822719	N/A	2	3	4	---	---	---	---	---
	#36	822771	---	---	---	---	5	6	7	8	9
4D. 40 MM Main Burner Orifices, LP Gas, 2001-4500 Ft. Canada Only											
4D	#52	822721	N/A	2	3	4	5	6	7	8	9
4E	Screw, Machine, Slotted Round Head, #10-32 x 3/16" (Standing Pilot)	80860800	2	2	2	2	2	2	2	2	2
	Screw, Machine, Philips Head w/Captive Lockwasher, #10-32 x 1/4" (Electronic Ignition)	80860874	1	1	1	1	1	1	1	1	1
4F	Screw, Self Tapping, Philips Pan Head, 1/4 -20 x 1/2"	80860700	4	4	4	4	4	4	4	4	4
4G	Injection Shield Assembly	71860_ _62	A/R	A/R	A/R	A/R	A/R	A/R	A/R	A/R	A/R

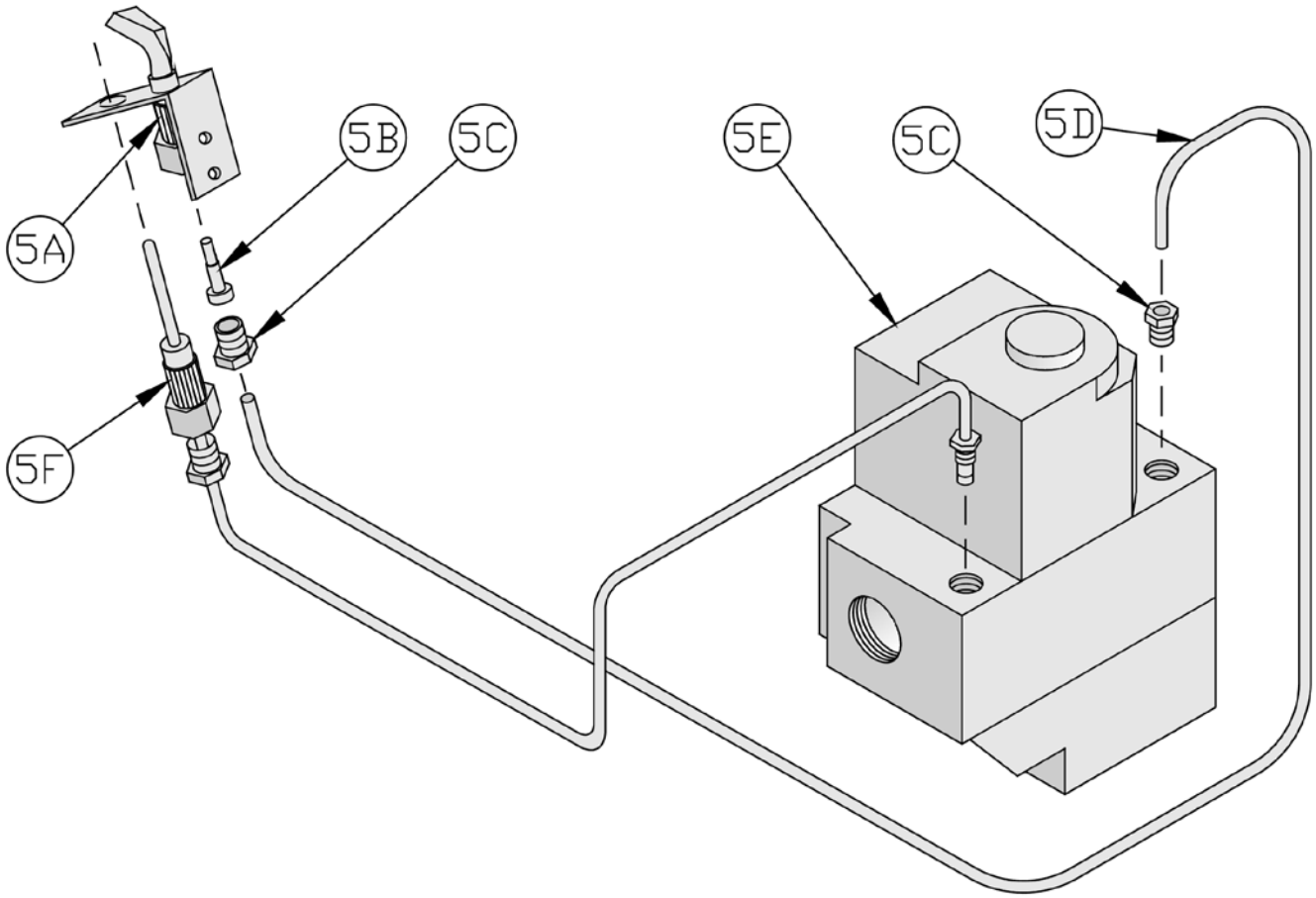
_ _: number of cast iron sections



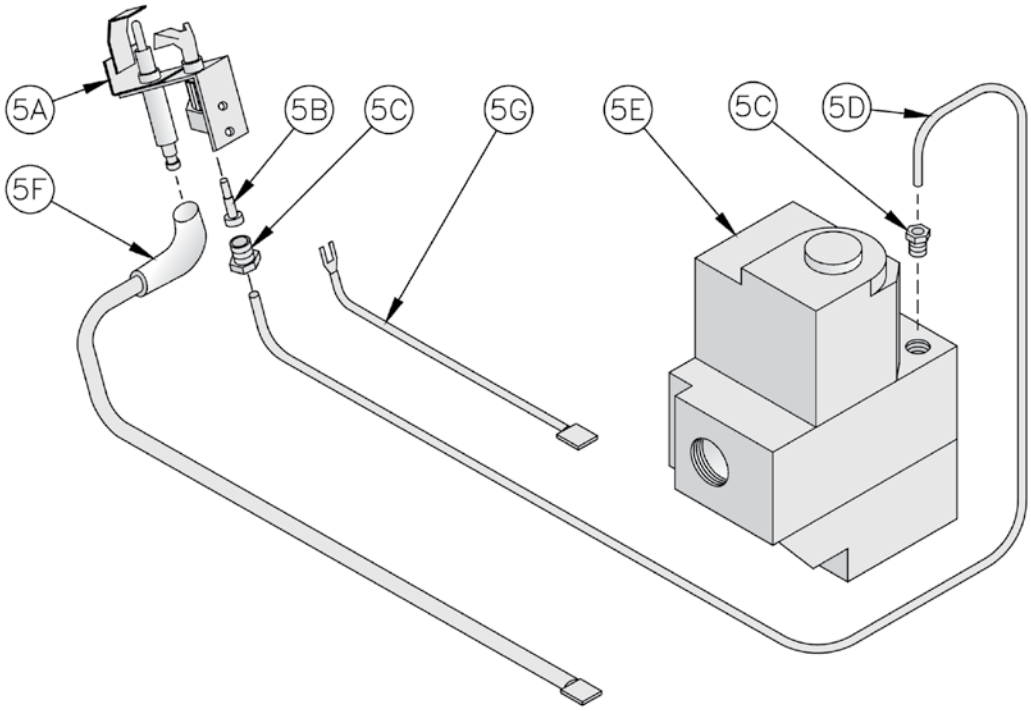
*** 1" Burner Only**

**** 40mm Burner Only**

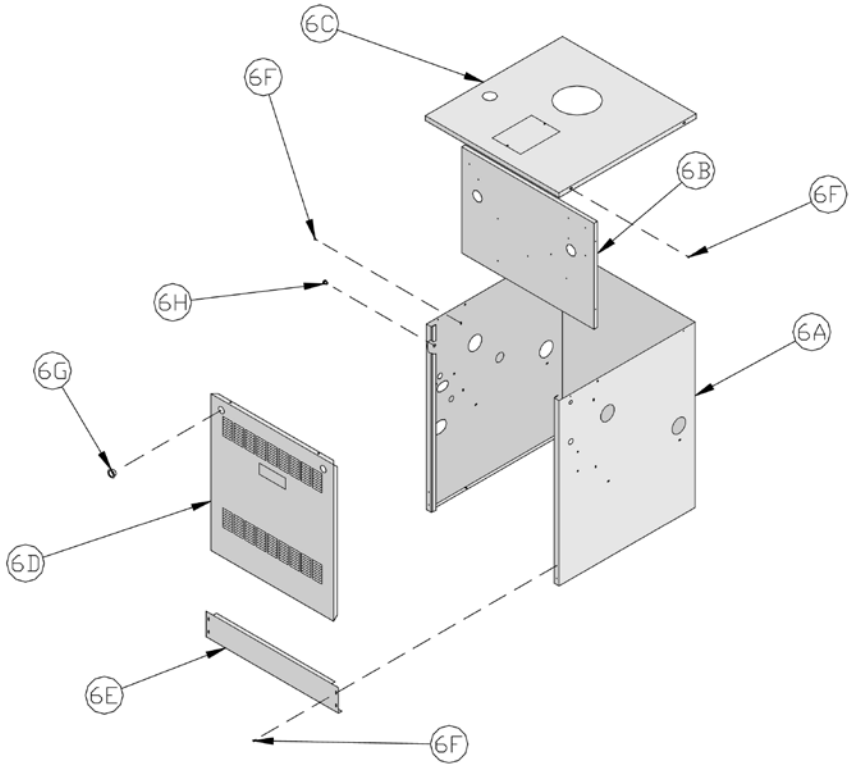
Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
5. Pilot Burner and Gas Valve, 24-volt Continuous Ignition, Natural Gas (1 Inch and 40mm Main Burners)												
5A	Pilot Burner, Honeywell Q350A1321	8236065	1	1	1	1	1	1	*1	---	---	---
	Pilot Burner, Honeywell Q327A1006	8236022	---	---	---	---	---	---	**1	1	1	1
5B	Pilot Orifice, Honeywell 390686-22 .012"	Included with 5A	1	1	1	1	1	1	---	---	---	---
	Pilot Orifice, Honeywell 388146AG .026"		---	---	---	---	---	---	1	1	1	1
5C	Adptr, 1/4"OD x 1/4" NPT Included w/5A & 5E	8236109	2	2	2	2	2	2	2	2	2	2
5D	Pilot Tubing, 1/4" OD x 30" LG	8236122	1	1	1	1	1	1	1	---	---	---
	Pilot Tubing, 1/4" OD x 40" LG	8236123	---	---	---	---	---	---	---	1	1	1
5E	Gas Valve, Honeywell VR8200C3005	81660143	1*	1*	1*	1*	1*	1*	---	---	---	---
	Gas Valve, Honeywell VR8300C4027	81660154	---	---	---	---	---	---	1*	1*	1*	1*
	Gas Valve, Honeywell VR8200C6065	100333-01	1**	1**	1**	1**	1**	1**	---	---	---	---
	Gas Valve, Honeywell VR8300C4266	100334-01	---	---	---	---	---	---	1**	1**	1**	1**
5F	Thermocouple, 30", Honeywell Q309A	8236024	1	1	1	1	1	1	1	1	1	1



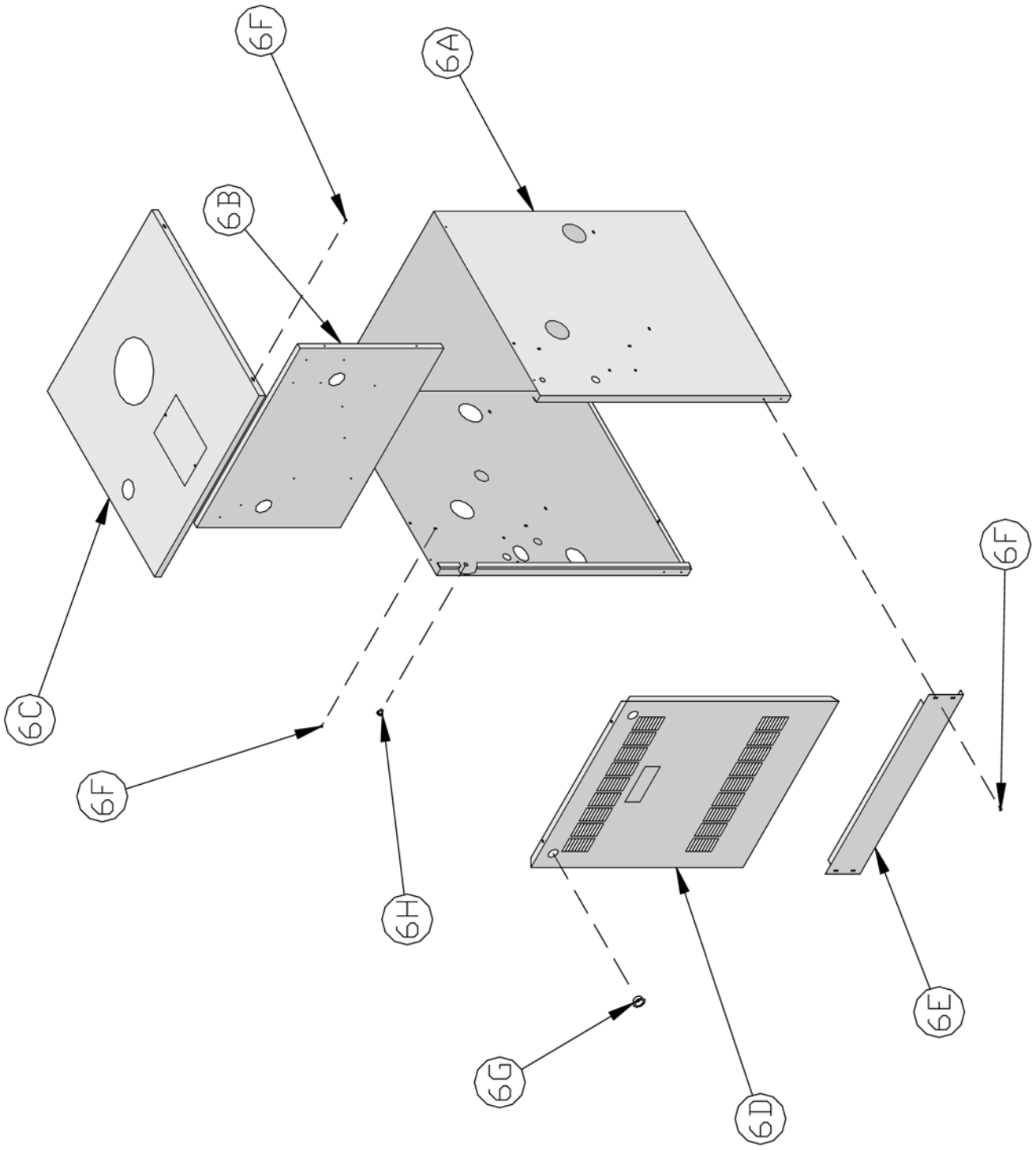
Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
5. Pilot Burner and Gas Valve, 24-volt Continuous Ignition, LP/Propane (1 Inch and 40mm Main Burners)												
5A	Pilot Burner, Honeywell Q327A1147	8236023	---	---	1	1	1	1	1	1	1	1
	Pilot Burner Assembly, Honeywell Q350A (Includes 5B & 5F)	8236105	1	1	---	---	---	---	---	---	---	---
5B	Pilot Orifice, Honeywell 388146KR (.014")	Included with 5A	---	---	1	1	1	1	1	1	1	1
	Pilot Orifice, Honeywell 390686-23 (.008")		1	1	---	---	---	---	---	---	---	---
5C	Adptr, 1/4"OD x 1/4" NPT Included w/5A & 5E	8236109	2	2	2	2	2	2	2	2	2	2
5D	Pilot Tubing, 1/4" OD x 30" LG	8236122	1	1	1	1	1	1	1	---	---	---
	Pilot Tubing, 1/4" OD x 40" LG	8236123	---	---	---	---	---	---	---	1	1	1
5E	Gas Valve, Honeywell VR8200C3013	81660144	1	1	1	1	1	1	---	---	---	---
	Gas Valve, Honeywell VR8300C4035	81660163	---	---	---	---	---	---	1	1	1	1
5F	Thermocouple, 30", Honeywell Q309A	8236024	1	1	1	1	1	1	1	1	1	1



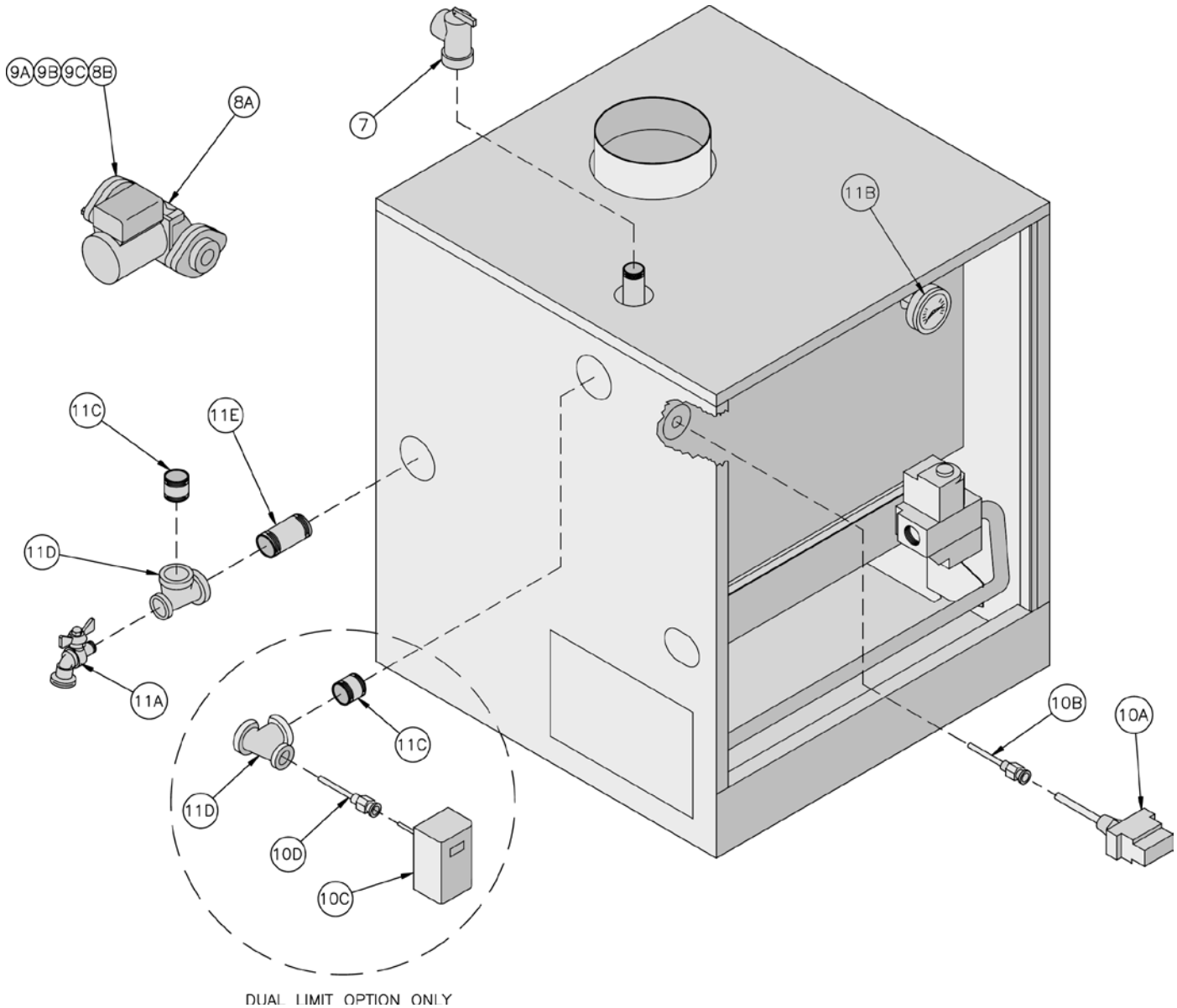
Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
5. Pilot Burner and Gas Valve, Electronic Ignition (EI), Natural Gas												
5A	Pilot Burner, Honeywell Q348A1002	8236072	1	1	1	1	1	1	1	1	1	1
5B	Pilot Orifice, Honeywell 388146NE	Included with 5A	1	1	1	1	1	1	1	1	1	1
5C	Compression Nut/Fitting, 1/4" OD x 1/4 C.C. (Included with 5A and 5E)	8236109	2	2	2	2	2	2	2	2	2	2
5D	Pilot Tubing, 1/4" OD x 30"	8236122	1	1	1	1	1	1	1	---	---	---
	Pilot Tubing, 1/4" OD x 40"	8236123	---	---	---	---	---	---	---	1	1	1
5E	Gas Valve, Honeywell VR8204C3007	81660145	1	1	1	1	1	1	---	---	---	---
	Gas Valve, Honeywell VR8304P4306	81660161	---	---	---	---	---	---	1	1	1	1
5F	Igniter/Sensor Cable, 36", Honeywell 394800	8236084	1	1	1	1	1	1	1	1	1	1
5G	Ground Wire Assembly	6136054	1	1	1	1	1	1	1	1	1	1
5. Pilot Burner and Gas Valve, Electronic Ignition (EI), LP/Propane												
5A	Pilot Burner, Honeywell Q348A1010	8236081	1	1	1	1	1	1	1	1	1	1
5B	Pilot Orifice, Honeywell 388146KP	Included with 5A	1	1	1	1	1	1	1	1	1	1
5C	Compression Nut/Fitting, 1/4" OD x 1/4 C.C. (Included with 5A and 5E)	8236109	2	2	2	2	2	2	2	2	2	2
5D	Pilot Tubing, 1/4" OD x 30"	8236122	1	1	1	1	1	1	1	---	---	---
	Pilot Tubing, 1/4" OD x 40"	8236123	---	---	---	---	---	---	---	1	1	1
5E	Gas Valve, Honeywell VR8204C3015	81660146	1	1	1	1	1	1	---	---	---	---
	Gas Valve, Honeywell VR8304P4314	81660160	---	---	---	---	---	---	1	1	1	1
5F	Igniter/Sensor Cable, 36", Honeywell 394800	8236084	1	1	1	1	1	1	1	1	1	1
5G	Ground Wire Assembly	6136054	1	1	1	1	1	1	1	1	1	1



Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
6. Jacket Assembly, Complete												
6	Jacket Assembly, Complete	604170254	1	---	---	---	---	---	---	---	---	---
		604170354	---	1	1	---	---	---	---	---	---	---
		604170454	---	---	---	1	---	---	---	---	---	---
		604170554	---	---	---	---	1	---	---	---	---	---
		604170654	---	---	---	---	---	1	---	---	---	---
		604170754	---	---	---	---	---	---	1	---	---	---
		604170854	---	---	---	---	---	---	---	1	---	---
		604170954	---	---	---	---	---	---	---	---	1	---
		604171054	---	---	---	---	---	---	---	---	---	1
6. Jacket Assembly												
6A	Jacket Wrap-Around Panel	604170215	1	---	---	---	---	---	---	---	---	---
		604170315	---	1	1	---	---	---	---	---	---	---
		604170415	---	---	---	1	---	---	---	---	---	---
		604170515	---	---	---	---	1	---	---	---	---	---
		604170615	---	---	---	---	---	1	---	---	---	---
		604170715	---	---	---	---	---	---	1	---	---	---
		604170815	---	---	---	---	---	---	---	1	---	---
		604170915	---	---	---	---	---	---	---	---	1	---
		604171015	---	---	---	---	---	---	---	---	---	1

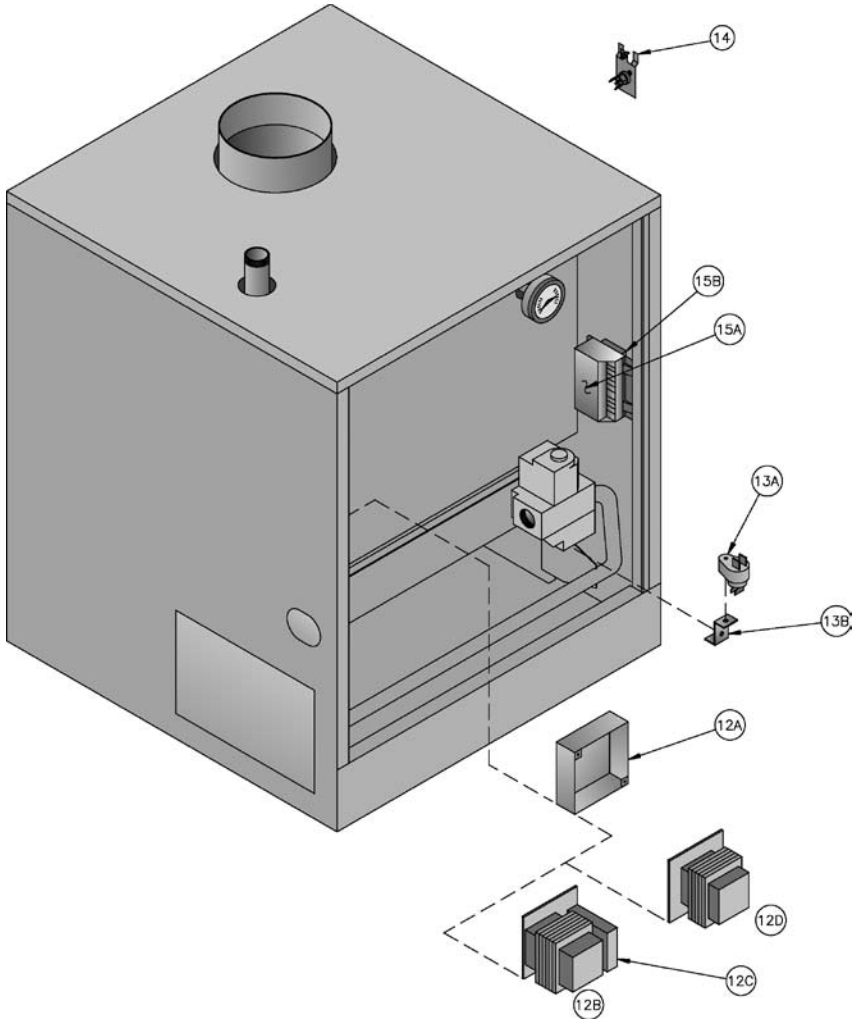

6F
6A
6B
6C
6F
6H
6F
6E
6G
6D

Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
6. Jacket Assembly (Continued)												
6B	Jacket Vestibule Panel	604170223	1	---	---	---	---	---	---	---	---	---
		604170323	---	1	1	---	---	---	---	---	---	---
		604170423	---	---	---	1	---	---	---	---	---	---
		604170523	---	---	---	---	1	---	---	---	---	---
		604170623	---	---	---	---	---	1	---	---	---	---
		604170723	---	---	---	---	---	---	1	---	---	---
		604170823	---	---	---	---	---	---	---	1	---	---
		604170923	---	---	---	---	---	---	---	---	1	---
		604171023	---	---	---	---	---	---	---	---	---	1
6C	Jacket Top Panel	604170233	1	---	---	---	---	---	---	---	---	---
		604170333	---	1	1	---	---	---	---	---	---	---
		604170433	---	---	---	1	---	---	---	---	---	---
		604170533	---	---	---	---	1	---	---	---	---	---
		604170633	---	---	---	---	---	1	---	---	---	---
		604170733	---	---	---	---	---	---	1	---	---	---
		604170833	---	---	---	---	---	---	---	1	---	---
		604170933	---	---	---	---	---	---	---	---	1	---
		604171033	---	---	---	---	---	---	---	---	---	1
6D	Jacket Front Removable Door	604170242	1	---	---	---	---	---	---	---	---	---
		604170342	---	1	1	---	---	---	---	---	---	---
		604170442	---	---	---	1	---	---	---	---	---	---
		604170542	---	---	---	---	1	---	---	---	---	---
		604170642	---	---	---	---	---	1	---	---	---	---
		604170742	---	---	---	---	---	---	1	---	---	---
		604170842	---	---	---	---	---	---	---	1	---	---
		604170942	---	---	---	---	---	---	---	---	1	---
		604171042	---	---	---	---	---	---	---	---	---	1
6E	Jacket Lower Front Panel	604170216	1	---	---	---	---	---	---	---	---	---
		604170316	---	1	1	---	---	---	---	---	---	---
		604170416	---	---	---	1	---	---	---	---	---	---
		604170516	---	---	---	---	1	---	---	---	---	---
		604170616	---	---	---	---	---	1	---	---	---	---
		604170716	---	---	---	---	---	---	1	---	---	---
		604170816	---	---	---	---	---	---	---	1	---	---
		604170916	---	---	---	---	---	---	---	---	1	---
		604171016	---	---	---	---	---	---	---	---	---	1
6F	Sheet Metal Screw, Type AB, Phillips Truss Head, #8 x 1/2"	80860000	26	26	26	26	26	26	26	26	26	26
6G	Snap Bushing, Heyco SB-1093-15	8136257	2	2	2	2	2	2	2	2	2	2
6H	Snap Bushing, Heyco SB-437-5	8136048	1	1	1	1	1	1	1	1	1	1

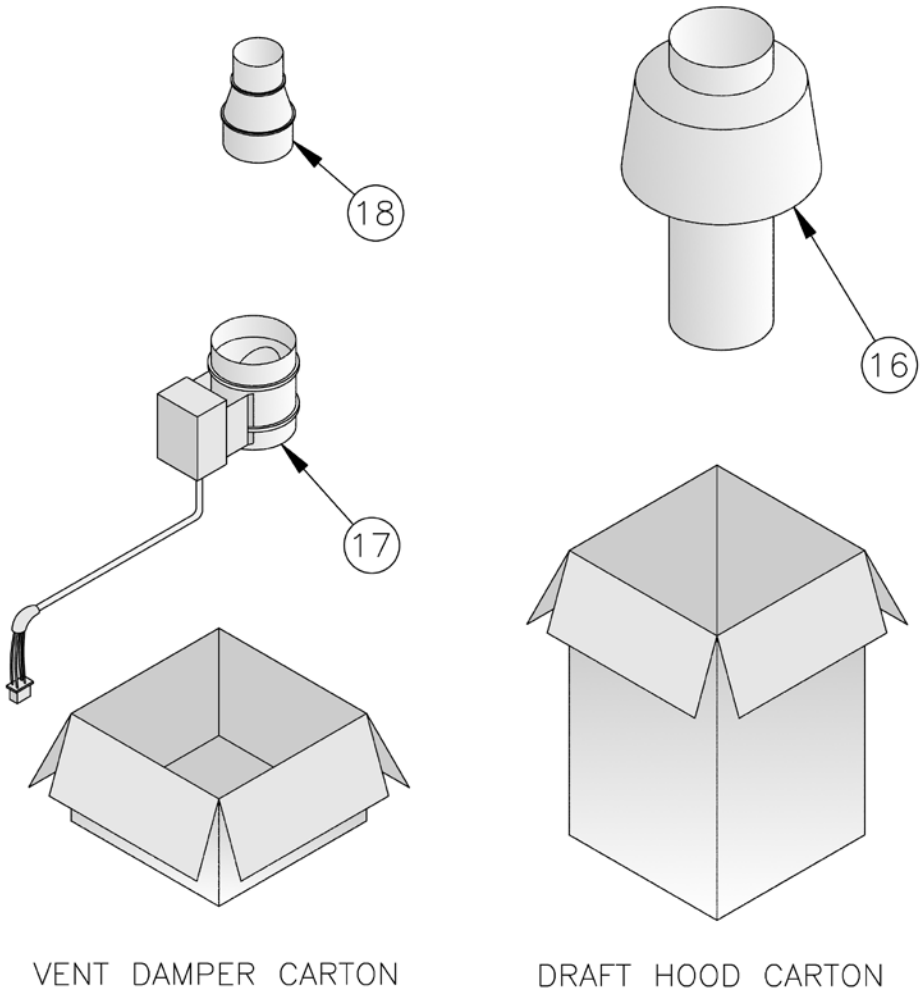

9A
9B
9C
8B
8A
7
11B
11C
11E
11D
11A
11C
11D
10D
10C
10B
10A
DUAL LIMIT OPTION ONLY

Water Trim

Key No.	Description	Part No.	Quantity
7	Safety Relief Valve, 30 psi, 3/4 NPT, Conbraco 10-408-05	81660319	1
	Safety Relief Valve, 50 psi, 3/4 NPT, Conbraco 10-303-10	101662-01	1
8. Circulator, Bell & Gossett SLC-30 Option (Intermittent and Continuous Circulation Only)			
8A	Circulator with Gaskets, Bell & Gossett NRF-22	8056174	1
8B	Gasket, Bell & Gossett NRF-22	806602029	2
8. Circulator, Grundfos Option (Intermittent and Continuous Circulation Only)			
8A	Circulator with Gaskets, Grundfos UP 15-42F	8056173	1
8B	Gasket, Grundfos 510179	806602016	2
8. Circulator, Taco 007 Option (Intermittent and Continuous Circulation Only)			
8A	Circulator with Gaskets, Taco 007F	8056170	1
8B	Gasket, Taco '00' Series	806602006	2
8. Circulator, Taco 0010 Option (Intermittent and Continuous Circulation Only)			
8A	Circulator with Gaskets, Taco 0010	8056176	1
8B	Gasket, Taco '00' Series	806602006	2
9. Miscellaneous Circulator Hardware (Intermittent and Continuous Circulation Only)			
9A	Flange, 1-1/4 NPT	806602013	2
9B	Screw, Cap Hex Head, 7/16 -14 x 1-1/2"	80861301	4
9C	Nut, Hex, 7/16 -14	80860406	4
10. Limit Control			
10A	Limit, Honeywell L4080D1234	100189-01	1
10B	Well, 1/2 NPT (Included w/10A)	----	1
10C	Limit, Honeywell L4080B1212 (Dual Limit Only)	80160474	1
10D	Well, 3/4 NPT, Honeywell 123870A (Dual Limit Only)	80160426	1
11. Miscellaneous Trim			
11A	Drain Valve, Conbraco 35-302-03	806603061	1
11B	Temperature - Pressure Gauge	100282-01	1
11C	Nipple, 1-1/4 NPT x 3"	806600005	1 or 2
11D	Tee, 1-1/4 x 3/4 x 1-1/4 NPT	806601002	1 or 2
11E	Nipple, 1-1/4 NPT x 4"	806600028	1



Key No.	Description	Part No.	Quantity
12. Transformer/Relay Assembly (Intermittent Circulation Only)			
12A	Junction Box, 4" x 4" x 1-1/2"	8136259	1
12B	Transformer/Relay, Honeywell R8285D5001	80160155U	1
12C	Relay, Honeywell R8222U1006	80160096U	1
12. Transformer (Continuous and Gravity Circulation Only)			
12A	Junction Box, 4" x 4" x 1-1/2"	8136259	1
12D	Transformer, 40VA, Honeywell AT140D1012 or AT72D1188	80160039	1
13. Flame Rollout Switch			
13A	Flame Rollout Switch	80160044	1
13B	Flame Rollout Switch Mounting Bracket	7186018	1
14. Blocked Vent Switch			
14	Blocked Vent Switch Replacement Assembly	6016058	1
15. Ignition Module (EI Only)			
15A	Ignition Module, Honeywell S8610M3009	100958-01	1
15B	Ignition Module Support Bracket	7016001	1



Key No.	Description	Part No.	Quantity									
			202	202X	203	204	205	206	207	208	209	210
16. Draft Hood Carton												
16	Draft Hood	8116067	1	1	1	---	---	---	---	---	---	---
		8111702	---	---	---	1	---	---	---	---	---	---
		8111703	---	---	---	---	1	1	---	---	---	---
		8111704	---	---	---	---	---	---	1	1	---	---
		8111705	---	---	---	---	---	---	---	---	1	1
17. Vent Damper												
17	4"	8116321	1	1	1	---	---	---	---	---	---	---
	5"	8116322	---	---	---	1	---	---	---	---	---	---
	6"	8116323	---	---	---	---	1	1	---	---	---	---
	7"	8116324	---	---	---	---	---	---	1	1	---	---
	8"	8116325	---	---	---	---	---	---	---	---	1	1
18. Vent Reducer												
18	Reducer, 4" x 3"	1	---	---	---	---	---	---	---	---	---	---

SERVICE RECORD

DATE SERVICE PERFORMED

SERVICE RECORD

DATE SERVICE PERFORMED

SERVICE RECORD

DATE SERVICE PERFORMED

VI. Low Water Cut Off (LWCO)

WARNING

DO NOT ATTEMPT to cut factory wires to install an aftermarket Low Water Cut Off (LWCO). Only use connections specifically identified for Low Water Cut Off.

In all cases, follow the Low Water Cut Off (LWCO) manufacturer's instructions.

When

A low water cutoff is required to protect a hot water boiler when any connected heat distributor (radiation) is installed below the top of the hot water boiler (i.e. baseboard on the same floor level as the boiler). In addition, some jurisdictions require the use of a LWCO with a hot water boiler.

Where

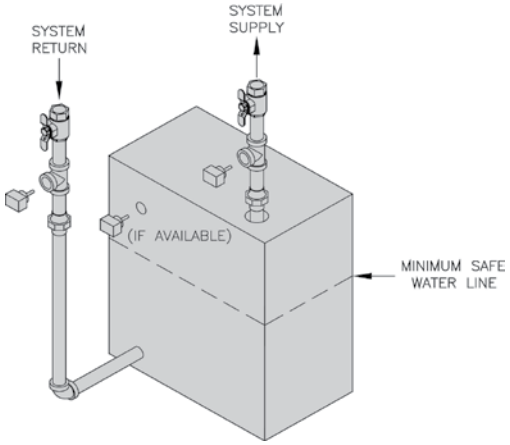
The universal location for a LWCO on both gas and oil hot water boilers is above the boiler, in either the supply or return piping. The minimum safe water level of a water boiler is at the uppermost top of the boiler; that is, it must be full of water to operate safely.

What Kind

Typically, in residential applications, a probe type LWCO is used instead of a float type, due to their relative costs and the simplicity of piping for a probe LWCO.

How to Pipe

A "tee" is commonly used to connect the probe LWCO to the supply or return piping, as shown below.



LWCO Location

Select the appropriate size tee using the LWCO manufacturer's instructions. Often, the branch connection must have a **minimum** diameter to prevent bridging between the probe and the tee. Also, the run of the tee must have a minimum diameter to prevent the end of the probe from touching or being located too close to the inside wall of the run of the tee.

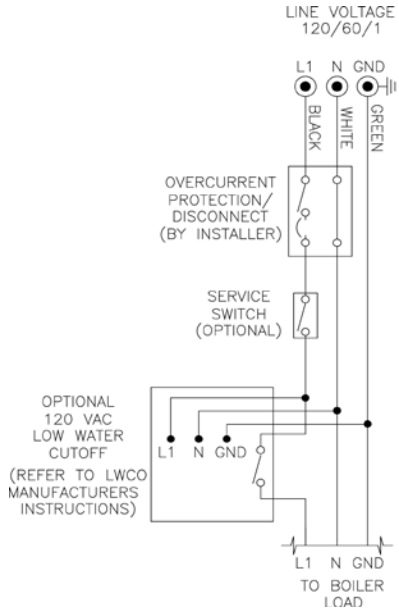
Ideally, manual shutoff valves should be located above the LWCO and the boiler to allow for servicing. This will allow probe removal for inspection without draining the heating system. Many probe LWCO manufacturers recommend an annual inspection of the probe.

How to Wire

LWCO's are available in either 120 VAC or 24 VAC configurations. The 120 VAC configuration can be universally applied to both gas and oil boilers by wiring it in the line voltage service to the boiler (after the service switch, if so equipped).

The presence of water in a properly installed LWCO will cause the normally open contact of the LWCO to close, thus providing continuity of the 120 VAC service to the boiler.

It is recommended to supply power to the probe LWCO with the same line voltage boiler service as shown below.



Wiring of Typical LWCO

A 24 VAC LWCO is used primarily for gas fired boilers where a 24 volt control circuit exists within the boiler. However, a 24 VAC LWCO can only be used if the boiler manufacturer has provided piping and wiring connections and instructions to allow for this application.

How to Test

Shut off fuel supply. Lower water level until water level is BELOW the LWCO. Generate a boiler demand by turning up thermostat. Boiler should not attempt to operate. Increase the water level by filling the system. The boiler should attempt to operate once the water level is above the LWCO.

U.S. Boiler Company, Inc.
P.O. Box 3020
Lancaster, PA 17604
(717) 397-4701
www.usboiler.burnham.com