



SERIES 8800 & 8900 FINNED COPPER GAS BOILERS & WATER HEATERS INSTALLATION & OPERATION MANUAL



MEA#117-96-E

DESIGNED AND TESTED ACCORDING TO A.S.M.E. BOILER AND PRESSURE VESSEL CODE, SECTION IV FOR A MAXIMUM ALLOWABLE WORKING PRESSURE OF 160 PSI WATER.

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

INSTALLER, THESE INSTRUCTIONS TO BE AFFIXED ADJACENT TO THE HEATER.
CONSUMER, RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE PURPOSES.



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AVERTISSEMENT. Assurez-vous de bien suivre les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort

Ne pas entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables à proximité de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- **Ne pas tenter d'allumer d'appareil.**
- **Ne touchez à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.**
- **Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les intructions du fournisseur.**
- **Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.**

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

CONTENTS

Before Your Start	page 2
Ratings & Capacities	page 3
Location	page 3
Combustion Air & Ventilation	page 3
Chimney & Vent Pipe Connections	page 4
Common Vent Systems	page 5
Heating System Piping	page 6
Domestic Water Supply Piping	page 11
Gas Supply Piping	page 13
Electrical Wiring	page 14
Operation	page 14
Lighting Instructions	page 15
Checking & Adjustment	page 16
Maintenance	page 17
Repair Parts, 8900	page 19
Repair Parts, 8900	page 25

BEFORE YOU START

This manual covers the application, installation, operation and maintenance of a Series 8800 and 8900 finned copper heating boiler/water heater.

To obtain the safe, dependable, efficient operation and long life for which this heating boiler/water heater was designed, these instructions must be read, understood and followed.

The Series 8800 and 8900 finned copper heating boiler/water heaters have been design certified by A.G.A and CGA for use with natural and propane gas under the latest revision of ANSI-Z21.10.3/CSA 4.3, Gas Water Heaters, ANSI-Z21.13/CSA 4.9, Gas-Fired Low Pressure Steam and Hot Water Boilers and CGA 3.3, Industrial and Commercial Gas-Designed Atmospherically-Fired Vertical Flue Boilers & Hot Water Supply Boilers. Each unit has been constructed and hydrostatically tested for a maximum working pressure of 160 psi in accordance with Section IV of the A.S.M.E. Boiler and Pressure Vessel Code.

All aspects of the boiler/water heater installation must conform to the requirements of the authority having jurisdiction, or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1-latest revision. Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

In Canada, the installation must be in accordance with the requirements of CAN/CGA B149.1 or .2, Installation Code for Gas Burning Appliances and Equipment.

The owner should maintain a record of all service work performed with the date and a description of the work done. Include the name of the service organization for future reference.

Direct all questions to your RBI Water Heaters distributor or contact the RBI Customer Service Department, 260 North Elm Street, Westfield, MA 01085. Always include the model and serial numbers from the rating plate of the boiler/water heater in question.

RATINGS & CAPACITIES

Before undertaking the installation of the Series 8800 and 8900 boiler/water heater check the rating plate to ensure that the unit has been sized properly for the job. The “Net I=B=R Ratings” specify the equivalent amount of direct cast iron radiation that the unit can supply under normal conditions. Also ensure that the unit has been set up for the type of gas available at the installation site. Other important considerations are the availability of an adequate electrical supply, fresh air for combustion and a suitable chimney or vent system.

BOILER/WATER HEATER LOCATION

1. Locate the boiler/water heater in an area that provides good access to the unit. Servicing may require the removal of jacket panels. Allow the minimum clearances between adjacent construction and the boiler/water heater as listed in Table 1. Accessibility clearances must take precedence over fire protection clearances.

Table 1 - Clearance to Combustibles

	8800/8900	
Top	24"	610 mm
Back	24"	610 mm
Left Side	24"	610 mm
Right Side	24"	610 mm
Front	48"	1220 mm
Flue	6"	152 mm

2. An optimum site will be level, central to the piping system, close to a chimney and have adequate fresh air for combustion. Ensure that the boiler/water heater is level from front to back and from side to side. Use metal shims to level the boiler/water heater. Electrical and electronic components must also be protected from exposure to water during operation and maintenance. **DO NOT** install this boiler/water heater in a location that would subject any of the gas ignition components to direct contact with water or excessive moisture during operation or servicing.
3. Ensure that the floor is structurally sound and will support the weight of the boiler/water heater. Never install a Series 8800 or 8900 boiler/water heater on a concrete floor that contains wires, cables, water pipes or hoses. This boiler/water heater is designed for noncombustible floors only! Never install this boiler/water heater on combustible materials or carpeting even if a non-combustible foundation material is placed over them!

WARNING: Never install a Series 8800 or 8900 boiler/water heater on top of combustible flooring! Failure to comply with this warning may result in a fire causing extensive property damage, severe personal injury or death!

4. Locate the boiler/water heater in an area that will prevent water damage to adjacent construction should a leak occur or during routine maintenance. If such a location doesn't exist, a suitable drain pan that's adequately drained must be installed under the unit. The pan must not restrict the flow of combustion air to the unit.
5. **DO NOT** place this boiler/water heater in a location that would restrict the introduction of combustion air into the unit or subject it to a negative pressure.
6. **NEVER** place this boiler/water heater in a location that would subject it to temperatures at or near freezing.

WARNING: Never store combustible materials, gasoline or any product containing flammable vapors or liquids in the vicinity of the boiler/water heater. Failure to comply with this warning can result in an explosion or fire causing extensive property damage, severe personal injury or death!

COMBUSTION AIR & VENTILATION

WARNING: This boiler/water heater must be supplied with combustion air in accordance with Section 5.3, Air for Combustion & Ventilation, of the latest revision of the National Fuel Gas Code, ANSI Z223.1 and all applicable local building codes. Canadian installations must comply with CAN/ CGA B149.1 or .2 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes. Failure to provide adequate combustion air for this boiler/water heater can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

To operate properly and safely this boiler/water heater requires a continuous supply of air for combustion. **NEVER** store objects on or around the boiler!

CAUTION: Combustion air contaminated with fluorocarbons or other halogenated compounds such as cleaning solvents and refrigerants will result in the formation of acids in the combustion chamber. These acids will cause premature failure of the boiler/water heater voiding the warranty!

Buildings will require the installation of a fresh air duct or other means of providing make-up air. Any building utilizing other gas burning appliances, a fireplace, wood stove or any type of exhaust fan must be checked for adequate combustion air when all of these devices are in operation at one time. Sizing of an outside air duct must be done to meet the requirements of all such devices.

WARNING: Never operate the boiler/water heater in an environment subjected to a negative pressure. This can result in excessive levels of carbon monoxide causing severe personal injury or death!

All Air From Inside The Building

If the boiler/water heater is to be located in a confined space minimum clearances of 24" (610 mm) must be maintained between the boiler/water heater and any combustible construction. When installed in a confined space two permanent openings communicating with an additional room(s) are required. The combined volume of these spaces must have sufficient volume to meet the criteria for an unconfined space. The total air requirements of all gas utilization equipment, fireplaces, wood stoves or any type of exhaust fan must be considered when making this determination. Each opening must have a minimum free area of 1 in²/1000 Btu/hr (2200 mm²/kW) based on the total input rating of **ALL** gas utilization equipment in the confined area. Each opening must be no less than 100 square inches (64516 mm²) in size. The upper opening must be within 12 inches (300 mm) of, but not less than 3 inches (80 mm) from, the top of the enclosure. The bottom opening must be within 12 inches (300 mm) of, but not less than 3 inches (80 mm) from, the bottom of the enclosure.

All Air From Outside The Building

When installed in a confined space two permanent openings communicating directly with, or by ducts to, the outdoors or spaces that freely communicate with the outdoors must be present. The upper opening must be within 12 inches (300 mm) of, but not less than 3 inches (80 mm) from, the top of the enclosure. The bottom opening must be within 12 inches (300 mm) of, but not less than 3 inches (80 mm) from, the bottom of the enclosure.

Where directly communicating with the outdoors or communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in²/4000 Btu/hr (550 mm²/kW) of the total input rating of all of the equipment in the enclosure.

Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in²/2000 Btu/hr (1100 mm²/kW) of the total input rating of all of the equipment in the enclosure.

When ducts are used, they must have the same cross-sectional area as the free area of the opening to which they connect.

When calculating the free area necessary to meet the make-up air requirements of the enclosure, consideration must be given to the blockage effects of louvers, grills and screens. Screens must have a minimum mesh size of 1/4" (6.4mm). If the free area through a louver or grill is not known ducts should be sized per Table 2 below.

Table 2 - Make-up Air Duct Sizing

Input (MBH)	Required Cross Sectional Duct Area in ² (cm ²)		
	1/4" (6.4 mm) Wire Screen	Metal Louvers	Wooden Louvers
420	105 (677)	140 (903)	420 (2710)
530	133 (858)	177 (1142)	530 (3419)
630	158 (1019)	210 (1355)	630 (4064)
735	184 (1187)	245 (1581)	735 (4742)
840	210 (1355)	280 (1806)	840 (5419)
950	238 (1535)	317 (2032)	950 (6129)
1050	263 (1697)	350 (2258)	1050 (6774)
1160	290 (1871)	387 (2497)	1160 (7484)
1260	315 (2032)	420 (2710)	1260 (8129)
1370	343 (2213)	457 (2948)	1370 (8839)
1470	368 (2374)	490 (3161)	1470 (9484)
1580	395 (2548)	527 (3400)	1580 (10,194)
1685	421 (2716)	562 (3626)	1685 (10,871)
1790	448 (2890)	597 (3852)	1790 (11,548)
1900	475 (3065)	633 (4084)	1900 (12,258)
2000	500 (3226)	667 (4303)	2000 (12,903)
2400	600 (3871)	800 (5161)	2400 (15,483)
2800	700 (4516)	933 (6019)	2800 (18,064)
3200	800 (5161)	1067 (6884)	3200 (20,645)
3600	900 (5806)	1200 (7742)	3600 (23,226)
4000	1000 (6452)	1333 (8600)	4000 (25,806)

CHIMNEY & VENT PIPE CONNECTIONS

WARNING: The vent installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1-latest revision or applicable provisions of the local building codes. Canadian installations must comply with CAN/CGA B149.1 or .2 Installation Code. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

Chimney Inspection & Sizing

If this boiler/water heater will be connected to a masonry chimney, a thorough inspection of the chimney must be performed. Ensure that the chimney is clean, properly constructed and properly sized. Table 3 lists the equivalent breeching and flue sizes required for the boiler/water heater.

Table 3 - Equivalent Breeching & Chimney Size

Model Size	Size in (mm)	Model Size	Size in (mm)
420	10 (254)	1580	18 (457)
530	10 (254)	1685	18 (457)
630	12 (305)	1700	20 (508)
735	14 (356)	1900	20 (508)
840	14 (356)	2000	22 (559)
950	14 (356)	2400	24 (610)
1050	16 (406)	2800	26 (660)
1160	16 (406)	3200	28 (711)
1260	16 (406)	3600	30 (762)
1370	18 (457)	4000	30 (762)
1470	18 (457)		

Note: These sizes are based on a 20 foot (6.1m) chimney height.

When more than one appliance is connected to the same chimney flue the flue must be large enough to safely vent the combined output of all the appliances.

WARNING: If an appliance using any type of a mechanical draft system operating under positive pressure is connected to a chimney flue, never connect any other appliances to this flue. Doing so can result in the accumulation of carbon monoxide which can cause severe personal injury or death!

VENT CONNECTIONS

Always use a type B or single wall galvanized metal vent pipe the same diameter as the draft diverter flue collar. Use the shortest, straightest vent system possible for the installation. If horizontal runs exceed 6 feet (1.8 m) they must be supported at 6 foot (1.8 m) intervals with overhead hangers. The vent system should be sloped up toward the chimney at a minimum rate of 1/4 inch/foot (2 cm/m) and terminate flush with the inside of the chimney flue. Fasten each connection with at least 3 corrosion resistant sheet metal screws.

WARNING: Never modify or alter any part of the boiler's draft diverter. This includes the removal or alteration of any baffles. Never install a vent pipe of a diameter different than that of the boiler draft hood flue collar. Failure to comply with this warning can result in severe personal injury or death.

Always provide a minimum clearance of 6 inches (152 mm) between type C vent pipe and any combustible materials. Type B1 vent may be used, clearance between it and any combustible material must be as listed.

WARNING: Failure to maintain minimum clearances between vent connectors and any combustible material can result in a fire causing extensive property damage, severe personal injury or death!

COMMON VENT SYSTEMS

If an existing boiler/water heater is removed from a common venting system, the common venting system may then be too large for the proper venting of the remaining appliances connected to it. At the time of removal of an existing boiler/water heater, 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.

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

- a) Seal any unused openings in the common venting system.

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

Inspecter de façon visuelle le système d'évacuation 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) 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 exhaust, so they will operate at maximum speed. Do not operate a summer exhaust fan for a boiler installation. Close fireplace dampers.

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 du système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sècheuses, 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) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

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

- 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.

Faire fonctionner le brûleur 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) 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 condition of use.

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 façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.

- 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. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 in the National Fuel Gas Code, ANSI Z223.1

Tout mauvais fonctionnement du système d'évacuation commun devrait être corrigé de façon que l'installation soit conforme au National Fuel Gas Code, ANSI Z223.1 et (ou) aux codes d'installation CAN/CGA-B149. Si la grosseur d'une section du système d'évacuation doit être modifiée, le système devrait être modifié pour.

GENERAL PIPING REQUIREMENTS

CAUTION: Improper piping of this boiler/water heater will void the manufacturer's warranty and can cause boiler failure resulting in flooding and extensive property damage! Excessive water hardness causing lime build-up in the copper heat exchanger tubes is *NOT* covered under the manufacturer's warranty, see Table 5. Excessive pitting and erosion of the internal surface of the copper heat exchanger tubes is *NOT* covered under the manufacturer's warranty if the result of high water flow rates, see Table 5. Return water temperatures below 115°F will result in heat exchanger damage from excessive condensation voiding the manufacturer's warranty, see Primary/Secondary Piping below.

Shut off valves and unions should be installed at the inlet and outlet connections of the boiler/hot water heater to provide for isolation of the unit should servicing be necessary.

Relief Valve

Install the pressure relief valve in the 3/4" NPT opening on the outlet side of the inlet/outlet header. On units where the relief valve is larger than 3/4" NPT, install the relief valve in the supply piping adjacent to the header. Pipe the discharge of the pressure relief valve to prevent scalding in the event of a discharge, see Figure 1. The discharge piping must be sized the same as the pressure relief valve outlet and installed to allow complete drainage of both the relief valve and the discharge piping.

WARNING: Never install any type of valve between the boiler/water heater and the relief valve or an explosion causing extensive property damage, severe personal injury or death may occur!

Flow Switch

The flow switch supplied with the boiler/water heater must be wired to the terminal strip in the junction box to prevent the boiler from firing unless there's adequate water flow through the unit. The flow switch must be installed in the supply piping adjacent to the boiler outlet connection.

CAUTION: Failure to properly install the flow switch may result in damage to the boiler/water heater heat exchanger voiding the warranty!

HEATING SYSTEM PIPING

General Piping Requirements

All heating system piping must be installed by a qualified technician in accordance with the latest revision of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV, and ANSI/ASME CSD-1, Standard for Controls and Safety Devices for Automatically Fired Boilers. All applicable local codes and ordinances must also be followed. A minimum clearance of 1" must be maintained between heating system pipes and all combustible construction. All heating system piping must be supported by suitable hangers not the boiler. The thermal expansion of the system must be considered when supporting the system. A minimum system pressure of 12 psig must be maintained.

Heating Boiler Piping Connections

The supply and return connections should be sized to suit the system, see Table 4.

Table 4 - Supply & Return Pipe Sizing

Boiler Model	Supply Size (in)	Return Size (in)
8900	2½" NPT	2½" NPT
8800	3" Victaulic	3" Victaulic

*Models 420-950 may have 2½" x 2" reducing fitting installed.

Pump Requirements

This low mass boiler requires a continuous minimum water flow for proper operation. The system pump must be sized to overcome the head loss of the boiler and the heating system in order to achieve the required temperature rise. Table 5 provides the heat exchanger pressure drop and temperature rise figures. **The temperature rise across the boiler must never exceed 30°F (17°C).** The pump should be wired to run continuously unless the optional pump delay is installed. The pump delay turns the pump on each time the burners fire and runs the pump for 100 seconds after the call for heat is satisfied.

CAUTION: A temperature rise outside of the range listed in Table 5 indicates that the flow rate through the heat exchanger is incorrect which will damage the heat exchanger voiding the warranty! The maximum allowable flow rate through an 8900 boiler is 100 GPM, 200 GPM for an 8800. If higher flow rates are required the optional Cupro-Nickel heat exchanger should be considered.

Low Water Cutoff

If a boiler is installed above any radiation elements it must be fitted with a low water cutoff device.

Expansion Tank

An expansion tank or other means to control thermal expansion must be installed in the heating system. An expansion tank must be installed close to the boiler on the suction side of the pump.

Primary/Secondary Piping

Boilers connected to heating systems using zone valves, zone pumps, or systems that have excessive flow rates or return water temperatures less than 110 °F (43°C) must be isolated from these systems to protect the boiler.

Variable Water Flows

Figure 1 shows a typical primary/secondary piping system. A dedicated pump is used to maintain a constant water flow through the boiler. This secondary pump is sized to overcome the head loss of the boiler and secondary piping system while supplying the flow rate required to maintain the desired temperature rise across the boiler. The primary pump is sized to provide the required flow to the heating system. The secondary piping connections to the primary system piping must not be more than 12" apart to ensure zero pressure drop in the primary system, see Figure 1.

Low Return Water Temperatures

To prevent the problems associated with condensation of the products of combustion due to low return water temperatures a primary/secondary piping system with a bypass and bypass valve must be installed, see Figure 2. The bypass and bypass valve must be sized the same as the secondary piping. A balancing valve must also be installed in the supply side of the secondary piping downstream of the bypass. The balancing valve should be adjusted to divert some of the heated discharge water into the return water until the required inlet water temperature is achieved. The primary and secondary pumps should be sized to provide the required flow through each system. The secondary piping connections to the primary system piping must not be more than 12" apart to ensure zero pressure drop in the primary system, see Figure 2.

Figure 1
Typical
Primary/Secondary
Piping System

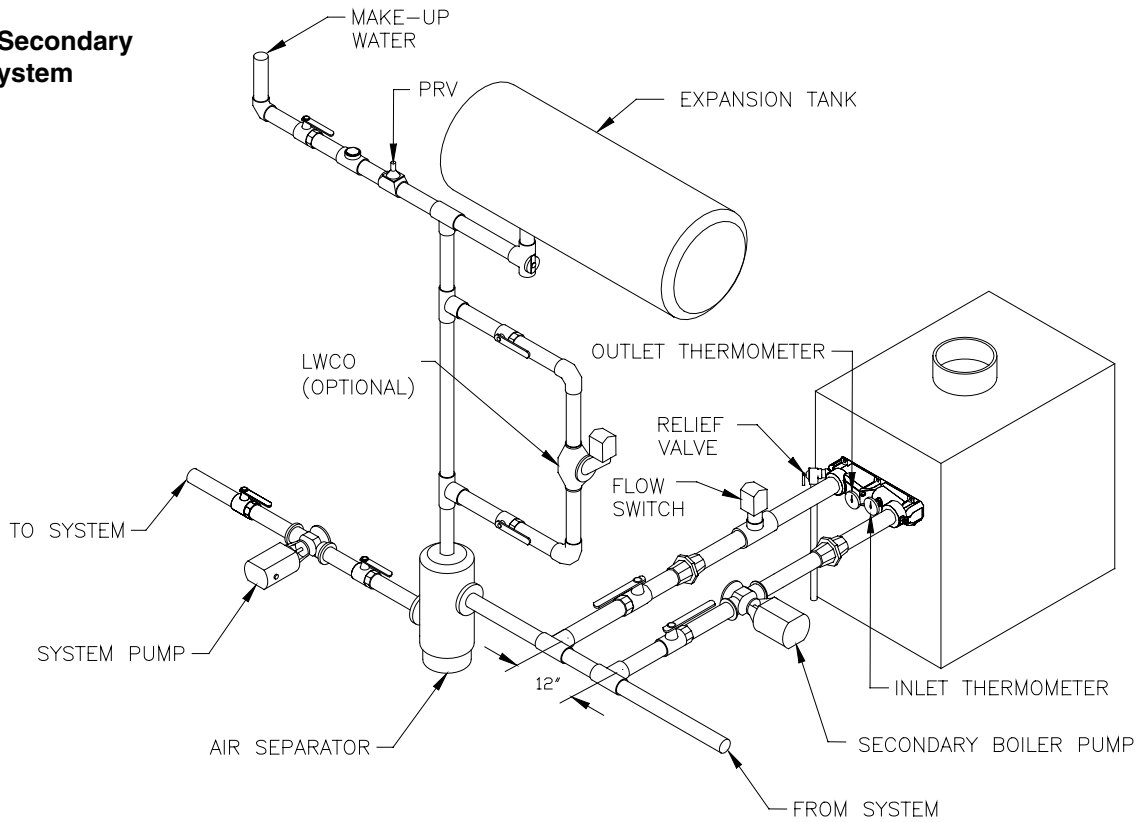
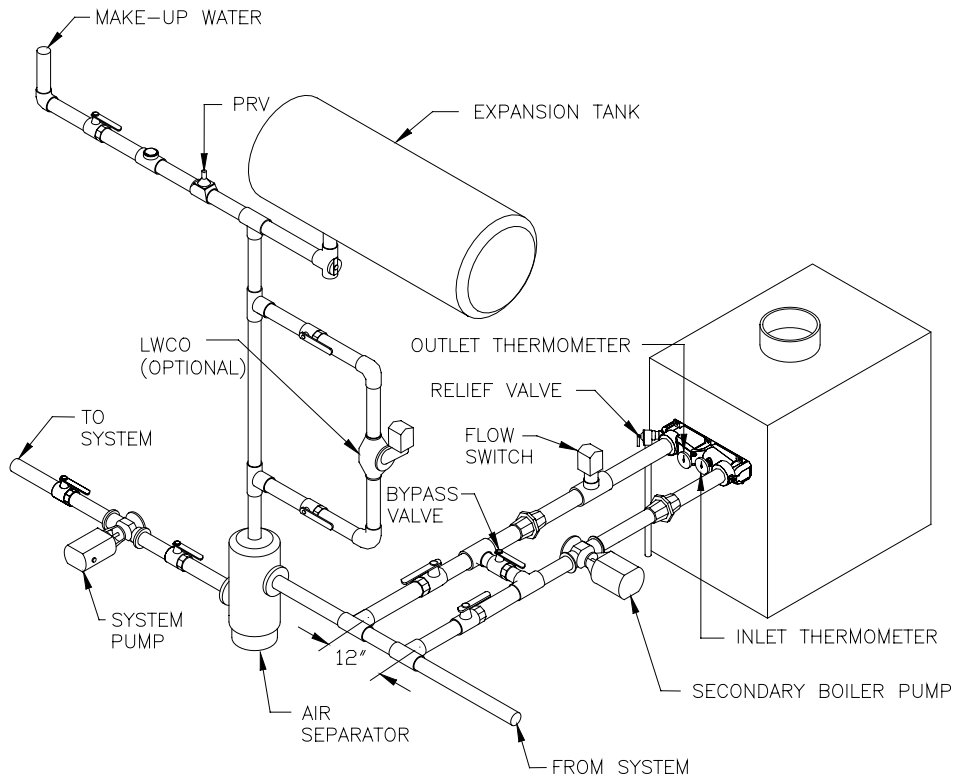


Figure 2
Low
Temperature
Piping



**Figure 3
Multiple
Boiler
Piping**

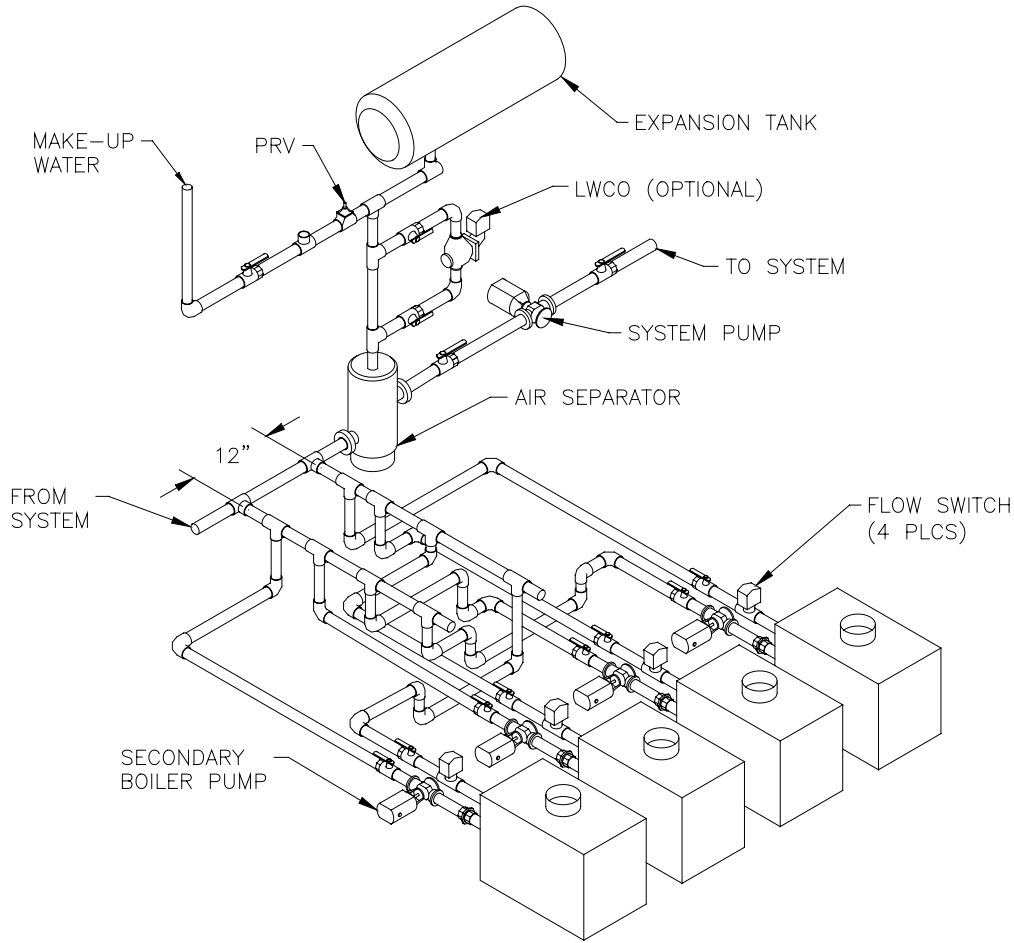


Table 5 - Temperature Rise Table

Model	20°F				25°F				30°F			
	GPM	I/s	P Ft	KPa	GPM	I/s	P Ft	KPa	GPM	I/s	P Ft	KPa
420	34.0	2.1	0.6	1.8	—	—	—	—	—	—	—	—
530	42.9	2.7	1.0	3.0	34.3	2.2	0.6	1.9	—	—	—	—
630	51.0	3.2	1.6	4.7	40.8	2.6	1.0	3.0	34.0	2.1	0.7	2.1
735	59.5	3.8	2.5	7.4	47.6	3.0	1.6	4.7	39.0	2.5	1.1	2.2
840	68.0	4.3	3.4	10.1	54.4	3.4	2.2	6.5	45.3	2.9	1.5	4.5
950	77.0	4.9	4.5	13.5	61.6	3.9	2.9	8.6	51.3	3.2	2.0	6.0
1050	85.1	5.4	6.1	18.2	68.1	4.3	3.9	11.6	56.7	3.6	2.7	8.1
1160	94.0	5.9	7.7	22.9	75.2	4.7	4.9	14.6	62.7	4.0	3.4	10.2
1260	102.1*	6.4	9.5	28.3	81.7	5.2	6.0	18.1	68.1	4.3	4.2	12.6
1370	111.0*	7.0	11.7	35.0	88.8	5.6	7.5	22.4	74.0	4.7	5.2	15.6
1470	119.1*	7.5	14.2	42.4	95.2	6.0	9.1	27.1	79.4	5.0	6.3	18.9
1580	128.0*	8.1	17.1	51.1	102.4*	6.5	10.9	32.7	85.3	5.4	7.6	22.8
1685	—	—	—	—	109.2*	6.9	13.0	38.8	91.0	5.7	9.0	30.6
1790	—	—	—	—	116.0*	7.3	15.3	45.6	96.6	6.1	10.6	32.4
1900	—	—	—	—	123.1*	7.9	16.3	48.7	102.6*	6.5	11.3	33.9
2000	164.0	10.3	5.9	17.5	131.2	8.3	3.7	11.2	109.3	6.9	2.6	7.8
2400	196.8	12.4	9.5	28.3	157.4	9.9	6.0	18.1	131.2	8.3	4.2	12.6
2800	229.6*	14.5	14.2	42.4	183.6	11.6	9.1	27.1	153.1	9.7	6.3	18.8
3200	262.4*	16.6	20.0	59.9	209.9*	13.2	12.8	38.3	174.9	11.0	8.9	26.5
3600	—	—	—	—	236.1*	14.9	17.6	52.5	196.8	12.4	12.2	36.5
4000	—	—	—	—	—	—	—	—	218.6*	13.8	15.1	45.1

*Flow exceeds recommended maximum rate, use a greater temperature rise or consult factory for applications in this range

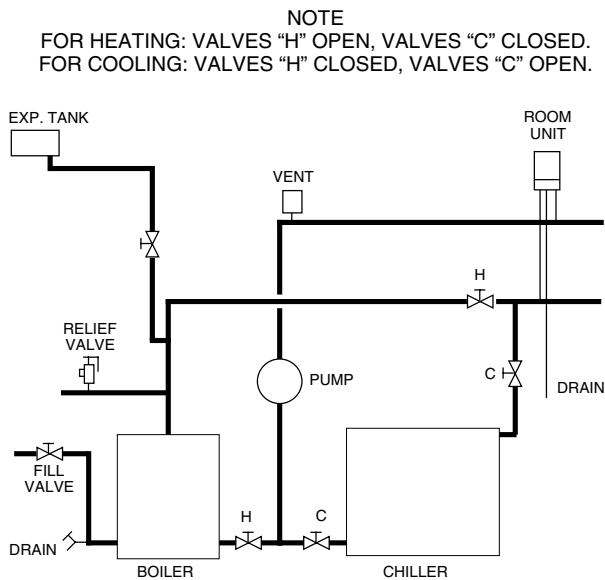
Multiple Boiler Systems

Systems using multiple boilers can also be installed using a primary/secondary manifold system, Figure 3.

Piping For Use With Cooling Units

The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler. Appropriate valves must be used to prevent the chilled water from entering the boiler, see Figure 4.

Figure 4 - Chilled Medium Piping



When a boiler is connected to a heating coil that may be exposed to refrigerated air from an air handling device, the piping system must be equipped with flow-control valves or some other automatic means of preventing gravity circulation of the boiler water during the cooling cycle.

DOMESTIC WATER SUPPLY PIPING

CAUTION: Proper controls must be used to prevent water supplied for domestic use from exceeding 130°F (54°C) or a scald injury will occur! When higher water temperatures are required for appliances such as a dishwasher, a mixing valve or some other tempering means must be installed. Households with small children may require water temperatures less than 120 °F (49°C). Local codes must be complied with!

General Piping Requirements

Ensure that the water heater is equipped with bronze headers. Piping and components connected to the water heater must be suitable for use with potable water. The water heater must not be connected to any heating system piping or components previously used with a non-potable water heating appliance. Toxic chemicals, such as those used for boiler treatment, are not to be introduced into any potable water used for space heating. If a hot water storage tank is used in the system it must be equipped with a temperature and pressure relief valve that complies with ANSI Z21.22 or CAN-4.4 and CAN-4.6.

NOTE: The storage tank must be located as close to the water heater as possible to prevent excessive head loss which will reduce flow.

Water Chemistry

The required temperature rise across the water heater is based on water having a hardness between 8 and 18 grains per gallon with a level of dissolved solids not exceeding 350 ppm. Water having a hardness less than 8 grains can cause excessive corrosion of the heat exchanger. Water that has a hardness greater than 18 grains per gallon and/or a level of dissolved solids exceeding 350 ppm will require a recalculation of the pump size and temperature rise. A Cupro-Nickel heat exchanger may also be required. The manufacturer should be consulted when these water conditions are encountered.

Expansion Tank

An expansion tank or other means to control thermal expansion must be installed in the water heating system if back flow prevention devices are installed.

Pump Requirements

This low-mass water heater requires a continuous minimum water flow for proper operation. The factory recommended circulating pump has been sized to overcome the head loss of the water heater plus a 30 foot piping loop under normal water conditions.

Table 5 provides the heat exchanger pressure drop chart and temperature rise table. **The temperature rise across the water heater must never exceed 30°F (17 °C).**

CAUTION: The pump should be wired to run continuously unless the optional pump delay is installed. If the pump delay is used a tank-mounted aquastat must be wired to the remote operator terminals in the control box and adjusted so it acts as the primary operator.

Cold Water Supply

The cold water supply must be piped to the water heater's outlet piping between the water heater and the hot water storage tank. This will prevent untempered water from entering the water heater, see the TEMPERATURE RISE CONTROL section below. A typical water heating system is show in Figure 5.

Temperature Rise Control

Water returned to the water heater inlet must not be less than 110°F (43°C) or excessive condensation of the products of combustion will damage the water heater voiding the warranty. The method outlined below can be employed to prevent this condition from occurring.

IMPORTANT: A balancing valve should be installed on the outlet side of the water heater for purposes of adjusting the flow rate through the heat exchanger. Thermometers are installed on both the inlet and outlet of the water heater for determining the temperature rise through the unit. The proper velocity through the water heater must be maintained in accordance with Table 5 for efficient operation and long life. If the temperature rise through the water heater is lower than recommended the water velocity is too high. Premature erosion of the heat exchanger will occur. Conversely, if the temperature rise is higher than recommended in Table 5 the flow rate is too low. Scaling and softening of the heat exchanger will occur.

Thermostatic Mixing Valve

Water Above 140°F (60°C) can be stored at temperatures above 140°F (60 °C) provided that a thermostatically controlled mixing valve is used to temper the hot water to an acceptable temperature before it's supplied for domestic use. The mixing valve **MUST** be set to prevent a scald injury from occurring, see the caution against scalding above. Storage of water for domestic use above 140°F (60°C) will provide an increased quantity of tempered water and help prevent the growth of water born bacteria.

Figure 5
Typical
Water
Heating
Piping

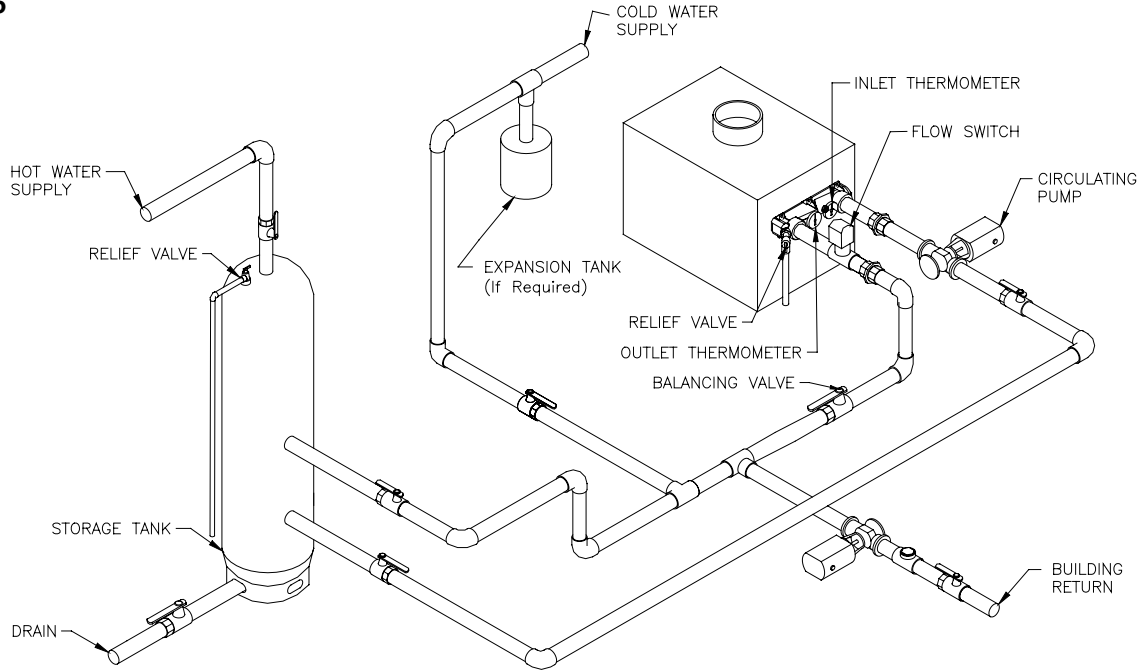
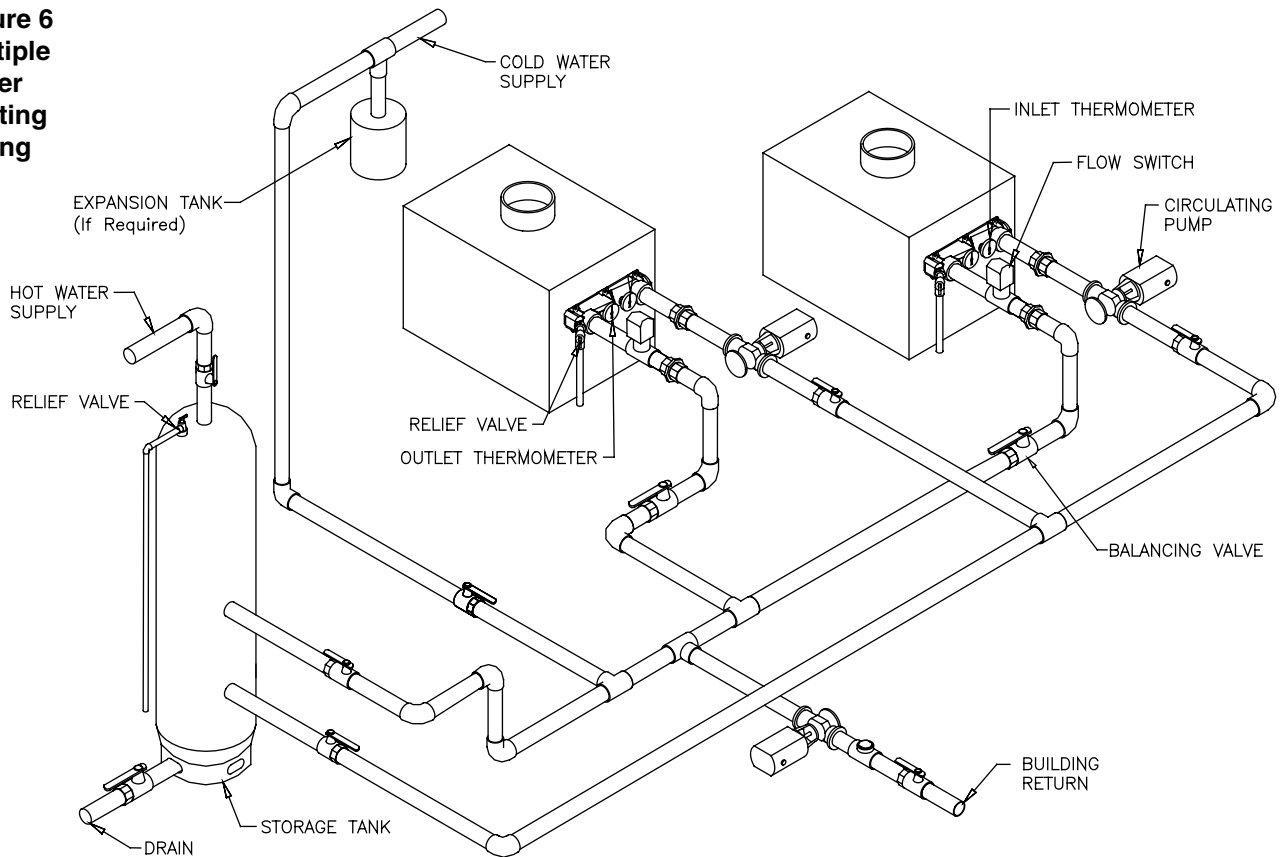


Figure 6
Multiple
Water
Heating
Piping



GAS SUPPLY PIPING

WARNING: Check the boiler/water heater rating plate to make sure that the boiler/water heater is for the type of gas that will be used. If it isn't, do not connect the boiler/water heater to the gas supply. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

The Series 8800 and 8900 come from the factory ready to be piped to the gas supply. If for any reason the boiler/water heater is not for the type of gas available at the installation site, call the nearest RBI Water Heaters representative to resolve the problem.

Table 6 should be used to ensure that the gas supply piping is sized properly. If more than one appliance is supplied by the same supply pipe, the piping must be sized based on the maximum possible demand. Do not neglect the pressure drop due to pipe fittings. Table 6 should be used in conjunction with Table 7 to ensure that the gas supply piping has the capacity to meet the demand.

Figure 7 depicts the proper way to connect the boiler/water heater to the gas supply piping. Provide a sediment trap at the bottom of the vertical section of the gas supply pipe upstream of the gas controls.

Table 6 - Gas Pipe Capacity

Maximum pipe capacity in ft ³ /hr based on 0.60 specific gravity gas at a pressure of 0.5 psig or less and a 0.3" WC pressure drop.									
Nominal Iron Pipe Size, (in)	Pipe length in feet								
	10	20	30	40	50	60	80	100	150
Maximum gas volume of pipe, (ft ³ /hr)									
1"	520	350	285	245	215	195	170	150	120
1 1/4"	1050	730	590	500	440	400	350	305	250
1 1/2"	1600	1100	890	760	670	610	530	460	380
2"	3050	2100	1650	1450	1270	1150	990	870	710
2 1/2"	4800	3300	2700	2300	2000	1850	1600	1400	1130
3"	8500	5900	4700	4100	3600	3250	2800	2500	2000
4"	17,500	12,000	9700	8300	7400	6800	5800	5100	4100

Note: Multiply the gas volume by 0.62 for propane flow capacity in ft³/hr. Multiply the propane flow capacity by 2500 Btu/ft³ to determine the propane Btu/hr capacity for a given pipe size and length.

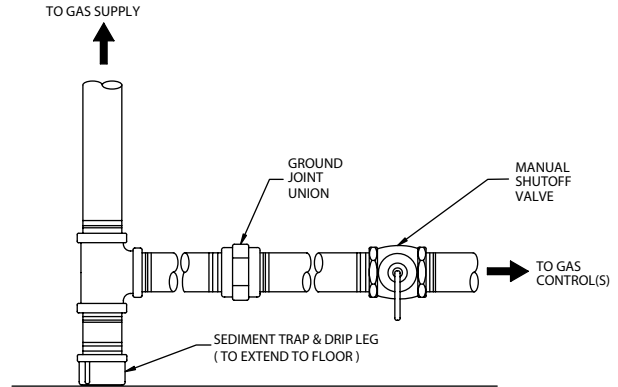
Table 7- Equivalent Pipe Length Chart

Nominal Iron Pipe Size, (in)	Type of pipe fitting			
	90° Elbow	Tee ¹	Gate Valve ²	Gas Cock ³
Equivalent of pipe length (ft)				
1"	2.6	5.2	0.6	1.5
1 1/4"	3.5	6.9	0.8	1.9
1 1/2"	4.0	8.0	0.9	2.3
2"	5.2	10.3	1.2	3.0
2 1/2"	6.2	12.3	1.4	3.7
3"	7.7	15.3	1.8	4.5
4"	7.7	15.3	1.8	4.5

Notes: 1. For flow through branch.
2. for flow at full open.

A ground joint union should be installed between the boiler gas controls and the supply piping. Each of these items are needed to ensure long life and ease of servicing. Always use a pipe sealant that is suitable for use with LP gas.

Figure 7 - Gas Supply Piping



CAUTION: Always use a wrench on the gas valve body when making gas connections to it. Never over-tighten the piping entering the gas valve body or gas valve failure may result!

When applicable, provisions for vent, bleed and gas relief lines must be made in accordance with the latest revision of ANSI Z223.1.

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler. All gas connections **MUST** be leak tested before putting the boiler into operation.

WARNING: Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

Whenever the gas supply piping is pressure tested the boiler/water heater gas controls must be protected. If the test pressure is equal to, or less than 1/2 psig (3.5 kPa) isolate the boiler/water heater by closing it's manual shut off valve, see Figure 16. If the test pressure is greater than, or equal to 1/2 psig (3.5 kPa), disconnect the boiler/water heater and its individual shut-off valve.

ELECTRICAL WIRING

Electrical Power Connections

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. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien terminé.

The electrical connections to this boiler/water heater must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI/NFPA-70. Installation should also conform with CSA C22.1 Canadian Electrical Code Part I if installed in Canada. Install a separate 120 volt 15 amp circuit for the boiler/water heater. A shut-off switch should be located at the boiler/water heater. The boiler/water heater must be grounded in accordance with the authority having jurisdiction, or if none, the latest revision of the National Electrical Code, ANSI/NFPA-70.

Line voltage field wiring of any controls or other devices must conform to the temperature limitation of type T wire at 95°F(35°C) above room temperature. Use copper conductors with a minimum size of #14 awg.

Refer to the wiring diagram supplied with the boiler/water heater for proper wiring connections.

BOILER/WATER HEATER OPERATION

WARNING: Before proceeding read and fully understand the instructions contained in this manual. Do not attempt to operate this boiler/water heater if it has not been installed in accordance with the guidelines set forth in this manual. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance. Do Not interrupt water flow through the boiler/water heater.

En cas de surchauffe ou si l'alimentation en gaz ne s'arrête pas, fermez manuellement le robinet d'arrêt de l'admission de gaz.

Hydronic Heating Boilers

Open the make-up water valve and slowly fill the boiler and all of the radiation with water. Ensure that all bleed and drain valves are closed.

Adjust the make-up water pressure regulator so a minimum 12 psig system pressure is maintained at the highest point in the system piping. If a make-up water pump is used adjust it as stated above.

Open the system bleed and drain valves, one at a time, to purge the air trapped in the heating system piping.

With the boiler off, run the system pump for at least 30 minutes and bleed the system piping using the bleed valves. If strainers are used in the system piping the make-up water valve should be closed and the strainers checked and cleaned.

The system expansion tank should be checked to ensure that the correct water level in the tank is maintained. The tank should be less than half full of water with the system full and adjusted to the correct operating pressure.

Start the boiler as described in the LIGHTING INSTRUCTIONS below. Run the boiler for at least an hour. The system pump(s) and all radiation unit must be operated during this time. Ensure that the make-up water valve is open.

Shut the boiler off and open the bleed valves to purge the air trapped in the heating system piping. Close the make-up water valve and check and clean the strainers and make-up water pressure reducing valve.

Open the make-up water valve and adjust the system pressure if necessary.

The system should be checked and bled after three day of operation.

LIGHTING INSTRUCTIONS FOR YOUR SAFETY READ BEFORE OPERATING

POUR VOTRE SÉCURITÉ LISEZ AVANT DE METTRE EN MARCHÉ

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

Cet appareil est muni d'un dispositif d'allumage qui allume automatiquement la veilleuse. Ne tentez pas d'allumer la veilleuse manuellement.

- 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 suppliers instructions.
- If you cannot reach your gas supplier, call the fire department.

AVANT DE FAIRE FONCTIONNER, reniflez tout autour de l'appareil pour déceler une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareil.
- Ne touchez à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suives les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur, appelez le service de incendies.

- C) 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 that has been under water.

N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

CAUTION: To prevent being burned, stand clear of the boiler during ignition and don't touch any hot metal parts!

Operating Instructions

1. **STOP!** Read the safety information above. If, at any time, the appliance will not operate properly, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.
2. Set the operating control or thermostat to off or its 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. Close the manual main and pilot gas shut-off valves.

6. 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. If you don't smell gas go to next step.
7. Connect a manometer having a minimum capacity of 20" WC to the outlet pressure port of the gas valve. Make sure that the gas supply piping has been purged of air and that all gas joints up to the gas valve have been thoroughly checked for leaks.
8. Open the manual pilot valve.
9. Turn on all electric power to the boiler.
10. Set the operating control or thermostat to the desired setting.
11. The pilot(s) should automatically light. Do not try to light the pilot(s) by hand!
12. With the pilot(s) lit, open the main gas shut-off valve.
13. The burners should light with proper boiler operation.
14. A boiler designed for use with natural gas should have a manifold gas pressure of approximately 4.0" WC. For an LP boiler, the manifold pressure should be 11" WC. To adjust the manifold gas pressure see the GAS PRESSURE ADJUSTMENT instructions in the CHECKING AND ADJUSTMENT section.
15. With the burners in operation, close the manual shutoff valve in the gas supply line. As soon as the main burner flames go out, open the manual shutoff valve. A normal ignition sequence should take place. If the burners fail to light the system will make one more ignition attempt. If the burners have not lit after the last ignition try, the gas valve will close and the system will go into lock out. **DO NOT** attempt to reset the system until the ignition system has been inspected and the problem resolved.

With the burners in operation, interrupt the power to the control circuit by lowering the operating control or thermostat. The main burners should go out. Reset the operating control or thermostat, a normal ignition sequence should follow.

To test the ignition safety shutoff device, close the manual shutoff valve in the gas supply line. Within 5 seconds of main burner flame extinction, the main gas valve solenoid should close with an audible noise.

A sparking noise should be heard while the ignition module tries to relight the pilot. After 15 seconds the module should lockout and the trial for ignition end. After 5 minutes a second trial for ignition should occur. Open the manual shutoff valve in the gas supply line and reset the ignition control system. A normal ignition sequence should take place.

Instructions De Mise En Marche

1. ARRÊTEZ! Lisez les instructions de sécurité sur la portion supérieure de cette étiquette.
2. Réglez le thermostat à la température la plus basse.
3. Coupez l'alimentation électrique de l'appareil.
4. Cet appareil est muni d'un dispositif d'allumage qui allume automatiquement la veilleuse. Ne tentez pas d'allumer la veilleuse manuellement.
5. Fermer la vanne manuelle d'arrêt d'alimentation de gaz.
6. Attendre cinq (5) minutes pour laisser échapper tout le gaz. Reniflez tout autour de l'appareil, y compris près du plancher, pour déceler une odeur de gaz. Si vous sentez une odeur de gaz, ARRÊTEZ! Passez à l'étape B des instructions de sécurité sur la portion supérieure de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
7. Ouvrir la vanne manuelle d'arrêt d'alimentation de gaz.
8. Mettez l'appareil sous tension.
9. Réglez le thermostat à la température désirée.
10. Si l'appareil ne se met pas en marche, suivez les instructions intitulées «Comment couper l'admission de gaz de l'appareil» et appelez un technicien qualifié ou le fournisseur de gaz.

To Turn Off Gas To Appliance

1. Set the operating control or thermostat to its lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Close the manual main and pilot gas shut-off valves.

COMMENT COUPER L'ADMISSION DE GAZ DE L'APAREIL

1. Réglez le thermostat à la température la plus basse.
2. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
3. Fermer la vanne manuelle d'arrêt d'alimentation de gaz.

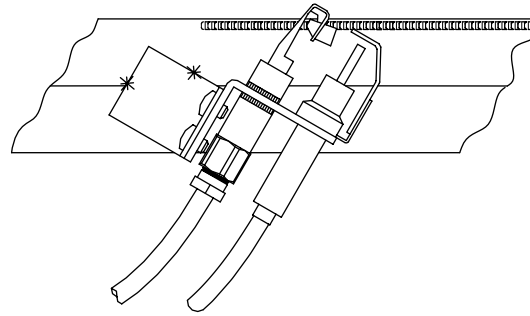
CHECKING & ADJUSTMENT

Pilot Adjustment

The pilot burner flame should envelope 3/8" to 1/2" of the flame sensing probe, Figure 8. To adjust the pilot the following steps must be taken:

1. Remove the pilot gas pressure regulator cap.
2. Turn the pressure regulator adjustment screw clockwise to increase the flame and counterclockwise to decrease it.
3. Replace the pressure regulator adjustment screw cap.

Figure 8 - Pilot Flame Adjustment



Gas Pressure Adjustment

CAUTION: The maximum inlet gas pressure listed on the rating plate must not be exceeded or damage to the boiler/water heater may occur!

The minimum supply pressure listed on the rating plate is for input adjustment.

NATURAL GAS: Optimum results are obtained when the boiler/water heater is operated at its full input rating, with 3.8" WC to 4.2" WC of manifold pressure. The manifold pressure should not vary outside this range. The gas valve pressure regulator has been preset at the factory. If adjustment is necessary the following steps must be followed:

1. Attach a 20" manometer to the tap on the manifold.
2. Remove the regulator adjustment screw cap from the gas regulator. On systems that do not use a separate gas regulator, remove the adjustment screw cap from the gas valve body on the valve closest to the gas supply piping.
3. Rotate the regulator adjustment screw clockwise to increase the manifold pressure, counterclockwise to decrease it.
4. Replace the regulator adjustment screw cap and manifold pressure tap plug.

CAUTION: Never force the regulator adjustment screw beyond the stop limits or damage to the regulator will occur!

PROPANE GAS: A manifold pressure of 11" WC must be maintained for proper operation of the boiler. If the manifold pressure is off by more than 5% adjust it according to steps 1 through 4 above.

Input Rate, Natural Gas

Gas appliances are rated based on sea level operation with no adjustment required at elevations up to 2000 feet. At elevations above 2000 feet, input ratings should be reduced by 4% for each 1000 feet above sea level.

Check the input rate as follows:

1. Turn off all other gas appliances that use the same gas meter as the boiler/water heater.
2. Call your gas supplier and ask for the heating value of the gas.
3. Start the boiler/water heater and let it run for 15 minutes.
4. Using the gas meter and a stopwatch, clock the time that it takes to burn 10 cubic foot of gas and divide this time by 10.
5. Insert the heating value and the time, in seconds, into the formula below.
6. $\text{Input} = (\text{heating value, Btu/hr})(3600)/(\text{time, seconds})$
7. If the computed rate deviates by more than 5% from the rated input value of the unit adjust the manifold pressure accordingly. **DO NOT** adjust the manifold pressure by more than 5%. If a proper rate cannot be maintained without adjusting the manifold pressure beyond the 5% limit, the main burner orifices must be replaced. If the input rate is too low, go to the next larger size of main burner orifices. If the input rate is too high, go to the next smaller size.

CAUTION: Never increase the input to the boiler/water heater above that for which it is rated. Doing so can cause premature failure of the unit!

Low Water Cutoff

If installed, ensure that the low water cutoff device(s) function properly. Test in accordance with the manufacturer's instructions included with the device(s).

Boiler Thermostat

If a thermostat is to be used to control the boiler always follow the instructions included with the thermostat. Proper location of the thermostat will ensure efficient trouble-free operation of the boiler. Mount the thermostat to an inside wall at a height approximately five feet above the floor.

Avoid placing the thermostat in areas that will not provide an accurate measurement of the room temperature. Locating the thermostat behind a door, in an alcove, close to a source of thermal radiation or in a drafty area will cause poor or sporadic heating.

For a thermostat that employs an adjustable heat anticipator, adjust the anticipator to match the current measured in the thermostat circuit. An increased anticipator setting may be necessary if the unit cycles frequently. If the room temperature over-shoots the thermostat setting, reduce the anticipator setting.

Water Heater Operation Controls

The operating control on the water heater is set to its lowest setting when the water heater leaves the factory. The preferred control setting for potable hot water is 130°F. The operating control should be set to the lowest setting that will satisfy the consumer's needs. The water heater high limit should be set a minimum of 40°F (22°C) higher than the operating control. Refer to the HOT WATER SUPPLY section for the proper supply water temperature.

WARNING: Setting the thermostat or operating control too high can result in scalding resulting in severe personal injury!

BOILER/WATER HEATER MAINTENANCE

WARNING: Disconnect electrical power and close the manual gas shut off valve before performing maintenance or severe personal injury may result!

CAUTION: Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment can damage the boiler /water heater!

The boiler/water heater should be cleaned and inspected once a year, before each heating season. Make sure that the burners and ignition components are free from dust, soot, dirt, corrosion or other deposits that would impair the boiler's performance. Refer to pages 19 & 27 for component identification.

Combustion Chamber Inspection

1. Remove the left or right lower jacket end panel, item 5 or 24 (8900) or item 5 or 26 (8800).
2. Remove the upper end refractory brackets and carefully remove the end refractory panel.
3. Inspect the combustion chamber, heat exchanger and burner tray components for sign of corrosion and/or deterioration.
4. Clean or replace components as required.

Burner Drawer & Burner Removal

1. Close the manual shutoff valves in the gas supply lines and turn off electrical power to the boiler/water heater.
2. Disconnect the gas train from the gas supply piping at the ground joint union, Figure 9.
3. Remove the Flame Roll-Out Shield, 8900 only.
4. Remove the two bolts that attach the burner drawer to the base frame.
5. Disconnect the pilot tubing from the solenoid valve and the ignition lead from the ignition control.

6. Pull the burner drawer out until the burners are fully exposed.
7. Inspect each burner for damage or signs of deterioration. Use a brush or compressed air to remove any debris from the burner ports.
8. **DO NOT** install damaged or badly corroded burners, replace them.
9. Install the burners making sure that they are properly seated in the burner drawer.
10. Replace the Burner Drawer and Flame Roll Out Shield, 8900 only, following the removal steps in reverse order.

Heat Exchanger Inspection & Cleaning

1. Close the shut off valves in the inlet and outlet piping. Relieve the system pressure from the boiler by carefully lifting the relief valve or opening the drain valve.
2. Disconnect the boiler/water heater from the system piping.
3. Remove the left and right headers and mounting studs.
4. Remove the left & right upper and left & right lower jacket end panels, items 5 & 24 (8900) or items 5 & 26 (8800).
5. Remove the left & right front corner trim panels, 8900.
6. Remove the flue collector front panel shown as part of item 19 (8900) or item 21 (8800).
7. Remove the upper front refractory channel assembly and front refractory panels.
8. Slide the heat exchanger out and thoroughly inspect it.
9. The outside surfaces of the copper tubes should be free of any soot deposits, A slight black smudge is normal with some types of gases. Black soot indicates poor combustion. Green deposits indicate condensation due to low return water temperatures. In either case the heat exchanger must be cleaned thoroughly with water and the problem resolved before the boiler/water heater is returned to service.
10. Replace the cleaned heat exchanger and other components in the reverse order of their removal.

Heat Exchanger Replacement

1. Sagging or distorted heat exchanger tubes are an indication of low water flow through the system.
2. A damaged heat exchanger must be replaced and the condition that caused the damage resolved before the boiler/water heater is returned to service.

Vent System

Thoroughly inspect the vent system for any signs of blockage, corrosion or leakage. Immediately replace any unsound vent system piping.

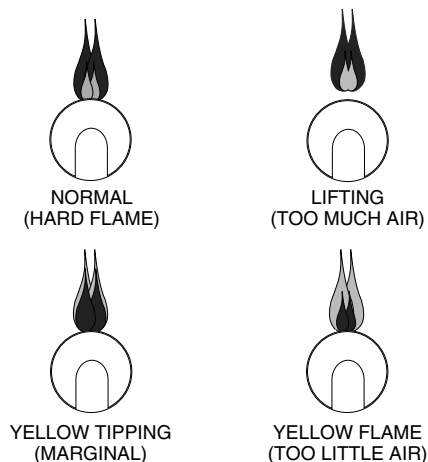
Controls

Use the BOILER/WATER HEATER OPERATION and CHECKING AND ADJUSTMENT sections of this manual for reference.

1. Check the thermostat or operating controls for proper operation.
2. A float type low water cutoff device must be flushed out per the manufacturers' instructions. The probe on a probe low water cut off must be removed, cleaned and inspected at least once a year. Ensure that the low water cutoffs operate properly. In not, replace them.
3. The relief valve should not weep or discharge water at normal system pressure. If it does contact a qualified service technician to have it inspected. **NEVER** try to clean or repair the relief valve! If the valve fails to operate properly, have it replaced!
4. The aquastat high limit controls the maximum water temperature in the boiler. It is adjustable from 140°F (60C) to 250°F (121°C). If the water temperature reaches the set temperature before the demand for heat has been met, the aquastat high limit should shut the boiler off. The water temperature should never exceed the maximum set point of 250°F (121°C). The aquastat high limit cannot be repaired. If it fails to function properly replace it.
5. Visually check the pilot and main burner flames to ensure proper operation, see Figures 8 & 9.

WARNING: Yellow, floating flames indicate a lack of combustion air. Do not operate the boiler until the problem is solved or severe personal injury or death may occur!

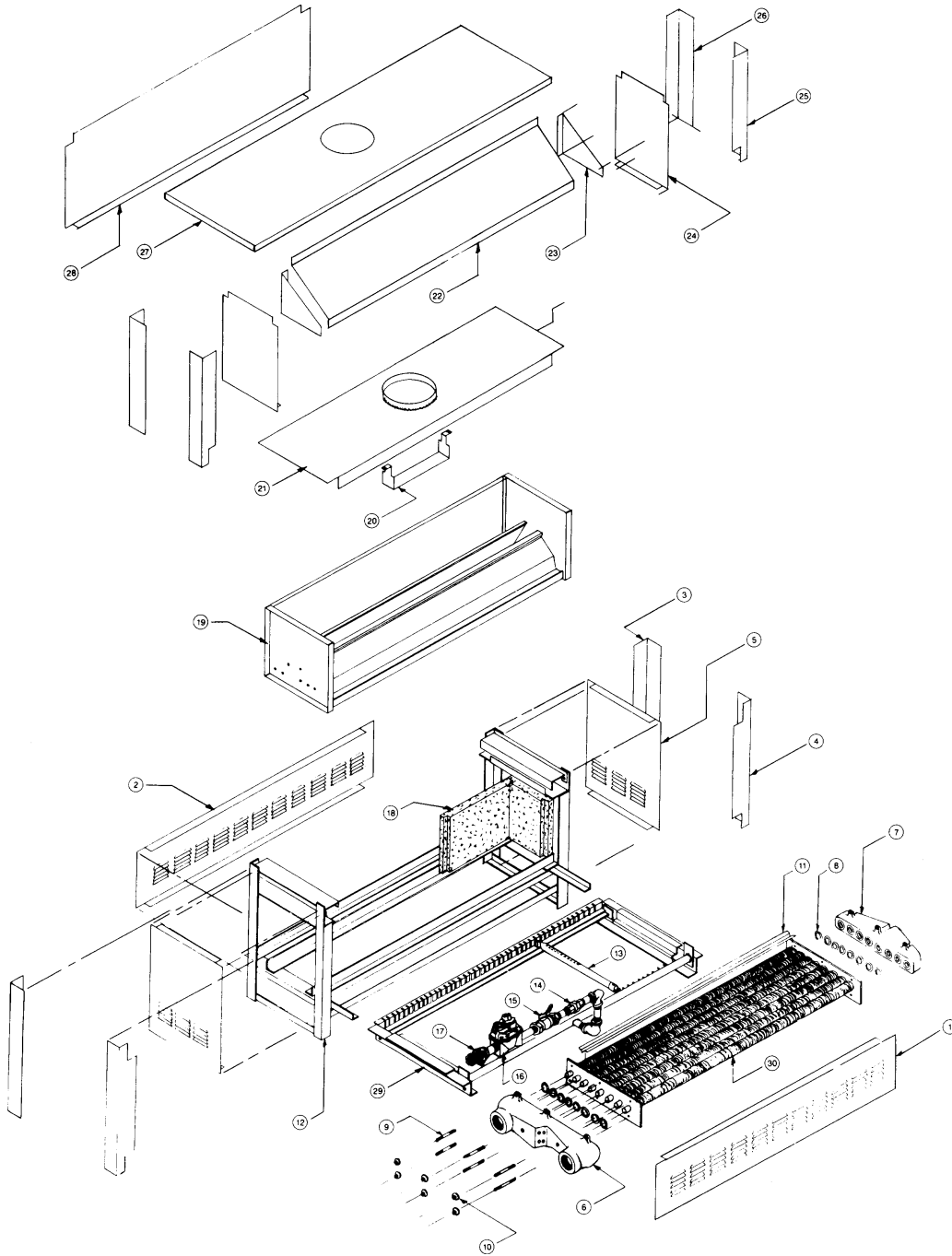
Figure 9 - Main Burner Flames



PARTS LIST (MODELS 420-1900)

Series 89

- 1 - Jacket Lower Front Panel
- 2 - Jacket Lower Rear Panel
- 3 - Jacket Lower Rear Corner Post
- 4 - Jacket Lower Front Corner Post
- 5 - Jacket Lower End Panel
- 6 - Inlet Outlet Header
- 7 - Return Header
- 8 - Black O-Rings
- 9 - Stud Bolts
- 10 - Flange Nuts
- 11 - V Baffle
- 12 - Frame Assembly
- 13 - Main Burner
- 14 - Union
- 15 - Firing Valve
- 16 - Main Gas Valve
- 17 - A Valve
- 18 - Refractory
- 19 - Flue Collector End
- 20 - Down Draft Preventer
- 21 - Flue Collector Top
- 22 - Jacket Upper Front Panel
- 23 - Jacket Panel Anchor Bracket
- 24 - Jacket Upper End Panel
- 25 - Jacket Upper Front Corner Post
- 26 - Jacket Upper Rear Corner Post
- 27 - Jacket Top Panel
- 28 - Jacket Upper Rear Panel
- 29 - Burner Tray Side
- 30 - Copper Fin Tube

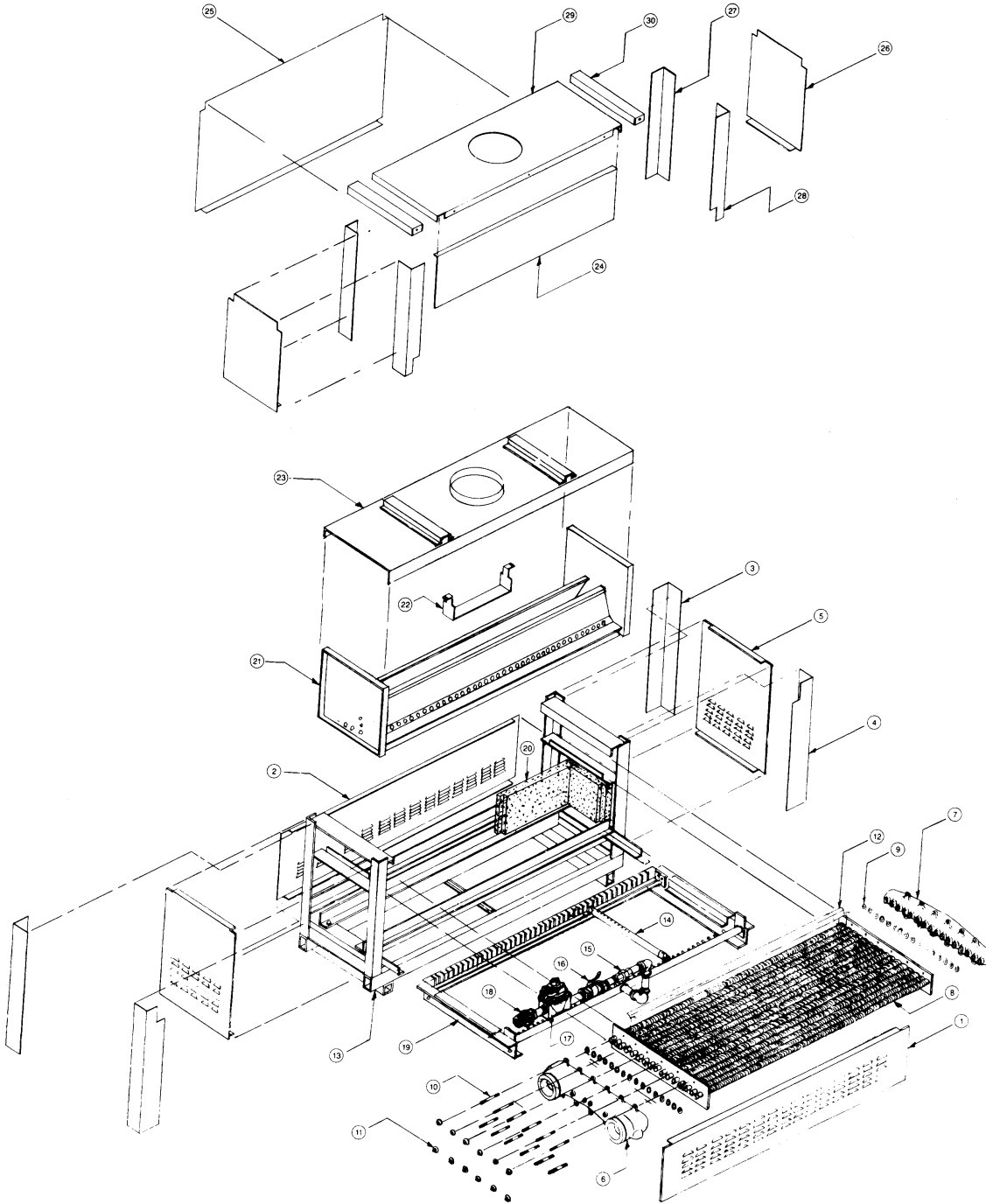


Ref #	Name of Part	Part #	420	530	630	735	840	950	1050	1160	1260	1370	1470	1580	1685	1790	1900	
Not Shown	Heat Exchanger Edge Baffle	03-0259	2															
		03-0260		2														
		03-0261			2													
		03-0262				2												
		03-0263					2											
		03-0264						2										
		03-0265							2									
		03-0266								2								
		03-0267									2							
		03-0268										2						
		03-0269											2					
		03-0270												2				
		03-0271													2			
		03-0272															2	
03-0273																2		
12	Base Frame Assembly	70-0192	1															
		70-0193		1														
		70-0194			1													
		70-0195				1												
		70-0196					1											
		70-0197						1										
		70-0198							1									
		70-0199								1								
		70-0200									1							
		70-0201										1						
		70-0202											1					
		70-0203												1				
		70-0204													1			
		70-0205														1		
70-0206															1			
13	Burner Tube, Aluminized Steel Nat	10-0252	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	
	Burner Tube, Aluminized Steel LP	10-0253	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	
	Burner Tube, Aluminized w/ Bracket	70-0499	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Burner Tube, Stainless Steel	10-0254	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	
	Burner Tube, Stainless w/ Bracket	70-0500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
14	Union, 1"	53-0054	1	1	1	1	1	1										
	Union, 1 1/4"	53-0055							1	1	1	1	1	1	1			
	Union, 1 1/2"	53-0056														1	1	
15	Firing Valve, 1"	11-0456	1	1	1	1	1	1										
	Firing Valve, 1 1/4"	11-0457							1	1	1	1	1	1	1			
	Firing Valve, 1 1/2"	11-0458														1	1	
16	Main Gas Valve, HW V88A, 1"	11-0156	1	1	1	1	1	1										
	Main Gas Valve, HW V88A, 1 1/4"	11-0157							1	1	1	1	1	1	1			
	Main Gas Valve, HW V88A, 1 1/2"	11-0158														1	1	
	Main Gas Valve, V8944B, 1"	11-0171	1	1	1	1	1	1										
	Main Gas Valve, V8944B, 1 1/4"	11-0172							1	1	1	1	1	1	1			
	Main Gas Valve, V8944B, 1 1/2"	11-0173														1	1	
17	"A" Valve, 1"	11-0451	1	1	1	1	1	1										
	"A" Valve, 1 1/4"	11-0452							1	1	1	1	1	1	1			
	"A" Valve, 1 1/2"	11-0453														1	1	
18	End Refractory Panel, Left & Right	05-0001	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
18	Center Refractory Panel	05-0002	2															
		05-0003		2														
		05-0004			0	0	0	2	2	2	2	4	4	4	6	6	6	

PARTS LIST (MODELS 2000-4000)

Series 89

- 1 - Jacket Lower Front Panel
- 2 - Jacket Lower Rear Panel
- 3 - Jacket Lower Rear Corner Post
- 4 - Jacket Lower Front Corner Post
- 5 - Jacket Lower End Panel
- 6 - Inlet Outlet Header
- 7 - Return Header
- 8 - Copper Fin Tube
- 9 - Black O-Rings
- 10 - Stud Bolts
- 11 - Flange Nuts
- 12 - V Baffle
- 13 - Frame Assembly
- 14 - Main Burner
- 15 - Union
- 16 - Firing Valve
- 17 - Main Gas Valve
- 18 - A Valve
- 19 - Burner Drawer Side
- 20 - Refractory
- 21 - Flue Collector End Panel
- 22 - Down Draft Preventer
- 23 - Flue Collector Top
- 24 - Jacket Upper Front Panel
- 25 - Jacket Upper Rear Panel
- 26 - Jacket Upper End Panel
- 27 - Jacket Upper Rear Corner Post
- 28 - Jacket Upper Front Corner Post
- 29 - Jacket Top Panel
- 30 - Jacket Top End Panel



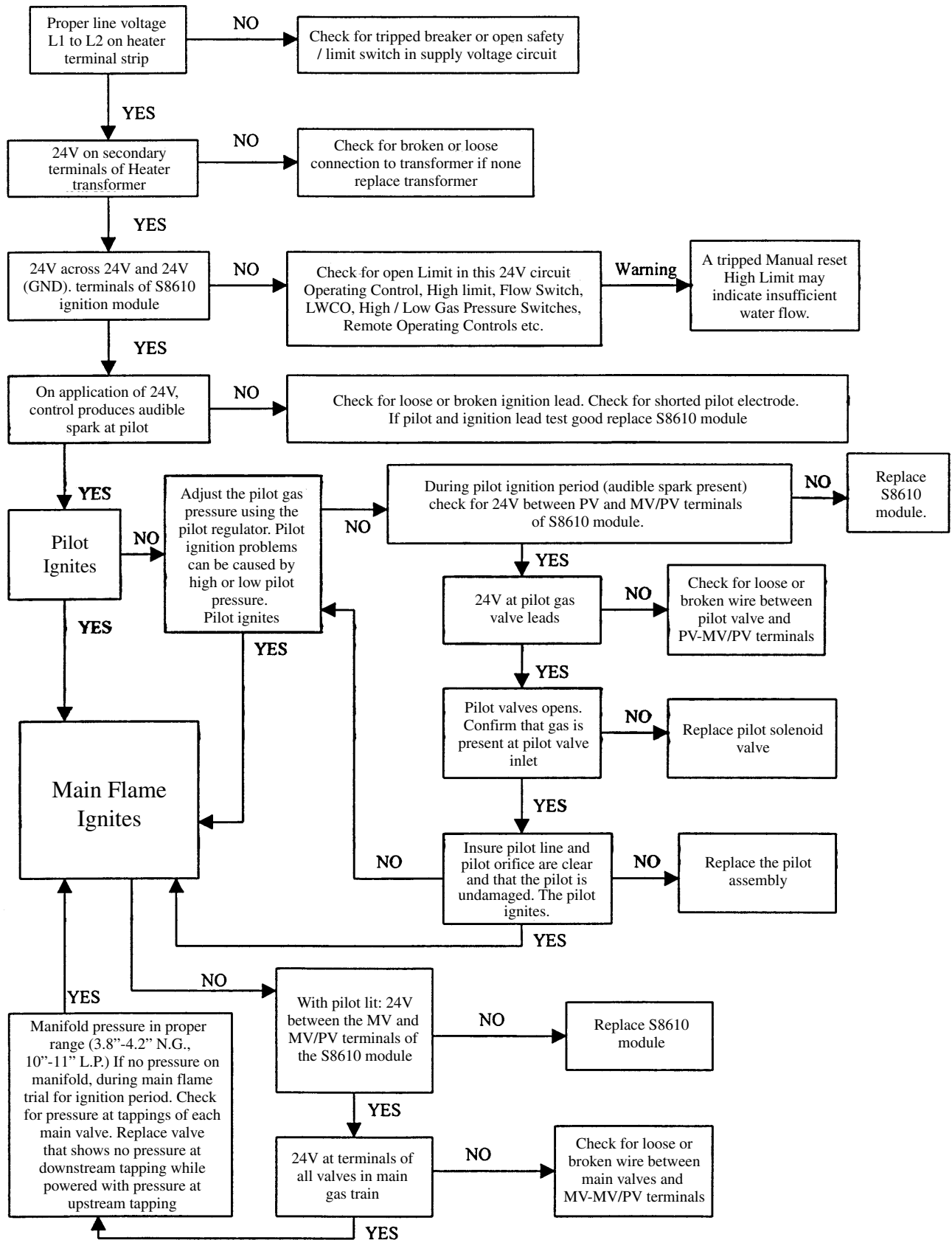
SERVICE AND REPLACEMENT PARTS LIST (MODELS 2000-4000)

Ref #	Name Of Part	Part #	2000	2400	2800	3200	3600	4000
1	Lower Front Jacket Panely	03-1077	1					
		03-1078		1				
		03-1079			1			
		03-1080				1		
		03-1081					1	
		03-1082						1
2	Lower Rear Jacket Panel	03-1071	1					
		03-1072		1				
		03-1073			1			
		03-1074				1		
		03-1075					1	
		03-1076						1
3	Lower Rear Corner Jacket Trim Panel, Left	03-1088	1	1	1	1	1	1
	Lower Rear Corner Jacket Trim Panel, Right	03-1089	1	1	1	1	1	1
4	Lower Front Corner Jacket Trim Panel, Left	03-1090	1	1	1	1	1	1
	Lower Front Corner Jacket Trim Panel, Right	03-1091	1	1	1	1	1	1
5	Lower Jacket End Panel, Left & Right	03-1083	1	1	1	1	1	1
6	Inlet/Outlet Header, Bronze	01-0012	1	1	1	1	1	1
7	Return Header, Bronze	01-0013	1	1	1	1	1	1
8	Heat Exchanger, SB75 Tubes	70-1684	1					
		70-1685		1				
		70-1686			1			
		70-1687				1		
		70-1688					1	
		70-1689						1
Not Shown	Heat Exchanger, SB111 Tubes	70-1690	1					
		70-1691		1				
		70-1692			1			
		70-1693				1		
		70-1694					1	
		70-1695						1
9	O Ring, Inlet/Outlet & Return Headers	06-0001	32	32	32	32	32	32
10	Stud, Inlet/Outlet & Return Headers	57-0223	24	24	24	24	24	24
11	Nut, Inlet/Outlet & Return Headers	57-0491	24	24	24	24	24	24
12	Heat Exchanger "V" Baffle	03-1147	15					
		03-1148		15				
		03-1149			15			
		03-1150				15		
		03-1151					15	
		03-1152						15
13	Base Frame Assembly	70-1708	1					
		70-1709		1				
		70-1710			1			
		70-1711				1		
		70-1712					1	
		70-1713						1
14	Burner Tube, Aluminized Steel	10-0256	19	23	27	30	34	38
	Burner Tube, Aluminized w/ Bracket	70-1851	1	1	1	2	2	2
Not Shown	Burner Tube, Stainless Steel	10-0258	19	23	27	30	34	38
	Burner Tube, Stainless w/ Bracket	70-1852	1	1	1	2	2	2
15	Union, 1 1/2"	53-0056	1					
	Union, 2"	53-0057		1	1	1		
	Union, 2 1/2"	53-0058					1	1
16	Firing Valve, 1 1/2"	11-0458	1					
	Firing Valve, 2"	11-0459		1	1	1		
	Firing Valve, 2 1/2"	11-0460					1	1
17	Main Gas Valve, V8944B, 1 1/2", (1 or 2 Stage)	11-0173	1					
	Main Gas Valve, V8944B, 2", (1 or 2 Stage)	11-0174		1	1	1		
Not Shown	Main Gas Valve, V88A, 1 1/2", (1 Stage)	11-0158	1					
	Main Gas Valve, V88A, 2", (1 Stage)	11-0159		1	1	1		
	Main Gas Valve, V88A, 2 1/2", (1 Stage)	11-0160					1	1

Ref #	Name Of Part	Part #	2000	2400	2800	3200	3600	4000
Not Shown	Main Gas Valve, V5055B, 1 1/2", (Modulating)	11-0253	1					
	Main Gas Valve, V5055B, 2, (Modulating)	11-0254		1	1	1		
	Main Gas Valve, V5055B, 2 1/2", (2 Stage or Mod.)	11-0255					1	1
Not Shown	Main Gas Valve Actuator, V4055A, (1 Stage)	11-0301					1	1
	Main Gas Valve Actuator, V4055A, (2 Stage)	11-0302					1	1
	Main Gas Valve Actuator, V9055A, (Modulating)	11-0303	1	1	1	1	1	1
Not Shown	Main Gas Pressure Regulator RV81, 1 1/2"	11-0503	1					
	Main Gas Pressure Regulator RV91, 2"	11-0504		1	1	1		
	Main Gas Pressure Regulator RV111, 2 1/2"	11-0505					1	1
18	"A" Valve, 1 1/2"	11-0453	1					
	"A" Valve, 2"	11-0454		1	1	1		
	"A" Valve, 2 1/2"	11-0455					1	1
19	Burner Drawer Side Rail Assy, Left	70-1793	1	1	1	1	1	1
	Burner Drawer Side Rail Assy, Right	70-1794	1	1	1	1	1	1
—	Burner Spacers	70-1795	1					
		70-1796		1				
		70-1797			1			
		70-1798				1		
		70-1799					1	
		70-1800						1
—	Heat Shield	70-1733	1					
		70-1734		1				
		70-1735			1			
		70-1736				1		
		70-1737					1	
		70-1738						1
Not Numbered	End Refractory Panel, Left & Right	05-0050	2	2	2	2	2	2
Not Shown	Center Refractory Panel	05-0051	4	4	6	8	8	10
20	Corner Refractory Panel	05-0052	4					
		05-0053		4				
		05-0054			4			
		05-0055				4		
		05-0056					4	
		05-0057						4
21	Draft Diverter Side Panel, Left & Right	03-1109	2	2	2	2	2	2
22	Draft Diverter Down Draft Baffle	03-1116	1					
		03-1117		1				
		03-1118			1			
		03-1119				1		
		03-1120					1	1
23	Draft Diverter Top Panel Assembly	70-1666	1					
		70-1667		1				
		70-1668			1			
		70-1669				1		
		70-1670					1	
		70-1671						1
24 & 25	Upper Rear & Front Jacket Panel	03-1064	1					
		03-1065		1				
		03-1066			1			
		03-1067				1		
		03-1068					1	
		03-1069						1
26	Upper Jacket End Panel, Left & Right	03-1070	2	2	2	2	2	2
27	Upper Rear Corner Jacket Trim Panel, Left	03-1084	1	1	1	1	1	1
	Upper Rear Corner Jacket Trim Panel, Right	03-1085	1	1	1	1	1	1
28	Upper Front Corner Jacket Trim Panel, Left	03-1086	1	1	1	1	1	1
	Upper Front Corner Jacket Trim Panel, Right	03-1087	1	1	1	1	1	1
29	Top Jacket Panel	03-1051	1					
		03-1052		1				
		03-1053			1			
		03-1054				1		
		03-1055					1	
		03-1056						1
30	Top Jacket Channel, Left & Right	03-1063	2	2	2	2	2	2
Not Shown	Pilot, Natural Gas, Q348	10-0103	1	1			1	1
	Pilot, LP Gas, Q348	70-0478	1	1			1	1

Ref #	Name Of Part	Part #	2000	2400	2800	3200	3600	4000
Not Shown	Pilot, Natural Gas, Q179C (*IRI Only)	10-0103	1*	1*	1	2	1	1
	Pilot, LP Gas, Q179C (*IRI Only)	70-0478	1*	1*	1	2	1	1
Not Shown	Pilot Orifice, Natural Gas	10-0005	1	1	1	2	2	2
	Pilot Orifice, LP Gas	10-0004	1	1	1	2	2	2
Not Shown	Pilot Valve, 24 V	11-0017	1	1	1	1	1	1
Not Shown	Pilot Regulator, RV12LT	11-0041	1	1	1	1	1	1
Not Shown	Manual Pilot Valve	11-0031	1	1	1	1	1	1
Not Shown	Ignition Module, S8610M	16-0054	1	1			1	1
	Ignition Module, RM7890A (*IRI Only)	16-0001	1*	1*	1	1	1	1
Not Shown	Transformer, 40 VA	15-0002	1	1	1	1	1	1
Not Shown	High Limit, L4008E (US only)	14-0104	1	1	1	1	1	1
	High Limit, GIP 9869 (CAN only)	14-0117	1	1	1	1	1	1
	High Limit, L4008E-1313 (Water Heaters)	14-0105	1	1	1	1	1	1
	High Limit, L4008E-1040 (Boilers)	14-0104	1	1	1	1	1	1
	High Limit, L4008A-1445 (Water Heaters)	14-0103	1	1	1	1	1	1
	High Limit, L4008A-1007 (Boilers)	14-0102	1	1	1	1	1	1
Not Shown	Operator, L4008A (US only)	14-0102	1	1	1	1	1	1
	Operator, GIP 9868 (CAN only)	14-0116	1	1	1	1	1	1
	Operator, L4008A-1007 (Boilers)	14-0102		1	1	1	1	1
	Operator, L6008A-1242 (Water Heaters)	14-0106		1	1	1	1	1
	Operator, L4008A-1445 (Water Heaters)	14-0103		1	1	1	1	1
	Operator, L6008G1009 (2 Stage)	14-0107		1	1	1	1	1
	Operator, T991E-1018 (Modulating) Boilers	14-0108		1	1	1	1	1
	Operator, T991E-1034 (Modulating) Water Heaters	14-0110		1	1	1	1	1
	Operator, T6031A-1052 (Pool Heaters)	14-0003		1	1	1	1	1
Not Shown	Orifice, Blank	10-0011	8	10	12	14	16	18
	Orifice, Natural Gas, # 17	10-0014	8	10	12	14	16	18
	Orifice, Nat Gas, # 18 (2000-4500 ft)	10-0015	8	10	12	14	16	18
	Orifice, LP Gas, # 39	10-0026	8	10	12	14	16	18
	Orifice, LP Gas, # 40 (2000-4500 ft)	10-0027	8	10	12	14	16	18
Not Shown	Pressure Relief Valve 50# 1" x 1 1/4"	13-0002	1					
	Pressure Relief Valve 50# 1 1/4" x 1 1/4"	13-0026		1	1	1	1	1
	Pressure Relief Valve 125# 3/4" x 3/4"	13-0009	1	1				
	Pressure Relief Valve 125# 3/4" X 1"	13-0003			1			
	Pressure Relief Valve 125# 1" x 1"	13-0053				1	1	1
Not Shown	Pressure Gauge	13-0301	1	1	1	1	1	1
Not Shown	Thermometer w/ Well	13-0320	1	1	1	1	1	1
Not Shown	Flow Switch	14-0201	1	1	1	1	1	1
Not Shown	Natural to LP Conversion Kit	21-0107	1					
		21-0108		1				
		21-0109			1			
		21-0110				1		
		21-0111					1	
		21-0112						1
Not Shown	Conversion Kit Natural to LP Gas	21-0113	1					
		21-0114		1				
		21-0115			1			
		21-0116				1		
		21-0117					1	
		21-0118						1
Not Shown	Conversion Kit LP to Nat Gas (2000-4500 ft)	21-0119	1					
		21-0120		1				
		21-0121			1			
		21-0122				1		
		21-0123					1	
		21-0124						1
Not Shown	Conversion Kit Nat to LP Gas (2000-4500 ft)	21-0125	1					
		21-0126		1				
		21-0127			1			
		21-0128				1		
		21-0129					1	
		21-0130						1

TROUBLE SHOOTING FLOW CHART FOR HONEYWELL S8610 CONTROL SYSTEM



TROUBLE SHOOTING

NOTE

Installation and service must be performed by a qualified installer, service agency or the gas supplier. An electrical multi meter and slack tube manometer are required for trouble shooting.

Problem	Cause	Solution
Boiler pounds or knocks	<ul style="list-style-type: none"> • Low or no water flow • Low or no system pressure • Heat exchanger blocked 	<ul style="list-style-type: none"> • Ensure that pump is operating properly - look for voltage through flow switch. • Ensure that all system valves are open. • Ensure that all air has been bled from the system. • Ensure that the maximum temperature rise of 30°F has not been exceeded. • Ensure that water makeup valve is open and functioning. • Remove return header and inspect the heat exchanger tubes.
Relief valve leaks	<ul style="list-style-type: none"> • System pressure too high • Expansion tank is waterlogged • Expansion tank is isolated 	<ul style="list-style-type: none"> • Ensure relief valve is properly sized for the system - never exceed 160 psi. • Ensure expansion tank is properly sized for the system. • Ensure valve between expansion tank and the system is open.
Sooting of heat exchanger	<ul style="list-style-type: none"> • Return water temperature to low • Inadequate combustion air • Rated input has been exceeded • Incorrect fuel type 	<ul style="list-style-type: none"> • Adjust balancing valves for a minimum return water temperature of 110°F (43°C). • Ensure that the make up air supply is adequate per NFPA 54/ ANSI Z223. • Ensure that the vent system is sized properly, is not blocked or restricted and that there is adequate draft present in the breeching. • Ensure that the input rate is correct. • Ensure that the fuel type supplied matches the rating plate.



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